April 7, 1942. H. KORNDÖRFER 2,279,024

ELECTRIC CIRCUIT INTERRUPTER

Filed Oct. 14, 1939

Fig. 1.

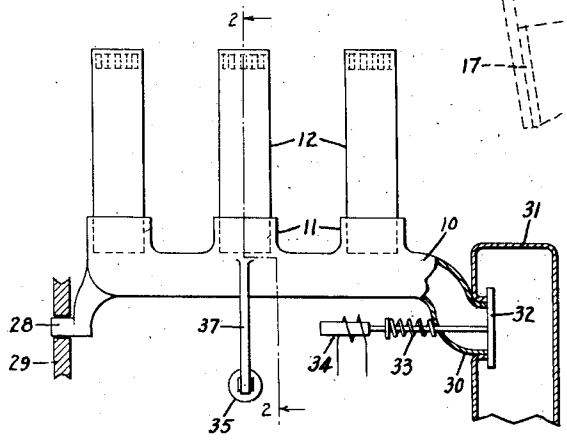


Fig. 2.

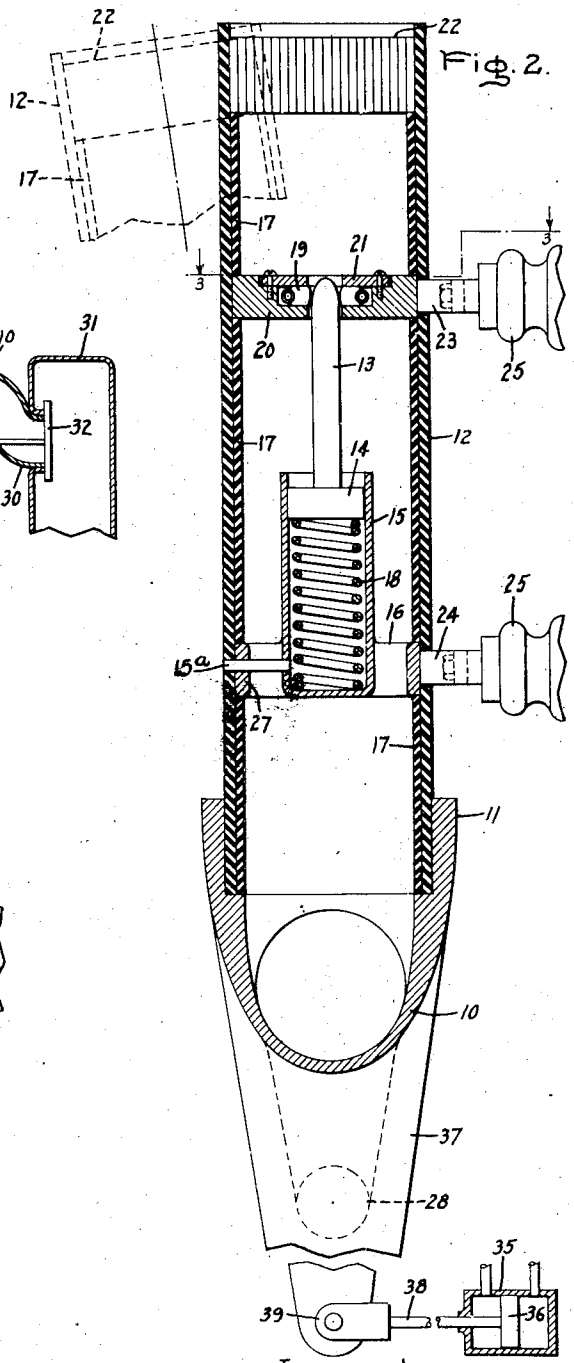
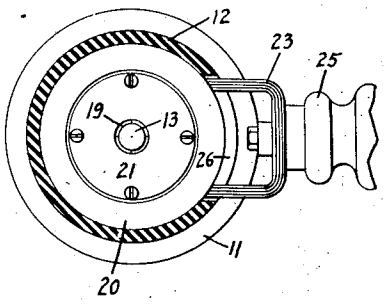


Fig. 3.



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ELECTRIC CIRCUIT INTERRUPTER

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5 Claims. (Cl. 200—148)

The present invention relates to electric circuit interrupters, and more particularly to circuit interrupters of the fluid blast type.

It is an object of the invention to provide an improved circuit interrupter construction particularly adapted for high voltage applications which is of simple and compact design.

It is another object of the invention to provide an improved and a simplified interrupter construction which performs both circuit-interrupting and circuit-isolating functions. In accomplishing this object of the invention the relatively movable circuit-interrupting contacts of the breaker form at least a part of the means for bridging the isolating contacts and are mounted on a support which moves away from the isolating contacts to isolate the breaker after the circuit-interrupting contacts have separated and the arc has been extinguished.

Further objects and advantages of the present invention will become apparent as the following description proceeds, reference being had to the accompanying drawing, in which Fig. 1 is an elevational view, partially in section, of a three-phase interrupter embodying the invention; Fig. 2 is an elevational view in section taken along the line 2—2 of Fig. 1 and showing the structural details of the interrupting units of one phase; and Fig. 3 is a sectional view taken along the line 3—3 of Fig. 2.

Referring to the drawing, I have shown my invention embodied in a three-phase circuit interrupter comprising a single manifold 10 having spaced collars 11 in each of which is secured a blast chamber 12 in the form of an elongated cylindrical tube 12 of insulating material. Each cylindrical tube houses the relatively movable circuit-interrupting contacts of the breaker and also forms a blast chamber in which the arc is extinguished.

Referring to Fig. 2, each of the tubes 12 is provided with a concentrically located movable contact rod 13 having an integral piston 14 at its lower end slidably mounted in a cylinder 15 carried by a supporting spider 16. One or more conduits 15a communicating with the lower end of the cylinder 15 and the atmosphere provides for the free transfer of air between the lower side of piston 14 and the atmosphere during movement of the contact 13. The spider is positioned in the tube 12 by spacer sleeves 17 of insulating material. The movable contact is normally biased to extended relationship with respect to the cylinder 15 by means of a helical compression spring 18. The fixed contact 19 of the circuit breaker is in the form of a spring-biased segmental sleeve and is supported in spaced relation to, and in axial alignment with, the movable contact 13 by means of a supporting collar 20 which is positioned in the tube 12 by means of the insulating sleeves 17. The fixed contact is secured in a recess in the upper face of the collar 20 by means of a washer 21. The tube 12 is preferably provided at its outer end with a muffler 22 in accordance with known practice for cooling the highly heated and ionized gases exhausted during circuit-interrupting operation of the breaker.

In accordance with the present invention the circuit connections to the relatively movable contacts of the circuit interrupter in each phase are completed through a pair of fixed isolating contacts 23 and 24 which are mounted in vertically spaced alignment by suitable insulating supports 25. The isolating contacts form essentially the terminals of the breaker. As illustrated in Fig. 3 the isolating contacts may have a substantially U-shaped section and comprise a plurality of laminations of suitable conducting material. The isolating contacts are arranged to pass through suitable openings 26 provided in the wall of the tube 12 and engage the conducting collar 20 and an outer ring 27 of the supporting spider 16 which are respectively associated with the fixed and movable contacts of the circuit interrupter.

The construction of the present invention is particularly designed for a circuit breaker capable of accomplishing both circuit-interrupting and circuit-isolating functions. In carrying out this phase of the invention the manifold 10 which supports the blast chamber forming tubes 12 is mounted for rotation about fixed pivots formed by a bearing arm 28 which is received in a suitable opening in a support 29 and an open end 30 of the manifold itself which is received in a suitable opening formed in a tank 31. The tank provides a supply of arc-extinguishing gas to the blast chambers of the circuit-interrupting units through the manifold 10 and under the control of a suitable blast valve 32 which is normally spring biased to closed position by a helical spring 33 and arranged to be opened upon the occurrence of abnormal current conditions by a solenoid 34. When the manifold 10 is in a position to support the blast chambers 12 so that they extend in a vertical direction the stationary isolating contacts 23 and 24 engage the ring 20 and collar 27 which are respectively connected to the relatively movable circuit-interrupting contacts 13 and 19. Means for rotating the manifold and tubes 12 away from the fixed isolating contacts

to isolate the breaker units formed by the tubes 12 and the relatively movable contacts associated therewith is provided by a cylinder 35 and a double-acting piston 36 which is connected to an extending arm 37 of the manifold by a connecting rod 38 and clevis 39.

A better understanding of the invention may be had by a consideration of the operation of the construction desscribed above. With the circuit interrupter in the position shown in Figs. 1 and 2 a circuit is completed in each phase thereof from one isolating contact 23 through the collar 20, stationary circuit-interrupting contact 19, movable circuit-interrupting contact 13, piston 14, cylinder 15, spider 16 and ring 27 to the isolating contact 24. Upon the occurrence of an abnormal condition in the power line with which the interrupter is associated, the blast valve 32 is opened by the solenoid 34 and the compressed air admitted to the blast chamber formed by the tube 12 is effective to move the contact 13 away from the fixed contact 19 against the bias of the spring 18. As the contacts 13 and 19 separate an arc is drawn which is extinguished by the action of the compressed air in a manner well understood by those skilled in the art. The hot gases are cooled as they pass through the muffler 22 before they are exhausted to the atmosphere.

As soon as the arc has been extinguished, the circuit-interrupting operation is complete and the circuit-isolating function of the interrupter is next accomplished by rotation of the manifold and associated blast chambers 12 in a counterclockwise direction to the position indicated by the dotted lines in Fig. 2. This movement is accomplished by the double-acting piston 35 which is actuated by any suitable fluid pressure supply which may to advantage be the same as that employed for extinguishing the arc. The extent of movement of the manifold and associated blast chambers may be varied to suit the particular installation involved, and a suitable stop or latch means may be provided to hold the breaker assembly in either of its operative positions, if desired. Since the interrupting contacts 13 and 19 are designed to interrupt the circuit current, it is necessary that they be separated and the arc be extinguished before the breaker assembly is moved away from the isolating contacts 23 and 24. In order to accomplish this, the actuating piston 36 may be suitably interlocked with the blast valve or the circuit-interrupting contacts. Inasmuch as the circuit-interrupting contacts are normally biased to their closed circuit position, it is necessary that the pressure be maintained in the blast chamber until the isolating movement of the breaker assembly is completed. This may be accomplished by providing suitable time delay means for retarding the closing of the blast valve for a sufficient interval of time to allow the circuit-isolating movement of the breaker to be completed.

From the preceding description it will be seen that this invention provides an extremely compact construction in a gas blast circuit interrupter which is capable of accomplishing both circuit-interrupting and isolating functions by utilizing the conducting elements of the circuit interrupter as a means for bridging the fixed isolating contacts.

While I have shown and described my invention in connection with a three-phase air blast breaker, it will be apparent to those skilled in the art that it is applicable to circuit interrupters of other types, and I intend in the appended claims to cover all modifications which fall within the spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. An electric circuit interrupter of the gas blast type comprising a gas supply duct mounted for rotation, a blast chamber supported by said duct, a pair of relatively movable circuit-interrupting contacts mounted in said blast chamber, a pair of fixed isolating contacts bridged by said circuit-interrupting contacts in one position of said duct, and means for rotating said supply duct and blast chamber away from said isolating contacts to isolate said circuit-interrupting contacts.

2. An electric circuit interrupter of the fluid blast type comprising a manifold supported for pivotal movement, a plurality of blast chambers supported on said manifold, each of said blast chambers forming a support for relatively movable circuit-interrupting contact structures, a pair of fixed isolating contacts electrically connected by said relatively movable contact structures in one angular position of said manifold, means for separating said relatively movable contacts, and means for rotating said manifold and associated blast chambers after separation of said relatively movable contact structures to isolate said contact structures from said isolating contacts.

3. A circuit interrupter of the gas blast type, a tank for supplying arc-extinguishing gas under pressure, a manifold having an open end rotatably mounted in said tank, a plurality of blast chambers mounted on said manifold and each supporting relatively movable circuit-interrupting contact structures, a pair of fixed isolating contacts associated with each of said blast chambers and electrically connected by the relatively movable contacts supported thereby in one angular position of said manifold, and means for rotating said manifold to move said blast chambers and interrupting contacts away from said fixed isolating contacts.

4. Electric switchgear comprising a circuit breaker of the fluid blast type mounted for bodily movement with respect to a stationary circuit controlled thereby and a pair of fixed isolating contacts connected to said stationary circuit, said circuit breaker comprising a support, a blast chamber mounted on said support, relatively movable circuit-interrupting contacts mounted in said blast chamber and normally biased to closed circuit position, means for supplying fluid under pressure to said blast chamber for moving said interrupting contacts to open circuit position and extinguishing the arc drawn therebetween, said fixed isolating contacts being shunted by said circuit interrupting contacts in one position of said support and blast chamber, and means for bodily moving said support and blast chamber away from said fixed isolating contacts to isolate said circuit breaker from said stationary circuit and prevent completion of the circuit controlled by said circuit breaker by closure of said interrupting contacts when said supply of fluid under pressure to said blast chamber ceases.

5. Electric switchgear comprising a pair of terminals connected to a stationary circuit and a circuit breaker of the gas blast type, said breaker comprising a pivoted support, a blast chamber carried by said support, relatively movable circuit-interrupting contacts mounted in

said chamber and normally biased to closed circuit position, means for supplying gas under pressure to said chamber to move said contacts to open circuit position and to extinguish the arc drawn when said contacts are separated, breaker terminal elements associated with each of said relatively movable contacts and accessible from without said blast chamber, said last-mentioned terminals being spaced to engage the terminals connected to said stationary circuit in one angular position of said support, and means for rotating said support to move said breaker terminals away from the terminals of said circuit after the arc drawn between said interrupting contacts has been extinguished to prevent completion of the circuit controlled by said breaker by closure of said interrupting contacts upon cessation of said supply of fluid under pressure to said blast chamber.

HUBERT KORNDÖRFER.