March 9, 1965 A. G. IMBRECHT 3,172,166

MOVABLE PARTITION

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FIG. 1

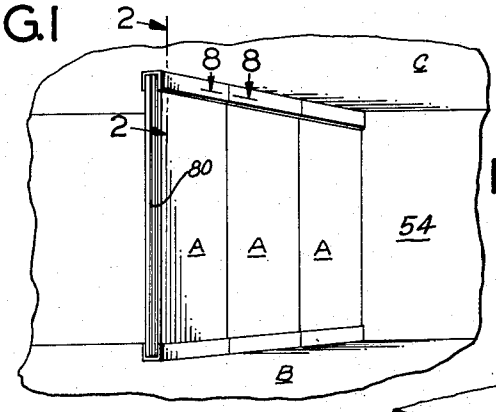


FIG. 2

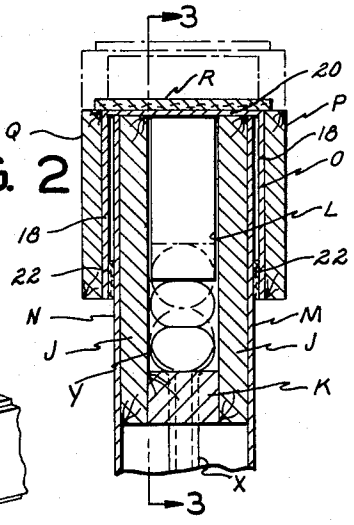
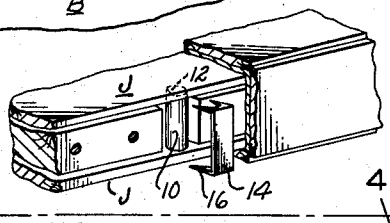


FIG. 4



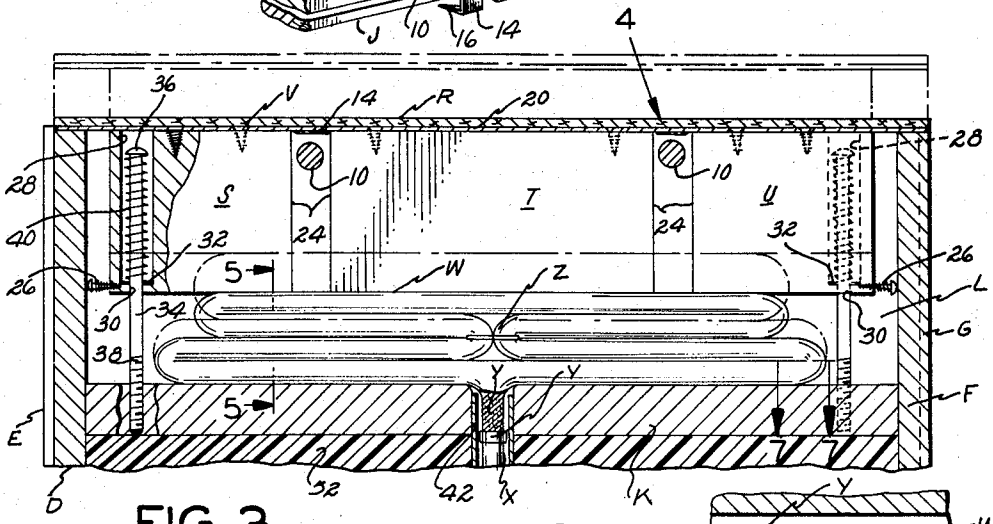
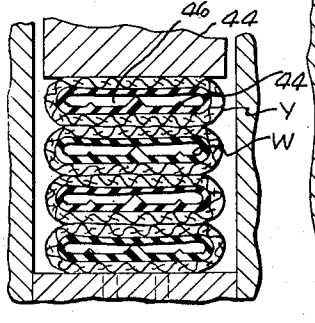


FIG. 3

FIG. 5



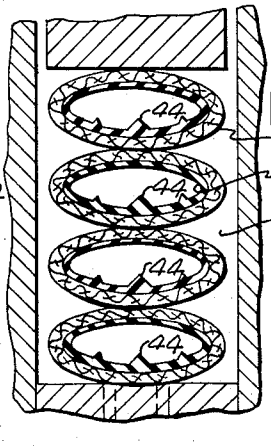


FIG. 6

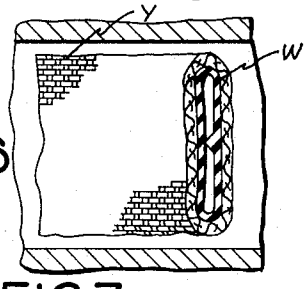


FIG. 7

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MOVABLE PARTITION

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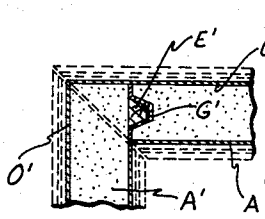


FIG. 9

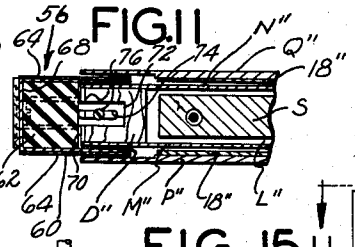


FIG. 11

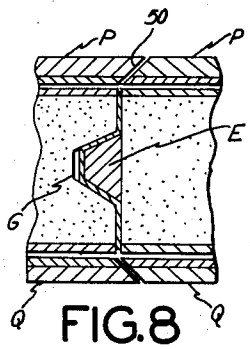


FIG. 8

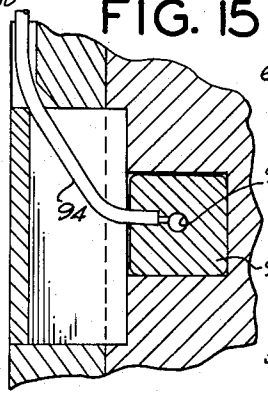


FIG. 15

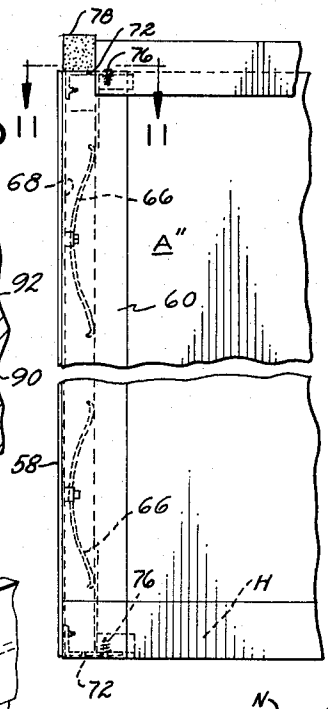


FIG. 10

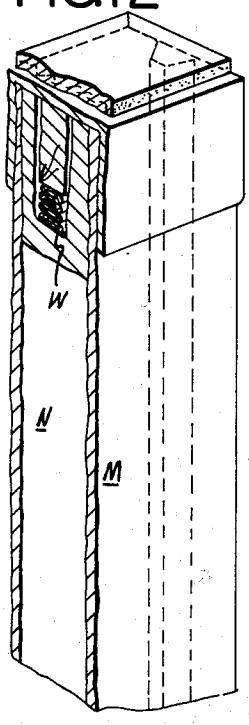


FIG. 12

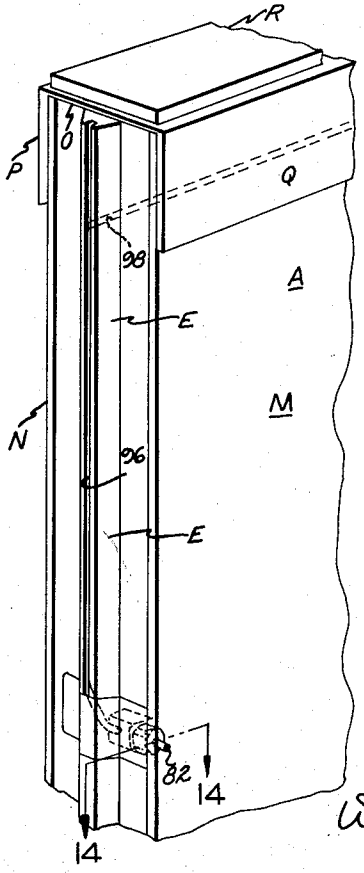


FIG. 13

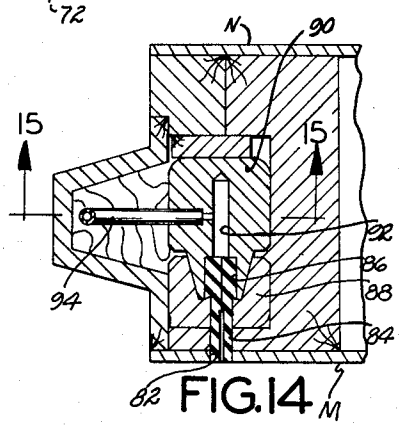


FIG. 14

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3,172,166

MOVABLE PARTITION

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Filed Dec. 29, 1961, Ser. No. 163,095
6 Claims. (Cl. 20—4)

The present invention relates generally to the field of movable partitions, and more particularly to an improvement in the structure and operation of the movable partition as disclosed and claimed in my United States Letters Patent No. 2,947,041 which issued August 2, 1960.

The use of movable partitions that can be easily and quickly moved from place to place within a large room having a floor and ceiling has been constantly increasing in popularity for some time. The increased demand for such movable partitions is undoubtedly due to the fact that they are light in weight, completely portable, require no floor or ceiling attachments, requiring only one accessory for the erection thereof, that of a source of fluid under pressure, and are substantially soundproof.

Other reasons for the popularity of such partitions is that they may be utilized to provide a semi-permanent wall or walls to subdivide a larger area into rooms of a desired shape and area, and inasmuch as the movable partitions are not mechanically affixed to the floor or ceiling, they are classified as furniture whereby the owner is able to remove them from a building when a lease expires or the owner decides to move to another location. Also, when these partitions are erected to define a wall, they provide substantial sound insulating value, and functions of a noisy nature in one area of a large room subdivided into smaller areas by these partitions will only be heard in the area in which the noise arises.

Many of the above advantages have been achieved by the use of the movable partition disclosed and claimed in Patent No. 2,947,041. However, in the commercial production of said partition, it was found that it could be improved to overcome certain disadvantages thereof. One such disadvantage was that the vertically movable beam defining the upper portion thereof had a limited throw, whereby the partition was only adapted for use in those rooms wherein the distance between the floor and ceiling fell within one inch and one and one-half inches of a predetermined height. Another disadvantage of the movable partition disclosed and claimed in said patent was that light could be transmitted from one side thereof to the other through the junctions of the movable beams when they were in an upwardly extended position.

Another operational difficulty encountered in the use of my first movable partition was that the inflatable tube used in moving the upper horizontal beam vertically, would also expand transversely, and when substantial fluid pressure was applied to the interior of the tube, this lateral expansion was sufficiently forceful to break the upper portions of the panel member, as well as deform the molding pieces which extended downwardly from the beam of T-shaped transverse cross section. Also, if a substantial transverse force was applied to the partition, slippage could conceivably occur between the lower portion of the partition and the flooring engaged thereby.

A major object in devising the present invention is to provide an improved movable partition having an upper horizontal beam with a vertical throw far greater than could be achieved by the inflatable structure disclosed and claimed in my previous patent, as well as a movable partition wherein no substantial lateral force is applied to the upper portion thereof, irrespective of how great a fluid pressure is exerted on the fluid-actuated mechanism used in raising the beam forming a part of the structure.

Another object of the present invention is to provide an improved movable partition that is particularly adapted for defining wall structures which include corner portions, as well as providing a movable partition that is easier to take down and erect than the partition disclosed and claimed in my previous patent.

These and other objects and advantages of the present invention will become apparent from the following description thereof, and from the accompanying drawings illustrating the same, in which:

FIGURE 1 is a perspective view of a number of the improved movable partitions in side-by-side interlocking engagement, with the upper and lower edges thereof being held in forceful frictional contact with the ceiling and floor respectively of the room in which they are installed;

FIGURE 2 is a fragmentary vertical cross-sectional view of one of the movable partitions taken on the line 2—2 of FIGURE 1;

FIGURE 3 is a combined side elevational and vertical cross-sectional view of one of the movable partitions taken on the line 3—3 of FIGURE 2;

FIGURE 4 is a fragmentary perspective view of a portion of the beam structure and the trough portion of the panel member in which it is partially disposed;

FIGURE 5 is a vertical cross-sectional view of a portion of the invention taken on the line 5—5 of FIGURE 3, showing the fluid actuatable resilient member in a compressed condition;

FIGURE 6 is the same view as FIGURE 5 after the resilient tube has been expanded by fluid pressure before the beam is in frictional contact with the ceiling;

FIGURE 7 is a fragmentary horizontal, cross-sectional view of a portion of the resilient tube and the woven envelope extending therearound, taken on the line 7—7 of FIGURE 3;

FIGURE 8 is a fragmentary horizontal, cross-sectional view of the junction between two of the movable partitions, taken on the line 8—8 of FIGURE 1;

FIGURE 9 is a horizontal cross-sectional view showing the manner by which two of the partitions may be so formed as to removably interlock and define a corner of a wall;

FIGURE 10 is a fragmentary side elevational view of one of the movable panels having a spring-loaded end piece mounted thereon, which end piece is held in abutting contact with one of the walls of the room in which the sequence of partitions shown in FIGURE 1 is located;

FIGURE 11 is a fragmentary horizontal cross-sectional view of the invention taken on the line 11—11 of FIGURE 10;

FIGURE 12 is a fragmentary perspective view of the upper portion of one of the movable partitions;

FIGURE 13 is a fragmentary perspective view of a second one of the movable partitions showing means for use in inflating the tube that raises the movable beam;

FIGURE 14 is a fragmentary transverse cross-sectional view of the invention taken on the line 14—14 of FIGURE 13; and

FIGURE 15 is a fragmentary vertical cross-sectional view of a portion of the invention taken on the line 15—15 of FIGURE 14.

Referring now to FIGURES 1 and 3 of the drawings for the general arrangement of the invention, it will be seen to include a number of rectangular movable partitions A that may be disposed in side-by side abutting contact to define a wall, with the lower portion of each partition A resting on the floor B and the upper portion of each partition in pressure contact with a ceiling C.

Each partition A, as can best be seen in FIGURE 3, is defined by a first vertical side piece D that has a tongue E projecting therefrom. Each partition A also includes a

second vertical side piece F in which a groove G is formed. The tongue E of one of the partitions A (FIGURE 1) is adapted to be slidably inserted within the groove G of an adjoining partition A when the partitions are in a wall-forming position, with the tongue and groove removably interlocking to prevent inadvertent displacement of one of the partitions A relative to an adjoining partition. The side pieces D and F are joined at the bottom by a lower cross piece H. Each partition A also includes two parallel laterally separated cross members J which abut against the interior surfaces of the side pieces D and F. A cross piece K connects the lower interior portions of the cross members J, as may best be seen in FIGURE 2.

The cross members J and cross piece K cooperatively define a longitudinally extending trough, referred to generally by the letter L, in each of the movable partitions A. Two cylindrical metallic spacers **10**, the structure of which is shown in FIGURE 4, have pointed ends **12** which are caused to engage opposite portions of the cross members J to hold them in a desired lateral relationship. The spacers **10** prevent inadvertent movement of the cross members J towards one another beyond a predetermined minimum spacing.

A number of metallic staple-like members **14** having downwardly extending prongs **16** on the ends thereof are driven into the upper portions of the cross members J and serve to hold the cross members in a fixed lateral relationship. Two rectangular panels M and N are bonded to the exterior surfaces of the side pieces D and F, lower cross piece H, and cross pieces J, as may best be seen in FIGURE 2. An inverted angular U-shaped cap O is provided for each of the partitions A, and each cap extends downwardly over the upper portions of the panels M and N. Each cap O has two parallel downwardly extending legs **18** that are connected on their upper ends by a horizontal web **20**. These caps O are preferably formed from a lightweight rigid material. The lower longitudinally extending interior surfaces of legs **18** have strips of felt **22** or like material affixed thereto, and these felt strips at all times are in frictional contact with the exterior surfaces of the panels M and N. The legs **18**, as can best be seen in FIGURES 1 and 2, support transversely extending molding strips P and Q respectively.

The upper surface of the web **20** supports a pad R formed of a resilient material that may be brought into pressure contact with the ceiling C and has a high coefficient of friction relative thereto. Three rectangular blocks S, T and U are affixed by screws V or other fastening means to the lower interior surface of the web **20**, as best shown in FIGURES 2 and 3. The blocks S, T and U are of a thickness which permits them to be freely movable in the trough L, and are laterally separated by spaces **24** which are greater than the diameter of the spacers **10**.

Two screws **26** extend laterally into the ends of the blocks S and U and are screwed into the blocks to a degree that the cap O with the blocks S, T and U affixed thereto may be moved vertically in the trough L but cannot move laterally relative to the panel members M and N. Bores **28** extend downwardly in blocks S and U from the upper surface thereof, and these bores **28** also are in communication with counter-bores **30** that extend upwardly from the lower edge of these blocks. A body shoulder **32** is defined at the junction between bores **28** and counter-bores **30**.

Two elongate rods **34** having heads **36** on the upper ends thereof extend downwardly through the bores **28** and counter-bores **30**. Threads **38** are formed on the lower ends of rods **34** which engage the cross piece K, which cross piece is preferably formed from wood. Two helical springs **40** encircle the upper portion of the rods **34**, with the upper ends of the springs abutting against the heads **36** and the lower ends of the springs against the body shoulder **32**. Springs **40** are at all times under at least slight compression, and tend to maintain the lower surface of the web **20** in contact with the upper edge surfaces of the cross members J, as may be seen in FIGURE 2.

An endless tube W formed of a resilient material such as butyl rubber, or the like, is provided that may be inflated or deflated by a tube X which is in communication therewith and extends downwardly through an opening **42** formed in substantially the center of the cross piece K. The entire exterior surface of the tube W and at least a part of the fluid inlet tube X are covered by an envelope Y formed of a woven material such as nylon, or the like, which prevents expansion of the tubing W beyond a predetermined transverse cross section, irrespective of the fluid pressure that may exist therein.

A band Z, which may be a rubber band, or similar device, encircles the central portion of the endless tube W and envelope Y and permits them to be folded as shown in FIGURE 3 to define two sets of loops disposed one above the other when the lowermost surface of the envelope Y rests on the upper surface of the cross piece K and the uppermost surface of the envelope and is in contact with the lower surfaces of the blocks S, T and U. When the invention is disposed as shown in FIGURE 3, the tube W is deflated and substantially compressed as shown in FIGURE 5. When the tube W is folded as well as compressed due to the positioning of the blocks S, T and U, the passage through the tube W could be blocked, for the opposite interior wall surfaces of the tube are in pressure contact with one another. To prevent such blocking of the interior passage through the tube W, this tube is formed with longitudinally extending ribs **44**, as may best be seen in FIGURE 5, that at all times maintain opposite interior surface portions of the tube out of contact with one another and assure that a continuous fluid passage **46** remains therein, irrespective of the compression which may be applied thereto.

When fluid under pressure such as air, Freon, or the like, is caused to discharge through the tube X into the interior of the tube W, the loops defined by this tube W (FIGURE 3) tend to assume a more vertical position, and in so doing the uppermost surface of the envelope Y is forced against the lower surfaces of the blocks S, T and U, causing the blocks and the cap O to be moved upwardly until the resilient pad R is in pressure contact with the ceiling C. The heads **36** on the elongate rods **34** cooperate with both the springs **40** and body shoulders **32** to prevent inadvertent displacement of the cap O from the partition A and serve to limit the upward throw of the blocks S, T and U relative to the panels M and N. When fluid under pressure is permitted to discharge from the tube X as will be explained in detail hereinafter, the compression on springs **40** moves to blocks S, T, and U, together with cap O, downwardly relative to the panels M and N, and returns the assembly to the position shown in FIGURE 3.

When the movable partitions A are arranged as shown in FIGURE 1, light from, say, the left-hand side of the room in which the partitions are disposed is not visible on the right-hand side of the movable partitions A due to the interlocking of the tongues E and grooves G. However, the ends of caps O adjacent one another do not interlock, and it would be possible for light beams to shine through the space therebetween when the caps have been moved upwardly to engage the ceiling C. To prevent passage of light, bevels **50** are formed on the ends of strips P and Q, which bevels overlap whereby light cannot pass through the cap edges.

When it is desired to arrange the movable partitions A to form an L-shaped wall structure, one of the partitions, which is identified by the letter A' in FIGURE 9 of the drawings, has a tongue E' formed on one of the side pieces thereof. Tongue E' interlocks with one of the grooves G of the movable partition A disposed at one end of the sequence of partitions forming a wall. When such a construction is used, the adjoining end portions of the

cap O in partition A and the cap O' in partition A' are cut on an angle of 45° whereby the edge portions thereof are in abutting contact.

For sound insulating purposes the interior of each movable partition below the cross piece K, between the side pieces D and F and above the lower cross piece H is preferably filled with a foamed plastic such as Styrofoam manufactured by the Dow Chemical Co., Midland, Michigan.

When a sequence of movable partitions A are extended between two parallel walls **54**, one of which is shown in FIGURE 1, the last of the partitions in the sequence must be provided with a horizontally movable, vertically extending end portion in order to make such positioning possible. A movable partition A'' having a horizontally movable end section **56** is shown in FIGURES 10 and 11.

The movable partition A'' is similar to the partitions A, except that a side piece D'' is provided which has no tongue E thereon. Those elements in partition A'' common to elements in partition A are identified by the same numeral or letter but to which a double prime has been added. The side piece D'' terminates in a flat vertically extending edge **58**. A horizontally movable, vertically extending end section **60** is mounted on the left-hand edge portion of partition A'', as best shown in FIGURES 10 and 11.

End section **60** includes a rigid upright **62** of square horizontal cross section that has two rectangular sheets **64** projecting therefrom which slidably engage the exterior surfaces of panels M'' and N''. Two bow springs **66** are affixed to the interior vertical surface **68** of upright **62**. Springs **66** bear against the exterior vertical surface **70** of end piece D'', and at all times tends to move upright **62** to the left away from end piece D'', as seen in FIGURE 10. Two elongate rigid strips **72** project to the right from the top and bottom of upright **62** (FIGURES 10 and 11). Each strip **72** has an elongate slot **74** formed therein which slidably engages a projecting screw **76** affixed to the partition A''. The screws **76**, slots **74** and strips **72** cooperatively prevent end section **60** from being inadvertently displaced from the partition A'' on which it is mounted.

A square section **78** of resilient material extends upwardly from the upper extremity of end section **60**, and can be deformed both vertically and horizontally as the end section **60** is moved relative to partition A'' to complete a sequence of partitions A between two walls of a structure. The tube X used in inflating or deflating the tube W can be extended to a normally closed valve having a tubular portion **80** that extends to the exterior of partition A, as shown in FIGURE 1. If portion **80** is located as shown in FIGURE 1, fluid under pressure can be discharged therein only when the sequence of partitions A is being erected to define a wall structure. If the sequence of partitions A are to remain standing for a prolonged period of time, it may be desirable to periodically add fluid under pressure to replace that which has been lost due to escape from the tube W. Each partition A has a small opening **82** formed in panel M located adjacent the side piece **13** (FIGURE 13) through which fluid under pressure may be periodically added to each of the tubes W while the partitions A in which they are situated are disposed as shown in FIGURE 1.

A resilient tubular member **84** extends inwardly from the opening **82** to communicate with a normally closed resilient body **86** that can be opened to have a passage extend therethrough when a tubular bayonet (not shown) is inserted within the confines of member **84** and forced through the normally closed body. Member **84** and body **86** are held in two interlocking components **88** and **90** that are disposed in a cavity formed in the side piece D. A bore **92** is formed in component **90** which is in communication with the body **86** as well as a resilient tube **94** of small transverse cross section that extends outwardly and upwardly through a longitudinally extending groove **96** formed in the tongue E, as may best be seen in FIGURE 13. The tube **94** at a position adjacent the upper end of the movable partition passes inwardly through a bore **98** formed in the tongue E and end piece D, and is attached by means (not shown) to the tube X.

When it is desired to inflate the tube W in a partition A, a tubular bayonet (not shown) is inserted within the confines of the tubular member **84** to expand the body **86** by discharging fluid under pressure such as air, Freon, or the like, into the bore **92** to flow through the tubes **94** and X into the resilient tube W to expand the same and raise the cap O upwardly relative to the partition A to cause the resilient pad R to pressure contact the ceiling C. When it is desired to deflate the tube W, a tubular member (not shown) is inserted within the confines of the tubular member **84** to expand body **86**, and permit the air under pressure to flow from the tubes W and X, and tubing **94** to the bore **92** where it passes into the ambient atmosphere through the tubular member **84**.

Operation of the invention is relatively simple. The partitions A are sequentially placed in the positions shown in FIGURE 1 or FIGURE 9 to form a wall of desired configuration. As each partition A is placed in position, it is caused to interlock with a partition already in place. Thereafter, the resilient tube W is inflated with fluid under pressure by means of the tube X, as previously described. The cap O of the partition A being positioned is moved upwardly as fluid under pressure is discharged into the tube W. Upward movement of the cap O stops when the resilient strip R pressure contacts the ceiling C. The pressure contact of strip R with ceiling C causes a like pressure to be exerted by the lower portion of partition A on the floor B. The partition A is then frictionally gripped in an upright position between the ceiling C and floor B. The last partition to be placed in the wall structure is the panel A'', as explained in detail hereinafter.

To prevent deformation of tubing W whereby it is forced out of the woven covering Y, after the tubing has been inflated for a prolonged period of time, the cover is preferably extended over a portion of the tube X, as may best be seen in FIGURE 3. The lower extremity of the woven cover Y is rigidly affixed to the tube X by a band or fitting Y'.

Although the present invention is fully capable of achieving the objects and providing the advantages hereinbefore mentioned, it is to be understood that it is merely illustrative of the presently preferred embodiments thereof and I do not mean to be limited to the details of construction herein shown and described, other than as defined in the appended claims.

I claim:

1. In a movable partition of the type including a rectangular panel having first and second vertical edges and horizontal top and bottom edges adapted to be disposed between a floor and ceiling, a horizontal trough of rectangular transverse cross section in said panel, an elongate member slidably disposed for vertical movement in said trough,

and an inverted U-shaped cap including a horizontal web affixed to the upper edge of said member, the combination of:

(*a*) an endless resilient tube longitudinally disposed in said trough;

(*b*) a woven cover enveloping said tube that limits the exterior diameter to which said tube can expand when inflated a distance less than the width of said trough;

(*c*) a fluid inlet tube connected to the interior of said resilient tube; and

(*d*) a band extending transversely around a portion of said resilient tube and said cover at a position intermediate the junction of said inlet tube with said resilient tube and the portion of said resilient tube opposite said inlet tube, said

band drawing the center portions of said resilient tube toward each other, whereby said band divides said resilient tube into first and second portions, with said first and second portions when said resilient tube is disposed in said trough and not inflated, being folded to define first and second sets of oppositely disposed loops, said loops of each set being superimposed one on top of the other, and with the lower surface of said cover that envelops said first portion resting on the lower surface defining said trough, while the upper surface of said cover that envelops said second portion is disposed adjacent the lower surface of said member, said loops when said resilient tube is inflated capable of moving upwardly a distance greater than that of the width of said trough.

2. A movable partition as defined in claim 1 which further includes spacer means inside said resilient tube for preventing complete obstruction of a fluid passage therethrough when said resilient tube is folded and not inflated.

3. A movable partition as defined in claim 2 wherein said cap also includes two elongate vertical legs that extend downwardly from the edges of said web over the upper portion of the panel, and wherein two parallel molding strips are affixed to the exterior surfaces of said legs, which strips have beveled ends that are capable of interlocking with beveled ends on molding strips provided on adjacently disposed partitions to prevent passage of light through the junction between said strips; and further includes

(*a*) two elongate felt strips that extend longitudinally along the lower interior edge surfaces of said legs, with said resilient strips slidably engaging the exterior surfaces of said panel as said member and cap are moved vertically relative thereto.

4. A movable partition as defined in claim 2 which further includes means for preventing lateral movement of said member in said trough transversely relative to said panel.

5. A movable partition as defined in claim 1 in which the said resilient cover also extends over a length of said air inlet tube disposed adjacent said resilient tube; and further includes

(*a*) means for affixing the outer extremity of said woven cover to said air inlet tube for preventing deformation of said endless tube out of said woven cover when said endless tube is inflated.

6. A movable partition as defined in claim 5 including spring means for at all times exerting a downward force on said member, which downward force is sufficient to deflate said resilient tube when fluid is permitted to discharge therefrom, and wherein said spring means in addition to exerting said downward force on said member, limit the upward movement of said member relative to said panel to the extent that the lower edges of said legs will not be raised above the upper horizontal edge of said panel.

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