

Dec. 26, 1922.

1,439,692.

C. B. COATES.
OVERLOAD CIRCUIT BREAKER.
ORIGINAL FILED MAY 7, 1920.

2 SHEETS—SHEET 1.

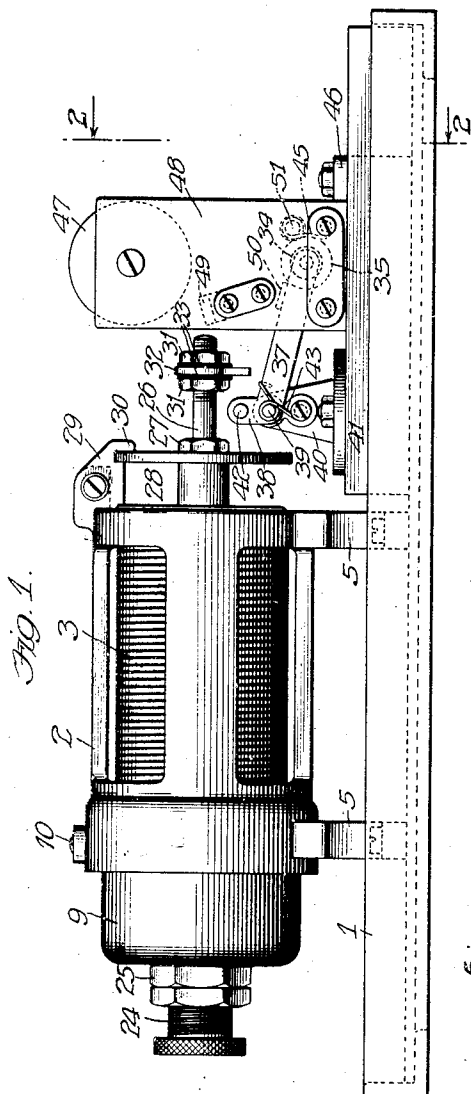


FIG. 1.

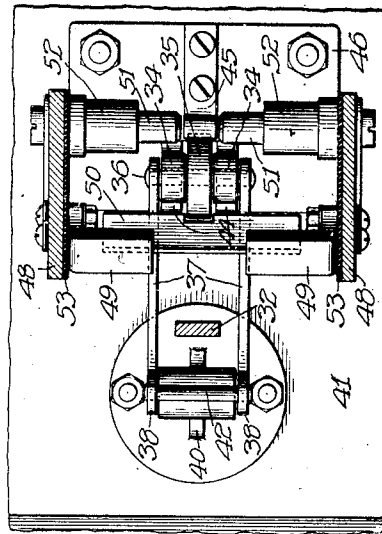


FIG. 4.

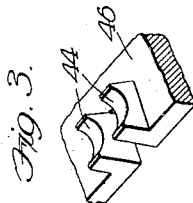
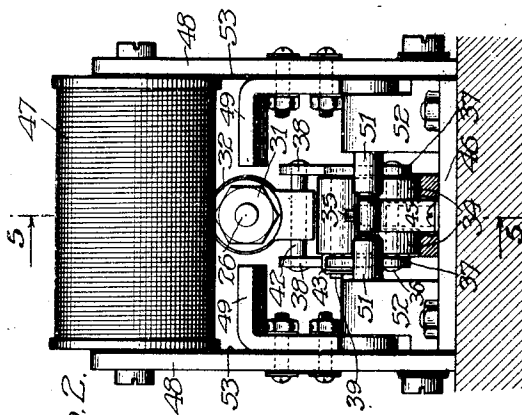


FIG. 2.

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2 SHEETS—SHEET 2.

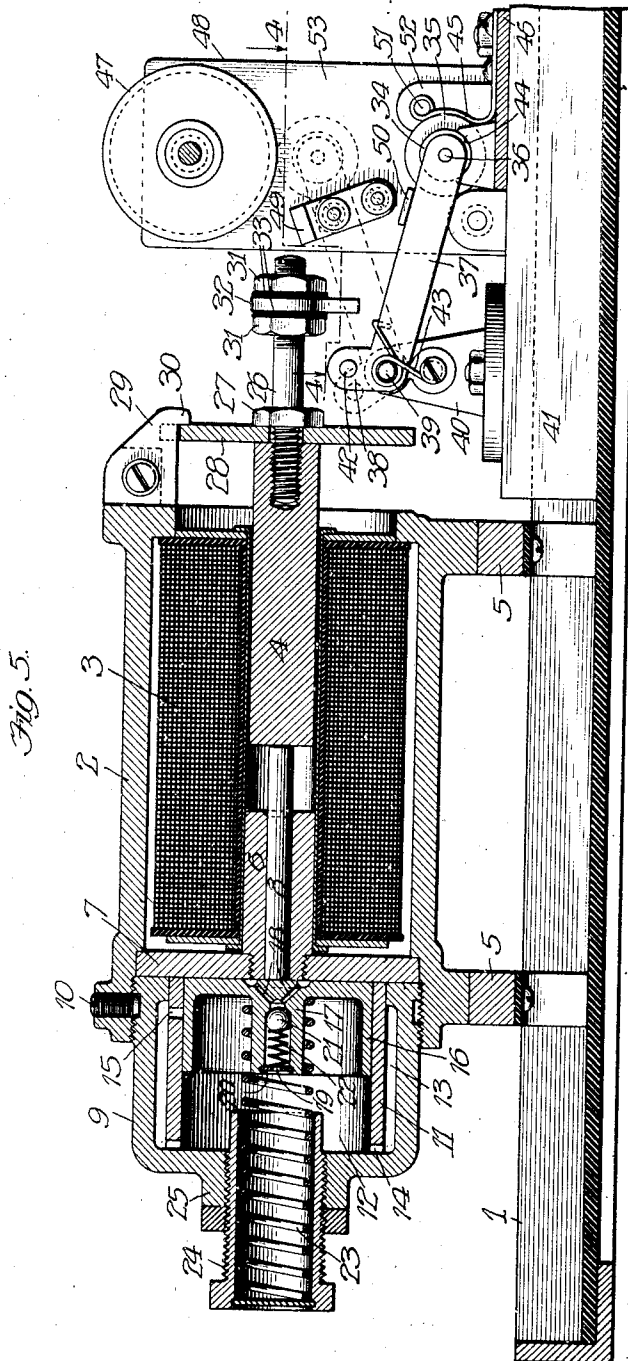


Fig. 5.

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Patented Dec. 26, 1922.

1,439,692

UNITED STATES PATENT OFFICE.

CHARLES B. COATES, OF ERIE, PENNSYLVANIA, ASSIGNOR TO CHICAGO PNEUMATIC TOOL COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

OVERLOAD-CIRCUIT BREAKER.

Original application filed May 7, 1920, Serial No. 379,460. Divided and this application filed March 14, 1921. Serial No. 452,162.

To all whom it may concern:

Be it known that I, CHARLES B. COATES, a citizen of the United States, now residing at Erie, in the county of Erie and State of Pennsylvania, formerly residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Overload-Circuit Breakers, of which the following is a specification, this application being divisional of an original application filed on May 7, 1920, Serial No. 379,460.

My invention relates to what are known as overload circuit breakers adapted for use with tools, for instance with portable electric drills and the like wherein it becomes necessary to break the circuit in the event that the drill bit should stick or otherwise be given an overload. The object of my invention is to provide a novel and efficient construction of arc extinguisher or blowout for a circuit breaker of this character.

In the drawings Fig. 1 is a side elevation of my circuit breaker; Fig. 2 an end elevation thereof viewed from the line 2—2 of Fig. 1 and looking in the direction of the arrow; Fig. 3 a perspective of a detail of the contact base; Fig. 4 a sectional plan of the switch mechanism taken on the irregular line 4—4 of Fig. 5; and Fig. 5 a sectional elevation on the line 5—5 of Fig. 2.

Referring to the particular embodiment of my invention which is herein shown for the purpose of a clear and definite description but which may partake of different forms, the mechanism is mounted on and supported by an angle iron framework 1 carrying a base 41 of insulating material. The mechanism comprises essentially a solenoid and switch mechanism together with a dashpot arrangement for controlling the movements of the solenoid core or plunger. This solenoid is preferably of the stopped iron clad type consisting of the casing or frame 2, series coil 3 and core or plunger 4. This solenoid is secured to the brackets 5 which in turn are secured to the frame work 1. The solenoid is also provided with an iron plug 6 which extends into the core opening of the coil and is secured to an end disk or plate 7 in suitable manner as by screwing thereinto. This plug has a central bore in which slides by a nice sliding fit a rod 8 which is made of suitable non-magnetic material such as brass,

This rod is unattached at either end but is adapted to contact at its right hand end the plunger 4 and at its left hand end the dashpot device as hereinafter explained.

The dashpot device is contained within a casing 9 secured in suitable manner to the casing or frame 2 of the solenoid as by screwing thereinto and locked in place by means of set screw 10. Within this case there is located a cylinder 11 which provides a dashpot chamber 12. A portion of the interior of the casing 9 is of larger diameter than the cylinder 11 with the result that an annular chamber 13 is formed therebetween. This annular space or chamber communicates with the dashpot chamber 12 through the rearward ports 14 and a forward port 15 which is located intermediate the length of the cylinder 11.

Within the cylinder 11 there reciprocates a piston 16 which has a tubular stem adapted to communicate with opposite sides of the piston through the ports and passages 18 and the port 19 passing through a disk 20 in the left hand end of such stem. The ports and passages 18 are governed by means of a check valve within the stem, which valve is here a ball 21 spring pressed to its seat by means of the spring 22. This piston is held to the normal position shown in Fig. 5 by means of a yielding pressure such as the coiled spring 23 bearing at its inner end against the piston and at its outer end against the head of an adjustable hollow screw 24 which screws into and through the boss 25 of the casing 9. The rod 8 bears at its outer end against the flat face of the piston 16 and is adapted to force such piston outwardly to the left when actuated by means of the plunger 4 in the manner hereinafter explained.

Referring to the switch controlling mechanism which is actuated by the plunger 4, the same consists of a bolt 26 secured to the projecting end of the plunger in suitable manner as by screwing thereinto and clamping between the end thereof and a nut 27, a plate 28 whose upper end is notched in order to receive the lower edge of a bracket or guide 29 which is secured to and projects forwardly of the right end of the casing 2. This bracket is provided with a flange 30 which limits the outward movement of the plate 28 and its plunger 4. Upon the outer

screw threaded end of the bolt 26 there is mounted two similar adjustable nuts 31 clamping between them a dog 32 separated therefrom by suitable insulating material 33. This dog projects downwardly and is thereby enabled to actuate the switch and its operating means now to be described.

My switch is of novel construction particularly as to the contacts which here consist of three rollers on the one side and two seats or saddles and interposed spring. Two of these rollers 34, 34 are of the same diameter but the third roller 35 which is interposed between them is of somewhat greater diameter. These rollers are all mounted upon a horizontal rod 36 connecting the outer ends of a yoke or substantially rectangular frame which is composed of two parallel bell cranks having long arms 37 and short upright arms 38. These bell cranks are pivoted upon the rod 39 at the upper end of the standard 40 which is secured to the base or support 41. The upper ends of the bell crank arms 38 are connected by the cross rod 42. These rollers and their yoke are held to the normal downward position shown in Fig. 5 by suitable means such as the spring 43.

These rollers 34 and 35 constitute switch contacts that are adapted to cooperate with other switch contacts which consist of the saddles 44 cooperating with the smaller rollers 34 and with a spring 45 made of suitable material such as bronze or non-arcng material. This spring is secured at its outer end to the plate 46 and its inner end projects forwardly between the two saddles 44 in position to be contacted by the larger roller 35. The construction and arrangement of these parts are such that the larger roller 35 does not leave its contact or spring 45 until after the smaller rollers 34 have left their seats in the saddles 44 with the result that the current passes through the larger roller and through its spring 45 when such current is finally broken, and is not then passing through the smaller rollers, so that the seats in the saddles for the smaller rollers are always bright and unaffected by any arcing action and therefore always in suitable conditions for carrying the current in service. It will be understood that the rollers and the saddles and the spring are connected to the electrical supply wires.

A shunt coil 47 is provided for the magnetic blowout and for holding the circuit breaker device in open switch position. One end of this coil is connected to the spring 45 and the other end to the base 40 so that current flows through it only when the switch is in the open position. This coil is mounted at the upper end of two uprights or standards or magnetic yokes 48 which are suitably mounted. This coil cooperates with a pair of magnetic poles 49 which in turn are adapted to attract and hold an iron arma-

ture 50 mounted upon the switch breaker device or frame 37. A pair of magnetic plugs 51 are secured in the brackets 52 which are a part of the casting containing the saddles 44 and positioned with their arc gap in the line of possible arc between the roller 35 and its spring 45 so as to blowout any such arc. In this construction these plugs 51 constitute the horns of the magnet and are placed very close to the roller 35 and its spring and moreover they have the same electrical polarity as these parts when they are in contact, and the same as the spring 45 after the circuit is opened. This is made possible by using electrical insulation 53 between the plugs 51 and the magnet yokes 48. The advantage of this construction is to provide a very short air gap through the arc and obtain an intense field for blowing out such arc.

Describing a cycle of operation of my circuit breaker and starting with the parts in their normal position shown in the drawings, when the tool such as an electric drill is started from a state of rest there is a momentary rush of current far in excess of the safe normal running current. The sudden and intense inward pull on the plunger 4 due to the high current passing through the coil 3 is opposed by the dashpot. This current is of extremely short duration and the port 15 is so placed that it is not uncovered by the piston 16 during this rush of starting current. After the drill has been started and is running without load the plunger 4 and dashpot 16 assume the positions shown in the drawings. When the drill is materially slowed down or stopped as by reason of the sticking of the drill bit the working current will increase in the solenoid with the result that the plunger will be moved to the left in Fig. 5 and consequently the piston 16 will be likewise moved by reason of the interposed rod 8. Inasmuch as the chamber 12 is a closed one this movement of the piston will cause a compression of the air to the left of such piston thereby opposing the movement of said plunger. When the straight side or right hand face of the piston 16 has moved sufficiently to the left to uncover the port 15 the annular chamber 13 will act as a bypass and the pressure of the air on opposite sides of the piston will be equalized whereupon there will be no further resistance offered to the movement of the plunger, and such plunger will then move rapidly or snappily to its full position to the left.

The plunger 4 in its movement or reciprocation to the left carries with it the dog 32 in whose path of movement is located the cross rod 42 which together with the movable members of the switch are rocked to the dotted line position shown in Fig. 5. The armature 50 is now held magnetically by the poles 49 which is the open switch position.

In this operation of the switch the small rollers 34 leave their seats while the larger roller 35 is still in contact with its spring and before it breaks contact with such spring. Moreover, the dog 32 does not strike the cross rod 42 of the breaker device until the plunger has moved to that point where the dashpot piston has passed the port 15, that is to say the cushioned movement of the plunger 4 occurs before the dog comes into contact with the rod 42 and the cushioning action is relieved at the moment when such dog makes such contact with the rod with the result that the rollers are moved out of contact with their contacts rapidly and with a rapid, snappy action. After the current has thus been interrupted or cut out the spring 23 will return the piston and the plunger.

In the solenoid an iron clad magnet is preferably employed so that when the current flows through the coil there is magnetic attraction between the adjacent ends of the plunger 4 and the plug 6 and also between the ends of the casing 2 and the plate 28.

I claim:

1. In an overload circuit breaker, the combination of a magnetically operated switch, and a shunt coil having magnetic poles for

holding the switch in open position, and also having magnetic poles for blowing out the arc at the switch.

2. In an overload circuit breaker, the combination of a magnetically operated switch, and a shunt coil having magnetic poles for holding the switch in open position, and also having magnetic poles electrically insulated from the rest of the magnetic circuit for blowing out the arc at the switch.

3. In an overload circuit breaker, the combination of a magnetically operated switch including a swinging frame carrying movable switch contacts, an armature on said frame and a shunt coil having poles cooperating with said armature and having electrically insulated poles for blowing out the arc at the switch.

4. In an overload circuit breaker, the combination of a magnetically operated switch including a swinging frame carrying movable switch contacts, an armature on said frame and a shunt coil having poles cooperating with said armature and having poles for blowing out the arc at the switch, said coil having yokes and insulation between such yokes and poles.

CHARLES B. COATES.