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(54) **BLADE ASSEMBLY**

KONTAKTANORDNUNG

ENSEMBLE A LAME

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Description

[0001] The invention relates to a blade assembly, particularly for use in circuit breakers.

[0002] More particularly, the invention relates to a blade assembly for a switch such as a circuit breaker, the blade assembly including a blade member, a trip lever, and a contact holder.

[0003] WO-A-9116720 describes a blade assembly of this type.

[0004] EP-A-0010678 describes a circuit breaker in which the blade member is formed from a plastic insulating material.

[0005] Circuit breakers generally include a breaker mechanism mounted in a housing. Such breaker mechanisms generally comprise a large number of separate pieces which are assembled in the housing. Because of the number of pieces involved and the complexity of such mechanisms it is extremely difficult to automate the assembly operation.

[0006] The invention is characterised in that:-

the blade member is of insulating material and has an integral trip lever mounting means, an integral contact holder mounting means, and a pawl mounting means (13);

the trip lever includes a nose portion for engaging with a corresponding recess in a pawl;

and in that the trip lever also includes an integral biasing spring means to urge the nose portion of the trip lever into engagement with a pawl.

[0007] In one embodiment of the invention the blade member comprises a pair of opposed side walls and connecting wall means extending between the side walls. Preferably the connecting wall means comprises a connecting web adjacent a contact end of the blade member and an end connecting wall adjacent an opposite end. Typically the end connecting wall includes an extension defining an integral indicator flag.

[0008] Preferably the trip lever mounting means comprises means for snap fittingly engaging with the trip lever. Typically the trip lever mounting means comprises an integral pivot pin and the trip lever includes a recess corresponding to the integral pivot pin for snap fitting engagement.

[0009] Preferably the integral spring means comprises a flexible arm which extends from the trip lever to engage with the blade member. Ideally the flexible arm is integral with the trip lever.

[0010] In a preferred arrangement the trip lever is of insulating material.

[0011] In one embodiment of the invention the contact holder is of electrically conductive material and the contact holder mounting means and contact holder have interengaging formations for engaging the contact holder

with the blade member. Preferably the contact mounting means includes opposed recesses in side walls of the blade member adjacent a contact end of the blade member. Typically the assembly includes ramp means for guiding the contact holder into the recesses on fitting.

[0012] In a preferred embodiment of the invention the pawl mounting means comprises opposed pivot holes in the blade member to receive a pawl mounting pivot pin, the pawl being mounted to the pivot pin.

[0013] The invention also provides a switch incorporating a blade assembly according to the invention.

[0014] The invention further provides a circuit breaker incorporating a blade assembly according to the invention.

[0015] The invention will be more clearly understood from the following description thereof, given by way of example only with reference to the accompanying drawings in which:-

Fig. 1 is an exploded perspective view of a blade assembly according to the invention;

Fig. 2 is an elevational view of the assembly;

Fig. 3 is a cross sectional view of the assembly;

Fig. 4 is a plan view of a circuit breaker incorporating the assembly in an on position of use with the contacts closed;

Fig. 5 is a plan view of the circuit breaker of Fig. 4 in a tripped position with a handle held in the on position; and

Fig. 6 is a plan view of the circuit breaker of Fig. 4 in an off position with a handle switched off.

[0016] Referring to the drawings and initially to Figs. 1 to 3 thereof there is illustrated a blade assembly according to the invention and indicated by the reference numeral 1.

[0017] The blade assembly 1 comprises a blade member 2A, a trip lever 2B, a contact holder 2C and, in this case, also a pawl 2D. At least the blade member 2A, and preferably also the trip lever 2B and the pawl 2D are of insulating, typically plastics material and are typically injection moulded.

[0018] The blade member 2A has a rear contact end 5 and a front flag end 6 and comprises a pair of opposed side walls 3, 4 which are joined by a flag end connecting wall 8, an intermediate wall 10 and a connecting web 11 adjacent the contact end 5. The flag end connecting wall 8 has an extension 12 which defines, in use, an indicator flag as will be described in more detail below. The extension 12 may extend upwardly as illustrated or downwardly.

[0019] Opposed holes 13 are provided in each side wall 3, 4 adjacent the flag end 6 to receive a pawl mount-

ing pivot pin 14 which passes through a first pivot hole 15 in the pawl 2D for pivotally mounting the pawl 2D to the blade member. The pawl 2D in this case also includes a second pivot hole 19 for receiving a link as will be described below.

[0020] A trip lever mounting pivot pin 20 is integrally moulded with the blade member 2A and extends between and projects from the blade side walls 3, 4 to define stub projections 20a. The pin 20 is sized to snap-fittingly engage with a correspondingly shaped recess 21 in the trip lever 2B. The trip lever 2B has a rear leg 26 and a forward leg 23 with a front nose portion 24 which engages with a corresponding recess 25 in the pawl 2D as will be particularly apparent from Fig. 3. An integral flexible arm 27 extends rearwardly from the trip lever 2B to engage underneath the web 11 of the blade member 2A. The arm 27 acts as a biasing spring to urge the nose 24 of the trip lever 2B into engagement with the recess 25 in the pawl 2D.

[0021] The contact holder 2C is of electrically conductive material and snap-fittingly engages with the blade member 2A at the contact end 5. A moving contact 34 (Figs. 4 to 6) is fitted to the contact holder 2C, for example by riveting, welding or forming in situ. The contact holder 2C is of generally L-shape having an upright portion 32 and a horizontal portion 31 which are cut-away on both sides at 33 to engage with the blade member 2A. At the contact end 5, the blade side walls 3, 4 each have an inwardly extending ramp formation 35 and an inwardly extending stop rib 36 which are spaced-apart to define therebetween recesses 37 for engaging with the contact holder 2C. On assembly, the upright portion 32 of the contact holder 2C is pressed forwardly to ride over the ramp formations 35 and snap into the recesses 37.

[0022] Referring to Figs. 4 to 6 the blade assembly 1 described above is shown mounted in one particular circuit breaker 50. The circuit breaker 50 has a housing 56 and includes a line terminal 51 for coupling to a source of electricity and a load terminal 52 for coupling to a load. A braided pigtail 53 is connected for example by crimping, welding or fixing, between the line terminal 51 and the contact holder 2C of the blade assembly 1. The stub projections 20a of the trip lever mounting pivot pin 20 of the assembly 1 engage with corresponding pivot recesses (not shown) in the housing 56. In a normal contacts closed position illustrated in Fig. 4 the moving contact 34 carried by the contact holder 2C is engaged with a fixed contact 58.

[0023] The current path from the fixed contact 58 includes a coil 60 and a load conductor 61 to which the load terminal 52 is connected. The circuit breaker in this case also includes an arc runner 63 and an arc stack 64 which cooperate to break any arc formed when the circuit breaker opens and the contacts 34, 58 are separated under load. The contacts 34, 58 may be separated in response to operation of a bimetal (not shown) or by a rod 65 which is normally biased downwardly by a so-

lenoid spring 62. The rod 65 is disposed within the coil 60 and is engagable against the rear leg 26 of the trip lever 2B of the blade assembly 1.

[0024] A cam 68 has an operating handle 69. A link 70 connects the cam 68 and pawl 2D through the hole 19 in the pawl 2D.

[0025] The housing 56 includes a viewing window 71 through which the flag 12 of the blade member 2A may be viewed when the contacts 34, 58 are in the off and tripped positions illustrated in Figs. 5 and 6. In the tripped or off positions a spring 55 urges the blade assembly about the pivot defined by the stub projections 20a so that the moving contact 34 carried by the contact holder 2C is disengaged from the fixed contact 58.

[0026] In use, the circuit breaker is tripped either by a thermal overload as detected by a bimetal (not shown) or by a current surge actuator defined by the coil 60. In the normal closed position the rod 65 is downwardly biased by the solenoid spring 62 and current passing through the coil 60 sets up an electromagnetic field acting on the rod 65. When the electromagnetic force set up in the coil 60 is disturbed by a current surge the rod 65 moves up to engage the rear leg 26 of the trip lever 2B of the blade assembly. This action pushes the forward leg 23 of the trip lever 2B downwardly so that the nose 24 of the trip lever 2B disengages from the recess in the pawl 2D. The spring 55 causes the contacts 34, 58 to separate.

[0027] Referring to Fig. 6, when the handle 69 is moved to the off position movement of the link 70 causes the pawl 2D to move about from the nose 24 of the trip lever 2B. The spring 55 urges the blade assembly 1 about the pivot defined by the stub projections 20a and the moving contact 34 is disengaged from the fixed contact 58.

[0028] It will be appreciated that the blade assembly of the invention is of low mass and is without expensive conducting materials such as copper components. There are substantially less parts than in conventional blade assemblies so that material and assembly costs are substantially reduced. Thus, a much more economical and efficient method of manufacture may be achieved.

[0029] It will also be appreciated that the spring 55 may be of any suitable type such as a helical, coil or leaf spring.

[0030] It will further be appreciated that while the invention has been described with particular reference to one type of circuit breaker it has wide applications not only to many different types of circuit breaker but also to switches in general.

Claims

1. A blade assembly (1) for a switch (50) such as a circuit breaker (50), the blade assembly (1) including:-

a blade member (2A);

a trip lever (2B); and

a contact holder (2C)

characterised in that

the blade member (2A) is of insulating material and has an integral trip lever mounting means (20), an integral contact holder mounting means (34, 35, 36), and a pawl mounting means (13);

the trip lever (2B) includes a nose portion (24) for engaging with a corresponding recess (25) in a pawl (2D);

and in that the trip lever (2B) also includes an integral biasing spring means (27) to urge the nose portion (24) of the trip lever (2B) into engagement with the pawl (2D).

2. A blade assembly as claimed in claim 1 wherein the trip lever integral biasing spring means (27) comprises a flexible arm (27) which extends from the trip lever (2B) to engage with the blade member (2A).
3. A blade assembly as claimed in claim 1 or 2 wherein the blade member (2A) includes an integral indicator flag (8, 12).
4. A blade assembly as claimed in any preceding claim wherein the blade member (2A) comprises a pair of opposed side walls (3) and connecting wall means (8, 10, 11) extending between the side walls (3).
5. A blade assembly as claimed in claim 4 wherein the connecting wall means (8, 10, 11) comprises a connecting web (11) adjacent a contact end of the blade member (2A) and an end connecting wall (8) adjacent an opposite end.
6. A blade assembly as claimed in claim 5 wherein the end connecting wall (8) includes an extension (12) defining an integral indicator flag.
7. A blade assembly as claimed in any preceding claim wherein the trip lever mounting means (20) comprises means (20) for snap fittingly engaging with the trip lever (2B).
8. A blade assembly as claimed in claim 7 wherein the trip lever mounting means (20) comprises an integral pivot pin (20) and the trip lever (2B) includes a recess (21) corresponding to the integral pivot pin (20) for snap fitting engagement.
9. A blade assembly as claimed in any preceding claim wherein the trip lever (2B) is of insulating material.
10. A blade assembly as claimed in any preceding claim wherein the contact holder (2C) is of electrically conductive material and the contact holder mounting means (34, 35, 36) and contact holder (2C) have interengaging formations (32, 35) for engaging the contact holder (2C) with the blade member (2A).
11. A blade assembly as claimed in claim 10 wherein the contact mounting means includes opposed recesses (37) in the side walls (3) of blade member (2A) adjacent a contact end of the blade member (2A).
12. A blade assembly as claimed in claim 11 including ramp means (35) for guiding the contact holder (2C) into the recesses (37) on fitting.
13. A blade assembly as claimed in any preceding claim wherein the pawl mounting means (13) comprises opposed pivot holes (13) in the blade member (2A) to receive a pawl mounting pivot pin (14), the pawl (2D) being mounted to the pivot pin (14).
14. A switch (50) incorporating a blade assembly (1) as claimed in any preceding claim.
15. A circuit breaker (50) incorporating a blade assembly (1) as claimed in any of claims 1 to 13.

Patentansprüche

1. Blatt- oder Klingenbaugruppe (1) für einen Schalter (50) so wie einen Trennschalter (50), wobei die Blatt- oder Klingenbaugruppe (1) einschließt:

ein Blattelement (2A);

einen Schalthebel (2B); und

einen Kontakthalter (2C)

dadurch gekennzeichnet, daß

das Blattelement (2A) aus Isoliermaterial besteht und ein integriertes Schalthebel-Befestigungsmittel (20), ein integriertes Kontakthalter-Befestigungsmittel (34,35,36) und ein Schaltklinken-Befestigungsmittel (13) umfaßt;

der Schalthebel (2B) einen Nasenteil (24) zum Eingreifen in eine entsprechende Vertiefung (25) in einer Schaltklinke (2D) einschließt;

und daß der Schalthebel (2B) weiter ein inte-

- griertes Vorspannfeder Mittel (27) einschließt, um den Nasenteil (24) des Schalthebels (2B) in Eingriff mit der Schaltklinke (2D) zu drücken.
2. Blatt- oder Klingenbaugruppe nach Anspruch 1, bei der das im Schalthebel integrierte Vorspannfeder Mittel (27) einen flexiblen Arm (27) aufweist, der sich von dem Schalthebel (2B) erstreckt, um mit dem Blattelement (2A) in Eingriff zu treten. 5
 3. Blatt- oder Klingenbaugruppe nach Anspruch 1 oder 2, bei der das Blattelement (2A) eine integrierte Anzeigeflagge (8, 12) einschließt. 10
 4. Blatt- oder Klingenbaugruppe nach einem der vorangegangenen Ansprüche, bei der das Blattelement (2A) ein Paar gegenüberliegender Seitenwände (3) und Verbindungswandmittel (8, 10, 11) aufweist, die sich zwischen den Seitenwänden (3) erstrecken. 15
 5. Blatt- oder Klingenbaugruppe nach Anspruch 4, bei der das Verbindungswandmittel (8, 10, 11) einen Verbindungssteg (11) neben einem Kontaktende des Blattelements (2A) und eine Endverbindungswand (8) benachbart einem gegenüberliegenden Ende aufweist. 20
 6. Blatt- oder Klingenbaugruppe nach Anspruch 5, bei der die Endverbindungswand (8) eine Verlängerung (12) einschließt, die eine integrierte Anzeigeflagge definiert. 25
 7. Blatt- oder Klingenbaugruppe nach einem der vorangegangenen Ansprüche, bei der das Schalthebel-Befestigungsmittel (20) Mittel (20) aufweist, um mit Schnappsitz mit dem Schalthebel (2B) in Eingriff zu treten. 30
 8. Blatt- oder Klingenbaugruppe nach Anspruch 7, bei der das Schalthebel-Befestigungsmittel (20) für Eingriff mit Schnappsitz einen integrierten Drehzapfen (20) aufweist und der Schalthebel (2B) eine Vertiefung (21) einschließt, die dem integrierten Drehzapfen (20) entspricht. 35
 9. Blatt- oder Klingenbaugruppe nach einem der vorangegangenen Ansprüche, bei der der Schalthebel (2B) aus Isoliermaterial besteht. 40
 10. Blatt- oder Klingenbaugruppe nach einem der vorangegangenen Ansprüche, bei der der Kontakthalter (2C) aus elektrisch leitfähigem Material besteht und das Kontakthalter-Befestigungsmittel (34, 35, 36) und der Kontakthalter (2C) ineinandergreifende Ausbildungen (32, 35) haben, um den Kontakthalter (2C) mit dem Blattelement (2A) in Eingriff zu bringen. 45
 11. Blatt- oder Klingenbaugruppe nach Anspruch 10, bei der das Kontaktbefestigungsmittel gegenüberliegende Aussparungen (37) in den Seitenwänden (3) des Blattelements (2A) angrenzend an ein Kontaktende des Blattelements (2A) einschließt. 50
 12. Blatt- oder Klingenbaugruppe nach Anspruch 11, die Rampenmittel (35) zum Führen des Kontakthalters (2C) in die Aussparungen (37) beim Anbringen einschließt. 55
 13. Blatt- oder Klingenbaugruppe nach einem der vorangegangenen Ansprüche, bei der das Schaltklinke-Befestigungsmittel (13) gegenüberliegende Zapfenlöcher (13) in dem Blattelement (2A) aufweist, um einen Schaltklickenbefestigungs-Drehzapfen (14) aufzunehmen, wobei die Schaltklinke (2D) an dem Drehzapfen (14) angebracht ist.
 14. Schalter (50), der eine Blatt- oder Klingenbaugruppe (1) nach einem der vorangegangenen Ansprüche enthält.
 15. Trennschalter (50), der eine Blatt- oder Klingenbaugruppe (1) nach einem der Ansprüche 1 bis 13 enthält.

Revendications

1. Un ensemble à lame (1) pour un interrupteur (50), tel un coupe-circuit (50), l'ensemble à lame (1) comprenant :
 - un élément-lame (2A) ;
 - un levier de déclenchement (2B) ; et
 - un porte-contact (2C)
 caractérisé en ce que
 - l'élément-lame (2A) est réalisé en un matériau isolant et possède un moyen de montage intégré (20) pour le levier de déclenchement, un moyen de montage intégré (34, 35, 36) pour le porte-contact et un moyen de montage (13) pour le cliquet;
 - le levier de déclenchement (2B) comporte une section nez (24) destinée à s'engager avec un évidement correspondant (25) pratiqué dans un cliquet (2D) ;
 - et en ce que le levier de déclenchement (2B) comporte également un moyen de poussée intégré à ressort (27) afin d'obliger la section nez (24) du levier de déclenchement (2B) à s'enga-

- ger avec le cliquet (2D).
2. Un ensemble à lame, selon la revendication 1, dans lequel le moyen de poussée intégré à ressort (27) pour le levier de déclenchement comprend un bras souple (27) qui s'étend à partir du levier de déclenchement (2B) afin de s'engager avec l'élément-lame (2A). 5
 3. Un ensemble à lame, selon la revendication 1 ou 2, dans lequel l'élément-lame (2A) inclut un repère indicateur intégré (8, 12). 10
 4. Un ensemble à lame, selon l'une quelconque des revendications précédentes, dans lequel l'élément-lame (2A) comprend une paire de parois latérales opposées (3) et des moyens de liaison de paroi (8, 10, 11) s'étendant entre les parois latérales (3). 15
 5. Un ensemble à lame, selon la revendication 4, dans lequel les moyens de liaison de paroi (8, 10, 11) comprennent une traverse de raccordement (11) adjacente à une extrémité de contact de l'élément-lame (2A) et une paroi de raccordement d'extrémité (8) adjacente à l'extrémité opposée. 20
 6. Un ensemble à lame, selon la revendication 5, dans lequel la paroi de raccordement d'extrémité (8) inclut une extension (12) laquelle définit un repère indicateur intégré. 25 30
 7. Un ensemble à lame, selon l'une quelconque des revendications précédentes, dans lequel le moyen de montage (20) pour le levier de déclenchement comprend un moyen (20) permettant un engagement par encliquetage rapide avec le levier de déclenchement (2B). 35
 8. Un ensemble à lame, selon la revendication 7, dans lequel le moyen de montage (20) pour le levier de déclenchement comprend un axe-pivot intégré (20) et le levier de déclenchement (2B) inclut un évidement (21) correspondant à l'axe-pivot intégré (20) en vue d'un engagement par encliquetage rapide. 40 45
 9. Un ensemble à lame, selon l'une quelconque des revendications précédentes, dans lequel le levier de déclenchement (2B) est réalisé dans un matériau isolant. 50
 10. Un ensemble à lame, selon l'une quelconque des revendications précédentes, dans lequel le porte-contact (2C) est réalisé dans un matériau électriquement conducteur et le moyen de montage (34, 35, 36) pour le porte-contact et le porte-contact (2C) présentent des formations (32, 35) s'engageant entre elles permettant au porte-contact (2C) de s'engager à l'élément-lame (2A). 55
 11. Un ensemble à lame, selon la revendication 10, dans lequel le moyen de montage du contact inclut des évidements opposés (37) pratiqués dans les parois opposées (3) de l'élément-lame (2A) adjacent à une extrémité de contact de l'élément-lame (2A).
 12. Un ensemble à lame, selon la revendication 11, comprenant un moyen à rampe (35) destiné à guider le porte-contact (2C) dans les évidements (37) lors du montage.
 13. Un ensemble à lame, selon l'une quelconque des revendications précédentes, dans lequel le moyen de montage (13) pour le cliquet comprend des orifices de pivot opposés (13) prévus dans l'élément-lame (2A) afin de recevoir un axe-pivot (14) de montage pour le cliquet, le cliquet (2D) étant monté sur l'axe-pivot (14).
 14. Un interrupteur (50) comprenant un ensemble à lame (1), selon l'une quelconque des revendications antérieures.
 15. Un coupe-circuit (50) comportant un ensemble à lame (1), selon l'une quelconque des revendications 1 à 13.

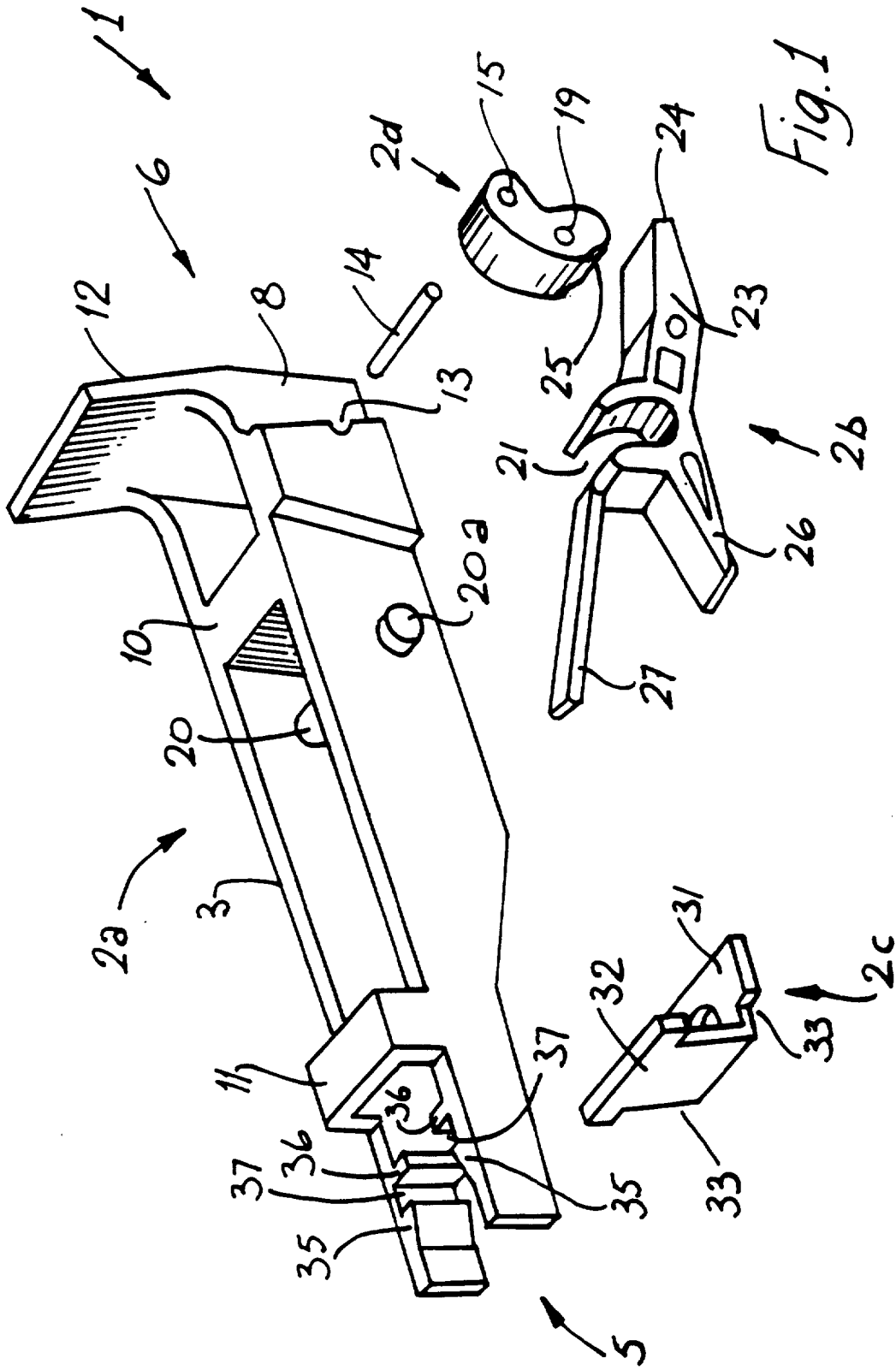


Fig. 1

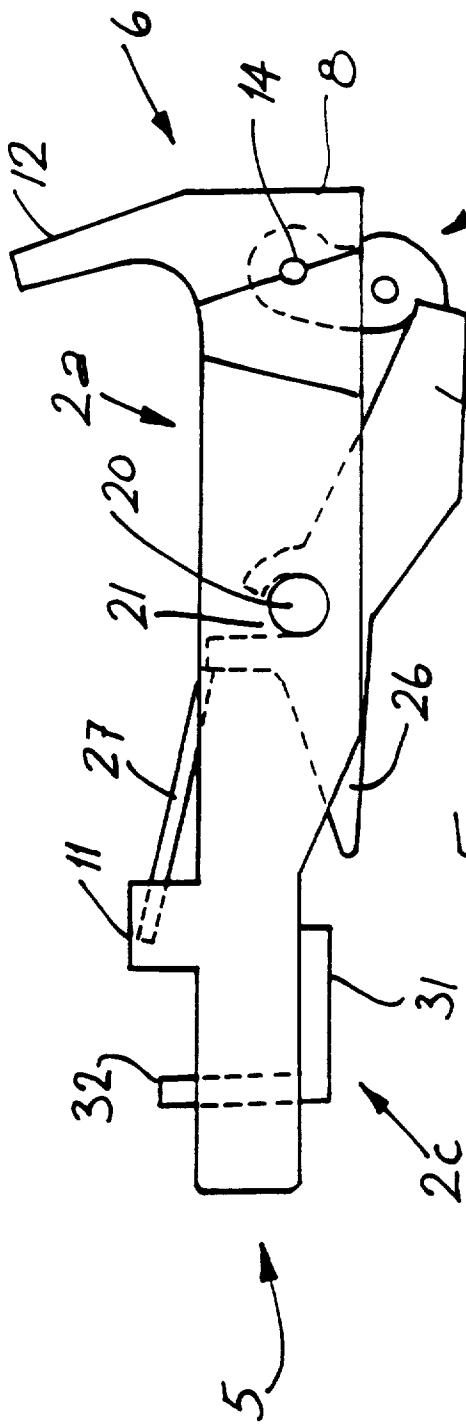


Fig. 2

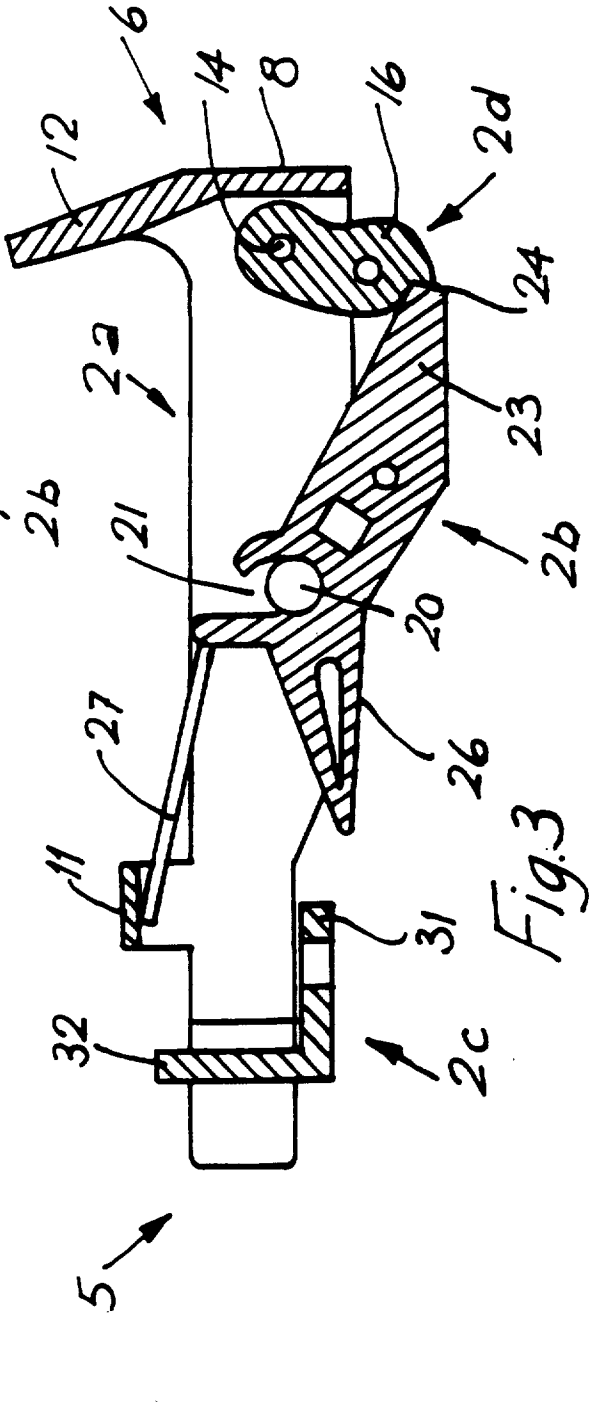


Fig. 3

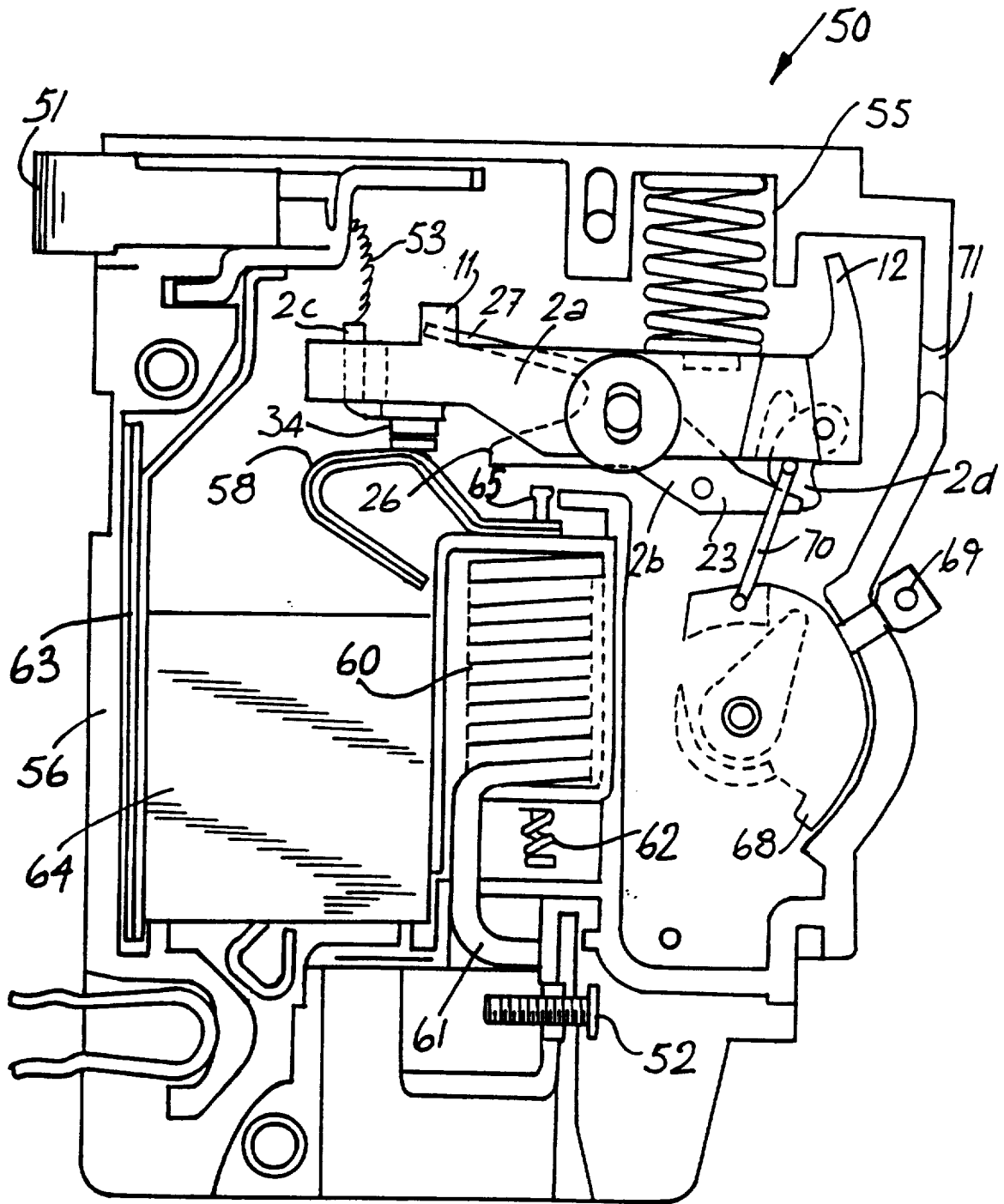


Fig. 4

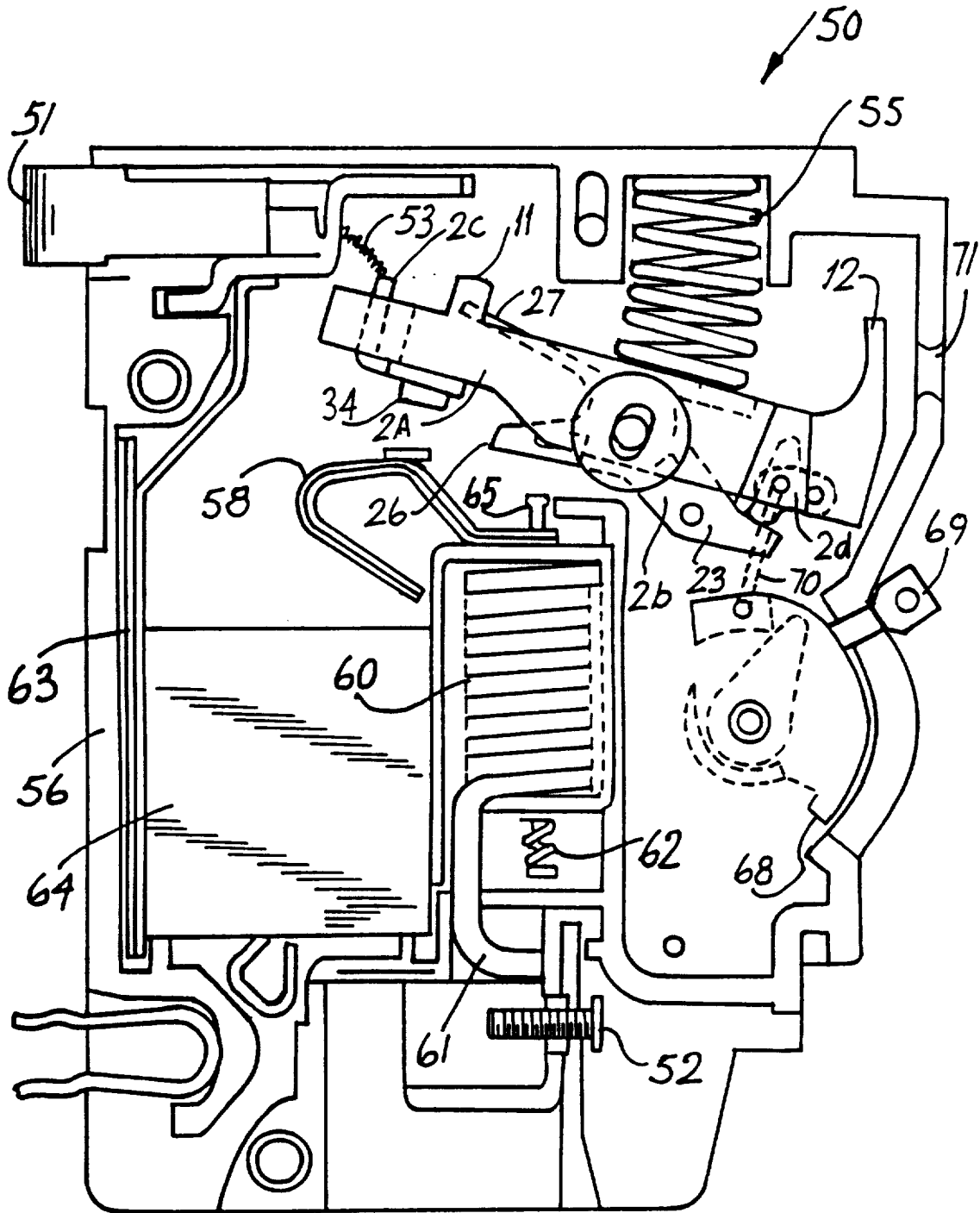


Fig. 5

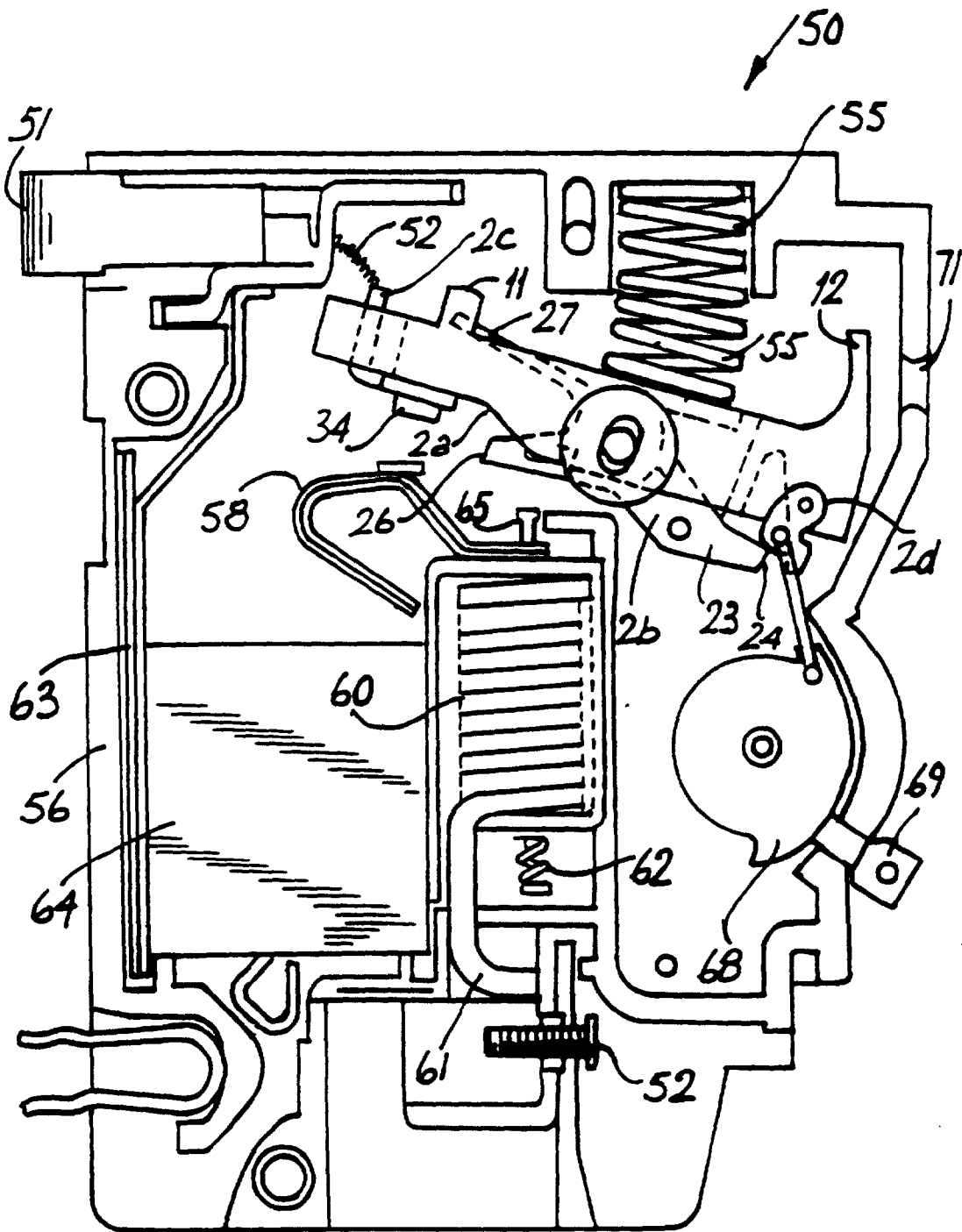


Fig. 6