United States Patent [19]

Gwozdz

[11] **3,898,708**

[45] **Aug. 12, 1975**

[54] **DOOR HINGE ADJUSTABLE CLOSING SPRING**

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[21] Appl. No.: **537,086**

[52] **U.S. Cl.** **16/72;** 16/50; 16/189

[51] **Int. Cl.²** **E05F 1/08**

[58] **Field of Search** 16/72, 76, 82, 85, 50, 16/188, 189, 78, 79, 80, 71, 49, 52, 129, 132, 134

[56] **References Cited**

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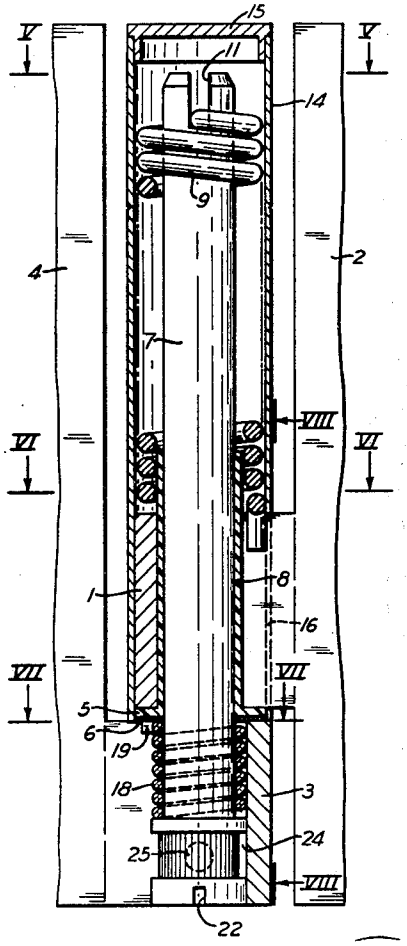
Primary Examiner—Geo. V. Larkin

Attorney, Agent, or Firm—Brown, Murray, Flick & Peckham

[57] **ABSTRACT**

A hinge pin extends through the overlapping knuckles of a door hinge and has an exposed end portion projecting from one of them. The pin is stationary in one of the knuckles during opening and closing of the hinge. A closing coil spring encircles the projecting end portion of the pin with one end anchored to the pin and the other end anchored in fixed position relative to the other knuckle. The spring is coiled in the direction that will cause it to be wound more tightly during opening of the hinge. An adjustment coil spring tightly encircles the pin inside the knuckle in which the pin is stationary. One end of this spring is free and the other end is anchored to the surrounding knuckle. The adjustment spring is coiled in the direction that will permit the pin to be turned manually in it to wind the closing spring more tightly.

13 Claims, 11 Drawing Figures



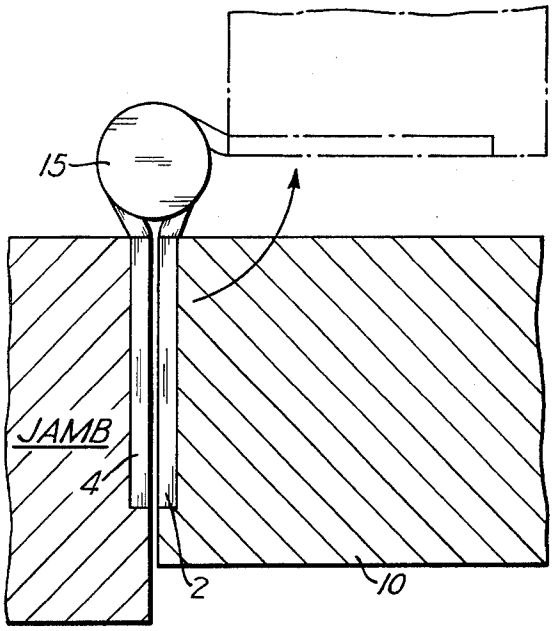


Fig. 1

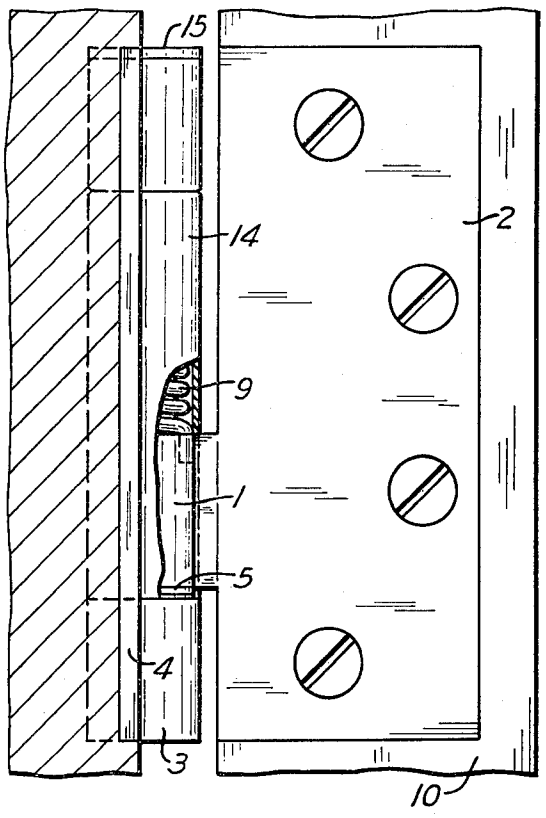


Fig. 2

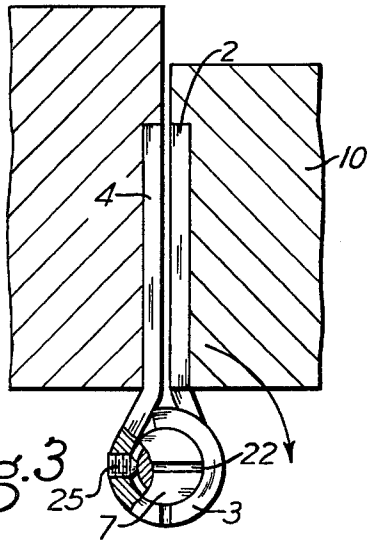


Fig. 3

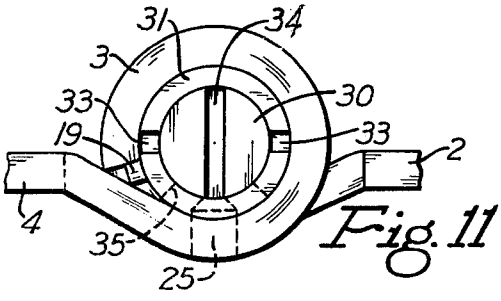


Fig. 11

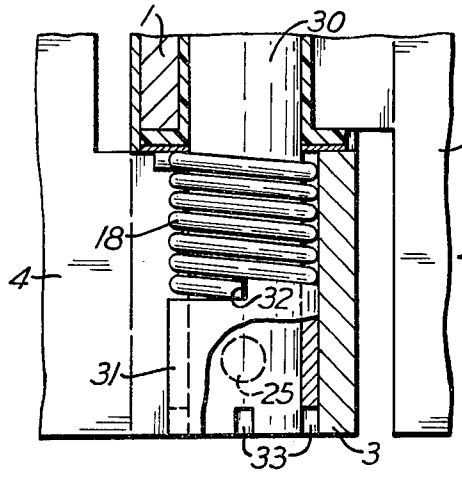


Fig. 9

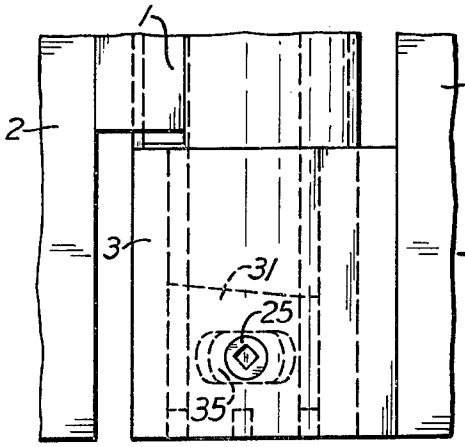


Fig. 10

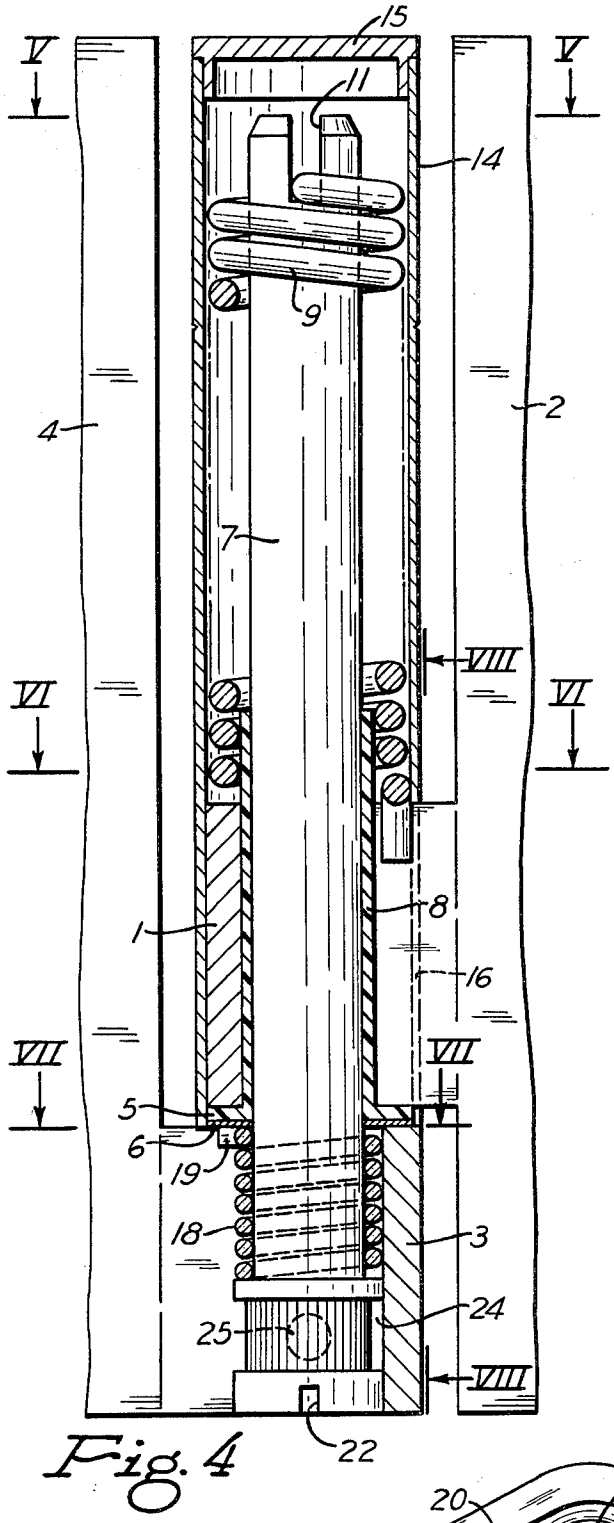


Fig. 4

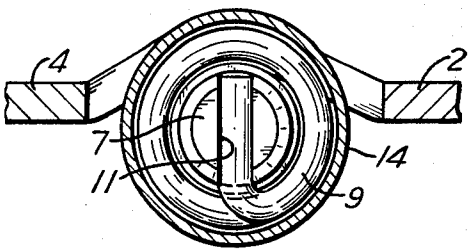


Fig. 5

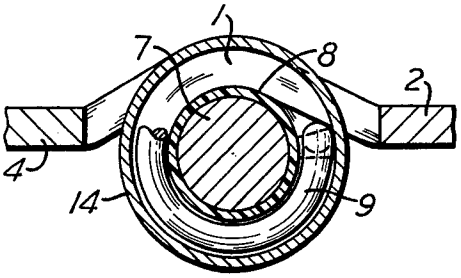


Fig. 6

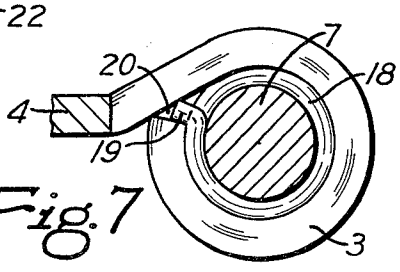


Fig. 7

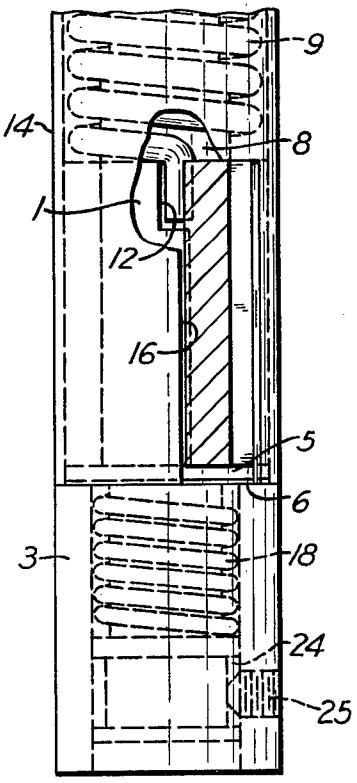


Fig. 8

DOOR HINGE ADJUSTABLE CLOSING SPRING

Door hinges are old in which coil springs are twisted more tightly when the door is opened so that when the opened door is released the hinge springs will close the door. It also is old to provide for adjusting the tension on such hinge springs in order to obtain the desired door-closing force. However, heretofore, such spring adjustments have been by increments, wich has resulted in some cases in the tension on the springs being either too strong or too weak, since there was no way to obtain an intermediate degree of spring tension.

It is among the objects of this invention to provide a door hinge that includes a coil spring for closing it, in which the tension on the closing spring is infinitely variable, in which the tension on the spring can be quickly and easily adjusted, and in which the adjusting means is very simple and inexpensive.

The invention is illustrated in the accompanying drawings, in which

FIG. 1 is a plan view of the hinge attached to a closed door;

FIG. 2 is a front view with the hinge open 90°;

FIG. 3 is a bottom view of the closed hinge, partly in section;

FIG. 4 is an enlarged fragmentary view of the hinge fully open;

FIGS. 5, 6 and 7 are horizontal sections taken on the lines V—V, VI—VI, and VII—VII, respectively, of FIG. 4;

FIG. 8 is a fragmentary vertical section taken on the line VIII—VIII of FIG. 4;

FIG. 9 is a fragmentary vertical section of the lower part of a modification;

FIG. 10 is a view of the opposite side of the modified hinge; and

FIG. 11 is a bottom view of the hinge shown in FIG. 9.

Referring to FIGS. 1 to 8 of the drawings, a hinge has the usual two leaves, each provided with a conventional knuckle formed by curling a lateral projection of the leaf into a cylinder. The knuckle 1 on the door leaf 2 is above the knuckle 3 on the jamb leaf 4 and is supported by it as shown in FIGS. 2, 4 and 8. Preferably, a nylon washer 5 seated on a metal washer 6 separates the two knuckles for easier opening and closing of the hinge. Extending upwardly through these knuckles and the washer is a hinge pin 7, the head of which is inside the lower knuckle. As shown in FIG. 4, this pin has an exposed end portion extending above the upper knuckle to substantially the top of the hinge. It will be realized, of course, that without departing from the invention the hinge could be inverted, with the jamb leaf becoming the door leaf and the hinge pin extending downwardly instead of upwardly. As shown in the drawings, the lower end or head of the pin is held stationary in the lower knuckle 3 by means that will be described later, and the door leaf swings around the stationary pin. A cylindrical bearing 8 made of a plastic, such as nylon, may encircle the pin inside the upper knuckle to improve the performance of the hinge. The lower end of this bearing may be integral with washer 5.

Encircling the exposed upper end portion of the hinge pin is a coil spring 9 that is for the purpose of closing the door 10. The upper end of this spring is anchored to the pin in any convenient manner, such as by providing the top of the pin with a transverse slot 11

(FIGS. 4 and 5) and by bending the upper end of the spring so that it will extend into the slot. The lower end of the spring is anchored in fixed position relative to the door leaf, preferably by bending the lower end of the spring wire downwardly into a vertical notch 12 in the upper end of the door leaf knuckle 1, as shown in FIG. 8. This door closing spring is coiled in the direction that will cause the spring to be wound more tightly; i.e., put under greater tension, as the door is opened. Thus, with the particular arrangement of hinge leaves shown in the drawing, the hinge is a left-hand hinge and the spring is coiled downwardly around the pin in a counterclockwise direction. Opening the door would, therefore, cause the door knuckle 1 to pull the lower end of the spring around the pin in a counterclockwise direction as indicated in FIG. 1 and thereby wind the spring more tightly. Release of the door would allow the spring to twist in the opposite direction to close the door.

The closing spring 9 can be concealed and the appearance of the hinge greatly improved by fitting over the spring a hollow cylindrical barrel 14 having an open bottom, and a top or outer end closed by a cap 15 fitting tightly therein. Since it is desirable that the barrel extend down around the upper knuckle and tightly engage it so that the barrel will be held in place, the lower end of the barrel is provided with an upwardly extending slot 16 (FIG. 8) that permits it to receive and straddle the narrow portion of the hinge that integrally connects the door leaf with its knuckle 1. By reducing the external diameter of this knuckle to compensate for the wall thickness of the barrel, the outer surface of the barrel can be made flush with the outer surface of the lower knuckle below it.

It is a feature of this invention that the tension on the closing spring 9 can be adjusted to any extent desired without having to make the adjustments by predetermined increments. Accordingly, as shown in FIGS. 4 and 7, an adjustment coil spring 18 is disposed inside the lower knuckle, where it encircles and tightly engages the hinge pin above its head. One end of the adjustment spring is free, but the other end is anchored to the surrounding knuckle. Preferably, for this purpose the upper end of the spring has a radial projection 19 that extends into the recess 20 that is created in the knuckle when the knuckle is formed. The lower end of the spring is not connected to the knuckle nor to the hinge pin. This spring is coiled in the same direction as the closing spring.

The closing spring 9 always is under some tension exerting a force in a counterclockwise direction on the hinge pin, but this force is prevented from turning the pin in the lower knuckle because the tendency of the pin to turn causes adjustment spring 18 to grip it tightly and hold it stationary. The grip of the spring on the pin is increased even further as the door is opened. On the other hand, if it is desired to increase the tension on the closing spring to increase its closing force, this can be done by manually turning the hinge pin in a clockwise direction. Rotation in this direction is permitted because the frictional engagement between the pin and adjustment spring tends to uncoil that spring and thereby loosen its grip on the pin. The extremely small clearance normally present between the adjustment spring and the encircling knuckle is sufficient to allow the coil to be expanded enough for the pin to slip inside of the coil. In order to turn the pin, its lower end is pro-

vided with a screw driver slot 22 or similar means for receiving a turning tool.

The lower end portion of the hinge pin beneath the adjustment spring may be provided with an annular recess 24 opposite a threaded radial hole in the lower knuckle. As shown in FIGS. 3 and 8, a set screw 25 threaded in this hole and tightly engaging the inner wall of the recess will prevent the pin from being turned unless the screw is loosened first. This makes it more difficult for anyone to tamper with the adjustment of the closing spring.

A hinge made in accordance with this disclosure has the advantage that the tension on its closing spring is infinitely variable, thereby permitting any desired tension to be obtained, because the hinge pin will be held in any position to which it is turned manually to adjust the spring tension. In other words, adjustment is not limited to predetermined increments. The adjustment spring is a very simple and inexpensive way of holding the pin in any desired position.

In the embodiment of the invention just described, the tension on the closing spring cannot be reduced because the adjustment spring prevents the hinge pin from being turned backward. Since there may be instances where it may be desirable to be able to reduce the closing spring force, the hinge can be modified as shown in FIGS. 9, 10 and 11.

In the modification the parts of the hinge are the same as those described above, except that the lower end portion of the hinge pin 30 is not provided with radial flanges that engage the lower knuckle 3. Instead, this portion of the pin is encircled by a cylindrical collar 31 that fits snugly between the pin and the knuckle. The purpose of this collar is to permit the tension on the closing spring 9 to be reduced, such as when it is found that in adjusting the tension it has been increased too much.

Accordingly, as shown in FIG. 9, the upper end of the collar is provided with an upwardly extending shoulder 32 that can abut against the free lower end of the adjustment spring 18. Normally, the shoulder is spaced slightly from the end of the pin so that the collar will not interfere with the gripping action of the adjustment spring on the hinge pin. However, if it is desired to reduce the tension on the closing spring, this can be accomplished by turning the collar in a clockwise direction (looking down on it) relative to the pin. For this purpose, the lower end of the collar may be provided with diametrically opposite notches 33 for receiving a screw driver. The collar is turned to press its shoulder 32 against the lower end of the adjustment spring so that the spring will expand just enough to permit the closing spring to turn the freed hinge pin in a counterclockwise direction to thereby reduce the tension on that spring. Of course, the movement of the collar for releasing the grip of the adjustment spring on the hinge pin is very slight. After this has been accomplished, the collar is turned manually in the opposite direction to separate shoulder 32 from the adjustment spring so that the spring again can grip the hinge pin. The pin then can be turned by a screw driver in slot 34 in a clockwise direction to obtain the desired increased tension on the closing spring.

To accommodate the set screw 25 that is threaded in the side of the lower knuckle and bears against the side of the pin to lock the hinge pin, collar 31 is provided with a slot 35 (FIGS. 10 and 11) extending part way around it, through which the central portion of the screw extends. This slot allows the collar to be turned while the set screw remains in place. Of course, the set screw is loosened before the collar is turned, so that the closing spring will be able to turn the hinge pin. The slot and screw also help to hold the collar up in the lower knuckle.

Although the adjustment spring is shown and described herein as coiled in the same direction as the closing spring, it could be coiled in the opposite direction and still perform in the same way, provided it is the lower end of the spring that is anchored to the lower knuckle. In other words, the adjustment spring should be coiled in the direction that will permit the hinge pin to be turned manually in it to wind the closing spring more tightly. Any attempt to turn the pin in the opposite direction will be prevented by the adjustment spring tightly gripping the pin. Of course, if the lower end of the adjustment spring is the one that is anchored, the tension-relieving collar 31 cannot be used in the form disclosed.

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 having a knuckle, a door leaf having a knuckle above the jamb leaf knuckle and supported by it, a hinge pin extending through said knuckles and having an exposed end portion projecting from one of them, the pin being stationary in one of said knuckles during opening and closing of the hinge, there being relative rotation between the other knuckle and the pin during said opening and closing, a closing coil spring encircling said projecting end portion of the pin and having one end anchored to the pin and having its opposite end anchored in fixed position relative to said other knuckle, the spring being coiled in the direction that will cause it to be wound more tightly during opening of the hinge, and an adjustment coil spring tightly encircling the pin in the knuckle in which the pin is stationary, one end of the adjustment spring being free and the other end being anchored to the surrounding knuckle, and the adjustment spring being coiled in the direction that will permit the pin to be turned manually in it to wind the closing spring more tightly.

2. A door hinge according to claim 1, in which the projecting end of the hinge pin is provided with a transverse slot, and the adjoining end of said closing spring extends into said slot.

3. A door hinge according to claim 1, in which said knuckle is provided with a notch, and the adjoining end of the closing spring extends into said notch.

4. A door hinge according to claim 1, in which said other end of the adjustment spring has a radial projection, and the inside of the encircling knuckle is provided with a recess receiving said projection.

5. A door hinge according to claim 1, including a hollow cylindrical barrel covering said closing spring and having a closed outer end.

6. A door hinge according to claim 1, in which the end of the pin opposite the closing spring is provided

with a screw driver slot for turning the pin in said adjustment spring.

7. A door hinge according to claim 1, in which the jamb leaf knuckle is at the bottom of the jamb leaf, said adjustment spring is inside that knuckle, and said closing spring is above the door leaf knuckle.

8. A door hinge according to claim 7, including a hollow cylindrical barrel enclosing the closing spring and the door leaf knuckle, the door leaf and its knuckle being integrally connected by a connecting portion, said barrel having a slot extending upwardly from its lower end and receiving said connecting portion, the outer diameter of the door leaf knuckle being less than the outer diameter of the other knuckle, and the outer diameter of said barrel being substantially the same as the outer diameter of the jamb leaf knuckle.

9. A door hinge according to claim 1, in which said surrounding knuckle is provided with a threaded radial opening, and a set screw in said opening bears tightly against the pin.

10. A door hinge according to claim 1, in which the adjustment spring is coiled in the same direction as the closing spring and it is the upper end of the adjustment spring that is anchored to the surrounding knuckle.

11. A door hinge according to claim 10, including means for manually reducing the tension on said closing spring.

12. A door hinge according to claim 11, in which said tension-reducing means include a collar rotatably mounted on the hinge pin in said surrounding knuckle and having a shoulder for pressing against said free end of the adjustment spring to release the grip of that spring on the pin.

13. A door hinge according to claim 12, in which said surrounding knuckle is provided with a threaded radial opening, said collar is provided with circumferential slot registering with said opening, and a set screw in said opening extends through said slot and bears tightly against the pin.

* * * * *