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MEANS FOR CAUSING ELECTRIC IMPULSES

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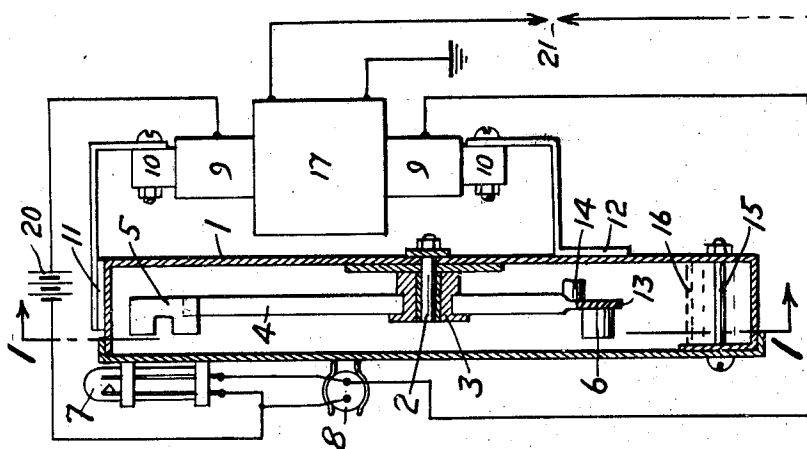


FIG. 2.

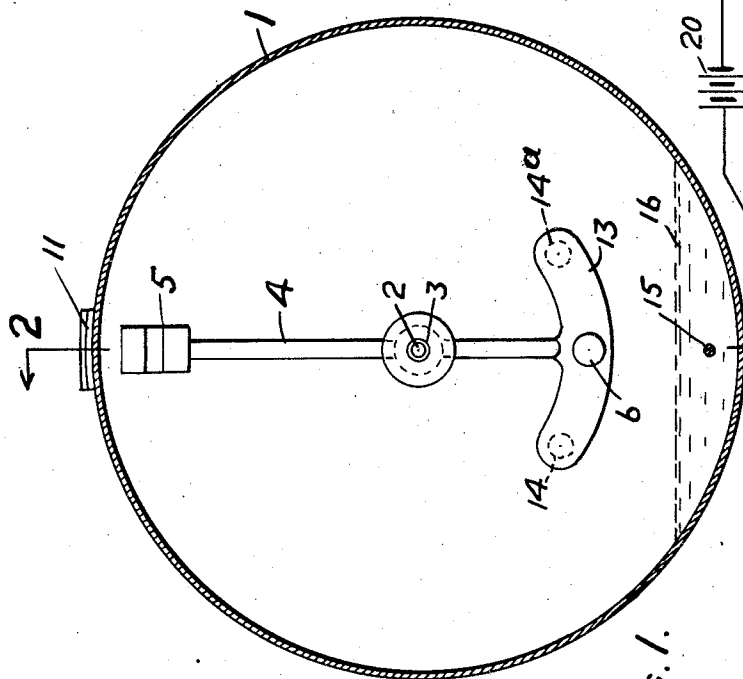


FIG. 1.

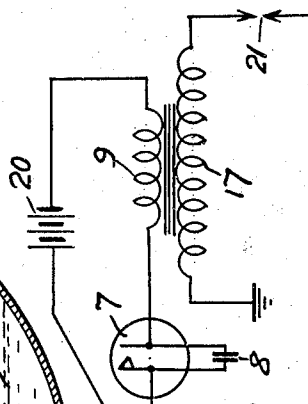


FIG. 3.

WITNESS:

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MEANS FOR CAUSING ELECTRIC IMPULSES

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Our invention comprises means for causing repeated momentary surges of electric energy. By the word surge we mean to include a rise from zero current to a maximum and back to zero in a small fraction of a second.

The object of our invention is to provide apparatus that will cause, at definite intervals, a quick short surge of electrical energy which, as the conditions may require, may be of high or low potential or both.

While our apparatus is particularly adapted for use with so-called electric fences it may be used in any other circumstances where momentary surges of electric energy are required.

One of the important requirements for electric fences is that the fence wire shall never be continuously charged even for a few seconds because, if so charged, animals or persons coming in contact with it may be injured or, in some cases, killed. One of our objects is to provide apparatus with which it is impossible to continuously charge a wire for more than a small fraction of a second.

Another object is to provide apparatus having all moving parts hermetically enclosed thereby excluding all dirt, moisture and other materials that might have a deleterious effect on them.

In the accompanying drawings, which illustrate an embodiment of our invention:

Fig. 1 is a vertical section inside a hermetically sealed case and at right angles to the axis of an oscillating pendulum like member on the line 1—1 of Fig. 2.

Fig. 2 is a vertical section through the center of the case on the line 2—2 of Fig. 1 and a side view of some parts outside of the case.

Fig. 3 is a schematic diagram of the electric circuits.

Referring to the drawings, 1 is the casing enclosing the moving parts and having attached to one side a spindle 2 supporting a hub 3 on which an oscillating member 4 is mounted. One end of this member 4 carries a permanent magnet 5 and the other end a counterweight 6 which may have a greater moment about the axis than the magnet and thus hold the magnet at the top when at rest or a lesser moment and thus allow the magnet to be at the bottom when at rest. In either case the normally lower end should be shorter than the upper end. Outside of the case close to the at-rest position of the magnet there is an electric switch 7 which is closable when a part of it is attracted by the magnet 5 but will remain open when not attracted. We prefer to have the magnet 5 at the longer end of the oscillatable member because then it will be moving faster when it passes the switch 7 and will hold it closed for a shorter time and thus cause less drain on the battery or other source of electrical energy. 8 is a condenser in parallel with the switch 7 to suppress sparking when the switch opens. 9 is the energizing coil of an electromagnet 10 having

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one pole 11 closely adjacent the at-rest position of one pole of the permanent magnet 5. The other pole 12 may be near to the path of movement of the counterweight 6 which may have attached to it a bar 13 carrying two pieces 14 and 14a of soft iron. A bumper 15 is secured in the lower part of the casing 1 in such a position that the shorter arm of the member 4 will clear it when oscillating but the longer arm will strike it and thus be stopped from continuous rotation. The lower part of the casing also contains a pool 16 of liquid into which the longer arm will dip as it approaches its lowest position.

A coil 17, having many times the number of turns contained in the energizing coil 9, is wound around the magnet 10. The coil 17 has one end grounded and the other end connected to a fence wire or other conductor to be charged. The coil 9 is adapted to be energized by a battery 20 or other source of low potential D. C. electric energy. The connections from the battery 20 to the magnetizing coil 9 are so chosen that the pole 11 of the electromagnet will have the same polarity as the nearest pole of the permanent magnet 5.

A spark gap 21 may be placed in the high potential circuit and may, if desired, be of such length that the potential caused by energizing the magnet 10 will not jump it but that caused by the quicker deenergization will jump it. Under such a condition the charge on the fence or other device will be of only the short duration of the maximum potential portion of the high potential surge.

With the permanent magnet 5 in the position shown in the drawings the switch 7 will be closed and current will flow through the coil 9 and magnetize the core 10. Because the pole 11 of the electromagnet has the same polarity as that of the adjacent pole of the permanent magnet 5 it will repel it and force it to one side of the center slightly raising the counterweight 6 and, at the same time, allowing the switch 7 to open and cease energization of the electromagnet 10 and the repulsion of the permanent magnet 5 thereby. Gravity, acting on the counterweight 6, will cause it to swing back to the center and carry the magnet 5 to its center position and reclose the switch 7. The inductive effect of the coil 9 and magnet 10 will delay the magnetic flux reaching full intensity till the magnet 5 reaches and passes its central position when the repulsion of the pole 11 will cause it to swing to the side opposite that of its first swing and allow the switch 7 to open again. With repeated swings, the amplitude of oscillation becomes greater and greater until, were it not for the liquid 16 and the stop 15 it would go past the center and begin to rotate continuously in one direction. With these it swings first one way and then the other through almost 360° of arc. By varying the depth of the liquid

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the amount of damping and, to a certain extent, the frequency of the oscillations can be regulated.

When the magnet 5 is forced to the right side of the center by the repulsion of the upper pole 11 of the electromagnet 10 the piece of iron 14a moves closer than the piece 14 to the pole 12 and is strongly attracted thereby thus increasing the force to cause oscillation and, when the magnet 5 moves to the left the iron 14 is attracted in the same manner.

Because the switch 7 is closed during only the very short interval of time that the magnet 5 is passing it, the drain on the battery 20 or other source of power is very slight and a battery will have long life. In the form illustrated the switch 7 is closed when an element formed of spring material is attracted by the magnet, and is opened by the spring element when the magnetic attraction ceases, but it will be understood that the switch could be biased by gravity acting on a weight, instead of by the spring.

What we claim and desire to protect by Letters Patent is:

1. Means for periodically opening and closing an electric circuit, comprising an oscillating member having oppositely disposed arms, a switch included in said circuit having a magnetically actuated member for closing the switch, means for opening the switch, a permanent magnet carried by one of the arms of the oscillating member, adapted to pass the switch and close the switch while passing and permit it to open after passing, an electromagnet having its windings included in said electric circuit, one pole of the electromagnet being adjacent to the pole of the permanent magnet of the same polarity, and spaced apart counterweight members of magnetic material on the other arm of the oscillating member and equally spaced from the other pole of the electromagnet when the first mentioned pole is opposite the switch.

2. Means for causing momentary electric surges, comprising an electromagnet, a source of electric energy and a normally open but magnetically closable switch in circuit with the electromagnet, an oscillatable member having its axis of oscillation displaced from the center of gravity of said member, whereby said member tends to occupy a definite position, and, at one end of said member, a permanent magnet which, when the member is in said definite position, is in operative relation with said switch, said electromagnet having a pole closely adjacent the permanent magnet pole of similar polarity when the member is in said definite position.

3. Means as defined in claim 2, in which the oscillatable member has at each side of its end opposite from the permanent magnet a magnetically attractable mass, the other pole of said electromagnet being closely adjacent the path of movement of said magnetically attractable masses and midway between their positions when the oscillatable member is in said definite position.

4. Means as defined in claim 2, in which the oscillatable member has relatively long and short end portions extending from the center of oscillation, and a volume of liquid having its level farther below the center of oscillation than the length of the shorter arm but nearer said center than the length of the longer arm.

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5. Means as defined in claim 2, in which the oscillatable member when in said definite position is generally vertical with a longer end up and a shorter end down, the permanent magnet being at the longer end, and a volume of liquid having its level farther below the center of oscillation than the length of the shorter arm but nearer said center than the length of the longer arm.

6. Means for causing momentary electric surges, comprising an hermetically sealed casing, an oscillatable member in the casing, a volume of liquid in the casing and engageable intermittently by said member in the oscillation thereof to limit such oscillation, a magnet on said member, a stationary magnet outside the casing and having a pole disposed adjacent the path of movement of one pole of said first magnet and intermediate the extremities of the oscillation thereof as determined by said liquid, one of said magnets being an electromagnet, a circuit for energizing the electromagnet to cause said poles of the magnets to have the same polarity, whereby the stationary magnet is operable to repel the other magnet, and means under control of the oscillatable member, and included in said circuit, for energizing the electromagnet when said magnets are in proximity and for deenergizing the electromagnet when the magnets are in distant relation.

7. A device for causing momentary electric surges, comprising a support, a mass including a magnet mounted for oscillation on the support with the center of gravity of the mass displaced from the support, whereby the mass tends to assume a definite position on the support, a stationary magnet adjacent to the path of movement of the first magnet when said mass is oscillated, one of said magnets being an electromagnet, a circuit for energizing the electromagnet to cause like poles of said magnets to be in opposing relation, the circuit including a control switch, and means for operating the switch to energize the electromagnet in response to proximity of the magnets and to deenergize the electromagnet in response to movement of the oscillatable magnet into distant relation to the other magnet.

8. A device as defined in claim 7, in which said switch operating means includes a magnetically attractable member disposed adjacent said like pole of the stationary magnet and adjacent the path of movement of the oscillatable magnet, said member being movable in one direction by the oscillatable magnet in passing the member, while out of contact therewith, to actuate the switch and thereby energize the electromagnet.

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