Dec. 22, 1942. S. S. ROBY 2,306,025

DOOR OPERATING MECHANISM

Filed May 2, 1939

Fig-1

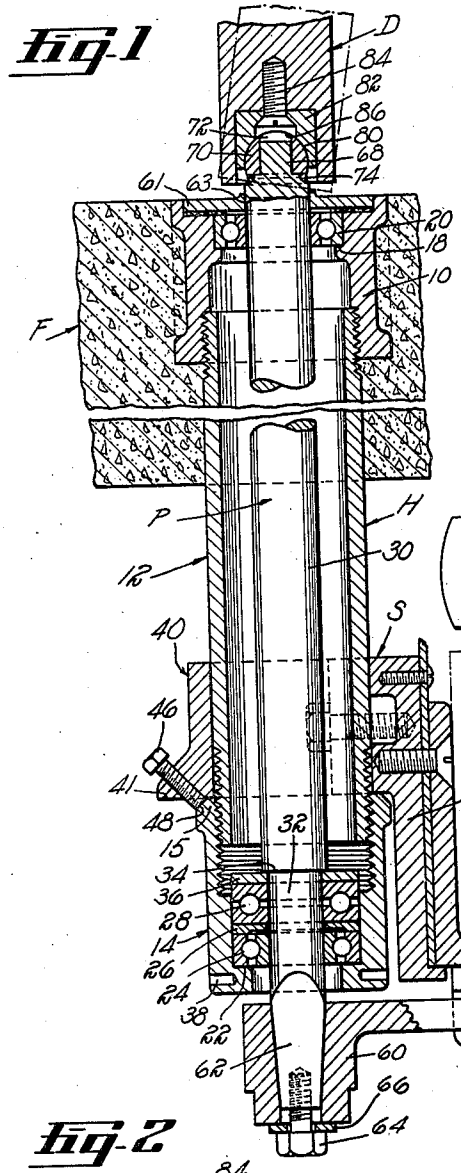


Fig-3

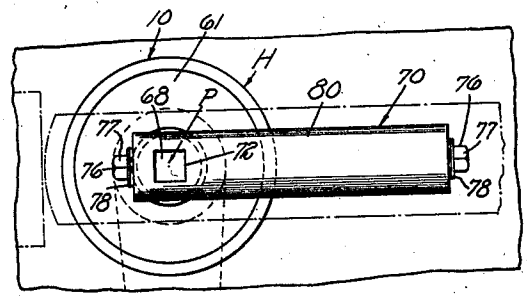


Fig-4

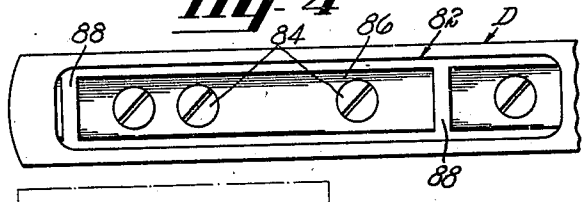


Fig-5

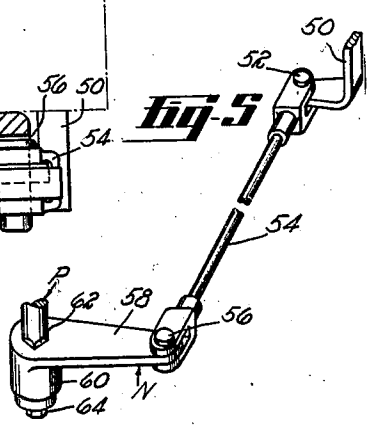
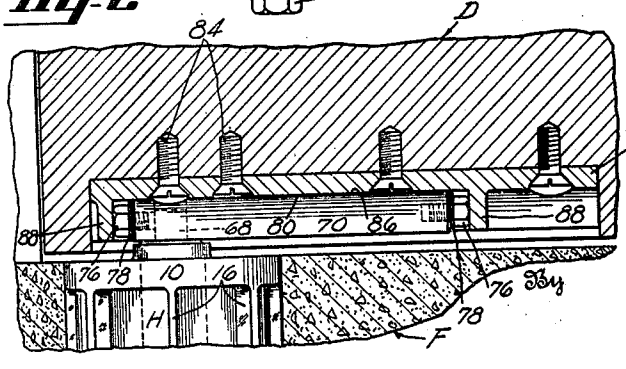


Fig-2



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DOOR OPERATING MECHANISM

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3 Claims. (Cl. 268—66)

The present invention relates to pivot means for supporting a swinging door and more particularly to an improved type of bottom pivot adapted to be used in cooperation with an automatic door opening and closing mechanism.

An object of the present invention is an improved bottom pivot adapted to be positioned in a floor and extend below same and have associated therewith and operatively connected to the lower end thereof an automatic door operating mechanism.

A further object is an improved bottom pivot wherein adjustment thereof may be readily and conveniently made to properly position the door within the doorway and without disturbing the operative connections between the pivot and automatic door operating means.

A still further object is a pivot of the above-indicated type, which is characterized by its simplicity, ease of assembly and installation, ruggedness and compactness of construction, and efficiency of operation.

Other objects will be in part obvious and in part pointed out more in detail hereinafter.

The invention accordingly consists in the features of construction, combination of elements, and arrangement of parts which will be exemplified in the construction hereafter set forth and the scope of the application of which will be indicated in the appended claims.

In the accompanying drawing:

Figure 1 is a sectional view of a pivotal mounting embodying the invention herein;

Fig. 2 is a fragmentary sectional view with the door in section to show the pivot supporting arm and cooperating door supporting plate;

Fig. 3 is a top view of the pivot with the door removed therefrom;

Fig. 4 is a bottom view of the door supporting plate; and

Fig. 5 is a plan view on reduced scale of the operative connection between the pivot and the automatic door operating mechanism.

Referring to the drawing, there is shown generally a door D mounted on a pivot pin P, which pin is rotatably mounted and supported for vertical adjustment in a housing H secured in and extending below a floor F. The lower end of the housing H also carries thereon a support S on which there is mounted an automatic door operating mechanism M having an operative connection N to the lower end of the pivot pin P.

The automatic door operating mechanism M may be of the type shown in applicant's copending application, Serial No. 56,069, wherein the mechanism is operative upon interruption of a light beam; it being understood, of course, that any suitable automatic door operating mechanism could be utilized.

In the drawing, only the lower pivot member has been shown, inasmuch as any suitable top pivot may be utilized.

More particularly, and for ease in manufacture and assembly, the pivot housing H comprises a top tubular collar 10 and intermediate elongated tubular sleeve 12 having its upper end threadably received within the lower end of the bore of the collar 10, and a bottom tubular collar 14 having the upper end of its inner bore threadably received on the lower end of the sleeve 12.

As clearly indicated, the top collar member 10 and the upper end of sleeve 12 are secured in the floor F with the upper rim of the collar flush with the top surface thereof, thus rigidly holding the housing H in position. To facilitate this, the outer periphery of the collar 10 may have a plurality of vertically extending, spaced apart ribs 16 (see Fig. 2) whereby the housing may be grouted into and non-rotatably held within the floor. With the collar 10 and sleeve 12 thus secured, the bottom collar 14 constitutes an adjusting member which may be rotated thereon to vertically adjust and position it at various distances from the floor F, for reasons hereinafter described.

The top collar 10 of housing H is further provided with a peripheral shoulder 18 extending radially from the inner bore thereof and spaced downwardly a short distance from the upper rim of the collar to support and position centrally of the housing an upper ball bearing race 20. The collar 14 is also provided with a peripheral shoulder or flange 22 extending radially from the lower end of the inner bore thereof to support and centrally position a lower ball bearing race 24. Positioned above the lower ball bearing race 24 and spaced therefrom by a suitable washer 26 is a thrust ball bearing race 28 which cooperates with the upper and lower ball bearing races 20 and 24 to vertically align and rotatably support the pin P within the housing H.

The pin P is of such length that it extends both above and below the housing H and comprises an upper portion 30 and lower reduced portion 32. The upper portion 30 closely fits within and extends through the ball bearing race 20, and the reduced portion 32 closely fits within and extends through thrust bearing 28 and lower ball bearing race 24, with the downwardly facing shoulder 34 therebetween resting

on a spacing washer 36 inserted between the shoulder and the thrust bearing 28.

With this arrangement, the upper and lower ball bearing races 20 and 24 cooperate to vertically align the pin P within the housing and permit free rotation thereof, and the shoulder 34 of pin P cooperates with the thrust bearing 28 to vertically support same and take the thrust of the pin and the door mounted thereon. Inasmuch as the thrust bearing 28 is supported within the collar 14, adjustment of the collar vertically will result in simultaneous adjustment of the thrust bearing 28 and pin P. To facilitate adjustment, collar 14 may be provided with suitable radial openings 38 for receiving a spanner wrench or other adjusting means.

In order to have the automatic door operating mechanism M simultaneously and vertically adjustable with the pivot pin P, the supporting means S therefor comprises a split ring 40 which closely surrounds the outer face of the sleeve 12 of housing H, with the lower flange 41 of the ring in abutting engagement with the upwardly facing end 15 of the collar 14. The ring 40 has integral therewith a downwardly depending arm 42 having secured thereto a right angle bracket 44 on which there is mounted the automatic door operating mechanism M. In order to hold the door operating mechanism M and the supporting means S therefor in fixed position, the ring 40 is provided with a suitable set screw 46 extending diagonally through the lower flange 41 and engaging a circumferentially bevelled edge 48 of the upper end 15 of collar 14. With the door operating mechanism thus carried by the housing and in close proximity to the pivot, it is connected thereto by the operative connection N, comprising a link 50 which is pivotally connected at one end by a pin 52 connecting to the operating mechanism arm 54 and pivotally connected at its other end by a pin 56 to a lever 58 mounted on the depending end of pivot pin P. As indicated, the lower end of the reduced portion 32 of the pivot pin P terminates in a downwardly tapering rectangular portion 62 adapted to receive the hub 60 of lever 58; the bore of the hub having a correspondingly shaped bore therethrough, whereby the lever 58 will be nonrotatably held thereon. The lever 58 is secured on pin P by suitable bolt 64 extending into the lower end of the pin P and having a washer 66 inserted between the head thereof and the lower end of the hub 60. In order to give the housing a finished appearance, the upper end of collar 10 has a recess therein to receive a closure plate 61 having a centrally arranged aperture 63 therein through which pin P extends.

With this arrangement, the housing H not only provides means for centrally locating the pin P, but also provides means for supporting both the pin P and the operative mechanism M for simultaneous vertical adjustment without disturbing the operative connection therebetween. This arrangement is also advantageous in that it allows the installation of the operating mechanism beneath the floor and in a space which would not otherwise be utilized, likewise making it accessible for ready adjustment. Moreover, as the supporting means S for the operating means M is also rotatably adjustable on the housing H, it can, in the embodiment illustrated, be placed in four positions ninety degrees apart, thus emabling it to be mounted in its most convenient position beneath the floor.

A further advantage of the present structure is the provision of means whereby the door may be adjusted angularly and laterally relative to the pivot pin P to properly position the door within the doorway to compensate for any slight misalignment of the pivots and likewise to permit the door's ready removal and replacement thereon.

To accomplish this, the upper end of the pin P has a rectangular head 68 adapted to support a pivot arm 70 having a rectangular aperture 72 extending vertically therethrough adjacent one end thereof. Preferably, the arm 70 is then welded to the pin, as at 74, to firmly secure the two together. The arm 70 is provided at each end thereof with a threaded aperture adapted to receive a threaded screw or bolt 76 having a large head 77 and carrying on the shank thereof a plurality of spacing washers 78. The washers 78 may be shifted from one bolt to the other, thus changing the over all length of the pivot arm 70 to either side of the pivot pin P, while maintaining the total over all length thereof constant. Thus, by providing the door with a suitable mortice having an over all length equal to the over all length of the pivot arm 70, the door may be shifted laterally a small amount by changing the length of the pivot arm to either side of the pivot.

In order to angularly adjust the door relative to the pivot, the pivot arm 70 is provided with an upwardly facing convex surface 80, which, in the embodiment shown, is approximately semicircular, and by providing the mortice with a corresponding downwardly facing convex curvature, the door may be rotated and angularly adjusted relative to the pin.

However, there is provided a rectangular door plate 82 adapted to be mounted in a rectangular mortice within the bottom of the door and secured therein by suitable screws 84. The bottom of the door plate 82 is recessed and has a concave surface 86 corresponding to the convex curvature 80 of the pivot arm 70, and thus when it is positioned in overlying cooperative engagement therewith the door may be tilted slightly thereon. This further enables the ready placement of the door on the pivot arm 70 by simply lifting it onto same at an angle such as indicated by the dotted lines in Fig. 1 and then rotating it into position.

The door plate 82 may be provided with end members 88, the inner surfaces of which are spaced apart a distance equal to the over all length of the pivot arm 70, whereby accurate lateral alignment may be obtained. The improved bottom pivot thus allows the pivot pin to be adjusted vertically simultaneously with the adjustment of the automatic door operating mechanism, as well as slight angular alignment and lateral adjustment by relatively simple operations which do not necessitate special tools or skilled mechanics. Thus if in the installation of the pivots they are slightly out of line or the mortice is not accurately cut, the cooperating door plate and pivot arm will permit slight misalignment of the door to compensate for the irregularities without interfering with the operation of the door.

It is likewise quite obvious from the foregoing that after the upper collar 10 and sleeve 12 are grouted and secured within the flooring, the other parts of the device may be readily assembled therein, whereupon such adjustments as are necessary to properly position the door may readily be made.

As many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the language used in the following claims is intended to cover all of the generic and specific features of the invention herein described and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

I claim as my invention:

1. A door hinge of the character described, comprising a housing adapted to have its upper end secured in a floor and its lower end extending below the floor, a pivot pin in said housing adapted to pivotally support and operatively engage a door so the door and pivot pin can rotate as a unit, an operating mechanism supported by said housing below the floor for rotating said pin and thereby pivoting the supported door, an operative connection between said pin and said operating mechanism, and means carried by said housing for simultaneously vertically adjusting said pin, said operating mechanism, and said operative connection relative to said housing.

2. A door hinge of the character described comprising an elongated tubular housing adapted to have its upper end secured in the floor and its lower end extending below the floor, a pivot pin in said housing of such length as to extend above and below the door of the housing and adapted to pivotally and operatively support a door on its upper end, means rotatably supporting the pin in a vertical position within the housing, an operating mechanism for rotating the pin and the operatively engaged door, means carried by said housing adjacent the lower end thereof for supporting said mechanism, an operative connection between said mechanism and the lower end of said pin, and means carried by said housing for simultaneously adjusting said pivot pin, operating mechanism and operative connection relative to said housing.

3. A door hinge of the character described comprising an elongated open ended tubular housing adapted to have its upper end secured in a floor and its lower end extending below the floor, a pivot pin in said housing of such length that it extends above and below the ends thereof, a member carried by the lower end of said housing and vertically adjustable thereon, an operating mechanism for rotating said pin carried by said member, an operative connection between said operating mechanism and said pivot pin and means for simultaneously adjusting said member and said pivot pin relative to said housing.

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