Dec. 20, 1927. 1,653,160

T. P. ENRIGHT

HINGE FOR SWINGING DOORS

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Fig. 1.

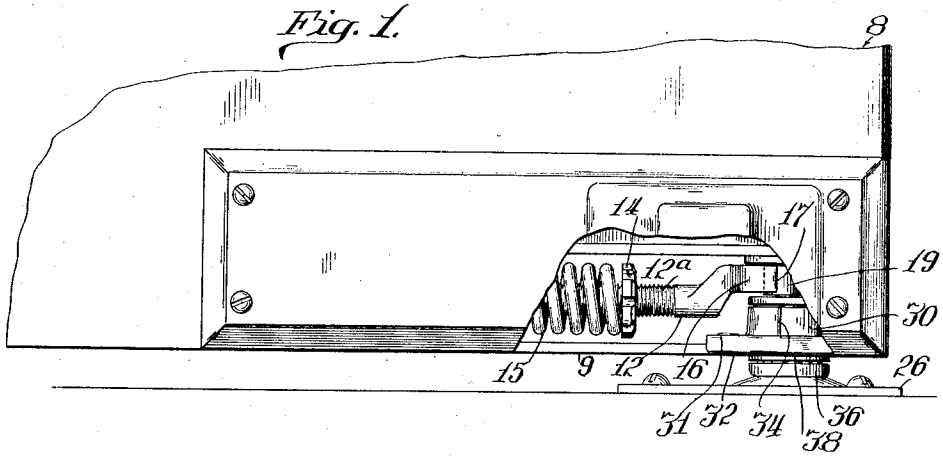


Fig. 2.

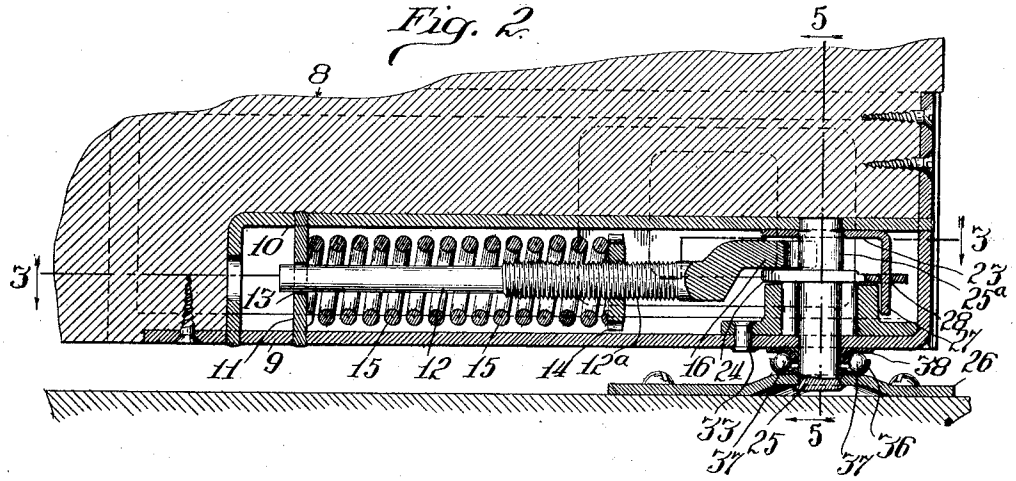
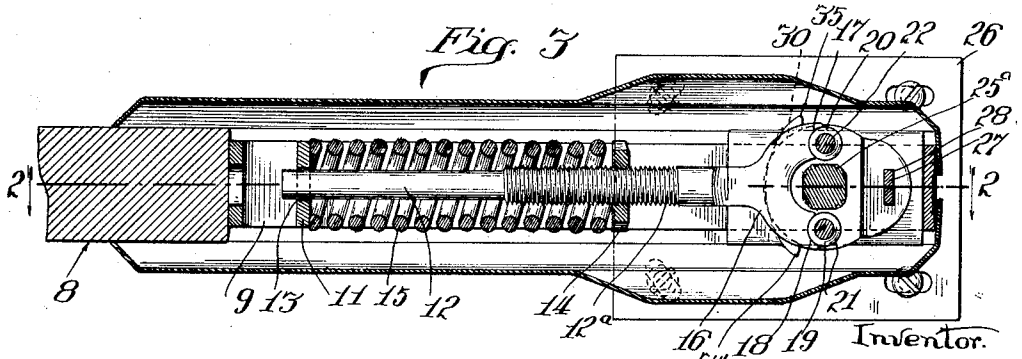


Fig. 3



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Fig. 4.

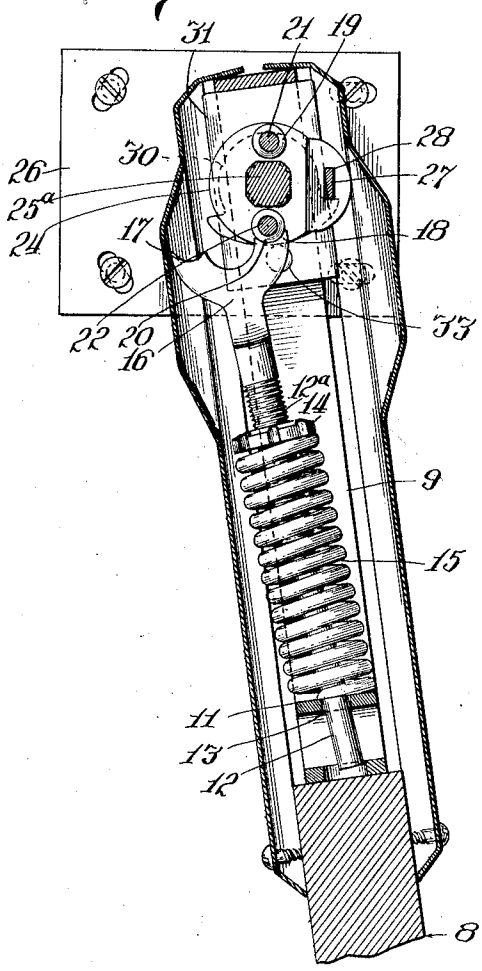


Fig. 5.

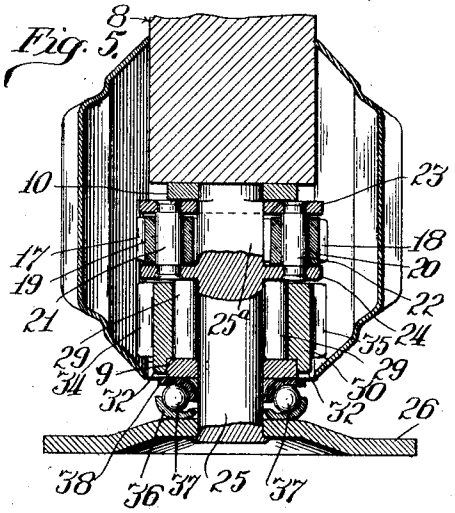


Fig. 6.

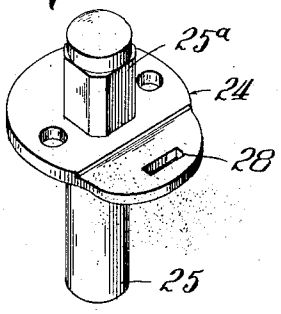
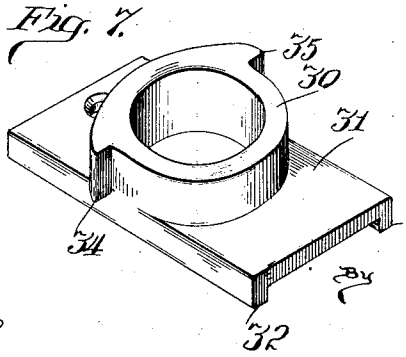


Fig. 7.



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UNITED STATES PATENT OFFICE.

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HINGE FOR SWINGING DOORS.

Application filed July 1, 1925. Serial No. 40,752.

My invention relates to hinges of the type commonly used on swinging doors to make the door self closing, and while, as will hereinafter appear, I have shown my invention embodied in a double acting hinge of that type, it may also be applied to hinges used on doors arranged to open in only one direction. Such hinges are usually applied to the lower inner corner of the door and comprise a stationary pivot secured to the floor, preferably by means of a floor plate, about which hinge pivot the door swings, a simple pivot in alinement therewith being provided for the upper inner corner of the door. This arrangement is shown in the drawings, except that the upper pivot is not shown, as the arrangement of such pivots is well understood. In hinges of the type referred to as heretofore constructed, it has been the practice to make the lower or hinge pivot in the form of a stud fixedly secured at its lower end to the floor plate and journaled at its upper end in a frame or housing in which is mounted a spring actuated plunger arranged to cooperate with a cross-head carried by the stud near its upper end in such manner that swinging of the door in either direction would move the plunger longitudinally in a direction to compress a stiff coiled spring, which when the door was released would restore it to its closed position. While such springs have operated very satisfactorily for a time, the end thrust of the plunger under the action of the spring was sustained by the upper bearing of the stud, and consequently in the course of time such upper bearing would become enlarged by wear so that the door would not be held in its proper position, but would sag, and therefore would not operate smoothly. To avoid this objection by relieving the upper bearing of the lower pivot of the strains tending to enlarge such bearing, is the principal object of my present invention. Another object is to improve the construction and operation of hinges of this type, as will hereinafter be more definitely pointed out. I accomplish these objects as illustrated in the accompanying drawings and as hereinafter described. What I regard as new is set forth in the claims.

In the accompanying drawings,—

Fig. 1 is a side elevation of the lower portion of a door showing my improved hinge in place thereon, part of one of the cover plates being broken away;

Fig. 2 is a central longitudinal vertical sectional view of the parts shown in Fig. 1, being substantially a section on line 2—2 of Fig. 3;

Fig. 3 is a horizontal section on line 3—3 of Fig. 2;

Fig. 4 is a similar view showing the position of the parts when the door has been opened to the fullest extent, at which time it is locked in its open position, as will be hereinafter explained;

Fig. 5 is a vertical cross-section on line 5—5 of Fig. 2;

Fig. 6 is a perspective view of the stud which forms the pivot for the lower inner corner of the door; and

Fig. 7 is a perspective view of the bearing plate that forms part of the hinge structure.

Referring to the drawings,—8 indicates the door, the lower corner only of which is shown. Said corner is cut away, as shown in Fig. 2, to receive the spring which is mounted in a frame or housing comprising an angle bar 9 secured to the bottom and end margins of the door, and an angle bar 10 which is connected with the angle bar 9 to form a rectangular framework corresponding substantially in dimensions with the cut-away portion of the door. An upright stop plate 11 is secured to the horizontal portions of the bars 9, 10 adjacent to the outer ends thereof to take the end thrust of the spring hereinafter described, and also to serve as a support and guide for the outer end of the plunger by which such spring is compressed. I have used the term "outer" as referring to the ends of the bars 9, 10 that are farthest from the inner margin of the door, and this applies also to the plunger.

Extending longitudinally of the frame or housing is an endwise movable plunger 12, the outer end portion of which is smooth and slides freely in a bearing 13 in the plate 11, while the intermediate portion thereof is screw-threaded, as shown at 12^a in Fig. 2, and is adapted to receive an adjusting nut 14. Mounted upon the plunger 12 between the nut 14 and the plate 11 is a compression spring 15, which obviously may be put under greater tension by moving the plunger endwise to the left as viewed in Fig. 2. The

inner end of the plunger is provided with a cross-head 16 disposed horizontally and having end portions 17, 18 provided with concave recesses, as best shown in Fig. 4.

This cross-head is adapted to cooperate with a stationary cross-head comprising a pair of rollers 19, 20 mounted on vertically disposed pins 21, 22, respectively that are secured between an upper disc or plate 23 and a lower disc or plate 24 as best shown in Fig. 5. These two discs are non-rotatably supported by a stud 25 that forms the lower pivot of the door and extends through the bar 9, and across the frame, substantially perpendicularly to the plunger 12, its lower end being fixedly secured to a floor plate 26. The upper end of said stud is journaled in a suitable bearing provided in the bar 10, as shown in Figs. 2 and 5. Preferably the disc 24 is in the form of an integral annular flange carried by the stud 25, as shown in Fig. 5, and the disc 23 is a separate plate fitted on a non-circular portion 25^a of the stud 25 and connected with the disc 24 by means of a depending arm 27 that extends through a slot 28 in the latter disc, as shown in Fig. 2 so that it is non-rotatably connected therewith. Thus as the stud 25 is non-rotatably secured to the floor plate 26, the cross-head comprising the rollers 19, 20 is held against rotation. As illustrated in Fig. 5 the lower disc 24 is swaged out of the body of the stud 25, and that portion of the stud immediately above said disc is squared to receive the upper disc 23 which lies a short distance from the upper end of the stud. The upper end of the stud is rounded for pivotal engagement with the upper horizontal member of the hinge frame. The depending arm 27 of the upper disc 23, as above explained, forms a connection between the two discs which holds the upper disc securely against relative rotation on the stud and prevents wear between the disc 23 and the stud. As shown in Fig. 3, the rollers 19, 20 lie in a vertical plane that is at right angles to the plunger 12 when the door is closed, and they are so positioned that the arms 17, 18 of the plunger cross-head 16 will bear against them at that time. It will be manifest, therefore, that when the door is swung in either direction from its closed position, one or the other of the rollers 19, 20 will act on the corresponding arm 17 or 18 to move the plunger 12 endwise in a direction to compress the spring 15, and therefore the spring will tend to close the door.

For relieving the upper bearing of the stud 25 of the strains incident to the end thrust of the plunger 12, I provide a series of upright rollers 29 which bear against the stud 25 below the disc 24 and extend from said disc down to the upper surface of the bar 9 on which they rest. Said rollers are confined and held in proper relation to the stud 25 by means of a sleeve 30 that encircles said rollers and is secured to the bar 9 by means of a plate 31 from which it rises. Said plate is provided with marginal flanges 32 spaced apart a distance equal to the width of the bar 9, so that said plate is adapted to fit upon said bar to which it is secured in any suitable way, as by a rivet 33. As best shown in Fig. 4, the plate 31 abuts against the inner or adjacent end of the hinge frame so that the end thrust incident to the compression of the spring 15 that occurs when the door is swung open is resisted by the end of the hinge frame as well as by the rivet 33, and, therefore, the plate 31 cannot move endwise relatively to said frame. It will be seen from the foregoing description that the rollers 29 are supported by the hinge frame, and that they support the stud 25 against lateral deflection by reason of the end thrust of the plunger 12. In a door hinge of this type ordinarily a pressure of approximately six hundred pounds is exerted by the swinging of the door, which tends to pull the hinge frame to the left as viewed in Fig. 2 against the vertical pivot 25^a. The result is that the top and bottom plates of the hinge frame tend to cut into the pivot, and if that tendency is not counteracted, in a short time the pivot is cut into deeply, if not entirely cut off. Besides, the holes in the frame members through which the pivot passes are enlarged so that the hinge does not work properly. My improved construction prevents movement of the hinge frame transversely of the axis of the pivot in response to the end thrust created by the compression of the spring 15, since the rollers 29 have an extended bearing on the pivot parallel with its axis and as they are firmly supported by the hinge frame through the sleeve 30 such cutting action cannot occur. The rollers 29 are placed loosely in the sleeve 30, which is concentric with the axis of the stud or hinge pivot, a sufficient number being used to completely surround the stud so that, in addition to protecting the stud or pivot against cutting as above explained, they also serve as a roller bearing interposed between the intermediate portion thereof and the frame of the hinge.

To provide stops for limiting the extent to which the door may be swung open in either direction, the plate 31 is provided at opposite sides with lugs 34, 35 that are adapted to cooperate with the lower end portion of the arm 27 for that purpose, as best shown in Fig. 4. Said lugs are preferably integral with the sleeve 30 which is integral with the plate 31 and as said plate is firmly secured to the lower member 9 of the hinge frame they are held in position very securely. Also, as will be seen from said figure, when the door is swung open to the

limit, owing to the past center position then assumed by the end portion 18 of the plunger cross-head, the spring 15 becomes inoperative to close the door and then tends to hold it in its fully open position. When the door is opened to the limit in the opposite direction, the other end portion 17 performs a like function. By making the disc 24 integral with the stud 25, and interlocking the disc 23 with it by means of the depending arm 27, I provide a very satisfactory construction from a manufacturing standpoint, as well as one that operates efficiently not only in making up the stationary cross-head, but also as a stop to limit the extent to which the door may be opened.

My improved hinge construction, above described, is particularly well adapted for hinges designed to be applied to the lower inner corner of a door, but my invention is not limited to a hinge designed for use at that point, or to hinges for doors only, as it may be used in any situation for which it is adapted, and the claims hereinafter made are therefore to be construed accordingly.

In the construction illustrated the weight of the door is supported at the bottom by ball bearings comprising a cup plate 36 mounted on the floor plate 26, balls 37 carried by said cup plate, and a cone 38 interposed between the balls and the lower bar 9 of the hinge frame, as best shown in Fig. 5.

The hinge is enclosed at the sides by cover plates 39 secured to the door. Said plates are alike in shape, and are symmetrical, so that they are interchangeable.

What I claim as my invention and desire to secure by Letters Patent, is—

1. A spring hinge for doors comprising a frame, an endwise movable plunger mounted therein, a compression spring thrusting against the plunger and the frame, a stationary pivot extending across the frame substantially perpendicularly to the plunger, a stationary cross-head carried by said pivot comprising upper and lower discs non-rotatably carried thereby and spaced apart, and rollers mounted between said discs, said cross-head serving to actuate said plunger to compress said spring when the door is opened, and means carried by one of said discs and engaging the other for holding said discs against relative rotation.

2. A spring hinge for doors comprising a frame, an endwise movable plunger mounted therein, a compression spring thrusting against the plunger and the frame, a stationary pivot extending across the frame substantially perpendicularly to the plunger, a stationary cross-head carried by said pivot comprising a lower disc non-rotatably carried by said pivot, an upper disc non-rotatably secured to the upper end portion of said pivot and having a depending arm non-rotatably engaging the lower disc, and rollers mounted between said discs at opposite sides of said pivot for actuating said plunger to compress said spring when the door is opened.

3. A spring hinge for doors comprising a frame, an endwise movable plunger mounted therein, a compression spring thrusting against the plunger and the frame, a stationary pivot extending across the frame substantially perpendicularly to the plunger, a stationary cross-head carried by said pivot comprising a lower disc integral with said pivot, an upper disc separate from and non-rotatably secured to the upper end portion of said pivot, said upper disc having a depending arm non-rotatably engaging said lower disc, and rollers mounted between said discs at opposite sides of said pivot for actuating said plunger to compress said spring when the door is opened.

4. A spring hinge for doors comprising a frame, an endwise movable plunger mounted therein, a compression spring thrusting against the plunger and the frame, a stationary pivot extending across the frame substantially perpendicularly to the plunger, a stationary cross-head carried by said pivot comprising a lower disc non-rotatably carried by said pivot, an upper disc non-rotatably secured to the upper end portion of said pivot and having a depending arm non-rotatably engaging the lower disc and extending down below the same, rollers mounted between said discs at opposite sides of said pivot for actuating said plunger to compress said spring when the door is opened, and fixed stops secured to the frame at opposite sides of said pivot and adapted to be engaged by the lower end portion of said arm for limiting the extent to which the door may be opened.

5. A spring hinge for doors comprising a frame, an endwise movable plunger mounted therein, a compression spring thrusting against the plunger and the frame, a stationary pivot extending across the frame substantially perpendicularly to the plunger, a stationary cross-head carried by said pivot comprising a lower disc non-rotatably carried by said pivot, an upper disc non-rotatably secured to the upper end portion of said pivot and having a depending arm non-rotatably engaging the lower disc and extending down below the same, rollers mounted between said discs at opposite sides of said pivot for actuating said plunger to compress said spring when the door is opened, a sleeve secured to said frame concentrically with the axis of said pivot, and stops carried by said sleeve at opposite sides of said pivot and adapted to be engaged by the lower end portion of said arm to limit the extent to which the door may be opened.

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