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Caton

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[54] **DRAW OUT TYPE ELECTRICAL SWITCHGEAR WITH IMPROVED MOVABLE CONTACT ASSEMBLY MOUNTING MEANS**

[75] Inventor: **George Caton,** Ilkley, England

[73] Assignee: **Yorkshire Switchgear and Engineering Co., Limited,** Yorkshire, England

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[52] **U.S. Cl.** ..... **200/50 AA,** 200/294

[51] **Int. Cl.** **H01h 9/00,** H02b 1/10

[58] **Field of Search** ..... 200/8 R, 8 A, 10, 11 TC, 200/15, 17, 153 G, 153 H, 153 SC, 162, 163, 50 AA; 317/103, 112, 119

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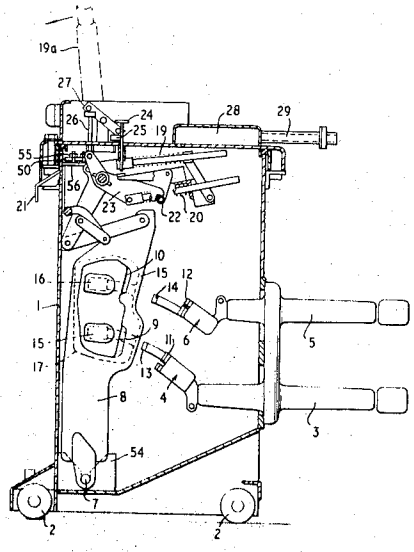
Primary Examiner—James R. Scott

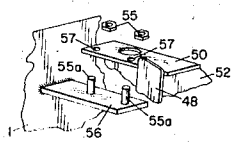
Attorney, Agent, or Firm—Stevens, Davis, Miller & Mosher

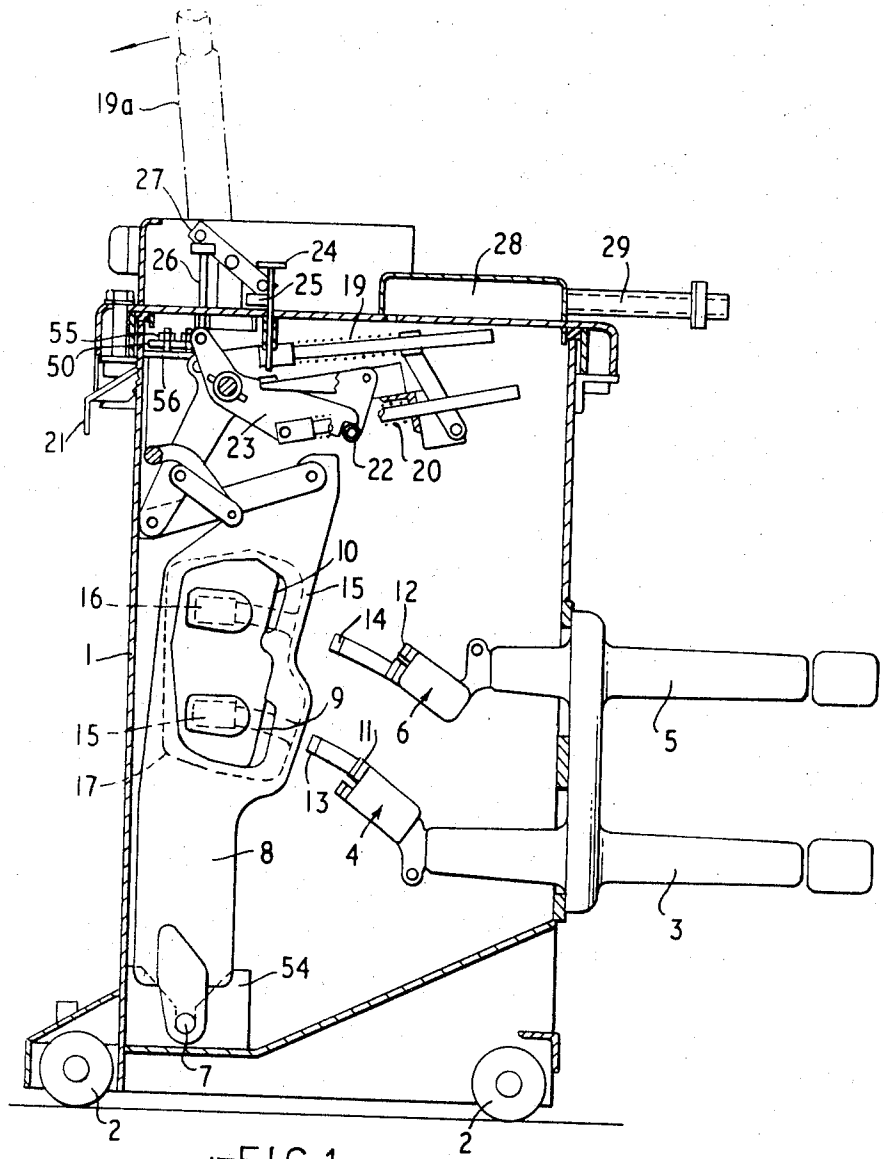
[57] **ABSTRACT**

An oil-immersed circuit breaker comprising one or more pairs of arcuate fixed contacts, an equivalent number of arcuate bridging contacts insulated from and supported on a carrier structure, means mounting the carrier structure for pivotal movement about an axis remote from the fixed contacts and coaxial with the arcuate contacts, and operating means for moving the carrier structure pivotally to effect engagement and disengagement of the bridging contacts with the fixed contacts. The removable mounting means consists of an apertured plate on the movable bridging contact assembly which coincides with structure plate with studs. Nuts are threaded onto the studs to hold the movable bridging contact assembly in fixed relationship to the framework structure.

8 Claims, 3 Drawing Figures



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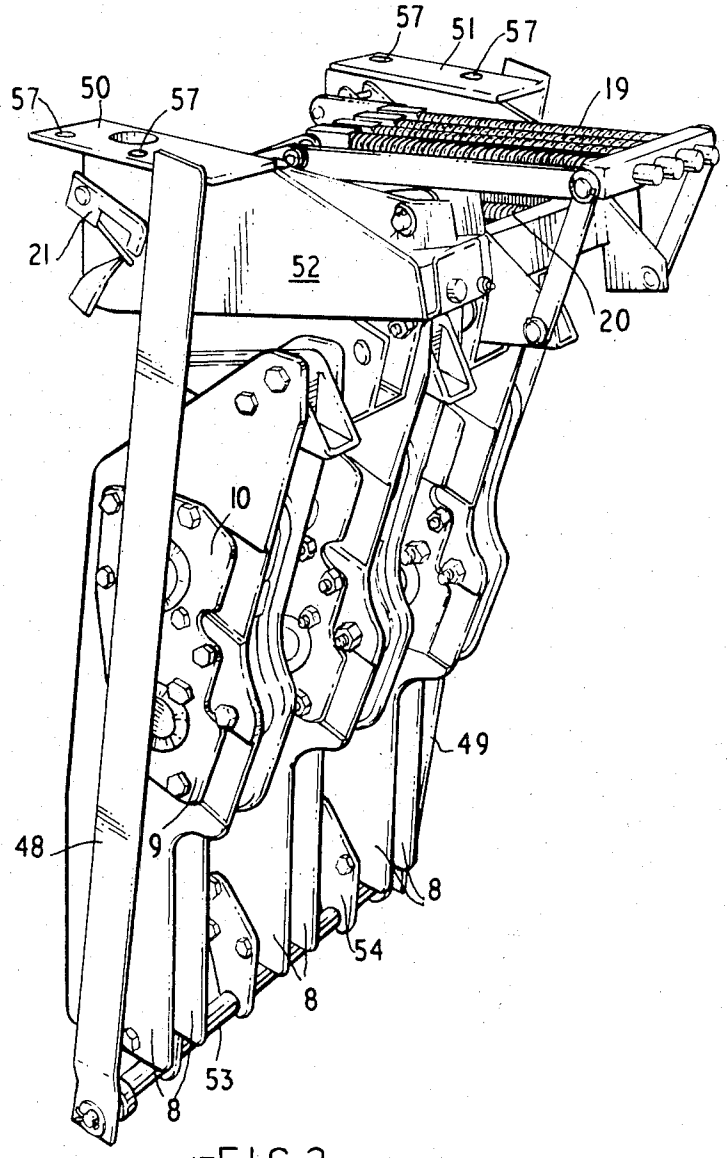
-FIG. 1-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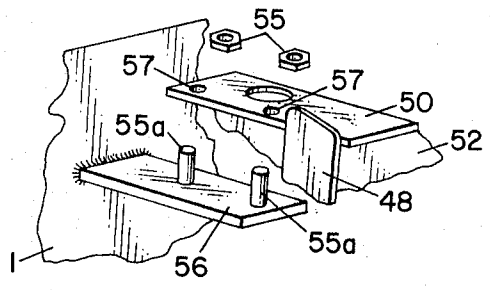
-FIG. 2-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-FIG. 3-

DRAW OUT TYPE ELECTRICAL SWITCHGEAR WITH IMPROVED MOVABLE CONTACT ASSEMBLY MOUNTING MEANS

This invention relates to switchgear for high voltage electrical supplies.

The invention is particularly concerned with oil- or gas-immersed electric circuit breakers provided with arc-quenching means. The term "oil-immersed" when used hereinafter is intended to cover immersion in oil, gas or in other insulating fluids contained in a suitable tank or enclosure. Conventional electric circuit breakers of this sort include one or more pairs of fixed contacts and a similar number of movable bridging contacts to make or break a circuit across each of the fixed contact pairs. An arc-quenching means is associated with either the fixed or the movable bridging contacts for extinguishing any arc struck between the movable and the fixed contacts. In such circuit breakers it has been customary to employ an external mechanism to operate through the wall of the enclosure to raise and lower the movable bridging contacts substantially vertically out of and into engagement with the fixed contacts. The internal component of this lifting equipment is subjected to considerable operational forces and endeavours are made to minimise the frictional loss and the need for large opening and closing efforts.

According to the present invention an oil-immersed electric circuit breaker comprises one or more pairs of arcuate fixed contacts, an equivalent number of arcuate bridging contacts insulated from and supported on a carrier structure, means mounting the carrier structure for pivotal movement about an axis remote from the fixed contacts and coaxial with the arcuate contacts, and operating means for moving the carrier structure pivotally to effect engagement and disengagement of the bridging contacts with the fixed contacts.

A pivotal structure supporting but insulated from the movable contacts and the means for moving this can be made more compact and comprehensively detachable than the customary combination of external mechanism and internal movable arrangement, and in particular can be made as a completely detachable assembly in the form of a relatively long lever with the pivot at one end and the operating means at the other to minimise the frictional effort required when operating on short circuit.

Preferably the pivotal axis of the carrier structure is designed to lie horizontally, and the carrier structure extends substantially vertically upwards from the axis when the bridging contacts are in their disengaged position. An angular movement of about 20° to 30° between the engaged and disengaged positions is generally sufficient, and this fairly small angular movement facilitates a compact arrangement.

It is desirable that an arc control device is mounted on the carrier structure for movement with the bridging contacts. Alternatively, an arc control device may be mounted on or around the fixed contacts.

Conveniently the carrier structure and operating means are mounted on a framework which is removably mounted in a housing to which the fixed contacts are secured. Thus, the whole of the movable contact assembly and controls therefor can readily be removed from the housing for replacement or maintenance purposes.

A specific embodiment of a circuit breaker according to the invention is shown by way of example in the accompanying drawings in which:

FIG. **1** is a schematic side elevation, partly sectioned and with parts removed for clarity, of a circuit breaker;

FIG. **2** is a perspective view of part of the circuit breaker; and

FIG. **3** is a prospective view of the manner in which the removable framework structure is secured to the housing.

The circuit breaker is contained in a housing **1** which is fitted with wheels **2** for easy movement. Projecting from one wall of the housing are two sets of three horizontally aligned plugs, each plug being connected to a fixed contact mounted inside the housing **1.** Thus, plug **3** of the first set has an associated fixed contact **4** and plug **5** of the second set has an associated fixed contact **6.**

Pivotally mounted within the housing **1** for movement about an axis **7** is a carrier structure comprising a number of pairs of parallel insulating arms **8,** each carrying movable contacts having bridge plates providing main contact surfaces **9** and **10,** the movable contacts being engageable with the fixed contacts **4** and **6** respectively. Each of the fixed and movable contacts is of arcuate form, and the center from which the arcs are drawn lies on the axis **7.** The fixed contacts are each made up of main contact setions **11, 12** respectively cooperating with the contact surfaces **9** and **10** on the movable contacts, and auxiliary arcing contact sections **13, 14** engageable with internal arcing contact sections **15** and **16** respectively on the movable contacts. The auxiliary arcing contact sections **15** and **16** on the movable contacts have an associated arc trap interrupting device **17** which may be of conventional form. As shown in FIG. **1** the pivotal axis **7** is horizontal and in the position where the movable and fixed contacts are disengaged the insulating carrier arms **8** extend upwardly substantially vertically from axis **7.** To engage the movable contacts with the fixed contacts the movable contacts are pivoted clockwise through about 20°. Movement of the movable contacts from the open positon, shown in the FIG. **1,** to the closed position is effected by a system of levers, shown schematically only, by releasing the stored force in a number of parallel closing springs **19.** These springs are capable of being charged into a compressed condition by means of a handle **19*a*** connected to the springs by a further lever system and manually operable to compress the springs. Release of the springs **19** to close the movable contacts is under the control of a manually operable release catch **21.** Movement of the handle **19*a*** to charge the closing springs **19** also has the effect of charging springs **20** which are effective when released to move the movable contacts from their closed position to their open position. The opening springs **20** are normally held in their charged position by engagement of a catch **22** with a lever **23,** and disengagement of the catch **22** from the lever **23** allows the springs **20** to be released for pivoting the movable contacts to the open position. The catch **22** may be moved to release the springs by depressing a trip element **24** projecting through the upper wall of the movable housing. The lever system controlling the position of the movable contacts also

drives two tappets **25** and **26** projecting through the upper wall of the movable housing **1** and engaging opposite ends of a rocker arm **27.** With the movable contact in the open position as shown tappet **26** is raised and tappet **25** is lowered, but when the movable contact is moved into the closed position tappet **26** is lowered and tappet **25** is raised.

The movable contact arms **8** and the lever system for controlling operation of these arms are all mounted on a frame which is removably mounted in the housing **1.** The frame comprises side members **48, 49** welded at their upper ends to plates **50, 51** which are welded in turn to a transverse frame member **52** supporting the lever system. The lower ends of the side members have holes through which a shaft **53** passes, the shaft being rotatable within the holes. The insulating arms **8** are secured to the shaft by plates **54,** and the shaft is pivotally supported in a socket block **60** in the lower part of the housing. The frame is thus located in the lower part of the housing by the socket block **60,** and is secured at the top of the movable housing by four nuts such as **55** secured to studs projecting upwards from brackets **56** at the front corners of the housing, and passing through holes **57** in plates **50** and **51.**

As shown in FIG. **3,** plate **56** extends from the rear wall of housing **1** and has studs **55**a secured thereon; plate **50,** fixed to side element **48,** has holes **57** formed therein which coincide with studs **55***a*. Nuts **55** are threaded onto studs **55**a and secure plate **50** to plate **56.** Obviously only one side is shown in the proposed FIG. **3,** it being understood that this structure is duplicated on the opposite side with respect to plate **51.**

The spring charging handle **19***a* and release catch **21** are both arranged to operate appropriate elements of the movable contact lever system through pusher elements so that there is no fixed connection between the lever mechanism and the manually operating members positioned externally of the movable housing. Thus, by merely removing the four nuts **55** securing the frame at the top of the movable housing it is possible to lift the frame out of the housing for maintenance of the movable contact and lever system. In order to facilitate such removal the movable housing is fitted with a removable lid, which may be hinged to the body of the housing.

As is conventional the switchgear in the movable housing is immersed in an oil bath which also partially covers the lever system. Whenever the switch is opened under short circuit conditions arcing at the contacts creates gas which must be released from the movable housing. To enable this release, the removable lid is formed with an expansion chamber **28** leading into two vents **29,** which can exhaust to atmosphere.

The lever system that is used for controlling the pivotal movement of the movable contacts is desirably that that shown in my co-pending application Ser. No. 340,304, file Mar. 12, 1973. However, it will be understood that other forms of lever system may be employed.

The tappets **25** and **26** projecting through the housing **1** give a mechanical indication of the position of the movable contacts. The trip element **24** provides mechanical means for opening the movable contact on depression of the trip element. These three mechanically movable members may be used to control mechanically, rather than electrically, secondary electrical circuits positioned in a further housing beneath which the housing **1** is located. In this way secondary electrical circuit elements may be omitted completely from the housing **1.** This makes the arrangement as described herein particularly suitable for use in a switchgear assembly as described in my co-pending Application Ser. No. 340,263, filed Mar. 12, 1973.

What I claim is:

1. A fluid-immersed circuit breaker apparatus, comprising:

a housing;

at least one pair of arcuately shaped fixed contact members;

means securing said fixed contact members to said housing;

a framework structure;

means removably mounting said framework structure in said housing;

a carrier structure;

means pivotally mounting said carrier structure to said framework structure;

a plurality of arcuately shaped bridging contact members equal in number to said fixed contact members mounted on said carrier structure, wherein the centers of curvature of said arcuately shaped fixed and bridging contact members substantially coincide with the pivot axis of said carrier structure; and

operating means mounted on said framework structure for pivoting said carrier structure between a first position for engaging said fixed and bridging contact members and a second position for disengaging said said fixed and bridging contact members from each other.

2. A circuit breaker according to claim **1** and including an arc interrupting device mounted on said carrier structure for engagement with said bridging contacts.

3. A circuit breaker according to claim **1** and including wheels rotatably mounted externally of the lower part of said housing and supporting said housing for horizontal movement.

4. A circuit breaker according to claim **1** in which said pivotal mounting means pivotally supports said carrier structure at a first end thereof, and said operating means is pivotally connected to said carrier structure at a second end thereof.

5. A circuit breaker according to claim **4** in which said pivotal mounting means supports said carrier structure for pivotal movement about a substantially horizontal pivot axis, and said carrier structure extends substantially vertically upwards from said axis in said second position.

6. A circuit breaker according to claim **5,** in which said framework structure comprises substantially vertically extending side members and a transverse member joining said side members at their upper ends with said operating means being mounted on said transverse member.

7. A circuit breaker according to claim **6,** in which said pivotal mounting means comprises a shaft to which said carrier structure is secured, said shaft extending between and rotatably mounted in lower ends of said side members, and a socket block secured in said housing and pivotally supporting said shaft.

8. A circuit breaker according to claim **6,** in which said side members are joined to said transverse member by plates formed with holes, said housing has studs located adjacent upper edges of side walls thereof, and said holes in said plates are fitted over said studs to locate and secure the upper part of said framework in said housing.

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