Jan. 1, 1946. S. HURWITZ 2,391,974

ELECTRO SIGNAL WARNING DEVICE

Filed Feb. 1, 1943

Fig. 1.

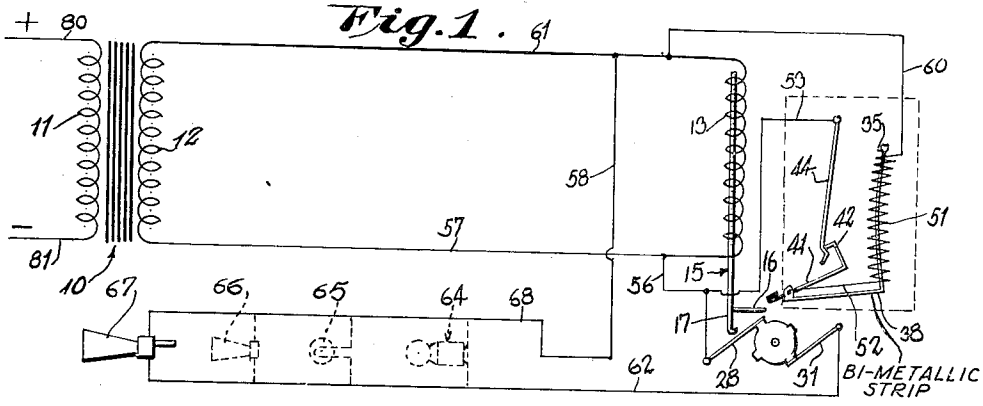


Fig. 2.

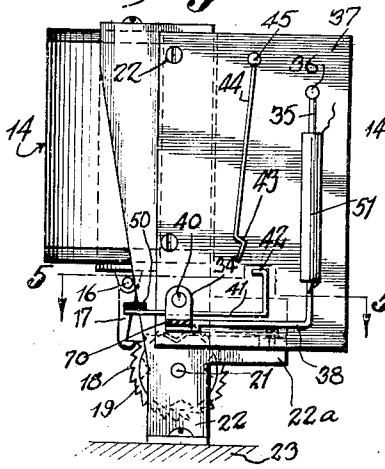


Fig. 3.

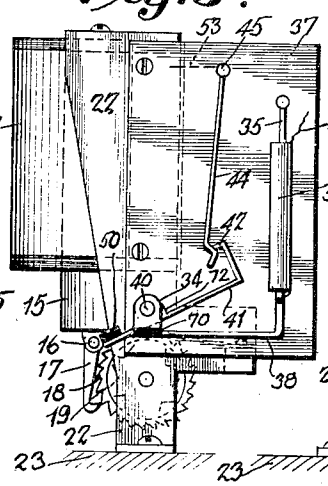


Fig. 4.

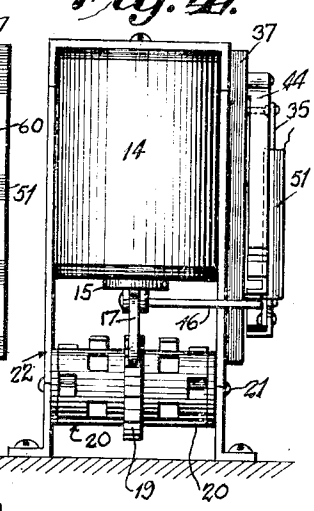


Fig. 5.

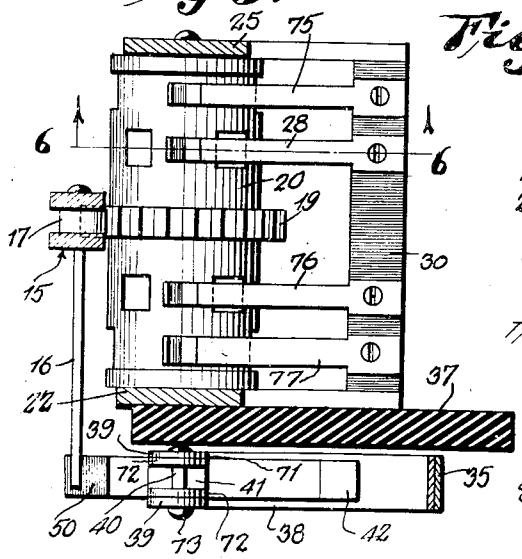
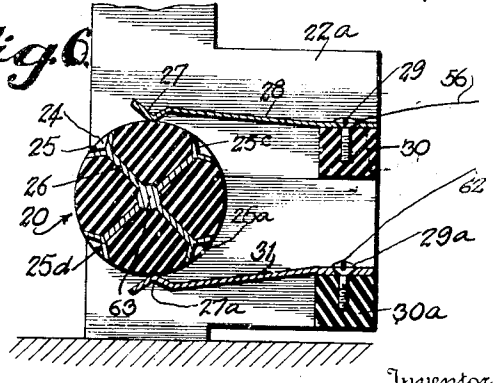


Fig. 6.



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ELECTROSIGNAL WARNING DEVICE

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Application February 1, 1943, Serial No. 474,350

8 Claims. (Cl. 175—375)

This invention relates to a signal warning device.

An object of this invention is the provision of a warning device, which may or may not employ a transformer for reducing the higher voltage of a line for actuating a solenoid, which controls a switch periodically, the current in turn being controlled by a thermostatic strip, which is heated by a resistance wire incorporated in a circuit which is shunted around the solenoid.

Another object of the invention is the provision of a warning device having a solenoid type drum switch and a thermostatic time switch which are used to operate a signal, buzzer, bell, horn, light, siren, or any other electric or pneumatic signal, or a combination of any of these various elements, in which the current to the solenoid is controlled by a shunted circuit, which includes a resistance coil for heating a bi-metallic strip, forming an element of the thermostatic switch.

A further object of the invention is the provision of a warning device in which any type of signal may be put into operation by a plurality of means which are directly connected to the power source with or without the use of a transformer, a drum switch being operated when the current to the solenoid has been temporarily interrupted.

This invention will be best understood from a consideration of the following detailed description, in view of the accompanying drawing forming a part of the specification; nevertheless, it is to be understood that the invention is not confined to the disclosure, being susceptible of such changes and modifications as define no material departure from the salient features of the invention as expressed in the appended claims.

In the drawing:

Fig. 1 shows more or less diagrammatically an electric circuit showing the elements of the warning device.

Fig. 2 is a side view of a unit, including the solenoid, a drum switch operated thereby, and a second switch controlled by a thermostatic element with the circuit to the resistance coil being broken.

Fig. 3 is a similar view of the same unit, showing certain parts in position for closing the circuit to the resistance coil.

Fig. 4 is an end view of the unit shown in Fig. 2.

Fig. 5 is a horizontal section taken along the line 5—5 of Fig. 2.

Fig. 6 is a fragmentary vertical section taken along the line of 6—6 of Fig. 5.

Referring more particularly to the drawing 10 generally designates a transformer which has its primary coil 11 in circuit with the usual house current or power line. The secondary coil 12 of said transformer is in circuit with a coil 13 of a solenoid, generally designated by the numeral 14.

The solenoid is provided with an armature 15, which has a laterally projecting pin 16 for a purpose which will be presently explained. A ratchet 17 is pivotally connected with the armature and is adapted to engage the teeth 18 of a ratchet wheel 19.

This ratchet wheel, as shown in Figs. 4 and 5, is formed on the central portion of a drum 20, carried by an axle 21, which has its ends supported by a U shaped bracket 22, which in turn is mounted on a base member 23. The drum is located between the legs of the bracket.

Said drum, as shown more directly in Figs. 5 and 6, is provided with circumferentially arranged depressions 24 in which are mounted V shaped metallic contacts 25 and 25a, shown at 26. Any number of these depressions are located in spaced relation on the drum which is formed of insulating material. When this drum is rotated by the ratchet 17 and the ratchet wheel 19, the free end 27 of a spring contact 28, which is secured at 29 to an insulated block 30, will automatically engage the contacts 25 and the outer surface of the drum 20. It will be noted from Fig. 1 that a pair of spring contacts 28 and 31 are located at opposite sides of the drum so that the free ends of these contacts will engage diametrically disposed contacts 25 and 25a, for closing the circuit to a warning signal. The spring arm 31 has a V shaped free end 27a which engages the contact 25a, and this spring arm is secured to an insulated block 30a by means of a screw or bolt 29a.

On the other hand, spring arms 28 and 31 may be arranged in pairs, and secured to the block 30, for closing the circuits to any number of warning signals or a combination of the signals.

Bi-metallic strip 35 is secured at 36 to a board 37, which is formed of insulating material, and this board, as shown in Fig. 4, is connected to one leg of the U shaped bracket 22. The strip is provided with a lateral extension 38, which projects toward the ratchet 17, but spaced therefrom as shown in Fig. 4. A pair of ears 39 carry a pintle 40 on which is mounted a switch arm 41. Said switch arm is insulated from the lateral extension 38 for a purpose which will be presently explained. The switch arm is provided with an upward hook 42, which engages a bent portion 43

at the lower end of a spring arm 44, which is secured at 45 to the board 37. The hook 42, as shown in Fig. 3, is adapted to engage over the bent portion 43 for retaining the switch arm in an elevated position.

The pin 16 extending from the solenoid of the armature 15 is adapted to engage an insulating member 50, which is secured to the outer end of the switch arm 41, so that when the armature is lowered as shown in Fig. 3 said pin will press downwardly on the insulating member 50 and cause the switch arm 41 to be tilted to its operative position, as shown in Fig. 3.

The bi-metallic strip 35 is wrapped with asbestos, and a resistance coil 51 is wrapped around the asbestos, and further asbestos encloses the resistance wire.

One end of this wire is connected by a wire 52 to the switch arm 41, and the circuit at this point is completed through the switch arm, the spring arm 44, a wire 53, and a wire 56. The wire 56 is connected to a wire 57, which joins one end of the secondary coil 12 and the coil 13 of the solenoid.

A wire 60 is connected with a wire 61 which joins it to the ends of the secondary coil 12 and the coil 13. The wire 60 is then connected from the other side of secondary coil 12 to the other end of the resistance coil 51. It will be seen by this construction that the current to the coil 13 will be at times shunted through the resistance coil 51 for a purpose which will be presently explained.

A wire 58 connects the wire 68 with the wire 61, so that the circuit to any of the signals is completed through the wires 61, 58, 62, the contact arms 31 and 28, the diametrically disposed contacts 25 and 25a on the drum 20, and the wires 56 and 57.

It will be noted from Figs. 2, 3 and 5, that an insulating block 70 is secured to the end of the lateral extension 38 of the bi-metallic strip 35, and upon this insulating block is mounted a U shaped member, generally designated by the numeral 71 carrying the ears 39. The pin 40 supports a pair of ears 72, which are formed integrally with the switch contact arm 41. Thus it will be seen that the member 41 is insulated from arm 38 of the bi-metallic strip 35 so that the wire 52, which extends from the resistance unit 51, must carry the current through the arm 41 only to the spring contact arm 44.

As shown in Fig. 5, plurality of spring arms 75, 76 and 77, is shown in parallel relation with arm 28. Other arms located below the last mentioned arms are shown in a position corresponding to the spring arm 31 in Fig. 6, so that there is a pair of arms in vertical alignment operating on the surface of the drum 20. In other words, a number of pairs of spring arms are employed, and these may be connected by wires to various types of signals, for operating a number of signals simultaneously, or for operating only one signal at a time. In this case a switch is connected in the circuit to the various pairs of arms for cutting out any of the pairs when desired. On the other hand, where it is desired to provide a more frequent operation of signals two pairs of arms may be employed for the purpose.

The operation of my device is as follows:

When current is passing through the power line represented by the wires 80 and 81 the secondary coil 12 of the transformer will be energized for reducing the current to the solenoid 13 and the resistance unit 51. When the current flows through the coil of the solenoid the armature 15 is raised, as shown in Fig. 2, the ratchet 17 will cause an angular rotation of the drum 20, through forty five degrees so that the members 27 and 27a will move from the contacts 25 and 25a (Fig. 6), to the insulating material of the drum 20. At the next rotation of forty five degrees of the drum the members 27 and 27a will fall into the contacts 25c and 25d.

It is to be borne in mind that when the current is on and flowing through the coil of the solenoid 13 the armature 15 will be raised, while, on the other hand, when the current is cut off by an interruption of the current, the armature will drop and the pin 16 will strike the pad 50 of the arm 41 and move the contacts 41 and 42 into operative relation. However, if the armature drops before the bimetallic strip has moved, its free end carrying the lever 41 away from the position shown in Fig. 2, the pin 16 will rest upon the pad 50 and the pawl will be in a raised position and will not be in a position to engage the teeth 18 of the ratchet 19 so that when the armature is again raised by current flowing through the coil 13, the drum 20 will not be revolved.

When the current flows again through the shunted circuit and the resistance unit 51, for a definite period, said unit will heat the bi-metallic strip 35 sufficiently to cause the arm 38 of the strip to bend downwardly (Fig. 1), and thus move the contact 42 away from the contact arm 44, so that the members 41 and 42 will fall to the position shown in Fig. 2. At this time, the current to the resistance unit 51 is then interrupted. If the current is interrupted at this time to the coil 13 the armature will drop carrying the pin 16 and the pawl 17, downwardly so that when the pin strikes the pad 50 it will rock the member 41, causing the contact 42 to be hooked over the contact 41 and the pad will then be in such a position that the pin 16 will clear the pad as shown in Fig. 3, provided that the current is interrupted to the coil 13 before the bimetallic strip has cooled sufficiently to place the member 41 in the position shown in Fig. 2. When the current is again turned on and flows through the coil 13 the solenoid 15 and the ratchet 17 will be raised, thereby rotating the drum 20 and causing the members 27 and 27a to engage respectively the contacts 25 and 25a, thereby closing the circuit to one or more signals as indicated by the numerals 64 to 67 inclusive.

The pin 16 on the armature 15 plays an important part in the closing of the shunted circuit. As previously explained the armature 15 drops when the current to the coil of the solenoid is cut off. When the armature moves downwardly the pin 16 is likewise carried downwardly and engages the insulating block or pad 50, thereby forcing the short end of the arm 41 downwardly, while the opposite end, carrying the contact member 42, is moved upwardly to the position shown in Fig. 3, thereby closing the shunted circuit to the resistance unit 51. Unless the member 41 and its attached pad 50 are in the proper position the pin will merely rest on the pad and the arm and ratchet 17 will be in an inoperative position with respect to the ratchet wheel 19. On the other hand the other end, after the bi-metallic strip 38 has been heated and has moved its free end downwardly, carrying with it the switch arm 41, and the current to the coil 13 has been cut off the armature 15 will drop, whence the pin 16 will clear the pad and the ratchet 17 will

be completely lowered and will be in position to engage the teeth of the ratchet wheel 19.

With the spring contacts 28 and 31 engaging the insulated portions of the drum 20 no signals will be sounded even though the current is passing through the coil 13 and through the shunted circuit including the resistance 51. If the current to the coil 13 is intentionally or accidentally interrupted, the armature will fall and after the parts are in the position shown in Fig. 2, the armature will drop and the pin will rest on the pad 50. When the current is again resumed the armature will be raised. Upon a second interruption within a predetermined time the armature will drop and the pin 16 will clear the pad 50. The bi-metallic strip is so constructed that it will break the shunted circuit at regular time intervals and it is within one of these time intervals that the second interruption must be made after the first interruption to the coil 13 in order that the armature will fall to its lowest limit. On the third interruption of the current to the coil 13 within the proper time interval the armature will fall completely so that when the current again passes through the coil 13 the armature will be raised and the pawl 17 being in engagement with the teeth 18 of the ratchet wheel 19 will revolve the drum 20 and move the contacts 25 and 25*a* out of engagement with the respective contacts 27 and 27*a*, thereby cutting off the signal.

The timing of the signals is controlled by the resistance in ohms of the wire 51, and the resistance to torsion by the bi-metallic strip 35. Therefore, the capacities of these two elements determine the periods at which the signals are operated.

This device was developed for a warning signal controlled from a central station by the interruption of the current at given time periods. The opening and closing of the main circuit represented by the wires 80 and 81 will not ordinarily set the mechanism in operation. If the armature 15 and ratchet 17 are dropped to their lowest positions shown in Fig. 3 by the opening of the circuit and the contacts 27 and 27*a* will engage the insulating material and no current would pass to the signals.

Again, if the current is on with the armature up as shown in Fig. 2, the armature when dropped by the cessation of the current would not fall completely because the pin 16 would rest on the pad 50 and retain the armature in an upper position although the contact 42 would engage contact 44.

In each of the above examples it would be necessary to energize the solenoid a second time in order to operate the signals within a predetermined period.

If the bi-metallic strip 38 is so formed that it will open the shunted circuit every thirty seconds, then the signals will remain in operation during the closed periods of said circuit and when current is supplied to the coil 13. If during this time the current is interrupted to coil 13 and the armature seats the pin 16 on pad 50, closing the switch 42—44 then upon resumption of the current, the signal will be operated until the heated strip 38 opens the shunted circuit through the switch 42—44. It must be borne in mind that at this time the ratchet does not operate the drum 20.

Each time that the strip 38 cools it moves the pad and lever to the position shown in Fig. 2, and as has been explained above it will be necessary to interrupt the current to winding 13 twice before the signals are set in operation. The time interval between the interruptions must be a predetermined number of seconds, that is, the number of seconds required to heat the strip 38 sufficiently to open the switch 42—44.

It will be appreciated that any number of signal lights may be operated consecutively with or without the audible signals.

I claim:

1. A signal operating device comprising a solenoid having an armature, a source of current connected with the solenoid winding, a branch circuit shunted around the solenoid winding and including a resistance unit and a switch, a thermostatic strip associated with the resistance unit, a movable contact arm pivoted on the strip and forming part of the switch, a contact included in the shunted circuit and engaged by one end of the contact arm, said strip when heated moving the contact arm away from the contact, for cutting off the current to the branch circuit; a pin on the armature adapted to engage the other end of the contact arm and move said arm to a position to engage the contact when the current to the solenoid winding has been interrupted for releasing the armature, a revolving switch having spaced, connected contacts, and a pair of spring contact arms engaging the spaced contacts, and cooperating means on the revolving switch and armature for causing step-by-step rotation of the revolving switch.

2. A signal operating device comprising a solenoid having an armature, a source of current connected with the solenoid winding, a branch circuit shunted around the solenoid winding and including a resistance unit and a switch, a thermostatic strip associated with the resistance unit, a movable contact arm pivoted on the strip and forming part of the switch, a contact included in the shunted circuit and engaged by one end of the contact arm, said strip when heated moving the contact arm away from the contact, for cutting off the current to the branch circuit; a pin on the armature adapted to engage the other end of the contact arm and move said arm to a position to engage the contact when the current to the solenoid winding has been interrupted for releasing the armature, a revolving switch having spaced, connected contacts, and a pair of spring contact arms engaging the spaced contacts for closing said circuit to the alarm, a ratchet on the rotatable switch and a pawl on the armature engaging the ratchet for causing step-by-step rotation of said switch when the armature is reciprocated.

3. A signal operating device comprising a solenoid having an armature, a source of current connected with the solenoid winding, a branch circuit shunted around the solenoid winding and including a resistance unit and a switch, a thermostatic strip associated with the resistance unit, a movable contact arm pivoted on the strip and forming part of the switch, a contact included in the shunted circuit and engaged by one end of the contact arm, said strip when heated moving the contact arm away from the contact to open the branch circuit, a pin on the armature adapted to engage the other end of the contact arm and move said arm to a position to engage the contact when the current to the solenoid winding has been interrupted for releasing the armature, a drum formed of insulating material and having diametrically disposed and connected contacts, and a pair of spring contact arms

adapted to engage alternately the contacts or the insulating material for aiding in closing or opening said circuit, and cooperating means on the drum and armature, causing step-by-step rotation of said drum when the armature is reciprocated.

4. A signal operating device comprising a solenoid having an armature, a source of current connected with the solenoid winding, a branch circuit shunted around the solenoid winding and including a resistance unit and a switch, a thermostatic strip associated with the resistance unit, a movable contact arm pivoted on the strip and forming part of the switch, a contact included in the shunted circuit and engaged by one end of the contact arm, said strip when heated moving the contact arm away from the contact to open the branch circuit, a pin on the armature adapted to engage the other end of the contact arm and move said arm to a position to engage the contact when the current to the solenoid winding has been interrupted for releasing the armature, a drum formed of insulating material and having diametrically disposed and connected contacts, said contacts being spaced 90° apart, and a pair of spring contact arms adapted to engage alternately the contacts or the insulating material for aiding in opening said circuit, and cooperating means on the drum and armature, causing step-by-step rotation of said drum 45° when the armature is reciprocated.

5. A signal operating device comprising a solenoid having an armature, a power line circuit including the coil of the solenoid, a branch circuit of the first circuit shunted around the solenoid winding and including a resistance unit and a switch, a thermostatic strip associated with the resistance unit, a movable contact arm pivoted on the strip and forming part of the switch, a contact included in the shunted circuit and engaged by one end of the contact arm, said strip when heated moving the contact arm away from the contact to open the branch circuit, a pin on the armature adapted to engage the other end of the contact arm and move said arm to a position to engage the contact when the current to the solenoid winding has been interrupted for releasing the armature, a revolving switch having spaced, connected contacts, and a pair of spring contact arms engaging the spaced contacts for closing a circuit, and cooperating means on the revolving switch and armature for causing step-by-step rotation of the revolving switch.

6. A signal operating device comprising a solenoid having an armature, a source of current connected with the solenoid winding, a branch circuit of the first circuit shunted around the solenoid winding and including an insulated resistance coil, and a switch, a bi-metallic strip received by the resistance coil, a movable contact arm pivoted on the strip and forming part of the switch, a contact included in the shunted circuit and engaged by one end of the contact arm, said strip when heated moving the contact arm away from the contact to open the branch circuit, a pin on the armature adapted to engage the other end of the contact arm and move said arm to a position to engage the contact when the current to the solenoid winding has been interrupted for releasing the armature, a revolving switch having spaced, connected contacts, and a pair of spring contact arms engaging the spaced contacts closing a circuit, and cooperating means on the revolving switch and armature for causing step-by-step rotation of the revolving switch when said armature is reciprocated.

7. A signal operating device comprising a solenoid having an armature and its coil in a power line circuit for energizing the coil to raise the armature, a branch circuit shunted around the coil and including a resistance coil and a switch, a thermostatic strip associated with the resistance coil and adapted to operate the switch to open the shunted circuit for a predetermined period, a pin on the armature engageable with the switch to close the same, said strip fully closing the shunted circuit when sufficiently cool, a rotatable drum having connected contacts thereon and spring contacts engageable with the contacts, and cooperating means on the drum and armature for rotating said drum step-by-step when the solenoid is energized, said drum having insulated portions engaged by the spring contacts in alternation with the contacts.

8. A signal operating device comprising a magnetic means connected to a circuit, a drum formed of insulating material, and having pairs of spaced connected contacts, spring contacts adapted to engage a pair of the contacts and the insulating material in alternation, means operated by the energized magnetic means for causing rotation of the drum step-by-step, a branch circuit shunted around the magnetic means and including a resistance unit and a thermostatically operated switch, a bi-metallic element associated with the unit so that when the strip is heated thereby said strip will open the switch and means actuated by the means operated by magnetic means for moving the switch towards closing position, the shunted circuit being fully closed when the strip has cooled sufficiently.

SAM HURWITZ.