Dec. 17, 1946. J. B. MacNEILL 2,412,897

CIRCUIT INTERRUPTER

Filed Dec. 26, 1942 2 Sheets-Sheet 1

Fig. 1.

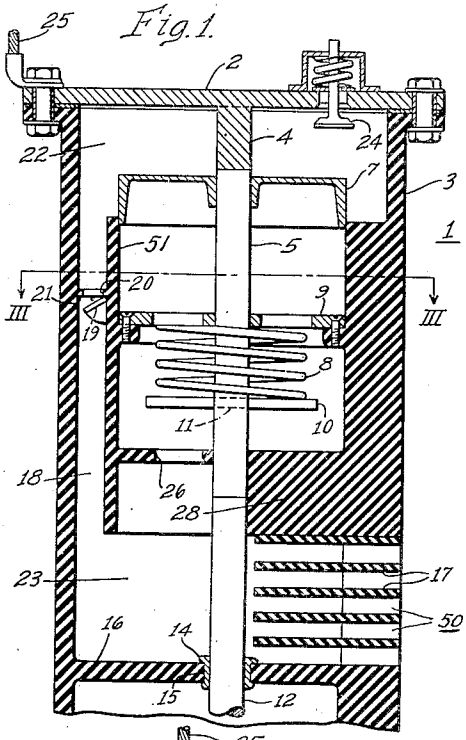


Fig. 2.

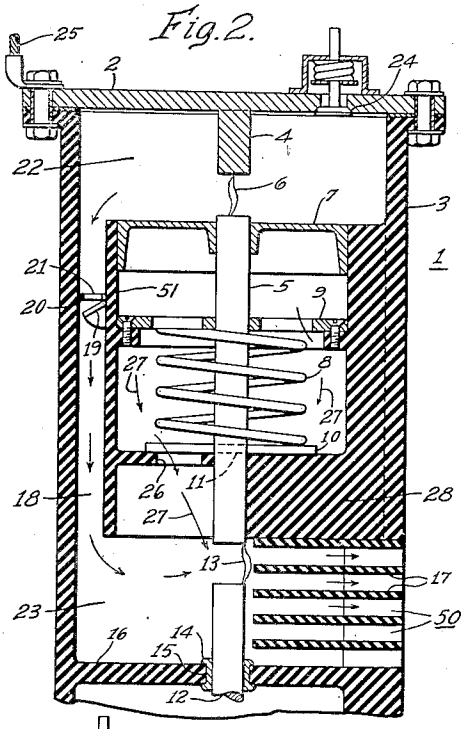
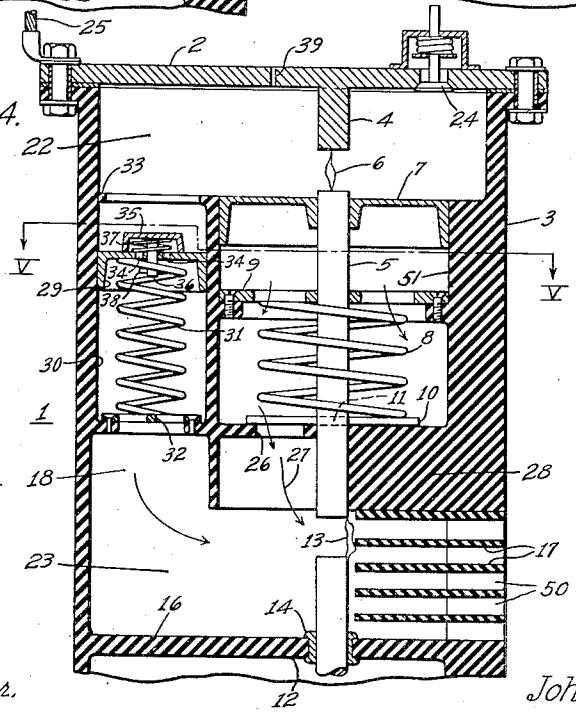


Fig. 4.



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Filed Dec. 26, 1942 2 Sheets-Sheet 2

Fig. 3.

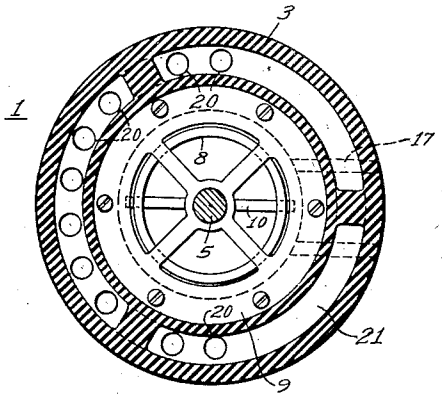


Fig. 5.

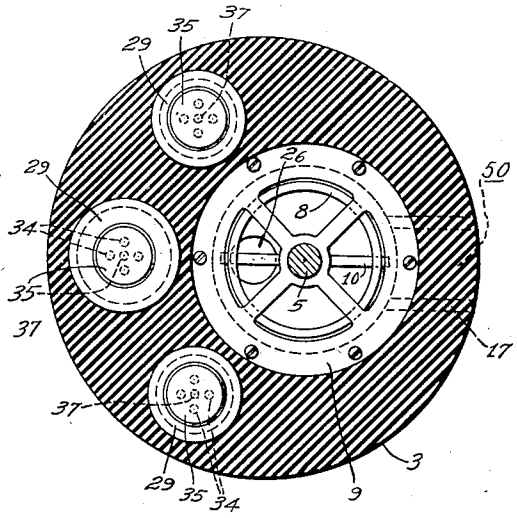


Fig. 6.

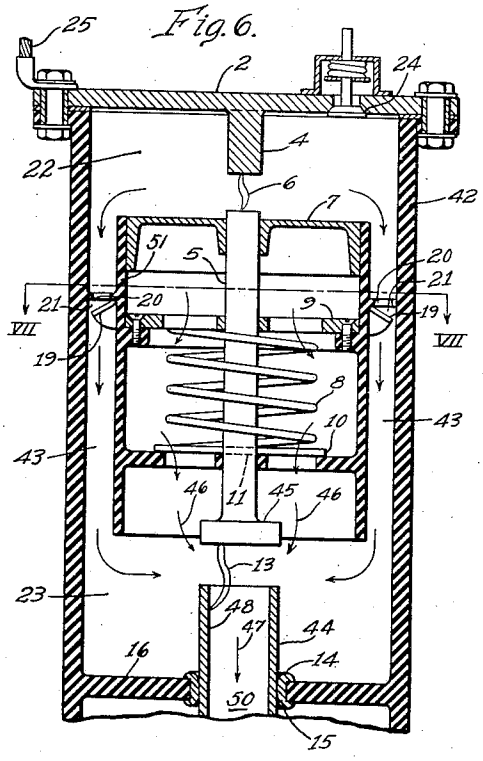
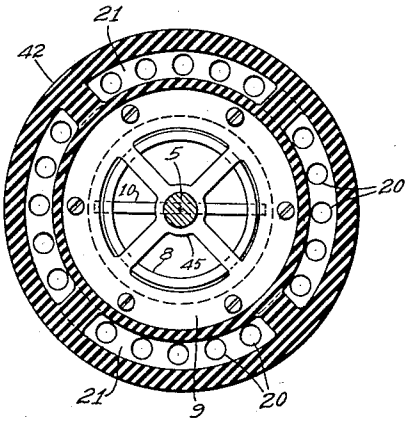


Fig. 7.



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Patented Dec. 17, 1946

2,412,897

UNITED STATES PATENT OFFICE

2,412,897

CIRCUIT INTERRUPTER

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Application December 26, 1942, Serial No. 470,161

9 Claims. (Cl. 200—150)

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This invention relates to circuit interrupters in general and, more particularly, to circuit interrupters which effect arc extinction by a blast of an arc extinguishing fluid.

An object of my invention is to provide an improved circuit interrupter in which rapid extinction of the arc produced upon opening the circuit interrupter is brought about by converging two streams of fluid upon the arc.

Another object of my invention is to provide an improved circuit interrupter in which two serially related arcs are drawn and to effect the rapid interruption of one of said arcs by subjecting it immediately upon establishment to a stream of fluid.

Another object of the invention is to provide an improved circuit interrupter in which both a pressure generating arc and an interrupting arc are established and to employ the pressure created by the pressure generating arc to create two streams of fluid converging on the interrupting arc, and to provide suitable means for preventing contaminated fluid adjacent said pressure generating arc from coming in contact with said interrupting arc.

Another object of my invention is to provide an improved circuit interrupter in which two serially related arcs are established and to associate a piston with the intermediate contact of said interrupter and also to provide a suitable by-passing channel by-passing said piston structure so that there results two streams of converging fluid directed at one of said serially related arcs.

In the patent application of Benjamin P. Baker and Winthrop M. Leeds, Serial No. 458,778, filed September 18, 1942, and issued March 27, 1945, as Patent No. 2,372,589, and assigned to the assignee of the instant application is described and claimed an improved circuit interrupter in which a piston is secured to and movable with the intermediate contact to provide a flow of arc extinguishing fluid against the interrupting arc of the circuit interrupter. My invention is concerned with numerous improvements of the circuit interrupter described in the aforesaid patent application.

It will be apparent to one skilled in the art that my invention is applicable in some of its aspects to circuit interrupters employing a gaseous arc extinguishing medium, such as air, but merely for purposes of illustration, and not by way of limitation, I describe my invention as embodied in an oil immersed circuit interrupter.

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

Figure 1 is a view in cross section of a circuit interrupter embodying my invention and shown in the closed circuit position;

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Fig. 2 is a view similar to that of Fig. 1 but showing the circuit interrupter of Fig. 1 in the partially open circuit position;

Fig. 3 is a view in cross section taken along the line III—III of Fig. 1;

Fig. 4 is a view in cross section of another circuit interrupter embodying my invention and shown in the partially open circuit position;

Fig. 5 is a view in cross section taken along the line V—V of Fig. 4;

Fig. 6 is a view in cross section of still another circuit interrupter embodying my invention and shown in the partially open circuit position; and

Fig. 7 is a view in cross section taken along the line VII—VII of Fig. 6.

Referring to the drawings, and more particularly to Figure 1, the reference numeral 1 designates generally a substantially enclosed arc extinguishing structure completely immersed in an arc extinguishing liquid, in this instance oil. The arc extinguishing structure 1 comprises a top metallic cover plate 2 which encloses at its upper end a cylindrically shaped insulating casing 3. A stationary contact 4 comprises, in this instance, an integral portion of the top metallic cover plate 2 and cooperates with a rod-shaped intermediate contact 5 to establish a pressure generating arc 6 more clearly shown in Fig. 2. Rigidly secured to the intermediate contact 5 is a metallic piston 7 movable within a piston cylinder 51 or piston chamber, the lower end of which is freely open. The intermediate contact 5 and the piston 7 rigidly secured thereto are biased downward by the compression spring 8 which seats at its upper end against a stationary metallic spider member 9 and seats at its lower end against a pin 10 which extends through an aperture 11 provided in the intermediate contact 5.

A movable contact 12 cooperates with the intermediate contact 5 to form an interrupting arc 13 more clearly shown in Fig. 2. The movable contact 12 is guided by a metallic bearing 14 inserted in an aperture 15 provided in the insulating plate 16, forming a portion of the insulating casing 3.

A plurality of insulating arc splitters 17 are provided adjacent the interrupting arc 13 within a venting passage 50 leading out of the structure. However, it is to be clearly understood that other suitable interrupting structure may be used in place of the arc splitters 17 to facilitate the interruption of the interrupting arc 13 during the opening operation of the circuit interrupter. A by-passing channel 18 is provided to transmit liquid from the pressure generating arc 6 toward the interrupting arc 13. In this instance the by-passing channel 18 extends nearly half-way around the insulating casing 3, as Fig. 3 more clearly shows. To prevent a reverse flow of liquid through the by-passing channel 18, that is, toward the pressure generating arc 6, a plurality

of flap valves 19 are provided which cooperate with apertures 20 drilled through an annular partition plate 21 in the insulating casing 3.

It will be noted that the annular partition plate 21 (see Fig. 3) creates a pressure generating chamber generally designated by the reference numeral 22 (see Fig. 1) and an interrupting chamber generally designated by the reference numeral 23. An inlet valve 24 is provided in the pressure generating chamber 22 to permit fresh oil to enter the pressure generating chamber 22 following a circuit opening operation. During high pressure conditions within the pressure generating chamber 22 the inlet valve 24 will close as more clearly seen in Fig. 2.

The operation of the circuit interrupter shown in Figs. 1, 2 and 3 will now be explained. In the closed circuit position of the interrupter the movable contact 12 engages the intermediate contact 5 holding the latter in abutting engagement with the stationary contact 4 maintaining the compression spring 8 in a compressed state. The electrical circuit through the interrupter in the closed circuit position comprises the line cable 25, the top metallic cover plate 2, stationary contact 4, intermediate contact 5 and movable contact 12. When it is desired to open the electrical circuit passing through the interrupter the movable contact 12 is drawn down by suitable operating mechanism, not shown. The intermediate contact 5 tends to follow the downward motion of the movable contact 12 because of the downward biasing action exerted by the compression spring 8. However, because the piston 7 is rigidly secured to the intermediate contact 5 there is a slight dashpot action and as a result the intermediate contact 5 does not move down as rapidly as the movable contact 12. Consequently, both a pressure generating arc 6 and an interrupting arc 13 are established as clearly shown in Fig. 2. It will be observed that the interrupting arc 13 is initially established immediately adjacent to the arc splitters 17 and vent passages 50 so that the flow of fluid can extinguish the arc as soon as it is formed.

During the interruption of large currents the pressure created within the pressure generating chamber 22 by the pressure generating arc 6 will act on the upper surface of the piston 7 to assist the downward motion of the intermediate contact 5 and hence to force clean oil of high dielectric strength through the aperture 26 and in the direction of the arrows 27 (see Fig. 2).

An important feature of my invention is the manner in which I have relieved excessive pressure within the pressure generating chamber 22 during the interruption of large currents by providing the by-passing channel 18. This by-passing channel 18 completely by-passes the stream of oil caused by the downward motion of the piston 7 and because of its length provides an independent passage for the flow of clean oil toward the interrupting arc 13. It will consequently be observed that two streams of oil converge on the interrupting arc 13. One of these streams, which is substantially longitudinal of the interrupting arc 13, is created by the downward motion of the piston 7, whereas the other stream of oil through the by-passing channel 18 is substantially transverse to the interrupting arc 13. By providing two streams of oil which merge at the interrupting arc 13 to force the interrupting arc 13 laterally against the arc splitters 17 a very effective interruption of the interrupting arc 13 results.

During the interruption of small currents the pressure created within the pressure generating chamber 22 by the pressure generating arc 6 may be very small, and in this event it will be noted that the compression spring 8 forces the piston 7 down to provide a flow of oil toward the interrupting arc 13 as indicated by the arrows 27 of Fig. 2. During the interruption of small currents there might be a tendency for the oil moved downwardly by the piston 7 to flow in a reverse direction through the by-passing channel 18, and to prevent such a possible reverse flow I have provided the flap valves 19 in the by-passing channel 18 which will immediately close.

Hence during the interruption of high currents the presence of the by-passing channel 18 effectively relieves high pressure conditions within the pressure generating chamber 22 and simultaneously provides a second stream of oil which cooperates with the stream of oil caused by the piston motion to merge at the interrupting arc 13 and force the latter against the arc splitters 17. During the interruption of small currents the compression spring 8 produces the desired motion of the piston 7 and the flap valves 19 prevent the liquid from flowing in a reverse direction through the by-passing channel 18 toward the pressure generating arc 6.

After the interrupting arc 13 has been extinguished the pressure within the insulating casing 3 will diminish to permit the inlet valve 24 to open, as shown in Fig. 1, and hence to permit fresh oil to flow into the insulating casing 3 through the inlet valve 24 and between the arc splitters 17.

It will be noted that the compression spring 8 serves two functions, (1) to accelerate the intermediate contact 5 toward the open circuit position, and (2) to produce the downward motion of the piston 7 during the interruption of small currents. It will also be noted that the portion 28 of the insulating casing 3 necessitates oil flow through the aperture 26, and hence in such a direction as to cooperate with the oil flow through the by-passing channel 18 to force the interrupting arc 13 to the right, as viewed in Fig. 2, against the arc splitters 17. It will furthermore be observed that by having the by-passing channel 18 of a width which extends approximately half way around the insulating casing 3 (see Fig. 3) the oil flow transmitted by the by-passing channel 18 strikes the interrupting arc 13 through a substantial portion of the periphery of the interrupting arc 13. Consequently, the lateral pressure on the interrupting arc 13 is maintained so that when the gas bubble created by the interrupting arc 13 decreases in its diameter as the current approaches its zero value, deionization of the arc space is more readily effected.

Figs. 4 and 5 illustrate a circuit interrupter similar in construction and operation to the circuit interrupter just described in connection with Figs. 1, 2 and 3. Similar reference numerals designate corresponding parts. It will be noted that a plurality of pistons 29, in this instance three, are operative in piston chambers 30. A compression spring 31 seated at its lower end on a spider 32 serves to bias the pistons 29 upward against the stop 33. A plurality of apertures 34 are drilled through the pistons 29. A valve 35, having a valve stem 36, is biased upward by the compression spring 37. A pin 38 projecting through the lower portion of the valve stem 36 serves as a stop for the upward motion of the valve 35 with respect to the piston 29. In this

instance three pistons 29 are provided to enable the by-passing channel 18 to extend part way around the insulating casing 3, as Fig. 5 more clearly shows. A bleeder opening 39 is provided for the pressure generating chamber 22.

The operation of the circuit interrupter shown in Figs. 4 and 5 will now be explained. In the closed circuit position of the interrupter the movable contact 12 engages the intermediate contact 5 raising the latter into abutting engagement with the stationary contact 4 against the downward biasing action exerted by the compression spring 8. The electrical circuit through the interrupter comprises the line cable 25, the top metallic cover plate 2, stationary contact 4, intermediate contact 5 and movable contact 12. In the closed circuit position of the interrupter the inlet valve 24 is open and the pistons 29 are in their upward position abutting against the stops 33 being biased in this position by the compression springs 31. The valves 35 in the pistons 29 are also in their upward position caused by the biasing action of the compression spring 37 and hence uncover the apertures 34. Since the inlet valve 24 is open, the apertures 34 are uncovered, and the bleeder opening 39 is open, fresh oil may readily enter the pressure generating chamber 22 and circulate therethrough carrying out decomposed products of decomposition resulting from the previous operation of the interrupter. The openings between the arc splitters 17 permit fresh oil to also circulate through the interrupting chamber 23, through the apertures 34, now uncovered, and into the pressure generating chamber 22.

When it is desired to open the interrupter the movable contact 12 is drawn down by suitable mechanism, not shown, to effect, as previously described, a pressure generating arc 6 between the stationary contact 4 and intermediate contact 5, and an interrupting arc 13 established between intermediate contact 5 and movable contact 12. During the interruption of high current the pressure generated by the pressure generating arc 6 within the pressure generating chamber 22 will be high and will cause the inlet valve 24 to close. The pressure within the pressure generating chamber 22 will act upon the upper face of the piston 7 forcing the latter downward and thus assisting the compression spring 8. The pressure within the pressure generating chamber 22 will also close the valves 35 since the compression springs 37 are weaker than the compression springs 31, thus closing the apertures 34 in the pistons 29 and causing downward motion of the pistons 29 compressing the compression spring 31.

It will therefore be apparent that oil will stream through the aperture 26 caused by the downward motion of the piston 7 to create a longitudinal flow of oil adjacent the interrupting arc 13. It will also be apparent that uncontaminated oil of high dielectric strength will be caused to flow through the by-passing channel 18 as a result of the downward motion of the three pistons 29 in the three piston chambers 30. The clean oil flowing through the by-passing channel 18 strikes the interrupting arc 13 substantially transversely thereto and through a considerable portion of the periphery of the interrupting arc 13 because of the use of three pistons 29 and the consequent width of the by-passing channel 18. The two streams of oil flow caused by the piston 7 and the three pistons 29 will merge at the interrupting arc 13 to force the

latter sidewardly against the arcing splitters 17 to effect a rapid extinction of the interrupting arc 13.

After the interrupting arc has been extinguished, the pressure within the insulating casing 3 will subside, the pressure within the pressure generating chamber 22 decreasing because of the presence of the bleeder opening 39. When the pressure has subsided sufficiently within the pressure generating chamber 22 the inlet valve 24 will open. When this occurs the pressure will rapidly decrease in the pressure generating chamber 22 and the valves 35 will be raised by the compression springs 37 to uncover the apertures 34 in the pistons 29. The pistons 29 will be retracted by the compression springs 31 to their upper positions against the stops 33. The circulation of the oil through the insulating casing 3 as permitted by the openings between the arcing splitters 17, the uncovering of the apertures 34 in the pistons 29 and the presence of the bleeder opening 39 and the inlet valve 24 all contribute to result in a rapid reflushing of the contaminated oil resulting from the previous interrupting operation.

It will thus be apparent that in the interrupter shown in Figs. 4 and 5 I have provided a novel construction to insure that no contaminated oil of relatively low dielectric strength will pass from the pressure generating arc 6 through the by-passing channel 18 and into the interrupting arc 13 to tend to lower the dielectric strength of the oil adjacent the interrupting arc 13.

During the interruption of small currents the pressure generated within the pressure generating chamber 22 will be low. Consequently the compression spring 8 is relied upon in this event to cause the downward movement of the piston 7 and to produce thereby the oil flow adjacent the interrupting arc 13. The low pressure within the pressure generating chamber 22 will be sufficient, however, to close the valves 35 held open by the weak compression springs 37 and hence to prevent reverse flow through the by-passing channel 18.

In the circuit interrupter embodying my invention and shown in Figs. 6 and 7 there is provided a cylindrically shaped insulating casing 42 having an annular by-passing channel 43. A tubular movable contact 44 forming the venting passage 50 engages an enlarged portion 45 of the intermediate contact 5 to raise the latter against the stationary contact 4 in the closed circuit position of the interrupter not shown. In the closed circuit position the electrical circuit through the interrupter comprises the line cable 25, the top metallic cover plate 2, stationary contact 4, intermediate contact 5, enlarged portion 45 and movable tubular contact 44.

The operation of the circuit interrupter shown in Figs. 6 and 7 will now be explained. When it is desired to open the electrical circuit through the interrupter the movable tubular contact 44 is moved downwardly by suitable operating mechanism, not shown, to effect in a manner previously described a pressure generating arc 6 and an interrupting arc 13. As clearly shown in Fig. 6 the pressure generated by the pressure generating arc 6 within the pressure generating chamber 22 will act on the upper face of the piston 7 to assist the compression spring 8 in moving the piston 7 downwardly, causing fresh clean oil of high dielectric strength to pass in a direction indicated by the arrows 46 longitudinal of the early formed part of the interrupting arc 13 and

discharging through the movable tubular contact 44 as indicated by the arrow 47.

Also during the interruption of high currents the pressure created by the pressure generating arc 6 within the pressure generating chamber 22 will open the flap valves 19 and cause oil to flow through the annular by-passing channel 43 transverse to the interrupting arc 13 and through the movable contact 44. It will be noted in this embodiment of my invention that the oil flow through the annular by-passing channel 43 is directed radially inwardly toward the interrupting arc 13 and substantially transverse thereto. This transverse flow through the annular by-passing channel 43 cooperates with the flow created by the piston 7 in moving the lower terminal of the interrupting arc 13 down along the inner wall 48 of the movable tubular contact 44.

Since the interrupting arc 13 is rapidly lengthened by the movement of its lower terminal, and since it is subjected to the combined action of the oil flow through the annular by-passing channel 43 and the longitudinal oil flow created by the downward motion of the piston 7 the interrupting arc 13 is very rapidly extinguished.

After the interrupting arc 13 is extinguished the pressure subsides within the insulating casing 42 and the inlet valve 24 opens to circulate fresh oil through the insulating casing 42.

During the interruption of small currents the compression spring 8 will produce the desired downward movement of the piston 7 and the flap valves 19 will prevent any reverse oil flow upward through the annular by-passing channel 43 toward the pressure generating arc 6.

Although I have shown and described specific structures, it is to be clearly understood that the same were merely for purposes of illustration and that changes and modifications may be made 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 fluid circuit interrupter, means defining a substantially enclosed arc extinguishing structure having a substantially enclosed pressure-generating chamber therewithin, a relatively stationary contact, an intermediate contact separable therefrom to establish a pressure-generating arc within the pressure-generating chamber, a movable contact separable from the intermediate contact to establish an interrupting arc, a piston attached to and movable with the intermediate contact, a piston cylinder within which the piston moves and having an open passage therefrom at the time when the interrupting arc is first established to permit fluid moved by the piston to strike the interrupting arc, a venting passage open at the time when the interrupting arc is first established and leading from within the substantially enclosed arc extinguishing structure to the exterior thereof, said intermediate and movable contacts having their point of initial separation immediately adjacent to said venting passage so that the fluid flow strikes the early formed part of the interrupting arc in passing out through the venting passage, and a by-passing channel leading from the pressure-generating arc to the interrupting arc.

2. In a fluid circuit interrupter, means defining a substantially enclosed arc extinguishing structure having a substantially enclosed pressure-generating chamber therewithin, a relatively stationary contact, an intermediate contact separable therefrom to establish a pressure-generating arc within the pressure-generating chamber, a movable contact separable from the intermediate contact to establish an interrupting arc, a piston attached to and movable with the intermediate contact, a piston cylinder within which the piston moves and having an open passage therefrom at the time when the interrupting arc is first established to permit fluid moved by the piston to strike the interrupting arc, a venting passage open at the time when the interrupting arc is first established and leading from within the substantially enclosed arc extinguishing structure to the exterior thereof, said intermediate and movable contacts having their point of initial separation immediately adjacent to said venting passage so that the fluid flow strikes the early formed part of the interrupting arc in passing out through the venting passage, a by-passing channel leading from the pressure-generating arc to the interrupting arc, and biasing means to bias both the movable intermediate contact and the piston to move within the piston cylinder.

3. In a fluid circuit interrupter, means defining a substantially enclosed arc extinguishing structure having a substantially enclosed pressure-generating chamber therewithin, a relatively stationary contact, an intermediate contact separable therefrom to establish a pressure-generating arc within the pressure-generating chamber, a movable contact separable from the intermediate contact to establish an interrupting arc, a piston attached to and movable with the intermediate contact, a piston cylinder within which the piston moves and having an open passage therefrom at the time when the interrupting arc is first established to permit fluid moved by the piston to strike the interrupting arc, a venting passage open at the time when the interrupting arc is first established and leading from within the substantially enclosed arc extinguishing structure to the exterior thereof, said intermediate and movable contacts having their point of initial separation immediately adjacent to said venting passage so that the fluid flow strikes the early formed part of the interrupting arc in passing out through the venting passage, a by-passing channel leading from the pressure-generating arc to the interrupting arc, and means in the by-passing channel to prevent a reverse flow of fluid within the channel toward the pressure-generating arc during low current interruption.

4. In a fluid circuit interrupter, means defining a substantially enclosed arc extinguishing structure having a substantially enclosed pressure-generating chamber therewithin, a relatively stationary contact, an intermediate contact separable therefrom to establish a pressure-generating arc within the pressure-generating chamber, a movable contact separable from the intermediate contact to establish an interrupting arc, a piston attached to and movable with the intermediate contact, a piston cylinder within which the piston moves and having an open passage therefrom at the time when the interrupting arc is first established to permit fluid moved by the piston to strike the interrupting arc, a venting passage open at the time when the interrupting arc is first established and leading from within the substantially enclosed arc extinguishing structure to the exterior thereof, said intermediate and movable contacts having their point of initial separation immediately adjacent to said venting passage so that the fluid flow strikes the

early formed part of the interrupting arc in passing out through the venting passage, a by-passing channel leading from the pressure-generating arc to the interrupting arc, biasing means to bias both the movable intermediate contact and the piston to move within the piston cylinder, and means in the by-passing channel to prevent a reverse flow of fluid within the channel toward the pressure-generating arc during low current interruption.

5. In a fluid circuit interrupter, a substantially enclosed arc extinguishing structure, the upper end of the structure forming a pressure-generating chamber, a relatively stationary contact, a rod-shaped intermediate contact separable therefrom to establish a pressure-generating arc within the pressure-generating chamber, a piston chamber formed intermediate the ends of the structure and having an opening from the lower end thereof, a piston movable within the piston chamber and secured to and movable with the rod-shaped intermediate contact, the lower end of the rod-shaped intermediate contact extending below the piston chamber, a lower movable contact separable from the lower end of the rod-shaped intermediate contact to establish an interrupting arc, venting means disposed adjacent the point of initial separation of the lower movable contact from the rod-shaped intermediate contact and leading to the exterior of the structure so that the interrupting arc is initially established immediately adjacent to the venting means and the fluid forced downwardly by the piston within the piston chamber strikes the first formed part of the interrupting arc and passes out of the structure through the venting means, and a by-passing channel extending from the pressure-generating chamber to a point adjacent the interrupting arc.

6. In a fluid circuit interrupter, a substantially enclosed arc extinguishing structure, the upper end of the structure forming a pressure-generating chamber, a relatively stationary contact, a rod-shaped intermediate contact separable therefrom to establish a pressure-generating arc within the pressure-generating chamber, a piston chamber formed intermediate the ends of the structure and having an opening from the lower end thereof, a piston movable within the piston chamber and secured to and movable with the rod-shaped intermediate contact, the lower end of the rod-shaped intermediate contact extending below the piston chamber, a lower movable contact separable from the lower end of the rod-shaped intermediate contact to establish an interrupting arc, venting means disposed adjacent the point of initial separation of the lower movable contact from the rod-shaped intermediate contact and leading to the exterior of the structure so that the interrupting arc is initially established immediately adjacent to the venting means and the fluid forced downwardly by the piston within the piston chamber strikes the first formed part of the interrupting arc and passes out of the structure through the venting means, a by-passing channel extending from the pressure-generating chamber to a point adjacent the interrupting arc, and means in the by-passing channel to prevent reverse upward flow toward the pressure-generating arc during low current interruption.

7. In a fluid circuit interrupter, a substantially enclosed arc extinguishing structure, contact structure operable to establish two serially related arcs and comprising a relatively stationary contact disposed at one end of the arc extinguishing structure, a movable intermediate contact and a hollow tubular contact, the hollow tubular contact providing a venting passage out of the arc extinguishing structure, a piston chamber within the arc extinguishing structure, a piston secured to the intermediate contact and movable within the piston chamber, said intermediate contact being elongated and having one end thereof extending beyond the piston chamber to make engagement with the hollow tubular contact, an opening from the piston chamber permitting the fluid forced out by the piston to strike the interrupting arc established between the intermediate and hollow tubular contacts and pass out of the substantially enclosed arc extinguishing structure through the venting passage provided by the hollow tubular contact, and a by-passing channel around the piston chamber permitting flow of fluid from the pressure-generating arc to the interrupting arc.

8. In a fluid circuit interrupter, a substantially enclosed arc extinguishing structure, contact structure operable to establish two serially related arcs and comprising a relatively stationary contact disposed at one end of the arc extinguishing structure, a movable intermediate contact and a hollow tubular contact, the hollow tubular contact providing a venting passage out of the arc extinguishing structure, a piston chamber within the arc extinguishing structure, a piston secured to the intermediate contact and movable within the piston chamber, said intermediate contact being elongated and having one end thereof extending beyond the piston chamber to make engagement with the hollow tubular contact, an opening from the piston chamber permitting the fluid forced out by the piston to strike the interrupting arc established between the intermediate and hollow tubular contacts and pass out of the substantially enclosed arc extinguishing structure through the venting passage provided by the hollow tubular contact, a by-passing channel around the piston chamber permitting flow of fluid from the pressure-generating arc to the interrupting arc, biasing means to bias the movable intermediate contact and the piston to move within the piston chamber, and means for preventing reverse flow within the by-passing channel toward the pressure-generating arc.

9. In a fluid circuit interrupter, a substantially enclosed arc extinguishing structure, a piston chamber interiorly thereof and having an opening therefrom at one end, a relatively stationary contact, a movable intermediate contact separable therefrom to establish a pressure-generating arc adjacent the other end of the piston chamber, venting means leading out of the substantially enclosed structure, a movable contact separable from the intermediate contact to initially establish an interrupting arc immediately adjacent to the venting means, piston means responsive to movement of the intermediate contact and movable within the piston chamber to cause fluid to flow out the open end thereof and strike the first formed portion of the interrupting arc in passing out of the structure through the venting means, and a by-passing channel extending around the piston chamber to permit fluid flow from the pressure-generating arc to the interrupting arc.

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