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COMPLETE SPECIFICATION

Circuit Interrupter

We, TERASAKI DENKI SANGYO KABUSHIKI KAISHA, of 27 Showa-cho-naka 5-chome, Abeno-ku, Osaka, Japan, a Japanese Company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a circuit interrupter of the type wherein an electrodynamic repulsion developed between a stationary and a movable contact assembly serves to shorten the interruption period and so provide a current limiting effect.

A general object of the invention is to provide an improved circuit interrupter of the type wherein, upon interruption of a flow of shortcircuiting current an electrodynamic repulsion developed between a stationary and a movable contact arm separates the movable arm from the stationary arm at a high speed to provide a current limiting effect.

A further object of the invention is to provide a circuit interrupter which is of small size and has a high interruption performance.

It is well known that a two point interruption mechanism is effective for reducing the interruption period and limiting the current flowing, the interrupter resulting in an increase in performance.

The conventional type of circuit interrupters for interrupting a flow of current therethrough at two points includes a bridge type movable contact device generally comprising either a single movable contact arm having a pair of movable contacts carried at both ends, or a movable contact arm divided into two portions. Such a single movable contact arm generally increased the inertia of the movable parts and was not suitable for high speed separation of contacts. Also the two part movable contact arm was not suitable for the interruption operation performed by the electrodynamic repulsion and tended to make the interruption mechanism complicated and to increase the size of the circuit interrupter.

Another object of the invention is, accordingly, to provide an improved circuit interrupter of the type including a two-point interruption mechanism suitable for performing an efficient interruption operation through an electrodynamic repulsion developed between a stationary and a movable contact arm upon the occurrence of a shortcircuiting fault.

Another object of the invention is to provide an improved circuit interrupter including a stationary and a movable contact arm disposed so as to increase an electrodynamic force developed between the two contact arms upon shortcircuiting the associated load circuit and to utilize efficiently the increased electrodynamic force.

A further object of the invention is to provide an improved circuit interrupter of electrodynamic repulsion type including a movable contact arm divided into two portions and rotatable while maintaining contacting of the two divided portions at the dividing point whereby to effect smooth interruption at a high speed.

A still further object of the invention is to provide an improved circuit interrupter of electrodynamic repulsion type wherein a loss of the electrodynamic repulsion due to friction is reduced and a space occupied by conductors constituting a stationary contact arm decreases to permit the circuit interrupter to be made in a small size.

The present invention consists in a circuit interrupter comprising a stationary contact arm on the source side and a stationary contact arm on the load side, one stationary contact carried on each of the stationary contact arms, a movable contact assembly separably

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Price 25p

engaging a pair of the stationary contacts to bridge the latter, an operating mechanism for engaging and disengaging the movable contact assembly with and from the stationary contacts, releasable means for separating the movable contact assembly away from the stationary contacts, and trip means responsive to a flow of overload current through the circuit interrupter to release the releasable means, the movable contact assembly also being separable away from the stationary contacts through an electrodynamic repulsion developed between the stationary contact arms and the movable contact assembly immediately upon the occurrence of very high current flowing through the circuit interrupter, wherein said movable contact assembly is split into a pair of bilaterally symmetric movable contact arms rotatably carried on at least one holder plate by a pair of supporting pins, each of said movable contact arms having a contact bearing surface in substantially the same plane as a contact bearing surface on the other movable contact arm in its closed position, a spring connecting said pair of movable contact arms to exert a contact pressure upon a common point on said movable contact arms where they contact each other, and upon the development of said electrodynamic repulsion said pair of movable contact arms are rotated in the opposite directions about the axes of the supporting pins while one of said movable contact arms is maintained in rolling contact with the other movable contact arm thereby to separate the said pair of movable contact arms away from the associated stationary contacts.

In the accompanying drawings:—

Fig. 1 is an elevational view, partly in section, of a circuit interrupter according to the invention,

Fig. 2 is a bottom view of the interrupter with a lower cover member for an arc-extinguishing chamber removed and with a movable contact assembly for one pole removed to expose the associated stationary contact assembly,

Fig. 3A is a fragmental side elevational view of a movable contact assembly in its operative position where it has just been separated from the associated stationary contact assembly by the action of an electrodynamic repulsion developed therebetween,

Fig. 3B is a fragmental side elevational view of the movable contact assembly in its operative position where it is about to return back to its OFF position,

Fig. 3C is a fragmental side elevational view of the movable contact assembly in its operative position where a tripping operation has been completed and it is in OFF, position, and

Fig. 4 is a perspective view of a pair of movable and stationary contact assemblies in a closed position.

While the invention will now be described in terms of a three-pole circuit interrupter it is to be understood that it is equally applicable to circuit interrupters having any desire number of poles.

Referring now to the drawings and more particularly to Fig. 1 thereof, there is illustrated a circuit interrupter embodying the principle of the invention. An arrangement illustrated comprises a housing member 10, an upper cover member 12, detachably closing the upper end of the housing and a lower cover member 14 also detachably closing the lower end of the housing, all the members being formed of any suitable electrically insulating material by moulding technique. The housing member 10 includes a mounting plate 16 which may be formed of the same material as the members 10, 12 and 14 and dividing the interior of the housing member 10 into an upper and a lower compartment.

As best shown in Fig. 2, three stationary contact assemblies generally designated by the reference numeral 20 are disposed on the lower surface as viewed in Fig. 1 of the mounting plate 16 in spaced parallel relationship, one for each pole. Each of the stationary contact assemblies 20 is identical in construction to the other stationary contact assemblies, and therefore one such an assembly for the central pole will now be described. The stationary contact assembly 20 comprises a pair of outer stationary contact arms 21 disposed in spaced parallel relationship and an intermediate stationary contact arm 22 interposed between and spaced from the outer stationary contact arms 21. All the stationary contact arms 21 and 22 are fitted into electrically insulating sleeves 24 respectively which are, in turn, secured in parallel grooves (not shown) disposed on the mounting plate 16 in order to ensure that the stationary contact arms are electrically insulated from each other.

As shown in Figs. 2 and 4, the outer stationary contact arms 21 are bridged on one end portion by an electrically conductive contact block 26 having centrally mounted thereon a stationary contact 28 and electrically connected on the other end portions to a terminal plate 30 disposed on the upper surface, as viewed in Fig. 1, of the mounting plate 16 adjacent the wall of the housing 10. The intermediate stationary contact arm 22 is provided on one end portion, interposed between the outer arms 21, with a contact block 32 also having centrally mounted thereon a stationary contact 28a. As shown in Fig. 2, each of the outer arms 21 is provided on its portion corresponding to the middle between the stationary contacts 28 and 28a with an elongated rectangular slot 38 for the purpose hereinafter described.

As shown in Fig. 1, one pair of terminal members 34 and 34a for each pole are disposed in opposed relationship adjacent the wall of the housing and above the mounting plate

16. The terminal 34a is electrically connected to the terminal plate 30 and the terminal 34 is electrically connected to the other end portion of the intermediate stationary contact arm 22 through a conductor 36. That portion of the housing adjacent to each of the terminals 34 and 34a is open whereby the terminals are accessible through the openings. One of the terminals, in this case, the terminal 34a, is adapted to be connected to a source of electrical power (not shown) and the other terminal 34 is adapted to be connected to a load (not shown). Therefore, the outer stationary contact arms 21 and the stationary contact 28 are on the source side while the intermediate stationary contact arm 22 and the stationary contact 28a are on the load side.

A movable contact assembly generally designated by the reference number 40 comprises a pair of movable contact arms 42 and 42a of bilaterally symmetrical shape rotatably disposed in end-to-end relationship directly below the stationary contact assembly 20. It will be understood that in the arrangement illustrated three movable contact assemblies are provided, one for each pole. Since all the movable contact assemblies are substantially identical in construction to each other, only the central movable contact assembly will now be described.

Each of the movable contact arms 42 or 42a is rotatably carried by a support pin 44 or 44a in the manner as will be described hereinafter and includes a movable contact 46 or 46a adapted to engage the associated stationary contact 28 or 28a in its closed position. The movable contact 46 is on the source side while the contact 46a is on the load side. It is to be noted that the adjacent end faces of both movable contact arms are constructed to be of arcuate configuration having the centre on the axis of the associated supporting pin, thus ensuring that the movable contact arms effect rotational movement while maintaining one of the arms in contact with the other.

The pair of movable contact arms 42 and 42a are electrically connected to each other by a flexible lead 48 attached on the lower sides or those sides of the arms remote from the respective contacts 46 and 46a for the purpose described hereinafter.

A pair of longitudinal contact holder plates 50, mounted in spaced parallel relationship (see Fig. 2), are secured through the mounting plate 16 (see Fig. 1) and extend through the slots 38 on the outer stationary contact arms 21 so as to be electrically insulated from the latter. The holder plates 50 are each provided on that portion projecting downwardly beyond the mounting plate 16, with a pair of aligned holes 52 or 52a which serve to rotatably support the supporting pin 44 or 44a respectively. One pair of holes, in this case the holes 52a, is slightly elongated in the direction perpendicular to the common longitudinal axis of the holder plates. The contact holder plates are made in a unitary structure by having rivets 54 disposed on the lower end portions thereof.

Each of the movable contact arms has a pin 56 or 56a disposed substantially parallel to the supporting pin 44 or 44a thereon and vertically movable within a longitudinal notch defined by a pair of spaced shoulders 58 or 58a and 60 or 60a formed on either side of each holder plate 50. Anchored on the pair of the pins 56 and 56a is a coiled spring 62 functioning to provide a contact pressure under which the pair of movable contacts 46 and 46a contact the associated stationary contacts 28 and 28a, also a contact pressure under which the adjacent portions of the movable contact arms contact each other.

A pair of balancing rods 64 and 64a are rotatably mounted at one end to the pins 56 and 56a respectively and at the other end together to a common pin 66 which is, in turn, slidable within a pair of aligned longitudinal guide slots 68 formed on the end portions of the contact holder plates 50. As shown in Fig. 2, the pin 66 is provided on both ends projecting beyond the holder plates 50, with a pair of rollers 70 movable within a pair of longitudinal grooves 72 disposed on the lower cover 14. In order to limit downward movement of the rollers 70, the lower cover 14 is provided with a notched projection 74 of electrically insulating material integral with the inner bottom surface of the lower cover member 14.

As shown in Fig. 1, a pair of arc-extinguishing chambers 76 and 76a of conventional design are disposed on both sides of the movable contact assembly 40 respectively.

The upper compartment as viewed in Fig. 1 is provided with means for engaging and disengaging the movable contact assembly 40 with and from the stationary contact assembly 20.

An operating mechanism for opening and closing the contacts comprises a rockable operating handle 78 of any suitable electrically insulating material projecting externally beyond the upper cover member 12 and a U-shaped operating lever 80 fixed to the operating handle 78 and pivotably mounted on a pivot shaft 82 which, in turn, extends horizontally in a direction normal to the plane of Fig. 1 from a frame 84 erected on the mounting plate 16. The frame 84 carries a horizontal trip pin 86 on which a trip lever 88 is pivotably mounted at one end and has the other end operatively coupled to a trip unit as will be described hereinafter. The trip lever 88 has a toggle pin 90 disposed on the central portion.

A releasable toggle mechanism comprises a pair of toggle arms 92 and 93. The toggle arm 92 is pivotably mounted on the toggle pin 90 at one end and articulated at the

other end to the adjacent end of the other toggle arm 93 by a connecting pin 94. Articulated at the other end of the toggle arm 93 is a contact operating lever 96 rockably supported on a pivot 98 to a support block 100 rigidly secured on the mounting plate 16. The lever 96 is articulated at one end to the upper ends of the contact holder plates 50. The toggle mechanism further comprises a spring 102 having one end anchored to an anchoring plate 101a pivotally mounted by a pin 95 to the righthand end of a projection 80a integral with the operating lever 80, and having the other end anchored to an anchoring plate 101b pivotally mounted on the pin 94.

A trip unit generally designated by the reference numeral 104 is disposed on the right hand portion of the upper compartment as viewed in Fig. 1. The trip unit comprises a housing 106 of any suitable electrically insulating material having accommodated therein trip means comprising a thermally responsive element such as a bimetallic element 108 and an instantaneous trip electromagnet device 110 responsive to any overload current flowing through the conductor 36 connecting the load terminal 34 and the intermediate stationary contact arm 22. Disposed within the trip housing 106 are an instantaneous trip rod 112 operatively connected to the electromagnet device 110, a trip shaft 114 including a pawl 116 and trip adjusting screw 118.

In order to operatively couple the trip lever 88 to the trip pawl 116, there is a hook device including a primary hook member 120 releasably engaging the trip lever 88 and a secondary hook lever 122 releasably connected to both the primary hook member 120 and the trip pawl 116.

The trip unit 104 and the hook device 120—122 may each be of conventional design and do not form part of the invention.

In order to operate the three interrupter units for respective poles, a connecting rod 124 is operatively connected to the respective contact operating levers 96 and hence to the associated contact holder plates 50. It is also to be understood that the operating handle 78 is common to all the three poles.

Fig. 1 shows the circuit interrupter and more particularly the central interrupter unit in its ON position in which that face of the movable contact assembly 40 opposing to the stationary contact arms 21 and 22 is substantially in parallel to the latter in order to efficiently utilize with both, an electrodynamic repulsion developed between the movable and stationary contact arms upon the occurrence of any shortcircuiting current. In order to move the interrupter from its ON position to its OFF position, the operating handle 78 can manually rock from its position illustrated in Fig. 1 to its OFF position, or in the clockwise direction as viewed in Fig. 1. This causes the pair of toggle arms 92 and 93 to collapse to permit the contact operating lever 96 to turn about the axis of the pivot 98 in the clockwise direction a viewed in Fig. 1 which is accompanied by downward movement of the pair of contact holder plates 50. The downward movement of the holder plate pair 50 causes the pair of movable contact arms 42 and 42a to be depressed while maintaining the contact bearing faces substantially parallel to the stationary contact arms 21 and 22 or flush with each other as in their ON position. At the same time the rollers 70 on both ends of the balancing pin 66 slide downwardly within the guide grooves 72 formed on the lower cover member 14 until the movable contacts 46 and 46a are separated away from the associated stationary contacts 28 and 28a whereupon the interruption operation has been completed.

Then if the interrupter is desired to be closed, the operating handle 78 can be manually returned back to its ON position as illustrated in Fig. 1 to contact the movable contacts 46 and 46a with the stationary contacts 28 and 28a through the process reversed from that above described.

It is now assumed that an ordinary magnitude of overload current flows through the circuit interrupter in its ON position. Then such a flow of current through the conductor 36 heats the bimetallic element 108 to deflect the latter to press the adjusting screw 118. This causes the trip shaft 114 to be rotated in the clockwise direction as viewed in Fig. 1 to disengage the trip pawl 116 from the secondary hook member 122 resulting in rotational movement of the secondary and primary hook members 122 and 120 in the clockwise direction. Therefore, the primary hook member 120 disengages from the trip lever 88 to permit the toggle arm pair 92, 93 to collapse whereby the movable contacts 46 and 46a are separated away from the associated stationary contacts 28 and 28a in the same manner as previously described in conjunction with the opening operation until the position illustrated in Fig. 3C is reached.

If a flow of overload current equal in magnitude to from 8 to 10 times a flow of rated current occurs, the electromagnet device 110 is immediately operated to cause the trip rod 112 to rotate the trip shaft 114 in the same manner as above described with reference to the tripping operation until the movable contact assembly 40 reaches its position illustrated in Fig. 3C.

It is now assumed that a flow of heavy current such as a shortcircuiting current has occurred. Then an electrodynamic repulsion is developed between the pairs of movable and stationary contact arms 42, 42a and 21, 22 arranged in substantially parallel relationship, by that current flowing through the arms in the opposite directions and immediately causes the pair of movable contact arms 42 and 42a

to be rotated about the respective supporting pins 44 and 44a in the opposite directions whereupon the movable contacts 46 and 46a are separated from the associated stationary contacts 28 and 28a with the contact holder plates 50 remaining in ON position. More specifically, the balancing pins 66 slide downwardly within the longitudinal guide slot 68 to displace the pins 56 and 56a downwardly. Then the spring 62 spanned between the pins 56 and 56a tending normally to press the movable contacts against the stationary contacts is reversed in the direction to exert its force. This causes the movable contact arms 42 and 42a to be rotated about the supporting pins 44 and 44a in the opposite directions thereby to separate the movable contacts 46 and 46a away from the stationary contacts 28 and 28a respectively until the movable contact arms are bent and maintained in V-shape.

Under these circumstances, downward movement of the pins 56 and 56a is accompanied by downward movement of the pin 66 having the balancing rods 64 and 64a connected together thereto within the aligned guide slots 68 on the contact holder plates 50 and also by downward displacement of the rollers 70 on the pin 66 in the grooves 72 on the lower cover 14.

In this way, the movable contact assembly 40 and the associated parts have reached their position as illustrated in Fig. 3A where the movable contacts 46 and 46a have been separated away from the stationary contacts 28 and 28a. However, the movable contact arms 42 and 42a cannot return back to their original position provided that they are kept intact. Soon after the contacts have been separated away from each other in the manner as above described, the shortcircuiting current having flowed through the conductor 36 will operate the electro-magnetic trip device to release the operating mechanism from its constrained position in the manner as previously described. This causes the contact holder plates 50 to move downwardly.

During this downward movement of the contact holder plates 50, the repelled contact arms 42 and 42a are moved downwardly along with the holder plates 50 until the rollers 70 on the pin 66 strikes against the stop 74. At that time the repelled contact arms 42 and 42a begin to be moved to their previous state in which the contact bearing surfaces thereof are substantially flush with each other (see Fig. 3B).

More specifically, the contact holder plates 50 are depressed while being locked by the pin 66 to raise the movable contact arms 42 and 42a by the balancing rods 64 and 64a through the pins 56 and 56a. This reverses the direction in which the spring 62 exerts its force on the movable contact arms 42 and 42a thereby to permit the latter to be restored to their position where the contact bearing surfaces thereof are substantially flush with each other. Thus the movable contact assembly 40 is maintained in its normal open or OFF position (see Fig. 3C). Then a resetting operation may be performed to make the interrupter ready for the subsequent closing operation.

From the foregoing it will be apparent that the stationary contact arms 21 and 22 on the source and load sides respectively are adapted to have a flow of current therethrough opposite in direction to that through the bridge type movable contact arm pair 42—42a disposed iin substantially parallel relationship with respect to the stationary arms. Upon the occurrence of a flow of very high current such as a shortcircuiting current an electrodynamic repulsion developed between the stationary and movable contact arms is utilized to rotate the two-part movable contact arms 42 and 42a about the axes of their supporting pins 44 and 44a-respectively. In order for the electrodynamic repulsion to efficiently provide a force with which the movable contact arms 42 and 42a are rotated, it is desirable to disposed the movable contact arms close to the stationary contact arms 21 and 22 and also to permit the full magnitude of the shortcircuiting current to flow through the rotating contact arms 42 and 42a. Further it is necessary to effect smooth rotation of the movable contact arms 42 and 42a while maintaining them in contact with each other at a point where the movable contact arms are divided. To this end, that side surface of one of the movable contact arms 42 and 42a successively contacting the corresponding surface of the other movable contact arm should be formed into a circularly arcuate rolling surface having its longitudinal axis on the axis of the associated supporting pin 44 or 44a. This permits the movable contact arms to be rotated in the opposite directions about the axes of the respective support pins while maintaining rolling contact therebetween with the spring 62 serving to provide a proper contact pressure under which such rolling contact is maintained.

As will be readily understood, it is difficult to shape each of the contacting surfaces on both movable contact arms into such a circular arcuate segment that both movable contact arms 42 and 42a can be rotated about the axes of the supporting pins 44 and 44a respectively while maintaining the arms in perfect contact with each other. The circularly arcuate surface inevitably has partially minor irregularities. Under these circumstances, a fixed distance between the centres of the pins 44 and 44a leads to the difficulty of maintaining both the movable contact arms under a constant stable contact pressure for the reason that during rotation of the contact arms the contact point at which both arms contact each other is moved with respect to the arms

resulting in a variation in contact pressure occurring at the contact point.

The invention avoids this difficulty by the provision of one pair of aligned bearing openings, in this case the openings 52a shaped in an elongated slot within which the associated supporting pin 44a is movable in accordance with movement of the contact point at which both arms contact each other, relative to the arms whereby movement of the pin 52a compensates for any irregularities of the arms This ensures that both the movable contact arms 42 and 42a effect smooth rotational movement about the axes of the respective bearing pins 44 and 44a while maintaining the same in stable contact with each other.

If, upon the occurrence of a flow of short-circuiting current, one of the movable contact arms is subjected to an electrodynamic repulsion different in magnitude from the other movable contact arm, then both the arms may be different from each other in speed of rotation and therefore an interruption distance by which the movable contact is separated from the associated stationary contact resulting in interruption at one point. This leads to serious damage to both the movable contacts and their arms and decreases the interruption performance of the circuit interrupter.

In order to eliminate the above-mentioned disadvantage according to the invention, the pair of movable contact arms 42 and 42a are connected together by the pin 66 through the pair of balancing rods 64 and 64a and the pin 66 is adapted to slide in the guide slots 68 on the holder plates 50. This measure ensures that both the movable contacts 46 and 46a are separated from the associated stationary contacts 28 and 28a while maintaining their interruption distances substantially equal to each other and that the movable contacts are in such a constant state that they are ready for simultaneous engagement with the associated stationary contacts.

Further, it is presumed that when the movable contact arms 42 and 42a are rotating in the opposite directions about the axes of the respective support pins 44 and 44a, while continuously contacting the arms at their dividing point, a change in both the electrodynamic repulsion and contacting of the movable contact arms may be accompanied by arcing at the contact point, resulting in damage to the movable contact arms. To minimize or substantially eliminate the occurrence of arc at the contact point, the flexible shunt lead 48 has been provided which electrically connects both the movable contact arms 42 and 42a.

It is recalled that the two movable contact arms 42 and 42a of bridge type are operatively connected to the holder plate pair 50 and are adapted to be moved toward and away from the associated stationary contact arms 21 and 22. In order to effect movement of the movable contact arms, the pin 66 connects the movable contact arms together through the pair of balancing rods 64 and 64a and is provided on both ends projecting beyond the guide slots 68 on the holder plates 50, with a pair of the rollers 70 which, in turn, is adapted to vertically slide in the guide grooves 72 on the lower cover 14. This permits both the movable contact arms to be of a bilaterally symmetrical shape with respect to the common longitudinal axis of the holder plates 50 and ensures that even in the normal opening operation, both the movable contacts are always maintained in balanced interruption distance.

As previously described, an electrodynamic repulsion developed between the movable and stationary contact arms due to a flow of short-circuiting current therethrough causes the pair of movable contact arms 42 and 42a to be rotated in opposite directions and brought into their open position through the reversal of direction in which the spring 62 applies its force to both movable contact arms. If the movable contact arms are kept intact, they cannot perform the subsequent closing operation. Therefore, the movable contact arms must be brought into their position where the contact bearing surfaces thereof are substantially flush with each other. To this end, the trip unit 104 is adapted to operate keeping pace with the rotational movement of the movable contact arms and to release the operating mechanism from its constrained position slightly after the movable contact arms have been rotated, to thereby lower the holder plates 50 to put the movable contact arms in their OFF position and to simultaneously return the spring 62 to its original state in the manner previously described. Therefore, a resetting operation may be performed to make the movable contact arms ready for the subsequent closing operation.

In order to increase a magnitude of electrodynamic repulsion for rotating the movable contact arms 42 and 42a about the axes of the respective supporting pins 44 and 44a, and to improve the high speed interruption effect, the movable and stationary contact assemblies 40 and 20 are constructed and arranged such that a flow of current through the pair of outer stationary contact arms 21 is equal in direction to that through the intermediate stationary contact arm 22 while at the same time the flow of current through all stationary contact arms is opposite in direction to that through the pair of movable contact arms 42 and 42a as shown by the arrows in Fig. 4. In addition, the three stationary contact arms are arranged such that they have flowing therethrough no component of a current in attraction relationship with respect to, or in phase with, a current flowing through the movable contact arms. This measure makes it possible to reduce the space occupied by the stationary contact arms and therefore the dimension of the interrupter measure along

the direction designated by line X—X in Fig. 1. Further, the fact that the three stationary contact arms are composed of straight conductors disposed in a plane permits the arms to be enclosed with the electrically insulating sleeves ensuring that the source arms 21 are satisfactorily insulated from the load arm 22.

WHAT WE CLAIM IS:—

1. A circuit interrupter comprising a stationary contact arm on the source side and a stationary contact arm on the load side, one stationary contact carried on each of the stationary contact arms, a movable contact assembly separably engaging a pair of the stationary contacts to bridge the latter, an operating mechanism for engaging and disengaging the movable contact assembly with and from the stationary contacts, releasable means for separating the movable contact assembly away from the stationary contacts, and trip means responsive to a flow of overload current through the circuit interrupter to release the releasable means, the movable contact assembly also being separable away from the stationary contacts through an electrodynamic repulsion developed between the stationary contact arms and the movable contact assembly immediately upon the occurrence of very high current flowing through the circuit interrupter, wherein said movable contact assembly is split into a pair of bilaterally symmetric movable contact arms rotatably carried on at least one holder plate by a pair of supporting pins, each of said movable contact arms having a contact bearing surface in substantially the same plane as a contact bearing surface on the other movable contact arm in its closed position, a spring connecting said pair of movable contact arms to exert a contact pressure upon a common point on said movable contact arms where they contact each other, and upon the development of said electrodynamic repulsion said pair of movable contact arms are rotated in the opposite directions about the axes of the supporting pins while one of said movable contact arms is maintained in rolling contact with the other movable contact arm thereby to separate the said pair of movable contact arms away from the associated stationary contacts.

2. A circuit interrupter as claimed in claim 1, wherein said holder plate is provided with at least one slot relatively elongate transversely to the longitudinal axis to receive the corresponding supporting pin for one of said movable contact arms, said corresponding supporting pin being movable within said slot during rotational movement of said movable contact arms in the opposite directions about the axes of the supporting pins whereby said pair of movable contact arms are always maintained in stable contact with each other during rotational movement.

3. A circuit interrupter as claimed in claim 1 or 2, including a longitudinal guide slot formed on said holder plate, a connecting pin movable in said guide slot, and a pair of balancing rods connected together at one end by said connecting pin to operatively connect said pair of movable contact arms so as to effect rotational movement of one of said movable contact arms in one direction accompanied by rotational movement of the other movable contact arm in the other direction, the arrangement being such that said connecting pin is movable in said guide slot to permit said pair of movable contact arms to be separated away from the associated stationary contacts while being maintained substantially equidistant from the latter.

4. A circuit interrupter as claimed in claim 1, 2 or 3, wherein a flexible conductor is provided for electrically connecting said pair of movable contact arms to provide a shunt path around the latter.

5. A circuit interrupter as claimed in claim 1, wherein said contact arms are mounted on a pair of spaced, parallel holder plates, said plates being longitudinally movable to engage and disengage said movable contact arms with and from said stationary contacts, and provided with a pair of aligned guide slots having a connecting pin movable therein, there being provided a pair of balancing rods connected together at one end by said connecting pin operatively connecting said pair of movable contact arms, and one roller mounted on each end of said connecting pin projecting beyond said pair of holder plates which is capable of sliding in a guide groove disposed on a housing for said circuit interrupter.

6. A circuit interrupter as claimed in claim 5, wherein after said pair of movable contact arms have been separated away from said associated stationary contacts through said electrodynamic repulsion, said trip means are operated to release said operating mechanism from its constrained position to move said pair of holder plates downwardly while during downward movement of said holder plates said rollers on both ends of said connecting pin strike against a stop disposed on the housing and a further downward movement of said holder plates is accompanied by upward movement of said movable contact arms through said balancing rods thereby to return said spring to its position relative to said movable contact arms where the arms are in their closed position and also to put said movable contact arms in their OFF position where the contact bearing surfaces on the movable contact arms are substantially flush with each other whereby the circuit interrupter is ready for the subsequent closing operation.

7. A circuit interrupter as claimed in any of the preceding claims, wherein said stationary contact arms respectively on the source and load sites include those portions disposed

the direction designated by line X—X in Fig. 1. Further, the fact that the three stationary contact arms are composed of raight conductors disposed in a plane permits the arms to be enclosed with the electrically insulating sleeves ensuring that the source arms 21 are satisfactorily insulated from the load arm 22.

WHAT WE CLAIM IS:—

1. A circuit interrupter comprising a stationary contact arm on the source side and a stationary contact arm on the load side, one stationary contact carried on each of the stationary contact arms, a movable contact assembly separably engaging a pair of the stationary contacts to bridge the latter, an operating mechanism for engaging and disengaging the movable contact assembly with and from the stationary contacts, releasable means for separating the movable contact assembly away from the stationary contacts, and trip means responsive to a flow of overload current through the circuit interrupter to release the releasable means, the movable contact assembly also being separable away from the stationary contacts through an electrodynamic repulsion developed between the stationary contact arms and the movable contact assembly immediately upon the occurrence of very high current flowing through the circuit interrupter, wherein said movable contact assembly is split into a pair of bilaterally symmetric movable contact arms rotatably carried on at least one holder plate by a pair of supporting pins, each of said movable contact arms having a contact bearing surface in substantially the same plane as a contact bearing surface on the other movable contact arm in its closed position, a spring connecting said pair of movable contact arms to exert a contact pressure upon a common point on said movable contact arms where they contact each other, and upon the development of said electrodynamic repulsion said pair of movable contact arms are rotated in the opposite directions about the axes of the supporting pins while one of said movable contact arms is maintained in rolling contact with the other movable contact arm thereby to separate the said pair of movable contact arms away from the associated stationary contacts.

2. A circuit interrupter as claimed in claim 1, wherein said holder plate is provided with at least one slot relatively elongate transversely to the longitudinal axis to receive the corresponding supporting pin for one of said movable contact arms, said corresponding supporting pin being movable within said slot during rotational movement of said movable contact arms in the opposite directions about the axes of the supporting pins whereby said pair of movable contact arms are always maintained in stable contact with each other during rotational movement.

3. A circuit interrupter as claimed in claim 1 or 2, including a longitudinal guide slot formed on said holder plate, a connecting pin movable in said guide slot, and a pair of balancing rods connected together at one end by said connecting pin to operatively connect said pair of movable contact arms so as to effect rotational movement of one of said movable contact arms in one direction accompanied by rotational movement of the other movable contact arm in the other direction, the arrangement being such that said connecting pin is movable in said guide slot to permit said pair of movable contact arms to be separated away from the associated stationary contacts while being maintained substantially equidistant from the latter.

4. A circuit interrupter as claimed in claim 1, 2 or 3, wherein a flexible conductor is provided for electrically connecting said pair of movable contact arms to provide a shunt path around the latter.

5. A circuit interrupter as claimed in claim 1, wherein said contact arms are mounted on a pair of spaced, parallel holder plates, said plates being longitudinally movable to engage and disengage said movable contact arms with and from said stationary contacts, and provided with a pair of aligned guide slots having a connecting pin movable therein, there being provided a pair of balancing rods connected together at one end by said connecting pin operatively connecting said pair of movable contact arms, and one roller mounted on each end of said connecting pin projecting beyond said pair of holder plates which is capable of sliding in a guide groove disposed on a housing for said circuit interrupter.

6. A circuit interrupter as claimed in claim 5, wherein after said pair of movable contact arms have been separated away from said associated stationary contacts through said electrodynamic repulsion, said trip means are operated to release said operating mechanism from its constrained position to move said pair of holder plates downwardly while during downward movement of said holder plates said rollers on both ends of said connecting pin strike against a stop disposed on the housing and a further downward movement of said holder plates is accompanied by upward movement of said movable contact arms through said balancing rods thereby to return said spring to its position relative to said movable contact arms where the arms are in their closed position and also to put said movable contact arms in their OFF position where the contact bearing surfaces on the movable contact arms are substantially flush with each other whereby the circuit interrupter is ready for the subsequent closing operation.

7. A circuit interrupter as claimed in any of the preceding claims, wherein said stationary contact arms respectively on the source and load sites include those portions disposed

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in juxtaposed parallel relationship, said stationary contact arms and said movable contact arms being arranged such that currents flow in the same direction through said juxtaposed and parallel portions of said stationary contact arms while at the same time a flow of current through said stationary contact arm is opposite in direction to a flow of current through said movable contact arms.

8. A circuit interrupter substantially as described with reference to the accompanying drawings.

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