March 24, 1964 G. HOLLANDS 3,126,049

CURTAIN PARTITION

Filed Jan. 3, 1962 4 Sheets-Sheet 1

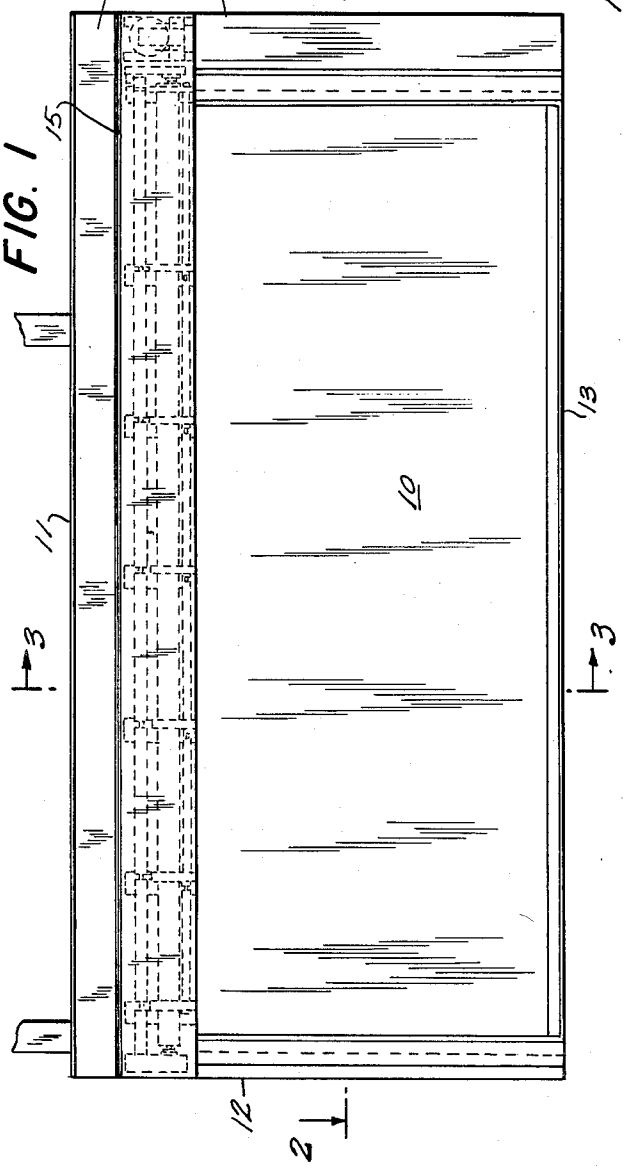


FIG. 1

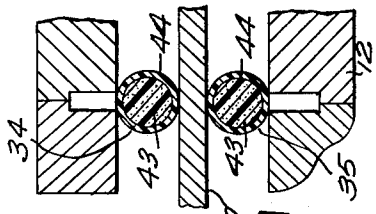


FIG. 2A

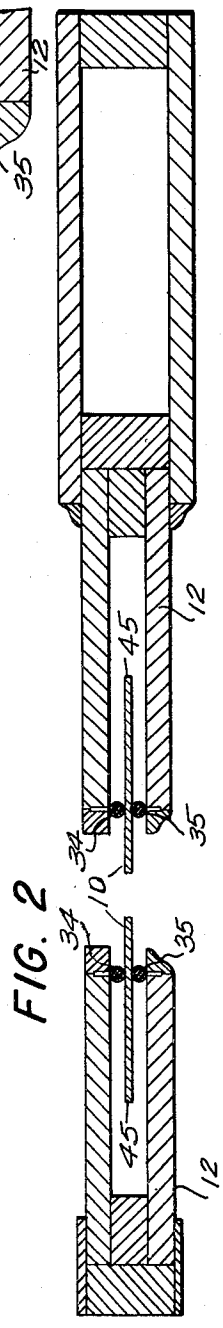


FIG. 2

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March 24, 1964 G. HOLLANDS 3,126,049

CURTAIN PARTITION

Filed Jan. 3, 1962 4 Sheets-Sheet 2

FIG. 3

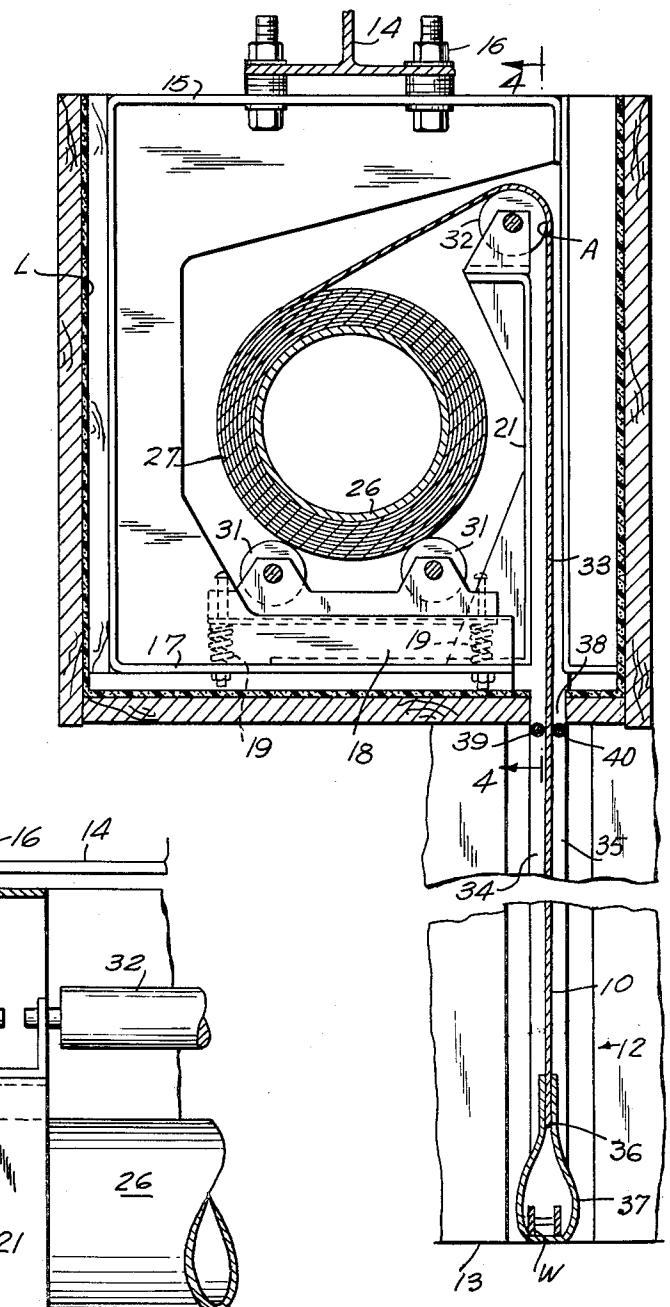
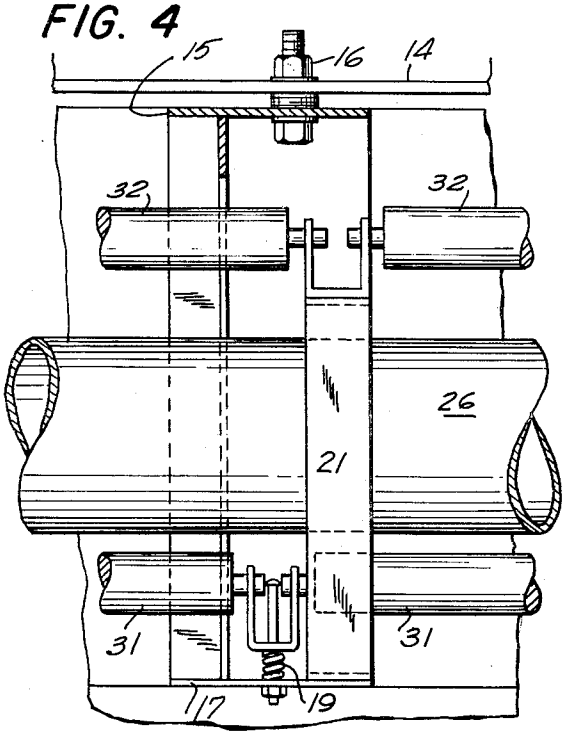


FIG. 4



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March 24, 1964 G. HOLLANDS 3,126,049

CURTAIN PARTITION

Filed Jan. 3, 1962 4 Sheets-Sheet 3

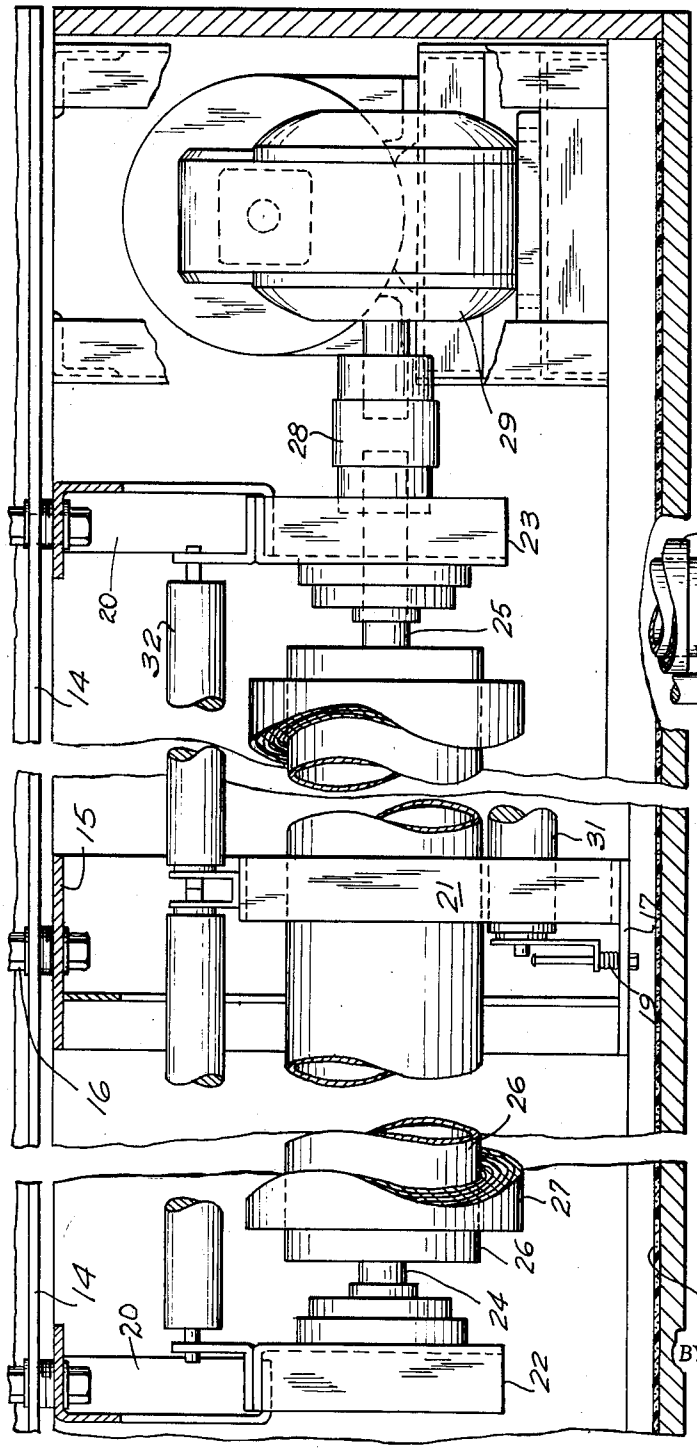


FIG. 5

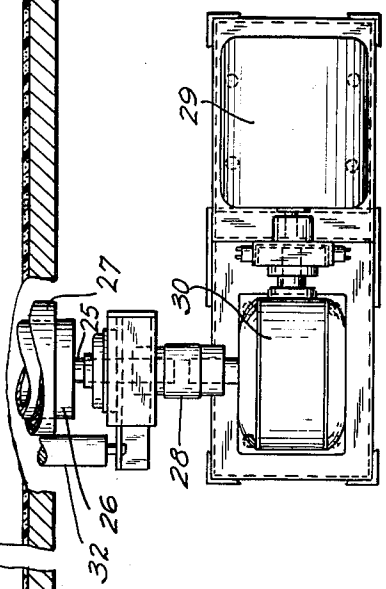


FIG. 6

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March 24, 1964 G. HOLLANDS 3,126,049

CURTAIN PARTITION

Filed Jan. 3, 1962 4 Sheets-Sheet 4

FIG. 8

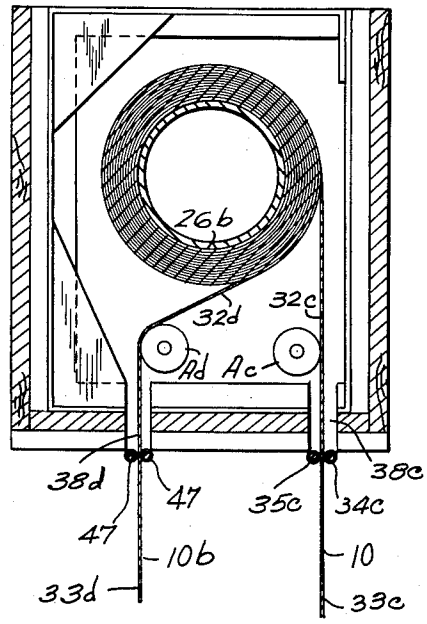


FIG. 7

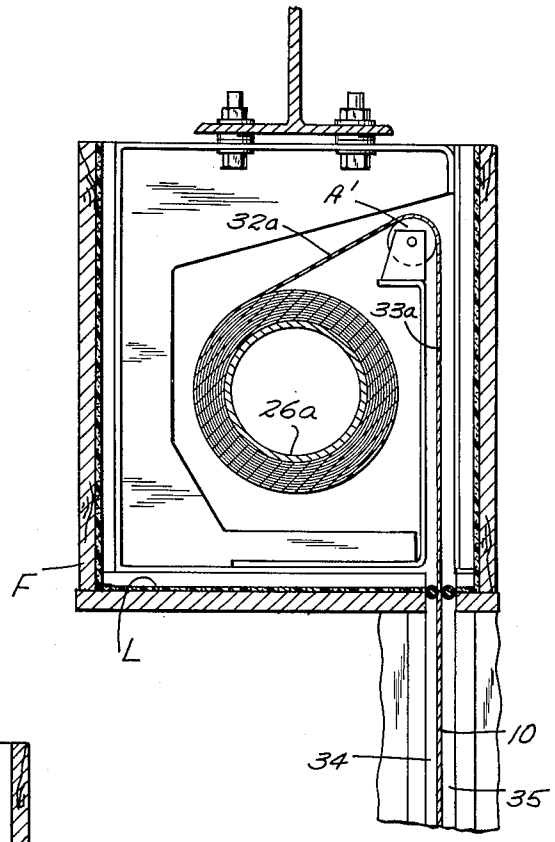
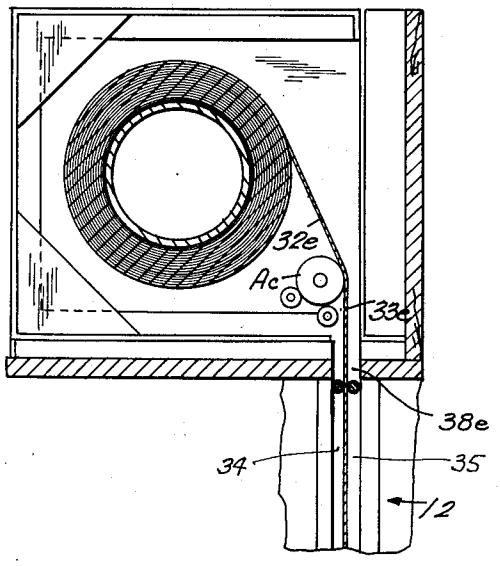


FIG. 9



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United States Patent Office 3,126,049 Patented Mar. 24, 1964

3,126,049

CURTAIN PARTITION

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Filed Jan. 3, 1962, Ser. No. 164,092
1 Claim. (Cl. 160—40)

This invention relates to a vertical lift curtain partition, and more particularly to a curtain partition having valuable acoustical properties of sound transmission loss and still more particularly to an operating means for a flexible curtain partition having highly effective acoustical properties of sound transmission loss.

This invention is concerned with and has for its object the provision of a flexible room divider or curtain for the rapid conversion of rooms, such as class rooms, into smaller units, for isolating of larger study groups into smaller units with the great facility of a drop curtain, while achieving a sound transmission loss factor of high magnitude, with a minimum loss of space.

The discovery of the acoustic value of limp, flexible, lead or like heavy metal filled sheets or fabrics to provide a material which has a high sound transmission loss number or effective airborne sound transmission loss, in accordance with the ASTM designation E90–61T, and the American Standards Association designation Z24.19–1957 has created problems occasioned particularly by the relative weight or density of such sheeting in relation to high flexibility, to tend to discourage its use where frequent conversion of rooms, as in mobile curtain partitioning, is desirable. With such a high degree of flexibility almost to a flaccid state, as evident by a Young's modulus of elasticity of 2000 pounds per square inch and a relatively high weight factor of one-half to three pounds per square foot for sheeting of .025 to .125" thickness, an "instant" curtain partition of a vinyl resin, lead impregnated sheet of the sound transmission class numbers from 18 to 34 introduces problems sufficient to discourage its use, despite its said attractive acoustical properties.

It is an object of this invention to provide an acoustical curtain with materials of the class described that occupies a minimum area in the form of a vertical lift curtain partition and operating means affording its economical and practical use, despite its great weight and flexibility and the normal handling problems engendered by such desirable material.

More specifically, it is an object of this invention to provide a novel vertical lift curtain partition of flexible lead or heavy metal-filled sheeting of the acoustical magnitude described, including operating and assembly means therefor, whereby room conversion may be facilely and quickly effected and full efficiency retained in use of the desirable, high sound transmission loss factor.

Still more particularly, it is an object of this invention to provide a novel operating assembly in the form of a vertical lift curtain of highly flexible, lead-filled vinyl resin film of the acoustical magnitude which may permit rapid conversion of large room units into small ones, with separation having high sound transmission loss with minimum space loss.

To attain these objects and such further objects as may appear herein or be hereinafter pointed out, reference is made to the accompanying drawing forming a part hereof, in which—

FIGURE 1 is an elevation of a curtain in accordance with the invention;

FIGURE 2 is a magnified section on the line 2—2 of FIGURE 1;

FIGURE 2*a* is a magnified fragmentary section of a detail shown in FIGURE 2;

FIGURE 3 is a magnified section on the line 3—3 of FIGURE 1;

FIGURE 4 is a fragmentary section taken on the line 4—4 of FIGURE 3;

FIGURE 5 is a fragmentary front elevation of the drive assembly;

FIGURE 6 is a plan view of the drive assembly;

FIGURE 7 is a section of another embodiment of the invention corresponding substantially to the view taken in connection with FIGURE 3;

FIGURE 8 is a fragmentary section of a still further embodiment;

FIGURE 9 is a fragmentary diagrammatic section of a still further embodiment of the invention.

Reference will now be made to the drawings wherein it is disclosed by the invention to provide a room divider curtain **10** suspended from the ceiling **11** and guided along the guides **12, 12** to the floor **13.**

The curtain **10** constitutes a material of a high sound transmission loss number or one having an effective air borne sound transmission loss. The preferred material is a sheeting in which a fused vinyl plastic or like high fusion flexible plastic has uniformly distributed in its powdered lead, the composition being modified by a plasticizer to secure a high order of flexibility approaching limpness. When tested in accordance with the ASTM designation E90–61T and the American Standards Association designation Z24.19–1957, sheeting of the thickness of .025 inch to .125 inch, having a relative density of ½ to 3 pounds per square foot has a sound transmission class number in the range from 18 to 34.

Specifically, a material which is preferred and which is sold under the trademark "LeadX" of Bar-Ray Products, Inc., 209 25th Street, Brooklyn, New York, has the following additional constitution:

Vinyl resin, plasticizer, powdered lead or like dense, heavy metal, in the ratio of between 35% to 45% lead equivalent so that a finished sheet of .100 inch thick will have a lead content equivalent to a lead sheet of .035 to .045 inch thick or a finished sheet of .025 inch thick will have a lead equivalent to a lead sheet of .00875 inch to .01125 inch thick, while exhibiting a high degree of flexibility approaching limpness to achieve the sound transmission class number in the range of from 18 to 34 for material ½ to 3 pounds per square foot, respectively. "Limp flexibility" as herein utilized is characterized by a Young's modulus of elasticity of 1000 to 4000 pounds per square inch.

The specific invention herein lies in the provision of an assembly for achieving and securing the maximum benefits of this curtain material so that its high sound transmission class number may be more effectively utilized as a room divider, notwithstanding its extreme weight and high flexibility or limpness, so that in partitioning rooms, such as classrooms, a large study room or hall may be isolated into smaller units, without the space loss of architectural partition structures which normally are employed in building rigid, extensive dividing walls.

In accordance with the invention, it is preferred to support from the beam **14** extending downwardly from the ceiling **11**, spaced brackets **15** by bolts **16**. The bottom section **17** of each bracket **15** is provided with a base **18**, resiliently supported on the springs **19** in relation to the vertical bracket **20** etxending from the inner side wall **21**. The bracket **20** provides support for end bearings **22, 23**, between which are journalled the trunnions **24, 25** for the tubular roll **26** upon which the convolutions **27** of the roll up curtain **10** are wound. Trunnion **25** is suitably coupled to a flexible coupling **28** to a motor drive **29** through a brake controlled transmission **30** of a known design which need not be here described in detail.

The convolutions 27 on the roll 26 are desirably rested upon transverse supporting rolls 31, 31 extending from the base 18 at intervals, depending upon the extensiveness of width of the curtain, it being understood that for a short length and width of roll body 26 or a large cylindrical diameter thereof, where little or no sagging tendency may be experienced for the weight of curtain, the supporting rolls 31 may be eliminated.

The curtain sheet material 10 is guided over a guide roll 32 so that its vertical flight 33 at the point A tangential to the roll 32 in the vertical plane is medially positioned between side wall strips 34, 35 of the vertical guides 12.

The curtain 10 has its leading edge 36 terminating in a floor engaging loop 37 and is weighted by the weight W, which preferably is capable of conforming to the irregularities of the floor 13. Preferably a weighted chain, such as a tractor link chain which is rigid in one plane and is positioned to be flexible in the vertical but which retains a rectilinear outline in the horizontal plane, is included within the loop 37.

The vertical flight 33 of the curtain between the tangential point A and the midpoint between the strips 34, 35 is sealed at the emerging slot 38 and along the entire height of the slot between the strips 34, 35, by spaced seals 39 and 40. These seals, as shown in magnified section in FIGURE 2*a*, consist of a core 43 of a foamed polyurethane within a sleeve 44 of cured vinyl resin film. Frictional contact is effected to seal the edges 45, 45 acoustically, with a minimum amount of friction adjacent the slot 38, as well as at the periphery defined by the guide strips 12, 12.

While there has been shown and described a curtain sheet of fused, leaded vinyl plastic, such as polyurethane, which has the powdered lead uniformly distributed in it, the preferred product being known as "LeadX" as described, it will be understood that a foamed sheet of the material, foamed to a range to change the relative thickness from ⅛ inch to ½ inch, may be used to provide a partition having a sound transmission loss factor in the 18 to 34 class number, as well as to act as an acoustical absorbent partition, provided the foaming treatment also serves to form cell structure with intercommunicating passages. If the cells are closed, no significant change in the transmission loss factor is secured between a lead impregnated sheet curtain foamed to a thickness 400% of the unfoamed equivalent sheet. However, by using foamed material with closed or intercommunicating cells, mechanical sealing advantages at the edges of the curtain may be obtained to a degree to eliminate the need for the foamed core seals 34, 35, 39, 40, as well as the high frictional sealing contact which would ordinarily be required between the seals and the curtain when the curtain is extended from the ceiling to the floor, as described.

While there is shown and described a curtain sheet resting transversely upon rolls in the embodiment illustrated in FIGURE 3, it may be found desirable, especially in shorter widths of curtains and in the interest of minimizing mechanical contact between the supporting structure and the partitioning curtain, to guide the main roll with minimum contact to the supporting structure. For this purpose, as in the embodiment illustrated in FIGURE 7, the main roll of sheet material 10 is supported only at its ends on the tubular core 26*a* and its leading flight 32*a* is guided to provide a vertical flight 33*a* from the guide roll *a'* so that the point of tangency is midway between the strips 34, 35, as in the prior embodiment. The leading edge of the curtain, adjacent its terminus 36*a*, has vertically flexible ballast means in the form of a floor engaging loop 37*a*, as in the prior embodiment, but is additionally stiffened transversely by aluminum stiffeners 46 immediately above the loop 37*a*. Within the loop 37*a* there is a compensating continuous weight which, as in the prior embodiment, constitutes a flat link chain W, which yields in one plane only, and is positioned to be yieldable only in the vertical plane on the floor.

For minimizing the transmission of sound through the curtain, the fascia F containing the roll may be lined with a layer of "LeadX" flexible lead-plastic sheeting L.

Another embodiment of the invention is illustrated in FIGURE 8 wherein the flexible "LeadX" curtain 10 is augmented by vertically suspending a supplement curtain 10*b* in parallelism therewith. These sheets are, for storage, superimposed in rolled up relation on the single core 26*b*. The leading edges 32*c* and 32*d* from each layer are branched out and guided over guide rolls Ac and A*d*, to direct the vertical flights 33*c* and 33*d* in spaced planes from each other through emerging slots 38*c* and 38*d* between sealing strips 34*c* and 35*c*, and 47, 47, respectively, which are arranged in side wall strips of the vertical guides, as in the prior embodiment. The gap between the flights 33*c* and 33*d* need not be great, and for an ordinary classroom, a gap of four to eight inches may be employed. A gap of seven inches is preferable and will largely increase the efficiency of the flexible curtain of minimum thickness disclosed herein, to maintain a high sound transmission loss class number, with little structural loss of room area.

While in the prior embodiments illustrated, the idler guide roll is placed in a position so that a maximum length of vertical flight is assured and the great weight of the roll is thereby relieved from the main roll, it is also possible that this guide roll may be placed adjacent the emerging aperture. For this purpose, reference is made to FIGURE 9 where a still further embodiment of the invention is illustrated, insofar as the head section assembly is concerned.

In this embodiment, the flight 32*e* is guided over the guide roll Ac so that the point of tangency of the vertical flight 33*e* is midway between the walls defining the emerging slot 38*e*. In other respects, the vertical flight 33*e* is guided between sealing strips to seal the horizontal as well as vertical edges of the curtain as it is guided through the emerging slot and through the vertical guides 12, as in the prior embodiment.

By the construction described, installations to effect the objective of a flexible room divider for rapid conversion of rooms into smaller units is achieved, without materially disturbing the wall structure. Thus, assembly rooms of large area may be instantly divided into separate rooms for team teaching. The curtain provides privacy and isolates sound. The mass of the curtain and its density make it possible to utilize the curtain for outlining chalk panels.

Particularly resistant to any swaying action is the embodiment illustrated in FIGURE 8 where both a main and a supplemental curtain are supported from the ceiling in spaced parallel planes.

No special floor tracks are necessary to incorporate the acoustical curtain and by reason of the weighted flexible loop, compensation is made for irregularities in floor levels and the loop with a flexible filler will conform to such irregularities in the floor, to seal off light, and sound within the limits of the sound transmission loss factors specified.

When the curtain is not in use, the roll of acoustical material may be housed in the ceiling enclosures described to occupy a minimum amount of space, regardless of the height or length of the room to be subidivided. The curtain lends itself readily to both powerized means of rolling or unrolling and manual control, as no complicated power transmission problems are entailed.

Likewise, when the curtain is not in use and is raised adjacent the ceiling, it is out of reach and not subject to marring or damage, as would be the case with paneled partitions, such as folding doors, or accordion pleated curtains, which require side wall space for installation.

It will be understood that while there is described and preferred a flexible, pliable, limp sheeting consisting merely of the fused plastic with powdered lead distributed therethrough, that for subdividing large transverse areas,

in which a large mass of curtain would necessarily present a weight problem insofar as elongation of the sheet is concerned once it is hung in position, it may be desirable to reinforce the composition of the plastic material with dispersed fibre. However, it will be understood that increasing the weight of the partition will not increase the sound transmission loss factor proportionately to the increased weight, and economy may dictate the employment of the supplemental curtain described in connection with FIGURE 8 in preference to an increase in the weight factor of the sheeting itself.

By the employment of pressure seals at the vertical and horizontal edges of the curtain and by the employment of a floor conforming loop, highly efficient sound sealing is effected in addition to the achievement of high sound transmission loss class numbers by the use of the curtain employed.

Having thus described the invention and illustrated its use, what is claimed as new and is desired to be secured by Letters Patent is:

As a new article, a room partition acoustical curtain comprising a pliable, relatively limp, flexible sheet of fused plastic having uniformly distributed therethrough 25 to 45% by volume powdered lead, characterized by a sound transmission class number of from 18 to 34 in sheets of from one half to three pounds per square foot, convoluted in a roll about a core, a horizontally disposed guide roll laterally spaced from said core, said curtain

passing over said guide roll and hanging in a vertical plane tangent to a side edge of said guide roll, means for rotating said core about a horizontal axis to raise and lower said curtain, vertically disposed side wall strips having spaced guides sealingly engaged with portions of said curtain in the lowered position thereof, said curtain, at its lower edge, having heavy ballast means, said ballast means being flexible in a vertical plane but not in a horizontal plane whereby said lower edge is enabled to conform to vertical irregularities of the floor but stiffens the lower edge of said curtain against flexure in a horizontal plane.

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