Feb. 2, 1954 E. VOGELSANGER ET AL 2,668,217

LIQUID SWITCH

Filed Jan. 11, 1952

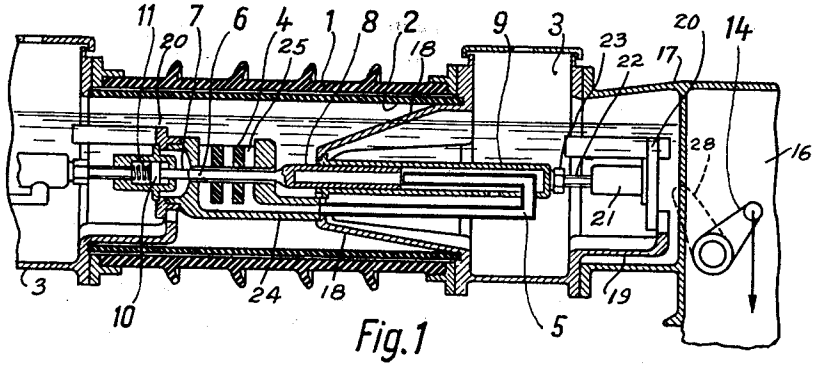

Fig.1

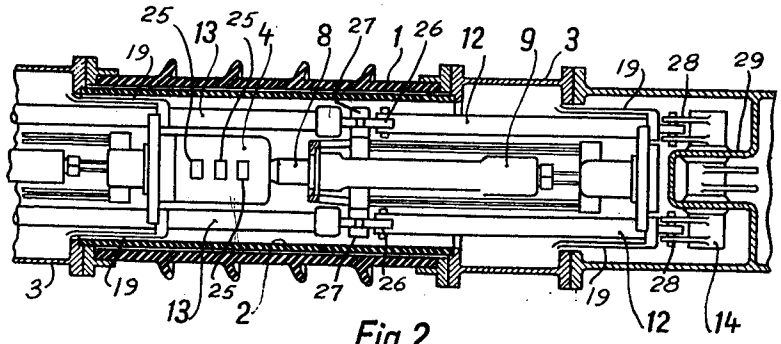

Fig.2

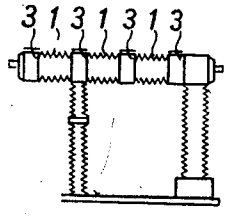

Fig.3

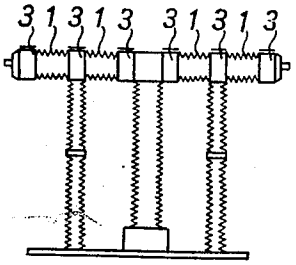

Fig.4

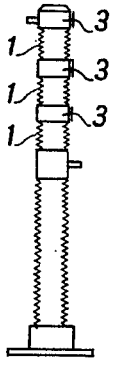

Fig.5

INVENTORS

Ernst Vogelsanger.

Lorenzo Ubezio.

BY

Benjamin Roman.

Atty

Patented Feb. 2, 1954

2,668,217

UNITED STATES PATENT OFFICE

2,668,217

LIQUID SWITCH

Ernst Vogelsanger and Lorenzo Ubezio, Zurich, Switzerland, assignors to Ateliers de Construction Oerlikon, Zurich-Oerlikon, Switzerland, a corporation of Switzerland

Application January 11, 1952, Serial No. 266,022

Claims priority, application Switzerland August 28, 1951

2 Claims. (Cl. 200—150)

1

This invention relates to liquid switches, and more particularly to electric circuit breakers of the fluid blast type.

Liquid switches with points of interruption arranged in series and a pumping arrangement to feed the insulating liquid to the quenching chambers require considerable power for blasting the liquid through the vaporized quenching medium because of the increased pressure thereof when the switch opens.

This disadvantage can be eliminated if according to the present invention the movable contact of each quenching chamber is given the form of a piston and is guided in a cylinder which together with the piston forms a pump which forces the quenching liquid through a channel connecting the cylinder with the quenching chamber across the switching-off arc.

In the drawing:

Fig. 1 is a fragmentary, longitudinal, vertical cross-sectional view of a liquid switch illustrating the invention;

Fig. 2 is a fragmentary, longitudinal, horizontal cross-sectional view of such switch;

Fig. 3 is a view in side elevation of a circuit breaker composed of three liquid switch units embodying the invention;

Fig. 4 is a view in side elevation of a modification composed of six switch units; and

Fig. 5 is another modification of three switch units arranged in a vertical pile.

As shown in Figs. 1 and 2 of the drawing the switch unit comprises a tubular insulator 1 containing an insulating tube 2. Such insulator 1 and tube 2 are connected to a right-hand metal housing or casing 3 which, in turn, is mounted on a hollow support 16 having a liquid tight socket 17 in communication with the interior of the housing 3. Such housing is provided with internal brackets 18, 18 in which is mounted one end of an elongated cylinder 9. The housing 3 also contains internal brackets 19, 19 which serve to support the other end of the cylinder 9 through an annulus 20 mounted on the brackets 19, 19, a cylinder 21 mounted on such annulus, a rod 22 mounted on the cylinder 21, and a nut 23 connecting the ends of the rod 22 and the cylinder 9.

Corresponding brackets 19, 19 in the left-hand housing 3 serve to support another annulus 20 which in this case in turn supports one end of an arc quenching chamber device 4, the other end of which is supported by the brackets 18, 18. The device 4 is provided with an eccentric passage 24 for the arc quenching liquid (oil),

2

which is in communication at one end with the outlet of a liquid conduit 5, and at the other end with three arc quenching passages 25. The conduit 5 is U shaped, the inlet end thereof being centered in the cylinder 9 and adapted to project into the open end of a hollow piston 8 which is integral with a switch contact rod 6 when the latter is moved axially to the right away from a countercontact 7 of the switch. Such movement is accomplished through the actuation to the right of parallel coupling rods 12, 12 which are connected at one end by links 26, 26 to lateral arms 27, 27 affixed to the hollow piston 8, and at the other end to arms 28, 28 of a crank 14. The crank is mounted to turn on a bracket 29 in the support 16. When so operated the hollow piston 8 serves to deliver the insulating medium and serves at the same time, at least to a certain extent, as damping means for the moving masses. Cylinder 9 is the guide of the movable contact rod 6 and at the same time the cylinder of the piston 8. The parts 5, 8 and 9 form the liquid pump. The countercontact 7 is provided with a piston 10 on which presses a screw spring 11. The countercontact 7 is displaced by the pressure of the movable rod 6 in an axial direction. The piston 10 and spring 11 provide a follow-up motion of the contact 7 in circuit opening, and the energy of the moved masses is absorbed in circuit closing.

When the pump is operated in opening the switch, the arc quenching medium forced through the conduit 5 is blasted across the contact opening. The fluid back-pressure arising in the chamber 4 when the circuit is opened renders acceleration of the contact rod 6 impossible by retarding the movement of pump piston 8. At the same time the pump piston 8 serves to dampen the circuit opening of contact 6, while the countercontact 7 dampens the circuit closing thereof.

As shown by Figs. 1 and 2, the quenching chamber device 4 with the movable contact 6 and the countercontact 7 form a switching element inserted in the insulator. These parts may be constructed independently of adjacent switch elements.

Figs. 3–5 show, for example, assemblies of switch elements made according to Fig. 1.

Having thus described our invention, we claim:

1. A liquid switch comprising the combination of an elongated switch contact member having opposite portions consisting of a contact rod and a hollow piston, respectively; a device having an arc quenching chamber provided with a longi-

tudinal passage for said rod and a series of cross passages for directing an arc quenching liquid blast; an elongated cylinder constituting a guide for said hollow piston; a U-shaped conduit having one end alined with said hollow piston and projecting therein when the latter is moved inwardly of said cylinder; said arc quenching chamber device having a quenching liquid inlet passage in communication with the other end of said conduit; such parts forming a liquid pump which, when the elongated switch contact member is actuated to open the switch, forces an arc quenching liquid blast through said cross passages; a countercontact for said switch, a piston connected to said countercontact, a cylinder for said last-named piston; and a spring in said last-named cylinder urging said countercontact piston and countercontact toward said movable contact, whereby during the switch opening movement, the separation of said contacts is delayed by said countercontact spring which urges said countercontact piston and the countercontact to follow the movable contact to a certain extent until the arc extinguishing blast of the arc-quenching pump is effective to extinguish the arc resulting from such separation, and during the switch closing operation the motion of the movable contact is damped by said countercontact piston; a liquid container for said parts provided with means supporting said cylinders and said arc quenching chamber device in fixed relative relationship in the container; and an arc quenching liquid in which such parts are immersed in said container.

2. A circuit breaker comprising a plurality of liquid switches, as defined by claim 1, means connecting said switches in series relation, and means for operating such switches in unison comprising lateral arms fixed to each movable contact member, means including parallel couplings linked with said arms, and a crank connected to a pair of said couplings for retracting and advancing said movable contact members to open and close all of the switches and the pumps of the circuit breaker in unison.

ERNST VOGELSANGER.
LORENZO UBEZIO.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,740,531	Aalborg	Dec. 24, 1929
1,740,558	Ainsworth	Dec. 24, 1929
1,814,847	Paul	July 14, 1931
2,158,846	Balachowsky	Feb. 4, 1937
2,219,171	Balachowsky	Oct. 22, 1940