Oct. 30, 1923. 1,472,370

V. MARTINETTO

AUTOMATIC MAXIMUM AND MINIMUM CURRENT CIRCUIT BREAKER

Filed March 13, 1922 2 Sheets-Sheet 1

Fig. 2

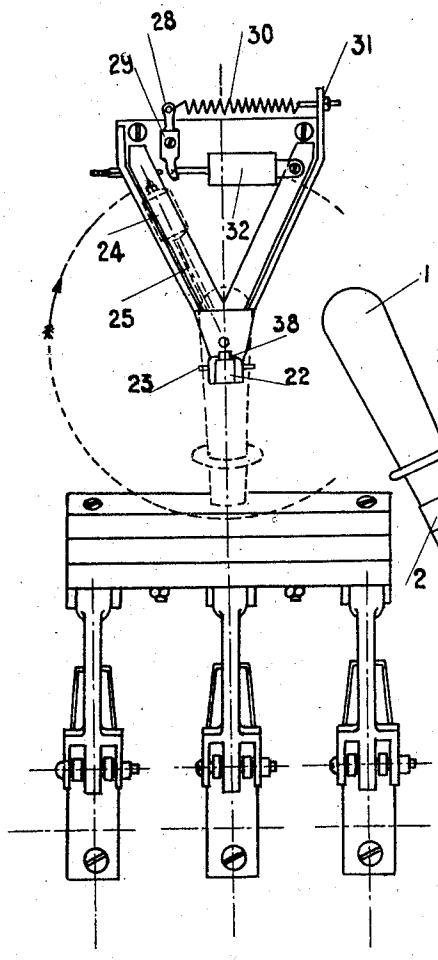
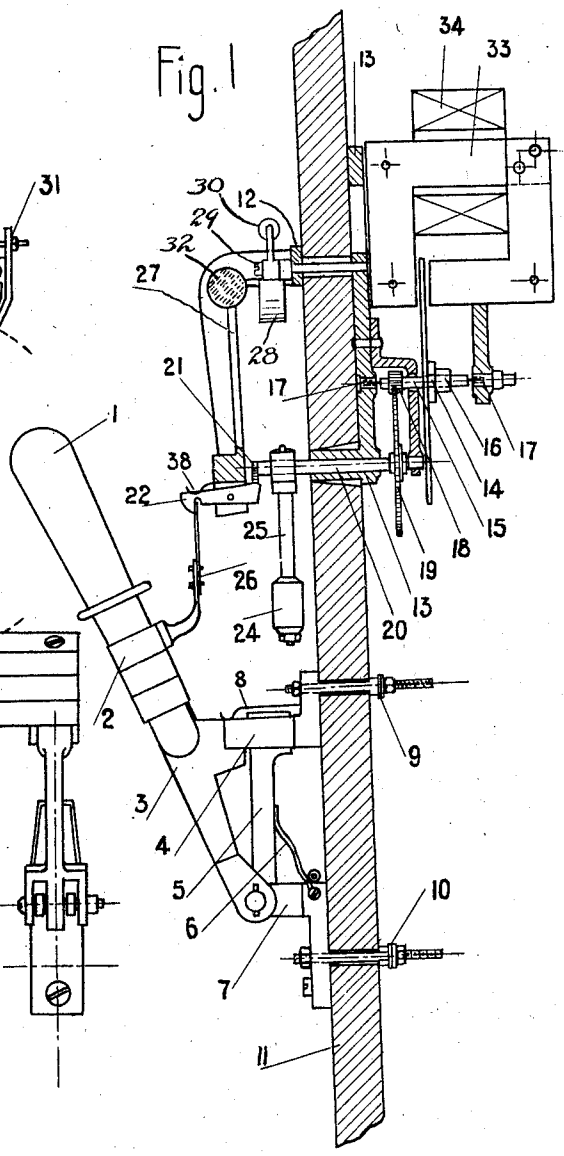


Fig. 1



Inventor

Vittorio Martinetto

By E. T. J. P. Brandenburg

Attorneys

Oct. 30, 1923. 1,472,370

V. MARTINETTO

AUTOMATIC MAXIMUM AND MINIMUM CURRENT CIRCUIT BREAKER

Filed March 13, 1922 2 Sheets-Sheet 2

Fig. 3

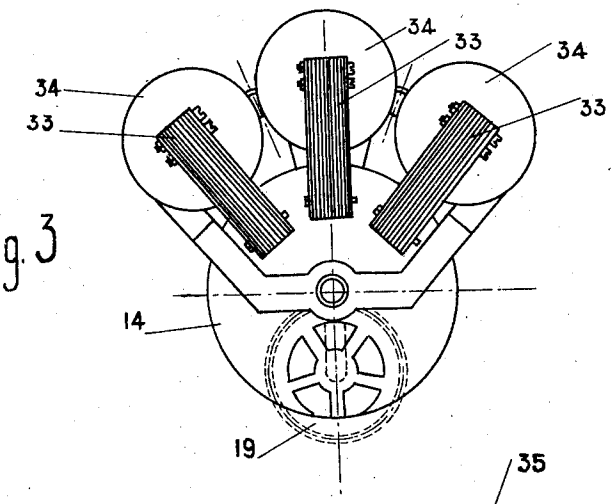
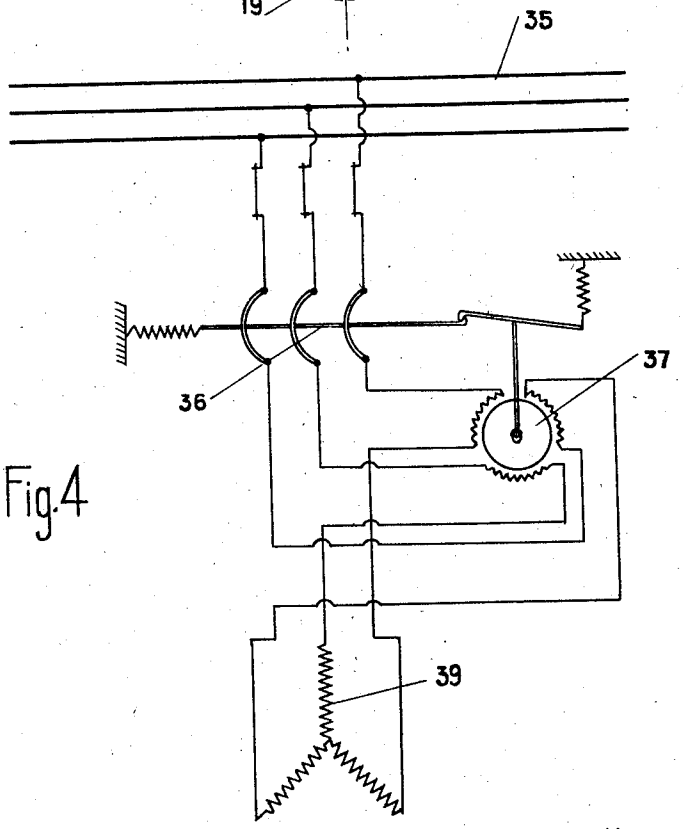


Fig. 4



Inventor

Vittorio Martinetto

By E. J. Prince & Co.

Attorneys.

Patented Oct. 30, 1923. 1,472,370

UNITED STATES PATENT OFFICE.

VITTORIO MARTINETTO, OF TURIN, ITALY.

AUTOMATIC MAXIMUM AND MINIMUM CURRENT CIRCUIT BREAKER.

Application filed March 13, 1922. Serial No. 543,418.

To all whom it may concern:

Be it known that I, VITTORIO MARTINETTO, a citizen of the Kingdom of Italy, residing at Turin, Italy, 18 Via Mercanti, have invented certain new and useful Improvements in Automatic Maximum and Minimum Current Circuit Breakers, of which the following is a full, clear, and exact specification.

The invention relates to automatic circuit breakers for single-phase and poly-phase alternating currents, such as are used in the protection of motors. According to the invention the variation of the torque produced by an auxiliary induction motor, the movement of which is due to windings connected in series with the main motor circuit, is utilized to operate the circuit breaker both at maximum current and at zero current.

For a given value of the torque the rotor will take up a position which by suitable mechanism maintains the circuit breaker closed, while either an increase or a decrease of the torque opens the breaker; if the torque increases the circuit will be opened for a predetermined maximum current; if, on the other hand, the torque decreases the circuit will be opened by a total failure of the current or even of one phase if the current is poly-phase. A time lag can be produced in the operation by one of the known methods. Automatic circuit breakers for protecting motors are known for maximum current, but according to the invention the circuit is opened for a minimum current or for a maximum and minimum current with one and the same apparatus.

The acompanying drawings represent an example of a construction according to the invention. Fig. 1, 2 and 3 are respectively side, front and rear views of an automatic tri-polar interrupter of the knife type for maximum and minimum currents, and Fig. 4 shows the circuit arrangements of the connections of the windings to the interrupter and to the motor.

In order to reduce as far as possible the weight and dimensions of the motor, the torque is transmitted to the circuit breaker by multiplying gearing so as to increase correspondingly the available force.

In Figs. 1, 2 and 3 the different parts constituting a tri-polar lever circuit breaker, of the knife type are shown. 1 is the lever handle provided with a collar 2, and 3 one of the blades of a triple switch, while 4 are fixed contacts and 5 contact strips under action of springs 6, 7 are supports carrying the pivots of the knife blades, 9 and 10 are the terminals of the electric circuit to the interrupter.

The circuit breaker is fixed on a plate 11 of insulating material to which is also fixed by means of a screw 12 the frame 13 serving to support the different parts of the auxiliary motor. The latter consists of a disc 14 secured to a spindle 15 by means of a hub 16, the spindle 15 being provided with pivots turning on adjustable supports 17. The spindle 15 also carries a pinion 18 which gears with a toothed wheel 19 of a second spindle 20, carrying at its front end a cam 21 which when the spindle is rotated oscillates a hooked lever 22 mounted on a screw threaded pivot 23. On the spindle 20 is secured a weight 24 which can be displaced along an arm 25. The lever 22 can engage with an arm 26 carried by the lever of the interrupter, as it oscillates on the pivot 23 secured to a support 27, on the upper part of which is a small catch 28 pivoted on a screw 29; the movement of the catch is resisted by the tension of a spring 30, controlled by means of a threaded nut 31 and by a dashpot piston 32. The hooked end of the lever 22 is maintained in its engaging position by a spring 38 acting against the weight 24. The disc 14 can rotate between the poles of magnets 33 of laminated magnetic material energized by bobbins 34.

In Fig. 4, 35 are the supply mains, 36 is the circuit breaker, 37 the motor controlling the circuit breaker, and 39 the principal motor for the protection of which the automatic interrupter is provided.

The action is as follows: When the interrupter is closed, the current in the windings 34 produces a rotating field which causes the rotation of the disc 14, of the spindle 15 and of the gears 18 and 19; the spindle 20 will raise the weight 24 so that it rests against the pivoted lever 28. At the same time the spindle 20 displaces the cam 21 and allows the hooked end of the lever 22 to be lowered by the spring 38 and by engaging the arm 26 keeps the interrupter closed.

If for any reason the current fails in all or in one of the three supply phases, the torque vanishes and the weight 24 will carry the cam 21 to its lowest position,

which in its turn will raise the lever 22 and allow the interrupter to open.

If, on the contrary, the torque which effects the rotation of the disc and which maintains the weight 24 in contact with the lever 28 increases, it will overcome the action of the spring 30 and will continue to turn in the direction of the arrow. The cam 21 passing its normal position will release the lever 22 and allow the interrupter to open. The increase of the torque being proportional to the current circulating in the windings 34, the interrupter will open for a certain maximum value of the current. By adjusting the tension of the spring 30, the value of this maximum current can be adjusted; on the other hand, by suitably displacing the counterweight 24 along the arm 25, the minimum value of the torque which maintains the interrupter closed can be adjusted.

This system of control can be employed in any type of circuit breaker without departing from the object of the invention, and similarly the disc motor can be replaced by the usual type of induction motor by making the necessary mechanical modifications in the apparatus.

It will be understood that, if necessary, a transformer may be inserted between the line and the circuit breaker.

By the construction described and illustrated in the annexed drawings, there has been found that the rotation of the armature-disc is effected too slowly to have the current exactly and instantaneously cut off at the proper moment. This disadvantage is specially incurred in case of short circuits, with simultaneous breaking off of a phase in polyphase plants, which breaking may cause damages in the apparatus or circuits.

In order to avoid the said disadvantage, and to obtain a greater security in like cases, an electro-magnetic arrangement can be provided for the release of the stop-device of the breaker lever, by having this arrangement operated independently from the armature-disc of the auxiliary motor to promptly release the hooked pawl engaging the lever of the interrupter.

Such an arrangement may be embodied in two different essential ways:

1. An electro-magnet can be connected in series with the windings of the induction motor, at a suitable place, and caused to instantaneously operate—by a sudden increase or decrease of the current—the hooked latch or a piece suitably connected therewith, to disengage the breaker lever.

2. An oscillating magnetic member may be placed closely to the poles of the main magnet, and directly repelled or attracted thereby, in case of short circuits, thus releasing the hooked latch of the breaker lever.

By either of these arrangements is attained the desired sudden breaking of the circuit, independently from the armature or induced disc of the auxiliary induction motor.

The cited auxiliary arrangements are not shown in the drawings, since they will be readily understood being in se well known by the electricians.

What I claim is:

1. A maximum and minimum current automatic circuit breaker of the kind described, comprising a cut-out switch, an induction motor the windings whereof are directly connected in series with the main current, a lever handle, an arm carried thereon, an hooked pawl engaging said arm, a rotatable shaft in gearing connection with the said motor, a cam mounted on the said shaft, an oscillating arm carried by the same shaft and provided with a counterweight adjustable along the said oscillating arm, an oscillating stop pawl, a spring connected with one end of said stop pawl, a dashpot piston the stem of which cooperates with the other end of said stop pawl, the said counterweighted arm being able to dash against said stop pawl when oscillating.

2. A maximum and minimum current automatic circuit breaker of the kind described, comprising a cut-out switch, an induction motor the windings thereof are connected in series through a transformer with the main current circuit, a lever handle, an arm carried thereon, an hooked pawl engaging said arm, a rotatable shaft in gearing connection with the said motor, a cam provided on the said shaft, an oscillating arm carried by the same shaft and provided with a counterweight slidably mounted thereon, an oscillating stop pawl, an adjustable spring connected with one end of said stop pawl, a dashpot piston the stem of which cooperates with the other end of the same stop pawl, the said counterweighted arm being able to shock against said stop pawl when oscillating.

3. A maximum and minimum current automatic circuit breaker of the kind referred to, comprising a cut-out lever switch, an induction motor, an oscillating magnetic member placed closely to the poles thereof, a lever handle, an arm carried thereon, an oscillating hooked pawl capable to engage and disengage said arm, said pawl being suitably connected with the said oscillating magnetic member to be caused to release the lever handle when the oscillating magnetic member is either repelled or attracted by the field produced by the induction motor.

In witness whereof, I have hereunto signed my name in the presence of two subscribing witnesses.

VITTORIO MARTINETTO.

Witnesses:

UMBERTO FRANCESCONI,

ENRICA DELFORNO.