Aug. 25, 1942. S. A. MOORE 2,294,196

CIRCUIT MAKING AND BREAKING DEVICE

Filed June 4, 1941

Fig. 1.

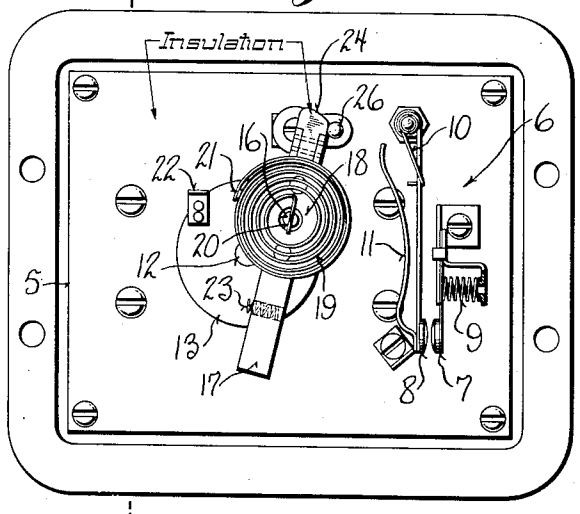
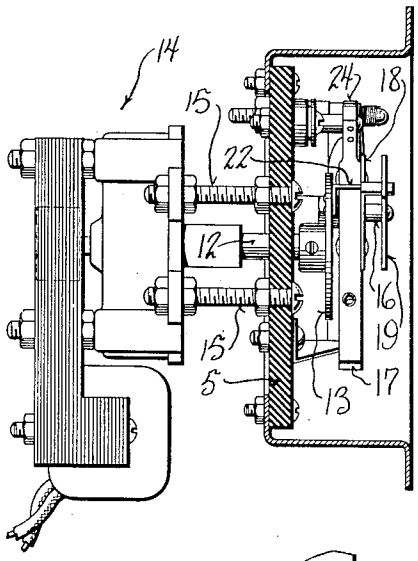


Fig. 2.



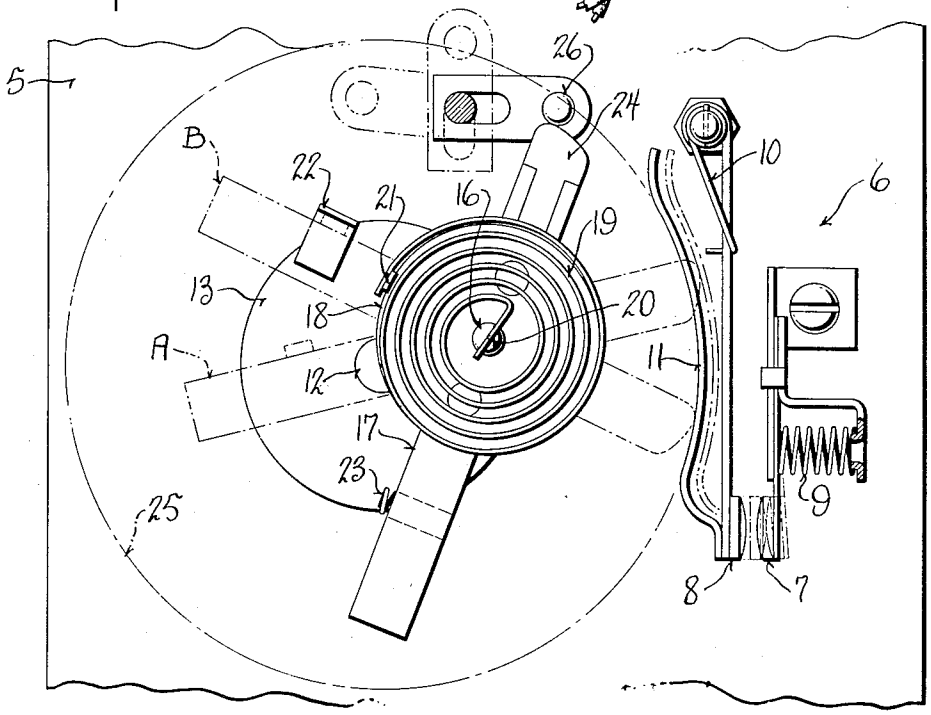


Fig. 3.

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CIRCUIT MAKING AND BREAKING DEVICE

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12 Claims. (Cl. 200—19)

This invention relates to circuit making and breaking devices and refers particularly to circuit making and breaking devices primarily adapted for use in electric fence controllers.

In electric fences, especially alternating current fences wherein the electromotive force for energizing the fence is taken from the commercial supply lines, it is important that failure of the circuit interrupter which periodically opens and closes the primary circuit of the energizing transformer will not result in the contacts remaining closed.

If this happens, it results in the exceedingly dangerous condition of a continuously charged fence wire. In many instances, such failure of the fence controller has resulted in the loss of human life. It is therefore, an object of this invention to provide a circuit making and breaking device which is so designed and constructed that the contacts will not remain closed if the interrupter fails for any reason whatsoever.

Another prerequisite of the circuit making and breaking device in a fence controller and also of other circuit making and breaking devices is that the duration of contact closure and also the frequency of the closure may be adjusted.

It is, therefore, another object of this invention to provide a circuit making and breaking device wherein adjustment of these factors is readily effected.

Electric fence controllers have advanced to the stage where the cost of the mechanism is an important consideration. Controllers are now sold for a price. Consequently, every effort must be made to keep the manufacturing cost of its component parts down to a minimum.

With this objective in view, the present invention has as another of its objects the provision of a circuit making and breaking device which is extremely simple in design and construction and which lends itself readily to production at a very low cost.

With the above and other objects in view which will appear as the description proceeds, this invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described, and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the herein disclosed invention may be made as come within the scope of the claims.

The accompanying drawing illustrates one complete example of the physical embodiment of the invention constructed in accordance with the best mode so far devised for the practical application of the principles thereof, and in which:

Figure 1 is a plan view of a circuit making and breaking device constructed in accordance with this invention;

Figure 2 is a cross sectional view taken through Figure 1 on the plane of the line 2—2; and

Figure 3 is an enlarged detail plan view illustrating the operation of the device.

Referring now particularly to the accompanying drawing in which like numerals indicate like parts, the numeral 5 designates a base of suitable insulating material upon which a switch designated generally by the numeral 6 is mounted. If desired the base may serve as one wall of a housing within which the switch and its actuating mechanism are enclosed.

The switch comprises a stationary contact 7 and a movable contact 8. Suitable terminals are provided for the contacts by which the switch may be connected in the circuit to be controlled. The stationary contact is yieldingly held in its fixed position by a spring 9 and the movable contact is biased to a "switch open" position by means of a torsion spring 10.

The specific design and construction of the switch forms no part of this invention as any switch which is biased to its open position and capable of momentary closure will suffice.

The movable contact of the switch has a curved arm or bar 11 connected thereto in such a way that its depression effects closure of the switch.

The arm 11 is so positioned that the arc formed by its curvature is substantially concentric to the axis of a shaft 12. The shaft 12 passes through the base 6 and at the front face of the base mounts a carrier 13. Any suitable means may be provided for continuously revolving the shaft as for instance a synchronous motor indicated generally by the numeral 14 which may be supported from the base by studs 15.

While the carrier 13 is shown in the form of a disc, its circular shape is of no consequence. The function of the carrier, as will be apparent, is that of a crank. To this end it has a pivot 16 eccentrically mounted thereon. This pivot forms the pin of the crank so that upon revolution of the carrier by the shaft 12 the pin 16 and consequently, an actuator 17 mounted thereon is recurrently carried around a defined path.

The actuator 17 consists of a relatively heavy cross bar medially pivoted on the pin 16 and a cylindrical plate or disc 18 on its medial portion concentric to its pivotal mounting. A spiral spring 19 overlying the disc 18 has its inner end

anchored to the pin 16 as at 20 and its outer end fixed to the disc 18 as at 21 to bias the actuator to a retracted position defined by a stop 22 on the carrier. A buffer spring 23 seated in a well in the actuator is preferably provided to cushion the engagement of the actuator with the stop.

At one end the actuator carries a tip 24 of fibre or other suitable insulating material. It is this part of the actuator which engages the curved arm or switch closing part 11 during operation of the circuit breaker.

In the normal retracted position of the actuator to which it is biased by the spring 19 and which, as stated, is defined by the stop 22, the extremity of the tip 24 travels in an orbit indicated by the broken line 25. This orbit as will be seen from Figure 3 coincides with the curvature of the arm or switch closing part 11.

Hence, if the actuator were to remain in this retracted position, it would be ineffective to close the switch. It is to be observed, however, that the distance from the pivot of the actuator to the extremity of its tip 24 added to the length of the crank arm (the distance from the actuator pivot to the axis of the shaft 12) is sufficient to project the tip 24 beyond the orbit 25. Consequently, if the actuator is in radial alignment with the crank arm axis at the time the crank faces the arm 11 as indicated in the dotted line position A in Figure 3, closure of the switch results.

Such disposition of the actuator is momentarily effected during each revolution of the carrier by a stop 26 mounted on the base 5. This stop is so positioned with relation to the orbit 25 and the position of the switch closing arm 11 that as the actuator is moved along by the carrier, its tip engages the stop as shown in Figure 1. The carrier, of course, continues to rotate, but the tip of the actuator is restrained by the stop so that the biasing spring 19 is wound up to increase its tension.

As the carrier continues to move, it pulls the tip of the actuator away from the stop 26 until at a position shown in full lines in Figure 3 the actuator is freed from the stop. Thereupon its biasing spring 19 snaps the actuator back to its retracted position shown in the dotted line position B in Figure 3. During the passage of the actuator from its position at which it leaves the stop 26 to its retracted position its tip 24 wipes against the arm 11 to momentarily close the contacts.

It will be readily apparent that several factors cooperate to determine the duration of switch closure. The speed of the carrier, the length of the arm 11, the strength of the biasing spring 19 and the inertia of the actuator all contribute in determining this period. In addition, the stop 26 is adjustably mounted on the base so that its location may be varied. This enables adjustment of the period of switch closure after the other factors have been set.

From the foregoing description taken in connection with the accompanying drawing, it will be readily apparent to those skilled in the art that this invention provides a circuit making and breaking device which will not fail in the circuit closing position, and that while admirably suited for use in electric fence controllers the invention is not limited thereto. Any condition requiring continuous circuit making and breaking coupled with assurance against accidental continued closure is embraced by this invention.

What I claim as my invention is:

1. A circuit making and breaking device comprising: a switch biased to a normally open position; an actuator for momentarily closing the switch; a carrier for the actuator movable along a defined path past the switch; means biasing the actuator to a retracted position at which it would be ineffective to close the switch as it is traversed past the switch by the carrier; and stop means acting on the actuator as it approaches the switch for moving the actuator out of its retracted position to increase the tension in its biasing means, said stop means releasing the actuator in time to have it moved by its biasing means through a switch closing motion which momentarily closes the switch.

2. A circuit making and breaking device comprising: a switch biased to a normally open position; an actuator for momentarily closing the switch; means for moving the actuator along a defined path past the switch; means biasing the actuator to a position at which it would be ineffective to close the switch as it is moved past the switch; and means transiently operable on the actuator to cause the same to be moved by its biasing means in a switch closing motion as it moves past the switch to thereby momentarily close the switch.

3. A circuit making and breaking device comprising: a carrier constrained to motion in a defined path; a movable switch actuator on the carrier; means biasing said switch actuator to a predetermined position with relation to its carrier with a part thereof moving along a defined path; a normally open switch having a part disposed adjacent to said path of the actuator part and engageable by the actuator part whenever said actuator part projects beyond its said path; and means for momentarily projecting said actuator part beyond its path of movement to engage the switch part and effect momentary closure thereof as the actuator is carried past the switch.

4. A circuit making and breaking device comprising: a normally open switch; a carrier movable in a defined path adjacent to the switch; a switch actuator carried thereby and biased to a position at which it would be ineffective to close the switch as it moves therepast but movable to a position operable to close the switch; and a stop so positioned with relation to said path of the carrier as to engage and detain the switch actuator and thereby store energy in its biasing means which upon release of the actuator moves the same through a switch closing motion to momentarily close the switch, said actuator being weighted so that the inertia of the actuator has a controlling effect upon the speed at which the actuator moves to close the switch.

5. A circuit making and breaking device comprising: a normally open switch having a part engageable by an actuator to close the switch; a carrier rotatable about a fixed axis; a switch actuator; a pivot eccentrically mounted on the carrier and having the actuator pivotally mounted thereon; a spring biasing the actuator to a retracted position at which its switch contacting part moves in an orbit clear of said movable switch part; and stop means for detaining the actuator while its carrier continues to move to thereby store up energy in the biasing spring which upon release of the actuator from the stop means swings the actuator outwardly beyond said orbit, said stop means being so located with relation to the switch that the outward swing of the actuator beyond its normal orbit occurs in time to engage the movable switch part and effect momentary closure of the switch.

6. A circuit making and breaking device comprising: a normally open switch having a part engageable by an actuator to close the switch; a carrier rotatable about a fixed axis; a switch actuator; a pivot eccentrically mounted on the carrier and having the actuator pivotally mounted thereon; a spring biasing the actuator to a retracted position at which its switch contacting part moves in an orbit clear of said movable switch part; and stop means for detaining the actuator while its carrier continues to move to thereby store up energy in the biasing spring which upon release of the actuator from the stop means swings the actuator outwardly beyond said orbit, said stop means being so located with relation to the switch that the outward swing of the actuator beyond its normal orbit occurs in time to engage the movable switch part and effect momentary closure of the switch, said movable switch part having a portion extending along the normal orbit of the actuator to increase the duration of switch closure.

7. A circuit making and breaking device comprising: a normally open switch having a part engageable by an actuator to close the switch; a carrier rotatable about a fixed axis; a switch actuator; a pivot eccentrically mounted on the carrier and having the actuator pivotally mounted thereon; a spring biasing the actuator to a retracted position at which its switch contacting part moves in an orbit clear of said movable switch part; and stop means for detaining the actuator while its carrier continues to move to thereby store up energy in the biasing spring which upon release of the actuator from the stop means swings the actuator outwardly beyond said orbit, said stop means being so located with relation to the switch that the outward swing of the actuator beyond its normal orbit occurs in time to engage the movable switch part and effect momentary closure of the switch, said actuator having sufficient weight to constitute an inertia member having a controlling effect upon the rate of motion of the actuator in response to its biasing spring so that the duration of switch closure is determined at least partially by the weight of the actuator.

8. A circuit making and breaking device comprising: a normally open switch having a part engageable by an actuator to close the switch; a carrier rotatable about a fixed axis; a switch actuator; a pivot eccentrically mounted on the carrier and having the actuator pivotally mounted thereon; a spring biasing the actuator to a retracted position at which its switch contacting part moves in an orbit clear of said movable switch part; and stop means for detaining the actuator while its carrier continues to move to thereby store up energy in the biasing spring which upon release of the actuator from the stop means swings the actuator outwardly beyond said orbit, said stop means being so located with relation to the switch that the outward swing of the actuator beyond its normal orbit occurs in time to engage the movable switch part and effect momentary closure of the switch, said actuator having sufficient weight to constitute an inertia member having a controlling effect upon the rate of motion of the actuator in response to its biasing spring so that the duration of switch closure is determined at least partially by the weight of the actuator and the movable switch part extending along the normal orbit of the switch actuator for a substantial distance to increase the period of switch closure by lengthening the period of engagement thereof with said actuator.

9. A circuit making and breaking device comprising: a normally open switch having a part normally occupying a predetermined position from which it is movable to effect closure of the switch, said part having a predetermined length; an actuator engageable with said part to effect closure of the switch; means moving said actuator along a defined path; means biasing the actuator to a normally retracted position clear of said switch part; and a stop in the path of the switch actuator for detaining the same as it is moved along said path to cause the same to move to a position from which the biasing means snaps the actuator back to its retracted position and in doing so, carries the actuator beyond its normal retracted position; said stop means being so located with relation to the switch that the actuator in snapping back to its retracted position wipes agains the switch closing part to momentarily close the switch.

10. In a circuit making and breaking device: the combination with a normally open switch having a part adapted to be depressed to effect closure of the switch, of means for periodically and momentarily depressing said part to effect momentary closure of the switch comprising, a driven shaft; a crank on the shaft; an actuator pivoted on the pin of the crank to be carried along an orbit circumscribing the shaft; a spring biasing the actuator to a retracted position at an angle to the crank throw and at which its outer end will not reach the switch part, said outer end of the actuator being spaced from the center of the crank pin a distance which when added to the crank throw is sufficient to dispose the end of the actuator beyond its normal orbit to depress the switch part; and means for effecting swinging motion of the actuator on its pivot through a dead center position in radial alignment with the crank throw whenever the crank passes said switch part to thus momentarily effect closure of the switch.

11. In a circuit making and breaking device: the combination with a normally open switch having a part adapted to be depressed to effect closure of the switch, of means for periodically and momentarily depressing said part to effect momentary closure of the switch comprising, a driven shaft; a crank on the shaft; an actuator pivoted on the pin of the crank to be carried along an orbit circumscribing the shaft; a spring biasing the actuator to a retracted position at an angle to the crank throw and at which its outer end will not reach the switch part, said outer end of the actuator being spaced from the center of the crank pin a distance which when added to the crank throw is sufficient to dispose the end of the actuator beyond its normal orbit to depress the switch part; and stop means in the path of the outer end portion of the actuator to engage and detain the same as the actuator is carried along by the crank and thereby increase the tension on its biasing spring which upon release of the actuator from the stop means swings the actuator through a fully extended position and back to its retracted position, and said stop means being so located with relation to the depressible switch part that the swinging of the actuator to and past its fully extended position occurs when the crank arm faces the depressible switch part to thus effect momentary closure of the switch.

12. In a circuit making and breaking device: the combination with a normally open switch

having a part adapted to be depressed to effect closure of the switch, of means for periodically and momentarily depressing said part to effect momentary closure of the switch comprising, a driven shaft; a crank on the shaft; an actuator pivoted on the pin of the crank to be carried along an orbit circumscribing the shaft; a spring biasing the actuator to a retracted position at an angle to the crank throw and at which its outer end will not reach the switch part, said outer end of the actuator being spaced from the center of the crank pin a distance which when added to the crank throw is sufficient to dispose the end of the actuator beyond its normal orbit to depress the switch part; and stop means in the path of the outer end portion of the actuator to engage and detain the same as the actuator is carried along by the crank and thereby increase the tension on its biasing spring which upon release of the actuator from the stop means swings the actuator through a fully extended position and back to its retracted position, and said stop means being so located with relation to the depressible switch part that the swinging of the actuator to and past its fully extended position occurs when the crank arm faces the depressible switch part to thus effect momentary closure of the switch and said actuator being weighted to increase its inertia and thus retard its return to retracted position.

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