

March 26, 1968

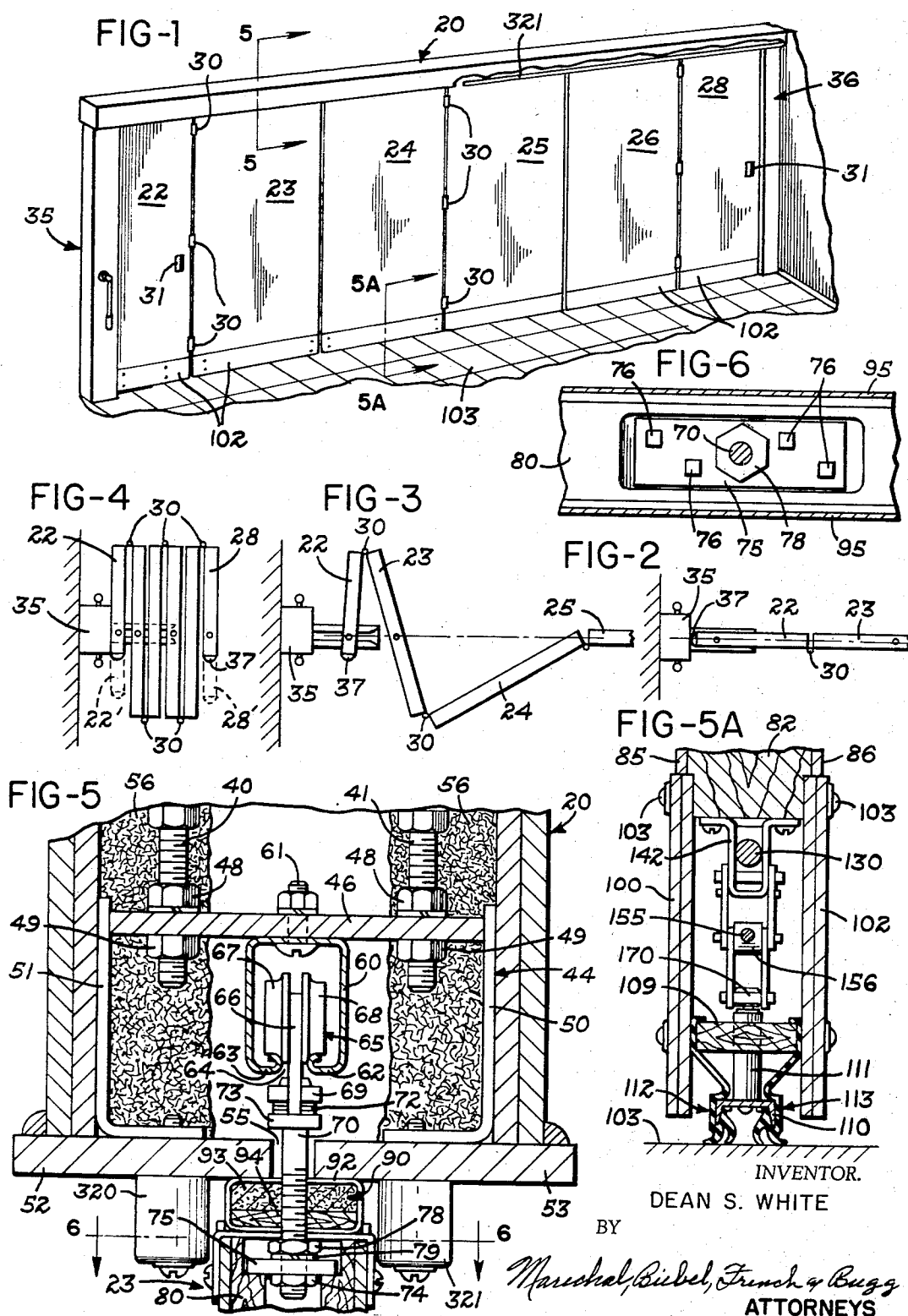
D. S. WHITE

3,374,821

MOVABLE SPACE DIVIDER STRUCTURE

Filed Oct. 14, 1965

5 Sheets-Sheet 1



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MOVABLE SPACE DIVIDER STRUCTURE

Filed Oct. 14, 1965

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FIG-7

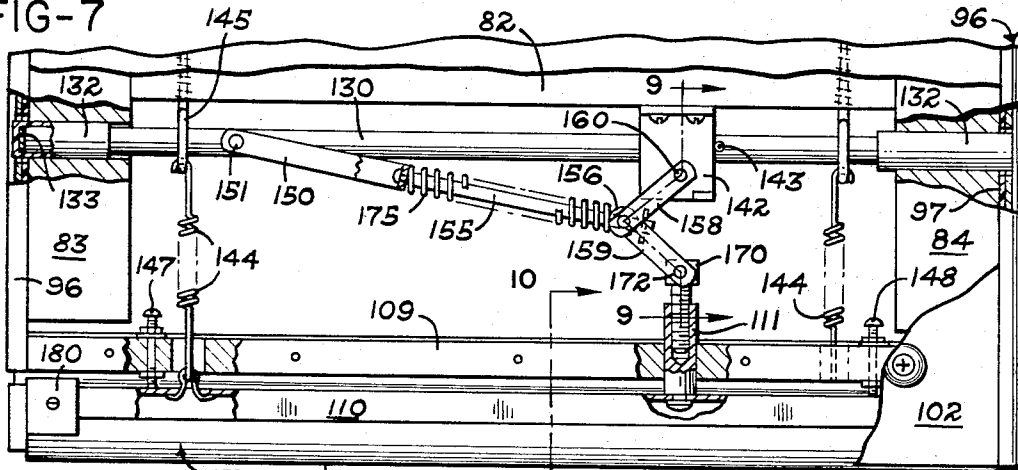


FIG-8

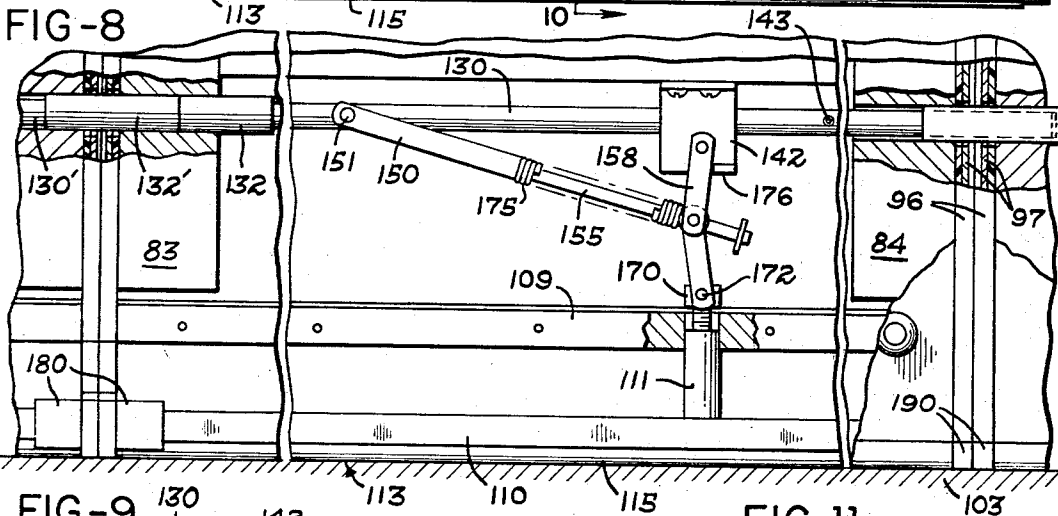
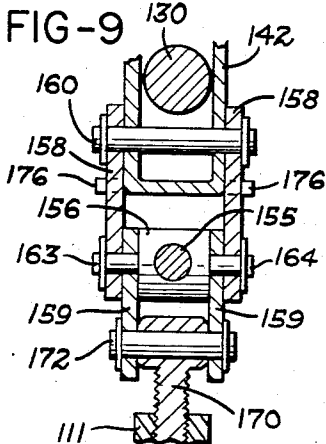


FIG-9



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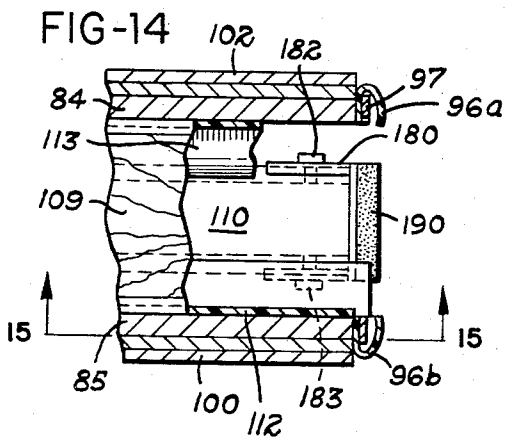
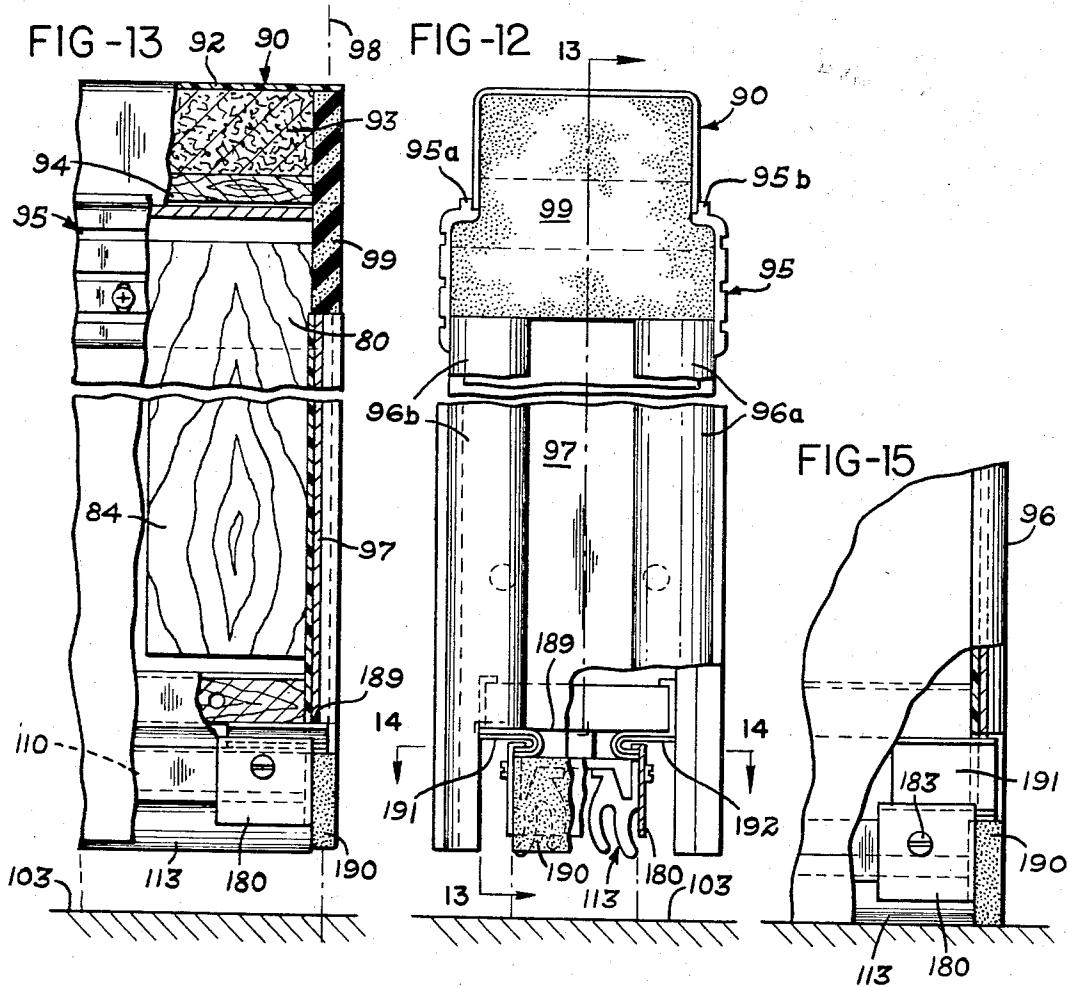
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MOVABLE SPACE DIVIDER STRUCTURE

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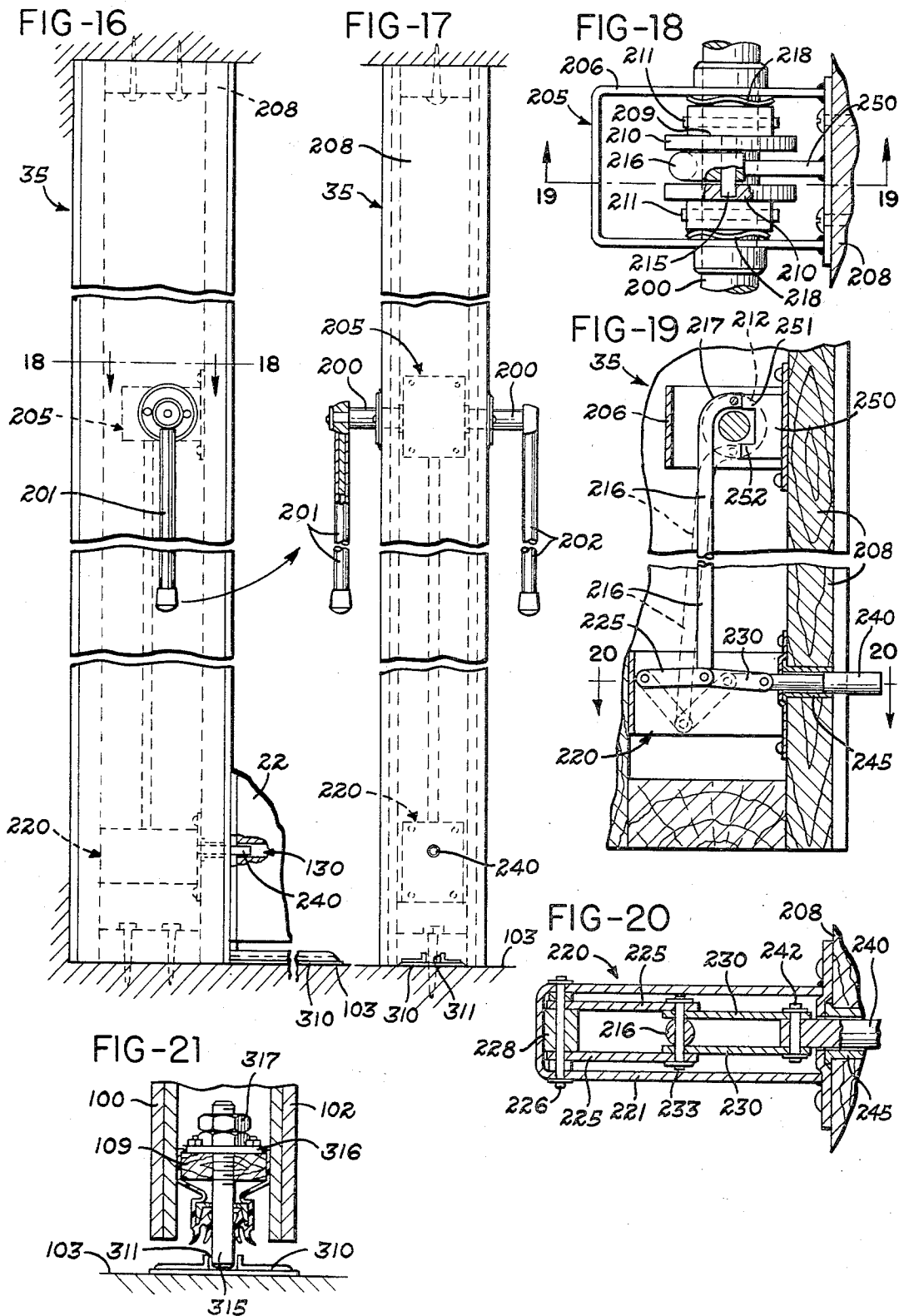
D. S. WHITE

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FIG-22

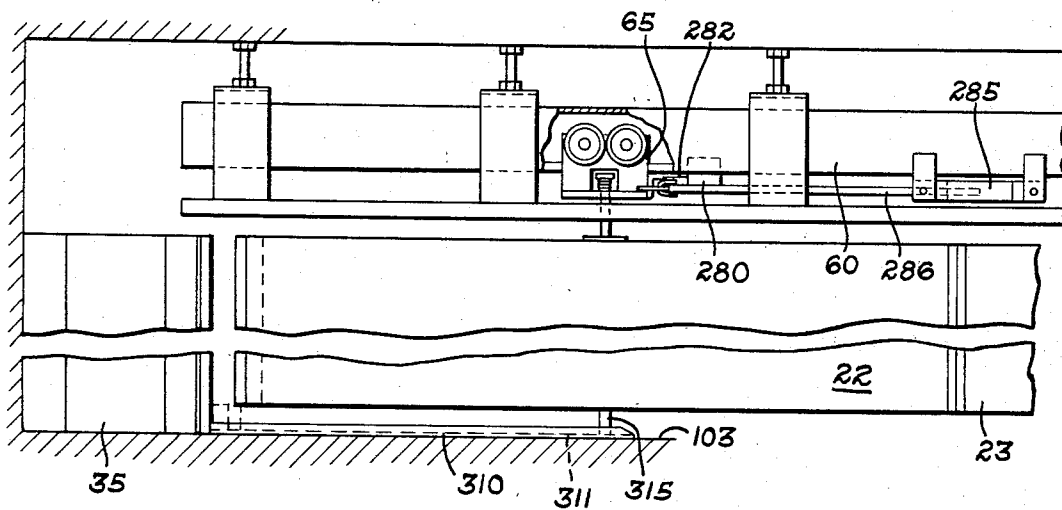
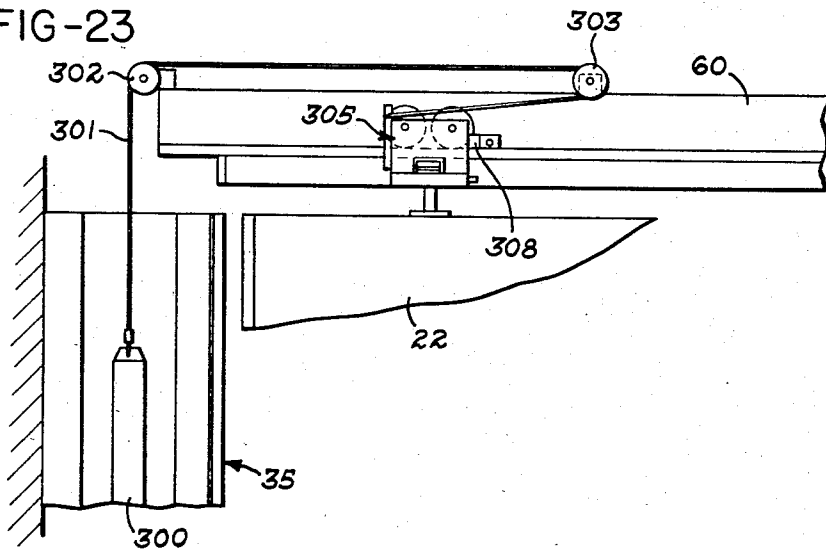


FIG-23



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MOVABLE SPACE DIVIDER STRUCTURE

Dean S. White, New Castle, Ind., assignor to New Castle Products, Inc., a corporation of Indiana
Filed Oct. 14, 1965, Ser. No. 495,988
9 Claims. (Cl. 160—40)

ABSTRACT OF THE DISCLOSURE

A folding partition incorporating a floor sealing mechanism operated by a handle, in which a plunger in the fixed jamb post engages a floor seal rod in the adjacent panel, with the rod motion being translated from panel to panel, the partition also incorporating end seals at the ends of the floor seals to effect sound isolation free of air gaps between panels and further incorporating a spring biasing mechanism for assisting in the turning of the first panel next to the jamb when the panels are moved from the extended position to the folded position.

This invention relates to movable space divider structures and more particularly to such structures which comprise a foldable closure assembly for closing a wall opening, and in which a plurality of essentially rigid panels are movable from a closed position in which the panels extend in coplanar relation across the wall opening to a storage position in which the panels are stacked in side-by-side relation against a fixed jamb.

The invention is more specifically directed to improvements in such movable space dividers which result in a lower cost unit and in which many of the parts, including the intermediate panels, can be preassembled to standardized and predetermined widths thus reducing the number of especially made components for any given installation. The space divider structures of this invention are thus particularly adapted for use in classrooms, public buildings, churches, restaurants and the like where a highly efficient space divider is needed for acoustical and physical separation of groups of people.

It is accordingly an object of the invention to provide apparatus which forms a movable closure or wall which is useable in a wide variety of installations and in which many of the components are adapted for quantity production.

A further important object of this invention is to provide a foldable closure assembly, as outlined above, incorporating an improved floor seal and seal operating mechanism. The panel floor seals are preferably operated simultaneously from a single remote fixed location, such as from a mechanism in a fixed jamb post.

It is accordingly a further important object of this invention to provide a foldable closure assembly, as outlined above, in which each panel has a floor seal mechanism operated from a master control in a fixed jamb post for sealing the panels to the floor in the closed position of the panels.

A further object of this invention is the provision, in a movable space divider structure, of an improved floor sealing mechanism which is actuated or activated by a master mechanism in a fixed jamb post and in which a sealing force is transmitted by translational movement through each of the contiguous panels in the coplanar position thereof, without effecting translatory or lifting movement of the individual panels.

A still further object of this invention is the provision of an improved floor sealing mechanism in which a floor seal is connected at the bottom of the panel through a rolling or flexible, continuous, and preferably impervious strip, effectively forming a barrier sealing the opposite sides of the panel at the floor.

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Another object of this invention is the provision of a foldable assembly of panels in which the trail panel positioned next to a fixed jamb post is mounted on a track and biased or urged in a direction away from the jamb post to facilitate turning movement between the folded and the coplanar positions, without interference with the jamb post.

A further object of this invention is the provision of apparatus, in a foldable closure assembly, for urging the trail panel in a direction away from an adjacent jamb post with a relatively constant force. Preferably, this force is sufficient to move the trail panel to provide necessary clearance as the panel pivots on its support trolley but which force is insufficient to move a combined stack of such panels away from the jamb post once they are in their folded or storage position against the jamb.

Another object of this invention is the provision of a foldable closure assembly comprising a plurality of essentially rigid panels in which at least the intermediate panels, and the fixed jamb may be standardized as to width and in which adjustment for the width of the opening is made by suitably varying the width of the trailing and leading panels, which are of equal widths.

A further advantage of the floor seal operating mechanism of this invention is that it compensates for irregularities in the levelness of the floor being sealed and has a grasping action with the floor which minimizes swaying movement of the panels when sealed, and provides an effectively rigid wall closure.

It will be seen from the above that a further important object of the invention is to provide a low-cost movable space divider which is characterized by effective sound isolation and which can be easily moved between the open and the closed positions.

A still further object of this invention is the provision, in an assembly of movable panels, of a floor seal operating mechanism in which end or edge seals are movable with a movable floor seal and form, in effect, a continuation of the floor seal providing a generally unbroken seal between adjacent panels in the closed position thereof, and which are movable or retractable to facilitate ease of movement of the panels between a storage position and a coplanar or closing position.

These and other objects and advantages of the present invention will become apparent from the following description, the accompanying drawings and the appended claims.

In the drawings—

FIG. 1 is a front perspective view of a movable space divider constructed according to this invention;

FIG. 2 is a diagrammatic fragmentary plan view of the divider of FIG. 1 illustrating the panels in the closed coplanar position of FIG. 1;

FIG. 3 is a view similar to FIG. 2 but showing the initial movement of the panels during folding;

FIG. 4 is a view similar to FIGS. 2 and 3 but showing the panels in the stacked or stored position;

FIG. 5 is an enlarged fragmentary vertical section through the head section of the space divider taken generally along the line 5—5 of FIG. 1;

FIG. 5A is a further vertical fragmentary section through the bottom portion of one of the panels taken generally along the line 5A—5A of FIG. 1;

FIG. 6 is a plan view, partially in section, showing the pendant bolt attachment to a panel taken generally along the line 6—6 of FIG. 5;

FIG. 7 is an elevational view of the floor seal operating mechanism of one of the panels with the kickplate and other parts being broken away;

FIG. 8 is a view similar to FIG. 7 but showing the seal actuating mechanism in the operated position and

showing fragments of adjacent contiguous doors in their extended position;

FIG. 9 is an enlarged vertical fragmentary section taken generally along the line 9—9 of FIG. 7;

FIG. 10 is an enlarged vertical fragmentary section showing the floor seal and support taken generally along the line 10—10 of FIG. 7;

FIG. 11 is an enlarged fragmentary section through a panel showing the vertical edge seals;

FIG. 12 is an elevational view of one of the panels looking at the edge thereof, with parts being broken away to expose details of the end seals;

FIG. 13 is a vertical section through the panel edge showing the edge seal and the movable end seals, taken generally along the line 13—13 of FIG. 12;

FIG. 14 is a transverse section through one end of a panel showing the mounting arrangement for the end seals on the floor seal support channel, taken generally along the line 14—14 of FIG. 12.

FIG. 15 is a vertical section, similar to FIG. 13, but taken along the line 15—15 of FIG. 12 showing the end seal in the lower position;

FIG. 16 is a side elevational view, partially broken away, of the fixed jamb post;

FIG. 17 is a front elevational view of the jamb post of FIG. 16;

FIG. 18 is a fragmentary plan view, with parts broken away, of the upper bracket assembly hook as indicated by the lines 18—18 of FIG. 16;

FIG. 19 is a vertical fragmentary section through the fixed jamb post showing details of the jamb post floor seal operating mechanism;

FIG. 20 is a horizontal section through the lower bracket assembly taken generally along the line 20—20 of FIG. 19;

FIG. 21 is a fragmentary section through the lower portion of the trail panel showing the guide pins and the floor-mounted guide pin plate;

FIG. 22 is an elevational view of the support and bias arrangement for a trial panel, with parts being removed for the purpose of clarity; and

FIG. 23 is a modified arrangement of the trailing panel support and bias arrangement.

Referring to the drawings which illustrate preferred embodiments of the invention, a movable space divider assembly constructed according to this invention is shown in FIG. 1 as including a head section 20 which is suitably connected or forms a part of a ceiling and extends across a wall opening to be closed by this invention. A plurality of essentially rigid, individual, acoustical-isolation panels are top hung and movably supported on a track in the head section 20, and includes a trail panel 22, a plurality of identically constructed intermediate panels, such as the panels 23—26, and a lead panel 28. The panels comprising the foldable closure assembly are continuously hinged or connected together by hinges 30, which are arranged alternately on opposite sides of the panels to permit folding of the panels into a stacked, side-by-side relation, such as shown in FIG. 4. Recessed hand pulls 31 are formed in the leading and trailing panels to facilitate operation of the closure assembly.

The foldable closure assembly further includes a fixed jamb post 35 which is positioned against one wall of the opening to be sealed, and a bumper jamb post 36 which is positioned diametrically opposite to the post 35, on the opposite wall. Preferably, the intermediate panels 23, 24, 25 and 26 are essentially of identical construction. Therefore, these panels may be constructed to a standard size. The lead panel 28 and the trail panel 22 are also preferably formed with the same width, which may be less than the width of the intermediate panels. Further compensation for the exact width of the opening may be made suitably varying the width of the bumper jamb post 36. In this manner, savings may be effected by standardizing on the construction of the intermediate

panels 22—26 and the fixed jamb post 35. Bulb seals 37 at the lead and trail panel edges form a seal with the posts 35 and 36.

The trail panel 22, the next adjacent panel 23, and alternate panels thereafter, such as the panel 25 and the lead panel 28, are supported for traverse and pivotal movement on suitable trolleys within a concealed track in the head section 20. As shown in FIG. 5, the head section 20 is attached, such as by longitudinally spaced pairs of hanger rods 40 and 41, to a suitable structural member, such as an I-beam or other supporting structure, not shown. The rods 40 and 41 adjustably support a plurality of track bracket assemblies 44, as shown in FIG. 5. These assemblies each include a transversely positioned cross-member 46 which is adjustably supported on the rods by nuts 48 and 49. Soffit supporting brackets 50 and 51 extend downwardly from the member 46 and inwardly to support soffit boards 52 and 53 which extend longitudinally the width of the wall opening. The boards are spaced apart, as shown at 55, to provide a slot for the movement of the panel supporting mechanism there-through during the opening and closing of the panels. Blankets 56 of acoustical insulation provides sound isolation and containment of trolley noises.

A steel track is supported at longitudinally spaced locations within the head section 20 by the bracket assemblies 44. The track 60 is attached by a bolt 61 to the cross members 46. The assemblies 44 are spaced more closely at the end of the track 60 nearest the fixed jamb post 35, in order adequately to support the concentrated weight of the panels when they are in the folded position, as shown in FIG. 4.

The track 60 includes opposite, inwardly-turned flanges 62 and 63 which define therebetween a longitudinal slot 64 in general alignment with the space 55 between the soffit boards 52 and 53. Four-wheeled trolleys 65 are received within the track 60, there being one trolley 65 for each of the lead and trail panels and preferably for the panel 23 which joins the trail panel 22. However, the alternate panels, such as the panels 24 and 26, are supported by the hinges 30 to the adjacent trolley supported panels.

Each trolley 65 includes a carriage plate 66 on which are mounted two pairs of flanges wheels such as the wheels 67 and 68 shown in FIG. 5. The lower end of the carriage plate 66 extends through the slot 64 and is apertured to receive a sleeve or collar 69 supported on the upper end of a panel supporting pendant 70. The collar 69 of the pendant 70 is supported on thrust bearings and races 72 and on a flange 73 on the plate 66, permitting pivotal movement of the supported panel in relation to the trolley 60.

The pendant 70 is adjustably attached to the top of the associated panel, such as the panel 23 in FIGS. 5 and 6, by means of a nut 74 which is welded or otherwise suitably secured to the lower surface of a plate 75 received in a recess formed in the top of the panel. The plate 75 may be suitably secured to the top rail 80 of the panel such as by lag bolts 76, as shown in FIG. 6. The pendant 70 is adjustable by rotating in the nut 74 to adjust the vertical position of the panel in relation to the header 20 and the track 60. Once this adjustment has been made, the pendant 70 may be locked in place by a lock nut 78 and lock washer 79 which is received on the threaded end of the pendant.

The panels are preferably of essentially identical construction, and are preferably formed with a wooden perimeter frame which includes the top wooden rail 80 as shown in FIG. 5, a bottom wooden rail 82 as shown in section in FIG. 5A, and vertical front and rear edge stiles 83 and 84, the lower ends of which extend below the bottom rails 82 at the region of the kickplates, as shown in FIG. 7. Each panel is preferably of semi-hollow construction and includes face panels 85 and 86, as shown in FIG. 5A, which may consist of one-quarter inch hard-

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board or plywood facing, and suitably finished either by a vinyl wall covering or wood veneer, as desired. The space between the face panels may be filled with a suitably acoustical or sound deadening material, such as mineral wool.

Each of the panels includes means forming a sweep seal 90 extending along the top thereof, as shown in FIGS. 5 and 12. The horizontal top sweep seals are made in halves or sections and each preferably consists of a vinyl skin or covering 92 filled with polyurethane foam 93 and wrapped about a plywood strip 94. The seals 90 are adjustably supported on the top of the associated panel in sealing relation to the soffit boards and in close end-to-end abutment at the pendant 70 by an extruded metal astragal 95. The astragal 95 is received over the top edge of the panel and supports the top seals 90 between flanges 95a and 95b formed in the top surface thereof.

The sections of the astragal 95 which are carried on the trolley-supported panels are longitudinally split so that they may be assembled following the initial adjustment of the panel and trolley, as described above. The astragals 95 which are used on the intermediate panels, such as the panel 24, need not be split. The sweep seals 90 terminate adjacent the vertical edges of each of the associated panels, as shown in FIG. 13. The seals 90 which are associated with the trolley-supported panels may, alternatively, be provided with a hole so that they may be threaded over the pendant 70, prior to the attachment of the panel to the pendant and prior to the final installation of the astragals 95.

Each of the adjoining panels is provided with vertical edge seals, such as the seal 96 shown in section in FIG. 11. The seal 96 may be formed of vinyl with inwardly-turned, opposite, vertically-extending edges 96a and 96b and retained by a vertical keeper plate 97. The seal 96 preferably extends along the outer edge of stiles 83 and 84 from a position spaced from the top of the panels to the bottom edges thereof. A half of one of the hinges 30 is also shown in FIG. 11 as defining a hinge pivot line 98. Since adjacent panels pivot about this pivot line, the seal edges 96a and 96b will be slightly compressed against a corresponding seal edges on the adjacent panel when the panels are in coplanar alignment. Also, rubber end seal pads 99 (FIGS. 12 and 13) shaped to conform to the outline of the astragals 95 and the top seal 90 are mounted at the tops of the panel edges and are flush with the seal 96a and 96b for abutment with corresponding pads when the panels are extended.

As shown in FIGS. 1 and 5A, each of the panels is formed with kickplates 100 and 102 which extend longitudinally across the width of the panels at the bottom. The kickplates are removably secured to the lower ends of the stiles 83 and 84 and to the bottom rail 82, by means of screws 103, and conceal a floor seal and floor seal operating mechanism therein. The kickplates 100 and 102 terminate a short distance above the surface of the floor 103 to permit unrestricted movement of the panels when the floor seal is retracted. A portion of the floor seal and its operating mechanism is shown in FIG. 5A, with further details being shown in FIGS. 7-10 and 12-15.

Referring to FIGS. 7-10, the floor seal mechanism includes a wooden floor seal rail 109 which extends between the kickplates in spaced relation to the bottom edges thereof. A generally channel-shaped floor seal support 110 extends longitudinally in the space between the bottom edges of the kickplates 100 and 102. The support 110 is mounted for limited vertical movement between a raised position, as shown in FIG. 10, and a lowered position as shown in FIG. 5A. A post 111 extends from the support 110 through the kickplate rail 109 for operating the support 110.

The support 110 includes a pair of floor engaging ex-

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truded elastomeric sealing strips 112 and 113 which are preferably formed of vinyl and which may be of identical construction. The floor seals 112 and 113, are each provided with two or more longitudinally extending, downwardly depending lip portions 115 for engaging the surface of the floor 103 and for providing an effective sound barrier therewith. The laterally spaced lip portions 115 resiliently engage the floor 103 in the operated position of the floor sealing mechanism, and have inner surfaces which are received over the channel flanges of the support 110 and suitably secured thereto such as by adhesive.

Each of the strips 112 and 113 is formed with a continuous flexible side wall 120 which has a continuous edge or lip 122 adhesively secured or clamped between one of the kickplates 100 and 102 and rail 109. The flexible walls 120 form a continuous rolling barrier and also serve as a support or a guide for the vertical movement of the seal support 110. Thus, the walls 120 form an effective floor sound barrier free of openings or gaps from one side of the panel to the other.

Means for moving the floor seal between its raised and lowered positions, in each of the panels, includes a generally horizontally disposed seal operator or actuator rod 130. The rod 130 is also mounted within the space defined between the kickplates in the lower portion of the associated panel for translatable or horizontal movement therein, and is formed with a length which substantially approximates the width of the panel. The only exception to this is the rod 130 in the lead panel which is preferably shortened at its forward end so as not to protrude when the sealing mechanism is lowered and locked in position.

As shown in FIG. 7 and 8, the rod 130 has opposite ends which are received within suitable aligned access openings formed in the stiles 83 and 84, and each end of the rod is preferably provided with a plastic cap 132. If desired, washers 133 may be received within the end of the cap 132 for making minor adjustments in the effective length of the seal actuator rod 130. As shown in FIG. 8, each rod 130 is in generally horizontal alignment with a corresponding rod in the adjacent panels when the panels are in the closed or coplanar position. The lengths of the rods 130 are such that translatable movement of the actuator rod 130 in the trail panel 22 is directly transmitted from rod to rod with a minimum of lost motion through all of the intermediate panels to the corresponding rod 130 in the lead panel 28. This is effected by movement of the lead end of one rod into operating engagement with the butt end of the next adjacent rod through the access openings in the edge seal plates and vertical stiles, between panels, as shown by the cap 132' of the rod 130' extending into operative engagement with the cap 132 on the butt end of the rod 130 in the upper left hand corner of FIG. 8.

A U-shaped hanger bracket 142 is fixed to the lower surface of the rail 82 over the rod 130, and a roll pin 143 in the rod 130 on one side of the bracket 142 defines the retracted position of the rod. Reactive springs 144 have upper ends secured to the rail 82 by eye-bolts 145 and lower ends connected to the support 110 by clips, and tend to raise or lift the support to a floor seal retracted position against adjustable stops 147 and 148 in the kickplate rail 109.

Link means connecting each rod 130 to the seal support 110 for effecting vertical movement thereof from the raised to the lowered position with translatable movement of the rod 130 includes a bifurcated inclined yoke 150 which is pivoted at one end to the rod 130 at a pin 151. The yoke 150 supports a yoke pin 155 which has a forward end slidably received through a transverse opening in a generally cylindrical bushing or spacer 156, as shown in FIGS. 7 and 9.

The bushing 156 forms the pivotal connection between a toggle mechanism formed by a pair of upper link straps 158 and a pair of lower link straps 159. The upper

link straps 158 are pivoted to the hanger bracket 142 by a pin 160 and form a pivotal toggle connection with the lower link straps 159 at the projections 163 and 164, the latter being a part of the bushing 156. The lower link straps 159 form a vertical thrust connection with the upper end of an adjusted screw 170 through a connecting pin 172. The lower end of the adjusting screw is received with a suitable threaded opening formed in the post 111 of the seal support 110.

A yoke pin spring 175 is mounted on the pin 155 between the bushing 156 and the yoke 150. The spring 175 comprises the force transmitting member connecting the rod 130 to the toggle mechanism and defines the force by which the floor seal strips 112 and 113 are caused to engage the floor 103. Also, irregularities in the levelness of the floor, or in the height of the panel, are compensated for here in the sliding connection between the pin 155 and the toggle bushing 156, and also allows for over-travel of rod 130.

In the operation of the floor seal actuating mechanism, when the operator rod 130 is moved to the right, as shown in FIG. 8, a force is applied by the yoke spring 175 to the bushing 156 of the toggle mechanism causing the toggle to be spread apart or opened. This forces the floor seal support 110 and the floor seal strips 112 and 113 into sealing engagement with the floor with a predetermined and substantially constant force, as determined by the spring 175.

The toggle mechanism is prevented from moving over-center by a flange 176 on the bracket 142 which engage the upper toggle straps 158 in operated position. Irregularities in the spacing of the floor in relation to the bottom of each panel may be compensated for by suitable adjustment of the screw 170 so that when all of the floor seals move together an effective acoustical seal is maintained across the width of the wall opening. In addition, the downward force against the floor by the floor seals and the panel-to-panel lock formed by the rods 130 minimizes swaying and buckling movement of the panels in the closed position.

Each floor seal mechanism further includes a pair of end seals which are carried on the support 110 and which are movable with the support between the raised and lowered positions. Referring to FIGS. 12-15, U-shaped clip 180 is flanged at 181 along the upper edges and is retained by machine screws 182 and 183 extending into the support 110.

The end plate 97 is provided with an opening 189 therein within which a generally rectangular, sponge rubber end seal 190 is reciprocally removable. The seal 190 is suitably secured, such as by an adhesive, to the front face of the clip 180 and moves within the opening 189 with the support 110 between a raised position shown in FIG. 13, and a lowered position shown in FIG. 15. As shown in FIG. 12, the edge seal portions 96a and 96b extend to the bottom of the panel but are cut out at the opening 189 to receive the end seal 190 therebetween. Also, the side wall portions 120 of the floor seals have a pad 191 and 192 suitably secured and extend transversely into the space between adjacent panels, as shown in FIG. 15.

The thickness of the pads 190, 191 and 192 are such as to extend transversely a short distance outwardly of the hinge pivot reference line 98, as shown in FIG. 13, in the same manner as the upper pads 99. Accordingly, there will be effected a slight end-to-end compression of these seals and the edge seal edges 96a and 96b when the panels are extended, tending to hold the panels rigidly extended. The arrangement is such that a complete closure, free of gaps, is effected with the end seals 190 being, in effect, a continuation of the floor seal between adjacent panels in the extended position.

Adjustable leveling screws 147 and 148 will allow positioning of the floor seal support 110 in a retracted position such that the end seals 190 on each adjacent panel at the

hinge point are the same height above the floor when panels are in a stacked position. This further assures that when panels are moved from a stacked to an extended position, the end seals 190 will be in correct alignment when the floor seal mechanism is activated.

Means for effecting the operation of each of the individual floor seal mechanisms in unison when the panels are extended, as shown in FIG. 1, includes a seal operating mechanism in the fixed jamb post 35, as shown in FIGS. 16-20. The seal operating mechanism includes a shaft 200 which extends to opposite sides of the opening on which are mounted handles 201 and 202. The shaft 200 is rotatably mounted therein within an upper bracket assembly 205 shown in FIG. 18.

The assembly 205 includes a generally rectangular frame 206 which has one end thereof mounted on the side surface of a front mounted board 208 of the jamb post 35. A pair of sleeves 209 and 210 are mounted within the frame 206 and are secured by keys 211 to the shaft for rotation therewith. These sleeves are formed with enlarged, circular disk-shaped ends 212 which are fixed in spaced apart relation and which receive a crank pin 215 therebetween. A cane-shaped connecting rod 216 has its curved upper end 217 journaled on the pin 215, and extends downwardly within the jamb post 35. A pair of wave washers 218 are positioned between the sleeves 210 and 211 and the adjacent inner surfaces of the frame 206. The washers 218 introduce friction to maintain the handles in the released or vertical position.

A lower bracket assembly 220 is also formed with a generally rectangular frame 221 which has one side thereof mounted on a side surface of the board 208. The lower assembly 220 includes a toggle link arrangement consisting of a pair of rear toggle link straps 225 journaled within the frame 221 on a pin 226 on either side of a spacer sleeve 228. Forward toggle links comprise a pair of straps 230 which form a pivotal connection with the rear link straps 225 at a connecting pin 233. The lower end of the connecting rod 216 is also journaled on the pin 233 so that when the rod 216 is raised or lowered, it causes the toggle link mechanism to extend or retract.

Operator means in the fixed jamb post 35 to operate the floor seals includes a plunger 240 which is received in the mounting board 208 for reciprocal movement and which is connected to the forward links 230 at a pin 242. The plunger 240 is of such length as to be substantially retracted within the fixed jamb post in the raised position of the handles 201 and 202, and is caused to project outwardly in the lowered position of the handles as shown in full lines in FIG. 19. Preferably a metal sleeve bearing 245 is inserted within the mounting board 208 in order to provide a bearing surface for the plunger 240.

The plunger 240 is positioned in longitudinal alignment with the exposed end of the rod 130 in the trail panel 22 when the panels are in the closed position, as shown in FIG. 1. The extent of rotation of the operating handles is defined by a stop plate 250 in the upper bracket assembly 205 which has abutments 251 and 252 which, respectively, engage the end of the connecting rod 216 in the lowered and raised position of the handles.

Accordingly, the floor seal operating handles are movable between a raised position in which the plunger 240 is substantially retracted within the board 208 to a lowered position in which the toggle links 225 and 230 are moved slightly over-center, as shown in FIG. 19, with the plunger 240 extending into operating engagement with the floor seal operating rod 130 of the trail panel. As described above, this motion is translated from one panel to the next simultaneously engaging each of the panel floor seals with a predetermined and substantially constant force against the floor.

As outlined above, a further important feature of this invention is the provision of apparatus which urges the panel 22 adjacent the fixed jamb post 35 in a direction away from the jamb post 35 to permit turning or pivotal

movement. For this purpose, the invention includes means biasing the adjacent or trail panel in a direction away from the fixed jamb post with a relatively constant force. This force is sufficient to move this panel and usually the next panels 23 and 24 away from the jamb post, but is insufficient to move the entire stack of stored panels.

Referring to FIG. 22, it will be seen that the trolley 65 is mounted for limited forward movement, there being provided a stop 280 on the track 60 which is engageable with a member 282 on the trolley defining the limit of forward trolley movement. Relatively constant bias means includes a clock spring sash balance mechanism 285 fixed to the track in non-interfering relation to the trolleys carried thereon and includes a flexible tension member, such as a tape 286 which has one end thereof connected to the trolley 65. A mechanism suitable for this purpose is the type 242 sash balance made by Caldwell Manufacturing Company, P.O. Box 444, Rochester 2, N.Y.

The force exerted by the spring mechanism 285 on the trolley 65 is applied generally linearly and constantly in a direction tending to move the panel 22 away from the fixed jamb post 35, as shown in FIG. 22. However, the force of the spring mechanism 285 is insufficient to move more than two or three of such panels, so that when all of the panels have been retracted to the storage or stacked position, as shown in FIG. 4, they may then be easily moved as a unit against the jamb post 35 and will stay in that position.

In FIG. 23 there is shown a slightly modified form of the constant force means, comprising a weight 300 which is suspended on a cord 301. A pair of pulleys 302 and 303 in the header 20 guide the cord 301 to a position forwardly of the trolley 305 and apply a constant force to the trolley in a direction tending to move the same and the supporting trail panel 22 thereon away from the jamb post 35, to facilitate the final movement of the panels during extension into coplanar relationship. Again, a stop or abutment 308 may be formed on the track for engagement with the trolley 305 to limit the extent of movement which may be effected by the weight 300.

Means for guiding the bottom of the trail panel 22 and to stabilize all of the panels when folded or stacked in the storage position, includes a floor plate 310, FIG. 22, which is formed with central and longitudinally aligned slot 311. As shown in FIG. 2, a fixed pin 315 is adjustably carried on a plate 316 on an upper surface of the kick-plate rail 109 in depending relation through a suitable opening formed in the floor seal support 110 between the sealing strips, with the lower end of the pin 315 received in the slot 311. The pin adjustment is maintained by a lock nut 317. The floor pin 315 is aligned on the panel directly beneath the support trolley, as shown in FIG. 22, and forms a pivot about which the panel turns, and guides the panel when it moves in translation. Preferably, the next adjacent full size panel 23 also includes a similar pin which will move into the slot when the panels are folded, such as shown in FIG. 4.

In order to provide coplanar movement for the major portion of the closure assembly during opening and closing, a pair of guide molds 320 and 321 are supported on the head section soffit boards 52 and 53 to guide the movement of the lead panel 28. These guide molds do not extend the full width of the head section, but terminate in spaced relation to the fixed jamb post 35 as shown in FIG. 1 to permit each panel to swing into a folded position out of its coplanar position, as shown in FIG. 3.

The operation of the invention is largely self-evident from the foregoing description. It will be seen that the assembly of panels may be easily moved from the stacked position shown in FIG. 4 to the coplanar position shown in FIG. 2 by grasping the lead panel 28 and moving the same across the opening and between the guide molds 320 and 321. The terminal or final movement may sometimes be aided by applying force to the joining edges of two of the panels, such as between the trail panel

22 and the first size panel 23, to move the panels into coplanar relation. In this position, the bulb seals 37 at the vertical edges of the lead and trail panels, the vertical edge seals 96, the top seals 99 and the end seals 190 are in slight compression. The sweep seals 90 at the top of each panel forms a substantially continuous seal thereacross.

The sealing operation is then completed by rotating one of the handles 202 or 203 from the raised position to the lowered position, as shown in FIG. 1. As explained above, this effects the unison sealing movement of the floor seal mechanisms which are now in end-to-end alignment and in compression, through translatory movement of the operator rods 130. The sealed position is maintained by the overcenter movement of the toggle mechanism within the fixed jamb post, as shown by the full lines in FIG. 19. The floor seal strips 112 and 113, and the end seal pads 190 form therewith a substantially continuous floor seal free of any gaps or air spaces which would permit the transmission of sounds from one side of the panels to the other. The plunger 240 extends into the first panel 22 and locks it against turning, and the rods 130 provide panel-to-panel rigidity. Since the panels are continuously hinged at alternate edges and since the closing force effected by the end bulb seals and the edge seals is transversely of the opening through the center of the panels, the panels tend to remain extended until broken by a lateral force.

When it is desired to open the closure assembly, the handles 201 or 202 are rotated to the upper position retracting the plunger 240 and breaking the floor seal by permitting retraction of the floor seal support channels by the springs 144. The operator may now grasp the trail panel at one of the recessed handles, and by applying a lateral breaking force between adjacent panels near the trail panel 22, the stacking movement may be started. The panel 22 will be the first to pivot, as shown in FIG. 3 with the bottom thereof being guided by the guide pin 315 and the floor plate 310. The remaining panels then may be moved in zig-zag manner into the stacked storage position with the entire assembly of panels moved back against the fixed jamb post 35, as shown in FIG. 4. In this position, the force exerted by the bias means 285 or 300 is insufficient to move the entire stack of panels outwardly, and they will remain in stacked position against the fixed jamb post indefinitely, or until otherwise moved. It should also be noted that in this position, the handles 201 and 202 are rather inaccessible and out of the reach of children and the like.

Accordingly, there is provided a continuously hinged wall closure assembly of panels which is free of any hinge pivotal connection, or other support at the jamb posts, and which has a floating pivot at one panel to provide ease of movement from the stacked to the extended position. The trail panel is thus free of the usual levers and mechanical turning mechanisms which are commonly employed in folding panel assemblies to rotate the trail panel between a stored and an extended position when trail panel is not hinged to wall or jamb.

The continuously hinged closure assembly preferably has a plurality of identical intermediate panels, such as the panels 23, 24, 25 and 26, and preferably identical lead and trail panels, usually of narrower width than the intermediate panels. The intermediate panels may accordingly be made to standard widths, with the height being determined by the particular installation.

The closure assembly which is made according to this invention thus lends itself to low cost quantity production. For example, the trail post 35 and the included mechanisms may be standardized, as well as the floor seal mechanisms, the head sections, and the accessories, such as chalk boards, tack boards, and pass-through doors which may be incorporated in the intermediate sections 23-26 or lead panel 28.

The full width of the wall opening may then be accommodated by providing lead and trail panels 22 and 28 of generally identical dimensions having a width anywhere from the full width of one of the intermediate panels down to approximately one-half of such full width. Specifically, the portions of the panels 22 and 28 which "overhang" the trolley supports, may be varied in width, such as shown for instance by the broken lines at 22' and 28' in FIG. 4. Also, the jamb posts 36 may be varied in width, as necessary, to fill the required opening.

It will accordingly be seen that this invention provides a folded closure assembly which is easy to operate and which may be constructed with cost savings. The mechanism is both troublefree and foolproof in operation and in construction, and the entire closure assembly may be readily operated without any prior instructions or special precautions being taken by the operator.

While the forms of apparatus herein described constitutes preferred embodiments of the invention it is to be understood that the invention is not limited to these precise forms of apparatus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. A folding closure assembly for a wall opening including a fixed jamb post adjacent one side of said opening, an overhead track extending across said opening, and a plurality of individual panels mounted on trolleys on said track for movement between an extended position in which the panels are in coplanar closing relation to said opening and a stored position in which the panels are stacked in side-by-side relation adjacent said jamb post, the improvement comprising separately operable floor seals on each of said panels, each floor seal including a seal support extending substantially the width of the associated panel and mounted thereon for movement between a raised and a lowered position, a floor engaging elastomeric seal carried on said support and movable therewith into sound sealing engagement with a floor in the lowered position of said support and having continuous flexible side walls connected to the panel, a seal operator rod in each of said panels mounted for translatable sliding movement therein, means connecting each rod to effect lowering movement of the associated said seal support with translatable sliding movement of said rod, said rods being in general longitudinal alignment one with the other in the said closed position of said panels with a minimum of lateral spacing therebetween so that sliding movement of the rod in the panel adjacent said jamb post is translated to corresponding sliding movement of each of the said rods in the remaining said panels, and means in said jamb post engagable with the rod in the adjacent panel for effecting simultaneous translatable sliding movement of said rods for effecting sealing of said panels at a floor.

2. The assembly of claim 1 in which said last-named means includes an overcenter link mechanism connecting said handle to said plunger and movable over center during extension of said plunger by rotation of said handle to lock said plunger in its extended position.

3. A folding closure assembly for a wall opening including a fixed jamb post adjacent one side of said opening, an overhead track extending across said opening, and a plurality of individual panels mounted on trolleys on said track for movement between an extended position in which the panels are in coplanar closing relation to said opening, and a stored position in which the panels are stacked in side-by-side relation adjacent said jamb post, the improvement comprising separately operable floor seals on each of said panels, each floor seal including a seal support extending substantially the width of the associated panel and mounted thereon for movement between a raised and a lowered position, a floor engaging elastomeric seal carried on said support and movable therewith into sound sealing engagement with a floor in

the lowered position of said support, an end seal mounted on each end of said seal support and movable therewith for effecting a seal between adjacent panels in the coplanar position thereof, a generally horizontally disposed seal operator rod in each of said panels mounted for translatable sliding movement therein, means connecting each rod to effect lowering movement of the associated said seal support with said translatable sliding movement of said rod, said rods being in general longitudinal alignment one with the other in the said closed position of said panels with a minimum of lateral spacing therebetween so that sliding movement of the rod in the panel adjacent said jamb post is translated to corresponding sliding movement of each of the said rods in the remaining said panels, and means in said jamb post engagable with the rod in the adjacent panel for effecting said translatable sliding movement thereof for effecting sealing of said panels at a floor.

4. A folded closure assembly for closing a wall opening including a fixed jamb post and a plurality of rigid panels movable in relation to said jamb post between an extended position in which the panels are in a generally common plane in closing relation to the wall opening and a storage position in which the panels are stacked in side-by-side relation adjacent the jamb post, the improvement comprising a separate articulated floor seal in each of said panels mounted for generally vertical movement between a raised position clear of the floor and a lowered position in sound sealing engagement with the floor, a floor seal operator in each of said panels including a generally horizontally disposed operator member having a length substantially corresponding to the width of the associated panel and mounted for translatable sliding movement thereon, means in the vertical edge of each of said panels defining an operator member access opening in alignment with the floor seal operator member of the adjacent panel, link means connecting each of said members to the associated said seal for effecting movement thereof from said raised position to said lowered position with said translatable sliding movement of said member, each of the said members in each panel being in general alignment in the closed position of said panels and being engagable one with another through said access openings so that said movement of the member in the panel next adjacent the fixed jamb post is translated to each of the members in each subsequent panel, and a floor seal operator in said jamb post including a handle, a plunger mounted in said jamb post and having an end movable out of said jamb post and into operative engagement with the member in the said adjacent panel to effect said translatable sliding movement of all of said members simultaneously to effect floor sealing of said panels, and means connecting said handle and said plunger to effect said plunger movement upon the rotation of said handle.

5. A panel for a folding closure assembly having a plurality of such panels which are movable between a coplanar position in closing relation to a wall opening and a storage position in which the panels are stacked at one side of said opening, comprising a pair of spaced apart kickplates across the bottom of said panel defining a space therebetween which opens downwardly toward the floor and outwardly at the vertical edges of the panel, controllable floor seal means received in closing relation to said opening including a floor seal support between said kick plates and having opposite ends substantially at the vertical edges of said panel, means mounting said support for vertical movement between a floor sealing lowered position and a raised position, a continuous floor seal carried on said support and movable therewith into engagement with the floor in the lowered position of said support, and means defining a pair of sponge-like end seals one each carried on each said support ends at the vertical edges of said panel extending in end closing relation thereto and engagable with the floor in the lowered position of said support and having a thickness sufficient to

engage the corresponding said end seal of an adjacent said panel forming a continuation of the floor seal between adjacent said panels in the coplanar position thereof.

6. A folding closure assembly for a wall opening including a fixed jamb post adjacent one side of said opening, an overhead track extending across said opening, and a plurality of individual panels including a lead and a trail panel mounted on trolleys on said track for movement between an extended position in which the panels are in coplanar closing relation to said opening and a stored position in which the panels are stacked in side-by-side relation adjacent said jamb post, the improvement comprising a separately operable floor seal on each of said panels mounted thereon for movement between a raised position and a lowered position in sound sealing engagement with a floor, a seal operator rod in each of said panels mounted for translatable sliding movement therein, means connecting each rod to effect lowering movement of the associated said seal with said sliding movement of said rod, said rods being in general longitudinal alignment one with the other in the said closed position of said panels with a minimum of lateral spacing therebetween so that sliding movement of the rod in the panel adjacent said jamb post is translated to corresponding sliding movement of each of the said rods in the remaining said panels, means in said jamb post engagable with the rod in the adjacent panel for effecting simultaneous translatable sliding movement of said rods for effecting sealing of said panels at a floor, means mounting the trail panel next adjacent said jamb on said track for pivotal and translatable movement thereon in relation to said jamb as said panels are moved from said stacked position to said extended position, and means biasing said trail panel on said track in a direction away from said jamb post with a relatively constant force which is sufficient to move said trail panel away from said jamb post to provide clearance as said trail panel pivots from its stacked position to an extended position and which force is insufficient to move

said stack of panels away from said jamb post in the stored position thereof.

7. A folding closure assembly for closing a wall opening including a fixed jamb post adjacent one side of said opening and a plurality of individual panels mounted on an overhead track for movement between an extended position in which said panels are in generally coplanar relation across said opening to a storage position in which said panels are stacked in side-by-side relation adjacent said jamb post, the improvement comprising means mounting the trail panel next adjacent said jamb post on said track for limited movement thereon in relation to said jamb post as said panels are moved from said stacked position to said extended position, means urging said trail panel on said track away from said post including a flexible tension carrying member, means connecting one end of said member to said panel, and bias means connected to said member constantly urging said panel away from said post with a relatively constant force sufficient to move said trail panel along during the extension of said assembly and insufficient to move the said stack of panels away from said jamb post in the folded position of said panels.

8. The assembly of claim 7 in which said bias means comprises a sash spring.

9. The assembly of claim 7 in which said bias means comprises a weight received in said jamb post.

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DAVID J. WILLIAMOWSKY, *Primary Examiner*.

J. KARL BELL, *Assistant Examiner*.