July 2, 1940. P. E. PARKINSON 2,206,468

ELECTRIC CIRCUIT BREAKER

Filed July 24, 1939

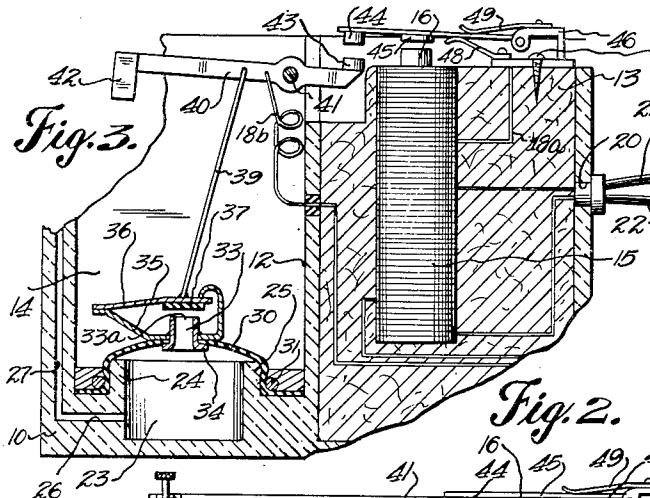


Fig. 3.

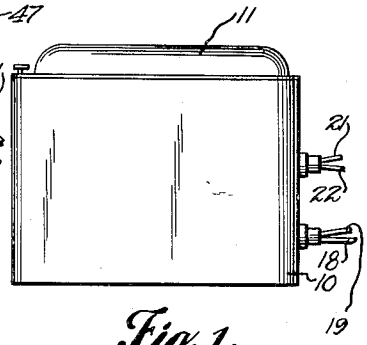


Fig. 1.

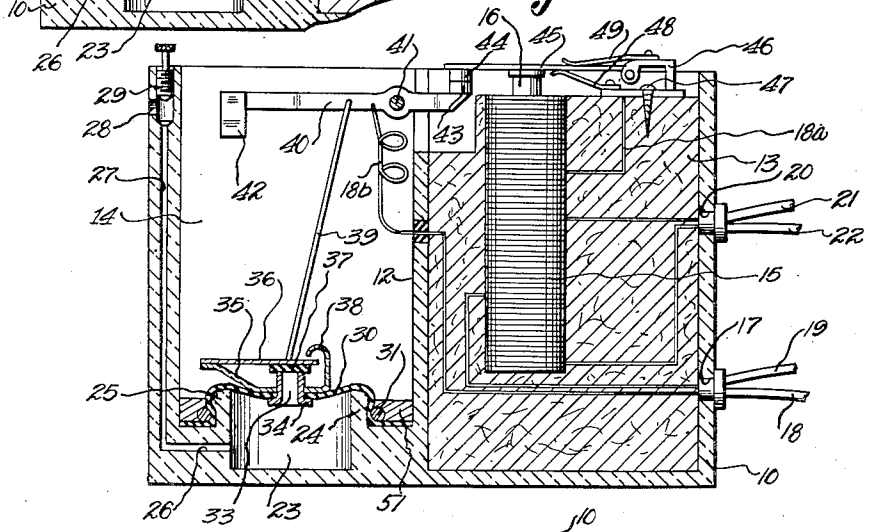


Fig. 2.

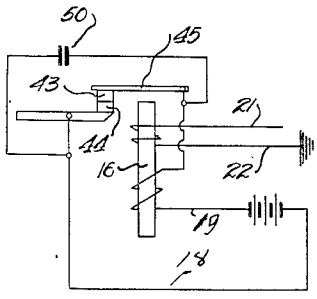


Fig. 5.

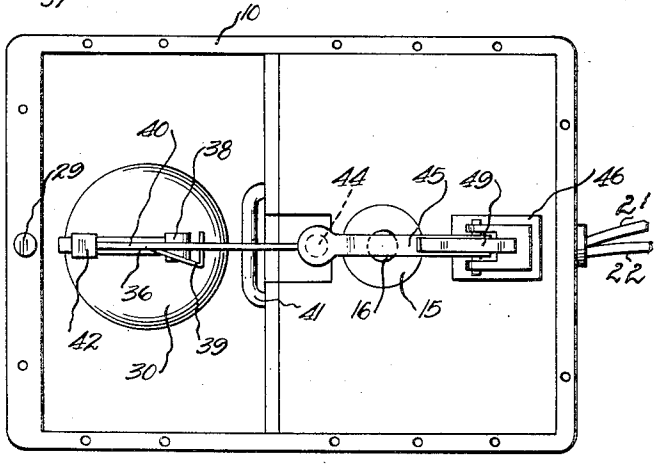


Fig. 4.

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ELECTRIC CIRCUIT BREAKER

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3 Claims. (Cl. 200—97)

The breakers to which I am referring are intended particularly for use in conjunction with induction coils known as shock coils, that is transformers including a magnetic core and employing a primary circuit of electromotive force and capable of producing high tension secondary currents of very short duration. The purpose of my device is to secure intermittent charges of electric current by means of such an induction coil. It is intended for use by farmers who keep their cattle in enclosures surrounded by wire fences. When properly connected to a source of electromotive energy and a fence, my device, including a coil, will send along said fence intermittent charges of electricity at intervals which may be selectively controlled. This will serve to deter animals within the enclosure from trying to break through such fence. Since it is known from practical experience that shocks to be issued along the fence are sufficiently frequent even when they come at intervals anywhere from 20 to 60 seconds, I have built my device in such a manner that it is capable of producing these shocks at intervals within that range. It will be understood that these intervals may be properly adjusted without any limitation to the above said periods of time of frequency and that my invention lies in the consruction and relation of parts, as set forth in the specification. It is my further purpose to provide a device of this kind which will be of simple construction, reliable in operation and easy to make.

I shall now describe my invention with reference to the accompanying drawing, in which:

Fig. 1 shows a side elevation of my device as it is contained in its casing.

Fig. 2 shows a longitudinal sectional view of my device at the moment when the electric circuit therein is closed.

Fig. 3 shows a fragmentary sectional view of the device showing the relation of parts when the electric circuit is open.

Fig. 4 shows a plan view of my device with the cover removed.

Fig. 5 shows a wiring diagram of my device.

Similar numerals refer to similar parts throughout the several views.

My device including the induction coil and the circuit breaker cooperating therewith, is contained in a casing indicated by numeral 10 and provided with a removable cover 11. While this casing may be made of any substance, the preferred material is a suitable plastic such as Bakelite, so that the whole casing with some component parts therein may be molded and thus produced as a unit. It is this type of a casing that I am showing in my drawing.

The casing is divided into two compartments indicated by numerals 13 and 14, by a separating wall 12. One of these compartments holds the induction coil 15, which is of the conventional design and comprises an iron core 16 and what is known as primary and secondary windings, serving to conduct the primary and secondary current of electricity, respectively. Because of the conventional design of the coil, I am not showing in the accompanying drawings the details of said windings, although the relation of said windings and connections to the source of electric energy are indicated in the diagram in Fig. 5. Compartment 13 is filled with a suitable non-conducting material such as wax, in order to protect the coil from moisture.

On one side the casing 10 is provided with an opening 17 to introduce into the casing wires 18 and 19, adapted to be connected to a source of electric energy, such as a battery, which is not shown in the drawing, said wires affording a part of the path of the primary circuit of the coil. Another outlet 20 provides a passage for wires 21 and 22, forming the terminals of the secondary or induced circuit of said coil. It will be understood that all the wires serving to conduct electric current are suitably insulated.

Having described the location of the coil with respect to the casing in which it is contained, I shall now describe means devised by me for the purpose of successively closing and breaking the primary electric circuit and inducing the secondary high tension current which is intended to be transmitted to the wire fences as above stated. In effecting my purpose, I am using what may generally be described as pneumatic means of the kind in which the frequency of the periodic action is determined by the amount of leakage of air from an air chamber.

It will be seen by reference to my drawing that compartment 14 of casing 10 contains at the bottom thereof a circular chamber 23 which may form an integral part of said casing when same is molded. The chamber is provided with an upright annular wall 24, being provided at the top with a bead 25. An outlet 26 at the bottom of the chamber communicates with passage 27 within one of the end walls of the casing, as shown. At the top, said passage 27 terminates in an outlet 28, providing an avenue of escape for air contained in chamber 23, while screw valve 29 at the top of passage 27 serves to regulate the

amount of air which is allowed to escape through said outlet 28.

Expanding over the open side of the air chamber 23 is a flexible diaphragm 30, which may be made of such material as oiled chamois leather, or some other suitable substance. The edges of the diaphragm may be tucked under the bead 25 and secured to the outer wall of the chamber by an annular wire clamp 31, whereupon wax, pitch or other insulating material, indicated by numeral 51, may be poured in the space between the outer wall of the chamber and the inner walls of the compartment 14 so as to securely seal the edges of said diaphragm against any air leaks. This construction, I would like to point out, is very satisfactory, economical and very easy to effect. Secured to the central portion of the diaphragm in order to provide a channel for the intake of air into said chamber, is a tubular nipple 33 provided at the end with a flange 34. The portion of the diaphragm which abuts the outer wall of the nipple 33 is kept in an air-tight contact therewith, by being compressed between said flange 34 and member 35 on the outer side of said diaphragm. Said member 35 supports a strip of resilient metal 36 which carries on its underside a pad 37 adapted to cover in an air-tight manner the outer opening 33*a* of the nipple 33. A hooklike extension 38 of member 35 serves to limit the extent of the movement of strip 36. Affixed to the upper surface of strip 36, just above the outer opening 33*a* of nipple 33, is a rod 39 connecting said strip with lever 40, fulcrumed on pin 41, the latter being disposed transversely and suitably supported in the casing. One arm of said lever, specifically the one to which rod 39 is pivotally connected, is at its end provided with a weight 42. The end of the opposite arm of said lever forms a contact point 43 by means of which electric circuit intended to pass through the respective windings of coil 15 may be closed. The complementary or opposite point, serving to close the circuit, is indicated by numeral 44 and is supported at the end of iron armature 45, hinged to bracket 46, just above the end of core 16. On magnetization of said core, said armature will be attracted thereto. It may be remarked at this point that the contact point 44 ought to be made preferably broad, as its purpose is not only to serve as a connecting link in the path of electric current but also as a hammer by means of which lever 40 may be actuated as described below.

To complete the description of the parts entering into my device, I wish to say that numeral 47 indicates a screw by which bracket 46 may be secured to the insulating substance within compartment 13 of the casing. Numeral 48 indicates a spring connected to wire 18*a*, forming a part of the path of the primary circuit. The purpose of the spring is to keep the contact points 43 and 44 normally apart, thus causing the primary electric circuit to be normally open. Numeral 49 shows a member mounted on bracket 46, the purpose of same being to limit the extent of the movement of armature 45. 18*b* indicates a flexible wire also forming a part of the path of the primary circuit.

I shall now describe the operation of the device by referring to Fig. 3 of my drawing, which shows the relation of movable parts at the moment when the air chamber 23 contains so much air that the diaphragm 30 is in a raised or inflated position, the apex of the diaphragm being above the level of the upper edges of the chamber. The current of the primary circuit is supplied from a source of electromotive energy, such as a battery, to the coil by means of wire 18, along the flexible wire unit 18*b*, along the shorter arm of lever 40 to point 43, thence through point 44, when points 43 and 44 are in contact, along the armature 45 to the spring 48 and thence along the conductor 18*a* into the coil 15. From the coil the current is returned to the source of electromotive energy by wire 19. It will be noticed that in Fig. 3 the points 43 and 44 are set apart and that because of that the primary circuit is open.

Actuated by weight 42, lever 40 swings downward transmitting the movement by means of rod 39 to member 36. Under the pressure of said rod 39, member 36 equipped with pad 37 closed the outlet of nipple 33. Simultaneously the diaphragm, actuated by the same rod 39, is forced inward into the air chamber and expels therefrom air which leaks out through channel 27 and outlet 28. Owing to the retarded passage of outlet 28, the movement of the diaphragm from its inflated position as shown in Fig. 3 to a deflated position as shown in Fig. 2, occupies a certain space of time. When, actuated by said weight 42, lever 40 has swung sufficiently downward, point 43 placed on said lever gets in contact with point 44, closing the circuit of the primary current. This serves to magnetize core 16, which attracts armature 45. The sudden jerk of the armature to the core causes point 44 to act as a hammer, causing said point 44 to thrust point 43 sharply downward. Simultaneously, the opposite arm of lever 40, carrying weight 42, is made to fly upward, thus causing the contact between points 43 and 44 to be broken. In its upward movement, lever 40 acts upon member 36 by means of rod 39, raising said member 36 above opening of nipple 33 and raising the diaphragm into a position shown in Fig. 3. While the diaphragm is thus being raised, air is allowed to flow into the chamber 23. Immediately, however, on reaching the limit of its movement, lever 40 actuated by weight 42 begins its downward swing, causing the opening 33*a* to be closed by means of strip 36 and pad 37 and forcing the diaphragm downward, as above said, thus repeating the cycle. It is hardly necessary to add here that when the primary circuit is closed by contact of points 43 and 44, and when said circuit is broken on separation of said points, secondary currents are created in the secondary circuit and that these are conducted by means of wires 21 and 22 along the wire fence, to which my device may be attached. Specifically, I wish to say that one of said wires, and it does not matter which, is to be grounded and that the other is to be attached to the fence. In compliance with the best practice in building such coils, a condenser of conventional design may be shunted across said contact points. This is shown in the diagram by numeral 50.

It will be seen from the above that the momentary closing of the circuit may be effected periodically and that intervals of time between one closing and another may be regulated by the amount of air which is allowed to escape from said air chamber through outlet 28. If the outlet is made smaller, then the period of time necessary to bring the diaphragm into a deflated position when the contact occurs may be longer. If it is desirable to make these contacts more frequent, this may be accomplished by allowing more air to escape from said chamber. This

may be accomplished by adjusting the screw valve 28.

It is obvious that changes in the construction of my device and in the relation of parts shown by me may be introduced without departing from the spirit and scope of my invention.

What I claim is as follows:

1. A circuit breaker for an electric coil equipped with a magnetizable core comprising a movable armature spaced from the core but responsive to the magnetic pull thereof, a contact carried by said armature, a casing defining an air chamber provided with an adjustable outlet for retarded escape of air from the chamber, diaphragm pump means to fill the chamber with air to expand the diaphragm into an inflated position, weight means to force the diaphragm into the chamber against resistance of air through said retarded outlet to a deflated position, and a lever, a contact carried by said lever for cooperating with the contact carried by said armature, said lever being responsive to the movement of the diaphragm and being adapted to close the breaker when the diaphragm is in a deflated position, and to raise the diaphragm into an inflated position and to open the breaker.

2. In a structure of the character described, an electric coil equipped with a magnetizable core, an armature normally spaced from the core of said coil and responsive to magnetic pull thereof, a contact carried by said armature, a lever pivotally mounted with one end extending under said armature and provided with a contact for engaging the contact of the armature, a weight for tilting said lever to a position disposing its contact in engagement with the contact of said armature, a casing defining an air chamber provided with an air passage leading therefrom, adjustable means for controlling flow of air through the air passage, a diaphragm associated with said air chamber, a nipple carried by said diaphragm, a closure movable into and out of closing relation to the outer end of said nipple, and means connecting said closure with said lever moving the closure into and out of a closed position and actuating the diaphragm for pumping air into and out of the air chamber in response to movements of the lever.

3. In a structure of the character described, an electric coil equipped with a magnetizable core, an armature normally spaced from the core of said coil and responsive to magnetic pull thereof, a contact carried by said armature, a lever pivotally mounted with one end extending under said armature and provided with a contact for engaging the contact of the armature, a weight for tilting said lever to a position disposing its contact in engagement with the contact of said armature, a casing defining an air chamber provided with an air passage leading therefrom, adjustable means for controlling flow of air through the air passage, a diaphragm associated with said air chamber, a tubular nipple secured through said diaphragm, a support extending laterally from said nipple outside the diaphragm, a resilient valve strip carried by said support and extending across the outer end of the nipple and normally spaced therefrom in an opened position, a pad carried by the valve strip for sealing the outer end of the nipple when the strip is in a closed position, means carried by said support for limiting movement of the valve strip away from the nipple when opened, and a rod connecting said valve strip with the weighted end portion of the lever to effect opening and closing of the valve strip and impart pumping movement to the diaphragm in response to movements of the lever.

PERCY E. PARKINSON.