March 22, 1949. J. M. CUMMING 2,465,203

CIRCUIT INTERRUPTER

Filed Oct. 12, 1944

2 Sheets-Sheet 1

Fig. 1.

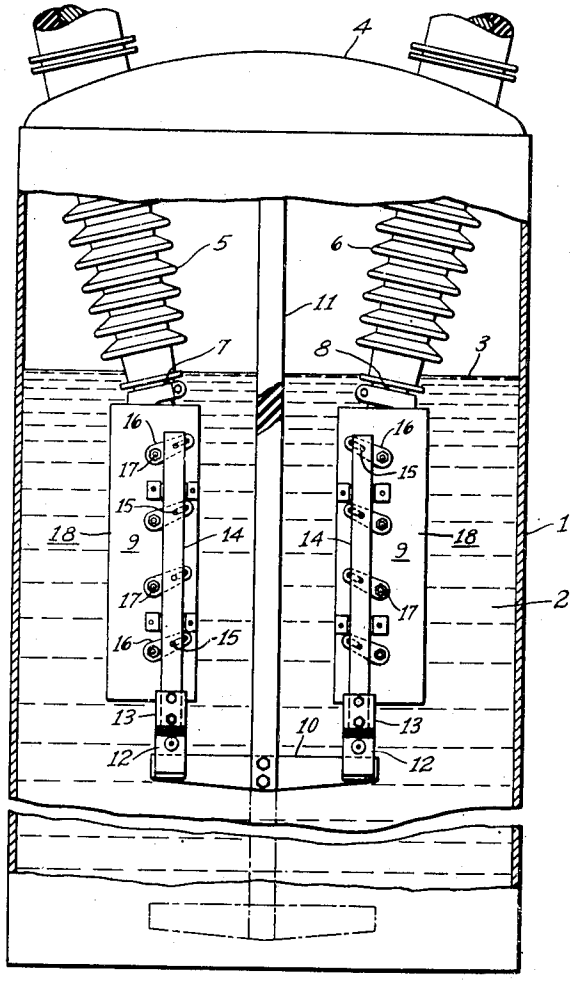
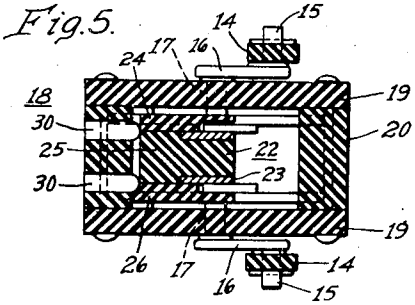


Fig. 5.



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Fig. 2.

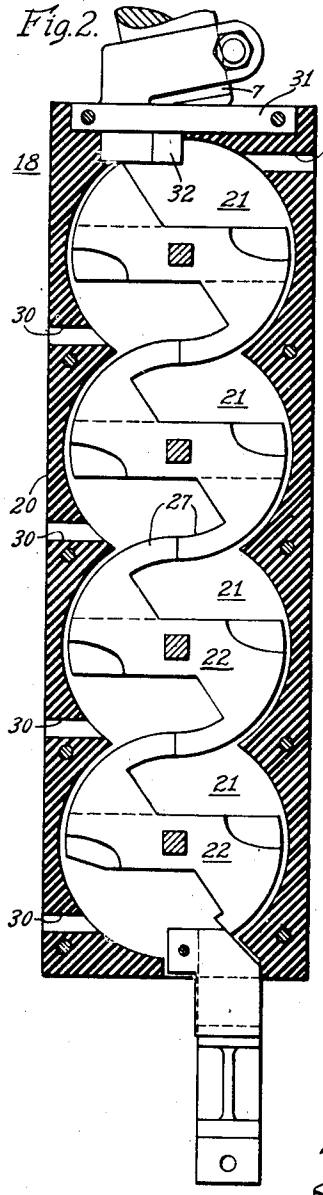


Fig. 3.

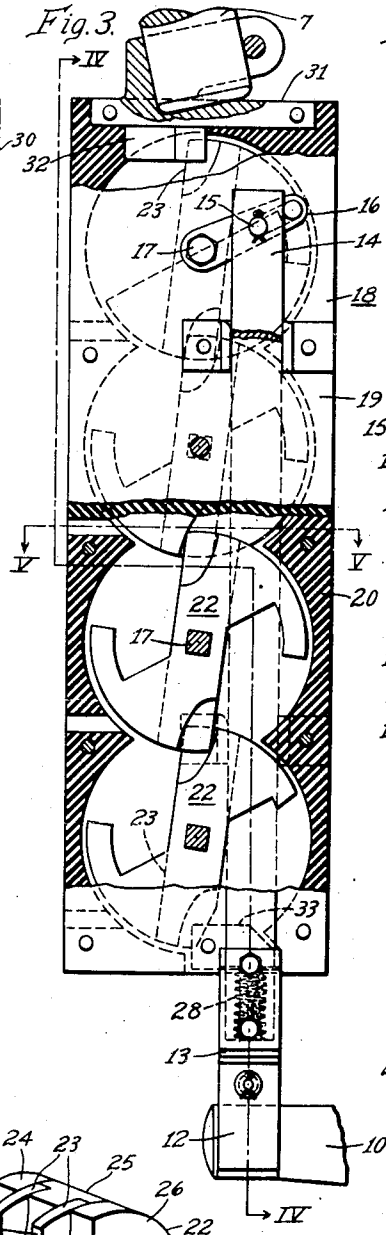
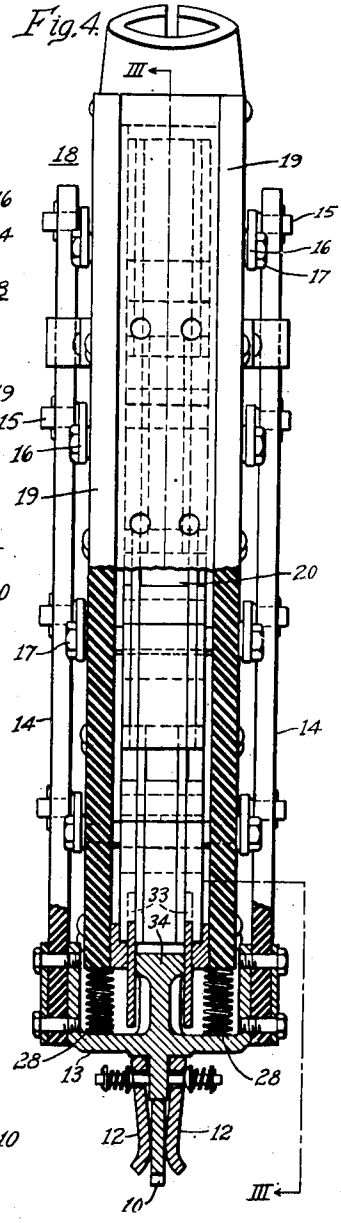


Fig. 4.



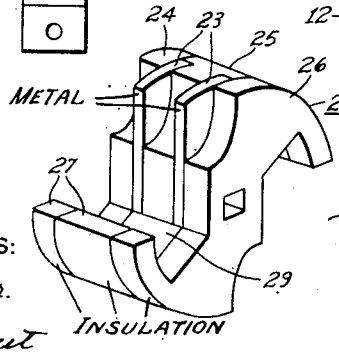


Fig. 6.

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2,465,203

UNITED STATES PATENT OFFICE

2,465,203

CIRCUIT INTERRUPTER

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Application October 12, 1944, Serial No. 558,310

12 Claims. (Cl. 200—150)

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This invention relates to circuit interrupters, in general, and more particularly, to arc-extinguishing structures therefor.

My invention constitues an improvement over the operating arrangements disclosed in United States application Serial No. 553,997, filed September 14, 1944, by Winthrop M. Leeds, and assigned to the assignee of the instant application.

A general object of my invention is to provide a circuit interrupter of improved construction in which a plurality of arcs are drawn and extinguished in a more effective manner than has heretofore been achieved.

Another object is to provide an improved circuit interrupter comprising two serially related arc-extinguishing assemblages, in each of which are disposed a plurality of rotatable contacts. Preferably I employ a fluid moving means associated with each contact to facilitate the extinction of the arc drawn thereat.

Further objects and advantages will readily become apparent upon a reading of the following specification taken in conjunction with the drawings, in which:

Figure 1 is an elevational view, partly in section, of a circuit interrupter embodying my invention and shown in the closed circuit position.

Fig. 2 is a vertical sectional view taken through the left-hand arc-extinguishing assemblage of Fig. 1, the parts being shown in the fully open circuit position;

Fig. 3 is a view similar to Fig. 2 but taken substantially on the line III—III of Fig. 4, the parts being shown in the closed circuit position;

Fig. 4 is a side elevational view partly in section taken substantially on the line IV—IV of Fig. 3;

Fig. 5 is a view in section taken on the line V—V of Fig. 3; and

Fig. 6 is a perspective view of one of the rotatable contact structures.

Referring to the drawings and more particularly to Fig. 1 thereof, the reference numeral 1 designates a tank in which a suitable arc-extinguishing fluid 2, such as circuit breaker oil, is filled to the level 3. Depending from the cover 4 of the tank 1 are two insulating bushings 5, 6, through which extend terminal studs 7, 8.

Threadedly secured to the lower ends of the terminal studs 7, 8 are two identical arc-extinguishing assemblages generally designated by the reference numeral 9. Electrically interconnecting the two arc-extinguishing assemblages 9 in the closed circuit position of the interrupter, as shown in Fig. 1, is a movable conducting bridging member 10 reciprocally operated in a vertical

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direction by an insulating operating rod 11 actuated by a suitable mechanism, not shown.

During the closing operation, the bridging member 10 moves upwardly, sliding between disconnect fingers 12 and striking a conducting cross member 13 which supports at its outer ends two insulating operating rods 14 extending exteriorly on opposite sides of each arc-extinguishing assemblage 9. The rods 14 are pivotally connected at 15 to a plurality of crank arms 16 which serve to rotate during the opening and closing operations shafts 17.

The arc-extinguishing assemblage 9 comprises a casing generally designated by the reference numeral 18 which is formed by two side plates 19 formed of insulating material and a suitably shaped center member 20 also formed of insulating material. The center member 20 has formed therein a plurality of annular cavities or recesses, generally designated by the reference numeral 21. Rotatably positioned on the shafts 17 within the annular cavities 21 are a plurality of disks or liquid moving members, generally designated by the reference numeral 22.

Each disk 22 carries a pair of contacts 23, as more clearly shown in Fig. 6. The assembling of the disk 22 is facilitated by constructing the disk 22 out of three suitably shaped parts of insulating material which separately may be designated by the reference numerals 24, 25, and 26. The contacts 23 may then be inserted within suitably shaped recesses provided in the center part 25 of the disk 22.

It will be observed, referring to Fig. 3, that in the closed circuit position the pair of contacts 23 associated with a disk 22 slidably engages with the pair of contacts 23 associated with the adjacently disposed disk 22.

It will be observed that each of the parts 24, 25 and 26 have associated therewith a portion 27 which extends between the contacts 23 in the fully open circuit position of the interrupter as shown in Fig. 2.

During the opening operation, the bridging member 10 moves downwardly to permit the accelerating compression springs 28 (Fig. 4) to move the cross member 13 downwardly, thereby lowering the operating rods 14. The lowering of the rods 14 effects, as viewed in Figs. 2 and 3, a clockwise rotation of the disks 22 and a consequent separation of adjacently disposed pairs of contacts 23 to establish a plurality of serially related arcs. The rotation of the disk 22 causes the movement of fluid within the cavity 21 by the piston action caused by the rotative movement of

the portion 29 of the disk 22 to force oil through the arc and out a plurality of vents 30 formed in the center member 20. The turbulence thereby created at the arcs rapidly effects the extinction thereof and the conducting bridging member 10 separates from the disconnect fingers 12 to introduce two isolating gaps into the circuit.

It will be observed that associated with the conducting clamp 31 is a stationary contact 32 with which the upper pair of contacts 23 makes sliding engagement in the closed circuit position of the interrupter, as shown in Fig. 3.

Also disposed at the lower end of the casing 18 are a pair of contacts 33 with which the lower pair of contacts 23 makes sliding engagement in the closed circuit position of the interrupter. A portion 34 of the cross member 13 makes sliding engagement with the pair of contacts 33 at all times.

From the foregoing description, it will be apparent that I have provided an improved circuit interrupter in which circuit interruption is effected by a rotative movement of a plurality of disks carrying movable contacts 23. The rotative movement of the disk 22 forces by piston action oil to flow against the arcs formed, and a portion 27 of each disk 22 coacts with a similar portion 27 of the adjacently disposed disk 22 to introduce insulating means between the several contacts in the fully open circuit position of the interrupter, as shown in Fig. 2.

It will be noted that the arrangement is exceedingly simple and has no shunts. It will also be noted that the arrangement is easily inspected as the removal of one of the outside plates 19 exposes all the contacts at once. This inspection feature is quite essential and most complicated on the majority of multi-contact interrupters. If desired, the side plates 19 could have associated therewith impedance means to serve as voltage distribution shields, thus dividing the voltage equally along the arc-extinguishing assemblage between the several contacts 23.

Although I have shown and described a specific structure, it is to be clearly understood that the same was merely for purposes of illustration, and that changes and modifications may readily be made therein by those skilled in the art without departing from the spirit and scope of the appended claims.

I claim as my invention:

1. In a circuit interrupter, an arc-extinguishing assemblage comprising a plurality of movable contacts making substantially end-to-end engagement in the closed circuit position, means for pivotally mounting each of the contacts intermediate the ends thereof, means defining a cavity associated with each movable contact within which the movable contact rotates, means for effecting simultaneous rotative opening movement of all of the contacts within the cavities, and insulating means forming a fluid moving wing associated with each contact and movable within the respective cavity to force fluid through the arc drawn by said contact.

2. In a circuit interrupter of the liquid break type, an arc-extinguishing assemblage comprising a casing immersed in liquid, a plurality of recesses formed in the casing, a plurality of movable contacts disposed in the plurality of recesses and making substantially end-to-end engagement in the closed circuit position of the interrupter, means pivotally mounting the movable contacts intermediate the ends thereof, and means for simultaneously effecting opening rotative movement of all of the contacts to establish arcing and move liquid within the recesses to facilitate arcing by the piston action of the movable contacts.

3. In a liquid break circuit interrupter, a substantially enclosed insulating casing forming a plurality of annular cavities and immersed in liquid, a plurality of movable insulating liquid moving members disposed in the plurality of cavities, each member carrying a movable contact, the contact making engagement with the contact associated with the adjacent member, means for pivotally mounting the members, and means for simultaneously effecting opening rotative movement of all of the liquid moving members.

4. In a circuit interrupter, a substantially enclosed insulating casing forming a plurality of annular cavities, a plurality of movable insulating disks disposed in the plurality of cavities, each disk carrying a movable contact, the contact making engagement with the contact associated with the adjacent disk, means for pivotally mounting the disks, means for simultaneously effecting opening rotative movement of all of the disks, means for venting the casing at a plurality of points, and the opening rotative movement of the disks forcing liquid toward the venting means.

5. In a circuit interrupter, an arc-extinguishing assemblage including a casing, a plurality of recesses formed in the casing, a plurality of elongated movable contacts disposed in the plurality of recesses and making substantially end-to-end engagement in the closed circuit position of the interrupter, means pivotally mounting the movable contacts intermediate the ends thereof, and a fluid moving wing associated with at least one of the movable contacts and movable therewith within the recess to force fluid toward the established arc.

6. In a circuit interrupter, an arc-extinguishing assemblage including a casing, a plurality of recesses formed in the casing, a plurality of elongated movable contacts disposed in the plurality of recesses and making substantially end-to-end engagement in the closed circuit position of the interrupter, means pivotally mounting the movable contacts intermediate the ends thereof, a fluid moving wing associated with at least one of the movable contacts and movable therewith within the recess to force fluid toward the established arc, and means for simultaneously effecting opening rotative movement of all the movable contacts.

7. In a circuit interrupter, an arc-extinguishing assemblage including a casing, a plurality of recesses formed in the casing, a plurality of elongated movable contacts disposed in the plurality of recesses and making substantially end-to-end engagement in the closed circuit position of the interrupter, means pivotally mounting the movable contacts intermediate the ends thereof, a fluid moving wing associated with at least one of the movable contacts and movable therewith within the recess to force fluid toward the established arc, and means for simultaneously effecting opening rotative movement of all the movable contacts in the same direction.

8. In a liquid break circuit interrupter, an arc-extinguishing assemblage including a casing immersed in liquid the casing including a member having a plurality of cavities formed therein, a plurality of liquid moving elongated movable contacts disposed in the plurality of cavities and making substantially end-to-end engagement in

the closed circuit position of the interrupter, means pivotally mounting each of the movable contacts intermediate the ends thereof, and a side cover plate enclosing the cavities, the removal of the cover plate from the member facilitating inspection of the contacts.

9. In a circuit interrupter, an arc-extinguishing asssemblage including a casing, the casing including a member having a plurality of recesses formed therein, a plurality of elongated movable contacts disposed in the plurality of recesses and making substantially end-to-end engagement in the closed circuit position of the interrupter, means pivotally mounting each of the movable contacts intermediate the ends thereof, a fluid moving wing associated with at least one of the movable contacts and movable therewith within the recess to force fluid toward the established arc, and a side cover plate enclosing the recesses, the removal of the cover plate from the member facilitating inspection of the contacts.

10. In a circuit interrupter, an arc-extinguishing assemblage including a casing, the casing including a member having a plurality of annular recesses formed therein, a plurality of elongated movable contacts disposed in the plurality of recesses and making substantially end-to-end engagement in the closed circuit position of the interrupter, means pivotally mounting each of the movable contacts intermediate the ends thereof, an arcuately shaped fluid moving wing associated with at least one of the movable contacts and movable therewith within the annular recess to force fluid toward the established arc, and a side cover plate enclosing the annular recesses, the removal of the cover plate from the member facilitating inspection of the contacts.

11. In a circuit interrupter, an arc-extinguishing assemblage including a casing, the casing including a member having a plurality of annular recesses formed therein, a plurality of elongated movable contacts disposed in the plurality of recesses and making substantially end-to-end engagement in the closed circuit position of the interrupter, means pivotally mounting each of the movable contacts intermediate the ends thereof, an arcuately shaped fluid moving wing associated with at least one of the movable contacts and movable therewith within the annular

recess to force fluid toward the established arc, a side cover plate enclosing the annular recesses, the removal of the cover plate from the member facilitating inspection of the contacts, and means for causing the simultaneous rotation of all of the movable contacts within the annular recesses.

12. In a circuit interrupter, an arc-extinguishing assemblage including a casing, the casing including a member having a plurality of annular recesses formed therein, a plurality of elongated movable contacts disposed in the plurality of recesses and making substantially end-to-end engagement in the closed circuit position of the interrupter, means pivotally mounting each of the movable contacts intermediate the ends thereof, an arcuately shaped fluid moving wing associated with at least one of the movable contacts and movable therewith within the annular recess to force fluid toward the established arc, a side cover plate enclosing the annular recesses, the removal of the cover plate from the member facilitating inspection of the contacts, and means for causing the simultaneous rotation of all of the movable contacts in the same direction during the opening operation.

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