United States Patent

[11] 3,600,743

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[54] **SELF-CLOSING HINGE**
2 Claims, 7 Drawing Figs.

[52] **U.S. Cl.** **16/180,** 16/142
[51] **Int. Cl.** **E05f 1/12**
[50] **Field of Search** 16/142, 180, 145, 50, 71, 72, 128, 182, 184

[56] **References Cited**

UNITED STATES PATENTS

494,549	4/1893	Clement	16/140
760,890	5/1904	Mackinder	16/142
1,379,814	5/1921	Gustafson	16/142

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ABSTRACT: A self-closing hinge having a hinge pin with a flattened section mounted to rotate with a first hinge plate and a resilient sleeve positioned on a second hinge plate disposed concentrically about said pin and having a complementary flattened portion adapted to pivotally engage an edge of the flattened portion of the hinge pin so as to cause a door to shift towards a closed position and to be biased in said closed position.

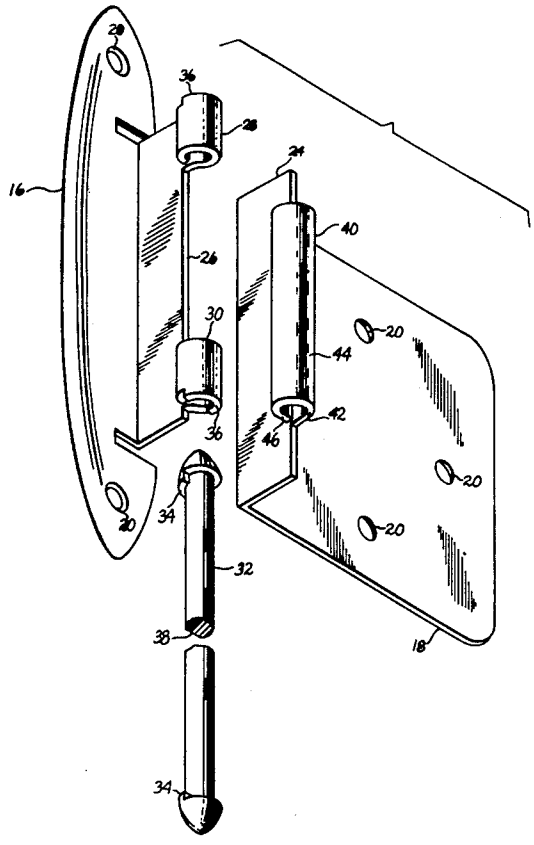
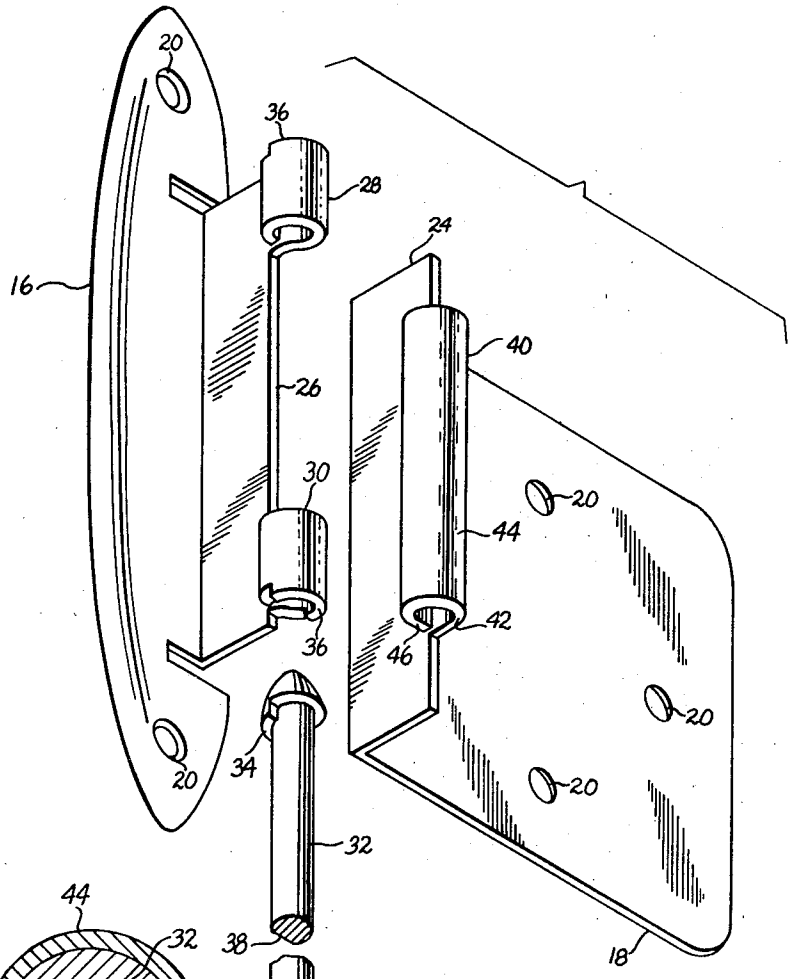


FIG. 1



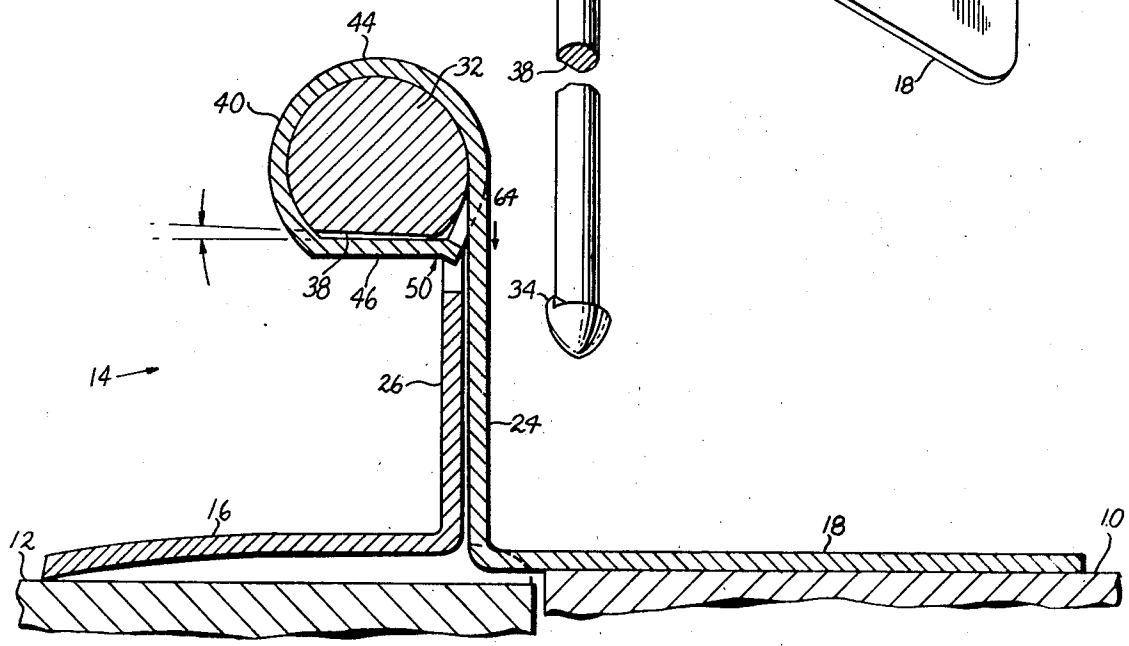


FIG. 2A

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FIG. 3A

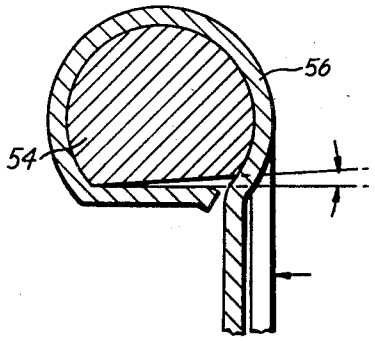


FIG. 2B

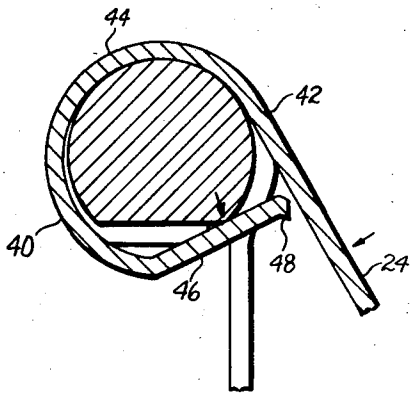


FIG. 3B

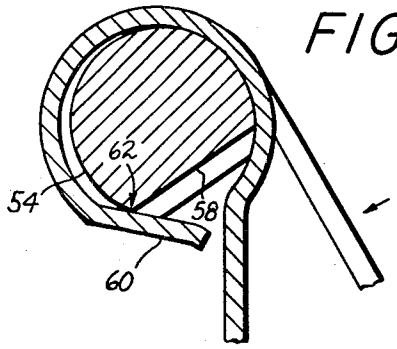
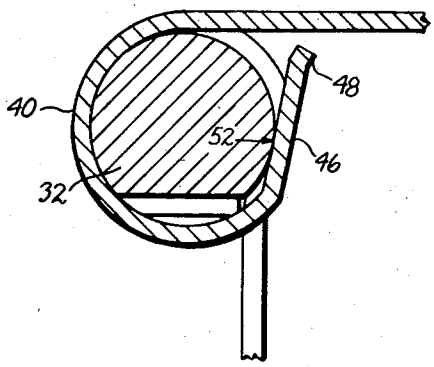


FIG. 2C



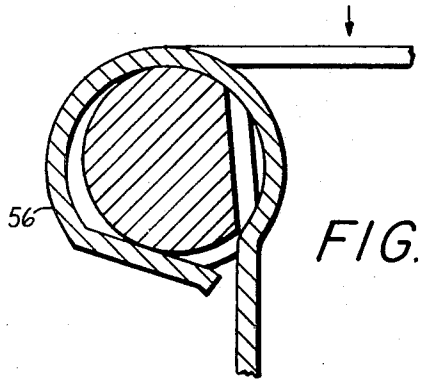


FIG. 3C

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SELF-CLOSING HINGE

BACKGROUND OF THE INVENTION

This invention relates to an improved self-closing hinge. More particularly, it relates to a self-closing hinge having an improved self-closing mechanism.

Various forms of self-closing hinges have been provided for resiliently urging doors to closed positions in order to eliminate the need for other latching means. In operation, the hinges are so positioned on the doors, that the doors are movable normally throughout the major portion of their swing with the exception of the last few degrees of movement toward the fully closed position, at which point the hinges are constructed for resiliently urging the doors into, and retaining the same in, the fully closed position.

A major difficulty with previous self-closing hinges has resided in the self-closing mechanism. For example, in U.S. Pat. No. 1,379,814, a self-latching mechanism was proposed employing a thin hinge pintle with a small, recessed, flattened section thereon mounted on a first hinge plate and a hinge knuckle mounted concentrically about the pin and having a cutaway portion capable of alignment with the pin flattened portion, and a separately mounted spring member aligned with both the cutaway portion of the knuckle and the flattened recessed portion of the hinge pin mounted on a second hinge plate. This three-membered self-latching hinge mechanism necessitated undue time and effort to manufacture. Further, since all three elements had to be in exact alignment during movement of the hinge mechanism, installation of the self-latching mechanism was difficult and excessively time consuming.

Further, the three-membered hinge mechanism was generally unsatisfactory under normal operating conditions. In operation, during the last few degrees of movement toward a fully closed position, the hinge mechanism underwent great strain as the spring member engaged the flattened portion of the hinge pin. Since only a small portion of the hinge pin was capable of pivotally engaging the spring member, both the hinge pin and spring member, and particularly the edges of said members were subject to excessive wear. Further, the hinge pin was quite likely to buckle under repeated closings owing to the small area of contact.

Although it might have been possible to overcome certain of these difficulties by employing members of increased thickness and strength from those normally employed in self-latching hinge mechanisms, such expedient was impractical as it required great expense and would result in a bulky and difficult-to-mount mechanism.

Later attempts to provide an inexpensive, easily mounted and serviceable, but durable self-latching assembly have met with only partial success. In general these attempts have involved fabricating large and ungainly hinge mechanisms having a plurality of elements, thereby increasing the chances for failure of the entire mechanism. Other mechanisms required time consuming and expensive installation, since they were disposed within a door rather than attached to a door member. Servicing such hinges was difficult owing to the relative inaccessability of the recessed mechanism.

Others have proposed employing mechanisms having transversely extending rod as an element. These mechanisms are subject to excessive metal fatigue, since only a relatively small portion of the rod is supported. It has also been proposed to employ a separate latch carriage assembly so as to remove pressure from individual hinge plates. However, this assembly has required precise manufacture and difficult and time-consuming alignment during assembly. This type assembly adds unduly to the weight and expense of the hinge.

SUMMARY OF THE INVENTION

It is, therefore, a principal object of this invention to provide an improved and simplified self-closing hinge capable of withstanding the stresses of normal operations. It is a further object of the invention to provide a self-closing hinge easily installed in the field and adapted for ready servicing.

The above and other objects are met by a self-closing hinge mechanism employing a hinge pin having a flattened portion extending along a substantial portion of its axial length. A complementary hinge sleeve is concentrically disposed about the hinge pin for at least a substantial portion of the axial length of the pin, said sleeve being constructed of a resilient, durable material and having a flattened portion capable of pivotally engaging the flattened portion of the hinge pin. Either the hinge pin or sleeve may be affixed to a door with the other member being affixed to a jamb. The member affixed to the door rotatably wipes the abutting surface of the member affixed to the jamb during opening and closing.

Such a self-closing mechanism is readily fabricated since the mechanism requires only two elements, a hinge pin and a complementary hinge sleeve. Both installation and servicing of the mechanism are simplified as no setscrews, bolts, or recessed members are employed in the mechanism. Alignment of the self-closing members is expedited during installation, as the hinge sleeve automatically aligns itself with the hinge pin in the closed position owing to their complementary construction.

BRIEF DESCRIPTION OF THE DRAWING

Other objects and advantages of the invention will be apparent from the following specification and accompanying drawings which are for the purpose of illustration only and in which:

FIG. **1** is an exploded, perspective view of the hinge, showing the various parts thereof;

FIG. **2***a* is an enlarged, transverse sectional view of the hinge of FIG. **1** in a closed position;

FIG. **2***b* is an enlarged, fragmentary, transverse sectional view of the hinge mechanism illustrating the point of pivotal engagement of the sleeve and pin;

FIG. **2***c* is an enlarged, fragmentary, transverse sectional view of the hinge mechanism in an opened position;

FIG. **3***a* is an enlarge, fragmentary, transverse sectional view of the hinge mechanism of a second embodiment of the invention in which the sleeve is connected to a door jamb and the pin is connected to a door; the hinge being in a closed position;

FIG. **3***b* is an enlarged, fragmentary, transverse sectional view of a second embodiment of the invention in accordance with FIG. **3***a* and illustrating the position of the pin and sleeve with the hinge mechanism in a partially opened position;

FIG. **3***c* is an enlarged, fragmentary, transverse sectional view of a second embodiment of the invention illustrating the hinge mechanism in opened position.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings and more particularly to FIGS. **1** and **2**, there is illustrated a door **10** and a door frame **12**. Door **10** is mounted for opening and closing movement by the aid of hinge butt **14**. The hinge butt includes a pair of hinge plates **16** and **18**. Hinge plate **16** is secured to door frame **12** by aid of a pair of wood screws (not shown) mounted in recessed screw ports **20**. Hinge plate **18** is secured to door **10** by the aid of wood screws mounted in recessed ports **22**.

In the invention as illustrated in FIGS. **1** and **2***a*–**2***c*, hinge plate **18** has upstanding bracket **24** integrally connected therewith. Hinge plate **16** has upstanding bracket **26** integrally connected therewith and disposed in parallel relation to bracket **24** when the hinge is in its normally closed position. A pair of spaced-apart axially aligned hinge knuckles **28** and **30** extend from bracket **26** so as to provide a channel therebetween.

Hinge pin **32** is vertically disposed between knuckles **28** and **30** on hinge plate **16** and extends outwardly through the knuckles. Protuberant shoulder portions **34** are spaced at both ends of the pin. Although shoulder portions are illustrated

herein as integrally associated with the pin, they may be removably associated with the pin. In any event the shoulder portion is nonrotatably mounted on the pin.

Hinge knuckles **28** and **30** have hinge pin shoulder receiving portions **36** spaced at the outer periphery of the knuckles to receive and retain the hinge pin in nonrotatable engagement so as to provide a pivotal connection between hinge plate **16** and hinge plate **18**, such that hinge pin **32** and hinge plate **16** rotate together.

As illustrated in FIG. **2***a*, hinge pin **32** has a circular transverse cross-sectional area with flattened portion **38**. The flattened portion extends the entire longitudinal axis of the pin and terminates at the shoulder portion thereof.

Hinge sleeve **40** is preferably fabricated from spring steel and is connected to bracket **24** of hinge plate **18** and is disposed in the channel between hinge knuckles **28** and **30**. As illustrated in FIGS. **1** and **2** hinge sleeve **40** has a generally upstanding portion **42** extending from bracket **24**, a generally circular portion **44** extending from said upstanding portion **42**, and a flattened portion **46** extending from the circular portion, perpendicularly toward upstanding portion **42**. The terminal portion **48** of flattened section **46** is angled downwardly from the flattened portion.

The hinge pin is force fit through the bore of the hinge sleeve such that the resilient sleeve is always in a partially flexed condition. As a result, flattened portion **46** of hinge sleeve **40** does not completely engage flattened portion **38** of pin **32** when the hinge mechanism is in a closed position. The respective flattened portions are slightly angled away from each other from a point of intersection defined by the abutting terminal ends of the flattened portions. A workable abutting angle is 2°.

As shown in FIG. **2**, flexed resilient hinge sleeve **40** exerts a torque originating at the point of pivotal engagement between the hinge and sleeve (at arrow **50**) that results in a vector of force **64** being directed to provide a positive pressure on door **10** in its closed position, which torque prevents bouncing of said door during closure and accidental opening.

Referring now to FIGS. **2***a* through **2***c*, there is illustrated the operation of the self-closing mechanism. With the door in an open position as illustrated in FIG. **2***c*, flattened portion **46** of hinge sleeve **40** wipes the arcuate surface of hinge pin **32** (see arrow **52**). At this point the sleeve is in a substantially flexed or loaded condition. Turning now to FIG. **2***b*, during closing, sleeve surface **46** wipes against hinge pin **32** until the terminal portion of flattened surface of the sleeve reaches the intersection of the hinge pin flattened surface **38** and arcuate surface (see arrow in FIG. **2***b*). At this point the hinge sleeve slidingly pivots to permit flattened sleeve surface **46** to flex inwardly and reduce the tension on the sleeve. A torque is thereby created through sleeve portion **42** and bracket **24** which swings the door toward and retains the door in its closed position.

Various changes may be made in the hinge mechanism within the scope of the invention. For example, hinge pin **32** may be key slotted to hinge knuckles **30** and **28** to prevent the pin from rotating within said knuckles. Hinge caps having internally threaded, downwardly extending shoulders may be threaded onto externally threaded ends of a hinge pin to facilitate installation. Such caps could also be force fit or otherwise affixed to the hinge pin.

A hinge sleeve may be employed in the form of spaced-apart axially aligned hinged sleeves. Such an arrangement might resemble the conventional five-knuckle hinge butt yet retain the unique features of the present invention. In this event a substantial area of the hinge pin should be enclosed by the separate hinge-sleeve knuckles. Although spring steel is the preferred material for the hinge sleeves, other resilient, but durable materials could be employed. For example, a reinforced material having a plastic memory could be employed, particularly reinforced elastomers.

In a second embodiment of the invention the hinge pin may be nonrotatingly connected to a hinge plate mounted on the door and the spring steel hinge sleeve may be associated with the hinge plate connected to the door frame. In this event during operation of the mechanism, the hinge pin would rotate within the bore of the hinge sleeve, as illustrated in FIGS. **3***a* through **3***c*. As seen in FIG. **3***a*, hinge pin **54** is nonrotatably positioned by a pair of spaced-apart hinge knuckles (not shown) as in FIG. **1**. The hinge knuckles are connected to a bracket (not shown) which, in turn, is associated with the movement of a door (not shown). Hinge sleeve **56** and hinge pin **54** are of the configuration previously described. Hinge pin **54** is connected to a bracket (not shown) which, in turn, is connected to a hinge plate affixed to a door frame (not shown).

As illustrated in FIG. **3***c*, when the hinge mechanism is in the open position spring steel hinge sleeve **56** is in an extreme state of flexure as compared to its condition in the closed state, as shown in FIG. **3***a*. During closing (see FIG. **3***b*) hinge pin **54** is rotated within the bore of the hinge sleeve until the flattened surface **58** of the hinge pin contacts the flattened surface of the hinge sleeve **60** (as indicated by arrow **62**). At this point the hinge pin is slidingly pivoted within the sleeve into its closed position (see FIG. **3***a*).

The self-closing hinge of the present invention has been described as being adapted for connection of a door to a door frame. It is not intended by the use of such language, however, to limit the principles of the present invention to such applications alone, but in addition to the various uses well known to those skilled in the art, for example, for attaching a cabinet door to a cabinet frame.

Wherefore I claim:

1. A self-closing hinge comprising:

a. first and second hinge plates;

b. bracket means connected integrally to said first hinge plate;

c. a pair of spaced-apart axially aligned knuckles connected to said bracket means forming a channel therebetween;

d. a hinge pin for pivotally connecting said first and second hinge plates, said hinge pin having a flattened portion extending along a substantial portion of its axial length, the balance of said pin having a circular configuration, said hinge pin being spaced within said channel and extending through said knuckles;

e. means for connecting said hinge pin to said knuckles such that said first hinge plate rotates with said hinge pin; and

f. a spring steel hinge sleeve connected to said second hinge plate and spaced in the channel between said knuckles, said hinge sleeve disposed about said hinge pin in at least a partially flexed condition, said sleeve having a complementary circular portion and flattened portion to said hinge pin for releasably engaging the flattened portion of said hinge pin a the hinge approaches the closed position so as to cause the hinge to shift toward and be biased in the closed position.

2. The invention in accordance with claim **1** wherein the hinge pin has a protruding shoulder at each end thereof, the flattened portion of said hinge pin extending the axial length of the pin terminating at the shoulders of the pin, the balance of the pin having a circular configuration and wherein each of said knuckles has a complementary cutaway portion for receiving and nonrotatably retaining said hinge pin.