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2,808,489

LOAD BREAK DISCONNECTS

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2 Sheets-Sheet 2

Fig. 3.

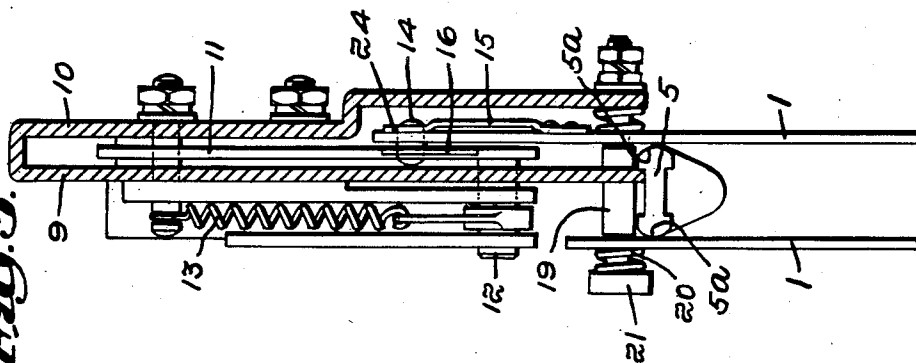
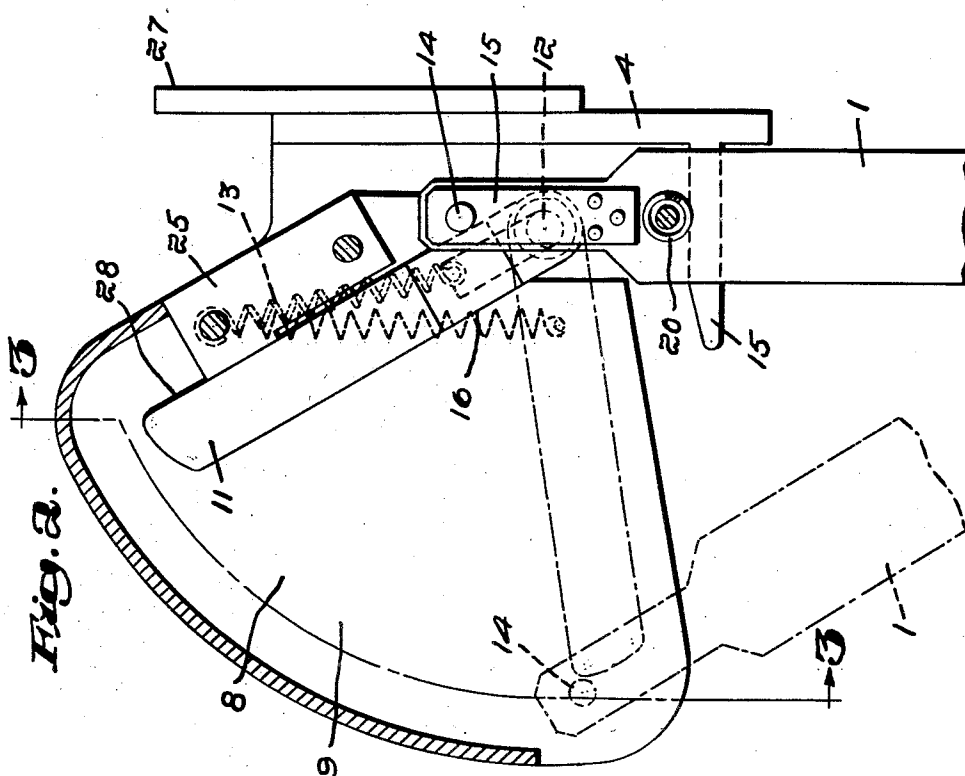


Fig. 2.



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LOAD BREAK DISCONNECTS

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9 Claims. (Cl. 200—146)

This invention relates generally to circuit interrupters and more particularly to load break disconnects, i. e. switches capable of interrupting load currents.

One object of this invention is to generally improve blade type disconnect switches capable of interrupting load currents with a minimum of arcing.

The blade type disconnect switches known heretofore are either not suited for interrupting load currents or, if suited for this particular duty, such switches are of relatively considerable bulk.

It is, therefore, another object of this invention to provide a load break disconnect which is less bulky than comparable prior art disconnects.

Another object of the invention is to provide a load break disconnect which projects relatively little above the supporting structure thereof.

Another object of this invention is to provide a load break disconnect having a pivotally mounted quick acting auxiliary contact and an arc chute for accommodating this contact wherein both the fulcrum structure for the contact and the arc chute are supported by a common supporting insulator.

In some prior art load break disconnects the quick-acting auxiliary contact is pivotally supported by the movable main contact. This arrangement of parts calls for very large opening strokes of the movable main contact.

It is, therefore, another object of the invention to provide load break disconnects wherein the quick-acting auxiliary contact is not hingedly supported by the movable main contact and which are not subject to the limitations and disadvantages of apparatus of this type.

Another object of the invention is to provide a novel load break disconnect which is simple and inexpensive to manufacture.

These and other objects and advantages of the invention will become more apparent upon consideration of the following specification of a preferred embodiment thereof, taken in connection with the attached drawings, wherein:

Fig. 1 is a side elevation of a load break switch embodying the invention;

Fig. 2 is a longitudinal section of the arc chute showing the parts which are arranged therein and associated with it;

Fig. 3 is a section along 3—3 of Fig. 2.

Referring now to the drawings, and particularly to Figs. 1 to 3 thereof, reference numerals 2 and 3 have been applied to indicate a pair of spaced supporting insulators of which each is provided with a terminal 26 and 27, respectively. Supporting insulators 2 and 3 are in turn supported by a common base or supporting structure 17. Supporting insulator 2 supports the blade contact or movable main contact 1 by means of a fulcrum structure 18 including a pivot pin. As best shown in Fig. 3 blade contact 1 comprises a pair of parallel spaced blades which are held in their spaced position by means of suitable spacers. Only one of these spacers has been shown in Fig. 3 and has been indicated by reference

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character 19. Spring 20 surrounding screw 21 tends to press the two blades of contact 1 firmly against spacer 19. Rocking blade contact 1 is adapted to be operated by means of an operating lever 6 of insulating material which is pivoted at point 22 movable relative to supporting structure 17 and pivoted at 23 to blade contact 1. Lever 6 may be moved forward and backward to move contact 1 selectively either in counterclockwise direction, or to move contact 1 in clockwise direction. Reference numeral 29 has been applied to indicate a lever mounted on and keyed to shaft 30 and supporting pin 22, on which contact operating lever 6 is hinged. Lever 7 is likewise mounted on, and keyed to, shaft 30. Hence both levers 29 and 7 move jointly upon rotation of shaft 30 in either direction. Reference numeral 31 has been applied to indicate a cylindrical abutment forming an integral part of lever 7. The position of the above referred-to parts when blade contact 1 is in the open position thereof has been indicated by dash-and-dot lines. In the fully open position of blade contact 1 the abutment 31 on lever 7 is positively engaged by base 17, thus limiting the opening stroke of the load break disconnect. Blade contact 1 is intended to cooperate with a fixed contact 4 which is generally L-shaped as clearly shown in Fig. 2 and comprises a projection 5 adapted to enter into the gap or space defined by the two blades of contact 1 when the latter is moved upwardly in clockwise direction into engagement with contact 4. Projection 5 has a pair of spherical surfaces 5a for engaging blade contact 1. Fixed contact 4 is supported by the supporting insulator 3 arranged on the upper side of supporting structure or base 17. One of the two blades of contact 1 is longer than the other—the right blade as seen in Fig. 3—and is provided with a transverse bore 24 receiving a substantially cylindrical abutment member 14. Abutment member 14 is acted upon by a leaf spring 15 supported by blade contact 1 tending to maintain abutment member 14 in the position shown slightly projecting with the axially inner end thereof beyond bore 24. Abutment member 14 is adapted to cooperate with a cam abutment indicated by reference character 16. Upon engagement of abutment member 14 by cam abutment 16 the former is being pushed against the bias of leaf spring 15 into bore 24. To achieve this end cam abutment 16 is provided with a suitably inclined surface imparting a wedge action to it. Cam abutment 16 forms an integral part of an auxiliary blade contact or quick-break contact 11 fulcrumed at 12. The fulcrum structure 12 of contact 11 is in turn supported by supporting insulator 3. Auxiliary blade contact 11 is acted upon by a helical spring 13 of which the lower end is attached to a spring anchor lever fixedly mounted on shaft 12 of blade contact 11, whereas the upper end of spring 13 is attached to a block 25 forming an integral part of an arc chute 8. Arc chute 8 comprises two spaced substantially parallel insulating walls 9 and 10 defining a narrow gap therebetween accommodating auxiliary blade contact 11. Walls 9 and 10 extend from the region of fulcrum structure 12 radially outwardly over the trajectory of the point of movable contact 11. Supporting insulator 3 forms a common support for arc chute 8 and fulcrum structure 12 and both may be attached to it in any desired way. Walls 9 and 10 are substantially in the shape of sectors of a circle having radii substantially equal to but slightly exceeding the length of auxiliary blade contact 11. Fulcrum structure 12 is arranged immediately adjacent the center of said circle or, in other words, immediately adjacent the center of curvature of walls 9 and 10.

In the closed position of the circuit interrupter double blade contact 1 is in engagement with the portion 5 of fixed contact 4. The spherical surfaces 5a of portion 5 of contact 1 engage the inner surfaces of the blades of

contact 1 under considerable pressure, thus minimizing contact resistance and consequent heat losses. When the blade contact 11 is in the position best shown in Figs. 2 and 3, contact 11 does not carry current, the current being carried from terminal 26 through blade contact 1 to co-operating fixed contact 4 and terminal 27. In other words, blade contact 11 is then shunted out of the current path on account of direct engagement of contacts 1 and 4. As long as the circuit interrupter is in the closed position thereof abutment member 14 extends transversely across the upper edge 28 of auxiliary blade contact 11, i. e. the edge thereof remote from blade contact 1. Edge 28 operates as an abutment cooperating with abutment member 14 to cause blade contact 11 to be moved downwardly when the main contact 1 is being moved downwardly by the action of link 6.

Upon separation of contact 1 from portion 5 of contact 4 on account of continued counterclockwise movement—as seen in Figs. 1 and 2—of contact 1 about fulcrum structure 18, the current path between contact 1 and portion 5 of contact 1 is interrupted and simultaneously a new current path is established extending from terminal 27 through a portion of contact 4 and through auxiliary blade contact 11, abutment means 14 sliding along edge 28 of contact 11, contact 1 and terminal 26.

As both contacts 1 and 11 are rocked about the respective fulcrum thereof, i. e. about fulcrum 18 and 19, respectively, spring 13 is progressively tensioned. Fig. 2 shows in dotted lines the respective position of contacts 1 and 11 at the instant when abutment means 14 slides off edge 28 of contact 11, thus permitting rapid return of the latter to the initial position thereof under the action of spring 13. On account of the rapid separation of contact 11 from contact 1, the arc drawn upon initial separation of contacts 1 and 11 is rapidly elongated, resulting in an increase of the arc voltage at a rapid rate. The immediate vicinity of the relatively cool insulating walls 9 and 10 to the arcing zone results in an intense cooling action upon the arc, thus increasing the interrupting ability of the switch to enable it to interrupt currents of load current proportions.

To reclose the circuit, contact 1 is moved in clockwise direction—as seen in Fig. 1—the circuit being re-established upon engagement of projection 5 of contact 4 by the two spaced blades of contact 1. Overtravel of contact 1 results in engagement of abutment member 14 by the cam 16, forming an integral part of switch blade 11. Cam 16 causes sliding of abutment member 14 within bore 24 of blade 1, but permits abutment member 14 to snap out of bore 24 under the action of spring 15 when abutment member 16 has passed cam surface 16 and is ready to pass across edge 28 of blade contact 11. When this occurs, the closing operation is completed and the load break switch is ready for a repeated opening operation.

It will be apparent from the foregoing that abutment means 14 can be moved by cam 16 against the action of spring 15 transversely to the plane of motion of contact 1, but cannot be moved relative to contact 1 in the direction of the pivotal or rocking motion thereof about fulcrum 18.

In the drawings no separate leads in addition to terminals 26 and 27 have been shown to indicate the circuit into which the load break switch is connected. Terminals 26 and 27 form an integral part of this circuit and are supposed to be a simplified pictorial indication thereof.

While the cam or abutment surface 28 formed by one of the edges of auxiliary quick-break blade contact 11 might be substituted by another cam or abutment surface serving the same function, it is preferable to use one of the edges of contact 11 as the cam or abutment means for pulling contact 11 by means of contact 1 toward the open position of the latter.

Having described a preferred embodiment of the invention as required by the patent statutes, it is desired

that the invention be not limited to the particular embodiment shown inasmuch as it will be obvious, particularly to persons skilled in the art, that many modifications and changes may be made without departing from the broad spirit and scope of the invention as defined in the appended claims.

I claim as my invention:

1. In a switch, a base, a fixed main contact mounted on said base, a movable main blade contact cooperating with said fixed main contact pivotally mounted on a first fulcrum, an auxiliary quick-break blade contact pivotally mounted on a second fulcrum spaced from said first fulcrum and arranged in a fixed relation to said base, co-operating abutment means on said main blade contact and on said quick-break blade contact to cause initial joint movement of said quick-break blade contact and of said main blade contact upon separation of said main blade contact from said fixed main contact, said abutment means being shaped to release said quick-break blade contact from said movable main blade contact upon a predetermined separation of said main blade contact from said fixed main contact, and spring means biasing said quick-break blade contact out of engagement with said main blade contact.

2. In a switch, a base, a fixed main contact mounted on said base, a movable main blade contact cooperating with said fixed main contact pivotally mounted on a first fulcrum, an auxiliary quick-break blade contact pivotally mounted on a second fulcrum spaced from said first fulcrum and arranged in fixed relation to said base an arc chute including spaced substantially parallel walls of insulating material defining a narrow gap therebetween accommodating said quick-break blade contact, co-operating abutment means on said main blade contact and said quick-break blade contact to cause initial joint movement of said quick-break blade contact and of said main blade contact upon separation of said main blade contact from said fixed main contact, said abutment means being shaped to disengage said quick-break blade contact from said main blade contact upon a predetermined separation of said main blade contact from said fixed main contact, and spring means tending to separate said quick-break blade contact from said main blade contact and move said quick-break blade contact into said arc chute to the initial position thereof.

3. In a switch, a base, a fixed main contact mounted on said base, a movable main blade contact cooperating with said fixed main contact pivotally mounted on a first fulcrum, an auxiliary quick-break blade contact pivotally mounted on a second fulcrum spaced from said first fulcrum and arranged in fixed relation to said base, an arc chute including spaced substantially parallel walls substantially in the shape of a sector of a circle arranged with the center thereof immediately adjacent said second fulcrum, said walls defining a narrow gap accommodating said quick-break contact, cooperating abutment means on said movable main blade contact and said quick-break blade contact to cause initial joint movement of said quick-break blade contact and of said main blade contact upon separation of said main blade contact from said fixed main contact, said abutment means being shaped to release said quick-break blade contact from said main blade contact upon a predetermined separation of said main blade contact from said fixed main contact, and spring means biasing said quick-break blade contact away from said main blade contact back into said arc chute.

4. In a switch, a base, a fixed main contact mounted on said base, a movable first blade contact comprising a pair of spaced blades cooperating with said fixed main contact pivotally mounted on a first fulcrum, a second blade contact arranged within the gap defined by the planes of said pair of blades of said first blade contact and pivotally mounted on a second fulcrum spaced from said first fulcrum and arranged in fixed relation to said

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base an arc chute including spaced substantially parallel walls defining a narrow gap therebetween accommodating said second blade contact, cooperating means on said first blade contact and said second blade contact to cause initial joint movement of said second blade contact and of said first blade contact upon separation of said first blade contact from said fixed main contact, said cooperating means being shaped to release said second blade contact from said first blade contact upon a predetermined separation of said first blade contact from said fixed main contact, and spring means biasing said second blade contact away from said first blade contact back into said arc chute.

5. In a switch, a base, a fixed main contact mounted on said base, a movable main blade contact cooperating with said fixed main contact pivotally mounted on a first fulcrum, an auxiliary quick-break blade contact pivotally mounted on a second fulcrum spaced from said first fulcrum and arranged in fixed relation to said base, an abutment on said movable main blade contact movable with respect thereto normally in cooperative relation with one of the edges of said quick-break blade contact, a first spring means biasing said abutment in a direction transversely to the plane of said main blade contact, the length of said quick-break blade contact being predetermined to cause disengagement of said abutment from said one of the edges of said quick-break contact upon a predetermined joint movement of said main blade contact and said quick-break blade contact away from said fixed main contact a second spring means biasing said quick-break blade contact out of engagement with said abutment, said quick-break contact being adapted to engage said abutment upon movement of said main blade contact toward said fixed main contact to move said abutment against the action of said first spring means transversely to said plane of said main blade contact away from said space occupied by said quick-break blade contact.

6. In a switch, a base, a fixed main contact mounted on said base, a movable main blade contact cooperating with said fixed main contact pivotally mounted on a first fulcrum, an auxiliary quick-break blade contact pivotally mounted on a second fulcrum arranged in spaced relation from said first fulcrum in fixed relation to said base, said quick-break contact comprising a first cam surface and a second cam surface, an arc chute including spaced substantially parallel walls of insulating material defining a narrow gap therebetween accommodating said quick-break contact, abutment means supported by said main blade contact cooperating with said first cam surface and with said second cam surface, said abutment means being normally juxtaposed to said first cam surface and adapted to slide off said first cam surface upon a predetermined joint movement of said main blade contact and said quick-break blade contact to the open position of said main blade contact, a first spring biasing said quick-break blade contact away from said main blade contact into said gap formed in said arc chute, and a second spring permitting said abutment means to yield to the action of said second cam surface during the closing stroke of said first contact to move said abutment means away from the space occupied by said second contact.

7. In a switch, a pair of spaced supporting insulators, a fixed contact mounted on one of said pair of insulators, a first movable blade contact cooperating with said fixed contact pivotally mounted on a first fulcrum structure supported by the other of said pair of insulators, a second movable blade contact mounted on a second fulcrum structure supported by said one of said pair of insulators, an arc chute also supported by said one of said pair of insulators including spaced substantially parallel insulating walls defining a narrow gap therebetween ac-

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commodating said second contact, said walls of said arc chute extending from the region of said second fulcrum structure radially outwardly over the trajectory of the point of said second contact, spring means biasing said second contact into said gap of said arc chute, a first abutment mounted on said first contact movable against spring bias relative to said first contact transversely to the plane of said first contact but fixedly arranged with regard to said first contact in the direction of the pivotal movement thereof, a second abutment forming an integral part of said second contact normally in cooperative relation with said first abutment to cause joint movement of said second contact and said first contact upon movement of said first contact away from said fixed contact, said first abutment and said second abutment being shaped to move out of their cooperative relation upon a predetermined movement of said first contact away from said fixed contact, and a cam surface forming an integral part of said second contact arranged across the trajectory of said first abutment to move said first abutment during the closing stroke of said first contact away from the space occupied by said second contact.

8. In combination an electric circuit, a pair of circuit terminals each supported by one of a pair of spaced supporting insulators, a first pivot supported by one of said pair of insulators pivotally supporting a first blade contact, a second pivot supported by the other of said pair of insulators pivotally supporting a second blade contact, said other of said pair of insulators also supporting a fixed contact cooperating with said first contact and normally shunting said second contact out of said circuit, said other of said pairs of insulators further supporting an arc chute comprising a pair of spaced substantially parallel walls each arranged to one of the sides of said second blade contact, cooperative abutment means effecting joint movement of said second contact and of said first contact about the respective pivot thereof upon separation of said first contact from said fixed contact, said abutment means being shaped to disengage upon a predetermined separation of said first contact from said fixed contact, and spring means arranged in said arc chute tending to pivot said second contact to the initial position thereof.

9. In combination an electric circuit, a pair of circuit terminals each supported by one of a pair of spaced supporting insulators, a first pivot supported by one of said pair of insulators pivotally supporting a first blade contact, a second pivot supported by the other of said pair of insulators pivotally supporting a second blade contact, said other of said pair of insulators also supporting a fixed contact cooperating with said first contact and normally shunting said second contact out of said circuit, said other of said pair of insulators further supporting an arc chute comprising a pair of spaced walls each arranged to one of the sides of said second contact, cooperating abutment means on said first contact and on said second contact for effecting joint movement of said first contact and of said second contact about said first pivot and said second pivot respectively upon separation of said first contact from said fixed contact, said abutment means comprising a spring biased abutment movable at right angles to the plane of said first contact engaging during the opening stroke of said first contact the trailing edge of said second contact, and a spring causing rapid separation of said second contact from said first contact upon disengagement of said abutment from said trailing edge of said second contact.

References Cited in the file of this patent

UNITED STATES PATENTS

2,527,269	Killian	Oct. 24, 1950
2,571,864	Graybill	Oct. 16, 1951