March 2, 1954 R. W. KNIGHT 2,670,496

SLIDING DOOR SUSPENSION DEVICE

Filed Dec. 5, 1950 2 Sheets-Sheet 1

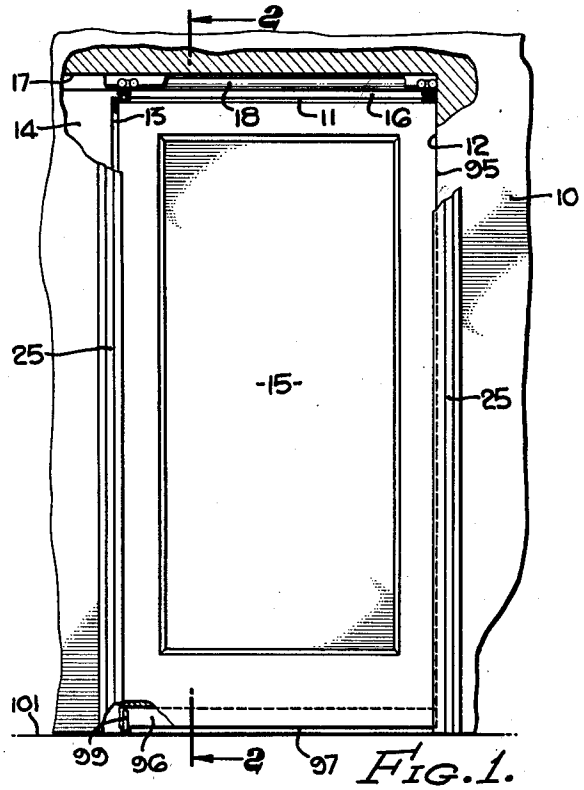


FIG. 1.

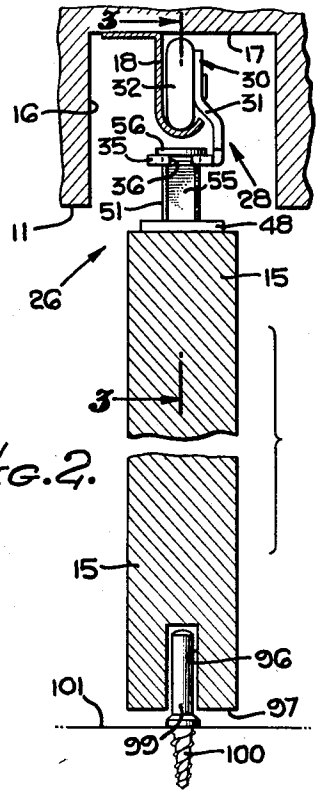


FIG. 2.

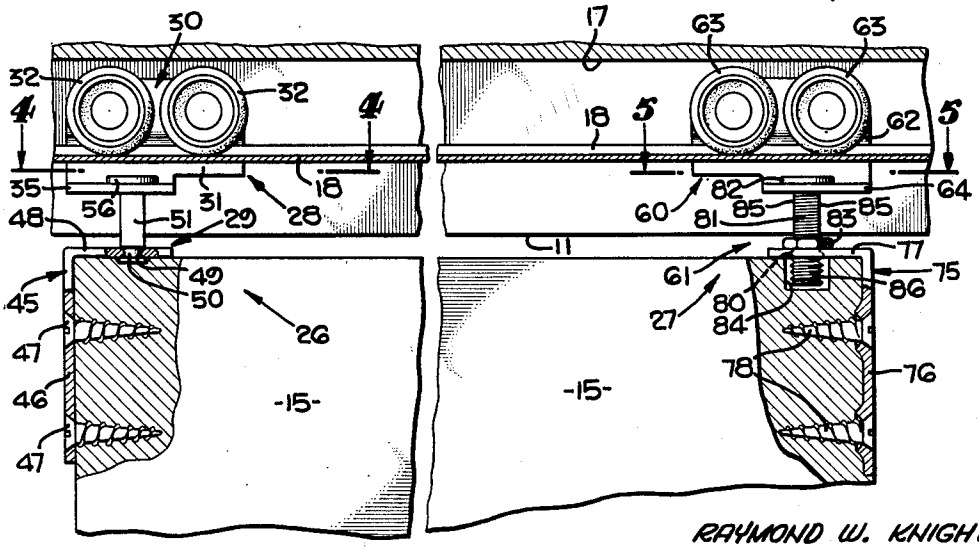


FIG. 3.

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SLIDING DOOR SUSPENSION DEVICE

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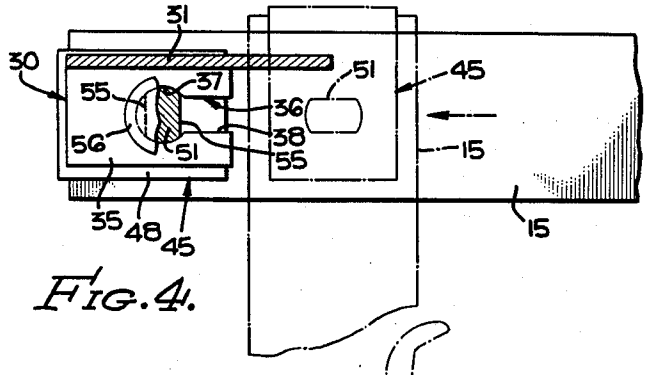


FIG. 4.

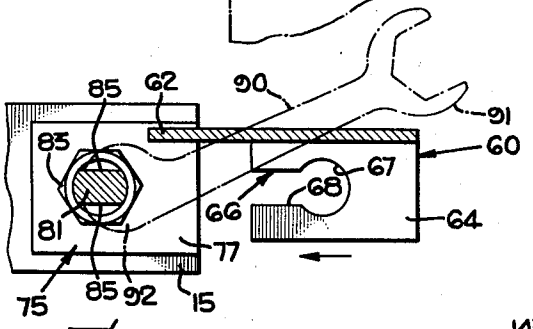


FIG. 6.

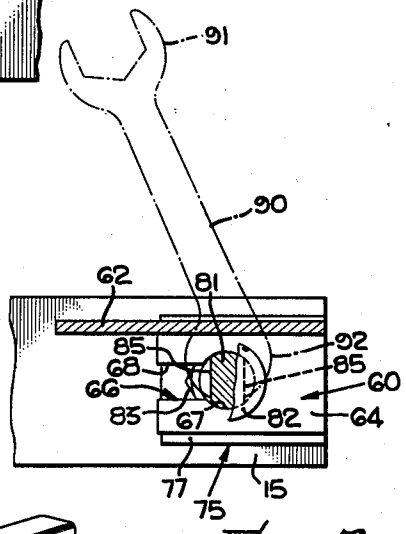


FIG. 5.

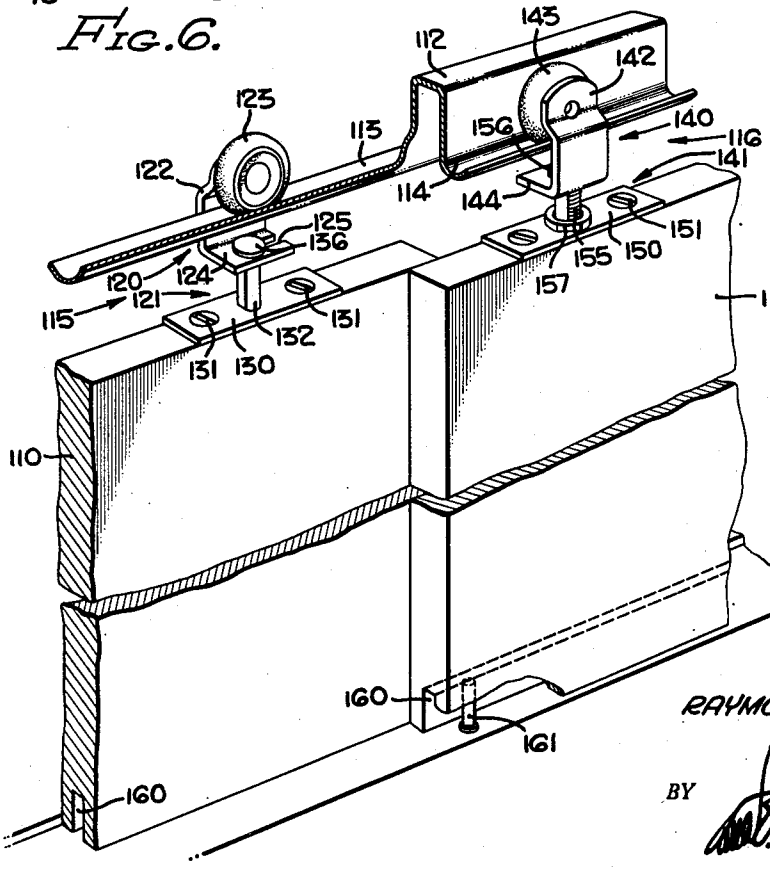


FIG. 7.

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SLIDING DOOR SUSPENSION DEVICE

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3 Claims. (Cl. 16—97)

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This invention relates to building hardware employed in hanging sliding doors.

The increasing use of sliding doors in present day residence construction has accented the need for smoother operation and lower installation and maintenance costs for this type of door.

It is an object of the present invention to provide hardware for sliding doors which will meet this need.

A further object is to provide sliding door hardware which will have a low labor cost of installation and will incorporate means operable by an unskilled person after the door is installed to plumb the door with the jamb.

The manner of accomplishing the foregoing objects, as well as further objects and advantages will be made manifest in the following description taken in connection with the accompanying drawings in which:

Fig. 1 is an elevational view of a regular sliding door which is suspended by sliding door hardware incorporating the present invention, portions of the door and surrounding wall structure being broken away to illustrate parts otherwise covered up.

Fig. 2 is an enlarged fragmentary sectional view taken on the line 2—2 of Fig. 1 and illustrating the manner in which a hanger of the invention is locked in place in a carrier thereof following completion of the installation of said sliding door with this suspended on said hardware and the latter traveling on an overhead track.

Fig. 3 is a fragmentary detail sectional view taken on the line 3—3 of Fig. 2 and illustrating said door suspended on two hardware assemblies, one of which on the inner upper corner of the door, employs a non-adjustable hanger while the other assembly located at the outer upper corner of the door, employs a vertically adjustable hanger.

Fig. 4 is a fragmentary horizontal sectional view taken on the line 4—4 of Fig. 3 and by use of broken lines illustrates the manner of connecting the hanger on the inner upper corner of said door, with its corresponding carrier, so that when the door is rotated into its final installed alignment with said track, said hanger and carrier automatically interlock.

Fig. 5 is a fragmentary horizontal sectional view taken on the line 5—5 of Fig. 3 and illustrates the manner in which the hanger on the assembly at the outer upper corner of the door is manually turned into interlocking relation with the carrier associated therewith and then locked in said interlocking relation.

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Fig. 6 is a view similar to Fig. 5 and taken on the same plane illustrating the manner in which the connection is made between the hanger at the outer edge of the door and the carrier associated therewith when installing the door.

Fig. 7 is a fragmentary perspective view illustrating a pair of wardrobe type sliding doors mounted in overlapping relation by use of a double overhead track and a modified form of the sliding door hardware of this invention.

Referring specifically to the drawings, Fig. 1 shows a wall 10, having a door opening 11, along one edge of which is provided a door jamb 12, and the opposite edge 13 of which has a vertical door pocket 14 opening therefrom which extends deeply to the left in the wall 10 whereby it is adapted to entirely receive a door 15 when said door is mounted by the use of the present invention in the opening 11 and then shifted to the left out of said opening. The pocket 14 extends above the upper edge 16 of the door opening 11 and along said upper edge and has an upper face 17 on which is mounted an overhead track 18.

A suitable molding 25 is applied to the wall 10 about the opening 11 after the door 15 has been installed therein as will presently be described, in order to finish the opening and make a close fit between all the edges of the wall opening 11 and the door 15 when the latter is disposed within said opening.

In mounting the door 15 so as to be slidably suspended on the overhead track 18, two units 26 and 27 of the sliding door hardware of my invention are employed. The unit 26 includes a carrier assembly 28 and a hanger assembly 29. The carrier assembly 28 comprises a carrier member 30 (Fig. 2), which is preferably stamped from sheet metal and shaped like an inverted question mark so as to include an upright element 31, on which a pair of wheels 32 are mounted for rotation on horizontal axes, and a horizontal catch plate 35 which is bent inwardly beneath the wheels 32 from the lower end of the upright element 31.

Formed in the catch plate 35 is an open-ended slot 36 which is keyhole shaped to include a circular hole 37 and a restricted mouth 38 the edges of which are parallel. The longitudinal axis of the slot 37, as clearly seen in Fig. 4, is parallel with the line of travel of the wheels 32 on the track 18. In other words, the longitudinal axis of the slot 37 is contained in the vertical plane of the wheels 32, which is normal to the axes of rotation of these.

The hanger assembly 29 includes an angular

bracket 45 having a vertical member 46, which is apertured for receiving screws 47 for securing said bracket to the door 15, and a horizontal upper member 48. The member 48 is provided with a hole 49 through which a lower end portion 50 of reduced diameter of a hanger stem 51 is extended, said stem being rigidly united with the bracket 45 by swedging the lower end of portion 50 as shown in Fig. 3. The stem 51 is cylindrical and has flattened faces 55 and is provided at its upper end with a flat head 56.

As shown in Fig. 4 the stem 51 lies with its faces 55 disposed transversely with respect to the bracket 45 and to the door 15, when said bracket is applied to said door. This stem is dimensioned so as to slide readily edgewise through the restricted mouth 38 of the slot 36 in the catch plate 35 when the stem 51 is aligned with said mouth as shown in broken lines in Fig. 4. When stem 51 is thus admitted into the circular hole 37 of slot 36, the door can be rotated, said stem turning with said door and being placed crosswise in said hole when said door is aligned with wall 10. The head 56 now resting on the catch plate 35 causes the upper left corner of the door 15 to be supported by the unit 26 on the overhead track 18.

The unit 27 of the sliding door hardware of this invention is applied to the right hand upper corner of the door 15 in a similar manner to that in which unit 26 is applied to the upper left hand corner of the door and cooperates with the unit 26 to suspend said door on the overhead track 18 as shown in Figs. 1 and 3. Unit 27 includes a carrier assembly 60 and hanger assembly 61. The carrier assembly 60 is a substantial duplicate of the carrier assembly 28 and includes a carrier member 62, wheels 63 rotatably mounted thereon to travel on track 18, and a catch plate 64, which is bent horizontally beneath the wheels 63 from the lower edge of member 62 and is located at the right hand end of the carrier assembly 60 whereas, the catch plate 35 is located at the left hand end of the carrier assembly 28.

Catch plate 64 has a keyhole shaped slot 66 formed therein as shown in Figs. 5 and 6. This slot includes a circular hole 67 having a restricted mouth 68 connecting said hole with the left hand edge of the catch plate 64.

The hanger assembly 61 includes rectangular bracket 75 including vertical and horizontal members 76 and 77 which fit around the upper right corner of the door 15, the member 76 being preferably counter-sunk in the vertical adjacent edge of said door and being apertured to receive screws 78 for securing the bracket 75 to the door. The member 77 is provided with a tapped aperture 80 in which a threaded stem 81, having a flat head 82, screws downwardly. A lock nut 83 is screwed onto the stem 81 for use in locking the stem against rotation relative to the bracket 75 or to release the stem so that it might be screwed in the aperture 80 to extend the stem 81 varying distances into a hole 84 provided in the door 51.

The stem 81 has opposed flattened faces 85 which do not extend the full length of the stem but which leave an unflattened end section 86 of the stem 81 for making a stronger connection between the stem 81 and the bracket member 77 when the stem end portion 86 is screwed into and locked within the threaded aperture 80 and the nut 83.

The stem in the zone of the flattened faces is reduced in thickness to where this stem may be received edgewise through the restricted mouth 68 of the keyhole 67. With the nut 83 released, the stem 81 may now be rotated crosswise in the hole 67 (Figs. 3 and 5) and locked in that position by tightening the nut 83 thus permanently assembling the carrier assembly 60 and hanger 61 of the unit 27.

Besides offering the opportunity to complete the assembly of the door 15 with the units 26 and 27 as above described, the unit 27 provides a means for adjusting the spacing between the upper right hand corner of door 15 and the overhead track 18 so as to plumb this door with the jamb 12. Rotation of stem 81 or nut 83 in assembling or adjusting unit 27 is preferably effected by the provision of an end wrench 90 having wrench ends 91 and 92, the first of which fits the nut 83 and the second of which fits the flat faces 85 of the stem 81. The manner of using this wrench will be explained in connection with the description to follow of the preferable procedure for hanging the door 15 by use of the sliding door hardware of the present invention.

After the wall 10 has been prepared with the opening 11 and internal wall pocket 14 extending to the left and upwardly from the opening 11, the overhead track 18 is secured to the wall material forming the upper face 17 of said pocket and the carrier assemblies 26 and 60 are set in place with the wheels 32 and 63 resting on the track 18, and with these assemblies related substantially as shown in Fig. 3.

The hanger assemblies 29 and 61 are now applied to the upper left and upper right corners of the door 15 as shown in Fig. 3 and with these hanger assemblies still unassociated with the carrier assemblies 28 and 60. The door 15 is then turned at right angles to the plane of the wall 10 as shown in broken lines in Fig. 4. With the door thus positioned and with the stem 51 disposed in the same longitudinal plane with the slot 36, the door 15 is elevated so that the head 56 of the stem 51 is above the level of the catch plate 35 whereupon the carrier assembly 28 is rolled along the track 18 to receive the stem 51 edgewise through the restricted mouth 38 of the slot 36 and into the circular hole 37 of said slot. The door 15 is now lowered until the head 56 engages the catch plate 35 whereby the door is supported on the track 18 by its upper left corner through the hardware unit 26. The door is now rotated into alignment with the wall 10, which, of course, rotates the stem 51 to a crosswise position in the hole 37 of the slot 36 thereby uniting the hanger assembly 29 with the carrier assembly 28 and preventing their disassembly except by reversal of the rotation just described.

By the application of the wrench end 91 to the lock nut 83 the latter may be loosened on the stem 81 and this stem may then be turned by the use of the wrench end 92 as shown in Fig. 6 to align said stem with the plane of the door 15. The right hand portion of the door 15 is now lifted, while allowing the door to remain in alignment with wall 10, so as to bring the head 82 of the stem 81 above the level of the catch plate 64 of the carrier assembly 60. Stem 81 will now be related to the slot 66 of the carrier assembly 60 as shown in Fig. 6. The carrier assembly 60 is now rolled along the track 18 to cause the stem 81 to be received edgewise through the restricted mouth 68 of the slot 66 and into the circular hole 67 of said slot.

The right hand portion of the door 15 is now lowered until the door is entirely supported by the slidable door hardware units 26 and 27.

Before locking the carrier assembly 60 and the hanger assembly 61 together it is desirable to adjust the vertical spacing between the upper right hand corner of the door 15 and the track 18 so that when the door 15 is in closed position as shown in Fig. 1 the right hand edge 95 of the door 15 lies flat against the right hand jamb edge 12 of the door opening 11. To effect this adjustment the wrench end 92 is applied to the flat faces 85 of the stem 81 as shown in Fig. 5 and this stem rotated so as to screw it upwardly or downwardly through the hole 80 in the bracket 75. This adjustment changes the angular relation between the door jamb 12 and the door edge 95 and is concluded at the point where the stem 81 is disposed cross-wise in the notch 66 and where the nearest possible approach to a perfect adjustment between said jamb and said door edge has been accomplished with the stem so disposed.

The wrench end 91 is now applied to the lock nut 83 and the latter turned down tightly against the horizontal member 77 of the bracket 75 thereby locking stem 81 in its crosswise position in the slot 66 which permanently assembles the carrier assembly 60 and hanger assembly 61 in interlocking relation. With the door thus hung and adjusted, and the permanent assembly of the sliding door hardware of the invention effected, the molding 25 is completed about the wall opening 11 so as to form a reasonably snug fit between said molding and said door when the latter is closed.

Suitable hardware is commonly applied to sliding doors to provide a hand-hold for sliding such doors between their retracted and extended positions and it is to be understood that the omission of any disclosure of such hand-hold hardware herein is merely because this has nothing to do with the invention herein disclosed.

To prevent the door 15 engaging the molding 25 on opposite sides of the edge 13 of the wall opening 11, this door may have a channel 96 formed upwardly in the lower edge 97 thereof. A pin 99 may also be provided having screw threads 100 which are screwed into the floor 101 near the edge 13 of the wall opening 11, as shown in Figs. 1 and 2, so that pin 99 is received in the channel 96 and is always locked within said channel to guide the door and retain this in the vertical plane containing the wheels 32 and 63 where it properly belongs.

The sliding door hardware of this invention is adapted for use in supporting lighter doors than those employed for controlling openings between rooms, such, for instance, as the overlapping sliding doors in common use in built-in wardrobes. Fig. 7 illustrates a pair of wardrode sliding doors 110 and 111 which are supported on an overhead double track 112, providing parallel tracks 113 and 114, by sliding door hardware units 115 and 116. These units are constructed and operate on identically the same principles as the units 26 and 27 described hereinbefore and will therefore be only briefly described.

Unit 115 includes a carrier assembly 120 and a hanger assembly 121. The carrier assembly 120 includes a carrier member 122 rotatably mounting a single wheel 123, and having a catch plate 124 in which is formed a keyhole shaped slot 125. The hanger assembly 121 includes a plate 130, apertured to receive screws 131 for securing the same to the upper edge of door 110. United with plate 130 and extending upwardly

therefrom is a flattened stem 132 with a head 136.

The unit 116 includes a carrier assembly 140 and a hanger assembly 141, the former having a carrier member 142 rotatably mounting a wheel 143 and having a catch plate 144, with a keyhole slot (not shown) which is similar to the keyhole slots 36, 66 and 125. The hanger assembly 141 includes a plate 150 which has a threaded hole and is also apertured to receive screws 151 for securing said plate to the upper edge of the door 111, the latter having a recess (not shown) disposed below the threaded hole in the plate 150 which threadedly receives the lower end of a flattened threaded stem 155 having a head 156 and carrying a lock nut 157.

Each of the doors 110 and 111 is equipped with a pair of the suspension units 115 and 116, these units being located near opposite upper corners of each door. As can readily be seen from the inspection of Fig. 7, the structures of unit 115 and 116 so nearly correspond respectively to the structures of the units 26 and 27, that the hanging doors 110 and 111 on the units 115 and 116 is accomplished by identically the same procedure as above described for hanging door 15 on units 26 and 27.

The doors 110 and 111 are provided with channels 160 formed upwardly in their lower edges, pins 161 being mounted in the sill 162 beneath the door 110 and 111 which pins extend into the channels 160 and maintain the doors 110 and 111 in vertical alignment with their respective tracks 113 and 114 as these doors are rolled back and forth on said tracks.

The claims are:

1. In a device providing a wheeled suspension for a sliding door from an overhead track confined in a longitudinal recess formed upwardly in the lintel of a doorway, the combination of: a carrier including an angular metal strap having a normally upright portion and a normally horizontal catch plate extending from the lower edge of said upright portion and wheel means mounted on said upright portion for travelling on a track so that said catch plate is disposed beneath said wheel means and track, there being a slot provided in said catch plate and opening from an edge thereof with a restricted mouth; a hanger including a bracket which is secured, when in use, to the upper edge of a door, a stem mounted on said bracket and extending vertically upward therefrom, and a head formed integrally with said stem at the upper extremity thereof, said stem having its opposite sides flattened to permit said stem to be inserted edgewise through the restricted mouth of said slot after which said stem is turned in said slot to broadside relationship with said restricted mouth, thereby preventing said stem being withdrawn from said slot through said restricted mouth, said head preventing withdrawal downwardly of said stem from said slot; and means holding said stem against rotation relative to said bracket so as to be in crosswise relation with said restricted mouth when said door is disposed in vertical alignment with said wheel means.

2. A combination as in claim 1 in which said stem is externally threaded and in which said bracket has a tapped hole into which said stem is screwed, said means for holding said stem against rotation relative to said bracket comprising a lock nut on said stem, which may be tightened against said bracket to fix said stem against rotation relative to said bracket and in crosswise relation with said mouth but which,

when loosened, permits adjustment of the effective length of said stem by rotation of the latter or the turning of said stem edgewise to said mouth for disengaging said hanger from said carrier, said flattening of said stem adapting the same to be engaged by a wrench to rotate said stem both to vertically adjust said bracket and door relative to said carrier, and, upon concluding said adjustment, to set said stem cross-wise to said mouth to prevent the disassembly of said carrier and said hanger, or edgewise to said mouth to facilitate the assembly or disassembly of said carrier and said hanger.

3. A combination as in claim 1 in which said stem is permanently fixed on said bracket so that when said door is in the same vertical plane with said track and wheel means, said stem is disposed crosswise relative to said restricted mouth whereby said door must be approximately at right angles to said plane to present said stem

edgewise to said restricted mouth and allow said stem to be inserted into said slot, it being necessary then to rotate said door about said stem and into said plane to present said stem crosswise to said restricted mouth and prevent withdrawal of said stem from said slot.

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