ABSTRACT: A power circuit breaker is comprised of a quench chamber, a hydraulic cylinder, and a hydraulic fluid system in permanent communication with the quench chamber and the hydraulic cylinder for supplying them with either a high-pressure or low-pressure source of hydraulic fluid. The quench chamber contains stationary contact means and a contact member movably positionable between an off position and an on position. A piston rod is connected to the contact member within the quench chamber and extends into the aligned hydraulic cylinder where it is attached to a piston. Positioned within the hydraulic system is a multiposition valve for selectively directing hydraulic fluid to the hydraulic cylinder and to the quench chamber. The hydraulic fluid system includes a pump having a high-pressure and a low-pressure side and a hydraulic fluid reservoir on the high-pressure side of the pump. An insulator chamber forms an annular space about the quench chamber and is in contact with low-pressure side of the hydraulic fluid system. A number of alternative arrangements are provided for removing switching gases from the quench chamber, generally these means include valve members which allow the switching gas to be discharged from the circuit breaker without any loss of pressure in the hydraulic fluid. Where it is important to maintain the liquid within the quench chamber separated from the hydraulic fluid an element is provided between the two fluids whereby the pressure of the hydraulic fluid is transmitted to the quench fluid without permitting any intermixing of the two fluids. Means are provided in combination with the hydraulic cylinder for dampening the movement of the piston rod and in turn the movable contact member at the termination of its movement between the off to the on position.
OIL CIRCUIT BREAKER WITH QUENCH CHAMBER CONNECTED TO THE HIGH PRESSURE SIDE OF A FLUID PUMP

SUMMARY OF THE INVENTION

The present invention is directed to a power circuit breaker operated by means of a hydraulic drive, and more particularly, to an arrangement which employs a limited quantity of fluid in the combined hydraulic fluid system and the power circuit breaker.

The primary object of the present invention is to afford a power circuit breaker wherein the breaker area is disposed within a quench pot or chamber filled with a fluid and a hydraulic system for operating the circuit breaker is in permanent communication with both the quench chamber and a hydraulic piston cylinder assembly for positioning movable contact means within the quench chamber.

Another object of the invention is to provide a hydraulic fluid system having a high-pressure source and a low-pressure source of fluid in communication with the power circuit breaker.

Still another object of the invention is to provide means for removing or discharging switching gases from the quench chamber in the power circuit breaker.

Moreover, another object of the invention is to provide a separator element between the liquid in the quench chamber and the fluid in the hydraulic system to prevent contamination of the hydraulic fluid due to intermixing with the quench liquid while transmitting pressure to the quench liquid.

Yet, another object of the invention is to furnish a multiposition valve in the hydraulic fluid system for selectively directing the hydraulic fluid to the hydraulic cylinder and to the quench chamber.

A still further object of the invention is to afford means for dampening the movement of the movable contact between the off and the on position of the power circuit breaker.

A further object of the invention is to provide a power circuit breaker which is simple in construction, effective in operation and capable of discharging switching gases which are generated in the movement of the switch between its off and on positions.

Accordingly, the present invention is directed to a power circuit breaker comprising a quench chamber disposed within an insulator. An annular space is provided between the insulator and the quench chamber and a liquid, such as a hydraulic fluid, fills the quench chamber and the annular space. A hydraulic cylinder is provided in alignment with the quench chamber and a piston rod is connected between a piston within the cylinder and a movable contact member within the chamber. By displacing the piston within the cylinder the movable contact can be positioned within the quench chamber between the on and off positions of the circuit breaker.

A sump is provided at one end of the quench chamber and is in communication with the annular space between the quench chamber and the insulator and may be in communication with the quench chamber. Various means may be provided between the quench chamber, the sump, and in some instances an additional outlet chamber, for discharging switching gases from the quench chamber. Hydraulic fluid is supplied to the quench chamber and to the hydraulic cylinder from a hydraulic fluid system which includes a pump, a reservoir, and various conduit means interconnecting the system with the different parts of the power circuit breaker. Located within the hydraulic system is a multiposition valve, a three-way or a four-way valve may be used, for directing the high-pressure and low-pressure sources of hydraulic fluid to the different parts of the power circuit breaker for directing the movable contact between the off and on positions.

In instances where it is important to maintain the quenching liquid and the hydraulic liquid separate, a separator element is arranged in the hydraulic fluid system for transmitting the hydraulic fluid pressure to the quenching liquid while preventing intermixing of the two liquids.

The various features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, its operating advantages and specific objects attained by its use, reference should be had to the accompanying drawings and descriptive matter in which there are illustrated and described preferred embodiments of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIGS. 1a and 1b show a somewhat schematic cross-sectional view of one embodiment of a power circuit breaker according to the present invention indicated in the on and off positions respectively;

FIGS. 2a and 2b display a power circuit breaker construction generally similar to the one shown in FIGS. 1a and 1b but setting forth an alternate arrangement of the quench chamber portion of the circuit breaker;

FIGS. 3a and 3b exhibit a similar arrangement to that set forth in FIGS. 2a and 2b, however, they disclose a different embodiment of the quench chamber for the circuit breaker;

FIGS. 4a and 4b show an arrangement generally similar to that set forth in FIGS. 1a and 1b, however, illustrating alternate arrangements of the hydraulic fluid system and the quench chamber for the power circuit breaker;

FIGS. 5a and 5b illustrate a quench chamber arrangement portion of the power circuit generally similar to that previously shown, but disclosing an alternate arrangement for the supply of hydraulic fluid to the quench chamber;

FIG. 6 is a schematic illustration of an alternate arrangement for maintaining the hydraulic fluid separate from the liquid employed within the quench chamber.

FIGS. 7a and 7b disclose another arrangement generally similar to that set forth in the prior FIGS., however, they illustrate an alternate arrangement for the hydraulic fluid system and also for the outlet from the quench chamber.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

In FIGS. 1a and 1b a power circuit breaker is shown divided into a power circuit breaker section 1 and a hydraulic fluid system section 2. In FIG. 1a the circuit breaker is shown in its on position, while in FIG. 1b it is in its off position. The hydraulic fluid system section 2 is comprised of a pump 3 which supplies high-pressure hydraulic fluid to a reservoir 4 and to a three-way valve 5. The power circuit breaker section 1 is made up of a hermetically sealed quench chamber 6 disposed within and spaced inwardly from an insulator 7. A fixed contact 8 is provided at the upper end of the quench chamber 6 and a contact member or contact stud 9 is movable position within the quench chamber between the on and off positions. Walls 10 located at the upper end of the quench chamber form a sump 11 which communicates through opening 11a with the annular space 7a between the insulator and the quench chamber. Attached to the base of the annular space 7a is a conduit 13 which is connected at its opposite end to the low-pressure side 14 of the pump 3. In the arrangement shown in FIGS. 1a and 1b the sump 11 is not in communication with the interior of the quench chamber 6 but only with the low-pressure side of the pump 3 through the annular space 7a.

Secured to the lower end of the quench chamber 6 and extending axially below it is a hydraulic cylinder chamber 16. A piston 18 is located within the cylinder chamber 16 and is interconnected to the movable contact 9 within the quench chamber by means of a piston rod 15. Within the hydraulic cylinder a variable zone 17 is provided above the piston 18 which communicates through the opening 24 situated near the upper end of the cylinder with branch conduit 13a. In turn the branch conduit 13a is connected to conduit 13 and communicates
through it with the low-pressure side 14 of the pump 3. On the opposite or lower side of the piston 18 a variable zone 19 is provided which communicates through opening 24a and the branch line 20 with the three-way valve 5.

In the hydraulic system section 2, the reservoir 4 is in continuous communication with the three-way valve 5 by means of line 21, and through the three-way valve it is connected to the quench chamber 6 by means of line 22. In this arrangement the quench chamber is always filled through line 22 with high-pressure hydraulic fluid. The three-way valve has a movable or rotatable section 5a containing a pair of connecting lines 23 and 26. In FIG. 1a the connecting line 23 supplies hydraulic fluid from the reservoir 4 into the line 20 connected with the hydraulic cylinder 16, while in the off position the line 23 is rotated to a disconnected position and the connecting line 26 supplies low-pressure hydraulic fluid from the branch conduit 13b into the line 20 supplying the hydraulic cylinder 16. In either of these positions the continuation of the line 21 through the section 5a of the three-way valve 5 supplies high-pressure fluid into the line 22 connected to the quench chamber.

In the on position (FIG. 1a) the movable section 5a of the three-way valve 5 is positioned so that high-pressure fluid flows through the connecting line 23 into the line 20 and then into the hydraulic cylinder 16. A control mechanism, not shown, is employed for positioning the movable part of the three-way valve. Due to the differences in the surfaces of F2 and F2 of the piston and the piston rod respectively, the introduction of the high-pressure hydraulic fluid into the cylinder causes the piston 18 to move upwardly and the piston rod 15 transports the movable contact 9 into contact with the stationary contacts 8 at the upper end of the quench chamber. As the piston 18 reaches the upper end of its stroke the movement of the piston rod and the movable contact 9 is damped because the piston partially closes the opening 24 connected with the low-pressure side of the hydraulic fluid system and the flow of hydraulic fluid from between the connector part 18c of the piston 18 and the opposed walls of the hydraulic cylinder 16 is restricted.

When the power circuit breaker is to be switched into the off position the movable part 5a of the three-way valve 5 is moved until the connecting line 26 joins the line 20 with the branch conduit 13b for supplying low-pressure hydraulic fluid into the hydraulic cylinder 16. At the same time the other connecting line 23 is disposed in a closed position while line 21 continues to supply high-pressure hydraulic fluid into the quench chamber. The zone in the hydraulic cylinder 16 is not connected to the low-pressure side of the hydraulic system and the piston rod 15 with the movable contact 9 moves downwardly to the position indicated in FIG. 1b due to the high-pressure hydraulic fluid within the quench chamber. As the piston 18 rides downwardly the hydraulic fluid within the zone 19 is discharged through the line 20 flowing through the three-way valve 5 into the branch conduit 13b and then through the conduit 13 to the pump 3.

When the quench chamber 6 is employed for switching very high currents it is desirable to remove any gases generated within the quench chamber during the switching operations. In the arrangement disclosed in FIGS. 1a and 10 the quench chamber is hermetically sealed and no provision is made for removing the switching gases. In the remaining FIGS. 16 and 17, with the exception of FIG. 6, various means are illustrated for removing the switching gases from the quench chamber.

In the drawings the same reference numerals are employed for similar elements in the various FIGS. and in certain of the FIGS. the hydraulic fluid system 2 is not shown since it is the same as illustrated in FIGS. 1a and 1b.

In FIGS. 2a and 1b a closed lock 27 is associated with the quench chamber 6 through an opening 6a and the lock in turn communicates with the oil sump 11 through an opening 27a. A valve 28 provides a closure for the opening 6a and a valve 29, mounted on a common valve stem 31 with the inlet valve 28, provides closure for the opening 27a. The lock 27 is filled with hydraulic fluid from the sump 11. Since both of the valves 29 and 28 are mounted on the common valve stem 31 when one valve is opened the other is closed. The valve stem 31 extends downwardly into the upper portion of the quench chamber and has an end member 32 biased in a downwardly extending position by means of a spring 32a mounted on the stem and contacting a portion of the quench chamber structure. In the off position of the circuit breaker the spring 32a maintains the end member 32 and the valve stem 31 in a downward position. As indicated in FIG. 2a when the contact member 9 moves into the on position its upper end pushes the end member 32 upwardly against the biasing action of the spring 32a causing the valve 28 to open. To prevent pressure losses from the quench chamber through the lock 27 into the sump 11, the valves 28, 29 are arranged so that the opened valve closes before the closed valve moves into the opened position.

When the power circuit breaker illustrated in FIGS. 2a and 2b is moved to the on position (2b) the movable contact 9 first passes between the stationary contact 8 and during this period gases are generated. As it continues its upward movement the movable contact 9 enganges the element 32 and pushes the valve stem 31 in the upward direction against the downward biasing action of the spring 32a. In FIG. 2b the position of the valve assembly is indicated wherein the outlet valve 29 is in the open position with the spring 32a in a condition of compression with the sump 11, as the valve stem 31 moves upwardly it first closes the valve 29 and then immediately it opens the valve 28 providing communication through the opening 6a between the quench chamber 6 and the lock 27. With the valve 28 in the opened position switching gases escape from the quench chamber into the lock. As long as the switch remains in its on position the switching gases are retained within the lock 27.

When the power circuit breaker is moved to the off position (FIG. 2b) the movable contact is disengaged from the stationary contact 8 and also releases the end element 32 of the valve assembly permitting the valve stem 31 to move in a downward direction under the biasing action of the spring 32a. In this way the valve 28 first closes the opening 6a and immediately thereafter the valve 29 is retracted from the opening 27a and the switching gases which have accumulated within the lock 27 are discharged into the sump 11.

Located above the sump 11 is an outlet chamber 30 which communicates with the sump through an opening 30a. A valve 33 is spring biased into a normally closed position in the opening 30a. An opening 34 is provided from the outlet chamber 30 to a drain passage 35 which extends from the circuit breaker when the accumulated gases within the sump 11 reach a pressure sufficient to overcome the spring biased valve 33 and pass through the opening 30a into the outlet chamber 30 and then through outlet 34.

In the sump 11 check valves 35 and 36 are provided in the openings communicating with the annular space 7a between the quench chamber and the insulator. These check valves 35 and 36 are provided to prevent the increase in pressure within the sump 11 from affecting the low-pressure side of the hydraulic fluid system which is in communication with the annular space 7a through the conduit 13.

In FIGS. 3a and 3b another embodiment is illustrated for discharging the switching gases from the quench chamber 6. In this embodiment the gases pass directly from the quench chamber through the opening 6a into the sump 11, the opening 6a is maintained in a normally closed position by the spring biased valve 37. The valve 37 has a spring 37a mounted on its valve stem 37b, the spring is arranged to maintain the valve in its normally closed position in opposition to the high-pressure hydraulic fluid within the quench chamber. During a switching operation where a large current is involved or in the course of several switching operations where a small current is involved, the quench chamber pressure increases due to the switching gases which are generated and these gases accumulate in the upper end of the chamber. When the pressure developed because of the switching gases reaches a certain level the bias-
The ing effect of the spring 37 is overcome and the valve stem 37b is moved upwardly displacing the valve 37 from the opening 6a and the switching gases exit through the opening into the sump 11. After the gases have been released from the quench chamber the spring 37a returns the valve 37 into the opening 6a until enough pressure is generated again by the gases for opening the valve 37. Similar to the arrangement shown in FIGS. 2a, 2b, when a predetermined pressure is developed by the gases within the sump 11 the spring biased valve 33 is opened permitting the switching gases to enter the outlet chamber 30 and exit from the opening 34. Further, check valve 35 retains low pressure fluid within the annular space between the quench chamber and the insulator to prevent the rise in pressure developed within the sump from influencing the low-pressure side of the hydraulic system.

In FIGS. 4a, 4b a different hydraulic system section 38 is provided for the power circuit breaker. In this arrangement during and following the placement of the circuit breaker in the on position the quench chamber 6 is in contact with the low-pressure side of the hydraulic fluid system, and as a result, the quench chamber is temporarily relieved of the high-pressure effect of the hydraulic fluid. Accordingly, the lock arrangement or the spring-biased valve construction for discharging switching gases from the quench chamber is not required in the embodiment shown in FIGS. 4a and 4b.

In place of the three-way valve 5 previously employed a four-way valve 39 is positioned in the hydraulic fluid system 38. The valve 39 is selectively positionable between a first position in which the low-pressure conduit 13 of the hydraulic fluid system in communication, in serial arrangement, through branch conduit 13b, the four-way valve 39 and the line 40 with the quench chamber 6. In the same position the hydraulic cylinder 41 is in communication with the high-pressure side of hydraulic fluid through the line 41c, the four-way valve 39 and line 20.

As distinguished from the previous arrangement there is no connection between the upper end of the hydraulic cylinder 41 and the low-pressure conduit 13 of the hydraulic fluid system. Within the hydraulic cylinder 41 a piston 43 is interconnected with the movable contact 9 by means of a piston rod 42. At the upper end of the cylinder 41 a constricted part 44 is provided to receive the piston 43 when the movable contact 9 is disposed in the on position as shown in FIG. 4a.

The movement of the contact stud 9 is determined by the difference in pressures acting on the piston 43 and its associated piston rod 42. When it is desired to place the circuit breaker in the on position the four-way valve 39 is set to deliver high-pressure hydraulic fluid into the hydraulic cylinder 41 and the low-pressure hydraulic fluid is supplied to the quench chamber. The differences in pressures acting on the piston assembly displaces the contact member 9 into contacting arrangement with the stationary contacts 8 at the upper end of the quench chamber. Near the end of the upward movement of the contact member as the piston 43 enters the constricted section 44 and the movement of the contact member 9 is damped.

In going from the on to the off position, (see FIG. 4b) the valve 39 is repositioned whereby the low-pressure side of the hydraulic system is in communication with the hydraulic cylinder 41 and its high-pressure side is in communication with the quench chamber 6 through the line 40. The pressure differential on the piston assembly causes the piston 43 to ride downwardly within the hydraulic cylinder 41 and the movable contact 9 is withdrawn from the stationary contact 8 and moves into the off position.

The quench chamber 6 is in communication with the sump 11 through an opening 45a containing a valve 45. As long as low-pressure hydraulic fluid is supplied to the quench chamber 6, the valve 45 remains open, permitting switching gases to pass into the sump 11 and then to exit from the outlet chamber 30 through the outlet opening 34. When sufficient pressure is developed to overcome the spring-biased valve 33. However, though the valve 45 remains open in the on position of the circuit breaker, that is, when low-pressure hydraulic fluid is within the quench chamber, when high-pressure hydraulic fluid is supplied into the chamber the valve is arranged to move into its closed position blocking the passage of switching gases into the sump. By closing the valve 45 when the high-pressure hydraulic fluid is within the quench chamber there is no loss of pressure to the fluid within the sump.

Another embodiment of the power circuit breaker is shown in FIGS. 5a and 5b wherein the quench chamber 6 is at the pressure of the low-pressure side of the hydraulic fluid system after it has been placed in the off position. However, during movement between the on and off positions, and while in the on position, the quench chamber is at the high-pressure side of the hydraulic fluid system. The hydraulic fluid system utilized for the embodiment shown in FIGS. 5a and 5b is the same as that set forth in FIGS. 1a, 1b accordingly, it has not been illustrated. In place of the line 22, connecting the three-way valve directly with the quench chamber as shown in FIGS. 1a and 1b, in FIGS. 5a and 5b, the three-way valve, not shown, is connected by way of the line 20 with the hydraulic cylinder 16 and a branch line 46 extends from the line 20 to the quench chamber 6. Additionally, a throttle valve 47 is positioned in the branch line 46 and a pressure reservoir is disposed in the branch line between the throttle valve and the quench chamber.

In the upper end of the quench chamber 6, there is a valve 49 which is disposed in the closed position sealing the opening 49a when high-pressure hydraulic fluid is within the quench chamber. In addition, a spring-biased valve 50 is disposed within the opening 50a and is arranged to open only when the switching gases within the quench chamber reach a level sufficient to overcome the biasing action thereby permitting the switching gases to flow into the sump 11.

In the movement of the circuit breaker into the on position and while it is in the on position the line 40, supplying hydraulic fluid both to the cylinder 16 and to the branch line 46, is in contact with the high-pressure side of the hydraulic system. The difference in pressure on the piston assembly, that is, the difference in area between the piston and the piston rod causes the movable contact member 9 to pass upwardly into engagement with the stationary contacts 8. The high pressure within the quench chamber maintains the member 9 in its closed position. At the same time, the high pressure of the hydraulic system is not sufficient to displace the valve 50 from the opening 50a, however, as switching gases are generated within the chamber, and the increase in pressure is sufficient to overcome the biasing action of the spring valve 50, the gases will flow through the opening 50a into the sump 11. During, the movable contact member 9 is forced downwardly out of engagement with the stationary contact 8 and while it is in the on position, the throttle the throttle valve 47 is opened and the reservoir 48 as well as the quench chamber 6 are filled with the high-pressure hydraulic fluid.

When the power circuit breaker is moved to the off position (FIG. 5b) the line 20 is in communication with the low-pressure side of the hydraulic system and accordingly, low-pressure hydraulic fluid communicates with the hydraulic cylinder 16. However, because of the throttle valve 47 there is a lag in the reduction of the high pressure of the hydraulic fluid which previously prevailed in the quench chamber prior to the changeover from the on to the off position. Due to the differences in pressure within the hydraulic cylinder 16 and the quench chamber 6, the movable contact member 9 is forced downwardly out of engagement with the stationary contact 8 to the lower end of the quench chamber. The combination of the pressure reservoir 48 and the throttle valve 47 prevents a rapid falloff in the pressure within the quench chamber which would be disadvantageous for arc extinction. When the movable contact is in the off position, the pressure within the quench chamber gradually drops to the low-pressure of the hydraulic system by means of the throttle valve 47. When the quench chamber is at the low-pressure level of the hydraulic system the valve 49 opens and any residual switching gases within the chamber pass into the sump. Any of the switching gases which enter the sump pass through the spring-biased
valve 33 when sufficient pressure is established to overcome the spring action of the valve and the gases then flow from the outlet chamber 30 passing through the opening 34.

In FIG. 6, an alternate arrangement is disclosed for supplying the pressure of the hydraulic system to the quench chamber while preventing any intermixing of the hydraulic fluid with the liquid within the quench chamber. In this arrangement, an element 51 is positioned in the line 22 which extends from the three-way valve 5 to the quench chamber 6, as shown in FIGS. 1a and 1b. An elastic bulk 52 is provided within the element 51 which prevents intermixing of the hydraulic fluid with the quench liquid within the chamber 6. The pressure of the hydraulic fluid is transmitted through the elastic bulk 52 to the quench liquid and any decomposition products associated with the quench liquid are prevented from entering into the hydraulic fluid and causing any problems or damage within the hydraulic system. By employing this arrangement, it is possible to use different fluids within the hydraulic system and the quench chamber. Moreover, instead of an elastic bulk 52, as shown in dotted lines in FIG. 6, a separating membrane may be provided within the chamber 51 or a floating piston may be utilized.

Another embodiment of the present invention is disclosed in FIGS. 7a, 7b wherein the quench chamber 6 is in permanent communication with the low-pressure side of the hydraulic system through the medium of a branch conduit 53 which extends between the conduit 13, connected to the low-pressure side of the valve 3 and the lower end of the quench chamber 6. The upper end of the quench chamber has a pair of apertures 54 and 55 opening from the quench chamber into the sump 11. As shown in some of the other embodiments, the sump 11 is in communication with an outlet chamber 30 by means of openings 30a normally closed by a spring-biased valve 33.

Another difference between the arrangement shown in FIG. 6 and that shown in FIG. 7b is that the line 22, instead of being connected to the quench chamber, is connected to the upper end of the cylinder 56. A differential piston 57 is provided within the piston cylinder and is connected by means of a piston rod with the movable contact member 9 located within the quench chamber.

In the on position, the quench chamber 6 is in contact with the low-pressure side of the hydraulic fluid system through the branch conduit 53 while both ends of the hydraulic cylinder communicate with the high-pressure side of the hydraulic system through the line 20 connected to the lower end of the cylinder and the line 22 connected to its upper end. Due to the differential surfaces of the piston 57 within the cylinder 56, the high-pressure fluid causes the movable contact 9 to move upwardly within the quench chamber into engagement with the stationary contacts 8 at the upper end. Any gases generated during this part of the switching operation pass through the apertures 54, 55 into the sump 11, and then exit into the outlet chamber 30 when sufficient pressure is developed to overcome the spring-biased valve 33. Moreover, as in several of the other embodiments, check valves 35 and 36 are provided in the sump to prevent any excess pressure developed by the switching gases from influencing the low-pressure side of the hydraulic fluid system.

In the off position (FIG. 7b) the upper end of the hydraulic cylinder 56 is in communication through the three-way valve 5 with the high-pressure side of the hydraulic system while the line 20 is in contact through the valve and the branch conduit 13b with the low-pressure side of the hydraulic system. As a result of the differential pressure acting on the piston, the movable contact member is displaced downwardly into the off position. In the off position, the quench chamber continues in contact with the low-pressure side of the hydraulic system and any gases which develop pass through the apertures 54 and 55 into the sump and then into the outlet chamber 30 for eventual discharge from the power circuit breaker.

While specific embodiments of the invention have been shown and described in detail to illustrate the application of the inventive principles, it will be understood that the invention may be embodied otherwise without departing from such principles.

We claim:
1. A power circuit breaker comprising walls forming a quench chamber arranged to be filled with a fluid, stationary contact means located within the chamber, a contact member movable relative to said stationary contact means within said chamber between an on position and an off position of the circuit breaker, a hydraulic cylinder arranged in alignment with and separated from said chamber, a piston disposed within said hydraulic cylinder, a piston rod extending between said cylinder and said quench chamber and attached to said piston and to said contact member, a hydraulic system for supplying a high-pressure source and a lower pressure source of hydraulic fluid for displacing said contact member between its on and off positions, said hydraulic system comprising a pump having a lower pressure side and a high-pressure side, conduit means affording a direct connection between the high-pressure side of said pump and said quench chamber and between said pump and said hydraulic cylinder, and a multiposition valve disposed in said hydraulic system for selectively directing the flow of the high-pressure and low-pressure hydraulic fluid to said hydraulic cylinder, whereby said movable contact member is selectively positionable in the on position and the off position within said quench chamber and said quench chamber is maintained under the influence of the high-pressure source of hydraulic fluid continuously while said movable contact member is maintained in the on and the off positions and when the movable contact member is being displaced between these two positions.
2. A power circuit breaker as set forth in claim 1, wherein a hydraulic fluid reservoir is disposed in communication with said conduit means on the high-pressure side of said pump.
3. A power circuit breaker, as set forth in claim 1, wherein said hydraulic fluid reservoir is disposed in said conduit means on the high-pressure side of said pump and said hydraulic cylinder and said third-way valve is arranged selectively to direct one of the high-pressure and low-pressure sources of hydraulic fluid to said hydraulic cylinder while maintaining a continuous supply of the high-pressure source of hydraulic fluid with said quench chamber.
4. A power circuit breaker as set forth in claim 1, wherein walls forming a fluid sump are disposed at one end of said quench chamber.
5. A power circuit breaker as set forth in claim 4, wherein insulator walls are spaced outwardly from and laterally enclosing said quench chamber forming therebetween a closed annular space.
6. A power circuit breaker as set forth in claim 4, wherein walls forming a lock are disposed within said sump at the end of the said quench chamber, said quench chamber having an opening therefrom communicating with said lock, valve means for closing the opening between said quench chamber and said lock, biasing means mounted on said valve for securing said sump in the closed position whereby said valve is disposed into the open position only upon the development of a sufficient pressure within the quench chamber to overcome the biasing effect upon the valve.
7. A power circuit breaker as set forth in claim 6, wherein said walls forming said lock have an opening communicating between said lock and said sump, an auxiliary valve member attached to said valve closing the opening between the said lock and said quench chamber and arranged to be disposed in the closed position in said opening between said lock and said sump when said valve in the opening between said lock and said quench chamber is in the opened position and to be in the opened position when said valve is in the closed position.
8. A power circuit breaker as set forth in claim 4, wherein said quench chamber has an opening therefrom communicating with said sump, valve means disposed within said opening for selectively opening and closing said opening for the passage therethrough of switching gases from said quench chamber into said sump.
9. A power circuit breaker as set forth in claim 8, wherein said valve means comprises a spring-biased valve disposed in the opening between said quench chamber and said sump whereby said valve is disposed in a normally closed position, and the combination of the pressure of the hydraulic fluid and the spring means within said quench chamber are required to overcome the biasing action of the valve for disposing it into its opened position for discharging switching gases from the quench chamber.

10. A power circuit breaker as set forth in claim 8, wherein said sump has an outlet opening therefrom, an outlet chamber in communication with the outlet opening from said sump, and a spring-biased valve means disposed in the opening between said sump and said outlet chamber for regulating the passage of switching gases from the sump into the outlet chamber.

11. A power circuit breaker as set forth in claim 8, wherein said valve means comprises a valve device disposed in the opening between said quench chamber and said sump whereby said valve device is arranged in the closed position in said opening when high-pressure hydraulic fluid fills said quench chamber and is arranged in the opened position when low-pressure hydraulic fluid fills said quench chamber.

12. A power circuit breaker, as set forth in claim 1, wherein a separator chamber is disposed in said conduit means having a first opening communicating with said quench chamber and a second opening communicating with said hydraulic system, a separator member disposed within said chamber for maintaining said hydraulic fluid separate from the fluid within said quench chamber while transferring the pressure of the high-pressure source of the hydraulic fluid to the fluid within said quench chamber.

13. A power circuit breaker as set forth in claim 12, wherein said separator member is an element secured within said separator chamber and arranged to contain the pressure of said hydraulic fluid and to transfer the hydraulic fluid pressure to the fluid within said quench chamber.

14. A power circuit breaker comprising walls forming a quench chamber arranged to be filled with a fluid, stationary contact means within said chamber, a contact member movable relative to said stationary contact means within said chamber between an on position and an off position of the circuit breaker, a hydraulic cylinder arranged in alignment with and separated from said chamber, a piston disposed within said cylinder, a piston rod extending between said cylinder and said quench chamber and attached to said piston and to said contact member, a hydraulic system in permanent communication with said piston cylinder and said quench chamber and arranged to provide a high-pressure source and a low-pressure source of hydraulic fluid, a multipositioned valve disposed in said hydraulic system for selectively directing the flow of the high-pressure and low-pressure hydraulic fluid through, whereby said movable contact member is selectively positionable in the off position and the on position within said quench chamber.

15. A power circuit breaker comprising walls forming a quench chamber arranged to be filled with a fluid, second walls forming a fluid sump disposed at one end of said quench chamber, said sump spaced outwardly from and laterally enclosed said quench chamber for pressure space therebetween, stationary contact means within said chamber, a contact member movable relative to said stationary contact means within said chamber between an on position and an off position of the circuit breaker, a hydraulic cylinder arranged in alignment with and separated from said chamber, a piston disposed within said cylinder, a piston rod extending between said cylinder and said quench chamber and attached to said piston and to said contact member, a hydraulic system in permanent communication with said piston cylinder and said quench chamber and arranged to provide a high-pressure source and a low-pressure source of hydraulic fluid, a multipositioned valve disposed in said hydraulic system for selectively directing the flow of the high-pressure and low-pressure hydraulic fluid therethrough, a conduit means interconnecting said pump and said hydraulic cylinder and quench chamber, a throttle valve disposed within said conduit means between said multipositioned valve and said quench chamber, a hydraulic fluid reservoir in communication with said conduit means between said throttle valve and said quench chamber, and wherein said quench chamber is arranged to be in communication with the high-pressure hydraulic fluid when the movable contact is in the on position and to be in communication with the low-pressure hydraulic fluid when the movable contact is in the off position whereby said throttle valve restricts the reduction in pressure in said quench chamber from the high-pressure hydraulic fluid to the low-pressure hydraulic fluid when said movable contact is disposed from the on position to the off position.
19. A power circuit breaker comprising walls forming a quench chamber arranged to be filled with fluid, stationary contact means within said chamber, a contact member movable relative to said stationary contact means within said chamber between an on position and an off position of the circuit breaker, a hydraulic cylinder arranged in alignment with and separated from said chamber, a piston disposed within said cylinder, a piston rod extending between said cylinder and said quench chamber and attached to said piston and to said contact member, a hydraulic system in permanent communication with said piston cylinder and said quench chamber and arranged to provide a high-pressure source and a low-pressure source of hydraulic fluid, a multipositioned valve disposed in said hydraulic system for selectively directing the flow of the high-pressure and the low-pressure hydraulic fluid therethrough so that said movable contact member is selectively positionable in the on position and the off position within said quench chamber, said hydraulic system comprising a pump having a low-pressure side and a high-pressure side, conduit means interconnecting said pump and said hydraulic cylinder and quench chamber and a branch conduit in communication with said conduit means and with said quench chamber whereby said quench chamber is maintained in communication with the low-pressure side of said hydraulic system.