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Romais

(54) **EXTENDABLE AND RETRACTABLE SUPPORT STRUCTURE**

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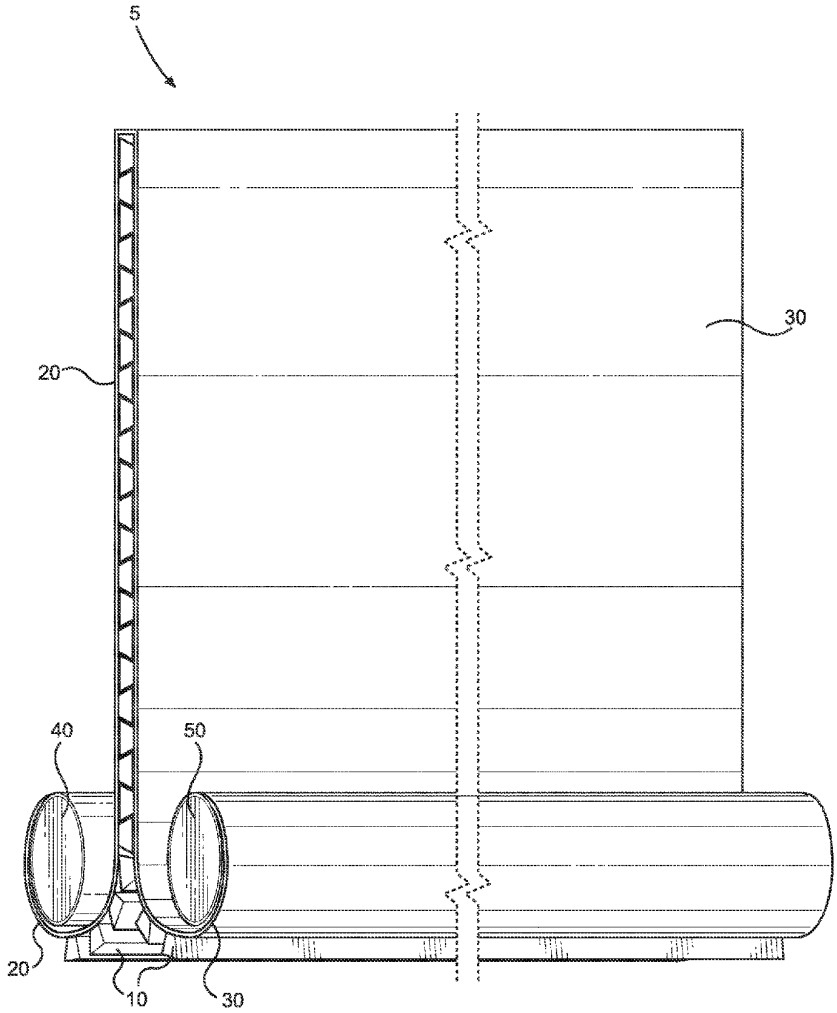
CPC ***E04C 3/005*** (2013.01); ***E04C 2/00*** (2013.01); *E04C 2002/001* (2013.01)

(57) **ABSTRACT**

Extendable and retractable support structure is a support structure that can be extended and retracted. The support structure could be linear, such as a post, stud, rafter, beam, or similar. The support structure could also be two-dimensional, such as a floor, ceiling, wall, platform, deck, or similar. The support structure is formed by two strings of trapezoidal links that weave together or interlock together to form a rigid support structure. Each string of trapezoidal links is a flexible member with a plurality of trapezoidal links attached thereto that are evenly spaced by the overall width of each trapezoidal link. Each string of trapezoidal links is wound or winded onto a roll or a roll core. To extend the support structure, the two rolls rotate to unwind the two strings of trapezoidal links in unison wherein each trapezoidal link from one string interlocks between or weaves between two adjacent trapezoidal links on the other string, and vice versa. To retract the support structure, the two rolls rotate to wind in the two strings of trapezoidal links in unison wherein each trapezoidal link from one string unlocks or unweaves itself from between the two adjacent trapezoidal links on the other string, and vice versa.



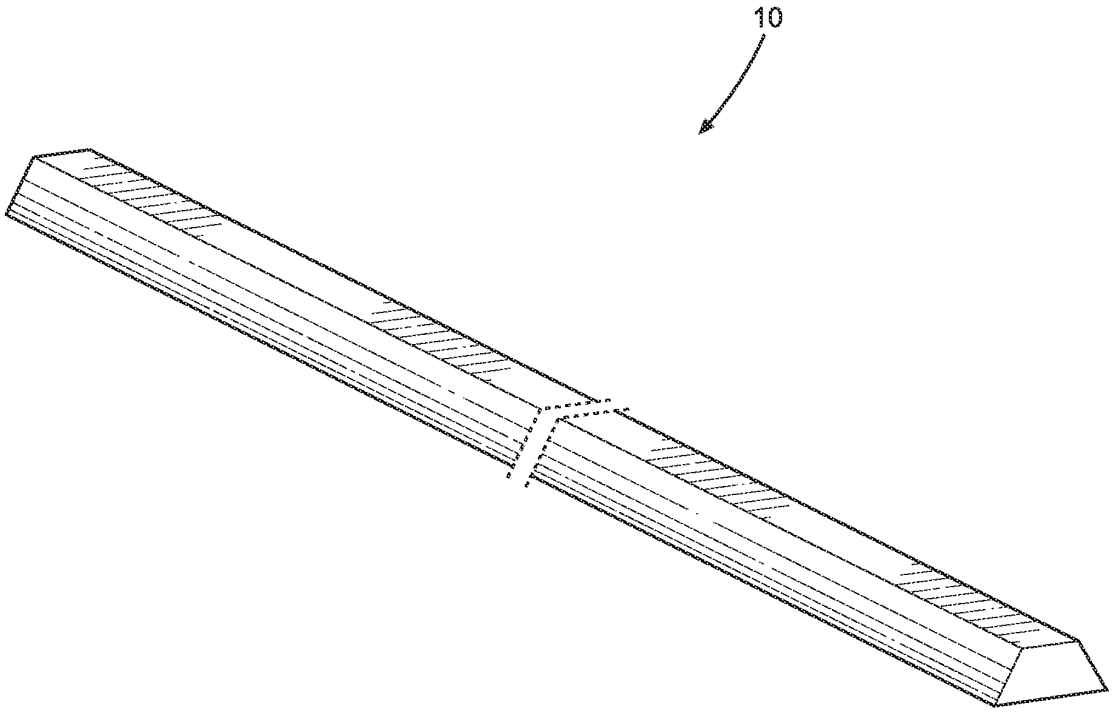


FIG. 1

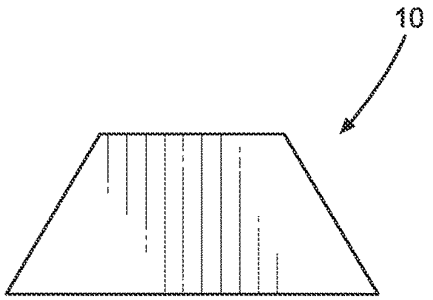


FIG. 2

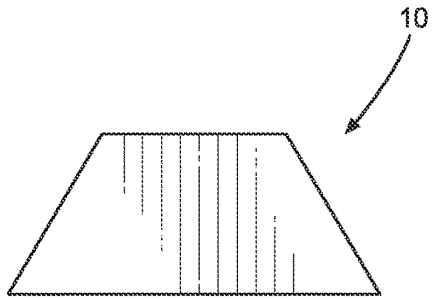


FIG. 3

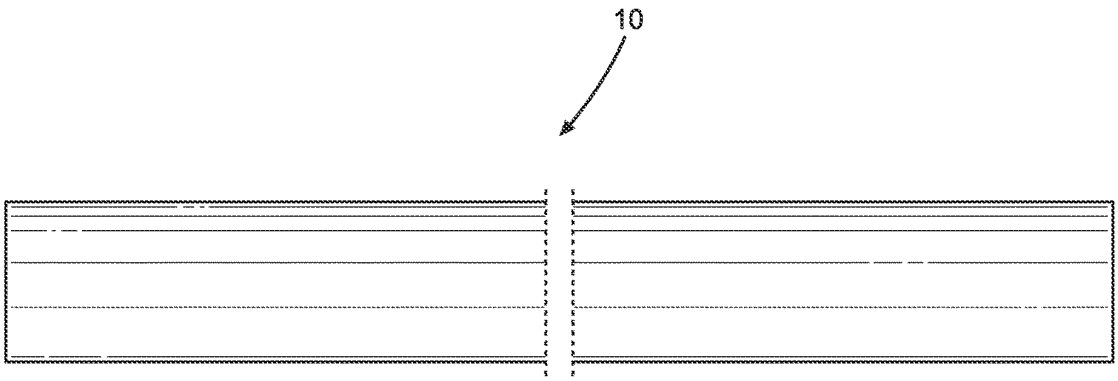


FIG. 4

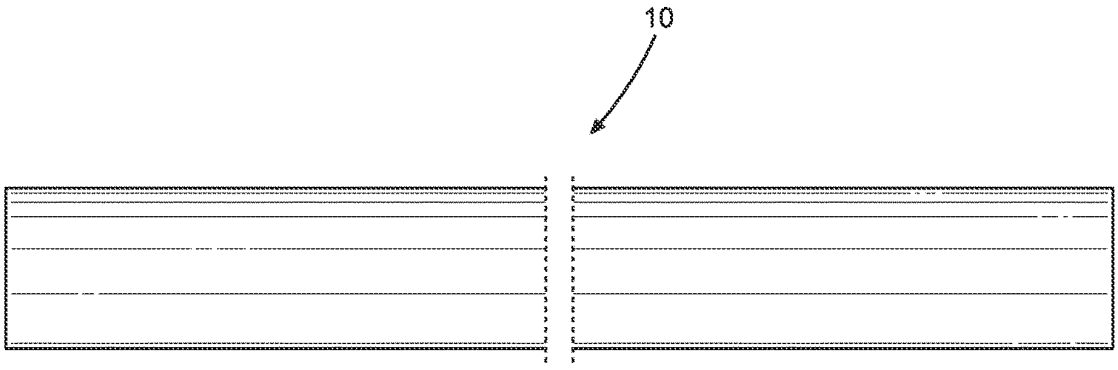
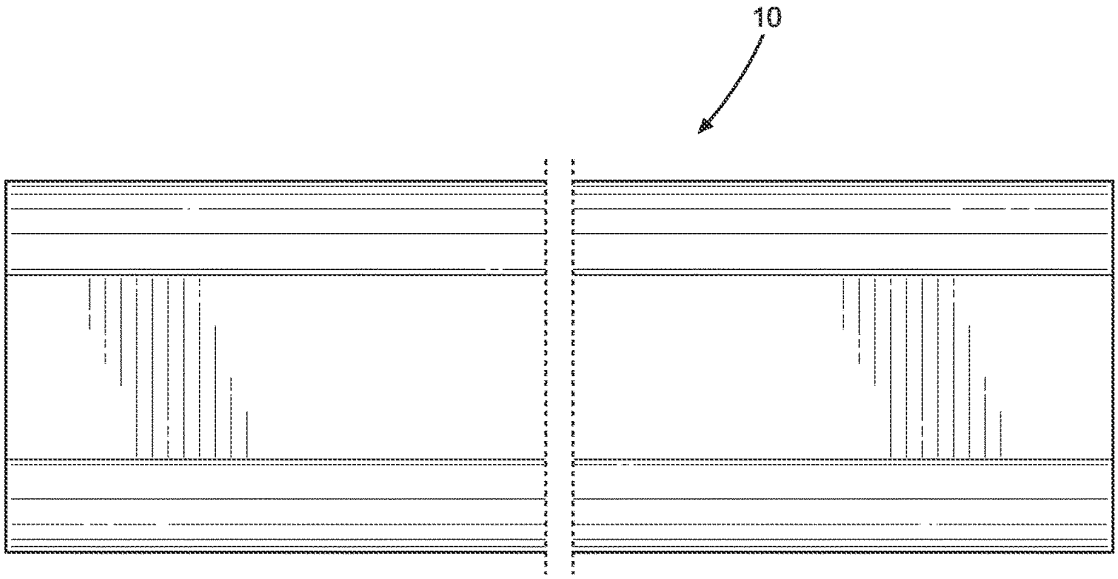


FIG. 5



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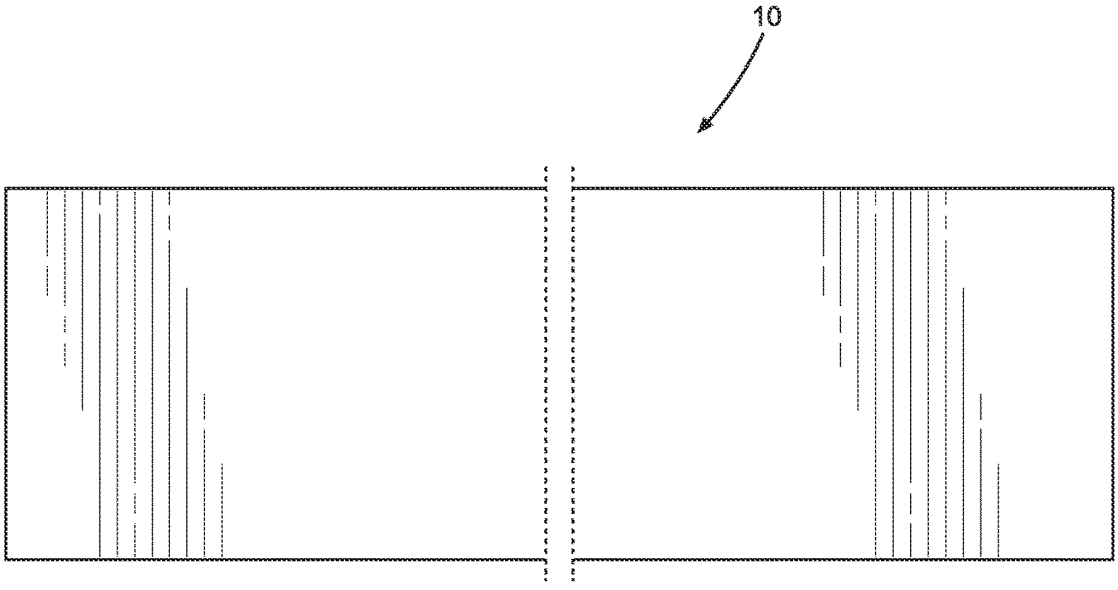

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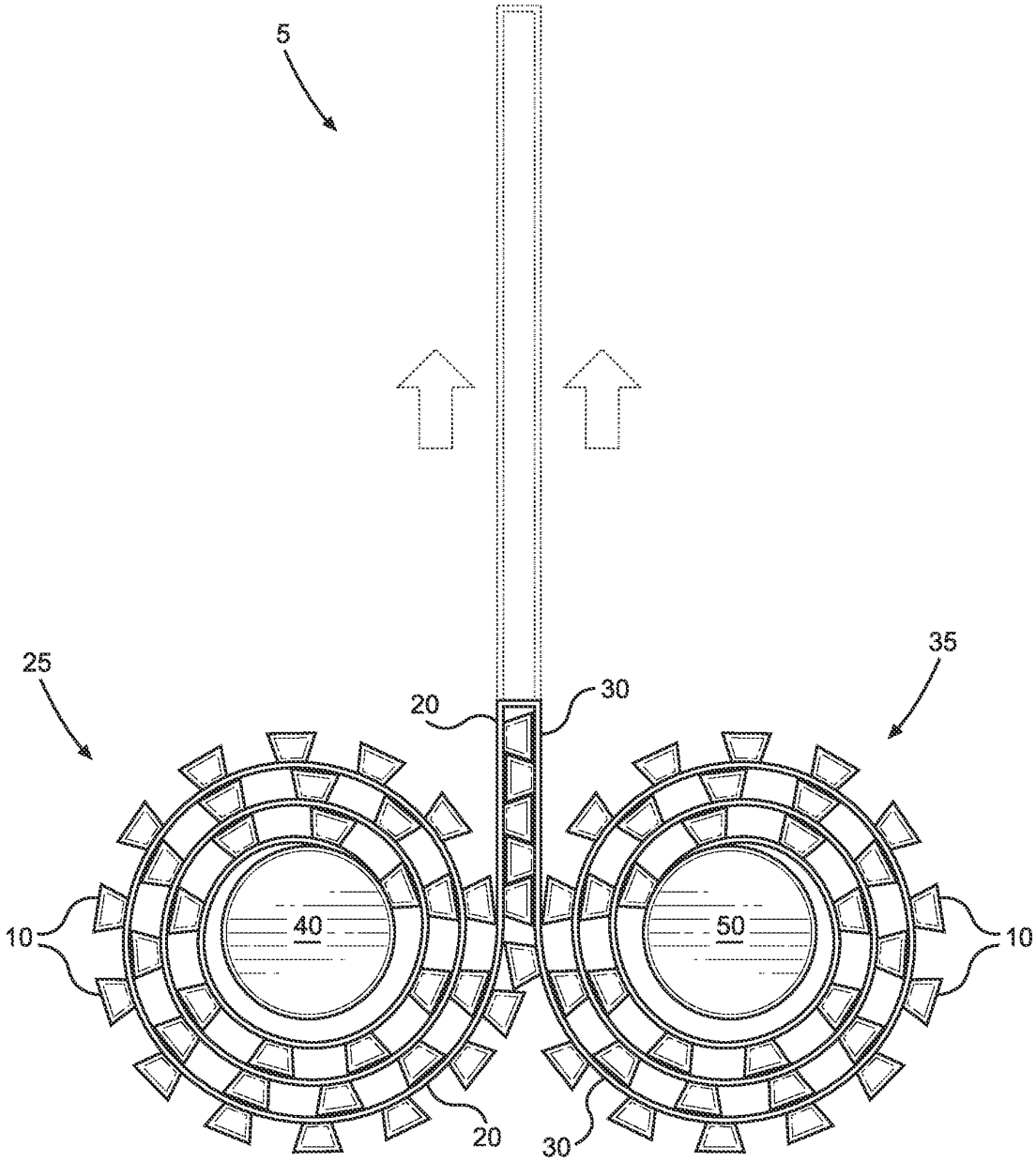
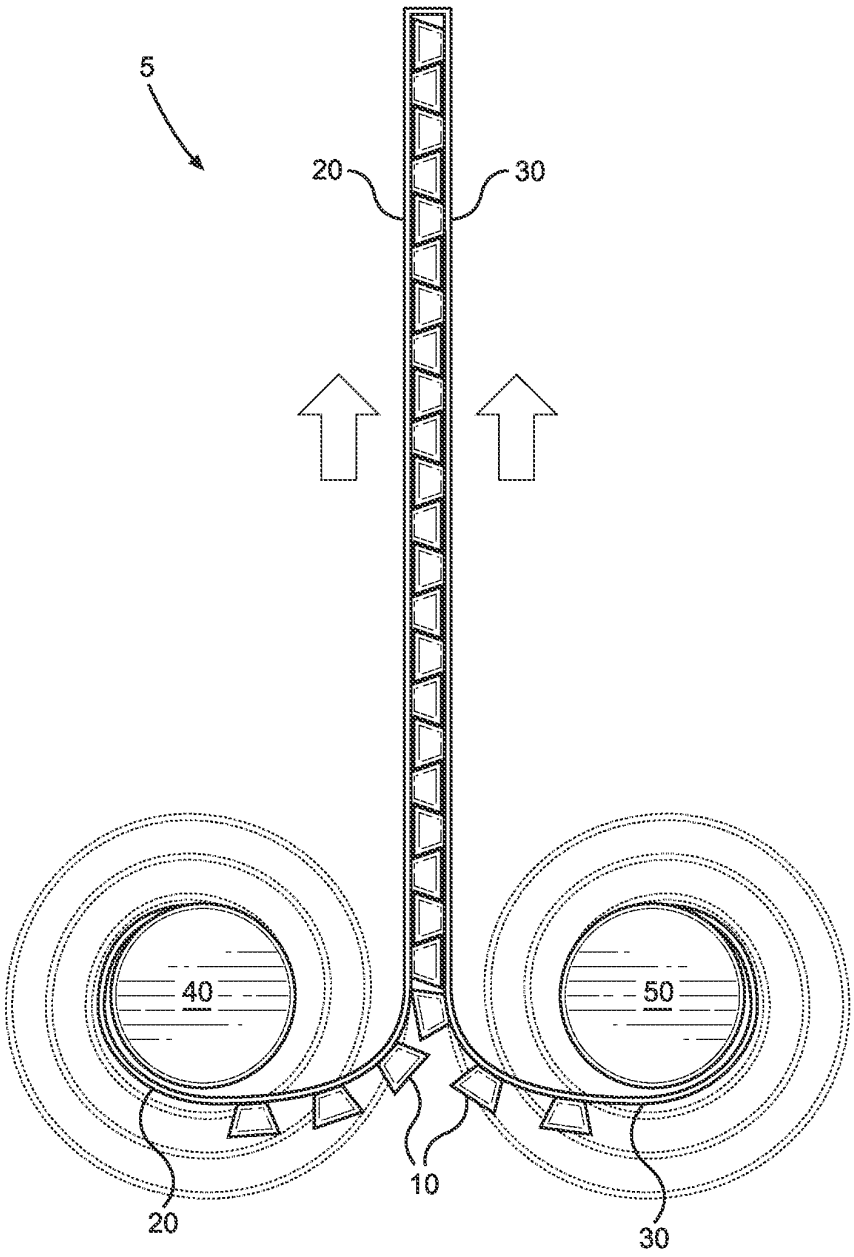


FIG. 8



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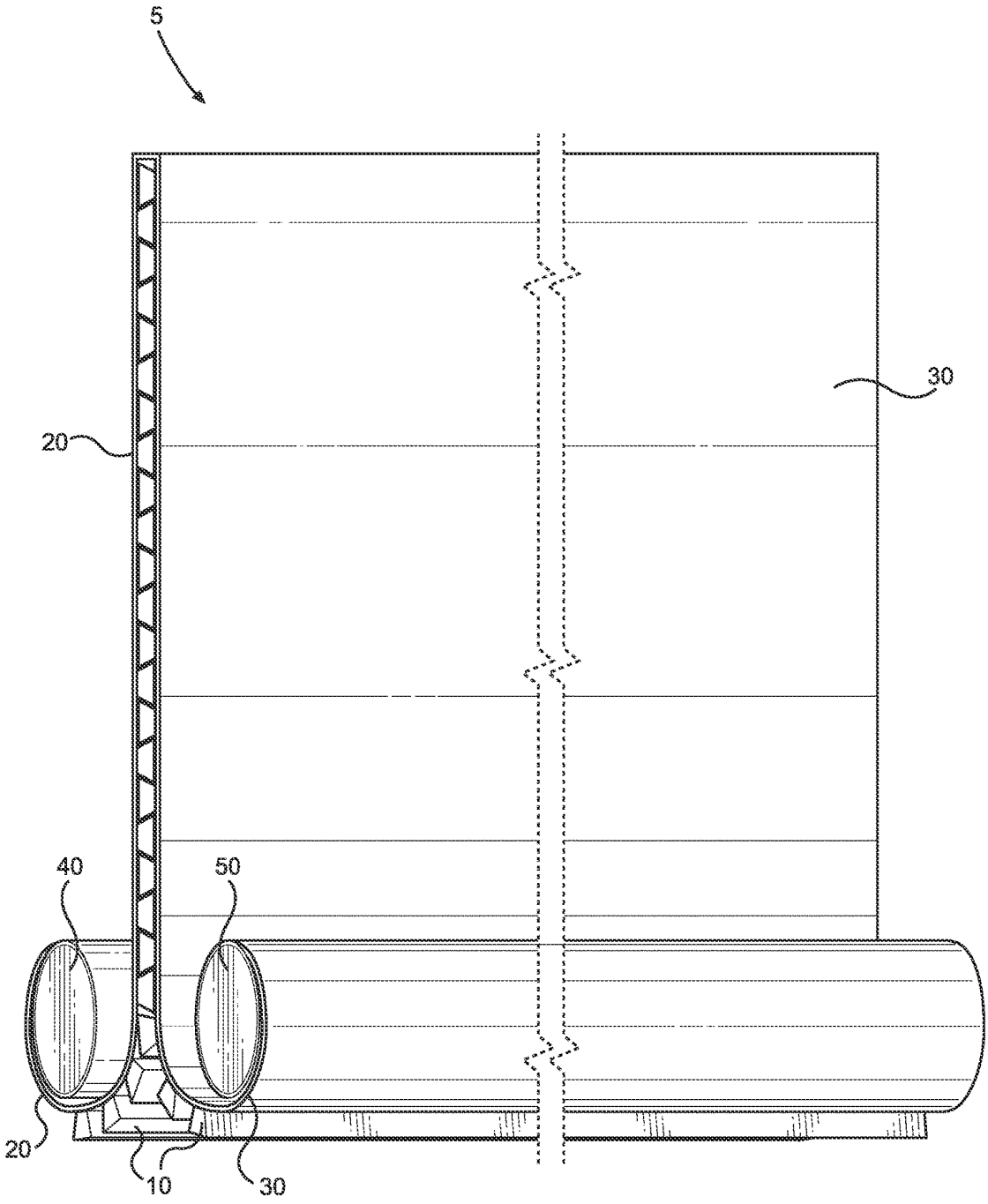

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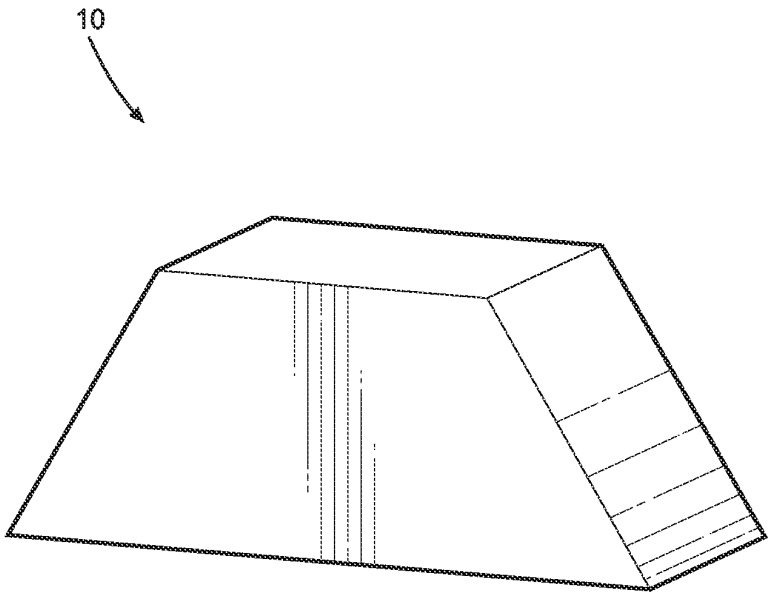

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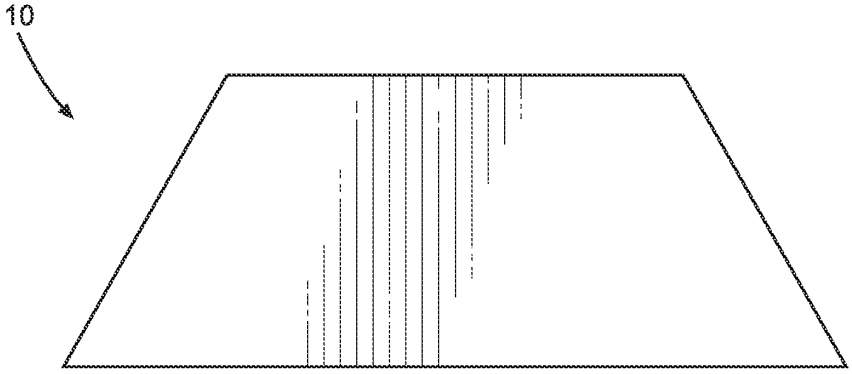

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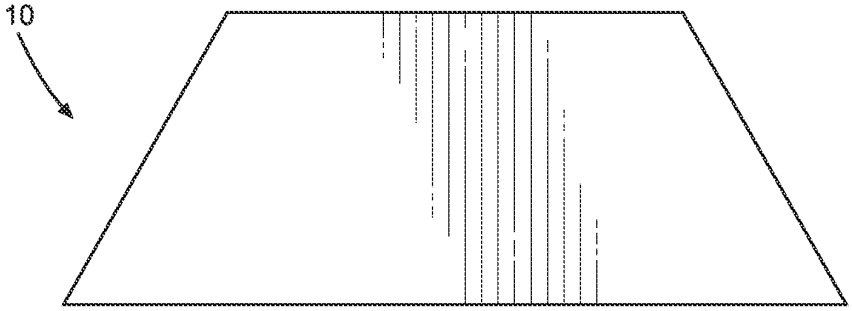

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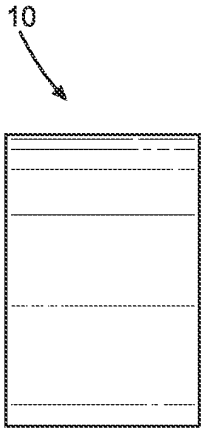

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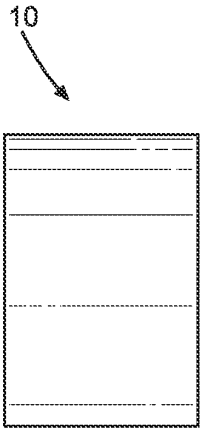

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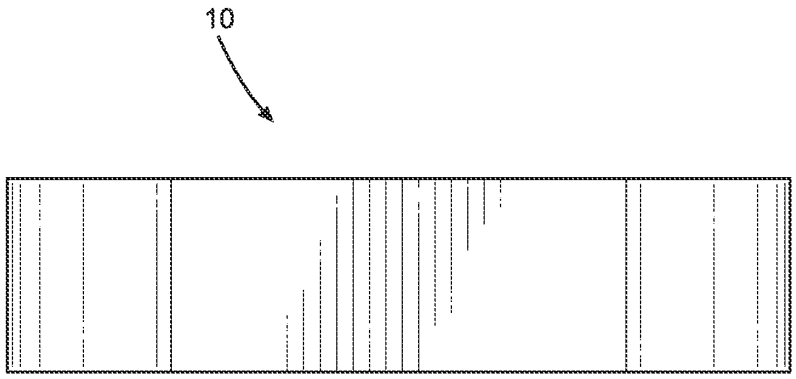

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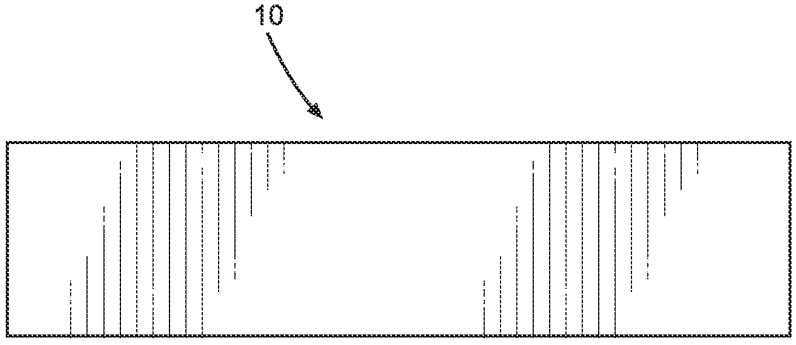
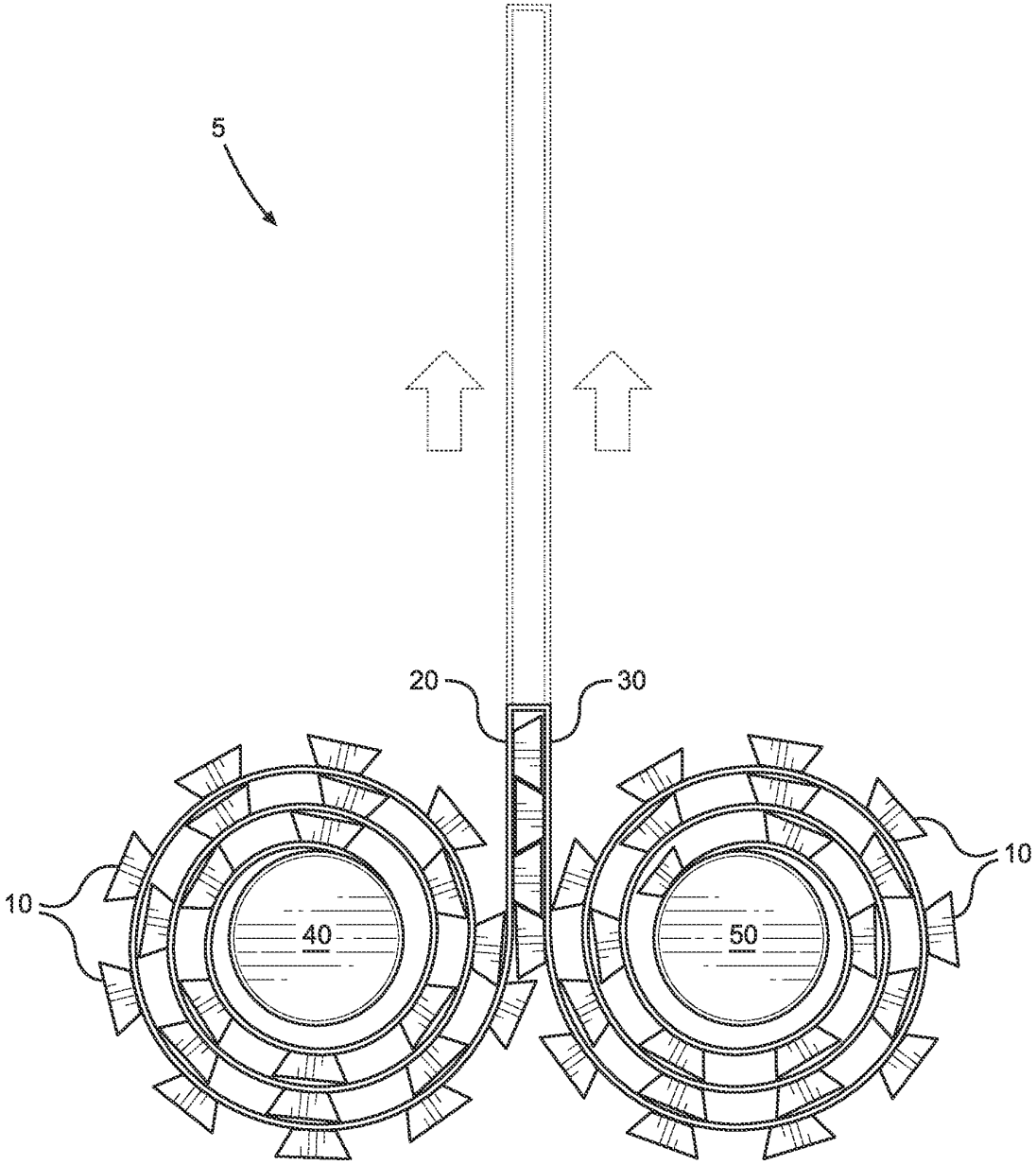


FIG. 17



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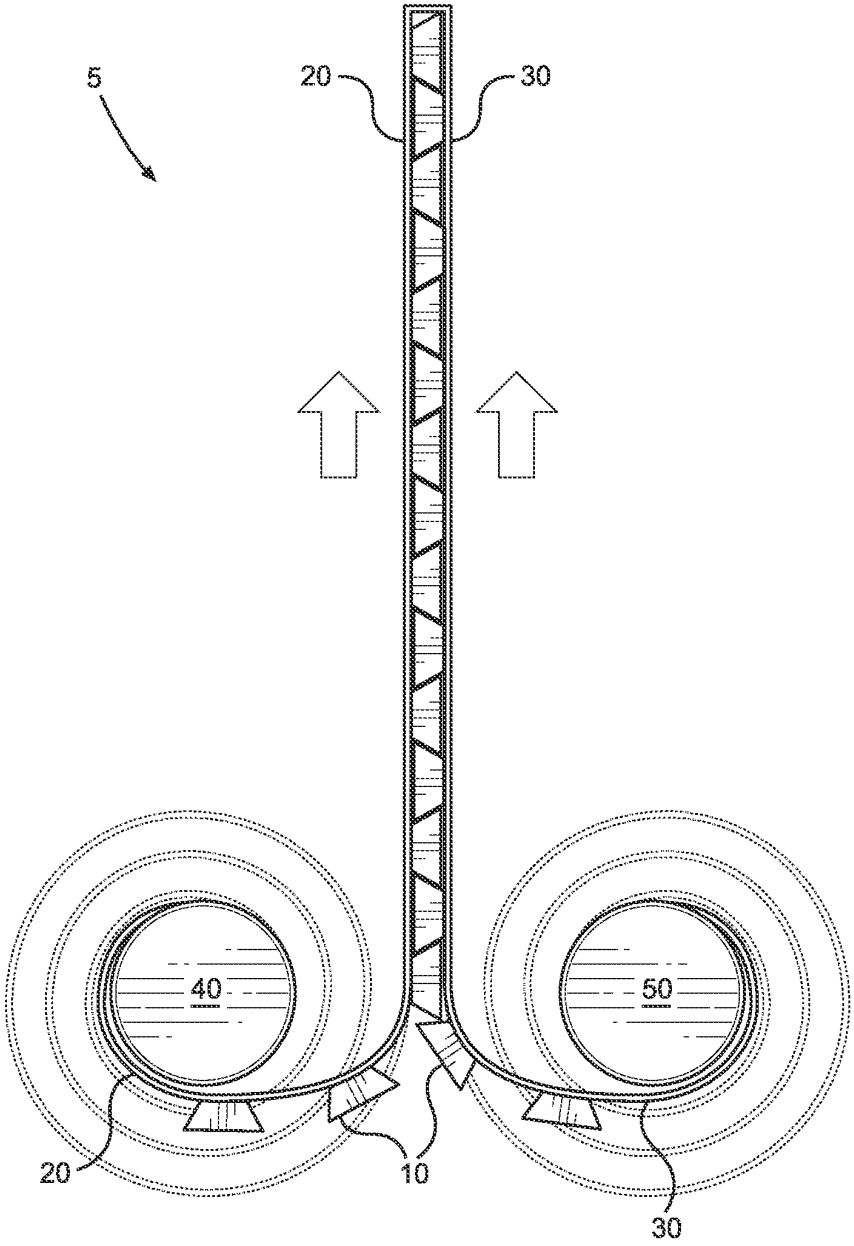

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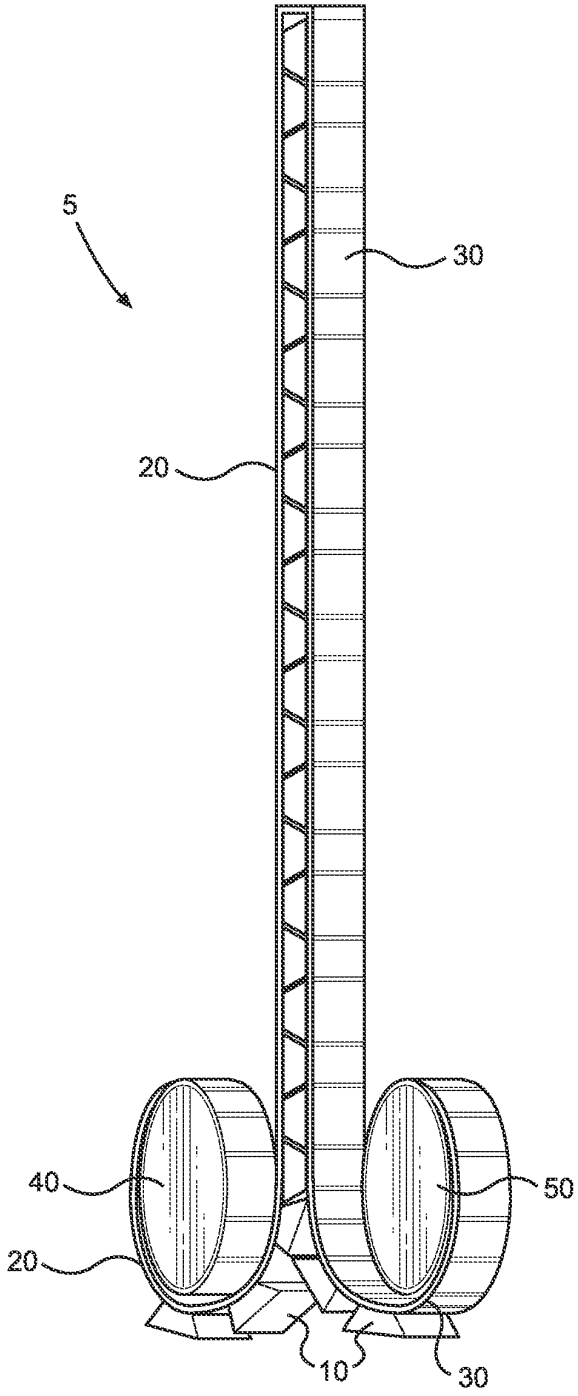

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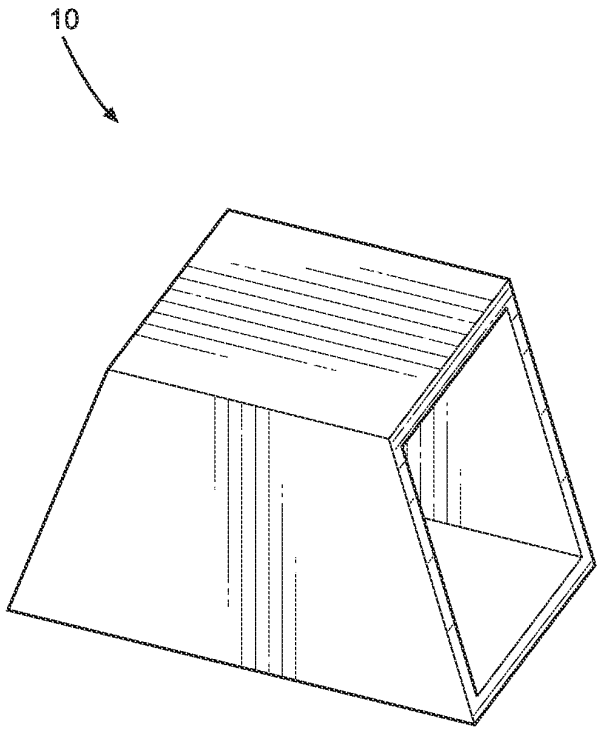

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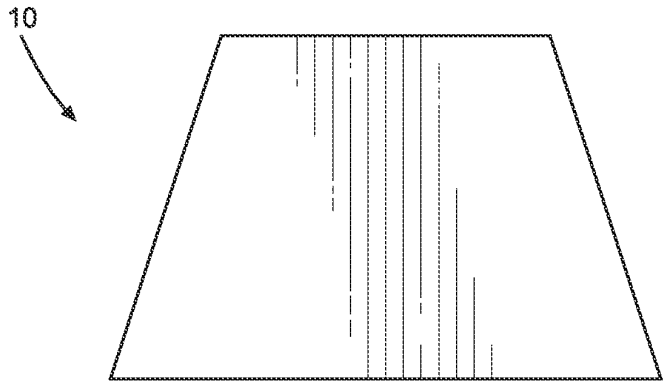

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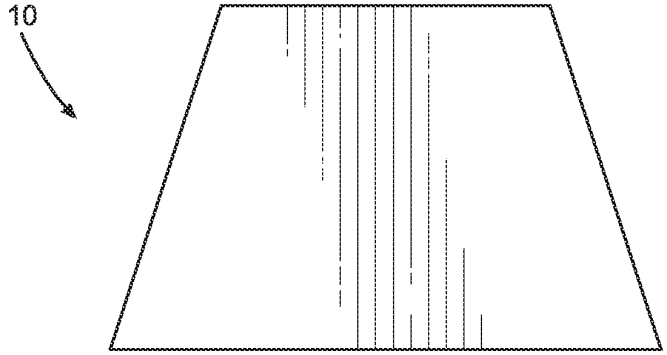

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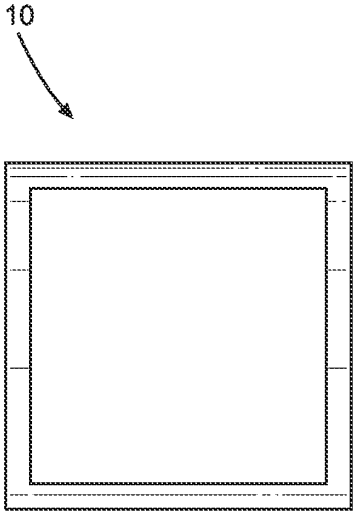

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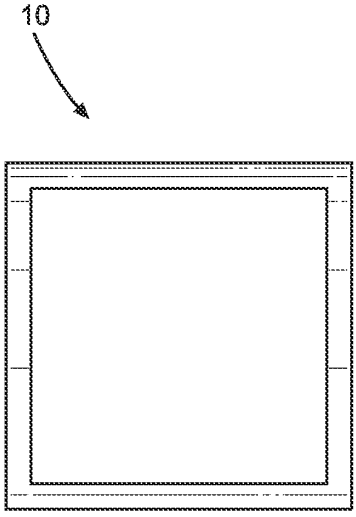

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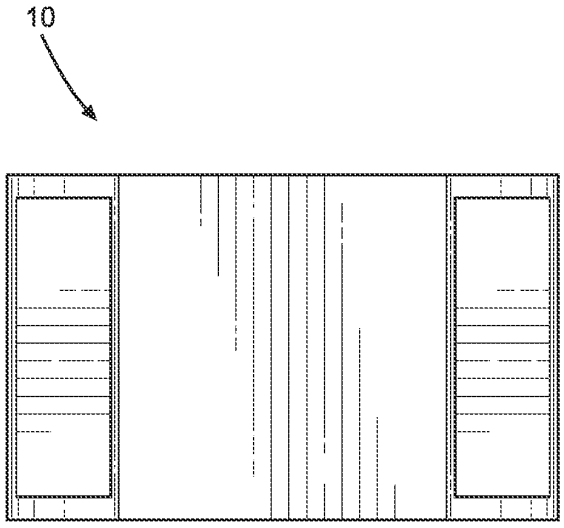

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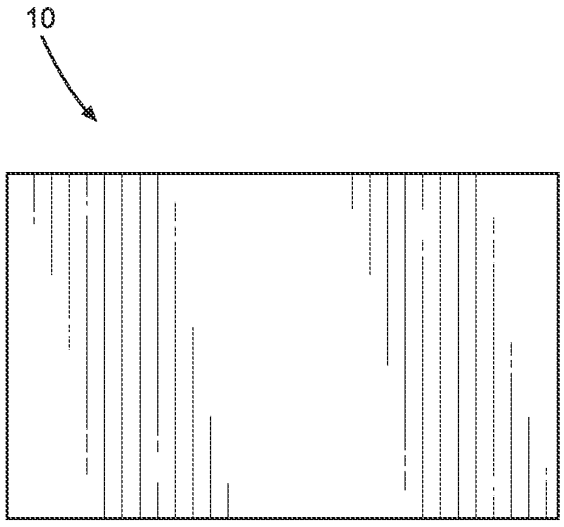

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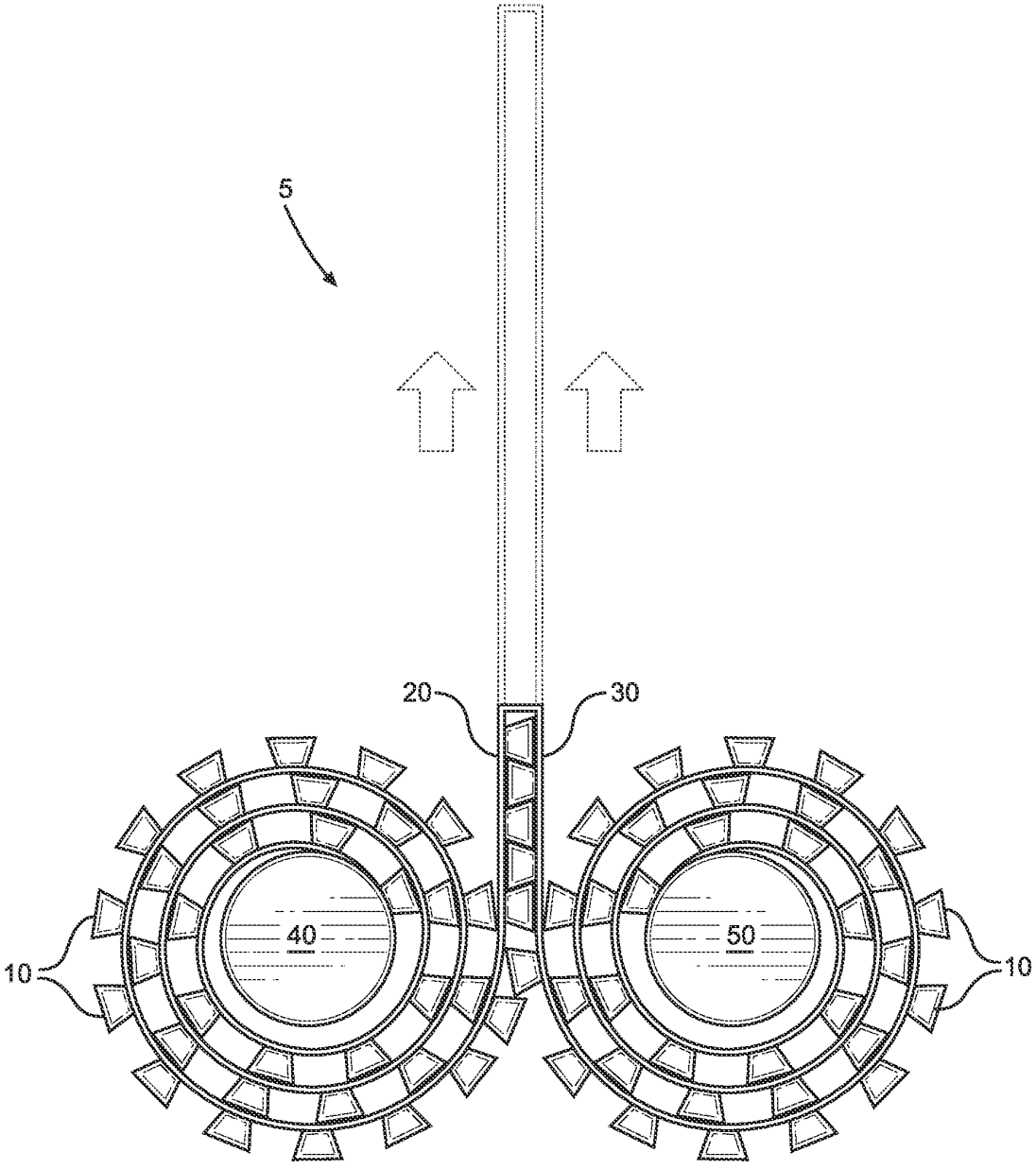

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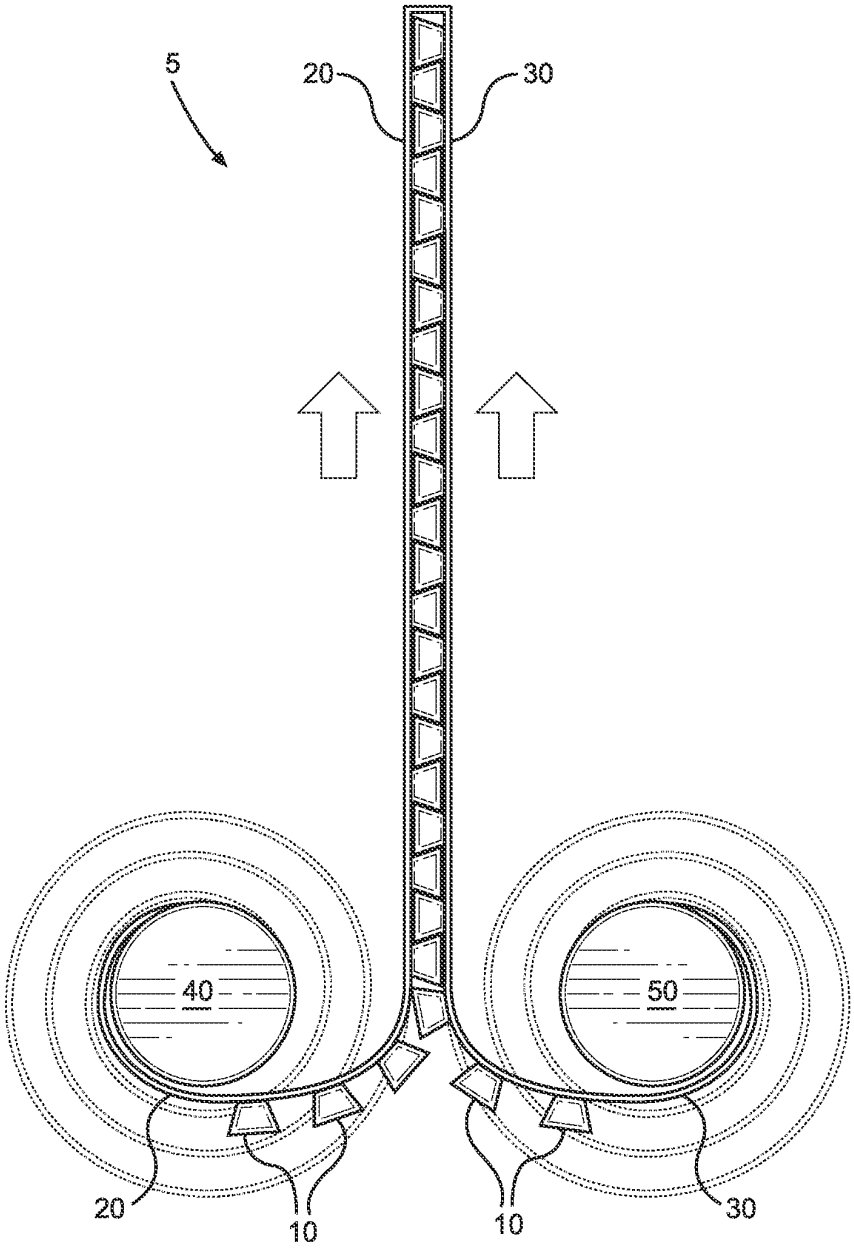

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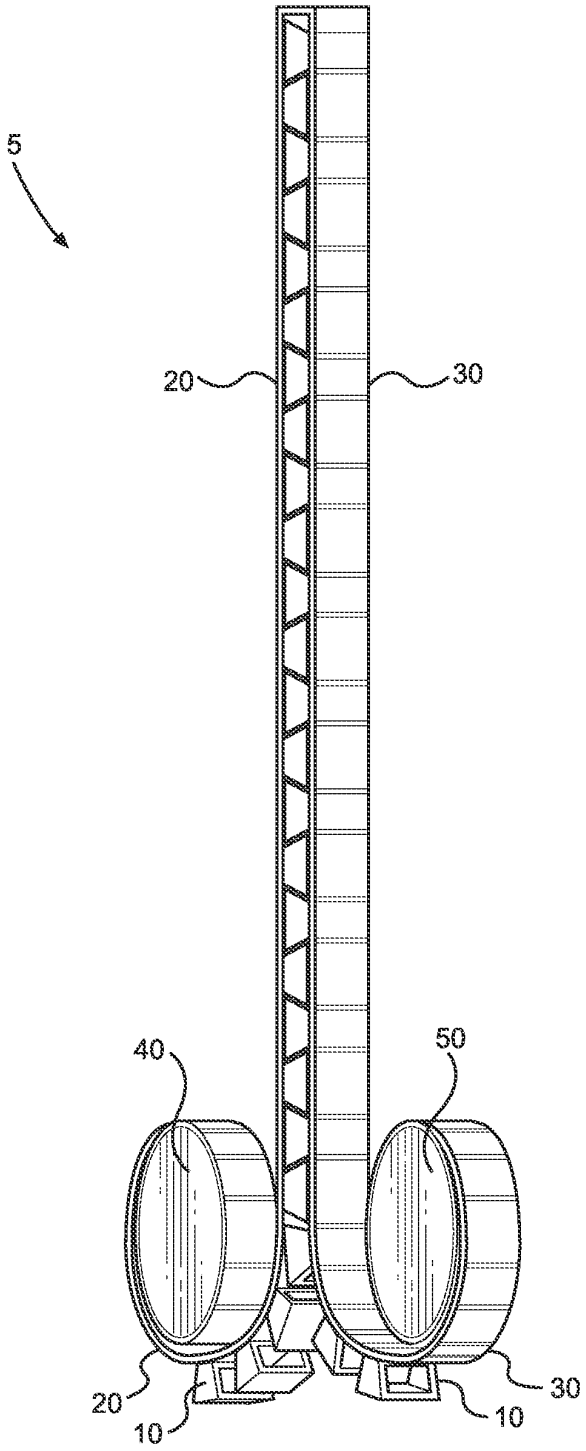
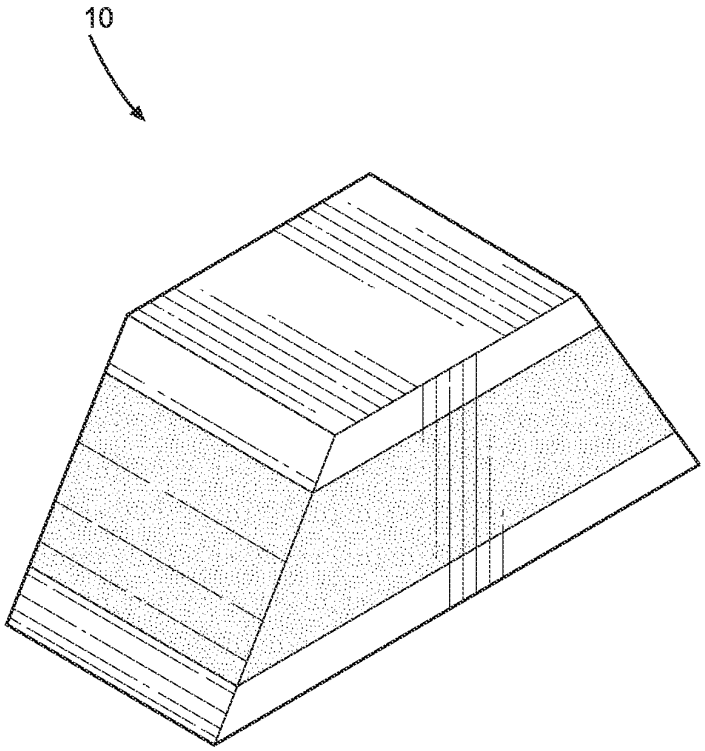


FIG. 30



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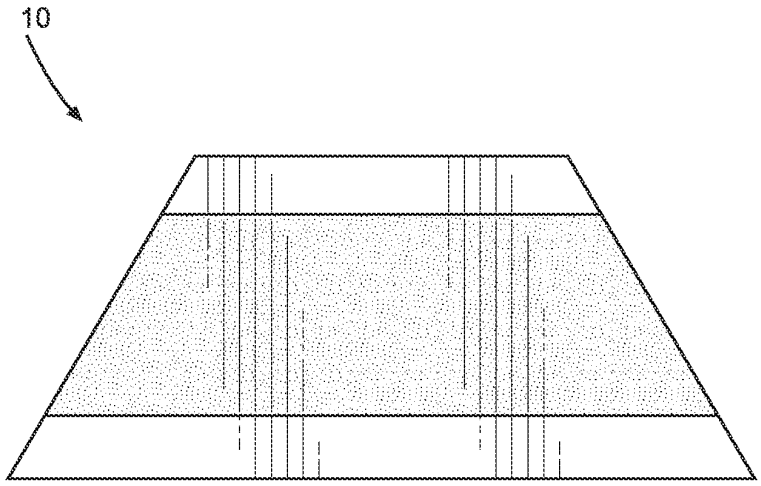

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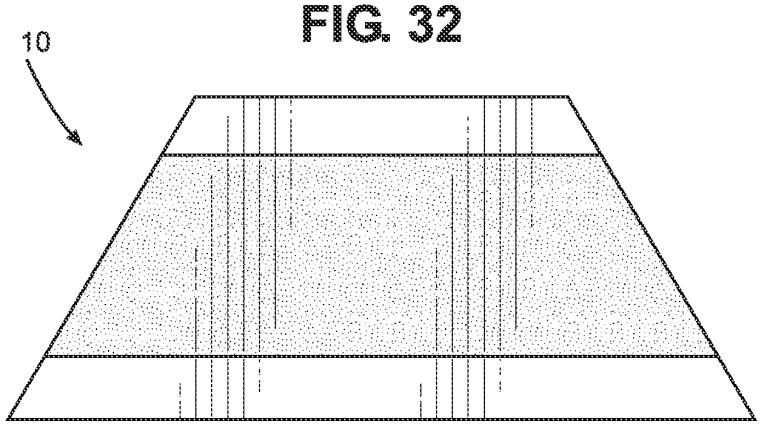
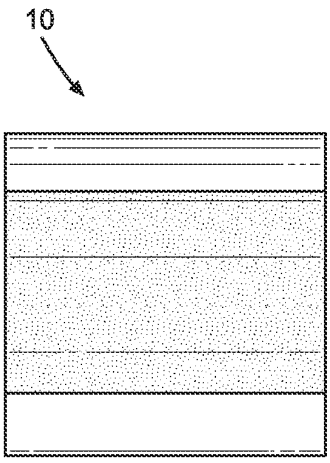


FIG. 33



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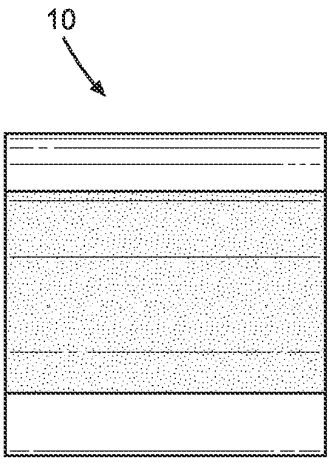

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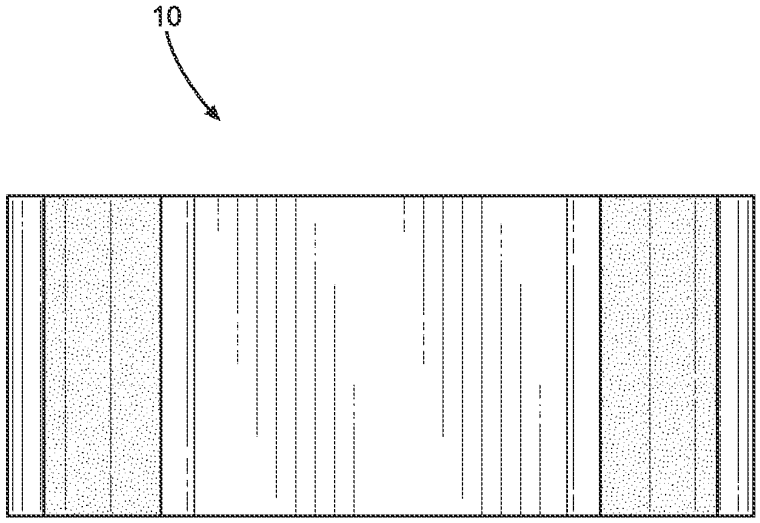
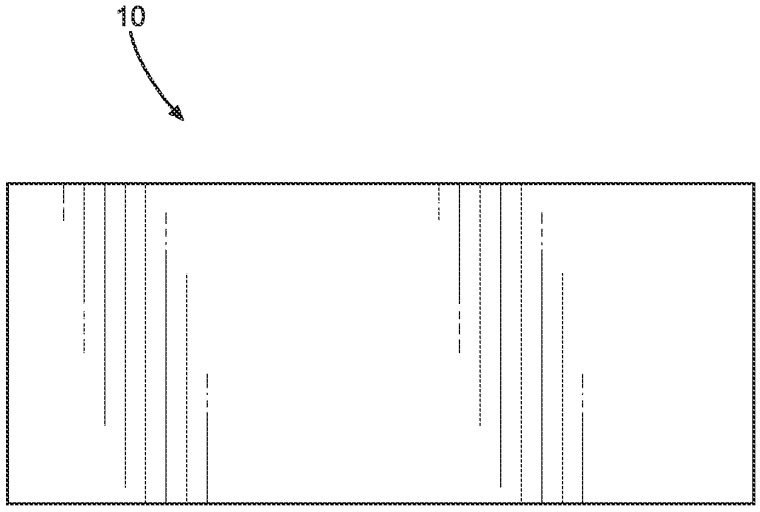


FIG. 36



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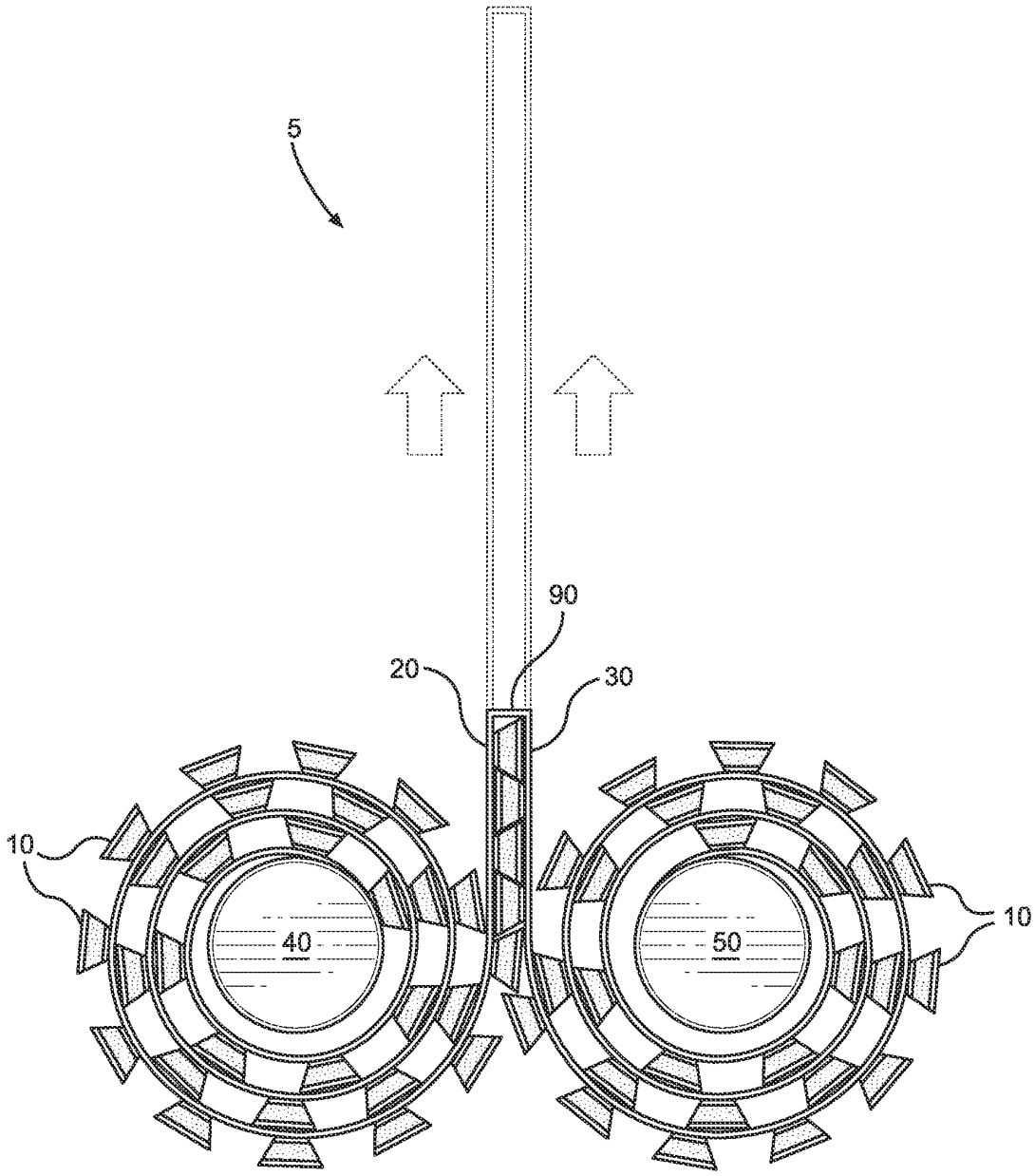

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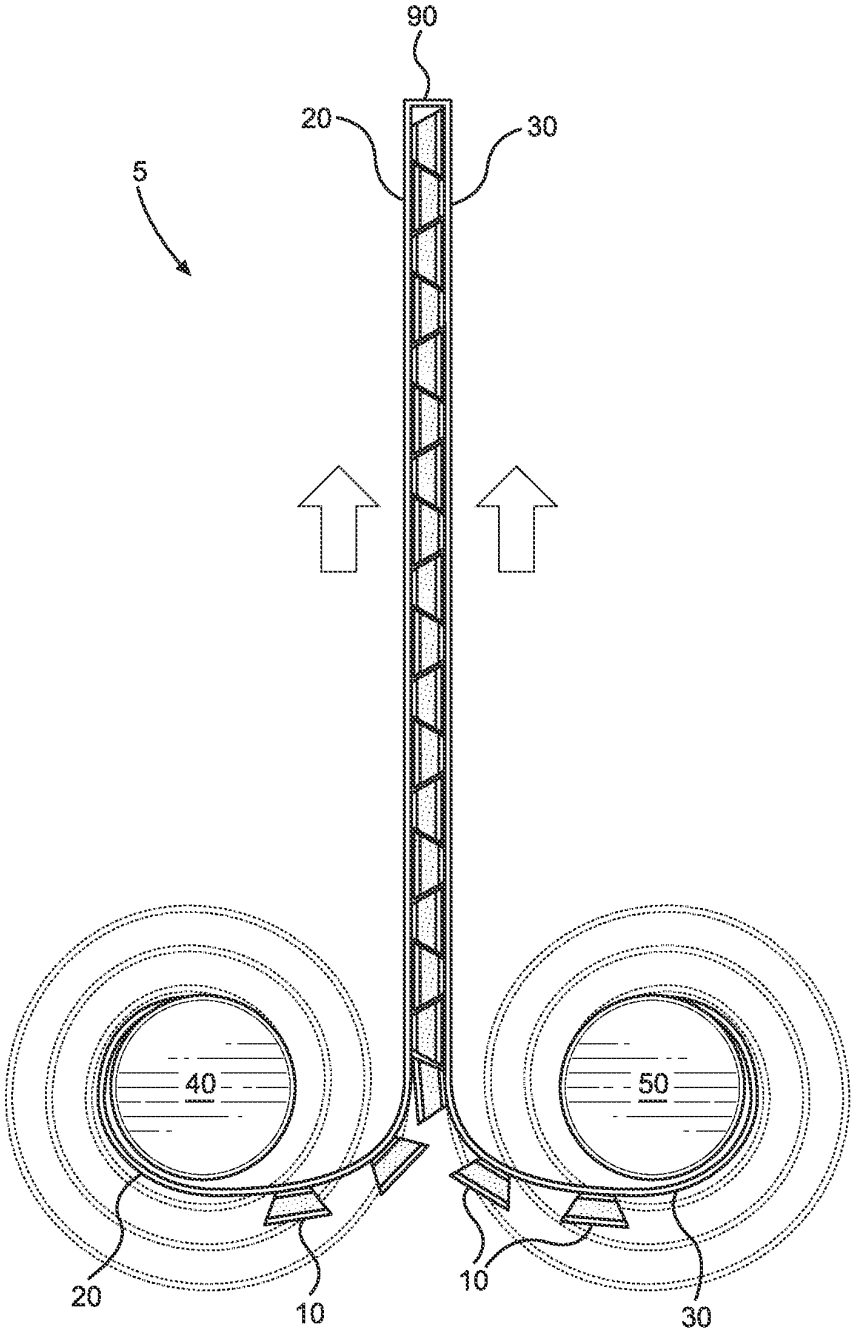


FIG. 39

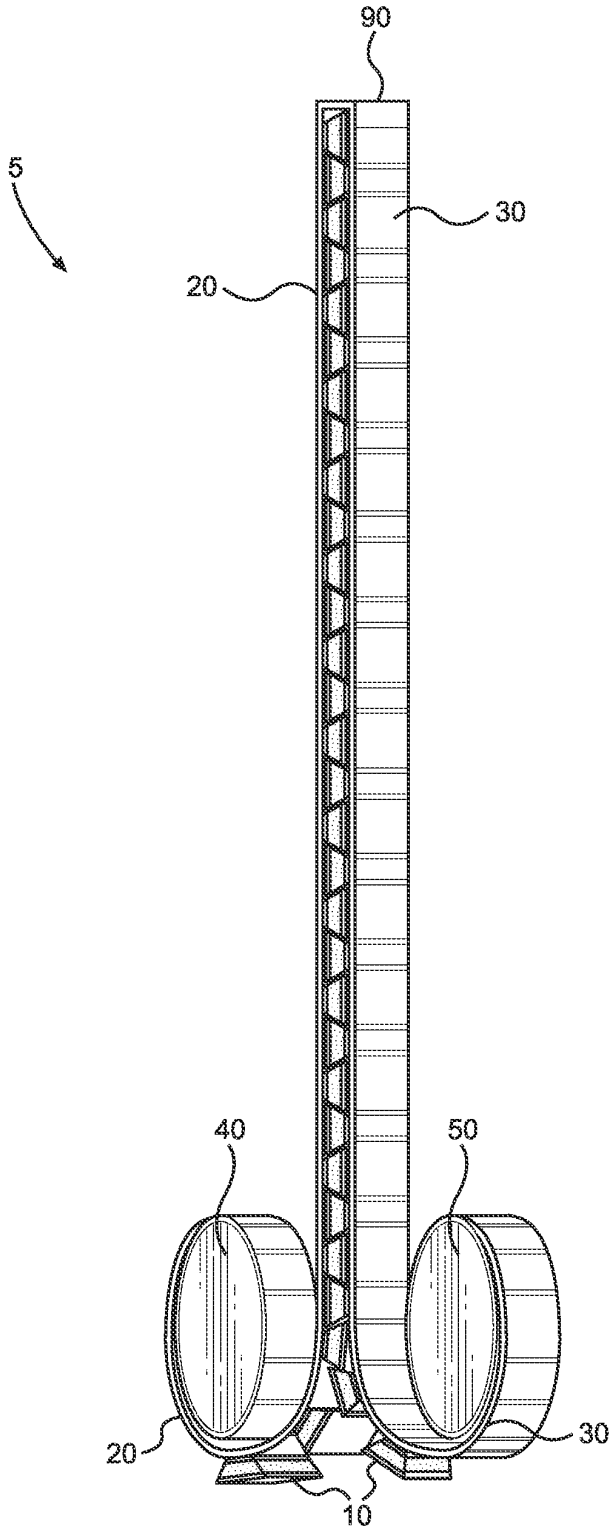


FIG. 40

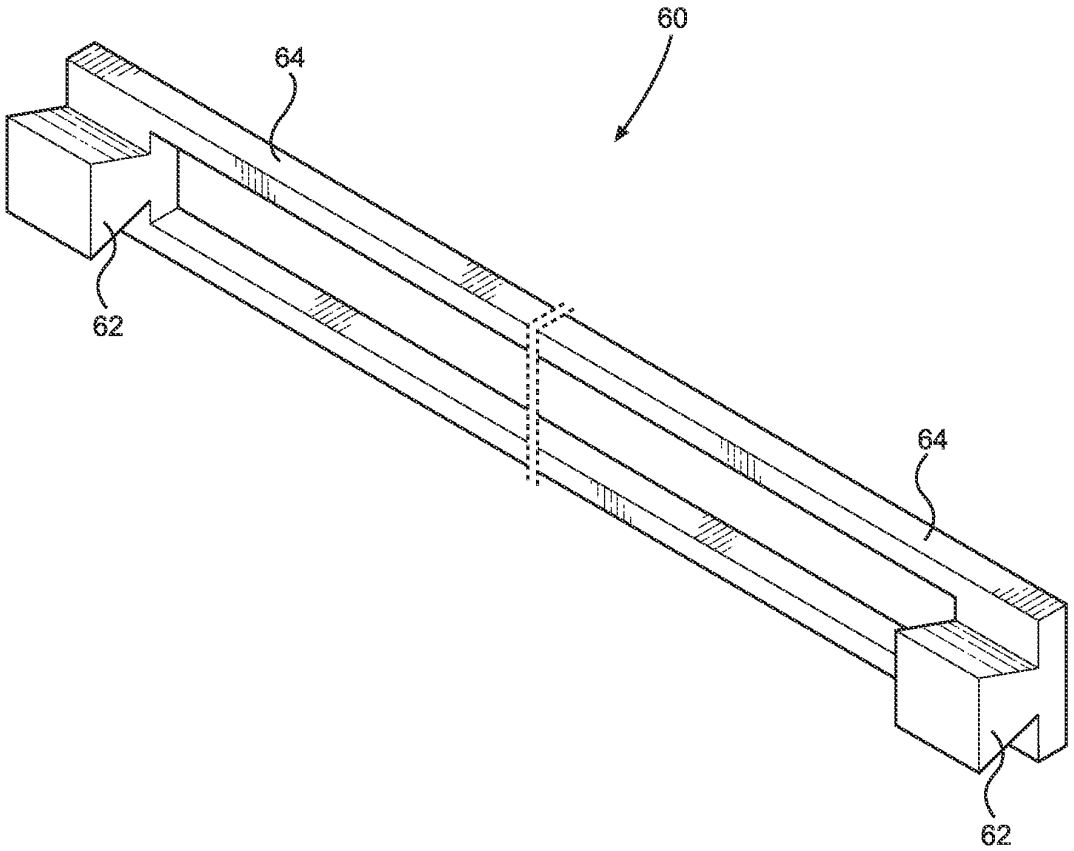
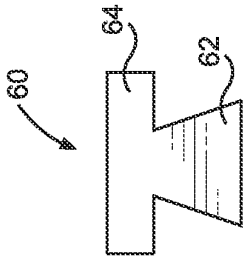


FIG. 41



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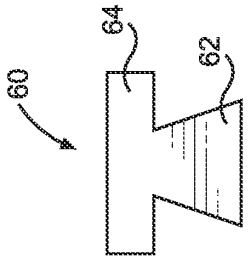

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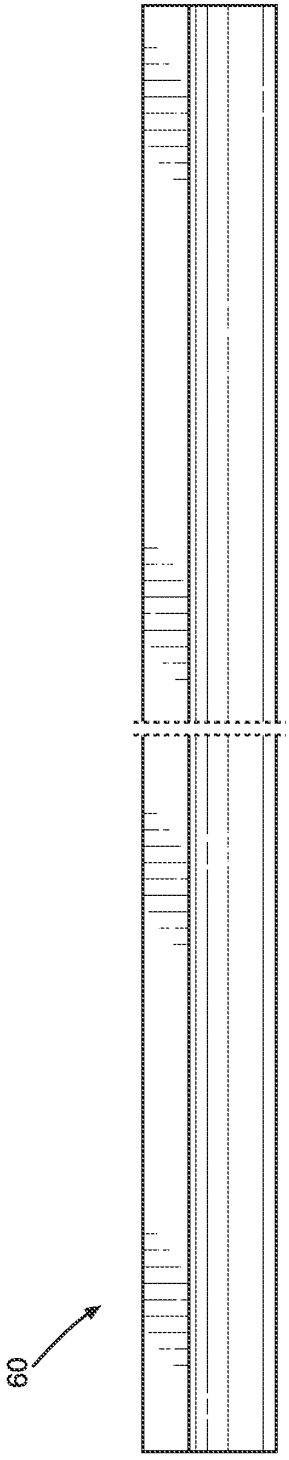

FIG. 44

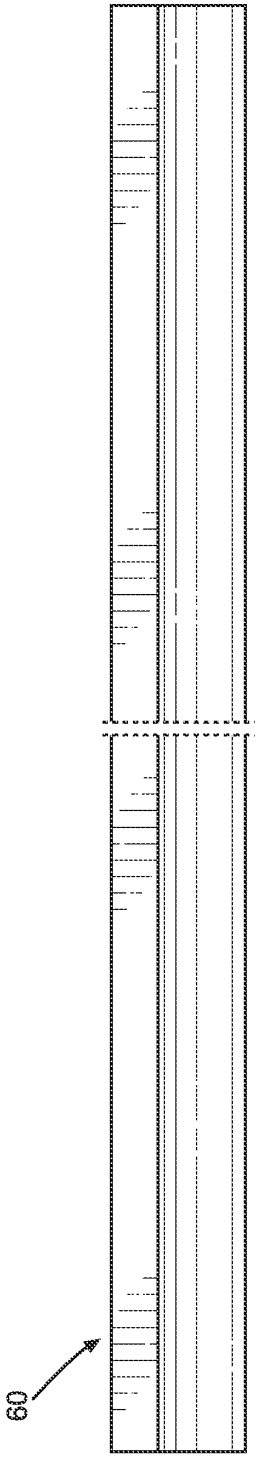

FIG. 45

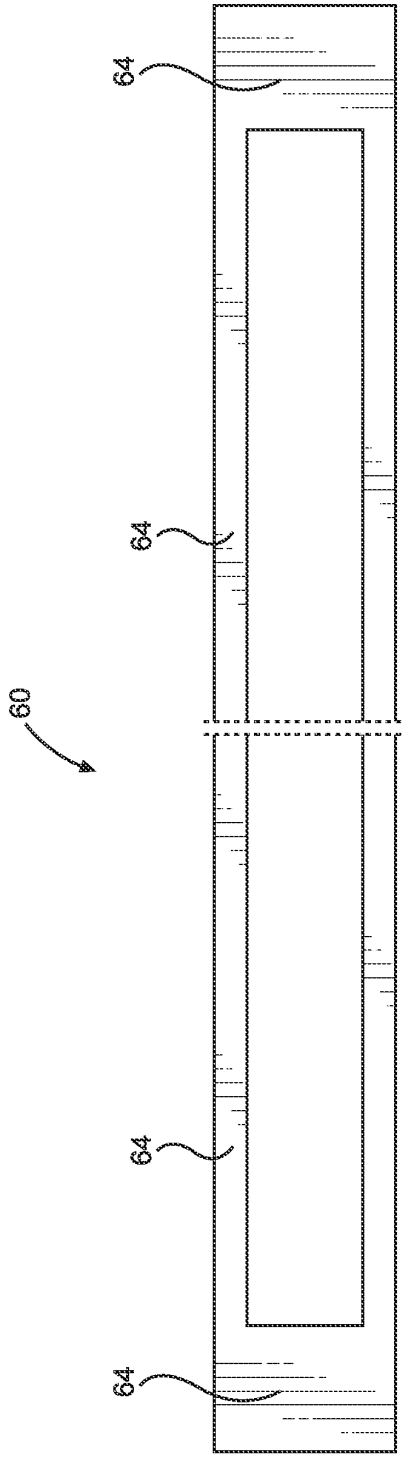

FIG. 46

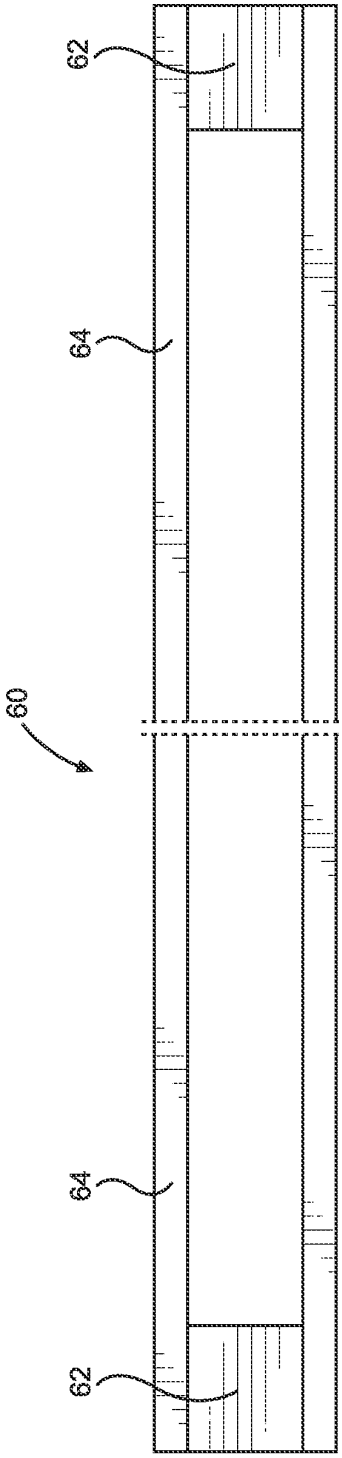

FIG. 47

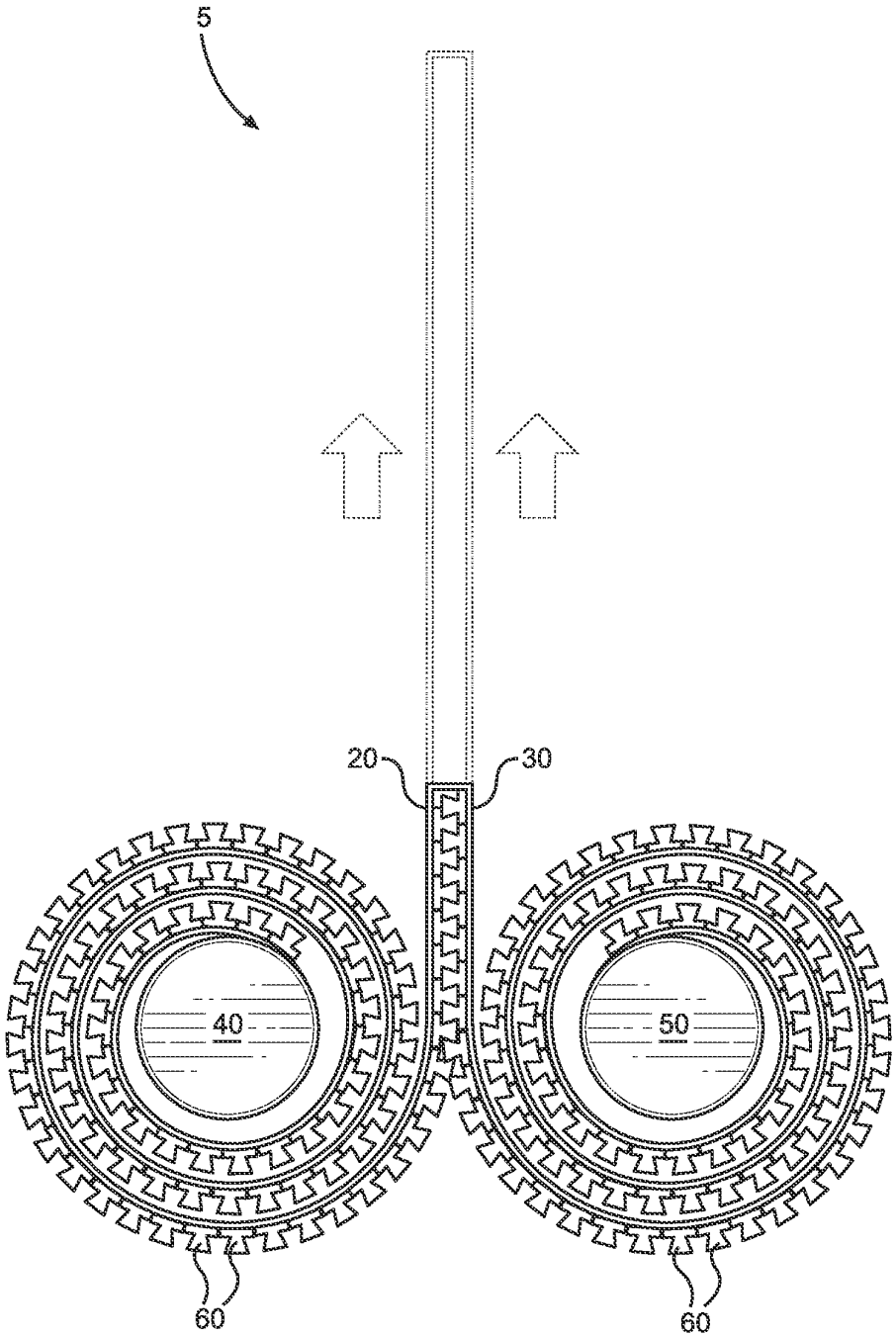

FIG. 48

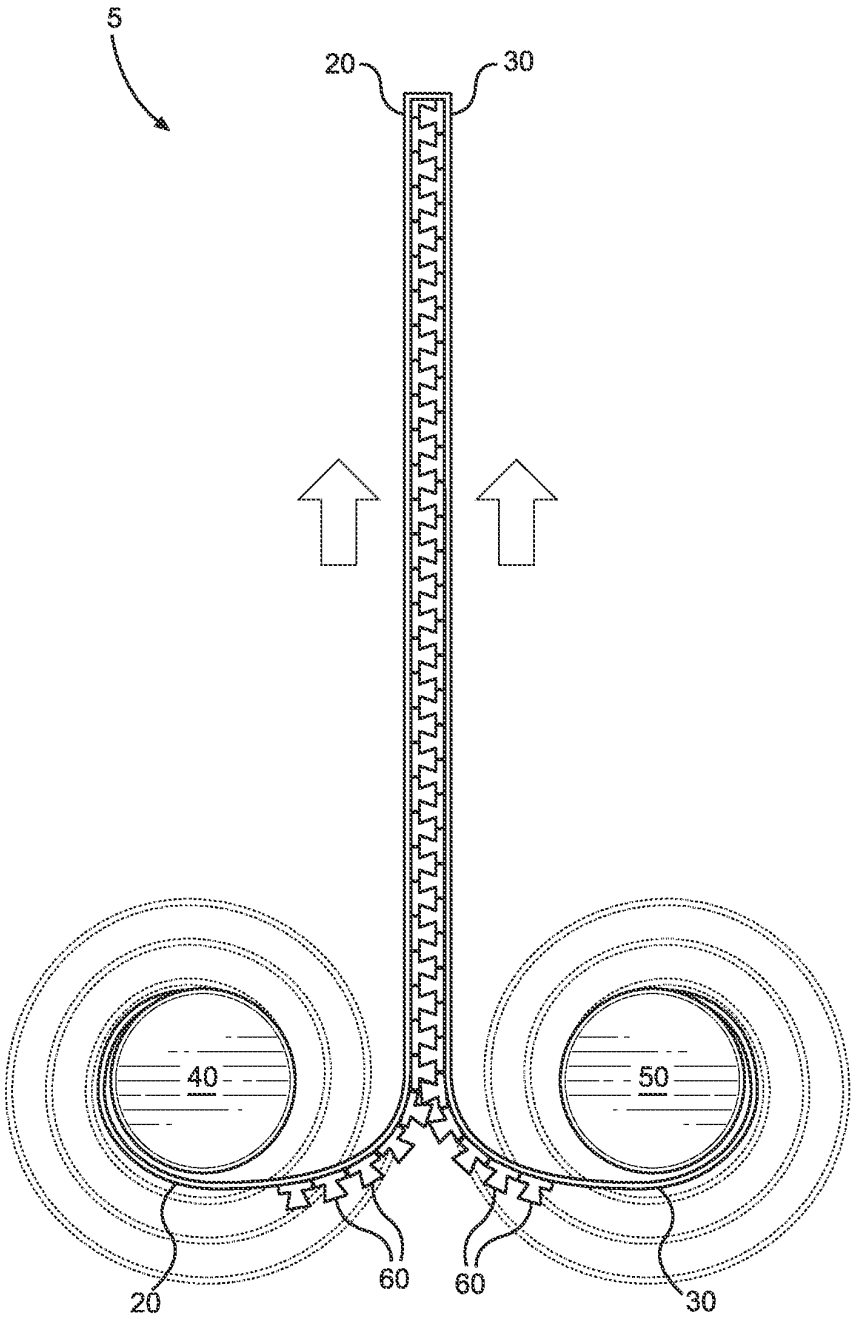

FIG. 49

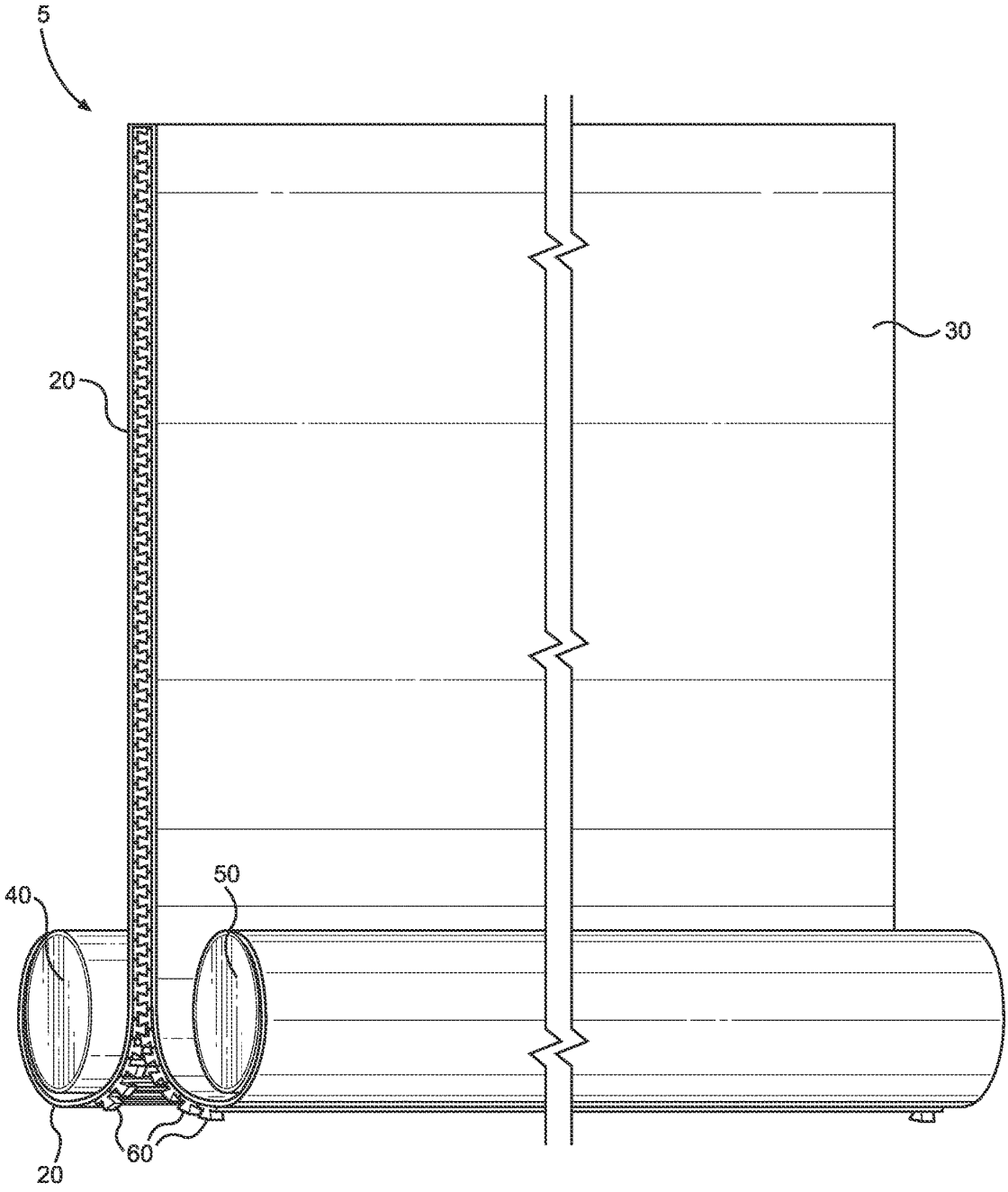

FIG. 50

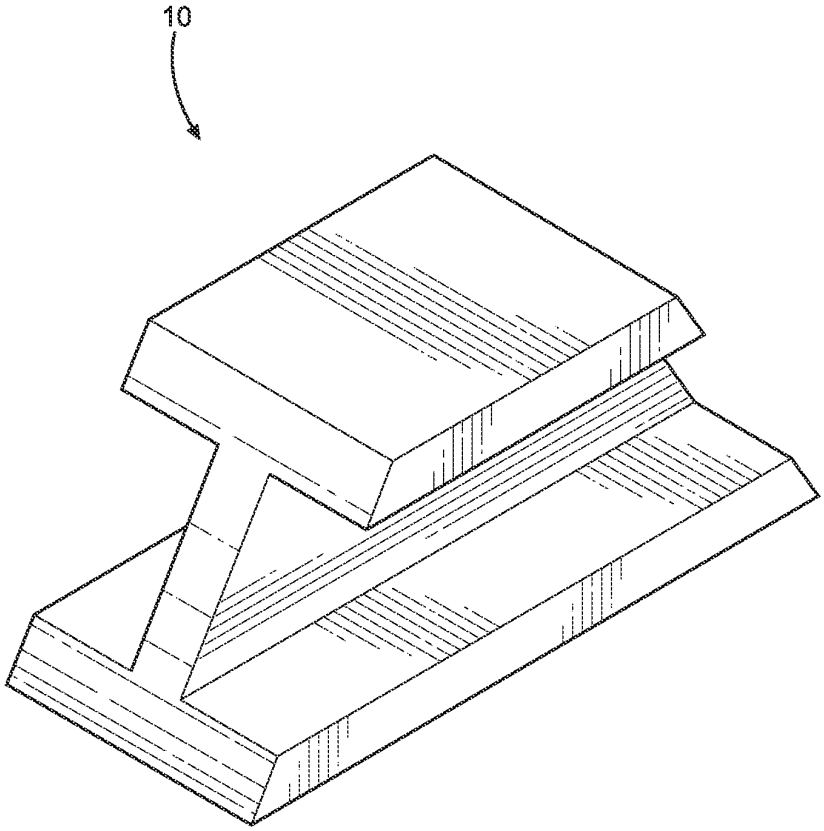

FIG. 51

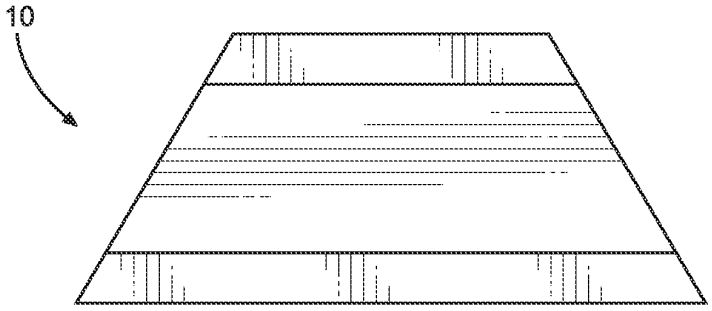

FIG. 52

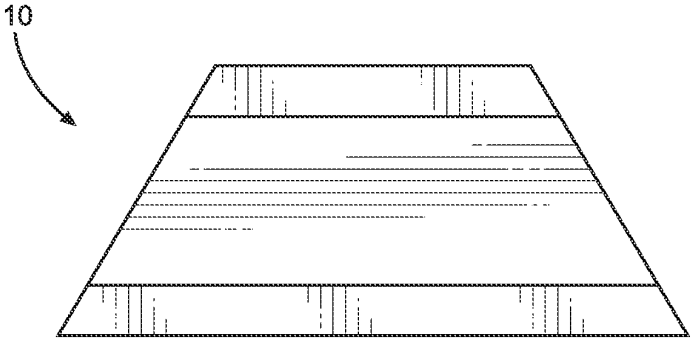

FIG. 53

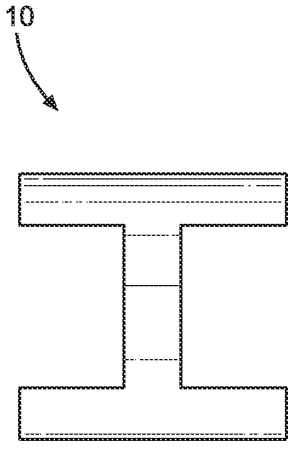

FIG. 54

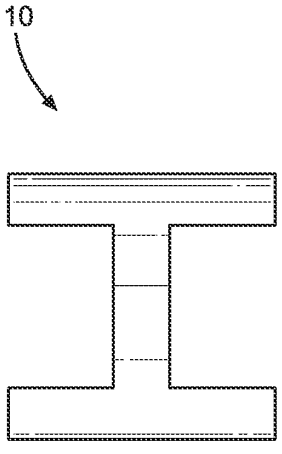

FIG. 55

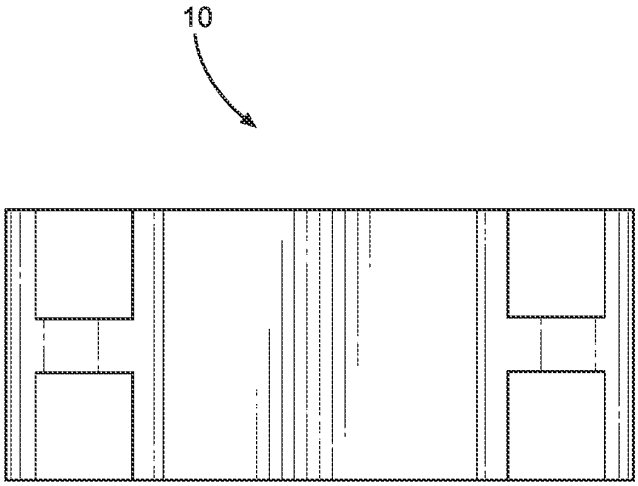

FIG. 56

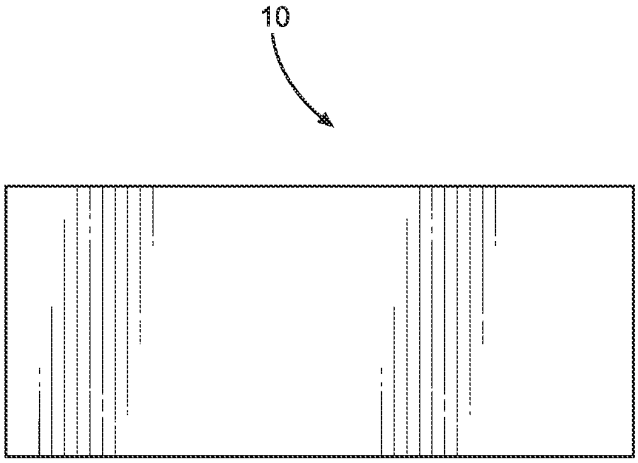

FIG. 57

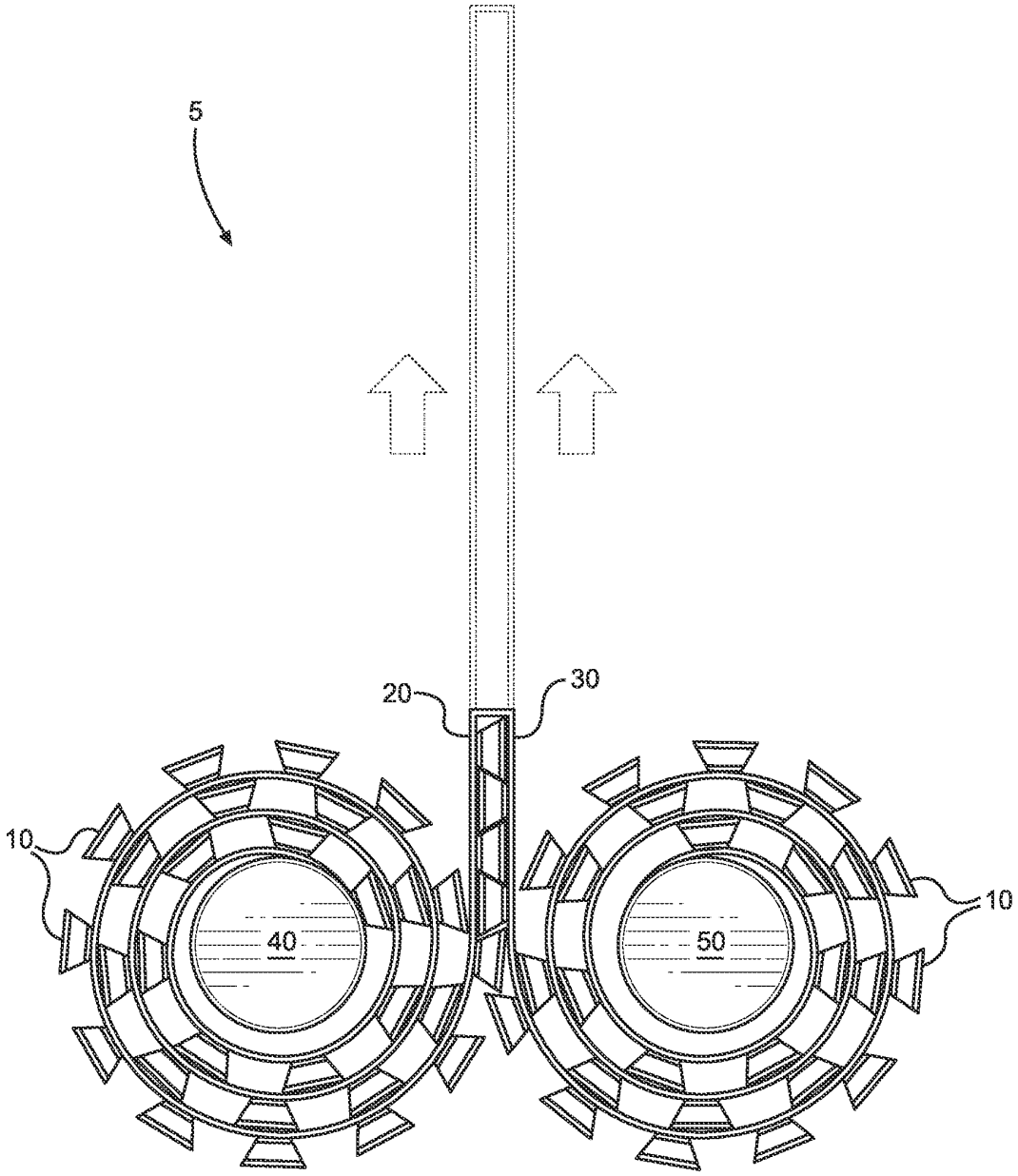

FIG. 58

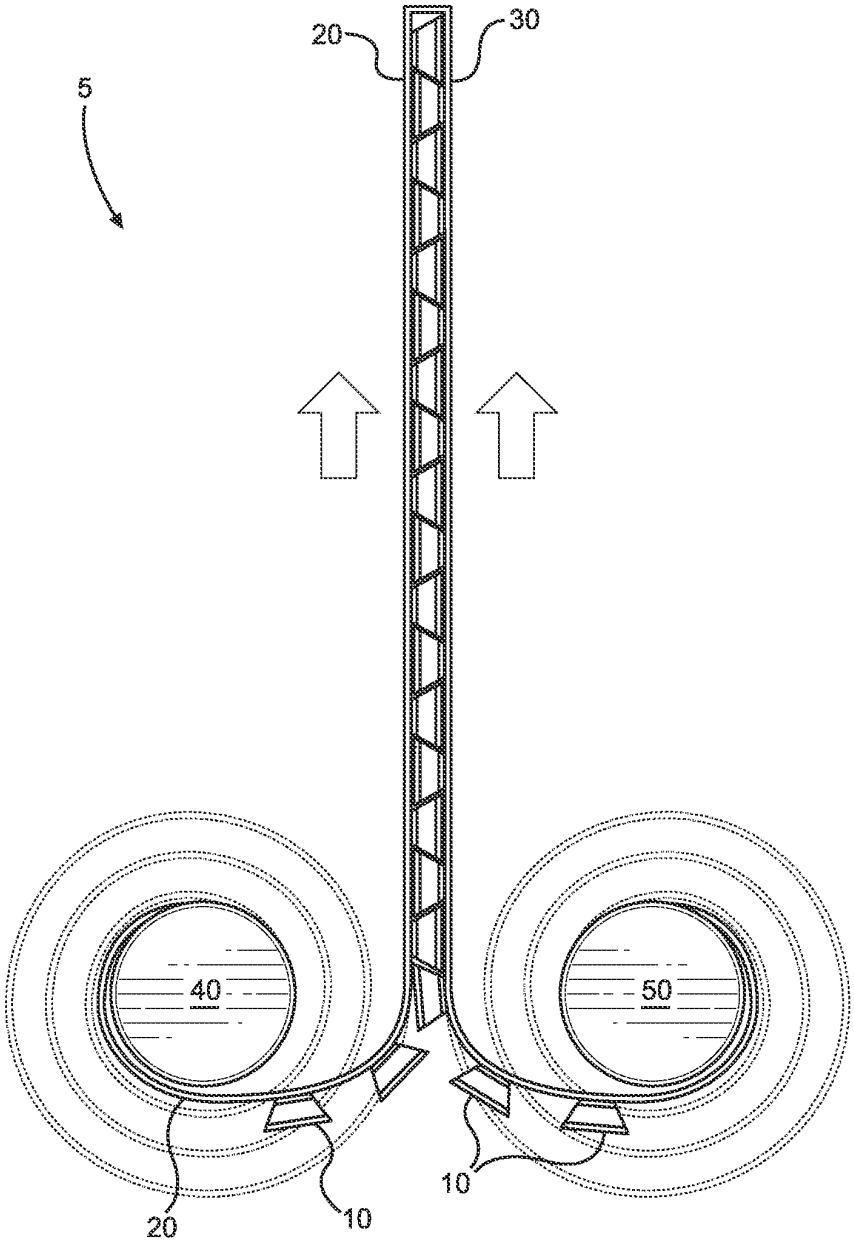

FIG. 59

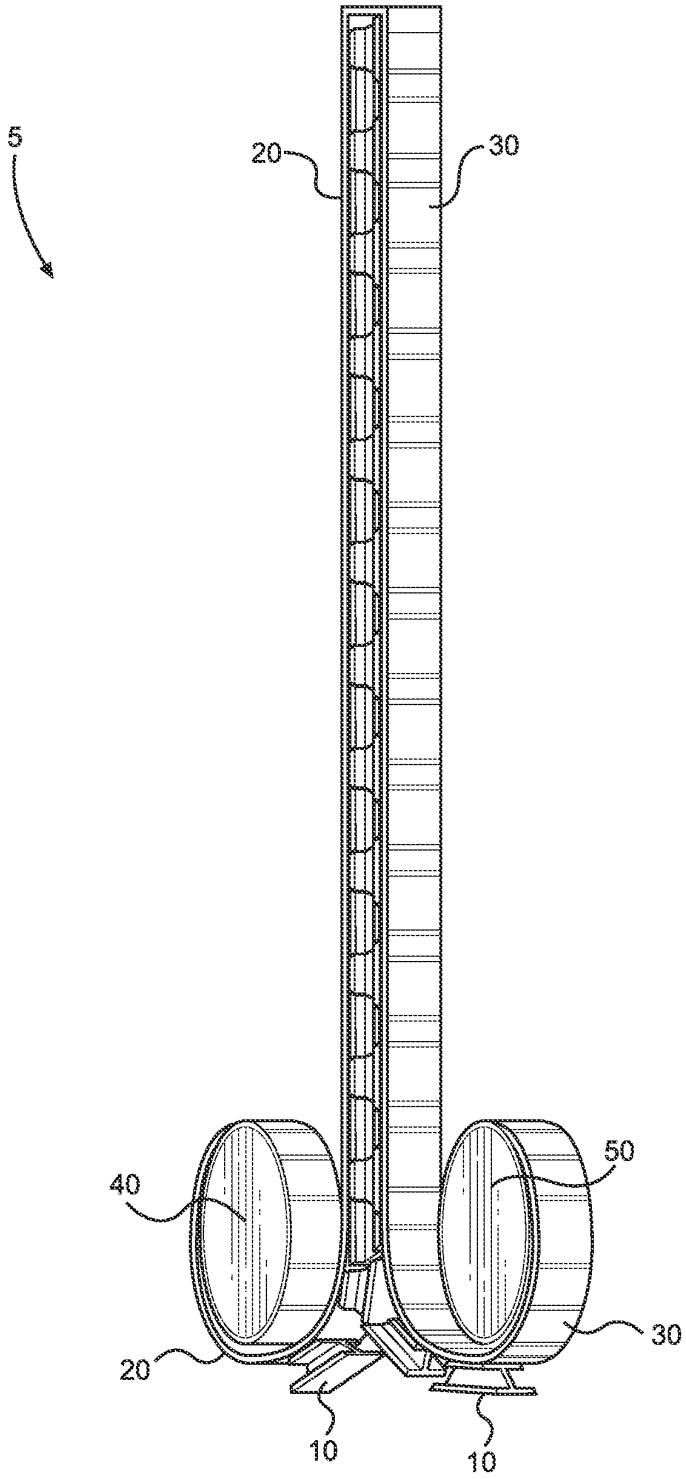

FIG. 60

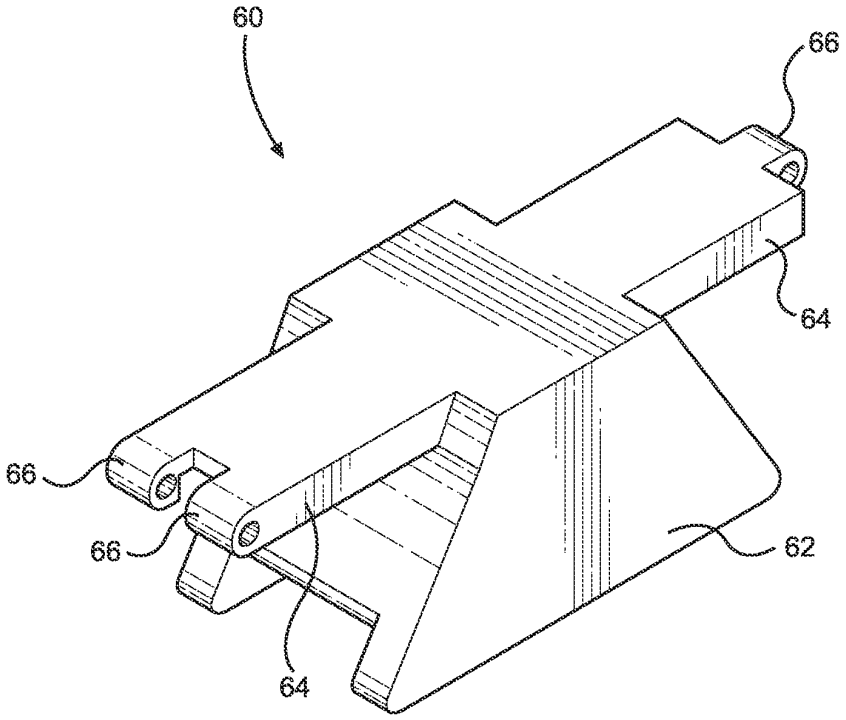

FIG. 61

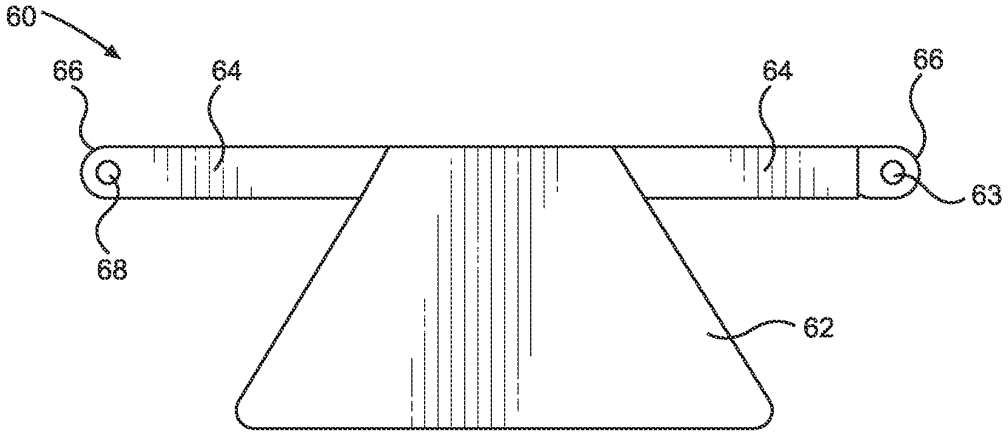

FIG. 62

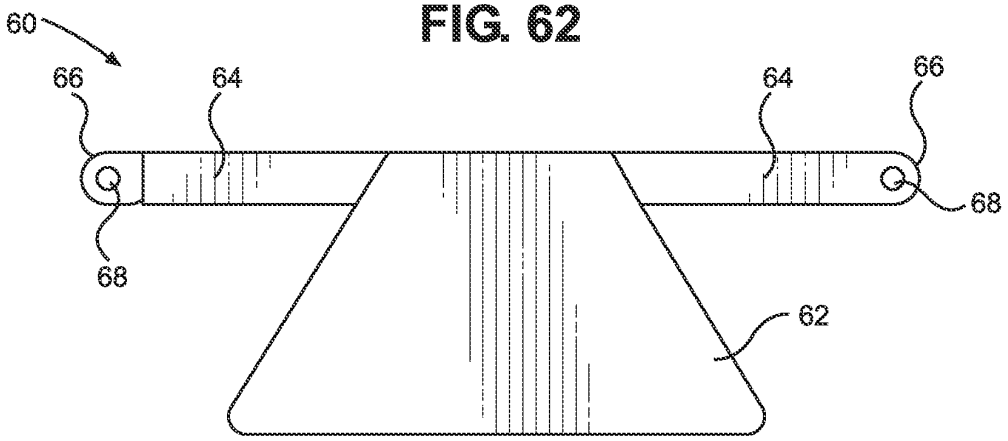

FIG. 63

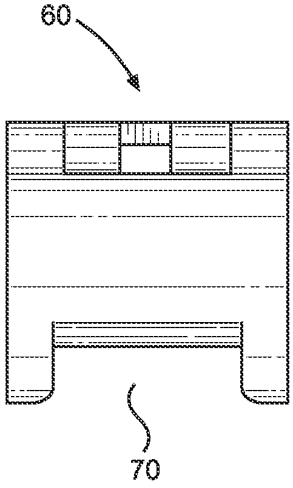

FIG. 64

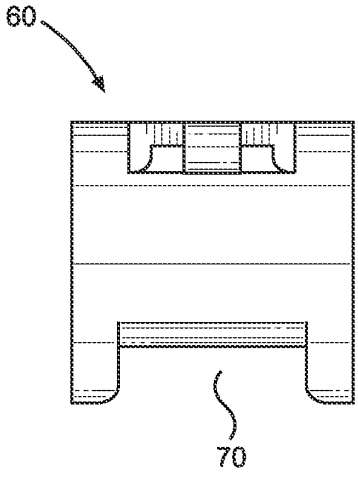

FIG. 65

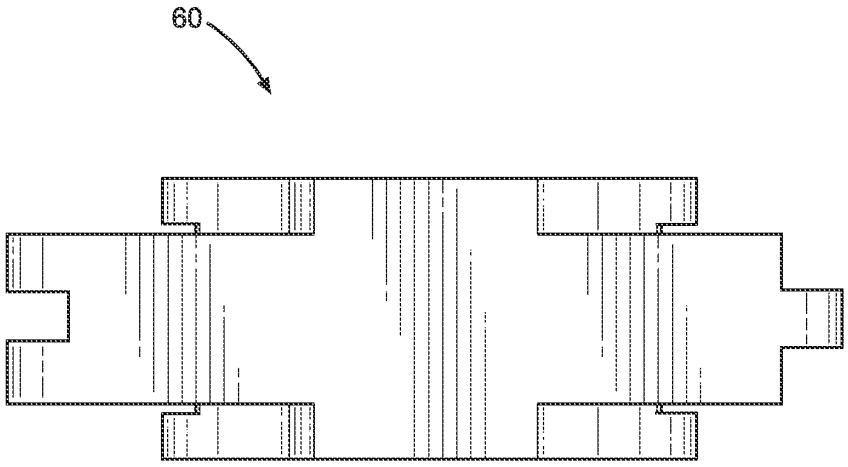

FIG. 66

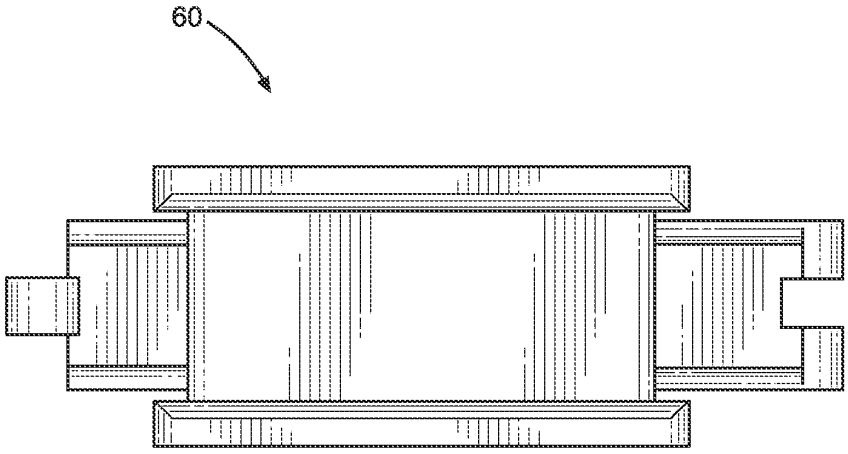

FIG. 67

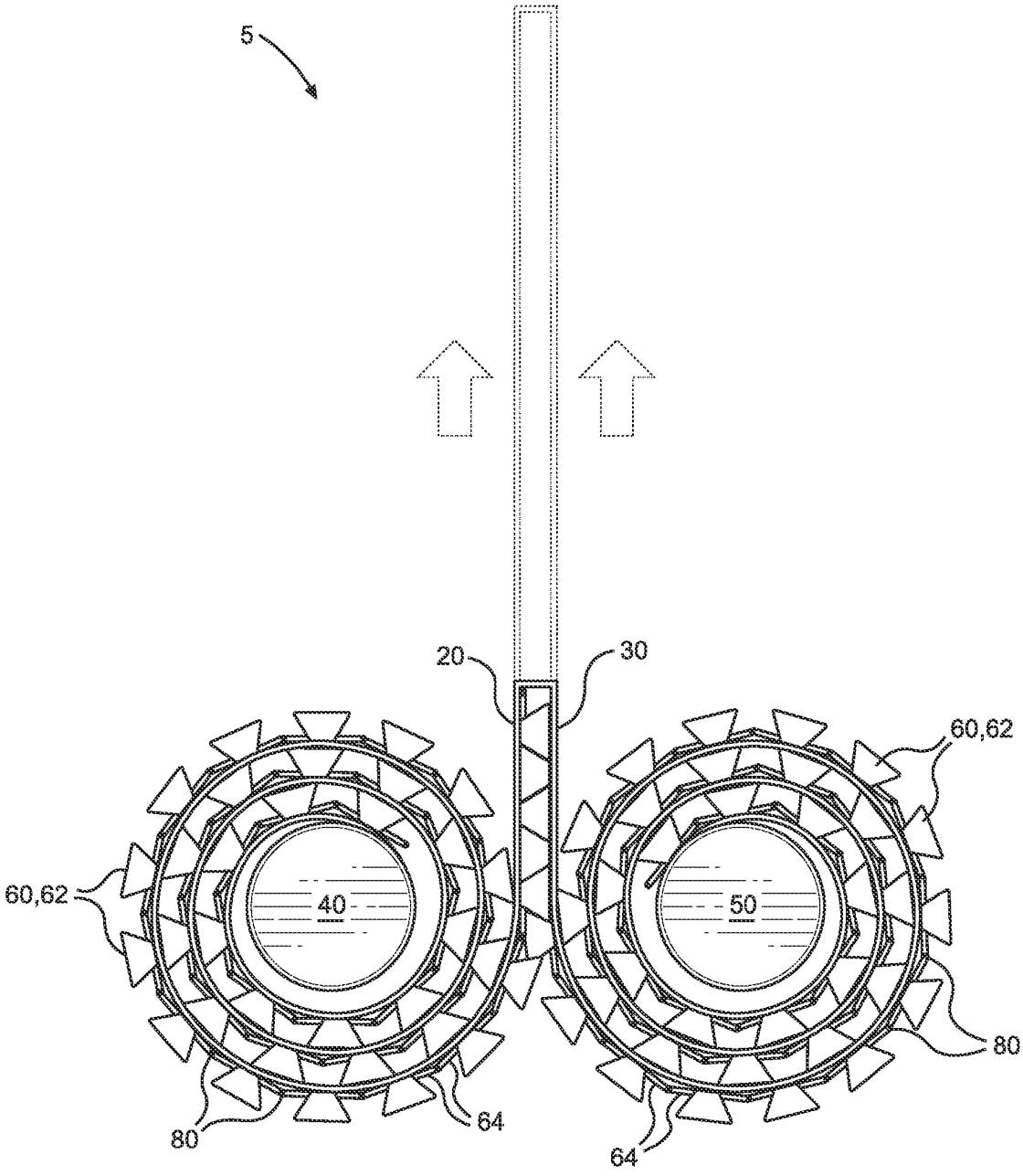

FIG. 68

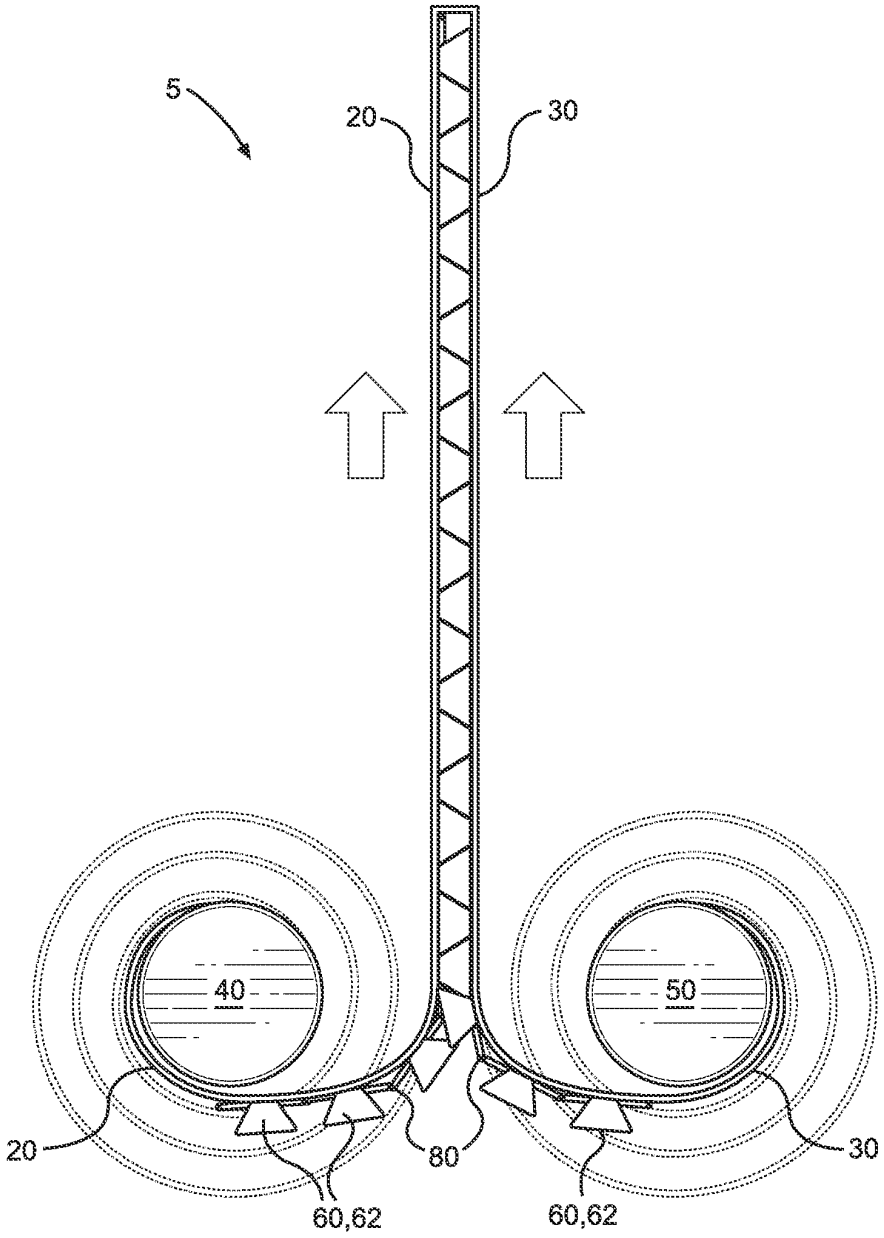

FIG. 69

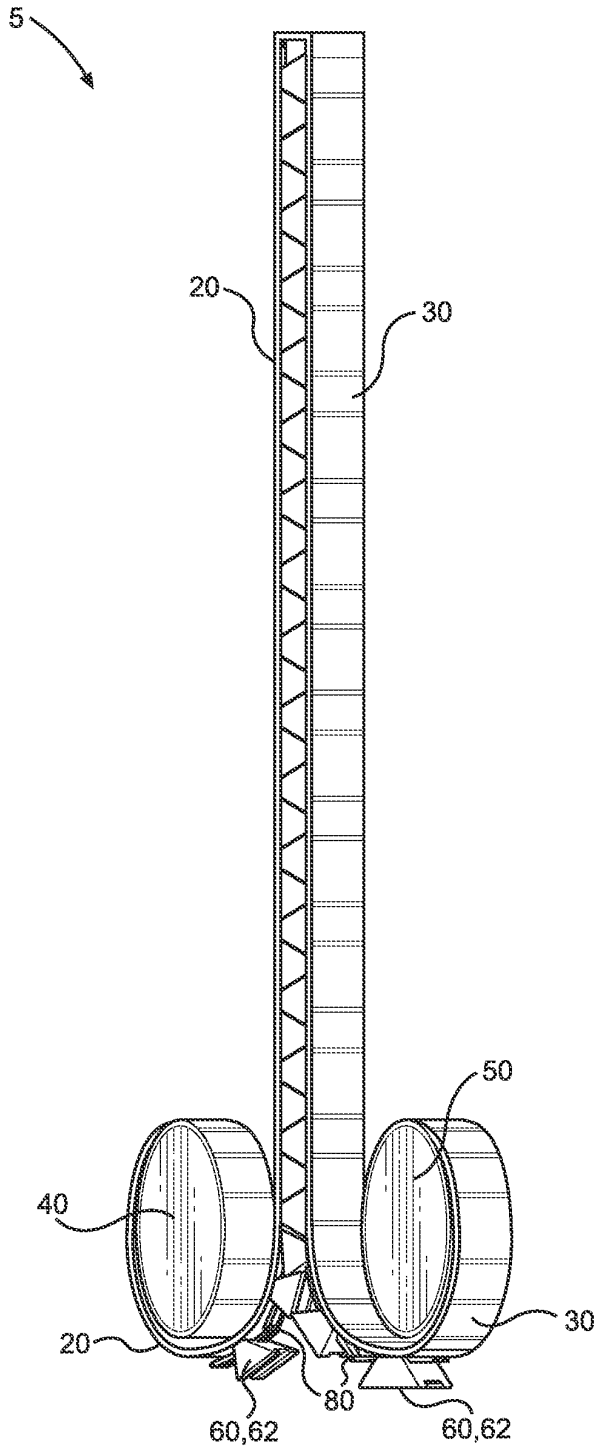

FIG. 70

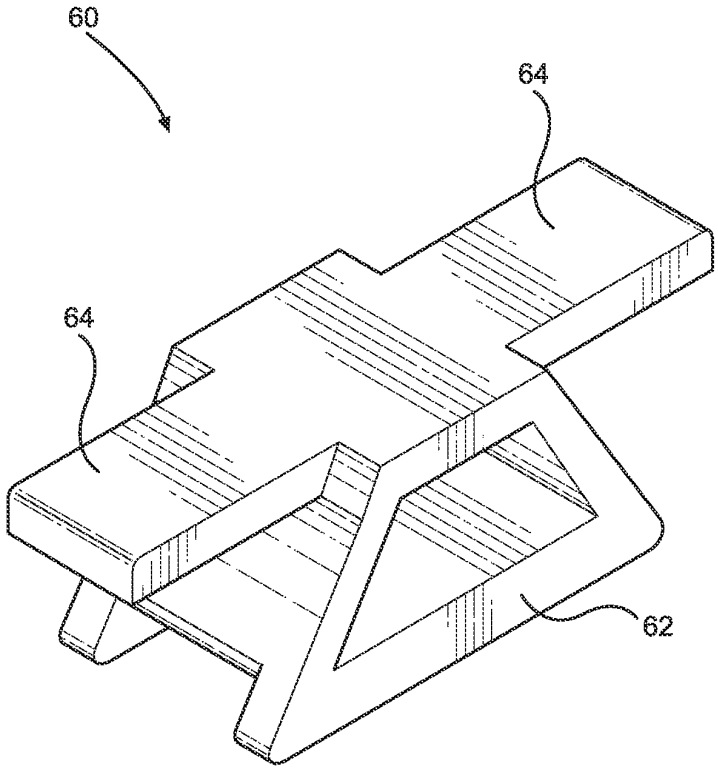

FIG. 71

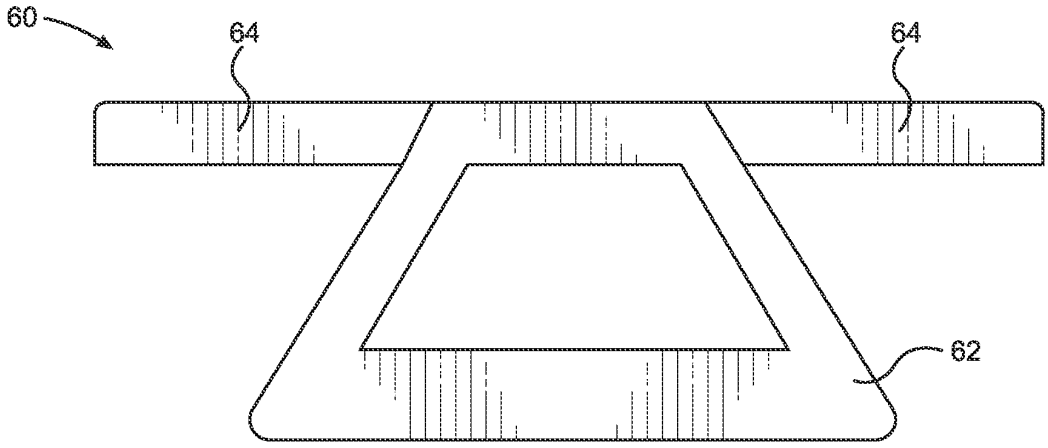

FIG. 72

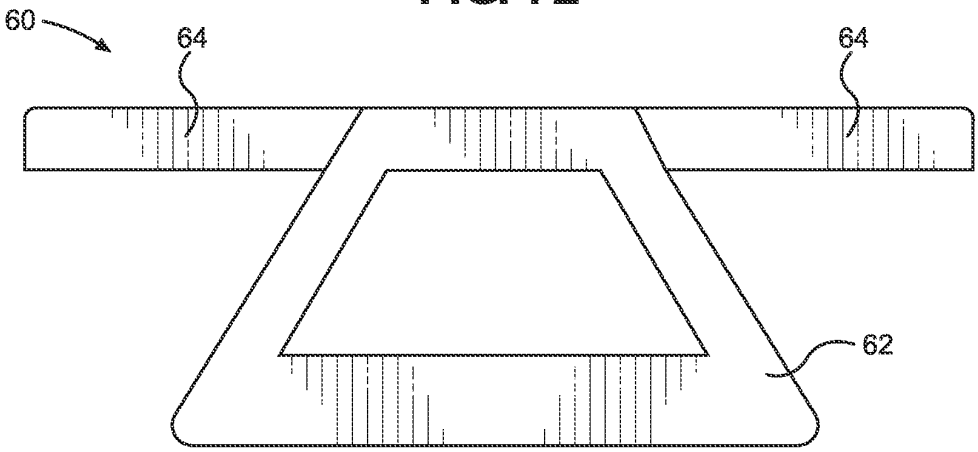

FIG. 73

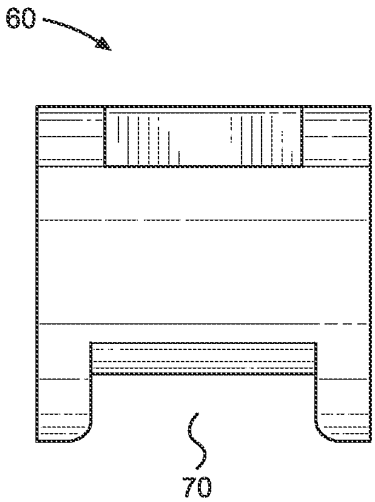

FIG. 74

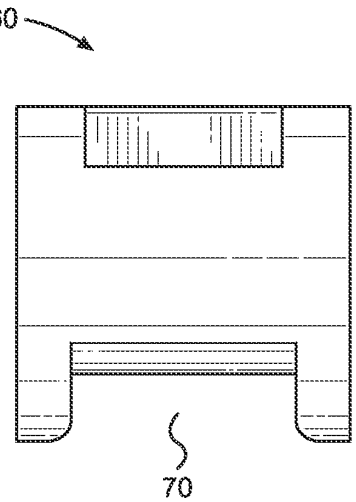

FIG. 75

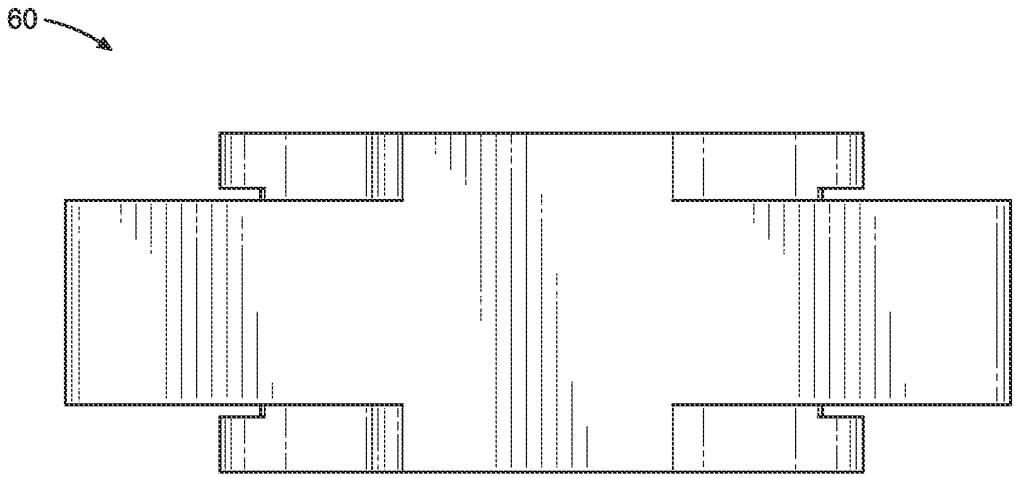

FIG. 76

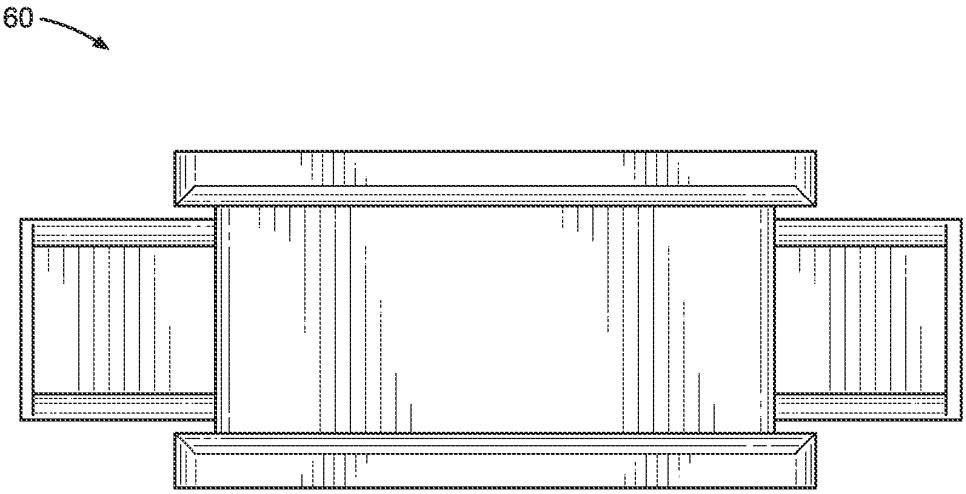

FIG. 77

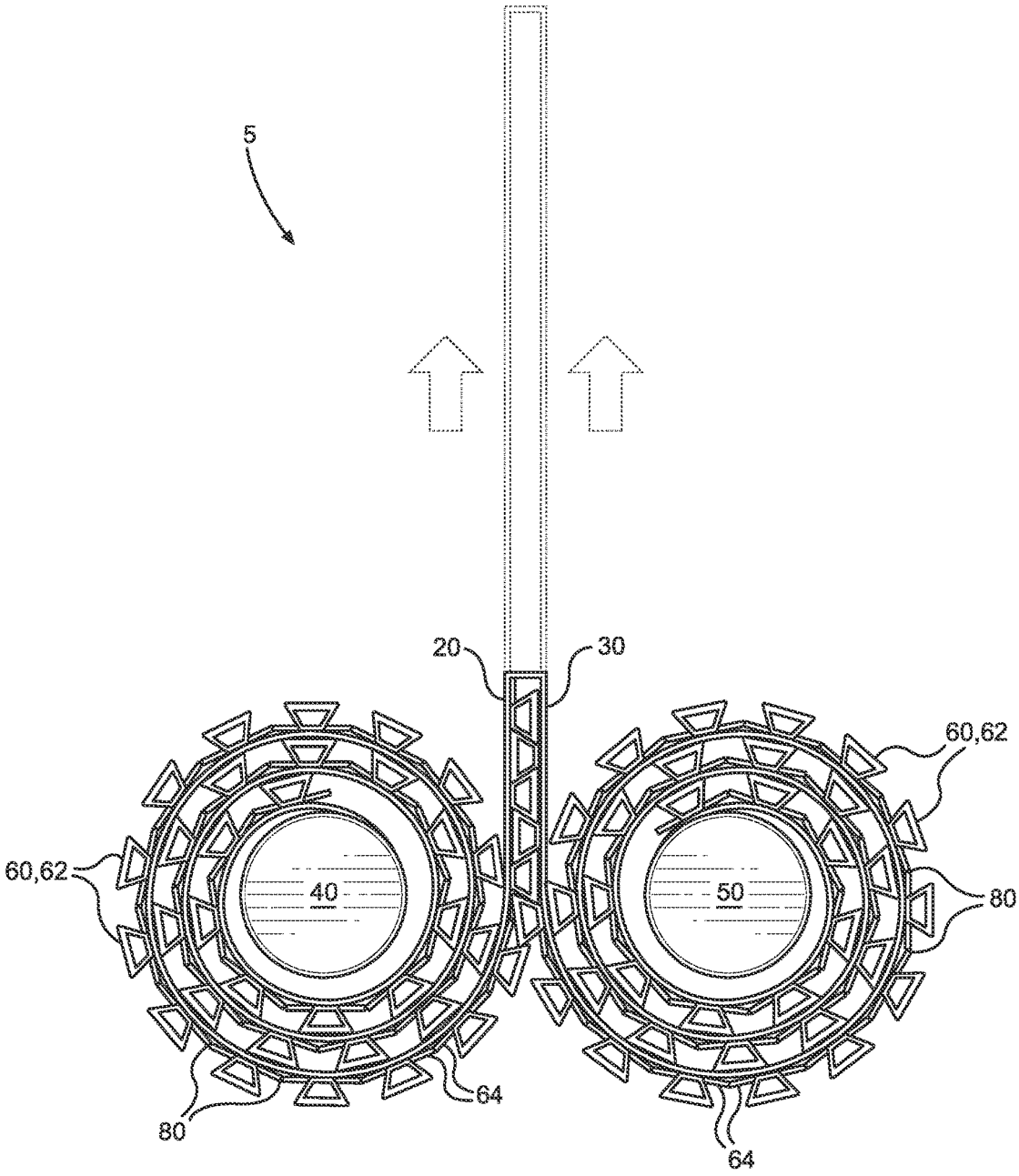

FIG. 78

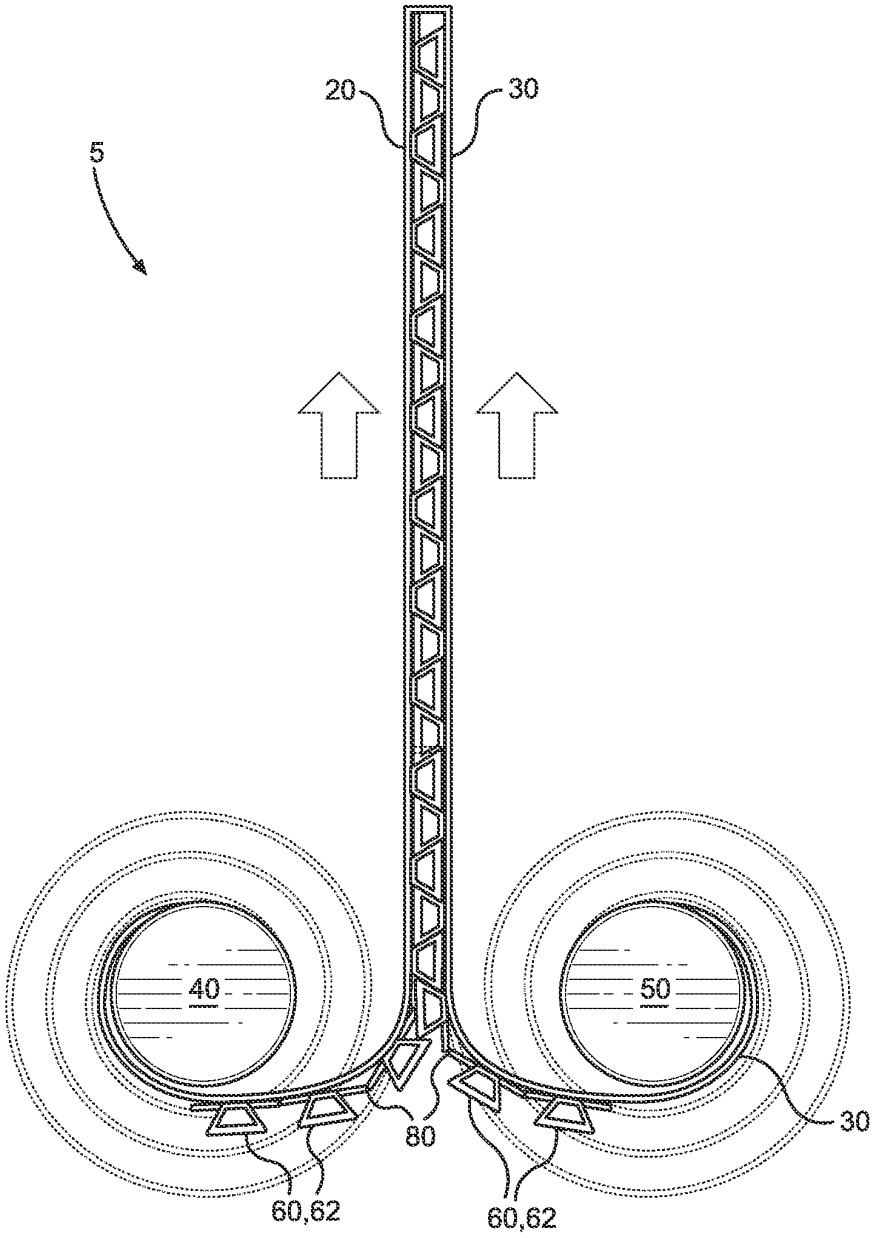

FIG. 79

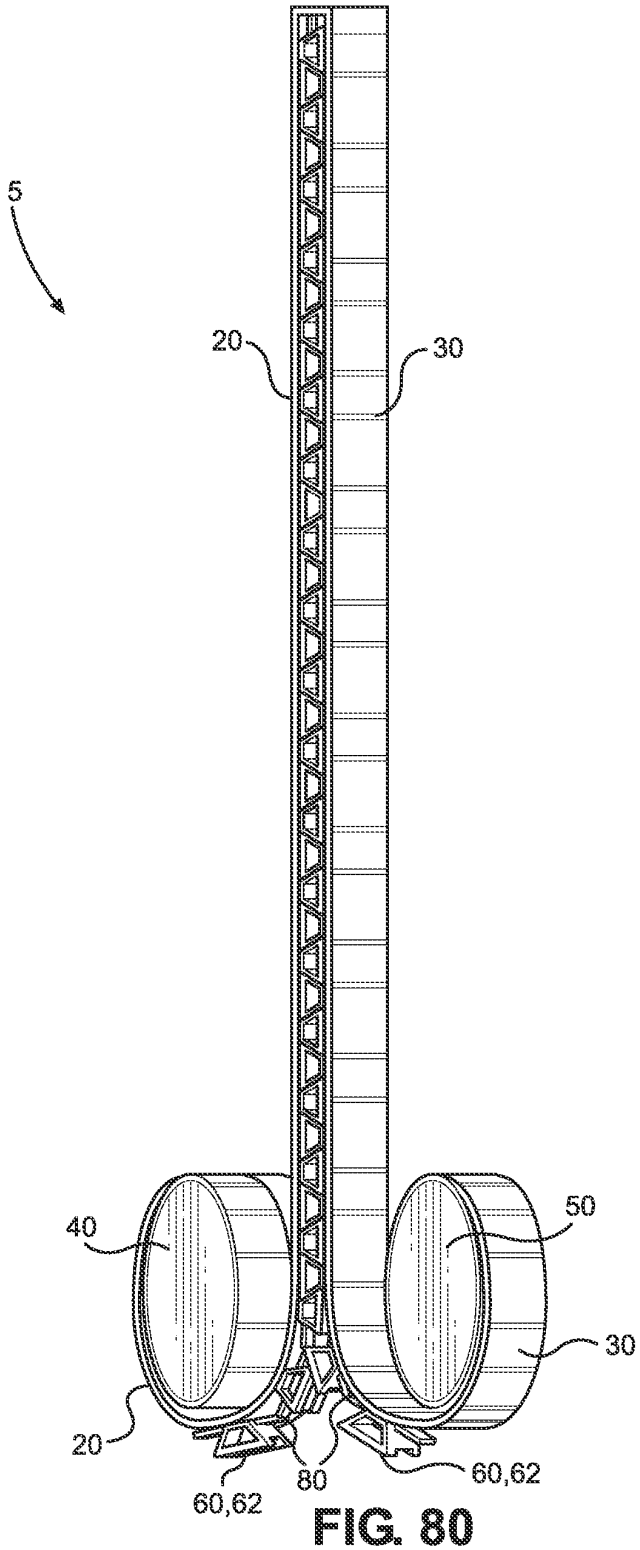

FIG. 80

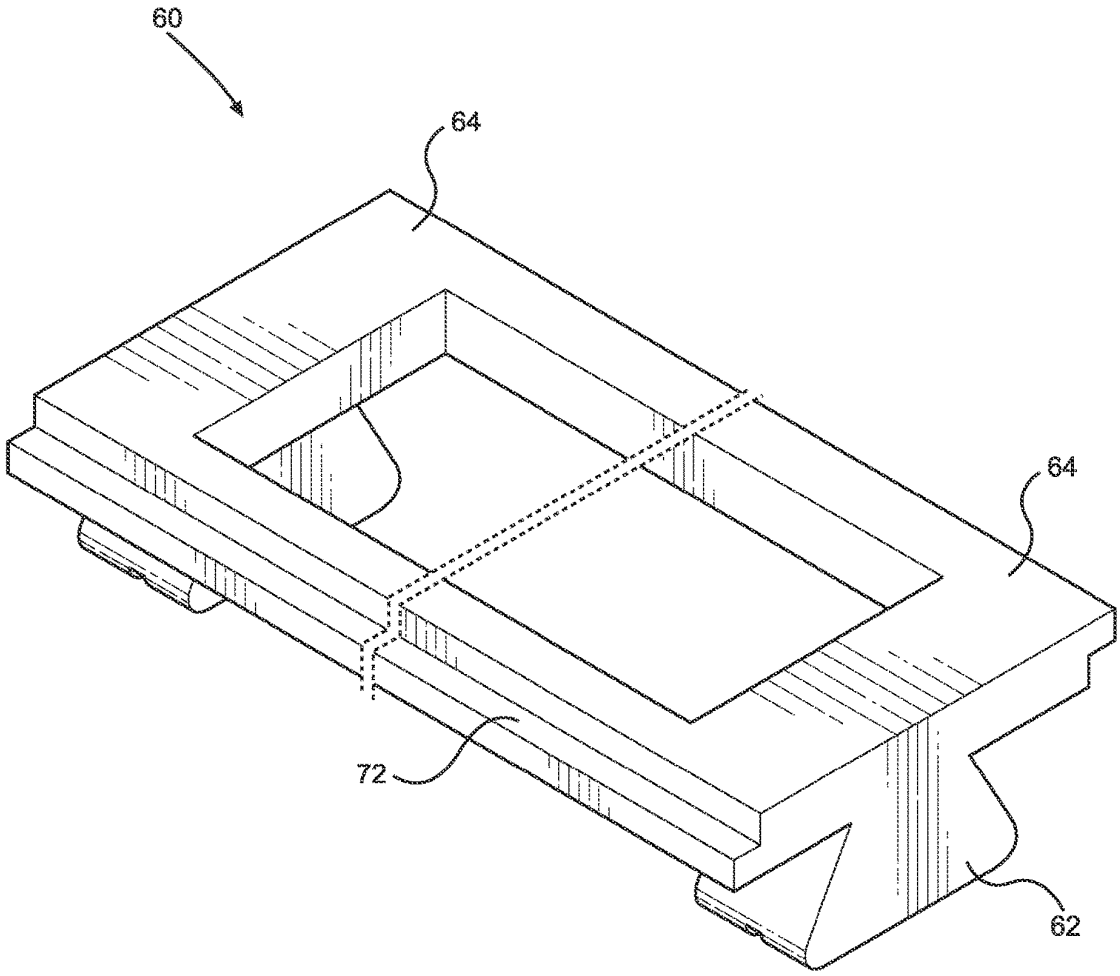

FIG. 81

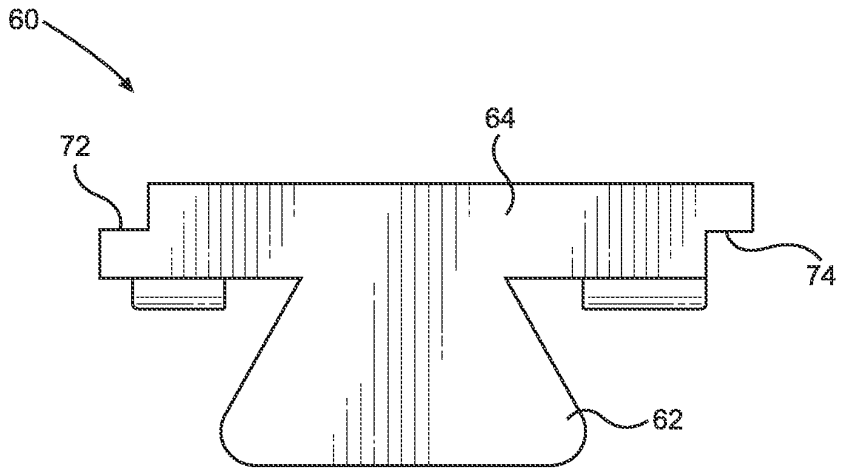

FIG. 82

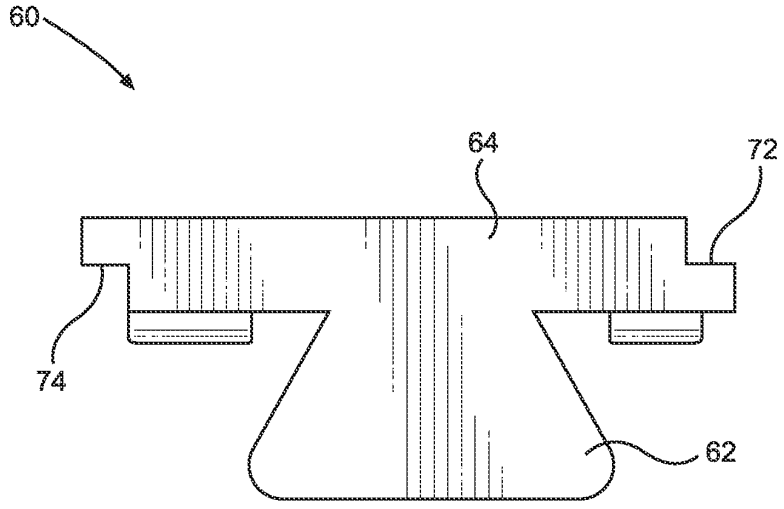

FIG. 83

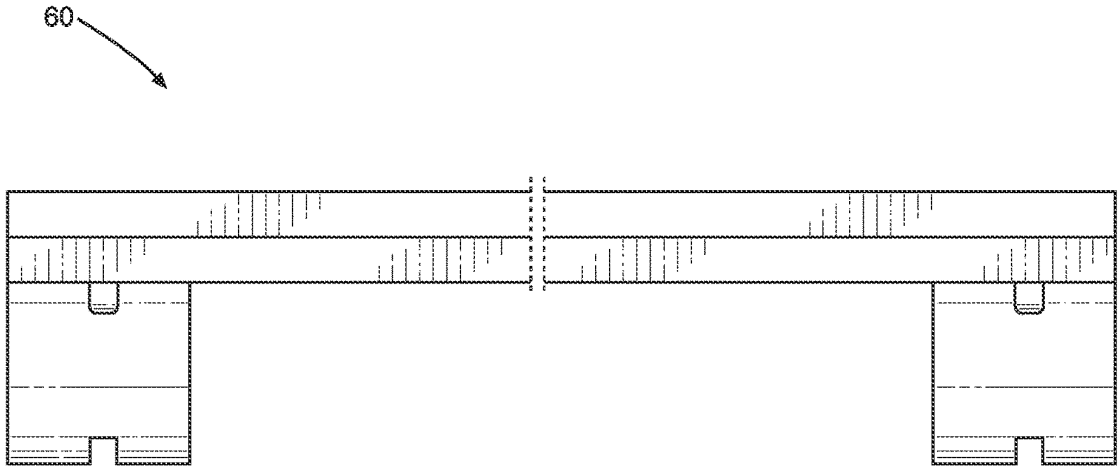

FIG. 84

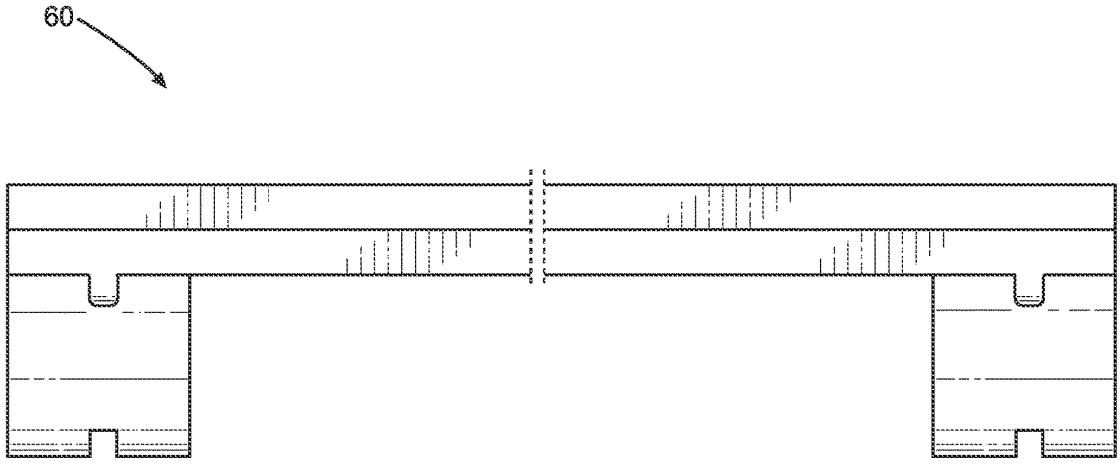

FIG. 85

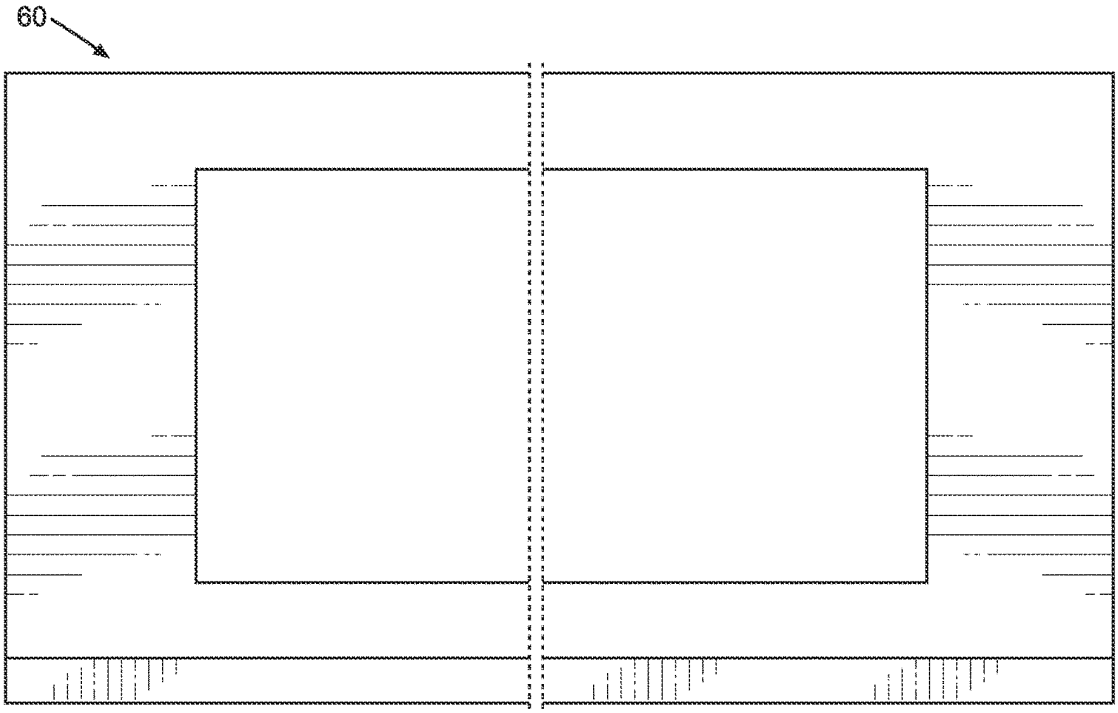

FIG. 86

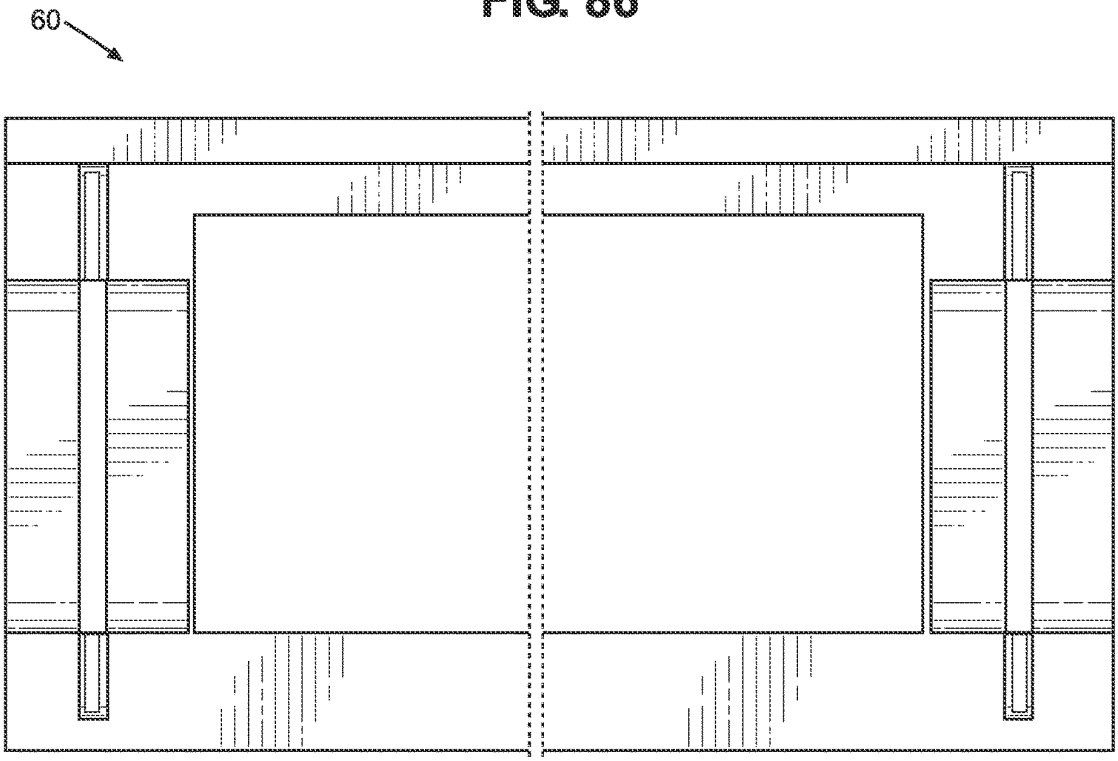

FIG. 87

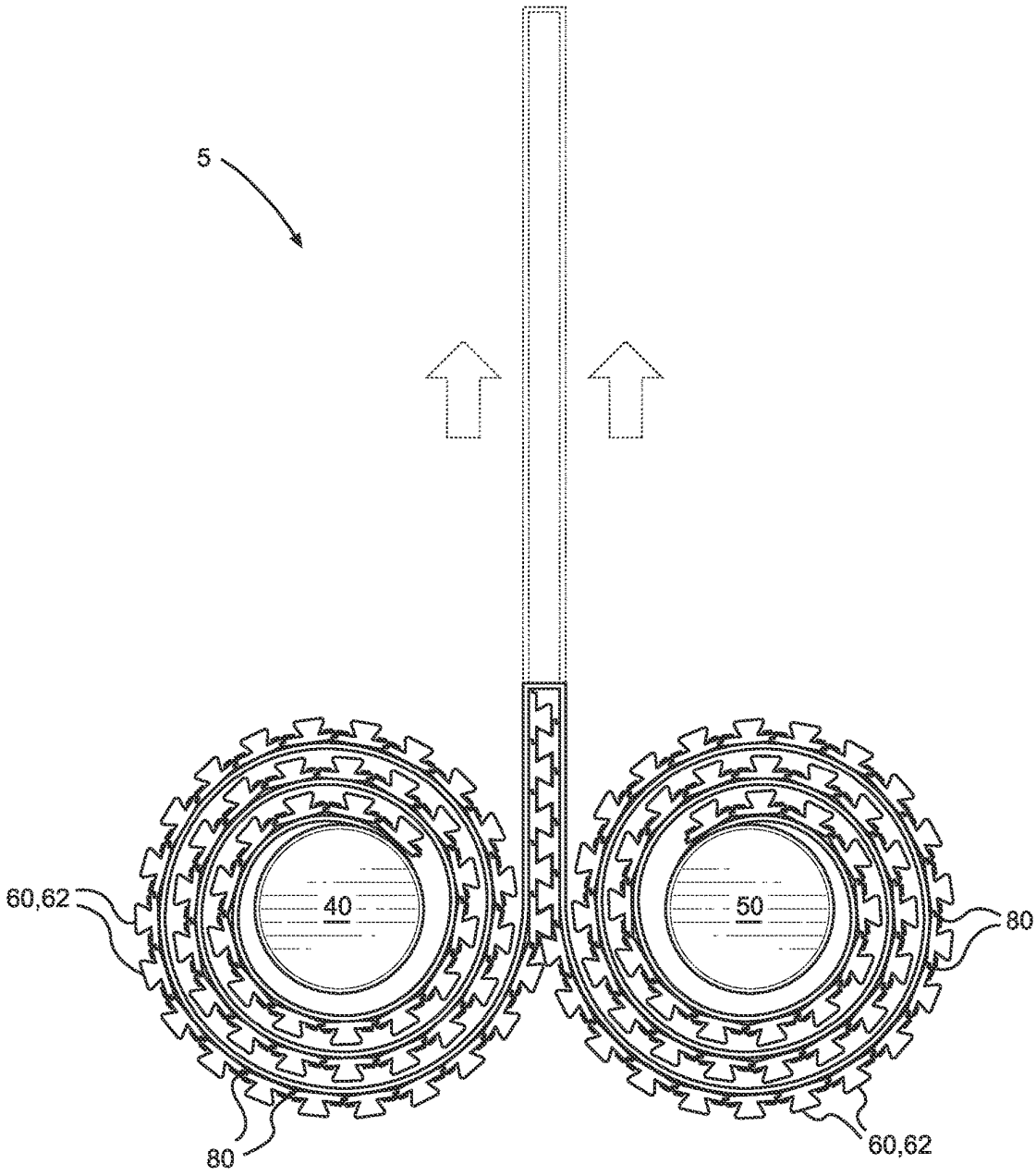

FIG. 88

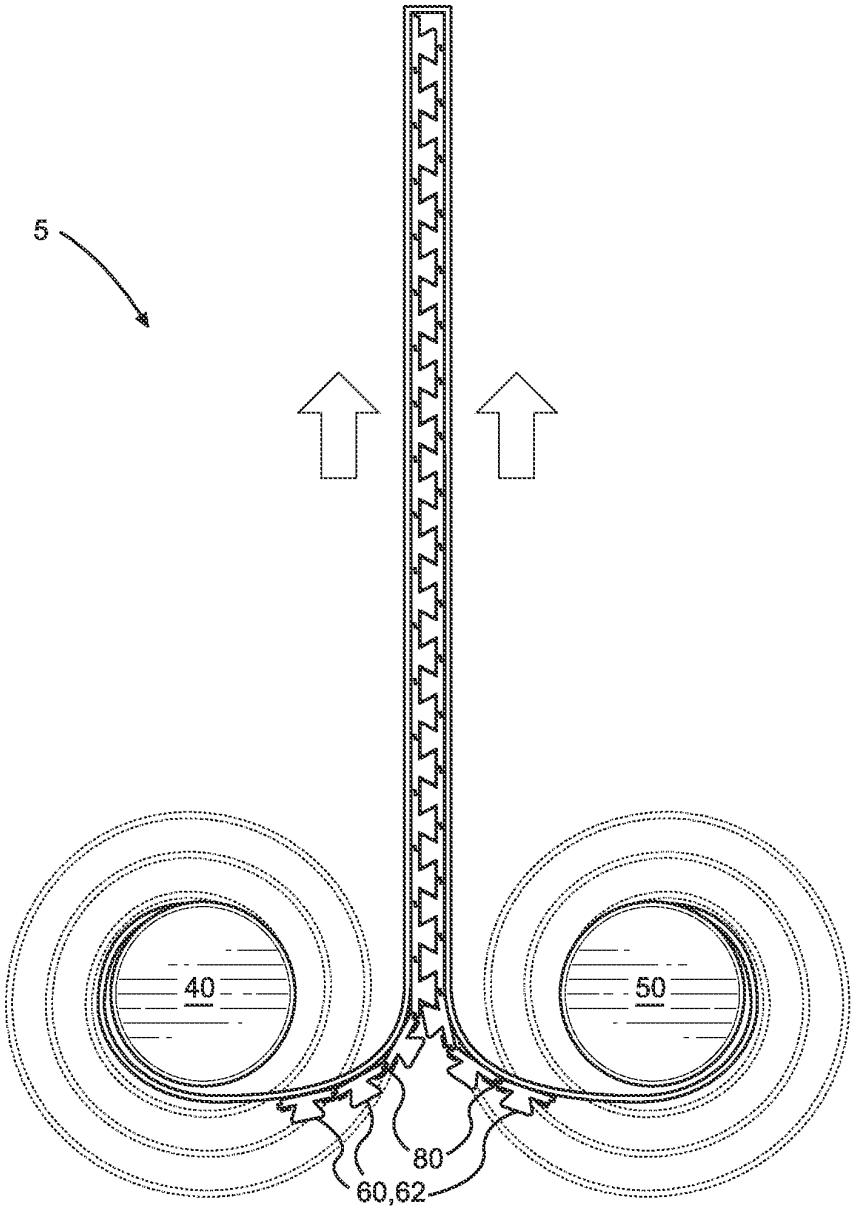

FIG. 89

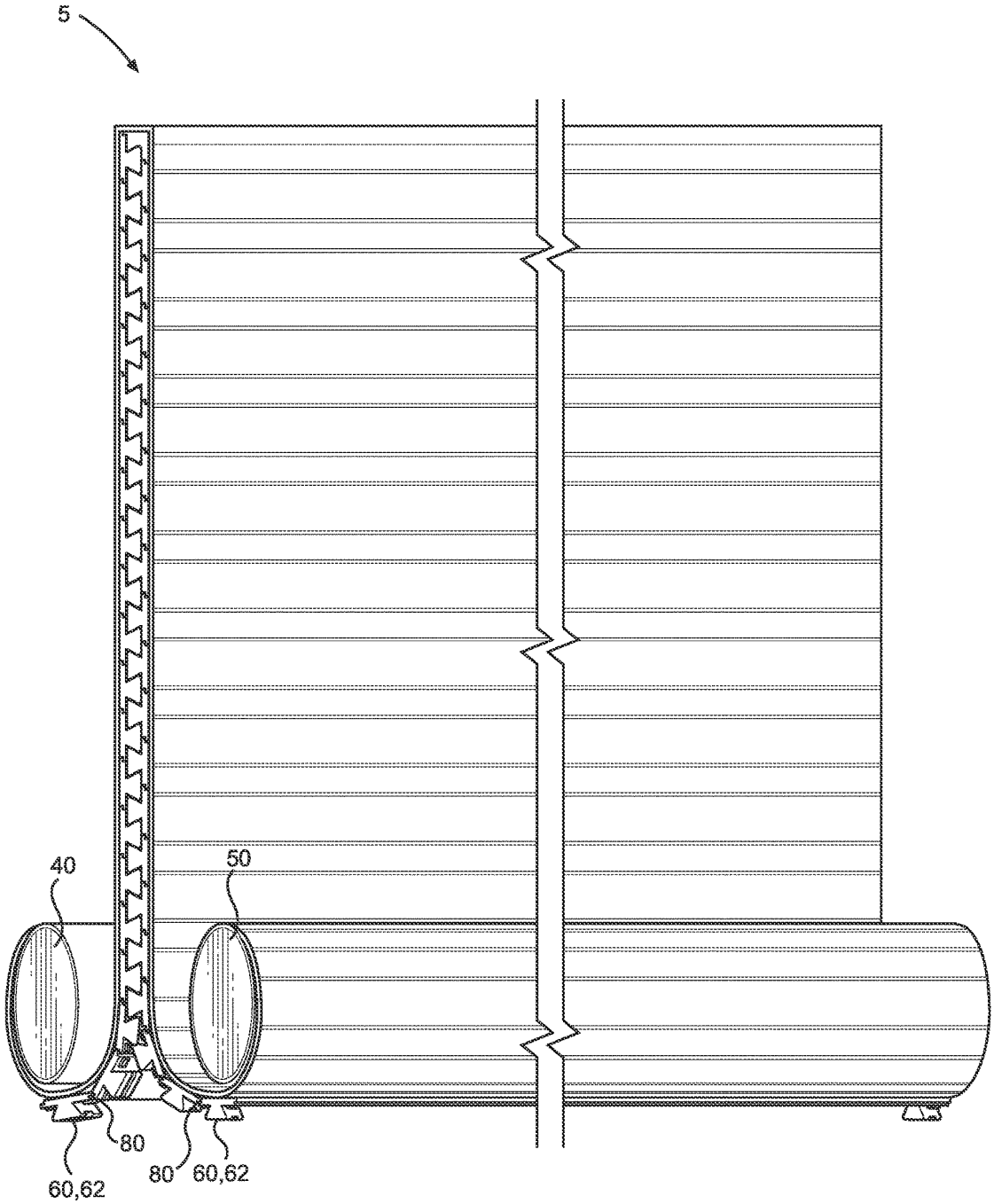

FIG. 90

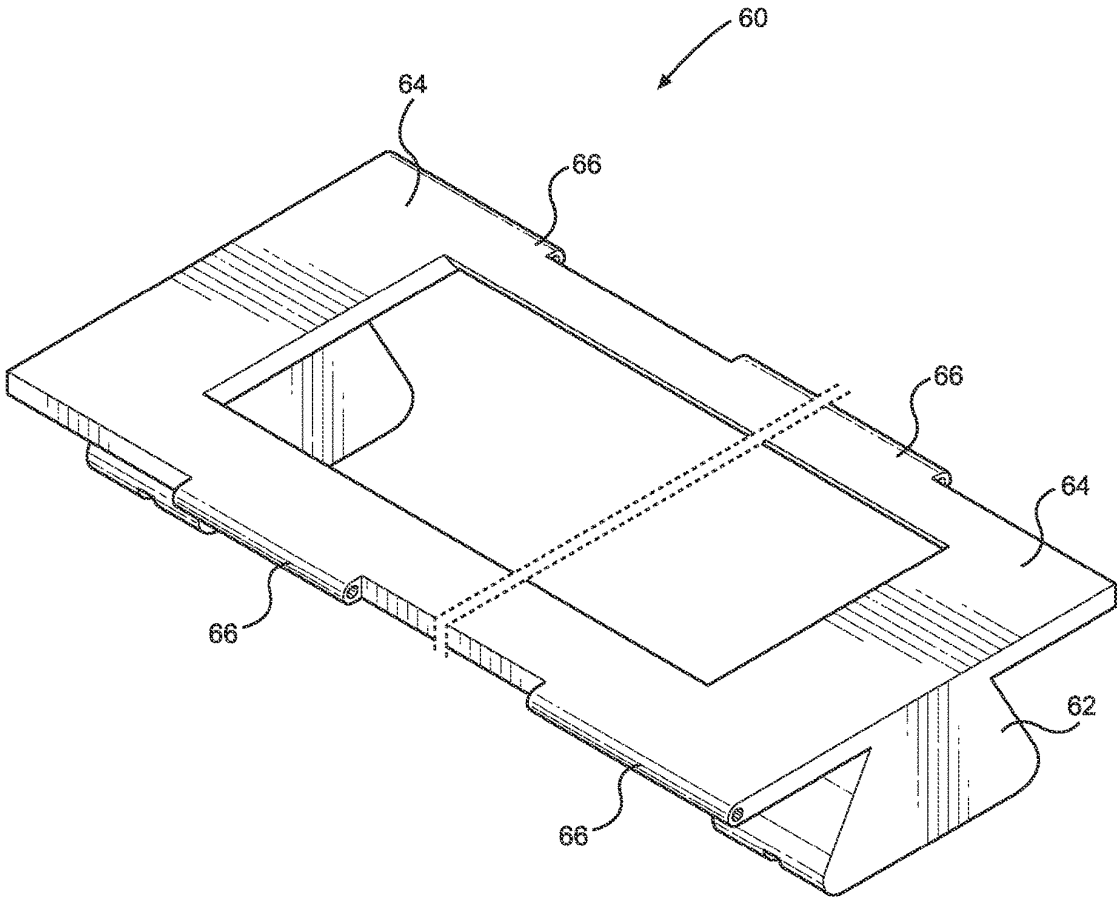

FIG. 91

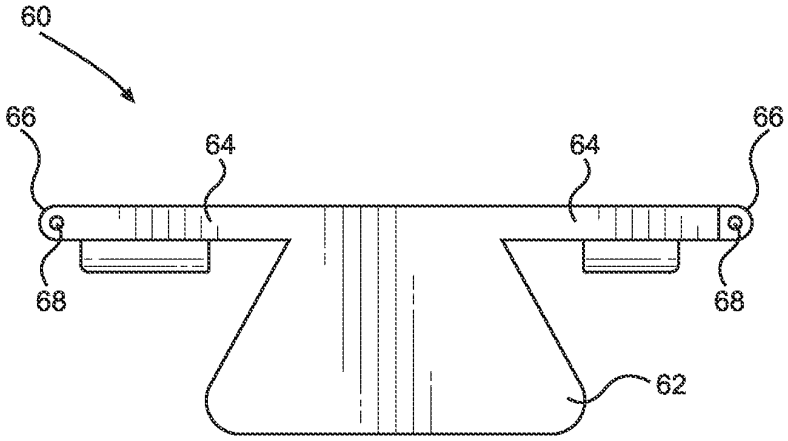

FIG. 92

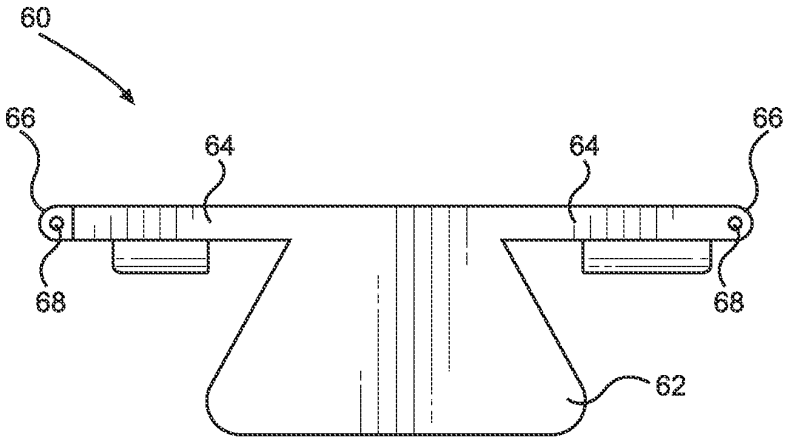

FIG. 93

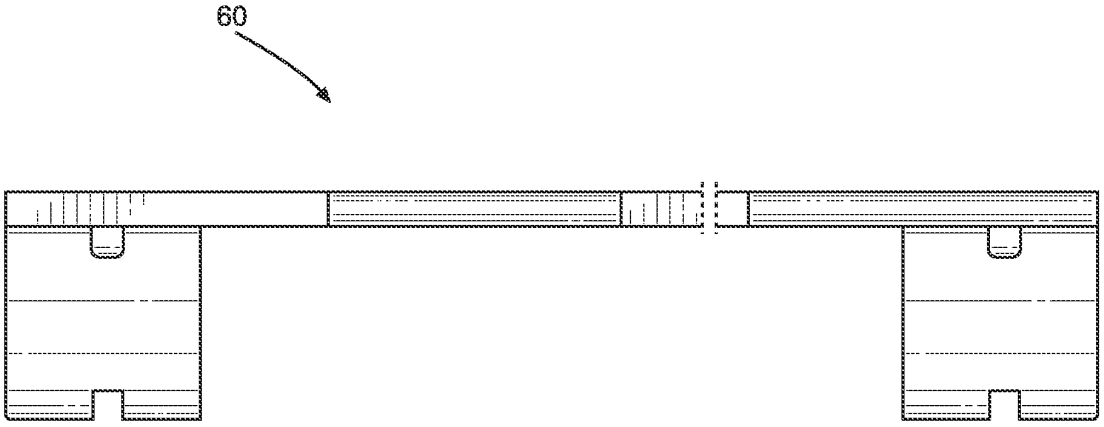

FIG. 94

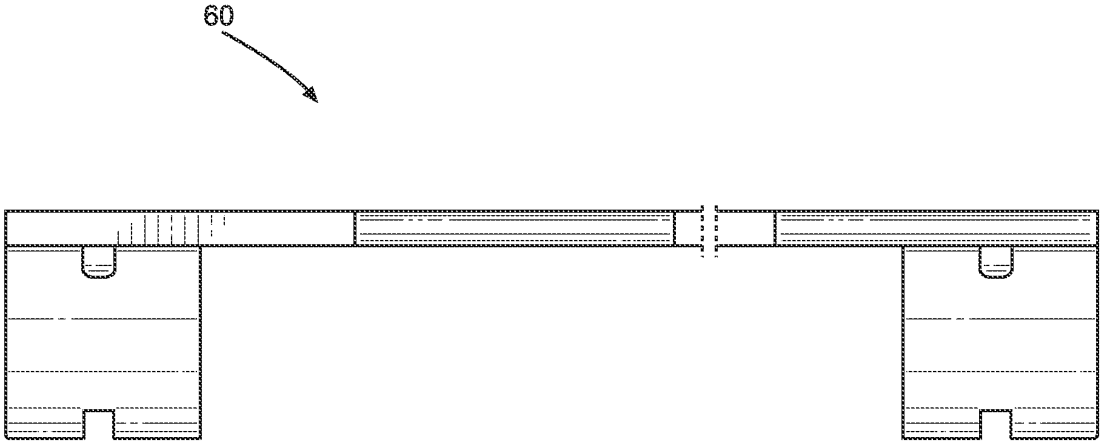

FIG. 95

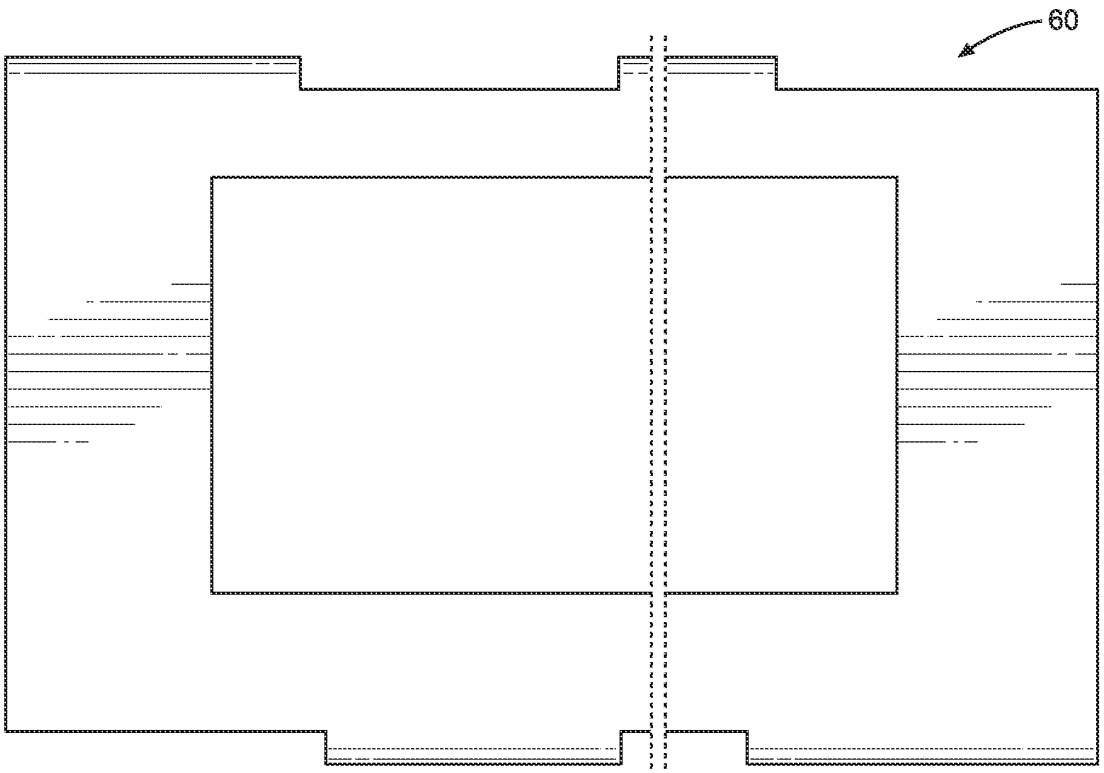

FIG. 96

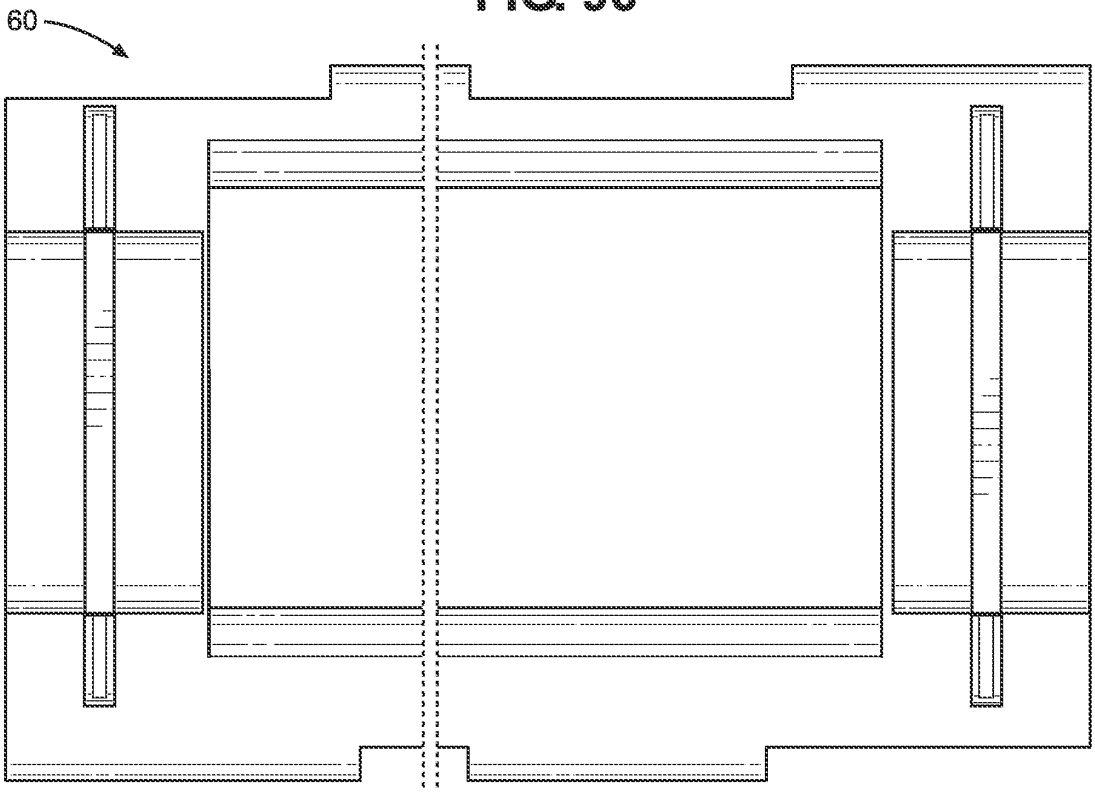

FIG. 97

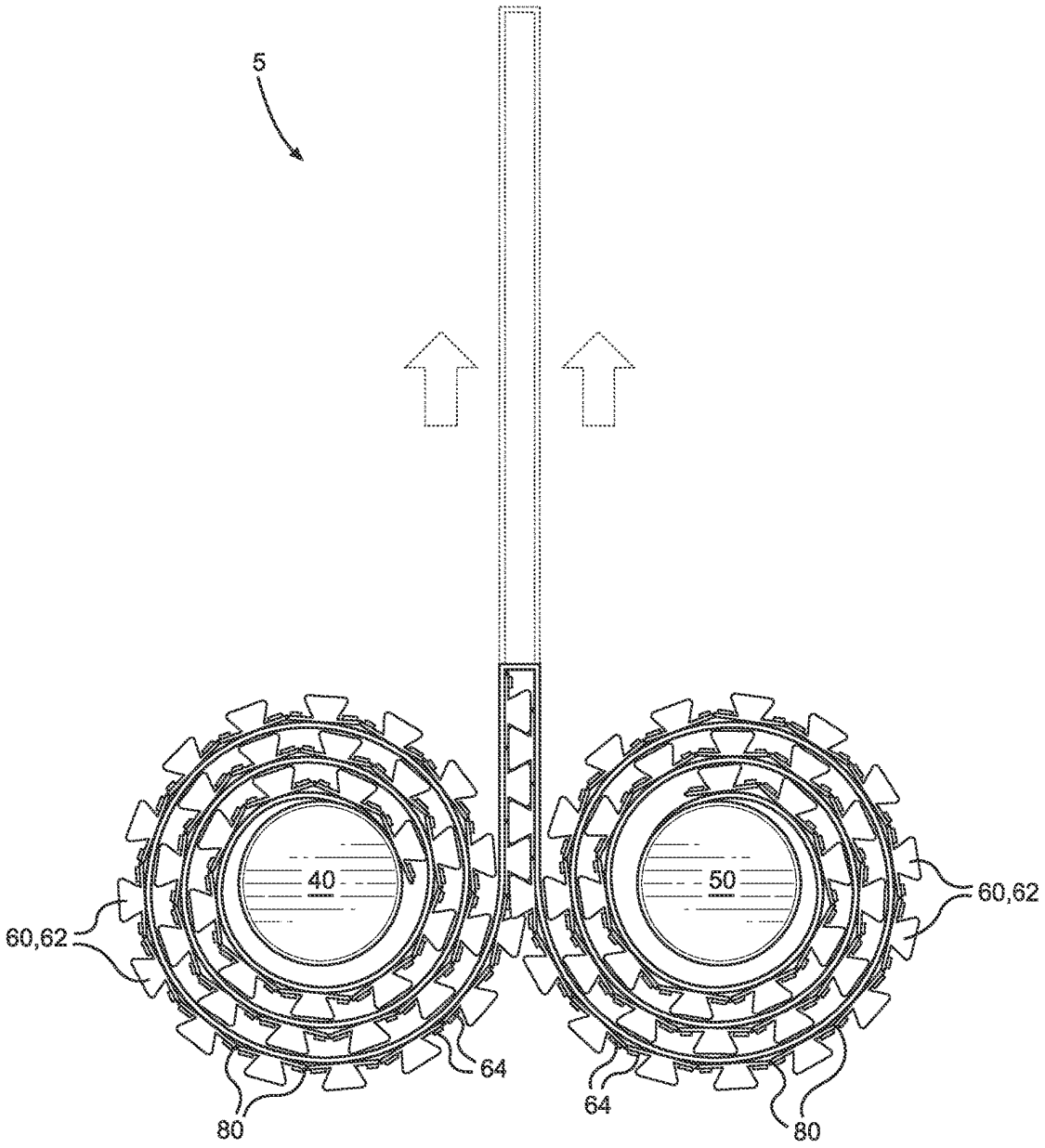

FIG. 98

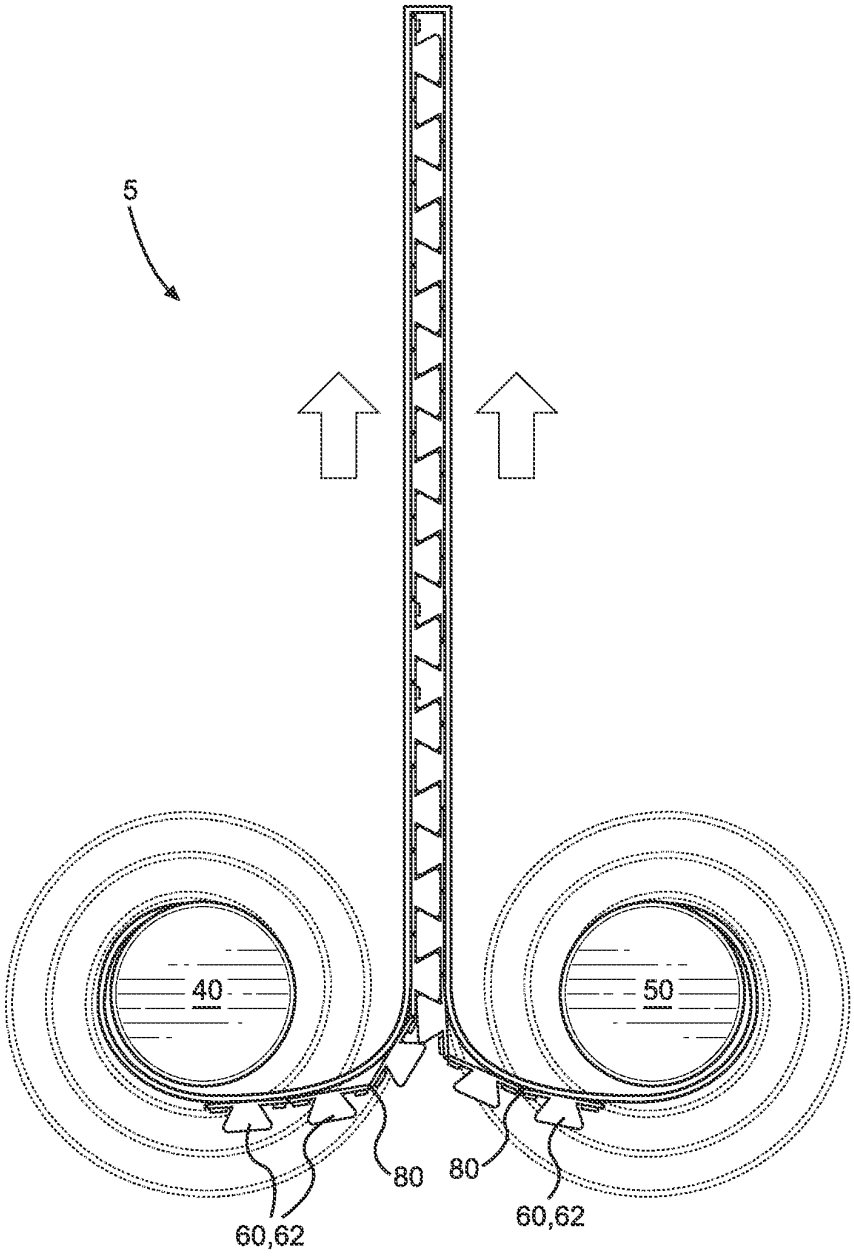

FIG. 99

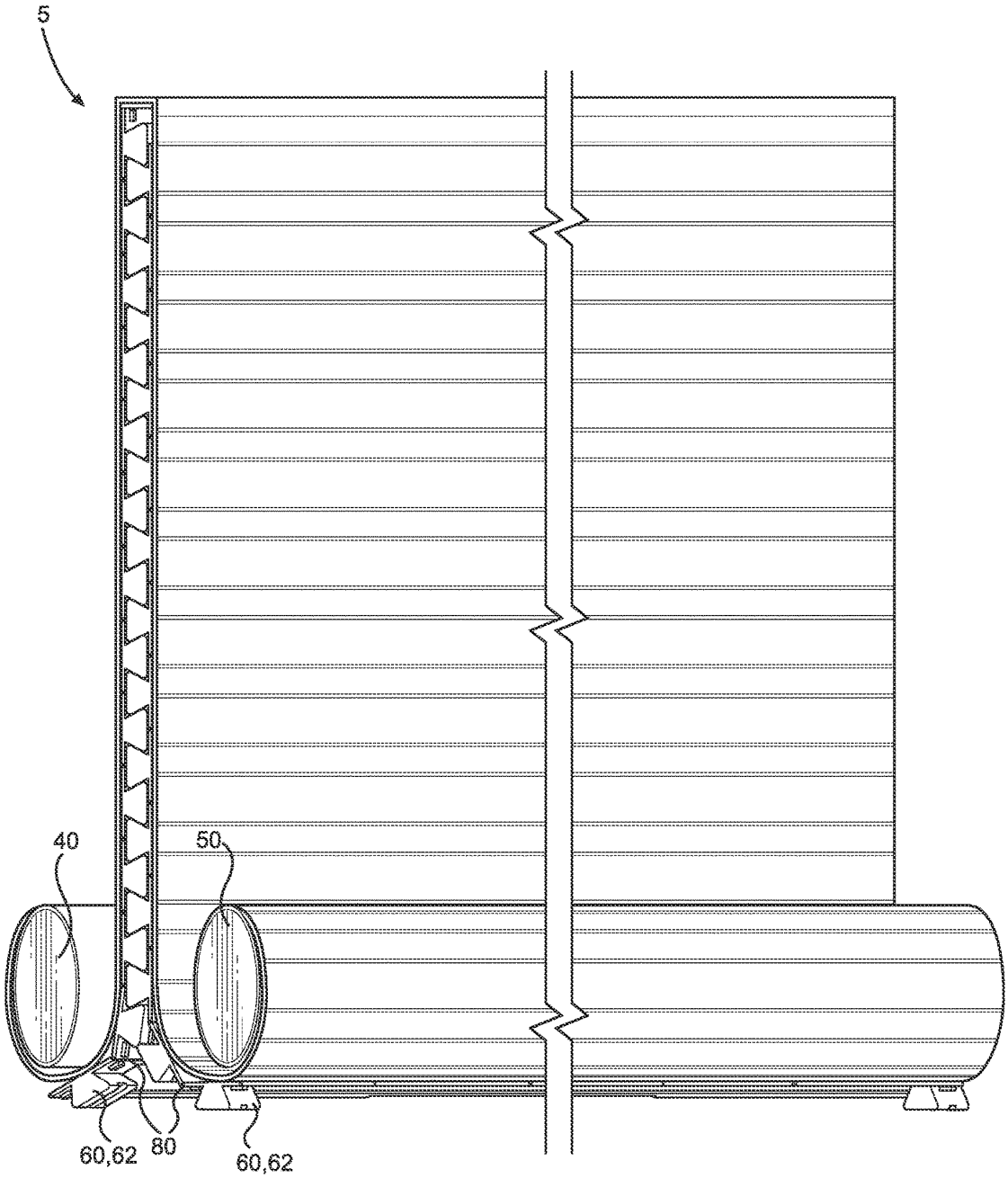

FIG. 100

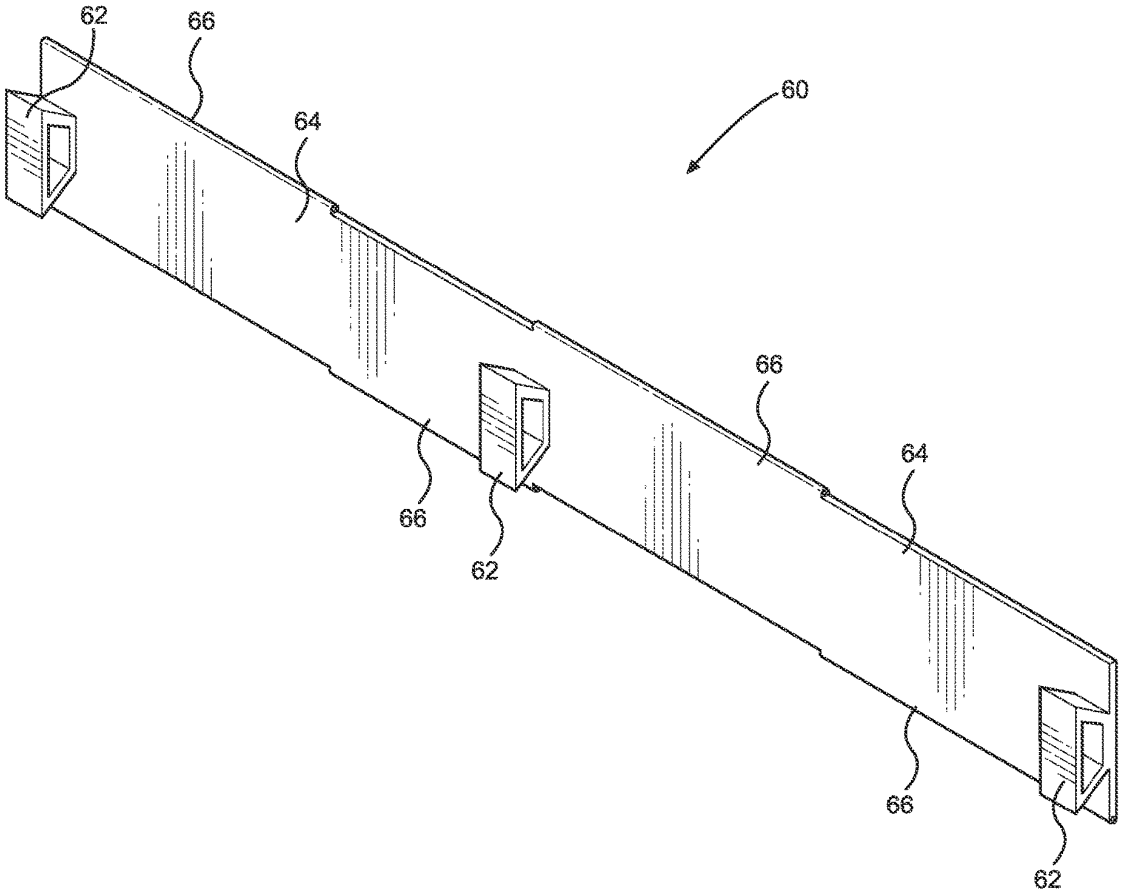

FIG. 101

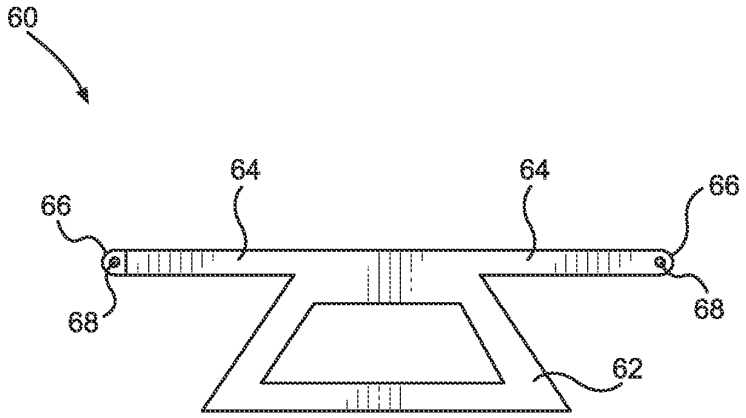

FIG. 102

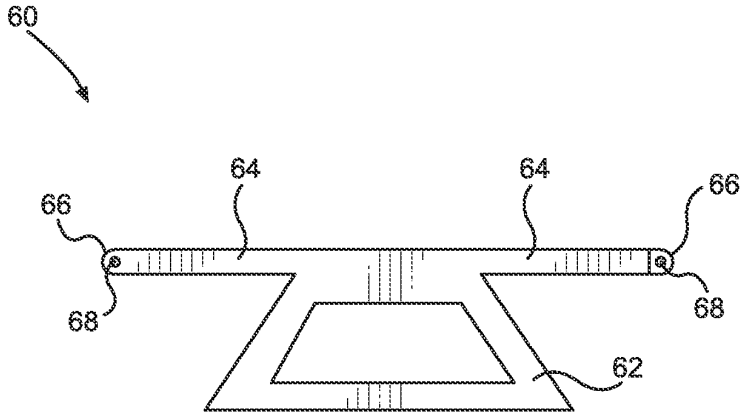

FIG. 103

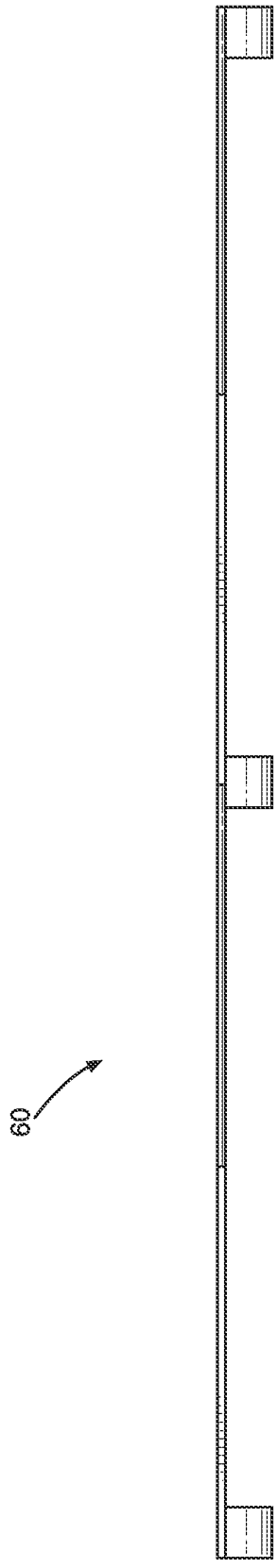

FIG. 104

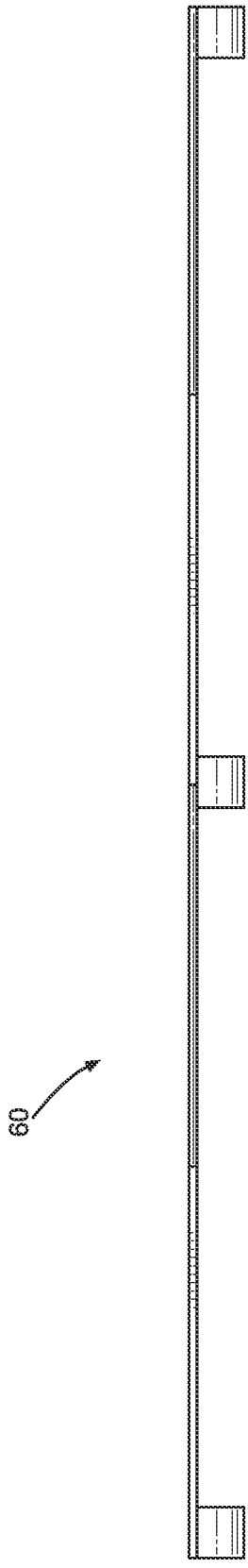

FIG. 105

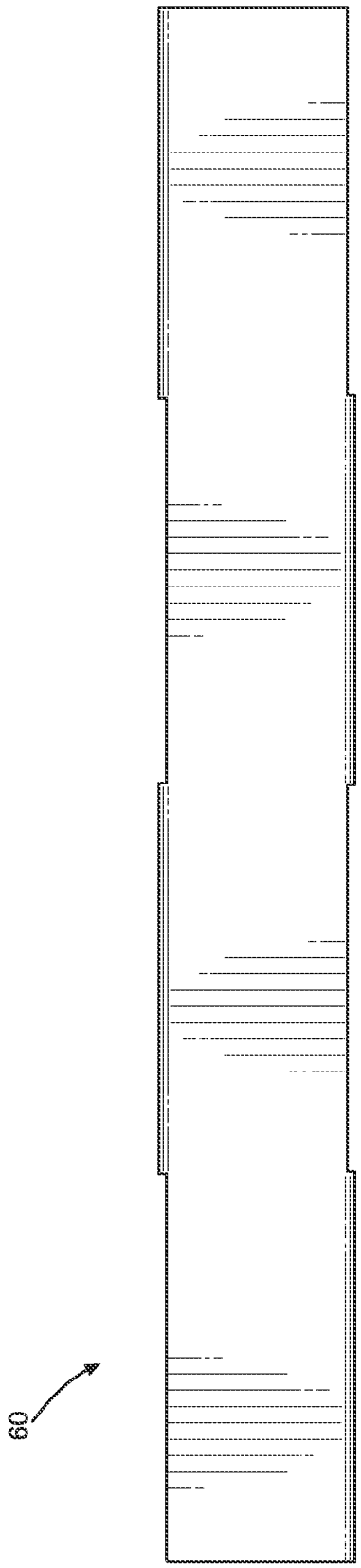

FIG. 106

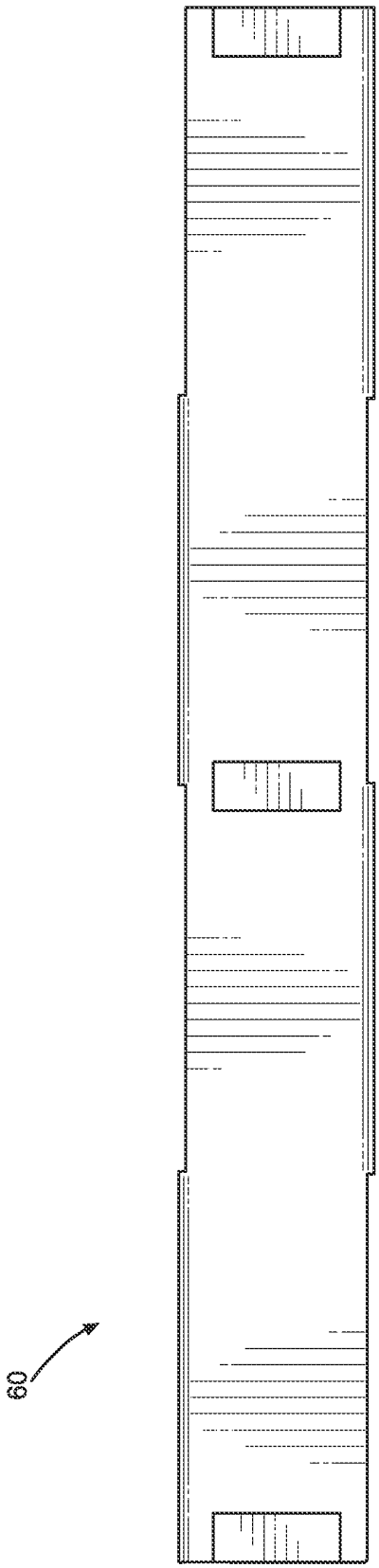

FIG. 107

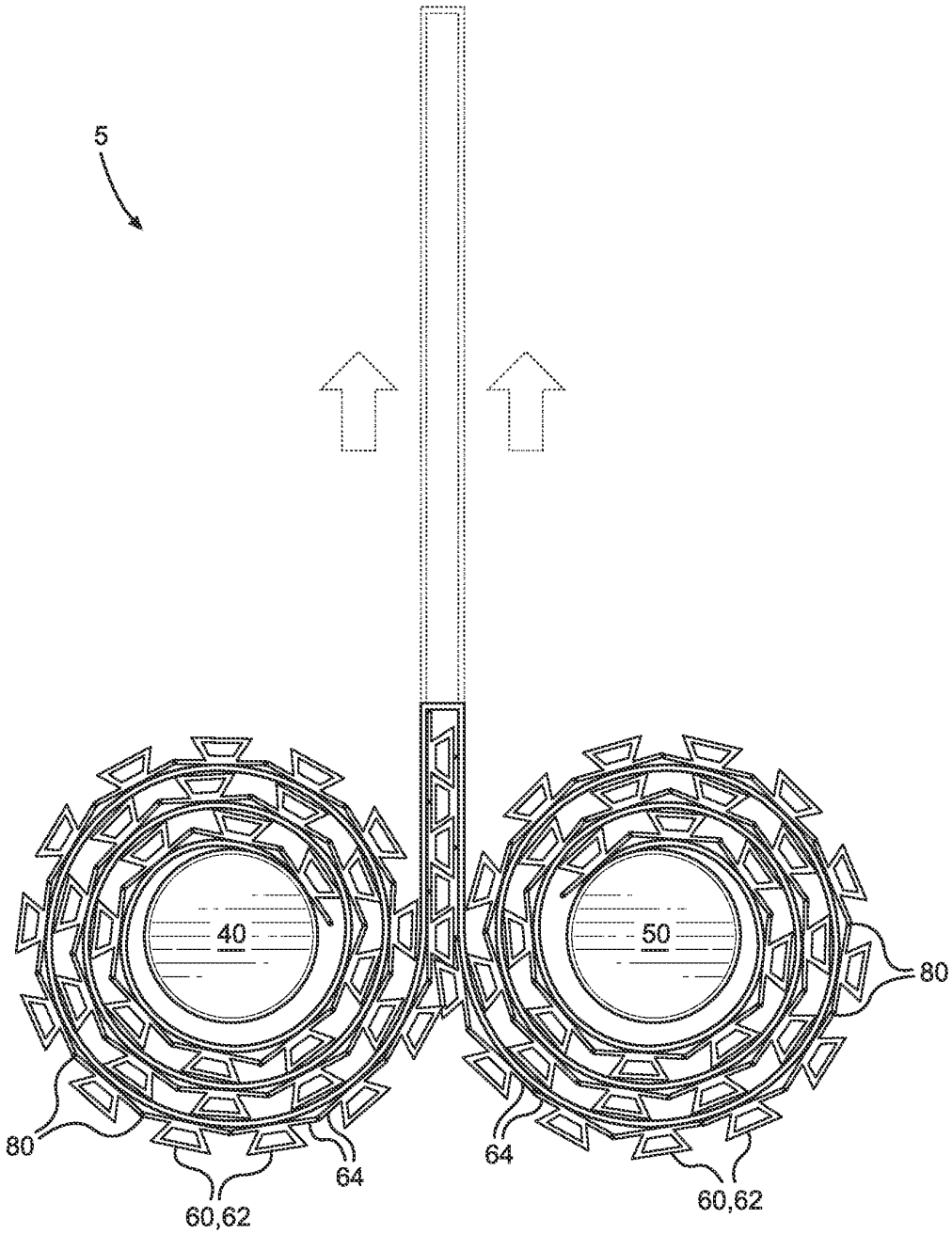

FIG. 108

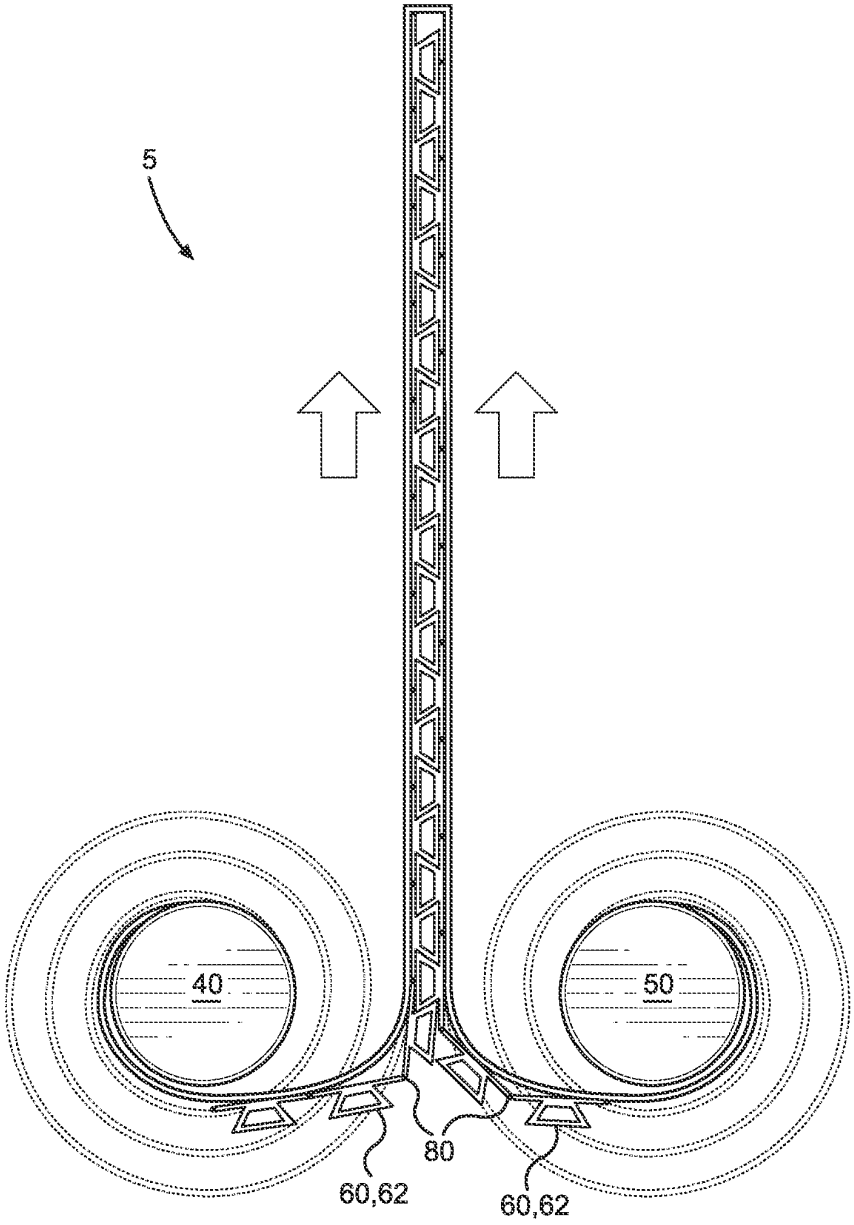

FIG. 109

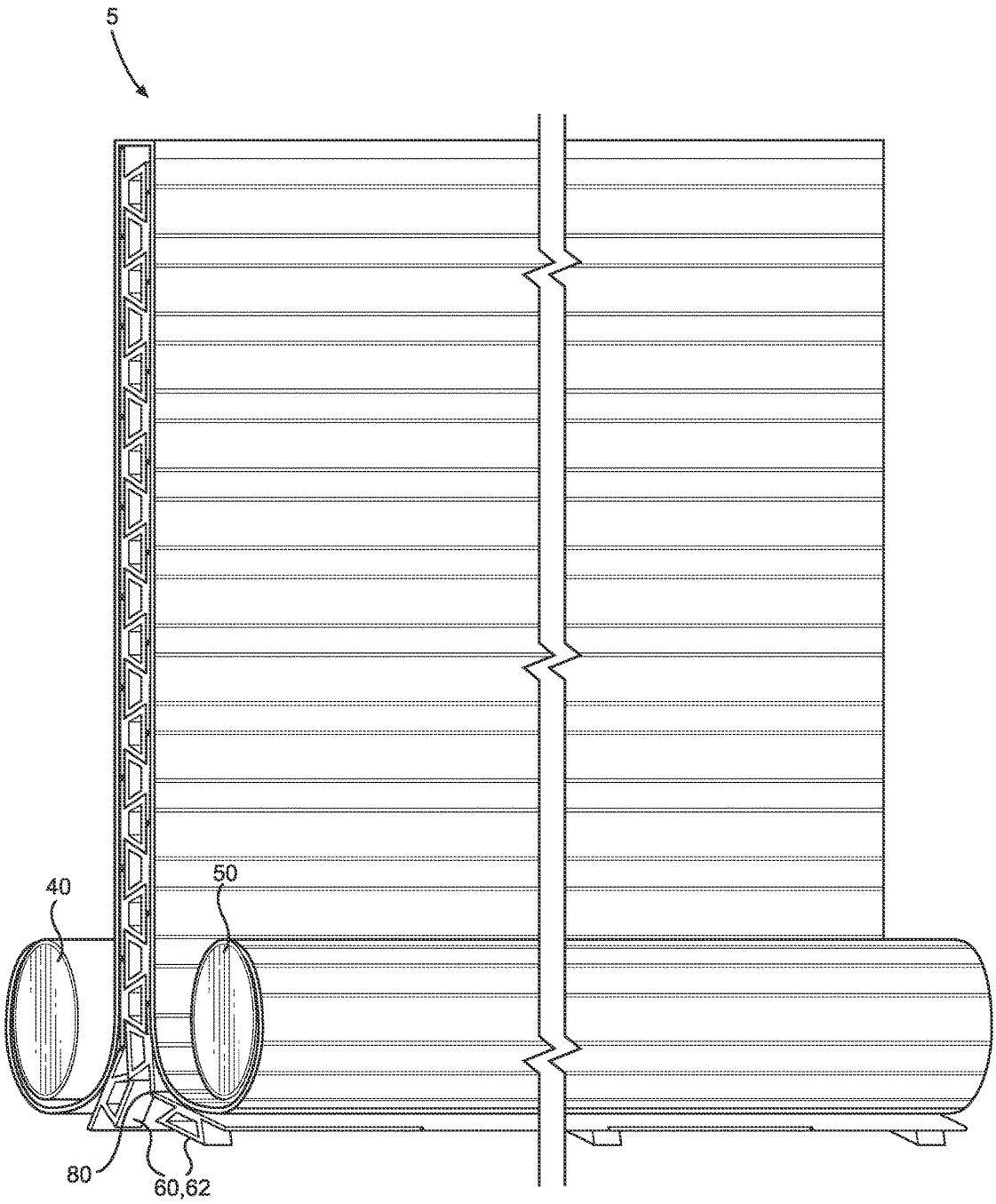

FIG. 110

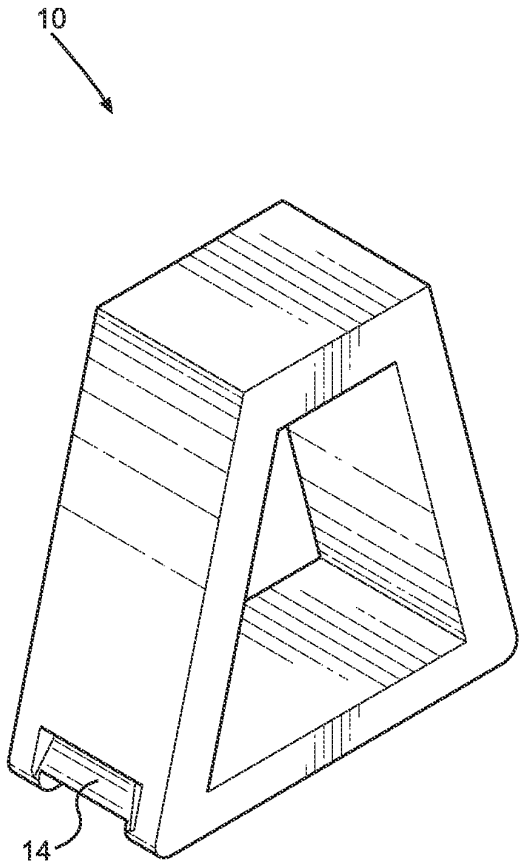

FIG. 111

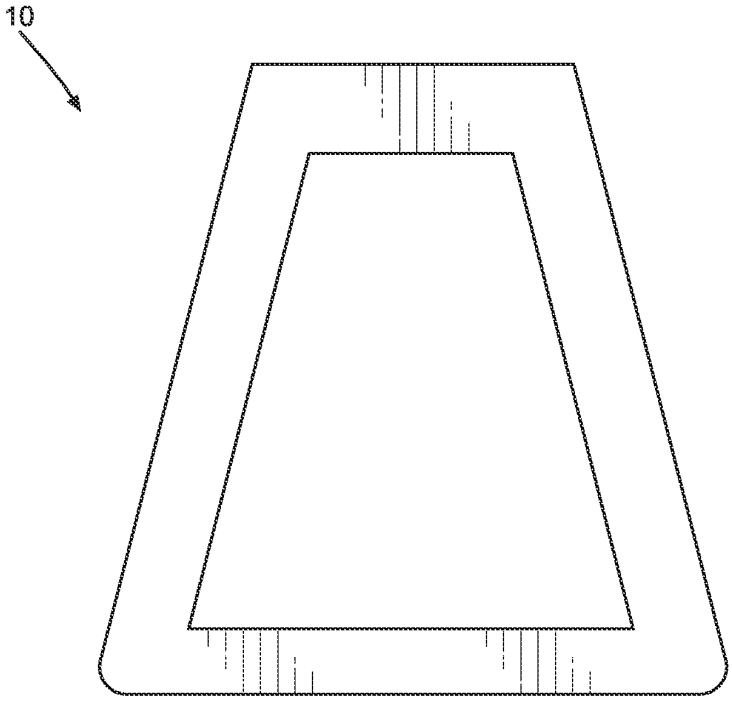

FIG. 112

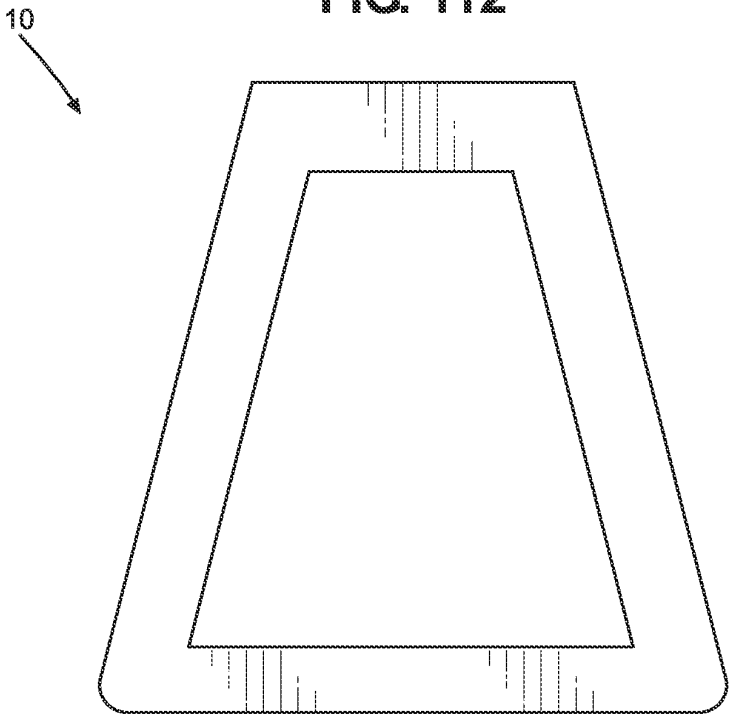

FIG. 113

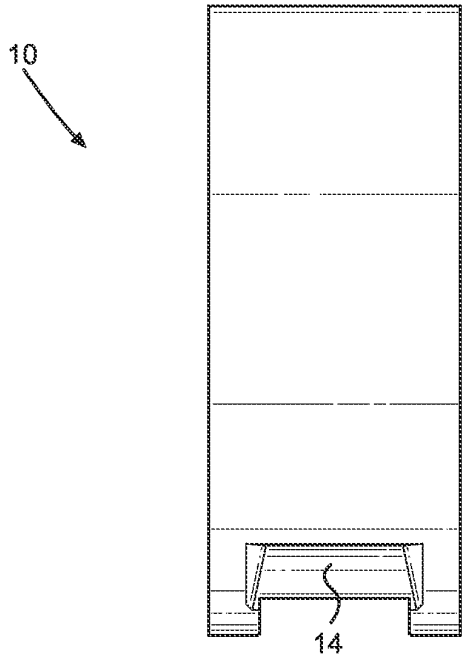

FIG. 114

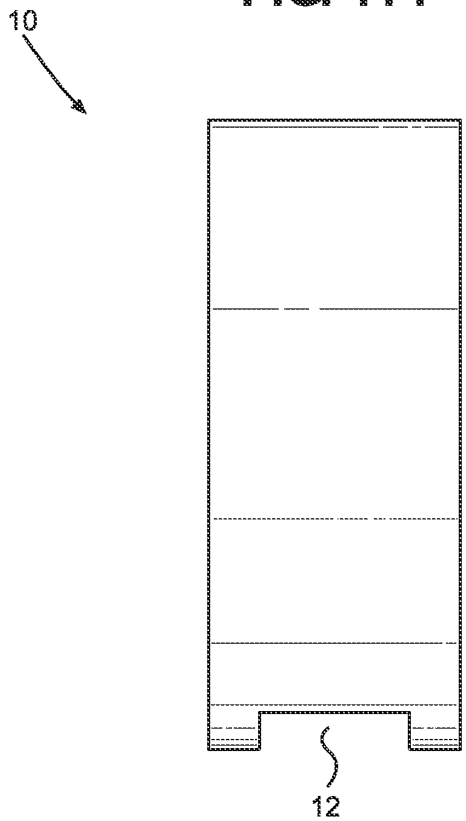

FIG. 115

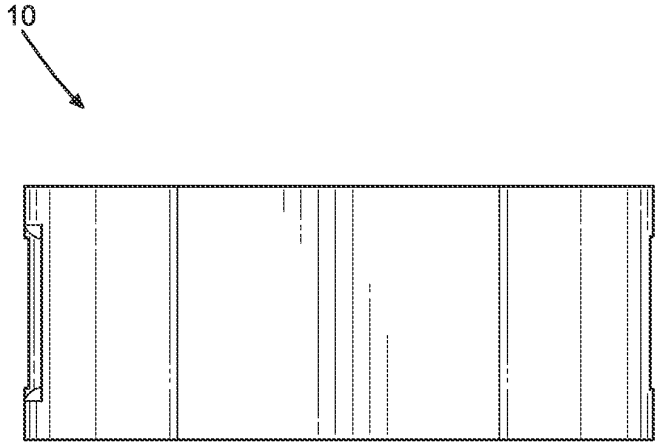

FIG. 116

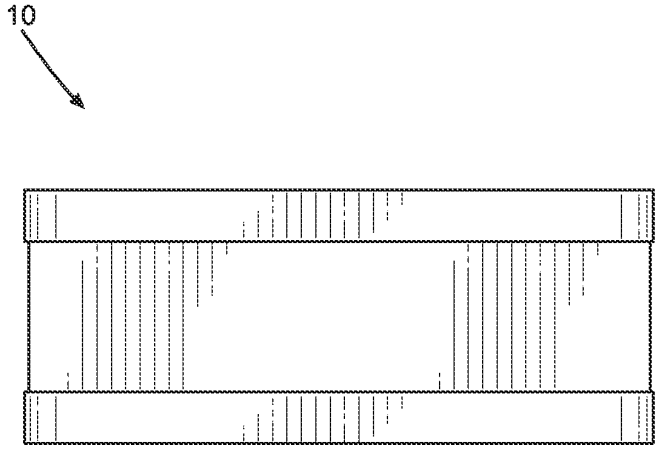

FIG. 117

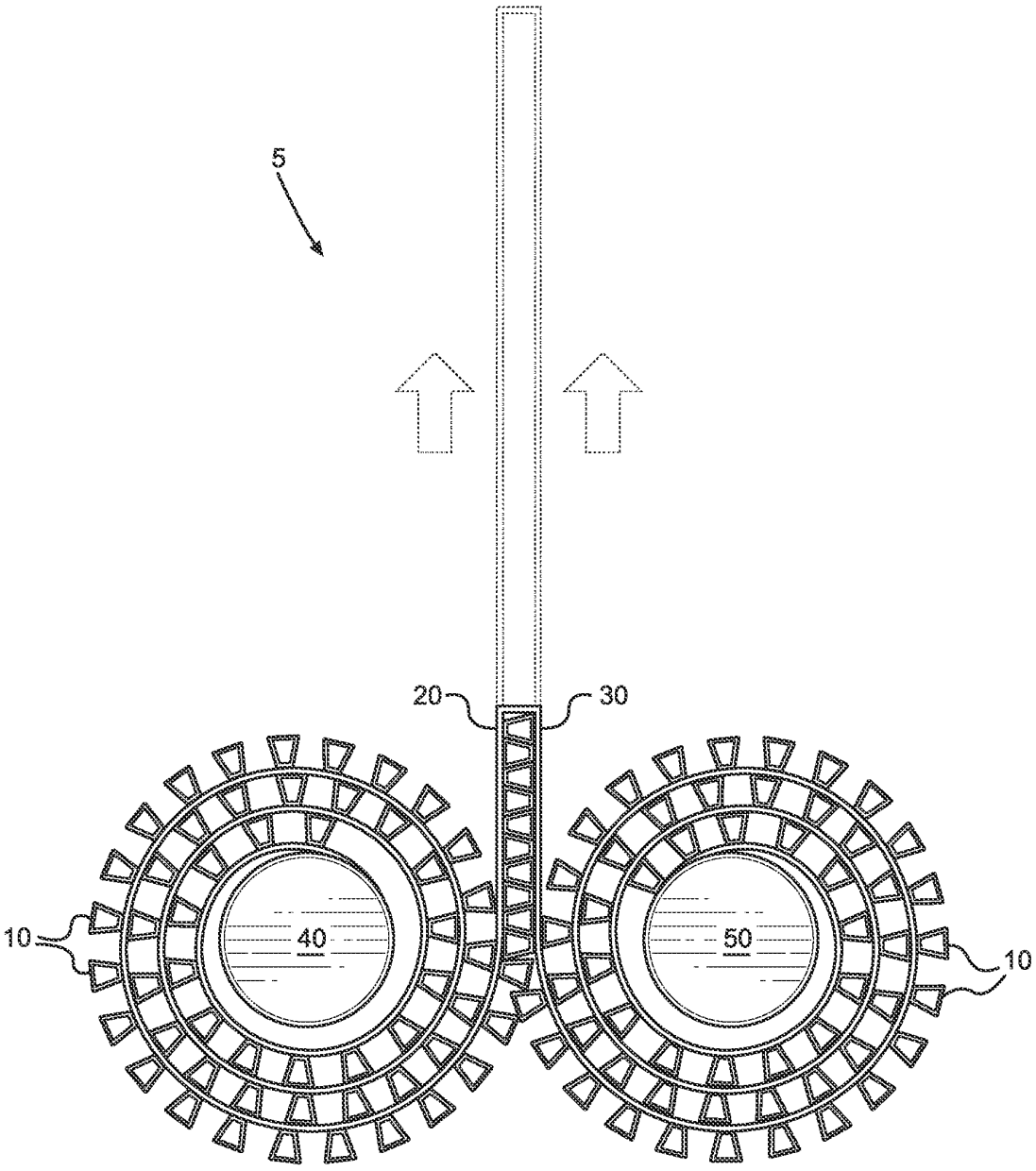

FIG. 118

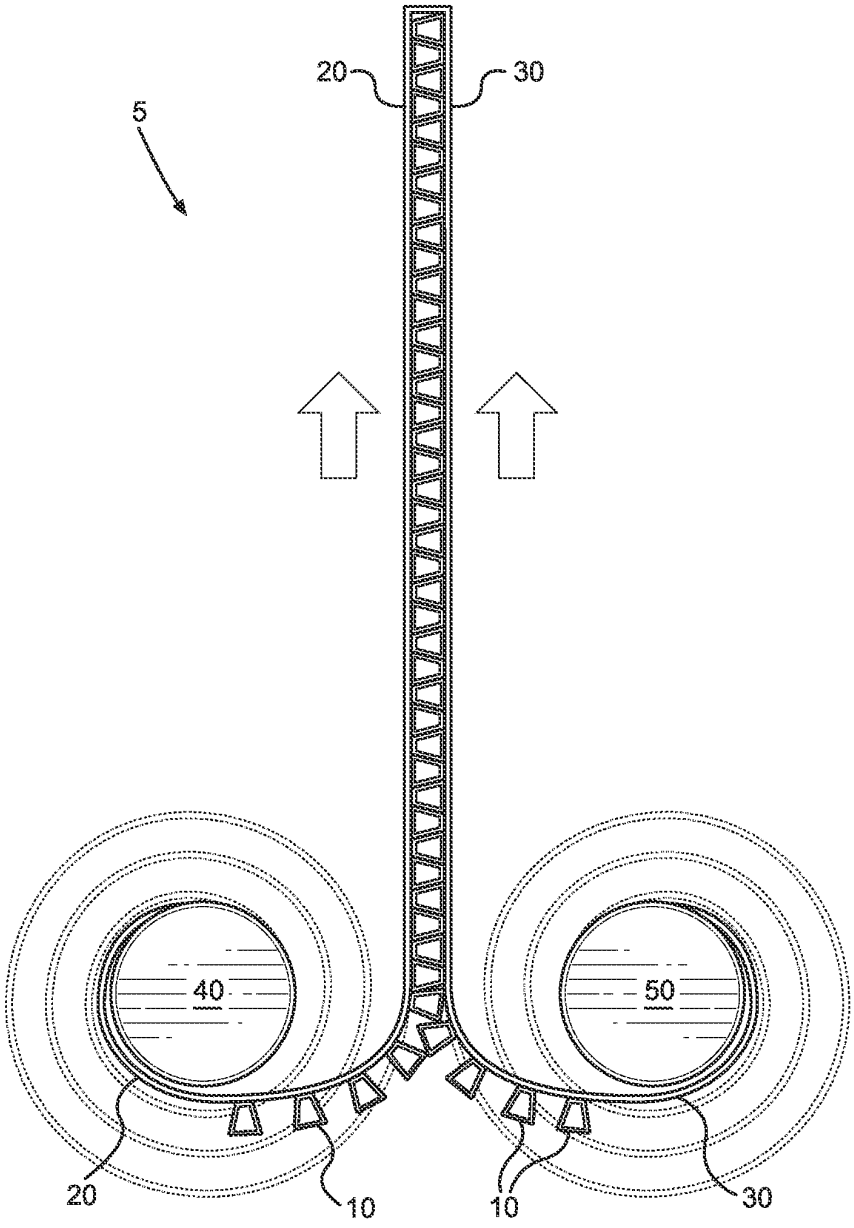

FIG. 119

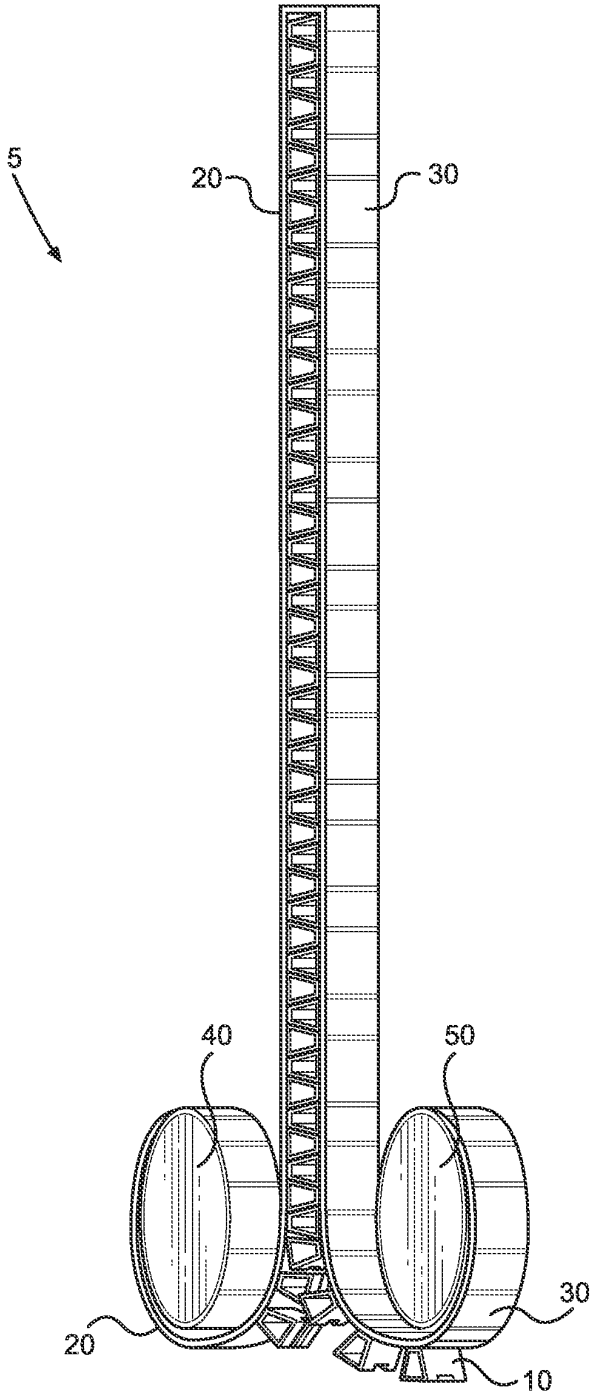

FIG. 120

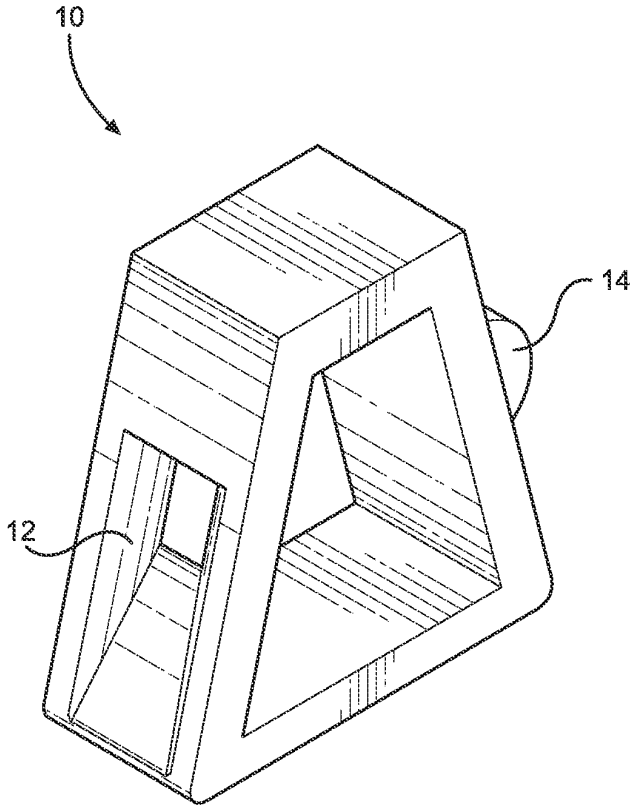

FIG. 121

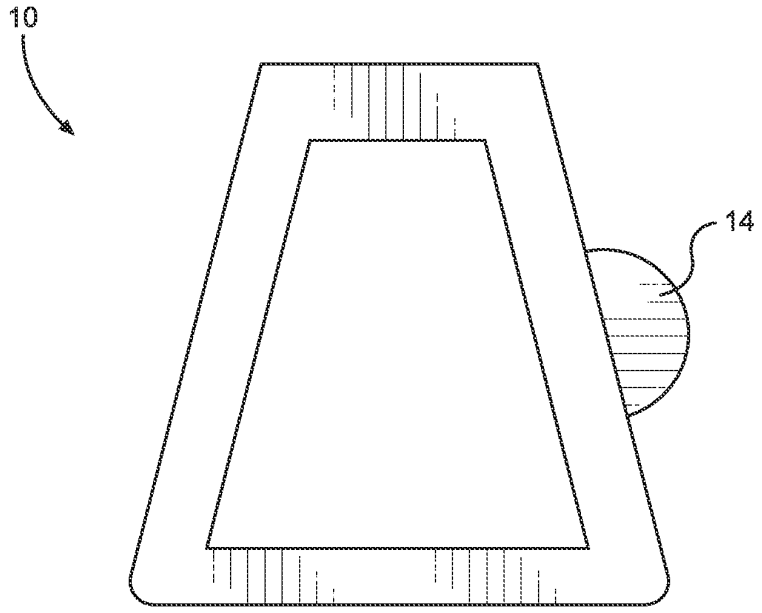

FIG. 122

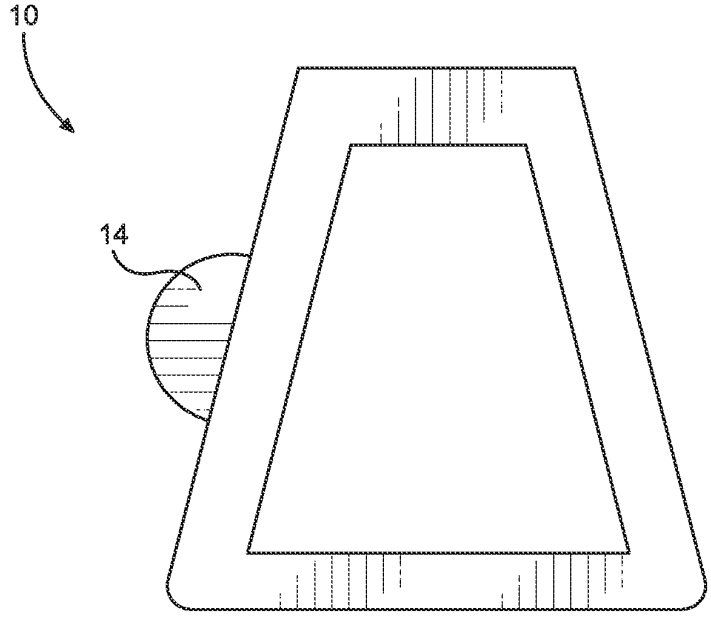

FIG. 123

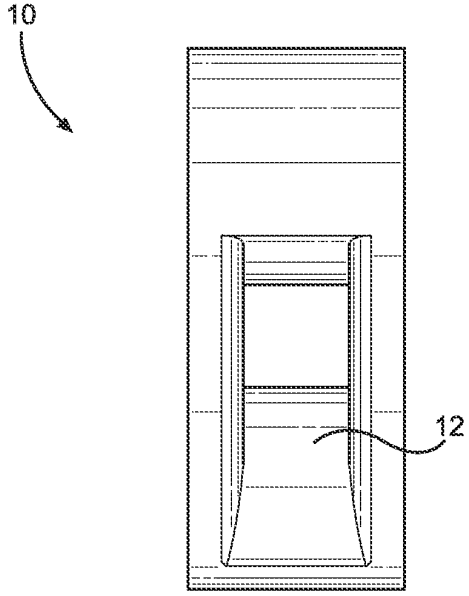

FIG. 124

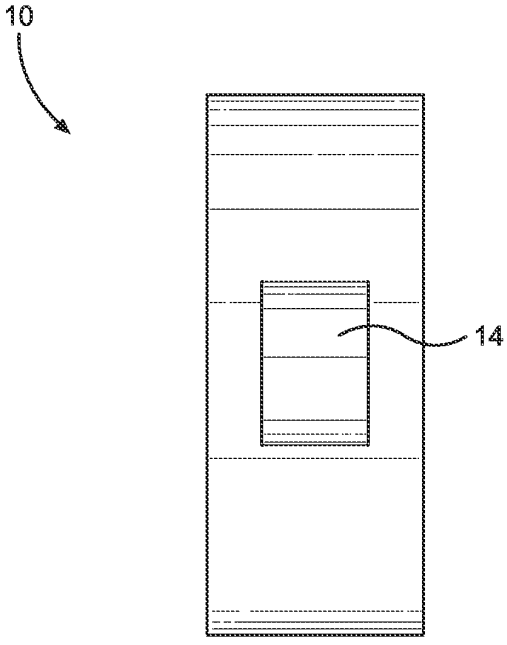

FIG. 125

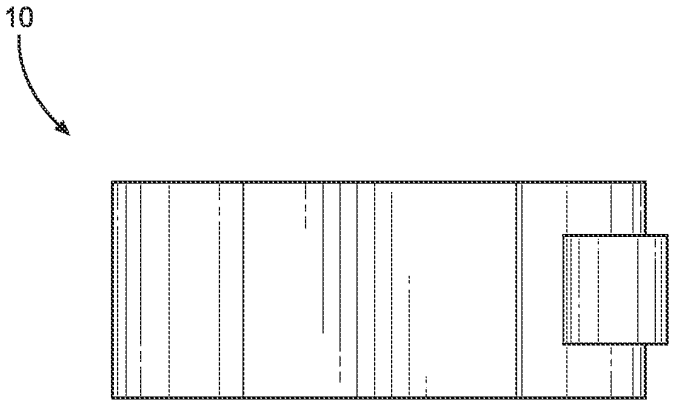

FIG. 126

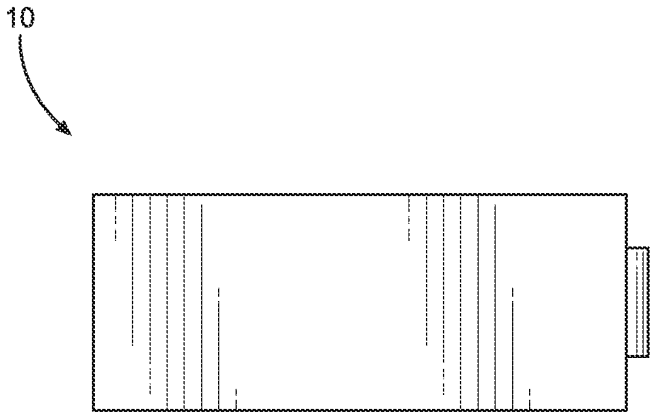

FIG. 127

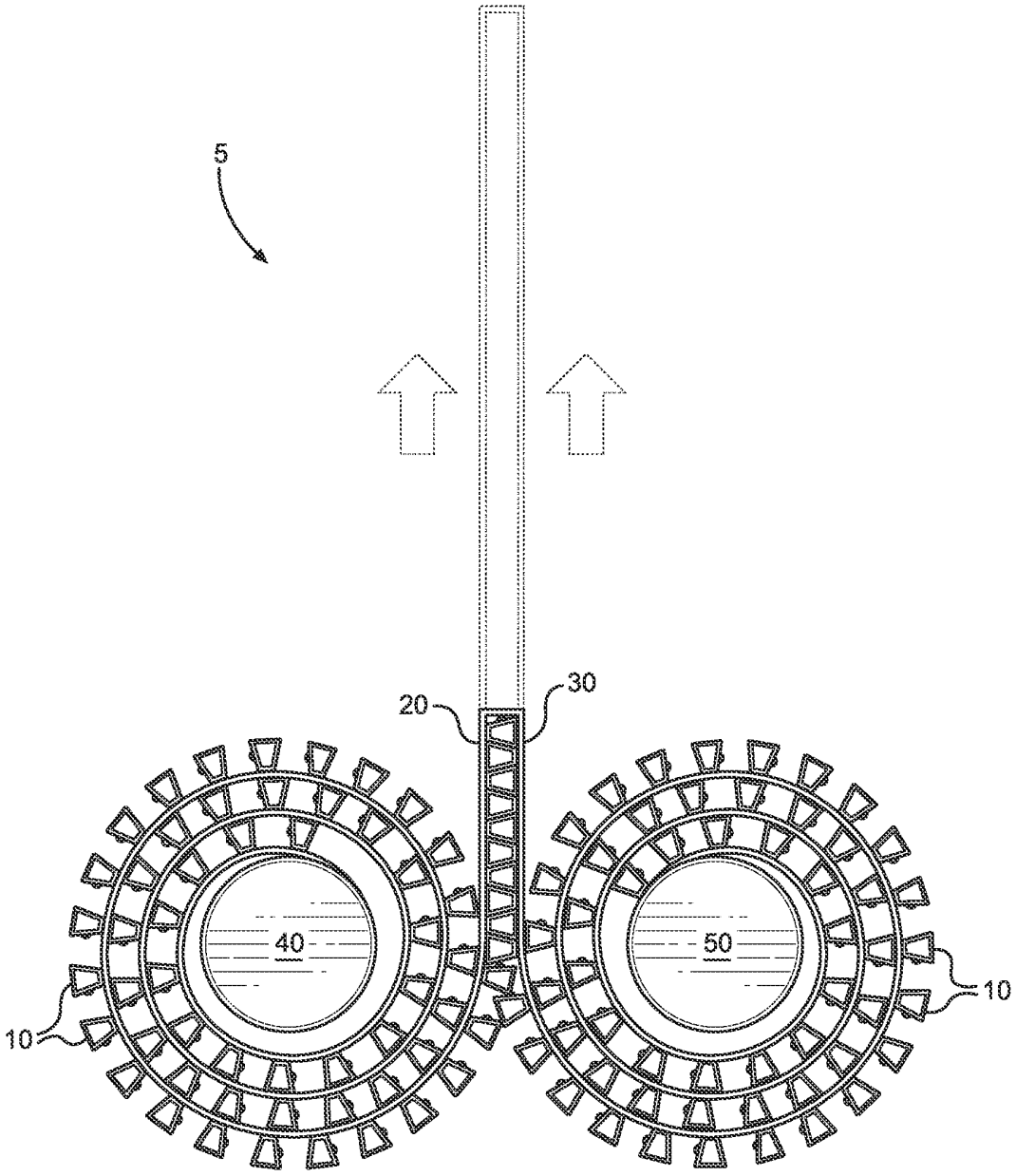

FIG. 128

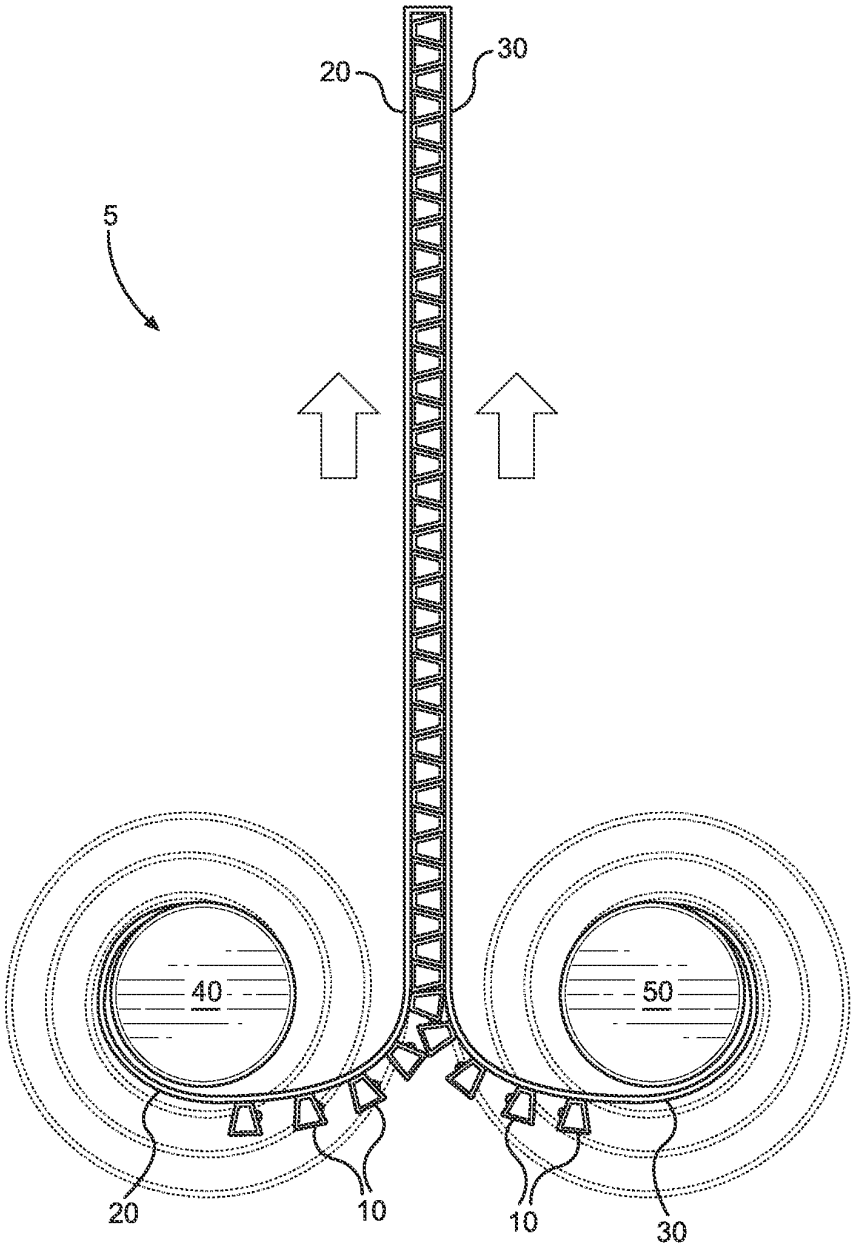

FIG. 129

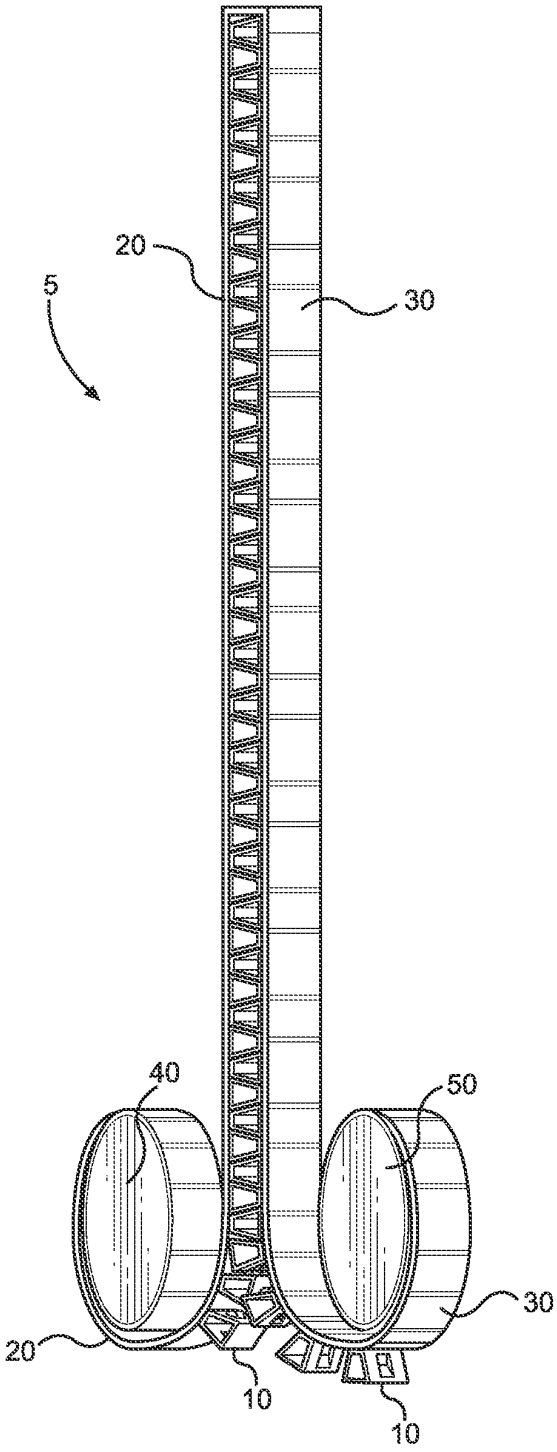

FIG. 130

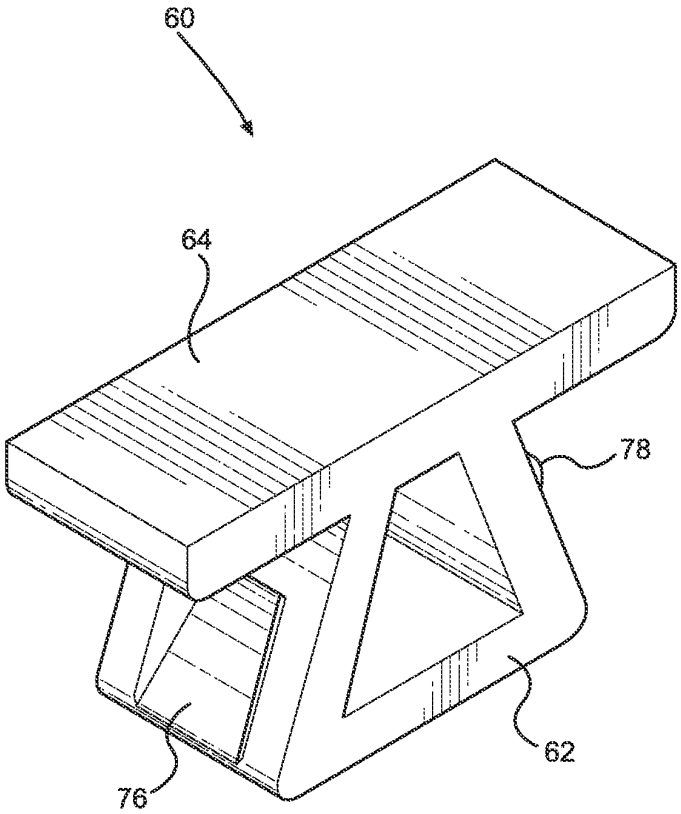

FIG. 131

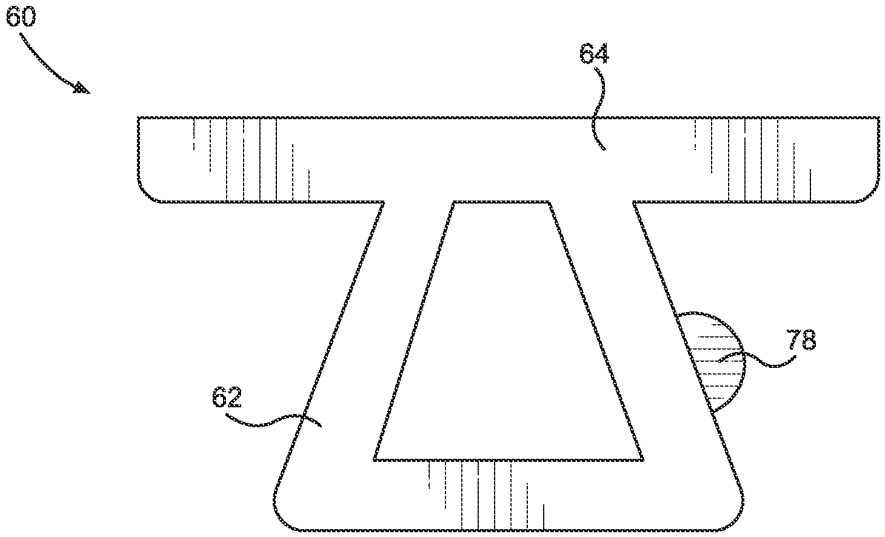

FIG. 132

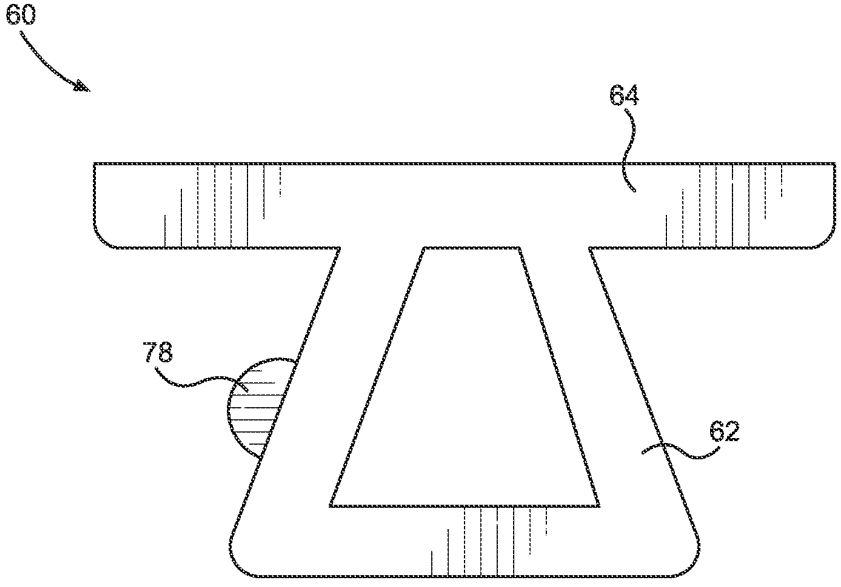

FIG. 133

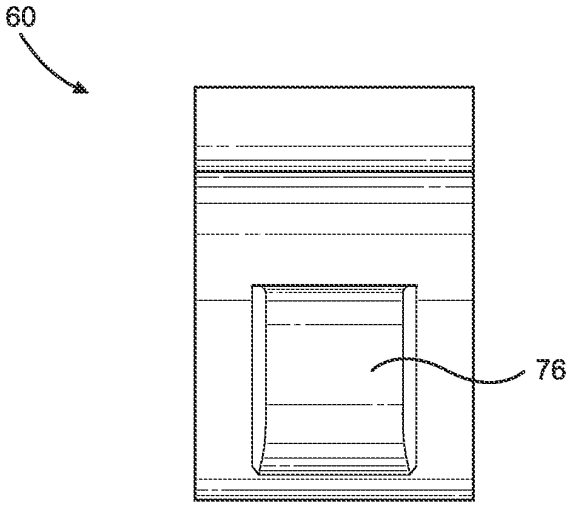

FIG. 134

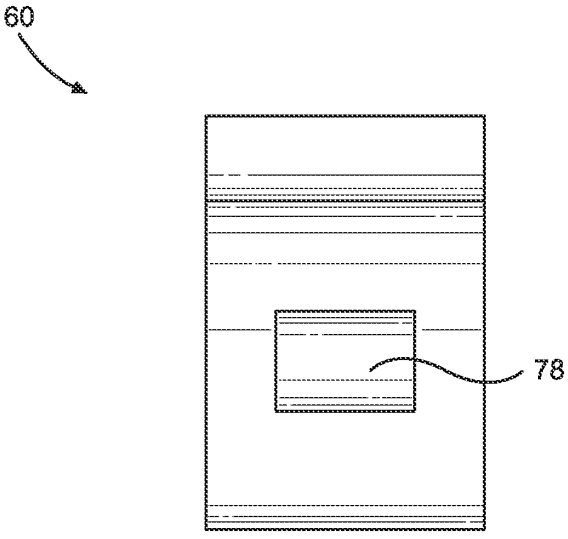

FIG. 135

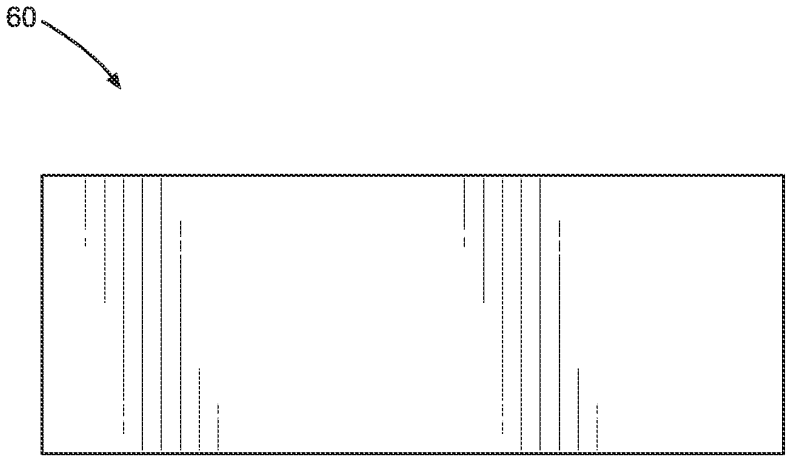

FIG. 136

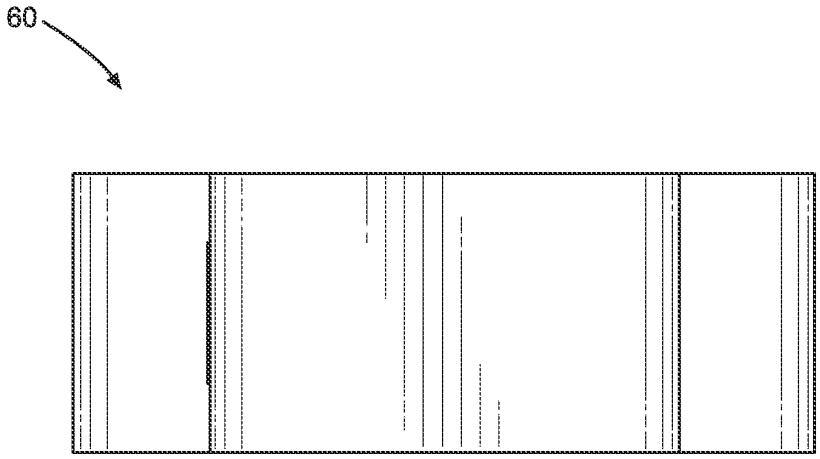

FIG. 137

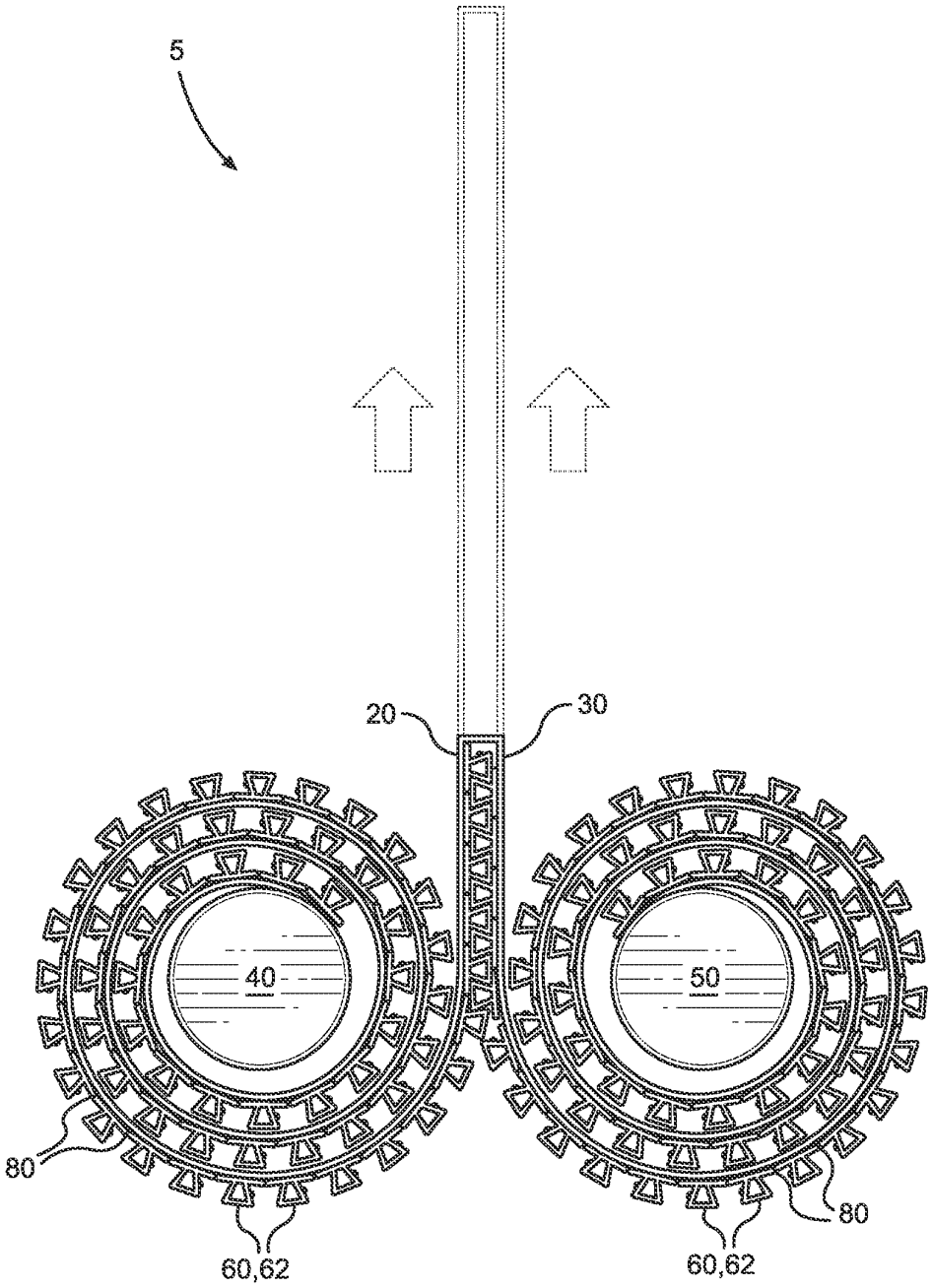

FIG. 138

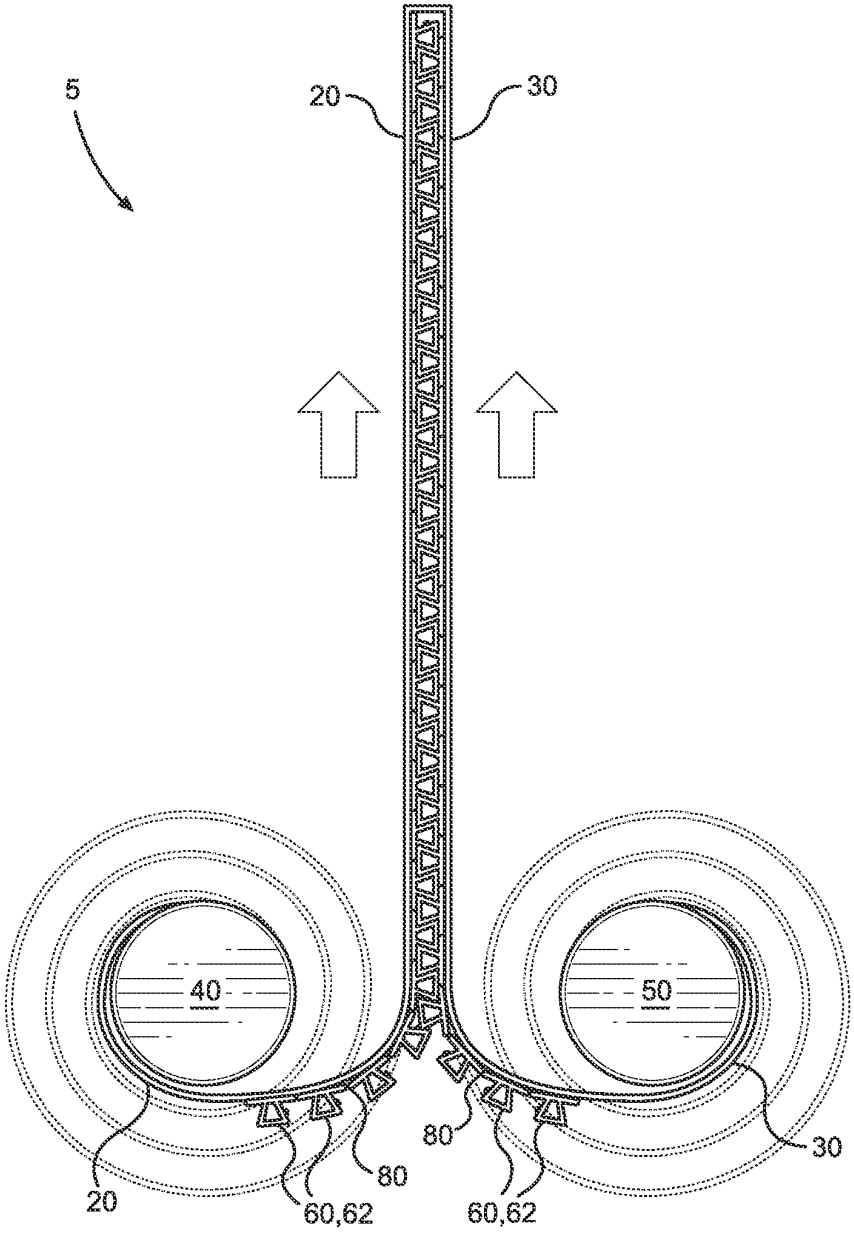

FIG. 139

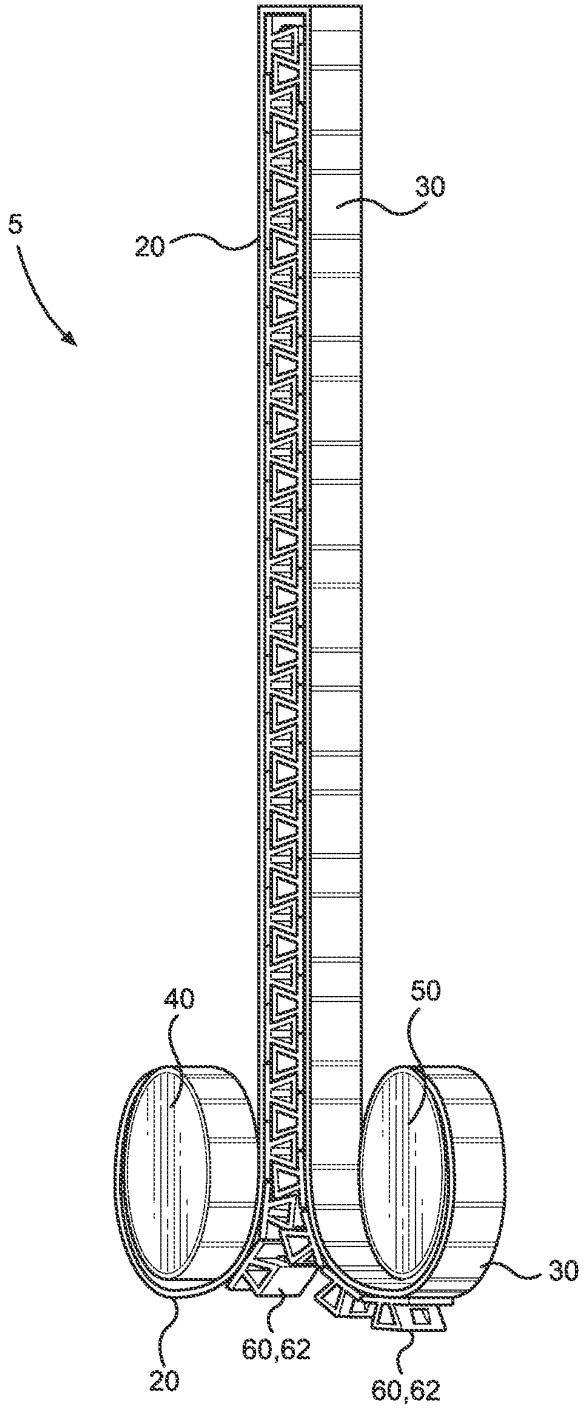

FIG. 140

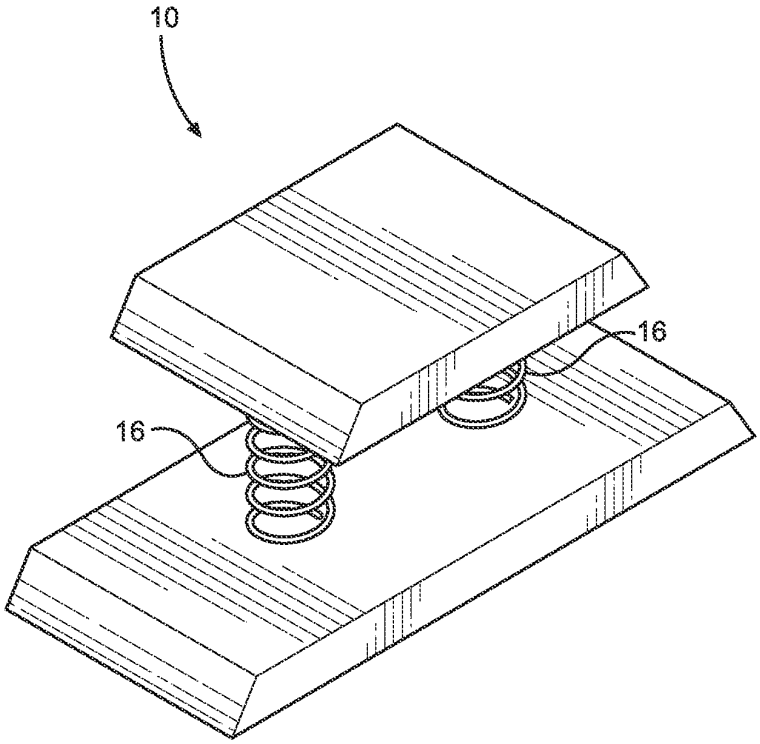

FIG. 141

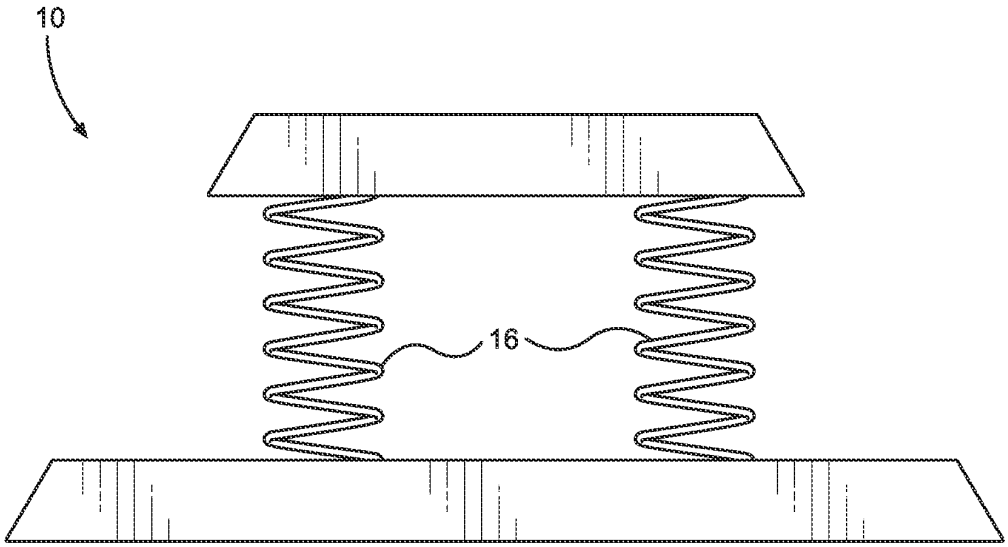

FIG. 142

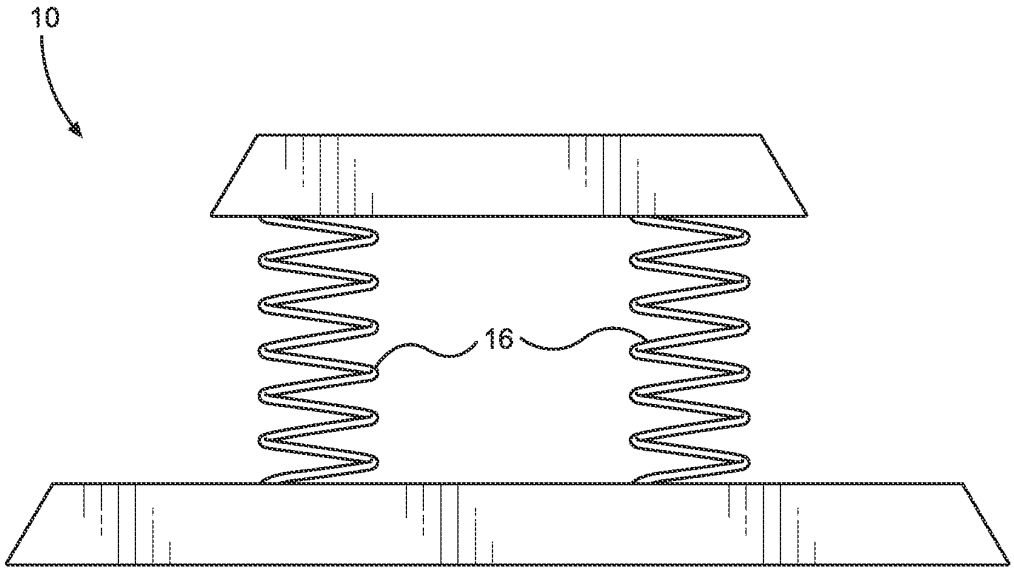

FIG. 143

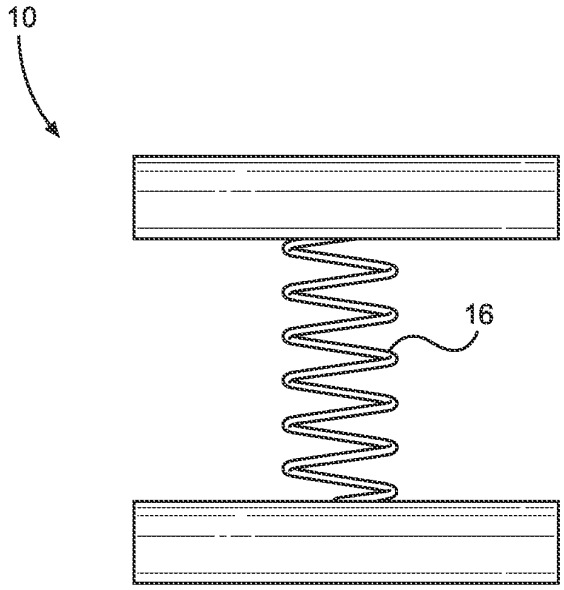

FIG. 144

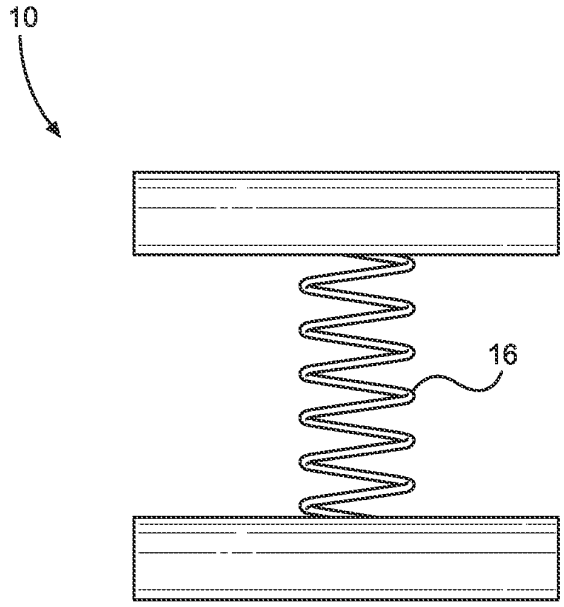

FIG. 145

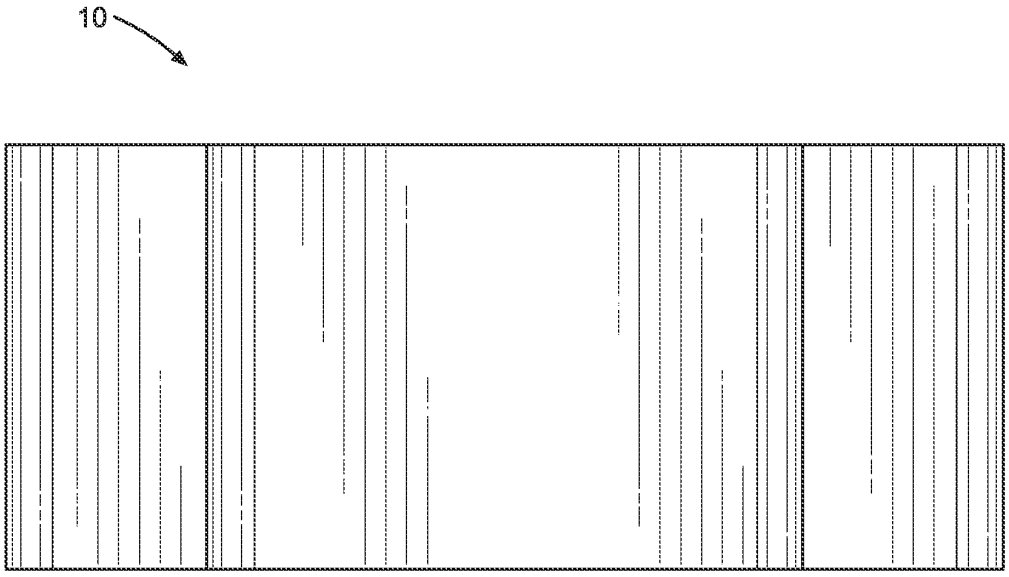

FIG. 146

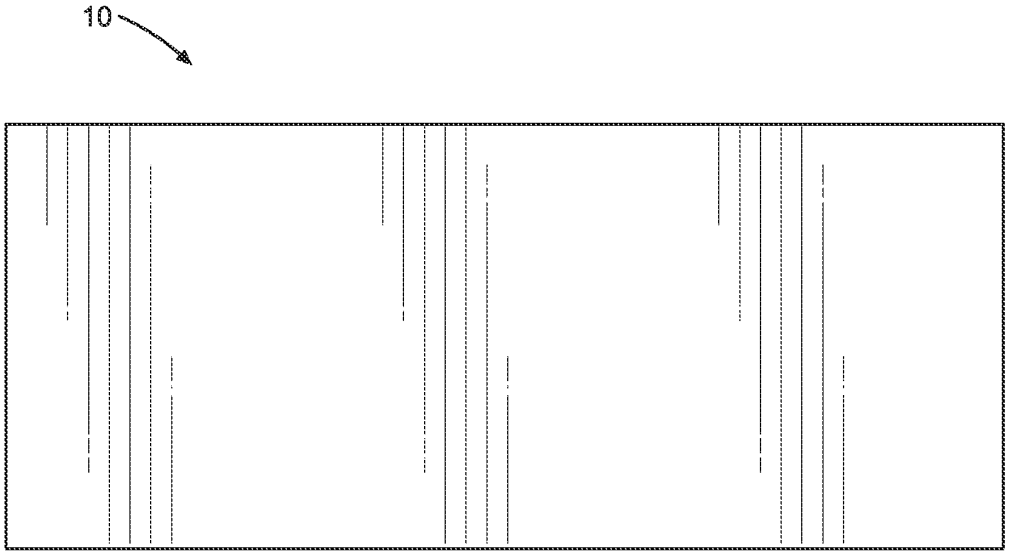

FIG. 147

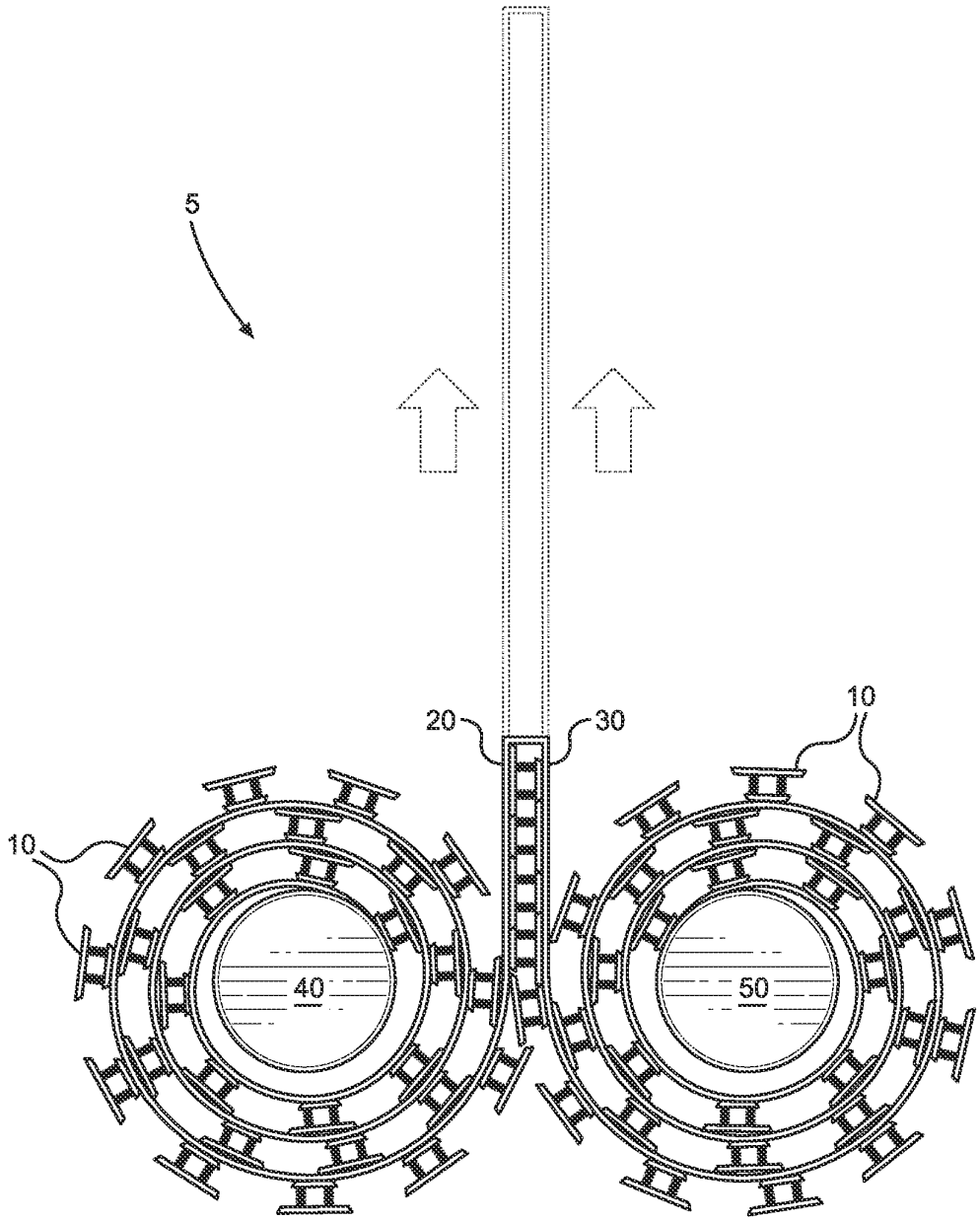

FIG. 148

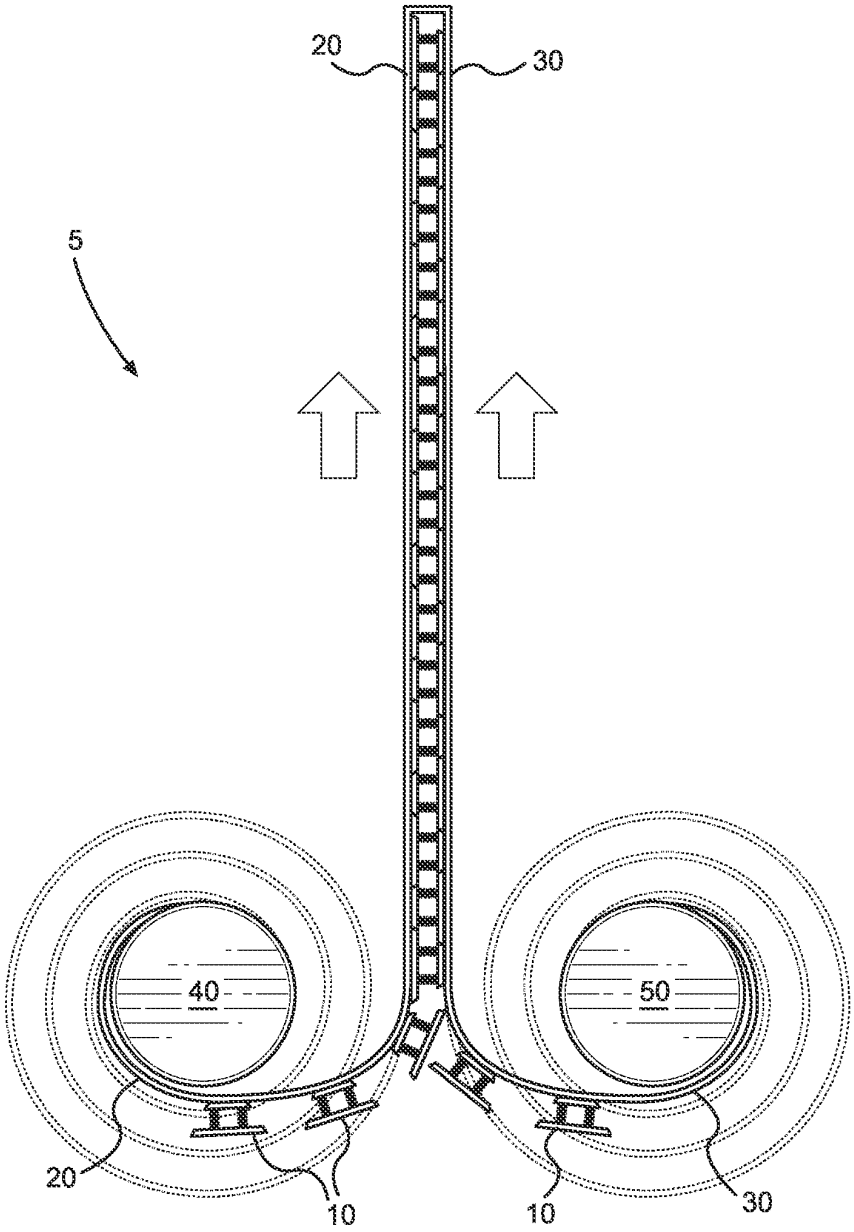

FIG. 149

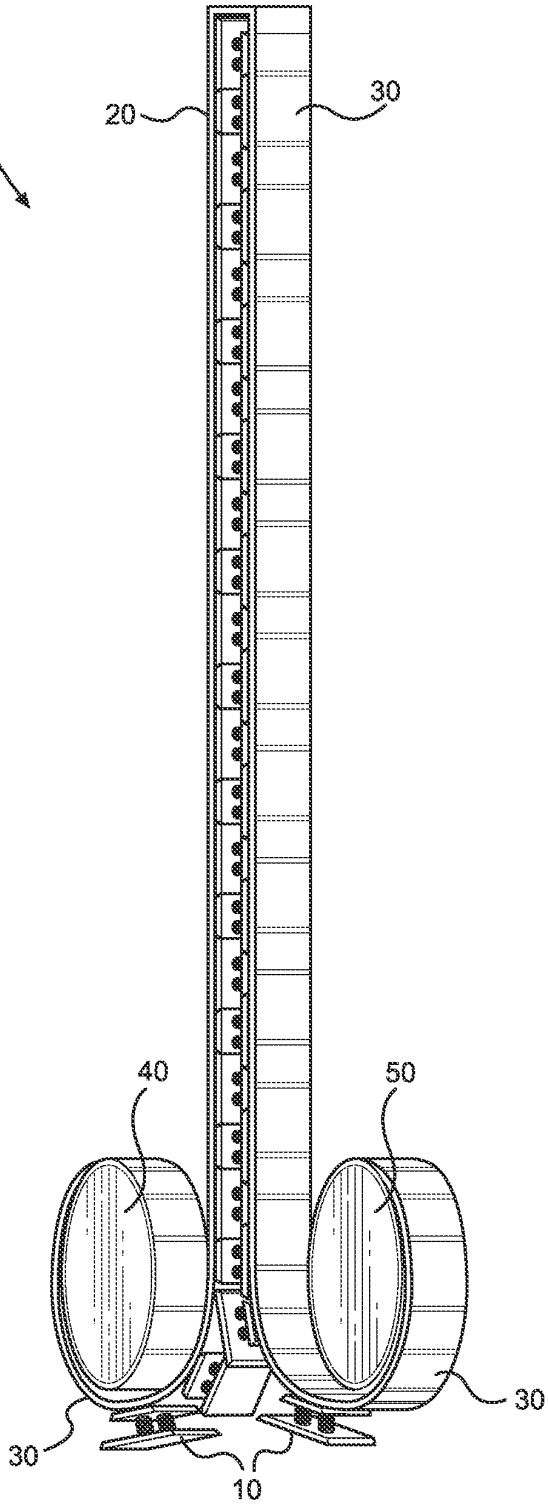

FIG. 150

EXTENDABLE AND RETRACTABLE SUPPORT STRUCTURE

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] This invention relates to a support structure that can be extended and retracted. The support structure could be linear, such as a post, stud, rafter, beam, or similar. The support structure could also be two-dimensional, such as a floor, ceiling, wall, platform, deck, or similar. The support structure is formed by two strings of trapezoidal links that weave together or interlock together to form a rigid support structure. Each string of trapezoidal links is a flexible member with a plurality of trapezoidal links attached thereto that are evenly spaced by the overall width of each trapezoidal link. Each string of trapezoidal links is wound or winded onto a roll or a roll core.

[0002] To extend the support structure, the two rolls rotate to unwind the two strings of trapezoidal links in unison wherein each trapezoidal link from one string interlocks between or weaves between two adjacent trapezoidal links on the other string, and vice versa, as the two roles unwind in order to form the support structure. Each trapezoidal link interlocks between two adjacent trapezoidal links on the other string and vice versa in order to create and extend a very solid support structure from the two rolls. This process projects the support structure out from the two rolls and essentially extends the support structure out into the air from the two rolls as the two rolls are rotated to project or unwind the support structure. As the two rolls unwind, links in the support structure lock together to form a very sturdy and solid support structure. The support structure does not require any other support or attachment other than to the two rolls. Hence, the two rolls and only the two rolls hold and support the support structure that extends from the two rolls.

[0003] To retract the support structure, the two rolls rotate to wind in the two strings of trapezoidal links in unison wherein each trapezoidal link from one string unlocks or unweaves itself from between the two adjacent trapezoidal links on the other string, and vice versa, as the two roles are wound in in order to retract the support structure. Each trapezoidal link unlocks from between the two adjacent trapezoidal links on the other string and vice versa in order to retract or roll in the support structure. This process retracts the support structure onto the two rolls and essentially winds in the support structure from the air. As the two rolls wind up, each string of trapezoidal links winds back up onto a core.

2. Description of Related Art

[0004] There are other extendable and retractable support structures in the prior art, however, there are none with two strings of trapezoidal links that are each wound up onto a core wherein the two strings can be unwound so that each string interlocks with or mates with the other string to form an exceptionally strong and rigid support structure that can also be wound back up to retract the support structure onto the roles as shown and described below.

BRIEF SUMMARY OF THE INVENTION

[0005] It is an aspect of extendable and retractable support structure to extend a rigid support member, structure, or framework out into the air.

[0006] It is an aspect of extendable and retractable support structure to retract a rigid support member, structure, or framework out from the air.

[0007] It is an aspect of extendable and retractable support structure to be linear, such as a post, stud, rafter, beam, or similar.

[0008] It is an aspect of extendable and retractable support structure to be two-dimensional, such as a floor, ceiling, wall, platform, deck, or similar.

[0009] It is an aspect of the extendable and retractable support structure to be formed by two strings of trapezoidal links that weave together or interlock together to form a rigid support structure.

[0010] It is an aspect of each string of trapezoidal links to be a flexible member with a plurality of trapezoidal links attached thereto that are evenly spaced by the overall width of each trapezoidal link.

[0011] It is an aspect of each string of trapezoidal links to be wound or winded onto a roll or a roll core wherein the rolls are unwound to extend the rigid support member, structure, or framework and wind in to retract the rigid support member, structure, or framework.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] FIG. **1** is a perspective view of a trapezoidal prism link.

[0013] FIG. **2** is a front elevation view of a trapezoidal prism link.

[0014] FIG. **3** is a rear elevation view of a trapezoidal prism link.

[0015] FIG. **4** is a right side elevation view of a trapezoidal prism link.

[0016] FIG. **5** is a left side elevation view of a trapezoidal prism link.

[0017] FIG. **6** is a top plan view of a trapezoidal prism link.

[0018] FIG. **7** is a bottom plan view of a trapezoidal prism link.

[0019] FIG. **8** is a side elevation view of an extendable and retractable support structure in the retracted position.

[0020] FIG. **8** is a side elevation view of an extendable and retractable support structure in the extended position.

[0021] FIG. **10** is a perspective view of an extendable and retractable support structure in the extended position.

[0022] FIG. **11** is a perspective view of a second embodiment of a trapezoidal prism link.

[0023] FIG. **12** is a front elevation view of a second embodiment of a trapezoidal prism link.

[0024] FIG. **13** is a rear elevation view of a second embodiment of a trapezoidal prism link.

[0025] FIG. **14** is a right side elevation view of a second embodiment of a trapezoidal prism link.

[0026] FIG. **15** is a left side elevation view of a second embodiment of a trapezoidal prism link.

[0027] FIG. **16** is a top plan view of a second embodiment of a trapezoidal prism link.

[0028] FIG. **17** is a bottom plan view of a second embodiment of a trapezoidal prism link.

[0029] FIG. **18** is a side elevation view of a second embodiment of an extendable and retractable support structure in the retracted position.

[0030] FIG. **19** is a side elevation view of a second embodiment of an extendable and retractable support structure in the extended position.

[0031] FIG. **20** is a perspective view of a second embodiment of an extendable and retractable support structure in the extended position.

[0032] FIG. **21** is a perspective view of a third embodiment of a trapezoidal prism link.

[0033] FIG. **22** is a front elevation view of a third embodiment of a trapezoidal prism link.

[0034] FIG. **23** is a rear elevation view of a third embodiment of a trapezoidal prism link.

[0035] FIG. **24** is a right side elevation view of a third embodiment of a trapezoidal prism link.

[0036] FIG. **25** is a left side elevation view of a third embodiment of a trapezoidal prism link.

[0037] FIG. **26** is a top plan view of a third embodiment of a trapezoidal prism link.

[0038] FIG. **27** is a bottom plan view of a third embodiment of a trapezoidal prism link.

[0039] FIG. **28** is a side elevation view of a third embodiment of an extendable and retractable support structure in the retracted position.

[0040] FIG. **29** is a side elevation view of a third embodiment of an extendable and retractable support structure in the extended position.

[0041] FIG. **30** is a perspective view of a third embodiment of an extendable and retractable support structure in the extended position.

[0042] FIG. **31** is a perspective view of a fourth embodiment of a trapezoidal prism link.

[0043] FIG. **32** is a front elevation view of a fourth embodiment of a trapezoidal prism link.

[0044] FIG. **33** is a rear elevation view of a fourth embodiment of a trapezoidal prism link.

[0045] FIG. **34** is a right side elevation view of a fourth embodiment of a trapezoidal prism link.

[0046] FIG. **35** is a left side elevation view of a fourth embodiment of a trapezoidal prism link.

[0047] FIG. **36** is a top plan view of a fourth embodiment of a trapezoidal prism link.

[0048] FIG. **37** is a bottom plan view of a fourth embodiment of a trapezoidal prism link.

[0049] FIG. **38** is a side elevation view of a fourth embodiment of an extendable and retractable support structure in the retracted position.

[0050] FIG. **39** is a side elevation view of a fourth embodiment of an extendable and retractable support structure in the extended position.

[0051] FIG. **40** is a perspective view of a fourth embodiment of an extendable and retractable support structure in the extended position.

[0052] FIG. **41** is a perspective view of a fifth embodiment of a trapezoidal prism link.

[0053] FIG. **42** is a front elevation view of a fifth embodiment of a trapezoidal prism link.

[0054] FIG. **43** is a rear elevation view of a fifth embodiment of a trapezoidal prism link.

[0055] FIG. **44** is a right side elevation view of a fifth embodiment of a trapezoidal prism link.

[0056] FIG. **45** is a left side elevation view of a fifth embodiment of a trapezoidal prism link.

[0057] FIG. **46** is a top plan view of a fifth embodiment of a trapezoidal prism link.

[0058] FIG. **47** is a bottom plan view of a fifth embodiment of a trapezoidal prism link.

[0059] FIG. **48** is a side elevation view of a fifth embodiment of an extendable and retractable support structure in the retracted position.

[0060] FIG. **49** is a side elevation view of a fifth embodiment of an extendable and retractable support structure in the extended position.

[0061] FIG. **50** is a perspective view of a fifth embodiment of an extendable and retractable support structure in the extended position.

[0062] FIG. **51** is a perspective view of a sixth embodiment of a trapezoidal prism link.

[0063] FIG. **52** is a front elevation view of a sixth embodiment of a trapezoidal prism link.

[0064] FIG. **53** is a rear elevation view of a sixth embodiment of a trapezoidal prism link.

[0065] FIG. **54** is a right side elevation view of a sixth embodiment of a trapezoidal prism link.

[0066] FIG. **55** is a left side elevation view of a sixth embodiment of a trapezoidal prism link.

[0067] FIG. **56** is a top plan view of a sixth embodiment of a trapezoidal prism link.

[0068] FIG. **57** is a bottom plan view of a sixth embodiment of a trapezoidal prism link.

[0069] FIG. **58** is a side elevation view of a sixth embodiment of an extendable and retractable support structure in the retracted position.

[0070] FIG. **59** is a side elevation view of a sixth embodiment of an extendable and retractable support structure in the extended position.

[0071] FIG. **60** is a perspective view of a sixth embodiment of an extendable and retractable support structure in the extended position.

[0072] FIG. **61** is a perspective view of a seventh embodiment of a trapezoidal prism link.

[0073] FIG. **62** is a front elevation view of a seventh embodiment of a trapezoidal prism link.

[0074] FIG. **63** is a rear elevation view of a seventh embodiment of a trapezoidal prism link.

[0075] FIG. **64** is a right side elevation view of a seventh embodiment of a trapezoidal prism link.

[0076] FIG. **65** is a left side elevation view of a seventh embodiment of a trapezoidal prism link.

[0077] FIG. **66** is a top plan view of a seventh embodiment of a trapezoidal prism link.

[0078] FIG. **67** is a bottom plan view of a seventh embodiment of a trapezoidal prism link.

[0079] FIG. **68** is a side elevation view of a seventh embodiment of an extendable and retractable support structure in the retracted position.

[0080] FIG. **69** is a side elevation view of a seventh embodiment of an extendable and retractable support structure in the extended position.

[0081] FIG. **70** is a perspective view of a seventh embodiment of an extendable and retractable support structure in the extended position.

[0082] FIG. **71** is a perspective view of an eighth embodiment of a trapezoidal prism link.

[0083] FIG. **72** is a front elevation view of an eighth embodiment of a trapezoidal prism link.

[0084] FIG. **73** is a rear elevation view of an eighth embodiment of a trapezoidal prism link.

[0085] FIG. **74** is a right side elevation view of an eighth embodiment of a trapezoidal prism link.

[0086] FIG. **75** is a left side elevation view of an eighth embodiment of a trapezoidal prism link.

[0087] FIG. **76** is a top plan view of an eighth embodiment of a trapezoidal prism link.

[0088] FIG. **77** is a bottom plan view of an eighth embodiment of a trapezoidal prism link.

[0089] FIG. **78** is a side elevation view of an eighth embodiment of an extendable and retractable support structure in the retracted position.

[0090] FIG. **79** is a side elevation view of an eighth embodiment of an extendable and retractable support structure in the extended position.

[0091] FIG. **80** is a perspective view of an eighth embodiment of an extendable and retractable support structure in the extended position.

[0092] FIG. **81** is a perspective view of a ninth embodiment of a trapezoidal prism link.

[0093] FIG. **82** is a front elevation view of a ninth embodiment of a trapezoidal prism link.

[0094] FIG. **83** is a rear elevation view of a ninth embodiment of a trapezoidal prism link.

[0095] FIG. **84** is a right side elevation view of a ninth embodiment of a trapezoidal prism link.

[0096] FIG. **85** is a left side elevation view of a ninth embodiment of a trapezoidal prism link.

[0097] FIG. **86** is a top plan view of a ninth embodiment of a trapezoidal prism link.

[0098] FIG. **87** is a bottom plan view of a ninth embodiment of a trapezoidal prism link.

[0099] FIG. **88** is a side elevation view of a ninth embodiment of an extendable and retractable support structure in the retracted position.

[0100] FIG. **89** is a side elevation view of a ninth embodiment of an extendable and retractable support structure in the extended position.

[0101] FIG. **90** is a perspective view of a ninth embodiment of an extendable and retractable support structure in the extended position.

[0102] FIG. **91** is a perspective view of a tenth embodiment of a trapezoidal prism link.

[0103] FIG. **92** is a front elevation view of a tenth embodiment of a trapezoidal prism link.

[0104] FIG. **93** is a rear elevation view of a tenth embodiment of a trapezoidal prism link.

[0105] FIG. **94** is a right side elevation view of a tenth embodiment of a trapezoidal prism link.

[0106] FIG. **95** is a left side elevation view of a tenth embodiment of a trapezoidal prism link.

[0107] FIG. **96** is a top plan view of a tenth embodiment of a trapezoidal prism link.

[0108] FIG. **97** is a bottom plan view of a tenth embodiment of a trapezoidal prism link.

[0109] FIG. **98** is a side elevation view of a tenth embodiment of an extendable and retractable support structure in the retracted position.

[0110] FIG. **99** is a side elevation view of a tenth embodiment of an extendable and retractable support structure in the extended position.

[0111] FIG. **100** is a perspective view of a tenth embodiment of an extendable and retractable support structure in the extended position.

[0112] FIG. **101** is a perspective view of an eleventh embodiment of a trapezoidal prism link.

[0113] FIG. **102** is a front elevation view of an eleventh embodiment of a trapezoidal prism link.

[0114] FIG. **103** is a rear elevation view of an eleventh embodiment of a trapezoidal prism link.

[0115] FIG. **104** is a right side elevation view of an eleventh embodiment of a trapezoidal prism link.

[0116] FIG. **105** is a left side elevation view of an eleventh embodiment of a trapezoidal prism link.

[0117] FIG. **106** is a top plan view of an eleventh embodiment of a trapezoidal prism link.

[0118] FIG. **107** is a bottom plan view of an eleventh embodiment of a trapezoidal prism link.

[0119] FIG. **108** is a side elevation view of an eleventh embodiment of an extendable and retractable support structure in the retracted position.

[0120] FIG. **109** is a side elevation view of an eleventh embodiment of an extendable and retractable support structure in the extended position.

[0121] FIG. **110** is a perspective view of an eleventh embodiment of an extendable and retractable support structure in the extended position.

[0122] FIG. **111** is a perspective view of a twelfth embodiment of a trapezoidal prism link.

[0123] FIG. **112** is a front elevation view of a twelfth embodiment of a trapezoidal prism link.

[0124] FIG. **113** is a rear elevation view of a twelfth embodiment of a trapezoidal prism link.

[0125] FIG. **114** is a right side elevation view of a twelfth embodiment of a trapezoidal prism link.

[0126] FIG. **115** is a left side elevation view of a twelfth embodiment of a trapezoidal prism link.

[0127] FIG. **116** is a top plan view of a twelfth embodiment of a trapezoidal prism link.

[0128] FIG. **117** is a bottom plan view of a twelfth embodiment of a trapezoidal prism link.

[0129] FIG. **118** is a side elevation view of a twelfth embodiment of an extendable and retractable support structure in the retracted position.

[0130] FIG. **119** is a side elevation view of a twelfth embodiment of an extendable and retractable support structure in the extended position.

[0131] FIG. **120** is a perspective view of a twelfth embodiment of an extendable and retractable support structure in the extended position.

[0132] FIG. **121** is a perspective view of a thirteenth embodiment of a trapezoidal prism link.

[0133] FIG. **122** is a front elevation view of a thirteenth embodiment of a trapezoidal prism link.

[0134] FIG. **123** is a rear elevation view of a thirteenth embodiment of a trapezoidal prism link.

[0135] FIG. **124** is a right side elevation view of a thirteenth embodiment of a trapezoidal prism link.

[0136] FIG. **125** is a left side elevation view of a thirteenth embodiment of a trapezoidal prism link.

[0137] FIG. **126** is a top plan view of a thirteenth embodiment of a trapezoidal prism link.

[0138] FIG. **127** is a bottom plan view of a thirteenth embodiment of a trapezoidal prism link.

[0139] FIG. **128** is a side elevation view of a thirteenth embodiment of an extendable and retractable support structure in the retracted position.

[0140] FIG. **129** is a side elevation view of a thirteenth embodiment of an extendable and retractable support structure in the extended position.

[0141] FIG. **130** is a perspective view of a thirteenth embodiment of an extendable and retractable support structure in the extended position.

[0142] FIG. **131** is a perspective view of a fourteenth embodiment of a trapezoidal prism link.

[0143] FIG. **132** is a front elevation view of a fourteenth embodiment of a trapezoidal prism link.

[0144] FIG. **133** is a rear elevation view of a fourteenth embodiment of a trapezoidal prism link.

[0145] FIG. **134** is a right side elevation view of a fourteenth embodiment of a trapezoidal prism link.

[0146] FIG. **135** is a left side elevation view of a fourteenth embodiment of a trapezoidal prism link.

[0147] FIG. **136** is a top plan view of a fourteenth embodiment of a trapezoidal prism link.

[0148] FIG. **137** is a bottom plan view of a fourteenth embodiment of a trapezoidal prism link.

[0149] FIG. **138** is a side elevation view of a fourteenth embodiment of an extendable and retractable support structure in the retracted position.

[0150] FIG. **139** is a side elevation view of a fourteenth embodiment of an extendable and retractable support structure in the extended position.

[0151] FIG. **140** is a perspective view of a fourteenth embodiment of an extendable and retractable support structure in the extended position.

[0152] FIG. **141** is a perspective view of a fifteenth embodiment of a trapezoidal prism link.

[0153] FIG. **142** is a front elevation view of a fifteenth embodiment of a trapezoidal prism link.

[0154] FIG. **143** is a rear elevation view of a fifteenth embodiment of a trapezoidal prism link.

[0155] FIG. **144** is a right side elevation view of a fifteenth embodiment of a trapezoidal prism link.

[0156] FIG. **145** is a left side elevation view of a fifteenth embodiment of a trapezoidal prism link.

[0157] FIG. **146** is a top plan view of a fifteenth embodiment of a trapezoidal prism link.

[0158] FIG. **147** is a bottom plan view of a fifteenth embodiment of a trapezoidal prism link.

[0159] FIG. **148** is a side elevation view of a fifteenth embodiment of an extendable and retractable support structure in the retracted position.

[0160] FIG. **149** is a side elevation view of a fifteenth embodiment of an extendable and retractable support structure in the extended position.

[0161] FIG. **150** is a perspective view of a fifteenth embodiment of an extendable and retractable support structure in the extended position.

DEFINITION LIST

[0162]

Term	Definition
5	Extendable and Retractable Support Structure
10	Trapezoidal Prism Link
12	Mortise on Trapezoidal Prism Link
14	Tenon on Trapezoidal Prism Link
16	Spring on Trapezoidal Prism Link
20	First Track
25	First String Assembly
30	Second Track
35	Second String Assembly

-continued

Term	Definition
40	First Roll
50	Second Roll
60	Track Section with One or More Integrated Trapezoidal Prism Links
62	Trapezoidal Prism Link on 60
64	Upper Planar Member on 60
66	Hinge Knuckle on 64
68	Pin Hole on 66
70	Bottom Groove on 62
72	Bottom Lap Joint on 64
74	Top Lap Joint on 64
76	Mortise on 62
78	Tenon on 62
80	Hinge Pin

DETAILED DESCRIPTION OF THE INVENTION

[0163] In some embodiments, extendable and retractable support structure **5** comprises: a plurality of trapezoidal prism links **10**; a first track **20**; a second track **30**; a first roll **40**; and a second roll **50**. A plurality of trapezoidal prism links **10** is attached to the first track **20** to make a first string assembly **25**. First string assembly **25** is wound or winded onto a first roll **40** and thereby attached to first roll **40**. A plurality of trapezoidal prism links **10** is attached to the second track **30** to make a second string assembly **35**. Second string assembly **35** is wound onto a second roll **50** and thereby attached to second roll **50**. First roll **40** with attached first string assembly **25** and second roll **50** with attached second string assembly **35** work together in tandem to unwind or uncoil in order to extend the structure and wind in or coil in order to retract the structure. As the first and second rolls **40**,**50** unwind or uncoil, the first string assembly **25** interlocks, weaves, mates, or attaches to the second string assembly **35** to create the extended structure. The extended structure is not supported on the extended end or anywhere in the middle. The extended structure is only supported by attachment to rolls **40**,**50** with interlocking attachment between each trapezoidal prism link **10** on first string assembly **25** and each trapezoidal prism link **10** on second string assembly **35**. Thus, the extended structure extends out from the first and second rolls **40**,**50** to essentially be suspended in mid-air without any other support. As discussed below, this is possible because of the special interlocking attachment mechanism between adjacent trapezoidal prism links **10** on first and second string assemblies **25**,**35**. These embodiments are depicted in FIGS. **1-40**, **51-60**, **111-130**, and **141-150**.

[0164] Each trapezoidal prism link **10** is a rigid Isosceles trapezoidal prism shaped member. An isosceles trapezoidal prism is a six sided prism or polyhedron made of two trapezoids that are joined together by four rectangles. Further each of two trapezoids is a convex Isosceles trapezoid. A convex Isosceles trapezoid is a trapezoid with a line of symmetry bisecting one pair of opposite sides where both sides are mirror images of each other. Alternatively, a convex Isosceles trapezoid can be defined as a trapezoid in which both legs and both base angles are of the same measure. Each trapezoidal prism link **10** must be an Isosceles trapezoidal prism shaped member in order to properly and rigidly interlock or weave together with adjacent trap-

ezoidal prism links **10**. In other words, both ends of each trapezoidal prism link **10** must be exactly the same shape so that one end of one trapezoidal prism link **10** may interlock with or weave with the other end of another trapezoidal prism link **10** as discussed below.

[0165] Each trapezoidal prism link **10** has a first surface, a second surface, an upper surface, a lower surface, a first end, a second end, a height, an overall width, a length, and a longitudinal axis. The first end of each trapezoidal prism link **10** is an Isosceles trapezoid shaped planar surface. The second end of each trapezoidal prism link **10** is an Isosceles trapezoid shaped planar surface. Each Isosceles trapezoid shaped planar surface has a short edge, a long edge, a first diagonal edge, and a second diagonal edge. The first end of each trapezoidal prism link **10** is opposite from the second end of each trapezoidal prism link. The first end and the second end are parallel with each other. The longitudinal axis of each trapezoidal prism link **10** runs from the first end to the second end of the trapezoidal prism link **10** and is perpendicular to the first end and to the second end of the trapezoidal prism link **10**. The upper surface of each trapezoidal prism link **10** is a rectangular planar surface that is adjacent to the short edge of the first end and adjacent to the short edge of the second end, lying in between the short edges of the first and second ends. The upper surface has a length and a width. The lower surface of each trapezoidal prism link **10** is a rectangular planar surface that is adjacent to the long edge of the first end and adjacent to the long edge of the second end, lying in between the long edges of the first and second ends. The lower surface has a length and a width. The upper surface and the lower surface are parallel with each other. The first surface is a rectangular planar surface that is adjacent to the first diagonal edge of the first end and adjacent to first diagonal edge of the second end, lying in between the first diagonal edges of the first and second ends. The second surface is a rectangular planar surface that is adjacent to the second diagonal edge of the first end and adjacent to second diagonal edge of the second end, lying in between the second diagonal edges of the first and second ends. The first surface of each trapezoidal prism link **10** is the leading surface of each trapezoidal prism link **10** as the first and second rolls **40**,**50** are unwound as discussed below. The second surface of each trapezoidal prism link **10** is the trailing surface of each trapezoidal prism link **10** as the first and second rolls **40**,**50** are unwound as discussed below. The first and second surfaces are not parallel with each other wherein these surfaces form an obtuse angle between these members. The height of each trapezoidal prism link **10** is the perpendicular distance between the lower surface to the upper surface of the trapezoidal prism link **10**. The overall width of each trapezoidal prism link **10** is the width of the lower surface of each trapezoidal prism link **10**. The length of each trapezoidal prism link **10** is the length of the lower surface or the upper surface of each trapezoidal prism link **10** which are the same.

[0166] In the case of a linear extendable and retractable support structure **5**, such as a post, stud, rafter, beam, or similar, the length of each trapezoidal prism link **10** would be short or shorter than that in the case a two-dimensional extendable and retractable support structure **5**, as depicted in FIGS. **11-40**,**51-60**, **111-130**, and **141-150**.

[0167] In the case of a two-dimensional extendable and retractable support structure **5**, such as a floor, ceiling, wall, platform, deck, or similar, the length of each trapezoidal prism link **10** would be long or longer than that in the case a linear extendable and retractable support structure **5**, as depicted in FIGS. **1-10**.

[0168] In best mode, each trapezoidal prism link **10** is solid, as depicted in FIGS. **1-20**, wherein each trapezoidal prism link **10** is a solid block of material.

[0169] Alternately, each trapezoidal prism link **10** may be hollow, as depicted in FIGS. **21-30**, wherein the first and second surfaces of each trapezoidal prism link **10** are deleted or nonexistent to leave an open of hollow interior.

[0170] Alternately still, each trapezoidal prism link may be a composite that is made of two or more different layers of material, as depicted in FIGS. **31-40**.

[0171] Alternately still, each trapezoidal prism link may be made from an I-beam of have an I-shaped cross section, as depicted in FIGS. **51-60**.

[0172] Alternately still, each trapezoidal prism link **10** may be hollow, as depicted in FIGS. **111-130**, wherein the first and second ends of each trapezoidal prism link **10** are deleted or nonexistent to leave an open of hollow interior.

[0173] Alternately still, each trapezoidal prism link may be made from an upper planar member and a lower planar member connected together with two helical spring, as depicted in FIGS. **141-150**.

[0174] Each trapezoidal prism link **10** may alternately have a mortise **76** and a tenon **78**. Mortise **76** is a recess, void, or hole in the first or second surface of each trapezoidal prism link **10** as depicted. Tenon **78** is a raised area, protrusion, or knob in the first or second surface of each trapezoidal prism link **10** as depicted. If the tenon **78** is on the first surface, then the mortise **76** must be on the second surface, and vice versa. Tenon **78** functions to mate with mortise **76**, and vice versa, to make a typical mortise and tenon joint as two adjacent trapezoidal prism links **10** are interlocked or weaved together. This mode is depicted in FIGS. **121-130**.

[0175] Each trapezoidal prism link **10** may be made of any known material such as: metal, steel, aluminum, polymer, plastic, composite, wood, fiberglass, ceramic, carbon fiber, or any other known material.

Each trapezoidal prism link **10** may be monolithic or made from one solid block of material or alternately made by attaching together several different pieces of material.

[0176] First track **20** is a rectangular strip of flexible material or a rectangular sheet of flexible material. The flexible material of first track **20** has the ability to bend or compress without cracking or breaking. First track **20** has a first end, a second end, a first edge, a second edge, an inner surface, an outer surface, a width, a length, a thickness, and a longitudinal axis. First track **20** may be made of any known material such as: woven fabric, non-woven fabric, polymer, plastic, composite, carbon fiber, fiberglass, metal, steel, aluminum, or any other known material. The width of first track **20** must be similar or equal to the length of each trapezoidal prism link **10** for proper operation of extendable and retractable support structure **5**. In operation of the extendable and retractable support structure **5**, first track **20** is wound onto the first roll **40** in the retracted position and unwound from the first roll **40** in the extended position. The first end of first track **20** is the end of first track **20** that is first wound onto the first roll **40** and therefore is the inner end the roll of first track **20** when wound onto first roll **40**. The second end of first track **20** is opposite the first end of first track **20** and therefore is the outer end of the roll of first track

20 when wound onto first roll **40**. The inner surface of first track **20** is the surface of first track **20** that is on the inner side of the roll of first track **20** when wound onto first roll **40**. The outer surface of first track **20** is the surface of first track **20** that is on the outer side of the roll of first track **20** when wound onto first roll **40**. The first edge of first track **20** and the second edge of first track **20** are parallel and perpendicular to the first and second ends of the first track **20**. The longitudinal axis of first track **20** runs from the first end of first track **20** to the second end of first track **20** and is parallel with the first and second edges of the first track **20**.

[0177] A first string assembly **25** is created by attaching a plurality of trapezoidal prism links **10** to the first track **20**. A plurality of trapezoidal prism links **10** is attached to the first track **20** to yield a first string assembly **25**. First string assembly **25** has a first end, a second end, a first edge, a second edge, an inner surface, an outer surface, a width, a length, and a longitudinal axis that coincide and correspond with those from the first track **20**. Each trapezoidal prism link **10** is evenly spaced along the first track **20** by a distance that is the overall width of each trapezoidal prism link **10**. Thus, the center-to-center distance between each trapezoidal prism link **10** on the first string assembly **25** is the overall width of each trapezoidal prism link **10**. This spacing is required for the trapezoidal prism links **10** on the first string assembly **25** to properly interlock and weave with the trapezoidal prism links **10** on the second string assembly **35** and vice versa. To attach each trapezoidal prism link **10** to first track **20**, the upper surface of each trapezoidal prism link **10** is attached to the inner surface of first track **20** so that the longitudinal axis of each trapezoidal prism link **10** is perpendicular to the longitudinal axis of the first track **20**, the first end of each trapezoidal prism link **10** is flush with the first edge of first track **20**, and the second end of each trapezoidal prism link **10** is flush with the second edge of first track **20**. This attachment may be accomplished by any known means such as: weld, epoxy, glue, adhesive, fasteners, bolts, screws, nails, staples, brazing, seam seal, rolled seam, press fit, or any other know means. In best mode, this attachment is accomplished by a flexible means in which each trapezoidal prism link **10** remains attached to the first track **20** however this attachment still allows for some degree of play or movement between each trapezoidal prism link **10** and the first track **20**. This flexibility or play allows for easier winding and unwinding of the first string assembly **25** onto first roll **40** as discussed below. Also, this flexibility or play allows for easier engagement or interlocking or weaving of each trapezoidal prism link **10** on the first string assembly **25** with each trapezoidal prism link **10** on the second string assembly **35** as discussed below.

[0178] Second track **30** is a rectangular strip of flexible material or a sheet of flexible material. The flexible material of second track **30** has the ability to bend or compress without cracking or breaking. Second track **30** has a first end, a second end, a first edge, a second edge, an inner surface, an outer surface, a width, a length, a thickness, and a longitudinal axis. Second track **30** may be made of any known material such as: woven fabric, non-woven fabric, polymer, plastic, composite, carbon fiber, fiberglass, metal, steel, aluminum, or any other known material. The width of second track **30** must be similar or equal to the length of each trapezoidal prism link **10** for proper operation of extendable and retractable support structure **5**. Thus, the width of first track **20** must be equal to the width of second track **30**. In operation of the extendable and retractable support structure **5**, second track **30** is wound onto the second roll **50** in the retracted position and unwound from the second roll **50** in the extended position. The first end of second track **30** is the end of second track **30** that is first wound onto the second roll **50** and therefore is the inner end the roll of second track **30** when wound onto second roll **50**. The second end of second track **30** is opposite the first end of second track **30** and therefore is the outer end of the roll of second track **30** when wound onto second roll **50**. The inner surface of second track **30** is the surface of second track **30** that is on the inner side of the roll of second track **30** when wound onto second roll **50**. The outer surface of second track **30** is the surface of second track **30** that is on the outer side of the roll of second track **30** when wound onto second roll **50**. The first edge of second track **30** and the second edge of second track **30** are parallel and perpendicular to the first and second ends of second track **30**. The longitudinal axis of second track **30** runs from the first end of second track **30** to the second end of second track **30** and is parallel with the first and second edges of the second track **30**.

[0179] A second string assembly **35** is created by attaching a plurality of trapezoidal prism links **10** to the second track **30**. A plurality of trapezoidal prism links **10** is attached to the second track **30** to yield a second string assembly **35**. Second string assembly **35** has a first end, a second end, a first edge, a second edge, an inner surface, an outer surface, a width, a length, and a longitudinal axis that coincide and correspond with those from the first track **20**. Each trapezoidal prism link **10** is evenly spaced along the second track **30** by a distance that is the overall width of each trapezoidal prism link **10**. Thus, the center-to-center distance between each trapezoidal prism link **10** on the second string assembly **35** is the overall width of each trapezoidal prism link **10**. This spacing is required for the trapezoidal prism links **10** on the second string assembly **35** to properly interlock and weave with the trapezoidal prism links **10** on the first string assembly **25** and vice versa. To attach each trapezoidal prism link **10** to second track **30**, the upper surface of each trapezoidal prism link **10** is attached to the inner surface of second track **30** so that the longitudinal axis of each trapezoidal prism link **10** is perpendicular to the longitudinal axis of the second track **30**, the first end of each trapezoidal prism link **10** is flush with the first edge of second track **30**, and the second end of each trapezoidal prism link **10** is flush with the second edge of second track **30**. This attachment may be accomplished by any known means such as: weld, epoxy, glue, adhesive, fasteners, bolts, screws, nails, staples, brazing, seam seal, rolled seam, press fit, or any other know means. In best mode, this attachment is accomplished by a flexible means in which each trapezoidal prism link **10** remains attached to the first track **20** however this attachment still allows for some degree of play or movement between each trapezoidal prism link **10** and the first track **20**. This flexibility or play allows for easier winding and unwinding of the first string assembly **25** onto first roll **40** as discussed below. Also, this flexibility or play allows for easier engagement or interlocking or weaving of each trapezoidal prism link **10** on the first string assembly **25** with each trapezoidal prism link **10** on the second string assembly **35** as discussed below.

[0180] First roll **40** is a rigid roll core or rigid cylindrical member. First roll **40** has an outer surface, an inner surface, an inner diameter, an outer diameter, a circumference, a first

end, a second end, and a longitudinal axis. First roll **40** may be solid or hollow. First roll **40** may be made of any known material such as: polymer, plastic, composite, carbon fiber, fiberglass, metal, steel, aluminum, or any other known material. In the case of first roll **40** being hollow, the first end may be open or closed. In the case of first roll **40** being hollow, the second end may be open or closed.

[0181] The first string assembly **25** is attached to the first roll **40** and is wound onto the first roll **40** as follows. The first end of first track **20** is attached to the outer surface of first roll **40** wherein: the longitudinal axis of the first track **20** is perpendicular to the longitudinal axis of the first roll **40**, the first edge of first track **20** is adjacent to the first end of first roll **40**, and the second edge of first track **20** is adjacent to the second end of first roll **40**. This attachment may be accomplished by any known means such as: weld, epoxy, glue, adhesive, fasteners, bolts, screws, nails, staples, brazing, seam seal, rolled seam, press fit, or any other know means. Then the first string assembly **25** is wound onto or loaded onto the first roll **40** by winding the first string assembly around the first roll **40**. The entire first string assembly **25** is wound onto the first roll **40**.

[0182] Second roll **50** is a rigid roll core or rigid cylindrical member. Second roll **50** has an outer surface, an inner surface, an inner diameter, an outer diameter, a circumference, a first end, a second end, and a longitudinal axis. Second roll **50** may be solid or hollow. Second roll **50** may be made of any known material such as: polymer, plastic, composite, carbon fiber, fiberglass, metal, steel, aluminum, or any other known material. In the case of second roll **50** being hollow, the first end may be open or closed. In the case of second roll **50** being hollow, the second end may be open or closed.

[0183] The second string assembly **35** is attached to the second roll **50** and is wound onto the second roll **50** as follows. The first end of second track **30** is attached to the outer surface of second roll **50** wherein: the longitudinal axis of the second track **30** is perpendicular to the longitudinal axis of the second roll **50**, the first edge of second track **30** is adjacent to the first end of second roll **50**, and the second edge of second track **30** is adjacent to the second end of second roll **50**. This attachment may be accomplished by any known means such as: weld, epoxy, glue, adhesive, fasteners, bolts, screws, nails, staples, brazing, seam seal, rolled seam, press fit, or any other know means. Then the second string assembly **35** is wound onto or loaded onto the second roll **50** by winding the second string assembly **35** around the second roll **50**. The entire second string assembly **35** is wound onto the second roll **50**.

[0184] In order to properly install extendable and retractable support structure **5**, the first roll **40** and the second roll **50** must be pivotally attached and anchored to stable structure. The first roll **40** and the second roll **50** must be pivotally attached or anchored to a stable structure with: the longitudinal axis of the first roll **40** parallel with that of the second roll **50**, the first end of the first roll **40** flush or even with the first end of the second roll **50**, the second end of the first roll **40** flush or even with the second end of the second roll **50**, and the distance between the first roll **40** and the second roll **50** should be about equal to: the height of each trapezoid prism link **10** plus the width of first track **20** plus the width of second track **30**. This separation distance is required for the trapezoidal prism links **10** on first track **20** to properly interlock or weave between for the trapezoidal prism links **10** on second track **30**. The first end and the second end of the first roll **40** are each pivotally attached and anchored to a stable structure. This stable structure may be the framework of a building, living structure, vessel, boat, submarine, airplane, helicopter, aircraft, spaceship, or any other stable structure or framework. The first end and the second end of the second roll **50** are each pivotally attached and anchored to a stable structure. This stable structure may be the framework of a building, living structure, vessel, boat, submarine, airplane, helicopter, aircraft, spaceship, or any other stable structure or framework. First roll **40** and second roll **50** must be pivotally attached so that each of these roll may unwind to extend the extendable and retractable support structure **5** and wind back up to retract the extendable and retractable support structure **5**. First roll **40** and second roll **50** must be pivotally attached however this pivotal attachment must be sturdy and strong to prevent any translational movement of the first roll **40** and second roll **50** as they are winding and unwinding. First roll **40** and second roll **50** must be able to rotate but the rolls must not be able to move up, down, or side to side because any translational movement would not allow the trapezoidal prism links **10** on first track **20** to properly interlock or weave between for the trapezoidal prism links **10** on second track **30**.

[0185] In best mode, the first roll **40** has a first axle that is a rod or spindle along the longitudinal axis of first roll **40**. The first axle has a first end, a second end, and a longitudinal axis that is parallel and coincident with that of first roll **40**. First axle is rigidly attached to first roll **40**. The first end of the first axle is pivotally attached to the stable structure and the second end of the first axle is pivotally attached to the stable structure. In best mode, the first or the second end of the first axle is rigidly attached to a motor that drives the first axle to rotate in order to wind and unwind the first string assembly **25** on the first roll **40**. The motor may be any known type of motor such as: electric, internal combustion, steam, linear, magnetic, or any other known type of motor.

[0186] Alternately, the first roll **40** may have a first half axle and a second half axle. First half axle has a first end, a second end, and a longitudinal axis that is parallel and coincident with that of first roll **40**. Second half axle has a first end, a second end, and a longitudinal axis that is parallel and coincident with that of first roll **40**. The second end of the first half axle is rigidly attached to the first end of the first roll **40**. The first end of the first half axle is pivotally attached to the stable structure. The first end of the second half axle is rigidly attached to the second end of the first roll **40**. The second end of the second half axle is pivotally attached to the stable structure. In this mode, the first end of the first half axle or second end of the second half axle may be rigidly attached to a motor that drives the first axle to rotate in order to wind and unwind the first string assembly **25** on the first roll **40**. The motor may be any known type of motor such as: electric, internal combustion, steam, linear, magnetic, or any other known type of motor.

[0187] In best mode, the second roll **50** has a second axle that is a rod or spindle along the longitudinal axis of second roll **50**. The second axle has a first end, a second end, and a longitudinal axis that is parallel and coincident with that of second roll **50**. Second axle is rigidly attached to second roll **50**. The first end of the second axle is pivotally attached to the stable structure and the second end of the second axle is pivotally attached to the stable structure. In best mode, the first or second end of the second axle is rigidly attached to

a motor that drives the second axle to rotate in order to wind and unwind the second string assembly **35** on the second roll **50**. The motor may be any known type of motor such as: electric, internal combustion, steam, linear, magnetic, or any other known type of motor.

[0188] Alternately, the second roll **50** may have a first half axle and a second half axle. First half axle has a first end, a second end, and a longitudinal axis that is parallel and coincident with that of second roll **50**. Second half axle has a first end, a second end, and a longitudinal axis that is parallel and coincident with that of second roll **50**. The second end of the first half axle is rigidly attached to the first end of the second roll **50**. The first end of the first half axle is pivotally attached to the stable structure. The first end of the second half axle is rigidly attached to the second end of the second roll **50**. The second end of the second half axle is pivotally attached to the stable structure. In this mode, the first end of the first half axle or second end of the second half axle may be rigidly attached to a motor that drives the first axle to rotate in order to wind and unwind the second string assembly **55** on the second roll **50**. The motor may be any known type of motor such as: electric, internal combustion, steam, linear, magnetic, or any other known type of motor.

[0189] The first string assembly **25** interlocks or weaves with the second string assembly **35** to create and extend the extendable and retractable support structure **5** as follows. The first roll **40** unwinds by rotating around its longitudinal axis in the direction that unwinds the second end of the first track **20** from the first roll **40**. In unison with the rotation of the first roll **40**, the second roll **50** unwinds by rotating around its longitudinal axis in the direction that unwinds the second end of the second track **30** from the second roll **50**. This unwinding of the first string assembly **25** and the second string assembly **35** in unison causes the first surface of each trapezoidal prism link **10** on the first string assembly **25** to mate with or press against the second surface of the adjacent trapezoidal prism link **10** on the second string assembly **35** and the second surface of each trapezoidal prism link **10** on the second string assembly **35** to mate with or press against the first surface of the adjacent trapezoidal prism link **10** on the first string assembly **25**, except for the first surface of the first trapezoidal prism link **10** on the second string assembly **35** which does not press against another trapezoidal prism link **10** because it is the first trapezoidal prism link **10** on the extendable and retractable support structure **5** with no adjacent trapezoidal prism links **10**. This process occurs for every trapezoidal prism link **10**, one at a time, starting with the trapezoidal prism link **10** on the second end of the first string assembly **25** and the trapezoidal prism link **10** on the second end of the second string assembly **35** and ending with the trapezoidal prism link **10** on the first end of the first string assembly **25** and the trapezoidal prism link **10** on the first end of the second string assembly **35**, at which point the extendable and retractable support structure **5** is fully extended. The first surface of each trapezoidal prism link **10** presses against the second surface of the adjacent trapezoidal prism link **10** and vice versa because of the trapezoidal shape of the trapezoidal prism links **10**. This shape causes each trapezoidal prism link **10** to function as a wedge between the two adjacent trapezoidal prism links **10** to push against the two adjacent trapezoidal prism links **10** with enough pressure or force to rigidly hold the three trapezoidal prism links **10** together. This extension and locking process occurs between every trapezoidal prism link **10** on the first string assembly **25** and the second string assembly **35** to yield an exceptional strong and rigid structure that does not require any other support other than the support and attachment of the first string assembly **25** to the first roll **40** and second string assembly **35** to the second roll **50**.

[0190] The first string assembly **25** unlocks or unweaves with the second string assembly **35** to disassemble and retract the extendable and retractable support structure **5** as follows. The first roll **40** winds in by rotating around its longitudinal axis in the direction that winds up the second end of the first track **20** onto the first roll **40**. In unison with the rotation of the first roll **40**, the second roll **50** winds in by rotating around its longitudinal axis in the direction that winds up the second end of the second track **30** onto the second roll **50**. This winding of the first string assembly **25** and the second string assembly **35** in unison causes the first surface of each trapezoidal prism link **10** on the first string assembly **25** to pull away from the second surface of the adjacent trapezoidal prism link **10** on the second string assembly **35** and the second surface of each trapezoidal prism link **10** on the second string assembly **35** to pull away from the first surface of the adjacent trapezoidal prism link **10** on the first string assembly **25**. This process occurs for every trapezoidal prism link **10**, one at a time, starting with the trapezoidal prism link **10** on the first end of the first string assembly **25** and the trapezoidal prism link **10** on the first end of the second string assembly **35** and ending with the trapezoidal prism link **10** on the second end of the first string assembly **25** and the trapezoidal prism link **10** on the second end of the second string assembly **35**, at which point the extendable and retractable support structure **5** is fully retracted. The first surface of each trapezoidal prism link **10** may pull away from the second surface of the adjacent trapezoidal prism link **10** without obstruction because of the trapezoidal shape of the trapezoidal prism links **10**. This shape causes each trapezoidal prism link **10** to have clearance between the two adjacent trapezoidal prism links **10** to remove or dislodge itself from between the pressurized position between the two adjacent trapezoidal prism links on the opposite string assembly. This retraction and unlocking process occurs between every trapezoidal prism link **10** on the first string assembly **25** and the second string assembly **35** to fully retract the extendable and retractable support structure **5**.

[0191] In best mode, the second end of the first track **20** is attached to the second end of the second track **30** so that first track **20** and second track **30** form one continuous track as depicted. In best mode, first track **20** and second track **30** are integral and continuous as depicted. In best mode, first track **20** and second track **30** are one continuous piece of flexible material as depicted. In this configuration, during extension of the extendable and retractable support structure **5**, the first trapezoidal prism link on the first string assembly can more easily interlock or weave with the first trapezoidal prism link on the second string assembly **35**, wherein the connection between the second end of the first track and the second end of the second track **30** actually helps pull the first trapezoidal prism link on the first string assembly **25** into place and then pulls first trapezoidal prism link on the second string assembly **35** in place so that the second surface of the first trapezoidal prism link on the first string assembly **25** nicely interlocks or weaves with the first surface the first trapezoidal prism link on the second string assembly **35**. In this

mode, the distance between the trapezoidal prism link **10** on the second end of the first track **20** and the trapezoidal prism link **10** on the second end of the second track **30** is the width of the lower surface plus the width of the first surface of each trapezoidal prism link **10**.

[0192] In other embodiments, extendable and retractable support structure **5** comprises: a plurality of track sections with one or more integrated trapezoidal prism links **60**; a first track **20**; a second track **30**; a first roll **40**; and a second roll **50**. A plurality of track sections with one or more integrated trapezoidal prism links **60** is attached to the first track **20** to make a first string assembly **25**. First string assembly **25** is wound or winded onto a first roll **40** and thereby attached to first roll **40**. A plurality of track sections with one or more integrated trapezoidal prism links **60** is attached to the second track **30** to make a second string assembly **35**. Second string assembly **35** is wound onto a second roll **50** and thereby attached to second roll **50**. First roll **40** with attached first string assembly **25** and second roll **50** with attached second string assembly **35** work together in tandem to unwind or uncoil in order to extend the structure and wind in or coil in order to retract the structure. As the first and second rolls **40**,**50** unwind or uncoil, the first string assembly **25** interlocks, weaves, mates, or attaches to the second string assembly **35** to create the extended structure. The extended structure is not supported on the extended end or anywhere in the middle. The extended structure is only supported by attachment to rolls **40**,**50** with interlocking attachment between each trapezoidal prism link **10** on first string assembly **25** and each trapezoidal prism link **10** on second string assembly **35**. Thus, the extended structure extends out from the first and second rolls **40**,**50** to essentially be suspended in mid-air without any other support. As discussed below, this is possible because of the special interlocking attachment mechanism between adjacent track sections with one or more integrated trapezoidal prism links **60** on first and second string assemblies **25**,**35**. These embodiments are depicted in FIGS. **41-50**,**61-110**, and **131-140**. These embodiments allow for increased rigidity in the extendable and retractable support structure **5**.

[0193] Each track section with one or more integrated trapezoidal prism links **60** has an upper planar member **64** and one or more integrated trapezoidal prism links **62**.

[0194] Upper planar member **64** is a rigid rectangular planar member with a first edge, a second edge, an upper surface, a lower surface, a first end, a second end, a thickness, a width, a length, and a longitudinal axis. Upper planar member **64** may be solid as depicted in FIGS. **61-80**,**101-110**, and **131-140**. Upper planar member **64** may be hollow in the center as depicted in FIGS. **41-50** and **81-100**. The upper planar member **64** provides increased rigidity in the extendable and retractable support structure **5** over the embodiments that do not have the upper planar member. The first edge of each upper planar member **64** is the long edge of the rigid rectangular planar member that is adjacent to the first surface of each one or more integrated trapezoidal prism links **62**. The second edge of each upper planar member **64** is the long edge of the rigid rectangular planar member that is adjacent to the second surface of each one or more integrated trapezoidal prism links **62**. The upper surface of each upper planar member **64** is a rectangular planar surface that is opposite from each one or more integrated trapezoidal prism links **62**. The lower surface of each upper planar member **64** is a rectangular planar surface that is adjacent to each one or more integrated trapezoidal prism links **62**. The first end of each upper planar member **64** is the short edge of the rigid rectangular planar member that is adjacent to the first end of each one or more integrated trapezoidal prism links **62**. The second end of each upper planar member **64** is the short edge of the rigid rectangular planar member that is adjacent to the second end of each one or more integrated trapezoidal prism links **62**.

[0195] Each upper planar member may alternately have a bottom lap joint **72** and a top lap joint **74**. Bottom lap joint **72** is a rectangular void removed from the upper surface of the first or second edge of upper planar member **64** leaving a bottom ledge or step on the lower surface as depicted. Top lap joint **74** is a rectangular void removed from the lower surface of the first or second edge of upper planar member **64** leaving a top ledge or step on the upper surface as depicted.

If the bottom lap joint **72** is on the first edge, then the top lap joint **74** be on the second edge, and vice versa. Bottom lap joint **72** functions to mate with top lap joint **74**, and vice versa, to make a typical lap joint, as two adjacent integrated trapezoidal prism links **62** are interlocked or weaved together. This mode is depicted in FIGS. **81-90**.

[0196] Each of one or more integrated trapezoidal prism links **62** is a rigid Isosceles trapezoidal prism shaped member. An isosceles trapezoidal prism is a six sided prism or polyhedron made of two trapezoids that are joined together by four rectangles. Further each of two trapezoids is a convex Isosceles trapezoid. A convex Isosceles trapezoid is a trapezoid with a line of symmetry bisecting one pair of opposite sides where both sides are mirror images of each other. Alternatively, a convex Isosceles trapezoid can be defined as a trapezoid in which both legs and both base angles are of the same measure. Each trapezoidal prism link **10** must be an Isosceles trapezoidal prism shaped member in order to properly and rigidly interlock or weave together with adjacent trapezoidal prism links **10**. In other words, both ends of each integrated trapezoidal prism link **62** must be exactly the same shape so that one end of one trapezoidal prism link **10** may interlock with or weave with the other end of another trapezoidal prism link **10** as discussed below.

[0197] Each one or more integrated trapezoidal prism links **62** has a first surface, a second surface, an upper surface, a lower surface, a first end, a second end, a height, an overall width, a length, and a longitudinal axis. The first end of each one or more integrated trapezoidal prism links **62** is an Isosceles trapezoid shaped planar surface. The second end of each one or more integrated trapezoidal prism links **62** is an Isosceles trapezoid shaped planar surface. Each Isosceles trapezoid shaped planar surface has a short edge, a long edge, a first diagonal edge, and a second diagonal edge. The first end of each one or more integrated trapezoidal prism links **62** is opposite from the second end of each trapezoidal prism link. The first end and the second end are parallel with each other. The longitudinal axis of each one or more integrated trapezoidal prism links **62** runs from the first end to the second end of the integrated trapezoidal prism link **62** and is perpendicular to the first end and to the second end of the integrated trapezoidal prism link **62**. The upper surface of each one or more integrated trapezoidal prism links **62** is a rectangular planar surface that is adjacent to the short edge of the first end and adjacent to the short edge of the second end, lying in between the short edges of the first and second ends. The upper surface has a

length and a width. The lower surface of each one or more integrated trapezoidal prism links **62** is a rectangular planar surface that is adjacent to the long edge of the first end and adjacent to the long edge of the second end, lying in between the long edges of the first and second ends. The lower surface has a length and a width. The upper surface and the lower surface are parallel with each other. The first surface is a rectangular planar surface that is adjacent to the first diagonal edge of the first end and adjacent to first diagonal edge of the second end, lying in between the first diagonal edges of the first and second ends. The second surface is a rectangular planar surface that is adjacent to the second diagonal edge of the first end and adjacent to second diagonal edge of the second end, lying in between the second diagonal edges of the first and second ends. The first surface of each one or more integrated trapezoidal prism links **62** is the leading surface of each integrated trapezoidal prism link **62** as the first and second rolls **40**,**50** are unwound as discussed below. The second surface of each one or more integrated trapezoidal prism links **62** is the trailing surface of each integrated trapezoidal prism link **62** as the first and second rolls **40**,**50** are unwound as discussed below. The first and second surfaces are not parallel with each other wherein these surfaces form an obtuse angle between these members. The height of each one or more integrated trapezoidal prism links **62** is the perpendicular distance between the lower surface to the upper surface of the integrated trapezoidal prism link **62**. The overall width of each one or more integrated trapezoidal prism links **62** is the width of the lower surface of each integrated trapezoidal prism link **62**. The length of each one or more integrated trapezoidal prism links **62** is the length of the lower surface or the upper surface of each integrated trapezoidal prism link **62** which are the same.

[0198] Each one or more integrated trapezoidal prism links **62** may be solid as depicted in FIGS. **41-50**, **61-70** and **81-100**.

[0199] Alternately, each one or more integrated trapezoidal prism links **62** may be hollow as depicted in FIGS. **71-80**,**101-110**, and **131-140**, wherein the first and second ends of each integrated trapezoidal prism link **62** are deleted or nonexistent to leave an open of hollow interior.

[0200] Each one or more integrated trapezoidal prism link **62** may alternately have a bottom groove **70**. Bottom groove **70** is a rectangular shaped void in the bottom surface. Bottom groove **70** has a length, a width, and a longitudinal axis. The longitudinal axis of bottom groove **70** is parallel with that of the integrated trapezoidal prism link **62**. Bottom groove breaks out of the first end and the second end of the integrated trapezoidal prism link. The width of bottom groove is the same or slightly larger than that of upper planar member **64** to that upper planar member makes a slip fit or a press fit within the bottom groove **70**. Along with upper planar member **64**, bottom groove **70** functions to increase the rigidity of the interlocked connection between each integrated trapezoidal prism link **62**. This mode is depicted in FIGS. **61-80** and **111-120**.

[0201] Each one or more integrated trapezoidal prism link **62** may alternately have a mortise **76** and a tenon **78**. Mortise **76** is a recess, void, or hole in the first or second surface of each integrated trapezoidal prism link **62** as depicted. Tenon **78** is a raised area, protrusion, or knob in the first or second surface of each integrated trapezoidal prism link **62** as depicted. If the tenon **78** is on the first surface, then the mortise **76** must be on the second surface, and vice versa. Tenon **78** functions to mate with mortise **76**, and vice versa, to make a typical mortise and tenon joint as two adjacent integrated trapezoidal prism links **62** are interlocked or weaved together. This mode is depicted in FIGS. **131-140**.

[0202] Each one or more integrated trapezoidal prism link **62** is rigidly attached to the upper planar member **64**. In order to make each track section with one or more integrated trapezoidal prism links **60**, the upper surface of each one or more integrated trapezoidal prism links **62** is rigidly attached to the lower surface of upper planar member **64** so that the longitudinal axis of each one or more integrated trapezoidal prism links **62** is parallel with that of the of upper planar member **64**. Rigid attachment may be accomplished by any known means. In best mode, the upper surface of each one or more integrated trapezoidal prism links **62** is integral to upper planar member **64** wherein these members are made from the same solid piece of material.

[0203] In the case of a linear extendable and retractable support structure **5**, such as a post, stud, rafter, beam, or similar, each track section with one or more integrated trapezoidal prism links **60** has one integrated trapezoidal prism links **62**, as depicted in FIGS. **61-80** and **131-140**.

[0204] In the case of a two-dimensional extendable and retractable support structure **5**, such as a floor, ceiling, wall, platform, deck, or similar, each track section with one or more integrated trapezoidal prism links **60** has more than one integrated trapezoidal prism links **62**, as depicted in FIGS. **41-50** and **81-110**.

[0205] In these embodiments, the first string assembly **25** is created by attaching a plurality track sections with one or more integrated trapezoidal prism links **60** to the first track **20**. A plurality of plurality track sections with one or more integrated trapezoidal prism links **60** is attached to the first track **20** to yield a first string assembly **25**. First string assembly **25** has a first end, a second end, a first edge, a second edge, an inner surface, an outer surface, a width, a length, and a longitudinal axis that coincide and correspond with those from the first track **20**. Each track section with one or more integrated trapezoidal prism links **60** is tightly spaced along the first track **20** wherein the first edge of the upper planar member **64** of one track section with one or more integrated trapezoidal prism links **60** is placed up against the second edge of the upper planar member **64** of the adjacent track section with one or more integrated trapezoidal prism links **60** and vice versa so that the first edge of one upper planar member **64** is contiguous with and essentially touching the second edge of upper planar member **64** and vice versa along the whole first string assembly **25**. This spacing is required for the integrated trapezoidal prism link **62** on the first string assembly **25** to properly interlock and weave with the integrated trapezoidal prism links **62** on the second string assembly **35** and vice versa. To attach each track section with one or more integrated trapezoidal prism links **60** to first track **20**, the upper surface of each upper planar member **64** is attached to the inner surface of first track **20** so that the longitudinal axis of each track section with one or more integrated trapezoidal prism links **60** is perpendicular to the longitudinal axis of the first track **20**, the first end of each track section with one or more integrated trapezoidal prism links **60** is flush with the first edge of first track **20**, and the second end of each track section with one or more integrated trapezoidal prism links **60** is flush with the second edge of first track **20**. This

attachment may be accomplished by any known means such as: weld, epoxy, glue, adhesive, fasteners, bolts, screws, nails, staples, brazing, seam seal, rolled seam, press fit, or any other know means. In best mode, this attachment is accomplished by a flexible means in which each track section with one or more integrated trapezoidal prism links **60** remains attached to the first track **20** however this attachment still allows for some degree of play or movement between each track section with one or more integrated trapezoidal prism links **60** and the first track **20**. This flexibility or play allows for easier winding and unwinding of the first string assembly **25** onto first roll **40**. Also, this flexibility or play allows for easier engagement or interlocking or weaving of each track section with one or more integrated trapezoidal prism links **60** on the first string assembly **25** with each track section with one or more integrated trapezoidal prism links **60** on the second string assembly **35**.

[0206] In these embodiments, the second string assembly **35** is created by attaching a plurality track sections with one or more integrated trapezoidal prism links **60** to the second track **30**. A plurality of plurality track sections with one or more integrated trapezoidal prism links **60** is attached to the second track **30** to yield a second string assembly **35**. Second string assembly **35** has a first end, a second end, a first edge, a second edge, an inner surface, an outer surface, a width, a length, and a longitudinal axis that coincide and correspond with those from the second track **30**. Each track section with one or more integrated trapezoidal prism links **60** is tightly spaced along the second track **30** wherein the first edge of the upper planar member **64** of one track section with one or more integrated trapezoidal prism links **60** is placed up against the second edge of the upper planar member **64** of the adjacent track section with one or more integrated trapezoidal prism links **60** and vice versa so that the first edge of one upper planar member **64** is contiguous with and essentially touching the second edge of upper planar member **64** and vice versa along the whole second string assembly **35**. This spacing is required for the integrated trapezoidal prism link **62** on the second string assembly **35** to properly interlock and weave with the integrated trapezoidal prism links **62** on the first string assembly **25** and vice versa. To attach each track section with one or more integrated trapezoidal prism links **60** to second track **30**, the upper surface of each upper planar member **64** is attached to the inner surface of second track **30** so that the longitudinal axis of each track section with one or more integrated trapezoidal prism links **60** is perpendicular to the longitudinal axis of the second track **30**, the first end of each track section with one or more integrated trapezoidal prism links **60** is flush with the first edge of second track **30**, and the second end of each track section with one or more integrated trapezoidal prism links **60** is flush with the second edge of second track **30**. This attachment may be accomplished by any known means such as: weld, epoxy, glue, adhesive, fasteners, bolts, screws, nails, staples, brazing, seam seal, rolled seam, press fit, or any other know means. In best mode, this attachment is accomplished by a flexible means in which each track section with one or more integrated trapezoidal prism links **60** remains attached to the second track **30** however this attachment still allows for some degree of play or movement between each track section with one or more integrated trapezoidal prism links **60** and the second track **30**. This flexibility or play allows for easier winding and unwinding of the second string assembly **35** onto second roll **50**. Also, this flexibility or play allows for easier engagement or interlocking or weaving of each track section with one or more integrated trapezoidal prism links **60** on the second string assembly **35** with each track section with one or more integrated trapezoidal prism links **60** on the first string assembly **25**.

[0207] The first string assembly **25** is attached to the first roll **40** and is wound onto the first roll **40** as follows. The first end of first track **20** is attached to the outer surface of first roll **40** wherein: the longitudinal axis of the first track **20** is perpendicular to the longitudinal axis of the first roll **40**, the first edge of first track **20** is adjacent to the first end of first roll **40**, and the second edge of first track **20** is adjacent to the second end of first roll **40**. This attachment may be accomplished by any known means such as: weld, epoxy, glue, adhesive, fasteners, bolts, screws, nails, staples, brazing, seam seal, rolled seam, press fit, or any other know means. Then the first string assembly **25** is wound onto or loaded onto the first roll **40** by winding the first string assembly **25** around the first roll **40**. The entire first string assembly **25** is wound onto the first roll **40**.

[0208] The second string assembly **35** is attached to the second roll **50** and is wound onto the second roll **50** as follows. The first end of second track **30** is attached to the outer surface of second roll **50** wherein: the longitudinal axis of the second track **30** is perpendicular to the longitudinal axis of the second roll **50**, the first edge of second track **30** is adjacent to the first end of second roll **50**, and the second edge of second track **30** is adjacent to the second end of second roll **50**. This attachment may be accomplished by any known means such as: weld, epoxy, glue, adhesive, fasteners, bolts, screws, nails, staples, brazing, seam seal, rolled seam, press fit, or any other know means. Then the second string assembly **35** is wound onto or loaded onto the second roll **50** by winding the second string assembly **35** around the second roll **50**. The entire second string assembly **35** is wound onto the second roll **50**.

[0209] The first string assembly **25** interlocks or weaves with the second string assembly **35** to create and extend the extendable and retractable support structure **5** as follows. The first roll **40** unwinds by rotating around its longitudinal axis in the direction that unwinds the second end of the first track **20** from the first roll **40**. In unison with the rotation of the first roll **40**, the second roll **50** unwinds by rotating around its longitudinal axis in the direction that unwinds the second end of the second track **30** from the second roll **50**. This unwinding of the first string assembly **25** and the second string assembly **35** in unison causes the first surface of each integrated trapezoidal prism link **62** on the first string assembly **25** to mate with or press against the second surface of the adjacent trapezoidal prism link **10** on the second string assembly **35** and the second surface of each integrated trapezoidal prism link **62** on the second string assembly **35** to mate with or press against the first surface of the adjacent trapezoidal prism link **10** on the first string assembly **25**, except for the first surface of the first trapezoidal prism link **10** on the second string assembly **35** which does not press against another trapezoidal prism link **10** because it is the first trapezoidal prism link **10** on the extendable and retractable support structure **5** with no adjacent trapezoidal prism links **10**. This process occurs for every trapezoidal prism link **10**, one at a time, starting with the trapezoidal prism link **10** on the second end of the first string assembly **25** and the

trapezoidal prism link **10** on the second end of the second string assembly **35** and ending with the trapezoidal prism link **10** on the first end of the first string assembly **25** and the trapezoidal prism link **10** on the first end of the second string assembly **35**, at which point the extendable and retractable support structure **5** is fully extended. The first surface of each integrated trapezoidal prism link **62** presses against the second surface of the adjacent trapezoidal prism link **10** and vice versa because of the trapezoidal shape of the trapezoidal prism links **10**. This shape causes each integrated trapezoidal prism link **62** to function as a wedge between the two adjacent trapezoidal prism links **10** to push against the two adjacent trapezoidal prism links **10** with enough pressure or force to rigidly hold the three trapezoidal prism links **10** together. This extension and locking process occurs between every trapezoidal prism link **10** on the first string assembly **25** and the second string assembly **35** to yield an exceptional strong and rigid structure that does not require any other support other than the support and attachment of the first string assembly **25** to the first roll **40** and second string assembly **35** to the second roll **50**.

[0210] The first string assembly **25** unlocks or unweaves with the second string assembly **35** to disassemble and retract the extendable and retractable support structure **5** as follows. The first roll **40** winds in by rotating around its longitudinal axis in the direction that winds up the second end of the first track **20** onto the first roll **40**. In unison with the rotation of the first roll **40**, the second roll **50** winds in by rotating around its longitudinal axis in the direction that winds up the second end of the second track **30** onto the second roll **50**. This winding of the first string assembly **25** and the second string assembly **35** in unison causes the first surface of each integrated trapezoidal prism link **62** on the first string assembly **25** to pull away from the second surface of the adjacent trapezoidal prism link **10** on the second string assembly **35** and the second surface of each integrated trapezoidal prism link **62** on the second string assembly **35** to pull away from the first surface of the adjacent trapezoidal prism link **10** on the first string assembly **25**. This process occurs for every trapezoidal prism link **10**, one at a time, starting with the trapezoidal prism link **10** on the first end of the first string assembly **25** and the trapezoidal prism link **10** on the first end of the second string assembly **35** and ending with the trapezoidal prism link **10** on the second end of the first string assembly **25** and the trapezoidal prism link **10** on the second end of the second string assembly **35**, at which point the extendable and retractable support structure **5** is fully retracted. The first surface of each integrated trapezoidal prism link **62** may pull away from the second surface of the adjacent trapezoidal prism link **10** without obstruction because of the trapezoidal shape of the trapezoidal prism links **10**. This shape causes each integrated trapezoidal prism link **62** to have clearance between the two adjacent trapezoidal prism links **10** to remove or dislodge itself from between the pressurized position between the two adjacent trapezoidal prism links on the opposite string assembly. This retraction and unlocking process occurs between every trapezoidal prism link **10** on the first string assembly **25** and the second string assembly **35** to fully retract the extendable and retractable support structure **5**.

[0211] In best mode, the second end of the first track **20** is attached to the second end of the second track **30** so that first track **20** and second track **30** form one continuous track as depicted. In best mode, first track **20** and second track **30** are integral and continuous as depicted. In best mode, first track **20** and second track **30** are one continuous piece of flexible material as depicted. In this configuration, during extension of the extendable and retractable support structure **5**, the first trapezoidal prism link on the first string assembly **25** can more easily interlock or weave with the first trapezoidal prism link on the second string assembly **35**, wherein the connection between the second end of the first track and the second end of the second track **30** actually helps pull the first trapezoidal prism link on the first string assembly **25** into place and then pulls first trapezoidal prism link on the second string assembly **35** in place so that the second surface of the first trapezoidal prism link on the first string assembly **25** nicely interlocks or weaves with the first surface the first trapezoidal prism link on the second string assembly **35**. In this mode, the distance between the track section with one or more integrated trapezoidal prism links **60** on the second end of the first track **20** and the track section with one or more integrated trapezoidal prism links **60** on the second end of the second track **30** is the width of the lower surface plus the width of the first surface of each integrated trapezoidal prism link **62**.

[0212] In other embodiments, extendable and retractable support structure **5** comprises: a plurality of track sections with one or more integrated trapezoidal prism links **60**; a plurality of hinge pins **80**; a first roll **40**; and a second roll **50**. A plurality of connected and hinged track sections with one or more integrated trapezoidal prism links **60** is attached to and wound or winded onto a first roll **40** and thereby attached to first roll **40**. A plurality of connected and hinged track sections with one or more integrated trapezoidal prism links **60** is attached to and wound onto a second roll **50** and thereby attached to second roll **50**. First roll **40** and second roll **50** work together in tandem to unwind or uncoil in order to extend the structure and wind in or coil in in order to retract the structure. As the first and second rolls **40**,**50** unwind or uncoil, the two rolls of connected and hinged track sections with one or more integrated trapezoidal prism links **60** interlock, weave, mate, or attach to create the extended structure. The extended structure is not supported on the extended end or anywhere in the middle. The extended structure is only supported by attachment to rolls **40**,**50**. Thus, the extended structure extends out from the first and second rolls **40**,**50** to essentially be suspended in mid-air without any other support. As discussed below, this is possible because of the special interlocking attachment mechanism between adjacent track sections with one or more integrated trapezoidal prism links **60**. These embodiments are depicted in FIGS. **61-70** and **91-110**. These embodiments do not include a first track **20** or a second track **30** because each track sections with one or more integrated trapezoidal prism links **60** is connected by a hinge pin **80** as discussed below.

[0213] In these embodiments, the upper planar member **64** on each track section with one or more integrated trapezoidal prism links **60** further comprises one or more hinge knuckles **66**. A hinge knuckle **66** is a rigid rectangular shaped tab, protrusion, protuberance on the first edge and second edge of upper planar member **64**. Each hinge knuckle **66** has a width, a depth, a thickness, and a longitudinal axis that runs along the width dimension. The thickness of hinge knuckle **66** is equivalent to that of upper planar member **64**. Hinge knuckles **66** on the first edge of upper planar member **64** mate with hinge knuckles **66** on the second edge of upper

planar member **64**. There must be an even number of hinge knuckles **66** on the first edge and an odd number of hinge knuckles **66** on the send edge or vice versa for proper mating between the hinge knuckles **66**. Hinge knuckles **66** must be separated by a distance that is the width of each hinge knuckles **66** for proper mating between the hinge knuckles **66**. The width of each hinge knuckle **66** must make a slip fit between two adjacent hinge knuckles **66** for proper mating between the hinge knuckles **66**.

[0214] Each hinge knuckle **66** has a pin hole **68**. Pin hole **68** is a cylindrical hole with an inner diameter and a longitudinal axis. Pin hole **68** runs completely through each hinge knuckle **66**. The longitudinal axis of pin hole **68** is parallel with that of hinge knuckle **66**.

[0215] Each of the plurality of hinge pins **80** is a hinge pin that is a solid rigid cylindrical member with a length, an outer diameter, and a longitudinal axis. The outer diameter of hinge pin **80** is sized to make a slip fit or a press fit with the inner diameter of pin hole **68**. The length of hinge pin **80** is equal to the length of upper planar member **64**.

[0216] In these modes, the plurality of track sections with one or more integrated trapezoidal prism links **60** are pivotally attached to each other through a hinged connection created by hinge knuckles **66** on the first edge of the upper planar member **64** of one track section with one or more integrated trapezoidal prism links **60** mating with hinge knuckles **66** on the second edge of the upper planar member **64** of another track section with one or more integrated trapezoidal prism links **60**, and vice versa, and then driving a hinge pin **80** through the mated hinge knuckles **66** to create a hinge connection between these members. In this way, a first string assembly **25** and a second string assembly **35** are created without using a first track **20** or a second track **30**. In these modes, the track sections with one or more integrated trapezoidal prism links **60** are connected by hinge pins **80**. One hinge pin **80** is required for each pivotal connection. These embodiments may have an advantage over embodiments with a first track **20** and a second track **30** because these embodiment have less components, are a simpler design, and are easier to assemble.

[0217] The first string assembly **25** is attached to the first roll **40** and is wound onto the first roll **40** as follows. The first end of the first string assembly **25** is attached to the outer surface of first roll **40** wherein: the longitudinal axis of the first string assembly **25** is perpendicular to the longitudinal axis of the first roll **40**, the first edge of first string assembly **25** is adjacent to the first end of first roll **40**, and the second edge of first string assembly **25** is adjacent to the second end of first roll **40**. This attachment may be accomplished by any known means such as: weld, epoxy, glue, adhesive, fasteners, bolts, screws, nails, staples, brazing, seam seal, rolled seam, press fit, or any other know means. Then the first string assembly **25** is wound onto or loaded onto the first roll **40** by winding the first string assembly **25** around the first roll **40**. The entire first string assembly **25** is wound onto the first roll **40**.

[0218] The second string assembly **35** is attached to the second roll **50** and is wound onto the second roll **50** as follows. The first end of the second string assembly **35** is attached to the outer surface of second roll **50** wherein: the longitudinal axis of the second string assembly **35** is perpendicular to the longitudinal axis of the second roll **50**, the first edge of second string assembly **35** is adjacent to the first end of second roll **50**, and the second edge of second string assembly **35** is adjacent to the second end of second roll **50**. This attachment may be accomplished by any known means such as: weld, epoxy, glue, adhesive, fasteners, bolts, screws, nails, staples, brazing, seam seal, rolled seam, press fit, or any other know means. Then the second string assembly **35** is wound onto or loaded onto the second roll **50** by winding the second string assembly **35** around the second roll **50**. The entire second string assembly **35** is wound onto the second roll **50**.

[0219] The first string assembly **25** interlocks or weaves with the second string assembly **35** to create and extend the extendable and retractable support structure **5** as follows. The first roll **40** unwinds by rotating around its longitudinal axis in the direction that unwinds the second end of the first string assembly **25** from the first roll **40**. In unison with the rotation of the first roll **40**, the second roll **50** unwinds by rotating around its longitudinal axis in the direction that unwinds the second end of the second string assembly **25** from the second roll **50**. This unwinding of the first string assembly **25** and the second string assembly **35** in unison causes the first surface of each integrated trapezoidal prism link **62** on the first string assembly **25** to mate with or press against the second surface of the adjacent trapezoidal prism link **10** on the second string assembly **35** and the second surface of each integrated trapezoidal prism link **62** on the second string assembly **35** to mate with or press against the first surface of the adjacent trapezoidal prism link **10** on the first string assembly **25**, except for the first surface of the first trapezoidal prism link **10** on the second string assembly **35** which does not press against another trapezoidal prism link **10** because it is the first trapezoidal prism link **10** on the extendable and retractable support structure **5** with no adjacent trapezoidal prism links **10**. This process occurs for every trapezoidal prism link **10**, one at a time, starting with the trapezoidal prism link **10** on the second end of the first string assembly **25** and the trapezoidal prism link **10** on the second end of the second string assembly **35** and ending with the trapezoidal prism link **10** on the first end of the first string assembly **25** and the trapezoidal prism link **10** on the first end of the second string assembly **35**, at which point the extendable and retractable support structure **5** is fully extended. The first surface of each integrated trapezoidal prism link **62** presses against the second surface of the adjacent trapezoidal prism link **10** and vice versa because of the trapezoidal shape of the trapezoidal prism links **10**. This shape causes each integrated trapezoidal prism link **62** to function as a wedge between the two adjacent trapezoidal prism links **10** to push against the two adjacent trapezoidal prism links **10** with enough pressure or force to rigidly hold the three trapezoidal prism links **10** together. This extension and locking process occurs between every trapezoidal prism link **10** on the first string assembly **25** and the second string assembly **35** to yield an exceptional strong and rigid structure that does not require any other support other than the support and attachment of the first string assembly **25** to the first roll **40** and second string assembly **35** to the second roll **50**.

[0220] The first string assembly **25** unlocks or unweaves with the second string assembly **35** to disassemble and retract the extendable and retractable support structure **5** as follows. The first roll **40** winds in by rotating around its longitudinal axis in the direction that winds up the second end of the first string assembly **35** onto the first roll **40**. In unison with the rotation of the first roll **40**, the second roll

50 winds in by rotating around its longitudinal axis in the direction that winds up the second end of the second string assembly **35** onto the second roll **50**. This winding of the first string assembly **25** and the second string assembly **35** in unison causes the first surface of each integrated trapezoidal prism link **62** on the first string assembly **25** to pull away from the second surface of the adjacent trapezoidal prism link **10** on the second string assembly **35** and the second surface of each integrated trapezoidal prism link **62** on the second string assembly **35** to pull away from the first surface of the adjacent trapezoidal prism link **10** on the first string assembly **25**. This process occurs for every trapezoidal prism link **10**, one at a time, starting with the trapezoidal prism link **10** on the first end of the first string assembly **25** and the trapezoidal prism link **10** on the first end of the second string assembly **35** and ending with the trapezoidal prism link **10** on the second end of the first string assembly **25** and the trapezoidal prism link **10** on the second end of the second string assembly **35**, at which point the extendable and retractable support structure **5** is fully retracted. The first surface of each integrated trapezoidal prism link **62** may pull away from the second surface of the adjacent trapezoidal prism link **10** without obstruction because of the trapezoidal shape of the trapezoidal prism links **10**. This shape causes each integrated trapezoidal prism link **62** to have clearance between the two adjacent trapezoidal prism links **10** to remove or dislodge itself from between the pressurized position between the two adjacent trapezoidal prism links on the opposite string assembly. This retraction and unlocking process occurs between every trapezoidal prism link **10** on the first string assembly **25** and the second string assembly **35** to fully retract the extendable and retractable support structure **5**.

What is claimed is:

1. An extendable and retractable support structure comprising: a plurality of trapezoidal prism links [**10**]; a first track [**20**]; a second track [**30**]; a first roll [**40**]; and a second roll [**50**], wherein

each of said plurality of trapezoidal prism links [**10**] is a rigid Isosceles trapezoidal prism shaped member, with a first surface, a second surface, an upper surface, a lower surface, a first end, a second end, a height, an overall width, a length, and a longitudinal axis,

said longitudinal axis of each of said plurality of trapezoidal prism links [**10**] runs from said first end of each of said plurality of trapezoidal prism links [**10**] to said second of each of said plurality of trapezoidal prism links [**10**] and is perpendicular to said first end of each of said plurality of trapezoidal prism links [**10**] to said second end of each of each of said plurality of trapezoidal prism links [**10**],

said first track [**20**] is a rectangular strip of flexible material or a rectangular sheet of flexible material with a first end, a second end, a first edge, a second edge, an inner surface, an outer surface, a width,

a length, a thickness, and a longitudinal axis,

said second track [**30**] is a rectangular strip of flexible material or a sheet of flexible material with a first end, a second end, a first edge, a second edge, an inner surface, an outer surface, a width, a length, a thickness, and a longitudinal axis,

a first number of said plurality of trapezoidal prism links [**10**] is attached to said first track [**20**] wherein each of said first number of said plurality trapezoidal prism links [**10**] is evenly spaced along said first track [**20**] by a distance that is said overall width of each of said plurality of trapezoidal prism links [**10**], with said upper surface of each of said first number of said trapezoidal prism links [**10**] attached to said inner surface of said first track [**20**], with said longitudinal axis of each of said first number of said plurality of trapezoidal prism links [**10**] perpendicular to said longitudinal axis of said first track [**20**], said first end of each of said first number of said plurality of trapezoidal prism links [**10**] is flush with said first edge of said first track [**20**], and said second end of each of said first number of said plurality of trapezoidal prism links [**10**] is flush with said second edge of said first track [**20**],

a second number of said plurality of trapezoidal prism links [**10**] is attached to said second track [**30**] wherein each of said second number of said plurality trapezoidal prism links [**10**] is evenly spaced along said second track [**30**] by a distance that is said overall width of each of said plurality of trapezoidal prism links [**10**], with said upper surface of each of said second number of said trapezoidal prism links [**10**] attached to said inner surface of said second track [**30**], with said longitudinal axis of each of said second number of said plurality of trapezoidal prism links [**10**] perpendicular to said longitudinal axis of said second track [**30**], said first end of each of said second number of said plurality of trapezoidal prism links [**10**] is flush with said first edge of said second track [**30**], and said second end of each of said second number of said plurality of trapezoidal prism links [**10**] is flush with said second edge of said second track [**30**],

said first roll [**40**] is a rigid roll core or rigid cylindrical member with an outer surface, an inner surface, an inner diameter, an outer diameter, a circumference, a first end, a second end, and a longitudinal axis,

said second roll [**50**] is a rigid roll core or rigid cylindrical member with an outer surface, an inner surface, an inner diameter, an outer diameter, a circumference, a first end, a second end, and a longitudinal axis,

said first track [**20**], with said first number of said plurality of trapezoidal prism links [**10**] attached thereto, is attached to and wound onto said first roll [**40**],

said second track [**20**], with said second number of said plurality of trapezoidal prism links [**10**] attached thereto, is attached to and wound onto said second roll [**50**],

said first roll [**40**] and second said roll [**50**] unwind in unison to extend said extendable and retractable support structure, and

said first roll [**40**] and second said roll [**50**] wind in in unison to retract said extendable and retractable support structure.

2. An extendable and retractable support structure comprising: a plurality of track sections with one or more integrated trapezoidal prism links [**60**]; a first track [**20**]; a second track [**30**]; a first roll [**40**]; and a second roll [**50**], wherein

each of said plurality of track sections with one or more integrated trapezoidal prism links [**60**] has an upper planar member [**64**] and one or more integrated trapezoidal prism links [**62**] attached thereto,

said upper planar member [**64**] is a rigid rectangular planar member with a first edge, a second edge, an

upper surface, a lower surface, a first end, a second end, a thickness, a width, a length, and a longitudinal axis,

each of said one or more integrated trapezoidal prism links [**62**] is a rigid Isosceles trapezoidal prism shaped member with a first surface, a second surface, an upper surface, a lower surface, a first end, a second end, a height, an overall width, a length, and a longitudinal axis,

said longitudinal axis of each of said one or more integrated trapezoidal prism links [**62**] runs from said first end of each of said one or more integrated trapezoidal prism links [**62**] to said second of each of said one or more integrated trapezoidal prism links [**62**] and is perpendicular to said first end of each of said one or more integrated trapezoidal prism links [**62**] to said second end of each of said one or more integrated trapezoidal prism links [**62**],

each of said one or more integrated trapezoidal prism links [**62**] is rigidly attached to said upper planar member [**64**] wherein said upper surface of each of said one or more integrated trapezoidal prism links [**62**] is rigidly attached to said lower surface of said upper planar member [**64**] so that said longitudinal axis of each of said one or more integrated trapezoidal prism links [**62**] is parallel with said longitudinal axis of said of upper planar member [**64**],

said first track [**20**] is a rectangular strip of flexible material or a rectangular sheet of flexible material with a first end, a second end, a first edge, a second edge, an inner surface, an outer surface, a width, a length, a thickness, and a longitudinal axis,

said second track [**30**] is a rectangular strip of flexible material or a sheet of flexible material with a first end, a second end, a first edge, a second edge, an inner surface, an outer surface, a width, a length, a thickness, and a longitudinal axis,

a first number of said plurality of track sections with one or more integrated trapezoidal prism links [**60**] is attached to said first track [**20**] wherein each of said first number of said plurality of track sections with one or more integrated trapezoidal prism links [**60**] is tightly spaced along said first track [**20**] wherein said first edge of said upper planar member [**64**] of each of said first number of said plurality of track sections with one or more integrated trapezoidal prism links [**60**] is contiguous with or placed up against said second edge of said upper planar member [**64**] of the adjacent said track section with one or more integrated trapezoidal prism links [**60**] and said second edge of said upper planar member [**64**] of each of said first number of said plurality of track sections with one or more integrated trapezoidal prism links [**60**] is contiguous with or placed up against said first edge of said upper planar member [**64**] of the adjacent said track section with one or more integrated trapezoidal prism links [**60**],

a second number of said plurality of track sections with one or more integrated trapezoidal prism links [**60**] is attached to said second track [**30**] wherein each of said second number of said plurality of track sections with one or more integrated trapezoidal prism links [**60**] is tightly spaced along said second track [**30**] wherein said first edge of said upper planar member [**64**] of each of said second number of said plurality of track sections with one or more integrated trapezoidal prism links [**60**] is contiguous with or placed up against said second edge of said upper planar member [**64**] of the adjacent said track section with one or more integrated trapezoidal prism links [**60**] and said second edge of said upper planar member [**64**] of each of said second number of said plurality of track sections with one or more integrated trapezoidal prism links [**60**] is contiguous with or placed up against said first edge of said upper planar member [**64**] of the adjacent said track section with one or more integrated trapezoidal prism links [**60**],

said first roll [**40**] is a rigid roll core or rigid cylindrical member with an outer surface, an inner surface, an inner diameter, an outer diameter, a circumference, a first end, a second end, and a longitudinal axis,

said second roll [**50**] is a rigid roll core or rigid cylindrical member with an outer surface, an inner surface, an inner diameter, an outer diameter, a circumference, a first end, a second end, and a longitudinal axis,

said first track [**20**], with said first number of said plurality of trapezoidal prism links [**10**] attached thereto, is attached to and wound onto said first roll [**40**],

said second track [**20**], with said second number of said plurality of trapezoidal prism links [**10**] attached thereto, is attached to and wound onto said second roll [**50**],

said first roll [**40**] and second said roll [**50**] unwind in unison to extend said extendable and retractable support structure, and

said first roll [**40**] and second said roll [**50**] wind in in unison to retract said extendable and retractable support structure.

3. An extendable and retractable support structure comprising: a plurality of track sections with one or more integrated trapezoidal prism links [**60**]; a plurality of hinge pins [**80**]; a first roll [**40**]; and a second roll [**50**], wherein

each of said plurality of track sections with one or more integrated trapezoidal prism links [**60**] has an upper planar member [**64**] and one or more integrated trapezoidal prism links [**62**] attached thereto,

said upper planar member [**64**] is a rigid rectangular planar member with a first edge, a second edge, an upper surface, a lower surface, a first end, a second end, a thickness, a width, a length, and a longitudinal axis,

said upper planar member [**64**] further comprises one or more hinge knuckles [**66**],

each of said one or more hinge knuckles [**66**] is a rigid rectangular shaped tab, protrusion, protuberance on said first edge and said second edge of said upper planar member [**64**],

each of said one or more hinge knuckles [**66**] has a width, a depth, a thickness, and a longitudinal axis that runs along said width dimension,

each of said one or more hinge knuckles [**66**] has a pin hole [**68**],

each said pin hole [**68**] is a cylindrical hole with an inner diameter and a longitudinal axis,

said longitudinal axis of each said pin hole [**68**] is parallel with said longitudinal axis of each of said one or more hinge knuckles [**66**],

each of said one or more integrated trapezoidal prism links [**62**] is a rigid Isosceles trapezoidal prism shaped member with a first surface, a second surface, an upper

surface, a lower surface, a first end, a second end, a height, an overall width, a length, and a longitudinal axis,

said longitudinal axis of each of said one or more integrated trapezoidal prism links [**62**] runs from said first end of each of said one or more integrated trapezoidal prism links [**62**] to said second of each of said one or more integrated trapezoidal prism links [**62**] and is perpendicular to said first end of each of said one or more integrated trapezoidal prism links [**62**] to said second end of each of said one or more integrated trapezoidal prism links [**62**],

each of said one or more integrated trapezoidal prism links [**62**] is rigidly attached to said upper planar member [**64**] wherein said upper surface of each of said one or more integrated trapezoidal prism links [**62**] is rigidly attached to said lower surface of said upper planar member [**64**] so that said longitudinal axis of each of said one or more integrated trapezoidal prism links [**62**] is parallel with said longitudinal axis of said of upper planar member [**64**],

each of said plurality of hinge pins [**80**] is a hinge pin that is a solid rigid cylindrical member with a length, an outer diameter, and a longitudinal axis,

said outer diameter of each of said plurality of hinge pins [**80**] is sized to make a slip fit or a press fit with said inner diameter of said pin hole [**68**],

said length of each of said plurality of hinge pins [**80**] is equal to said length of said upper planar member [**64**],

a first number of said plurality of track sections with one or more integrated trapezoidal prism links [**60**] are pivotally attached together through a hinged connection created by one of said one or more hinge knuckles [**66**] on said first edge of said upper planar member [**64**] of each of said first number of said plurality of track sections with one or more integrated trapezoidal prism links [**60**] mating with one of said one or more hinge knuckles [**66**] on said second edge of said upper planar member [**64**] of each of said first number of said plurality of track sections with one or more integrated trapezoidal prism links [**60**] and one of said one or more hinge knuckles [**66**] on said second edge of said upper planar member [**64**] of each of said first number of said plurality of track sections with one or more integrated trapezoidal prism links [**60**] mating with one of said one or more hinge knuckles [**66**] on said first edge of said upper planar member [**64**] of each of said first number one of plurality of track sections with one or more integrated trapezoidal prism links [**60**], wherein one of said plurality of hinge pins [**80**] in inserted through said pin holes [**68**] on said one or more hinge knuckles [**66**] to create a hinge connection between these members,

a second number of said plurality of track sections with one or more integrated trapezoidal prism links [**60**] are pivotally attached together through a hinged connection created by one of said one or more hinge knuckles [**66**] on said first edge of said upper planar member [**64**] of each of said second number of said plurality of track sections with one or more integrated trapezoidal prism links [**60**] mating with one of said one or more hinge knuckles [**66**] on said second edge of said upper planar member [**64**] of each said second number of said plurality of track sections with one or more integrated trapezoidal prism links [**60**] and one of said one or more hinge knuckles [**66**] on said second edge of said upper planar member [**64**] of each of said second number of said plurality of track sections with one or more integrated trapezoidal prism links [**60**] mating with one of said one or more hinge knuckles [**66**] on said first edge of said upper planar member [**64**] of each of said second number one of plurality of track sections with one or more integrated trapezoidal prism links [**60**], wherein one of said plurality of hinge pins [**80**] in inserted through said pin holes [**68**] on said one or more hinge knuckles [**66**] to create a hinge connection between these members,

said first roll [**40**] is a rigid roll core or rigid cylindrical member with an outer surface, an inner surface, an inner diameter, an outer diameter, a circumference, a first end, a second end, and a longitudinal axis,

said second roll [**50**] is a rigid roll core or rigid cylindrical member with an outer surface, an inner surface, an inner diameter, an outer diameter, a circumference, a first end, a second end, and a longitudinal axis,

said a first number of said plurality of track sections with one or more integrated trapezoidal prism links [**60**], that are pivotally attached together, is attached to and wound onto said first roll [**40**],

said a second number of said plurality of track sections with one or more integrated trapezoidal prism links [**60**], that are pivotally attached together, is attached to and wound onto said second roll [**50**],

said first roll [**40**] and second said roll [**50**] unwind in unison to extend said extendable and retractable support structure, and

said first roll [**40**] and second said roll [**50**] wind in in unison to retract said extendable and retractable support structure.

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