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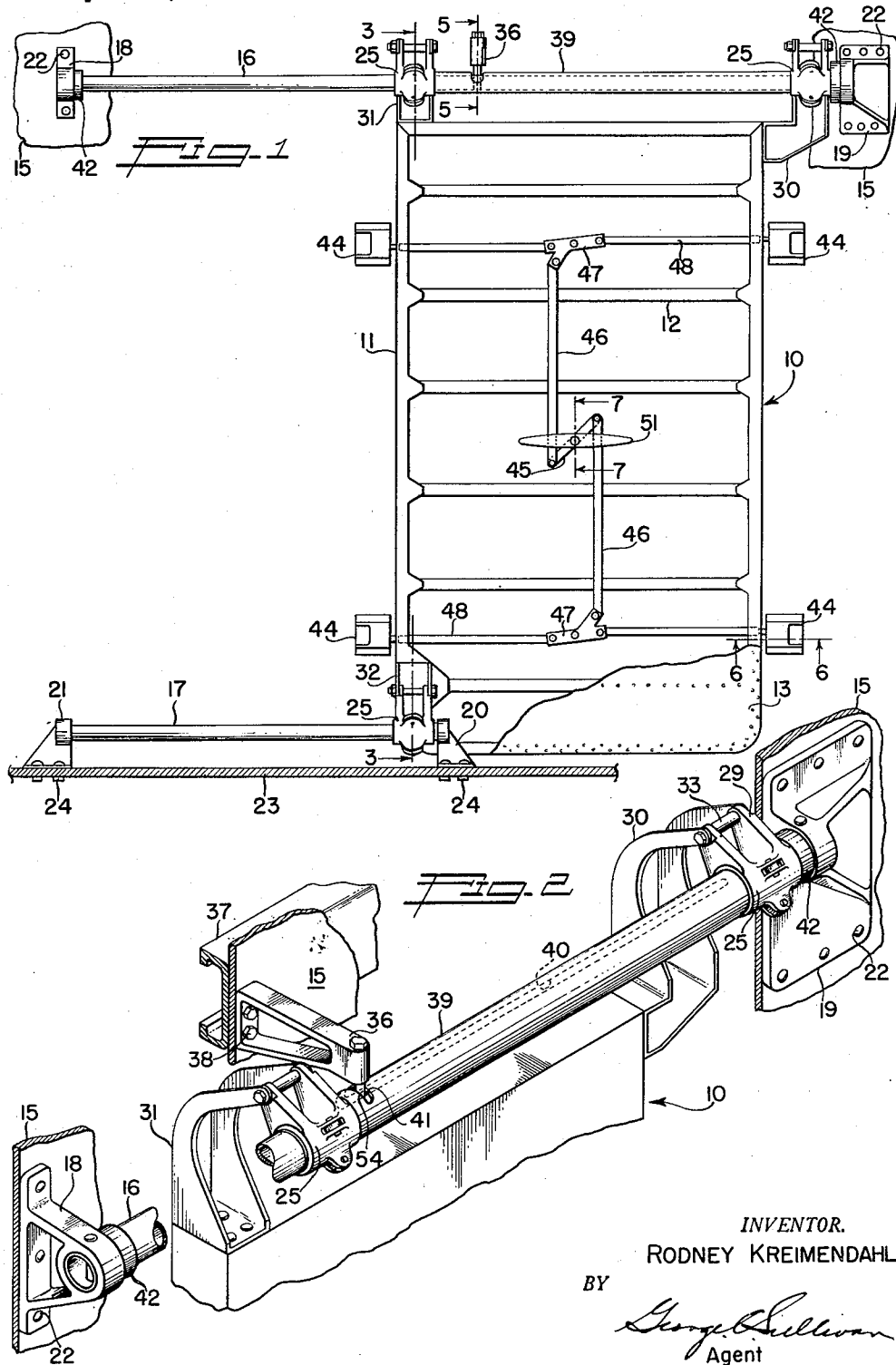
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2,570,563

OPERATING MEANS FOR SLIDING DOORS

Filed April 16, 1945

5 Sheets-Sheet 1



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Fig. 3

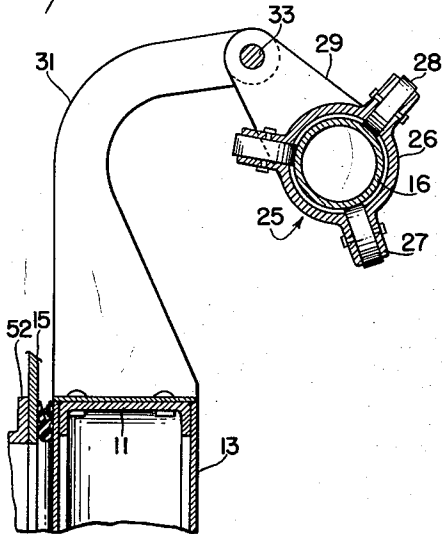
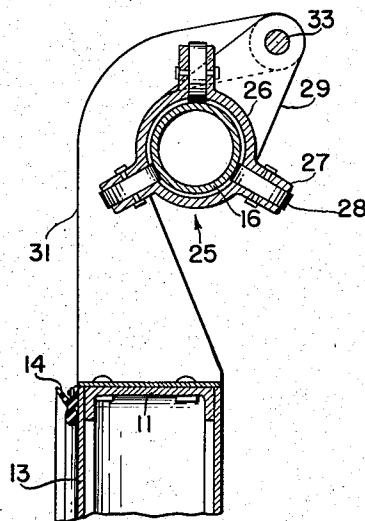
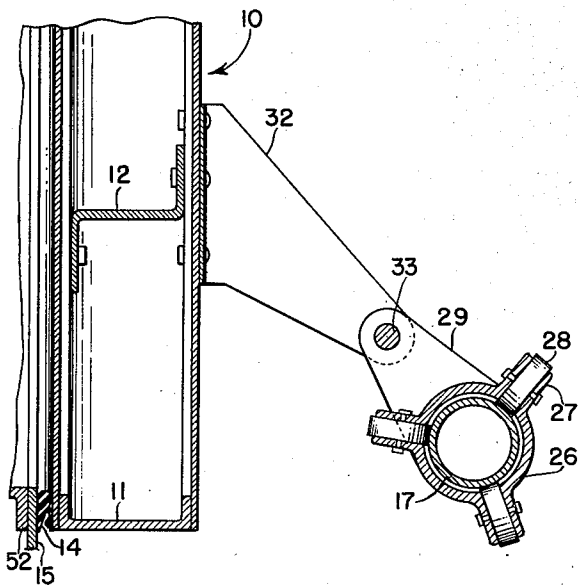
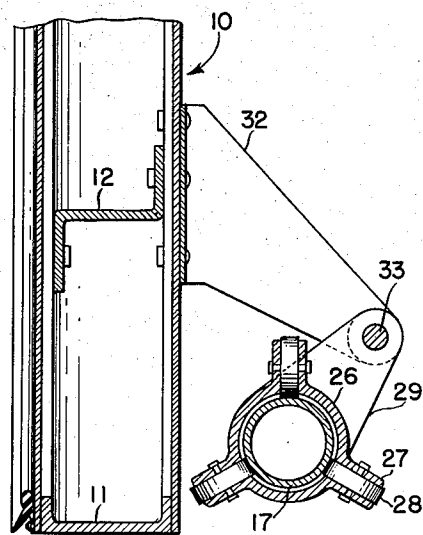


Fig. 4



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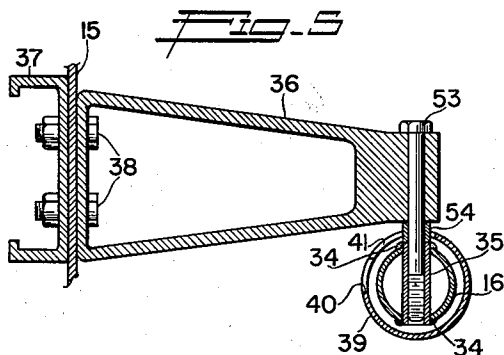
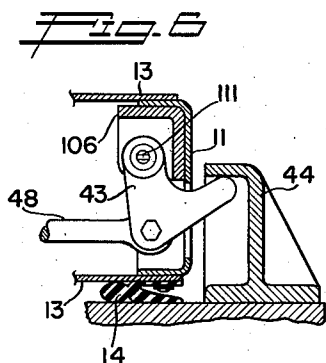
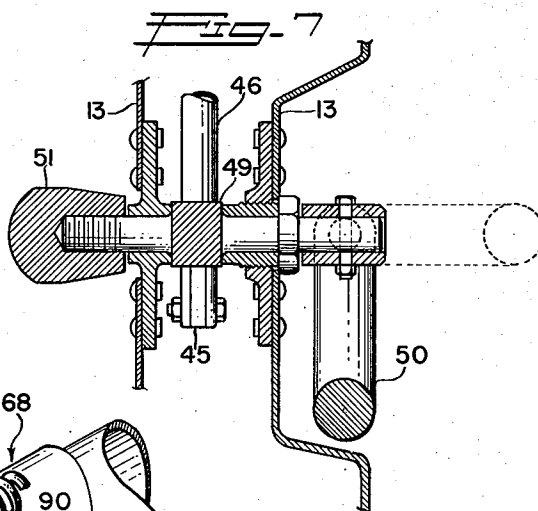
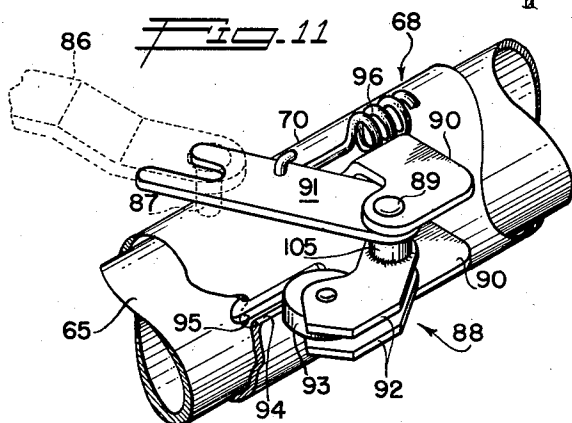
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5 Sheets-Sheet 3



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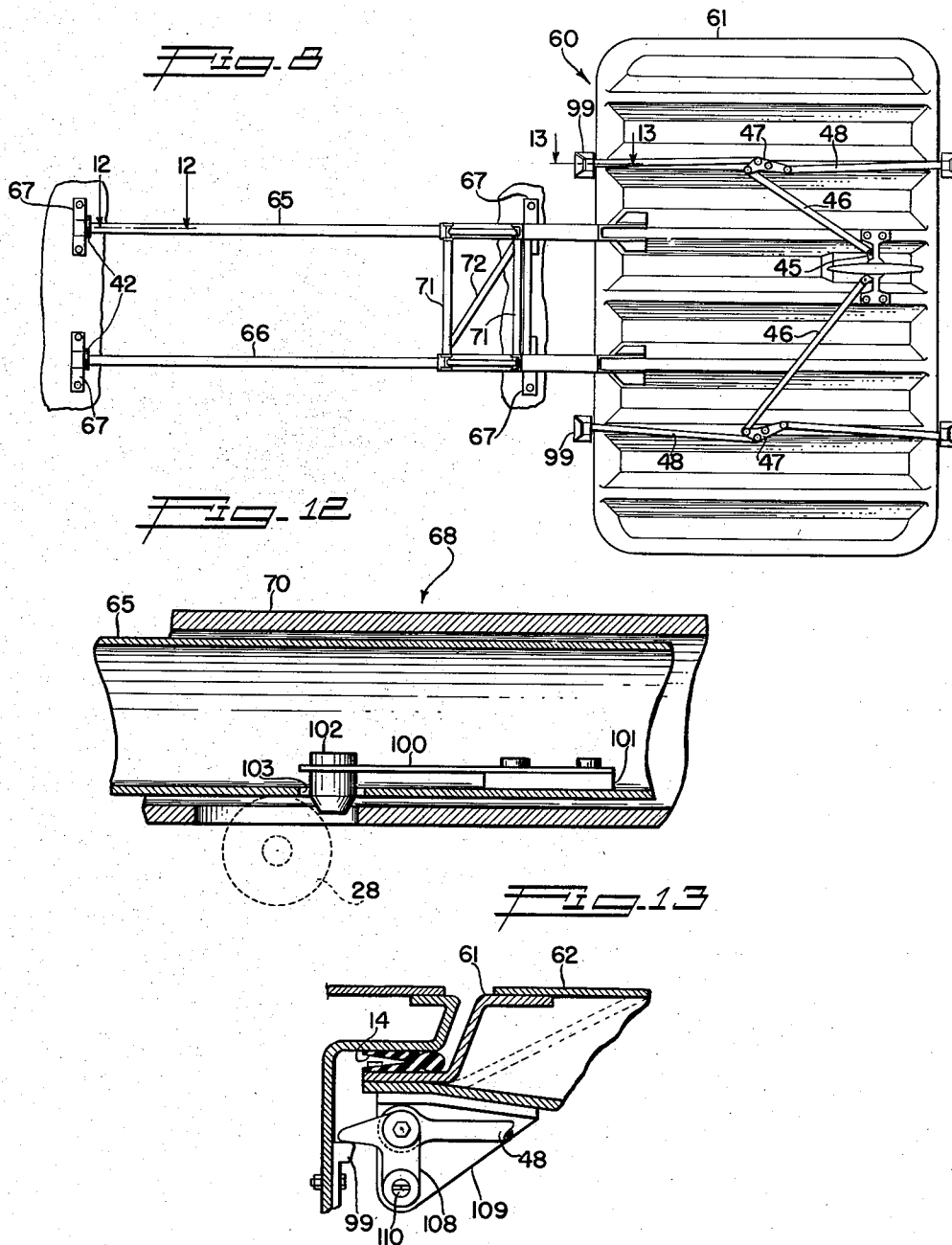
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OPERATING MEANS FOR SLIDING DOORS

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OPERATING MEANS FOR SLIDING DOORS

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4 Claims. (Cl. 20—23)

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This invention relates to sliding doors, and specifically to the fixtures or operating mechanism for sliding doors that have a soft, pliable seal installed around the edges.

When it is desired to keep out moisture and foreign matter, and to maintain a differential in temperature or air pressure, it is customary to install a soft, pliable seal around the edge of the door on the side adjacent the wall or partition. To be effective, the seal must be pressed as tightly as possible against the partition when the door is in the fully closed position.

Due to structural restrictions, doors having such a seal are often of necessity arranged to slide or roll along fixed horizontally extending tracks, attached in a substantially parallel arrangement to the wall or partition bearing the door opening. When the door is moved from the fully closed position to the limit of its travel and back again in a plane substantially parallel to the supporting wall or partition, the seal, pressed tightly against the partition in the closed position, rubs against the partition during its entire travel, and is so damaged by scuffing that in a short time it is rendered ineffective for further use.

An object of this invention is to provide means whereby the door cannot be slidably operated parallel to the wall or partition, until it has first been moved back substantially normal to the wall or partition, and adequate clearance provide to prevent damage to the seal and door during the sliding motion.

Another object of the invention is to provide means that positively prevents the door and seal from being pushed against the partition at any time during the sliding motion.

Another object of the invention is to provide operating means that permits the full weight of the door to press the seal against the wall or partition when the door is in the fully closed position.

A further object is to provide a roller carrier that will prevent the door from jumping off the tracks.

Other objects and advantages of the invention will become apparent from the following detailed description of typical preferred forms of the invention, in which reference will be made to the accompanying drawings, and in which like numerals are employed to designate like parts throughout the same.

Figure 1 is an elevational view of the door and the operating means, as seen from the inside of the doorway, with the door in closed position.

Figure 2 is an enlarged fragmentary perspective view of the upper portion of the operating means when the door is in the closed position.

Figure 3 is an enlarged fragmentary vertical section taken substantially along 3—3 of Figure 1 showing the door in closed position.

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Figure 4 is a view similar to Figure 3 showing the door in the open position.

Figure 5 is an enlarged vertical section taken substantially on the line 5—5 of Figure 1.

Figure 6 is an enlarged sectional view taken substantially on the line 6—6 of Figure 1.

Figure 7 is an enlarged vertical section taken substantially on the line 7—7 of Figure 1.

Figure 8 is an elevational view showing a modified operating means for a contoured door, as seen from the inside of the doorway, with the door in the closed position.

Figure 9 is an enlarged fragmentary perspective view of the modified operating means when the door is in the open position.

Figure 10 is an enlarged fragmentary perspective view of the upper portion of the modified operating means when the door is in the closed position.

Figure 11 is an enlarged fragmentary elevational view taken substantially in the direction of 11—11 in Figure 9, showing the latching device on the upper track of the modified operating means when the door is in position to be slidably operated along the tracks.

Figure 12 is an enlarged sectional view taken substantially on the line 12—12 of Figure 8.

Figure 13 is an enlarged sectional view taken substantially on the line 13—13 of Figure 8.

Referring to the drawings wherein a preferred embodiment of the invention is illustrated, numeral 10 designates a sliding door. The particular structure of the door, insofar as the invention is concerned, is immaterial. The door 10, chosen for purposes of illustration, is shown in Figure 1 and embodies a channel-supporting frame 11, Z stiffeners 12 extending horizontally between the supporting frame, and a sheet metal skin 13 secured to both sides of the frame. A sealing strip 14, of rubber composition or like material, is fastened around the edge of the door on the side adjacent to the wall or partition 15. A suitable stiffening member 52 surrounds the door opening on the side opposite the door.

The door is mounted so as to be capable of travel parallel to the wall or partition, being supported on an upper horizontally extending track 16 and guided by a lower horizontally extending track 17. The upper track 16, preferably a tubular section, is supported at the end remote from the door opening by bracket 18, and at the other end by bracket 19. The lower track 17, also a tubular section, is disposed so as to permit free access to the doorway, and is supported at its end adjacent the door opening by bracket 20, and at its other extremity by bracket 21. These supporting brackets may be bolted or riveted, or otherwise suitably fixed, to any suitable structural member of the vehicle, and for the purpose of illustration, brackets 18 and

19 are shown fastened to the wall or partition 15 by means of rivets 22, and brackets 20 and 21 are shown fastened to the floor 23 by means of rivets 24.

A roller housing 25, adapted to run along the track and support the door thereon, is pivotally connected to a bracket attached to each corner at the top of the door, and to a bracket attached to the bottom corner of the door adjacent the lower track when the door is in the closed position. Each of the said housings comprise a tubular portion 26 whose inner diameter is slightly larger than the outside diameter of the track. Three spaced pairs of side plates 27 are mounted in equally spaced relationship on the outer periphery of the tubular portion 26, and are so disposed that when the door is in the open position, one pair of side plates is directly above the top of the track. A roller 28 is pivotally mounted within each pair of said side plates and projects a small distance below the inner surface of the tubular portion so as to engage the track at all times.

A pair of spaced radially extending arms 29, rigidly attached to and forming a part of each roller housing 25, is adapted to be pivotally connected to the door-attaching brackets mentioned above. In the preferred form of the invention shown in Figure 1 and Figure 2, bracket 30 attached to the side of the door frame at the upper right hand corner, bracket 31 attached to the top of the door frame at the upper left hand corner, and bracket 32 attached to the front side of the door frame at the lower left hand corner, are formed with rearwardly extending arms and are pivotally connected at 33 to the forwardly extending arms 29 on the roller housing 25.

An internally threaded tube 35 shown in Figure 5, is welded at 34 to the upper track 16. A bracket 36, attached to the partition 15 and stiffener channel 37 by means of bolt 38, supports at its outer end a bolt 53. Passing through spacer 54 disposed between tube 35 and the bracket 36, the bolt 53 screws into tube 35 and supports track 16.

A tubular section 39, encircling the upper track 16, extends between and is rigidly attached to the roller housing 25 located at each corner of the top of the door. A longitudinal slot 40 permits the spacer 54 to slide therein when the door is in position to be slidably operated parallel to the wall or partition. Leading from the slot 40 is a right angled slot 41 that receives the spacer 54 when the door is moved normal to the wall or partition. A rubber bumper 42, attached to track 16 adjacent the supporting brackets 18 and 19, lessens the impact force on the roller housing.

In order to hold the door in the closed position when the air pressure outside the door exceeds the internal pressure by an amount sufficient to overcome the weight of the door, and to aid in pressing the seal against the partition, the door may be provided with a latch similar to that shown in Figure 6. To operate the latch, the rod linkage at the handle, shown in Figure 1, may comprise a common equalizer lever 45 operable by the door handle, and an intermediate rod 46 connected to the equalizer lever and actuating a pivoted member 47. Pivotally connected to the opposite ends of the member 47, a rod 48 actuates a bellcrank 43, pivotally attached at 111 to the bracket 106 and adapted to latch into the member 44.

The centralized trunnion 49 of the equalizer lever 45, shown in Figure 7, extends through the door panel and may be provided with an actuating handle 50, pivoted and spring loaded so as to normally lay adjacent the side of the door nearest the wall or partition, and a rigid actuating handle 51 on the other side of the door, that permits of selective manual operation from either panel side. If desired, the latching means may be equipped with a key lock.

Assuming the door to be in the fully closed position as shown in Figure 1 and Figure 2, the roller housing 25 will be disposed as shown in Figure 3, with one of the three equally spaced rollers near the bottom side of the track. The off-center location of the pivot 33 permits the full weight of the door to press the seal 14 against the wall or partition. The spacer 54, positioned in the slot 41 as shown in Figure 2, prevents the door from being slidably operated parallel to the wall or partition.

Before the door can be slidably operated, it must first be moved back, normal to the partition, until the inner face of the brackets 30 and 31 rests on the tubular portion 26 of the roller housing as shown in Figure 4. The spacer 54 will then be disposed in line with the longitudinal slot 40 and the door can be moved parallel to the wall or partition. Referring again to Figure 4, it can be seen that the pivot 33 is so located that the weight of the door is supported on the track 16 during the sliding motion. The roller housing 25 will be disposed so that one of the three equally spaced rollers will roll on top of the track and permit the door to be easily moved from one position to another. The spacer 54 is retained within the longitudinal slot 40 during the entire movement parallel to the partition, and it is therefore impossible to push the door or seal against the partition during the sliding motion. The location of the three equally spaced rollers in the roller housing precludes any possibility of the housing jumping off the track.

In the modified door operating means illustrated in Figure 8 to Figure 13 inclusive, the door 60 is formed to close an opening in a contoured surface. The particular structure of the door is immaterial, but for the purpose of illustration, the door shown in Figure 8 embodies a contoured Z frame 61 around the edge of the door, a skin 62 secured to the outside leg of the Z frame, and horizontally extending sheet metal pans 63 conforming to the contour and adapted to be fastened to the Z frame and the skin. A sealing strip 14, of rubber composition or like material is fastened to the inner leg of the Z frame on the side adjacent to the wall or partition 64.

The door 60 is mounted so as to be capable of travel parallel to the wall or partition 64 along an upper track 65 and a lower track 66, preferably formed of tubular sections, spaced equally from the center of the door. These tracks are supported at opposite ends by bracket 67 attached to the wall or partition 64.

The carriage 68, adapted to run along the upper track 65, and the carriage 69, adapted to run along the lower track 66, are pivotally connected to the door operating mechanism. Each of the carriages comprises a tubular portion 70 whose inner diameter is slightly larger than the outside diameter of the tracks. Three spaced pairs of side plates 27 are mounted substantially at each end of the tubular portion in equally

spaced relationship on the outer periphery. A roller 28 is pivotally mounted within each pair of side plates and projects a small distance below the inner surface of the tubular portion 70 so as to engage the track at all times. Rigidly connecting the upper carriage 68 and the lower carriage 69 so that they act as a unit, are the vertical posts 71 and the diagonal 72, all preferably formed of tubular sections.

Rigidly attached to each end of the carriage and forming a part thereof, is a pair of spaced horizontally extending arms 73, adapted to be pivotally connected to a portion of the door operating mechanism. The door is attached to the two U-shaped arms 74 of the operating mechanism by the angles 76. The arms 74 are actuated by a rigid tube 77 pivotally attached to the other end of the arm, and a rigid tube 78 pivotally attached to a mid-portion of the arm. Extending vertically between the upper and lower tube 78 and rigidly fastened thereto, is a torsional stiffening member 97 adapted to make the upper and lower member act simultaneously. The bellcrank 79 and the other end of the tube 77 are pivotally connected to the arms 73 farthest removed from the door on the upper and lower track. The substantially T-shaped member 80 and the other end of the upper tube 78 are pivotally connected to the arm 73 adjacent the door on the upper track, and the bellcrank 81 and the lower tube 78 are pivotally connected to the arm 73 adjacent the door on the lower track. A forwardly extending member 107, rigidly attached to the end of tubes 78 adjacent the arms 73, contacts the carriage 69 when the door is in position to be slidably operated and prevents the operating mechanism from being swung back too far.

Two horizontally extending connecting rods 84 are connected to the operating means so as to make it act as a parallelogram. The upper rod 84 is connected at one end to an arm 82 of the bellcrank 79 and at the other end to an arm 83 of the T-shaped member 80. The lower rod 84 is connected at one end to an arm 82 of the bellcrank 79 and at the other end to an arm 104 of the bellcrank 81. The other arm of the bellcrank 79 and the bellcrank 81 is rigidly attached to the tube 77 and the tube 78 respectively.

One laterally extending arm 85 of the T-shaped member 80 is rigidly attached to the tube 78, while the other laterally extending arm 86 is provided with a rigidly attached pin 87 adapted to engage the arm 91 of the latching cam 88.

The latching cam 88, shown in Figure 11, is pivotally attached at 89 to spaced parallel lugs 90 projecting upwardly and outwardly from the carriage 68, and comprises a plate 91 adapted to engage the pin 87 when the door is in position to be slidably operated, a pair of spaced parallel arms 92, a roller 93 pivotally mounted within the arms 92, and a tube 105 extending between the plate 91 and the arms 92 and rigidly attaching them in a fixed definite relationship. When the door is fully closed, the roller 93 fits into a slot 94 in the carriage 68 and a slot 95 in the track 65, and prevents the door from being slidably operated. A spring 96, attached to the carriage 68 at one end, engages the arm 91 at the other end and assures retention of the roller 93 in the slots 94 and 95 until the latching cam is actuated by the pin 87.

In order to hold the door in the closed position when the air pressure outside the door exceeds the internal pressure by an amount sufficient to overcome the weight of the door, and to aid in

pressing the seal against the partition, the door may be provided with a latch similar to that shown in Figure 13. To operate the latch, the rod linkage at the handle, shown in Figure 8, may comprise a common equalizer lever 45 operable by the door handle, and an intermediate rod 46 connected to the equalizer lever and actuating a pivoted member 47. Pivotally connected to the opposite ends of the member 47, a rod 48 actuates a bellcrank 108, pivotally attached at 110 to the bracket 109 and adapted to latch into the member 99.

The door may be provided with a centralized trunnion 49 extending through the door, having a rigid actuating handle 51 on the inside, and a pivoted, spring loaded actuating handle 50 on the outside, adapted to normally lay adjacent the side of the door, similar to the handles shown in Figure 7 for the preferred embodiment of the invention. If desired the latching means may also be equipped with a key lock.

To retain the door in the fully opened position, a flat spring 100 fixed at one end to the upper track 65 at 101, as shown in Figure 12, is provided with a pin 102 rigidly attached substantially at its end and adapted to project through a hole 103 in the track and engage one of the rollers 28 in the carriage 68.

A rubber bumper 42, attached to the upper track 65 and the lower track 66 adjacent the supporting bracket 67, lessens the impact on the carriages 68 and 69.

Assuming the door to be in position to be slidably operated parallel to the wall or partition as shown in Figure 9, the operating means are disposed in the form of a parallelogram having the U-shaped arm 74 and the connecting rod 84 as one pair of opposite parallel sides, and the tubes 77 and 78 as the other pair of opposite parallel sides. The roller 93 of the latching cam 88 is positioned outside the slot 95 in the track 65, as shown in Figure 11, and rides on the outside wall of the track while the door is being moved from one position to another. As the pin 87 in the arm 86 of the T-shaped member 80 cannot become disengaged from the arm 91 of the latching cam 88 so long as the roller 93 bears on the outside wall of the track 65, the operating mechanism must remain in the position shown in Figure 9 while being slidably operated, and it is therefore impossible to push the door or seal against the partition at any time during the sliding motion. When the door is being moved from open to closed position, the pressure placed on the roller 93, causes it, at the end of its travel, to automatically drop into the slot 95 in the track and forcibly release the pin 87. Slight effort is required to continue the operation of closing the door.

When in the fully closed position shown in Figure 10, the arms of the parallelogram of the operating means will be disposed so as to permit the door 60 to evenly press the seal 14 against the wall or partition. The spring 96 assures retention of the roller 93 in the slot 95, and prevents movement of the door parallel to the wall or partition. Before the door can again be slidably operated, it must first be swung back from the partition until the pin 87 in the arm 86 of the T-shaped member 80 engages the arm 91 of the latching cam 88 and removes the roller 93 from the slot 95 in the track. When the door is in this position, adequate clearance is provided to prevent the seal and the door from being damaged during the sliding motion.

While the form of the embodiments of the present invention, as herein disclosed, have been designed especially for doors and constitute the preferred forms, the invention has many applications. It is especially adaptable for use in installations such as windows. It is therefore to be understood that the invention is not to be construed as limited to the particular embodiments or applications described above, but is to be taken to include any variations or modifications that may appear to those skilled in the art or fall within the scope of the following claims.

I claim:

1. In a structure having a door opening in a wall thereof, a horizontally extending tubular shaped track above said doorway, a second horizontally extending tubular shaped track adjacent the lower part of said doorway and parallel to the first mentioned track, means securing the tracks to the said structure, a door, a sealing strip around the edge of the door on the side adjacent the wall, roller mounting means encircling said track and having a plurality of rollers equally spaced around the periphery thereof adapted to roll upon said track, hangers carried by the door and pivotally connected to the roller mounting means, said hangers having rearwardly extending arms so disposed that the weight of the door presses the sealing strip against the wall when the door is in the closed position, and a tubular shaped member encircling said upper track and holding the roller mounting means on said track in assembled relationship, said member being provided with a plurality of slots that engage one of the said track supporting means and prevents the door from being pushed against the wall during the sliding operation and prevents movement of the door parallel to the wall until it has first been moved back substantially normal to the wall and adequate clearance provided to prevent damage to the sealing strip while the door is being slidably operated.

2. Mounting means for a closure comprising spaced-apart tubular tracks carried by adjacent wall structure, means supported on said tracks for sliding movement lengthwise thereof between positions corresponding to the open and closed positions of said closure and for oscillatory movements on said tracks between two limits, hangers connected to said closure and pivotally connected to said supporting means in eccentric relation with respect to the axes about which said supporting means oscillate, whereby rotation of said supporting means in the direction of one of said limits moves said closure toward said structure and rotation of said supporting means in the direction of the other of said limits moves said closure away from said structure, and means mounted adjacent said supporting means for latching said supporting means against movement lengthwise of said tracks when it is rotated to said first limit and for releasing said supporting means when it is rotated to the other of said limits, whereby movement of said closure lengthwise of said tracks between closed and open positions and open and closed positions is permitted only when said supporting means has been rotated to the other of said limits.

3. Mounting means for a closure comprising spaced-apart tubular tracks carried by adjacent wall structure, means supported on said tracks for sliding movement lengthwise thereof between positions corresponding to the open and closed

positions of said closure and for oscillatory movements on said tracks between two limits, hangers connected to said closure and pivotally connected to said supporting means in eccentric relation with respect to the axes about which said supporting means oscillate, whereby rotation of said supporting means in the direction of one of said limits moves said closure toward said structure and rotation of said supporting means in the direction of the other of said limits moves said closure away from said structure, a sleeve on one of said tracks and connected to said supporting means for lengthwise and oscillatory movements therewith, said sleeve being formed with a cam track having longitudinally and circumferentially extending portions, and means cooperating with said cam track for latching said supporting means against movement lengthwise of said tubular tracks when it is rotated to said first limit and for releasing said supporting means when it is rotated to the other of said limits, whereby movement of said closure lengthwise of said tubular tracks between closed and open positions and open and closed positions is permitted only when said supporting means has been rotated to the other of said limits.

4. In a wall having a door opening, a door which may be closed against said wall, a sealing strip around the edge of the door on the side adjacent said wall spaced, parallel, horizontally-extending tubular tracks carried by said wall for supporting said door and for guiding it parallel to said wall, a carriage encircling each of said tracks and having a plurality of rollers for engagement therewith, said carriages being movable lengthwise of said tracks and being rotatable thereon between two limits, hangers rigidly secured to said door and pivotally connected to said carriages in eccentric relation with respect to the axes about which said carriages are rotatable, whereby rotation of said carriages in the direction of one of said limits moves said door against said partition to compress said sealing strip between the door and said wall and whereby upon rotation of said carriages in the direction of the other of said limits said door is moved to carry said sealing strip away from and in spaced relation with respect to said wall, and means for latching said carriages against movement lengthwise of said tracks when said carriages are rotated to said first limit and for releasing said latching means when said carriages are rotated to the other of said limits, whereby movement of said door lengthwise of said tracks between closed and opened positions and opened and closed positions is permitted only when said carriages are rotated to the other of said limits.

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