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Gwozdz

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[54] **DOOR HINGE SWITCH WITH PIN OPERATED, RECIPROCATING SWITCH ACTUATOR ROD**

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[52] **U.S. Cl.**..... **200/61.7,** 200/61.82, 200/331

[51] **Int. Cl.**..... **H01h 3/16,** H01h 17/00

[58] **Field of Search**..... 240/DIG. 4; 200/61.58 R, 200/61.62, 61.63, 61.7, 61.71–61.75, 61.81, 61.82, 331

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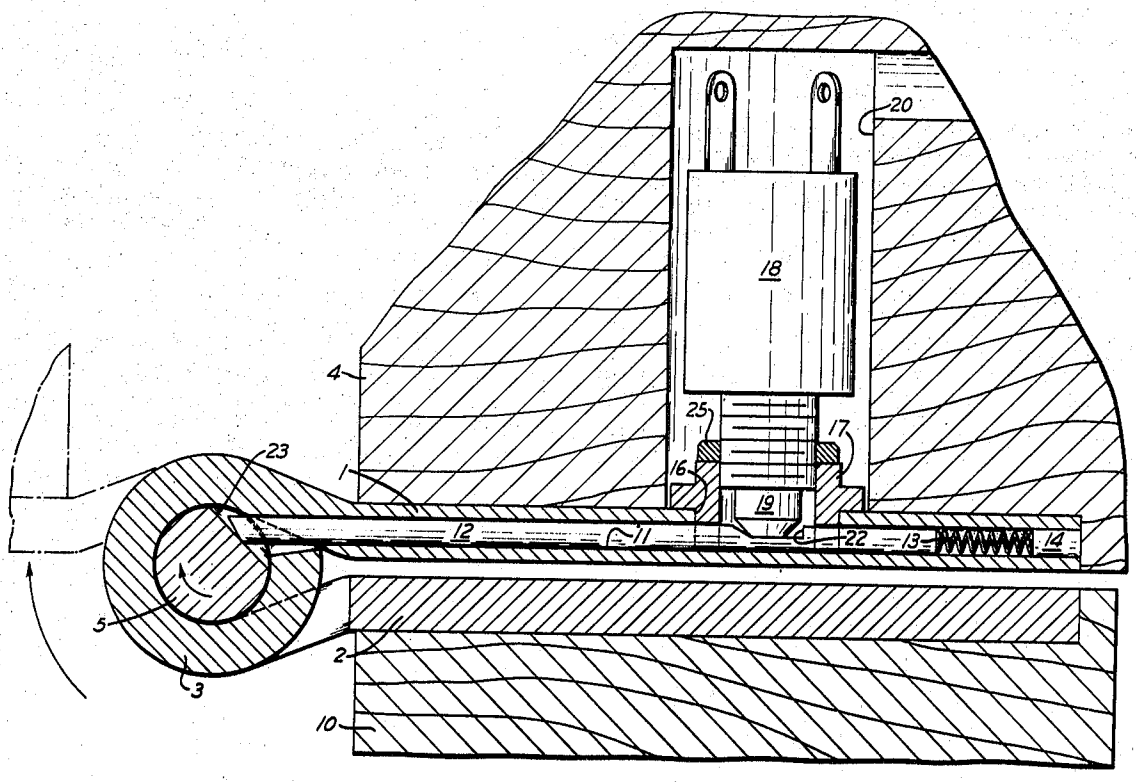
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[57] **ABSTRACT**

A hinge pin is rigidly connected to a knuckle of the door leaf of a hinge, the jamb leaf of which has a passage extending through it from inside a knuckle forming part of the leaf to the outer edge of that leaf. The inner end of a rod slidably mounted in the passage is pressed against the pin by a spring. The jamb side of the jamb leaf has an opening therein exposing one side of the rod, which has a notch in it adjacent that opening. A push button electric switch is mounted in the opening with its button projecting into the rod notch while the door leaf is in one of its open and closed positions. The side of the hinge pin has a depression in it receiving the inner end of the rod while the door leaf is in one of said positions so that rotation of the pin as the door leaf is swung toward its other position will cause the rod to move lengthwise. One end wall of the rod notch is positioned to push the projecting switch button outwardly into the switch when the rod moves the notch away from said leaf opening.

10 Claims, 3 Drawing Figures



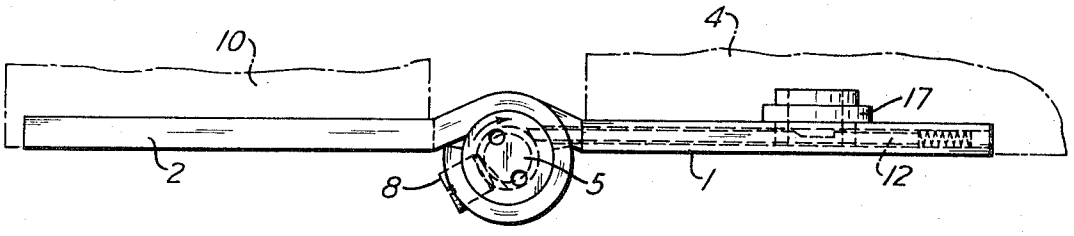


Fig. 1

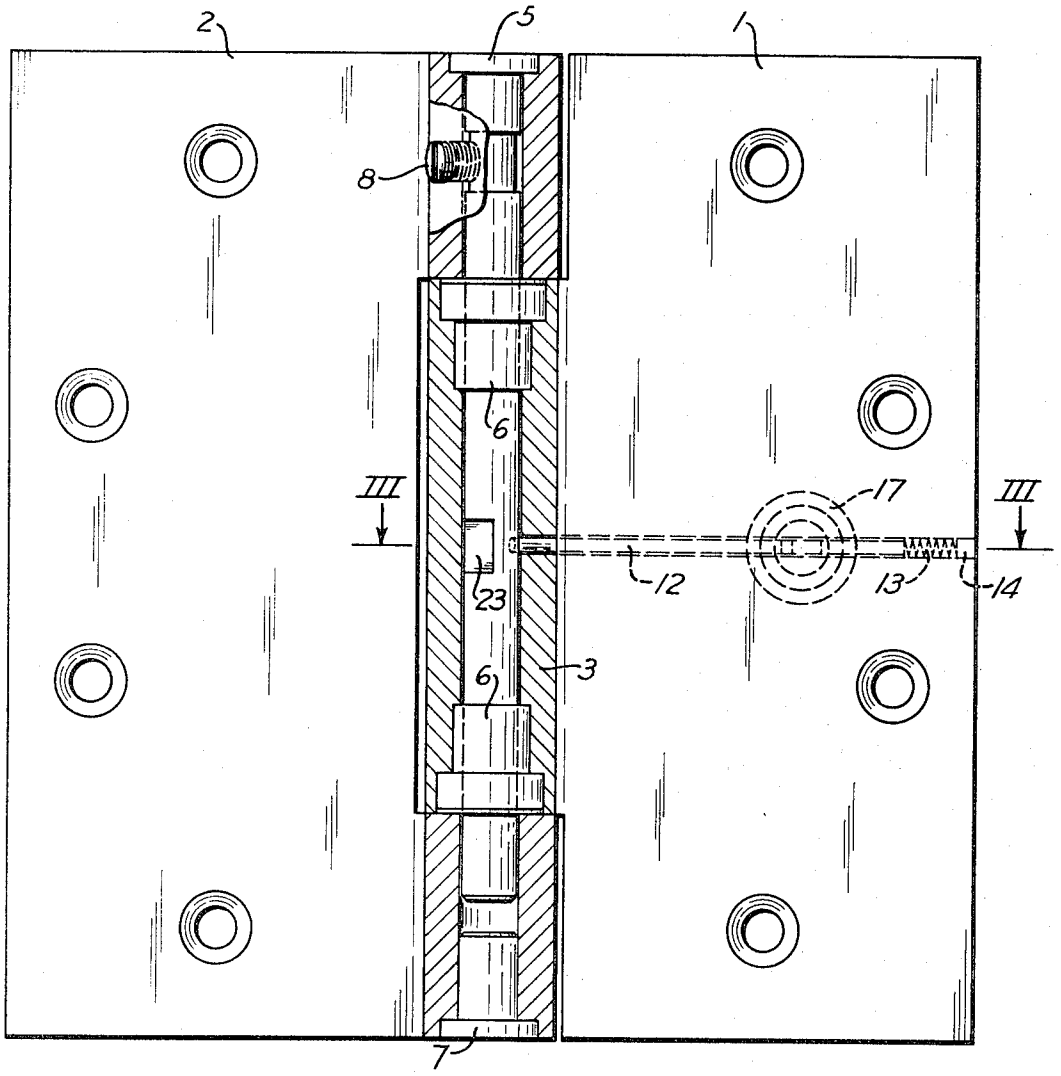


Fig. 2

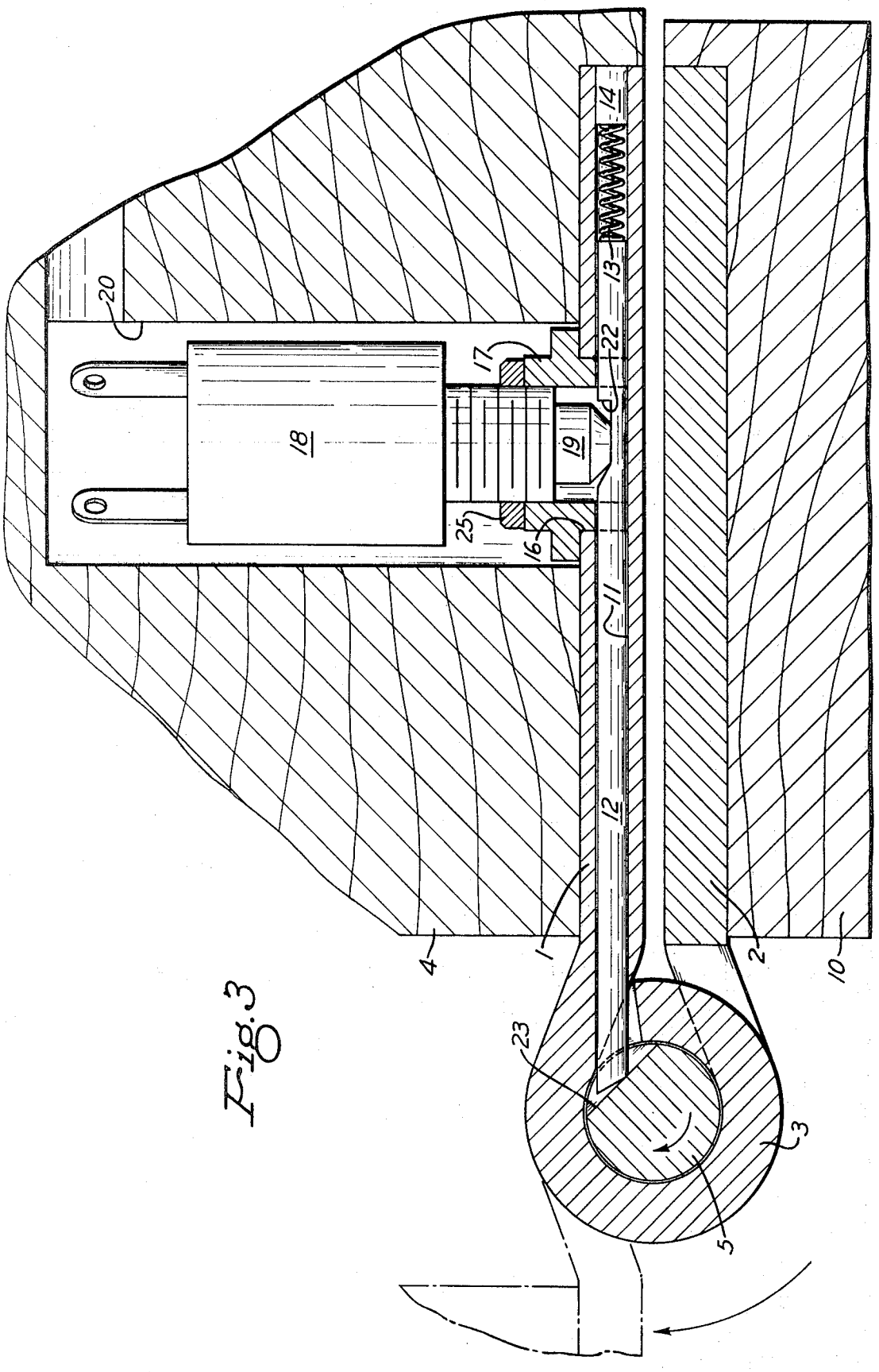


Fig. 3

DOOR HINGE SWITCH WITH PIN OPERATED, RECIPROCATING SWITCH ACTUATOR ROD

Door hinges installed in buildings are sometimes provided with electric switches that control electric circuits operating electric lights or audible signals so that an observer at a point remote from the doors can tell by the lights or other signals whether or not the doors are closed. One such known hinge has a switch extending through one of its leaves and actuated by an adjustable button projecting from the other leaf when the door is closed. This not only requires both leaves of the hinge to be specially made, but the switch and its actuator are fully visible when the hinge is opened. To adjust the operation of the switch, the hinge must be removed. In another type of hinge, the switch and its actuator are concealed by being mounted on the back sides of the leaves engaging the door and door jamb, but the switch is magnetically operated when a magnet on the other leaf is brought into close proximity to the switch. A drawback of such a switch is that it must be isolated from ferrous metal to assure proper switch performance. A strong magnetic field or a large mass of ferrous metal nearby may make the switch inoperable.

It is among the objects of this invention to provide a hinge and switch combination in which the presence of the switch is not disclosed when the hinge is opened, in which the switch is not affected by a magnetic field or by ferrous metal, in which the operation of the switch can be adjusted readily after the hinge has been installed, and which includes a minimum of parts.

The preferred embodiment of the invention is illustrated in the accompanying drawings, in which:

FIG. 1 is a plan view of the open hinge;

FIG. 2 is an enlarged view of the side of the hinge that is exposed when the hinge is in use, with the knuckles shown in section; and

FIG. 3 is a further enlarged horizontal section taken on the line III—III of FIG. 2, but with the hinge closed and installed.

Referring to FIGS. 1 and 2 of the drawings, a pair of hinge leaves 1 and 2 that are disposed side by side are provided with conventional tubular knuckles that are disposed in axial alignment with one another. There may be an odd or an even number of these knuckles, three being shown in FIG. 2. In the drawings the leaf 1 with the single knuckle 3 is the one that is screwed to the door frame or jamb 4 because for the purpose of this invention it is preferred, although not absolutely necessary, that the jamb leaf have a central knuckle. The two leaves are connected together in the usual manner by a pivot pin 5 that extends through their knuckles. The pin has a head that is countersunk in the upper knuckle, and the upper and lower ends of the center knuckle are counterbored to accommodate bearings 6 through which the pin extends. The lower end of the lower knuckle is closed by a plug 7 fitting tightly in it. The hinge pin normally cannot turn in the knuckles of leaf 2 because a set screw 8 in the side of the upper knuckle presses tightly against the side of the pin. The outer end of this screw is accessible when the hinge is wide open.

It is a feature of this invention that the hinge is provided with an electric switch that is connected in a circuit to indicate at a remote point whether the door 10 is open or closed. This indication can be accomplished by an electrically actuated visible or audible signal controlled by the switch, which in turn is operated by the hinge. Accordingly, as best shown in FIG. 3, the jamb leaf 1 of the hinge is drilled horizontally to provide it with a passage 11 extending through it from inside its knuckle 3 to the opposite or outer edge of the leaf. Slidably mounted in this passage is a rod 12, the inner end of which is pressed against the hinge pin by a coil spring 13 compressed between the outer end of the rod and a plug 14 pressed into the outer end of the passage. The back or jamb side of the leaf has an opening 16 therein that exposes a short length of the back side of the rod. Rigidly mounted in this opening, such as by a press fit, is a bushing 17 provided with an internal screwthread. Screwed into this opening is one end of a push button electric switch 18, the push button 19 of which is pressed against the rod by the usual spring (not shown) with which such a switch is provided. The bushing and the switch extend into a hole 20 drilled in the door jamb and therefore are concealed. As will be seen in FIG. 2, the exposed side of the jamb leaf gives no indication that a switch is connected to the hinge.

The side of rod 12 facing the switch is provided with a notch 22, into which push button 19 projects while the hinge is in only one of two positions, either closed or open, depending upon whether a normally open or a normally closed switch is used. The hinge is considered to be open for the purpose of this description whenever the door is not closed tightly. Preferably, as shown, the push button projects into the notch while the hinge is closed. When the hinge is opened by opening the door, the rod is moved lengthwise in hinge passage 11. To permit or cause this movement of the rod, the side of the pivot has a depression 23 in it that, in one position of the rod, receives the inner end of the rod. Although this depression could be so located that the inner end of the rod would be pushed into it by the coil spring when the hinge is opened, it is preferred that the depression receive the end of the rod while the hinge is closed, whereby the rod will be forced outwardly against the resistance of the coil spring when the hinge is opened. The depression in the pin can be a notch in its side having upper and lower end walls connected by a substantially flat vertical side wall engaging the rod.

With the parts of the hinge in the position shown in FIG. 3 of the drawings while the hinge is closed, opening of the hinge will cause the rotating pivot pin to move rod 12 outwardly in passage 11, during which the inner end of the rod notch 22 will press against the switch button and push it into the switch to either close or open the electric circuit, depending upon the construction of the switch. The end of the button is rounded or tapered and the inner end of the notch is inclined lengthwise of the rod to facilitate the wedging action that pushes the push button into the switch. The switch is wired into an electric circuit having a source of electric current and a signalling device (not shown), such as an electric lamp. If the switch has only two terminals and is open while the hinge is closed, the lamp will be lit only when the hinge is opened and the rod pushes the push button into the switch. If desired, the hinge can be provided with three terminals and constructed and wired so that a lamp of one color will be lit while the hinge is closed and a lamp of another color lit as soon as the hinge is opened.

At the factory where the hinge is made, the switch is screwed into bushing 17 a distance that is considered

to be correct for the proper operation of the switch and is locked in that position by a lock nut **25**. However, after the hinge has been installed, if it is found that the switch is not actuated at the desired moment when the hinge is opened or closed, another adjustment can be made. This is accomplished by loosening set screw **8** so that the hinge pin can be turned by means of a suitable tool provided with projections inserted in holes in the head of the pin, or by a screw driver if the head has a kerf. This will change the position of the notch **23** in the side of the pin relative the adjoining end of rod **12** so that the rod will actuate the switch push button sooner or later than it did before the adjustment was made. The head of the pin is marked with an arrow to show which way it should be turned to avoid pinching the adjoining end of the rod, which would interfere with operation of the hinge.

By having all of the doors of a building provided with hinges like the one disclosed herein, a caretaker at a location remote from the doors can monitor all of them and always know which ones are open and which ones are closed. The installed hinge gives no indication that it controls an electric switch, because there are no openings, except for the usual screw openings, in the exposed faces of the hinge leaves. Since the switch is operated mechanically by the turning of the hinge pin, the metal of the hinge presents no problem to switch operation as it often does with magnetically operated hinge switches. Also, unlike other hinges of this general type, the operation of the switch can be adjusted after the hinge is installed, without removing the hinge.

According to the provisions of the patent statutes, I have explained the principle of my invention and have illustrated and described what I now consider to represent its best embodiment. However, I desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

1. A door hinge comprising a jamb leaf and a door leaf disposed side by side and provided with tubular knuckles in axial alignment with one another, a pivot pin in said knuckles holding them in alignment so that the door leaf can be swung between open and closed positions, means rigidly connecting the pin to a knuckle of said door leaf, the jamb leaf having a passage extending therethrough from inside a knuckle forming part of that leaf to the outer edge of the leaf, a rod slidably mounted in said passage, a spring in the passage pressing the inner end of the rod against the pivot pin, the jamb side of the jamb leaf having an opening therein exposing one side of the rod, said side of the rod having a notch therein adjacent said opening, and a push button electric switch mounted in said opening with its button projecting into said notch while the door leaf is in one of said positions, the side of said pivot pin having a depression therein receiving the inner end of said rod while the door leaf is in one of said positions, whereby rotation of the pin as the door leaf is swung toward its other position will cause the rod to move lengthwise of said passage, and one end wall of said notch being positioned to push said projecting switch button outwardly into the switch when the rod moves the notch away from said opening.

2. A hinge according to claim **1**, including a plug rigidly mounted in the outer end of said passage, and said spring being a coil spring compressed between said plug and the outer end of said rod.

3. A hinge according to claim **1**, in which said switch is adjustable toward and away from said rod.

4. A hinge according to claim **1**, in which said pin depression is a notch having end walls connected by a substantially flat side wall engaging said rod.

5. A hinge according to claim **1**, in which said one end wall of the notch is inclined lengthwise of the rod.

6. A hinge according to claim **1**, in which said connecting means is a set screw mounted in a knuckle and pressing tightly against the side of the pivot pin.

7. A hinge according to claim **6**, in which one end of said pivot pin is formed for turning the pin manually when said set screw is retracted, whereby the position of said pin depression relative to the inner end of said rod can be adjusted.

8. A hinge according to claim **1**, in which said rod notch receives the switch button while the hinge is closed.

9. A hinge according to claim **1**, in which said pin depression receives the inner end of the rod while the hinge is closed.

10. A hinge according to claim **1**, in which said rod notch receives the switch button while the hinge is closed, said pin depression receives the inner end of the rod while the hinge is closed, and said one end wall of the notch is at the inner end of the notch.

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