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BLOWING GAS SELF GENERATING BREAKERS

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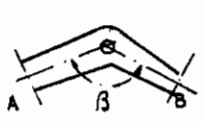

Fig.4

Fig.3

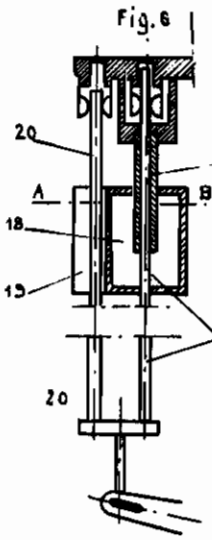

Fig.6

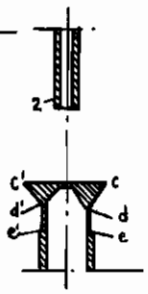

Fig.5

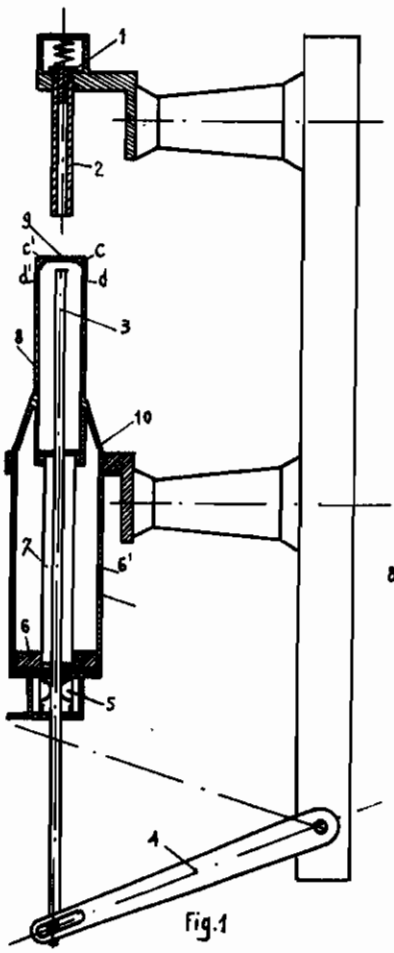

Fig.1

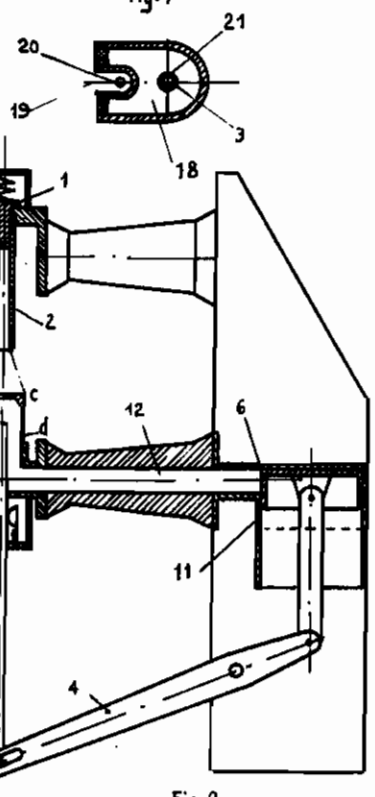

Fig.2

Fig.7

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BLOWING GAS SELF GENERATING BREAKERS

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The invention relates to a breaker in which the arc is blown at the same time on the fixed electrode by means of blowing gases produced either by the arc acting on the walls of an insulating tube closely surrounding the movable electrode in the "engaged" position, or by the action of air compression caused by the arc-heat in a closed space adjacent to the fixed electrode above the insulated tube mentioned above, and on the movable electrode by a pneumatic blowing process which produces the compressed fluid by using a piston shifting in a cylinder, driven by the motion of the movable electrode.

In such apparatus which have been realized up to now, the movable electrode, generally hollow is used as a conduct for the blowing gases and it is provided with a nozzle, some valves or slides being designed in order that the pneumatic blowing might only occur some time after the electrode has left the insulating tube surrounding it in its "engaged" position.

In order to obtain a thorough pneumatic blowing, a rather large-sized nozzle should be designed. But, the inside diamcter of the movable clectrode used as an air-conduct must be about twice the diameter of the neck of the nozzle, in order to avoid the excessive drops of pressure, and the inside diameter of thc insulating tube into which the movable electrode penetrates must be larger still, whilst the production of a high and efficacious blowing-gas self-generating process pressure necessitates, on the contrary, an insulating tube with a small diameter (appreciably equal to the diameter of the nozzle in order to obtain the best blowing conditions). This incompability is removed by a realization carried out according to the invention characterized by the use of a solid cylindrical movable electrode shifting through a blowing-nozzle in a fixed chamber supplied with the blowing fluid compressed by the piston, driven by the motion of the movable electrode.

The annexed drawing shows several realizations carried out according to the invention.

In the drawing:

Fig. 1 shows a breaker with self-blowing of the arc on the fixed electrode and with pneumatic blowing in the opposite direction on the movable electrode.

Fig. 2 shows a breaker of the same type as that of Fig. 1, but realized in such a way as to make the movable part much lighter.

Fig. 3 shows a process that delays the action of the pneumatic blowing.

Fig. 4 shows a similar process realized in another way.

Fig. 5 shows some improvement in the blowing-nozzle of the movable electrode.

Fig. 6 shows in cross-section, and Fig. 7 in front-section, an advantageous disposition of the expansion-chambers of self-generated blowing gases for contact breakers provided with disconnecting electrodes disposed in parallel with the cutting-off electrode.

In Fig. 1, 1 represents the fixed electrode, 2 an insulating chamber closely surrounding the movable electrode in the "engaged" position, and, in the particular case of this realization, also the fixed electrode 1, 3 the movable electrode constituted by a rod controlled by a steering-gear including the lever 4. The current is transmitted to the movable electrode by a system of contact-fingers 5. A piston 6 is fixed upon the electrode 3 by means of a sleeve 7 fixed on the movable electrode by stays 7' allowing the air compressed by piston 6 in a cylinder 6' co-axial with the electrode, to penetrate into a tube 8 in which the sleeve 7 slides. This tube 8, used as a nozzle, is provided, at its end, with a blowing-nozzle 9. Apertures 10 are made in the bottom of the cylinder 6' and prevent the compression or depression on the back face of the piston 6. In order to delay the action of compression and to lessen the working of the piston, apertures 11 are made in the cylinder 6' in such positions necessary to produce the wanted delay.

The cutting-off of high intensities is carried out when the electrode-rod 3 gets out from the extremity of the insulating tube 2, and the cutting off of low and mean currents, on the first passage of the intensity to 0, following the coming of the rod 3—end above the neck of thc blowing-nozzle 9, which is fixcd up so that the end of the movable electrode in the "disengaged" position is in the part of the neck of the nozzle where it is subject to the highest blowing.

The quantity of air wasted before the coming of the electrode to the breaking-position is reduced to a minimum because of the slight play existing between the electrode 3 and the nozzle 9. In order to avoid the loss of air, the compression may also take place only after a certain run of the movable electrode by using, for instance, the above mentioned apertures 11.

Fig. 2 represents a realization, similar to that of Fig. 1, but in which it has been endeavoured to make the movable part the lightest possible.

In this figure, the fixed electrode 1 is still surrounded with the insulating tube 2, the movable electrode 3 passes through a blowing-chamber 8 provided with a blowing-nozzle 9. The current is transmitted to the movable electrode by a sys-

ten of contact-fingers 5. A controlling steering-gear includes a lever 4. At the same time, the lever 4 operates the piston of a compressor 6, which supplies, by means of a conduct 12 adjusted in the insulating-support, the chamber 8 with blowing fluid.

This process allows to shorten the rod which constitutes the electrode 3; the result is a diminution of the length and space occupied of the outfit, a diminution of the drops in voltage in the rod and at the same time a diminution of the weight of the latter.

In order to delay the action of the piston 8 and of the blowing, apertures 11 may also be designed in the cylinder of the compressor, or even another disposition, such as the one represented in Fig. 3, in which the operating-lever 4 is provided with an axis 13 sliding in a button-hole 14 arranged on the push-rod of the piston 6, the axis 13 being elastically bound by a spring 15 to a fixed thrust-block 16 of the push-rod of the piston. At the beginning of the disengaging motion, the lever 4 compresses the spring without appreciably driving the piston 6 submitted to the increase of pressure of the fluid in the cylinder. This lack of connection between the lever 4 and the piston 6 allows the lever 4 and the electrode 3 to be quickly set to full speed.

The same kind of result may be obtained by using, as a lever 4 linked to the push-rod of the piston, a cranked lever represented in Fig. 4, and the angle of which is such as, to an important longitudinal shifting of the extremity A connected to the electrode, should correspond a longitudinal shifting, first relatively small and afterwards more important, of the extremity B setting the piston in motion.

In the device of Figs. 1 and 2, the cylinder of the compressor constitutes a damper for the cutting-off of high currents which is made at full speed. In the cutting-off of low and mean currents, the strain on the movable rod, due to the pressure of the self-generated blowing-gas device, is added to the strain of the switch driving organ to raise the pressure of the pneumatic blowing.

In order to avoid the metallic projections or carbonized deposits on the leakage-line of the nozzle, we may adopt a nozzle with cylindrical external outlines protecting, by its cross-section (c—c'), the leakage-line (c—d, c'—d'), as it is shown on Figs. 1 and 2. In order to improve the protection of this leakage-line, the nozzle may be provided, as it is shown in Fig. 5, with a protecting the leakage-line (c—d—e,$c'd'e'$) against the projections blown out from the aperture of the insulating tube 2.

Of course, though the self-generated blowing gas device of the fixed electrode, schematically described and represented, works thanks to blowing-gases generated on the walls of the insulating tube closely surrounding the movable electrode in its "engaged" position, the invention applies also, since it presents the same advantage when the self-generated blowing gas device is realized in such a way that a closed space is adjacent to the fixed electrode above the insulating tube either or not emitting gases under the effect of the electric arc and closely surrounding the movable electrode in its "engaged" position. Whatever principle is used for the generation of the blowing gases, it is advantageous to have the extremity of the blowing-tube come out into a chamber of large size with regard to that of the tube, and in which the gases expand and grow cold before being evacuated outside.

Figs. 6 and 7 show a specially interesting realization of this expansion chamber in the case when the high power switch, the cutting-off electrode section of which is too small to stand the nominal current continually, has to be shunted by a disconnecting switch which presents itself in the shape of a second electrode parallel with the cutting-off electrode of the disconnecting switch.

The large size given to the chamber in which the arc-gases expand, considerably interfere with a rational disposition of the electrode constituting the disconnecting switch in relation to the cutting-off electrode.

A disposition already used consists in having the electrode constituting the disconnecting switch pass in the chamber used for the gas-expansion, and designing an electric and mechanical separation of the passage of the electrode constituting the disconnecting switch with regard to the inside of the chamber.

This realization presents a few difficulties of construction and also has the disadvantage of withdrawing the disconnecting electrode from ventilation on part of its length.

A realization made according to the invention eliminates these disadvantages and, on the contrary, presents some particular advantages; it consists in adjusting, in the chamber where the gas-expansion is carried out, a conduct the section of which is that of a U and in which the electrode constituting the disconnecting switch passes.

In the realization of figs. 6 and 7, the enclosure 18, in which the gas expand before it is rejected outside, includes a channel 19 in the shape of a U in which the disconnecting electrode 20 passes, while the cutting-off electrode 3 passes in the inside of the insulating tube 21 surrounded with the chamber 16. The cutting-off of the disconnecting electrode precedes that of the cutting-off electrode, its engaging following that of the cutting-off electrode.

The special shape of the channel allows a good ventilation of the electrode 20 and at the same time the particular shape of the chamber resulting from the presence of the channel 2 contributes to a better guiding for the evacuation of the cutting-gases.

Of course, instead of making one channel only in the chamber where the gas expansion is carried out, we may make several of them, in which several disconnecting electrodes disposed in parallel with the cuttting-off electrode, will pass.

Independently of the advantages of working, already mentioned, in improved conditions of cutting-off resulting from the use of a movable electrode, and consequently of an insulating tube closely surrounding it in the "engaged" position, of a small diameter, and of a fixed blowing air-conduct the diameter of which is independent of that of the insulating tube, this device presents numerous advantages still in relation to the similar devices known up to now. Indeed the very slight play between the electrode-rod and the nozzle allows to carry out the pneumatic blowing only at the best moment and in a definite geometrical position, independent from the cut off intensity, when the extremity of the electrode-rod comes above the neck of the nozzle, whereas the working of a gas-operated valve is uncertain.

The fixity of the blowing-organ, nozzle and air-conduct reduces the weight, thence the inertia of the movable part, specially with the disposi-

tion of fig. 2 and allows to obtain greater speeds of engaging and disengaging.

For an equal nominal intensity, the diameter of the blowing electrode-tube being superior to the diameter of a rod realized according to the invention, in the known devices, the acceleration imparted to the movable part by the pressure of the arc-gases or of the air compressed by the arc-heat in the chamber adjacent to the fixed electrode above the insulating tube closely surrounding the movable electrode in its "engaged" position, will be greater and the kinetic energy, that is to be damped down, will also be greater than in the devices carried out according to the invention.

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