

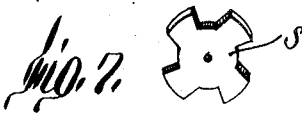
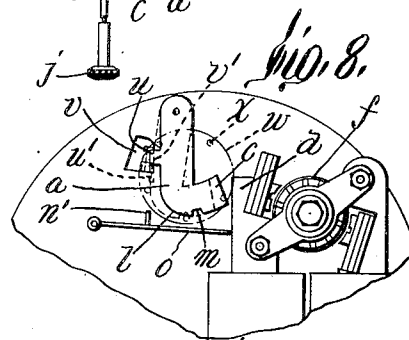
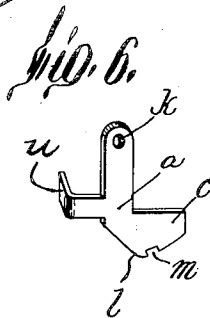
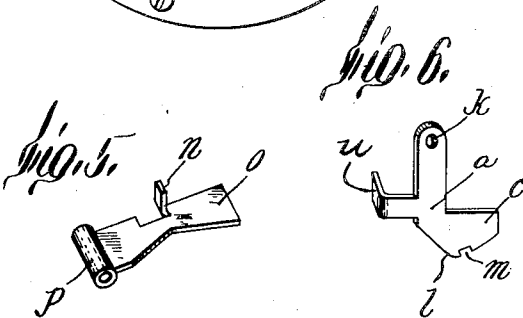
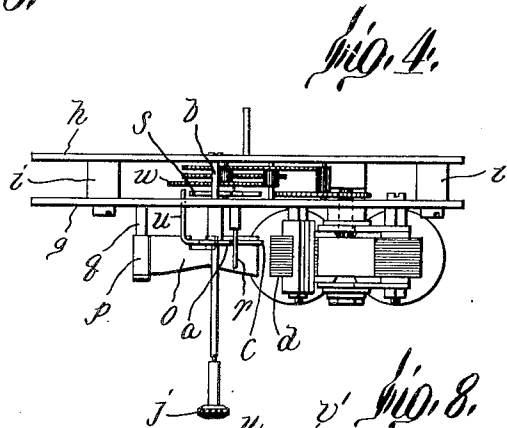
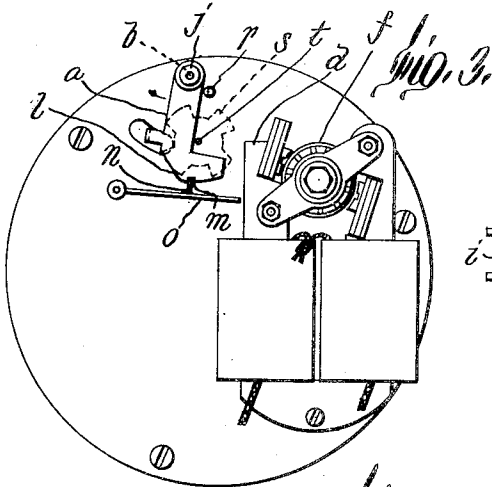
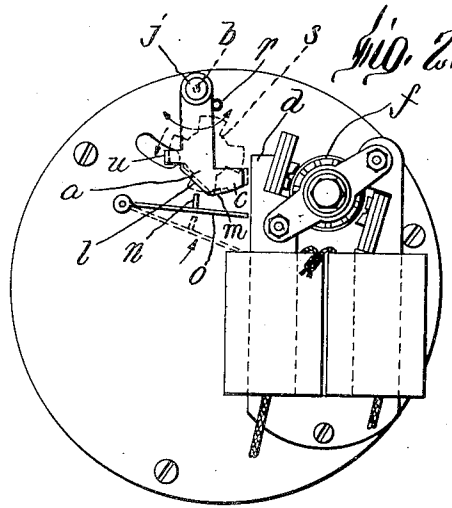
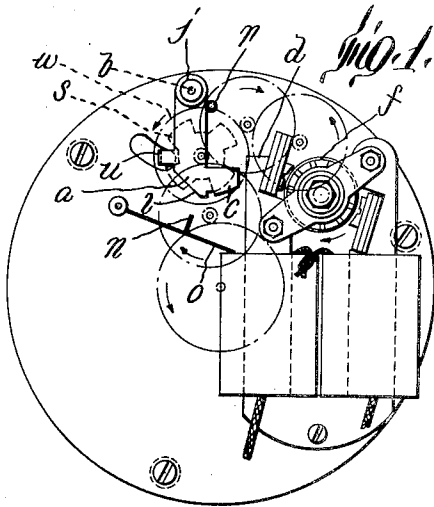
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W. H. BALZER

2,063,076

ELECTRICALLY OPERATED SIGNAL

Filed Aug. 30, 1933



Inventor
Werner H. Balzer
by Wright, Brown, Smith & Gray
Attys

UNITED STATES PATENT OFFICE

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ELECTRICALLY OPERATED SIGNAL

Werner H. Balzer, Waltham, Mass., assignor to
Waltham Watch Company, Waltham, Mass., a
corporation of Massachusetts

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11 Claims. (Cl. 53—26)

The present invention has for its object to provide a signal device adapted to perform its function by causing sound vibrations, and to be operated for that purpose when current flow is resumed through an electric circuit after an interruption. It comprises essentially a vibrator in such proximity to an electromagnet interposed in an alternating current circuit as to be vibrated by the reversals of the current, and a lock which is normally caused by the attraction of the magnet to prevent such movement of the vibrator when the current is flowing, but is caused by cessation of the current to release the vibrator so as to permit the latter to generate sound vibrations when the current flow is thereafter resumed.

One particular field of utility of this invention is in connection with electric clocks and the like for indicating audibly the necessity for resetting the time indicator of the clock after temporary stoppage has occurred by reason of an interruption of the current. Indicator devices have heretofore been used in connection with electric clocks to make a visual indication upon interruption of the current. Such devices, however, do not change their indication upon resumption of current flow after an interruption; and, as commonly made in commercial practice, are relatively inconspicuous, so that oftentimes the signal given by them is overlooked and ignored.

The desirability of a signal device of this nature with electric clocks is practically (but not necessarily) limited to clocks of the self starting type, for with those which are not self starting, the stationary position of the hands or other time indicator alone is sufficient to show that a stoppage of current has occurred, and it continues to show this fact after resumption of the current and until the motor of the clock is started by external mechanical force. But with self starting clocks the hands alone serve this purpose only so long as the current interruption continues, for the motor begins to run again as soon as the current flow is resumed, whereupon comparison with a correctly set time piece is necessary to show that the electric clock is wrong.

With these conditions in mind I have produced an indicator which, being ordinarily mounted in a concealed position, gives no sensible indication when the current is interrupted, or as long as the interruption continues, but makes its prescribed signal only when the current is flowing again after an interruption. This indicator moreover is of a character to give an audible signal which insistently calls attention to itself and reduces to

the practical minimum the liability or possibility of being overlooked or disregarded. The invention consists in the device and combinations described in the following specification, and in all equivalents thereof embodying the same principles within the scope of the appended claims.

In the drawing,—

Fig. 1 is a rear elevation of an electric clock to which is applied an indicating device embodying this invention, in operative proximity to the field magnet of the electric motor which drives the clock, and in the static condition assumed when there is no flow of current through the coils of the magnet;

Fig. 2 is a view similar to Fig. 1 but showing the signal device in operation by the effect of current flowing through the magnet winding after an interruption;

Fig. 3 is a view similar to the preceding figures showing the signal device locked out of action in the condition in which it may be put manually when current is flowing;

Fig. 4 is a plan view of the apparatus as seen from above;

Figs. 5, 6, and 7 are perspective views of details of the signal device;

Fig. 8 is a fragmentary view similar to Fig. 2 showing another form of the invention.

Like reference characters designate the same parts wherever they occur in all the figures.

In this illustration *a* represents a vibrator which is hung from a pivot *b* and has a projection *c* at one side extending toward one of the poles *d* of an electromagnet, the field coils of which are connected in circuit with a source of alternating current. In this illustration the electromagnet is the stator of an electric motor, the rotor *f* of which is adapted to drive the hands, or other time indicators, of a clock through a reducing train of pinions and gears of well known character, shown by broken circles in Fig. 1, and also shown in part by Fig. 4. The arrangement is such that when the clock is in its correct normal position and the vibrator free from restraining influences, said vibrator may hang by gravity in the position shown in Fig. 1, where it is free to swing about the pivot *b* and its lateral projection *c* is beside the end part of magnet pole *d*, out of contact with it, but at the same time near enough to be moved by the magnetic field thereof.

The magnet is mounted on the back plate *g* of a movement frame to which the front plate *h* is connected by spacing pillars *i*. The pinion and gear shafts of the reducing train are mounted in these plates. Pivot *b* is a rod journaled in plates

g and *h*, protruding rearwardly and terminating in a knob *j* adapted to be grasped and manually turned. The vibrator is conveniently made of a stamping from a sheet of iron or iron alloy, sufficiently thick to be substantially rigid, and having a hole *k* which is fitted friction tight on a portion of the pivot rod *b*. There is a notch *m* in the lower edge of the vibrator to receive a locking dog *n*. The edge of the vibrator adjacent to such notch and at the side thereof away from the magnet pole is cut away and formed with an incline at *l* for a purpose presently explained.

Such locking dog, in one form of the invention, is a finger or lug *n* partially cut out and bent up from an arm *o* of stiff sheet iron, or equivalent magnetic material, which has a hub or eye *p* at one end rotatably supported by a stud *q* which is mounted in the plate *g* and protrudes rearwardly therefrom. This arm extends toward the magnet pole *d* far enough to be within the influence of the magnetic field thereof, so that its free end may be raised thereby when the magnet is energized, and may fall away by gravity when the magnet is deenergized. The drop of the arm is limited by a stop, which in this instance is the adjacent end of the nearer field coil, but may equally well be a stop of any other character suitably located to arrest the arm with its locking projection clear of the vibrator, but its free end still near enough to the magnet pole to be raised by the magnetic attraction thereof.

An abutment *r*, which in one form of the invention is a pin set into the frame plate *g* and projecting thence across the plane of the vibrator, is provided to be engaged by the vibrator and to cause rebound of the latter. It is located at the side toward which the vibrator moves in approaching the magnet pole and at a point where it will be struck by the adjacent side edge of the vibrator before the projection *c* of the latter strikes the magnet pole; but is sufficiently yielding and resilient to be flexed by the pressure then exerted by the vibrator and to permit the projection to strike the side of the magnet pole. When the magnetic flux increases with each reversal of polarity by the alternating current, the vibrator is thus attracted and strikes the abutment first, and then the magnet pole. Then as the magnetic flux diminishes and reversal of polarity commences, the spring of the abutment, augmented by the repulsive effect of whatever residual magnetism remains in the vibrator, throws the vibrator back from the pole piece. The noise of the signal is produced by the vibrator in thus striking the abutment and magnet pole and is augmented by the rattling of the shaft *b* in its bearings. The movement takes place between approximately the position of the vibrator shown by full lines in Figs. 1 and 2, and the position in which projection *c* touches the magnet pole. The position shown by dotted lines in Fig. 2 is that where the vibrator strikes the abutment in its movement toward the magnet. By locating the abutment near the pivot point of the vibrator, substantially as shown in the drawing, the mechanical advantage due to leverage is made great enough to flex the abutment as described when the abutment is made as a short and relatively stiff pin. Thus the abutment is able to rebound swiftly and powerfully enough to serve the purpose above described. The vibrator swings in both directions with each reversal of polarity, i. e., 120 times per second when the magnet is excited by a 60 cycle current.

The signal device as thus far described oper-

ates as follows. When the magnet winding is in circuit with the source of alternating current and current is flowing under conditions of normal operation, the parts occupy the position shown in Fig. 3, wherein the lock arm is raised by the attraction of the magnet and its locking projection *n* occupies the notch *m* holding the vibrator away from the magnet and also away from the abutment *r*; for the projection and notch are so located as to be interengaged only when the vibrator is displaced away from the magnet further than its outward limit of vibration. When the current is interrupted for any reason, whether by design of the possessor of the apparatus or by failure of the current, the lock falls away, as shown in Fig. 1, leaving the vibrator free to swing toward the magnet. Then when the current is turned on after interruption, the vibrator is moved toward the pole piece *d* by magnetic attraction until arrested by the pole piece. Upon release by dropping of the lock, the vibrator may or may not be shifted by gravity action immediately toward the pole piece. But even if it should remain then in the original position, the magnetic pull when current is afterward turned on moves it toward the magnet pole enough to displace the notch from locking position before the lock arm rises far enough to engage it; both because the vibrator, owing to its mode of suspension, offers less resistance to such movement than the lock arm, and also because a much shorter displacement of the notch is sufficient for the purpose than is required of the lock in rising to enter the notch.

When current is afterwards caused to flow through the field coils of the magnet, the vibrator is operated in the manner previously described, and produces a humming or buzzing noise. The noise may be made louder or weaker by adjusting the position of the abutment to allow the vibrator a greater or less amplitude of swinging movement. Such adjustment in the present instance is obtained by bending the abutment away from or toward the vibrator, but may well be effected in other ways. The abutment here is made of brass with a massive base which is staked solidly into the plate *g*, while the part which crosses the vibrator is more slender and may be bent repeatedly back and forth through a small angle without injury.

Although the magnet also raises the lock arm at the same time, the vibrator is not locked thereby because its notch is then out of register with the projection *n*, and the amplitude of vibration is not great enough to bring it into register. The lock arm occupies the position of equilibrium between the forces of gravity and magnetic attraction, acting at right angles to each other; and the positions of its pivot, of the locking projection *n*, and the cut away side of the vibrator are located so that the projection is clear of the vibrator, or nearly enough so as not to hinder its movements. In order to stop this action of the vibrator, the operator grasps the knob *j* and turns it until notch *m* is brought into register with the projection *n*, which is first displaced by the inclined edge *l*, and then instantly enters the notch under the impulsion of the magnetic force.

The noise made by the vibrator is so insistent as to force itself on the attention of persons in the vicinity. When applied to clocks of the dimensions of desk, mantel or wall clocks, it will be heard by any one with ordinarily good hearing who is near enough to the clock to read its time indication.

In order to emphasize the indication of the signal and distinguish it more definitely from other sounds, I prefer to make it intermittent. For that purpose I have provided in the clock here illustrated, a cam disk *s* which is mounted on the shaft *t* of one of the gears of the reducing train. Such disk is provided with a series of projections and intermediate spaces which cooperate with a lug *u* projecting from the vibrator across the plane of the cam disk. The projections displace the vibrator from the magnetpole and the abutment, preventing it from making any sound, while the spaces leave the vibrator free to operate as above described. This cam may have any desired number and dimensions of projections and may be geared to run at any prescribed rate, so as to cause the vibrator to make a noise and to be silent alternately during such periods of time as may be selected. For instance, it may be caused to sound for a period of say five seconds in every fifteen. The withdrawal of the vibrator caused by the projection is not far enough to bring the locking notch *m* into register with the locking finger *n*.

An alternative form of the signal device is shown in Fig. 8 which, while differing in details from the form previously described, is identical with it in principle. In this modification the abutment pin *r* is omitted. Instead, the hole *v* in the frame plate *g*, through which the lug or finger *u* of the vibrator projects to engage the cam, is so located that its forward edge *v'* is engaged by this lug when the vibrator is brought to a position close to, but not quite in contact with, the side of the magnet pole; i. e., approximately the position shown by full lines in Fig. 8. The finger *u* is itself resilient, and is flexed, and rebounds, essentially in the manner and with the effect of the abutment pin *r*, as previously described. Also in place of the cam *s*, the third wheel *w* of the gear train is made into an equivalent cam by providing it with pins *x* protruding in the axial direction from points near its rim, which serve as cam projections to act on a tab *u'* extending from one side of the finger *u*. The locking dog *n'* is here made out of a piece of nonmagnetic metal secured to the lock arm *o* so as to rise therefrom in the same manner as the projection *n*; the use of nonmagnetic metal here is to avoid any possibility of short circuiting the magnetic flux through the vibrator and lock arm when the projection is in contact with the vibrator. Otherwise the parts shown in Fig. 8 are substantially like those shown in the other figures and are designated by the same reference characters.

In both forms of the invention here illustrated, as in equivalent embodiments, the resilient abutment (pin *r*, edge *v'* cooperating with finger *u* in Fig. 8, and the like), arranged to be struck by the vibrator before the latter strikes the magnet pole, is important and valuable as a means to prevent so-called "freezing" of the vibrator to the magnet; i. e., permanent retention of the vibrator against the magnet pole. It assures withdrawal of the vibrator from the magnet with each reversal of polarity, thereby assuring that the desired noise will be produced.

In these illustrations, the vibrator and lock arm are so arranged that the action of gravity is either usefully effective or innocuous. That is, the weight of the lock arm is utilized to release it from the vibrator, while the latter is arranged so that gravity offers the least possible resistance to its operation. However, it is within my contemplation to mount the parts in other rela-

tionships with springs applied to exert force equivalent to gravity, or to counteract the force of gravity. But even without the employment of springs, a considerable angular variation with respect to the center of the frame plates is possible with the arrangement of parts otherwise exactly the same as shown here, without prevention or derangement of the operation in the manner described.

The details of purpose, construction and function are illustrative of the principles of the invention rather than limiting as to the scope of protection which I claim. All substantial equivalents of this specific disclosure, applied to any of the uses for which they are capable, are intended to be within such protection.

What I claim and desire to secure by Letters Patent is:

1. A signal comprising the combination of an electromagnet, a vibrator mounted so near to one of the poles of said magnet as to be vibrated in response to the changes of polarity when free thus to vibrate and said magnet is energized by an alternating current, an abutment arranged to be engaged by the vibrator, in swinging toward the magnetpole, at a point short of contact with said pole, and a lock attracted by the energized magnet to hold the vibrator in a withdrawn position from said pole, but being made inoperative when the magnet becomes dead and then leaving the vibrator free to be so vibrated upon resumption of current flow after an interruption.

2. An electric signal comprising an electromagnet adapted to be energized by an alternating current, a pivoted vibrator adapted to occupy a position under the influence of gravity where its swinging part is near enough to one of the magnet poles to be attracted thereby when the magnet is energized, an abutment in the path of the vibrator at a point where it is engaged by the vibrator when approaching the magnet pole under magnetic attraction, and causes rebound of the vibrator when the magnetic flux subsides in the magnet pole, and a lock attracted by the energized magnet, organized normally to prevent such approach of the vibrator, but being made inoperative when the magnet is de-energized by interruption of current, thus leaving the vibrator free to approach the magnet pole when current flow is resumed.

3. An electric signal designed to effect an indication upon resumption of current flow after an interruption in such flow which comprises an electromagnet adapted to be energized by alternating current, a signal-causing member operable by the alternating flux of said magnet, and a lock for said signal-causing member influenced by the flux of said magnet to hold the signal-causing member out of action when current is normally flowing through the field coil of the magnet, said lock being rendered inoperative when the current flow ceases, and then leaving the signal-causing member in condition to be operated by the flux of the magnet when current flow is resumed.

4. An electric signal comprising an electromagnet adapted to be energized by alternating current, a vibrator operable by the reversing magnetic flux of a pole of said magnet to produce a sound signal, and a lock engageable with said vibrator to hold the latter out of action and being maintained in its locking position by the attraction of the magnet when the latter is energized; said lock being released from the vibrator when the magnet-exciting current fails, thereby leav-

ing the vibrator free to give its signal indication when the magnet is again excited by resumption of current flow.

5. An electric signal comprising an electromagnet adapted to be excited by alternating current, a vibrator having its movable portion adjacent to a pole of said magnet to be vibrated thereby when free to move, a lock adapted to be held by attraction of said magnet pole in connection with said vibrator to hold the latter from movement in a position withdrawn from the magnet pole, said lock being yieldingly impelled to release the vibrator when the magnet is deenergized and being so positioned relatively to the vibrator and magnet pole that it permits useful vibration of the vibrator when the magnet is thereafter energized.

6. An electric signal comprising an electromagnet adapted to be excited by alternating current, a vibrator having its movable portion adjacent to a pole of said magnet to be vibrated thereby when free to move, a lock adapted to be held by attraction of said magnet pole in connection with said vibrator to hold the latter from movement in a position withdrawn from the magnet pole, said lock being yieldingly impelled to release the vibrator when the magnet is deenergized, and the vibrator having means to prevent entrance of said lock into interlocking connection therewith when the lock is attracted by the re-energized magnet pole.

7. An electric signal comprising an electromagnet adapted to be excited by alternating current, a pivoted vibrator adapted to hang from its pivot with its moving portion in position to be attracted and vibrated by a pole of the magnet when the latter is active, a lock having a projection and the vibrator having an abutment to interlock with said projection when the vibrator is shifted aside from its normal gravity-pendent position and the lock is raised from a lowered position, the lock being held in its said raised position by attraction of the magnet and being adapted to fall from such position when the magnet is deenergized; the said vibrator abutment being out of register with the lock projection when the vibrator is thereafter influenced by the re-energized magnet.

8. An electric signal comprising an electromagnet adapted to be excited by alternating current, a sound producing vibrator in position adjacent to a pole of said magnet for actuation by the reversing magnetic flux thereof, a lock movable toward and away from said vibrator and arranged to be drawn toward the latter by the attraction of the magnet and to be moved away when the

magnet is de-energized, said vibrator having a portion adapted to be interlocked with said lock only when the vibrator is placed in a definite position withdrawn from its position of proximity to the magnet pole wherein it is held when released from the lock.

9. An electric signal apparatus for indicating resumption flow of electric current after interruption thereof which comprises an electromagnet excitable by alternating current, a signal causing member under the influence of a pole of said magnet and adapted to be moved thereby when the magnet is excited, a lock adapted to be interlocked with the signal causing member when the latter is withdrawn from the magnet pole and being held so interlocked by the attraction of the magnet, said lock being organized to release the signal causing member when such attraction fails, and the said member being shiftable out of its interlocking relationship with the lock by the attraction of said magnet pole when the magnetic is re-energized by resumption of current flow after interruption.

10. In an electric time piece, a self starting synchronous electric motor having a field magnet excited by alternating current, and means for giving a signal when current flow through the field winding of the motor is resumed after interruption which comprises a signal member operable by a pole of the field magnet when the latter is energized, and a lock under the attraction of the magnet arranged to hold said signal member out of action when the magnet is energized in normal course, the lock being releasable when the magnet becomes dead upon failure of current and the signal member being thereafter placed out of locking relationship to said lock and being actuated to give a signal when the magnet is re-energized by resumption of current flow.

11. An electric signal comprising an electromagnet adapted to be energized by alternating current, a vibrator mounted adjacent to a pole of said magnet in position to be moved back and forth by the reversing magnetic flux in such pole, means whereby the vibrator in its movements produces a sound, and a lock engageable with the vibrator to withhold the latter from movement and being maintained in its locking position by the attraction of the magnet when the latter is energized, said lock being released from the vibrator when the magnet-exciting current fails, thereby leaving the vibrator free to move when the magnet is again excited by resumption of current flow.

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