67520/87

601169

APPLICATION ACCEPTED AND AMENDMENTS ALLOWED 27-6-90

COMMONWEALTH OF AUSTRALIA

Patents Act 1952

APPLICATION FOR A STANDARD PATENT

We, WESTINGHOUSE ELECTRIC CORPORATION of Beulah Road, Pittsburgh, Pennsylvania 15235, United States of America hereby apply for the grant of a standard patent for an invention entitled:

CIRCUIT BREAKER WITH SHOCK RESISTANT LATCH TRIP MECHANISM

which is described in the accompanying complete specification.

DETAILS OF BASIC APPLICATION:

Country	Date	Number
United States	15 January 1986	818,947

Our address for service is:

Halford & Maxwell,
Patent & Trade Mark Attorneys,
Level 20, National Mutual Centre,
44 Market Street,
SYDNEY N.S.W. 2000

Dated this 13 day of January 1987.

WESTINGHOUSE ELECTRIC CORPORATION
By its Patent Attorneys
HALFORD & MAXWELL

T.F. Maxwell

To: The Commissioner of Patents
Fee: $165.00
File: C 87 002

PATENT OFFICE 5 FIVE DOLLARS
PATENT OFFICE 100 ONE HUNDRED DOLLARS
PATENT OFFICE 60 SIXTY DOLLARS

LODGED AT SUB-OFFICE
13 JAN 1987
Sydney

FEE STAMP TO VALUE OF $165.00 ATTACHED
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W.E. Case 51,215/Australia

FORM 7 REGULATION 11 (2)

COMMONWEALTH OF AUSTRALIA

PATENTS ACT 1952-1954

DECLARATION IN SUPPORT OF A CONVENTION APPLICATION UNDER PART XVI FOR A PATENT

In support of the Convention Application made under Part XVI of the Patents Act 1952-1954 by WESTINGHOUSE ELECTRIC CORPORATION for a patent for an invention entitled "CIRCUIT BREAKER WITH SHOCK RESISTANT LATCH TRIP MECHANISM"

I, G. C. Dorman
of 1619 Tiffany Ridge Road, Pittsburgh, Pennsylvania 15241
United States of America, do solemnly and sincerely declare as follows:

1. I am authorized by WESTINGHOUSE ELECTRIC CORPORATION, the applicant for the patent, to make this declaration on its behalf.

2. The basic application as defined by Section 141 of the Act was made in the United States of America on January 15, 1986, by the inventors nominated in clause (3) below.

3. JERE LEE MCKEE, GLENN ROBERT THOMAS of, respectively, RD 4, Box 329, New Castle, Pennsylvania 16101, USA, 128 Edgewood Drive, Beaver, Pennsylvania 15009, USA are the actual inventors of the invention and the facts upon which WESTINGHOUSE ELECTRIC CORPORATION is entitled to make the application are as follows:

The said WESTINGHOUSE ELECTRIC CORPORATION is the assignee of the said JERE LEE MCKEE, GLENN ROBERT THOMAS.

4. The basic application referred to in paragraph 2 of this declaration was the first application made in a convention country in respect of the invention the subject of the application.

Declared at Pittsburgh, Pennsylvania

This 30 day of December , 19 86 .

Vice-President
G. C. Dorman

To,
THE COMMISSIONER OF PATENTS,
COMMONWEALTH OF AUSTRALIA.

(12) PATENT ABRIDGMENT (11) Document No. AU-B-67520/87
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 601169

(54) Title
CIRCUIT BREAKER WITH SHOCK RESISTANT LATCH TRIP MECHANISM

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(71) Applicant(s)
WESTINGHOUSE ELECTRIC CORPORATION

(72) Inventor(s)
JERE LEE MCKEE; GLENN ROBERT THOMAS

(74) Attorney or Agent
HALFORD & CO. SYDNEY

(56) Prior Art Documents
US 3928826

(57) Claim

1. A circuit breaker comprising a housing including a mounting frame, a circuit breaker structure having a pair of separable contacts and having a releasable lever pivotally supported and operable between latched and unlatched positions to open the separable contacts, operating means for actuating a contact arm and comprising a first toggle linkage between the releasable lever and the contact arm, manually operable means to open and close the contacts when the releasable lever is in the latched position, a trip bar operable automatically in response to overload current conditions above a predetermined value to release the releasable lever from the latched position to the unlatched position to open the contacts, latching means for latching the releasable lever including a latch lever detachably connected to the releasable lever, the latching means also

.../2

including a second toggle linkage comprising a first link pivotally connected to the latch lever, a second link pivotally connected to the mounting frame, and the first and second links have pivotally interconnected end portions forming a pivot joint, the trip bar having a projection for releasably engaging the second toggle linkage so as to cause latching and unlatching of the releasable lever upon rotation of the trip bar, and the manually operable means being operable to move the releasable lever from the tripped position to the latched position following release of the releasable lever and wherein said projection in the untripped position is mechanically urged against a portion of said second toggle linkage.

AUSTRALIA

601169

Form 10

PATENTS ACT 1952

COMPLETE SPECIFICATION

(ORIGINAL)

FOR OFFICE USE

Short Title:

Int. Cl:

Application Number: 67520/87.
Lodged:

This document contains the amendments made under Section 49 and is correct for printing.

Complete Specification—Lodged:
Accepted:
Lapsed:
Published:

Priority: 15 January 1986

Related Art:

TO BE COMPLETED BY APPLICANT

Name of Applicant: WESTINGHOUSE ELECTRIC CORPORATION

Address of Applicant: Beulah Road, Pittsburgh, Pennsylvania, 15235
United States of America

Actual Inventor: JERE LEE MCKEE
GLENN ROBERT THOMAS

Address for Service: Halford & Maxwell,
Level 20,
National Mutual Centre,
44 Market Street,
SYDNEY N.S.W. 2000

Complete Specification for the invention entitled:

CIRCUIT BREAKER WITH SHOCK RESISTANT LATCH TRIP MECHANISM

The following statement is a full description of this invention, including the best method of performing it known to me:—*

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* Note: The description is to be typed in double spacing, pica type face, in an area not exceeding 250 mm in depth and 160 mm in width, on tough white paper of good quality and it is to be inserted inside this form.

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This invention relates to a circuit breaker, more specifically to a molded case circuit breaker and, in particular, it pertains to latching and tripping mechanism which utilizes a series of linkages.

Moulded case circuit breakers are designed to provide circuit protection for low voltage distribution systems. They protect connected apparatus against overload and/or short circuits. The proper breaker for a specific application can be selected by determining a few parameters, such as voltage, frequency, interrupting capacity, continuous current ratings, and unusual operating conditions. When a circuit breaker is applied where there is a possibility of high shock, a special anti-shock device should be used. Such a device may consist of inertia weight over the center pole for holding the trip bar latched under shock conditions without preventing thermal or magnetic trip units from functioning on overload and short circuit.

In one broad form there is provided a circuit breaker comprising a housing including a mounting frame, a circuit breaker structure having a pair of separable contacts and having a releasable lever pivotally supported and operable between latched and unlatched positions to open the separable contacts, operating means for actuating a contact arm and comprising a first toggle linkage between the releasable lever and the contact arm, manually operable means to open and close the contacts when the releasable lever is in the latched position, a trip bar operable automatically in response to overload current conditions above a predetermined value to release the releasable lever from the latched

position to the unlatched position to open the contacts, latching means for latching the releasable lever including a latch lever detachably connected to the releasable lever, the latching means also including a second toggle linkage comprising a first link pivotally connected to the latch lever, a second link pivotally connected to the mounting frame, and the first and second links have pivotally interconnected end portions forming a pivot joint, the trip bar having a projection for releasably engaging the second toggle linkage so as to cause latching and unlatching of the releasable lever upon rotation of the trip bar, and the manually operable means being operable to move the releasable lever from the tripped position to the latched position following release of the releasable lever and wherein said projection in the untripped position is mechanically urged against a portion of said second toggle linkage.

The invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Fig. 1 is a vertical sectional view through a circuit breaker in a contact closed position and showing the latch trip mechanism of this invencion;

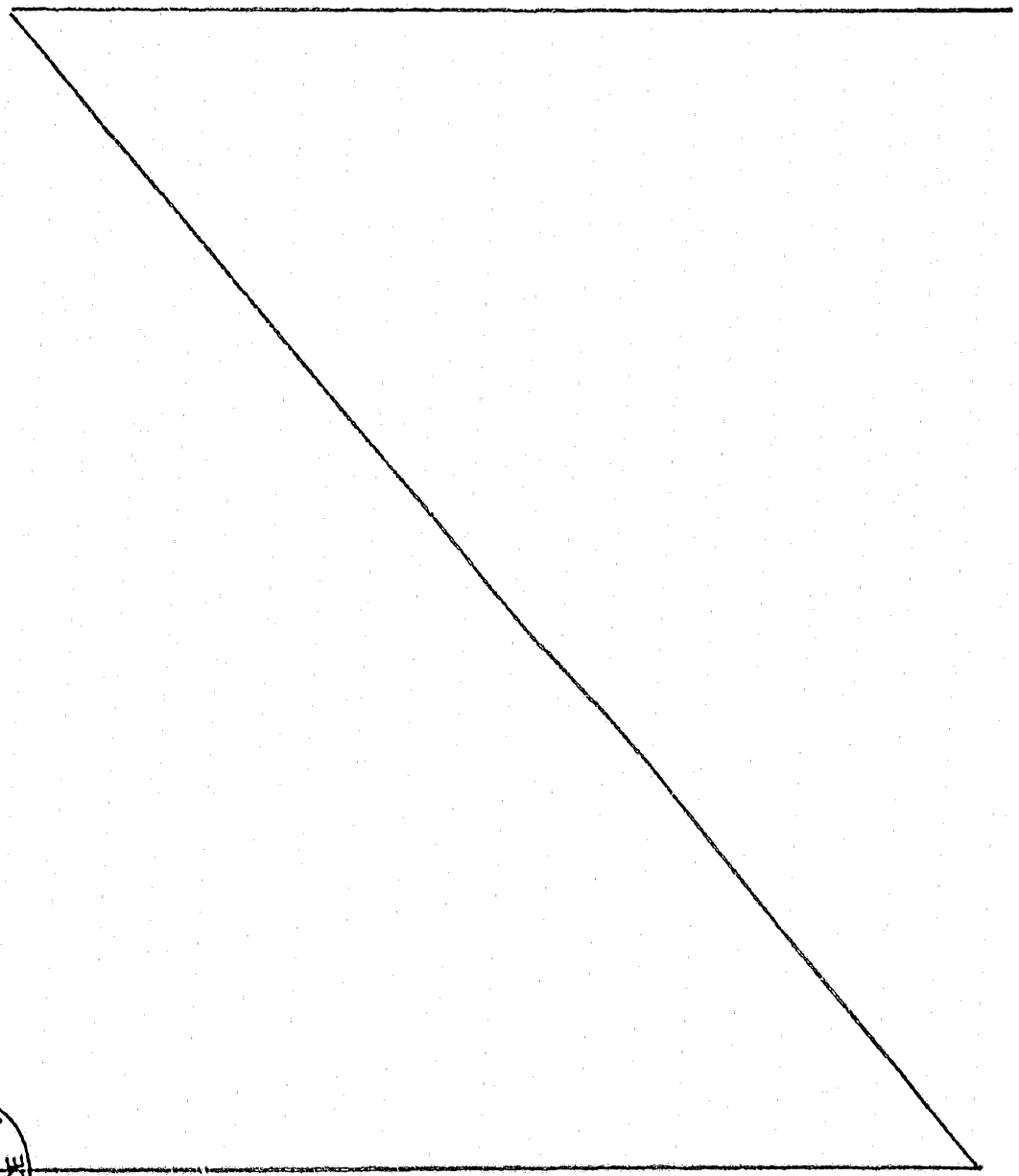
Fig. 2 is a horizontal sectional view taken on the line II-II of Fig. 1;

Fig. 3 is an enlarged fragmentary view showing the latch trip mechanism in the latched position;

Fig. 4 is an enlarged fragmentary view of the latch trip mechanism in the unlatched position; and

Fig. 5 is an enlarged, fragmentary side view of the resetting position.

A molded case circuit breaker 10 in Fig. 1 comprises a base 12 having a cover 14. The base and the cover are assembled at a parting line 16 and create an internal compartment in which circuit breaker apparatus is disposed which includes a fixed contact 18 and a movable contact 20. The fixed contact is mounted on a conductor 22 to which a stab 24 is connected.



The movable contact 20 is mounted on a contact carrying arm 26 which is pivotally mounted on pivot 28. A pair of flexible conductors, or shunts, 30, 32 extend from the arm 26 to a connector 34 of a conductor 36 which conductor is connected to a stab 38. Thus, a circuit through the circuit breaker extends from the stab 24 through the several parts 22, 18, 20, 26, 30, 32, 34, 36 to the stab 38.

As shown in Fig. 1 the pin 28 is a pivotal point for rotation of a contact arm assembly and a mounting bracket 39 comprised of a pair of similar spaced plates (Fig. 2) fixedly mounted on the crossbar 56. The contact arm assembly includes the contact arm 26 and a switch arm 27 which is an inverted channel member and within which the contact arm is disposed. In effect the assembly of the contact arm 26 and the switch arm 27 comprise the operating contact arm. The switch arm 27 is pivotally mounted on the pin 28 on which it is independently rotatable with the mounting bracket 39. Latching means are provided between the switch arm and the bracket for releasably maintaining them together for simultaneous or separate movement.

An operating mechanism generally indicated at 40 is provided for opening and closing the contacts by means of a conventional toggle assembly which includes toggle links 44, 46 which are pivotally interconnected at pivot 48. Link 46 is pivotally connected at pivot 50 to the mounting bracket 39. The link 44 is pivotally connected at pivot 52 to a releasable arm or cradle 54. The toggle mechanism also includes a coil spring 55 in a conventional manner.

Opening of the contacts 18, 20 is accomplished either by the handle 42 or automatically in response to over-current conditions occurring in the circuit.

In the open position, the contact arm 26 is disposed in a broken line position 26a. The mounting bracket 39 supports a crossbar 56 which is interconnected with contact arms in adjacent pole units of the three-pole

circuit breaker 10 (Fig. 2) for opening and closing corresponding contacts similar to contacts 18, 20, simultaneously. Accordingly, when the operating mechanism 40 actuates the contact arm 26 between either open or closed positions, the contact arms in adjacent poles of the circuit breaker are moved correspondingly by the operating mechanism 40.

In accordance with this invention, the circuit breaker 10 also comprises a latching device generally indicated at 58 and it comprises a latch lever 60, a pair of links 62, 64, and a trip bar 66. As shown more particularly in Fig. 3, the links 62, 64 are pivotally interconnected at pivot 68 forming a toggle joint. The lower end of the link 64 is pivoted at 70 to a frame member 72 and the upper end of the link 62 is pivotally connected at 74 to the latch lever 60, which lever is pivoted at 76 to the frame 72.

In Fig. 3 the latching device 58 is disposed in the latched position of the cradle 54 which is pivotally mounted to the frame 72 at pivot 78. That is, end 80 of the cradle 54 is retained in place by a surface 82 of the latch lever 60, which lever is retained in place by the links 62, 64 disposed in substantially aligned positions (Fig. 3). The links 62, 64 are retained in that position against a stop pin 84 by pressure from a lever 86 extending from the trip bar 66. So long as the latching device 58 remains in the latched position with respect to the cradle 54, the circuit breaker may be opened only by movement of the handle 42 to the "off" position.

However, when in response to overcurrent conditions, such as a short circuit, the trip bar 66 is rotated clockwise to move the lever 86 from contact with the surface 88 of the link 62, whereby a bias spring 90 rotates the toggle link to the left (Fig. 3), causing the latch lever 60 to rotate clockwise. As a result, the latch lever 60 rotates clockwise to release the cradle 54 which rotates counterclockwis in response to pressure of springs in the

toggle linkage of the operating mechanism 40 to the position shown in Fig. 4. Thus, the circuit breaker 10 is tripped and the latching device 58 assumes the condition shown in Fig. 4.

Automatic tripping of the circuit breaker occurs in response to overcurrent conditions which may operate at least one device, such as a bimetal, electromagnet, or a current transformer. For example, a current transformer 92 (Fig. 1) is disposed around the conductor 36. When a current exceeding a prescribed rating passes through the conductor 36, the current transformer 92 feeds an electronic trip unit (not shown) which, in turn, actuates a solenoid 94 (Fig. 5) having a plunger 96 which moves against a lever 98 for rotating the trip bar clockwise.

When the trip bar 66 is rotated clockwise, the lever 86 moves off the surface 88 and the combination of the pressure applied by the cradle 54 and the spring 90 collapses the latching device 58 to the position shown in Fig. 4. As the trip bar 66 rotates, a lever 100 (Fig. 4) mounted thereon, stretches a coil spring 102, one end of which is attached to the lower end of the lever 100 and the other end of which is attached to a frame member 104, thereby providing a bias for returning the trip bar 66 in the latching device 58 to the latched position.

In addition, the lever 100 bears against a spring-loaded pin 106 mounted on a bracket 108 which is pivotally mounted on the pin 76. The pin 106 is slidably mounted on a flange of the bracket 108 where it is retained by a nut 110. The bracket 108 is a generally Z-shaped member having a flange 112.

Resetting of the circuit breaker 10 occurs by rotating the handle 42 (Fig. 1) clockwise to rotate an inverted U-shaped operating lever 114 about a pivot 116, causing a pin 118 on the lever to move against an edge 120 (Fig. 4) to rotate the cradle 54 clockwise to the position shown in Fig. 5. Thus, the right end of the cradle 54 engages the flange 112 and rotates the bracket 108 and the

spring-loaded pin 106 against the lever 100, whereby the trip bar 66 rotates counterclockwise. That action causes the lever 86 to move over an inclined or camming surface 122, thereby urging the toggle links 62, 64 back to the latched condition. The latch surface 82 of the latch lever 60 is positioned in the path of movement of the end 80 of the cradle 54 for latching the cradle when the handle 42 is released.

A spring-loaded pin 124 is slidably mounted on the frame member 104 for establishing a setting position for the lever 100. For that purpose a nut 126 is adjustably mounted on the pin 124 for making adjustments of the position of the lever. Rotation of the cradle arm 54 to the position shown in Fig. 5 for rotating the bracket 108 moves the lever 98 against and return the plunger 96 into a retracted position within the solenoid 94. In this position, the plunger 96 is ready for a subsequent tripping of the latching device 58.

In conclusion, the latching and tripping mechanism of this invention utilizes a series of linkages which offer the advantages of low latch loads, high shock resistance, and minimum adjustments to provide high resistance to shock forces while allowing the trip forces to be controlled to reasonable values.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. A circuit breaker comprising a housing including a mounting frame, a circuit breaker structure having a pair of separable contacts and having a releasable lever pivotally supported and operable between latched and unlatched positions to open the separable contacts, operating means for actuating a contact arm and comprising a first toggle linkage between the releasable lever and the contact arm, manually operable means to open and close the contacts when the releasable lever is in the latched position, a trip bar operable automatically in response to overload current conditions above a predetermined value to release the releasable lever from the latched position to the unlatched position to open the contacts, latching means for latching the releasable lever including a latch lever detachably connected to the releasable lever, the latching means also including a second toggle linkage comprising a first link pivotally connected to the latch lever, a second link pivotally connected to the mounting frame, and the first and second links have pivotally interconnected end portions forming a pivot joint, the trip bar having a projection for releasably engaging the second toggle linkage so as to cause latching and unlatching of the releasable lever upon rotation of the trip bar, and the manually operable means being operable to move the releasable lever from the tripped position to the latched position following release of the releasable lever and wherein said projection in the untripped

position is mechanically urged against a portion of said second toggle linkage.

2. A circuit breaker as claimed in claim 1 in which the end portion of one of the links of the second toggle linkage includes a camming surface over which the projection moves to relatch the releasable lever as the manually operable means moves to reset the trip bar.

3. A circuit breaker as claimed in claim 2 in which the links are aligned against a stop pin by the projection.

4. A circuit breaker as claimed in claim 2 in which the links are biased away from the stop pin.

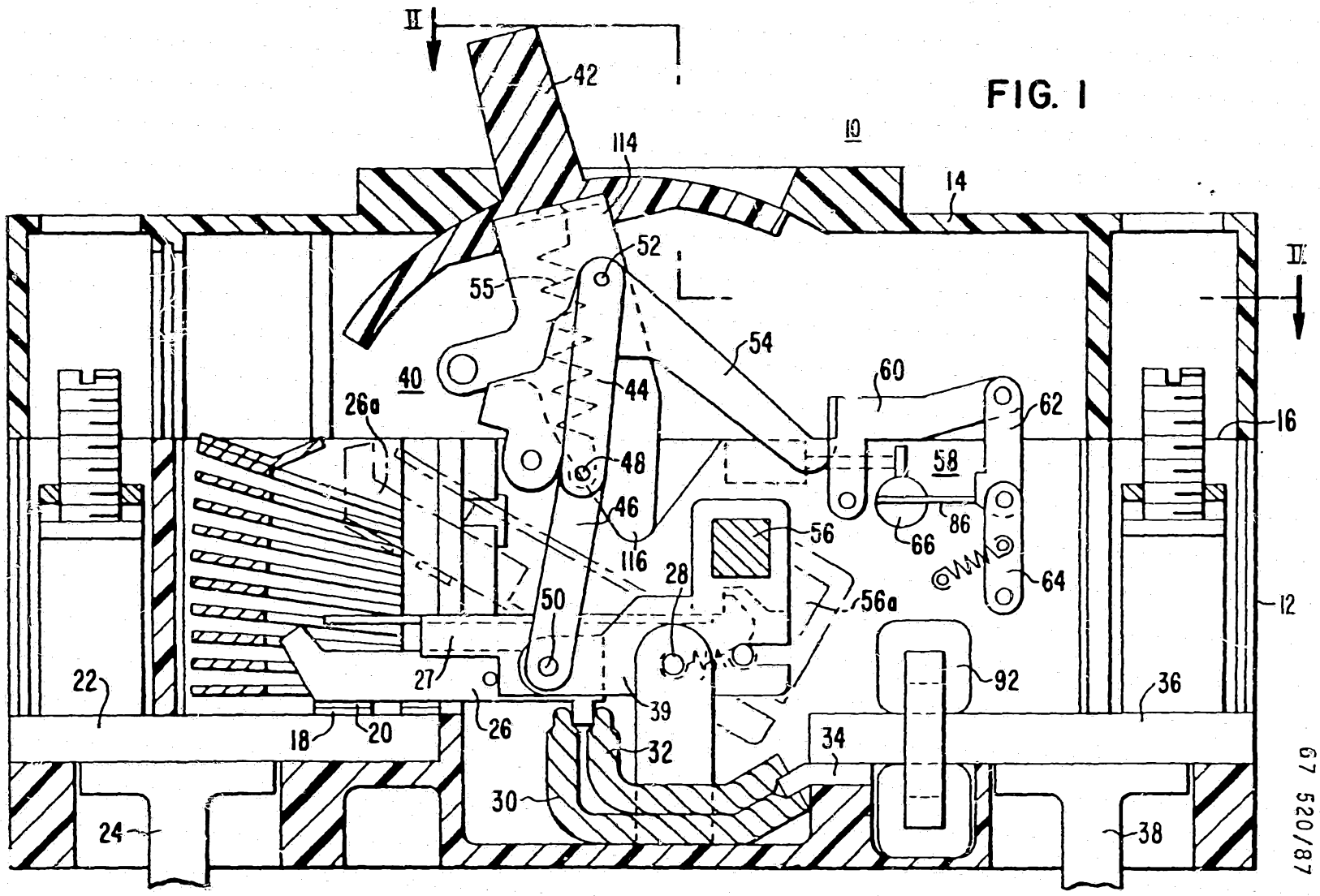
5. A circuit breaker as claimed in any one of claims 2, 3 or 4 wherein said camming surface is biased away from said stop pin and towards said projection.

6. A circuit breaker, constructed and adapted for use, substantially as hereinbefore described and illustrated with reference to the accompanying drawings.

Dated this 6th day of June, 1990.

WESTINGHOUSE ELECTRIC CORPORATION
By their Patent Attorneys
PETER MAXWELL & ASSOCIATES.

FIG. 1



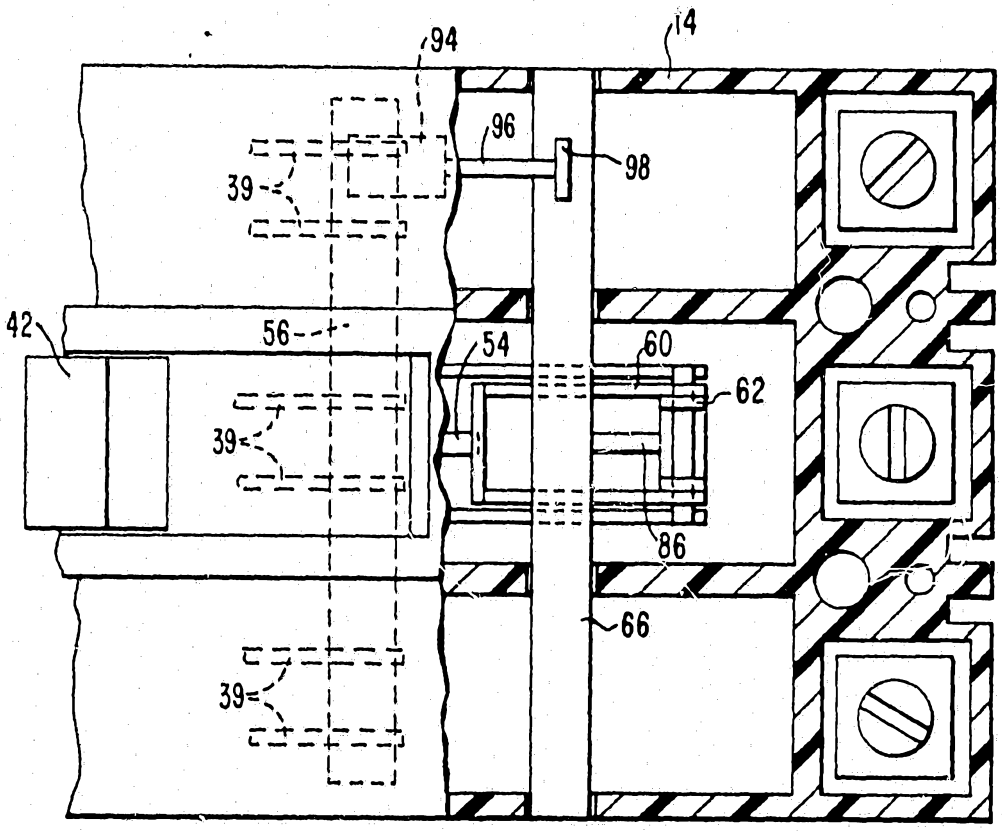


FIG. 2

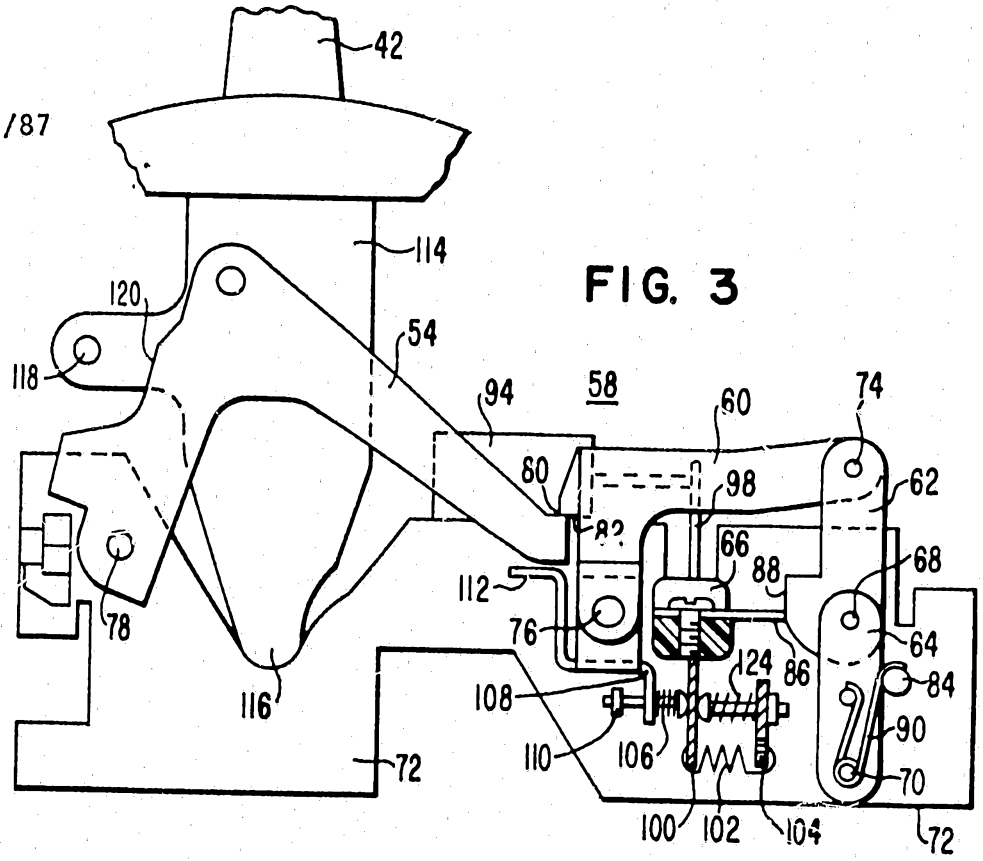

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FIG. 3

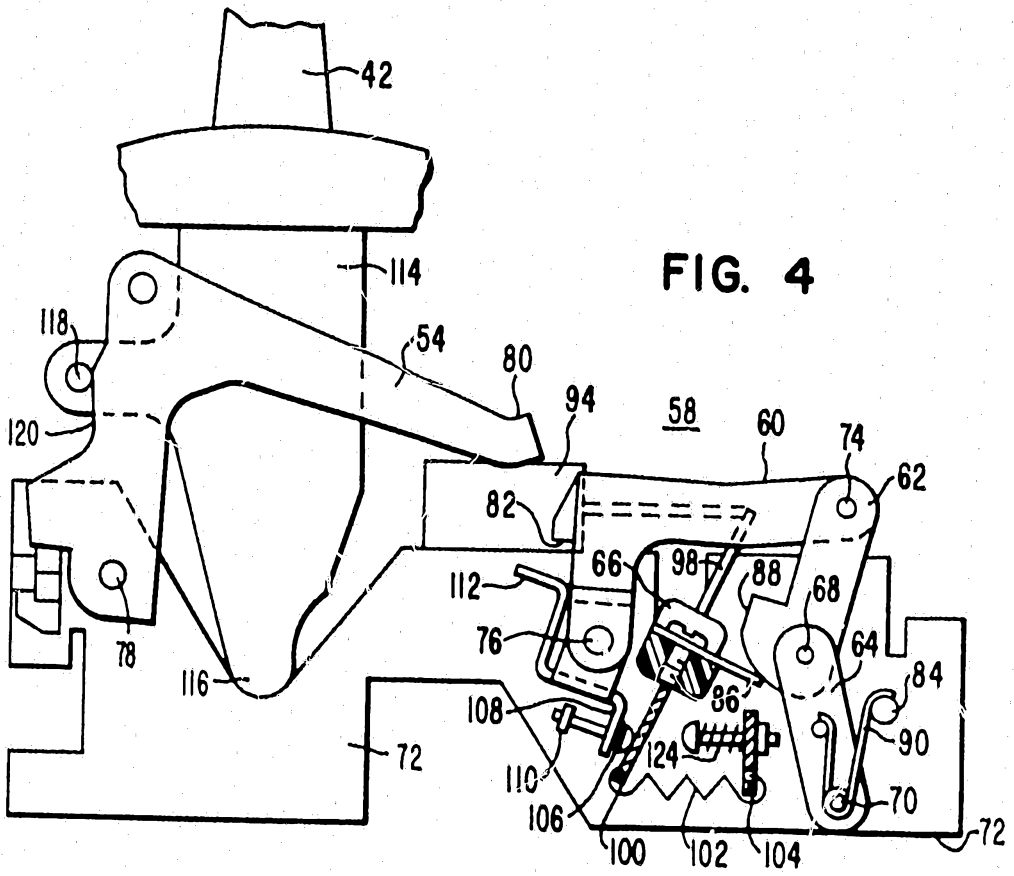
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FIG. 4

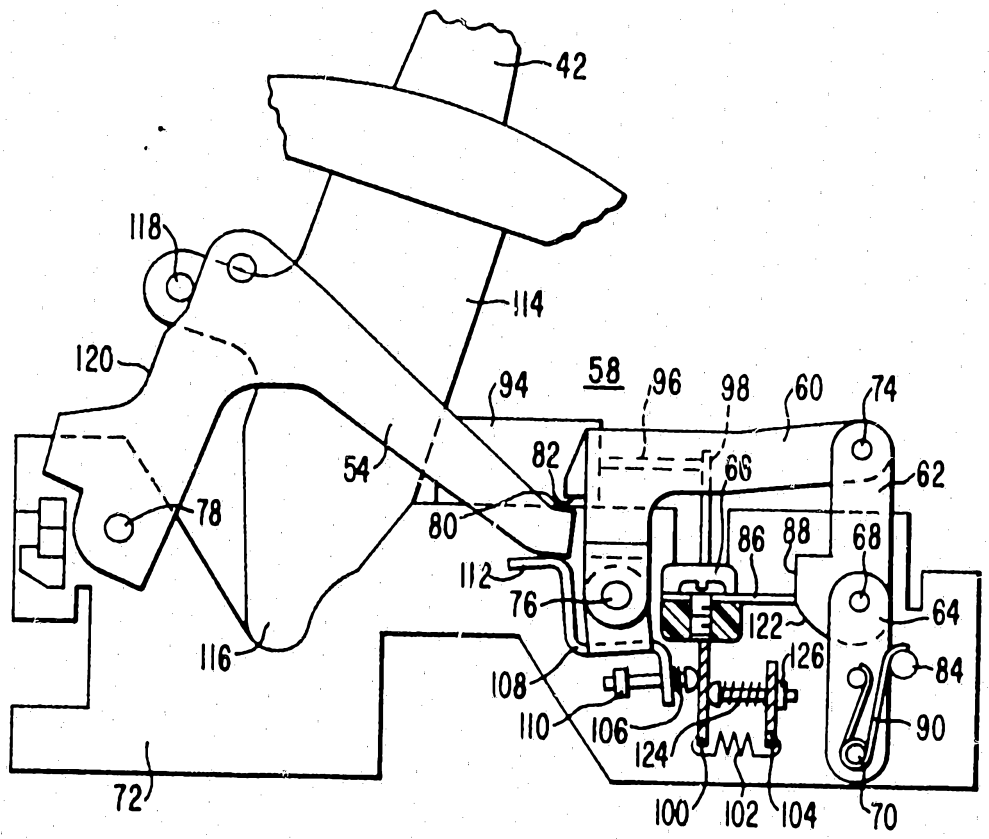
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FIG. 5