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54 A circuit breaker, preferably but not exclusively a double-pole circuit breaker, for mounting on enclosed box carrier frames of civil ranges of electric equipment.

57 A circuit breaker (1) for mounting on enclosed box carrier frames of civil ranges of electric equipment, such as the MAGIC, LIVING, TEKNE ranges and the like models, is simple construction-wise and suitable for automated assembling and comprises a supporting core member (2) for circuit breaking linkages (24), a plurality of cheek pieces (5,6,10,11,12,13) each provided with means (5a,6a,10a,11a,12a,13a) of attachment to a carrier frame from a respective civil range, and means (7) of fastening each cheek piece (5,6,10,11,12,13) to the core member (2).

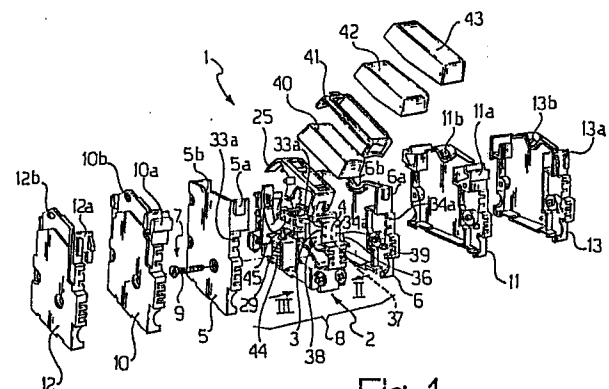


Fig-1

Description

This invention relates to a circuit breaker intended for mounting on enclosed box carrier frames of civil ranges of electric equipment, such as the MAGIC, LIVING, TEKNE ranges and the like models.

It has become common practice to fit dwelling areas with electric equipment mounted within an enclosed box which is adapted to accommodate -- secured to a small carrier frame therein -- a number of electric system components, specifically circuit breakers.

Also known is that the related branch of the industry provides several civil ranges of equipment which are basically all alike but may show some differences in point of detail, both as regards dimensions and shapes, and the design of their carrier frames and circuit breakers. The civil MAGIC, LIVING, and TEKNE civil ranges manufactured and sold by the Applicant may be taken as exemplary of this situation.

Owing to such differences, the problem arises that a circuit breaker production has to be split into several batches, each of limited volume. Accordingly, manufacture is penalized by difficulties which ultimately reflect in heavier costs.

It is the object of this invention to provide a circuit breaker of the type specified above, which has such constructional and operational features as to obviate the above-mentioned shortcomings.

This object is achieved by a circuit breaker as indicated being characterized in that it comprises a supporting core member for circuit breaking linkages, a plurality of cheek pieces, each provided with means of attachment to a carrier frame from a respective civil range, and means of fastening each cheek piece to the core member.

Further features and the advantages of the circuit breaker according to this invention will become apparent from the following detailed description of a preferred embodiment thereof, given by way of illustration and not of limitation with reference to the accompanying drawings, where:

Figure 1 is an exploded perspective view of a circuit breaker according to the invention;

Figure 2 is a perspective detail view of the circuit breaker shown in Figure 1, as viewed in the direction of the arrow II;

Figure 3 is an elevation detail view of the circuit breaker shown in Figure 1, as viewed in the direction of the arrow III;

Figure 4 is an elevation view of the same detail as shown in Figure 3 but at a different operating stage thereof; and

Figure 5 is an enlarged scale plan view of another detail of the circuit breaker of Figure 1.

With reference to the drawing figures, the numeral 1 designates generally a circuit breaker according to this invention, as intended for mounting on a small carrier frame, omitted from the drawing, within an enclosed type box for a civil electric equipment range. Understandably, such circuit breakers as this would also lend themselves for jutting installations

and incorporation to exchanges.

The circuit breaker 1 of this invention comprises a core member 2 of substantially parallelepipedal shape which is formed of a substantially rectangular central diaphragm 3 bounded by a framing member 4 along one side and both sides adjoining said one side. The circuit breaker 1 further comprises a pair of cheek pieces, namely a first cheek piece 5 and second cheek piece 6, and fasteners 7 for securing the cheek pieces 5 and 6 on the core member 2, thereby a box-type body 8 is formed which is suitable for mounting on a carrier frame from the MAGIC civil range and constitutes a module, its cross dimensions measuring preferably 23 to 25 mm. To this aim, the cheek pieces 5 and 6 are provided with attachment means, respectively indicated at 5a and 6a, in the form of preset size blocks adapted to engage with mating attachment means associated with the MAGIC range carrier frame.

The fasteners 7 for securing the cheek pieces 5 and 6 on the core member 2 comprise four screws 9 extending from the cheek piece 5 through the core member 2 to threadably engage in the cheek piece 6.

The circuit breaker 1 also comprises a further pair of cheek pieces 10 and 11, respectively interchangeable with the cheek pieces 5 and 6 in the first-mentioned pair and having like fasteners 7. In this instance, the circuit breaker 1 would fit a carrier frame from the LIVING civil range. To this aim, the cheek pieces 10 and 11 are provided with respective attachment means 10a and 11a in the form of blocks of a preset size and adapted to engage with mating means of attachment associated with a carrier frame from the LIVING range.

The circuit breaker 1 additionally comprises a further pair of cheek pieces 12 and 13, also respectively interchangeable with the cheek pieces 5 and 6 in the first-mentioned pair, and also attachable to the core member 2 by means of like fasteners 7. In this instance, the circuit breaker 1 would fit a carrier frame from the TEKNE range. To this aim, the cheek pieces 12 and 13 are provided with hook-up dogs 12a and 13a which are adapted to engage in corresponding sockets associated with a carrier frame from the TEKNE range.

Housed within the body 8 of the circuit breaker 1 are a pole pair, namely a protected pole 14 and a neutral pole 15. The protected pole 14 is accommodated between the core member 2 and the cheek piece 5, and extends from an input terminal 16 to an output terminal 17. Provided along the pole 14 are a fixed contact 18, located on the input terminal 16 side, and a moving contact 19 located on the output terminal 17 side. The neutral pole 15 is accommodated between the core member 2 and the cheek piece 6, and extends from an input terminal 20 to an output terminal 21. Along the pole 15, there are provided a fixed contact 22, located on the input terminal 20 side, and a moving contact 23 located on the output terminal 21 side.

The circuit breaker 1 also comprises circuit

breaking linkages, comprehensively designated 24, which are supported on the core member 2. The linkages 24 include a key 25 and a moving contact holder assembly 26. Between the key 25 and the moving contact holder assembly 26 there is provided a toggle mechanism, known per se, as indicated at 27.

The circuit breaking linkages 24 also comprise a spring-loaded lever 28 for hooking the moving contact holder assembly 26 into the making position of the circuit breaker. The lever 28 is pivoted to the diaphragm 3 astride it, and has two lugs 29 and 30 placed on opposed sides of the diaphragm 3, the lug 29 being located on the cheek member 5 side, and the lug 30 being located on the cheek member 6 side.

The moving contact holder assembly 26 includes a contact carrier body 31, being a one-piece construction from a non-conductive material, such as a plastics material, which straddles the diaphragm 3 of the core member 2. Spring mounted to the contact carrier body 31 are two moving contacts 19 and 23 via respective means of attachment 32 to be explained hereinafter.

The two moving contacts 19 and 23 extend on opposed sides of the diaphragm 3 into two respective arcing chambers 33 and 34 formed in the body 8 between the core member 2 and the cheek pieces 5 and 6, respectively. The arcing chambers 33 and 34 are formed with respective venting slits 33a and 34a which open outwards and are formed in part in the cheek pieces and in part in the framing member 4 of the core member 2 on opposed sides relatively to the central diaphragm 3. The moving contacts 19 and 23 are movable along equal paths T toward and away from their respective fixed contacts 19 and 22 facing in said chambers 33 and 34, respectively.

In the diaphragm 3 of the core member 2 there is formed a throughgoing socket 35 having an L-shaped cross section. The numeral 36 denotes a metal cross-piece, preferably made of copper-plated iron, which has an L-shaped cross-section matching the L-shaped cross-section of the throughgoing socket 35.

This crosspiece penetrates, with a middle portion 37 thereof, the throughgoing socket 35 in a substantially force fit relationship therewith, and has opposed end portions 38 and 39 overhanging into the chambers 33 and 34.

The socket 35, and hence the crosspiece 36, are positioned relatively to the moving and fixed contacts such that the crosspiece locates itself at a preset distance from the path T, preferably at 2-3 mm therefrom, and such that the back of the "L" is facing the path T.

The key 25 of the circuit breaker 1 of this invention is adapted to be snap-action fitted with a capping 40 as appropriate for the MAGIC civil range. It should be noted that the cheek pieces 5 and 6 are provided with respective seats 5b and 6b mating with the key 25. Indicated at 41 is a yoke which extends all around the key 25 and its capping 40, and has means of mechanical connection arranged to interact between the attachment means 5a and 6a and the carrier frame from the MAGIC civil range.

The key 25 is adapted to be snap-action fitted, in an interchangeable manner with the capping 40, a capping 42 appropriate for the LIVING civil range, as well as a capping 43 appropriate for the TEKNE civil range, also interchangeably with the capping 40.

The cheek pieces 10 and 11, and the cheek pieces 12 and 13, are provided with respective seats 10b, 11b and 12b, 13b mating with the key 25.

The inventive circuit breaker 1 further comprises, within the body 8, an amperometer coil 44 of large cross-section area wire, which is accommodated on the core member 2 on the cheek piece 5 side, at the protected pole 14. The amperometer coil 44 has a respective pusher 45 adapted to engage with the lug 29 on the hook-up lever 28 to release the moving contact carrier assembly 26 on the occurrence of shorting currents, thereby causing the circuit breaker to break.

This circuit breaker 1 also includes a bimetallic strip thermal relay 62 housed at a location close to the amperometer coil 44, between the core member 2 and the cheek piece 5. It is operative on the lever 28 to release the moving contact carrier assembly 26.

The circuit breaker 1 of this invention also comprises, within the body 8, a thin wire voltmeter coil 46 which is accommodated on the core member 2, on the cheek piece 6 side and at the neutral pole 15. The voltmeter coil 46 has a respective pusher 47 adapted to engage with the lug 30 on the hook-up lever and release the moving contact carrier assembly 26 on the occurrence of a remote control command or by differential operation, thereby causing the circuit breaker to break.

Thus, the circuit breaker 1 either operates manually, by acting on the capping, or automatically by operation of the amperometer and voltmeter coils and of the thermal relay.

The means of attachment 32 for spring-loaded attachment of the moving contact 19 to the contact carrier body 31 will be next described. These attachment means 32 comprise a pin 48 jutting out of the contact carrier body 31 toward the cheek piece 5. The pin 48 engages with a hole 49 formed in a central portion 50 of the moving contact 19. The attachment means 32 also comprise a forked spring 51 having a base 52 and two prongs 53 and 54 with free ends 55 and 56. The forked spring 51 has a base 52 which lies astride the moving contact 19 at an active forward portion 57 thereof, has its prongs 53 and 54 extending from the opposed sides of the center portion 50 and wound into a spiral with turns wound in opposite directions around the pin 48, and has its free ends 55 and 56 of the prongs 53 and 54 engaged with a lug 58 formed on the contact carrier body 31.

The spring 51 constantly urges, with its base 52, the moving contact 19 to rotate around the pin 48 toward the fixed contact 18. A rearward tail portion 59 of the moving contact 19 engages with the lug 58 to stop the rotary movement.

Retainer means 60 are provided to retain the moving contact 19 axially on the pin 48. These retainer means 60 are comprised of an elevation 61 formed on the lug 58 of the contact carrier body 31,

against which the free end 56 of the prong 54 of the spring 51 engages laterally.

The attachment means 32 for spring-loaded attachment of the moving contact 23 to the contact carrier body 31 are arranged symmetrically with respect to the ones discussed above for securing the contact 19 relatively to the diaphragm 3, and accordingly, will not be described in detail.

The circuit breaker of this invention affords the principal advantage of facilitating production of a variety of models, in agreement with various civil ranges for which it is intended. A main portion of the circuit breaker is shared by the various models and can be readily fitted with simple parts, such as the cheek pieces and the cappings, in order to adapt it for use with the different civil ranges to be equipped therewith.

The net result is simplification of the production cycle which can therefore be highly automated, at least as far as the common portion is concerned. In fact, the circuit breaking linkages, key, contact carrier assembly, and coils are all supported on the core member and may be assembled sequentially thereto by means of suitable assembling robots.

A further important advantage of the circuit breaker according to this invention resides in its compact size. In fact, by virtue of its structure being provided with a core member and cheek pieces, it can accommodate both a protected pole and a neutral pole, as well as an amperometer coil, a voltmeter coil, and a thermal relay for safeguarding against shorting, remote control, and thermal protection within a single module.

A not negligible advantage of the circuit breaker according to this invention is that it lends itself to accommodate additional electric functions, such as differential protection, by merely replacing a cheek piece with a suitable box-type element dimensioned to contain that electric function.

Furthermore, the circuit breaker of this invention is, thanks to its compact size and ability to accommodate a variety of ancillary electric functions, in keeping with the growing trend toward splitting of electric systems, that is multiplication of the protected branch-offs individually located in the proximities of the individual use outlets.

Of course, the circuit breaker disclosed hereinabove may be altered and modified in various ways by a skilled person in the art to meet specific contingent requirements, within the protection scope of the invention as set forth in the appended claims.

Claims

1. A circuit breaker (1) for mounting on enclosed box carrier frames of civil ranges of electric equipment, such as the MAGIC, LIVING, TEKNE ranges and the like models, characterized in that it comprises a supporting core member (2) for circuit breaking linkages (24), a plurality of cheek pieces (5,6,10,11,12,13), each provided with means (5a,6a,10a,11a,12a,13a) of attachment to a car-

rier frame from a respective civil range, and means (7) of fastening each cheek piece to the core member.

2. A circuit breaker (1) according to Claim 1, characterized in that it comprises a protected pole (14) and a neutral pole (15) on opposed sides of the core member (2) and extending between said core member (2) and respective ones of said cheek pieces (5,6,10,11,12,13).

3. A circuit breaker (1) according to Claim 2, characterized in that it comprises an amperometer coil (44) housed in said core member (2) on the protected pole (14) side and arranged to act on the circuit breaking linkages (24).

4. A circuit breaker (1) according to Claim 2, characterized in that it comprises a voltmeter coil (46) housed in said core member (2) on the neutral pole (15) side and arranged to act on the circuit breaking linkages (24).

5. A circuit breaker (1) according to Claim 4, characterized in that it comprises a thermal relay (62) accommodated in the proximities of the amperometer coil (44) between said core member (2) and a respective one of said cheek pieces (5,10,12) and arranged to act on the circuit breaking linkages (24).

6. A circuit breaker (1) according to Claim 1, characterized in that the circuit breaking linkages (24) include a moving contact holder assembly (26) having a contact carrier body (31) formed integrally from a plastics material and arranged to straddle said core member (2).

7. A circuit breaker (1) according to Claim 6, characterized in that the moving contact holder assembly (26) includes two moving contacts (19,23) supported on the contact carrier body (31) and being movable within respective arcing chambers (33, 34) formed in opposed portions of the core member (2) between the core member (2) and the cheek pieces (5,6,10,11,12,13).

8. A circuit breaker (1) according to Claim 6, characterized in that it comprises a key (25) straddling the core member (2) and arranged to act by toggle action on the moving contact holder assembly (26), being adapted to receive by snap action a key capping (40,42,43) from a respective civil range.

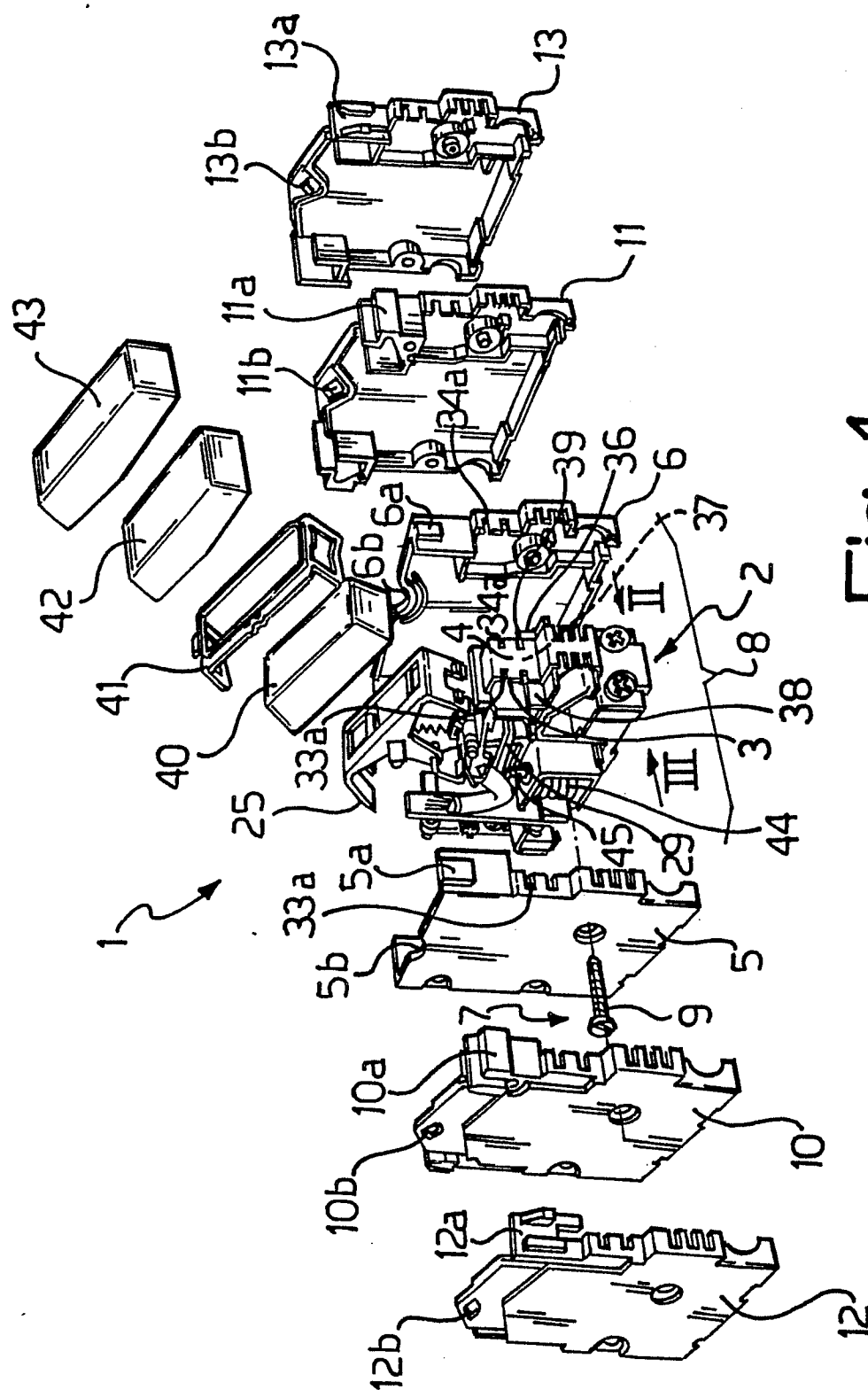


Fig-1

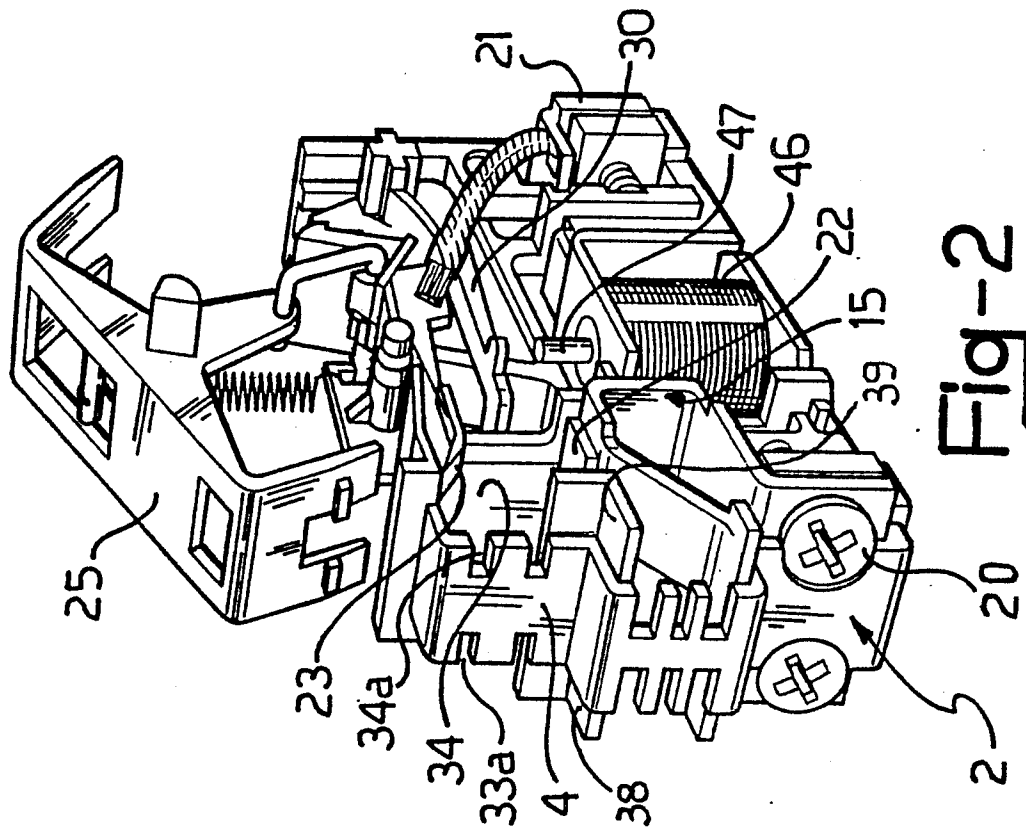


Fig-2

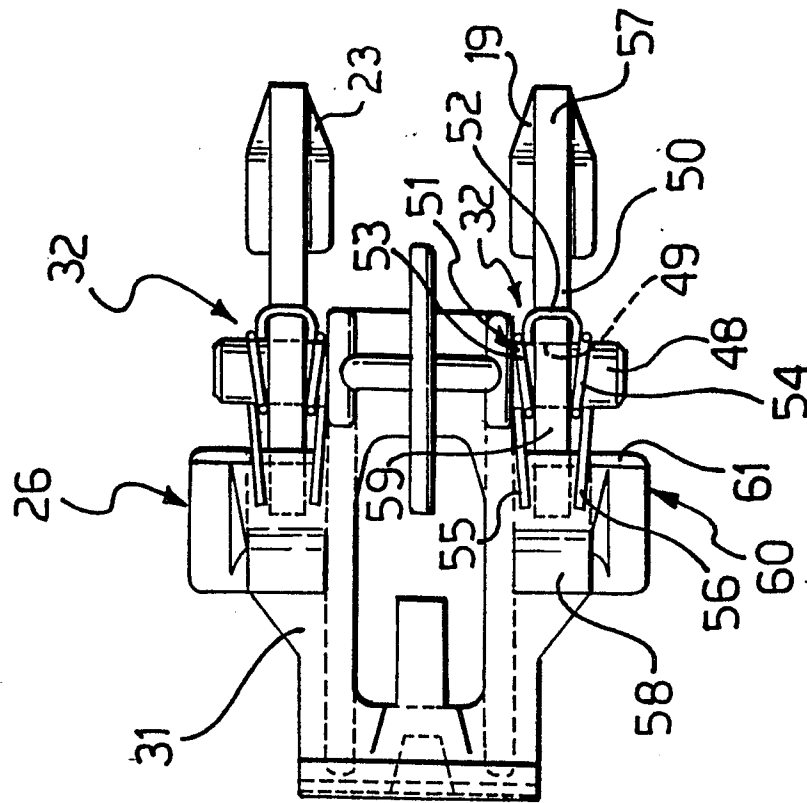


Fig-5

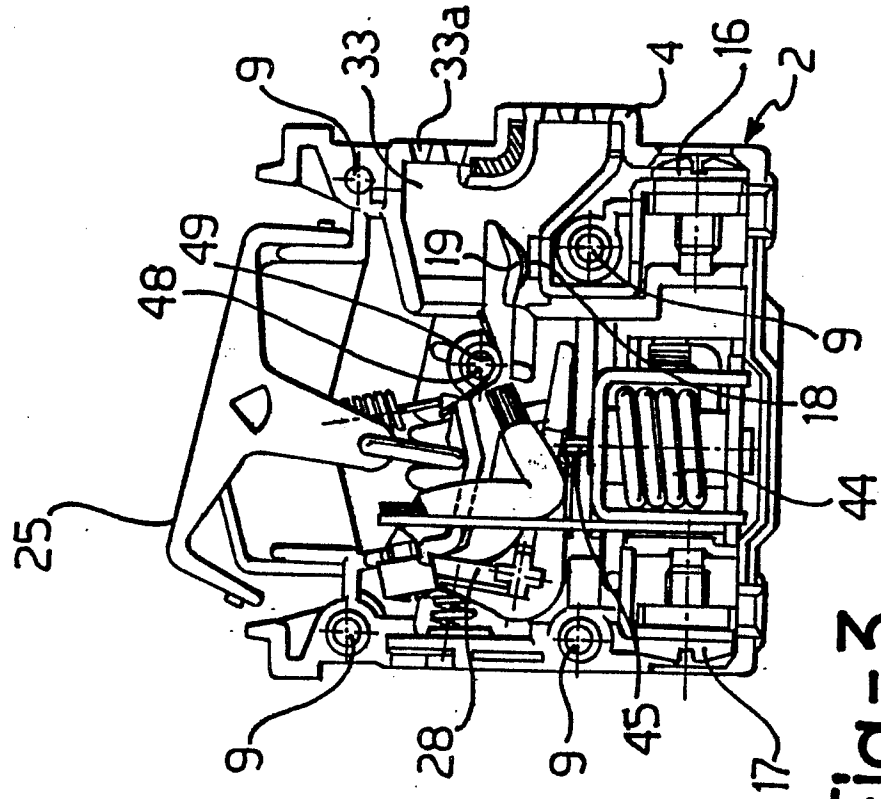


Fig-3

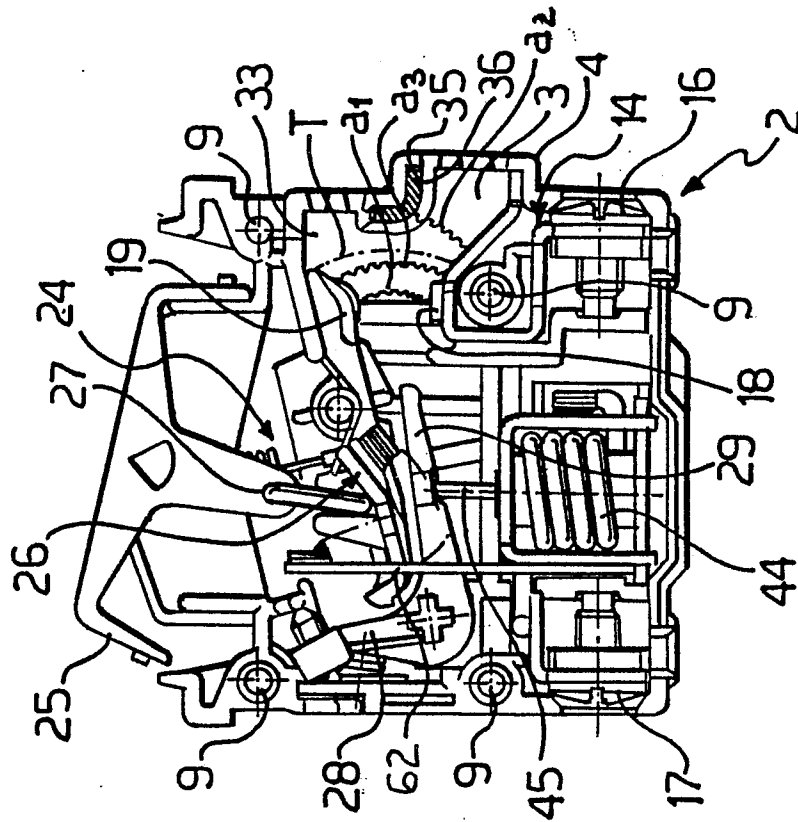


Fig-4