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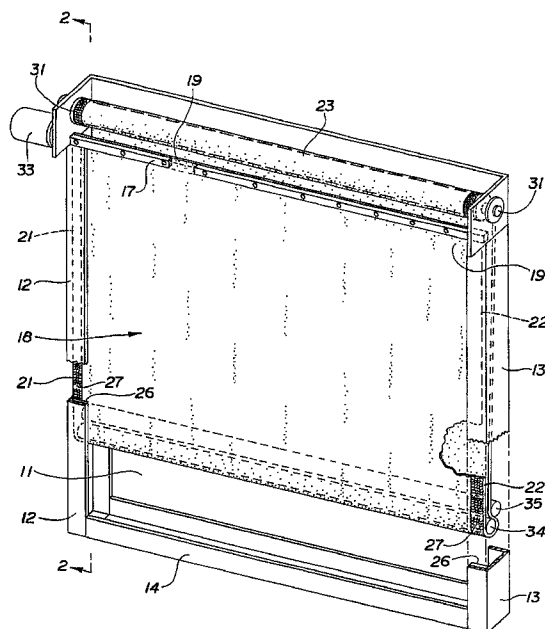
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(54) **COUVERTURE ETANCHE**

(54) **SEALABLE COVER**



(57) A roll-up closure utilizing a flexible cover (18). The cover (18) is at least as wide as the portal (11) to be covered and is typically longer than the portal (11). Each lateral margin (21, 22) of the cover (18) has a strip of fastener material (27) affixed thereto, and a complementary strip (26) is affixed to the lateral margins (12, 13) of the structure defining the portal (11). A first end (19) of the cover (18) is affixed across a first margin (17) of the portal (11). The opposite end (23) is upturned and connected to a take-up roller (31) mounted above the first margin (17) of the portal (11). A transverse rod (34) is supported within a pocket formed by the upturned end (23). Activation of the roller (31) lengthens or shortens the effective length of the cover (18) and the mating fasteners (26, 27) are positioned to seal and unseal the cover (18) to the lateral margins (12, 13) of the portal (11). Additional elements can be included to promote formation of an adequate seal.

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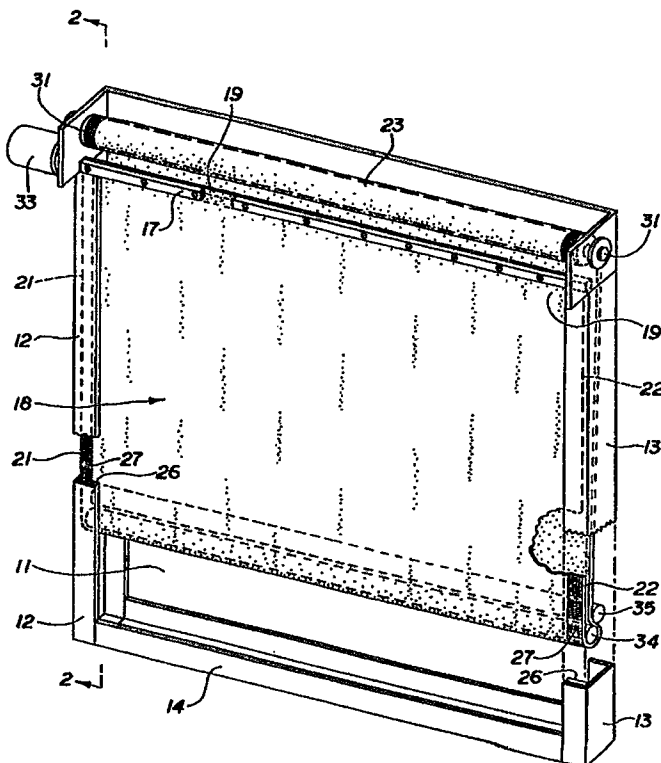
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(21) International Application Number: PCT/US96/18351 (22) International Filing Date: 8 November 1996 (08.11.96) (30) Priority Data: 08/556,484 13 November 1995 (13.11.95) US 08/684,992 22 July 1996 (22.07.96) US 08/733,784 18 October 1996 (18.10.96) US (71) Applicant: HIRED HAND MANUFACTURING, INC. [US/US]; P.O. Box 99, Bremen, AL 35033 (US). (72) Inventors: CRIDER, Grant, W.; Route 1, Box 17, Bremen, AL 35033 (US). HARBISON, Charles, H.; 3217 Georgetown Place, Birmingham, AL 35216 (US). (74) Agents: VEAL, Robert, J. et al.; Suite 125, 200 Cahaba Park Circle, Birmingham, AL 35242 (US).		(81) Designated States: AU, BR, CA, CN, IL, JP, KP, KR, MX, NO, NZ, Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report.</i>

(54) Title: SEALABLE COVER

(57) Abstract

A roll-up closure utilizing a flexible cover (18). The cover (18) is at least as wide as the portal (11) to be covered and is typically longer than the portal (11). Each lateral margin (21, 22) of the cover (18) has a strip of fastener material (27) affixed thereto, and a complementary strip (26) is affixed to the lateral margins (12, 13) of the structure defining the portal (11). A first end (19) of the cover (18) is affixed across a first margin (17) of the portal (11). The opposite end (23) is upturned and connected to a take-up roller (31) mounted above the first margin (17) of the portal (11). A transverse rod (34) is supported within a pocket formed by the upturned end (23). Activation of the roller (31) lengthens or shortens the effective length of the cover (18) and the mating fasteners (26, 27) are positioned to seal and unseal the cover (18) to the lateral margins (12, 13) of the portal (11). Additional elements can be included to promote formation of an adequate seal.



SEALABLE COVER

Technical Field

The present invention relates to the field of closures for windows, doors, or other portals and more particularly to closures which can be selectively positioned. In greater particularity the present invention relates to a non-sliding roll-up closure for a portal.

Background Art

Various applications are known wherein a portal requires a closure, or cover, to prevent the passage of wind, rain, light, insects, or any other elements through the portal. As used herein, portal simply means an opening which would allow the passage of such elements therethrough; hence a portal may be a window or door and the closure of the instant invention may control the passage of any of the above elements therethrough. The present invention addresses the need for improved closures for portals such as may be found on patios, pool houses, green houses, livestock houses, atriums or any other similar structures. The portal may be as small as would accommodate a ventilation fan in a gymnasium or livestock house, or as large as an atrium wall in a solar efficient building or an inclined roof panel. Additionally, the position of the portal can range from vertical to horizontal or any angle therebetween.

Disclosure of Invention

It is the object of the present invention to provide a means for effectively covering portals such as windows and doors in a number of differing types of buildings.

Another object of the invention is to provide a reliable and easily operated closure for such portals.

Still another object of the invention is to provide a closure which is relatively impervious to the accumulation of debris thereon.

These and other objects and advantages of the present invention are accomplished through the use of a novel combination of features in a roll-up closure. The closure utilizes a flexible curtain or cover selected from a material suitable to

effect the type of closure sought. For example, the cover may be comprised of a material having a weave that would be permeable to air yet block a certain amount of light. Similarly, the cover could be impermeable to moisture yet permeable to air, or vapor proof yet transparent, or numerous other variations to meet the needs of the particular structure on which the closure is used. The cover is at least as wide as the portal to be covered and is typically longer than the portal. Each lateral margin of the cover has a strip of hook and loop fastener material affixed thereto, and a complementary strip is affixed to the lateral margins of the structure defining the portal. A first end of the cover is rigidly affixed across a first margin of the portal. The opposite end of the cover can be upturned and connected to a driven take-up roller mounted to the first margin of the portal. In this embodiment, an elongated transverse rod is supported within the upturned end of the cover. In an alternate embodiment, the opposite end of the cover can be attached to an elongated transverse rod such that as the cover is raised or lowered, the cover is wound or unwound around the rod, respectively.

In either embodiment, activation of the driven roller lengthens or shortens the effective length of the cover. As the driven roller is activated, the mating hook and loop fasteners are positioned to seal and unseal the cover to the lateral margins of the portal. The rod can either have sufficient weight to maintain tension on the cover such that the cover forms an adequate seal with the lateral margins of the portal, for example where the portal covered has an angle greater than 15 degrees above horizontal, or in the alternative, a secondary weighted rod or biasing means, such as a spring assembly or a second driven roller mounted to a second margin of the portal opposite the first margin, can be utilized to maintain tension on the cover. If present, the weighted rod is supported atop the elongated rod and separated therefrom by the upturned end of the cover. Alternative embodiments may have multiple layers of cover material or various sealing means incorporated.

These and other objects and advantages of the invention will become apparent from the following detailed description of the modes for carrying out the invention.

Brief Description of Drawings

Apparatus embodying features of the invention are depicted in the accompanying drawings which form a portion of this disclosure and wherein:

FIG. 1 is a front perspective view of the invention in a partially raised position and shown partially in section;

FIG. 2 is a sectional view of the invention taken along line 2-2 of FIG. 1;

FIG. 3 is a front elevational view of the invention;

FIG. 4 is a rear perspective view of an alternate drive means;

FIG. 5 is a sectional view of an alternative embodiment using multiple cover layers.

FIG. 6 is front perspective view of an alternative embodiment in a partially raised position and shown partially in section;

FIG. 7 is a sectional view of the invention taken along line 7-7 of FIG. 6;

FIG. 8 is a perspective view of the torsion spring shown in FIG. 7;

FIG. 9 is a rear perspective view of an alternative embodiment of the invention;

FIG. 10 is an enlarged view of the bearing plug shown in FIG. 9;

FIG. 11 is a rear perspective view of an alternative embodiment of the invention;

FIG. 12 is a rear perspective view of an alternative embodiment of the invention;

FIG. 13 is an underside perspective view of an alternative embodiment of the invention.

FIG. 14 is a front perspective view of an alternative embodiment in a partially raised position and shown partially in section;

FIG. 15 is a front perspective view of an alternative embodiment in a partially raised position;

FIG. 16 is a front perspective view of an alternative embodiment shown partially in section;

FIG. 17 is a sectional view taken along line 17-17 of FIG. 14;

FIG. 18 is a sectional view taken along line 18-18 of FIG. 16;

FIG. 19 is a perspective view of an alternate embodiment shown partially in section; and

FIG. 20 is a side sectional view of the embodiment of FIG. 19.

Modes for Carrying Out The Invention

The present invention is usable with a variety of building types, and is usable to cover a variety of openings such as doors, sidewalks, roofs, windows, and skylights in such applications. Accordingly, the following description is intended to encompass any specific use to which the structure may be afforded. A more complete understanding of the invention may be obtained by reference to the accompanying drawings wherein the closure covers an opening 11 having a pair of lateral margins 12 and 13. Margins 12 and 13 extend the full vertical length of opening 11 and may terminate at a lower margin 14, which extends across the width of the opening. In some applications a sealing gasket 16, such as a compressible layer of a foam-like material will be useful in the bottom of lower margin 14. Across the top of opening 11 is an upper margin 17 which extends from margin 12 to margin 13. Thus, it may be seen that the opening is completely framed by margins 12, 13, 14, and 17. It is to be understood that the present invention may be positioned vertically, horizontally, or inclined and is not limited to only vertical disposition of the unit.

Attached to margin 17 is a first end of a curtain or cover 18, the cover being comprised of a flexible material selected in accordance with the purposes of the present invention for its ability to block or transmit light, air, moisture, insects, or the like from one side to the other thereof. As an air barrier, we have noted that a woven polyester fabric has exhibited good durability having withstood over 60,000 cycles of operation of the invention. However, canvas, other plastics, some metals and fabrics which are selectively permeable are known to exist which may find application in the present invention. Therefore, cover 18 is properly defined as a flexible barrier material, having a first end 19 secured to margin 17, opposing longitudinal sides 21 and 22, which are longer than the length of margins 12 and 13, and a second end 23.

Attached to margins 12 and 13 and to sides 21 and 22 are complementary closure members 26 and 27. For example, hook and loop fastener material was attached to the polyester fabric used in testing the invention and to the inside of margins 12 and 13 such that sides 21 and 22 could be selectively attached and detached from the margins. Other means of fastening, such as magnetic strips, may be used when appropriate to the particular application. Note that the closure members

need only be approximately commensurate in length with the length of the margins. A transverse closure may be provided in conjunction with lower margin 14; however, on a door, margin 14 would not be present.

End 23 may be upturned and directly connected to a transverse take-up spindle or pipe 31 mounted for rotation above the tops of margins 12 and 13, shown in FIG. 1. Alternatively, end 23 may be connected to pipe 31 by cables or straps 32, shown in FIG. 4, and the pipe may include a spool for such cables or straps. In this embodiment, the cover length need only be approximately commensurate in length with the length of the margins. In any case, pipe 31 is driven by a reversible motor 33 attached to a selected means of control and supports upturned end 23. An elongated transverse roller or rod 34, which may be a solid or tubular pipe, is supported within the curve of cover 18 created by upturned end 23.

Lateral margins 12 and 13 can have optional opposing channel members 28 and 29, shown in FIG. 6, attached thereto such that the opposing ends of rod 34 can extend into opposing channels 28 and 29 so that rod 34 can roll freely vertically in the channels, but cannot pivot in the horizontal plane about its mid-point, thus preventing the cover from being pulled away from the portal. Additionally, rod 34 can have a torsion spring 36 mounted at each end to urge rod 34 towards lateral margins 12 and 13 to engage closure members 26 and 27. Torsion springs 36 would preferably have rollers 37 mounted thereon to allow torsion springs 36 to move within channel members 28 and 29 with minimal resistance concomitantly with rod 34 as rod 34 is raised or lowered. Torsion springs 36 would be particularly useful in a vertical embodiment of the present invention, the torsion spring being illustrated in Figs. 7 and 8.

Rod 34 can have sufficient weight to maintain the cover taut, or a weighted roller 35 can be included above and parallel to rod 34 and separated therefrom by cover 18. In the embodiment having both rod 34 and roller 35, channels 28 and 29 are preferably wider than the diameter of rod 34 and roller 35 such that roller 35 is supported in offset vertical relation to rod 34, although this is not critical. As pipe 31 unwraps the cover or straps from itself, gravity urges rod 34, or roller 35 if present, and cover 18 to a lowered position. Cover sides 21 and 22 carrying closure 27 are pressed against complementary closure 26 of the margin as a result of rod 34 or roller

35, thereby ensuring a sealing connection. As pipe 31 raises the cover, the lifting force is transferred around rod 34 to provide an opening force to the closures nearly normal thereto, such that they are readily detached. From the foregoing, it is easily seen that as pipe 31 rotates, it effectively varies the length of cover 18 such that rod 34, or roller 35 if present, urges closure members 26 and 27 into sealing engagement.

In an alternative embodiment shown in FIG. 5, a second cover 41 is provided and is attached to a second upper margin 42. Second cover 41 has the same structure as cover 18 and has an upturned end 43 which passes beneath roller 35, but not rod 34. Upturned ends 43 and 23 are attached such that they are commonly supported by pipe 31, and move concomitantly vertically between margins 14 and 42. It will be appreciated that the closure members 46 carried by cover 41 mate with closure members 47 mounted on margins 12 and 13 to provide a double sealed barrier.

In another alternative embodiment shown in FIG. 9, a tension spring 49 can be affixed at one end to lower margin 14 and attached at the other end to a first end of cable 51. Cable 51 preferably travels about a first pulley 52, through rod 34, about a second pulley 53, about a third pulley 54, and is attached at a second end to a spool 55 mounted to pipe 31 such that rod 34 is biased towards lower margin 14 of the portal. In this embodiment, rod 34 is hollow and has a bearing plug 56 mounted at each end. Each bearing plug 56 has an aperture therethrough with a pulley 57 mounted therein such that cable 51 travels over pulleys 57 to prevent bearing plugs 56 from rotating with rod 34, the bearing plug with pulley being best illustrated in Fig. 10. Additionally, pulleys 57 are preferably mounted within the bearing plugs 56 such that cable 51 travels through the axial center of rod 34. As pipe 31 varies the length of cover 18, the length of cable 51 is concomitantly varied such that as cover 18 is raised, cable 51 is unwound from spool 55 and as cover 18 is lowered, cable 51 is wound around spool 55.

In another alternative embodiment shown in Fig. 11, a pair of cords 61 can each be affixed at a first end to pipe 31 and at a second end to a tension spring 62, tension spring 62 preferably interconnecting the second ends of cords 61 between two pulleys 63 subjacent lower margin 14. Cords 61 preferably travel about first pulleys 64, about the ends of rod 34, and about pulleys 63 such that rod 34 is biased towards lower margin 14 of the portal. As pipe 31 varies the length of cover 18, the length of

cords 61 are concomitantly varied such that as cover 18 is raised, cords 61 are unwound from pipe 31 and as cover 18 is lowered, cords 61 are wound around pipe 31. Alternatively, an elastic cord 66 can be attached to each end of rod 34 and about a plurality of pulleys 67 affixed subjacent lower margin 14 to bias rod 34 towards lower margin 14, as shown in FIG. 12.

In another alternative embodiment shown in Fig. 13, a second transverse take-up roller 71 can be mounted for rotation below lower margin 14 with a cord 72 across each end of rod 34. Each cord 72 is preferably mounted at a first end to second roller 71 and at a second end to a tension spring 73, tension spring 73 preferably interconnecting the second ends of cords 72 between two pulleys 74. Second roller 71 is driven by a second reversible motor 75 such that second roller 71 works cooperatively with pipe 31 to raise or lower cover 18 while constantly maintaining tension on the cover. Thus, rod 34 has a force biasing it toward the lower margin of the portal which, in turn, keeps the cover taut and facilitates sealing of closure members 26 and 27 as pipe 31 lowers the cover. It should be understood that other means can be used to apply force on rod 34 in the direction towards lower margin 14 without departing from the spirit of the invention; however, precaution should be taken to insure that the force is applied equally across rod 34.

In another alternative embodiment shown in FIG. 15, lateral margins 12 and 13 can have optional guide cables 30 attached thereto such that the opposing ends of rod 34 or roller 35 are captured by the guide cables, thus preventing the curtain from being pulled away from the portal. In this embodiment, it is preferable to have guide pulleys 38, which act as bearings, rotatably attached to the ends of rod 34, or roller 35, if present, to provide minimal resistance to raising and lowering of rod 34 or roller 35. As illustrated in FIGS. 14, 16 and 17, it is not necessary for the opposing ends of rod 34 to be captured within channel members 28 and 29 or guide cables 30, although this is preferred if roller 35 is not present. However, if roller 35 is present, the opposing ends of roller 35 are preferably captured within opposing channel members 28 and 29 or guide cables 30 such that roller 35 can travel vertically as pipe 31 is rotated, but cannot pivot in the horizontal plane about its mid-point or move significantly along its axis.

In another alternative embodiment shown in FIGS. 16 and 18, end 23 of the cover can be fixedly attached to rod 34. At least one cord 39 encircles rod 34 and is attached at one end to pipe 31 and at a second end to a point above the maximum height of rod 34 when fully raised. As pipe 31 rotates, cords 39 are wound around pipe 31, effectively shortening the length of cords 39. As a result, rod 34 is rotatably raised and end 23 is wound around rod 34. In this embodiment, roller 35 is preferably included and is again located above rod 34 and separated therefrom by cords 39. The opposing ends of roller 35 are captured by channel members 28 and 29, or guide cables (not shown). Alternatively, roller 35 could be located between cords 39 and cover 18, shown in FIG. 18.

In another alternative embodiment shown in FIGS. 19 and 20, a dual curtain assembly includes channel members 28 and 29 wherein each channel member has a rigid guide flange 69 which extends the vertical length of the channel members. In this embodiment, there are two covers 18, two rods 34 having pulleys 38 mounted on the ends, and four sets of complementary closure members 26 and 27, with closure members 26 utilized with the cover farthest from the portal being mounted on the channel members. Pulleys 38 engage flange 69, which is shown as a T-track, such that as pipes 31 rotate to vary the length of covers 18, rods 34 urge closure members 26 and 27 into sealing engagement. The pulleys may be resiliently mounted or made of a resilient material to urge the closure members into sealing engagement. Pipes 31 can be independently driven such that both covers 18 can be raised or lowered at the same time, or in the alternative, one cover can be raised while the other is lowered. This design may become useful where the covers are comprised of different materials suitable for different purposes and it is desirous to block various elements at the same or different times, such as sunlight only, sunlight and wind, wind only, wind and rain, etc. It should also be noted that the "T" track may be an "L" track in an assembly utilizing only one cover.

The control mechanism may be any of a number of mechanisms depending on the needs of the application of the invention. For example, in a livestock confinement house where temperature control is a necessity, the present invention may be used as a cover for a ventilation fan, and as a variable height curtain over a window. In this situation a temperature controller such as the type manufactured by Hired Hand

Manufacturing, Inc. may be attached to each motor for each curtain and constantly monitor the temperature in the house. In this manner, the fans may be uncovered and actuated, and the curtain raised or lowered to meet specific airflow conditions. In another example, the present invention may be used in a greenhouse, having a need to control the amount of sunlight on certain plants during particular months. In this situation, the motor may be controlled by a timer or may be connected to a sensing system connected to a plurality of photocells that incrementally indicate to the motor how much of the curtain should be raised or lowered. Likewise, the opening can be monitored to close during a rain shower. In the simplest case a switch to turn the motor on and off may be provided. Furthermore, limit switches of various kinds may be placed at various locations to further control the movement of the curtain, such that it may eliminate air currents or the like.

It is ostensibly noteworthy to mention that the present invention is not limited to vertical portals, but can be used with portals ranging from vertical to horizontal or any angle therebetween. Additionally, the present invention is not susceptible to sliding friction between the parts because all of the mating surfaces are contacting each other in a rolling relationship. Therefore, wear on the curtain is minimized, and the drive units do not have to overcome friction to position the curtain. Furthermore, the curtain is not susceptible to jamming due to debris being wedged into sliding engagement with a component since no sliding movement is provided. Accordingly, we have developed a roll-up curtain system that is amenable to a variety of uses in numerous applications from residential to commercial to botanical to agricultural.

While I have shown my invention in various forms, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various changes and modifications without departing from the spirit thereof.

The embodiments of the invention in which an exclusive liberty or privilege is claimed are defined as follows:

1. Apparatus for sealably covering and uncovering a portal characterized by a pair of spaced apart opposing members defining lateral margins (12, 13) of said portal (11); a flexible cover (18) having elongated side portions (21, 22), a first end (19) and a second end (23) each having a dimension commensurate with the separation of the opposing members, with said first end being fixedly attached across said portal at a first end (17) thereof, said second end folded back on itself to define a pocket opening toward said first end; an elongated rod (34) captured within said pocket; means operatively connected to said rod for biasing said rod toward a second end (14) of said portal to maintain said cover taut between said first end and said second end of said cover; means (26, 27) for releasably and repeatedly attaching said elongated side portions to said lateral margins concomitantly with positioning said elongated rod at selected positions; and means (31, 33) operatively connected to said second end of said cover for urging said second end along a path parallel to said margins such that said pocket is positioned at selected locations.

2. Apparatus as defined in claim 1 wherein said urging means comprises a first driven roller (31) mounted adjacent said portal cooperatively connected to said second end of said cover and said biasing means comprises a second driven roller (71) operatively connected to said elongated rod such that said second driven roller works cooperatively with said first driven roller to maintain said cover taut between said first end and said second end of said cover as said first driven roller positions said pocket at selected locations.

3. Apparatus as defined in claim 1 wherein said means for biasing comprises a spring assembly, said spring assembly including a spring (49) mounted to said second end of said portal, and a cord (51) connected at one end to said spring and at an opposite end to said urging means, said cord passing through said rod and about a plurality of pulleys (52, 53, 54) such that as said urging means positions said pocket at selected locations, said urging means concomitantly varies the length of said cord such that said cover is continually taut between said first end and said second end of said cover as said urging means positions said pocket at selected locations.

4. Apparatus as defined in claim 1 wherein said means for biasing comprises a spring assembly, said spring assembly including a spring (62) positioned adjacent said second end of said portal, and at least two cords (61), wherein each of said cords has a first end connected to said spring and a second end connected to said urging means, wherein each of said cords passes about an end of said rod and about a plurality of pulleys (63, 64) such that as said urging means positions said pocket at selected locations, said urging means concomitantly varies the length of said cords such that said cover is continually taut between said first end and said second end of said cover as said urging means positions said pocket at selected locations.

5. Apparatus as defined in claim 1 wherein said means for biasing comprises an elastic cord (66) connected to each end of said rod and passing about a plurality of pulleys (67) mounted to said second end of said portal such that as said urging means positions said pocket at selected locations, the tension of said cord varies such that said cover is continually taut between said first end and said second end of said cover as said urging means positions said pocket at selected locations.

6. Apparatus for opening and closing a portal in a structure characterized by a pair of spaced apart opposing lateral margins (12, 13) of said portal (11); a flexible cover (18) having elongated side portions (21, 22), a first end (19) and a second end (23) each having a dimension commensurate with the separation of the lateral margins, with said first end being fixedly attached across said portal at a first end (17) thereof, said second end folded back on itself to define a pocket opening toward said first end; an elongated rod (34) captured within said pocket; a weighted roller (35) supported on and separated from said elongated rod by

said second end of said cover and means (31, 33) for urging said second end along a path parallel to said margins such that said elongated rod is positioned at selected locations.

7. Apparatus as defined in claim 6 wherein said lateral margins include means for holding opposing ends of said rod such that said rod may travel freely in a direction parallel to said margins but is substantially prevented from movement transverse to said margins.

8. Apparatus as defined in claim 7 wherein said weighted roller has opposing ends also confined by said holding means such that said roller may travel freely in said direction parallel to said margins but is substantially prevented from movement transverse to said margins.

9. Apparatus as defined in claim 6 wherein said lateral margins include means for holding opposing ends of said weighted roller such that said roller may travel freely in a parallel direction but is substantially prevented from transverse movement.

10. Apparatus as defined in claim 6 or 7 further comprising a second flexible cover (41) having a length greater than the length of said lateral margins of said portal, elongated side portions, a first end and a second end each having a dimension commensurate with the separation of said lateral margins of said portal, with said first end being fixedly attached across said portal at an upper end (42) thereof, said second end (43) folded back on itself to define a second pocket within which said weighted roller is captured, with the second end of said second cover and the second end of said first cover adapted for concomitant motion.

11. Apparatus for opening and closing a portal in a structure characterized by a pair of spaced apart opposing lateral margins (12, 13) of said portal (11); a flexible cover (18) having elongated side portions (21, 22), a first end (19) and a second end (23) each having a dimension commensurate with the separation of the lateral margins, with said first end being fixedly attached across said portal at an upper end (17) thereof; an elongated rod (34) fixedly attached to said second end of said cover; means (31, 33) for urging said elongated rod along a vertical path such that said elongated rod is positioned at different heights; and a weighted roller (35) supported on said elongated rod and separated therefrom by said urging means.

12. Apparatus as defined in claim 11 wherein said means for urging comprises a driven roller (31) mounted superjacent said portal; and at least one cord (39) encircling said elongated rod and separating said elongated rod from said weighted roller, said cord operatively attached at a first end to said driven roller and fixedly attached at a second end to a point above a position corresponding to the maximum height of said elongated rod such that as said cord is wound around said driven roller, said lower end of said cover is wound around said elongated rod as said elongated rod is rotatably positioned at different heights.

13. Apparatus as defined in claim 6 or 11 further comprising means for releasably and repeatedly attaching said elongated side portions to said lateral margins concomitantly with positioning said elongated rod at selected positions.

14. Apparatus as defined in claim 13 wherein said attaching means includes hook and loop fasteners (26, 27) cooperatively affixed to said elongated portions and said lateral margins.

15. Apparatus as defined in claim 7 or 9 wherein said holding means comprises opposing channel members (28, 29).

16. Apparatus as defined in claim 7 or 9 wherein said holding means comprises a pair of guide cables (30).

17. Apparatus as defined in claim 7 or 9 wherein said holding means are engaged by rotatable pulleys (38) mounted coaxially on each end of said elongated rod.

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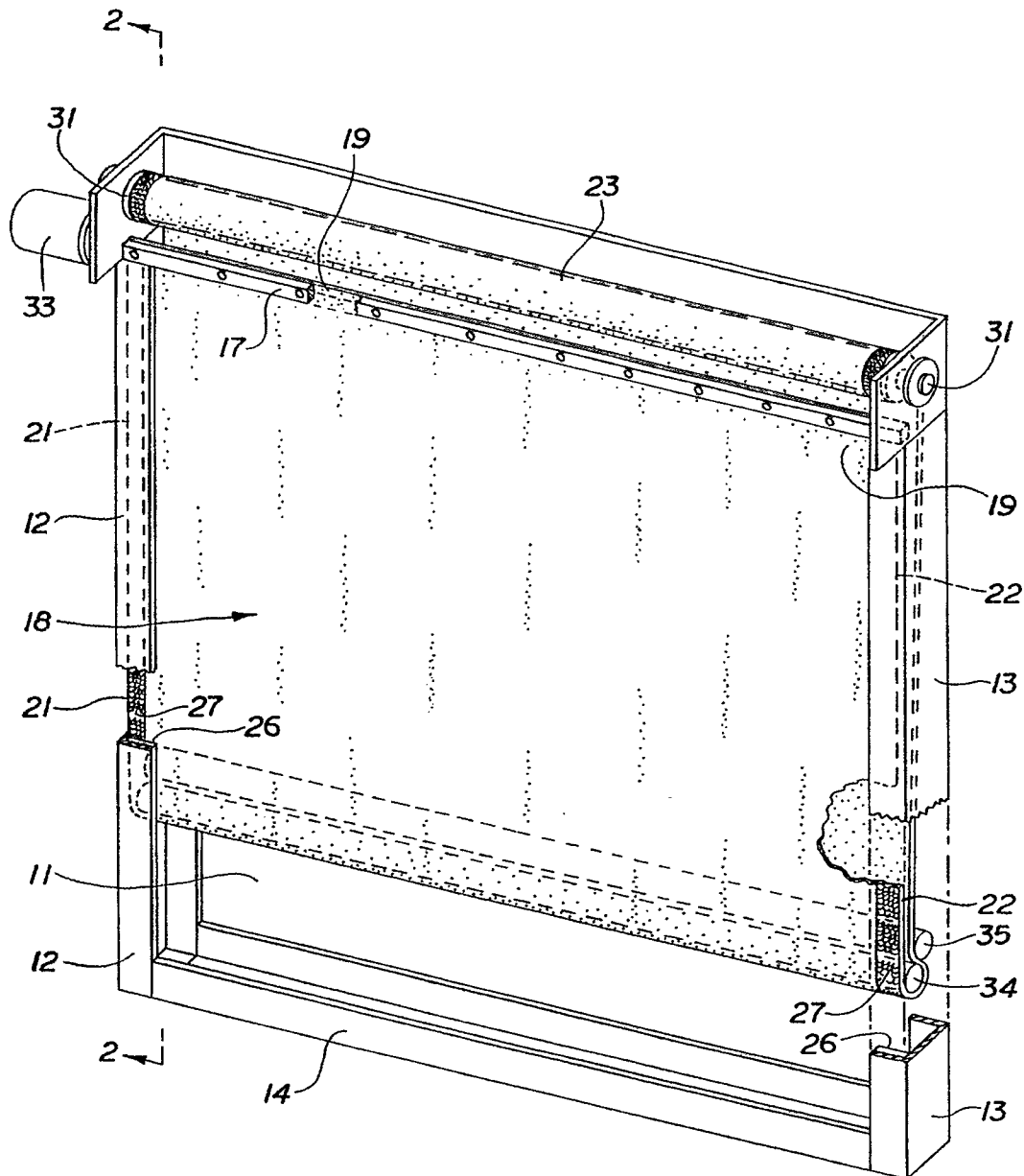
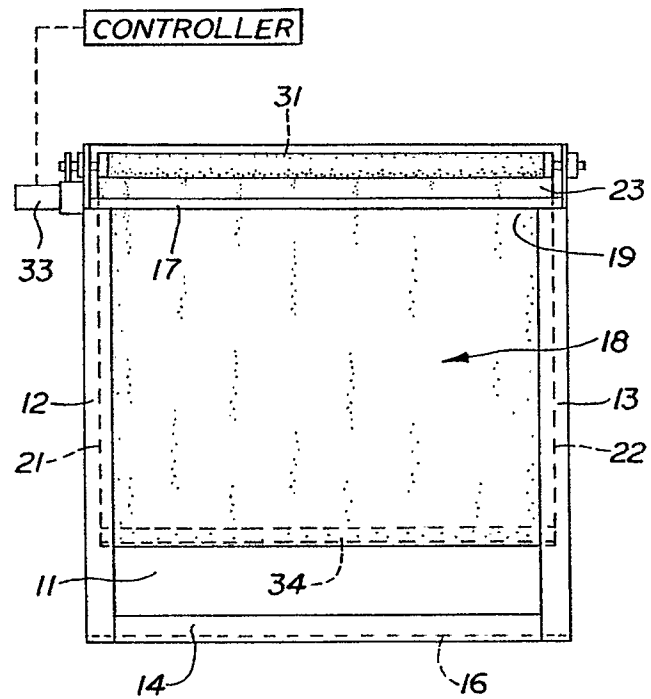
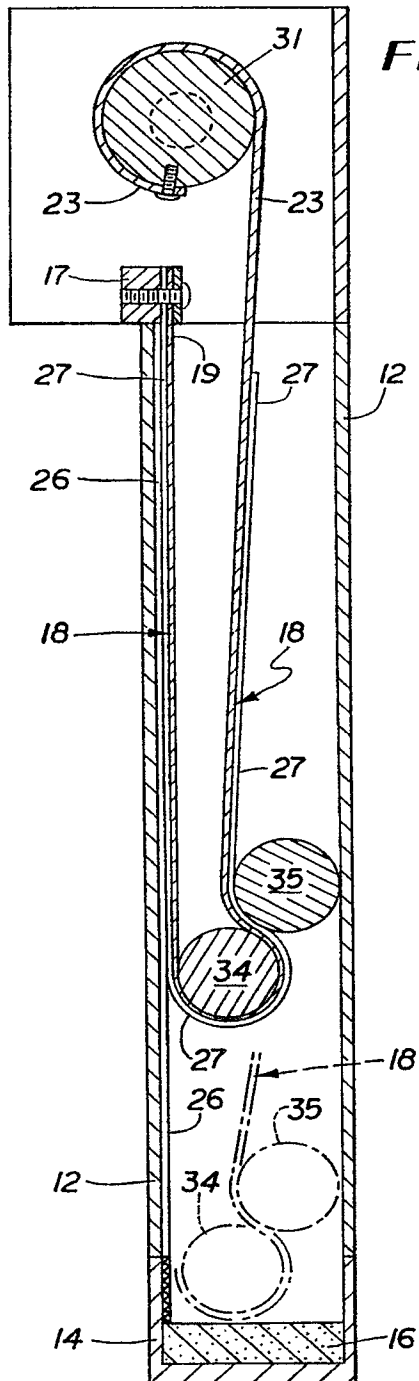
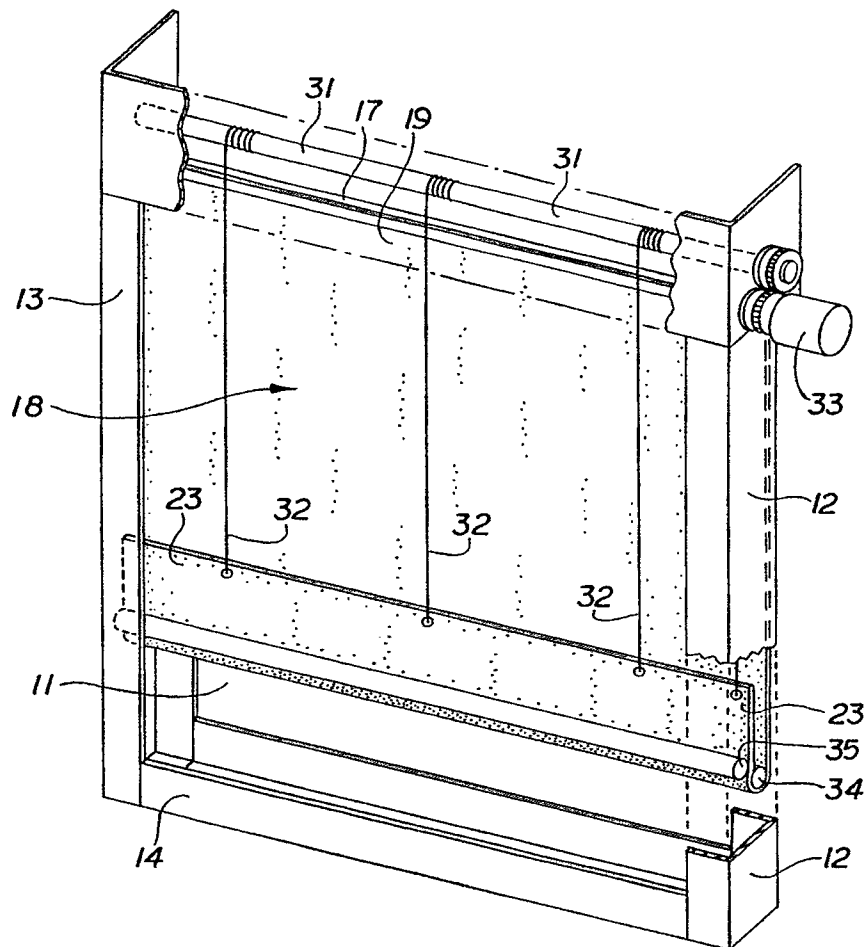


FIG. 1

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**FIG. 4**

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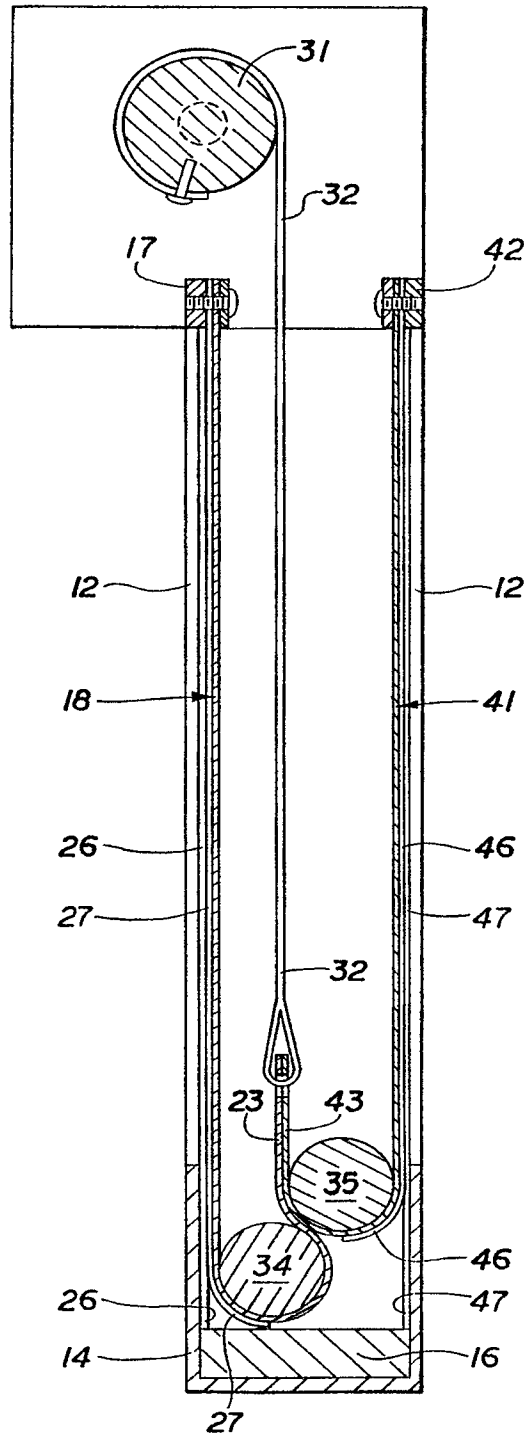
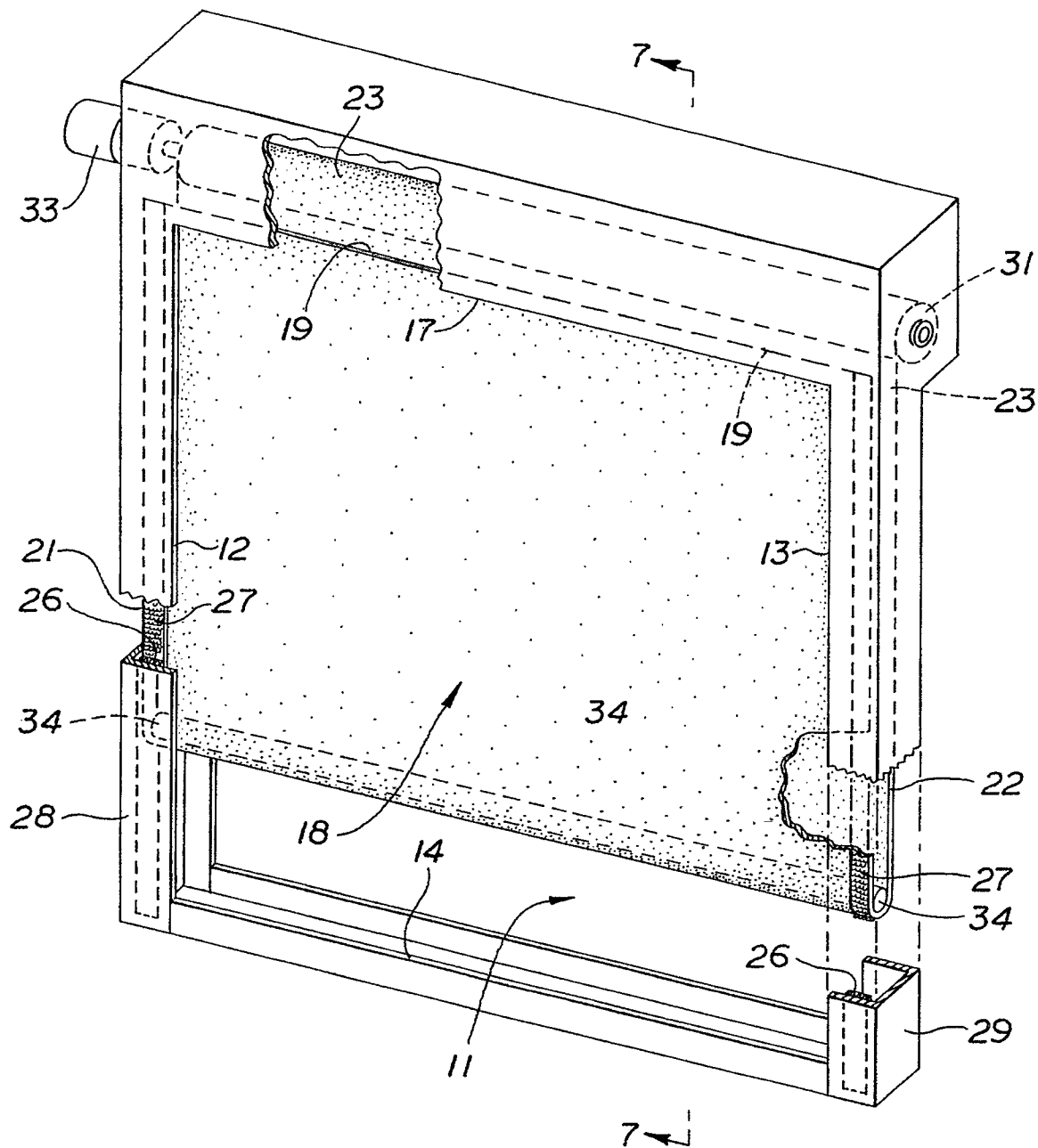


FIG. 5

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FIG. 6



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FIG. 7

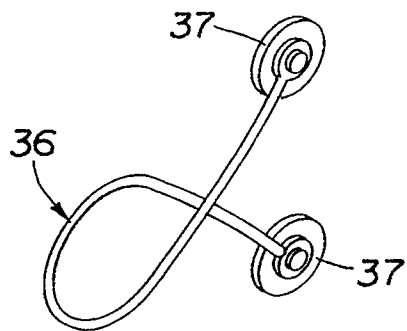
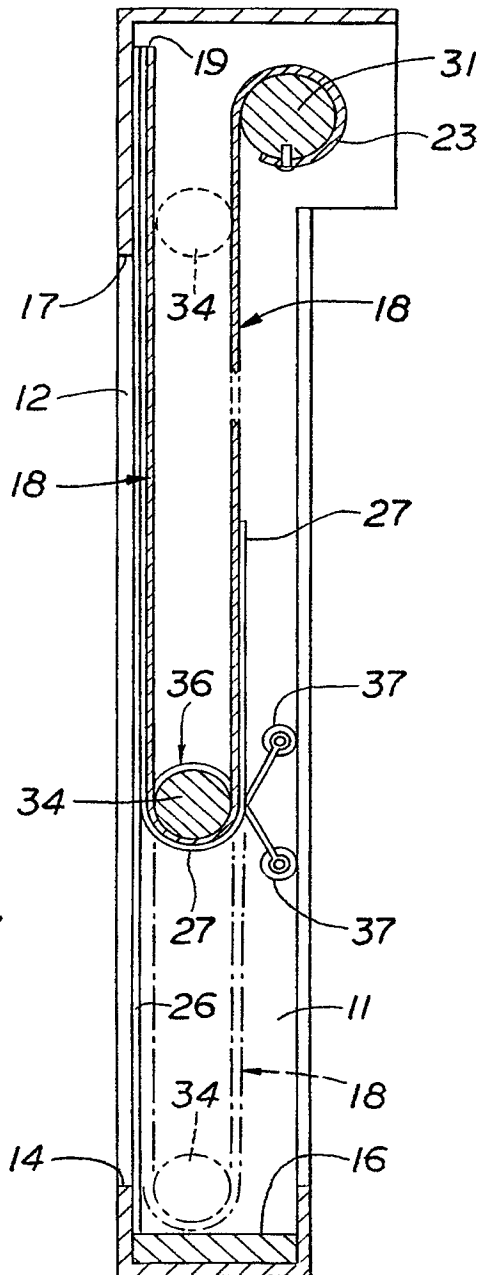


FIG. 8

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FIG. 9

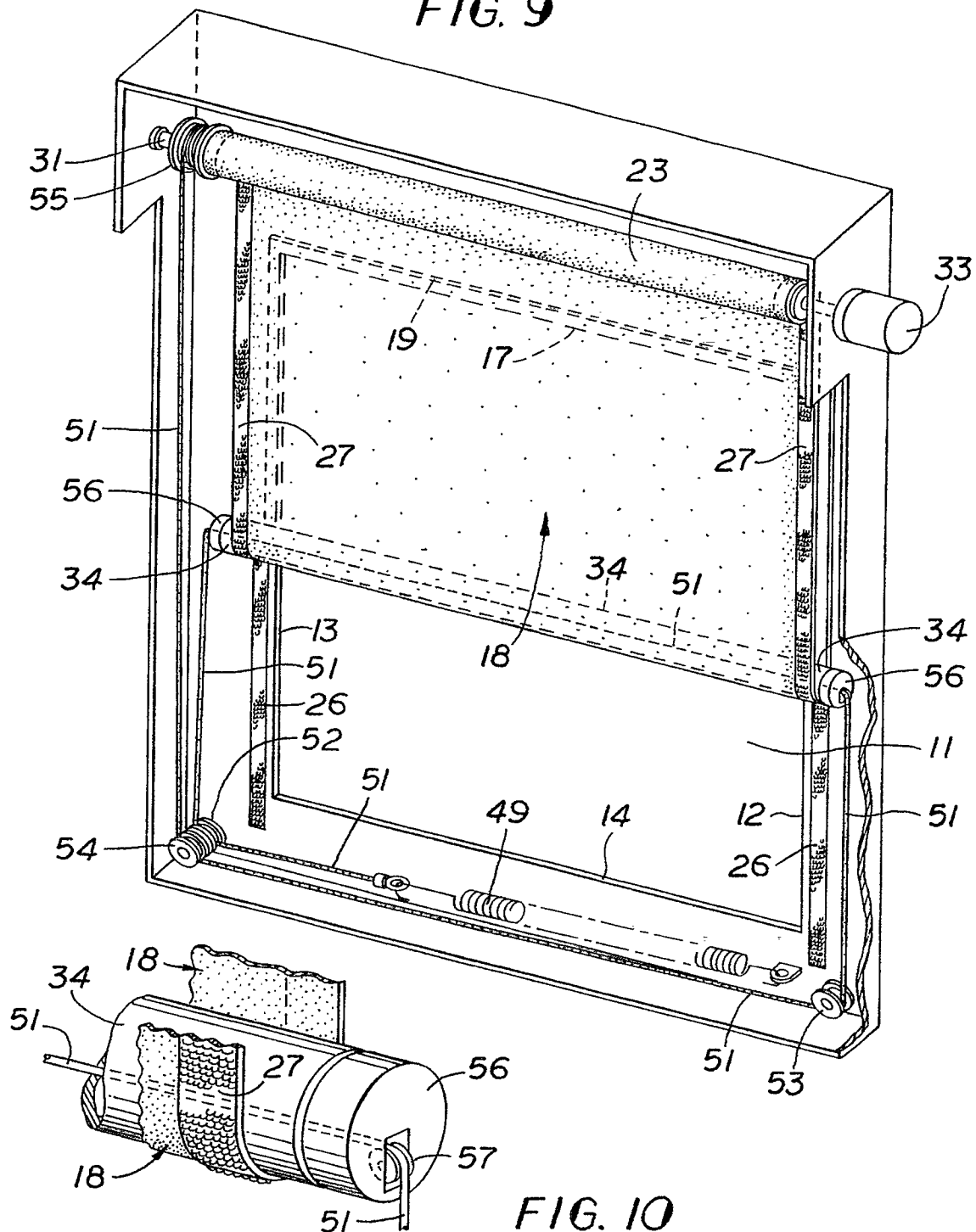
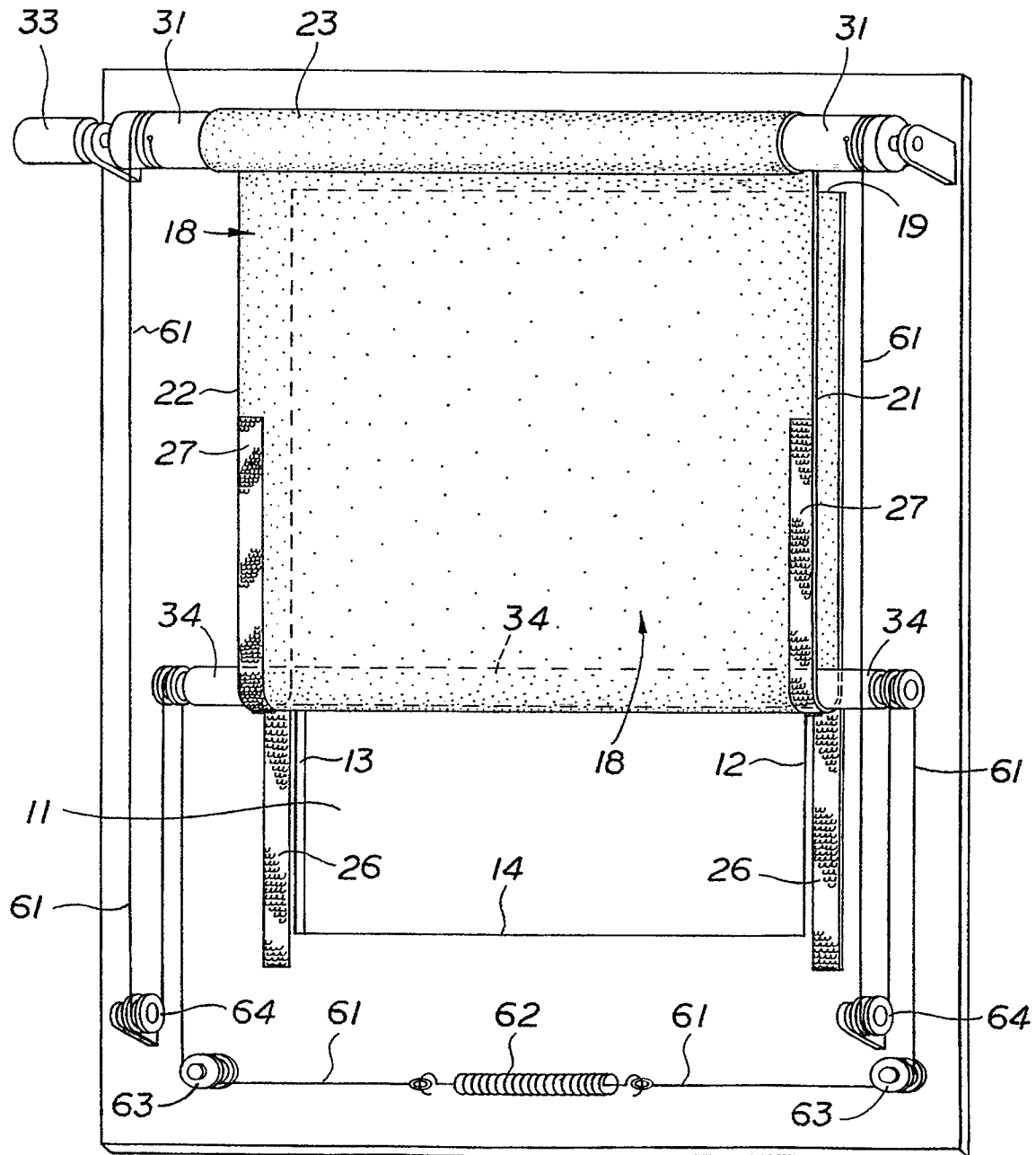


FIG. 10

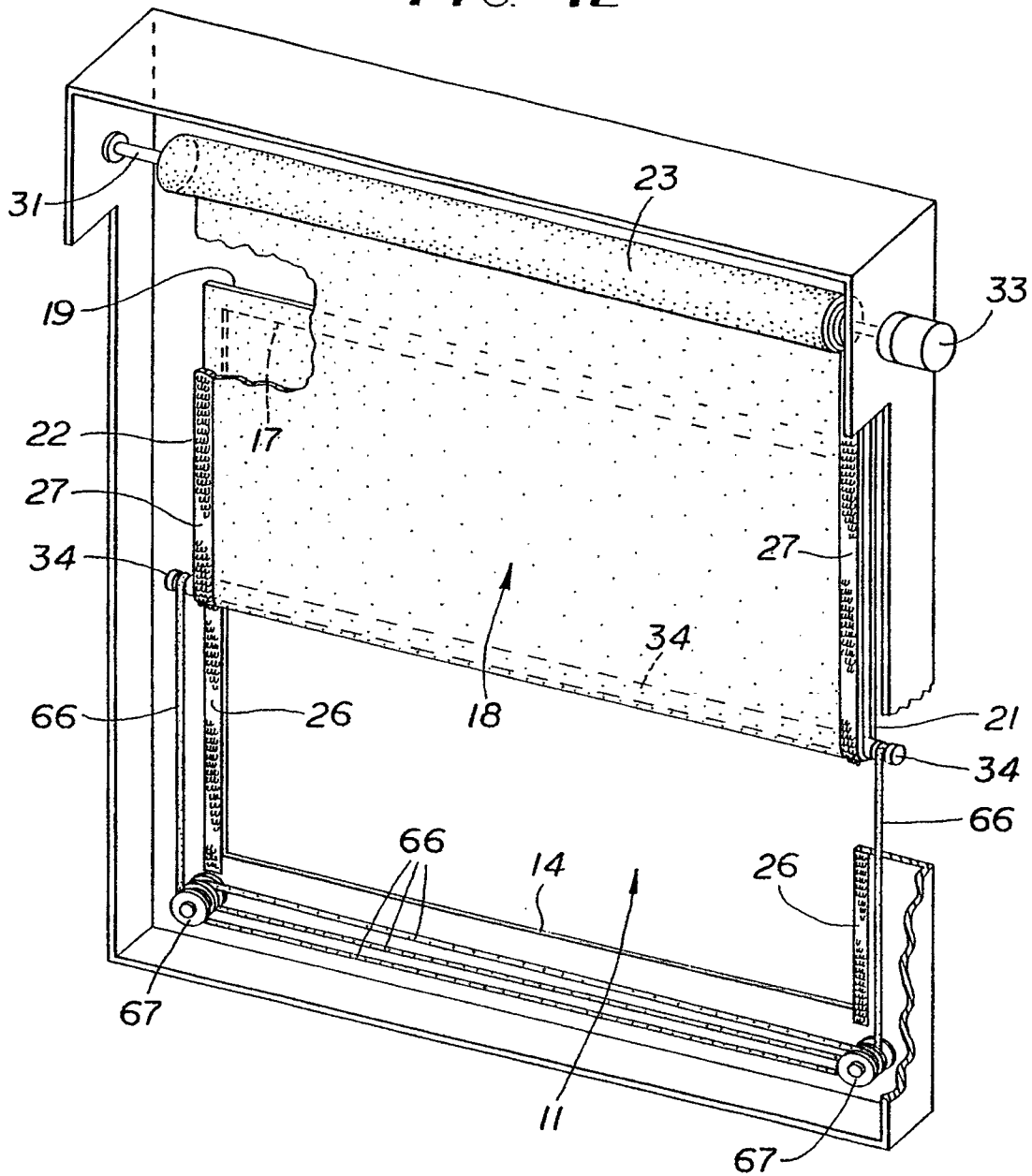
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FIG. 11



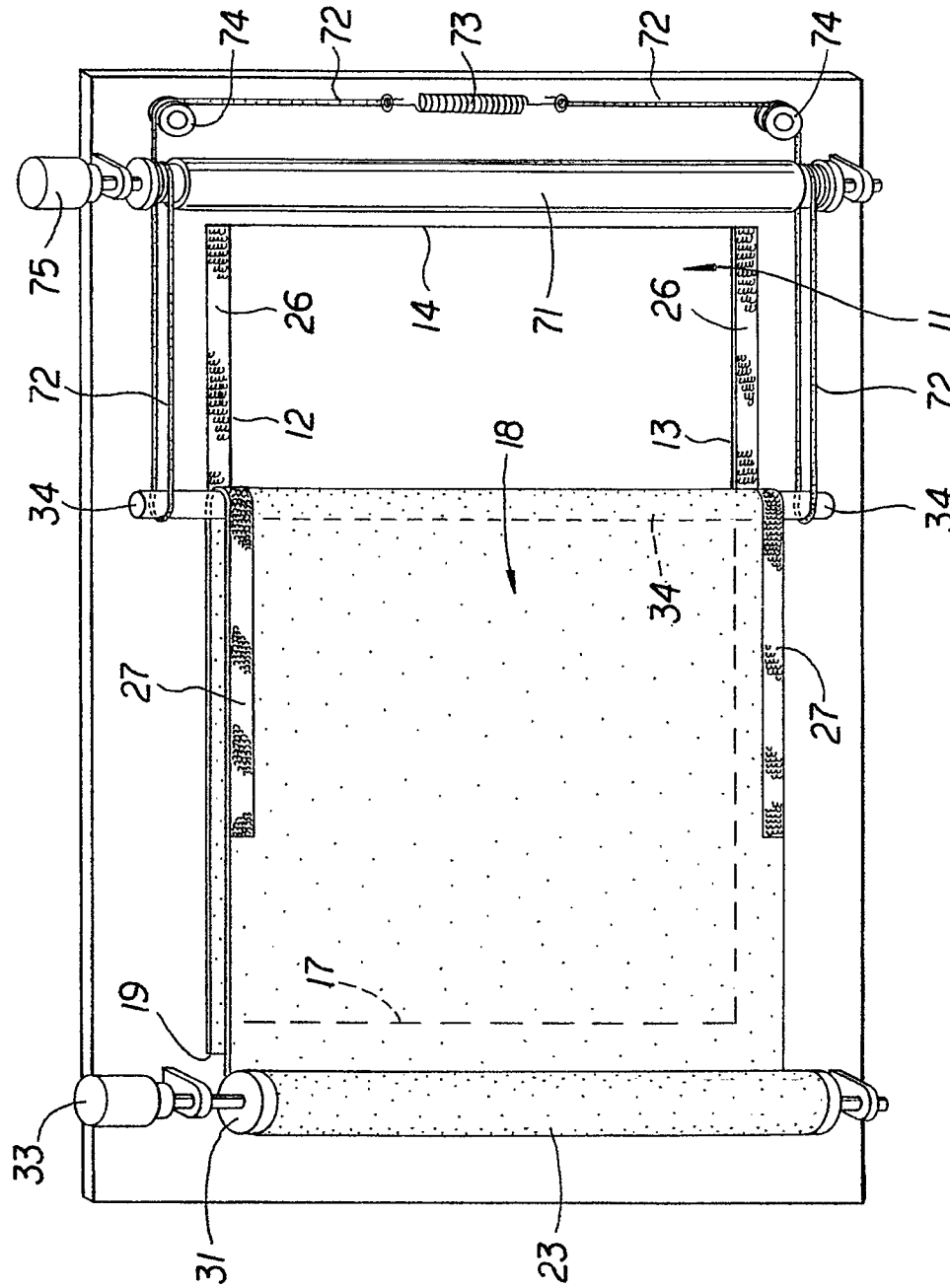
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FIG. 12



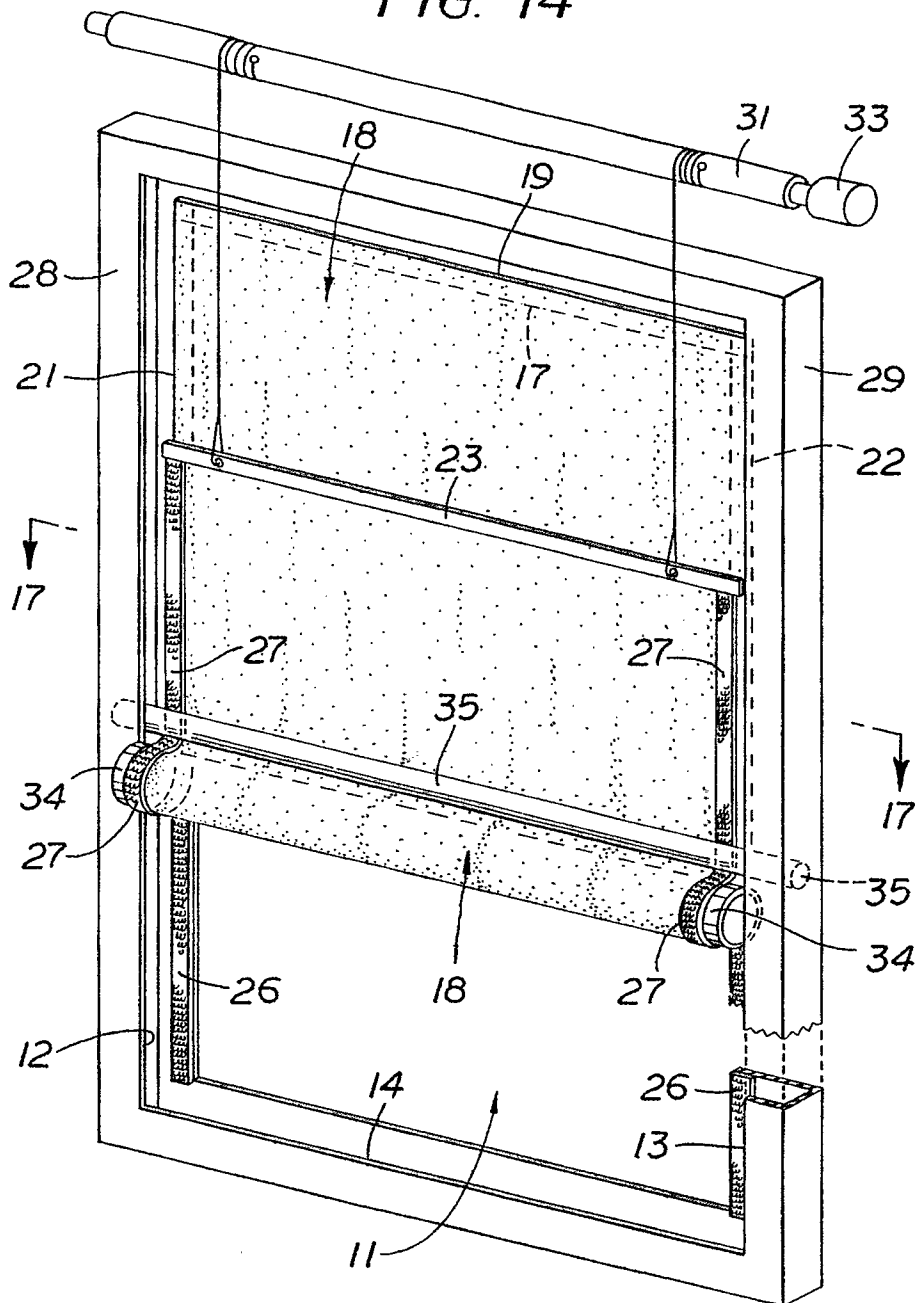
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FIG. 13



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FIG. 14



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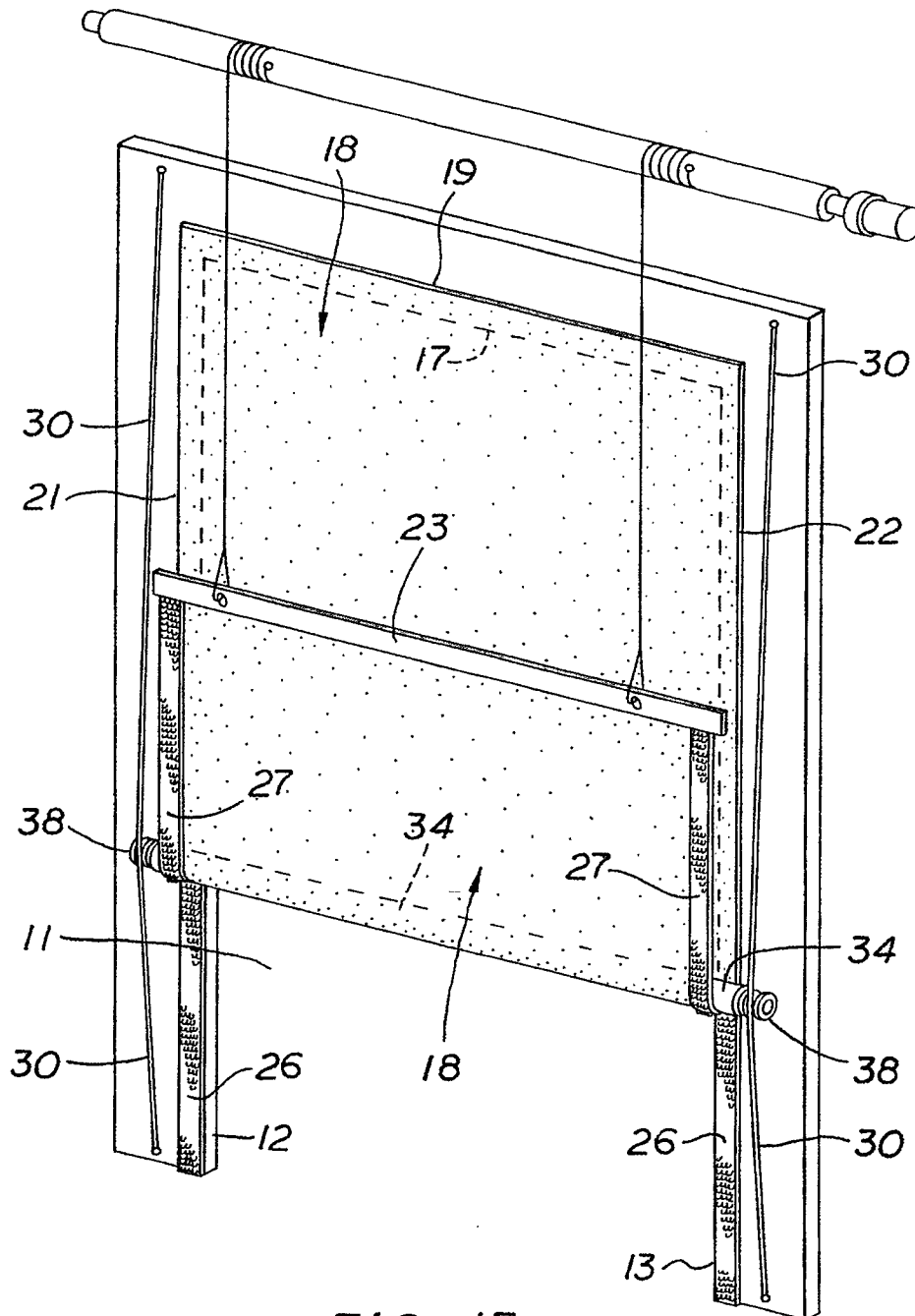
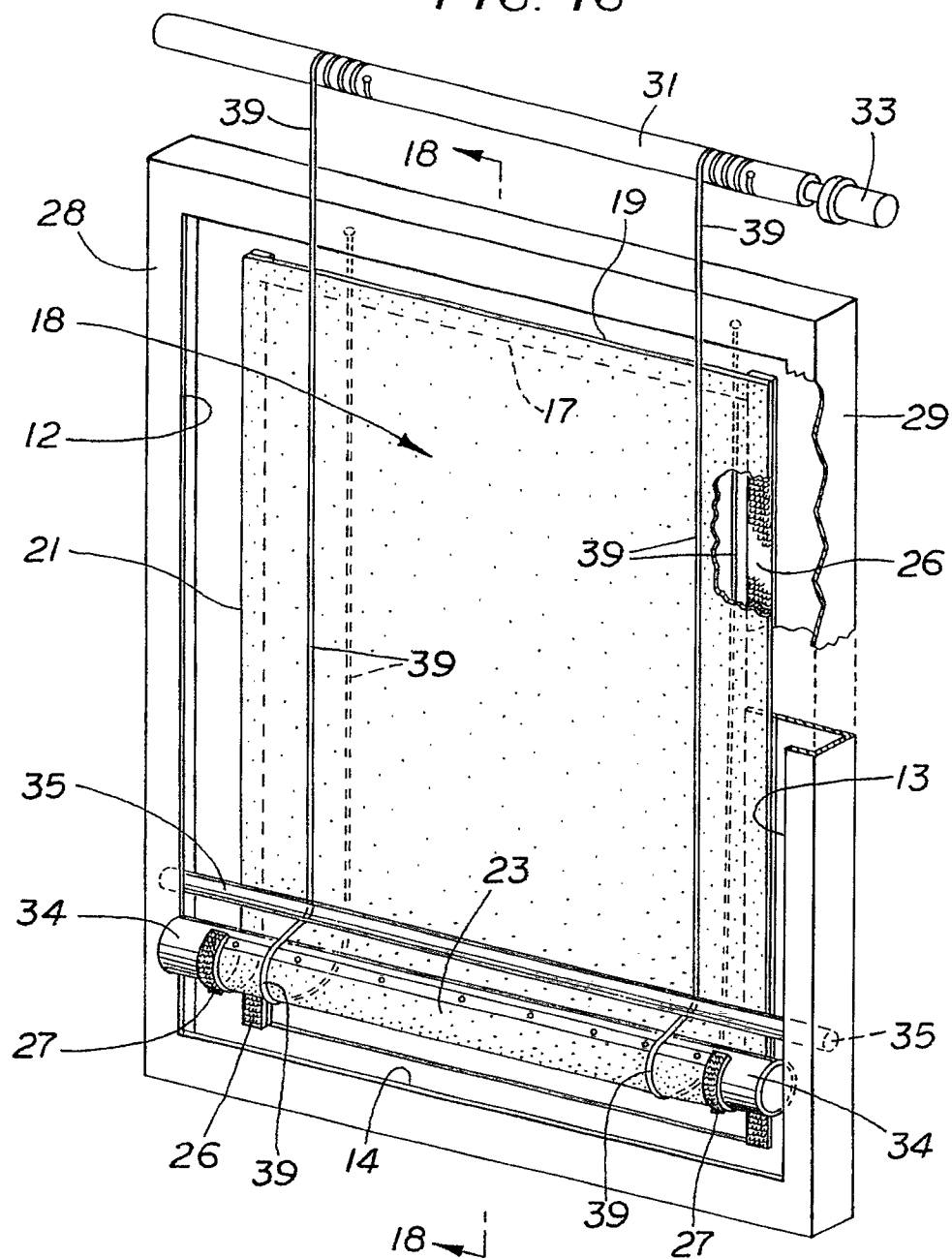


FIG. 15

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FIG. 16



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FIG. 17

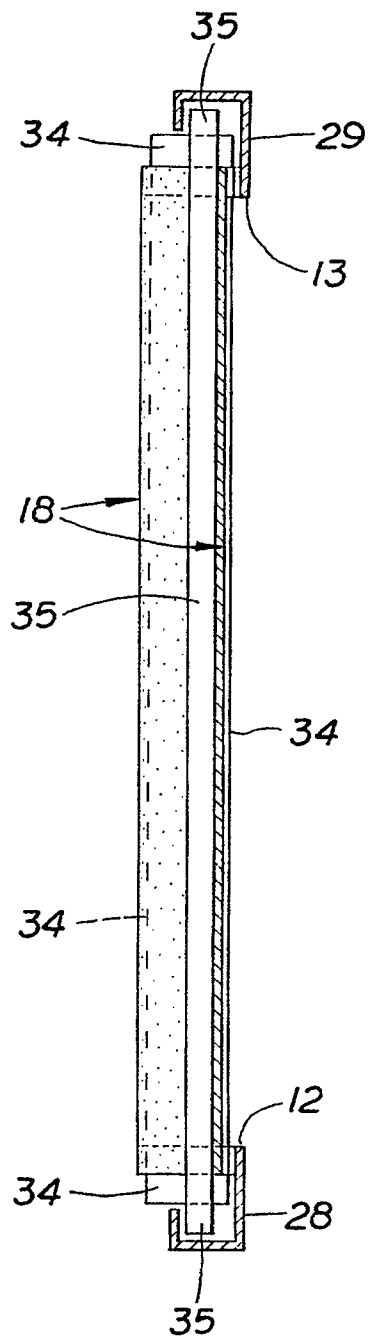
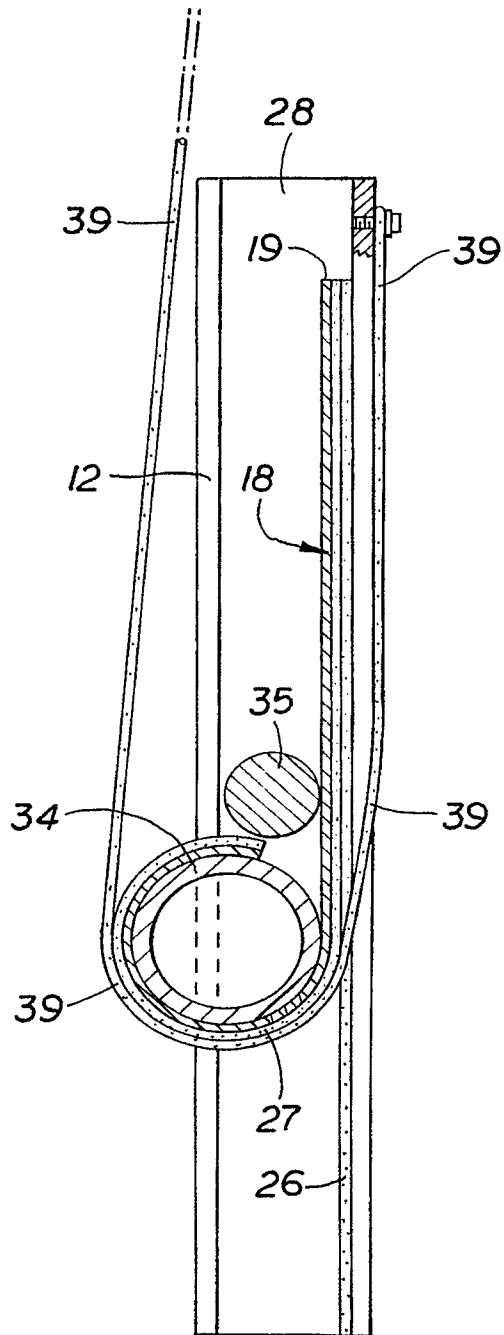
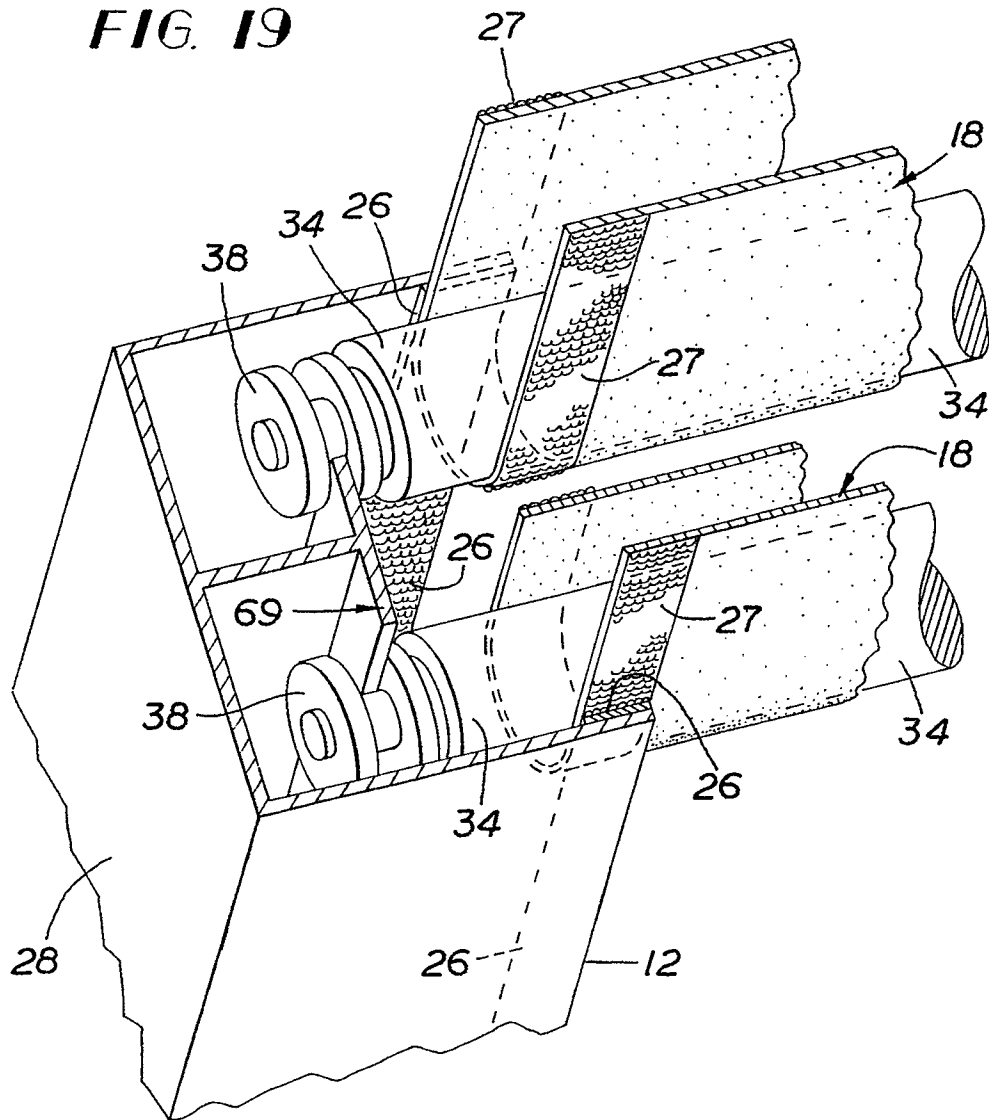


FIG. 18



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FIG. 19

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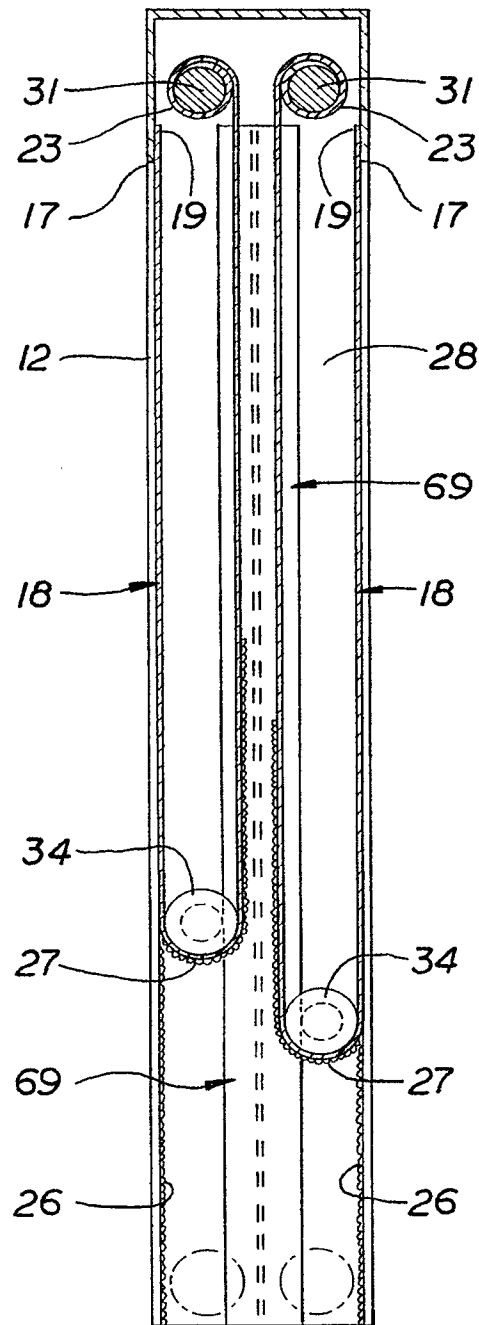


FIG. 20

