

Sept. 22, 1959

D. J. SEAMAN
CLOSURE STRUCTURE

2,904,819

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5 Sheets-Sheet 1

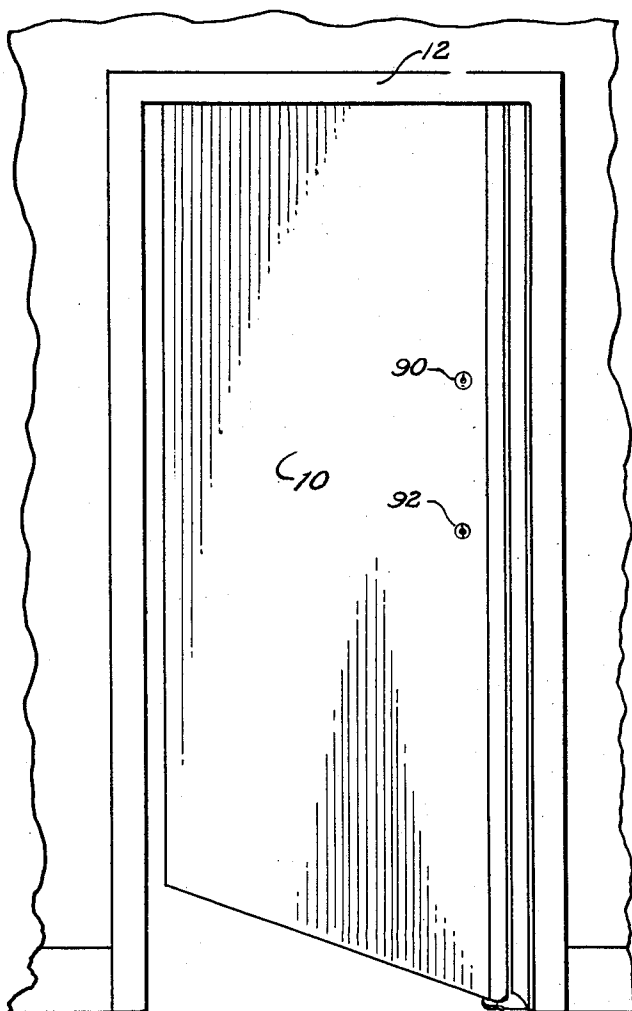


Fig. 1.

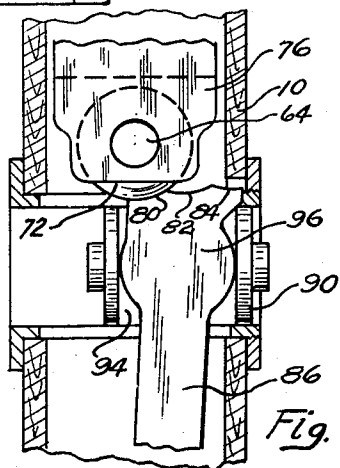


Fig. 14.

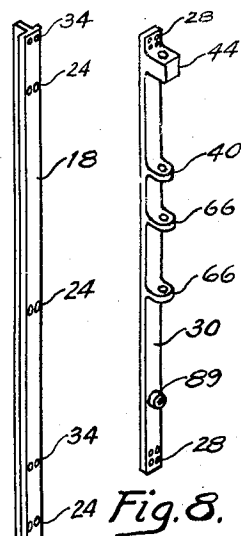


Fig. 8.

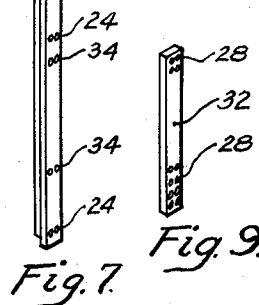


Fig. 9.

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5 Sheets-Sheet 2

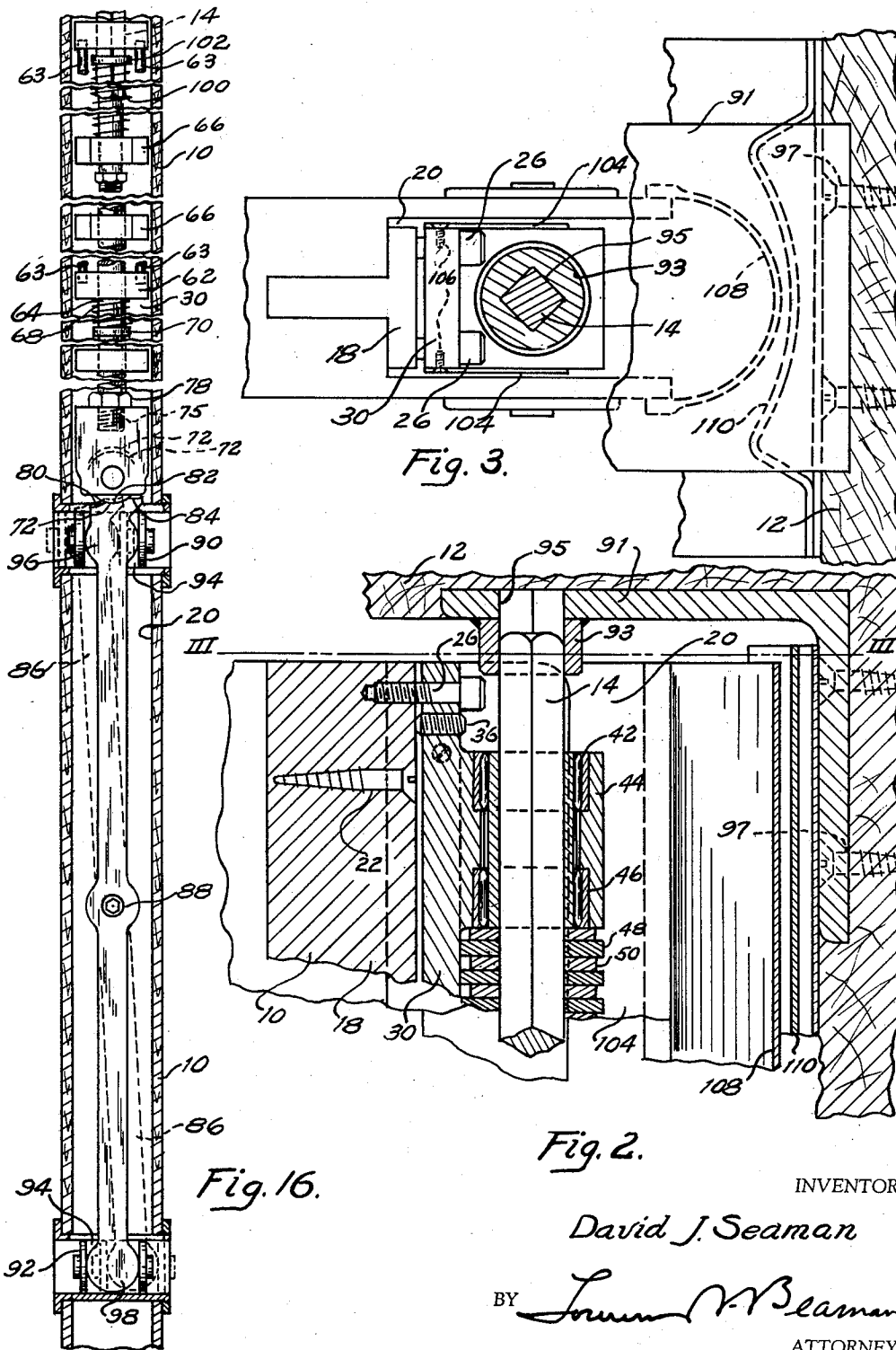


Fig. 2.

Fig. 16.

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5 Sheets-Sheet 4

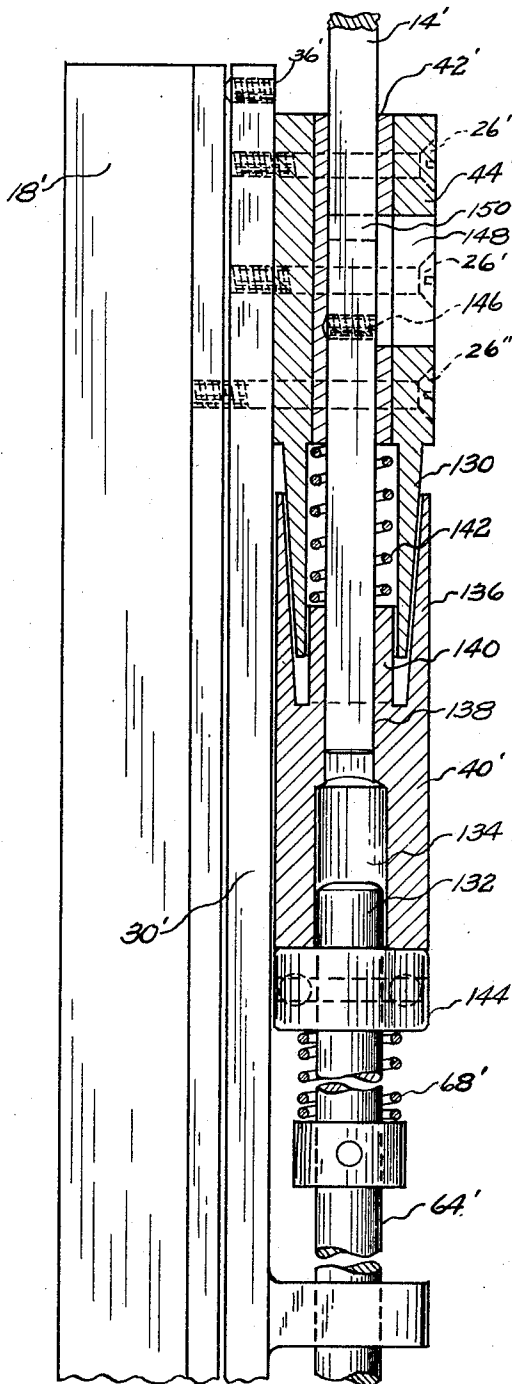


Fig. 17.

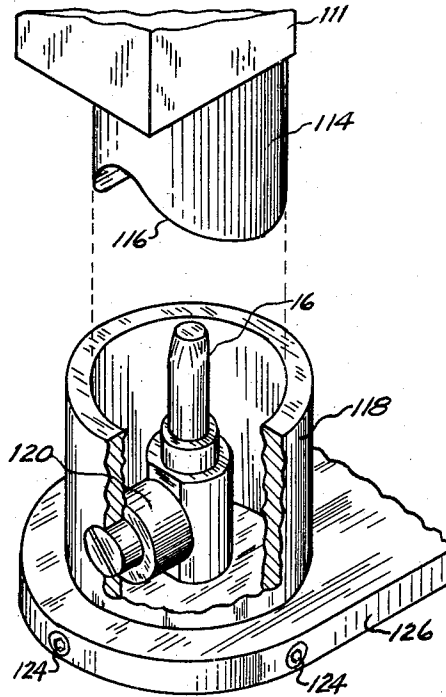


Fig. 6.

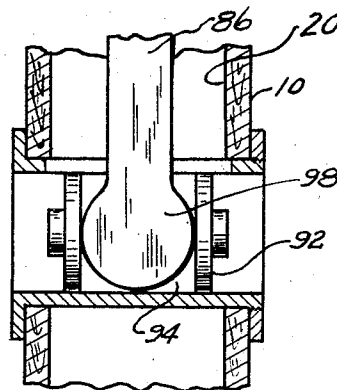


Fig. 15.

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5 Sheets-Sheet 5

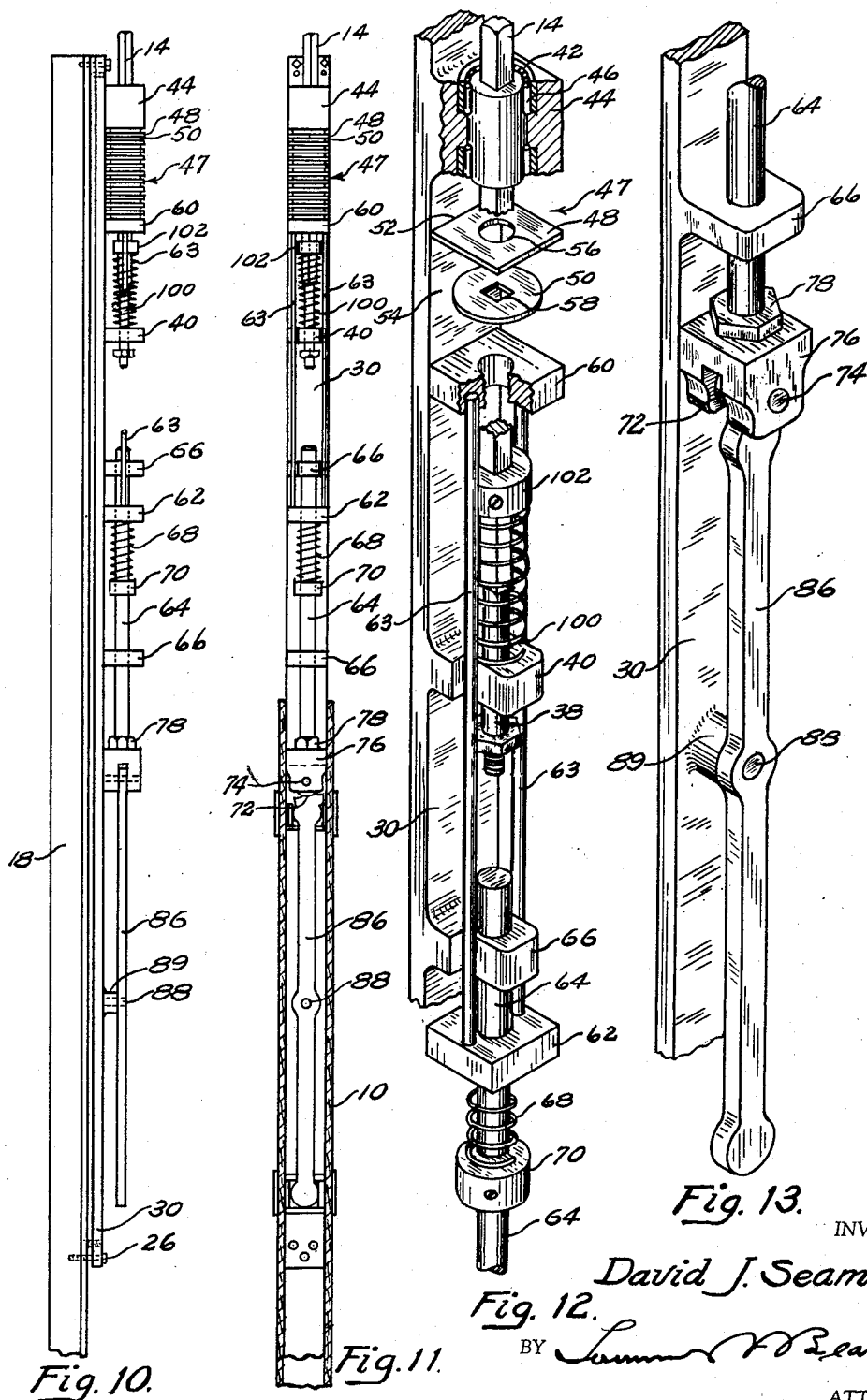


Fig. 13.

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Fig. 12.

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2,904,819

CLOSURE STRUCTURE

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Application February 10, 1953, Serial No. 336,125

2 Claims. (Cl. 16—50)

The present invention relates to improvements in closure structure designed to swing about a vertical axis, being particularly adapted to hinged doors although some of the structural features have equal application to hinged windows as well as other similar structure which, in use, is adjusted or moved about a vertical or horizontal axis.

As its principal object, the invention provides a hinged door or the like and mounting structure which avoids all installation of structure below the floor level or equivalent surface yet is characterized by its ease of swinging and the fact that its check and closure structure are all concealed within an edge of the door or the like.

Another object is to provide a hinged closure structure such as doors, windows and the like, having an improved built-in and concealed check structure for holding the hinged closure in selected positions.

A further object is to provide an improved check and mounting structure for hinged doors and the like which may be conveniently installed and concealed along an edge of the door or the like.

A still further object resides in the provision of an improved gravity closer structure for vertically hinged doors.

A still further object is to provide a new and improved mounting, check and closer structure for wooden doors and the like which supports the door to a great extent against warping and provides a simple adjustment for compensating for swelling and other forms of misalignment experienced during the period the door or the like is in service, or at the time of installation of the door.

These and other objects and advantages residing in the construction, arrangement and combination of parts will more fully appear from the following specification and claims.

In the drawings,

Fig. 1 is an illustrated view of a swinging door embodying the present invention,

Fig. 2 is a fragmentary vertical section of the pivot at the top of the door and its support structure,

Fig. 3 is a fragmentary top view of the door and its supporting hinge structure, taken on the line III—III of Fig. 2,

Fig. 4 is a fragmentary elevational view of the bottom of the door partly broken to expose the mounting and closer structure, shown in section,

Fig. 5 is a sectional view of Fig. 4 taken on line V—V,

Fig. 6 is an exploded perspective view of the closer structure partly shown in broken section,

Fig. 7 is a perspective view of the T-shaped edge frame of the door,

Fig. 8 is a view similar to Fig. 7 of the frame structure for the check,

Fig. 9 is a view similar to Fig. 7 of the frame member for the gravity closer cam,

Fig. 10 is a fragmentary side elevational view of the

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edge frame and check structure assembly shown removed from the door,

Fig. 11 is an end view of Fig. 10, with the assembly shown in association with the morticed edge of the door in its lower portion,

Fig. 12 is an enlarged perspective view of a portion of the check assembly with some parts shown broken and other parts omitted,

Fig. 13 is a view similar to Fig. 12 of the remaining portion of the check assembly and showing the check actuator,

Fig. 14 is an enlarged detail of the upper shifter structure for the check actuator,

Fig. 15 is a view similar to Fig. 14 of the lower shifter for the check actuator, with the actuator arm in position corresponding to its full line position as seen in Fig. 16,

Fig. 16 is a fragmentary front view of the entire shifter structure for the check actuator, with the actuator rocker arm shown in two of its three possible positions of adjustment, the rocker arm being shown in one position in full lines and in the other position in dotted lines, and

Fig. 17 is a side-elevational view of an alternative form of check.

Referring to the drawings, the door 10 is shown as a swing type capable of swinging to either side of the door frame 12 about the vertical axis of the square shaft 14 and the round pin 16. Although in the particular example illustrated in the drawings the invention is shown applied to a door mounting in which the door is capable of swinging through substantially 180° to opposite sides of the door frame to constitute what is known as a "double action" door, it is to be understood that with suitable modification the invention is applicable to the conventional "single action" door mounting in which the door is only capable of swinging to one side of the door frame.

In the illustrated form, which is shown especially well adapted to wooden doors, a T-shaped bar 18 extends the entire length of the door 10 in the mortise 20. Wood screws 22 in the holes 24 firmly anchor the bar 18 in position upon the door. This bar, because of its rigidity, gives support to the door and resists any tendency for warpage.

The hinge pivot structure as well as the check and closer structure are all housed within the mortise 20 and attached to the bar 18 by tension bolts 26 extending through holes 28 in further bars 30 and 32 to be received in threaded holes 34 in the bar 18. Adjacent each bolt 26 are stop screws 36 which may be adjusted, as more clearly shown in Fig. 4, to move the door 10 horizontally relative to its pivots as well as to tilt the door up or down.

The bar 30 carries the upper pivot shaft 14 and the check structure. As shown, the shaft 14 is of square cross-section except for its cylindrical lower end portion 38 which is guided and supported in the guide block 40 on the bar 30. At its upper end the shaft 14 has a sliding fit within the bushing 42 supported in the bearing block 44 through suitable bearings 46 (Figs. 2 and 12), the block 44 being also integrally formed on the bar 30. The shaft 14 extends through a check stack 47 in the form of alternately arranged friction plates 48 and 50. To hold the alternate plates 48 against rotation relative to the bar 30, a flat side 52 (Fig. 12) is provided on each of these plates which abuts the face 54 of the bar 30, with the squared portion of the shaft 14 extending through a circular opening 56 in these alternate plates 48 so that these plates can rotate with the door relatively to the shaft 14. Alternate plates 50 are shown of circular shape with square holes 58 providing a sliding fit with the shaft 14 and with the

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plates 50 held against rotation relative to the shaft. Thus, if the bar 30 is rotated about the axis of the shaft 14, with the shaft 14 held against rotation, the plates 48 will rotate and the plates 50 will be held against rotation. With the bearing block 44 functioning as an abutment an upward thrust upon the check stack 47 will increase the friction between the plates 48 and 50 and rotation of the bar 30 about the axis of the shaft 14 will be resisted.

The check actuator structure comprises a thrust pad 60 upon which the lowermost plate of the check stack 47 is supported. Rods 63 (Figs. 10, 11, 12 and 16) extend between and connect the pad 60 and another thrust pad 62, the latter being guided on the shaft 64, which shaft is in turn guided for vertical movement in the vertically spaced guide blocks 66 on the bar 30. The connection between the pad 62 and the shaft 64 is through a compression spring 68 carried upon an adjustable collar 70. At the lower end of the shaft 64 is a cam follower in the form of a roller 72 supported on a shaft 74 in the member 76 into which the shaft 64 is threaded and held against loosening by a jam nut 78. The spring 68 cushions the thrust applied to the shaft 64 and the initial loading of this spring is capable of adjustment by loosening the jam nut 78 and adjusting the effective length of the shaft at its screwed connection with the member 76 as indicated at 75 in Fig. 16.

For exerting an upward thrust upon the rod 64 and hence the pad 60, the roller 72 contacts a series of surfaces 80, 82 and 84 located at one end of the double ended rocker arm 86, said surfaces being of progressively greater distances from the rocker arm pivot 88 carried in the boss 89 on the bar 30. With the arm 86 in the position shown in Fig. 14 with the surface 80 engaging the roller 72, the pad 60 is in its retracted or lowermost position and there is a minimum of friction between the plates 48 and 50. When the arm 86 is rocked counterclockwise to bring the surface 82 into contact with the roller 72, as indicated in full lines in Fig. 16, the shaft 64 will be raised and the spring 68 will exert an upward thrust on the pad 60 to increase the frictional contact between the plates 48 and 50. Further rocking of the cam 86 counterclockwise to bring the surface 84 into contact with the roller 72, as indicated in dotted lines in Fig. 16, will provide the maximum thrust on the spring 68 and develop the maximum pressure between the plates 48 and 50 and hence the maximum resistance to relative rotation.

To actuate the rocker arm 86 from either side of the door 10 upper and lower push button structure 90 and 92, respectively, is provided in the form of pistons having notched out central portions 94 in which abutment portions 96 and 98 on the arm 86 are received. With the arrangement shown, the upper button 90 when pushed in from one side of the door will tend to lower the shaft 64 and when the same button is pushed in from the opposite side of the door 10, it will tend to raise the shaft 64. A similar situation exists with respect to the actuation of the button 92. Thus the check structure may be applied and released from either side of the door 10.

The upper support structure for the shaft 14 is best shown in Figs. 2 and 3 wherein an L-shaped bracket 91 is suitably attached to the door frame (as by the wood screws 97) and carries a boss 93 having a square hole 95 in which the squared upper end of the shaft 14 has a sliding fit. A spring 100 reacting against the collar 102 on the shaft 14 (see Fig. 12) holds the shaft 14 in the illustrated position of Fig. 2 yet permits the shaft 14 to be forced downwardly against the tension of the spring 100 to insert the shaft 14 in the boss 93 when the door 10 is hung. To complete the housing of the check and closer structure, side plates 104 attached to the opposite sides of the bars 30 and 32 by screws 106 (Fig. 3) are provided, as well as a channel member

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108 located at the inner edge of the door 10. A suitably shaped exterior door frame member 110 seals the edge of the door defined by the member 108.

Closure structure for the door 10 is best shown in Figs. 4, 5 and 6 wherein a rigid block member 111 is attached by screws 112 to the lower end of the frame 32. Carried upon the lower end of the member 111 is a cylindrical boss 114 having a cam surface 116 upon its lower edge. The boss 114 is freely received within the cylindrical housing 118 of the support structure for the pin 16 to present the cam surface 116 to the supporting roller 120, which roller carries the weight of the door 10. The pin 16 has a suitable bearing 117 secured within the bore 122 of the boss 114. Set screws 124 attached to the housing 118 to the lower support structure 126, which structure is shown in the form of an L-shaped bracket attached by screws 128 to the door frame. In Fig. 4 the bearing 117 is shown as comprising an outer race 117' with a spherical interior surface with which a corresponding spherical ring 117'' engages and receives the upper end of the pin 16. This bearing arrangement is particularly useful since it enables a certain amount of self aligning of the bearing ring 117'' with respect to the pivot pin 16.

In Fig. 4, 119 indicates a sleeve rotatably mounted about the cylindrical housing 118 for concealing such securing screws as might otherwise be exposed on the housing. The sleeve would have such openings as may be needed for registering with the screw heads in the housing upon relative rotation of the sleeve to expose the screw heads.

In Fig. 17 there is shown a modified form of check in which the squared shaft 14', held against rotation like the shaft 14, extends through a squared hole in the bushing 42', mounted in the block 44', and carries at its lower end the male member 130 of a cone clutch. The cylindrical shaft 64', which may be connected to its actuator in the manner of the shaft 64, has a reduced end portion 132 located in an enlarged cylindrical hole 134 in the lower end of a block 40', which block includes the female member 136 of the cone clutch. The block 40' has a squared hole 138 in which the lower end of the squared shaft 14' extends to hold this block against rotation, with the block having an inner sleeve portion 140 guidedly located within the male clutch member 130. A coil spring 142 is located between the sleeve 140 and the bushing 42' for urging the female clutch member 136 to the release position. Pressure is applied to the block 40' from the shaft 64' through spring 68' and thrust bearing 144, the pressure being applied, or released, by raising and lowering the shaft 64' in the manner of the shaft 64.

18' and 30' indicate the T-bar and the bar for supporting the check and actuator structure corresponding to bars 18 and 30. The block 44' is shown secured to the bar 30' by tension screws 26'. Screws 26'' serve to secure the block 44' and the bar 30' to the T-bar 18', with set screws 36' being provided for horizontal and tilting adjustment. The shaft 14' is held in its elevated position by a screw 146 which passes transversely through the shaft and engages in the bushing 42'. An elongated slot 148 at the front of the block 44' and extending into one side of the bushing 42' enables access to be had to the screw 146 and to a longitudinally spaced hole 150 in the shaft 14'. To lower the shaft it is merely necessary to remove the screw 146. To raise the shaft, for mounting, it is merely necessary to pass a tool through the slot 148 and into the hole 150 to lift the shaft into position to receive the screw 146.

By raising and lowering the shaft 64' in the same manner described with respect to shaft 64 the degree of engagement of the friction clutch can be varied to produce the required check action.

The closer structure best shown in Figs. 4, 5 and 6 is such that when the roller 120 is resting within the lower

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point of the cam 116 the door 10 will be closed. When the door 10 is swung to either side of its frame, the rotation of the boss 114 will bring one of the complementary high sides of the cam 116 into engagement with the roller 120 resulting in the door being lifted as it is rotated about its vertical axis. When the door is released to gravitational action the door will tend to swing toward its closed position as the boss 114 rotates, bringing the roller toward the lowermost point of the cam 116.

The check structure as shown in enlarged detail in Fig. 12 is such that the friction that may be developed between the plates 48 and 50 is capable of holding the door in any position into which it is swung by manipulating the proper push button associated with the actuator 86. As heretofore described the check may be applied or released from either side of the door depending upon which of the push buttons associated with the actuator 86 is manipulated.

While the invention has been specifically described with reference to a wooden door structure it is to be understood that it is capable of application to metal and composite door and like swingable structures, which may be manufactured with a mortise along one edge to receive the present mounting structure or which may be subsequently formed with the mortise to receive the mounting structure.

Having thus described my invention what I claim as new and desire to protect by Letters Patent is:

1. In a door having pivot structure including a pivot shaft and mounting means supporting the door for swinging motion relative to the shaft, the improvement com-

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prising check means associated with the shaft and mounting means to check the swinging motion, actuator structure for said check means and means for operating said actuator structure to control said check means, said check means comprising a stack of friction elements including alternate elements fixed against rotation relative to the shaft and elements intermediate said alternate elements fixed for swinging motion with the mounting means and relative to the shaft, said actuator structure being operable to vary the degree of frictional engagement between said alternate and intermediate elements.

2. In a door structure having a door provided with a vertical edge and pivot structure about which the door swings upon a vertical axis, the combination with check mechanism having predetermined positions of adjustment for restraining and releasing the door for swinging movement, of a vertically extending actuator for said check mechanism including a horizontal pivot about which said actuator is rocked for adjusting the positions of the check mechanism, and longitudinally reciprocable means transversely disposed in the door, said means engaging with said actuator for adjusting said check mechanism and being accessible from either side of the door.

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