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OIL CIRCUIT BREAKER WITH TWO EXTINGUISHING CHAMBERS

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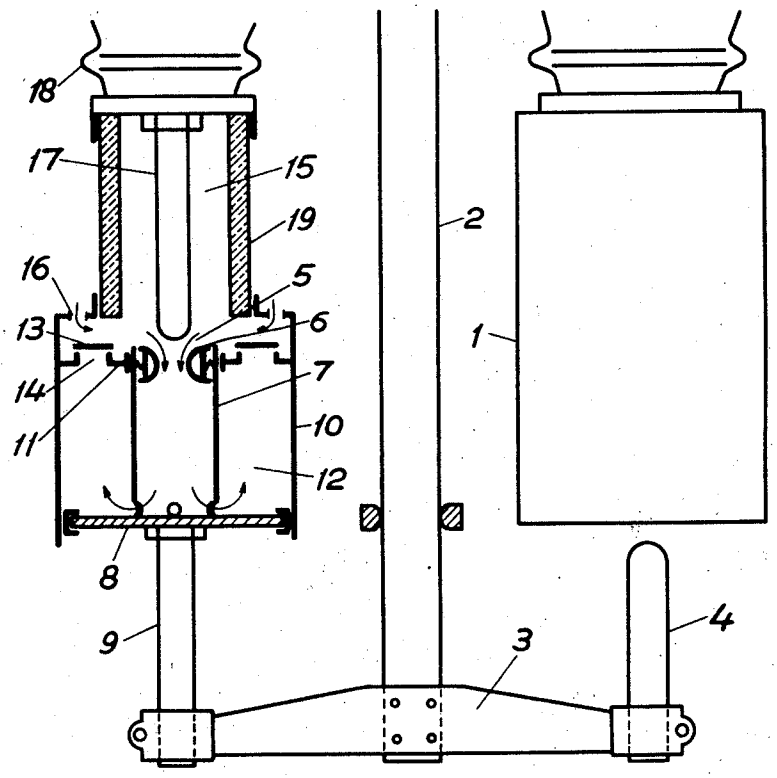

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OIL CIRCUIT BREAKER WITH TWO EXTINGUISHING CHAMBERS

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4 Claims. (Cl. 200—150)

The present invention relates to a conventional high tension oil circuit breaker with two extinguishable chambers, which are arranged to be connected in series by the movable contacts and a contact bridge carrying said contacts. An important feature of the invention is that one of the said extinguishing chambers, which is intended for heavy currents, is constructed in a known manner and preferably consists of an extinguishing chamber containing a differential piston actuated by the gas generated by the arc. The extinguishing chamber, intended for low currents on the other hand, has a hollow movable contact carried by a tubular member, which is connected to a piston movably arranged in a cylinder, said piston tending to lower the fluid pressure in said cylinder during the first part of the contact movement. During the last part of the contact movement the contacts in the low current extinguishing chamber are separated, and an extinguishing oil stream passes between the contacts and into the cylinder through the opening in the hollow movable contact from the space where the stationary contact is arranged. This last mentioned space is in communication with an oil-filled space outside the extinguishing chamber. The cylinder, containing the piston, is also through the opening in the movable contact, in communication with the space outside the cylinder through a number of openings provided with check-valves, and through which openings the oil in the cylinder can be quickly, and with low resistance, pressed out by closing the breaker. The piston that lowers the fluid pressure may be actuated by a spring in the opening direction, so that the operating force when opening the breaking gap will be low. The spring is then tensioned during the closing of the breaker.

In the breaker according to the invention an improved action is obtained, as two extinguishing chambers are connected in series, of which chambers one gives the breaker good characteristics with heavy currents while the other gives the breaker good characteristics with low currents. The breaking qualities of extinguishing chambers as generally used with a differential piston actuated by the pressure of the gases generated by the arc, and which pressure causes an extinguishing oil stream, depend on the value of the current to be broken and for low currents are inadequate as the gas pressure generated by the arc is too low for moving the differential piston. When the extinguishing chamber for heavy currents as mentioned above is combined with an extinguishing chamber designed for breaking low currents, a circuit breaker is obtained, which with all currents that may occur is able to effectively extinguish the breaker arc. In order to reduce the stress of the extinguishing chamber for low currents it is so arranged that its contacts are first separated after that the contacts of the extinguishing chamber for high currents have been separated and the breaking arc in this chamber has normally already been extinguished. For this reason only occasionally an arc may occur in the extinguishing chamber designed for low currents, in which chamber at every breaking an extinguishing oil stream generated independently of the arc passes the breaking gap. If the piston area, the cross-section of the opening in the movable contact and the stroke of the piston are suitably chosen, the oil current may be maintained during a desired time period.

The accompanying drawing illustrates one embodiment of the invention having a conventional extinguishing chamber **1** of the type containing a differential piston. This chamber is designed for heavy currents and is by means of a bridge member **3**, which is fixed to the operating rod **2**, connected in series with an extinguishing chamber for low currents. The member **3** carries the movable contact **4** of the chamber **1** as well as the movable contact of the extinguishing chamber connected in series therewith. In the extinguishing chamber for low currents, the breaking gap **5** has a stationary contact **17** which is formed as a rod and is fixed on the insulator **18**. A tubular member **19** of insulating material surrounds the contact **17**, and is also attached to the said insulator. The cylinder **10** is attached to the lower end of the member **19**. The space **15** around the contact **17** is in communication with the space outside the extinguishing chamber through openings **16**. The movable contact of the breaking gap can slide along the stationary contact and consists of a number of spring actuated contact segments **6**, which are arranged at the upper end of a tube **7**, which tube at its lower end is attached to a piston **8**. The movable contact **6** and the piston **8** are carried by a rod **9** attached to the bridge member **3**. The tube **7** extends through an opening in the wall **11** in the cylinder. Openings **14** in said wall **11** are provided with check-valves **13** and allow the oil in the space **12** to escape, when the piston **8** is moving upwardly.

The extinguishing chamber for low currents operates as follows: At breaking, the piston **8** and the movable contact move downwardly. During the first part of this downward movement the movable contact **6** slides along the stationary contact **17**, which projects into the tube **7**. The opening in the movable contact **6** is consequently closed by the stationary contact **17**, and the fluid pressure is lowered in the space **12**. A little before the end of the movement the contacts are separated and the space **12** is thus brought into communication with the space **15** through the movable hollow contact. An extinguishing oil stream then passes between the contacts into the space **12**. When the piston **8** moves upwards the check-valves **13** allow free passage of oil from the space **12** to the space **15**.

I claim as my invention:

1. An oil circuit breaker comprising two arc extinguishing units each having a movable contact, a common conducting bridge member electrically connecting the said units in series, one of the said units being designed to interrupt high currents and to open before the other unit which is designed to interrupt low currents, the last mentioned unit comprising a stationary contact, a cylinder arranged at the outer end of said contact, an annular movable contact slidable along said stationary contact, an end wall in said cylinder, a tubular member carrying said movable contact and passing through the said end wall, a piston movable in said cylinder and attached to said tubular member, said end wall and piston forming a fluid space, located between the cylinder and the annular member, said piston tending to lower the fluid pressure in the cylinder during its movement away from the stationary contact, and the said fluid space in said cylinder being in communication with the exterior of the cylinder through the said movable contact only during the last part of the contact movement and in the open interrupting position.

2. An oil circuit breaker having an arc extinguishing unit for low currents, comprising a fixed contact, a movable tubular contact adapted to slide over the fixed contact, a piston secured to the tubular contact, a cylinder

surrounding the tubular contact and within which the said piston operates, a cylinder end wall having an opening for the passage of the tubular contact, an annular fluid space being formed between the said cylinder and the tubular contact and between said piston and the said end wall, openings providing communication between the interior of the tubular contact and the said annular fluid space, so that the fluid pressure in the cylinder is reduced as the tubular contact is withdrawn from the fixed contact and is moved toward the open position of the contacts, in combination with an arc extinguishing unit for high currents, comprising a casing and a movable contact, and a bridge member so connecting the movable contacts of the two arc extinguishing units for high and low current that said units are electrically connected in series with each other.

3. An oil circuit breaker having an arc extinguishing unit for low currents, comprising a fixed contact, a movable tubular contact adapted to slide over the fixed contact, a piston secured to the tubular contact, a cylinder surrounding the tubular contact and within which the said piston operates, a cylinder end wall having an opening for the passage of the tubular contact, an annular fluid space being formed between the said cylinder and the tubular contact and between said piston and the said end wall, openings providing communication between the interior of the tubular contact and the said annular fluid space, so that the fluid pressure in the cylinder is reduced as the tubular contact is withdrawn from the fixed contact and is moved toward the open position of the contacts, an insulating tubular member surrounding the fixed contact with an annular space therein for the accommodation of the tubular contact, and means whereby the said cylinder is supported from the lower end of said insulating member, in combination with an arc extinguishing unit for high currents, comprising a casing and a movable contact, and a bridge member so connecting the movable

contacts of the two arc extinguishing units for high and low current that said units are electrically connected in series with each other.

4. An oil circuit breaker having an arc extinguishing unit for low currents, comprising a fixed contact, a movable tubular contact adapted to slide over the fixed contact, a piston secured to the tubular contact, a cylinder surrounding the tubular contact and within which the said piston operates, a cylinder end wall having an opening for the passage of the tubular contact, an annular fluid space being formed between the said cylinder and the tubular contact and between said piston and the said end wall, openings providing communication between the interior of the tubular contact and the said annular fluid space, so that the fluid pressure in the cylinder is reduced as the tubular contact is withdrawn from the fixed contact and is moved toward the open position of the contacts, and check valves in the said cylinder end wall to permit the escape of fluid from the said annular fluid space between the piston and the said wall when the movable contact is moved upwardly onto the fixed contact, in combination with an arc extinguishing unit for high currents, comprising a casing and a movable contact, and a bridge member so connecting the movable contacts of the two arc extinguishing units for high and low current that said units are electrically connected in series with each other.

References Cited in the file of this patent

UNITED STATES PATENTS

2,235,901	Ronnberg	Mar. 25, 1941
2,252,983	Rossman	Aug. 19, 1941
2,463,029	Fry	Mar. 1, 1949
2,551,772	Thibaudat	May 8, 1951

FOREIGN PATENTS

741,488	France	Dec. 12, 1932