

Jan. 30, 1973

J. H. LEONARD ET AL

3,714,383

KEY OPERATED ELECTRIC CIRCUIT BREAKER

Filed Oct. 27, 1971

3 Sheets-Sheet 1

FIG. 1

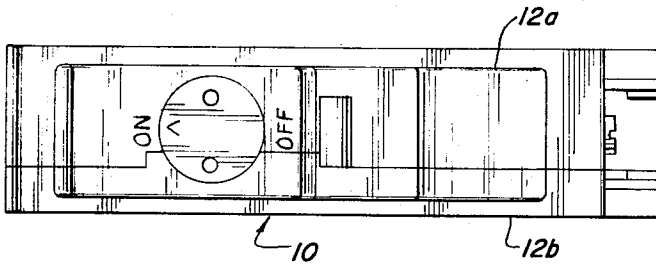


FIG. 3

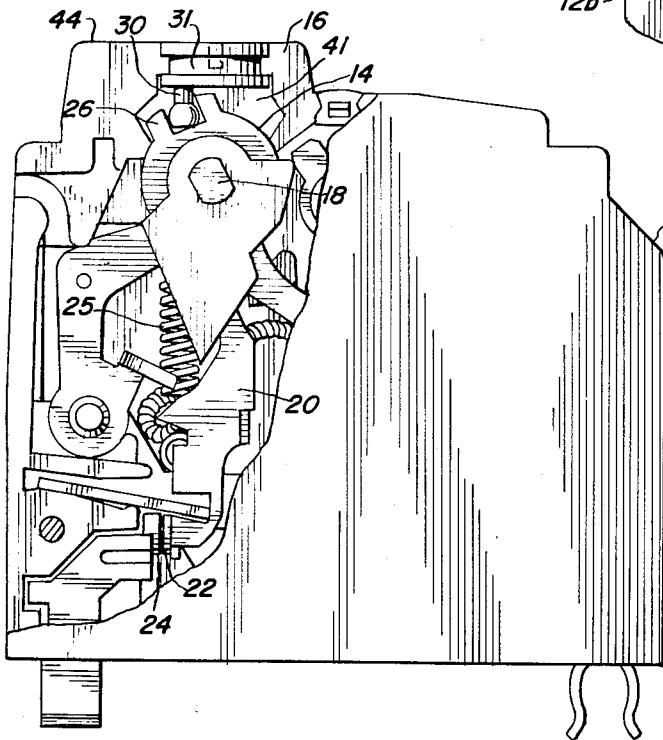
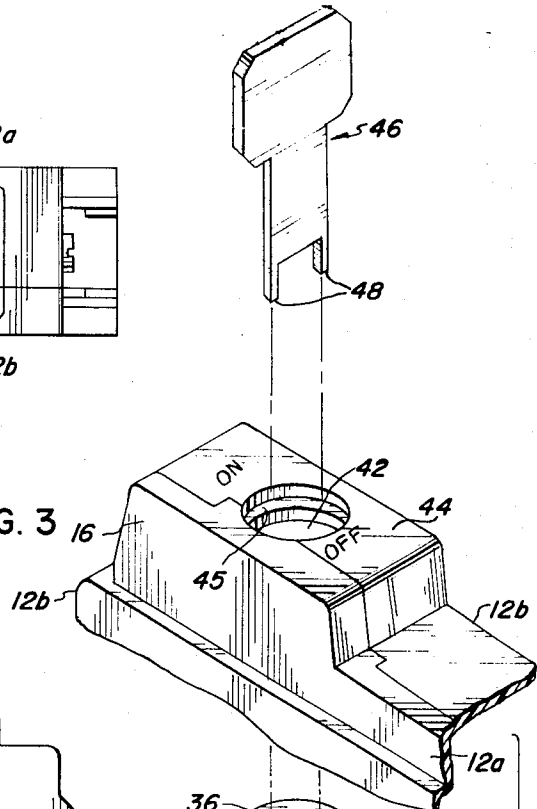
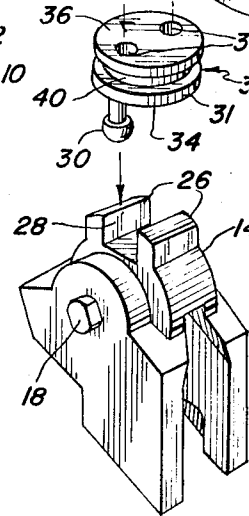


FIG. 2



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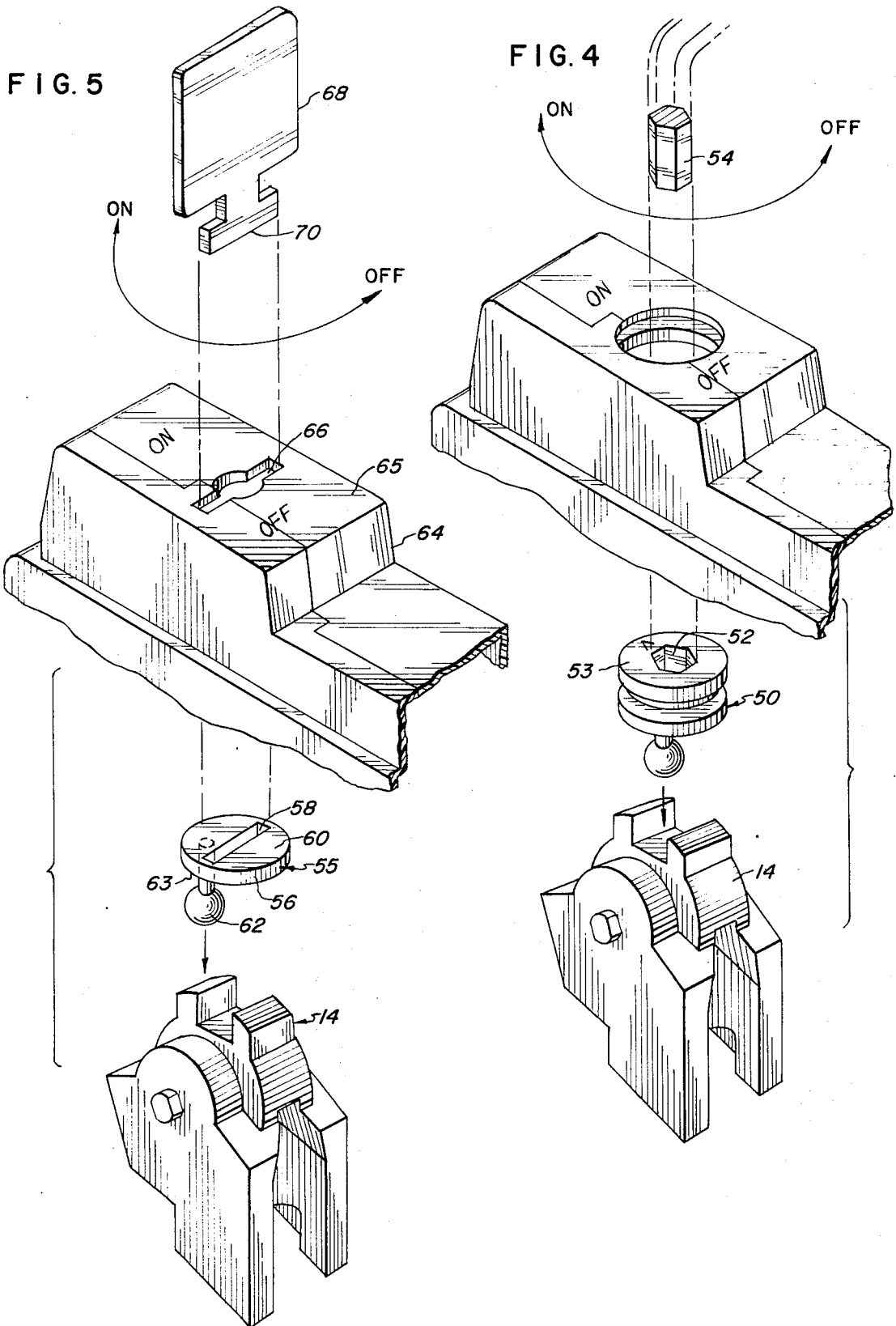
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FIG. 7

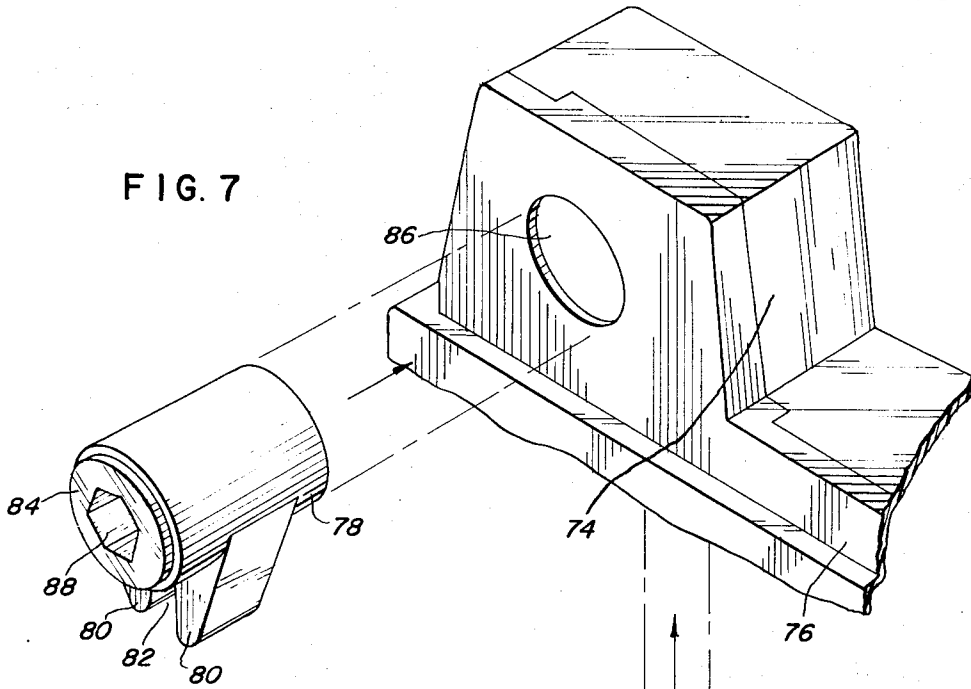
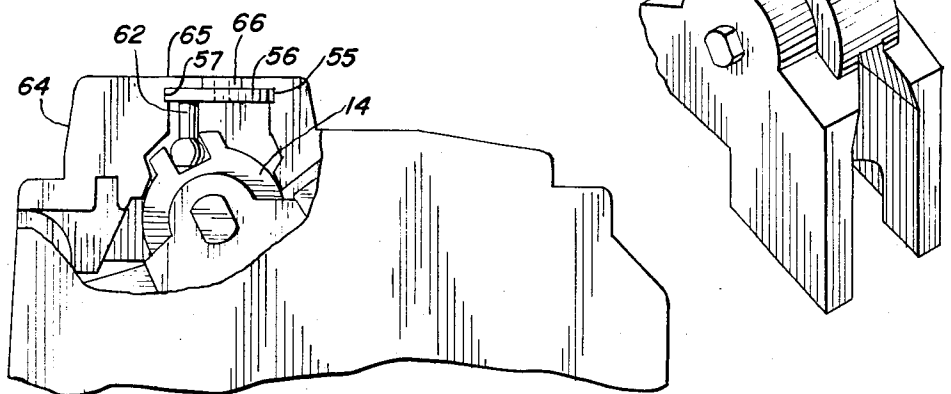


FIG. 6



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KEY OPERATED ELECTRIC CIRCUIT BREAKER
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U.S. Cl. 200-44

7 Claims

ABSTRACT OF THE DISCLOSURE

A movable contact arm of the circuit breaker is arranged to be moved selectively to ON and OFF positions by a key or tool which rotates an actuating member having an eccentric pin which actuates a driving member for the contact arm.

This invention relates generally to key-operated electric switches or circuit breakers, and more particularly to a circuit breaker having a rotatable actuator turnable only by a key, or by either a key or tool, for operating a movable contact arm by means of a rockable driving member.

In prior key operated switches having a rockable driving member for a movable contact arm, a key inserted through an elongated slot engages the driving member of the switch, and rocking motion of the key lengthwise of the slot is imparted to the driving member to move the contact arm selectively to ON and OFF positions. Consequently, it is possible to operate such prior switches by means of a screwdriver or other readily available tool as well as by a key. Under circumstances where access to the breaker operating mechanism should be limited, it is desirable that the circuit breaker be operable only by a key. Should no restrictions on accessibility be necessary, it might be preferable that the breaker mechanism be operable either by a tool or a key. Therefore, for greater versatility, it is desired to provide means turnable only by a key, or with slight modification, turnable by either a key or tool.

In accordance with this invention, an eccentric pin of a rotatable actuating member engages a rockable driving member which moves a contact arm of a switch upon rotation of the actuating member. The actuating member thus operates as a motion converter between a key or a tool and the driving member to convert rotary motion of the key or tool into the rocking motion required to move the contact arm selectively to ON and OFF positions. The actuating member may be arranged to be operated only by a key, or by either a tool or key as desired.

It is an object of this invention to provide an improved key-operated or tool-operated circuit breaker.

Another object is to provide an improved circuit breaker or toggle switch in which a rotatable actuating member interposed between a driving member for a contact arm of the circuit breaker or switch and the key or tool translates rotary motion of the key or tool into the rocking motion required of the driving member to move a contact arm of the circuit breaker or switch selectively to ON and OFF positions.

BRIEF DESCRIPTION OF THE DRAWINGS

Further objects and advantages of this invention will become apparent when the following specification is considered, along with the accompanying drawings, in which:

FIG. 1 is a top view of a key-operated circuit breaker constructed in accordance with this invention;

FIG. 2 is a side elevational view, partially in section,

of the circuit breaker of FIG. 1, with portions broken away;

FIG. 3 is a fragmentary exploded view of the circuit breaker of FIGS. 1 and 2;

FIG. 4 is a fragmentary exploded view similar to FIG. 3, but illustrating a modified embodiment of the invention in which a circuit breaker like that of FIGS. 1, 2, and 3, is arranged for operation by a tool;

FIG. 5 is a fragmentary exploded view similar to FIG. 3, but illustrating a further embodiment of the invention;

FIG. 6 is a fragmentary side elevational view of the embodiment of FIG. 5, with portions broken away; and

FIG. 7 is a fragmentary exploded view similar to FIG. 3, but illustrating still another embodiment of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

With reference to FIGS. 1 to 3, a molded case circuit breaker 10 is shown. The circuit breaker 10 may be similar to that disclosed in U.S. Pat. No. 2,902,560, issued Sept. 1, 1959. Such prior circuit breakers have a handle with a portion protruding through the casing for turning the circuit breaker selectively to ON and OFF positions, and reference may be made to the patent for a complete description of the inside mechanism of the circuit breaker.

The circuit breaker 10 has a molded case 12 including a base 12a and a cover 12b and encloses the usual operating mechanism, but the handle of the prior circuit breakers is replaced by a rockable driving member 14 extending into a raised portion 16 of the case 12 and pivotally mounted in the base 12a and cover 12b by a pair of integral trunnions 18. A movable contact arm 20 carrying a movable contact 22 is moved into and out of engagement with a stationary contact 24 by a tension spring 25 upon rocking motion of the driving member 14. Extending upwardly from a curved upper surface of the driving member 14 is a pair of spaced projections 26 which define a channel-shaped recess 28 therebetween. The recess 28 receives a ball-shaped outer end portion of a driving pin 30 extending eccentrically from a disc-shaped body 31 of a rotatable actuating member 32.

The disc-shaped body 31 of the member 32 is mounted for rotary movement about a vertical axis as viewed in FIG. 2 and has opposite planar inner and outer end faces 34 and 36. The pin 30 extends eccentrically from the inner end face 34 and a pair of key-receiving recesses 38 are formed in the outer end face 36. The body 31 of the member 32 also has a circumferential groove 40 disposed midway between the end faces 34 and 36.

Within the raised portion 16 of the case 12 is a cavity 41 in which the member 32 is rotatably mounted. The cavity 41 accommodates the rocking motion of the driving member 14 and extends outwardly to an opening 42 which passes through an upper wall 44 of the raised portion 16. The opening 42 has a circumferential ridge 45 located at the mid-thickness of the wall 44, and upon assembly of the base 12a and cover 12b, the ridge 45 is received in the groove 40 of the body 31 of the member 32 and retains the member 32 for free rotary movement about the vertical axis of the body 31.

A key 46 has two prong portions 48 respectively receivable in the recesses 38 in the outer end face 36 of the member 32. When the prong portions 48 are inserted into the recesses 38 and a rotary motion is imparted to the key 46, the member 32 operates as a motion converter translating the rotary motion of the key 46 into rocking motion of the driving member 14 required to effect movement of the contact arm 20 by the spring 25 to ON or OFF position through engagement of the eccentrically mounted pin 30 of the member 32 with the projections 26 of the driving member 14.

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In the embodiment of FIG. 4 the actuating member 32 of FIG. 3 is replaced by a similar actuating member 50 having a hexagonal recess 52 in an outer end face 53 which receives a tool, such as an Allen wrench 54, for rotating the actuating member 50 and thus operating the contact arm as in the embodiment of FIGS. 1 to 3.

In the embodiment of FIGS. 5 and 6, an actuating member 55 comprises a wafer-shaped body 56 having a diametrical slot 58 in an outer end face 60 and a pin 62 eccentrically mounted on an inner end face 63. The driving member 14 and the actuating member 55 are enclosed in a raised portion 64 of a casing which receives the member 55 in an annular recess 57 (FIG. 6) in an upper wall 65 of the raised portion 64. The member 55 is freely rotatable in the recess 57 in the raised portion 64 of the casing. A longitudinal opening 66 in the upper wall 65 of the raised portion 64 of the casing provides access to the slot 58 of the member 55. A key 68 having a T-shaped actuating prong 70 is insertible in the slot 58 for rotating the member 55 and thus operating the contact arm as in the embodiment of FIGS. 1 to 3. The actuating member 55 cannot be operated by a readily available tool.

In the embodiment of FIG. 7 a cylindrical contact arm driving member 72 has a single projection 73 extending outwardly from a flattened upper surface thereof. The driving member 72 is enclosed by a raised portion 74 of a casing 76 for a circuit breaker. Also contained within the raised portion 74 of the casing 76 is a generally cylindrical actuating member 78. The member 78 has a pair of spaced projections 80 extending downwardly from the cylindrical surface thereof to define a recess 82 therebetween. The recess 82 receives the projection 73 of the driving member 72. Substantially aligned with an end face 84 of the member 78 is an opening 86 in the raised portion 74 of the casing 76. The end face 84 of the member 78 is provided with a hexagonal recess 88 therein for reception of a tool, such as an Allen wrench 54 as shown in FIG. 4. It is obvious that other configurations of recesses can be provided instead of the hexagonal recess 88 to necessitate use of a key to turn the member 78.

The member 78 operates as a motion converter, converting the rotary motion of the Allen wrench 54 into rocking motion of the driving member 72 required to move the contact arm of the circuit breaker to ON or OFF position through engagement of the projections 80 of the member 78 with the projection 73 of the driving member 72.

We claim:

1. An electric circuit breaker comprising a molded case, a movable contact arm in the case, a one-piece driving member pivotally mounted in the case and pivoting about a first pivotal axis in opposite directions to effect movement of the contact arm selectively to ON and OFF positions, and a one-piece actuating member pivotally mounted in the case and pivoting about a second pivotal axis perpendicular to the first pivotal axis, the actuating mem-

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ber having an outer face having at least a portion exposed for access from the exterior of the case, said member having mutually interlocking portions to cause pivoting of the driving member upon pivoting of the actuating member, and said exposed portion of said outer face including means engageable by a manually operable actuating means for pivoting the actuating member thereby.

2. A circuit breaker as claimed in claim 1 wherein the actuating member comprises a body portion having an inner end face and said outer face, and the interlocking portions include a recess in the driving member and a driving pin extending from the inner end face eccentrically of the pivot axis of the actuating member and received in the recess.

3. A circuit breaker as claimed in claim 1 wherein the case has an upper wall having a circular opening therein defining a cylindrical wall surface, the actuating member has a cylindrical body portion rotatably received in the opening, one of said wall surface and said body portion has a circumferential groove therein, and the other of said wall surface and said body portion has a circumferential ridge receive in the groove to restrain the actuating member against axial movement.

4. A circuit breaker as claimed in claim 1 wherein the case has an upper wall having a circular opening defining a cylindrical wall surface, the actuating member has a body portion comprising a cylindrical wafer, the wall surface has a circumferential groove therein, and the body portion of the actuating member is received in the circumferential groove to restrain the actuating member against axial movement.

5. A circuit breaker as claimed in claim 1 wherein the actuating member has a pair of recesses in said outer face for receiving a pair of actuating prongs of a key.

6. An electric circuit breaker as claimed in claim 1 wherein the case has an upper wall having an opening therein, an upper portion of the case beneath the upper wall has a cavity therein, the actuating member has a body portion retained within said cavity, and the outer face of the actuating member has a recess therein aligned with the opening in the upper wall and engageable by said manually operable actuating means.

7. A circuit breaker as claimed in claim 6, wherein the upper wall of the case covers the outer face of the actuating member exclusive of the recess.

References Cited

UNITED STATES PATENTS

1,825,325	9/1931	Millermaster et al.	200—42 T
3,075,396	1/1963	Smith	200—172 A

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U.S. CI. X.R.

200—172 A, 42 T