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(54) **MULTILAYER CURTAIN**

(57) An intermediate curtain layer (2) arranged between first and second outer curtain layers (4, 5) is supported by carrier elements (6) sliding along a rail. The outer curtain layers are connected to the intermediate curtain layer at attachment positions being mutually spaced along the intermediate curtain layer. For sequentially following attachment positions of the intermediate curtain layer, a first length (12') of the first outer curtain layer extending between a first and a second attachment

position of the intermediate curtain layer is longer than a corresponding first length (13') of the second outer curtain layer extending between said first and second attachment position, and a second length (13'') of the second outer curtain layer extending between the second and a third attachment position of the intermediate curtain layer is longer than a corresponding second length (12'') of the first outer curtain layer extending between said second and third attachment position.

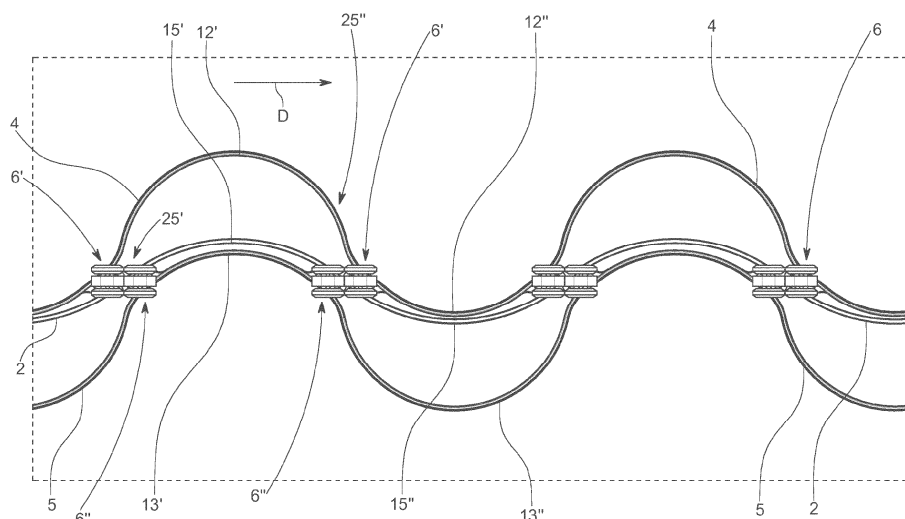


FIG. 15

Description

[0001] The present invention relates to a multilayer curtain including at least one intermediate curtain layer arranged between a first outer curtain layer and a second outer curtain layer, wherein the at least one intermediate curtain layer is supported by carrier elements slidably arranged in a row along an upper rail, wherein the at least one intermediate curtain layer is provided with a number of connectors being arranged at a number of attachment positions being mutually spaced along an upper edge of the at least one intermediate curtain layer, wherein at least one connector at each attachment position of the at least one intermediate curtain layer is connected to a carrier element, wherein each of the first outer curtain layer and the second outer curtain layer is provided with a number of connectors being mutually spaced along an upper edge of the respective first or second outer curtain layer, wherein each connector of the first outer curtain layer is connected to a respective connector of the at least one intermediate curtain layer so that a length of the first outer curtain layer extends between neighbouring attachment positions of the at least one intermediate curtain layer, and wherein each connector of the second outer curtain layer is connected to a respective connector of the at least one intermediate curtain layer so that a length of the second outer curtain layer extends between neighbouring attachment positions of the at least one intermediate curtain layer.

[0002] US 3,242,972 relates to an acoustic curtain arranged slidably along an upper track and including a first and a second drapery and an acoustic barrier layer arranged there between. The acoustic barrier layer is carried by the upper track in which sliders are guided which carry the acoustic barrier layer by means of pendants. The draperies are hung at either side of the acoustic barrier layer by means of hooks which engage the pendants. When the acoustic barrier layer is fully stretched, the first and second draperies are still folded and forms a symmetrical pattern, thereby forming so-called dead-air spaces between the draperies and the acoustic barrier layer. However, whereas the folding pattern of the draperies seems to be predetermined in the fully extended position of the acoustic curtain, the folding pattern of the acoustic barrier layer is not controlled when the acoustic curtain is drawn back from the illustrated fully closed position to an open position. In fact, when drawing back the acoustic curtain, the acoustic barrier layer may impede the operation, in particular in the case of a heavy and/or thick acoustic barrier layer, because the folding pattern of the acoustic barrier layer is not predefined. As a result, the appearance of the acoustic curtain in a partially or fully drawn back position may be less desirable, because an uneven folding pattern of the acoustic barrier layer may also affect the folding pattern of the draperies arranged on either side of the acoustic barrier layer. Furthermore, although in the fully stretched position of the acoustic barrier layer, the first and second

draperies are still folded and forms said dead-air spaces between the draperies and the acoustic barrier layer, those dead-air spaces are not continuous along the acoustic barrier layer, because folds of the draperies contact the acoustic barrier layer at intervals, thereby reducing the sound attenuation effect of the acoustic curtain.

[0003] DE-102018105110-A1 discloses a soundproof curtain with at least two curtain layers being suspended from separate, spaced-apart rows of suspension points, so that two adjacent curtain layers are spaced apart from one another and a sound-insulating air cushion is formed between them. The soundproof curtain may have a common support structure on which the spaced-apart rows of suspension points are arranged or formed. The common support structure may be a crossbeam, preferably a three-point crossbeam or a four-point crossbeam, and the suspension points may be displaceable along their row. However, whereas this solution is in particular suitable for large rooms, such as exhibition halls or concert venues, the solution may be less suitable for smaller rooms, such as offices or the like, because the operation of the curtain may be cumbersome due to the fact that each curtain layer must be drawn back and forth separately. In particular in the case of thick and/or heavy curtain layers, the operation may be difficult.

[0004] CN 221153748 U discloses a multi-layer light-shielding and sound-insulating curtain arranged at a mounting track and comprising a decorative layer, a sound insulation layer bonded to one side of the decorative layer, and a light-shielding layer arranged on one side of the sound insulation layer by means of hook-and-loop attachment. A plurality of hanging rings are installed through each of the decorative layer, the sound insulation layer and the light-shielding layer. Because all layers of the multi-layer curtain are laminated together to form one single curtain layer without any dead-air spaces in between, this curtain cannot provide a substantial sound-attenuating effect without one or more of the layers being relatively thick and/or heavy, something which would seriously impede the operation of the curtain due to resistance against bending of the curtain. The hanging rings extending through all layers of the curtain as well as space formed between an upper edge of the curtain and the mounting track also seriously reduce the sound-attenuating effect of the curtain.

[0005] The object of the present invention is to provide a multilayer curtain being easy to operate and which consistently forms regular folds during operation.

[0006] In view of this object, seen in a direction of the upper rail, for sequentially following attachment positions of the at least one intermediate curtain layer, a first length of the first outer curtain layer extending between a first and a second attachment position of the at least one intermediate curtain layer is longer than a corresponding first length of the second outer curtain layer extending between said first and second attachment position of the at least one intermediate curtain layer, and a second

length of the second outer curtain layer extending between the second and a third attachment position of the at least one intermediate curtain layer is longer than a corresponding second length of the first outer curtain layer extending between said second and third attachment position of the at least one intermediate curtain layer.

[0007] In this way, by connecting alternately, via attachment positions of the at least one intermediate curtain layer, a relatively longer length of the first outer curtain layer to a relatively shorter length of the second outer curtain layer and a relatively shorter length of the first outer curtain layer to a relatively longer length of the second outer curtain layer, a predetermined waveform may be imparted to all of the different layers of the multilayer curtain. This waveform may be maintained during operation of the multilayer curtain, and therefore, the resistance to displacement of the curtain layers between a closed position and an open position may be substantially reduced as compared to known solutions. As a result, the handling of the curtain when drawing the curtain back from the closed position to the open position and vice versa may be greatly facilitated. In particular, relatively heavier and/or thicker first and second outer curtain layers may, as a result of resistance to bending, facilitate the formation of said predetermined waveform and therefore facilitate operation of the curtain as opposed to prior art solutions in which particularly such relatively heavier and/or thicker curtain layers may impede operation. Furthermore, said waveform may ensure that an air gap is always maintained between at least the first and the second outer curtain layers along the entire longitudinal direction of the multilayer curtain, thereby providing a substantial sound attenuation effect of the multilayer curtain.

[0008] In an embodiment, a first length of the at least one intermediate curtain layer extending between said first and said second attachment position of the at least one intermediate curtain layer is shorter than said first length of the first outer curtain layer and longer than or at least almost equal to said corresponding first length of the second outer curtain layer, and a second length of the at least one intermediate curtain layer extending between said second and said third attachment position of the at least one intermediate curtain layer is shorter than said second length of the second outer curtain layer and longer than or at least almost equal to said corresponding second length of the first outer curtain layer. Thereby, it may be even better ensured that a predetermined waveform may be imparted to the at least one intermediate curtain layer which provides an air gap between the at least one intermediate curtain layer and the first and second outer curtain layers during all stages of operation between the closed and open curtain, thereby ensuring low resistance to displacement of the multilayer curtain and thereby improving sound attenuation of the multilayer curtain.

[0009] In an embodiment, the first length of the first

outer curtain layer is at least 20 per cent longer than, preferably at least 30 per cent longer than, and most preferred at least 40 per cent longer than, the corresponding first length of the at least one intermediate curtain layer, and the second length of the second outer curtain layer is at least 20 per cent longer than, preferably at least 30 per cent longer than, and most preferred at least 40 per cent longer than, the corresponding second length of the at least one intermediate curtain layer. Thereby, low resistance to displacement of the multilayer curtain and improvement of sound attenuation of the multilayer curtain may be even better ensured.

[0010] In an embodiment, the first length of the first outer curtain layer is at least 20 per cent longer than, preferably at least 30 per cent longer than, and most preferred at least 40 per cent longer than, the corresponding first length of the second outer curtain layer, and the second length of the second outer curtain layer is at least 20 per cent longer than, preferably at least 30 per cent longer than, and most preferred at least 40 per cent longer than, the corresponding second length of the first outer curtain layer. Thereby, the handling of the curtain when drawing the curtain back from the closed position to the open position and vice versa may be even better facilitated. Furthermore, the sound attenuation effect of the multilayer curtain may be even better.

[0011] In an embodiment, a bending stiffness along the upper edge of the first outer curtain layer and a bending stiffness along the upper edge of the second outer curtain layer, respectively, are each substantially larger than a total bending stiffness corresponding to a sum of bending stiffnesses along respective upper edges of all layers forming the at least one intermediate curtain layer. Thereby, as a result of a relatively stiff first and second outer curtain layer and a relatively flexible at least one intermediate curtain layer, the formation of said predetermined waveform may be facilitated, and therefore operation of the curtain may be further facilitated.

[0012] In an embodiment, a bending stiffness along the upper edge of the first outer curtain layer and a bending stiffness along the upper edge of the second outer curtain layer, respectively, are each defined at least substantially by a curtain tape attached along the upper edge of the first and second outer curtain layer, respectively. Thereby, a suitable bending stiffness along the upper edges of the first and second outer curtain layer may be provided independently of the bending stiffness of the material of the first and second outer curtain layer itself.

[0013] In a structurally particularly advantageous embodiment, each connector of the at least one intermediate curtain layer, of the first outer curtain layer and of the second outer curtain layer is formed as a loop provided by a curtain tape attached along the upper edge of the respective curtain layer.

[0014] In an embodiment, a curtain tape of the first outer curtain layer and of the second outer curtain layer are each provided with loops being mutually spaced along the respective curtain tape by alternately a first

distance and a second distance, and the first distance is longer than the second distance. Thereby, the above-mentioned first length and second length of the first and second outer curtain layer, respectively, may be predefined by the loops of the curtain tape which may facilitate assembly of the multilayer curtain when connecting each connector of the first and second outer curtain layer, in the form of a loop, to a respective connector of the at least one intermediate curtain layer.

[0015] In an embodiment, a curtain tape of the first outer curtain layer and of the second outer curtain layer are each provided with a row of loops, only some of said loops are marked loops which are visually marked for connection with respective loops of the at least one intermediate curtain layer, and the marked loops are arranged mutually spaced along the respective curtain tape by alternately a first distance and a second distance, and the first distance is longer than the second distance. Thereby, the above-mentioned first length and second length of the first and second outer curtain layer, respectively, may be predefined by the marked loops of the curtain tape which may facilitate assembly of the multilayer curtain when connecting connectors of the first and second outer curtain layer, in the form of loops, to respective connectors of the at least one intermediate curtain layer. In this way, a number of unmarked loops may be arranged between the marked loops, and such unmarked loops may provide an adjustment possibility, for instance in the case that a different relationship between the above-mentioned first length and second length of the first and second outer curtain layer should be desired. In that case, some of the unmarked loops may alternatively to some of or all of the marked loops be used for the connection with respective loops of the at least one intermediate curtain layer.

[0016] In an embodiment, a first curtain tape on a first side of the at least one intermediate curtain layer and a second curtain tape on a second side of the at least one intermediate curtain layer are each provided with loops being regularly spaced in a longitudinal direction of the respective curtain tape. Thereby, a regular spacing between the connectors of the at least one intermediate curtain layer may be predefined by the loops of the curtain tape which may facilitate assembly of the multilayer curtain when connecting each connector of the first and second outer curtain layer to a respective connector, in the form of a loop, of the at least one intermediate curtain layer.

[0017] In an embodiment, a first curtain tape on a first side of the at least one intermediate curtain layer and a second curtain tape on a second side of the at least one intermediate curtain layer are each provided with a row of loops, only some of said loops are marked loops which are visually marked for connection with respective loops of the first outer curtain layer or of the second outer curtain layer, and the marked loops are mutually arranged regularly spaced in a longitudinal direction of the respective curtain tape. Thereby, a regular spacing

between the connectors of the at least one intermediate curtain layer may be predefined by the marked loops of the curtain tape which may facilitate assembly of the multilayer curtain when connecting connectors of the first and second outer curtain layer to a respective connector, in the form of a marked loop, of the at least one intermediate curtain layer. In this way, a number of unmarked loops may be arranged between the marked loops, and such unmarked loops may provide an adjustment possibility, for instance in the case that a shift in the positions of the above-mentioned attachment positions of the at least one intermediate curtain layer should be desired. In that case, some of the unmarked loops may alternatively to some of or all of the marked loops be used for the connection with respective loops of the first or second outer curtain layer.

[0018] In an embodiment, a first connector is arranged on a first side of the at least one intermediate curtain layer at each attachment position, and a second connector is arranged on a second side of the at least one intermediate curtain layer at each attachment position. Thereby, the at least one intermediate curtain layer may, at each attachment position, be connected to both the first outer curtain layer and the second outer curtain layer without penetration of the at least one intermediate curtain layer and without need for any element bridging the first and second side of the at least one intermediate curtain layer. Therefore, the at least one intermediate curtain layer may in this way be connected to both the first outer curtain layer and the second outer curtain layer before hanging the multilayer curtain below the upper rail by connecting the curtain to the carrier elements slidably arranged along the upper rail.

[0019] In an embodiment, the at least one intermediate curtain layer has a first side facing the first outer curtain layer, each first connector on said first side is connected to a respective connector of the first outer curtain layer by means of a first hook element, the at least one intermediate curtain layer has a second side facing the second outer curtain layer, each second connector on said second side is connected to a respective connector of the second outer curtain layer by means of a second hook element. Thereby, the at least one intermediate curtain layer may by way of the hook elements be connected to both the first outer curtain layer and the second outer curtain layer before hanging the multilayer curtain below the upper rail by connecting the hook elements to the carrier elements slidably arranged along the upper rail. The hook elements may provide a certain distance between the at least one intermediate curtain layer and the first and second outer curtain layer, respectively, thereby ensuring a better sound attenuation effect of the multilayer curtain.

[0020] In a structurally particularly advantageous embodiment, each first hook element is hanging in a carrier element, and each second hook element is hanging in a carrier element. Thereby, a good balance between either side of the multilayer curtain may be obtained when the

curtain is hanging in the upper track.

[0021] In a structurally particularly advantageous embodiment, each hook element has a first hook engaged with a connector of an intermediate curtain layer of the at least one intermediate curtain layer and a second hook engaged with a connector of the first or second outer curtain layer.

[0022] In an embodiment, the first hook is arranged above the second hook when hook element is hanging in a carrier element. Thereby, it may easily be obtained that the at least one intermediate curtain layer is hanging slightly higher than the first and second outer curtain layers so that it may provide a close fit to the upper rail for a better sound attenuation effect when the upper rail is mounted on a ceiling or any other suitable building structure. This may be obtained by arranging a curtain tape on either side of the at least one intermediate curtain layer, and a curtain tape on each one of the first outer curtain layer and the second outer curtain layer, whereby all curtain tapes are arranged at the same distance from a top edge of the respective curtain layers. Thereby, manufacturing of the curtain layers may be facilitated.

[0023] In a structurally particularly advantageous embodiment, the hook elements are arranged in pairs in each of which a first hook element is engaged with a connector on said first side of the at least one intermediate curtain layer facing the first outer curtain layer, and in each of which a second hook element is engaged with a connector on said second side of the at least one intermediate curtain layer facing the second outer curtain layer, and a distance, seen in the direction of the upper rail, between subsequent pairs of hook elements may vary between a fully closed position of the multilayer curtain and a fully drawn back position of the multilayer curtain.

[0024] In an embodiment, seen in the direction of the upper rail, in subsequent pairs of hook elements, in a first pair, the first hook element is arranged before the second hook element, and in a subsequent second pair, the second hook element is arranged before the first hook element. Thereby, the above-mentioned predetermined waveform may even better be imparted to all of the different layers of the multilayer curtain, and thereby the resistance to displacement of the curtain layers between a closed position and an open position may be even more reduced as compared to known solutions. As a result, the handling of the curtain when drawing the curtain back from the closed position to the open position and vice versa may be even better facilitated.

[0025] In an embodiment, in each pair of hook elements, each first hook element is hanging in a first carrier element and each second hook element is hanging in a second carrier element. Thereby, a certain flexibility may be obtained between the positions of the first and second hook elements of each pair of hook elements in the direction of the upper rail. This flexibility may provide for even easier handling of the multilayer curtain and may provide for a larger air gap between the first and

second outer curtain layers when the multilayer curtain is fully extended to a closed position so that an even better sound attenuation effect may be obtained. Furthermore, said flexibility may enable the multi-layer curtain to be drawn back relatively even further to an open position, i.e. the curtain may be even more compacted when drawn back. Thereby, the drawn back curtain may take up less space in the room when not in use as a room divider.

[0026] In an embodiment, seen in the direction of the upper rail, in subsequent pairs of hook elements, in a first pair, the first carrier element is arranged slidingly on the upper rail before the second carrier element, and in a subsequent second pair, the second carrier element is arranged slidingly on the upper rail before the first carrier element. Thereby, in particular, the above-mentioned predetermined waveform may even better be imparted to all of the different layers of the multilayer curtain, and thereby the resistance to displacement of the curtain layers between a closed position and an open position may be even more reduced as compared to known solutions. As a result, the handling of the curtain when drawing back the curtain from the closed position to the open position and vice versa may be even better facilitated.

[0027] In an embodiment, the at least one intermediate curtain layer includes a number of intermediate curtain layers, neighbouring intermediate curtain layers are connected by means of connecting hooks each engaging a first connector on a first side of a first one of the neighbouring intermediate curtain layers and a second connector on a second side of a second one of the neighbouring intermediate curtain layers. Thereby, a further air gap may be created between the intermediate curtain layers, thereby providing even better sound attenuation effect.

[0028] In a structurally particularly advantageous embodiment, all carrier elements are slidingly arranged in a row along a single upper rail. Thereby, the resistance to displacement of the curtain layers between a closed position and an open position may be substantially reduced as compared to known solutions with more than one rail, and the handling of the multilayer curtain is greatly facilitated.

[0029] In an embodiment, the at least one intermediate curtain layer is an acoustically dampening layer. Thereby, an even better sound attenuation effect may be obtained. The at least one intermediate curtain layer may preferably be a heavier type of material which may be covered by the first and second outer curtain layers, thereby providing for an aesthetic appearance.

[0030] The invention will now be explained in more detail below by means of examples of embodiments with reference to the very schematic drawing, in which

Fig. 1 is a perspective view of an embodiment of a multilayer curtain according to the invention, in a drawn back, partly open position;

Fig. 2 is a perspective view of the multilayer curtain of Fig. 1, in a partially closed position;

Fig. 3 is a perspective view of the multilayer curtain of Fig. 1, in a fully closed position;

Fig. 4 is a perspective view of a detail of the drawn back partly open multilayer curtain as illustrated in Fig. 1, seen from a slightly different angle of view;

Fig. 5 is a detail of Fig. 4, wherein, however, an upper rail has been removed for illustrative purposes;

Fig. 6 is a perspective view of a detail of the partially closed multilayer curtain as illustrated in Fig. 2, seen from a slightly different angle of view;

Fig. 7 is a detail of Fig. 6, wherein, however, an upper rail has been removed for illustrative purposes;

Fig. 8 is a perspective view of a detail of the fully closed multilayer curtain as illustrated in Fig. 3, seen from a slightly different angle of view;

Fig. 9 is a cross-sectional perspective view of a detail of the fully closed multilayer curtain as illustrated in Fig. 3, seen from a slightly different angle of view;

Fig. 10 is a detail of Fig. 8, wherein, however, an upper rail has been hidden for illustrative purposes;

Fig. 11 is a perspective view corresponding to that of Fig. 10, wherein, furthermore, a first outer curtain layer has been hidden for illustrative purposes;

Fig. 12 is a perspective view corresponding to that of Fig. 11, wherein, furthermore, an intermediate curtain layer has been hidden for illustrative purposes;

Fig. 13 is a top view of part of the drawn back partly open multilayer curtain as illustrated in Fig. 1, wherein the upper rail has been hidden for illustrative purposes;

Fig. 14 is a detail of Fig. 13, wherein, however, carrier elements for carrying hook elements have been hidden for illustrative purposes so that said hook elements are visible;

Fig. 15 is a top view of part of the fully closed multilayer curtain as illustrated in Fig. 3, wherein the upper rail has been hidden for illustrative purposes;

Fig. 16 is a detail of Fig. 15, wherein, however, carrier elements for carrying hook elements have been hidden for illustrative purposes so that said hook elements are visible;

Fig. 17 is a perspective view corresponding to that of Fig. 16, wherein, furthermore, the hook elements have been hidden for illustrative purposes;

Fig. 18 illustrates a side view of a top edge of the intermediate curtain layer of Fig. 17, wherein the intermediate curtain layer has been fully flattened;

Fig. 19 illustrates a side view of an inner top part of the first outer curtain layer of Fig. 17, wherein the first outer curtain layer has been fully flattened;

Fig. 20 is an end view of a hanging system of the multilayer curtain according to the invention;

Fig. 21 is a perspective view of a carrier element of the hanging system of Fig. 20;

Fig. 22 is a perspective view of a hook element of the hanging system of Fig. 20;

Fig. 23 is a perspective view of a detail of an alternative embodiment according to the invention of a fully closed multilayer curtain similar to that illustrated in Fig. 3;

Fig. 24 is a top view of part of the alternative embodiment, of which a detail is illustrated in Fig. 23, of the fully closed multilayer curtain, wherein the upper rail has been hidden for illustrative purposes;

Fig. 25 is a cross-section taken in the direction of an upper rail, through part of an alternative embodiment of an multilayer curtain according to the invention, wherein the multilayer curtain includes two intermediate curtain layers connected by means of additional hook elements; and wherein the upper rail has been removed;

Fig. 26 is a perspective view of the additional hook element of Fig. 25; and

Fig. 27 is a perspective view of an embodiment of packaging for a multilayer curtain according to the invention.

[0031] In the following, generally, similar elements of different embodiments have been designated by the same reference numerals.

[0032] Figs. 1 to 3 illustrate perspective views of an embodiment of a multilayer curtain 1 according to the present invention in a partially open position, a partially closed position, and a fully closed position, respectively. As seen in the partial views of Figs. 4 to 12, the illustrated embodiment of the multilayer curtain 1 includes an intermediate curtain layer 2 arranged between a first outer curtain layer 4 and a second outer curtain layer 5.

[0033] However, as explained in further detail below,

the multilayer curtain 1 according to the present invention may include any suitable number of intermediate curtain layers 2, 3. The intermediate curtain layer 2 or layers is/are supported by carrier elements 6 slidably arranged in a row along an upper rail 7 as seen for instance in Fig. 8. In Fig. 10 is seen a view corresponding to that of Fig. 8, however, wherein the upper rail 7 has been removed so that the carrier elements 6 are visible. Each carrier element 6 includes two rollers 29 arranged to roll on flanges 38 in the upper rail 7 as seen in Figs. 20 and 21.

[0034] The multilayer curtain 1 according to the present invention may preferably be used as a flexible room divider with sound attenuation effect. The upper rail 7 is adapted to be mounted on a not shown ceiling or any other suitable building structure in a building so that the multilayer curtain 1 may extend between said ceiling or other building structure and a not shown floor of said building. The multilayer curtain 1 may thereby in its fully extended, closed position extend between two opposed walls of the building, thereby fully closing the passage between two parts of the room. However, the multilayer curtain 1 may also be used for other purposes, such as for instance as a window curtain or the like. The upper rail 7 is adapted to be mounted on said not shown ceiling or the like in any suitable way, such as by means of screws.

[0035] It should be noted that intermediate curtain layer 2 or layers may be supported directly by the carrier elements 6 as illustrated or may alternatively be supported via the first and/or second outer curtain layer 4, 5 in the case that one of these or both these layers 4, 5 is/are directly supported by the carrier elements 6.

[0036] The intermediate curtain layer 2 is provided with a number of connectors 8', 8" being arranged at a number of attachment positions 9 being mutually spaced along an upper edge 10 of the intermediate curtain layer 2, as seen in Fig. 17 which shows a partial top view of the fully closed multilayer curtain 1 as illustrated in Fig. 3. As illustrated in Figs. 10 to 12 and as further explained below, each connector 8', 8" at each attachment position 9 of the intermediate curtain layer 2, 3 is connected to a carrier element 6. However, in an alternative, not shown embodiment, only a first one of the two connectors 8', 8" at each attachment position 9 of the intermediate curtain layer 2, 3 is directly connected to a carrier element 6, and a second one of said two connectors 8', 8" is indirectly connected to said carrier element 6 via the intermediate curtain layer 2, 3 and the first one of the two connectors 8', 8".

[0037] As further seen in Fig. 17, each of the first outer curtain layer 4 and the second outer curtain layer 5 is provided with a number of connectors 14 being mutually spaced along an upper edge 11 of the respective first or second outer curtain layer 4, 5. As seen in Fig. 16, each connector 14 of the first outer curtain layer 4 is connected to a respective connector 8' of the intermediate curtain layer 2 so that a length 12 of the first outer curtain layer 4 extends between neighbouring attachment positions 9 of the intermediate curtain layer 2, and each connector 14 of

the second outer curtain layer 5 is connected to a respective connector 8" of the intermediate curtain layer 2 so that a length 13 of the second outer curtain layer 5 extends between neighbouring attachment positions 9 of the intermediate curtain layer 2, 3.

[0038] As indicated in Fig. 16, according to the present invention, seen in a direction D of the upper rail 7, for sequentially following attachment positions 9', 9", 9''' of the intermediate curtain layer 2, a first length 12' of the first outer curtain layer 4 extending between a first and a second attachment position 9', 9" of the intermediate curtain layer 2 is longer than a corresponding first length 13' of the second outer curtain layer 5 extending between said first and second attachment position 9', 9" of the intermediate curtain layer 2, and a second length 13" of the second outer curtain layer 5 extending between the second and a third attachment position 9", 9''' of the intermediate curtain layer 2 is longer than a corresponding second length 12" of the first outer curtain layer 4 extending between said second and third attachment position 9", 9''' of the intermediate curtain layer 2.

[0039] In this way, by connecting alternately, via attachment positions 9', 9", 9''' of the intermediate curtain layer 2, a relatively longer first length 12' of the first outer curtain layer 4 to a relatively shorter first length 13' of the second outer curtain layer 5 and a relatively shorter second length 12" of the first outer curtain layer 4 to a relatively longer second length 13" of the second outer curtain layer 5, a predetermined waveform may be imparted to all of the different layers 2, 4, 5 of the multilayer curtain 1 as illustrated in Figs. 16 and 17. This waveform may be maintained during operation of the multilayer curtain 1, and therefore, the resistance to displacement of the curtain layers 2, 4, 5 between a closed position as seen in Figs. 3 and 15 to 17, a partly open position as seen in Figs. 1 and 13, as well as a not shown fully open position, may be substantially reduced as compared to known solutions. As a result, the handling of the multilayer curtain 1 when drawing the curtain back from the closed position to the open position and vice versa may be greatly facilitated. In particular, relatively heavier and/or thicker first and second outer curtain layers 4, 5 may, as a result of resistance to bending, facilitate the formation of said predetermined waveform and therefore facilitate operation of the multilayer curtain 1 as opposed to prior art solutions in which particularly such relatively heavier and/or thicker curtain layers may impede operation. Furthermore, said waveform may ensure that an air gap 39 is always maintained between at least the first and the second outer curtain layers 4, 5 along the entire longitudinal direction of the multi-layer curtain 1, thereby providing a substantial sound attenuation effect of the multi-layer curtain 1.

[0040] As further indicated in Fig. 16, according to the present invention, preferably, a first length 15' of the intermediate curtain layer 2 extending between said first and said second attachment position 9', 9" of the intermediate curtain layer 2 is shorter than said first length 12'

of the first outer curtain layer 4 and longer than, equal to, or at least almost equal to said corresponding first length 13' of the second outer curtain layer 5, and a second length 15" of the intermediate curtain layer 2 extending between said second and said third attachment position 9", 9" of the intermediate curtain layer 2 is shorter than said second length 13" of the second outer curtain layer 5 and longer than, equal to, or at least almost equal to said corresponding second length 12" of the first outer curtain layer 4. Thereby, it may be even better ensured that said predetermined waveform may be imparted to the intermediate curtain layer 2 which predetermined waveform provides air gaps 39 between the intermediate curtain layer 2 and the first and second outer curtain layers 4, 5, respectively, during all stages of operation between the closed and open curtain, thereby ensuring low resistance to displacement of the multilayer curtain 1 and thereby improving sound attenuation of the multilayer curtain 1.

[0041] Preferably, according to the present invention, the first length 12' of the first outer curtain layer 4 is at least 20 per cent longer than, preferably at least 30 per cent longer than, and most preferred at least 40 per cent longer than, the corresponding first length 15' of the intermediate curtain layer 2, and the second length 13" of the second outer curtain layer 5 is at least 20 per cent longer than, preferably at least 30 per cent longer than, and most preferred at least 40 per cent longer than, the corresponding second length 15" of the intermediate curtain layer 2. Thereby, low resistance to displacement of the multilayer curtain 1 and improvement of sound attenuation of the multilayer curtain 1 may be even better ensured.

[0042] Preferably, according to the present invention, the first length 12' of the first outer curtain layer 4 is at least 20 per cent longer than, preferably at least 30 per cent longer than, and most preferred at least 40 per cent longer than, the corresponding first length 13' of the second outer curtain layer 5, and the second length 13" of the second outer curtain layer 5 is at least 20 per cent longer than, preferably at least 30 per cent longer than, and most preferred at least 40 per cent longer than, the corresponding second length 12" of the first outer curtain layer 4. Thereby, the handling of the multilayer curtain 1 when drawing the curtain back from the closed position to the open position and vice versa may be even better facilitated. Furthermore, the sound attenuation effect of the multilayer curtain 1 may be even better.

[0043] Curtain fullness or curtain gather is a measure of the additional width of fabric or material that is actually used to cover an opening seen in relation to the width of the opening. A flat drape has the same width as the respective opening and no fullness. To achieve 50 per cent fullness, is required 1.5 times the fabric width used for a flat curtain. 100 per cent fullness equals double that width. According to the present invention, it is preferred that the fullness of the first outer curtain layer 4 and of the second outer curtain layer 5 is at least 15 per cent, preferably at least 20 per cent and most preferred at least

25 per cent.

[0044] Preferably, according to the present invention, a bending stiffness along the upper edge 11 of the first outer curtain layer 4 and a bending stiffness along the upper edge 11 of the second outer curtain layer 5, respectively, are each substantially larger than a total bending stiffness corresponding to a sum of bending stiffnesses along respective upper edges 10 of all layers forming the at least one intermediate curtain layer 2, 3. In other words, it is preferred that, along an upper edge part of the multilayer curtain 1, a bending stiffness of the first outer curtain layer 4 is substantially larger than a total bending stiffness of the at least one intermediate curtain layer 2, 3, which in the embodiment illustrated in Figs. 15 to 17 is formed by a single intermediate curtain layer 2. Likewise, it is preferred that, along an upper edge part of the multilayer curtain 1, a bending stiffness of the second outer curtain layer 5 is substantially larger than said total bending stiffness of the at least one intermediate curtain layer 2, 3. Thereby, as a result of a relatively stiff first and second outer curtain layer 4, 5 and a relatively flexible at least one intermediate curtain layer 2, 3, the formation of said predetermined waveform may be facilitated, and therefore operation of the multilayer curtain 1 may be further facilitated.

[0045] Preferably, according to the present invention, a bending stiffness along the upper edge 11 of the first outer curtain layer 4 and a bending stiffness along the upper edge 11 of the second outer curtain layer 5, respectively, are each defined at least substantially or partly by a curtain tape 16 attached along the upper edge 11 of the first and second outer curtain layer 4, 5, respectively. Thereby, a suitable bending stiffness along the upper edges 11 of the first and second outer curtain layer 4, 5 may be provided at least substantially independently of the bending stiffness of the material of the first and second outer curtain layer itself. A curtain tape 16 attached along the upper edge 11 of the first outer curtain layer 4 is illustrated in Fig. 19 illustrating a side view of a top part of an inner side 40 of the first outer curtain layer 4, wherein the first outer curtain layer 4 has been fully flattened. Said curtain tape 16 may for instance be woven by means of monofilament yarns in order to provide a substantial bending stiffness.

[0046] By bending stiffness of a fabric or curtain tape is understood the resistance of the fabric or curtain tape to bending or flexing. It depends on the material, yarn, weave, finish, and thickness of the fabric. Fabric stiffness can influence the shape and movement of curtains. To measure fabric stiffness, different methods can be used, such as cantilever, circular bending, loop, and bending length. In order to overcome limitations of these methods may be used standardized procedures, calibrated instruments, and proper sample preparation and handling. Furthermore, advanced techniques, such as image analysis, laser scanning, or computer simulation, may be used to obtain more accurate and objective data.

[0047] In the illustrated embodiments, each connector

8', 8" of the intermediate curtain layer 2 is formed as a loop 18 provided by a curtain tape 17', 17" attached along the upper edge 10 of the intermediate curtain layer 2. In the same way, each connector 14 of the first outer curtain layer 4 and of the second outer curtain layer 5 is formed as a loop 18 provided by a curtain tape 16', 16" attached along the upper edge 11 of the first or second outer curtain layer 4, 5, respectively.

[0048] Although it is preferred providing the connectors 8', 8" of the intermediate curtain layer 2 and the connectors 14 of the first and second outer curtain layers 4, 5 by means of curtain tapes or the like, according to the present invention, these connectors 8', 8", 14 could also be provided in any other suitable way, such as for instance in the form of clips, rings or any other suitable elements with are attached to the respective curtain layers 2, 3, 4, 5. Said connectors 8', 8", 14 could even be provided as part of the curtain layers 2, 3, 4, 5 themselves, for instance by cut-outs therein, or said connectors 8', 8", 14 could simply be formed by attaching the curtain layers 2, 3, 4, 5 to each other at the respective attachment positions 9 by for instance sewing, welding, gluing or any other suitable process. In such case, at each attachment position 9 of the intermediate curtain layer 2 should be attached in any suitable way to the respective carrier element 6 directly or by means of the first and/or second outer curtain layer 4, 5. For instance, rings, clips or any other suitable connection element could be used for this purpose.

[0049] Referring to Figs. 16 and 17, it is understood that the connectors 8', 8", 14 in the form of loops 18 may provide a certain tolerance in the connections between the intermediate curtain layer 2 and the first and second outer curtain layers 4, 5. As explained further below, each connector 14 of the first and second outer curtain layer 4, 5 is connected to a respective connector 8', 8" of the at least one intermediate curtain layer 2 by means of a hook element 21, 22 provided with two hooks 23, 24 engaging the respective loops 18. Therefore, depending on the width of the loops 18, the hooks 23, 24 may move somewhat in their engagement with the loops 18. This relative movement may provide a certain flexibility to the multilayer curtain 1, thereby facilitating the handling thereof when drawing the curtain back from the closed position to the open position and vice versa. Furthermore, it is noted that this relative movement may provide a certain flexibility in the relative relationship between for instance the above mentioned first length 12' of the first outer curtain layer 4 and said corresponding first length 13' of the second outer curtain layer 5, both extending between said first and said second attachment position 9', 9" of the intermediate curtain layer 2.

[0050] As illustrated in Fig. 19 showing an embodiment of the inner side 40 of the first outer curtain layer 4 in a fully flattened configuration of the first outer curtain layer 4, a curtain tape 16', 16" of the first outer curtain layer 4 and of the second outer curtain layer 5 are each provided with loops 18 being mutually spaced along the respective

curtain tape 16', 16" by alternately a first distance d' and a second distance d'' , wherein the first distance d' is longer than the second distance d'' . Thereby, the above-mentioned first length 12', 13' and second length 12", 13" of the first and second outer curtain layer 4, 5, respectively, may be predefined by the loops 18 of the curtain tape 16', 16" which may facilitate assembly of the multilayer curtain 1 when connecting each connector 14 of the first and second outer curtain layer 4, 5, in the form of a loop 18, to a respective connector 8', 8" of the at least one intermediate curtain layer 2.

[0051] In a not shown embodiment alternative to the embodiment illustrated in Fig. 19, a curtain tape 16', 16" of the first outer curtain layer 4 and of the second outer curtain layer 5 are each provided with a row of loops, and only some of said loops are marked loops 18 which are visually marked for connection with respective loops 18 of the at least one intermediate curtain layer 2, 3. For instance, in the row of loops, the loops could be evenly spaced along the respective curtain tape 16', 16". In that case, a standard curtain tape could be used. The marked loops 18 are arranged mutually spaced along the respective curtain tape 16', 16" by alternately a first distance d' and a second distance d'' , and the first distance d' is longer than the second distance d'' . Thereby, the above-mentioned first length 12', 13' and second length 12", 13" of the first and second outer curtain layer 4, 5, respectively, may be predefined by the marked loops 18 of the curtain tape 16', 16" which may facilitate assembly of the multilayer curtain 1 when connecting connectors 14 of the first and second outer curtain layer 4, 5, in the form of loops 18, to respective connectors 8', 8" of the at least one intermediate curtain layer 2. In this way, a number of unmarked loops may be arranged between the marked loops 18, and such unmarked loops may provide an adjustment possibility, for instance in the case that a different relationship between the above-mentioned first length 12', 13' and second length 12", 13" of the first and second outer curtain layer 4, 5 should be desired. In that case, some of the unmarked loops may alternatively to some of or all of the marked loops be used for the connection with respective loops of the at least one intermediate curtain layer 2.

[0052] As illustrated in Fig. 18 showing an embodiment of a second side 20 of the intermediate curtain layer 2 in a fully flattened configuration of the intermediate curtain layer 2, a first curtain tape 17' on a first side 19 of the intermediate curtain layer 2 and a second curtain tape 17" on a second side 20 of the intermediate curtain layer 2 are each provided with loops 18 being regularly spaced in a longitudinal direction of the respective curtain tape 17', 17". Thereby, a regular spacing between the connectors 8', 8" of the at least one intermediate curtain layer 2 may be predefined by the loops 18 of the curtain tape 17', 17" which may facilitate assembly of the multilayer curtain 1 when connecting each connector 14 of the first and second outer curtain layer 4, 5 to a respective connector 8', 8", in the form of a loop 18, of the intermediate curtain

layer 2.

[0053] In a not shown embodiment alternative to the embodiment illustrated in Fig. 18, a first curtain tape 17' on a first side 19 of the at least one intermediate curtain layer 2, 3 and a second curtain tape 17" on a second side 20 of the at least one intermediate curtain layer 2, 3 are each provided with a row of loops 18, only some of said loops 18 are marked loops which are visually marked for connection with respective loops 18 of the first outer curtain layer 4 or of the second outer curtain layer 5, and the marked loops are mutually arranged regularly spaced in a longitudinal direction of the respective curtain tape 17', 17". Thereby, a regular spacing between the connectors 8', 8" of the at least one intermediate curtain layer 2, 3 may be predefined by the marked loops 18 of the curtain tape 17', 17" which may facilitate assembly of the multilayer curtain 1 when connecting connectors 14 of the first and second outer curtain layer 4, 5 to a respective connector 8', 8", in the form of a marked loop 18, of the at least one intermediate curtain layer 2, 3. In this way, a number of unmarked loops may be arranged between the marked loops 18, and such unmarked loops may provide an adjustment possibility, for instance in the case that a shift in the positions of the above-mentioned attachment positions 9 of the at least one intermediate curtain layer 2, 3 should be desired. In that case, some of the unmarked loops may alternatively to some of or all of the marked loops 18 be used for the connection with respective loops 18 of the first or second outer curtain layer 4, 5.

[0054] The marked loops 18 of the curtain tapes 16', 16" of the first outer curtain layer 4 and of the second outer curtain layer 5 as well as the marked loops 18 of the first and second curtain tapes 17', 17" of the at least one intermediate curtain layer 2, 3 may be visually distinguished from the unmarked loops of the respective curtain tapes in any suitable way. For instance, the marked loops may have a different colour than the unmarked loops, they may be broader or narrower, taller or shorter or they may have a different surface pattern or the like. For instance, the marked loops may be made by, woven by or attached by means of different yarns, such as yarns having a different colour or thickness or being of another material, than yarns of the unmarked loops. In particular, the marked loops could be provided with an additional layer, part or surface including yarns having a different visual appearance, such as having a different colour than a remaining part of or a main part of the respective curtain tape.

[0055] Purely as an example, in an embodiment, the first and second curtain tapes 17', 17" of the at least one intermediate curtain layer 2, 3 is provided with a row of loops being mutually regularly spaced, and between each pair of neighbouring marked loops, there is arranged seven unmarked loops. Furthermore, the curtain tapes 16', 16" of the first outer curtain layer 4 and of the second outer curtain layer 5 are each provided with a row of loops being mutually regularly spaced with a spacing

corresponding to the spacing provided between the loops of the first and second curtain tapes 17', 17" of the at least one intermediate curtain layer 2, 3, and, between each pair of neighbouring marked loops, there is arranged alternately seven unmarked loops and twelve unmarked loops. The mentioned number of unmarked loops between the marked loops could be varied in any suitable way. Advantageously, according to this embodiment, standard curtain tapes may be used with an additional marking of loops as per the actual requirements.

[0056] As it is understood from Figs. 18 and 19, it is preferred that the curtain tapes 16', 16" of the first outer curtain layer 4 and of the second outer curtain layer 5 are arranged in the same distance from the upper edge 11 of the curtain layers 4, 5 as the distance by which the curtain tapes 17', 17" of the at least one intermediate curtain layer 2 are arranged from the upper edge 10 of the at least one intermediate curtain layer 2. Thereby, the manufacturing process may be simplified and errors of positioning of the curtain tapes may be prevented. The height of the upper edges 10, 11 of the respective curtain layers when these are mounted below the upper rail 7 may in this case be varied by means of hook elements 21, 22 with hooks 23, 24 arranged in different heights, as explained in further detail below.

[0057] The loops 18 of the curtain tapes 16', 16" of the first outer curtain layer 4 and of the second outer curtain layer 5 as well as of the curtain tapes 17', 17" of the at least one intermediate curtain layer 2 may be formed by interweaving two bands which are separately woven where the loops are formed. Alternatively, of course, a band may be sewn onto another band between the loops. In any case, it may be preferred that the curtain tapes 16', 16", 17', 17" are sewn onto the respective curtain layers 2, 3, 4, 5.

[0058] As seen in Figs. 16 and 17, according to the present invention, preferably, a first connector 8' is arranged on a first side 19 of the intermediate curtain layer 2 at each attachment position 9, and a second connector 8" is arranged on a second side 20 of the intermediate curtain layer 2 at each attachment position 9. Thereby, the intermediate curtain layer 2 may, at each attachment position 9, be connected to both the first outer curtain layer 4 and the second outer curtain layer 5 without penetration of the intermediate curtain layer 2 and without need for any element bridging the first and second side 19, 20 of the intermediate curtain layer 2. Therefore, the intermediate curtain 2 layer may in this way be connected to both the first outer curtain layer 4 and the second outer curtain layer 5 before hanging the multilayer curtain 1 below the upper rail 7 by connecting the curtain 1 to the carrier elements 6 slidably arranged along the upper rail 7.

[0059] As illustrated in Fig. 16, and as further visualised in Figs. 10 to 12, the intermediate curtain layer 2 has a first side 19 facing the first outer curtain layer 4, and each first connector 8' on said first side 19 is connected to a respective connector 14 of the first outer curtain layer

4 by means of a first hook element 21 as illustrated in Fig. 22. Furthermore, as seen, the intermediate curtain layer 2 has a second side 20 facing the second outer curtain layer 5, and each second connector 8" on said second side 20 is connected to a respective connector 14 of the second outer curtain layer 5 by means of a second hook element 22. Thereby, the intermediate curtain layer 2 may by way of the hook elements 21, 22 be connected to both the first outer curtain layer 4 and the second outer curtain layer 5 before hanging the multilayer curtain 1 below the upper rail 7 by connecting the hook elements 21, 22 to the carrier elements 6 slidingly arranged along the upper rail 7. The hook elements 21, 22 may provide a certain distance between the intermediate curtain layer 2 and the first and second outer curtain layer 4, 5, respectively, thereby ensuring a better sound attenuation effect of the multilayer curtain 1.

[0060] As seen in Fig. 20, each first hook element 21 is hanging in a carrier element 6 as illustrated in Fig. 21, and each second hook element 22 is hanging in such a carrier element 6. Thereby, a good balance between either side of the multilayer curtain 1 may be obtained when the curtain is hanging in the upper rail 7. Although according to the present invention, a first and a second hook element 21, 22 could both hang in one single carrier element 6, it is preferred that each first hook element 21 and each second hook element 22 are hanging in each their respective carrier element as further explained below and as seen in the view of Fig. 20, wherein the first hook element 21 is hanging in a visible carrier element 6 and wherein the second hook element 22 is hanging in a carrier element 6 which is not visible, because it is hidden behind the visible carrier element 6. The carrier element 6 used in the illustrated embodiments is of a type known *per se* and, as mentioned above, includes two opposed rollers 29 rolling on the upper side of two opposed flanges 38 of the upper rail 7. The two rollers 29 are arranged rotatably about a horizontal axis on a frame 30 which carries an eyelet 31 arranged below the frame and rotatably about a vertical axis in relation to the frame 30. Thereby, the first and second hook elements 21, 22 hanging in the eyelet 31 are allowed to rotate about said vertical axis, thereby adding flexibility to the multilayer curtain 1 and consequently facilitating the handling thereof when drawing the curtain back from the closed position to the open position and vice versa. Nevertheless, although the known type of carrier element 6 has been used in the illustrated embodiments, any suitable carrier element may be used according to the present invention. Even slidingly arranged carrier elements without rollers may be used. As seen in Fig. 20, a cross-section of the upper rail 7 has an inverted U-form wherein the two opposed flanges 38 extend in the direction of each other from a lower end of either leg of the U-form, thereby creating a space between the two opposed flanges 38 through which the carrier element 6 extends so that the rollers 29 are arranged inside the U-form and the eyelet 31 hangs below the U-form. The upper rail 7 may be

composed of several profile sections attached to each other end to end. Although the illustrated upper rail 7 has a U-formed cross-section, any other suitable rail or track may be used according to the present invention in order to support the carrier elements 6 slidingly along a single line.

[0061] As illustrated in Figs. 10 to 12, each hook element 21, 22 has a first hook 23 engaged with a connector 8', 8" of the intermediate curtain layer 2 and a second hook 24 engaged with a connector 14 of the first or second outer curtain layer 4, 5.

[0062] Preferably, the first hook 23 is arranged above the second hook 24 when hook element 21, 22 is hanging in a carrier element 6. Thereby, it may easily be obtained that the intermediate curtain layer 2 is hanging slightly higher than the first and second outer curtain layers 4, 5 so that it may provide a close fit to the upper rail 7, i.e. the upper edge 10 of the intermediate curtain layer 2 may touch the upper rail 7, thereby sealing between the intermediate curtain layer 2 and the upper rail 7 for a better sound attenuation effect when the upper rail 7 is mounted on a not shown ceiling or any other suitable building structure. This may be obtained by arranging a curtain tape 17', 17" on either side 19, 20 of the intermediate curtain layer 2, and a curtain tape 16', 16" on each one of the first outer curtain layer 4 and the second outer curtain layer 5, whereby all curtain tapes are arranged at the same distance from a top edge 10, 11 of the respective curtain layers 2, 4, 5. Thereby, manufacturing of the curtain layers may be facilitated as already explained above.

[0063] Furthermore, it is preferred that the intermediate curtain layer 2 is slightly longer in a vertical direction than each one of the first outer curtain layer 4 and the second outer curtain layer 5 so that a lower edge 36 of the intermediate curtain layer 2 may provide a close fit to a not shown floor of the room in which the multilayer curtain 1 is installed, by mounting the upper rail 7 on said not shown ceiling or any other suitable building structure, even without that a lower edge 37 of the outer curtain layers 4, 5 touches the floor. This situation which is illustrated in Fig. 3 may be advantageous in that the intermediate curtain layer 2 which is preferably a sound attenuating layer may provide a close fit to the floor and therefore provide good sound attenuating effect without that the outer curtain layers causes additional an unnecessary friction against the floor.

[0064] As indicated in Fig. 16 and as further visible in Figs. 10 to 12, in the illustrated embodiments, the hook elements 21, 22 are arranged in pairs 25', 25" in each of which a first hook element 21 is engaged with a connector 8' on said first side 19 of the intermediate curtain layer 2 facing the first outer curtain layer 4, and in each of which a second hook element 22 is engaged with a connector 8" on said second side 20 of the intermediate curtain layer 2 facing the second outer curtain layer 5, and a distance d_{pair} , seen in the direction D of the upper rail 7, between subsequent pairs 25', 25" of hook elements 21, 22 may

vary between a fully closed position of the multilayer curtain 1 and a fully drawn back, open position of the multilayer curtain. As understood, in the fully closed position of the multilayer curtain 1, the distance d_{pair} is longer than it is in the fully drawn back, open position.

[0065] As further seen in the embodiment illustrated, seen in the direction D of the upper rail 7 as indicated in Fig. 16, in subsequent pairs 25', 25" of hook elements 21, 22, in a first pair 25', the first hook element 21 is arranged before the second hook element 22, and in a subsequent second pair 25", the second hook element 22 is arranged before the first hook element 21. Thereby, the above-mentioned predetermined waveform may even better be imparted to all of the different layers 2, 4, 5 of the multilayer curtain 1, and thereby the resistance to displacement of the curtain layers between a closed position and an open position may be even more reduced as compared to known solutions. As a result, the handling of the multilayer curtain 1 when drawing the curtain back from the closed position to the open position, and vice versa, may be even better facilitated.

[0066] Comparing Figs. 15 and 16, it is understood that, in each pair 25', 25" of hook elements 21, 22, each first hook element 21 is hanging in a first carrier element 6' and each second hook element 22 is hanging in a second carrier element 6". This is further seen in Figs. 10 to 12. Thereby, a certain flexibility may be obtained between the positions of the first and second hook elements 21, 22 of each pair 25', 25" of hook elements in the direction D of the upper rail 7. This flexibility may provide for even easier handling of the multilayer curtain 1 and may provide for a larger air gap 39 between the first and second outer curtain layers 4, 5 when the multilayer curtain 1 is fully extended to a closed position so that an even better sound attenuation effect may be obtained. Furthermore, said flexibility may enable the multilayer curtain 1 to be drawn back relatively even further to an open position, i.e. the curtain may be even more compacted when drawn back. Thereby, the drawn back multilayer curtain 1 may take up less space in the room when not in use as a room divider.

[0067] Comparing Figs. 8, 9, 10 and 15, it is understood that, seen in the direction D of the upper rail 7, in subsequent pairs 25', 25" of hook elements 21, 22, in a first pair 25', the first carrier 6' element is arranged slidingly on the upper rail 7 before the second carrier element 6", and in a subsequent second pair 25", the second carrier element 6" is arranged slidingly on the upper rail 7 before the first carrier element 6'. Thereby, in particular, the above-mentioned predetermined waveform may even better be imparted to all of the different layers of the multilayer curtain 1, and thereby the resistance to displacement of the curtain layers between a closed position and an open position may be even more reduced as compared to known solutions. As a result, the handling of the multilayer curtain 1 when drawing back the curtain from the closed position to the open position and vice versa may be even better facilitated.

[0068] Fig. 25 illustrates another embodiment of the multilayer curtain 1 according to the present invention, wherein a first and a second intermediate curtain layer 2, 3 are arranged between the first outer curtain layer 4 and the second outer curtain layer 5, and wherein neighbouring intermediate curtain layers 2, 3 are connected by means of connecting hooks 26 each engaging a first connector 8' on a first side 19 of the first intermediate curtain layer 2 and a second connector 8" on a second side 20 of the second intermediate curtain layer 3. Thereby, a further air gap may be created between the intermediate curtain layers 2, 3, thereby providing even better sound attenuation effect. The connecting hook 26 is further illustrated in Fig. 26.

[0069] As further seen in Fig. 25, the hook element 21 has a first hook 23 engaged with a connector 8' of the second intermediate curtain layer 3 and a second hook 24 engaged with a connector 14 of the first outer curtain layer 4. Similarly, as seen in Fig. 25, the hook element 22 has a first hook 23 engaged with a connector 8" of the first intermediate curtain layer 2 and a second hook 24 engaged with a connector 14 of the second outer curtain layer 5.

[0070] As seen in the illustrated embodiments, according to the present invention, preferably, all carrier elements 6, 6', 6" are slidingly arranged in a row along a single upper rail 7. Thereby, the resistance to displacement of the curtain layers between a closed position and an open position may be substantially reduced as compared to known solutions with more than one rail, and the handling of the multilayer curtain 1 is greatly facilitated.

[0071] Preferably, the at least one intermediate curtain layer 2, 3 is an acoustically dampening layer. Thereby, an even better sound attenuation effect may be obtained. The at least one intermediate curtain layer 2, 3 may preferably be a heavier type of material which may be covered by the first and second outer curtain layers 4, 5, thereby providing for an aesthetic appearance. The intermediate curtain layer or layers 2, 3 may for instance be molton coated with polyurethane, or similar. The polyurethane layer may stop air flow through the layer and thereby practically stop sound. The molton layer may provide dampening. The first and second outer curtain layers 4, 5 may be formed by any suitable fabric, webbing, foil, etc. according to preferences.

[0072] Along opposed vertical edges forming ends of the multilayer curtain 1, the at least one intermediate curtain layer 2, 3 and the first and second outer curtain layers 4, 5 may be mutually connected to each by means of not shown connectors, such as snap fasteners of any suitable kind, or for instance hook-and-loop attachment or the like. Thereby, handling of the curtain may be facilitated and an even more aesthetic appearance may be achieved.

[0073] Figs. 23 and 24 illustrate an alternative embodiment of the multilayer curtain 1 according to the present invention, seen in a fully closed position of the multilayer curtain 1. According to this embodiment, the multilayer

curtain 1 is allowed to extend somewhat further in its fully closed position as compared to the embodiment illustrated in Figs. 3 and 15 to 17. As seen, in the embodiment illustrated in Figs. 3 and 15 to 17, in the fully closed position of the multilayer curtain 1, the intermediate curtain layer 2 is still somewhat curved and therefore allows both the first and second outer curtain layers 4, 5 to also curve. However, as seen, in the embodiment illustrated in Figs. 23 and 24, in the fully closed position of the multilayer curtain 1, the intermediate curtain layer 2 is fully extended to an at least substantially flat configuration. As further seen, the first and second outer curtain layers 4, 5, respectively, are also alternately at least substantially fully stretched to a flat configuration between sequentially following neighbouring attachment positions of the intermediate curtain layer 2. The multilayer curtain 1 of the embodiment illustrated in Figs. 23 and 24 may be provided by extending the upper rail 7 of the embodiment illustrated in Figs. 3 and 15 to 17 and possibly adjusting the relative length of the first and second outer curtain layers 4, 5. Even according to the embodiment illustrated in Figs. 23 and 24, it is seen that a substantial air gap is provided continuously between the different layers 2, 3, 4, 5 of the multilayer curtain 1 along the length thereof.

[0074] Fig. 27 illustrates an advantageous method of packaging a multilayer curtain 1 according to the present invention. According to the method, each intermediate curtain layer 2, 3, the first outer curtain layer 4 and the second outer curtain layer 5 are rolled up on a separate cardboard roll core 33. The cardboard roll cores 33 are preferably provided by folding a piece of cardboard to form a roll having triangular cross-section as seen in the figure. The curtain layers 2, 3, 4, 5 are preferably rolled up so that the upper edge 10, 11 of each respective layer is parallel to a length direction of the respective cardboard roll 33. Before rolling up the curtain layers 2, 3, 4, 5, each layer is preferably folded along lines being perpendicular to the respective upper edge 10, 11 thereof, so that independently of the width of the layers, a certain length of each roll may be obtained. Thereby, independently of the width of the layers, the same cardboard roll cores 33 may be used.

[0075] After rolling up the curtain layers on the cardboard roll cores 33, as illustrated in Fig. 27, the rolls are arranged in a cardboard box 34 so that a roll with a first one of the first or second outer curtain layer 4, 5 is positioned at the bottom of the box, a roll with the at least one intermediate curtain layer 2, 3 is positioned on top of the first roll, and a roll with the second one of the first or second outer curtain layer 4, 5 is positioned on top of the second roll. Thereby, unpacking and assembly of the multilayer curtain 1 may be greatly facilitated in that the rolls may be unpacked in the an order corresponding to the order in which the curtain layers should be arranged on top of each other before connecting these to each other by means of the hook elements 21, 22.

[0076] As further illustrated in Fig. 27, the upper rail 7 may be packaged in a separate cardboard box 35. The

upper rail 7 may be composed by a number of separate rail sections which may be assembled after unpacking.

List of reference numbers

[0077]

D	direction of upper rail
d', d"	distance between loops of curtain tape of first or second outer curtain layer
d _{pair}	distance between subsequent pairs of hook elements
1	multilayer curtain
2, 3	intermediate curtain layer
4	first outer curtain layer
5	second outer curtain layer
6, 6', 6"	carrier element
7	upper rail
8', 8"	connector of intermediate curtain layer
9', 9", 9'''	attachment position of intermediate curtain layer
10	upper edge of intermediate curtain layer
11	upper edge of first or second outer curtain layer
12', 12"	length of first outer curtain layer between neighbouring attachment positions
13', 13"	length of second outer curtain layer between neighbouring attachment positions
14	connector of first outer curtain layer or of second outer curtain layer
15	length of intermediate curtain layer between neighbouring attachment positions
16', 16"	curtain tape of first or second outer curtain layer
17', 17"	curtain tape of intermediate curtain layer
18	loop of curtain tape forming connector
19	first side of intermediate curtain layer
20	second side of intermediate curtain layer
21	first hook element
22	second hook element
23	first hook of hook element
24	second hook of hook element
25', 25"	pair of hook elements
26	connecting hook
27	first hook of connecting hook
28	second hook of connecting hook
29	roller of carrier element
30	frame of carrier element
31	eyelet of carrier element
32	top hook of hook element
33	cardboard roll core for curtain layer
34	cardboard box for rolls of curtain layers
35	cardboard box for upper rail
36	lower edge of intermediate curtain layer
37	lower edge of outer curtain layer
38	flange of upper rail
39	air gap
40	inner side of first outer curtain layer

41 inner side of second outer curtain layer

Claims

1. A multilayer curtain (1) including at least one intermediate curtain layer (2, 3) arranged between a first outer curtain layer (4) and a second outer curtain layer (5), wherein the at least one intermediate curtain layer (2, 3) is supported by carrier elements (6) slidably arranged in a row along an upper rail (7), wherein the at least one intermediate curtain layer (2, 3) is provided with a number of connectors (8', 8'') being arranged at a number of attachment positions (9) being mutually spaced along an upper edge (10) of the at least one intermediate curtain layer (2, 3), wherein at least one connector (8', 8'') at each attachment position (9) of the at least one intermediate curtain layer (2, 3) is connected to a carrier element (6), wherein each of the first outer curtain layer (4) and the second outer curtain layer (5) is provided with a number of connectors (14) being mutually spaced along an upper edge (11) of the respective first or second outer curtain layer (4, 5), wherein each connector (14) of the first outer curtain layer (4) is connected to a respective connector (8') of the at least one intermediate curtain layer (2, 3) so that a length (12) of the first outer curtain layer (4) extends between neighbouring attachment positions (9) of the at least one intermediate curtain layer (2, 3), and wherein each connector (14) of the second outer curtain layer (5) is connected to a respective connector (8'') of the at least one intermediate curtain layer (2, 3) so that a length (13) of the second outer curtain layer (5) extends between neighbouring attachment positions (9) of the at least one intermediate curtain layer (2, 3), **characterised in that**, seen in a direction (D) of the upper rail (7), for sequentially following attachment positions (9) of the at least one intermediate curtain layer (2, 3), a first length (12') of the first outer curtain layer (4) extending between a first and a second attachment position (9', 9'') of the at least one intermediate curtain layer (2, 3) is longer than a corresponding first length (13') of the second outer curtain layer (5) extending between said first and second attachment position (9', 9'') of the at least one intermediate curtain layer (2, 3), and a second length (13'') of the second outer curtain layer (5) extending between the second and a third attachment position (9'', 9''') of the at least one intermediate curtain layer (2, 3) is longer than a corresponding second length (12'') of the first outer curtain layer (4) extending between said second and third attachment position (9'', 9''') of the at least one intermediate curtain layer (2, 3).
2. A multilayer curtain according to claim 1, wherein a first length (15') of the at least one intermediate curtain layer (2, 3) extending between said first and said second attachment position (9', 9'') of the at least one intermediate curtain layer (2, 3) is shorter than said first length (12') of the first outer curtain layer (4) and longer than or at least almost equal to said corresponding first length (13') of the second outer curtain layer (5), and a second length (15'') of the at least one intermediate curtain layer (2, 3) extending between said second and said third attachment position (9'', 9''') of the at least one intermediate curtain layer (2, 3) is shorter than said second length (13'') of the second outer curtain layer (5) and longer than or at least almost equal to said corresponding second length (12'') of the first outer curtain layer (4).
3. A multilayer curtain according to claim 2, wherein the first length (12') of the first outer curtain layer (4) is at least 20 per cent longer than, preferably at least 30 per cent longer than, and most preferred at least 40 per cent longer than, the corresponding first length (15') of the at least one intermediate curtain layer (2, 3), and wherein the second length (13'') of the second outer curtain layer (5) is at least 20 per cent longer than, preferably at least 30 per cent longer than, and most preferred at least 40 per cent longer than, the corresponding second length (15'') of the at least one intermediate curtain layer (2, 3).
4. A multilayer curtain according to any one of the preceding claims, wherein the first length (12') of the first outer curtain layer (4) is at least 20 per cent longer than, preferably at least 30 per cent longer than, and most preferred at least 40 per cent longer than, the corresponding first length (13') of the second outer curtain layer (5), and wherein the second length (13'') of the second outer curtain layer (5) is at least 20 per cent longer than, preferably at least 30 per cent longer than, and most preferred at least 40 per cent longer than, the corresponding second length (12'') of the first outer curtain layer (4).
5. A multilayer curtain according to any one of the preceding claims, wherein a bending stiffness along the upper edge (11) of the first outer curtain layer (4) and a bending stiffness along the upper edge (11) of the second outer curtain layer (5), respectively, are each substantially larger than a total bending stiffness corresponding to a sum of bending stiffnesses along respective upper edges (10) of all layers forming the at least one intermediate curtain layer (2, 3).
6. A multilayer curtain according to any one of the preceding claims, wherein a bending stiffness along the upper edge (11) of the first outer curtain layer (4) and a bending stiffness along the upper edge (11) of the second outer curtain layer (5), respectively, are each defined at least substantially by a curtain tape (16) attached along the upper edge (11) of the first

and second outer curtain layer (4, 5), respectively.

7. A multilayer curtain according to any one of the preceding claims, wherein each connector (8', 8", 14) of the at least one intermediate curtain layer (2, 3), of the first outer curtain layer (4) and of the second outer curtain layer (5) is formed as a loop (18) provided by a curtain tape (16', 16", 17', 17") attached along the upper edge (10, 11) of the respective curtain layer. 5
8. A multilayer curtain according to claim 7, wherein a curtain tape (16', 16") of the first outer curtain layer (4) and of the second outer curtain layer (5) are each provided with loops (18) being mutually spaced along the respective curtain tape (16', 16") by alternately a first distance (d') and a second distance (d"), and wherein the first distance (d') is longer than the second distance (d"). 10
9. A multilayer curtain according to claim 7, wherein a curtain tape (16', 16") of the first outer curtain layer (4) and of the second outer curtain layer (5) are each provided with a row of loops (18), wherein only some of said loops (18) are marked loops which are visually marked for connection with respective loops (18) of the at least one intermediate curtain layer (2, 3), and wherein the marked loops are arranged mutually spaced along the respective curtain tape (16', 16") by alternately a first distance (d') and a second distance (d"), and wherein the first distance (d') is longer than the second distance (d"). 15
10. A multilayer curtain according to any one of the claims 7 to 9, wherein a first curtain tape (17') on a first side (19) of the at least one intermediate curtain layer (2, 3) and a second curtain tape (17") on a second side (20) of the at least one intermediate curtain layer (2, 3) are each provided with loops (18) being regularly spaced in a longitudinal direction of the respective curtain tape (17', 17"). 20
11. A multilayer curtain according to any one of the claims 7 to 9, wherein a first curtain tape (17') on a first side (19) of the at least one intermediate curtain layer (2, 3) and a second curtain tape (17") on a second side (20) of the at least one intermediate curtain layer (2, 3) are each provided with a row of loops (18), wherein only some of said loops (18) are marked loops which are visually marked for connection with respective loops (18) of the first outer curtain layer (4) or of the second outer curtain layer (5), and wherein the marked loops are mutually arranged regularly spaced in a longitudinal direction of the respective curtain tape (17', 17"). 25
12. A multilayer curtain according to any one of the preceding claims, wherein a first connector (8') is arranged on a first side (19) of the at least one intermediate curtain layer (2, 3) at each attachment position (9), and wherein a second connector (8") is arranged on a second side (20) of the at least one intermediate curtain layer (2, 3) at each attachment position (9). 30
13. A multilayer curtain according to claim 12, wherein the at least one intermediate curtain layer (2, 3) has a first side (19) facing the first outer curtain layer (4), wherein each first connector (8') on said first side (19) is connected to a respective connector (14) of the first outer curtain layer (4) by means of a first hook element (21), wherein the at least one intermediate curtain layer (2, 3) has a second side (20) facing the second outer curtain layer (5), wherein each second connector (8") on said second side (20) is connected to a respective connector (14) of the second outer curtain layer (5) by means of a second hook element (22). 35
14. A multilayer curtain according to claim 13, wherein each first hook element (21) is hanging in a carrier element (6), and wherein each second hook element (22) is hanging in a carrier element (6). 40
15. A multilayer curtain according to claim 13 or 14, wherein each hook element (21, 22) has a first hook (23) engaged with a connector (8', 8") of an intermediate curtain layer (2, 3) of the at least one intermediate curtain layer and a second hook (24) engaged with a connector (14) of the first or second outer curtain layer (4, 5). 45
16. A multilayer curtain according to claim 15, wherein the first hook (23) is arranged above the second hook (24) when hook element (21, 22) is hanging in a carrier element (6). 50
17. A multilayer curtain according to any one of the claims 13 to 16, wherein the hook elements (21, 22) are arranged in pairs (25', 25") in each of which a first hook element (21) is engaged with a connector (8') on said first side (19) of the at least one intermediate curtain layer (2, 3) facing the first outer curtain layer (4), and in each of which a second hook element (22) is engaged with a connector (8") on said second side (20) of the at least one intermediate curtain layer (2, 3) facing the second outer curtain layer (5), and wherein a distance (d_{pair}), seen in the direction (D) of the upper rail (7), between subsequent pairs (25', 25") of hook elements (21, 22) may vary between a fully closed position of the multilayer curtain (1) and a fully drawn back position of the multilayer curtain. 55
18. A multilayer curtain according to claim 17, wherein, seen in the direction (D) of the upper rail (7), in

subsequent pairs (25', 25") of hook elements (21, 22), in a first pair (25'), the first hook element (21) is arranged before the second hook element (22), and in a subsequent second pair (25"), the second hook element (22) is arranged before the first hook element (21). 5

19. A multilayer curtain according to claim 18, wherein, in each pair (25', 25") of hook elements (21, 22), each first hook element (21) is hanging in a first carrier element (6') and each second hook element (22) is hanging in a second carrier element (6"). 10

20. A multilayer curtain according to claim 19, wherein, seen in the direction (D) of the upper rail (7), in subsequent pairs (25', 25") of hook elements (21, 22), in a first pair (25'), the first carrier (6') element is arranged slidingly on the upper rail (7) before the second carrier element (6"), and in a subsequent second pair (25"), the second carrier element (6") is arranged slidingly on the upper rail (7) before the first carrier element (6'). 15 20

21. A multilayer curtain according to any one of the preceding claims, wherein the at least one intermediate curtain layer (2, 3) includes a number of intermediate curtain layers, wherein neighbouring intermediate curtain layers (2, 3) are connected by means of connecting hooks (26) each engaging a first connector (8') on a first side (19) of a first one (2) of the neighbouring intermediate curtain layers (2, 3) and a second connector (8") on a second side (20) of a second one (3) of the neighbouring intermediate curtain layers. 25 30

22. A multilayer curtain according to any one of the preceding claims, wherein all carrier elements (6, 6', 6") are slidingly arranged in a row along a single upper rail (7). 35 40

23. A multilayer curtain according to any one of the preceding claims, wherein the at least one intermediate curtain layer (2, 3) is an acoustically dampening layer. 45

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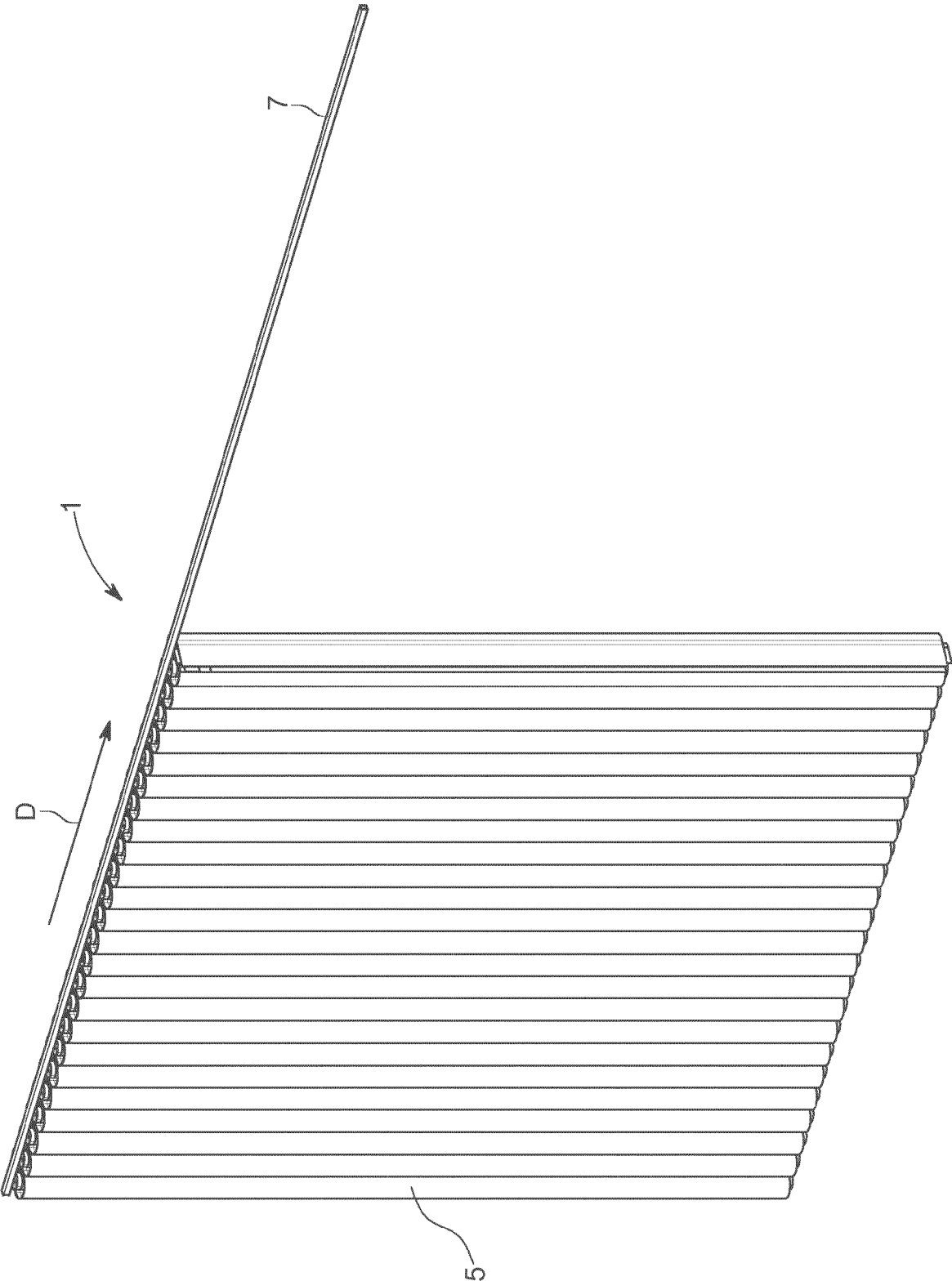


FIG. 1

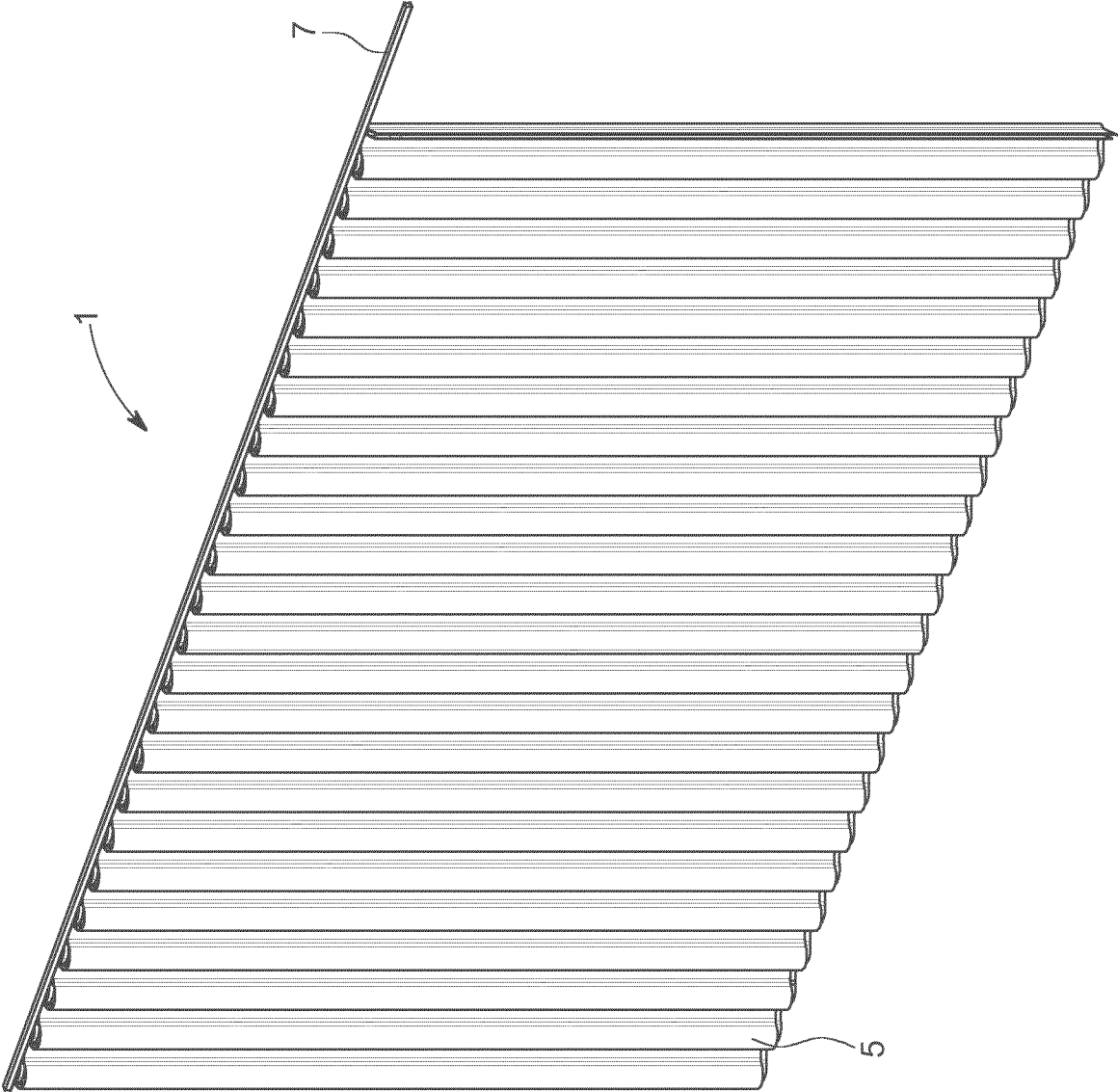


FIG. 2

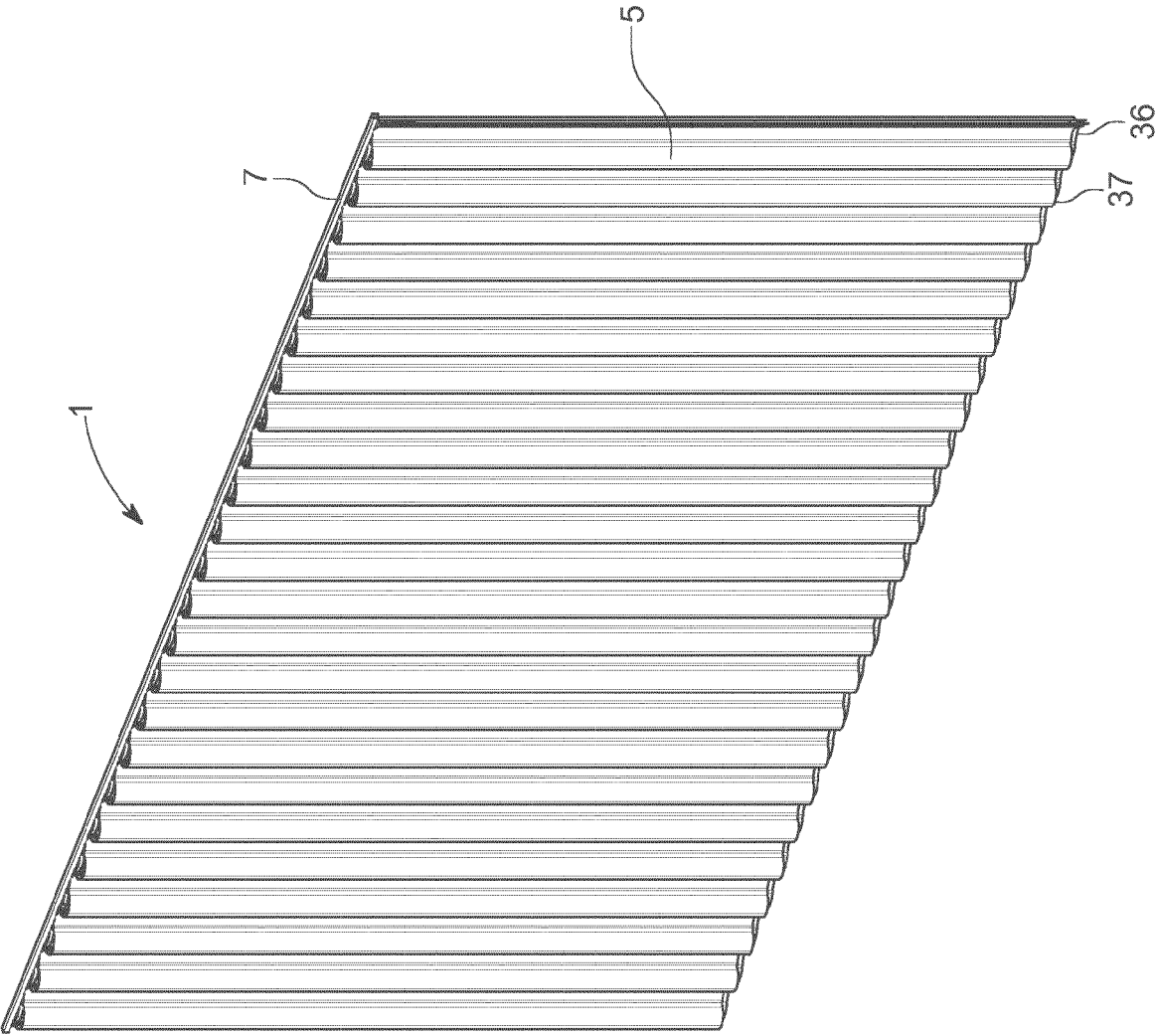


FIG. 3

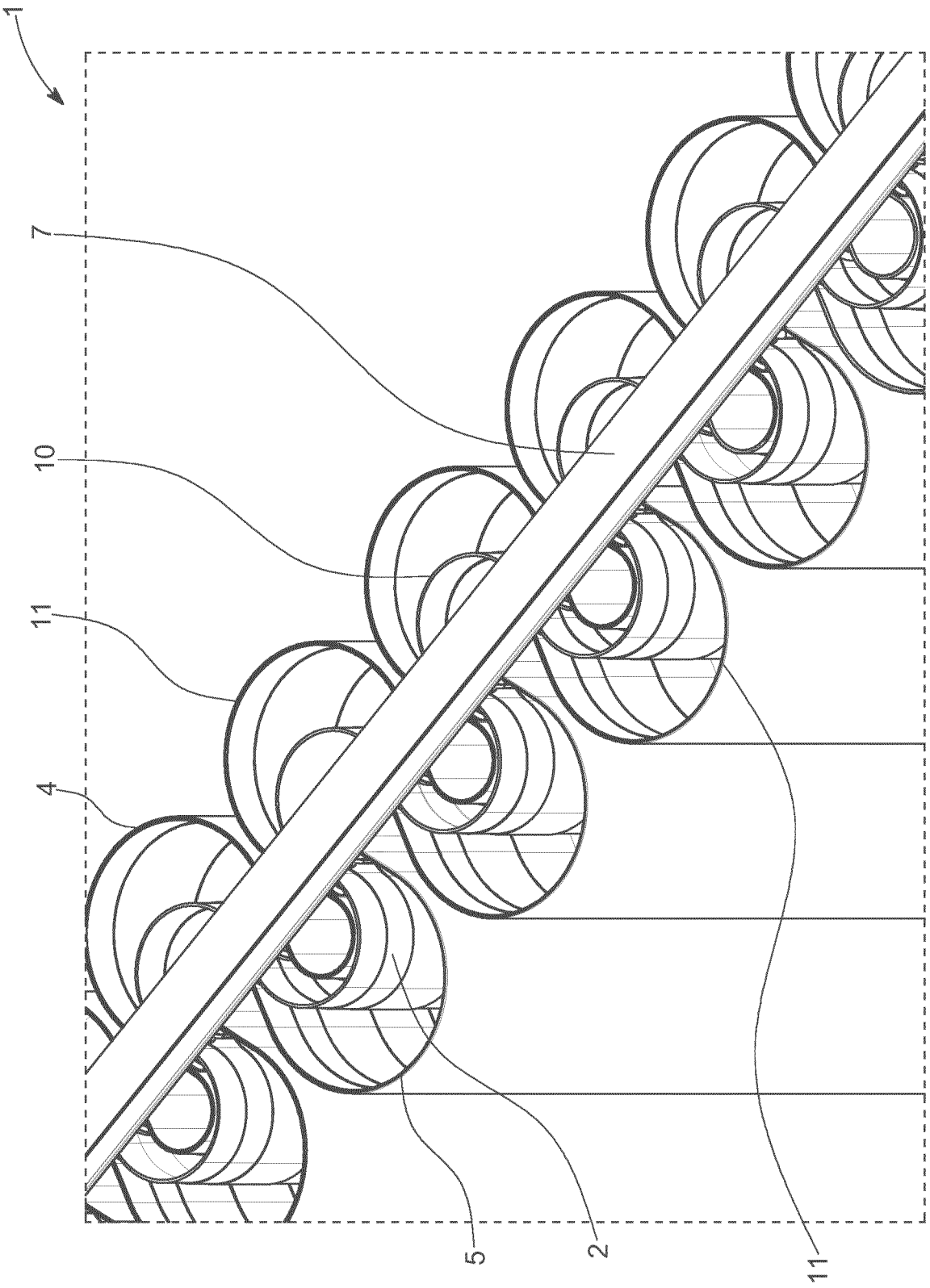


FIG. 4

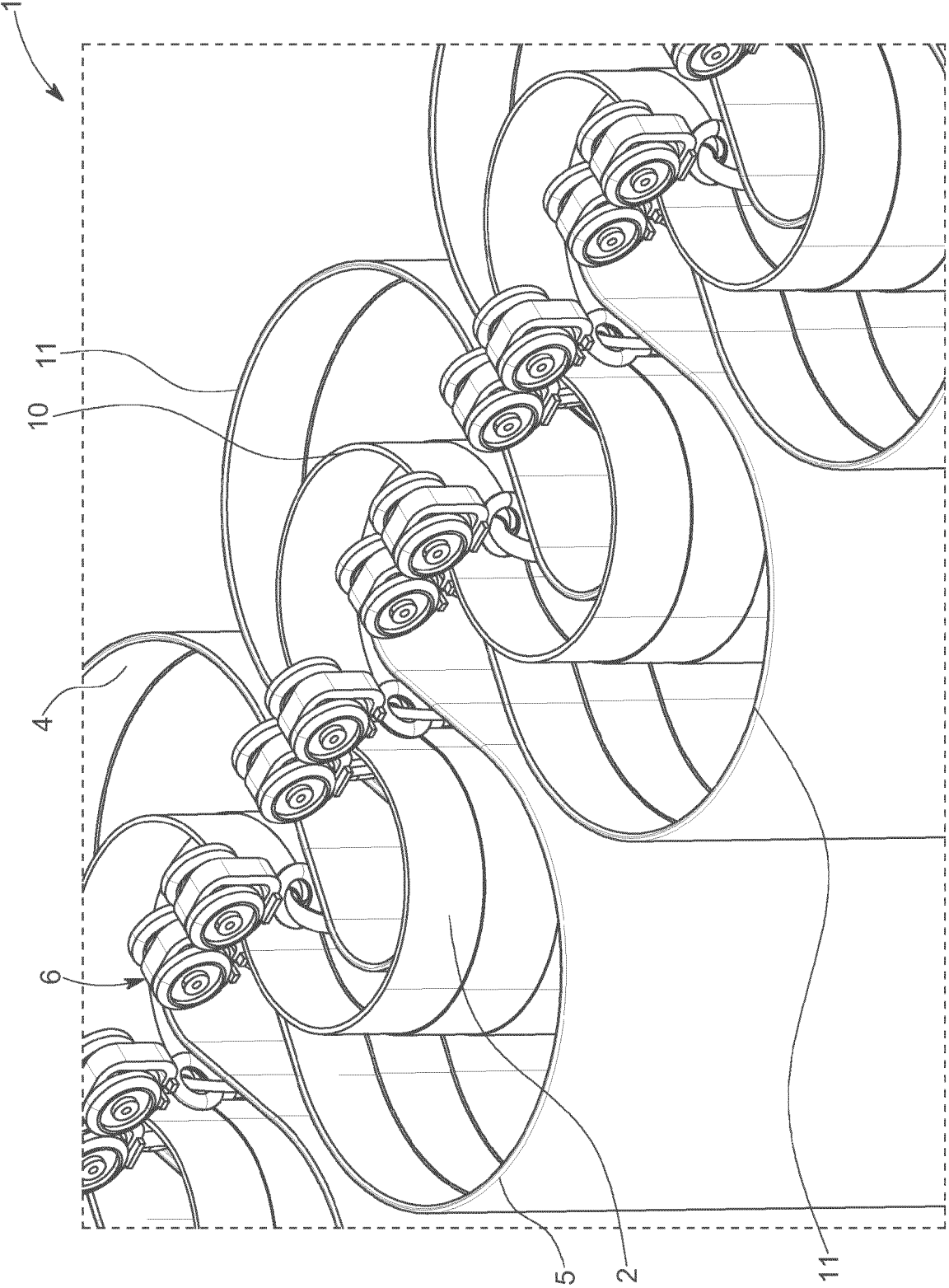


FIG. 5

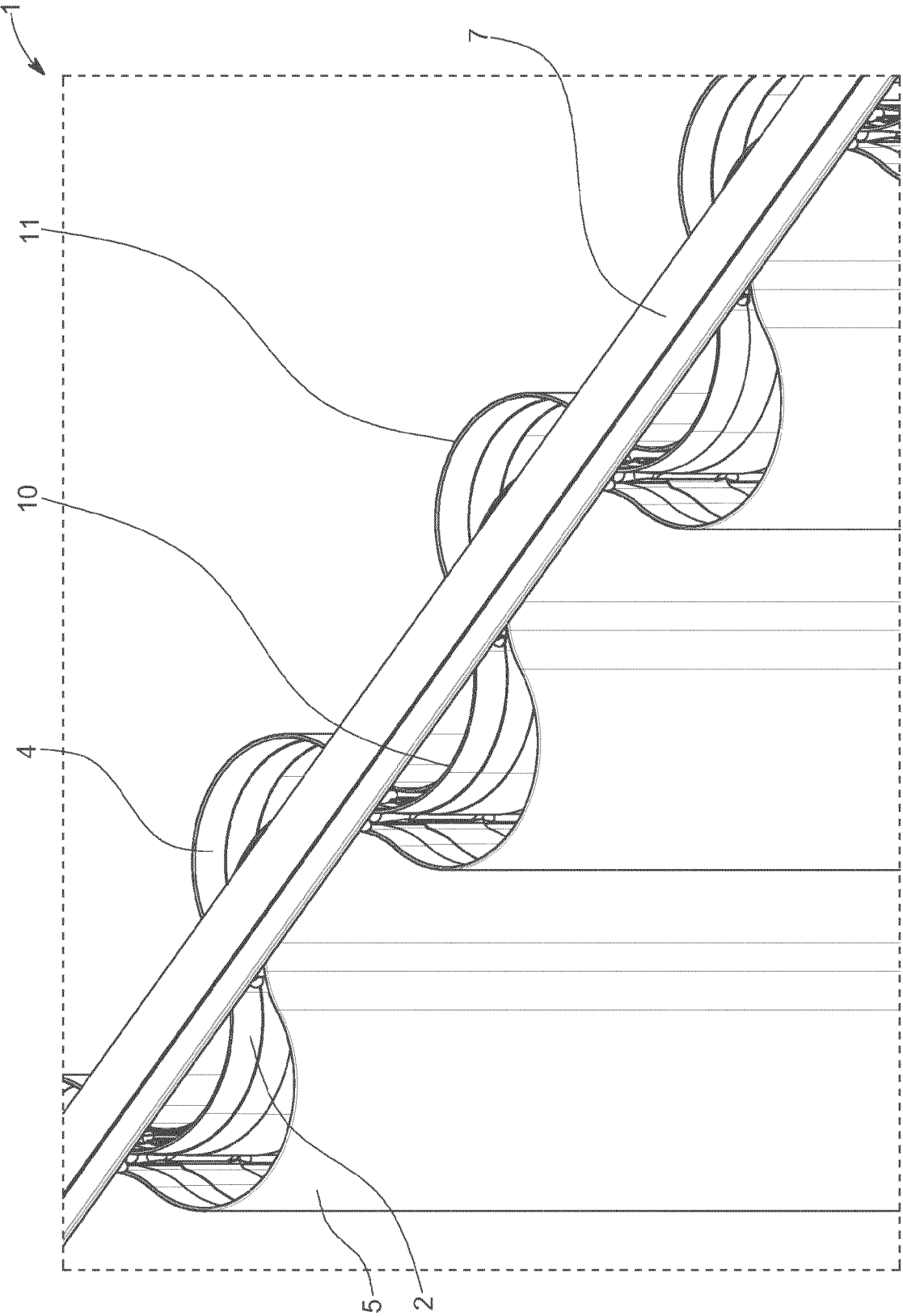


FIG. 6

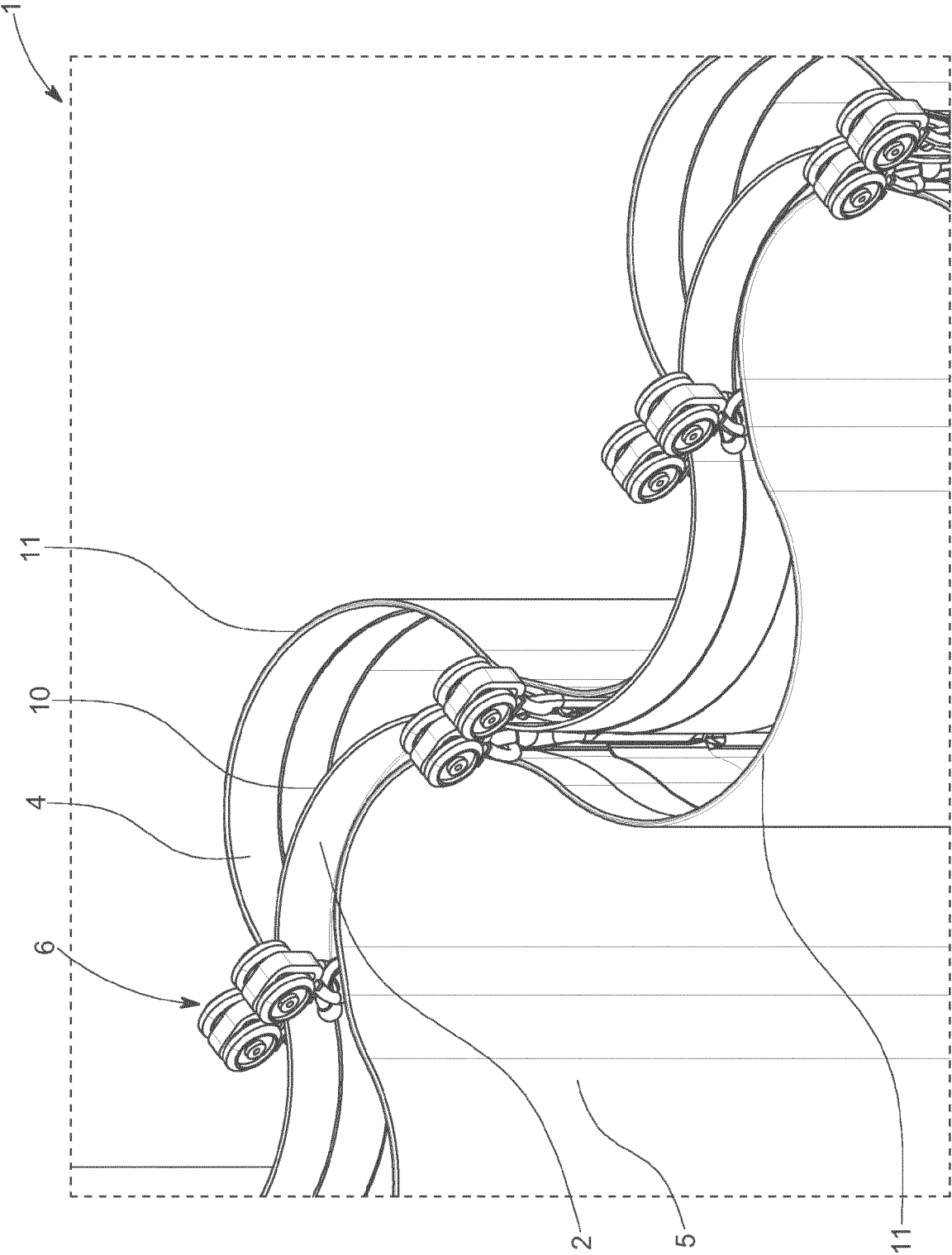


FIG. 7

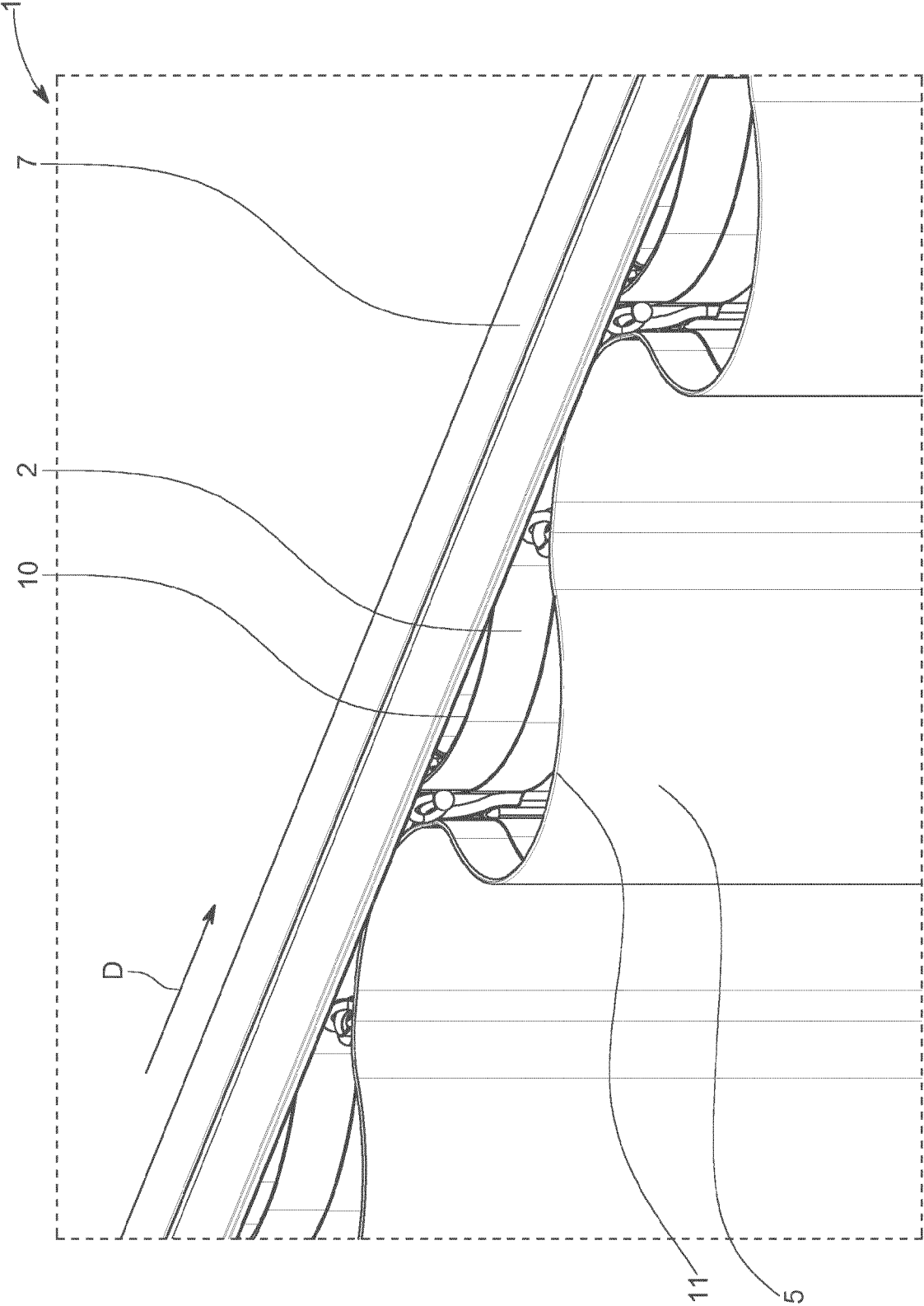


FIG. 8

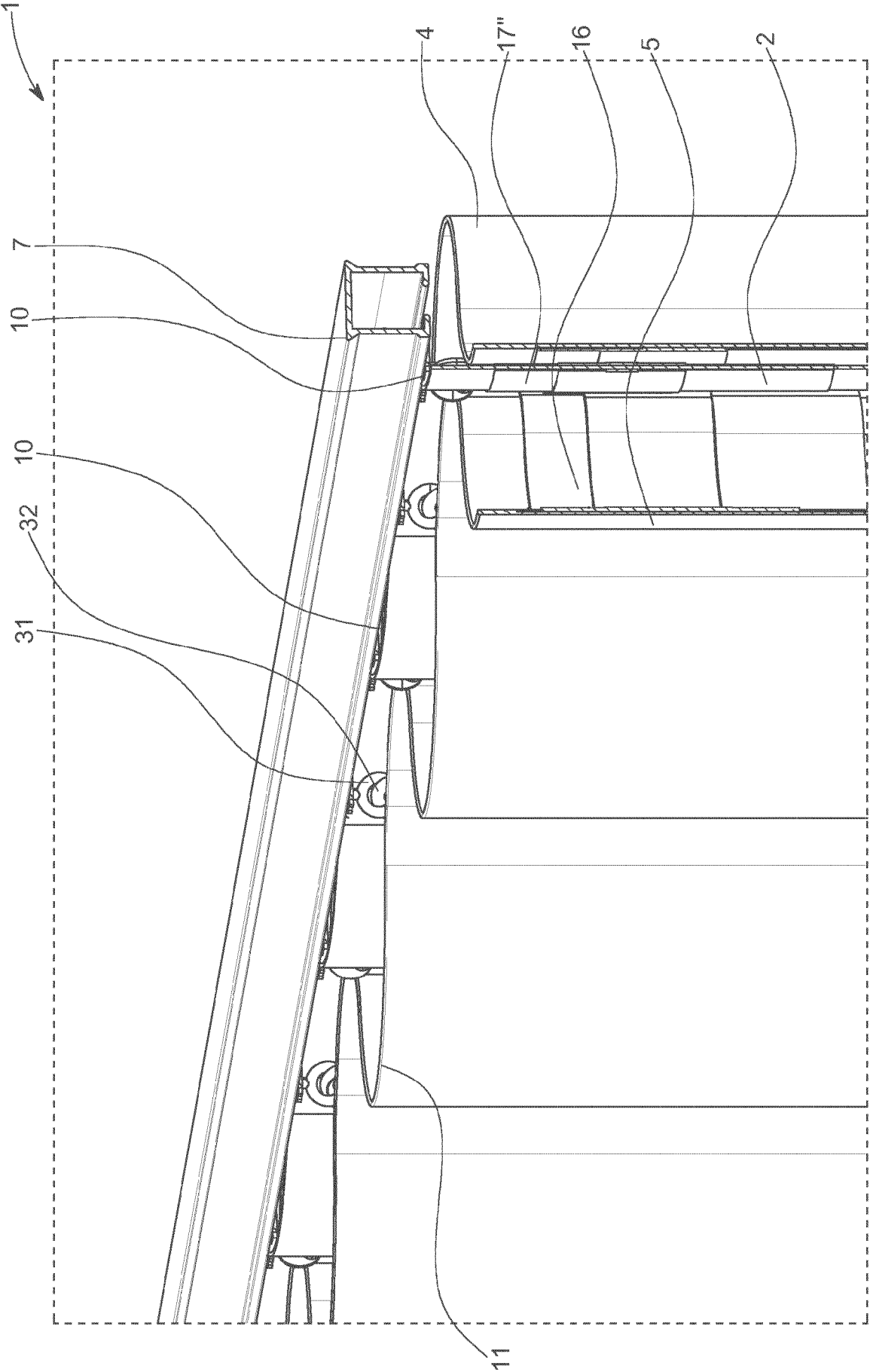
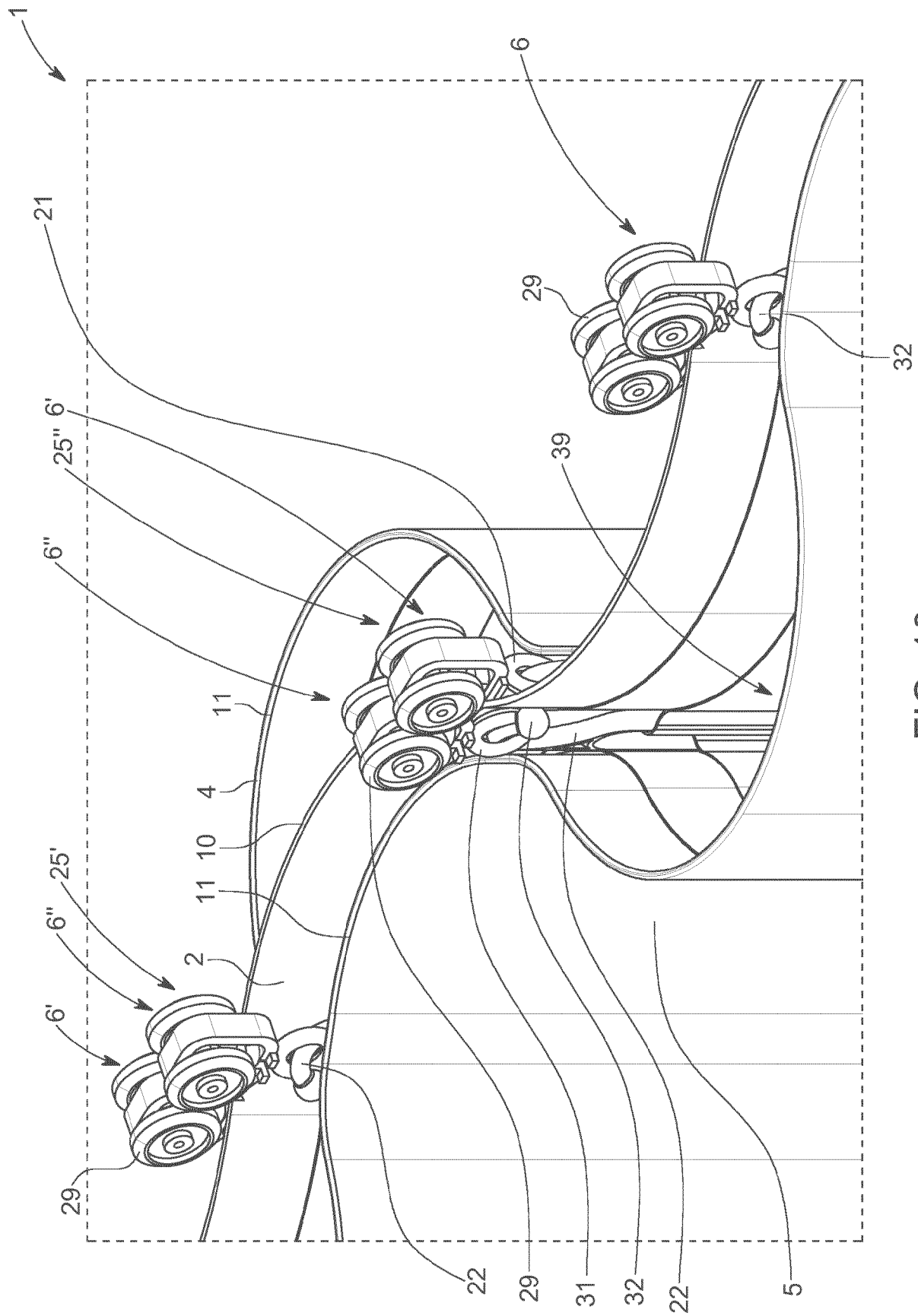


FIG. 9



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G.
E

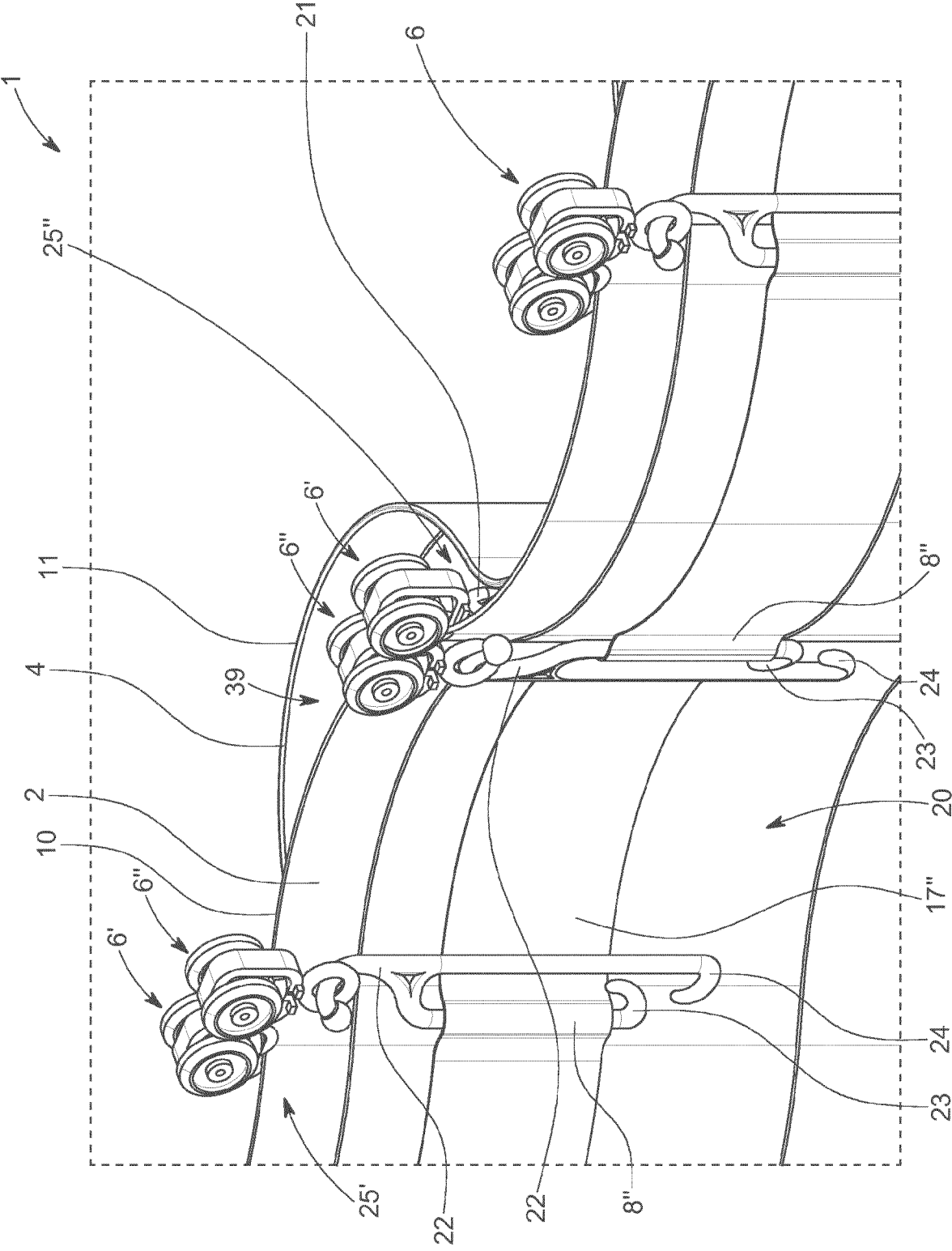


FIG. 11

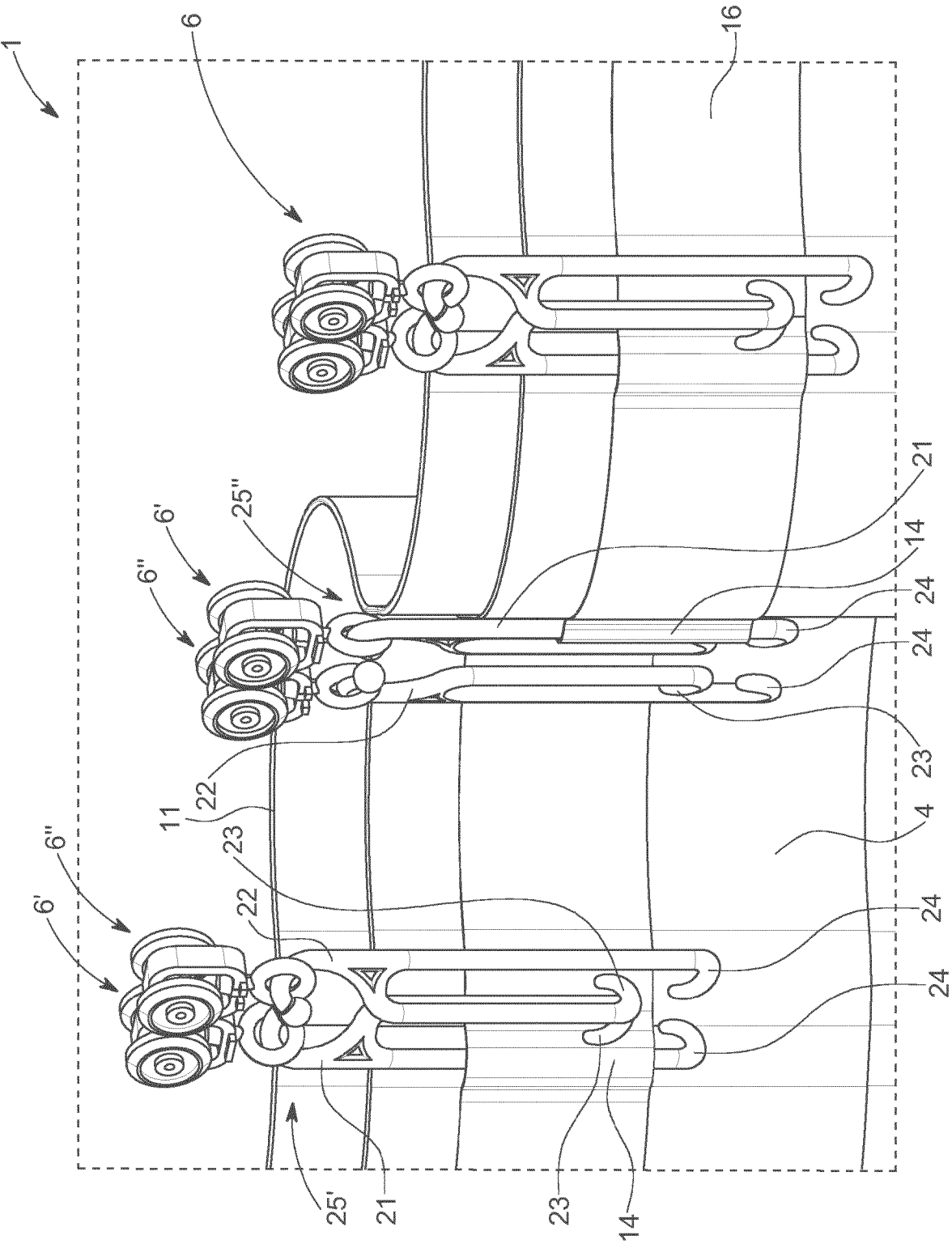


FIG. 12

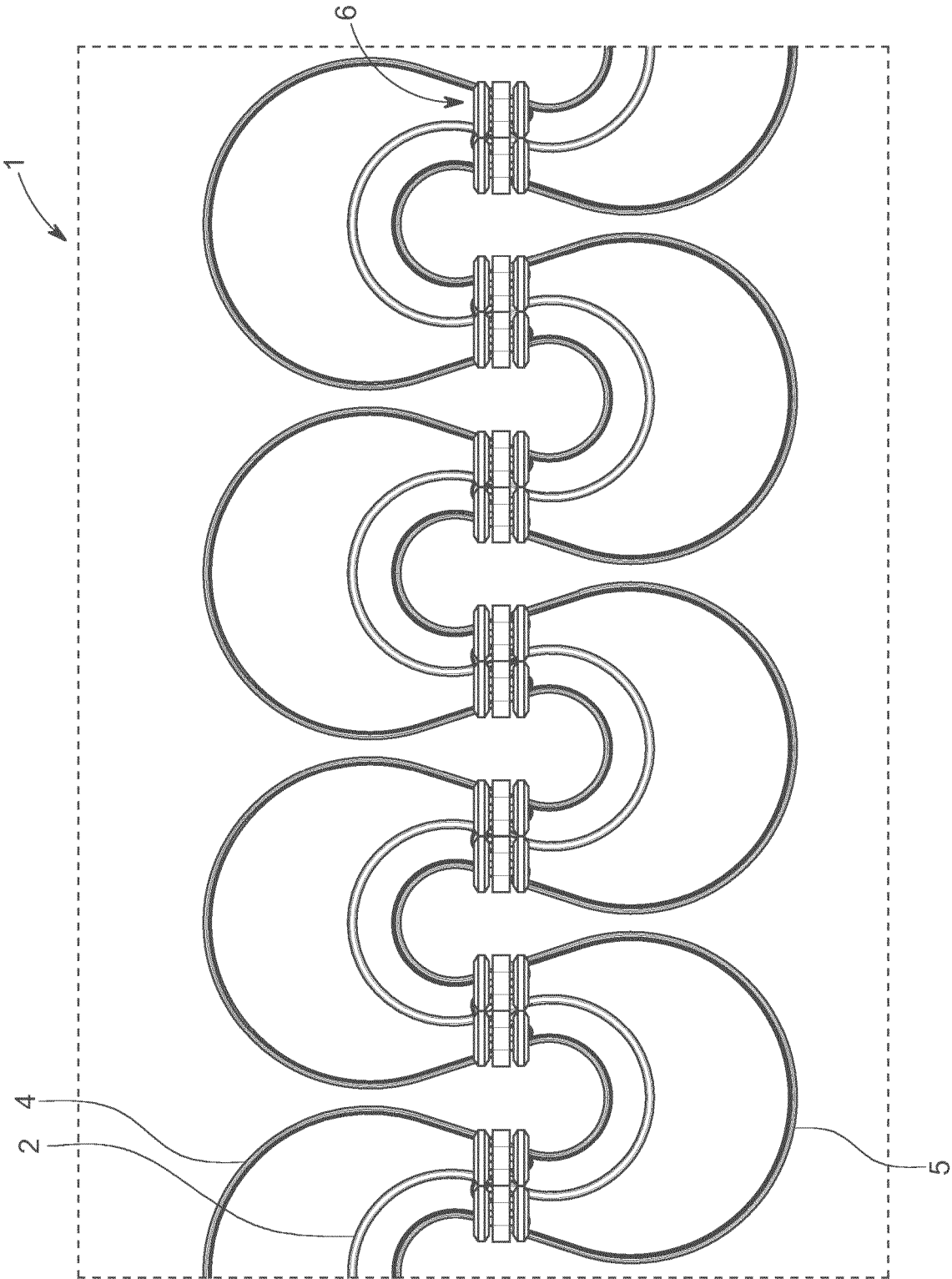


FIG. 13

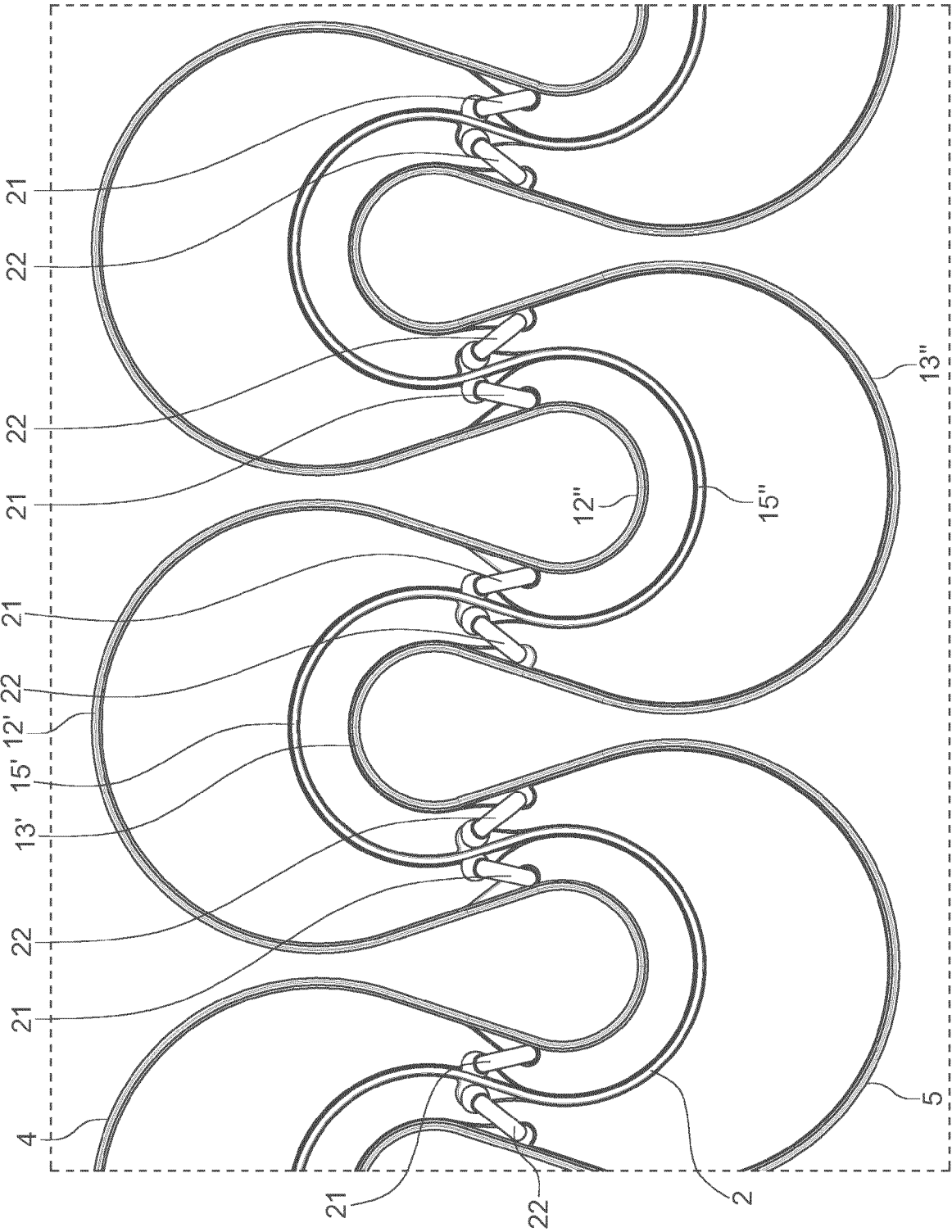


FIG. 14

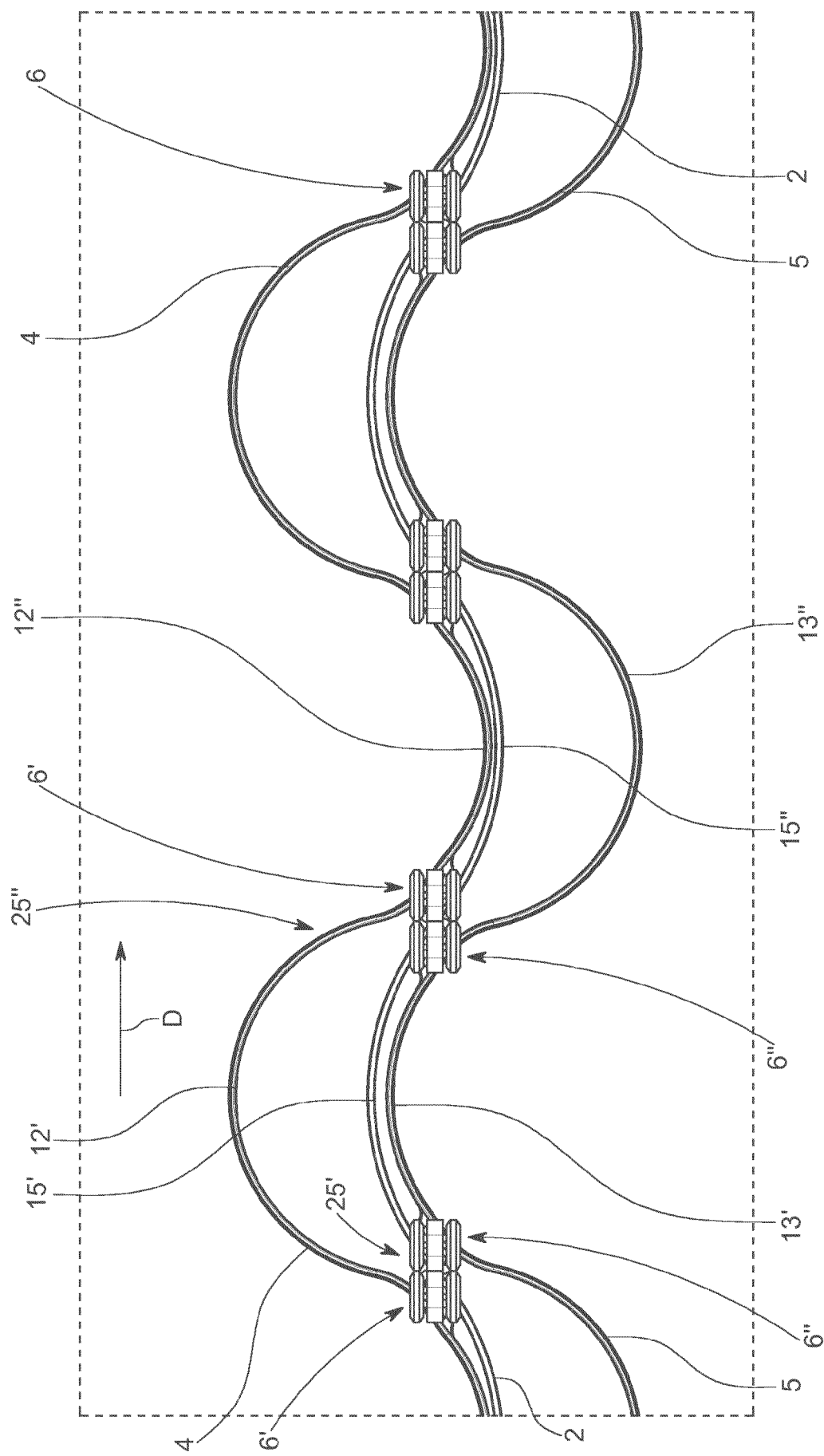
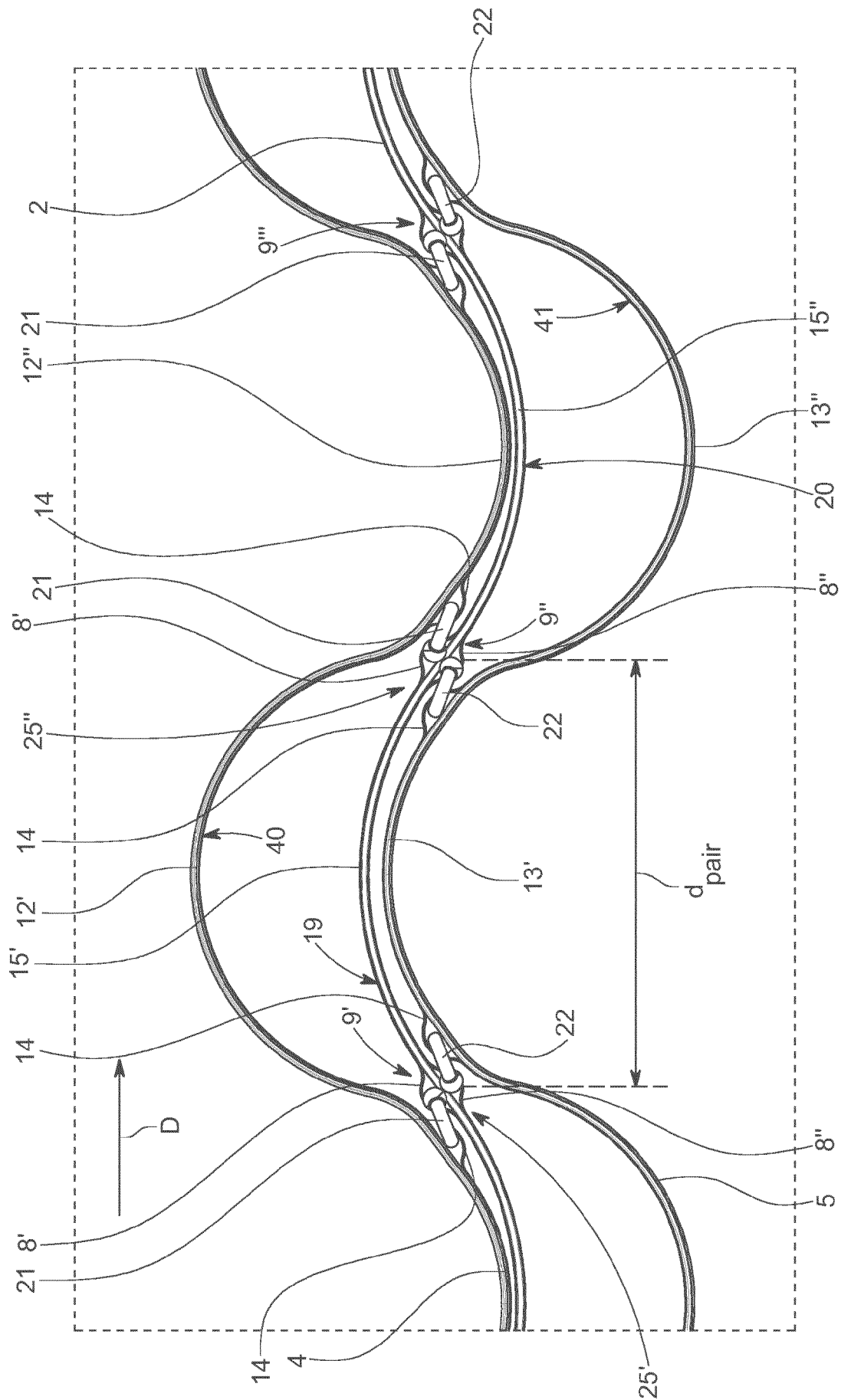
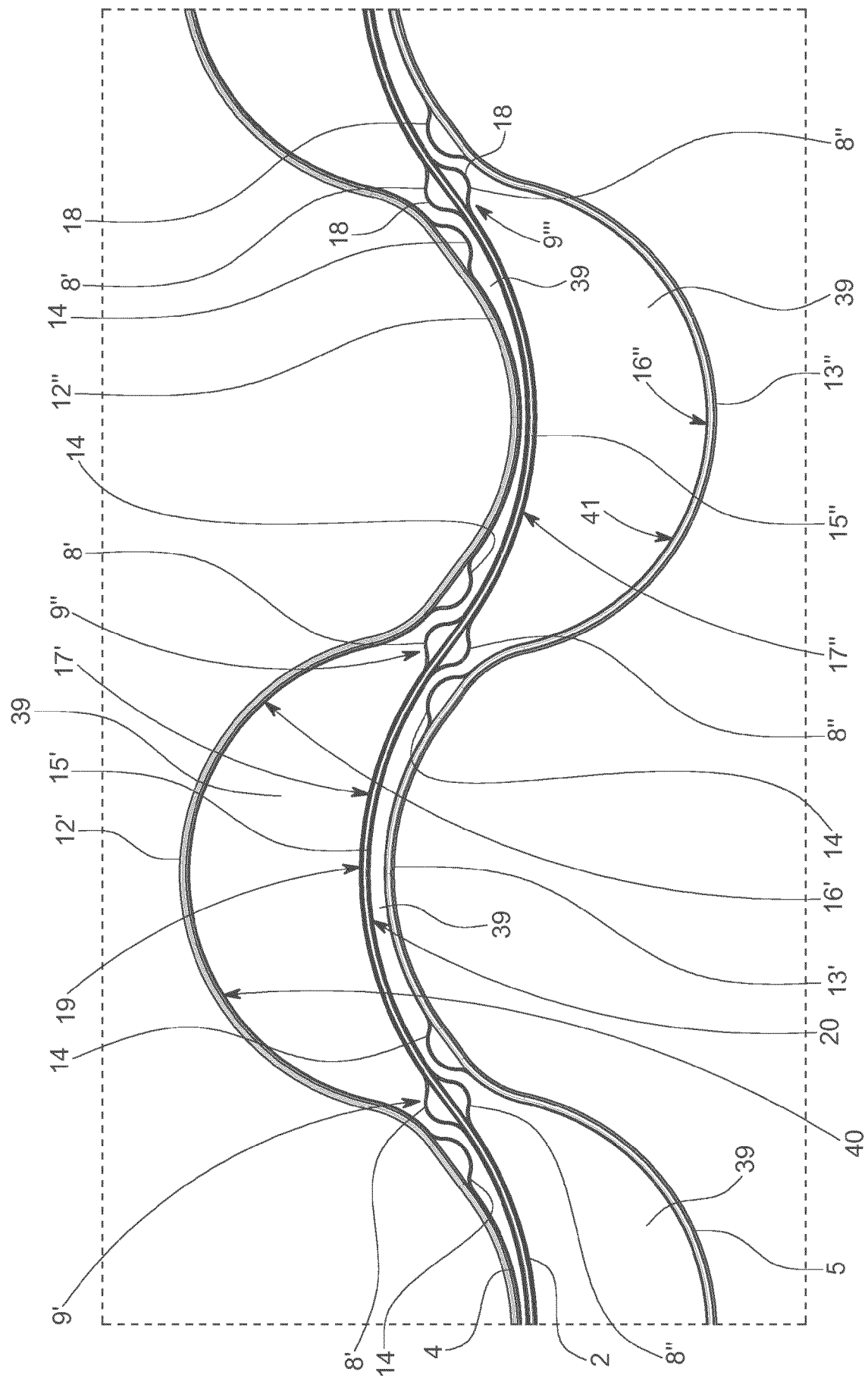


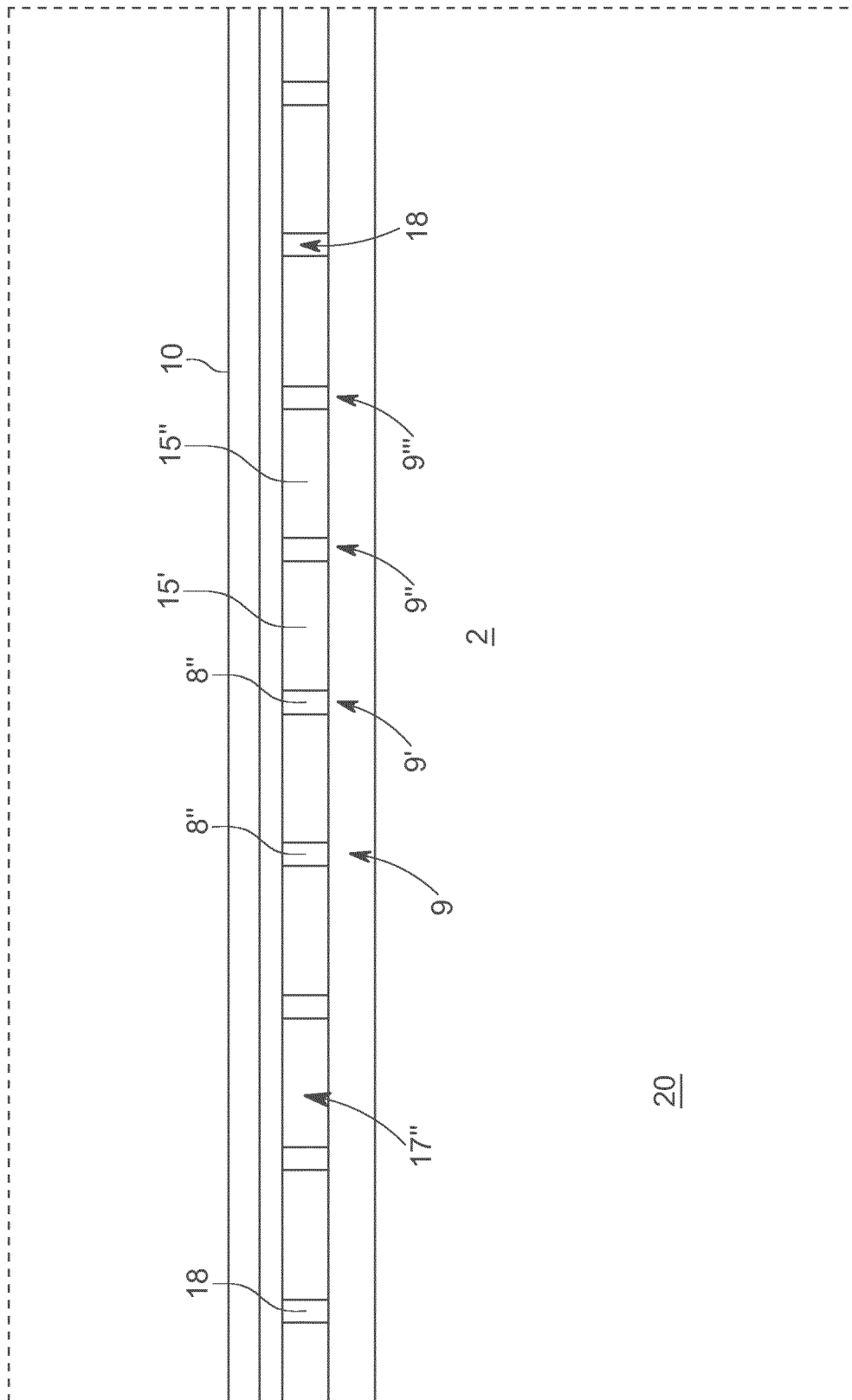
FIG. 15



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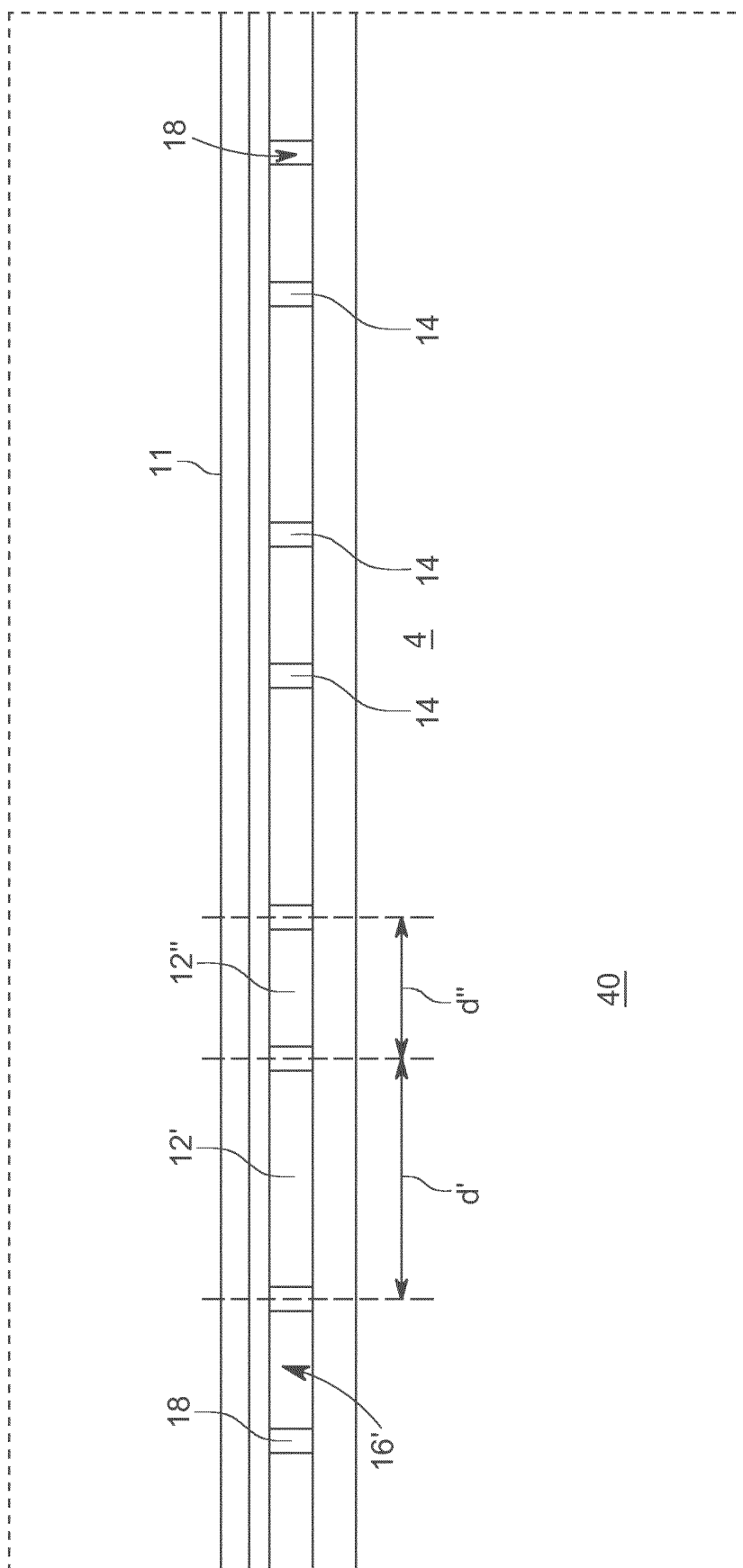


Fig. 19

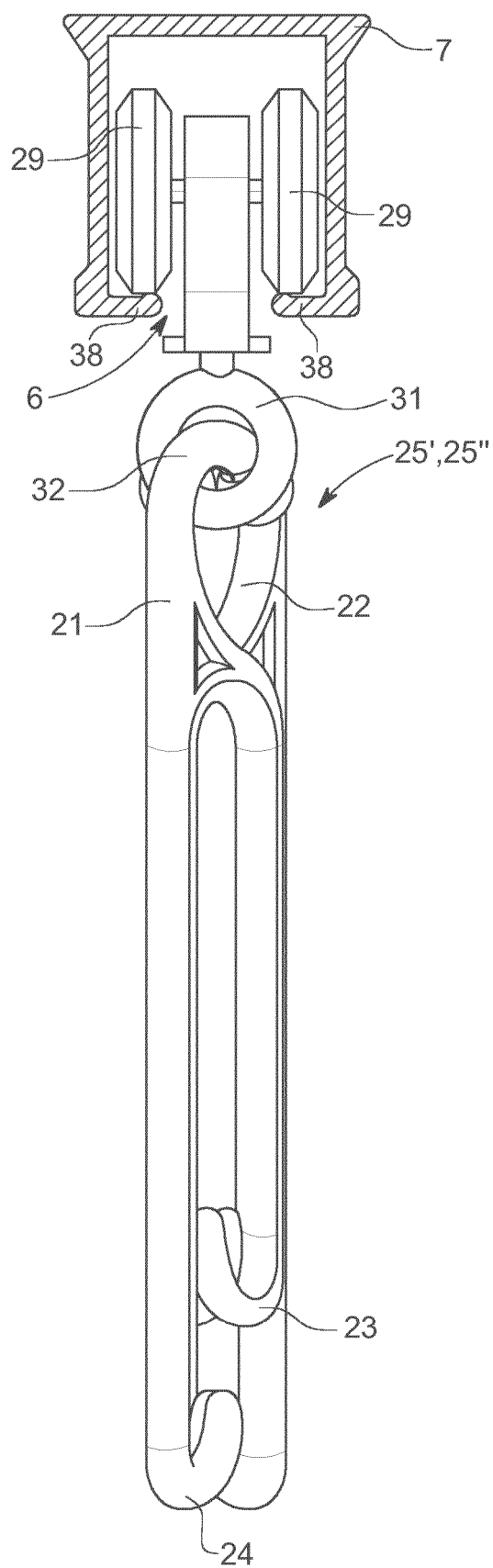


FIG. 20

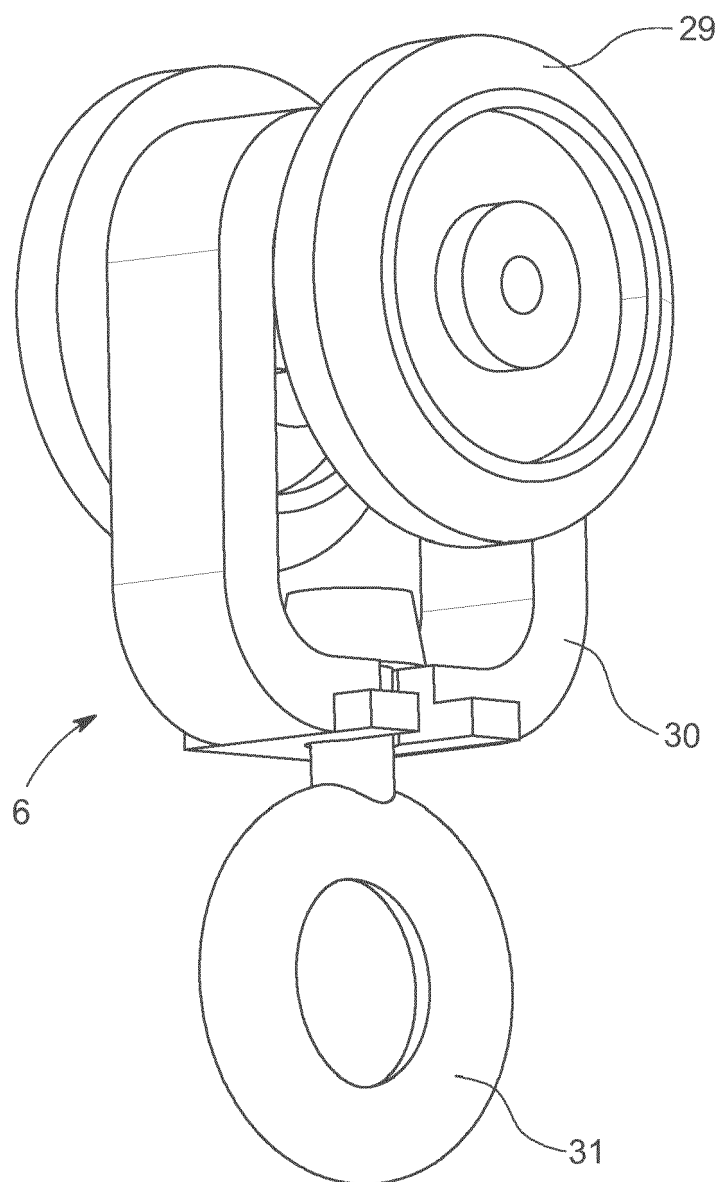


FIG. 21

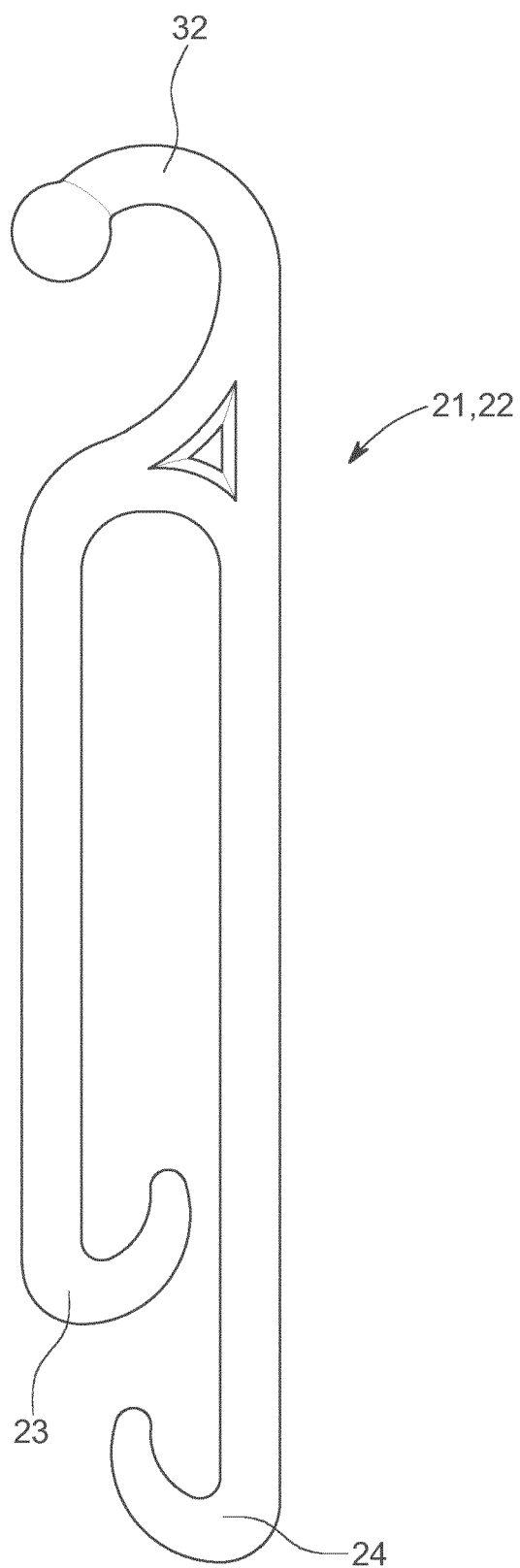


FIG. 22

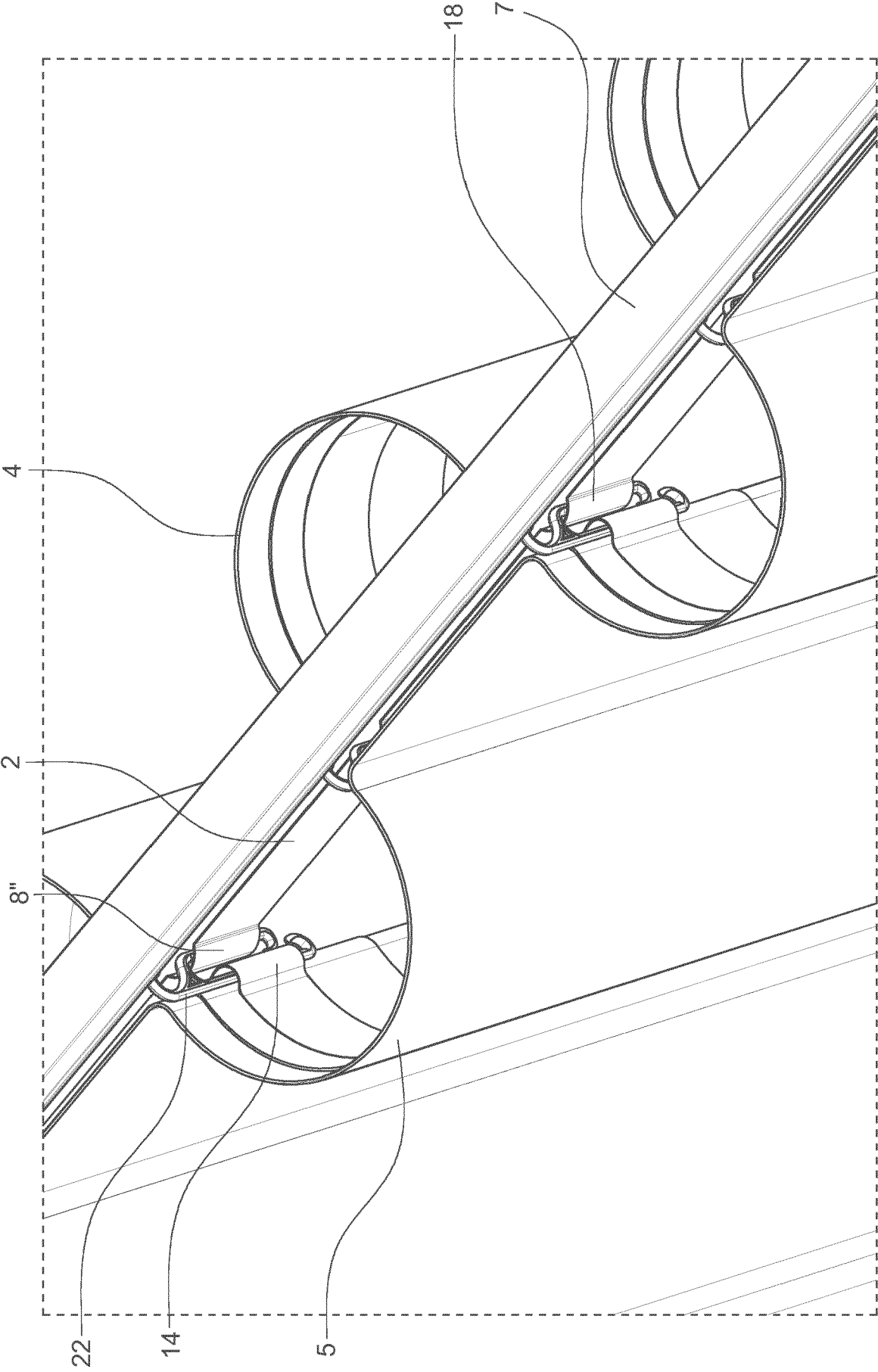


FIG. 23

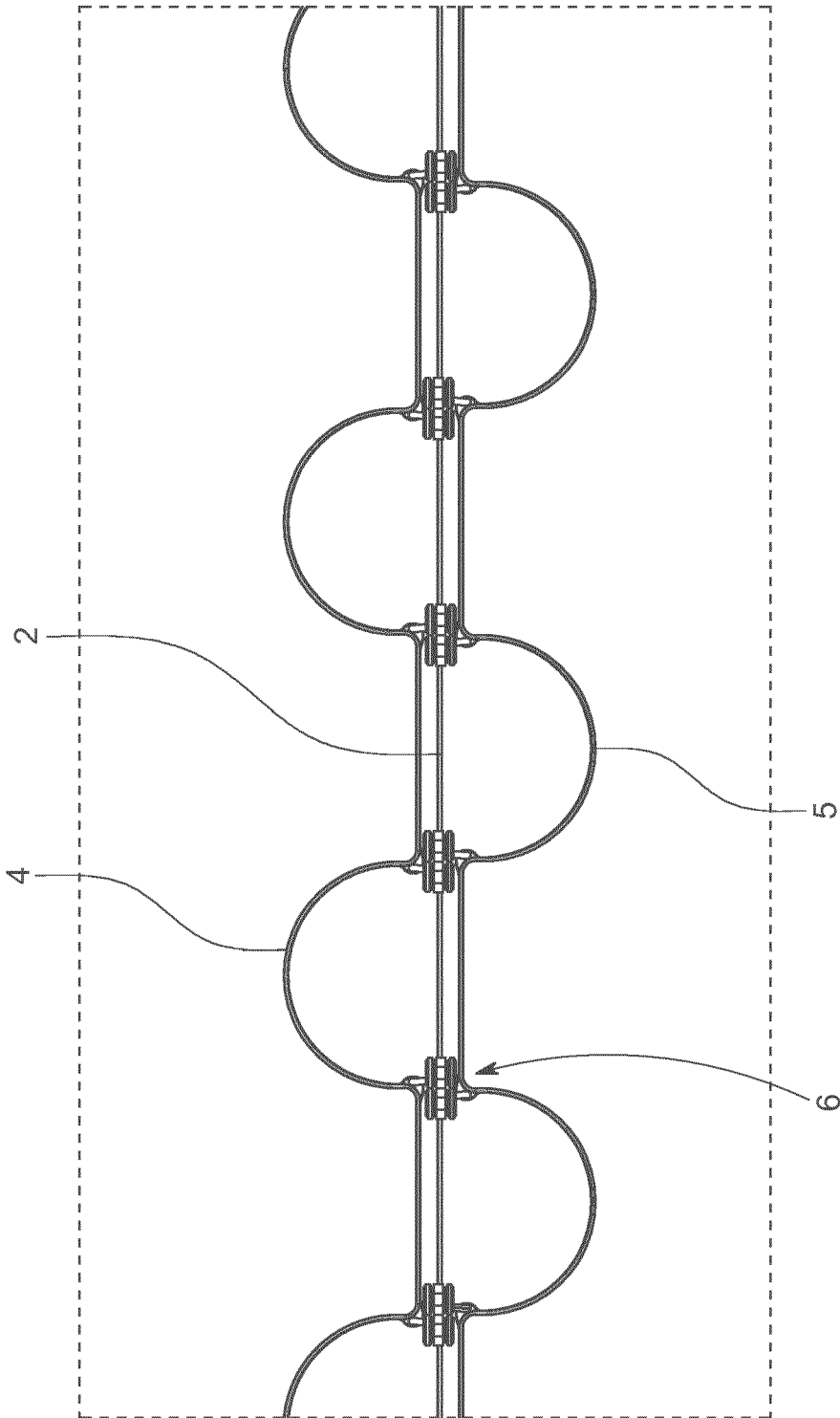


FIG. 24

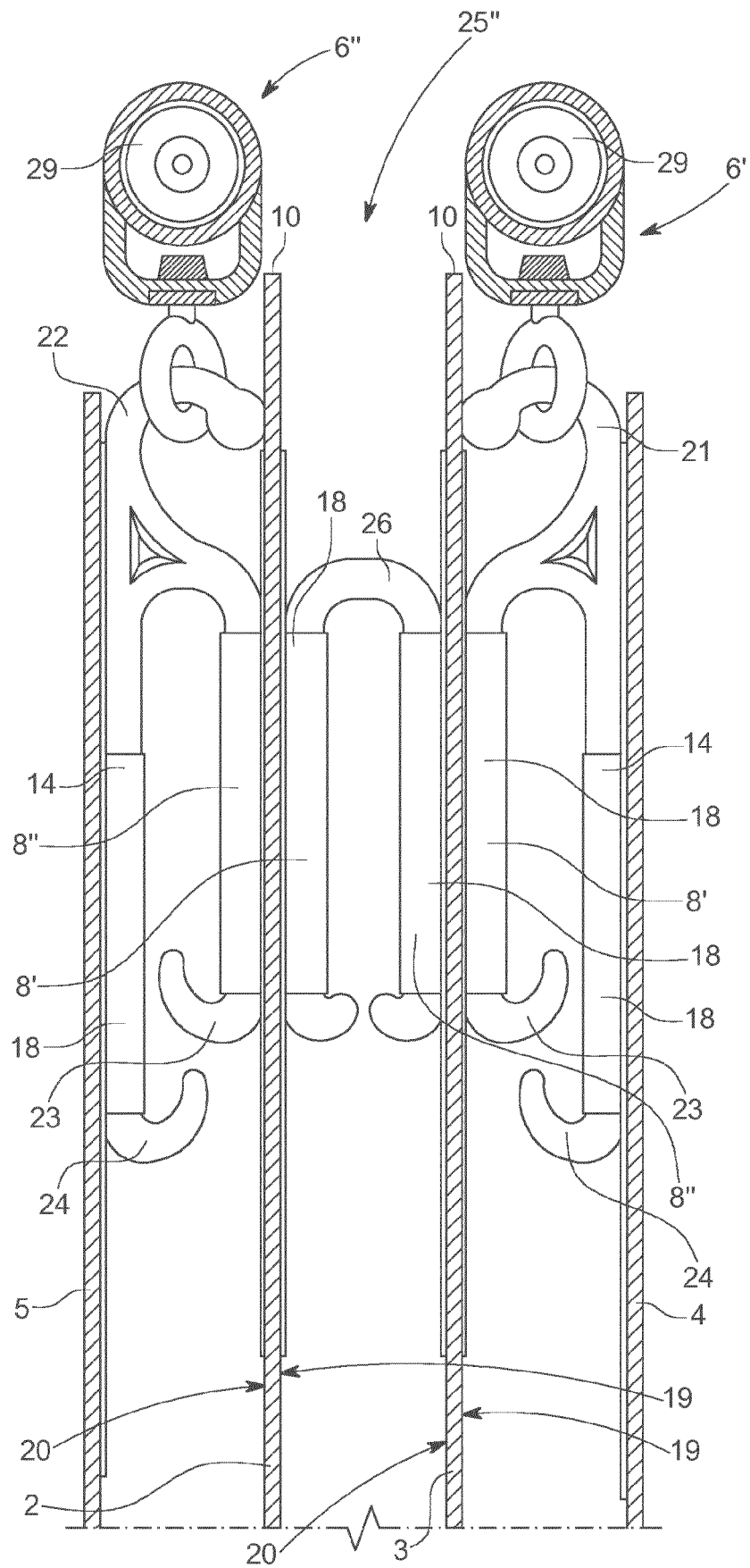


FIG. 25

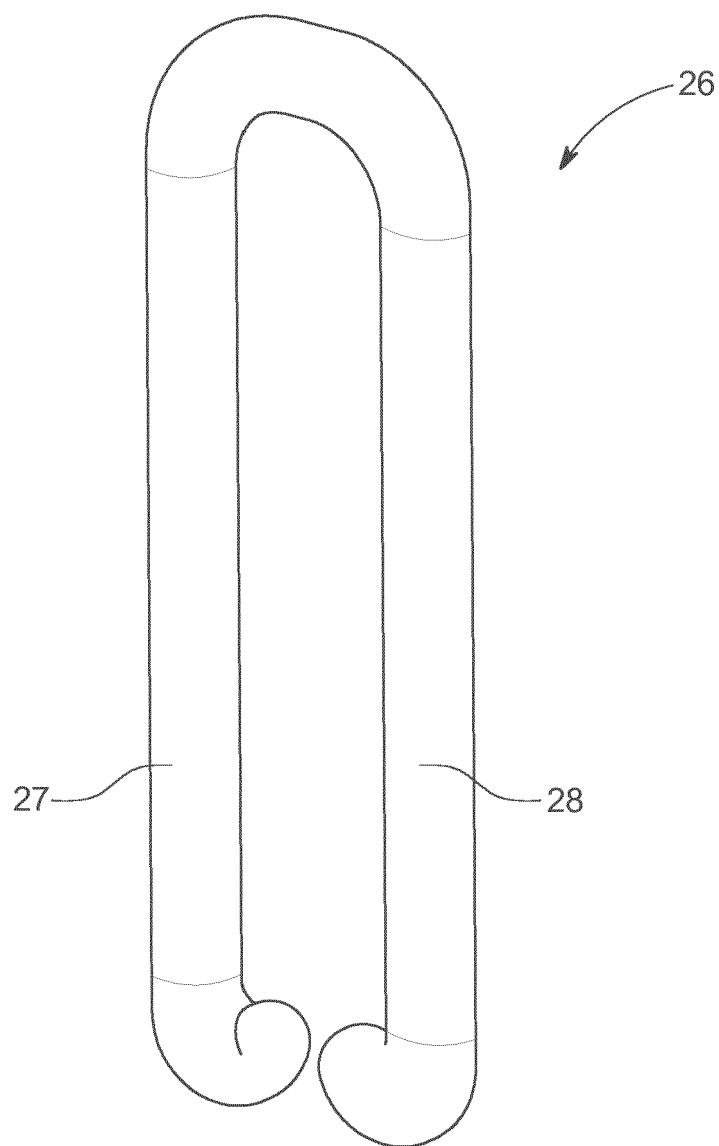


FIG. 26

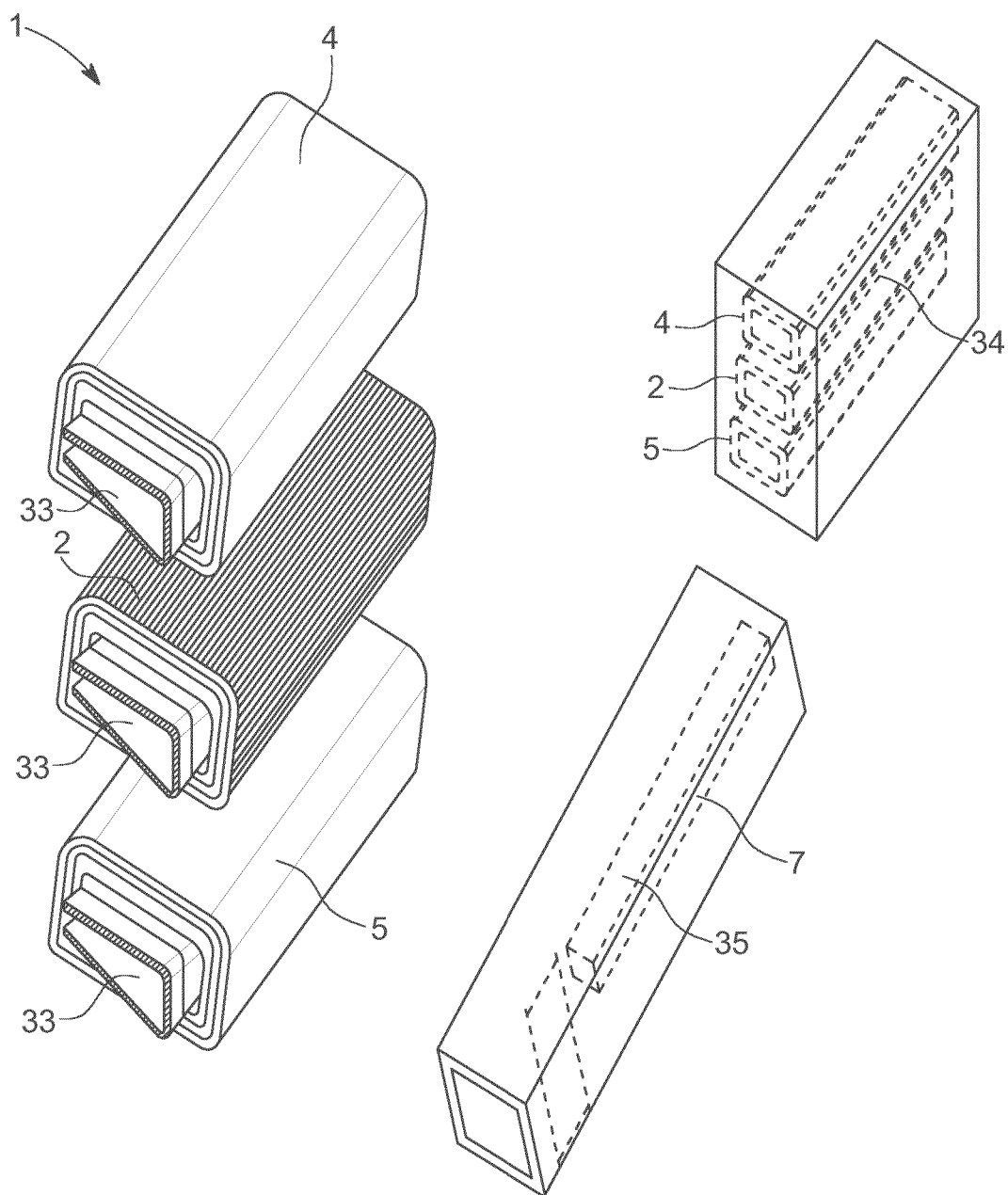


FIG. 27



EUROPEAN SEARCH REPORT

Application Number

EP 25 16 8617

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 3 242 972 A (TRUESDALE CAVOUR L) 29 March 1966 (1966-03-29) * figures 1,3,4 * * column 3, line 70 - line 75 * * column 4, lines 5-8,35-43 * -----	1-23	INV. A47H1/04 A47H13/04 A47H13/16 A47H15/02 A47H23/00 A47H23/08 E04B1/82 E04B1/84 E04B2/28
A	KR 101 751 139 B1 (PARK JONG WON [KR]) 27 June 2017 (2017-06-27) * the whole document * -----	1-23	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			A47H E04B
Place of search			Examiner
Munich			Cornu, Olivier
Date of completion of the search			
21 August 2025			
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EPO FORM 1503 03.82 (P24C01)

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EP 25 16 8617

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21-08-2025

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 3242972	A	29-03-1966	NONE

KR 101751139	B1	27-06-2017	NONE

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- DE 102018105110 A1 [0003]
- CN 221153748 U [0004]