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(54) Vertically movable partitions

(57) A partition, upwardly movable into storage position and downwardly movable into vertical, down position, to condone off areas or for sectioning usable space in a building. The partition comprises a plurality of similar trains (4) of elongated members (10). The members (10) of each train (4) are arranged to form a single pantograph forming longitudinally aligned rows of diamonds. The trains (4) are spaced laterally to form a partition plane and oriented so that the diamonds of the pantographs operate in a plane at a 90° angle to that partition plane. Bars (22) or panels are secured to corresponding members (10) in adjacent trains (4). Cables (28) are provided to raise and lower the trains (4) at a similar rate. When panels are used, they form a vertical wall when the pantographs are in elongated, down position.

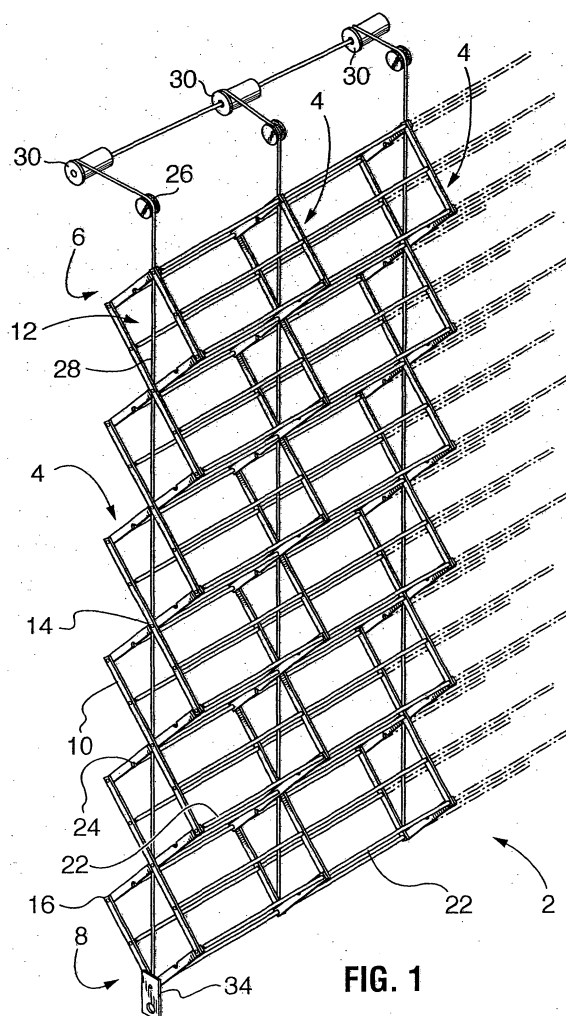


FIG. 1

EP 1 475 508 A2

Description

[0001] The present invention relates to partitions which may be in the form of mechanical curtains or partition walls, and more particularly to vertically movable partitions for use within buildings, for example, to cordon off areas, as required, to prevent public access, for crowd control, or for reconfiguring and sectioning usable space in the building.

[0002] Security partitions in the form of security gates are well known and may take the form of horizontally sliding bar systems, for example to close off open fronts of shops in shopping centers or to be moved across entrance ways to shops on streets. These types of movable security gates usually require storage space beside the area being protected, to accommodate the gate components when not in use. Conversely, existing "roll-up" security gates are stored in ceiling space when not in use. This type of gate is severely limited in width and height as the roller can only be supported at its ends and cannot deflect under the load of the gate.

[0003] U.S. Patent No. 5,062,464 of Miles Peterson, issued November 5, 1991 describes and illustrates a wall partition, which uses a pantograph type of construction to provide a rigid wall section, which is vertically collapsible and movable to a storage position. Movable wall partition systems have similar problems of storage and structural support requirements and the Peterson vertically movable wall partition avoids those problems by providing ceiling storage for the wall partitions and a single permanent location for all of the panels so that the loads imposed on the building support structure do not vary because of lateral movement of the panels. Further, this design of the wall system allows the partition to be of any width or height as it is lifted and supported at multiple points across its width. This is made possible as the partition is folded up rather than rolled up.

[0004] The pantograph structure as suggested by the Peterson construction is similar to that for instance found in baby gates in which a series of elongated members are pivotally linked together in spaced fashion to provide a series of similar diamonds along the length of the gate. In a single (as opposed to multiple) pantograph construction, a pair of members of similar size are pivotally linked at their midpoints. One pair of their ends are pivotally linked to the ends of a further corresponding pair of members of similar length similarly pivoted at their midpoint, and so on. The midpoints of the members are longitudinally aligned and form opposed longitudinal apexes of diamond shapes; the other opposed corners of these diamonds are formed by the pivotally secured ends of adjacent pairs of intersecting members, and are the lateral apexes. The pantograph structure expands and contracts longitudinally. The pantograph structure in such applications is useful because it causes forces applied longitudinally, in the direction of expansion and contraction of the pantograph, to be transmitted evenly throughout all of the members of the pantograph struc-

ture. As well, all of the apexes of the diamonds formed by the points of intersection of the members, as the structure is contracted, will arrive at their final, fully contracted position at the same time, meaning that the longitudinal apexes of the diamonds at one end of the pantograph structure, which are moving towards the other end during contraction, will move at a much greater speed than the apexes of the diamonds at the other end.

[0005] It is an aim of the present invention to provide a wall or other type of partition which is movable vertically, and which is based on these pantograph principles.

[0006] In accordance with one aspect of the present invention there is provided a partition, upwardly movable into open position and downwardly movable into closed or down position. The partition comprises a plurality of similarly constructed trains of elongated members, the members of each train arranged to form a single pantograph forming longitudinally aligned rows of diamonds. The trains are spaced laterally to lie within a curtain plane and are oriented so that the pantographs operate in a plane at a 90° angle to that curtain plane. A plurality of bars are secured in parallel spaced fashion to corresponding members of adjacent trains, perpendicular thereto. Means are provided to raise and lower the trains at a similar rate, the pantographs being contracted when the curtain is in open position and being elongated when the curtain is in closed position.

[0007] In one embodiment of the present invention, particularly applicable for use as a security gate, the partition is further provided with locking means to secure the partition in closed position against unwanted opening.

[0008] In accordance with another embodiment of the present invention, the partition is in the form of a wall. A plurality of panels, instead of bars, are provided, each panel being secured to a pair of corresponding members in adjacent trains. The panels are secured to corresponding pairs of opposed sides of the diamonds. Means are provided to raise and lower the trains at a similar rate. The pantographs are contracted when the wall is in a storage position and the elongated when the wall is in down position. The panels form a vertical wall when the pantographs are elongated in down position.

[0009] In a preferred form of this particular embodiment, similar pairs of elongated members intersect and are secured pivotally together at a central point between their ends, that point being on a longitudinal center line of each member, to form adjoining, longitudinally disposed apexes of adjacent diamonds. Ends of these pairs of intersecting members are pivotally connected to the ends of similar pairs of intersecting members at points which are laterally offset to the outside of that center line, to form at these ends laterally disposed apexes of the diamonds, so that when the trains are contracted the longitudinal apexes of each diamond are drawn together and the laterally disposed apexes are more separated, and when the trains are elongated the

longitudinal apexes of each diamond become more separated and the laterally disposed apexes are drawn together. Also, in each train, similar pairs of elongated members make up one pair of opposed sides of diamonds and are spaced about similar single members making up the other opposed pair of sides of the diamonds. The panels are secured only to the spaced pairs of elongated members along the length of the train.

[0010] The partition according to the present invention has many advantages. Because its components move vertically rather than horizontally, storage space is not required to the side of the area within which the wall operates, since the wall folds and stores above the area in question. Furthermore, because the partition does not move horizontally, the loads imposed on the support structure are constant. Also, the height and width restrictions present with conventional roll-up security gates are avoided since the wall of the present invention may be lifted and supported at multiple points across its width.

[0011] These and other advantages of the invention will become apparent upon reading the following detailed description and upon referring to the drawings in which:

FIGURE 1 is a perspective partial view of a partition adapted to be used as a security gate, in a partially closed position;

FIGURE 2a, 2b and 2c are side elevation views of an end train of the partition of Figure 1, showing that train respectively in expanded (or closed) position, partially closed position and fully contracted (or open) position;

FIGURE 3 is an enlarged size elevation view of a portion of a train of the partition of Figure 1, in partially closed position as shown in Figure 2b, showing in more detail certain of the components of the train;

FIGURE 4 is a plan view from the top of a portion of the partition of Figure 1;

FIGURE 5a, 5b and 5c are side elevation views of an end train of an alternative embodiment of the partition according to the present invention, showing that train respectively in expanded, partially closed and fully contracted positions;

FIGURE 6 is a perspective view of an alternative train construction for a partition according to the present invention;

FIGURE 7 is an enlarged side elevation view of a portion of the train of Figure 6 in partially closed position showing in more detail certain of the components of the train;

FIGURE 8 is a side elevation view of the train of Figure 7 in fully expanded (or closed) position;

FIGURE 9 is a plan view from the top of a portion of the partition according to the present invention incorporating the construction of Figure 7;

FIGURE 10 is a partial front elevation view showing

details of an alternative embodiment of the partition of the present invention;

FIGURE 11 is a perspective view of yet a further alternative embodiment of partition according to the present invention in partially closed position;

FIGURE 12 is a schematic side elevation view of the partition of Figure 12 without fabric;

FIGURE 13 is a schematic side elevation view of a portion of the partition of Figure 12, with fabric;

FIGURE 14 is perspective view, partially broken away, of a portion of partition wall, as an alternative embodiment of the present invention, the wall being in an intermediate position between storage and down positions;

FIGURE 15 is an end view of the wall of Figure 14; FIGURE 16 is an end view of the wall of Figure 14 showing the members and panels in down position; FIGURE 17 is a side view of the wall of Figure 14 in storage position; and

FIGURE 18 is a perspective view of a portion of the partition wall in down position.

[0012] While the invention will be described in conjunction with illustrated embodiments, it will be understood that it is not intended to limit the invention to such embodiments. On the contrary, it is intended to cover all alternatives, modifications and equivalents as may be included within the spirit and scope of the invention as defined by the appended claims.

[0013] In the following description, similar features in the drawings have been given similar reference numerals.

[0014] Turning to FIGURE 1 there is illustrated a mechanical curtain 2 in accordance with the present invention, in partially lowered (closed) position. The curtain as illustrated is particularly useful as a security gate. Curtain 2 is formed from a plurality of similar pantograph trains 4, longitudinally laterally spaced to form a plane of the curtain. Each train has an upper end 6 and a lower end 8, and is composed of elongated members 10, which form, in each train 4, aligned rows of diamonds 12. Other than for the last diamond 12 in each train 4, (at upper end 6 and lower end 8), similar pairs of elongated members 10 intersect and are secured pivotally together centrally between their ends as illustrated, to form vertically disposed longitudinal apexes 14 of diamonds 12. Corresponding ends of these pairs of intersecting members 10 pivotally connect to the ends of other pairs of similar intersecting members 10 to form at these ends laterally disposed apexes 16. Thus, as can be seen in FIGURE 2a, when trains 4 are elongated in the longitudinal direction, the longitudinal apexes 14 of each diamond 12 are more separated and the laterally disposed apexes 14 are drawn together, while, as can be seen in FIGURE 2c, when the trains are contracted, the longitudinal apexes 14 of each diamond 12 are drawn together and the laterally disposed apexes 16 are more separated.

[0015] Cooperating pairs of intersecting elongated members are preferably laterally offset on opposite sides of the apexes 14 and 16 by central spacers 18 (FIGURE 4) so that they do not obstruct each other during opening and closing operation of the curtain. A longitudinally oriented aperture 20, of the longitudinal apexes 14 the function of which will be described subsequently, may be provided in each spacer 18.

[0016] Each pantograph train 4 operates with its diamonds 12 being in a plane, which is at a 90° angle to the partition plane, as can be seen in FIGURE 1.

[0017] Extending between adjacent trains 4 and secured to corresponding members 10 of adjacent trains are a plurality of spaced bars 22. Notches 24 (FIGURE 3) are provided along interior edges of members 10 in each diamond, to receive portions of corresponding bars in opposite members 10 of the diamonds, when the trains are in their most elongated position.

[0018] As can be seen in FIGURE 3, as an option, a fabric 25 (chain-line) may be secured about bars 22 over a portion or all of the intended surface area of the partition, the fabric for example being interwoven through the bars over one side of the diamonds 12 of the trains, as illustrated.

[0019] As can be seen in FIGURE 1, to move the partition 2 longitudinally between upper, open position and lower, closed position, a drums 30 are provided with cables 28, one end of each of which is wrapped around its corresponding drum. Each cable passes over a corresponding sheave or pulley 26, and its other end may be operatively connected to a lower end 8 of its corresponding train 4, as illustrated, or to a bar 22 extending between adjacent trains 4 at their lower end 8. For proper balance, the cables may extend vertically downwardly from sheaves 26 through aperture 20 in spacers of the longitudinal apexes 14 and be secured to the lower longitudinal apex 14 of its corresponding train 4.

[0020] As can be seen in FIGURE 4, bars 22 may be mounted so as to extend outwardly towards adjacent trains at longitudinal apexes 14. Alternatively, for example, the cables 28 may be looped around a pulley 31 (phantom, FIGURE 3) with the free end of the cable appropriately connected above the partition, to provide a double purchase arrangement for raising and lowering the partition. An appropriate drive means 33 (FIGURES 2a, 2b, 2c) for drums 30 is provided so that by unwinding and winding each cable 28 in a similar manner with respect to drums 30, the pantographs are respectively elongated to close or contracted to open the partition.

[0021] When the partition is designed as a security gate, an appropriate conventional lock mechanism 32 (FIGURES 2a and 2b) may be provided, for example secured on or in an appropriate portion of the floor below the partition, to cooperate with lock mechanism 34 secured, to lower end 8 of train 4.

[0022] For purpose of weight balance of the partition, it is desired that similar numbers of bars 22 be secured to elongated members 10, preferably in an alternating

fashion, on each side of the center line of the trains (i. e. on each side of the longitudinal axis of the trains running through the longitudinal apexes).

[0023] FIGURES 5a, 5b and 5c are schematic side elevation views of an alternative embodiment of partition 2 in accordance with the present invention. In this case, the trains 4 are pivotally secured to a wall or other support 40 at the upper ends 42 of the upper most elongated members 10 as illustrated. In this manner, as drums 30 wind up cables 28 over their corresponding sheaves 26, from closed position (FIGURE 5a) to open position (FIGURE 5c), the center line of trains 4 along the longitudinal apexes 14 progressively moves away from support 40 until, when the partition is in open position as illustrated in FIGURE 5c, those longitudinal apexes 14 have moved their maximum distance away from support 40 and are preferably positioned below sheaves 26.

[0024] Turning to FIGURES 6, 7 and 8, there is illustrated an alternative construction of partition 2 in which each elongated member 10 of train 4 is provided with a jog 46 as illustrated. Opposite ends of 48 and 50 of these members, on either side of jog 36, are parallel. As can be seen in FIGURES 7 and 9, pairs 10a of such members 10, on which bars 22 outwardly extend in opposite directions, the members being similarly oriented and positioned, are spaced beside each other and make up one opposing pair of sides of diamonds 12, while similar elongated single members 10b, to which no bars 22 are secured make up the other opposing sides. These members 10b are sandwiched between members 10a at the apexes where they are connected, and are reversed in their orientation with respect to members 10a. When the partition is in elongated, closed orientation, (FIGURE 8) this construction permits the bars to be in vertical orientation, albeit, again for reasons of balance, staggered on opposite sides of the longitudinal axis of the partition trains 4 as illustrated. (The embodiment of partition illustrated in FIGURES 1 to 5, prevents the bars from being in vertical alignment.) The embodiment of train construction illustrated in FIGURES 6 to 8 requires inner members 10b to have no bars secured to them so that the bars secured to members 10a of a particular diamond 12 will not bear against cooperating, opposed members 10b in that diamond during the contraction of the trains.

[0025] In this embodiment, cables 28 are illustrated as passing through apertures 52 centered in the lowest bars 22 extending between longitudinal apexes 14 of trains 4.

[0026] In FIGURE 10, additional horizontally disposed subsets of bars 56 may be provided as required, extending between trains 4, for aesthetic or functional purposes.

[0027] In the embodiment illustrated in FIGURE 11, a similar extension 60 is laterally disposed in the plane of each diamond 12, from each laterally disposed apex 16. The end of each extension 60 is secured by appropriate conventional means to slide up and down within a cor-

responding track 62. In this embodiment, cables 28 lie along one edge of each pantograph train 4, as illustrated, and are secured at its free end to their lowest extension 52. Track 62 may be supported by existing structures such as walls or posts, or may be free standing.

[0028] As illustrated in FIGURE 11, a fabric 25 may also be fitted over bars 22 as desired, for purposes such as decoration, obscuring or preventing visibility through the partition, or other functions. This fabric may for instance be a type of Kevlar (trademark) cloth which is bullet proof or may be solar type cloth which has solar heat control or energy creation applications (i.e. which is made of solar cell material that can convert light energy into electrical energy).

[0029] In FIGURE 12, an arrangement of partition, similar to that of FIGURE 11 but without any fabric on it, is illustrated in side elevation view, at a position in mid travel between its open and closed positions. In FIGURE 13, a more detailed view, again from a side elevation perspective, of the partition of FIGURE 11 is illustrated, on which fabric 58 is illustrated.

[0030] The partition of the present invention, whether used for security, solar control or otherwise, is relatively simple to construct and operate, and may readily be made visually appealing, while having all of the above mentioned advantages over prior art security gates and the like.

[0031] Turning to FIGURE 14, there is illustrated a partition wall 72 in accordance with the present invention in an intermediate position between an upper, storage position and a down position where the wall is in vertical orientation (Figures 16 and 18). As can be seen in Figures 14 and 15, a plurality of similar trains 74 of elongated members 76 are provided, the members 76 of each train 74 arranged to form a single pantograph 78 forming longitudinally aligned rows of diamonds 80 (Figure 15). While two trains have been illustrated in Figure 14, any number of trains may be spaced laterally to form a wall of appropriate width. These trains lie in the vertical plane of the wall and are oriented so that the diamonds 80 of the pantographs lie and operate in a plane at a 90° angle to that wall plane.

[0032] A plurality of panels 82 are provided, secured to members 76 as will be discussed in more detail hereinafter. Each panel 82 is secured to a pair of corresponding members 76 in adjacent trains, as illustrated. The panels are secured to corresponding pairs 84 of opposed sides of the diamonds.

[0033] An appropriate means to move the wall panels 82 into storage position or into down position is provided in the form of a power driven line shaft 86 to which drums 88 are secured. One end of each of cables 90 is wrapped around a corresponding drum 88. Each cable 90 passes over a corresponding sheave or pulley 92 and its other end is for example operatively connected to a lower end 94 of its associated train 74, as illustrated, or to a bar (not illustrated) extending between adjacent trains 74 at their lower ends 94.

[0034] As can be seen in Figure 15, similar pairs 96 of elongated members 76 intersect and are secured pivotally together at a central point 98 between their ends. This point is on a longitudinal center line 100 of each member. In this manner adjoining, longitudinally disposed apexes 102 of adjacent diamonds 80 are formed. Corresponding ends 104 of these pairs 96 of intersecting members 76 are pivotally connected to the ends 104 of similar pairs of intersecting members 76 at points 105 and 106 respectively, which points are laterally offset to the outside of center lines 100, to form, at these ends, laterally disposed apexes 108 of the diamonds 80, so that, when the train 74 are contracted, the longitudinal apexes 102 of each diamond 80 are drawn together and the laterally disposed apexes 108 are more separated, and when the trains 74 are elongated, the longitudinal apexes 102 of each diamond 80 become more separated and the laterally disposed apexes 108 are drawn together.

[0035] In each of the trains 74, similar pairs 76a and 76b (Figure 14) of elongated members, making up one pair of opposed sides of diamonds 80, are spaced about similar single members 76c, which members make up the other opposed pair of opposite sides of the diamonds. The panels 82 are secured only to the spaced pairs of elongated members 76a and 76b, along the length of the train. They are not secured directly to single members 76c.

[0036] As can be seen in Figure 14, each panel 82 is secured to one of the pairs of parallel elongated members making up one pair of opposed sides of diamonds, say member 76a, and confronting member 76b from the adjacent similar pair of parallel elongated members, members 76a and 76b in this context being in separate, but adjacent, trains 74. With this manner of connecting the panels 82 to the members 76, the panels 82 do not interfere with the operation of single members 76c, or vice versa, when the pantographs are moved between contracted (storage) and down positions.

[0037] The partition wall construction according to this aspect of the present invention permits pairs of panels to be secured, in spaced fashion, as illustrated in Figure 14, to these confronting, elongated members 76a and 76b. The dead air space in the space between these panels provides sound or heat insulation. Alternatively, that space may be filled, for example, with insulation material (not shown).

[0038] Again, as can be seen in Figures 15 and 16, the use of pivot points 105 and 106 which are laterally offset to the outside of center line 100 of pairs of intersecting members for their laterally disposed apexes, and the forming of flushly mating ends 112 and 114 of these intersecting members 96, as illustrated, permits the elongated members 76 of the trains to reach a perfectly aligned orientation, as illustrated in Figures 16 and 18, when the trains are in down position. This feature enables the panels to align themselves, flushly in vertical orientation to form a unitary or unbroken vertical wall,

or a wall having desired features, depending upon the features of the panels provided, when the partition wall is in this down position. As can be seen in Figure 18, when in this position, only small spaces exist horizontally between the panels and somewhat wider, but still narrow vertical spaces exist between the panels.

[0039] It will be understood that the panels may be made of any suitable material, for example, metal, plastic or composite material. Some of the panels may be of transparent material, and applied so as to provide a completely transparent wall or a wall with window sections in it.

[0040] The wall may be as wide as desired, by adding appropriate numbers of similar trains 74 of elongated members 76, and associated panels 82 in adjacent fashion.

[0041] The partition wall construction according to the present invention is both simple and economical to construct and easy to operate.

[0042] Thus, it is apparent that there has been provided in accordance with the invention a partition that fully satisfies the objects, aims and advantages set forth above. While the invention has been described in conjunction with illustrated embodiments thereof, it is evident that many alternatives, modifications and variations will be apparent to those skilled in the art in light of the foregoing description. Accordingly, it is intended to embrace all such alternatives, modifications and variations as fall within the spirit and broad scope of the invention.

Claims

1. A partition, upwardly movable into open position and downwardly movable into closed position, the partition comprising:

a) a plurality of similarly constructed trains of elongated members, the members of each train arranged to form a single pantograph forming longitudinally aligned rows of diamonds, the trains spaced laterally to form a partition plane and oriented so that the diamonds of the pantographs operate in a plane at a 90° angle to that partition plane,

b) a plurality of bars secured in parallel spaced fashion to corresponding members in adjacent trains, perpendicular thereto, and,

c) means to raise and lower the trains at a similar rate the pantographs being contracted when the partition is in open position and the pantographs being elongated when the partition is in closed position.

2. A partition according to claim 1, wherein the means to raise and lower the trains comprises a cable means secured to the train, and means to manipu-

late the cable means so as to simultaneously raise or lower the trains at a similar rate.

3. A partition according to claim 2, wherein the cable means comprises a plurality of cables, each of the cables secured to a different one of the lower ends of each of the trains, portions of the cables wound about a power driven line shaft so that rotation of the line shaft in one direction, winding up the cables, causes the trains simultaneously and at a similar rate to move to contracted position and rotation of the line shaft in the other direction, unwinding the cables, and causes the trains simultaneously and at a similar rate to move to elongated position.
4. A partition according to claim 3, wherein similar pairs of elongated members intersect and are secured pivotally together centrally between their ends to form adjoining longitudinally disposed apexes of adjacent diamonds and corresponding ends of these pairs of intersecting members pivotally connect to the ends of similar pairs of intersecting members to form at these ends laterally disposed apexes of the diamonds, so that when the trains are contracted the longitudinal apexes of each diamond are drawn together and the laterally disposed apexes are more separated, and when the trains are elongated the longitudinal apexes of each diamond become more separated and the laterally disposed apexes are drawn together.
5. A partition according to claim 4, wherein in each train corresponding laterally disposed apexes as of the diamonds are provided with similar extensions, the extensions oriented within the plane of the diamond and being slidably secured within a track for expansion and contraction movement of the train.
6. A partition according to claim 4, wherein in each train similar pairs of elongated members, with their ends extending parallel to each other from a central jog, make up one opposing pair of sides of diamond while similar single members in reverse orientation make up the other opposing pair of sides of the diamonds, the members of the pairs being spaced from each other and seated about the single members, the longitudinal apexes of the diamonds being centered in the jogs, the bars being secured to extend outwardly from only the pairs of elongated members along the length of the train.
7. A partition according to claim 5, wherein the bars are secured on opposite sides of the longitudinal apexes so as to provide a balance of weight on either side of those apexes.
8. A partition according to claim 1 further provided with elongated lengths of fabric extending between ad-

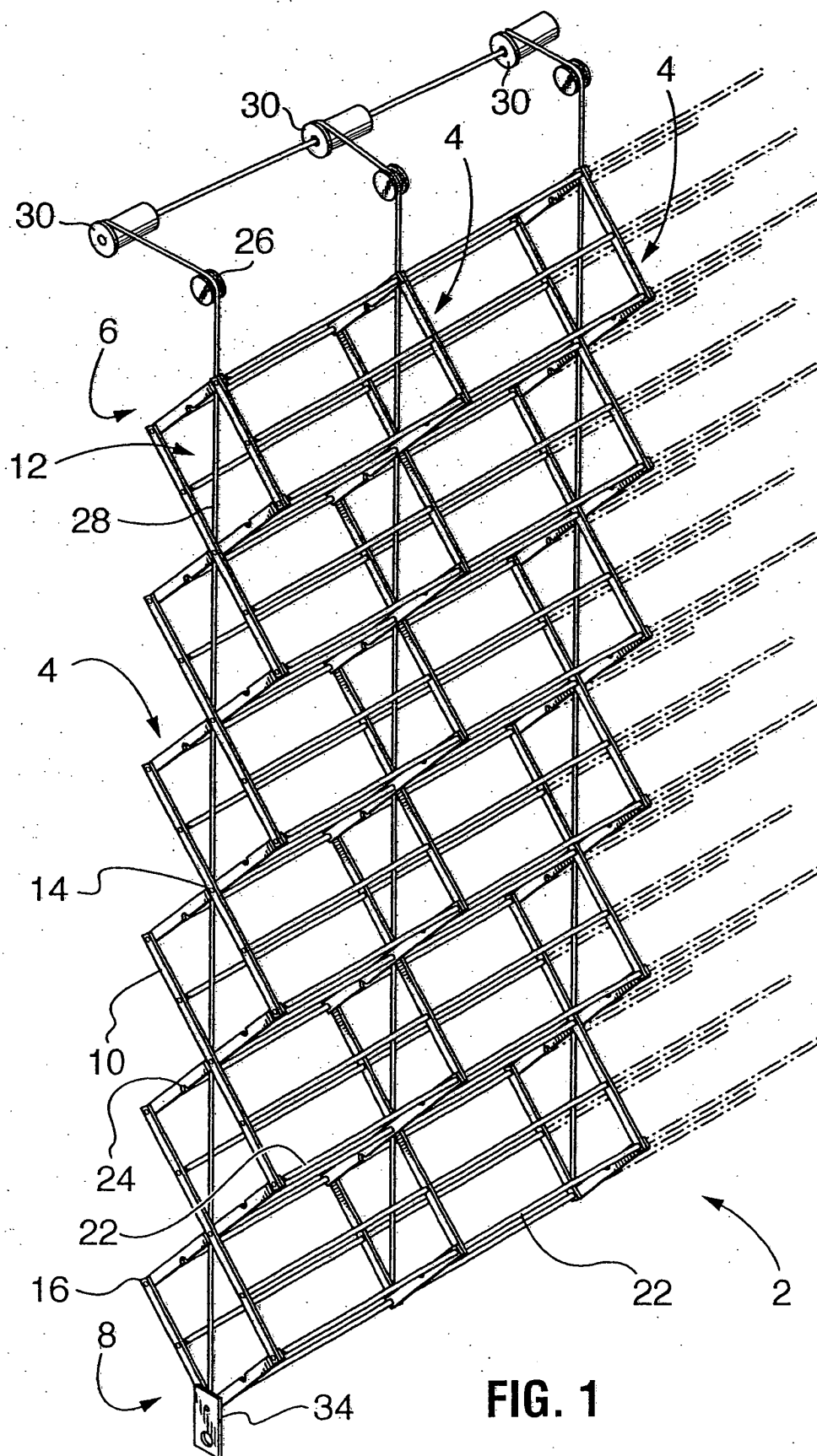
jacent trains and over a plurality of bars.

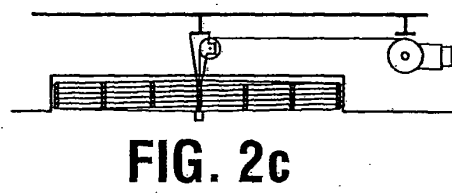
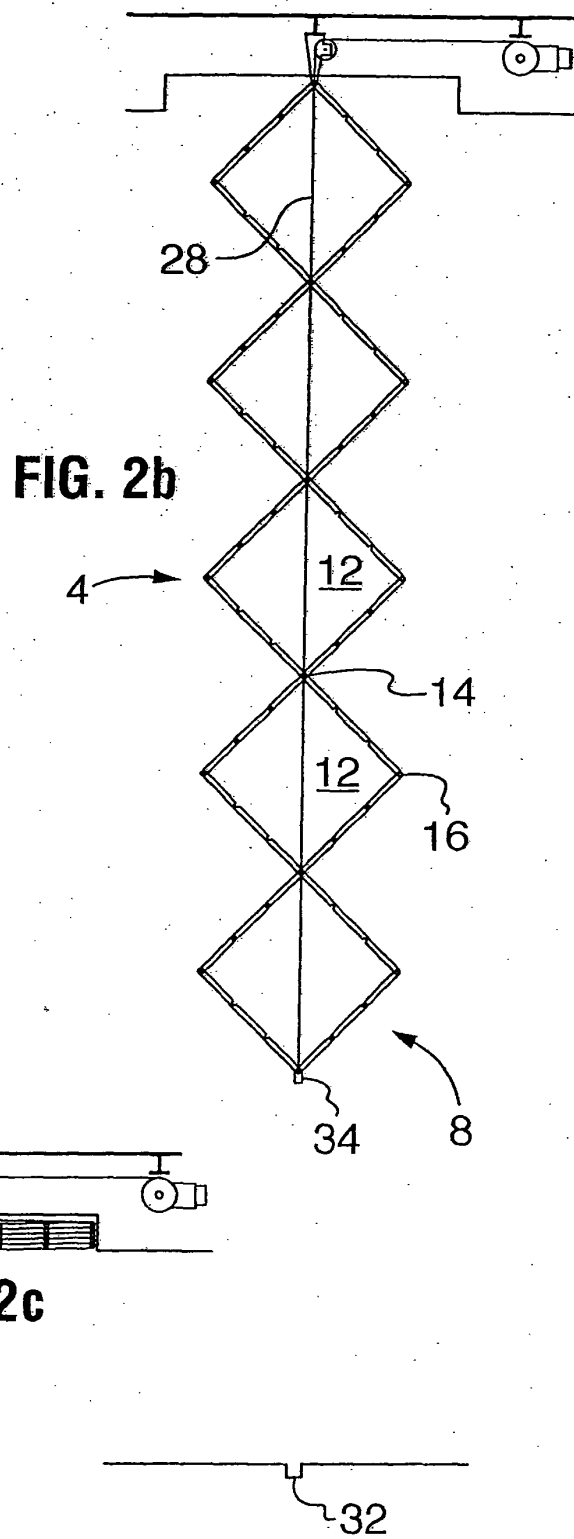
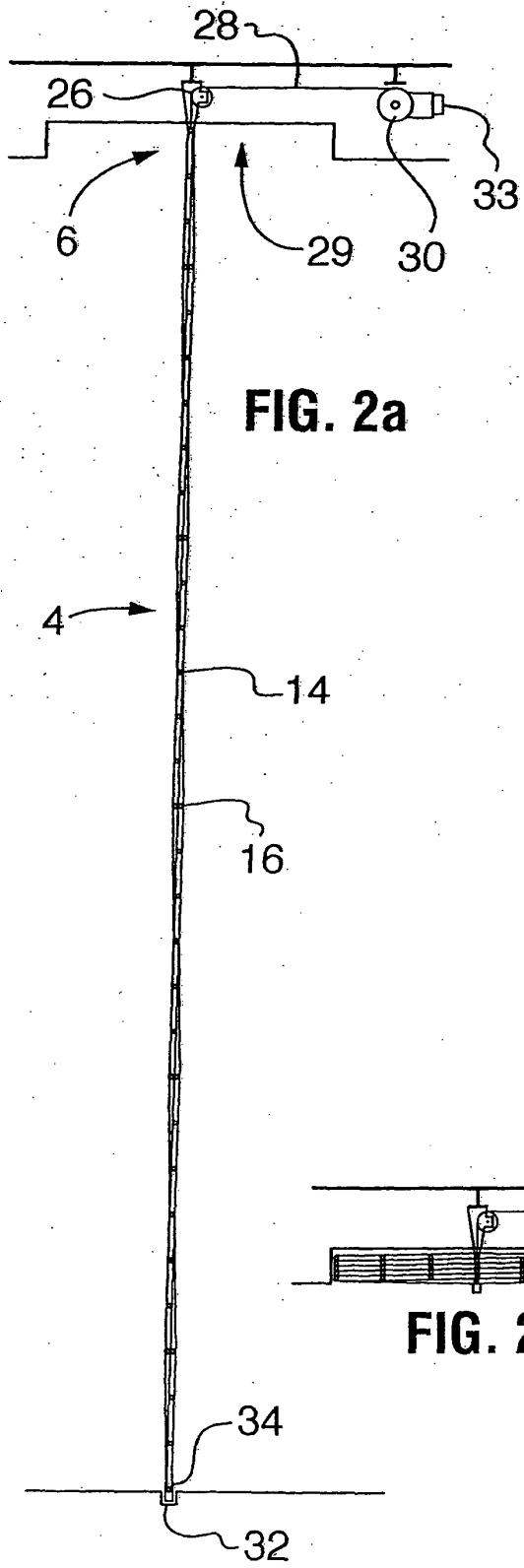
9. A partition according to claim 8, wherein the bars are secured on opposite sides of the longitudinal apexes so as to provide a balance of weight on either side of those apexes. 5
10. A partition according to claim 8, wherein the fabric is of flexible Kevlar (Trade-mark). 10
11. A partition wall, upwardly movable into storage position and downwardly movable into vertical, down position, the wall comprising:
 - a) a plurality of similar trains of elongated members, the members of each train arranged to form a single pantograph forming longitudinally aligned rows of diamonds, the trains spaced laterally to form a wall plane and oriented so that the diamonds of the pantographs operate in a plane at a 90° angle to that wall plane; 15
 - b) a plurality of panels, each panel secured to a pair of corresponding members in adjacent trains, the panels secured to corresponding pairs of opposed sides of the diamonds; 20
 - c) means to raise and lower the trains at a similar rate, the pantographs being contracted when the wall is in storage position and the pantographs being elongated when the wall is in down position; 25

the panels forming a vertical wall when the pantographs are elongated in down position. 35
12. A wall according to claim 11, wherein similar pairs of elongated members intersect and are secured pivotally together at a central point between their ends, which point is on a longitudinal center line of each member, to form adjoining, longitudinally disposed apexes of adjacent diamonds, and corresponding ends of these pairs of intersecting members are pivotally connected to the ends of similar pairs of intersecting members at points which are laterally off set to the outside of that center line, to form at these ends laterally disposed apexes of the diamonds, so that when the trains are contracted the longitudinal apexes of each diamond are drawn together and the laterally disposed apexes are more separated, and when the trains are elongated the longitudinal apexes of each diamond become more separated and the laterally disposed apexes are drawn together. 40 45 50 55
13. A wall according to claim 12, wherein in each train, similar pairs of parallel elongated members, making up one pair of opposed sides of diamonds, are

spaced about similar single members making up the other opposed pair of opposed sides of diamonds, the panels being secured only to members of the spaced pairs of elongated members along the length of the train.

14. A wall according to claim 13, wherein each panel is secured to adjacent elongated members of the spaced pairs of members in adjacent trains.
15. A wall according to claim 11, wherein the means to raise and lower the trains comprises a cable means secured to the train, and means to manipulate the cable means so as to simultaneously raise or lower the trains at a similar rate.
16. A wall according to claim 15, wherein the cable means comprises a plurality of cables, each of the cables secured to a different one of the lower ends of each of the trains, portions of the cables wound about a power driven line shaft so that rotation of the line shaft in one direction, winding up the cables, causes the trains simultaneously and at a similar rate to move to contracted position and rotation of the line shaft in the other direction, unwinding the cables, and causes the trains simultaneously and at a similar rate to move to elongated position.
17. A wall according to claim 11, wherein spaced pairs of panels are secured to pairs of corresponding members in adjacent trains.
18. A wall according to claim 14, wherein a pair of panels are secured in spaced fashion to , and extend between, adjacent ones of the elongated members in the spaced pair of members in adjacent trains so as to provide a double wall.





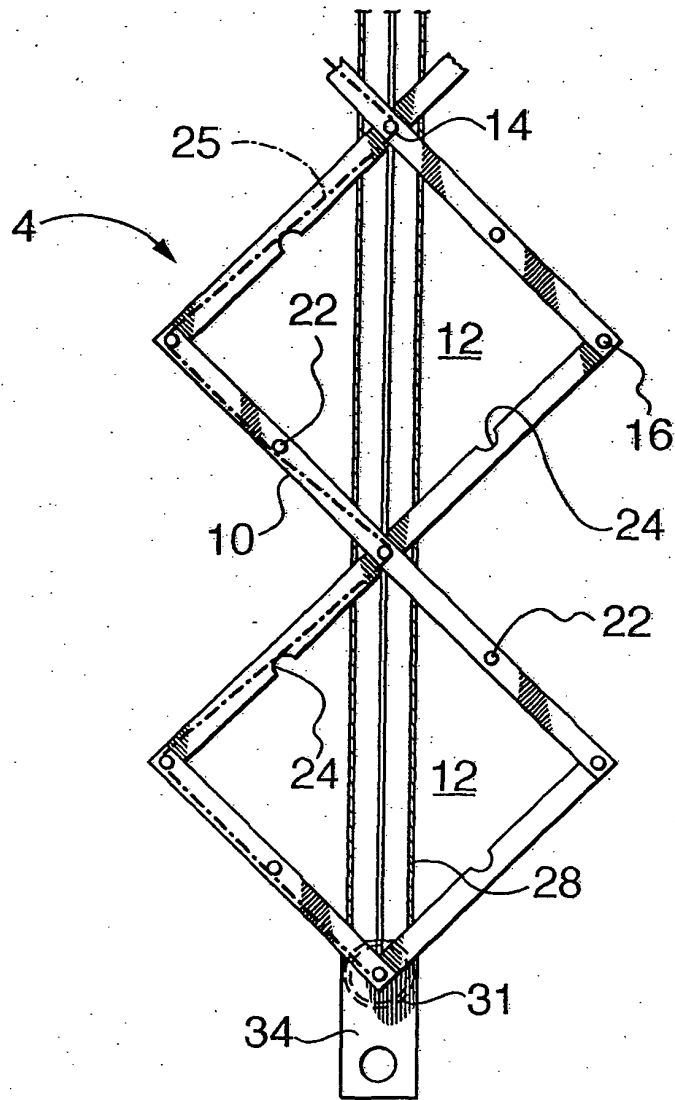


FIG. 3

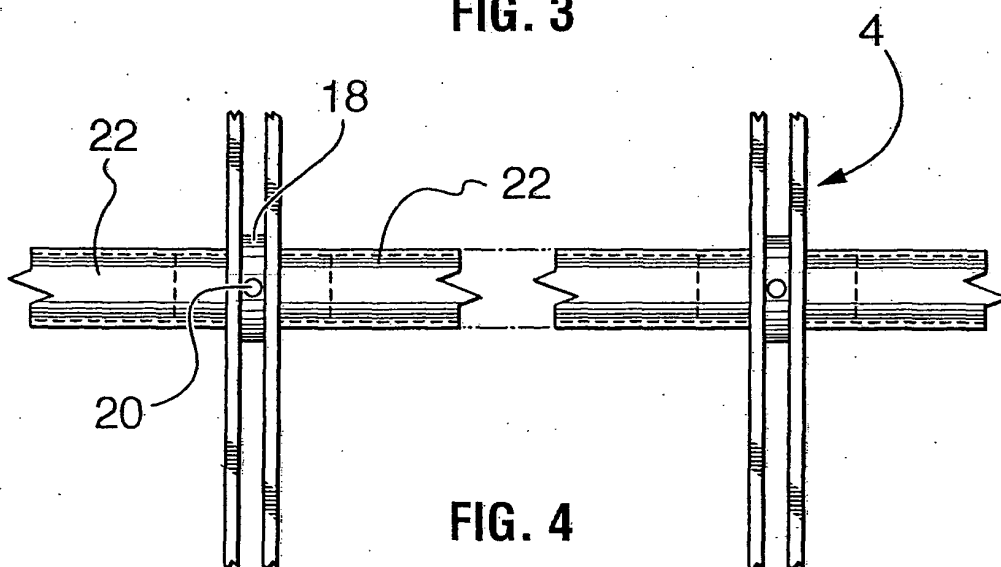
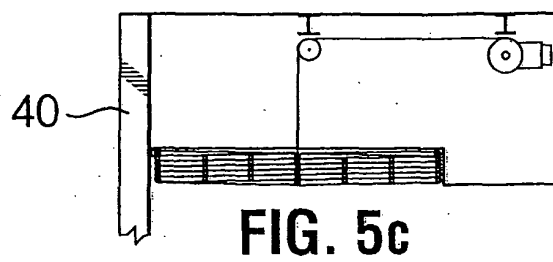
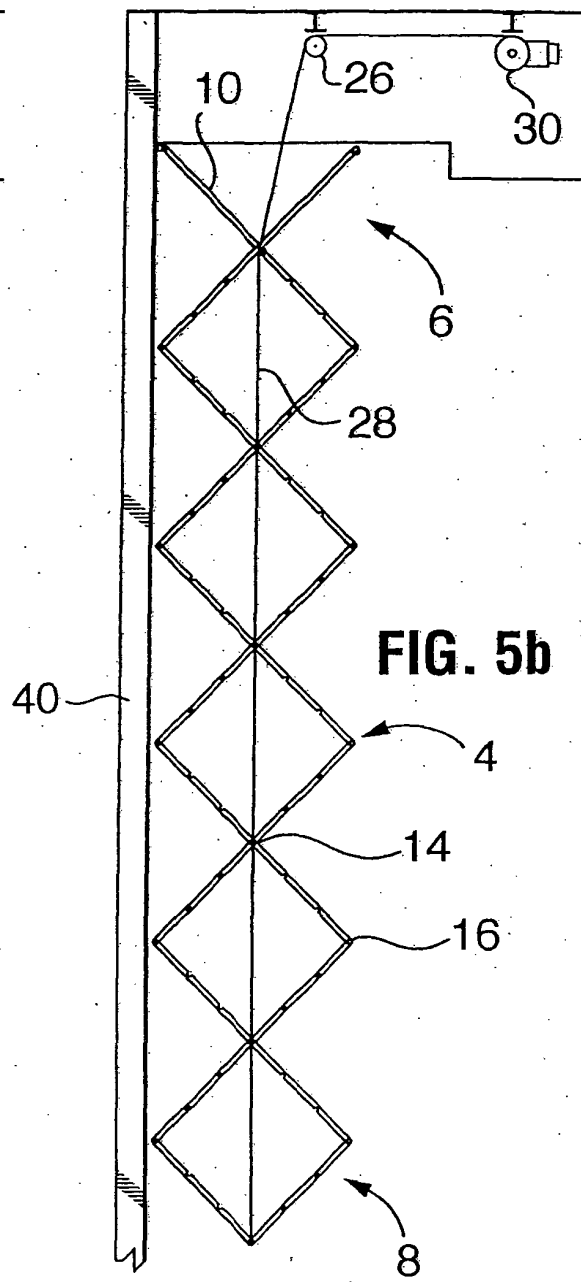
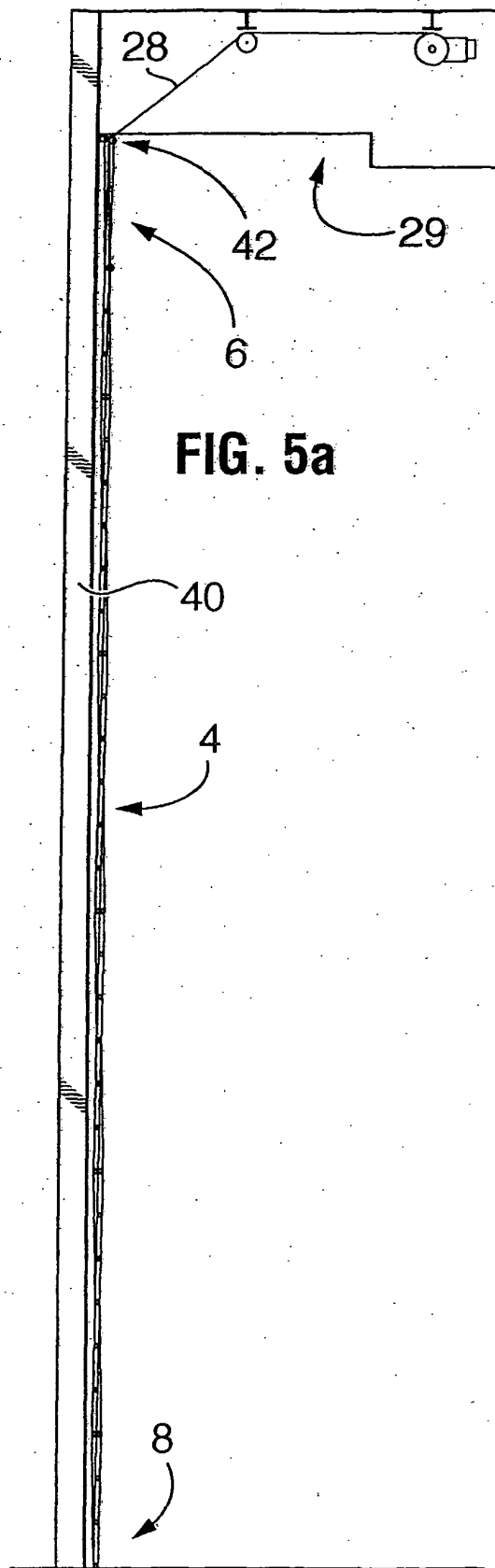


FIG. 4



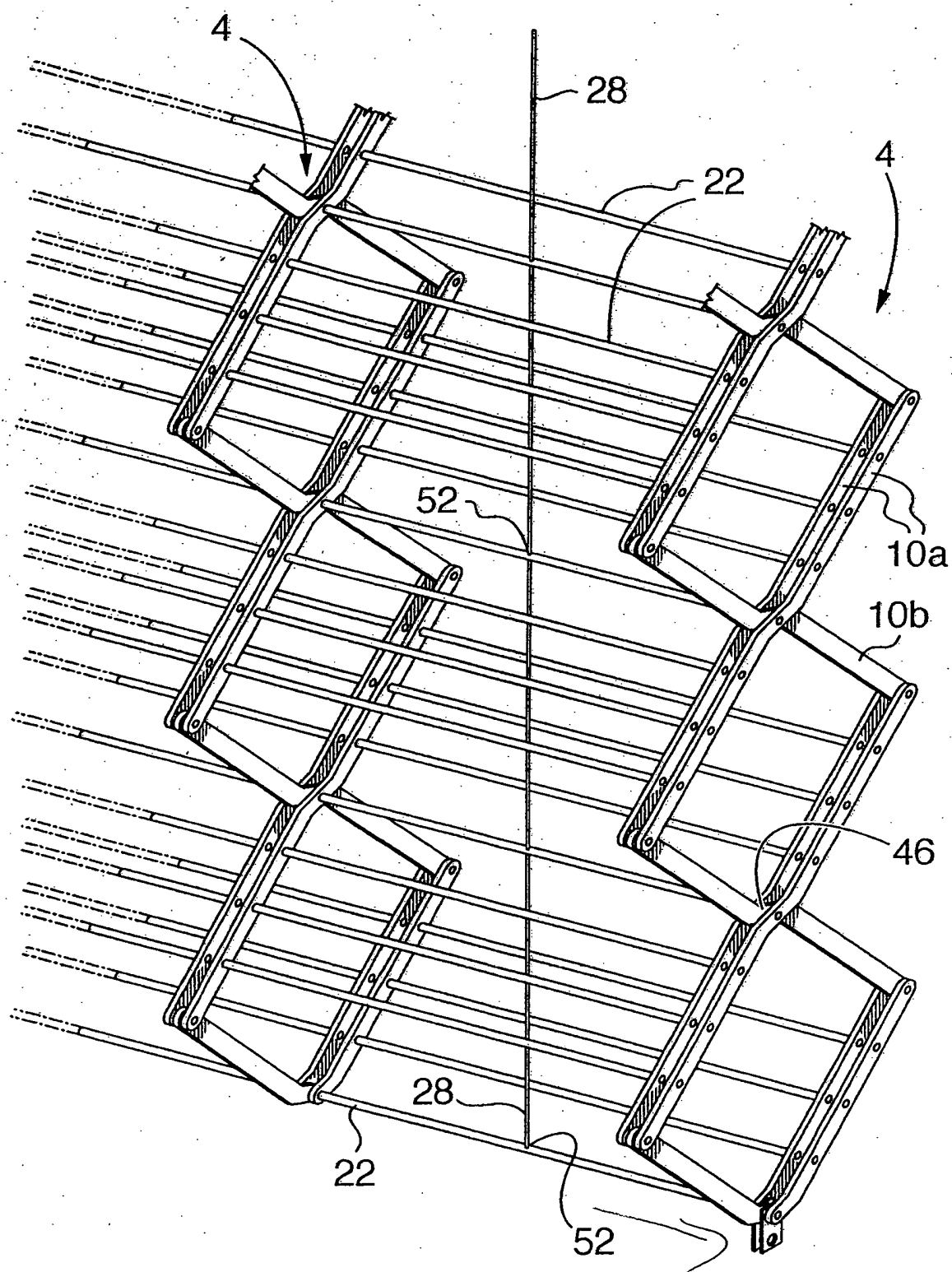


FIG. 6

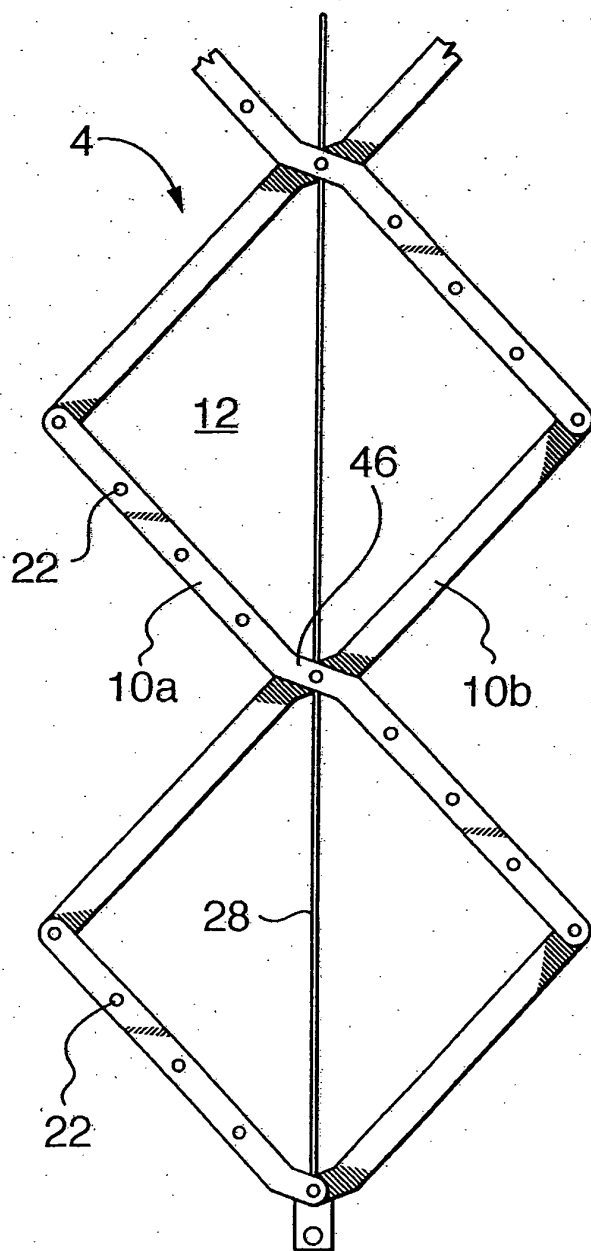


FIG. 7

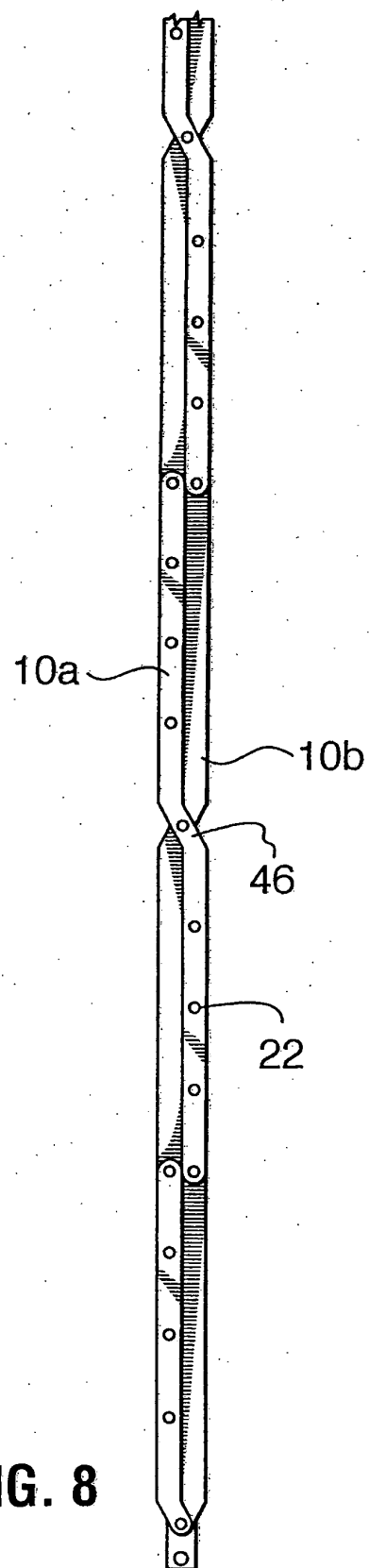
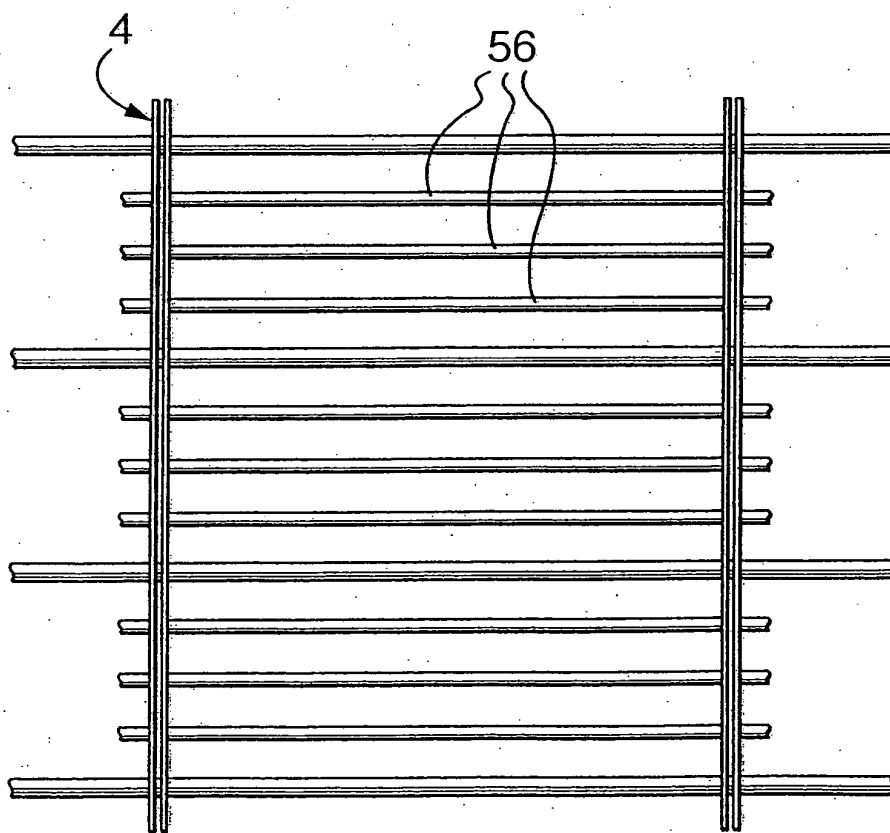
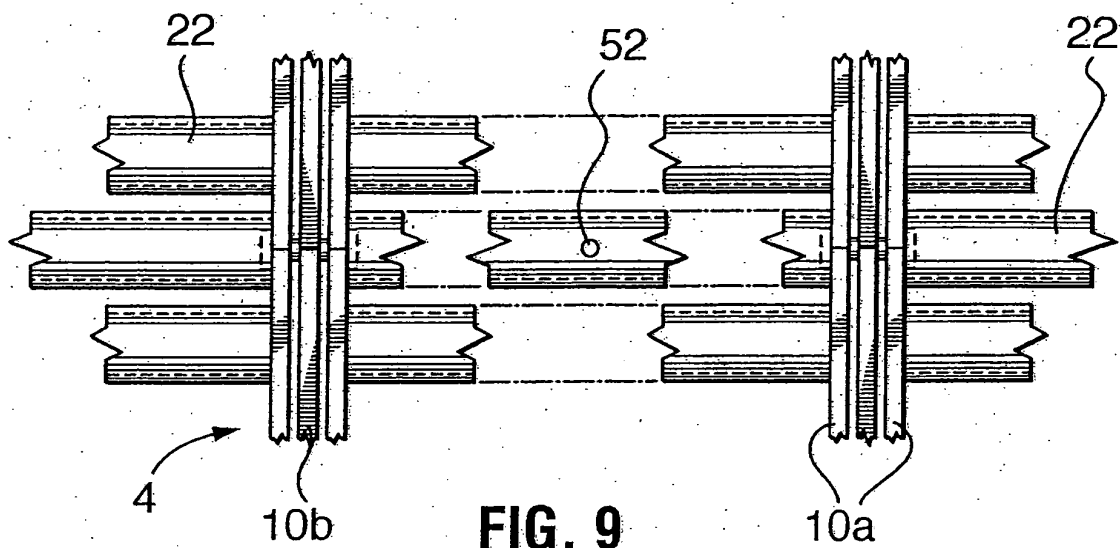


FIG. 8



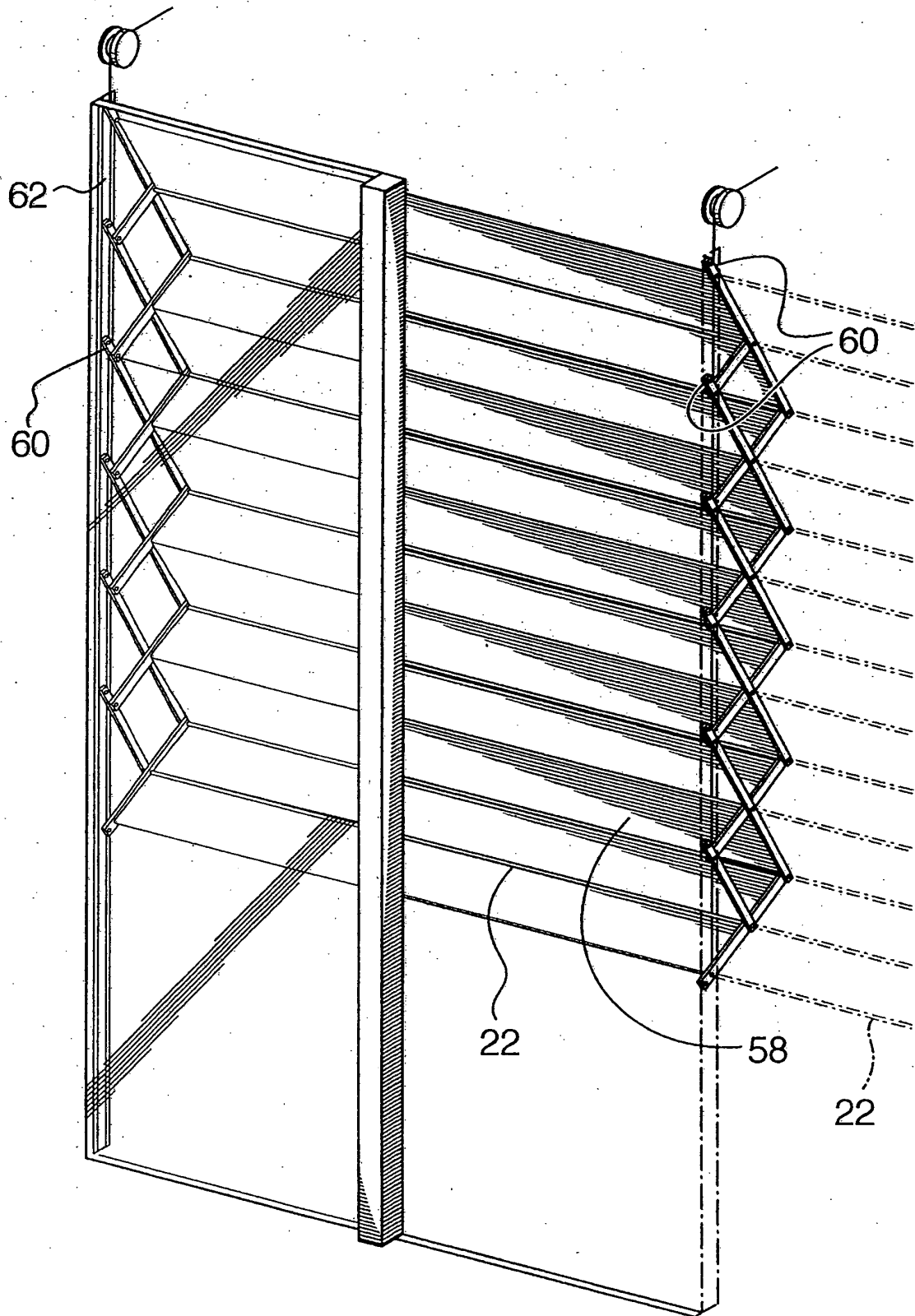


FIG. 11

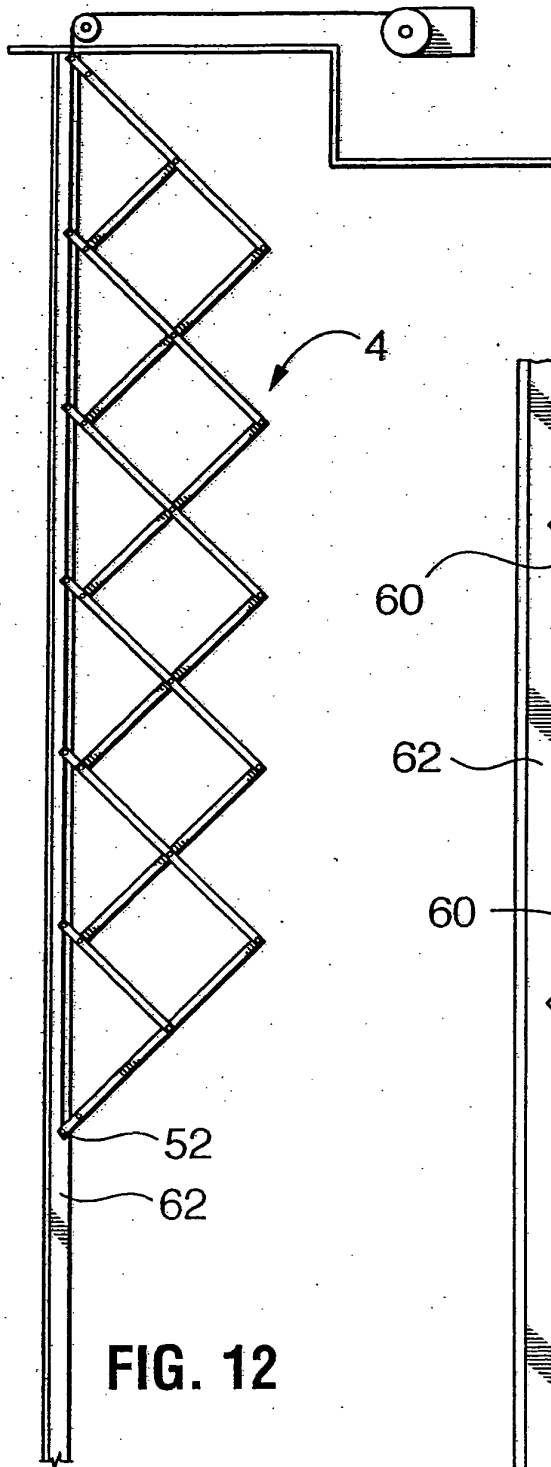


FIG. 12

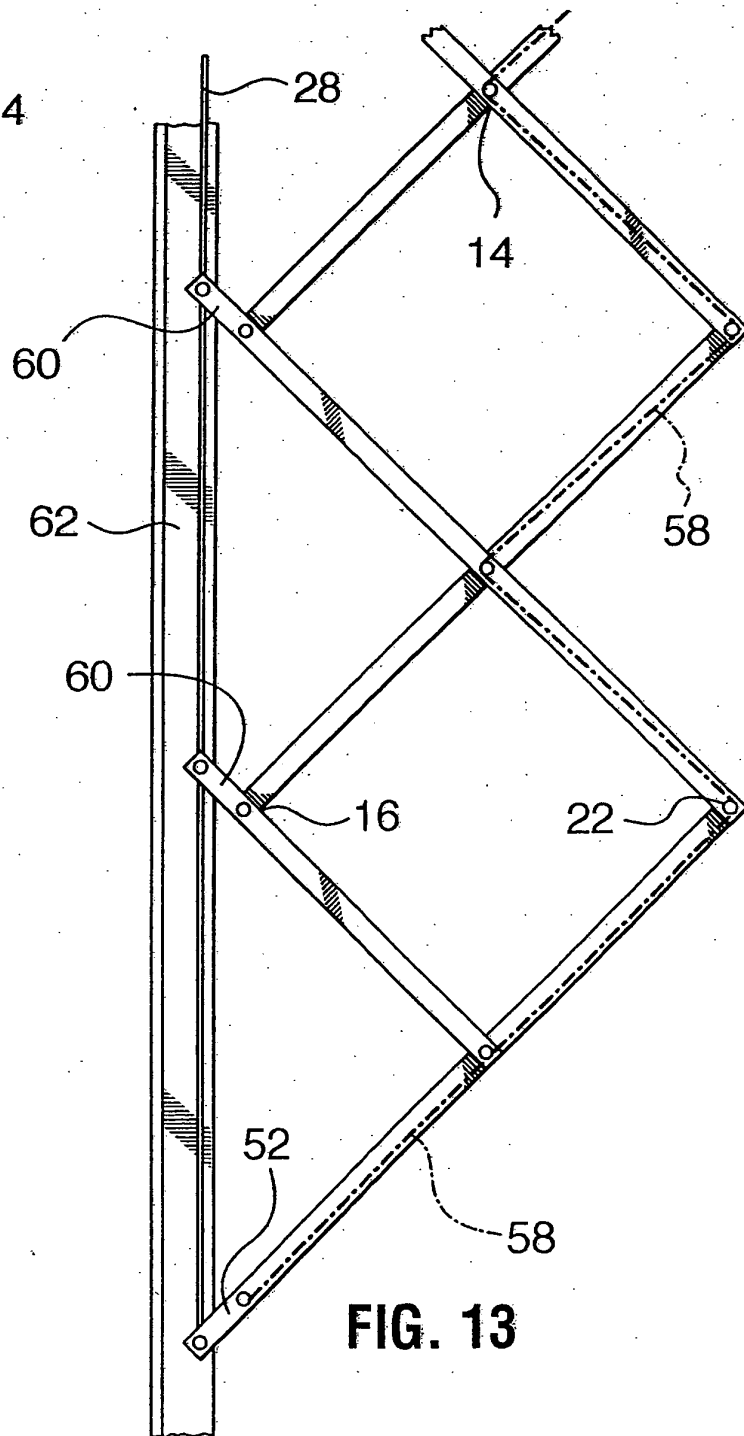
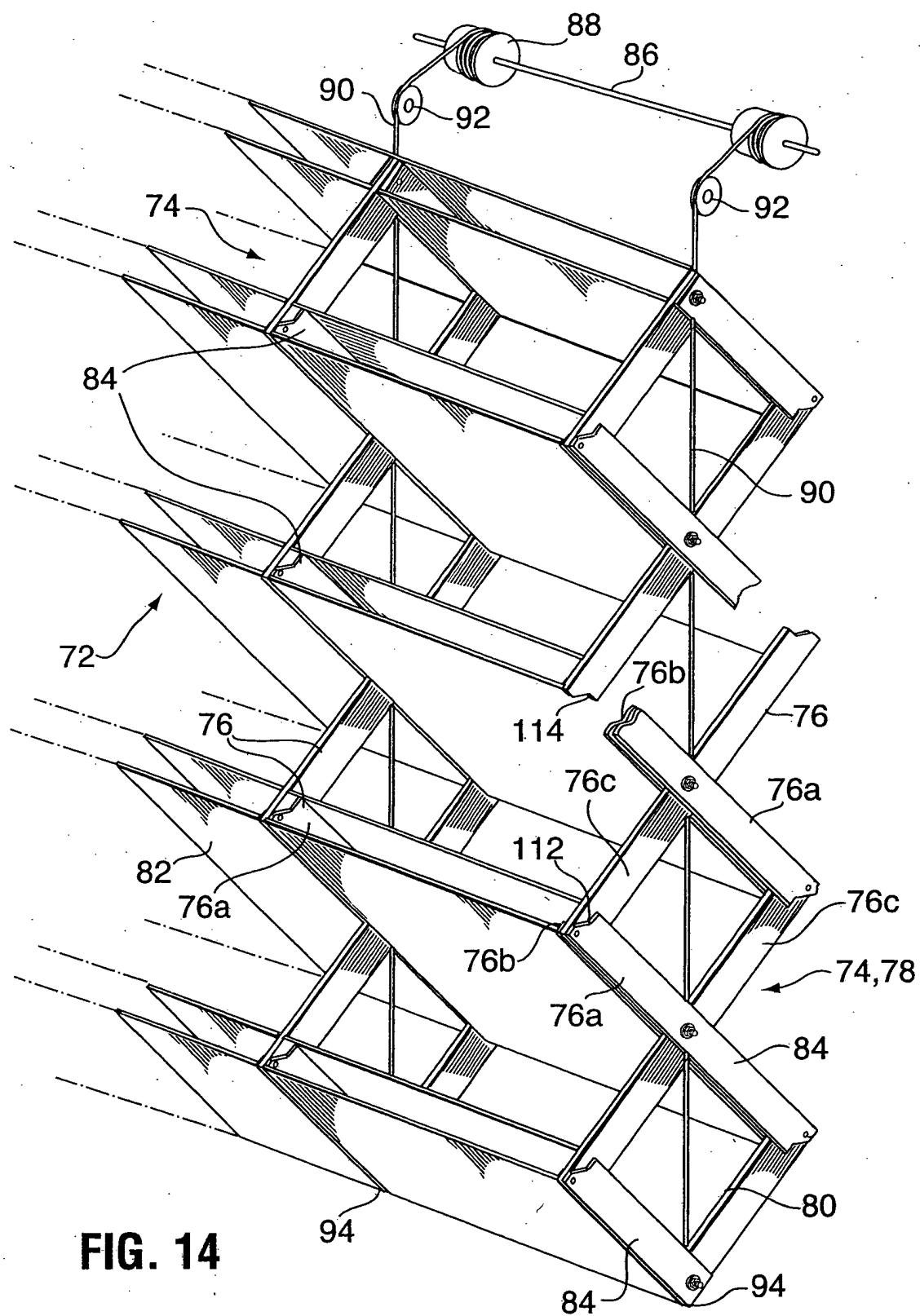
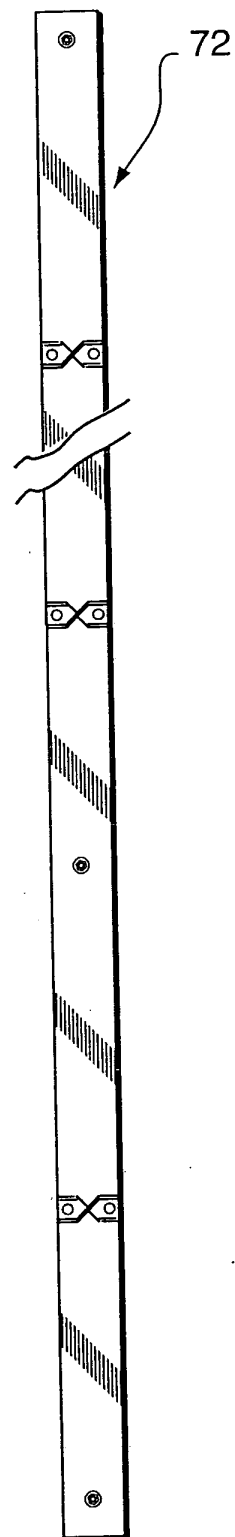
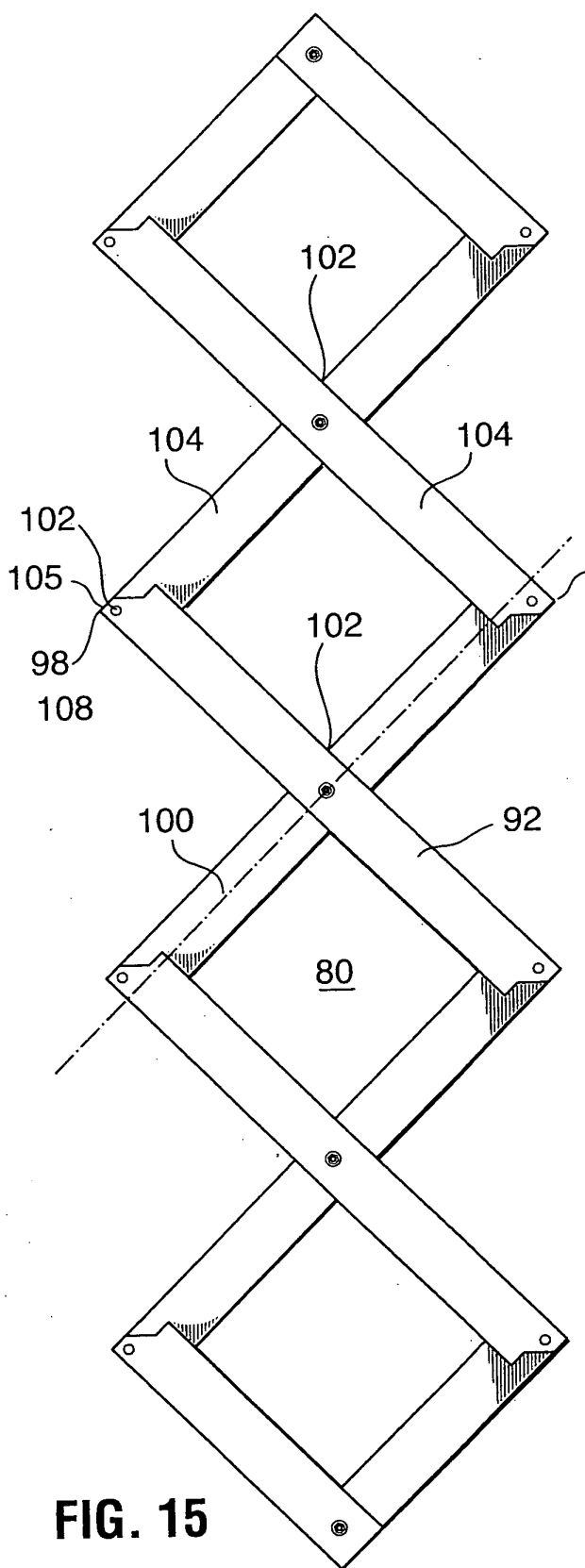


FIG. 13





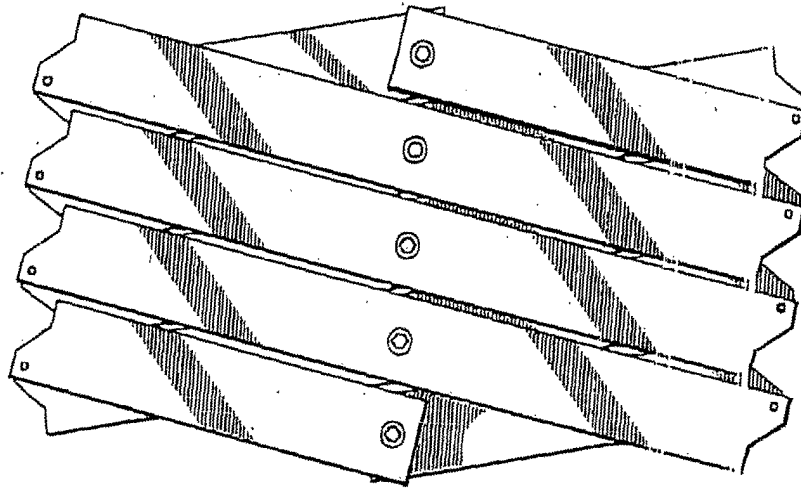


FIG. 17

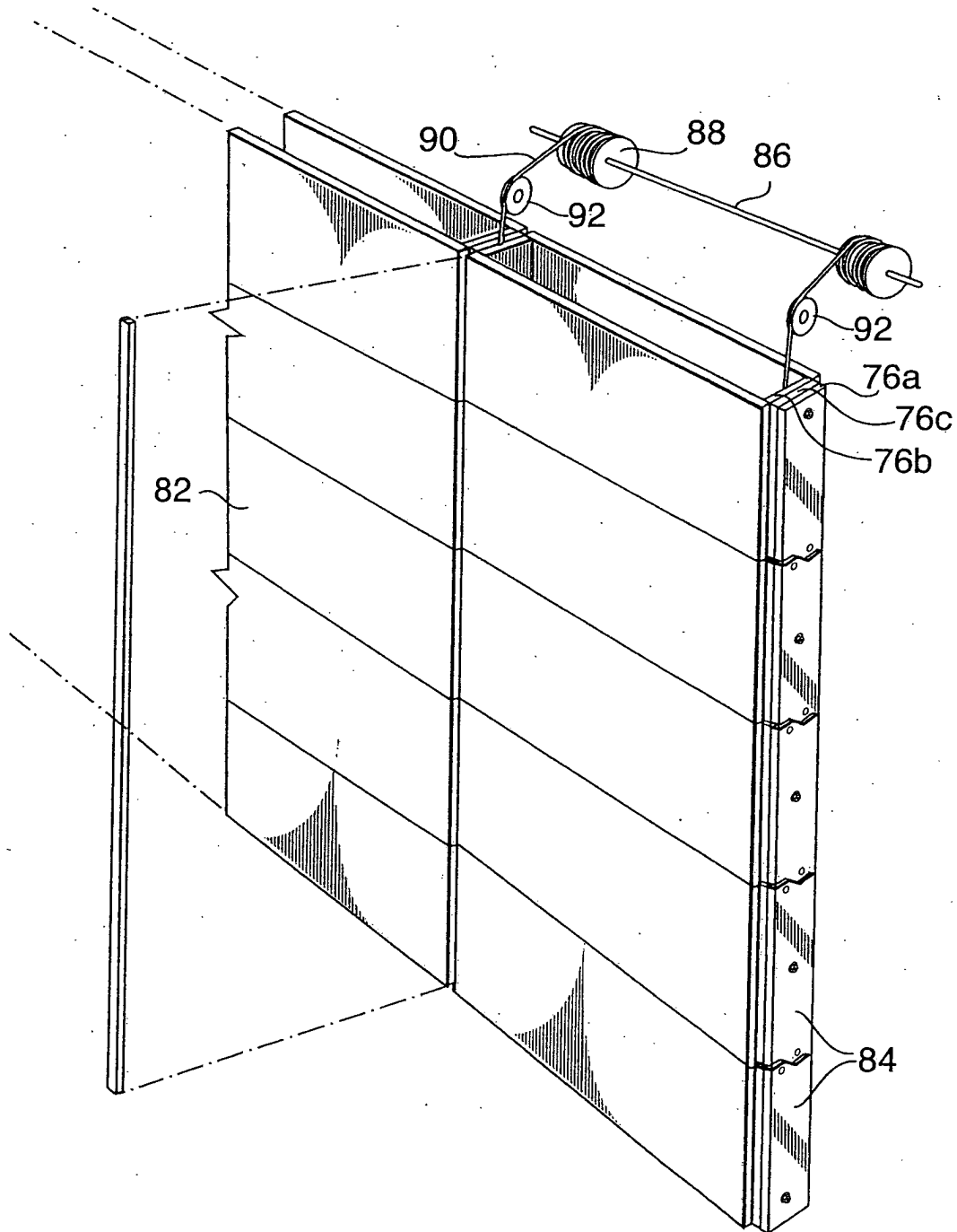


FIG. 18