

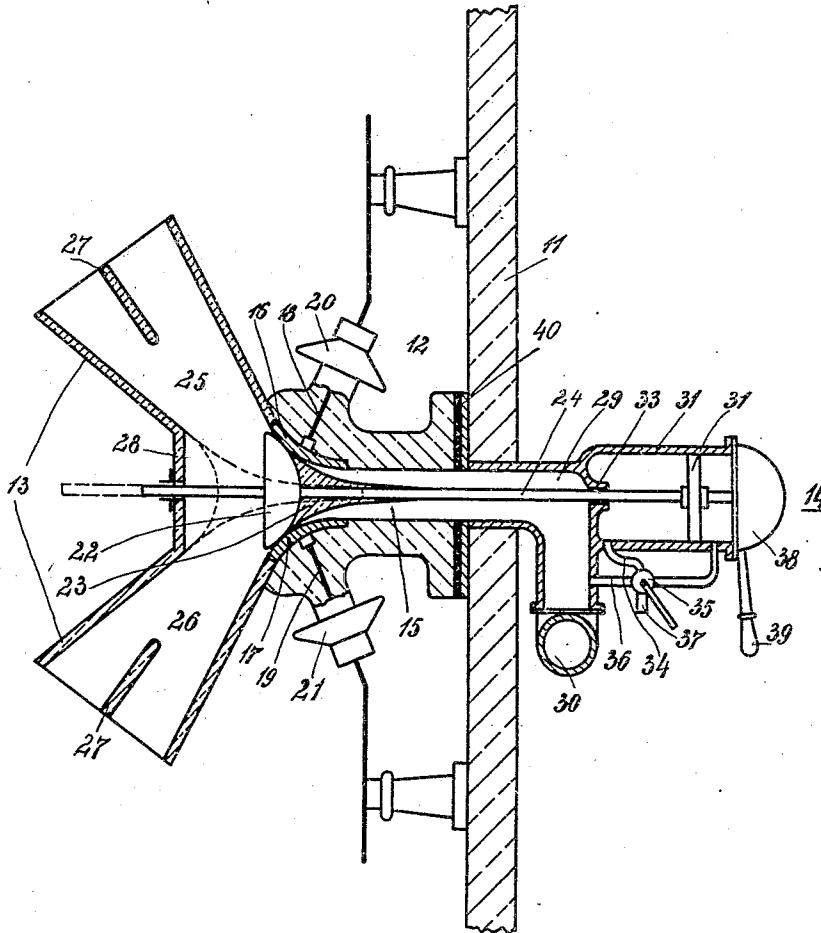
Feb. 18, 1930.

C. KOETTGEN

1,747,445

SWITCH

Filed Oct. 22, 1928



INVENTOR.

Carl Koettgen.

By Wesley E. Barr
ATTORNEY.

UNITED STATES PATENT OFFICE

CARL KOETTGEN, OF BERLIN, GERMANY, ASSIGNOR TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA

SWITCH

Application filed October 22, 1928, Serial No. 314,236, and in Germany October 22, 1927.

My invention relates to improvements in switches, and more particularly in switches in which the arc formed on opening an electrical circuit is extinguished by compressed

5 air.

There are already known switches in which the arc formed between the receding contacts is blown away from the point of break and thus extinguished. For this purpose a nozzle has been located below the contacts, and through this nozzle the compressed air is blown against the arc. Such switches are liable to backfiring, particularly if the nozzle consists of conducting material. The arc then strikes across to the edges of the nozzle, and thus passes out of the reach of the current of compressed air, so that the blowing action is no longer operative.

This drawback is eliminated by my invention. According to my invention the movable contact itself covers in the closed position of the contacts a bore or opening through which the compressed air is directed towards the point of break. Apart from this a solid insulating separating member is introduced between the contacts when the switch is opened. This insulating separating member is so formed, that the jet of air is directed towards the arc struck. If this insulating separating member is mounted on the movable contact, it extends in the open state of the switch into the current of compressed air and forms a continuation of the movable contact in such a way, that the passage of the stream of air into the extinguisher chambers takes place without the formation of eddies or without any baffling of the air. These extinguisher chambers constructed of insulating material form a direct continuation of the point of break. The chambers or compartments may be provided with transverse walls of metal or insulating material in order to subdivide still further the arc blown into them.

In the drawing affixed hereto and forming part of my specification an embodiment of my invention is illustrated by way of example, as applied to a single-pole switch.

Referring to the single figure of the drawing it will be observed that the switch is

mounted on a wall 11 and consists of a central member 12 constructed of some suitable insulating material, such as porcelain, earthenware or steatite, with the extinguishing chambers or compartments 13 located on the left of the wall 11 and the operating or control gear 14 on the right thereof. The central member 12 is provided with an axial bore 15 of uniform cross-section, the inner diameter of which corresponds with the gap between the stationary contacts 16, 17 mounted at the mouth of the central member 12. These contacts are located at the end of the bore 15 and connected through rods 18, 19 to the terminals mounted on insulators 20, 21. The stationary contacts 16, 17 are connected with each other by the movable contact bridge 22, when the switch is in the closed state. The mouth of the bore 15 of the central insulator 12 is tightly sealed by the movable contact bridge when the contacts are closed. On this movable bridge contact 22 is mounted between the fixed contacts 16, 17 an insulating separating member 23, which closely adapts itself to the shape of the contact bridge 22 and extends into the bore 15 of the central insulator 12. Through the bore 15 passes the operating rod 24 of insulating material for the bridge contact 22 to the operating or control gear located on the other side of the wall.

The extinguisher compartments 13 on the left of the central insulator 12 consists of two chambers 25, 26, the walls of which are constructed of a refractory insulating material. They constitute a direct continuation of the stationary contacts 16, 17 and are mounted on the central insulator 12. At the mouths of the extinguisher chambers are located partition walls 27. The movable contact bridge 22 abuts in the off position of the switch shown in broken lines against the connecting wall 28 of the extinguisher chambers. In this position the insulating separating member 23 forms in conjunction with the stationary contacts and the walls of the extinguisher chambers 25, 26 a tubular passage of constantly increasing cross-section.

The operating or control gear 14 of the switch located at the right of the central portion is grounded and consists substan-

tially of a compressed air cylinder 31 mounted on the bend 29 of the compressed air supply pipe 30, in which a piston 32 is adapted to be reciprocated. To this piston is fixed the operating rod 24 passed through a stuffing box 33 into the cylinder. Since the stuffing box is located between the compressed air cylinder 31 and the compressed air supply pipe 30 the advantage is obtained, that a packing of the operating rod towards the atmosphere is not necessary, when the switch is closed.

For closing the switch the left-hand end of the compressed air cylinder is adapted to be put in communication with the compressed air supply pipe 30 through the pipe 34, the valve 35 and the pipe 36. That part of the cylinder, which is not in communication with the compressed air pipe, is in communication with the atmosphere through the branch 37. When the switch is closed this process is reversed.

The valve 35 effecting the necessary connections may be controlled either by hand or by a magnet in dependence of the line current or the voltage. The compressed air cylinder is closed by a cap 38 in which is housed the manual operating gear 39.

The mode of operation of my improved switch is as follows:

When the switch is in the closed position the compressed air in the pipe 30 acts upon the insulating separating member 23 and through the agency of the pipe 36, the valve 35 and the pipe 34 against the piston 32 of larger cross-sectional area, so that the switch remains in the on position. The contact pressure of the movable bridge contact 32 upon the stationary contacts 16, 17 may be chosen at will by giving the piston a corresponding cross-section. It will be understood, however, that this may be attained by providing an additional spring arrangement. When an overload develops, for instance, the valve 35 is operated in such a manner, that the part of the cylinder located on the left of the piston is cut off from the compressed air supply and is put in communication with the atmosphere by the branch or nipple 37, so that the compressed air acting on the insulating separating member 23 forces the contact bridge 22 into the position shown in broken lines. Arcs are then struck between the stationary contact 16 and the movable contact bridge 22, on the one hand, and the movable contact 22 and the other stationary contact 17, on the other hand, the said arcs being blown into the extinguisher chambers 25 and 26. By making the bore 15 in the central member 12 of uniform cross-section and giving the insulating separating member 23, the contact bridge 22 and the walls of the extinguisher chambers 25, 26 a suitable shape or configuration, the compressed air may pass practically free from eddies or whirls smoothly from the bore 15 into the chambers

25, 26. The partition walls 27 at the mouths of the chambers then subdivide the arc still further. When the switch has been opened the supply of compressed air is interrupted in known manner, for instance in dependence of the extinguishing of the arc.

For closing the switch the valve 35 is controlled in such a manner, that it puts the portion of the cylinder on the left of the piston again in communication with the compressed air supply pipe 30 and the portion of the cylinder on the right of the piston in communication with the atmosphere, so that the piston is moved towards the right and forces the movable contact bridge 22 against the stationary contacts 16, 17 by the aid of the operating rod 24.

The central insulator 12 of the switch may by means of a suitable packing 40 be mounted on the flanged end of the compressed air supply tube 30, which in the embodiment illustrated, is inserted into the wall 11 and supports the entire switch.

Instead of the movable bridge contact 22 shown as solid block, brushes with arcing tips may be employed for larger interrupting capacities of the switch. In the case of higher voltages a plurality of break points may in customary manner be connected in series and special extinguishing chambers be provided for each of the breaks. An ordinary air-break switch may be connected in parallel with my improved switch, and its contacts be first separated from each other when the circuit is interrupted, the opening of the circuit by means of my improved compressed air switch taking place then only.

It will be understood that instead of compressed air any other suitable gas under pressure may be employed.

Various other changes and modifications may be made without departing from the spirit and the scope of the invention, and I desire, therefore, that only such limitations shall be placed thereon as are imposed by the prior art.

I claim as my invention:

1. In a switch of the type in which the arc is extinguished by compressed air, in combination, a stationary member of insulating material provided with a central bore, stationary contacts located at the mouth of said bore, a rod traversing said bore, and a movable contact bridge mounted on said rod adapted to close the contact with said stationary contacts by operating said rod, said contact bridge in its closed state adapted to seal the central bore in said stationary member.

2. In a switch of the type in which the arc is extinguished by compressed air, in combination, a stationary member of insulating material provided with a central bore, stationary contacts located at the mouth of said bore, a rod traversing said bore, and a mov-

able contact bridge mounted on said rod adapted to close the contact with said stationary contacts by operating said rod, an insulating separating member forming an extension of said contact bridge and adapted to extend into the bore of said stationary member in the closed state of the switch, and means adapted to bring said contact bridge by means of compressed air into the two end positions.

3. In a switch of the type in which the arc is extinguished by compressed air, in combination, a stationary member of insulating material provided with a central bore, stationary contacts located at the mouth of said bore, a rod traversing said bore, and a movable contact bridge mounted on said rod adapted to close the contact with said stationary contacts by operating said rod, a pipe branch connected to the inner end of the bore of said stationary member and adapted to conduct compressed air through said bore to said contact bridge, an insulating separating member forming a continuation of said bridge contact and adapted to extend in the closed position of the switch into the bore of the stationary member and having a shape tapering towards the interior of the bore adapted to conduct the compressed air without eddies and continuously past the stationary contacts towards the outside, and means for moving the contact bridge into the opening and closing position.

4. In a switch of the type in which the arc is extinguished by compressed air, in combination, a stationary member of insulating material provided with a central bore, stationary contacts located at the mouth of said bore, extinguishing chambers forming a direct continuation of the stationary insulating member at the side of the stationary contacts, and operating gear located at the end of the stationary insulating member facing away from the stationary contacts adapted to move the contact bridge mounted upon an operating rod.

5. In a switch of the type in which the arc is extinguished by compressed air, in combination, a stationary member of insulating material provided with a central bore, stationary contacts located at the mouth of said bore, a movable contact bridge, extinguishing chambers forming a direct continuation of said stationary insulating member at the side of said contacts, transverse partition walls located in said extinguishing chambers and adapted to subdivide the arc developing in said chambers, and operating gear located at the end of said stationary insulating member facing away from said stationary contacts adapted to move said contact bridge.

6. In a switch of the type in which the arc is extinguished by compressed air, in combination, a stationary member of insu-

lating material provided with a central bore, stationary contacts located at the mouth of said bore, a movable contact bridge, extinguishing chambers forming a direct continuation of said stationary insulating member at the side of said contacts, operating gear located at the end of said stationary insulating member facing away from said stationary contacts, a compressed air piston in said control gear mounted on the rod carrying said bridge contact and moving in a compressed air cylinder adapted to move said bridge contact into the opening and closing position.

7. In a switch of the type in which the arc is extinguished by compressed air, in combination, a stationary member of insulating material provided with a central bore, stationary contacts located at the mouth of said bore, and a movable contact-bridging member adapted to engage said stationary contacts and to substantially seal the central bore.

8. In a switch of the type in which the arc is extinguished by compressed air, in combination, a stationary member of insulating material provided with a central bore, stationary contacts located at the mouth of said bore, a movable contact bridging said stationary contacts, an insulating directing member associated with said movable contact, and means for supplying air to said bore.

9. In a switch of the type in which the arc is extinguished by compressed air, in combination, a stationary member of insulating material provided with a central bore, stationary contacts located at the mouth of said bore, a movable contact adapted to engage the said stationary contacts, means adapted to conduct air through said bore to said contacts, an insulating deflecting member associated with said movable contact and means for actuating said movable contact.

10. In a switch of the type in which the arc is extinguished by compressed air, in combination, a stationary member of insulating material provided with a central bore, stationary contacts disposed at the mouth of said bore, an extinguishing chamber associated with said insulating member adjacent to the stationary contacts, a conducting bridging member adapted to engage said stationary contacts and means for actuating said bridging member to engaged and disengaged position.

11. In a switch of the type in which the arc is extinguished by compressed air, in combination, a stationary member of insulating material provided with a central bore, stationary contacts located at the mouth of said bore, a movable contact member, an extinguishing chamber associated with said insulating member adjacent said contacts, transverse partitions located in said extinguishing chamber adapted to subdivide said chamber

and operating gear adapted to actuate said movable contact member.

12. In a switch of the type in which the arc is extinguished by compressed air, in combination, a stationary member of insulating material provided with a central bore, stationary contacts located at the mouth of said bore, a movable contact member adapted to bridge said stationary contacts, an extinguishing chamber associated with said contacts, operating gear for said movable contact member, and air actuated means for moving said operating gear.

In testimony whereof, I have hereunto subscribed my name this 8th day of October, 1928.

CARL KOETTGEN.

20

25

30

35

40

45

50

55

60

65