

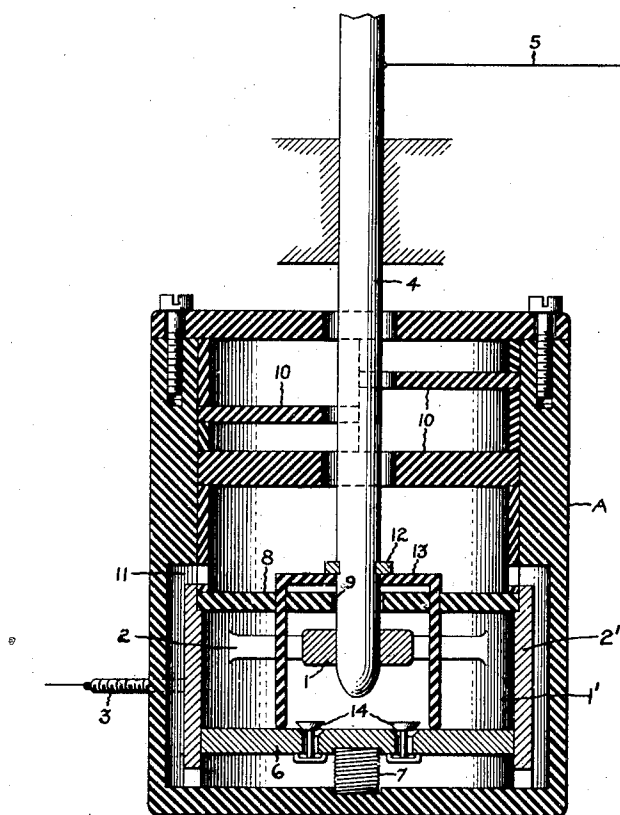
Jan. 31, 1939.

F. BRANN

2,145,706

ELECTRIC CIRCUIT INTERRUPTER

Filed Dec. 17, 1937



Inventor:
Fritz Brann,
by *Harry E. Dunham*
His Attorney.

UNITED STATES PATENT OFFICE

2,145,706

ELECTRIC CIRCUIT INTERRUPTER

Fritz Brann, Dresden, Germany, assignor to General Electric Company, a corporation of New York

Application December 17, 1937, Serial No. 180,381
In Germany January 5, 1937

3 Claims. (Cl. 200—150)

My invention relates to electric circuit interrupters, more particularly to circuit breakers of the impulse type for high voltage power circuits and has for its principal object the provision of an improved circuit breaker of the above type that is simple and rugged in construction, compact in design and capable of operating with a comparatively small amount of arc-extinguishing liquid and positive and efficient in operation throughout the entire interrupting range of the breaker.

Circuit breakers of the impulse type have been proposed wherein the piston or equivalent blast producing device is provided with a spring that is charged by the movable contact structure during the circuit-closing operation. The piston is therefore effective to produce an oil blast intended to interrupt the circuit when the breaker is opened. A primary disadvantage of these breakers is that the oil blast is often ineffective by reason of its tardy application. The blast should be applied to the arc at the very instant of its formation in order to prevent excess pressure in the breaker. That is, the arc pressure generated upon separation of the contacts may, if arc interruption is delayed, actually block operation of the piston with the result that the oil blast is not applied at the proper time. Also, in the case of closing on a short circuit, the arc pressure, if interruption is not rapid, may be so great that the breaker is damaged or destroyed.

In accordance with my invention an energy-storing device operatively related to the blast-producing piston is charged prior to actual closing of the circuit and is arranged in the case of normal opening of the circuit so as to cause or initiate an oil blast in advance of contact separation. Accordingly, an arc-extinguishing blast is under way in anticipation of formation of the power arc.

In the case of closing a breaker embodying my invention on a short circuit, immediate opening as in trip-free operation is accompanied by an oil blast since the power storing device is effective even prior to contact engagement to initiate the oil blast.

My invention will be more fully set forth in the following description referring to the accompanying drawing, and the features of novelty which characterize my invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

Referring to the drawing the single figure thereof is an elevational view, partly in section, of a circuit breaker embodying my invention in the circuit closed position thereof.

The impulse type circuit breaker illustrated comprises an insulating casing A adapted to contain an arc-extinguishing liquid such as oil. At the lower part of the casing immersed in the oil is the fixed contact structure 1 formed in the present instance as a socket contact that is mounted on a conducting spider structure 2 electrically connected to the breaker terminal indicated at 3. The movable contact coacting with the fixed contact comprises a rod contact 4 guided for reciprocal rectilinear movement and electrically connected to the other terminal conductor indicated at 5. In the position shown the contacts 2 and 4 are in engagement to close the circuit between the terminals 3 and 5.

For the purpose of interrupting the arc formed upon separation of contacts 1 and 4, there is provided a piston 6 mounted for reciprocal movement within a cylinder 2' forming part of the structure 2 at the lower part of the breaker casing beneath the fixed contact. A suitable energy-storing device, such as a spring 7 is mounted between the piston and the lower wall of the casing so as to bias the piston upward toward the fixed contact. The piston forms in effect a partition in the casing so that oil above the partition is urged upward toward the contact structure when the piston is projected upward by the spring 7.

An insulating baffle 8 having a central aperture 9 through which the rod contact 4 can move to engage the contact 1 defines an interrupting chamber 1' in which the fixed contact and piston are disposed. Additional baffle structure 10 may likewise be provided if desired for deflecting oil in a manner well known in the art.

For the purpose of balancing the arc pressure formed upon separation of contacts 1 and 4 at the piston 6 a by-pass 11 is formed in the casing between the space above the baffle 8 and the lower side of the piston. With this arrangement the piston 6 can operate substantially independent of the arc pressure so as to project a uniform stream of oil through the arc.

Referring more particularly to the means for controlling the piston and charging the spring 7, the movable contact 4 is provided with a fixed collar 12 in abutting engagement with an insulating U-shaped member 13 guided in and extending through the insulating partition 8. The member 13 extends beyond the contact tip of the rod 4 so as to engage the piston 6 and depress the same to a position below the rod contact. It will therefore be noted that the piston 6 is depressed and the spring 7 charged prior to actual engagement of the contacts 1 and 4. Therefore, at the

instant the contacts engage, the piston is in readiness if the occasion demands to project an arc-extinguishing blast through the arc.

In operation the breaker is closed by lowering the rod 4 by any suitable actuating means so that the member 13 as it is guided through the partition 8 engages the piston 6 to depress the same and charge the spring 7. Through this operation the oil beneath the piston is admitted to the arc chamber 1' through suitable non-return valves 14 mounted in the piston. The oil is also forced into the upper compartment through the by-pass 11. In the position illustrated the spring 7 is completely charged and in readiness to bias the piston 6 upward to project oil from the chamber 1' to the upper chamber.

When the breaker is opened by elevation of the rod 4 the upward movement of the piston controlling member 13 permits following movement of the piston 6 although the contacts 1 and 4 are still in engagement. The oil starts to flow from the chamber 1' at the clearance between the baffle 8 and contact 4 so that when the arc is actually formed between the contacts a high velocity oil jet starts to flow through the baffle opening 9 to interrupt the arc. The baffle 8 is preferably located as closely as possible to the fixed contact 1 so that the arc length will be very short. The piston controlling member 13, which is slidably mounted on the rod 4, is limited in its upward movement by the baffle structure 10 although the rod contact 4 can be withdrawn to an isolating position.

It will be noted that in case of closing of the breaker on short circuits the prior charging of spring 7 is particularly advantageous in causing an interrupting blast at the instant the contacts engage. That is, in normal trip-free operation the breaker is reopened at the instant of contact engagement where a short circuit or fault still exists on the line. This immediate application of the oil blast is effective to reduce the duration of the arc and thereby limit the pressure within the breaker. The piston 6 also is obviously very effective in the case of small currents which often generate insufficient gas pressure to interrupt the arc by an oil blast.

It will be apparent that a tubular contact having vents disposed above the baffle 8 can be used in place of the solid rod contact 4 if desired as such a construction is well known in practice. In such an arrangement shown for example by Prince Patent 1,922,862, granted Aug. 15, 1933 for "Electrical switching apparatus" the piston 6 would force the oil into the tubular contact so as to squeeze the arc in radial directions towards a position within the tube. There will also be a transverse blast of oil through the arc when the removable contact has cleared the baffle 8.

It should be understood that my invention is not limited to specific details of construction and arrangement thereof herein illustrated, and that changes and modifications may occur to one skilled in the art without departing from the spirit of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. An electric circuit breaker of the impulse type comprising a casing containing an arc-extinguishing liquid, fixed and movable contacts adapted to separate in said liquid, a piston immersed in said liquid and forming a partition in said casing, a spring for biasing said piston in a direction to cause a blast of said liquid through the arc formed upon separation of said contacts, said casing forming a by-pass around said piston so that the arc pressure at said contacts is balanced at said piston, and means extending beyond and operable with the movable contact for depressing said piston and charging said spring during the circuit-closing operation prior to actual engagement of said contacts.

2. An electric circuit breaker of the impulse type comprising a casing containing an arc-extinguishing liquid, fixed and movable contacts adapted to separate in said liquid, insulating baffle structure disposed in said casing arranged to define a chamber in which said fixed contact is disposed, a piston likewise disposed in said chamber, a spring for biasing said piston in a direction to cause a blast of said liquid through the arc formed at said fixed contact upon opening of the circuit, said casing forming a by-pass around said baffle and piston, and insulating means operable with said movable contact through said baffle for depressing said piston and charging said spring in accordance with the circuit-closing operation prior to actual engagement of said contacts.

3. An electric circuit breaker comprising a casing containing an arc extinguishing fluid, relatively movable contacts adapted to separate in said fluid, a piston immersed in said fluid, a spring for biasing said piston in a direction to cause a blast of said fluid through the arc formed upon separation of said contacts, an insulating baffle for directing said fluid blast through the arc path, said casing forming a pressure equalizing by-pass around said baffle and piston, and means forming an extension of and operable with one of said contacts for engaging said piston substantially in advance of engagement of said contacts, continued closing movement of said contacts causing charging of said spring whereby spring energy for creating a fluid blast is available at the instant said contacts engage.

FRITZ BRANN.