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(54) Title: ELECTRICAL SWITCHING APPARATUS INCLUDING OPERATING HANDLE WITH DAMPENING MEMBER

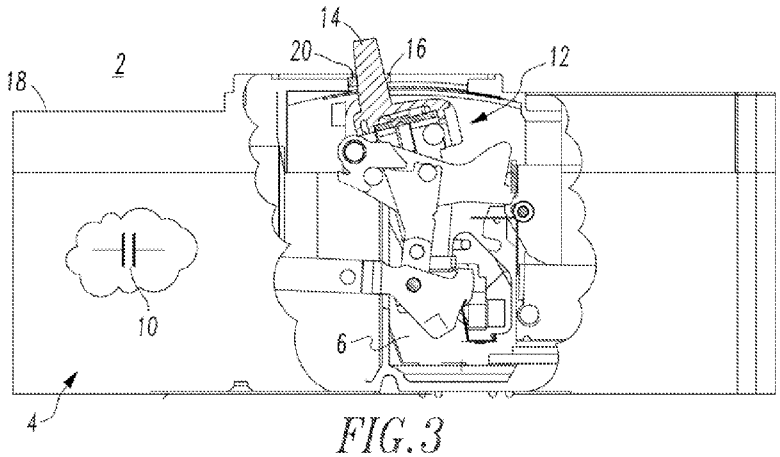


FIG. 3

(57) Abstract: An electrical switching apparatus (2) includes a housing (4) having an interior (6) and an opening (8), separable contacts (10), and an operating mechanism (12) structured to open and close the separable contacts. The operating mechanism includes an operating handle (14) extending from the interior of the housing and through the opening of the housing. A dampening member (16) is disposed on the operating handle. The dampening member is structured to engage the housing at the opening thereof when the operating handle moves to at least one of an "ON" position and a "RESET" or "OFF" position.

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ELECTRICAL SWITCHING APPARATUS INCLUDING OPERATING HANDLE WITH DAMPENING MEMBER

CROSS-REFERENCE TO RELATED APPLICATION

This application claims priority from and claims the benefit of U.S. Patent Application Serial No. 13/916,781, filed June 13, 2013, which is incorporated by reference herein.

BACKGROUND

Field

The disclosed concept pertains generally to electrical switching apparatus and, more particularly, to electrical switching apparatus, such as, for example, circuit interrupters, which include an operating handle.

Background Information

Electrical switching apparatus, such as circuit interrupters, provide protection for electrical systems from electrical fault conditions such as, for example and without limitation, current overloads, short circuits, abnormal voltage and other fault conditions. Typically, circuit interrupters include an operating mechanism which opens a number of electrical contact assemblies to interrupt the flow of current through the conductors of an electrical system in response to such fault conditions as detected, for example, by a trip mechanism, such as a trip unit.

Circuit interrupters, such as circuit breakers, are generally old and well known in the art. Circuit breakers include, for example, at least one set of separable contacts disposed within a non-conductive housing. Typically, there is a fixed contact coupled to the housing and a movable contact coupled to the operating mechanism. The operating mechanism includes a movable operating handle that extends outside of the housing. Movement of the separable contacts is accomplished by the operating mechanism.

In some areas of use, the operating handle of a molded case circuit breaker gets pushed relatively hard by a user when switched to an "ON" position or to a "RESET" or "OFF" position than was intended. This occurs when the user toggles the operating handle with excessive force and it goes beyond the toggle position. The additional force at the end of toggle travel of the operating handle creates a relatively high impact loading when the operating handle reaches the travel limit, which

typically is the top of the cover of the molded case. This is a dead stop to the cycling of the operating handle. The impact force is such that the plastic molded handle yields to the impact forces and the operating handle can fail mechanically.

There is room for improvement in electrical switching apparatus, such as, for example, circuit interrupters, which include an operating handle.

SUMMARY

These needs and others are met by embodiments of the disclosed concept in which a dampening member is structured to engage an electrical switching apparatus housing at an opening thereof when an operating handle moves to at least one of an "ON" position and a "RESET" or "OFF" position.

In accordance with one aspect of the disclosed concept, an electrical switching apparatus comprises: a housing including an interior and an opening; separable contacts; an operating mechanism structured to open and close the separable contacts, the operating mechanism including an operating handle extending from the interior of the housing and through the opening of the housing; and a dampening member disposed on the operating handle, the dampening member being structured to engage the housing at the opening thereof when the operating handle moves to at least one of an "ON" position and a "RESET" or "OFF" position.

As another aspect of the disclosed concept, a circuit interrupter comprises: a housing including an interior and an opening; separable contacts; an operating mechanism structured to open and close the separable contacts, the operating mechanism including an operating handle extending from the interior of the housing and through the opening of the housing; and an elastic dampening member disposed on the operating handle, the elastic dampening member being structured to engage the housing at the opening thereof when the operating handle moves to at least one of an "ON" position and a "RESET" or "OFF" position.

BRIEF DESCRIPTION OF THE DRAWINGS

A full understanding of the disclosed concept can be gained from the following description of the preferred embodiments when read in conjunction with the accompanying drawings in which:

Figure 1 is an isometric view of a circuit breaker in an "ON" position in accordance with embodiments of the disclosed concept.

Figure 2 is an isometric view of the circuit breaker of Figure 1 in a "RESET" or "OFF" position.

Figures 3 and 4 are vertical elevation views of the circuit breakers of Figures 1 and 2, respectively, with some parts cut away to show internal structures.

Figure 5 is an isometric view of the operating handle, dampening member and opening of Figure 1.

Figure 6 is an isometric view of an operating handle and dampening member in accordance with another embodiment of the disclosed concept.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

As employed herein, the term "number" shall mean one or an integer greater than one (*i.e.*, a plurality).

As employed herein, the term "dampening" and variations thereof shall mean reducing, checking, diminishing or absorbing the activity, vigor, force or loading of impact, contact or engagement between a housing of an electrical switching apparatus and an operating handle thereof.

As employed herein, the statement that two or more parts are "connected" or "coupled" together shall mean that the parts are joined together either directly or joined through one or more intermediate parts.

The disclosed concept is described in association with a circuit breaker, although the disclosed concept is applicable to a wide range of electrical switching apparatus, which include an operating handle.

Referring to Figures 1-4, an electrical switching apparatus 2 (e.g., without limitation, a circuit interrupter, such as the example molded case circuit breaker) includes a housing 4 having an interior 6 and an opening 8, separable contacts 10 (shown in block form in Figures 3 and 4), and an operating mechanism 12 structured to open and close the separable contacts 10. The operating mechanism 12 includes an operating handle 14 extending from the housing interior 6 and through the opening 8. A dampening member 16 is disposed on the operating handle 14 and is structured to engage the housing 4 at the opening 8 thereof when the operating handle 14 moves to at least one of an "ON" position (Figures 1 and 3) and a "RESET" or "OFF" position (Figures 2 and 4). In this example, the dampening member 16 engages the housing 4 at the opening 8 thereof in each of those positions.

Figures 1 and 3, and Figures 2 and 4, show the extreme positions of the operating handle 14 in the "ON" position, and the "RESET" or "OFF" position, respectively. A "TRIP" position (not shown) of the operating handle 14 is a position of travel between the two extreme positions, although the disclosed concept is applicable to electrical switching apparatus that do not include a "TRIP" position. Also, some electrical switching apparatus do not include a "RESET" position, while other electrical switching apparatus include an "OFF" position that is slightly offset from an extreme "RESET" position.

The dampening member 16 is structured to engage the housing 4 at the opening 8 thereof in order to reduce impact loading to the operating handle 14 by absorbing impact force when the dampening member 16 impacts the housing 4. The housing 4 further includes a cover 18 defining a predetermined travel stop 20 or 21 of the operating handle 14. As the operating handle 14 approaches the predetermined travel stop 20 (Figure 3) or 21 (Figures 2 and 4), the dampening member 16 first makes contact with the predetermined travel stop 20 or 21 and dampens an impact load to the operating handle 14.

The dampening member 16 increases a time it takes for the operating handle 14 to reach a dead stop at or about the predetermined travel stop 20 or 21.

The dampening member 16 is structured to have no effect on switching of the separable contacts 10 by the operating mechanism 12.

Referring to Figure 5, the operating handle 14, the dampening member 16 and the housing opening 8 of Figure 1 are shown. Preferably, a suitable elastic dampening member, such as an example elastic polymer ring 22, is made of a suitable shock absorbing material that also has relatively high temperature and dielectric strength characteristics. A non-limiting example material is a Sorbothane® visco-elastic polymer. The example elastic polymer ring 22 reduces the impact loading to the operating handle 14 by absorbing the impact force. This addition of the example elastic polymer ring 22 has no effect on the internal portion of the operating mechanism 12 or the switching of the circuit breaker separable contacts 10.

The disclosed example operating handle 14 includes the example elastic polymer ring 22 disposed thereon at or about the external portion of the base of the handle 14. This provides a dampening effect when the ring 22 impacts the circuit

breaker housing 4, such as the cover 18 (Figures 1 and 2) of a molded case 23 (Figures 1 and 2). As the handle 14 approaches the predetermined travel stop 20 (Figure 3), the ring 22 first makes contact and dampens the impact load, thereby preventing damage to the handle 14, which is made, for example and without limitation, of plastic. The ring 22 is structured to engage the housing 4 at the opening 8 thereof in order to provide a dampening effect when the elastic polymer ring 22 impacts the housing 4.

As can be seen in Figure 5, the operating handle 14 includes a number of notches 24 (in this example, one circular notch 24 is shown about the operating handle 14) to contain the elastic polymer ring 22. The elastic polymer ring 22 is contained on the operating handle 14 by tension of the ring 22 and is held in place by the example notch 24. For example, the notch 24 is proximate the housing opening 8 and is structured to hold and contain the elastic polymer ring 22.

Alternatively, the operating handle 14 is a molded member with a suitable notch geometry in order to hold and contain the example elastic polymer ring 22 or another suitable dampening member (not shown).

Figure 6 shows another operating handle 14′ and the dampening member 16 of Figure 1. In this example, a conventional operating handle (not shown) can be modified such that the example elastic polymer ring 22 is inserted and contained at or about the external portion of the base of the handle 14′. For example, notches 26 can be added to the handle 14 at each of the corners 28 as a secondary operation following the molding of the handle 14′. The elastic polymer ring 22 is contained on the handle 14′ by tension of the polymer ring 22 and is held in place by the example fitted notches 26. In this example, the operating handle 14′ is modified with the notches 26 proximate the housing opening 8 (Figures 1 and 3). The notches 26 are structured to hold and contain the ring 22. Here, the molded operating handle 14′ includes four corners 28, and four of the notches 26 are included on the molded operating handle, one of the four notches 26 at each of the four corners 28.

The disclosed electrical switching apparatus 2 includes a suitable circuit interrupter mechanism, such as the separable contacts 10 that are opened and closed by the operating mechanism 12, although the disclosed concept is applicable to a wide range of circuit interruption mechanisms (e.g., without limitation, contactor or

switch contacts) and/or operating mechanisms (e.g., without limitation, electro-mechanical or mechanical mechanisms).

While specific embodiments of the disclosed concept have been described in detail, it will be appreciated by those skilled in the art that various modifications and alternatives to those details could be developed in light of the overall teachings of the disclosure. Accordingly, the particular arrangements disclosed are meant to be illustrative only and not limiting as to the scope of the disclosed concept which is to be given the full breadth of the claims appended and any and all equivalents thereof.

What is Claimed is:

1. An electrical switching apparatus (2) comprising:

a housing (4) including an interior (6) and an opening (8);

separable contacts (10);

an operating mechanism (12) structured to open and close said separable contacts, said operating mechanism including an operating handle (14) extending from the interior of said housing and through the opening of said housing; and

a dampening member (16) disposed on said operating handle, said dampening member being structured to engage said housing at the opening thereof when said operating handle moves to at least one of an "ON" position and a "RESET" or "OFF" position.

2. The electrical switching apparatus (2) of Claim 1 wherein said electrical switching apparatus is a circuit interrupter (2) or a molded case circuit breaker (2).

3. The electrical switching apparatus (2) of Claim 1 wherein said dampening member is structured to engage said housing at the opening thereof when said operating handle moves to said "ON" position and when said operating handle moves to said "RESET" or "OFF" position.

4. The electrical switching apparatus (2) of Claim 1 wherein said dampening member is an elastic polymer ring (22) disposed on said operating handle.

5. The electrical switching apparatus (2) of Claim 4 wherein said elastic polymer ring is structured to engage said housing at the opening thereof in order to provide a dampening effect when said elastic polymer ring impacts said housing.

6. The electrical switching apparatus (2) of Claim 4 wherein said operating handle (14;14′) includes a number of notches (24;26) to contain said elastic polymer ring.

7. The electrical switching apparatus (2) of Claim 6 wherein said elastic polymer ring is contained on said operating handle by tension of said elastic polymer ring and is held in place by said number of notches.

8. The electrical switching apparatus (2) of Claim 6 wherein said operating handle is a molded member (14) with a notch (24) proximate the opening of said housing, said notch being structured to hold and contain said elastic polymer ring.

9. The electrical switching apparatus (2) of Claim 1 wherein said dampening member is structured to engage said housing at the opening thereof in order to reduce impact loading to said operating handle by absorbing impact force when said dampening member impacts said housing.

10. The electrical switching apparatus (2) of Claim 1 wherein said housing further includes a cover (18) defining a predetermined travel stop (20,21) of said operating handle; and wherein as said operating handle approaches the predetermined travel stop, said dampening member first makes contact with said predetermined travel stop and dampens an impact load to said operating handle.

11. The electrical switching apparatus (2) of Claim 10 wherein said dampening member increases a time it takes for said operating handle to reach a dead stop at or about the predetermined travel stop; or wherein said dampening member is structured to have no effect on switching of said separable contacts by said operating mechanism.

12. The electrical switching apparatus (2) of Claim 1 wherein said operating handle (14′) is modified with a plurality of notches (26) proximate the opening of said housing, said notches being structured to hold and contain said dampening member.

13. The electrical switching apparatus (2) of Claim 12 wherein said operating handle is a molded operating handle (14′) including four corners (28); and wherein four of said notches (26) are included on said molded operating handle, one of said four notches at each of said four corners.

14. The electrical switching apparatus (2) of Claim 1 wherein said dampening member is made of a shock absorbing material or a Sorbothane® visco-elastic polymer.

15. The electrical switching apparatus (2) of Claim 2 wherein said electrical switching apparatus is said circuit interrupter (2); and wherein said dampening member (16) is an elastic dampening member (16).

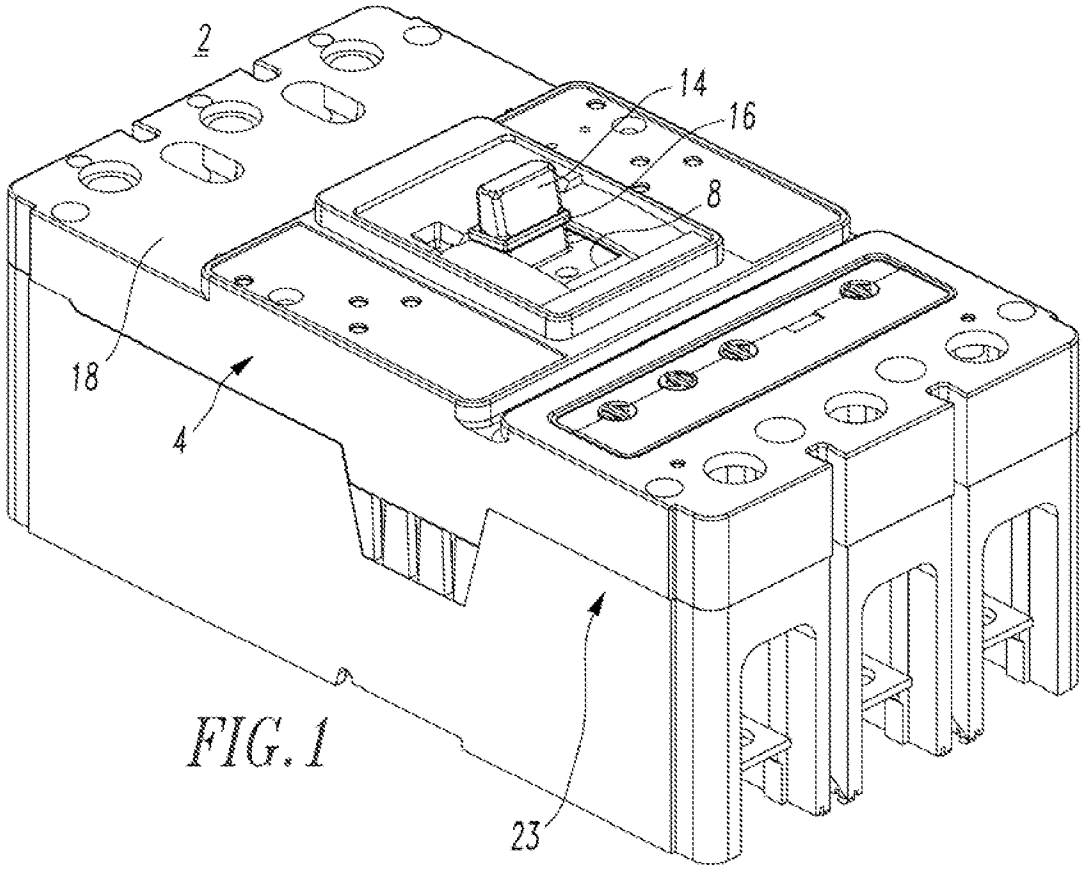


FIG. 1

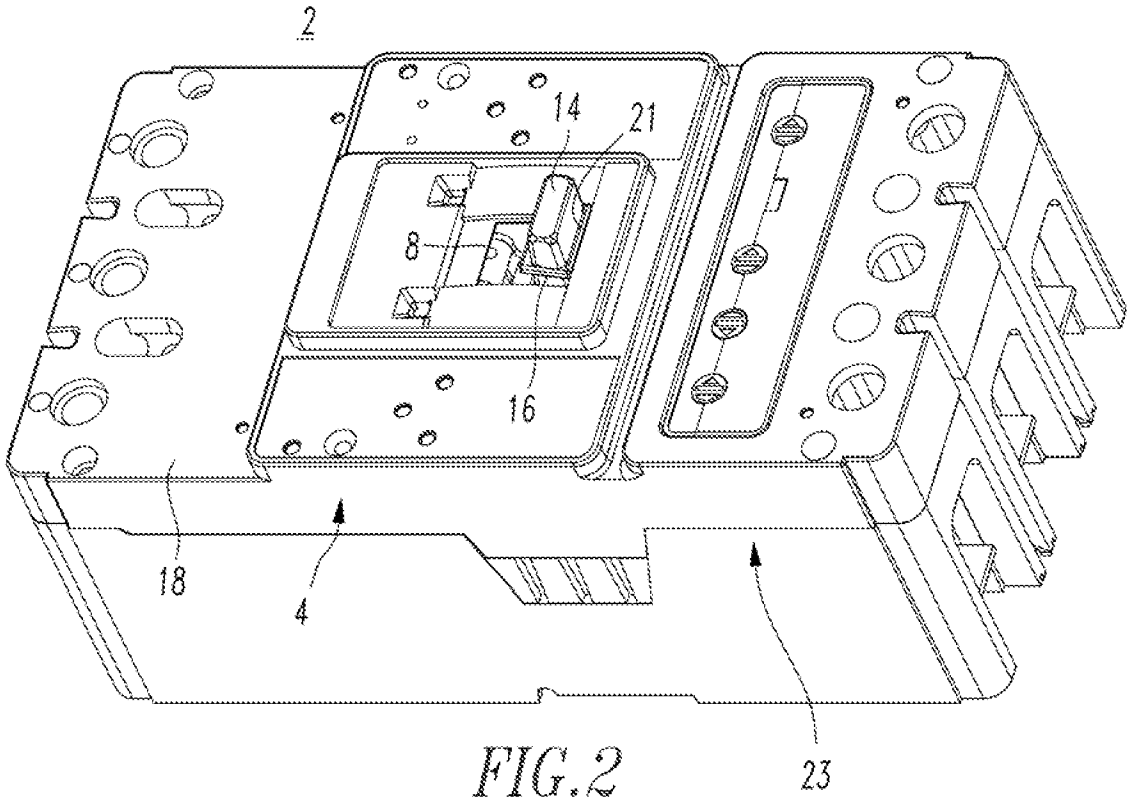


FIG. 2

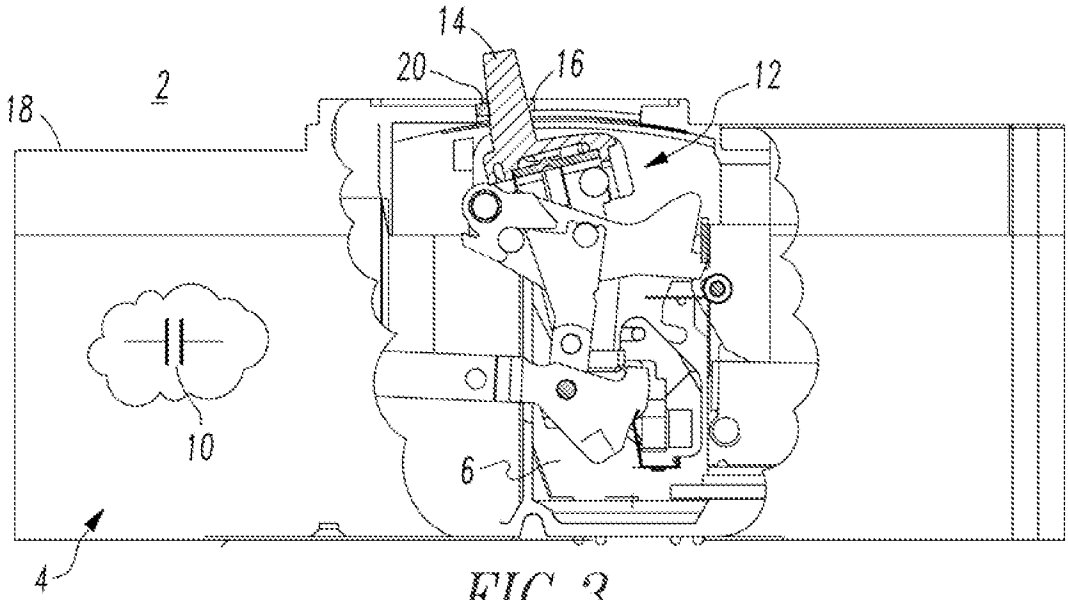


FIG.3

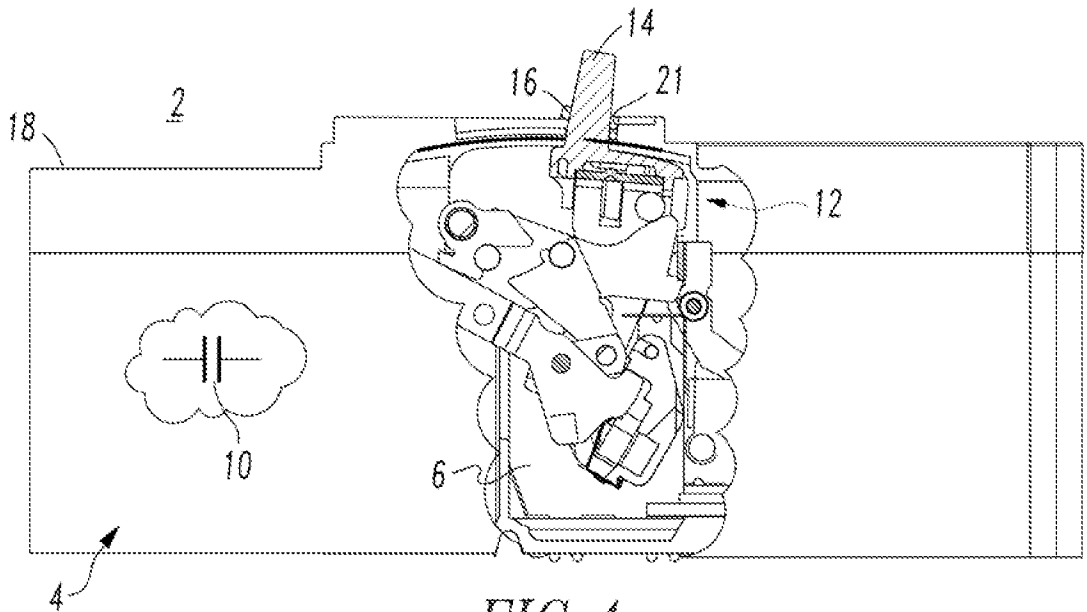


FIG.4

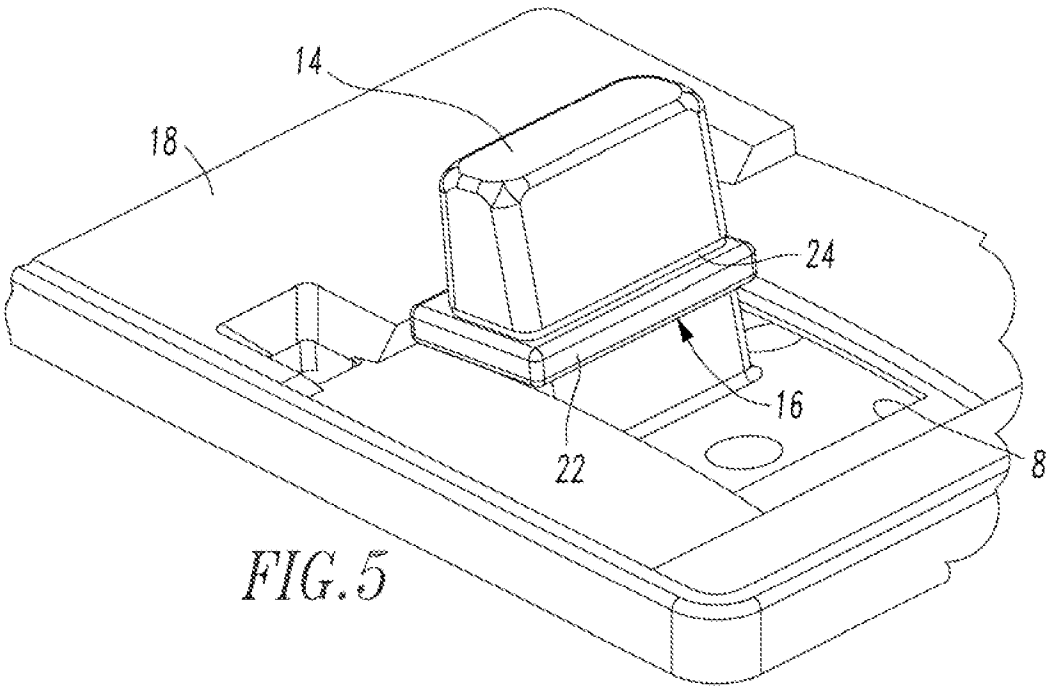


FIG.5

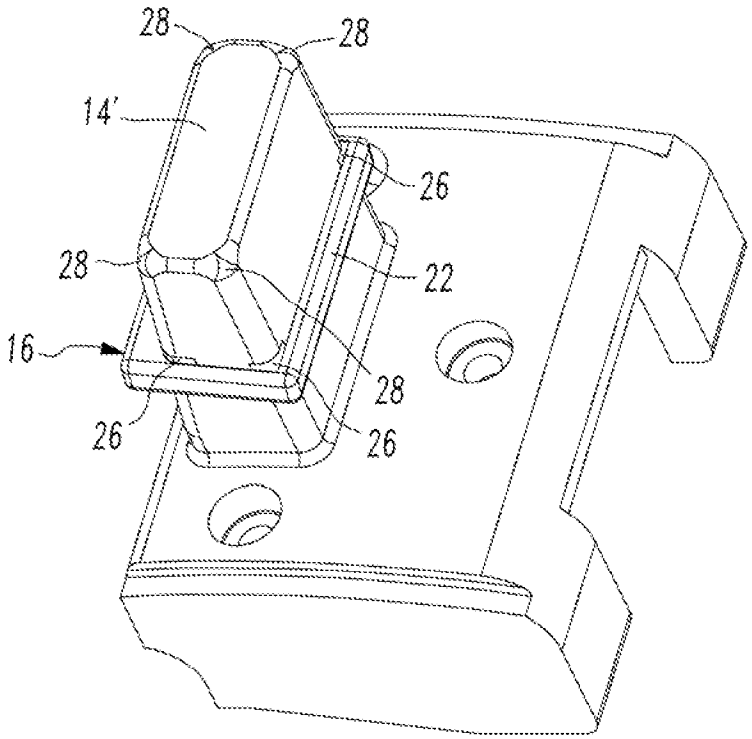


FIG.6

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2014/032451

A. CLASSIFICATION OF SUBJECT MATTER
INV. H01H3/60 H01H71/52
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H01H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 1 940 716 A (HUBBELL JR HARVEY) 26 December 1933 (1933-12-26) page 1, lines 1-11, 49-71; figures 1-4 page 1, line 108 - page 2, line 64	1-9, 11-15
Y	US 5 027 095 A (MCKAY GEOFFREY H [US] ET AL) 25 June 1991 (1991-06-25) column 2, lines 28-56; figures 1, 5, 6 column 3, line 20 - column 4, line 28	1,10
Y	US 4 626 811 A (MCKEE JERE L [US] ET AL) 2 December 1986 (1986-12-02) column 1, lines 12-22	1,10
A	US 6 420 669 B1 (SHENKER DAVID [US] ET AL) 16 July 2002 (2002-07-16) column 2, line 42 - column 3, line 5; figures 5A, 5C	1-15

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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Date of the actual completion of the international search	Date of mailing of the international search report
2 July 2014	09/07/2014

Name and mailing address of the ISA/	Authorized officer
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2014/032451

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 1940716 A	26-12-1933	NONE	
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