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(54) Sealing system for movable insulation.

(57) A curtain 12 of pocket-forming material layers (22, 32) is sealed by seal strips (46, 50, 62, 66) on the edges of the layers which slidingly engage seal guides (74, 78, 84, 88) provided in side frame channels (18, 20), and a housing structure (16) forms a top seal for the curtain (12). Weight bars (28, 38) in the lower extremities of the sheets (22, 32) enhance the seal on the bottom and keep the layers of material separated, and rotatable separating rollers (102, 104, 106) in housing (16) keep the layers separated and help in forming a top seal. A smooth operating manual chain drive (110, 112) and anchor mechanism (120) is provided, as well as a removable decorative fabric (54) for the front of the assembly.

Alternative embodiments include top seal guide extensions for separating the layers, a bottom curved seal guide for accommodating the lower ends of edge seal strips (46, 50, 62, 66) to prevent binding and loss of bottom seal by accommodating differential length movement of front and rear layers (22, 32), and edge seals for inner layers adapted for sealing edges as well as for maintaining layers separate in non-vertical applications.

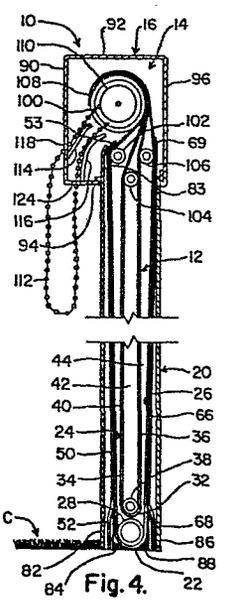

Fig. 4.

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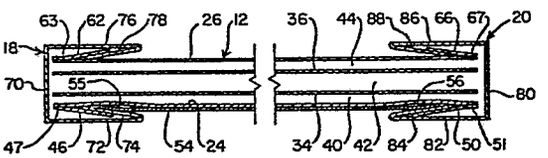
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Fig. 6.

SEALING SYSTEM FOR MOVABLE INSULATION

This invention concerns the technical field of movable insulation devices for covering window and wall surfaces, and concerns improved edge seals for such movable insulation devices for minimizing air currents within the devices and for retaining the edges in a track.

BACKGROUND ART

Movable insulation adapted to take advantage of the sun for efficient heating and cooling of the interiors of such buildings is beneficial and being used widely, particularly over large window areas such as those in commercial buildings and in passive solar homes. There have been many curtains developed that move into place over windows and retract away from the window surfaces to maximize the use of the day and night cycles of the sun. The most popular of these devices have usually included some variations of multiple layer curtains which form insulating air pockets between the layers. Examples of such devices include those disclosed in U.S. Patent Number 4,039,019, issued to T. Hopper, and U.S. Patent Number 4,187,896, issued to R. Shore. The disclosures in both of those patents recognize the importance of sealing the sides and ends of the insulation against infiltration and convection currents in order to maximize the use of the air pockets for insulation. These and other prior art devices have so far continued to suffer from significant insulation value losses due to

infiltration and convection currents because of inadequate seals around the sides and edges of the air pockets formed by the multiple layer movable insulation forming materials. Also, the edge seals in prior art movable insulation are difficult to maintain in non-vertical intallations and where pressure and volume between the insulation layers becomes too great.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide effective seals for the sides and edges of movable multiple layer air pocket insulation devices.

Another object of the present invention is to provide seals for the layers of multiple layer movable insulation devices which can accommodate sliding movement of the layer edges and which positively engage and retain the layers of insulation forming material in the guides as the insulation is moved into and out of place.

An additional object of the present invention is to provide seals which can accommodate differential movement between various layers of the insulation forming material.

Still a further object of the present invention is to provide removeable decorative fabric coverings for such multiplelayer movable insulation devices which is attractive, fully movable without jamming or wrinkling, and yet which does not interfere with the seals for the sides and edges of the layers of insulation forming material while providing a positive mechanical seal against infiltration.

The present invention is directed to a system and structure for sealing all edges of multiple layer movable insulation devices to minimize infiltration and convection currents. The side seals include returned edge strips along the lateral edges of the layers which engage oppositely directed rigid seal guides formed in enclosed side frame channels. The positive mechanical engagement of the seal strips with the seal guides prevent the layered sheets from being pulled out of the frame channels as the insulation forming materials are being moved. The seals also include sealing edges along the tops and bottoms of the multiple layered fabrics, the bottom which seals on the floor and the top which seals under or within an enclosed housing that covers the retraction roller assembly. The seals are also adapted to maintain physical separation of the layers even when the movable insulation forming layers are positioned in non-vertical applications. The invention also includes advantageous use of a decorative fabric covering which is easily detachable and removable from the front of the insulation forming material, and which runs within the side frame channels along with the insulation forming sheets but which does not interfere with the seals. Advantageous positioning of the roller assembly housing structure in relation to the side frame channels provides an easily accessible, smoothly operating, front depending pull chain drive for manually operating the retraction roller assembly.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a perspective view of the movable insulation assembly 10 of the present invention shown with the insulation in place over a window, and various cutaway portions illustrate the components and structure;

Figure 2 is a front elevation view of the movable insulation assembly shown with the insulation moved to the raised position to expose the window over which it is positioned;

Figure 3 is a left side elevation view of the movable insulation assembly in position over the front of a window;

Figure 4 is a sectional view of the movable insulation assembly taken along lines 4-4 of Figure 2;

Figure 5 is an enlarged elevation view of the upper right portion of the movable insulation assembly to illustrate the chain lock device;

Figure 6 is a cross section view of the insulation material and its seal components taken along lines 6-6 of Figure 2;

Figure 7 is a sectional view of the movable insulation assembly taken along lines 7-7 in Figure 2;

Figure 8 is a perspective view of a section of the left side frame channel showing the structure of the seal guides therein;

Figure 9 is a perspective view of the lower left portion of the insulation material showing a typical detail of the seal;

Figure 10 is a cross section in elevation similar to Figure 7, but showing a variation of the decorative fabric attachment to create a positive mechanical seal with the roller assembly housing;

Figure 11 is a sectional view of an alternative embodiment of the roller assembly, seals, and side frame channels taken along lines 11-11 of Figure 2;

Figure 12 is a perspective view of the upper portion of the left side channel frame assembly of the alternative embodiment of Figure 11;

Figure 13 is a perspective view of the bottom portion of the left side frame channel seal assembly with a bottom curved seal guide;

Figure 14 is a sectional view in elevation of the bottom portion of the left side channel frame assembly shown in Figure 13 with the insulation material in lowered position and showing the position of the seal strips therein in the curved seal guide;

Figure 15 is a perspective view of the front lower left portion of another alternative embodiment of the insulation material showing the details of seals for both the inner and outer layers of the insulation material; and

Figure 16 is a perspective view of a portion of the left channel frame assembly of an alternative embodiment designed to guide and hold the seals of the insulation materials shown in Figure 15.

DETAILED DESCRIPTION

The movable insulation assembly 10 of the present invention, shown in Figures 1-4, is comprised essentially of several layers of a curtain 12 forming insulation air pockets 40, 42, 44, a roller assembly 14 for raising and lowering the curtain 12, left and right frame channels 18, 20 respectively, for sealing the sides of the insulation pockets, and a roller assembly housing 16 for covering the roller assembly and sealing the top portion of the movable insulation assembly 10. When the curtain 12 is in position over a window W, the air in the insulation pockets 40, 42, 44 expand to provide an effective insulation barrier to thermal conductivity through the window. The window W is shown in Figure 3 mounted in frame F in a conventional manner, and the movable insulation assembly 10 is shown mounted directly in front of the window W.

For a more detailed description of the curtain 12, reference is made to Figures 1, 4, 6, and 7. The curtain 12 is basically comprised of two sheets of insulation pocket-forming material of fabric or film, including an outer sheet 22, having a front and rear layers portions 24 and 26, and an inner sheet 32 having front and rear layer portions 34 and 36. Both the outer and inner sheets 22, 32, respectively, are fastened along their upper edges to a main roller 100 by suitable fasteners, such as the adhesive strip 108. Sheets 22, 32 depend downwardly in double layers with the front and rear layers 34, 36 of inner sheet 32 positioned between the front and rear layers 24, 26 of the

outer sheet 22. Inner and outer weight bar 38, 28 are positioned to hang in the lower extremity of sheet 22, 32, and maintain sheets 22, 32 fully extended in such a manner that air spaces on pockets 40, 42, 44 are formed between the layers of the sheets to function as thermal insulation. Thus, an insulation pocket 40 is formed between the front layers 24, 34, insulation pocket 42 is formed between the front and rear layers 34, 36, and an insulation pocket 44 is formed between the rear layers 26, 36 of the respective front and rear sheets 22, 32. As the air in the insulation pockets 40, 42, 44 is heated by the sun, the air expands causing the sheets 22, 32 to inflate as shown in Figures 3 and 7 to result in a significant value of thermal insulation. The sheets 22, 32 can be raised and lowered by rotating the main roller 100. Manual drives for rotating the main roller can be used, as shown in Figures 1 through 4, or powered motors can be used.

A significant feature of this invention is the improved seals for sealing the top, bottom and sides of assembly 10 against infiltration and convection air currents. As best seen in Figures 4, 6 and 9, elongated flexible sealing strips 46, 62, 50, 66 are attached to the lateral edges of the outer sheet 22. For example, a flat, elongated flexible sealing strip 46 is attached by stitching 47 to the left edge of front layer 24 in such a manner that it returns along the outside surface of the front layer 24, and the flexibility of the material leaves a narrow space between the sealing strip 46

and the front layer 24. A similar sealing strip 62 is attached by stitching 63 to the left edge of the rear layer 26 in a manner such that the strip 62 returns a short distance along the outside surface of rear layer 26. Likewise, a sealing strip 50 is attached by stitching 51 to the right edge of outer layer 24, and the sealing strip 66 is attached by stitching 67 to the right edge of the rear layer 36 in a similar manner as the attachment of the sealing strips 46, 62 described above for the left edges. Although stitching elongated flexible seal strips to the lateral edges of the material layers as shown in the drawings and described above as one feasible manner in which the seal strips can be formed, it is also contemplated that they could be formed with equal effectiveness by other suitable attachment methods, such as adhesives, heat sealing, and the like. It is also contemplated that the seal strips can be formed merely by folding the sheet material edges back onto themselves and permenently creasing the folds. This latter method is particularly advantageous where the insulation forming sheets are plastic films in which the folds can be creased permanently by heat pressing.

Referring now primarily to Figure 8, the side channel frame members 18, 20 are provided with seal guides to run in the gaps between the sealing strips and the outer sheet. For illustration, a section of the left side frame channel member 18 is shown, and includes a side panel 70, front panel 72 extending outwardly from the front edge of the side panel 70, and a rear panel 76 extending outwardly from the

rear edge of the side panel 70. The distal end of the front panel 72 is folded inwardly toward itself to form seal guide 74, which extends toward side panel 70. A narrow gap is left between front panel 72 and seal guide 74. Likewise, the distal end of rear panel 76 is folded inwardly toward itself to form rear seal guide 78.

The seal guides 74, 78 in frame channel 18 are formed to receive the seal strips 46, 62 on the left edges of the outer sheet 22 in such a manner that a sheet 22 can slide freely in channel frame 18, but it cannot be pulled out of channel frame 18. Figure 6 illustrates the outer and inner sheets 22, 32 assembled in the left and right frame channels 18, 20. The seal guides 74, 78 in the left frame channel 18 are positioned in the gap between the seal strips 46, 62 on the left edges of outer sheet 22. When sealed in this manner, the frame channels 18 prevent any air flow from the air pockets 40, 42, 44 out the sides of the insulation forming material 12.

As the insulation pockets 40, 42, 44 between the material layers expand, the seals between the outer sheet 22 and the left and right frame channels 18, 20 are tightened to significantly increase their effectiveness in preventing infiltration and improving the thermal insulating quality of the assembly, yet the transverse forces caused by the expansion cannot pull the sealed surfaces out of the frame channels 18, 20 even when the sheets are pulled upwardly in

the channels by the roller 100 to raise the insulation assembly 12.

As best seen in Figures 4 and 9, a segment of the seal strips near the bottom of insulation forming material 12 are not attached to the outer sheet 22. This feature allows the portions of the outer sheet 22 adjacent the weight bar 28 to hang freely without causing the seal strips and sheet edges to bind in the seal assembly. Also, the rear layer 26 is positioned innermost on the main roller 100. Therefore, since the radius of curvature of the outer layer 26 around the roller 100 is greater than the radius of curvature of the inner layer 24, the outer layer 26 moves a greater distance than the inner layer 24. The loose ends or flaps 48, 52, 64, 68, accommodate this differential movement without binding the seal strips in the seal guides.

As mentioned above, the main roller 100 draws the insulating pocket-forming material 12 upwardly by rolling the material around its peripheral surface. As the main roller 100 is rotated in the opposite direction, the insulating pocket-forming material 12 is unrolled from its peripheral surface and descends downwardly in the frame channels 18, 20. As the material 12 descends downwardly, it is important that the several layers 24, 26, 34, 36 all remain separated from each other in order to form the insulation pockets 40, 42, 44 between them. If any of the layers are touching each other, the material forms a cold short in which the heat is conducted through the materials. The weight bars 28, 38 in the respective outer and inner

sheets 22, 32 function to maintain the separation of the layers toward the lower extremities of the material 12. In addition, the separation rollers 102, 104, 106 are provided under the main roller 100 to initially separate the layers as they are unrolled and to maintain the layer separation at the upper end of the material 12. The separation rollers are spaced apart with the front roller 102 positioned between layers 24, 34, the middle roller 104 positioned between layers 34, 36, and the rear roller of 106 positioned between the layers 36, 26. It is preferred that the separation rollers 102, 104, 106 are fully rotatable about their longitudinal axes. The upper extension 83 of the front panel 82 of right side frame channel 20 shown in Figure 4 helps to guide the seal strip 50 into the gap between front panel 82 and front seal guide 84 as the seal strip 50 is unrolled.

A roller assembly housing 16 comprised of a front panel 90, top panel 92, bottom panel 94, left side panel 98, and right side panel 99, contains the roller assembly 16 and seals the upper portion of the movable insulation assembly 10 from infiltration and leakage of air. In this structure, the interior of housing 16 is in communication with the air pockets 40, 42, 44 and with the interiors of frame channels 18, 20, but this entire interior air space is sealed from air outside the movable insulation assembly 10.

The main roller 100 can be either motor driven or manually rotated. In the embodiments shown in Figures 1

through 4, a manual chain drive is provided, which includes a sprocket 110 attached to the main roller 100 and a chain 112 extending forwardly and downwardly from the sprocket 110. Another significant feature of this invention is the position of the pull chain 112 in the front of the assembly instead of the conventional position at the side. The front panel 90 of the housing 16 is positioned a spaced distance forwardly of the main roller 100 and chain sprocket 110, and it is also a spaced distance forward of the insulation forming material 12 and side frame channel 20. A small opening 118 is provided in the front panel 90, and another small opening 124 is provided in forward portion of the bottom panel 94 to accommodate passage of the chain 112 therethrough. Chain guides 114, 116 are provided on the interior of the housing 16 to guide the chain from the sprocket to the respective openings 118, 124 for smooth, bind-free operation.

The opening 118 in the front panel 90 includes an anchor feature for anchoring the chain to hold the insulation forming material 12 in a raised position. The lower portion 120 of the opening 118 is wide enough to allow the ball links of the chain 112 to pass through easily. The top portion 122 of opening 118, however, is a narrow slot that is only wide enough to receive the connecting link portions of the chain 112, but not wide enough to allow the passage of the ball link portions of the chain 112. Therefore, when it is desired to hold the insulation forming material 12 in a raised position, a selected connecting link

is positioned in the narrow slot portion 122 to bind the chain against the wall of the front panel 90.

As best seen in Figures 1, 6, and 7, the decorative fabric 54 is an optional layer of pleasant looking material positioned over the front layer 24 of outer sheet 22. Fabric 54 is removably attached to front layer 24 by fastener strips 61 affixed to the decorative fabric 54 adjacent its top edge 60 and to the front layer 24 near its top just under the main roller 100. The decorative fabric extends downwardly over the front layer 24. The left edge 55 of the decorative fabric 54 is positioned to slide between the seal guide 74 and the front layer 24, and the right edge 56 is positioned to slide between the seal guide 84 and the front layer 54, as best shown in Figures 1 and 6. A weight bar 58 is also suspended at the bottom edge 57 of decorative fabric 54 by folding the end 57 to form a pocket around the weight bar 58. The weight bar 58 helps to keep the decorative fabric 54 hanging straight and to assist in forming the infiltration seal by laying on the carpet C when insulation forming material 12 is in the fully extended position. The decorative fabric 54 can be removed easily for cleaning.

There are several variations of the structure of the present invention that can be used singly or together in any combination with the embodiment already described. One example of such a variation is shown in Figure 10, where an alternative attachment of the decorative fabric 54

advantageously creates a positive mechanical seal 95 as well as tightens the fabric 54. Decorative fabric 54 is here attached at its top edge to main roller 100 a spaced distance (perferably about 120 degrees) from the attachment 128 of the insulation forming material 12 to the main roller 100. The lengths of the sheets 22, 32 of insulation forming material 12 are predetermined to reach the bottom or carpet C when the point of attachment 128 is on the lower rear side of main roller 100. In this position, the attachment 127 of decorative fabric 54 is on the lower front side of main roller 100. Therefore, as the main roller 100 rotates in the direction indicated by arrow 129 to unroll the material, just as the sheet 22 approaches the carpet, the roller 100 will begin to pull the top of the decorative fabric forward and up, as shown in Figure 10. This position causes the decorative fabric to positively form a mechanical seal at 95 with bottom panel 94 at the opening into the interior of the housing 16. A fastener strip 126 is provided to accommodate adjustment of the length of decorative fabric 54 while still forming a pocket to contain weight bar 58.

An alternative embodiment is shown in Figures 11 through 14 for application in large movable insulation assemblies for covering large windows. In very wide window applications where the roller assembly must be very long to span the window, it is impractical to use the separation rollers 102, 104, 106 of the preferred embodiment described above. The embodiment shown in Figure 11 excludes the interior of the housing 150 from the interior air pockets in

the insulation forming material 12. The interior of the insulation forming material 12 is sealed off on top at the location where it enters the housing 150 by extending the interior vertical partition 160 rearwardly toward the rear side return 164 at the base of rear panel 156 to provide only a narrow opening therebetween just sufficient to allow the passage of the layers of insulation forming material 12 therethrough as it is rolled onto and unrolled from the main roller 100. In this structure, the interior of the insulation forming material 12 between the layers thereof is confined to the insulation air pockets 40, 42, 44, and the interior of the side frame channels. The air in these insulation pockets cannot circulate into the interior of the housing 150. The respective distal ends 162, 164 of the interior partition 160 and rear return 164 also form deflation bars which squeeze the layers together and force out the air in insulation pockets 40, 42, 44 as the insulation forming material 12 is being drawn into the housing 150 to be wrapped around the main roller 100.

This embodiment shown in Figure 11 can still utilize the weight bars 28, 38 at the bottoms of sheets 22, 32, as shown in Figure 14, for spreading the layers 24, 34, 26, 36. The side frame channels shown in Figures 11 and 12 function to separate these layers as they are unrolled. For example, left frame channel includes a side panel 134 with a front panel 136 extending outwardly from the rear edge of side panel 134. The side frame channels include front seal guide

138 and rear seal guide 144 for engaging the edge seal strips 46, 62 of the outer sheet 22. However, in this embodiment, the front seal guide 138 is extended upwardly beyond the top of front panel 136 and curves slightly inwardly as shown at 140. The rear seal guide 144 also has a similar top extension 146 extending upwardly from and curved slightly inwardly from rear seal guide 144. These upper extensions 140, 146 of the seal guides 138, 134 extend to the vicinity of the opening between edges 162, 164 of the housing 150. Therefore, as the layers are unrolled off the main roller 100 and descend downwardly through the opening between edges 162, 166, the seal strips 46, 62 slide over the extensions 140, 146, respectively, thereby tending to physically pull the outer layers 24, 26 away from the inner layers 34, 36 as shown in Figure 11. The upper extension 135 of side panel 134 is provided to seal the upper end of the frame channel against the under side of the housing 150. The right frame channel is contructed in a similar manner.

Another significant feature of this invention described as a part of the alternative embodiment is shown in Figures 13 and 14. It includes a curved seal guide 170 on the bottom of the frame channel. In applications where the insulation forming material 12 is very long to cover very long or high windows, the rear layer 26 unrolls a significantly longer rear portion of material than the front layer 24 due to the differential in radius of curvatures as described above. Therefore, the lower ends 48, 64 of the seal strips 46, 62, respectively, reach the bottom of the

frame channel at different times. Because a longer length of rear layer 26 is unrolled from the main roller 100, the lower end portion 64 of the seal strip 62 reaches the bottom of the frame channel before the weight bar 28 and outer sheet 22 reaches the floor. If the end 64 of the seal strip 62 is not accommodated in some manner as it reaches the floor, it would cause the outer sheet 22 to bind up and not reach the floor or the carpet C, thus preventing a seal between the carpet C and the lower extremity of outer sheet 22. The curved poriton 170 extends from the rear panel 142 in a curvature downwardly and then upwardly to the front panel 136 to form a continuous track from the rear gap between seal guide 144 and rear panel 142 to the front gap between seal guide 138 and front panel 136. Therefore, the curved guide portion 170 causes the end 64 to merely continue by curving it downwardly and inwardly, around, and back upwardly without binding. Also, as the lower end 48 of seal strip 46 extends downwardly from front seal guide 138, it also can follow the curved guide 170 to overlap end 64 of seal strip 62 as shown in Figure 14.

Another alternative embodiment of the seals in the side frame channels is shown in Figures 15 and 16. These side seals are basically the same as those described above for the outer layers 24, 26 with the seal strips 46, 62 engaged with seal guides 74, 76, respectively. However, in this embodiment, seal strips 180, 182 are added to the lateral edges of inner layers 34, 36, as shown in Figure 15. The

inner layers 34, 36 are made slightly wider than the outer layers 24, 26 so that the lateral edges of inner layers 34, 36 extend outwardly beyond the edges of outer layers 24, 26. Seal strip 180 is attached to the edge of inner layer 36 by stitching 183 in a manner similar to the attachment of seal strips 46, 62 to outer layers 24, 26, as described above.

The side frame channel, as shown in Figure 16, has front seal guide 74 and rear seal guide 78 to engage seal strips 46, 62 as already described above. However, in addition, a smaller channel 191 is provided inside the outer channel frame and includes a front panel 192 and a rear panel 195 in parallel spaced apart relation to each other extending inwardly from the side panel 70 of the outer frame channel. The distal end of front panel 192 is bent inwardly to return toward itself to form seal guide 192, and rear panel 194 is bent inwardly to return toward itself to form seal guide 195. By considering Figure 15 in combination with Figure 16, it can be appreciated that the seal strips 180, 182 on inner layers 34, 36 are adapted to engage seal guides 193, 195 on the inner channel frame section shown in Figure 16, while the seal strips 46, 62 are adapted to engage seal guides 74, 78 to seal the outer layers 24, 26. The positive engagement of the edges of the layers to the seal guide prevents the layers from touching each other and cuasing a cold short. This feature is particularly advantageous for large, non-vertical applications.

Claims:

1. Sealed movable insulation assembly, characterised as:

an insulation curtain (12) comprised of an outer multiple layered sheet (22) adapted for movement into place over an area of a building wall desired to be covered and insulated, the layers of sheet (22) being in approximately parallel spaced apart relation with insulation an air pocket formed in the interior of the curtain (12) between the layers of sheet (22);

motion producing means (14) attached to the curtain (12) for moving the curtain (12) laway from the wall area and for moving the curtain (12) over the wall area;

side seal and anchor means on each lateral side of the curtain (12) for sealing said air pocket at its respective sides from the exterior and for mechanically anchoring said lateral sides of the curtain against transverse forces while allowing slidable movement of said curtain layers of sheet (22) upwardly and downwardly in response to said motion producing means (14); and

top seal means for sealing the top of air pockets from the exterior.

2. The assembly of Claim 1 further characterised wherein said motion producing means (14) includes an elongated rotatable roller (100) positioned adjacent the top of said curtain (12) and the top edge of said curtain (12) being attached to the roller (100) in such a manner that rotation of the roller (100) in one direction causes the

curtain (12) to be wrapped around the peripheral surface of the roller (100) to pull the curtain (12) upwardly away from the wall area and rotation of the roller (100) in the opposite direction causes the curtain (12) to be unwrapped from around the roller (100) to be lowered over the wall area.

3. The assembly of Claim 1 further characterised wherein said top seal means includes a housing (16) that encloses the motion producing means (14) and has an elongated opening in the underside thereof for accommodating passage of the curtain (12) therethrough, the edges (95, 97) of said opening being in physical contact with the exterior surfaces of layer (22) of the curtain (12) to seal the interior of the housing (16) from the exterior.

4. The assembly of Claim 3 further characterised by front portion of the curtain (12) being attached to the roller (100) a spaced angular distance from the attachment points of the more rearward portion of layer (22) to the roller (100) such that the roller (100) will pull the front portion of the curtain (12) forwardly into contact with the front edge (95) of the opening.

5. The assembly of Claim 3 further characterised by including a plurality curtain layers (22, 32) and a plurality of separator rollers (102, 104, 106) positioned between the layers (22, 32) and journaled for rotation in the housing (16) for mechanically separating the layers (22, 32) as they proceed through said opening.

6. The assembly of Claim 2 further characterised wherein housing (16) includes constriction members (160, 164) at the top of the curtain (12) to constrict the layer (22) together at the top to seal the air pocket from the exterior, the constriction members (160,164) being adapted to allow sliding movement of the layer (22) therethrough.

7. The assembly of Claim 1 further characterised wherein the side seal means includes an elongated channel-shaped structure (18, 20) positioned along each lateral side of the curtain (12) with the channels thereof positioned to receive the lateral edges of the layer (22), the front and rear panels of each channel-shaped structure (18, 20) being folded to return inwardly to form front and rear rigid seal guide and anchor members (74, 78, 84, 88), and including elongated seal strips (46, 50, 62, 66) connected to the lateral edges of the outer of layer (22) and being slidably positioned in a respective channel-shaped structure (18, 20) with a respective front seal guide and anchor member (74, 78, 84, 88) positioned between a respective seal strip (46, 50, 62, 66) and the exterior surface of the layer (22).

8. The assembly of Claim 7 further characterised by including a plurality of layers (22, 32) forming air pockets (40, 42, 44) therebetween and a curved guide surface (170) at the bottom of each channel-spaced member (18, 20) to guide the bottom portion of said seal strip inwardly and upwardly to prevent jamming at the bottom of said channel-shaped member and including extensions (140, 146) of each

seal guide and anchor member into housing (16) and converging toward one another to engage the lateral edges of the layers (22, 32) for separating them as they emerge from the housing (16).

9. The assembly of Claim 1, further characterised by an inner layer portion (34) positioned between said the layer portions (24, 26) of layer (22), an elongated channel-shaped structure (18) positioned adjacent the lateral side of curtain (12) with the channel thereof positioned to receive the lateral edges of layer portions (24, 26), the front and rear panels (72, 76) of the channel-shaped structure (18) being folded to return inwardly to form front and rear rigid seal guides and anchor members (74, 84), and including elongated seal strips (46, 62) connected to the lateral edges of the outer layer portions (24, 26) and being slidably positioned in channel-shaped structure (18) with a respective front seal guide and anchor member (74, 78) positioned between a respective seal strip (46, 62), and respective layer poritons (24, 26), and an inner panel (192) positioned between panels (72, 76) and folded to form an inner rigid seal guide and anchor member (193) and an elongated seal strip (180) on the edge of inner layer (34), the anchor member (193) being positioned between said seal strip (180) and said inner layer (34).

10. The assembly of Claim 1, further characterised by an insulation curtain (12) comprised of an outer multiple layered sheet (22) and an inner multiple layered sheet (32), the layers of sheets (22, 32) being adjacent each other in

approximately parallel spaced apart relation with insulation air pockets (40, 42, 44) formed in the interior of curtain (12) between layer portions (24, 34, 36, 26), an elongated outer channel-shaped structure (18) positioned along each lateral side of curtain (12) with the channel thereof positioned to receive the lateral edges of outer sheet (22), and an inner channel-shaped structure (170) positioned in said outer channel-shaped structure (18) with the channel thereof positioned to receive the lateral edges of inner sheet (32), the front and rear panels (72, 76, 192, 194) of each channel-shaped structure being folded to return inwardly to form front and rear rigid seal guide and anchor members (74, 78,193,195), and including elongated seal strips (46, 62, 180, 182) connected to the lateral edges of the respective outer layer portions (24, 26) and inner layer portions (34, 36) and being slidably positioned in a respective channel-shaped structure (18, 190) with a respective outer seal guide and anchor member (74, 78) positioned between a respective outer seal strip (46, 62) and the surface of respective outer layer portions (24, 26) and a respective inner seal guide and anchor member (193, 195) positioned between a respective inner seal strip (180, 182) and the surface of respective inner layer portions (34, 36).

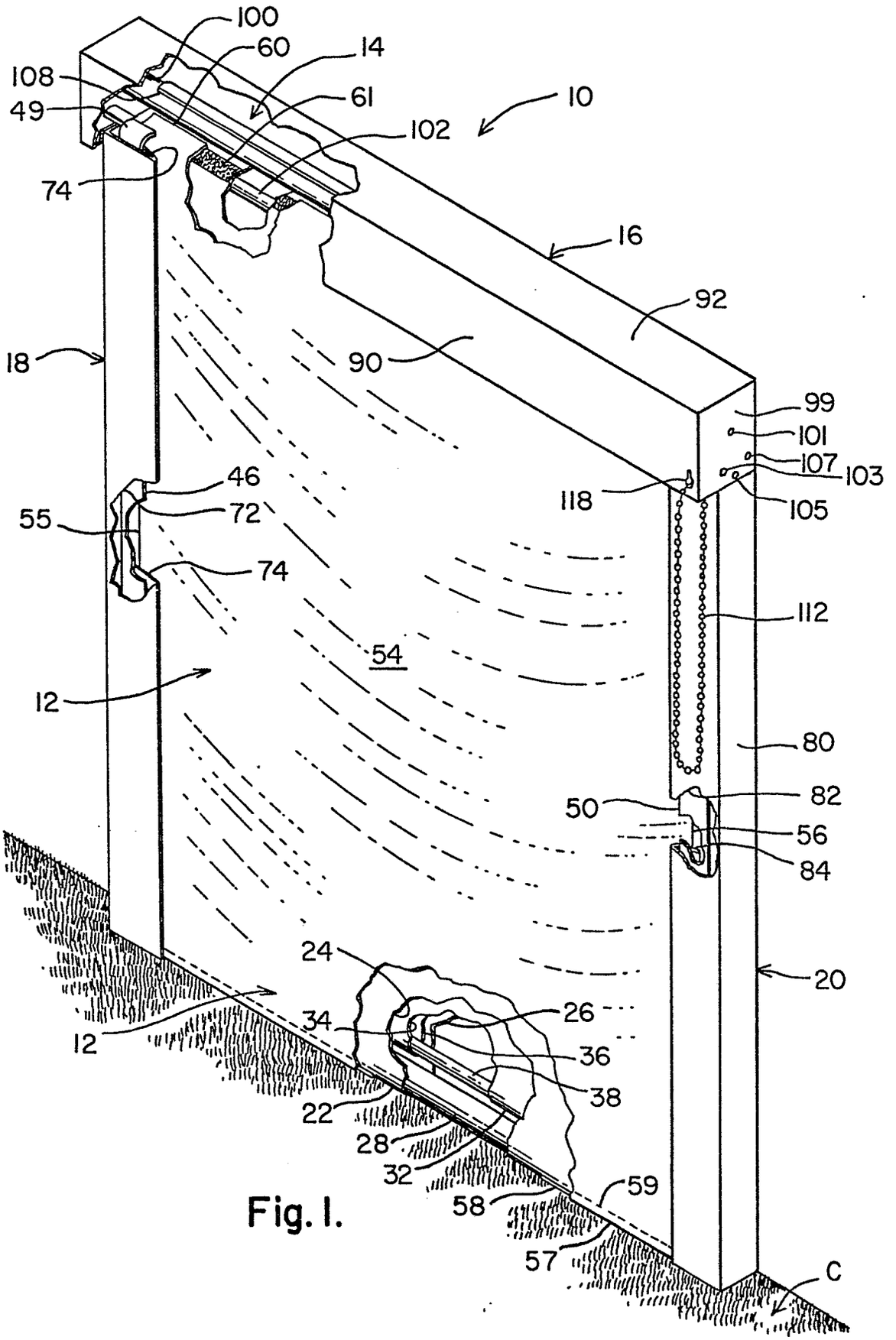
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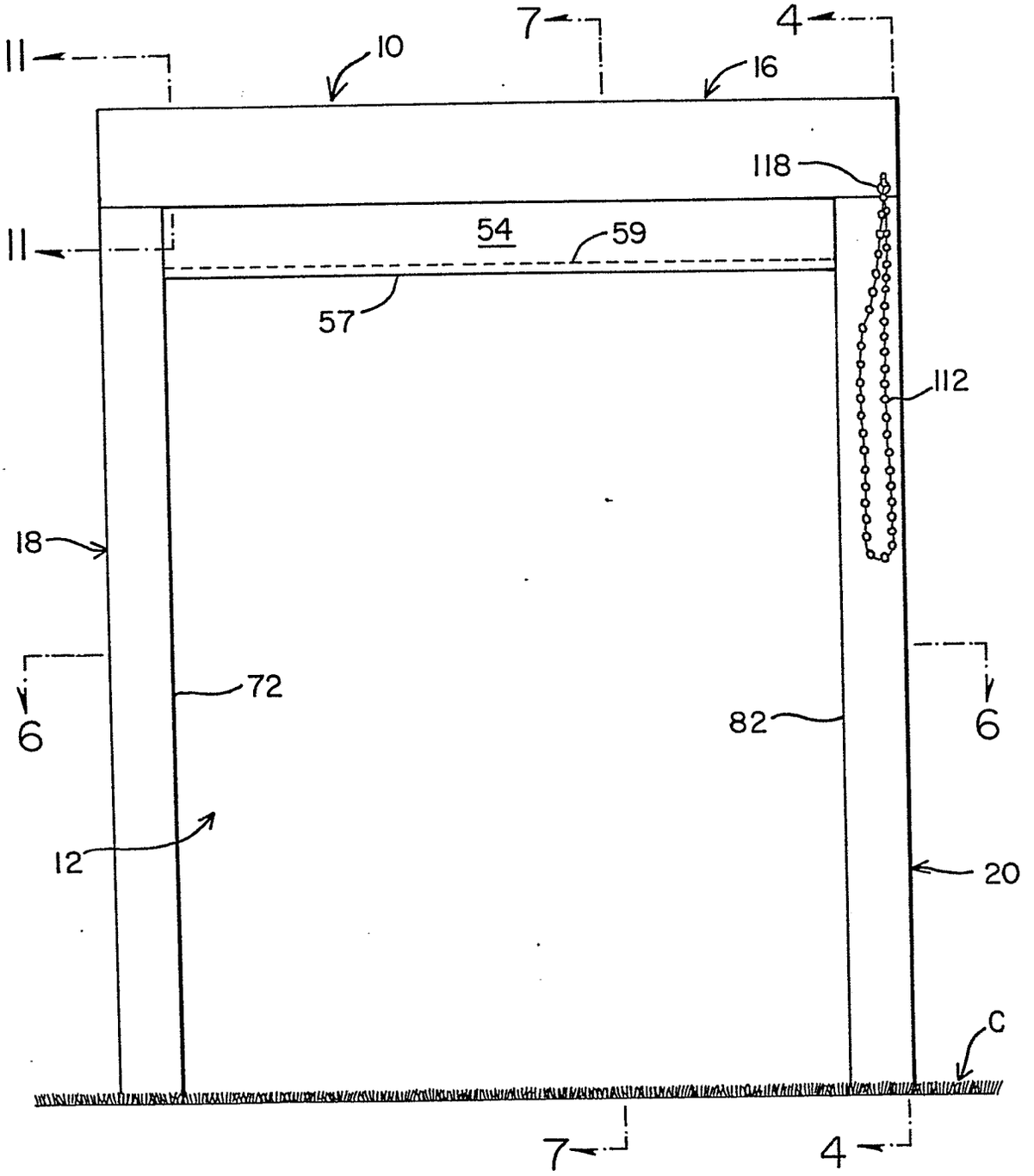
Fig. 1.



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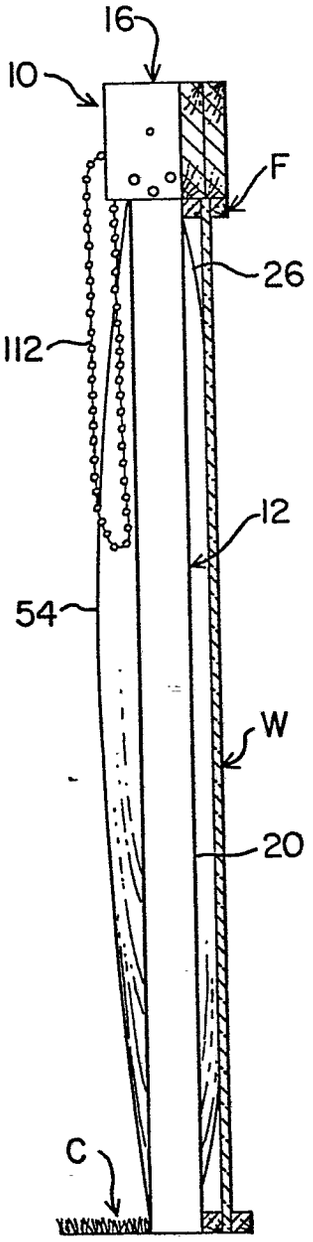

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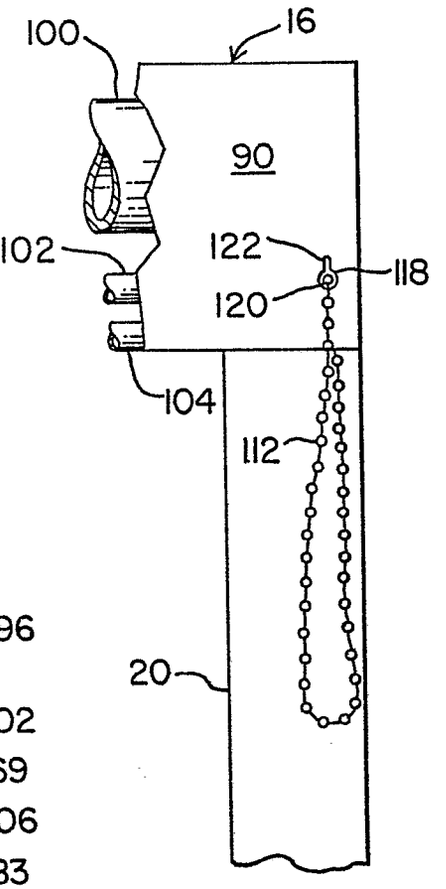

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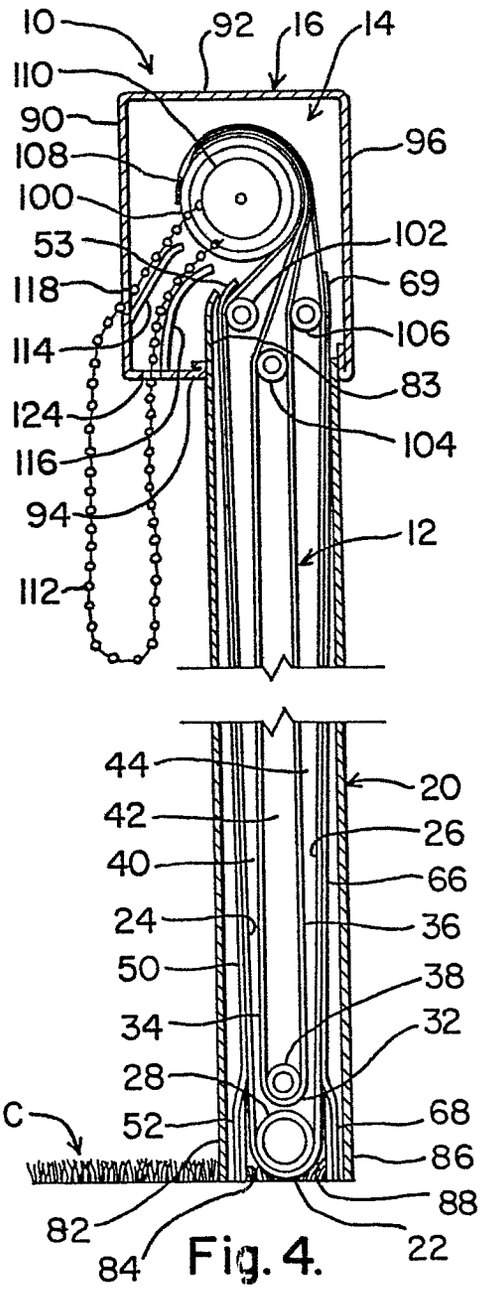

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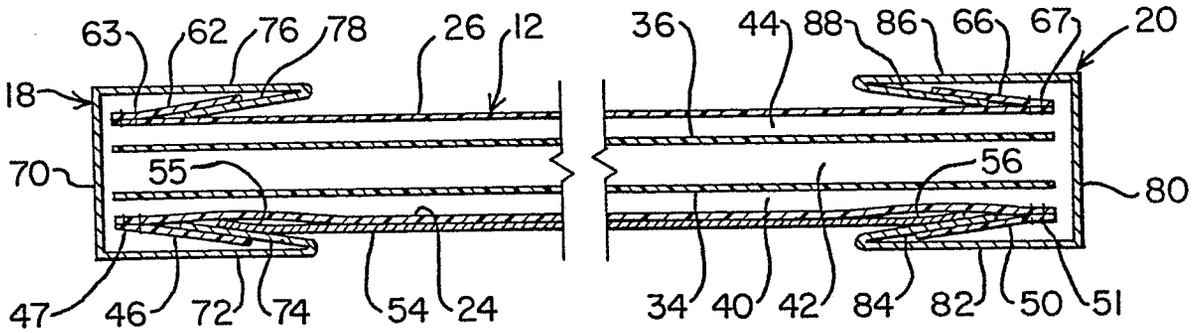

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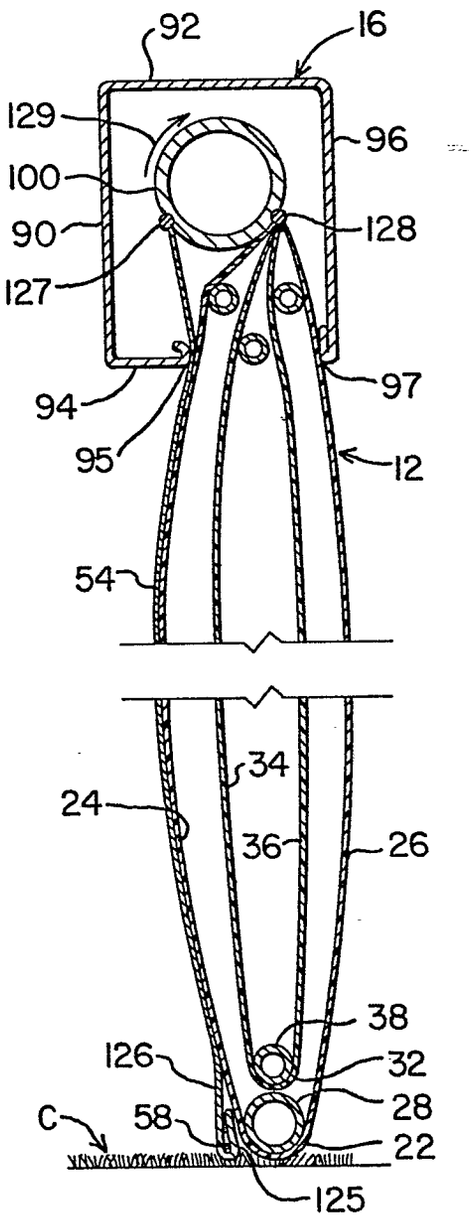

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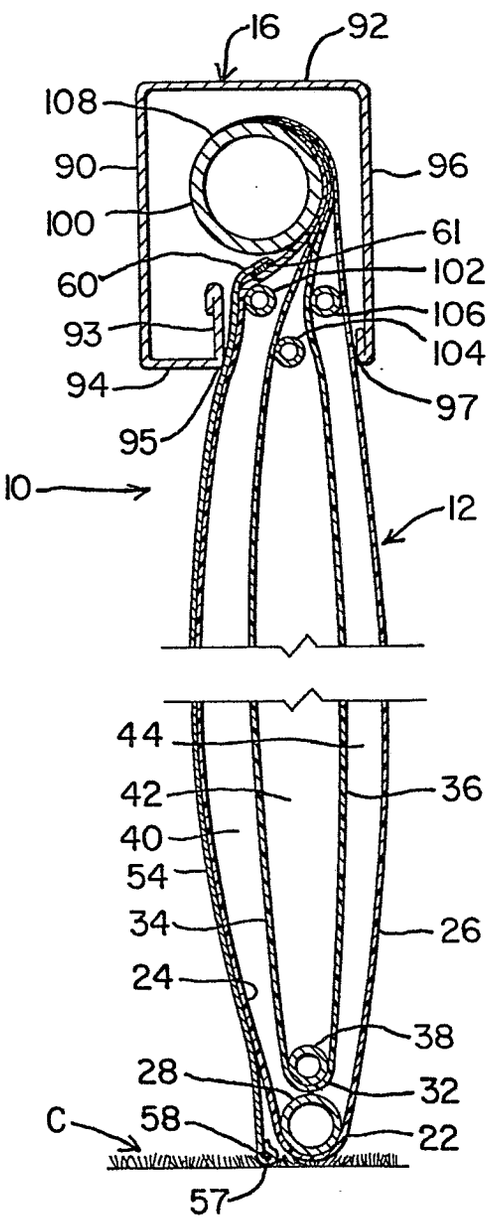

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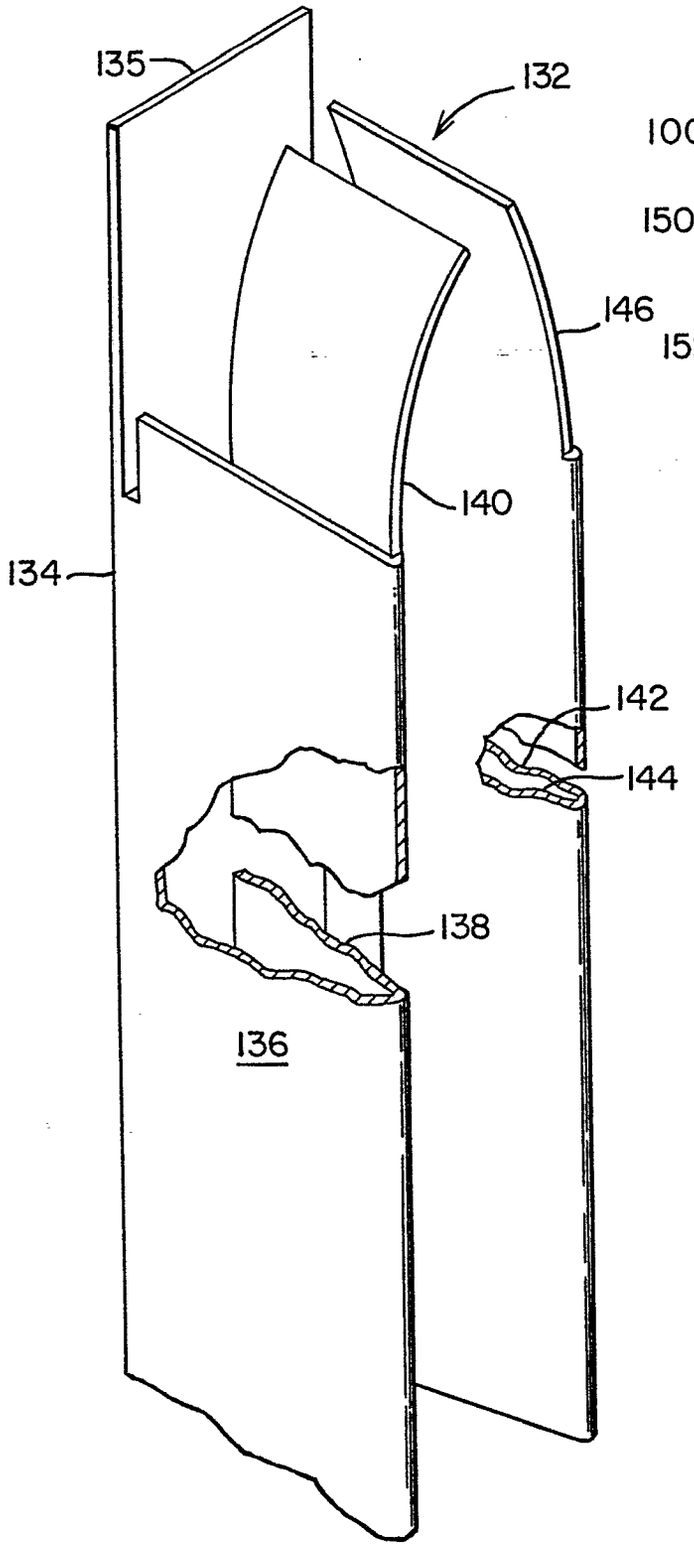
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Fig. 12.

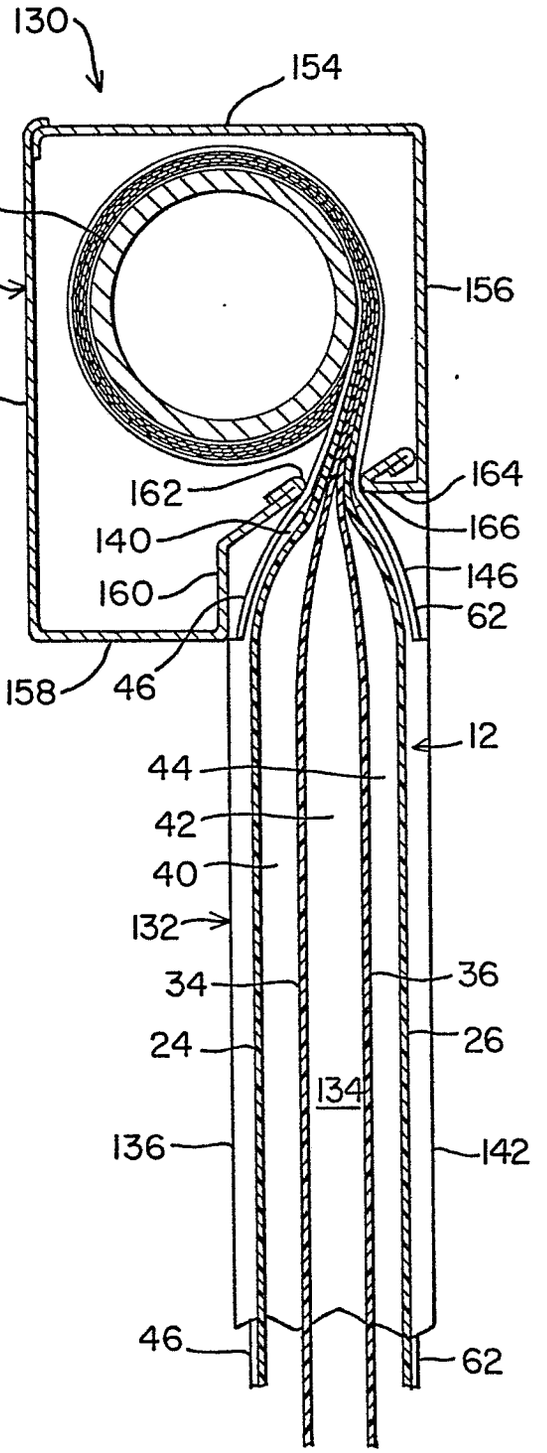
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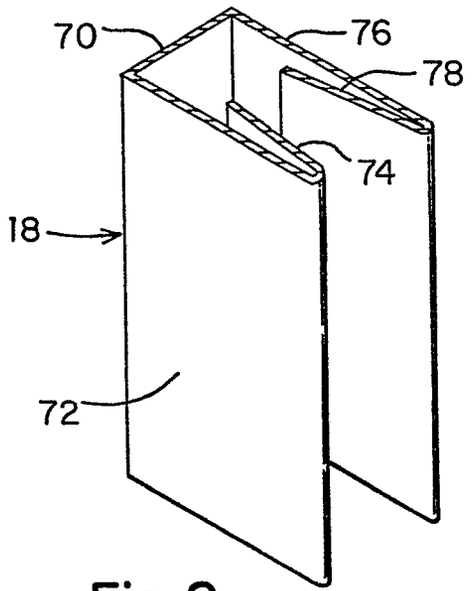
Fig. 11.



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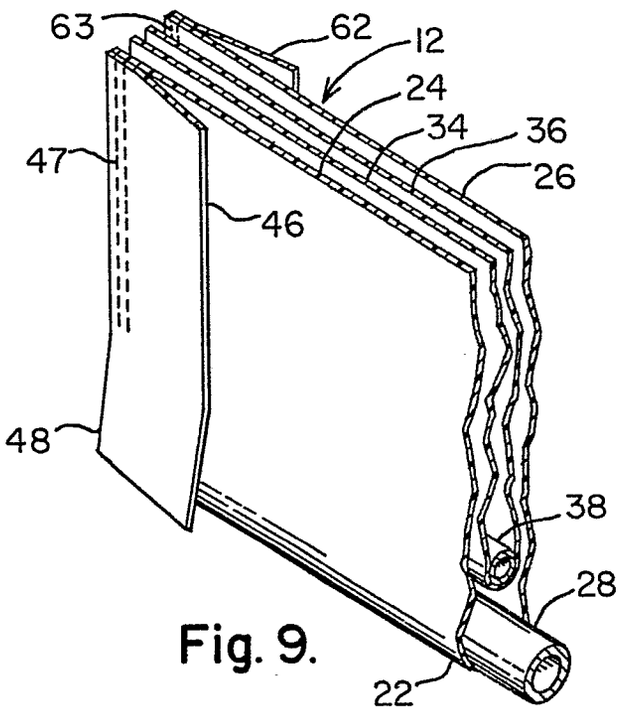

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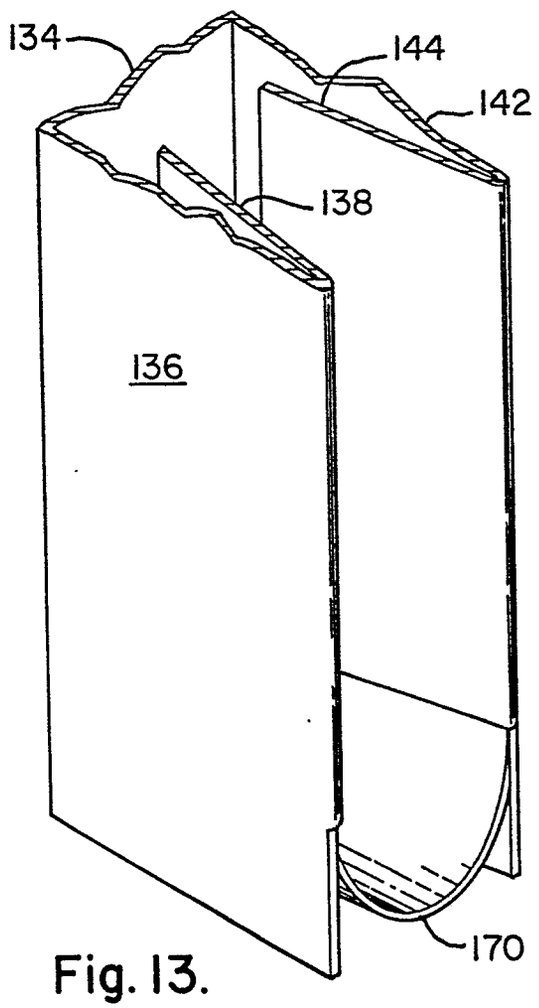

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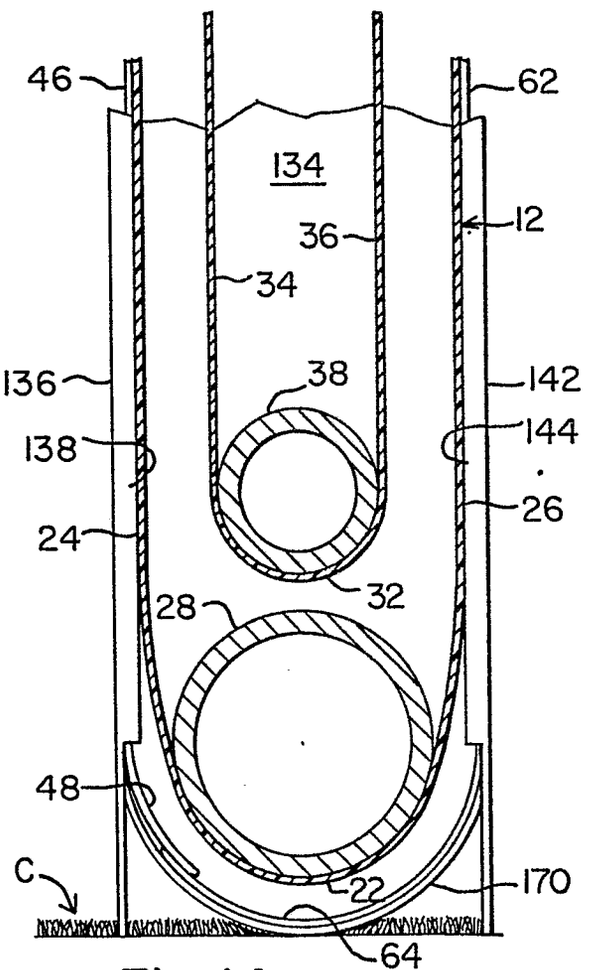

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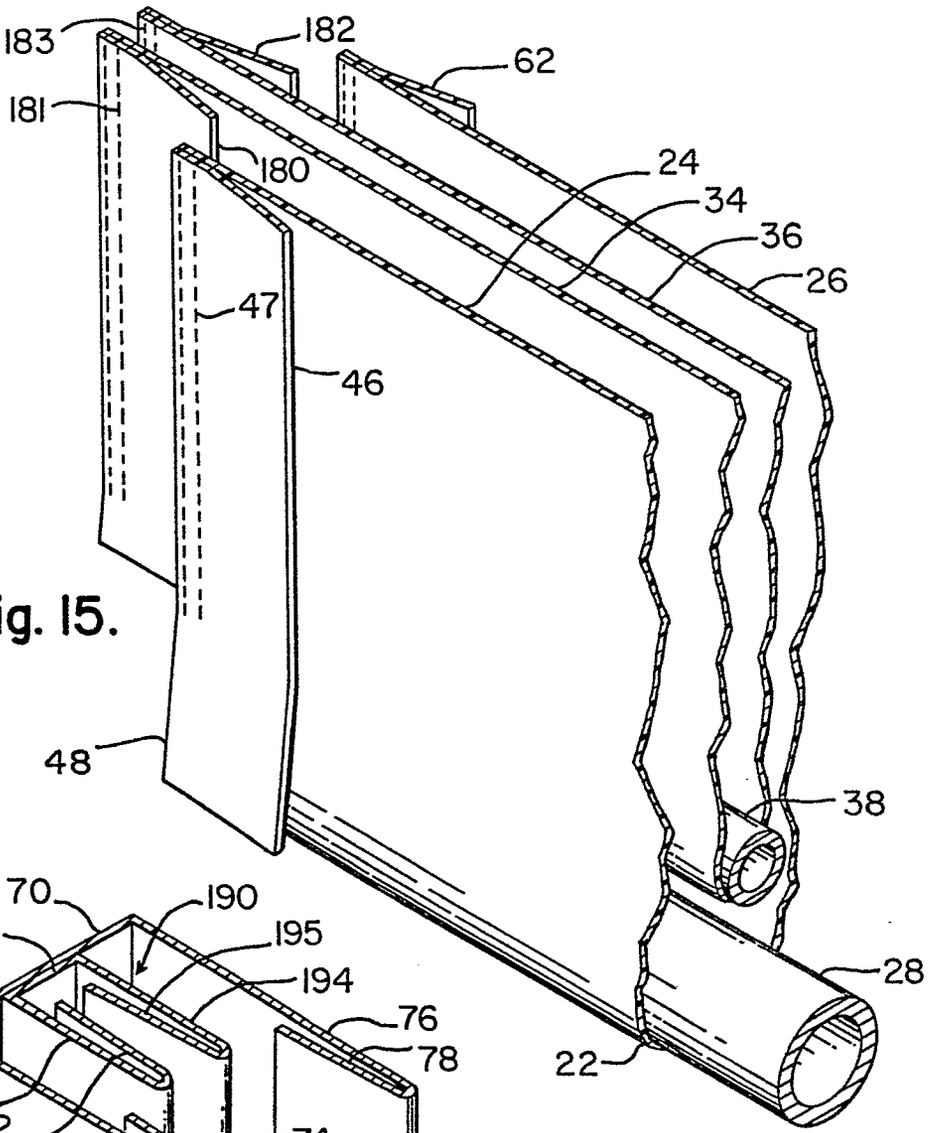
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Fig. 15.

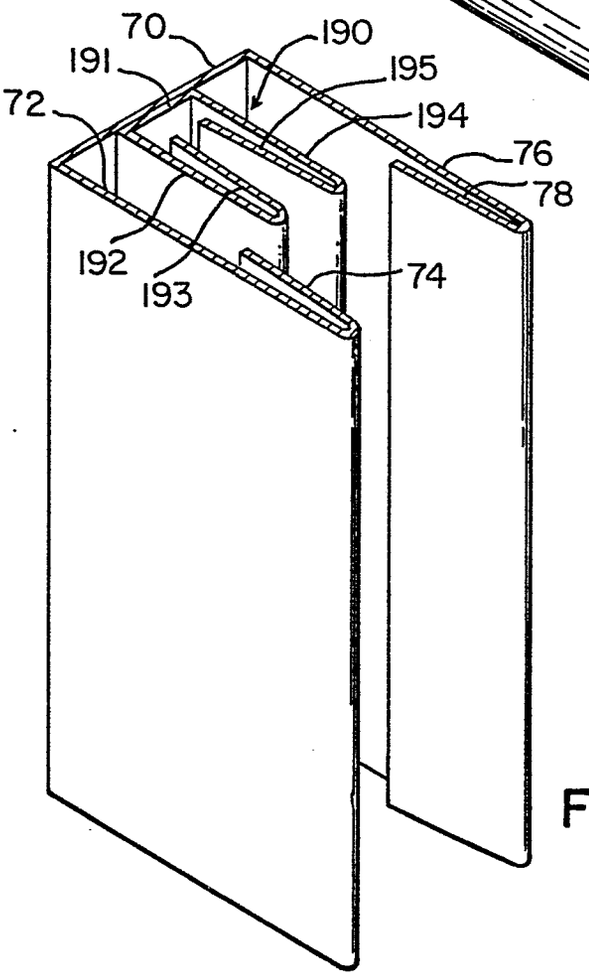
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Fig. 16.