March 22, 1960 E. R. HAWS 2,929,445

FOLDABLE PARTITION

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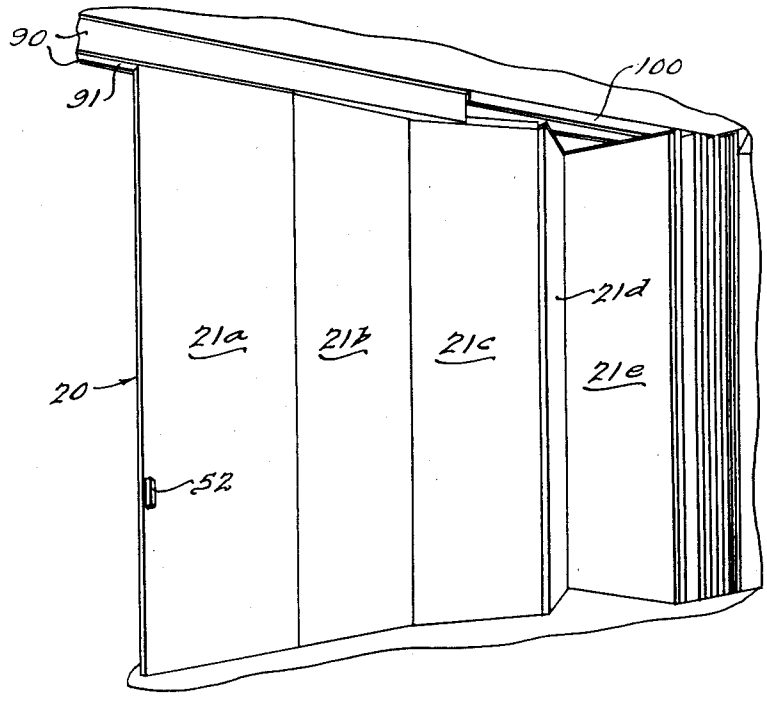


FIG. 1.

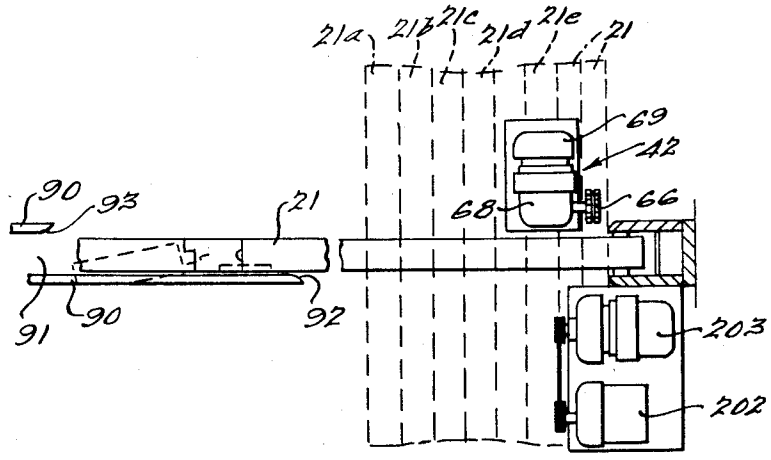


FIG. 2.

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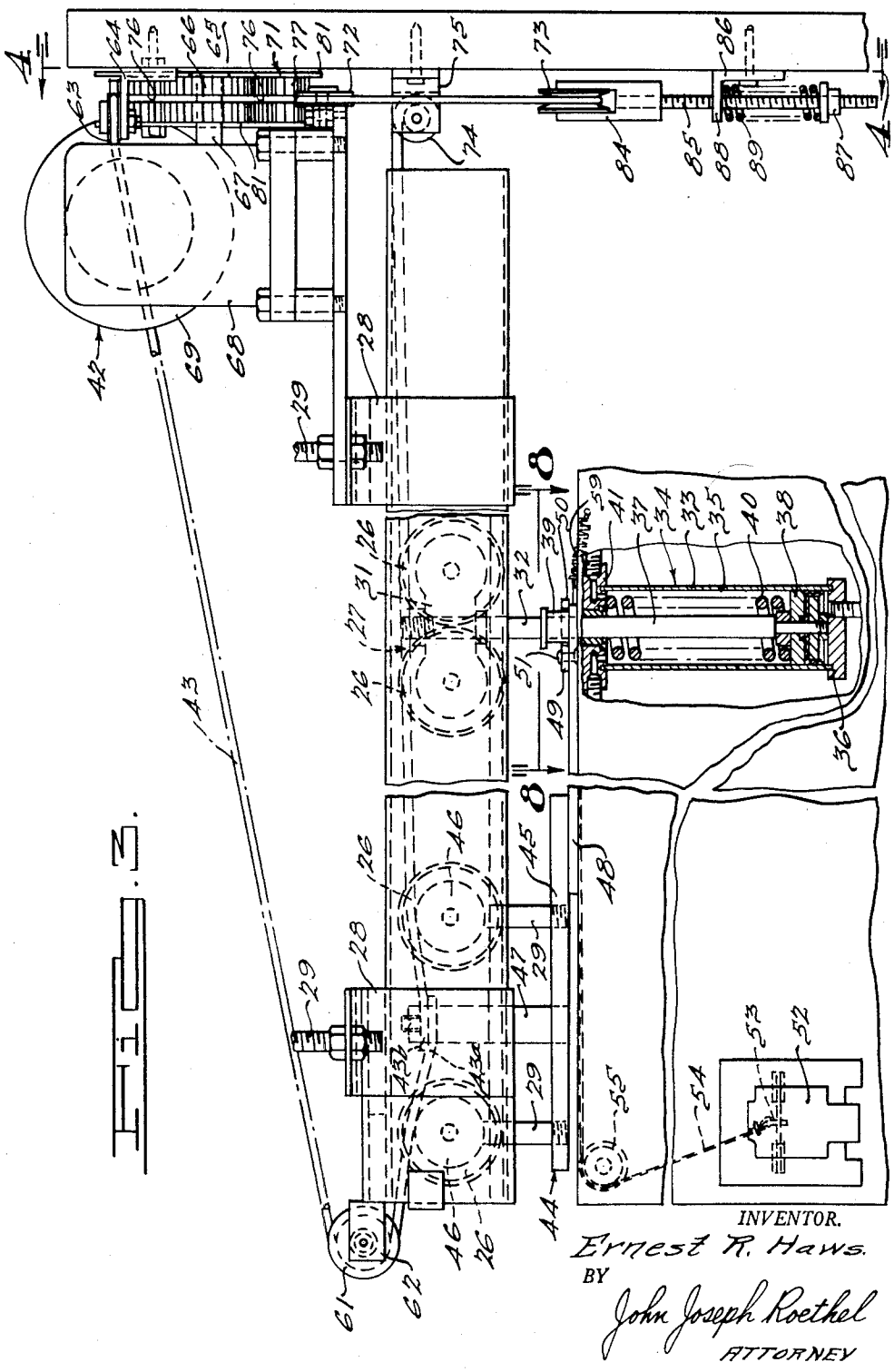


FIG. 2.

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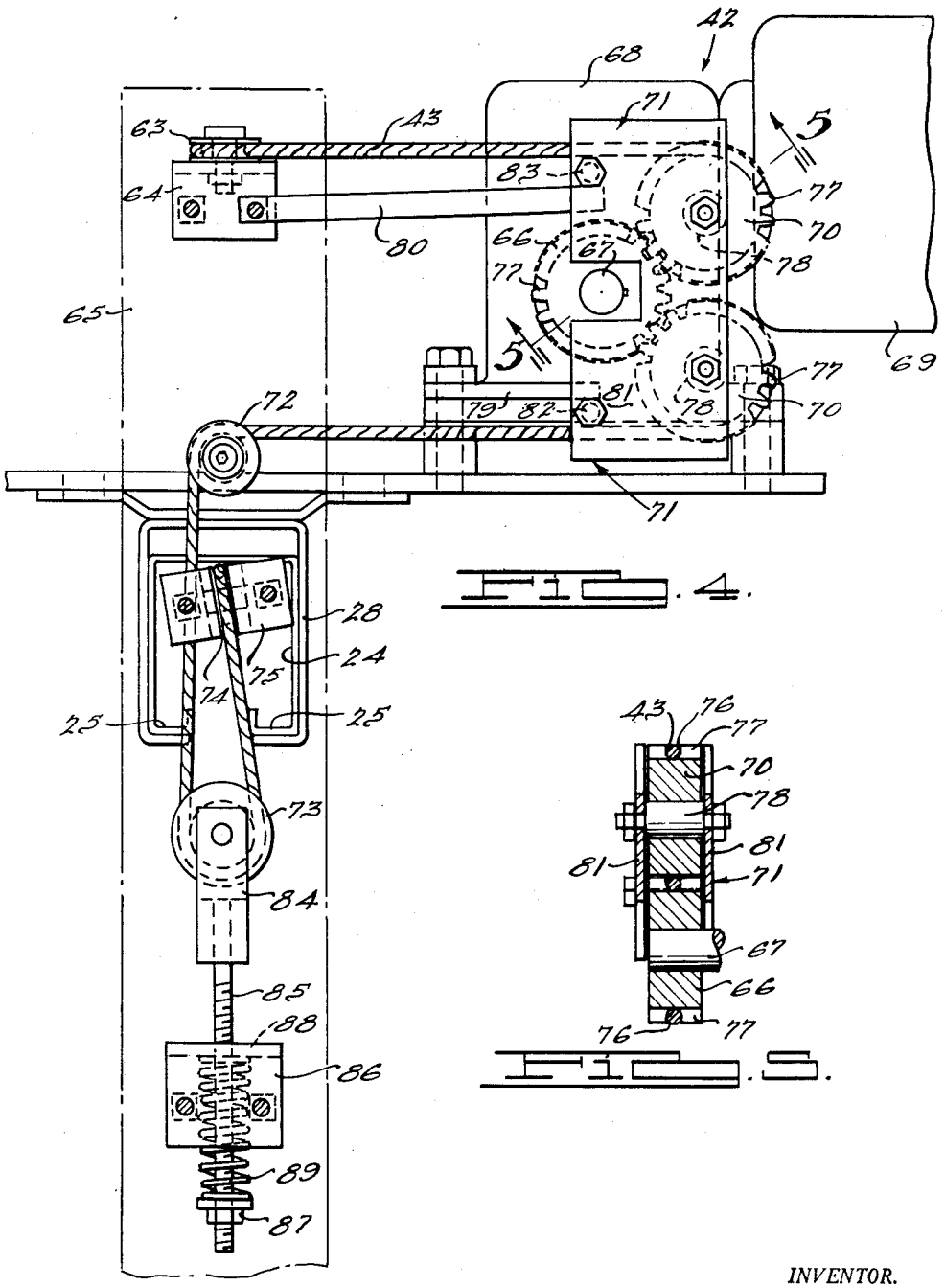


FIG. 4.

FIG. 5.

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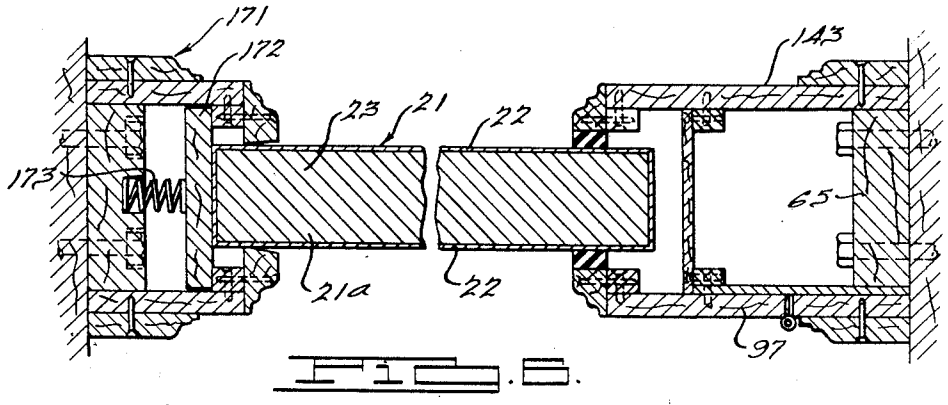


FIG. 5.

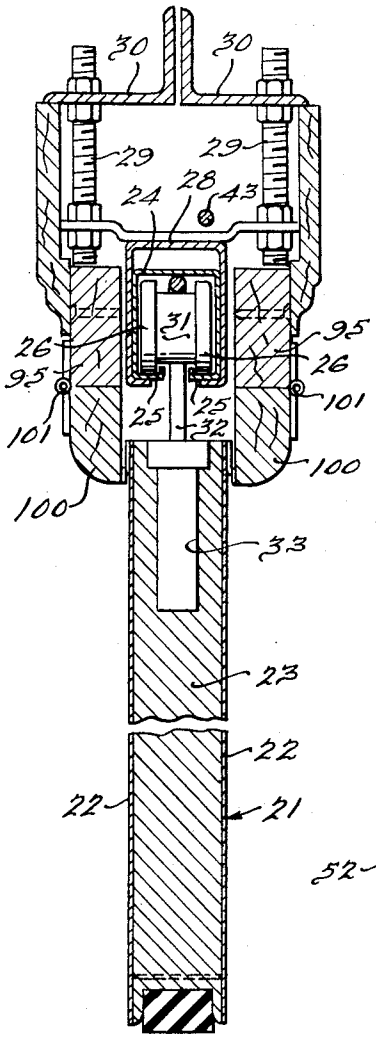


FIG. 7.

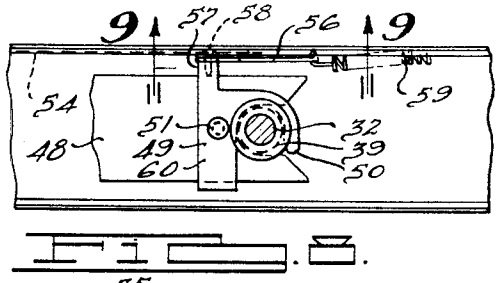


FIG. 6.

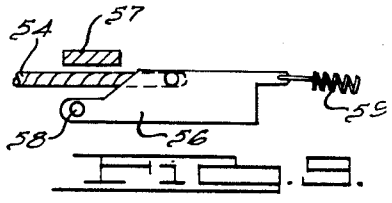


FIG. 8.

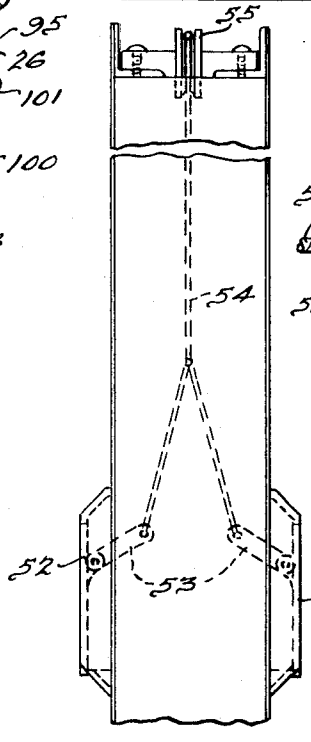


FIG. 10.

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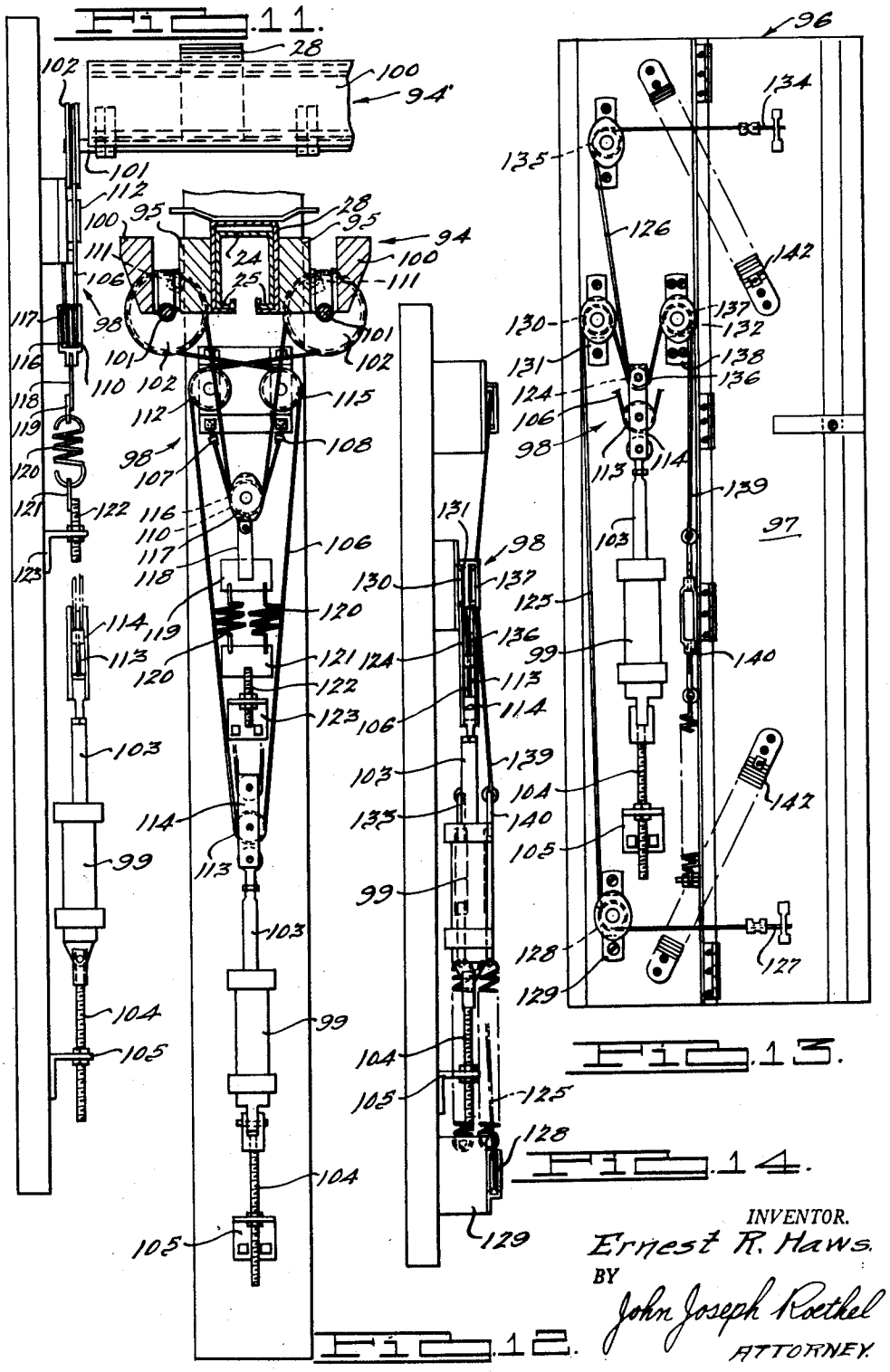


FIG. 11.

FIG. 13.

FIG. 14.

FIG. 12.

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FOLDABLE PARTITION

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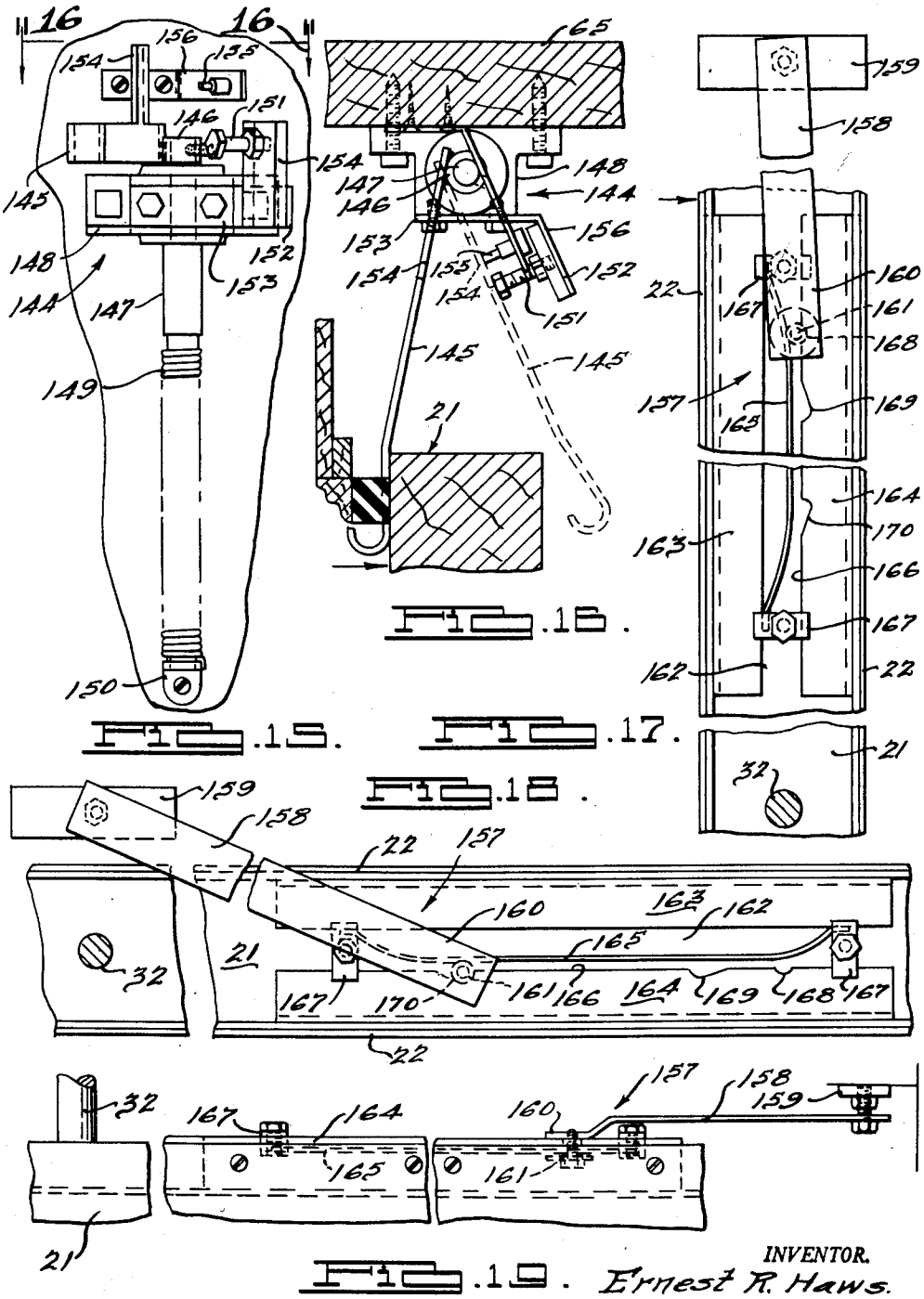


FIG. 16.

FIG. 15.

FIG. 17.

FIG. 18.

FIG. 19.

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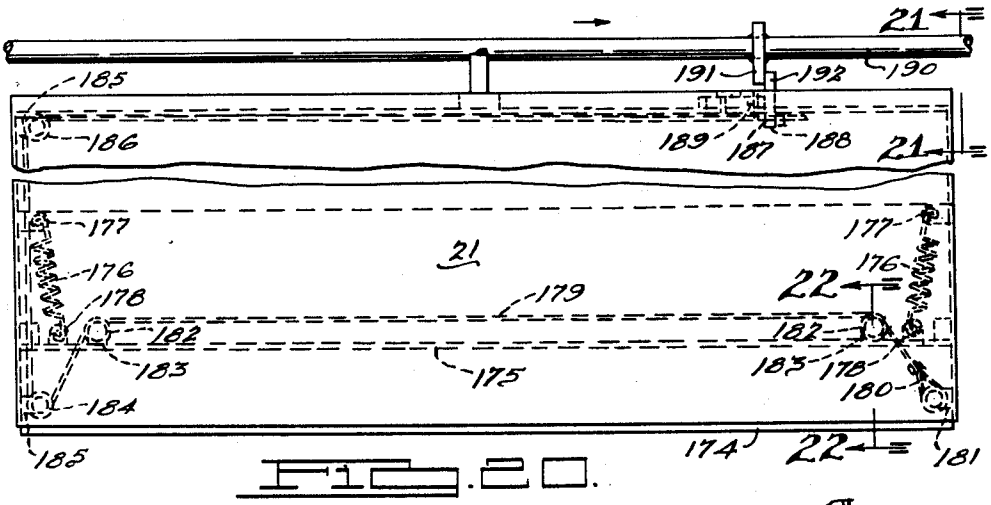


FIG. 20.

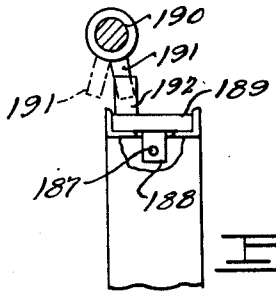


FIG. 21.

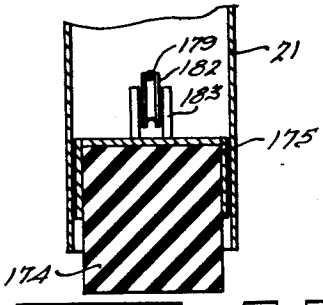


FIG. 22.

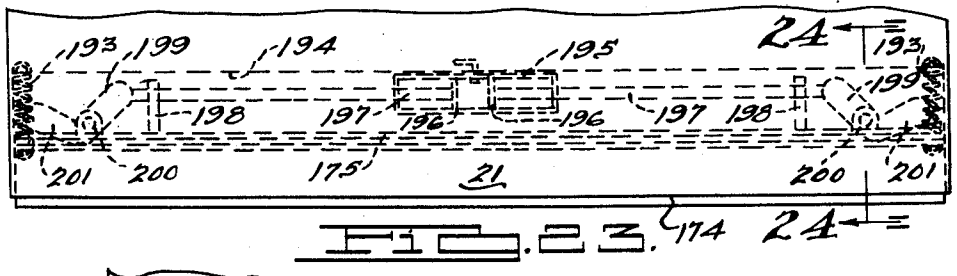


FIG. 23.

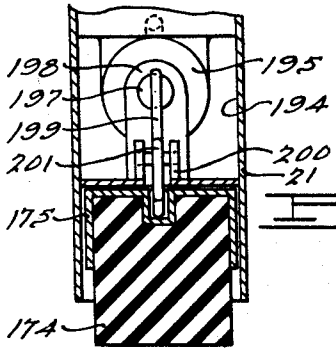


FIG. 24.

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FOLDABLE PARTITION

Filed April 4, 1956 8 Sheets-Sheet 8

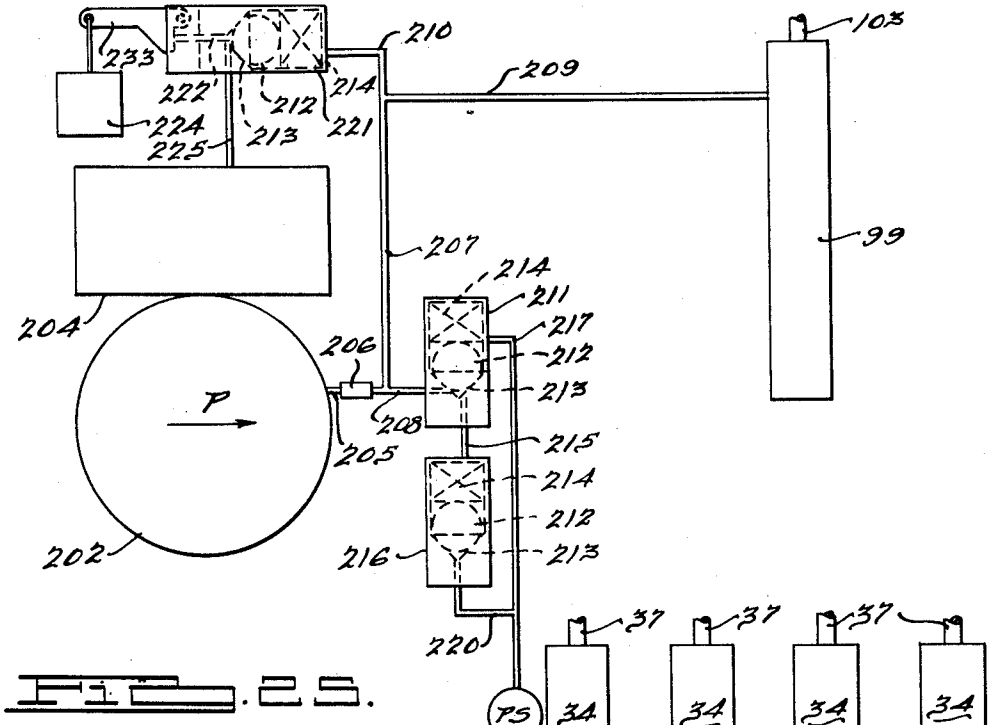


FIG. 2A.

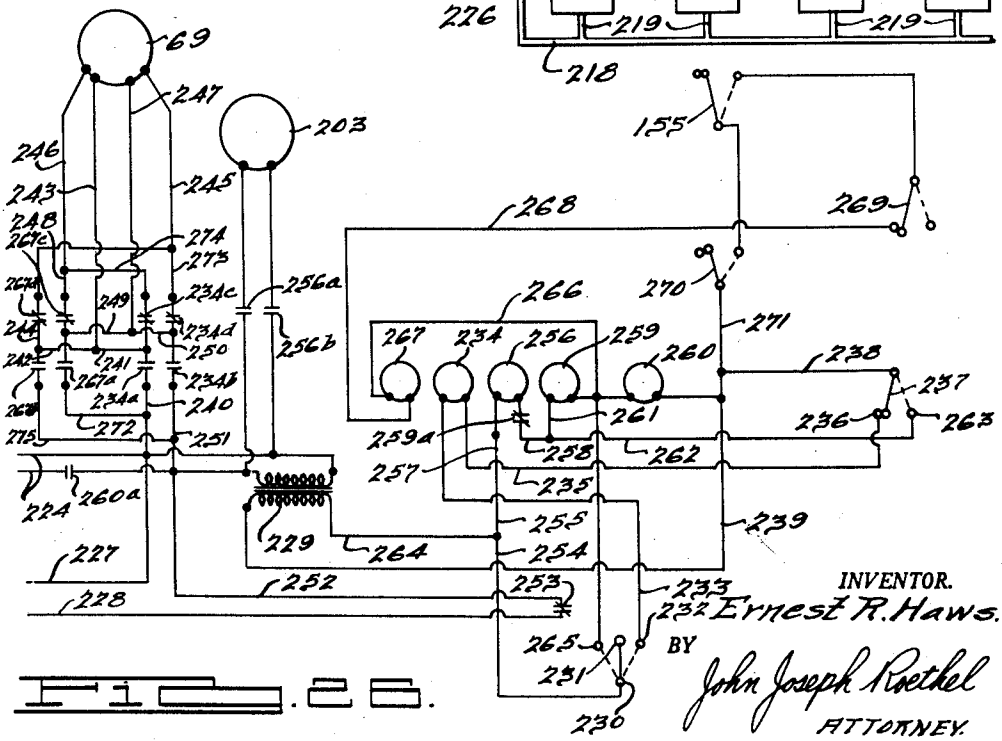


FIG. 2B.

United States Patent Office 2,929,445
Patented Mar. 22, 1960

2,929,445

FOLDABLE PARTITION

Ernest R. Haws, Detroit, Mich.

Application April 4, 1956, Serial No. 576,157
17 Claims. (Cl. 160—32)

This invention relates to foldable partitions or room dividers and more particularly to a foldable partition construction and arrangement embodying fully automatic operation in the folding and unfolding of the partition panels.

It is frequently desirable to be able to temporarily partition large auditoriums and gymnasiums or the like into sections so that several groups of persons may utilize the space to carry on varied activities without interference. The ideal foldable partition for temporarily partitioning a large room would be a room divider having characteristics approaching the rigidity and soundproof qualities of a permanent wall. Yet, such a partition must be comprised of light weight panels easily and efficiently movable into and out of room dividing position.

It is an object of the present invention to provide an improved partition having the desired characteristics of rigidity and soundproofness. It is a further object to provide improved means for moving the partition panel in a desired sequence of movements, that is, to cause the partition panels to be folded or unfolded as desired and in proper sequence therewith to cause the panels to be bodily raised or lowered relative to the room floor, the raising of the panels from the floor affecting the ease of their movement across the room and the lowering of the panels into contact with the floor affecting the stability, rigidity and soundproof qualities thereof when the partition is in room dividing position.

The improved partition structure embodying the present invention comprises rigid panel members hinged to each other along their adjacent vertical edges, at least alternate panel members being swivelly supported at their upper ends from an overhead supporting means, the latter including track means for guiding the partition during its folding and unfolding movements. Also, included is the provision of means for automatically moving the panel into extended position, said panels after reaching extended position being subject to actuation by a second means adapted to lower the panels into tight sealing contact with the floor of the room being divided. In the illustrated embodiment of the invention, the drive mechanism for moving the panels from a folded to an extended condition and then back to a folded condition comprises, preferably, a cable driven by electrically motivated cable drive means, said cable drive means having an improved construction and arrangement whereby the cable is gripped tighter should the resistance of the partition panel to movement increase for any reason, thus ensuring positive driving action under the most adverse conditions.

The mechanism for bodily moving the panels downwardly after they have been extended into their room dividing position comprises preferably, a hydraulically actuated means. The present invention also includes improved means for straightening and locking the last few panels in extended position, the leading panels being

guided into straight extended position by an overhead guide rail. The present invention also includes an improved device for "breaking" the panels when the panels are intended to be moved from extended to folded condition, it being necessary to provide a means for forceably swinging the first panel to be folded to start the proper folding sequence of all of the panels as the partition is moved from its extended condition to a folded condition. The present invention further includes the provision of means for manually disconnecting the partition from the drive mechanism thus providing a safety device permitting manual movement of the panels in the event of a power failure, the disconnection from the drive mechanism permitting the panels to be freely movable without requiring the exertion of force to otherwise overcome the frictional drag of the drive mechanism.

Other objects, features and advantages of the present invention will appear from the following description and appended claims, reference being had to the accompanying drawings forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

Fig. 1 is a perspective view of a foldable partition constructed in accordance with the present invention and showing the partition partially extended.

Fig. 2 is a diagrammatical plan view illustrating the arrangement of the partition operating motors, the latter being adapted to be located in ceiling pockets, which would be located at the upper right hand corner of Fig. 1.

Fig. 3 is a side elevational view of the driving mechanism for extending and retracting the partition and includes details of construction showing how the panel members may be supported for movement along the overhead track means.

Fig. 4 is a view in part sectional taken substantially through line 4—4 of Fig. 3 looking in the direction of the arrows.

Fig. 5 is a sectional view taken substantially through line 5—5 of Fig. 4 looking in the direction of the arrows.

Fig. 6 is a fragmentary horizontal sectional view taken on a plane just below the level of the top of the panels shown in Fig. 1, the view illustrating the relationship of the ends of the partition to the starting and sealing jambs.

Fig. 7 is a fragmentary vertical sectional view taken transversely through the hood jamb.

Fig. 8 is a view in part sectional taken substantially through line 8—8 of Fig. 3 looking in the direction of the arrows.

Fig. 9 is a view taken substantially through line 9—9 of Fig. 8 looking in the direction of the arrows.

Fig. 10 is an end view of the lead panel shown in Fig. 1.

Fig. 11 is a side elevation of the mechanism for automatically operating the hood jambs.

Fig. 12 is a front elevation of Fig. 11.

Fig. 13 is a front elevation of the mechanism for automatically operating the side jamb.

Fig. 14 is a side elevation of the mechanism shown in Fig. 13.

Fig. 15 is a front elevation of a means for imparting initial movement to the inner end panel upon folding operation of the partition.

Fig. 16 is a view taken substantially through line 16—16 of Fig. 15 looking in the direction of the arrows.

Fig. 17 is a fragmentary top elevation of a mechanism for controlling the swinging movement of an end panel.

Fig. 18 is a view showing the parts illustrated in Fig. 17 in a second position.

Fig. 19 is a side elevation of Fig. 17.

Fig. 20 is a fragmentary side elevation showing a mechanism for automatically operating the floor seal associated with the bottom of each panel.

Fig. 21 is a view in part sectional taken substantially through line 21—21 of Fig. 20 looking in the direction of the arrows.

Fig. 22 is a sectional view taken substantially through line 22—22 of Fig. 20 looking in the direction of the arrows.

Fig. 23 is a fragmentary view in part similar to Fig. 20 illustrating a second means of operating the floor seal.

Fig. 24 is a view taken substantially through line 24—24 of Fig. 23 looking in the direction of the arrows.

Fig. 25 is a schematic diagram of the hydraulic system utilized in the present embodiment for forcing the panels downwardly after the latter have reached their extended or room dividing position.

Fig. 26 is a schematic diagram of the electrical circuitry of the present invention.

Before explaining in detail the present invention it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also it is to be understood that the phaseology or terminology employed herein is for the purpose of description and not of limitation.

Referring to Fig. 1, there is shown a foldable partition generally designated 20. The partition 20 comprises a series of panels 21 hingedly connected to each other by vertically spaced concealed type hinges (not shown). The lead panel 21*a* and at least each alternate panel thereafter, such as the panels designated 21*c* and 21*e*, are swivelly suspended for swinging movement about a vertical axis from an overhead guideway structure extending substantially from wall to wall along the line of division of the space to be partitioned. It will be understood that the last panel 21 is also swivelly suspended. The panels intermediate the swivelly suspended panels, such as the panels 21*b* and 21*d*, are supported and guided by virtue of their hinged connection to the panels 21*a*, 21*c* and 21*e*, and so on. Preferably, each panel 21 is a hollow shell structure several inches thick having sound retarding and heat insulating aluminum facings 22 pressure mounted on a phenolic impregnated heavy fiber honeycomb core 23. Such a panel is relatively lightweight while being sufficiently rigid to withstand much abuse, such as being crashed into by persons engaged in athletic endeavors when the partition is used in gymnasium installations. Further, such a panel is impervious to expansion, shrinkage or warpage due to variations in seasonal moisture content of the air. As will be noted, the core is suitably hollowed out as required to provide passageways and cavities to receive hydraulic cylinders, tubing, control cable and the like.

The overhead guideway and supporting structure comprises an inverted substantially U-shaped track 24 having inturned lip portions 25 forming the surfaces on which the rollers 26 of panel carrying carriage devices 27 are adapted to roll. The U-shaped track 25 is carried by a series of spaced supporting brackets 28 which in turn are suspended from hangar bolts 29 carried by an overhead truss 30. The overhead truss 30 is supported by the building walls.

Each carriage device 27 comprises a body member 31 having the rollers 26, of which there are four, journalled at the corners in any convenient manner. Each body member 31 has journalled therein a vertically extending rod or stem 32. The rod or stem 32 projects downwardly between the track lip portion 25 to a point below the track 24. Substantially at the longitudinal center thereof those panels, such as the panels 21*a* and the alternate panels thereafter, which are adapted to be supported by a carriage device 27 are provided with a cavity 33 adapted to receive a hydraulic cylinder assembly 34. The hydraulic cylinder assembly 34 comprises a cylinder 35 adapted to be connected at its lower end 36 to a source of fluid under pressure. The cylinder piston rod 37 carries a piston 38 at its lower end and is coupled at its upper exposed end by a suitable coupling device 39 to the lower end of the rod or stem 32. Surrounding the piston rod 37 is a compression spring 40 having one end bearing on top of the piston 38 and the other end bearing against the underside of the upper cylinder head 41. In effect, the foregoing construction provides a fixed piston and movable cylinder arrangement. The compression spring 40 supports all of the weight of the panel 21 on the piston and piston rod assembly, the latter being supported by the carriage device 27. The introduction of fluid under pressure to the lower end 36 of the cylinder results in the cylinder 35 and the panel 21 being forced downwardly relative to the piston thereby placing the spring 40 under compression. Upon release of the fluid pressure, the spring 40 will raise the cylinder 35 and the panel 21 attached thereto upwardly to their normal inoperative position. The manner in which the up and down movement of the panels 21 fits into the sequence of operations of the present construction and arrangement will be hereinafter more fully explained.

The present invention embodies an improved drive mechanism for moving the partition 20 from folded to extended and then back to folded condition, as desired. In this preferred form, the drive mechanism, generally designated 42, utilizes a cable 43, although a chain drive may be utilized if desired.

Although the cable 43 could be fastened directly to any one of the carriage devices 27, particularly the carriage device 27 carrying the lead panel 21*a*, an important advantage, as will be explained, may be derived by attaching the cable 43 to a separate lead trolley, generally designated 44. The lead trolley 44 comprises a body member or platform 45 suspended below the track 24 from hanger bolts 29 carried by shaft housing members 46 in which the lead trolley rollers 26 are journalled in any suitable manner. As best seen in Fig. 3, the body member or platform 45 is provided with an upstanding post 47 to which the cable ends 43*a* and 43*b* are clamped in any convenient manner.

The platform 45 has secured to its underside a rearwardly extending extension piece 48 which, as is best shown in Fig. 8, is provided with a latch device pivotally mounted thereon. The latch device comprises a latch plate 49 swingable in a horizontal plane and having a hook portion 50 thereon. The hook portion 50 is adapted to encircle the coupling device 39 joining the piston rod 37 and the stem or rod 32, thus coupling the lead trolley 44 to the lead panel supporting carriage device 27. To uncouple the lead trolley 44 from the immediately following trolley or carriage device 27, it is only necessary to pivot the latch plate 49 in a counterclockwise direction about its pivot axis 51 to move its hook portion 50 out of engagement with the coupling device 39. The latch plate 49 is pivotally actuable by a remote control cable operated mechanism. Referring to Fig. 10, there is shown mounted on each side of the lead panel 21*a* a pivoted hand grip member 52 having a bell crank lever 53 extending inwardly of the panel. There are two hand grip members 52 accessible from opposite sides of the panel 21*a*. A common cable 54 extends from the levers 53 up and over a pulley 55 suitably mounted at the upper corner of the panel 21*a* to a trigger member 56 mounted on the interior of the panel 21*a* wall. As best seen in Fig. 9, the trigger member 56 underlies an arm 57 on the latch plate member 49. If one of the hand grip members 52 is grasped and pulled upwardly so as to swing a bell crank lever 53 downwardly about its pivot axis, the cable 54 will raise the trigger member 56 in a counter-clockwise direction

about its pivot axis 58. The upper edge of the trigger member 56 will abut the side edge of the arm 57 of the latch plate 49 causing the latch plate to be pivoted in a counter-clockwise direction about its pivot axis 51. A spring means 59 is provided to restore the trigger member to its normal inoperative position after actuation. The latch plate will remain in open position until the lead trolley 44 and the lead panel supporting carriage device 27 are brought back into their normal operative relationship. That is, upon the coupling device 39 abutting the inclined edge of the latch plate arm portion 60, the latch plate 49 will be swung in a clockwise direction so as to cause its hook portion 50 to again hook over the coupling device 39.

A function of the foregoing structure is to provide an emergency means for releasing the panels 21 from the drive mechanism 42. It will be readily understood that in the event of a power failure, such as might result from a fire within the building, it would be highly desirable to be able to move the panels 21 manually. Without the provision of means for releasing the panels from the drive mechanism, the frictional drag of the latter would make manual movement of the panels extremely difficult.

Referring now to Figs. 3 and 4 and starting with the end 43*a* of the drive mechanism cable 43, it will be noticed that the cable 43 passes over a pulley 61 mounted on a bracket 62 located substantially at the head end of the guide track 24. The cable 43 then extends completely across the room to a pulley 63 mounted on a bracket 64 secured to a structural member 65 of the building. It will be noted that the axis of the pulley 63 is a vertical axis to permit the cable to change direction and to extend in a substantially horizontal plane towards the cable drive mechanism 42, as best seen in Fig. 4. It will be noted that the cable 43 interwinds about the peripheries of three gears, one of which, the gear 66, is power driven. The power driven gear 66 is keyed to a shaft 67 of a speed reduction unit 68 powered by an electric motor 69. Two vertically spaced idler gears 70 mounted in a cage 71 and the gear 66 in mesh with the idler gears 70 comprise the three gears about which the cable 43 winds. It will be noted that the cable 43 is interwound between the gears 66 and 70 so that it passes around the top of gear 70, then between the top gear 70 and the driven gear 66, then around the gear 66, then between the gear 66 and the bottom gear 70, and then around the bottom gear 70 and off the underside thereof to a pulley 72 mounted for rotation about a horizontal axis on the building structural member 65. From the pulley 72 the cable passes downwardly around a second pulley 73 vertically spaced below the pulley 72 and then back up over a pulley 74 mounted on a bracket 75 secured to the structural member 65 of the building. The cable 43 then follows a substantially horizontal path to the point at which its end 43*b* is secured to the post 47 carried by the lead trolley 44.

Fig. 5 illustrates in cross-section the manner in which the cable 43 winds about the gears 66 and 70 without interfering with the gear teeth. It will be noted that the gears are provided with centrally located and peripherally extending slots 76. The diameter of the cable 43 is slightly larger than the depths of the slots 76 and, accordingly, the cable is slightly squeezed between the meshing gears, the teeth 77 of the gears being in mesh on each side of the cable 43. As has been stated, the gears 70 are idler gears carried by a cage 71, suitable shaft means 78 being provided for journalling the two gears 70 in the cage 71. The cage 71 is a floating unit. The cage 71 is supported only by the meshing relationship of the two idler gears 70 with the power driven gear 66. As the cable 43 is placed in tension it will tend to pull the cage 71 toward the power driven gear 66, thus increasing the tightness of the mesh of the teeth of the power driven gear 66 with the teeth of the idler gears 70 and at the same time increasing the grip of

the gear bodies on the cable 43. To prevent the cage 71 from rolling right around the power driven gear 66, a couple of torsion bars 79 and 80 are provided. A torsion bar 79 is secured to the base of the speed reduction unit 68 in any convenient manner and projects into the space between the side walls 81 of the cage unit 71 where it overlies a bolt head 82. The torsion bar 80 is secured in any convenient manner to the bracket 64 holding the upper pulley 63 and extends also into the space between the side walls 81 of the cage unit where it underlies a bolt head 83. The co-action between the torsion bars 79 and 80 and their respective co-acting bolt heads 82 and 83 is such that the cage unit can only move in a substantially horizontal direction inwardly and outwardly as the tension of the cable 43 is increased or decreased. Thus, even if the tension on one side of the cable 43 should be momentarily greater than the tension on the other side, the torsion bars will not permit the cage unit 71 to roll around the power driven gear 66.

The pulley 73 is mounted on a yoke member 84 carried on a head end of an adjusting stud or bolt 85. The adjusting stud projects through a bracket member 86 mounted on the building structural member 65. Interposed between nut means 87 carried on the lower end of the adjusting stud 85 and the flange portion 88 of the bracket member 86 is a compression spring 89. By placing the compression spring 89 under a pre-load, a desired tension may be maintained on the cable 43. Should the cable 43 eventually stretch, it would only be necessary to turn the nut means 87 to increase the compression on the spring 89 thereby taking up the slack in the cable 43, the spring pushing the adjusting bolt further downward.

It will be understood that the overhead track 24 may be concealed within the ornamental ceiling of the room to be partitioned.

Referring now to Fig. 1 and Fig. 2, there are shown a couple of spaced strips of material or rails 90 which extend below the ornamental ceiling of the room and which provide a guide way 91 for the upper ends of the panels 21. As shown in Fig. 2, the rail 90 toward the front extends closer to the side wall 81 of the building than the rail 90 to the rear. It will be understood that Fig. 2 does not represent a true scale picture of the relationship of the two ends of the rails 90. Upon the partition drive mechanism 42 being actuated to move the panels from folded to extended position, the lead panel 21*a* will start to move substantially broad side to the direction in which it should move to give the desired partitioning effect. However, since the front rail 90 will abut the panel 21*a* at a point off center from the panel center of suspension it will cause the panel to start to swing in a counter-clockwise direction, as viewed in Figs. 1 and 2. As shown in Fig. 2, the rail 90 may be provided with a rounded contact edge 92 to avoid the strip gouging into the upper surface of the panel and the panel may be provided with a wear strip (not shown) along its upper edge. The rear rail 90 having its end 93 further away from the right hand wall 81 of the room will permit the panel 21*a* to swing about its center of suspension until it is substantially parallel and between the rails 90, after which the panel will continue its movement in the desired direction. As the panel 21*a* is pulled across the room it will guide the following panels properly into the guide way or slot between the rails. It will be noted that neither of the two rails 90 extends completely to the right hand wall 81 of the room. As shown in Figs. 1 and 2, it is obvious that the guide rails 90 cannot extend completely to the wall 81 since room must be provided for the folding and the unfolding section of the panels 21. Accordingly, the present invention embodies improved automatic hood folding and unfolding means as well as improved automatic jamb folding and unfolding means.

The hood structure 94 comprises those strips of material 95 which form an extension of the guide rails 90 extending along the ceiling of the room. The jamb structure 96 includes a vertically extending panel 97 which is located at the extreme right end of the partition as viewed in Fig. 1. The hood and jamb mechanisms embodying the present invention comprise cable mechanism 98 operated from a common hydraulic cylinder 99, these structures being shown in detail in Figs. 11 to 14 inclusive.

Referring first to Figs. 11 and 12 which illustrates the hood operating mechanism, it will be noted that the hood structure 94 comprises strips of material 95 secured to the brackets 28 which support the U-shaped track 24. Hinged to each strip 95 on each side of the track is a flap 100. The hinge pivot comprises a longitudinally extending shaft 101 carrying a pulley 102 at the inner or wall 81 end thereof. The flaps 100 are secured to the shaft 101 so that when the shafts are rotated the flaps will swing. In Fig. 12 the flaps are shown in their up position which corresponds to the position in which they are shown in Fig. 1. In the illustrated embodiment, the flaps 100 are adapted to be pulled down by hydraulic power means and are adapted to be restored to their up position, as shown in Fig. 11, by spring power means. The reason for this is that the hood flaps 100 are utilized in straightening out the last several panels of the partition after the same have been extended completely across the room, as will be more fully explained. For hydraulically actuating and lowering the hood flaps, the hydraulic cylinder 99 having an upwardly extending piston rod 103 is provided. The hydraulic cylinder 99 is supported at its lower end by an adjusting screw 104 which passes through a mounting bracket 105 secured to a building structural member 65. The hydraulic cylinder 99 is held in upright position by the tension on a cable 106 through which movement of the piston rod 103 is transmitted to the pulleys 102 mounted on the hood shafts 101. The cable 106 follows a rather devious path mainly to reduce the distance that the piston rod 103 has to travel to get the desired rotation of the pulleys mounted on the hood shafts. It will be noted that the cable 106 is not a continuous cable, the two ends 107 and 108 respectively thereof being fastened to a bracket 109 mounted on the building structural member 65.

Referring to Fig. 12 and starting with the left end 107 of the cable 106 it will be noted that the cable passes downwardly around the underside of a pulley 110 then upwardly to the inner side of the right hood shaft pulley 102 and around this latter pulley. To insure that the cable 106 will not slip relative to this pulley 102, the cable is fastened at 111 to the periphery of the pulley. After almost completely encircling the pulley 102 the cable 106 passes off the underside thereof and laterally of the track 24 to an idler pulley 112 mounted on the bracket 65. The cable 106 then drops down to a pulley 113 carried by a pulley carrier 114 secured to the upper end of the piston rod 103. From this pulley 113 the cable 106 passes up to and around a second idler pulley 115 paralleling the first idler pulley 112 and then over to the second or left hood shaft pulley 102. Here again the cable 106 is secured to the periphery of this pulley to prevent any possibility of the cable slipping relative to the pulley. The cable 106 then passes downwardly through a pulley 116 paralleling the pulley 110 and then back up to where the other end 108 is secured to the bracket 109. The two pulleys 110 and 116 are mounted in a carrier 117 which is attached to a vertical member 118 connecting the pulley carrier 117 to a plate 119 illustrated as having two tension springs 120 depending therefrom. The lower ends of the two tension springs 120 are hooked into a second plate 121 which has attached thereto an adjusting screw 122, the adjusting screw 122 passing through a bracket 123 mounted on the building structural member 65. It will be readily apparent that movement of the adjusting screw 122 upwardly or downwardly relative to the bracket 123 will increase or decrease the tension on the springs 120 which in turn will effect the tention or the degree of slackness in the cable 106.

In operation, as the piston rod 103 is pulled downwardly due to the application of fluid under pressure to the hydraulic cylinder 99 the portions of the cable passing around the pulleys 110 and 116 will be pulled upwardly. The tension in the cable 106 will be transmitted through the cable 106 to the springs 120 which will be stretched permitting the pulleys 110 and 116 to rise permitting the cable portions to move. Because of the manner in which the cable portions are wound around the pulleys 102, the pulley 102 mounted on the left hand hood hinge shaft 101 will rotate in a counter-clockwise direction swinging the left flap 100 downwardly and the pulley 102 mounted on the right hand hood hinge shaft 101 will rotate in a clockwise direction swinging the right flap 100 on this shaft downwardly. Upon the hydraulic pressure being released the stored up energy in the springs 120 will cause the pulleys 110 and 116 to be pulled downwardly and this motion will be transmitted through the cable 106 to the piston mounted pulley 113 which will be raised upwardly. The hood flaps 100 will then fly upwardly.

As in the case of the hood flaps 100, the vertically extending jamb flap 97, of which there is only one, is moved to a closed position by the application of hydraulic force and is spring urged toward its open position. The same hydraulic cylinder 99 used to actuate the hood flaps 100 is also used to actuate the jamb flap 97. It will be noted that the carrier 114 connected to the end of the piston rod has mounted therein a second pulley 124 located above the first pulley 113 which was part of the cable and pulley system operating the hood jamb. The cable and pulley system involved in operating the jamb flap 97 is much simpler than that used in operating the hood flaps 100. The jamb flap cable and pulley mechanism involves use of two separate cables 125 and 126, respectively. The cable 125 is connected at its one end 127 to the jamb flap 97 near the bottom thereof and extends from this connection around an idler pulley 128 mounted on a bracket 129 located near the bottom of the building structural member 65. The cable 125 then passes upwardly to an idler pulley 130 mounted on a bracket 131 secured to the building structural member 65 and passes over the pulley 130 downwardly around the pulley 124 carried by the carrier 114 connected to the piston rod 103. The cable 125 then passes upwardly over an idler pulley 132 mounted in parallel relation to the idler pulley 131 and then downwardly to a toggle bolt 133. The second cable 126 is connected at 134 to the jamb flap 97 near the upper end thereof and passes from its point of connection over a pulley 135 located substantially vertically above the pulley 128 over which the first cable 125 passed. The second cable 126 passes downwardly through a second pulley 136 in alignment with the pulley 124 carried by the carrier 114 attached to the piston rod 103 and then passes upwardly over a second idler pulley 137 mounted in the same bracket 138 in which the idler pulley 132 over which the first cable 125 passed is mounted. The free end 139 of this cable 126 is also connected to the upper end of the toggle bolt 140. The cable 125 and the cable 126 could be one piece divided into two effective sections which are related on each side of a common toggle bolt. Each toggle bolt 133 and 140 is connected to a tension spring 141 secured to the building structure element. It will be readily apparent that each toggle bolt 133 and 140 may be adjusted to increase or decrease the tension on the tension spring 141 thereby increasing or decreasing the tension in the cable system.

The jamb flap 97 is urged in its open direction by two coil springs 142 which, as shown in Fig. 13, lie across the hinge line of the jamb flap. When the jamb

flap 97 is pulled to a closed position by hydraulic actuation the two springs 141 are folded over at the hinge line and since they have a tendency to exert a force which would cause them to straighten up they are always urging the jamb flap 97 in its open or outward direction. Thus, as soon as the pressure is released in the hydraulic cylinder 99 the springs 141 will exert tension through the jamb flap 97 on the cables 125 and 126 causing the piston rod 103 to be pulled back up. The mechanism is then ready for actuation the next time it is desired to close the jamb flap 97.

Referring for a moment to the right end of Fig. 6 the relationship of the jamb flap 97 to the cabinet structure 143 in which the hydraulic actuating and the cable and pulley mechanism 98 are concealed is clearly visible. Likewise, with reference to Fig. 7, the relationship of the hood flaps 100 to the overhead structure is also clearly visible.

In the foregoing there has been described the structural features embodying the construction of the partition, the overhead support structure, the drive mechanism, the safety device for permitting the manual disconnecting of the panels from the drive mechanism, the hood operating mechanism and the automatic jamb operating mechanism. Some reference has been made to the manner in which the individual mechanisms and units operate without any indication being given as to the sequence in which the various operations or movements might occur. However, before this can be done there are a few additional features of construction to be described.

Referring to Figs. 15 and 16, there is illustrated a mechanism for "breaking" the partition 20 so that it can be folded after having been extended across the room. Upon the drive mechanism 42 being reversed to pull the lead panel 21*a* from left to right as viewed in Fig. 1, the last panel 21 would have the normal tendency merely to travel in a straight line until it ran into a wall member. To start the panel folding properly, pressure must be exerted on the end thereof in the direction of the arrow shown in Fig. 16.

The pressure applying mechanism, generally designated 144 comprises an arm 145 secured, as by welding, to a collar 146. The collar 146 is carried on the upper end of a vertically extending shaft 147. The shaft 147 is journalled in a bracket 148 secured to a building structural member 65. Beneath the bracket 148 the shaft 147 carries a torsion spring 149, one end of which is affixed to the shaft 147 and the other end of which is hooked over the bracket 150 journalling the lower end of the shaft 147. Thus, as viewed in Fig. 16, when the arm 145 is forced in a clockwise direction the torsion spring 149 is wound up ready to drive the arm 145 to the dot and dash position shown in Fig. 16.

An adjustable stop 151 is mounted on an arm 152 of bracket 153 secured to the front face of the bracket 148. This stop limits the swinging movement of the arm 145 in a counter-clockwise direction.

The arm 145 is shown with an upstanding portion 154 adapted, in the dot and dash position of the arm, to engage a limit switch 155, for a reason to be hereinafter explained. The limit switch 155 is mounted on arm or bracket 156 secured to the building structural member 65 above the bracket 148.

The pressure or partition "breaking" device 144 may be mounted at any convenient height above floor level.

After the partition 20 has been "broken" by the pressure device 144, it is desirable that the movement of the last panel 21, the panel affected by the pressure device 144, be controlled or guided to prevent the panel from flopping from first one side and then to the other. Accordingly, the present invention includes a control or guide means, generally designated 157. The control or guide means comprises an arm 158 located above the panel 21 and pivotally journalled on a bracket 159. The bracket 159 may be secured in any convenient manner to the track 24. The free end 160 of the arm 158 is provided with a roller 161 adapted to operate in a slot 162 formed by two spaced horizontal metal strips or the like 163 and 164, respectively.

An elongated leaf spring 165 is provided to maintain the roller 161 in bearing engagement with the edge 166 of the strip 164. The spring 165 is maintained in proper position by clamps 167 interposed between the strips 163 and 164 at each end thereof.

The edge 166 of the strip 164 is notched at three places, that is, it is provided with notches 168, 169 and 170, respectively. The notch 168 provides a rest position for the roller 161 when the panel 21 is in the position shown in Fig. 17. That is, the panel 21 lies beneath the track 24 in parallel relationship thereto. Upon the panel being moved by the pressure device 144 in the direction of the arrow in Fig. 17, the roller 161 will leave the notch 168 and will be urged into the notch 169. As the panel 21 continues to be moved so that its center of suspension 32 moves toward the bracket 159, the roller 161 being hooked in the notch 169 results in the arm 158 being swung in a counter-clockwise direction as viewed in Fig. 17. And, as the center of suspension 32 of the panel moves toward the bracket 159, the panel swings about its center of suspension in a clockwise direction, the swinging movement being stabilized by the arm 158. Finally, the relationship shown in Fig. 18 is reached. The swinging movement of the panel in a clockwise direction had continued until the roller 161 was forced out of the notch 169. The panel then continued to move relative to the roller 161 until the notch 170 was reached, the spring 165 forcing the roller 161 into this notch. It will be noted from Fig. 18 that the center 32 is as close to the bracket 159 as it can get without the panel 21 going beyond the right angle relationship to the position it had in Fig. 17.

Upon the partition 21 again being unfolded or extended the roller 161 will remain in contact with the notch 170 causing the arm 158 to swing in a clockwise direction, as viewed in Fig. 18, as the panel suspension point 32 moves away from the bracket 158 and the panel swings in a counter-clockwise direction about its center of suspension. This continues until the relationship shown in Fig. 17 is again attained.

Referring now briefly to Fig. 6, there is shown at the left end thereof the structure comprising the sealing jamb, generally designated 171. The sealing jamb 171 is the structure for receiving the end of the panel 21*a* should the partition 20 be of the type that extends from wall to wall of the room. It will be understood that the room may be of such a width that it might be desirable to have two partitions 20 each extending from a side wall and meeting at the center of the room. In such an arrangement, each partition would be provided with a starting jamb comparable to that shown at the right end of Fig. 6. It will be further understood that these details do not directly affect the operability of the folding partition. The sealing jamb, 171, may be provided with a buffer 172 mounted by spring means 173 on the building wall and adapted to be abutted by the end of the partition 21*a* so as to provide a tight seal at this end.

Although the partition panels 21 are adapted to be raised and lowered hydraulically to cause the panels to press tightly against the floor of the room in which the partition is installed, there may be circumstances or conditions of installation in which it may be desirable to have the rubber seal, which is usually provided at the bottom of each panel 21, itself independently movable up and down. In Figs. 20 to 24 inclusive, there are shown two alternative methods of mounting and motivating the rubber seals for upward and downward movement relative to the panels 21*a*. Referring first to the construction illustrated in Figs. 20 to 22 inclusive, the rub-

ber seal 174 is shown mounted in a channel seal carrier 175. The seal carrier 175 is suspended by suitable suspension springs 176 from the panel 21. It will be noted that the panel has attached to the end walls thereof brackets 177 adapted to receive the upper ends of the springs 176. It will be further noted that the seal carrier 175 is provided with brackets 178 adapted to receive the lower ends of the springs 176. Suitable mechanism is provided for urging the seal carrier 175 and thereby the seal 174 downwardly relative to the panel 21. The mechanism includes a cable 179 having its one end 180 tied to a bracket 181 fastened to the end wall of the panel 21. From the bracket 181 the cable passes up and over two or more pulleys 182 mounted on brackets 183 secured to the top of the seal carrier 175. The cable 179 then passes downwardly around and under another pulley 184 mounted on a bracket 185 at the left end of the panel 21, as viewed in Fig. 20. The cable 179 then passes upwardly along the innerside of the left end of the panel 21 where it passes over a pulley 186. The cable 179 then passes along beneath the top of the panel 21 to the point where its end 187 is adapted to be connected to a depending projection 188 carried by a slide 189. Referring to Fig. 20, it will be readily apparent that if the slide 189 is moved to the right the cable 179 will be placed under tension causing it to exert a downward pressure on the pulleys 182. The downward pressure exerted on the pulleys 182 will force the rubber seal downwardly against the upward urging of the tension springs 176.

The slide 189 may be moved to the right, as viewed in Fig. 20, by any convenient means. There is illustrated a draw bar 190 having a projection 191 thereon. Referring to Fig. 21, the draw bar with its downwardly depending projection 191 is normally in the position shown in dotted outline. Upon all of the panels 21 having reached their extended position across the room, the draw bar 190 will be given a slight turn in a counterclockwise direction, as viewed in Fig. 21, so that the projection 191 thereon will be in alignment with the upstanding projection 192 on top of the slide 189. On the draw bar 190 being moved to the right by any suitable means, the projections 191 and 192 will abut each other causing the slide 189 to be moved to the right and will result in the seal 174 being pressed against the floor. It will be understood that the structure shown in Fig. 20 will be duplicated for each panel 21.

In Figs. 23 and 24 there is illustrated a mechanism comprising a hydraulic cylinder adapted to move the seal carrier 175 and the rubber seal 174 carried thereby in a downward direction relative to the panel 21. As in the previously described embodiment, the seal carrier is suspended from the bottom of the panel 21*a* by suspension springs 193, the panel being provided with a convenient or suitable recess 194 for receiving the suspension springs and the other parts of the mechanism for raising and lowering the seals. Also mounted in a recess 194 above the seal carrier 175 is a double ended hydraulic cylinder 195. The cylinder 195 is provided with two pistons 196 and two piston rods 197 extending in opposite direction. Since the piston rods are of substantial length, suitable support structures 198 may be provided to support the free ends of the piston rods. The free end of each piston rod 198 abuts one arm of a bell crank lever 199 pivotally mounted on a bracket 200 carried by the upper side of the seal carrier 175. Each bell crank lever 199 is provided with an arm 201 which extends in a substantially horizontal direction, the arm 201 acting more in the nature of a cam. Referring to Fig. 23, it will be noted that if the pistons 196 and piston rods 197 are moved in a direction to cause the bell cranks 199 to pivot about their pivot axis so that the arms 201 thereon will be swung in a downward direction, the arms 201 will cam the seal carrier 175 downwardly against the upward urging of the spring 193. Upon the hydraulic pressure in the cylinder 195 being released the spring will restore the seal carriers to their uppermost position; also restoring the parts of the hydraulic actuating mechanism to their normal inoperative position.

The foregoing substantially completes the detailed description of the construction and arrangement embodying the present invention. Further understanding of the manner in which the individual mechanisms and units operate and also further understanding as to the sequence in which the various operations or movements might occur may best be obtained after first explaining Figs. 25 and 26 which, respectively, schematically illustrate the hydraulic and electrical circuits involved in the present invention.

Referring first to Fig. 25, a pump 202 adapted to be driven by an electric motor 203 (see Fig. 1) is illustrated. The pump 202 is adapted to draw fluid from a sump, reservoir or tank 204. The pump 202 discharges into a line 205 having a check valve 206 therein. Beyond the check valve 206, the line 205 splits into two branches 207 and 208, respectively. The branch 207 in turn splits into two additional branches 209 and 210, respectively.

The branch or line 209 leads to the hydraulic cylinder 99 which operates the automatic hood and jamb folding mechanisms. The line or branch 208 of the main line 205 leads to a relief valve 211. The relief valve is provided with a ball 212 urged into sealing contact with its seal 213 by a spring 214. It will be noted that fluid flowing through line 209 is directed, when the ball 212 is in contact with its seat 213, to a line 215 leading to a second relief valve 216. In the relief valve 211, the fluid under pressure from line 208 tends to raise the ball 212; whereas, in relief valve 216 the fluid under pressure from line 215, which line is actually a conduit of line 208, tends to urge the ball 212 into seating engagement, as will be further explained. The relief valve 211 is connected above its ball 213 by a line 217 to a line 218 having branches 219 leading to each of the panel 21 hydraulic actuating cylinders 34. The relief valve 216 has a line 220 leading from beneath its ball 212 to the line 218.

The branch line 210, shown at the upper portion of Fig. 25, leads to a release valve 221. The release valve 221 is of similar construction to the relief valves, that is, it has a ball 212 adapted to seat against a conical seat 213 and spring urged into seating engagement by a spring 214. The line 210 leads into the spring side of the ball. The ball 213 of the release valve 221 may be dislodged from its seat by a rod 222 which may be pushed in ball unseating direction by a bell crank lever 233 actuated by a solenoid 224, as will be more fully explained. The release valve 221 has a line 225 leading therefrom to the sump or tank 204.

In operation, the fluid under pressure from the pump 202 passes through the line 205, through the check valve 206 and into the lines 207 and 208. At this moment the fluid in the line 208 does not have enough pressure to force open the relief valve 211. Therefore, all of the fluid will flow through the line 207 to the two branches 209 and 210. The fluid through the branch 210 is stopped because it urges the ball 212 of the relief valve 221 into tighter seating engagement with its seat 213. Therefore, the fluid will flow through the line 209 into the hydraulic cylinder 99 which operates the automatic hood and jamb folding mechanisms. It will be recalled that the hoods and jamb are hydraulically forced into closed position. Upon the completion of the closing movement of the hoods and jamb, the pressure will build up in the hydraulic cylinder 99 resulting in increased pressure in the lines 209, 207 and back to line 208. The pressure buildup in line 208 will be sufficient to cause the ball 212 of the relief valve 211 to lift from its seat thereby permitting fluid to flow from the line

208 through the relief valve 211 into the line 217, and thence to the line 218 and into the branches 219 leading to the hydraulic cylinders 34 located in the various panels 21. The pressure build up in the cylinders 34 will overcome the resistance of the springs 40 resulting in the panels 21*a* being forced downwardly.

Before the partitions 21*a* can be retracted or returned to a folded condition, the pressure in the system must be released. This is accomplished through the release valve 221. The solenoid 224 is actuated to swing the bell crank lever 233 in a direction to cause the rod 222 to unseat the ball 212 from the seat 213 of the release valve 221. The pressure in the hydraulic cylinder 99 will then drop permitting the springs which are part of the hood and jamb operating mechanism to retract the piston rod 103 forcing the fluid under pressure from the cylinder 99 back through line 209 and then through line 210 past the ball 212 into the line 225 leading to the tank 204. Meanwhile, the spring pressure of the spring 214 in the relief valve 211 will be strong enough to cause the ball 212 to seat against its seat 213 thereby blocking any return flow of fluid through the line 217. However, the line 220 is a bypass for the line 217 under this condition and as the springs 40 in the various panels 21 cause retraction or upward movement of the panels 21 the fluid beneath the pistons 38 in the cylinders 34 will be forced back through the lines or branches 219 into the line 218 and then through line 220 through the valve 216, the ball 212 of the valve 216 being lifted off its seat by the pressure of the fluid. The fluid being discharged from the cylinders 34 will then flow through the line 215 through the relief valve 211 into the line 208 leading therefrom and then through line 207 and into branch 210 from where it will find its way back to the tank 204 through the release valve 221.

Provisions may be made to operate the bell crank lever 233 by a manual pull cord in case of a power failure rendering the solenoid 224 inoperative.

It will be noted that the line 218 was indicated as having a valve 226 therein, the valve designation being the letters PS within a circle. The PS is a designation for a pressure switch. It will be understood that when the partition is extended across a room, the hydraulic pressure in the cylinders 34 as well as the hydraulic pressure in the cylinder 99 is acting to maintain the panels 21 in their down position and to maintain a hood and jambed in their closed positions, respectively. Pressure having been applied to the hydraulic system by the pump 202, the check valve 206 will maintain the fluid in the system under pressure and prevent the fluid from backing up into the pump. Under ideal conditions, the pressure would be maintained at the cut-off point until the release valve 221 was actuated to permit the fluid in the system to discharge back into the reservoir or tank 204. At the completion of the actuation of the hoods and jamb by the hydraulic cylinders 99 and the actuation of the panels by the cylinders 34, and upon pressure in the system reaching the predetermined cut-off point, the pressure switch 226 will automatically be actuated to cut-off the electric current to the pump motor 203.

As long as the partition is in its extended position, it is desirable that the pressure in the system be maintained above a limit at which the panels would begin to rise or the hoods and jamb would start to move away from the panels. The pressure switch 226 thus may be used to compensate for any seepage that might occur in the hydraulic cylinders 34 and 99. Should the pressure in the hydraulic cylinders 34 drop because of seepage, the pressure switch 226 would respond by closing the circuit leading to the electric motor 203 of the pump 204, thereby causing the pump motor to start up and to pump the pressure in the system back up to the predetermined cut-off point. Likewise, if seepage in the hydraulic cylinder 99 should cause a drop in the fluid pressure of this part of the circuit, this pressure drop would be reflected at the relief valve 216. The pressure in the conduit 218 leading to the hydraulic cylinders 34 would be greater than the pressure on the top side of the ball 212 of the relief valve 216 causing the ball 212 to rise off its seat and thereby causing a drop in pressure in the conduit 218. In other words, the pressure in the hydraulic cylinder 34 side of the system would become equal to the pressure in the hydraulic cylinder 99 side of the system. The drop in pressure in the conduit 218 would be reflected at the pressure switch 226 thereby permitting this switch to close causing the pump motor to restart.

Referring now to Fig. 26, the schematic electric circuit involved in the present invention is illustrated. As illustrated the electrical circuit comprises a one hundred and ten volt single phase circuit feeding power into lines 227 and 228. The electrical circuit includes a number of relays, micro switches, a key operated switch, a thermo-reset switch, a pressure switch and limit switches. All of the foregoing relays and switches utilize 24 volt current, which is obtained from a transformer indicated at 229. Movement of the partition 20 is actuated by operation of a key switch 230 which has to be held in the "in" or "out" position to cause movement of the partition. The purpose of this is to keep the operator from leaving while the partition is in motion.

To cause movement of the partition in the out direction, that is, from a folded position to an extended position across the room, the key must be turned so that a circuit is closed through the button 232 of the key operated switch 230. The actuation of the key operated switch 230 causes the switch contact 231 to engage the button 232 leading to the line 233. The line 233 leads to the input terminal of the coil of a control relay designated 234. The output side of the coil of the control relay 234 is connected to line 235 which leads to a terminal 236 of a limit switch 237. When the partition panels are in folded position, the limit switch 237 is closed, as shown in solid line in Fig. 26, thus providing a circuit through lines 238 and 239 to the input side of the transformer 229. The control relay coil 234 will thus be energized causing normally open control relay elements 234*a* and 234*b* to close and normally closed relay elements 234*c* and 234*d* to open, the relay 234 being a double throw unit.

To permit the circuit to be followed, it will be assumed that power line 227 is the input line. Thus, current will flow through line 227, line 240, relay element 234*a*, and to line 241. From line 241 the current splits into two branches formed by lines 242 and 243. From line 242 the current travels through line 244, through normally closed relay 267*d* to line 245. Lines 243 and 245 each lead to input terminals of the motor 69. It will be understood that the motor 69 is a split-phase motor having starting and running windings. Thus, lines 243 and 245 tie into the leads to the running and starting windings, respectively. In the condition as has just been described, lines 246 and 247 represent lines connected to the output terminals of the motor 69. The current flow from line 246 is through line 248, normally closed relay 267*c*, line 249, into line 250. The output current through line 247 ties into line 250 directly. Line 250 feeds into line 251 including the relay 234*b* which is now in closed condition due to the energization of the control relay coil 234. Line 251 feeds into line 252 which is connected to one side of a thermo-reset relay 253, the output side of the thermo-reset relay 253 being tied into power line 228. It should be noted that although control relays 234*c* and 234*d* are shown as normally being closed, when the key actuated switch 230 has been turned so as to close the circuit through the button 232 thereby energizing the control relay 234, the control relay elements 234*c* and 234*d* are open and no current can flow through the branches in which they are positioned.

Upon the partition 20 reaching its fully extended posi-

tion the limit switch 237 is operated so as to open the same, that is, causing the arm thereof to move from solid line position to the dot and dash position, thereby causing the arm to move off the button 236 and to engage the button 263. This stops the operation of the motor 69, because upon the circuit through the button 236 being broken the control relay 234 is de-energized causing the control relay elements 234*a* and 234*b* to open thereby isolating the motor from the input and output sides of the power source. However, it will be noted that the transformer line 264 has the two branches 254 and 255 leading therefrom. The branch 254 leads to the key actuated switch 230.

The branch 255 leads to the input terminal of a control relay 256 which when energized closes normally open contacts 256*a* and 256*b* thereby causing operation of pump motor 203. The line 255 has in series therewith a normally closed switch 257 which is the switch operated by the pressure device 226 shown in the hydraulic circuit diagram. As was stated, the switch 257 remains closed until the pressure in the system builds up to a pre-determined cut-off point at which point the switch is forced open to thereby deenergize the control relay 256, causing the contacts 256*a* and 256*b* to open and causing motor 203 to stop. Line 258 connected to the output side of control relay 256 contains normally closed relay contacts 259*a* related to control relay 259, having a function to be hereinafter explained.

In close proximity to control relay 259 is control relay 260 which when energized closes normally open contacts 260*a* thereby energizing solenoid 224, the solenoid which controls the action of the release valve 221 of the hydraulic circuit. The line 258 containing the contact relays 259*a* is joined with lines 261 and 262. The line 261 contains the aforementioned control relay 259. The line 262 leads to the terminal 263 of the limit switch 237.

Thus, upon the extension of the partition panels 21 completely across the room, the limit switch 237 arm will be moved from contact 236 to contact 263, causing the motor 69 to stop and pump motor 203 to start up. Pump motor 203 will cause pump 204 to pump fluid into the hydraulic system until the pressure switch 257 is forced open.

Should the pressure in the hydraulic system drop, the switch 257 will close, as has been explained, and the pump 203 will again start to deliver pressure.

The circuit for controlling the movement of the partition from "out" or extended condition to "in" or folded condition is slightly more complicated in that it includes additional limit switches, for reasons which will become apparent. To cause the partition to move in, that is, to fold, the operator must turn the key switch to make contact between the contact 231 and switch contact 265 thus closing a circuit between line 254 and line 266, the latter leading to the input terminal of control relay coil 267. The output terminal of the control relay 267 is hooked up to line 268 which is attached to one terminal of normally closed limit switch 269. In series with limit switch 269 are two additional limit switches, the normally open limit switches 155 and 270. Limit switch 155 has been mentioned before, it being shown in Figs. 15 and 16. The line 271 containing the limit switches 155 and 270 ties in with line 239 leading to the transformer 229.

Thus, in order for the control relay 267 to be energized the key switch 230 contact 231 must be in contact with button 265 and the limit switches 155 and 270 must be closed. Turning the key switch 230 to close contact 231 with contact 265 closes a circuit through the control relay 260 causing the solenoid 224 to be energized thereby opening release valve 221 and dumping the pressure in the hydraulic system. The release of the pressure in cylinders 34 will cause the partition panels 21 to be spring lifted as has been explained. Release of pressure in the cylinder 99 will permit the hood flaps 100 to raise by spring action and the jamb panel 97 to swing open, again by spring action. Upon the jamb opening the limit switch 270 will be moved from its normally open to a closed position. With the release of the pressure of the hood and jamb against the panels 21, the spring 149 will drive the arm 145 in a direction to "break" the last panel 21. Upon the arm portion 154 engaging the limit switch 155, this switch will close. The control relay 267 is now part of a closed circuit and will be energized causing its contacts 267*a* and 267*b* to close and its contacts 267*c* and 267*d* to open.

In the motor 69 circuit the condition now exists that current will flow through line 227 to line 272. In line 272 the current flows through now closed contacts 267*a* to line 249. From line 249 the current splits two ways. One branch is through line 247. The other branch is through line 250, to line 273 having normally closed contacts 234*d* in series therewith and then to line 245 to the motor.

On the output side of the motor current flows out through lines 243 and 246. From line 246 the current flows through line 274 having normally closed contacts 234*c* in series therewith, line 274 joining line 241 which makes a juncture with line 242. Line 243 also joins with line 242 and the current flows through now closed contact relays 267*b* through line 275 to a juncture with line 252 and on out through line 228.

The movement of the partition in the "in" or folded direction continues until the normally closed limit switch 269 is tripped and held open thus cutting the current to the cable drive unit motor 69.

It will be understood that the direction of rotation of the motor 69 is controlled by the actuation of the switch 230. With switch 230 closed at contact 232, input current to the motor was through leads 243 and 245 and output flow was through leads 246 and 247. With switch 230 closed at 265, input current to the motor is through leads 247 and 245 and output flow through leads 246 and 243. Thus, in effect leads 243 and 247 have been reversed. It will be readily understood that the reversal of a split-phase motor is easily accomplished by reversing one set of leads, preferably the leads to the starter winding. Preferably, leads 243 and 247 are the leads to the starter winding of the motor 69.

A brief resume of the operation sequence of the foldable partition embodied in the present invention is as follows: The operation involved in a complete cycle of the partition begins with the turning of the key in the key operated switch 230 to the "out" direction, it being assumed that the partition 20 is in a folded condition when it is desired to extend the partition across the room. Upon the key being turned and held toward the "out" position, the cable drive unit 42 will drive the partition in an outward or extended direction until the lead panel 21*a* of the partition reaches the out limit switch 237, causing the cable drive unit motor 69 to stop and the pump or hydraulic unit motor 203 to start up. The hydraulic unit 202, pumping oil to the hydraulic cylinder 99 located in the vertical jamb section, first causes the jamb 97 to pull the innermost panel within reach of the upper hood 100. Secondly the upper hood 100 aligns the first sections of the partition, which have no guide track at the top, as has been explained. After the jamb 97 and hood 100 have completed their operations, the pressure buildup in the hydraulic system causes the relief valve 211 to open causing the hydraulic pressure to shift to the cylinders 34 within the partition panels. The partition is then pressed downwardly to the floor. As has been explained, the partitions are maintained in tight engagement with the floor through the medium of the pressure switch 226.

The retraction of the partition begins with the turning of the key in the key operated switch to the "in" position. The first thing which occurs after the turning of the key to the "in" position is the energization of the solenoid 224 attached to the hydraulic system, the sole-

noid causing the pressure release valve **221** to open thereby releasing the pressure in the hydraulic system. Upon the hydraulic pressure being released, the doors will be spring raised to their up position. Also, the hood and jamb mechanism are restored to the up and open condition through the medium of the springs **120** and **142** which form part of their mechanism. The innermost panel **21** will be "broken" by the action of the spring loaded arm **145**. As soon as the arm reaches a predetermined position as determined by the adjustable stop **151**, the limit switch **155** will be closed and the circuit will be completed energizing the cable drive unit motor **69** causing the partition **20** to be moved by the cable unit **42** in a retracted or folding direction. When the partition is completely folded, as determined by the limit switch **269**, the cycle is completed.

I claim:

1. In a foldable partition installation, an overhead guideway, a series of carriage devices movable along said guideway, a series of hingedly connected partition panels, means swivelly suspending at least the lead, the last and selected intermediate panels from respective ones of said carriage devices, and power operated means for moving said carriage devices and thereby said panels between folded and extended positions, said power operated means driving an independent carriage device, coupling means carried by said independent carriage device coupling the same to the lead panel carriage device, and means operable to uncouple said coupling means from said lead panel carriage device to permit manual movement of said panels along said overhead guideway independently of any part of said power operated means.

2. In a foldable partition installation, an overhead guideway, a series of cariage devices movable along said guideway, a series of hingedly connected partition panels, means swivelly suspending at least the lead, the last and selected intermediate panels from said carriage devices, and power operated means comprising a cable means for moving said carriage devices and thereby said panels between folded and extended positions, said cable means driving an independent carriage device ahead of the lead panel carriage device, coupling means carried by said independent carriage device coupling the same to said lead panel carriage device from which said first panel is suspended, and manually operable means carried by said lead panel for uncoupling said lead panel carriage device from said independent carriage device to permit manual movement of said panels between extended and folded positions independently of said cable means.

3. In a foldable partition installation, an overhead guideway, a series of carriage devices, a series of hingedly connected partition panels, suspension means suspending at least the first, the last and alternate intermediate panels from said carriage devices, a cable drive mechanism for moving said carriage devices and thereby said panels between folded and extended positions, said suspension means including means resiliently supporting said panels for movement in an up and down direction relative to said guideway, hydraulic means adapted to urge and maintain said panels downwardly, and control means shifting motivation from said cable drive mechanism to said hydraulic means upon said partition reaching extended position, said control means including pressure responsive means adapted to stop motivation of said hydraulic means upon said panels meeting resistance to further downward movement.

4. In a foldable partition installation, an overhead guideway, a series of carriage devices, a series of hingedly connected partition panels, suspension means suspending at least the first, the last and alternate intermediate panels from said carriage devices, a cable drive mechanism for moving said carriage devices and thereby said panels between folded and extended positions, said suspension means including means resiliently supporting said panels for movement in an up and down direction relative to said guideway, hydraulic means adapted to urge and maintain said panels downwardly, and control means shifting motivation from said cable drive mechanism to said hydraulic means upon said partition reaching extended position, said control means including pressure responsive means adapted to stop motivation of said hydraulic means upon said panels meeting resistance to further downward movement, said pressure responsive means being effective to maintain the pressure exerted by the hydraulic means above a pre-determined point to prevent undesired upward movement of the partition.

5. In a folding partition, a series of partition panels, suspension means supporting at least each alternate panel directly from a carriage device movable along an overhead guideway, said suspension means comprising shaft means journalled in said carriage device for swivelling movement about a vertical axis, each alternate panel having hydraulic cylinder means secured therein, piston means operative within said cylinder means, said shaft means having a portion thereof supporting said piston means, resilient means interposed between said piston means and cylinder means effective to support said panel relative to the overhead guideway, and a source of fluid under pressure for moving said cylinder means and thereby said panel relative to said piston means in a downward direction against the resistance of said resilient means.

6. In a folding partition, a series of partition panels, suspension means suspending at least each alternate panel directly from a carriage device movable along an overhead guideway, said suspension means comprising shaft means journalled in said carriage device for swivelling movement about a vertical axis, said shaft means having a portion thereof projecting within said panel, hydraulic cylinder means fixed within said panel surrounding said shaft means portion, piston means carried by said portion, resilient means interposed between said piston means and said cylinder means effective to yieldably support said panel in raised position relative to the overhead guideway, and a source of hydraulic fluid for moving said cylinder means relative to the piston means contained therein whereby said panel will be moved downwardly relative to said overhead guideway against the resistance of said resilient member.

7. In a foldable partition installation having a series of interconnected partition panels, an overhead guideway, a series of carriage means including a suspension means suspending at least alternate ones of said panels therefrom for movement therewith along said guideway, a cable means, means connecting said cable means to at least one of said carriage means, and cable drive means comprising a motor driven gear and at least a pair of idler gears in mesh therewith, said idler gears being rotatably journalled on a floating cage means, said cable means passing around and between said gears in such a manner that increased tension on said cable will pull said gears in tighter mesh thereby increasing the gripping pressure on the cables at the points it passes therebetween, and torsion bar means limiting said cage means to movement inwardly and outwardly relative to the axis of rotation of said driven gear.

8. A cable drive means comprising, in combination, a cable, a motor driven gear, at least a pair of idler gears in mesh with said driven gear, a floating cage means rotatably journalling said idler gears in parallel spaced relationship, said cable passing around and between said gears in such a manner that increased tension on said cable will pull said gears in tighter mesh thereby increasing the gripping pressure on said cable at the points it passes therebetween, and means restricting said cage means to movement inwardly and outwardly relative to the axis of rotation of said driven gear.

9. In a folding partition, the combination of a series of movable partition panels, an overhead slotted guideway for guiding said panels during movement from a folding zone to an extended position, a pair of hood members overlying said folding zone, shaft means swingably mounting

said hood members for movement toward and from raised and lowered positions, cable and pulley means interconnected with said shaft means, biasing means acting on said cable means normally urging said hood members to raised position, and hydraulic means adapted to act on said cable means to overcome said biasing means and urge said hood members downwardly into engagement with the last partition panels remaining in the folding zone after the partition is fully extended, said hood members in their lowered position forming an extension of said guideway and thereby being effective to align said last panels within said guideway slot.

10. In a folding partition, the combination of a series of partition panels movable from a folding zone to an extended position, the last of said panels when said partition is in extended position being adapted to engage a fixed vertical jamb portion at one side thereof, means pivotally mounting a swingable vertical jamb member in juxtaposition to the other side of said last panel, means normally urging said swingable vertical jamb member in an open direction, and hydraulically actuated means adapted to swing said swingable vertical jamb member into engagement with said panel to maintain the latter in tight engagement with said fixed vertical jamb portion.

11. In a folding partition, the combination of a series of partition panels movable from a folding zone to an extended position, the last of said panels when said partition is in extended position being adapted to engage a fixed vertical jamb portion at one side thereof, means pivotally mounting a swingable vertical jamb member in juxtaposition to the other side of said last panel, resilient means normally urging said swingable vertical jamb member in an open direction, and hydraulically actuated cable means adapted to swing said swingable vertical jamb portion into engagement with said panel to maintain the latter in tight engagement with said fixed vertical jamb portion.

12. In a folding partition, the combination of a series of movable partition panels, an overhead slotted guideway for guiding said panels during movement from a folding zone to an extended position, a pair of hood members overlying said folding zone, shaft means swingably mounting said hood members for swinging movement about a horizontal axis toward and from a raised or lowered position, said hood members when in lowered position forming an extension of said guideway, said folding zone at one end thereof having a fixed vertical jamb portion, the last partition panel when said partition is in extended position being adapted to engage said fixed vertical jamb portion, means pivotally mounting a swingable vertical jamb member in opposing relation to said fixed vertical jamb portion, independent cable means operatively connected to said hood members and to said swingable vertical jamb member, biasing means normally urging said hood members and swingable vertical jamb member toward raised and open position, respectively, and a common hydraulic means effective to operate both cable means to forceably lower said hood members and to close said swingable vertical jamb member.

13. In a folding partition having a series of swivelly suspended partition panels selectively movable from a folding zone into extended position and back to said folding zone, the last of said panels when said partition is in extended position being adapted to be forceably urged into alignment with the panels outwardly thereof, the combination, comprising an arm member, shaft means swingably mounting said arm member at the inner end of said folding zone, torsion means concentric with said shaft means normally urging said arm member in a first direction, said arm member being forceably moved to and held in the opposite direction against the resistance of said torsion means upon said last panel being forceably aligned with said panels outwardly thereof, whereby upon release of the aligning force said arm member will forceably initiate swinging movement of said last panel toward folded condition.

14. In a folding partition having a series of swivelly suspended partition panels selectively movable from a folding zone into extended position and back to said folding zone, the last of said panels when said partition is in extended position being adapted to be forceably urged into alignment with the panels outwardly thereof, the combination, comprising a horizontal arm member, vertical means swingably mounting said arm member at the inner end of said folding zone, torsion means concentric with said shaft means normally urging said arm member in a first direction, said arm member being forceably moved to and held in the opposite direction against the resistance of said torsion means upon said last panel being forceably aligned with said panels outwardly thereof, whereby upon release of the aligning force said arm member will forceably initiate swinging movement of said last panel toward folded condition, and overhead guide means in engagement with said last panel to guide the same into proper position in said folding zone after completion of said arm member influenced swinging movement and as said panels are retracted to said folding zone.

15. A cable drive means comprising, in combination, a support structure, a power shaft rotatably journalled in said support structure, a drive gear member mounted on said power shaft, said drive gear member having a cable receiving groove thereon, a pair of idler gear members also having cable receiving grooves thereon, a floating cage member rotatably journalling said idler gear members, torsion means positioning said cage member on said support structure with the teeth of the idler gear members thereon in mesh with the teeth of said drive gear member, and cable means passing first around an idler gear member to and around said drive gear member and then to and around the other idler gear member whereby increased load on said cable means will tighten the frictional engagement between the surfaces of said gear member grooves and cable means.

16. In a folding partition, a series of partition panels, suspension means supporting selected panels directly from carriage devices movable along an overhead guideway, said suspension means comprising shaft means journalled in said carriage devices for swivelling movement about a vertical axis, each supported panel having hydraulic cylinder means fixedly secured therein, said shaft means having the piston means of said hydraulic cylinder means supported thereon, biasing means acting between said piston means and cylinder means effective to support said panel relative to the overhead guideway, and a source of fluid under pressure for moving said panel relative to said piston means in a downward direction against the resistance of said biasing means.

17. In a foldable partition installation, an overhead guideway, a series of carriage devices movable along said guideway, a series of hingedly connected partition panels, suspension means supporting selected panels from said carriage devices, said selected panels including the lead panel, power operated means for moving said carriage devices and thereby said panels between folded and extended positions, said power operated means including coupling means coupling said power operated means to the lead panel carriage device, means supporting said coupling means on said overhead guideway for movement with said lead panel carriage device when coupled thereto, and means operable to uncouple said coupling means from said lead panel carriage device to permit manual movement of said panels along said overhead guideway.

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