July 16, 1957 J. ELLENBERGER 2,799,786

INTERMITTENT LIGHT SIGNAL

Filed March 15, 1954

FIG. 3

FIG. 4

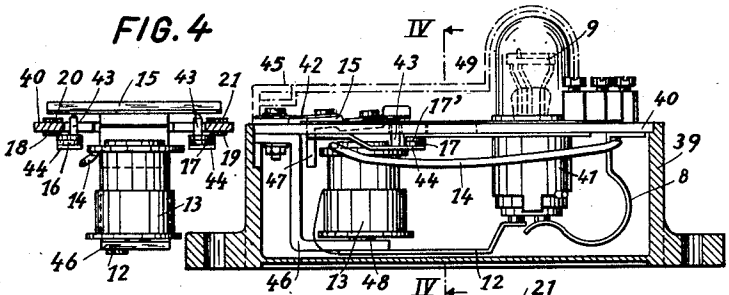


FIG. 5

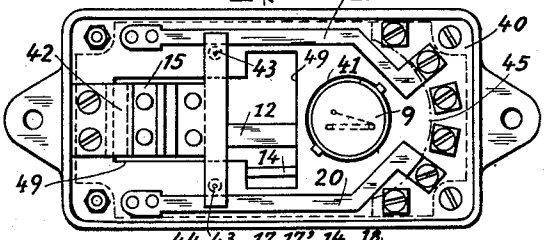


FIG. 6

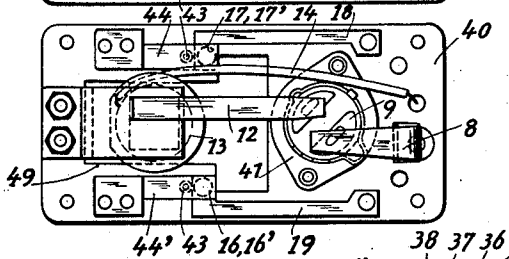


FIG. 1

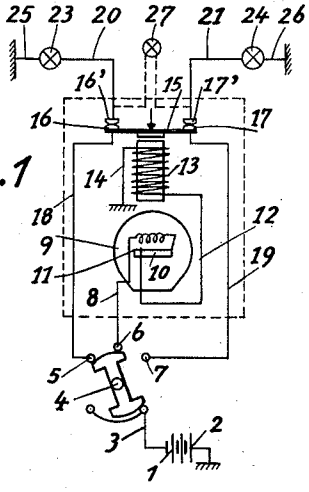
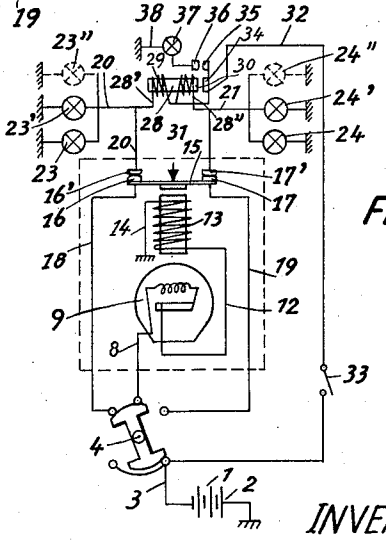


FIG. 2



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INTERMITTENT LIGHT SIGNAL

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8 Claims. (Cl. 307—132)

The present invention relates to an apparatus for producing intermittent changes in an electric circuit, and more particularly it relates to an apparatus for producing intermittent light signals to be used especially as directional signals for motor vehicles.

Devices of this kind as previously known usually are controlled by an intermittently acting circuit breaker or interrupter which preferably consists of a heated bimetal strip. Usually, these devices are provided with only one circuit both for controlling the circuit and heating the bimetal strip, so that, if applied as a blinker for an automobile, the signal bulbs lie within the heating circuit of the bimetal strip, and irregularities in the operation of the bulbs or the control mechanism are thus transferred from one part of the device to the other.

It is the object of the present invention to overcome these disadvantages of the prior art by providing several independent circuits, and by providing the circuit which is controlled by the intermittently acting circuit breaker with a relay for opening and closing the other circuits which are independent of the circuit of the circuit breaker. The provision of a relay according to the invention has the additional advantage that the time required for making and breaking the connection may be affected, for example, by a simple change of the armature gap.

Another feature of the invention as applied particularly to directional signals for motor vehicles consists in providing the relay armature with separate contacts for each of the circuits to be controlled. These contacts are preferably designed so as to cooperate with other, relatively stationary, contacts to control the various circuits. Another feature of the invention consists in bridging these stationary contacts by means of a signal light, so that the proper operation of the blinker system can be checked at all times. Another feature of the invention consists in providing such a relay to give audible knocking signals so as to call the driver's attention to the fact that the blinker is switched on and in operation.

A further feature of the invention consists in bridging the stationary contacts of the main relay by a differential relay, the coil center of which is connected to the respective battery terminal which controls the main relay. A signal light may also be provided in the armature circuit of the differential relay so as to call the driver's attention immediately whenever a failure or defect occurs in the mechanism. As an additional feature, a suitable throw switch may be provided for connecting one or the other of the relay contacts to the current provided by the battery.

According to one preferred embodiment of the invention, the solenoid of the main relay may be arranged below a suitable supporting plate, whereas the armature thereof may be resiliently mounted on such plate at the upper surface thereof. The contacts and those cooperating therewith are preferably mounted below such plate and controlled by the armature by means of pins passing through the plate. A bimetal circuit breaker which has been found especially suitable for the purpose of the invention consists of a bimetal strip which is enclosed in an evacuated tube or a tube filled with an inert gas, and which is heated directly, thus lying outside of the blinker light circuits.

These as well as other objects, features, and advantages

of the present invention will appear in detail from the following description and the accompanying drawings, in which—

Fig. 1 shows a wiring diagram of a simplified apparatus according to the invention;

Fig. 2 shows a wiring diagram of an apparatus according to the invention provided with a differential relay;

Fig. 3 is a longitudinal section through an apparatus according to a preferred embodiment of the invention;

Fig. 4 is a section taken along line IV—IV of Fig. 3;

Fig. 5 is a top view of the apparatus shown in Fig. 3; while

Fig. 6 is a bottom view of the base plate shown in Fig. 3.

In the drawings, the numeral **1** indicates the source of current, the negative pole **2** of which is grounded, while its positive terminal is connected by a conductor **3** to the throw switch **4**. This switch has contacts **5**, **6**, and **7**, the contact **6** of which is connected in any position of the switch to the conductor **3** and thus to the positive terminal of the battery **1**. Contact **6** is connected by a conductor **8** to the bimetallic circuit breaker or interrupter **9** which may be of a known design and in which the current is interrupted at **11** by the bimetal strip **10**. From the contact **11** the conductor **12** leads to the relay **13** and is grounded at **14**. The relay armature **15** carries the two contacts **16** and **17**, the first of which is connected by the conductor **18** to the contact **5** of the throw switch **4**, while the contact **17** is connected by the conductor **19** to the contact **7** of the switch **4**. The contacts **16** and **17** cooperate with the contacts **16'** and **17'**, respectively, which, in turn, are connected by conductors **20** and **21** with the blinker bulbs **23** and **24**, respectively, which are grounded at **25** and **26**, respectively. The two contacts **18** and **19** are bridged by the signal light **27**.

The new blinker system operates as follows:

In the position shown in Fig. 1, the contacts **5** and **6** are connected with the positive terminal of the battery **1** so that the current flows to the bimetal strip **10** which thus opens and closes intermittently, thereby also intermittently opening and closing the armature **15**. Since only the contact **16** of the armature **15** is connected with the battery, while the conductor **19** is interrupted at **7**, the bulb **23** lights up in accordance with the intermittent movement of the armature **15**. Thus, as easily seen, the current then flows in such circuit independently of the current passing through the bimetal strip **10**. Simultaneously, the current also flows through the signal bulb **27**, the other side of which is grounded through the conductor **21** and the bulb **24**. Thus, the signal light **27** also lights up intermittently in the same rhythm as the bulb **23**.

A modification of the invention is shown in Fig. 2, in which in place of the bulbs **23** and **24**, as shown in Fig. 1, a larger number of bulbs **23**, **23'**, **23''**, and **24**, **24'**, and **24''** are provided. The primary difference between the two systems, however, consists in the two contacts **16'** and **17'** being bridged by a differential relay **28** by means of branch conductors **28'** and **28''**. This differential relay **28** has two coils **29** and **30**, the center **31** of which is connected by a conductor **32** to the positive terminal of the battery **1**. The conductor **32** corresponds to the usual circuit provided in automobiles and is opened and closed by the ignition lock switch **33**. The armature **34** of the differential relay **28** carries a contact **35** which cooperates with the stationary contact **36** which leads to the signal light **37**, which, in turn, is grounded by the conductor **38**. The blinker system shown in Fig. 2 thus operates in the same manner as that shown in Fig. 1, with the only exception that the differential relay **28** is being energized.

By closing the ignition switch **33**, the positive terminal of the battery **1** is connected to the center **31** between

the two coils 29 and 30 of the differential relay 28, the outer ends of which lie on ground through the bulbs 23 and 24, respectively. Since the two coils 29 and 30 are energized by the same amount of current, the armature 34 is not attracted, so that the signal light 37 will not burn. If, however, one of the bulbs 23 to 23'' and 24 to 24'' on either side of the vehicle should become defective, the resistance ratios between the respective coil of the differential relay 28 and the ground are changed, whereby the armature 34 is attracted and the current will flow through the signal light 37, which thus indicates at any time whether or not the blinker system is operating correctly.

In the above description it was assumed that the switch 4 was in the inoperative position. If it is turned to the position shown in Fig. 2, the apparatus operates as described with respect to Fig. 1. The contacts 16, 18 and 17, 19, respectively, are opened and closed in the same rhythm as produced by the relay 13, so that the lights at one or the other side of the car light up intermittently. The current then flows through the differential relay as follows:

Since both ends of the coil 29 of the differential relay 28 are connected to the positive terminal of the battery 1, that is, at one end through the conductors 18 and 20, and at the other end 31 through the conductor 32, no current can flow through the coil 29. The other coil 30, however, is connected at 31 to the positive terminal of the battery 1, and at its other end through the conductor 21 and the bulbs 24 to 24'' to ground. The current can thus flow through coil 30, thereby attracting the armature 34 and lighting up the signal bulb 37. If the armature 15 is then released, the intermediate point 31 of the differential relay 28 is connected to the positive terminal through the conductor 32. Since the free ends of the two coils 29 and 30 are grounded, the current flows therethrough in opposite directions, thereby releasing the armature 34, so that the signal light 37 is disconnected. In other words, the signal light 37 burns intermittently in accordance with the rhythm of the oscillations of the armature 34, and thus it not only indicates whether or not the system is operating properly but also whether the lights are blinking properly.

In the embodiment of the invention as shown in Figs. 3 to 6, the blinker relay is mounted in a casing 39 with a cover plate 40 thereon which supports the socket 41 of the blinker switch 9. The plate 40 also supports the armature 15 which is resiliently mounted thereon by the spring 42. The armature 15 carries insulated pins 43 which extend through suitable apertures in the plate 40 and press upon springs 44 and 44', respectively, which carry the armature contacts 16 and 17. The stationary contacts 16' and 17' are mounted on the plate 40, while the relay coil 13 is mounted below the plate 40. The spring 42 of magnetically conductive material is magnetically connected with the pole shoe 46 which, in turn, is connected with the end 48 of the core of the relay coil 13. Thus, a closed magnetic circuit is formed. Since the spring 42 may not exceed a certain cross sectional area, the magnetic circuit is weakened at this point. In order to compensate for this, so that the relay 13 will operate properly with the least possible number of windings of the relay coil 13, the armature 15 may further be provided with a projection 47 which, when the relay operates, as shown in Fig. 3, at least approaches or even entirely abuts against the upper portion of the pole shoe 46, thus closing the magnetic circuit as much as possible. The conductors connecting the various parts of the apparatus are indicated by the same reference numerals as shown in Figs. 1 and 2.

On its upper side, the relay is enclosed entirely by a cover 45. The plate 40 may also be provided with a suitable cut-out portion 49 for receiving the differential relay 13, 15.

While I have described my invention to two preferred embodiments thereof, I wish it to be understood that my

invention is in no way limited to the details of such embodiments but is capable of numerous modifications within the scope of the appended claims.

What I claim is:

1. A periodic electric circuit interrupting switch arrangement for selectively pulsating either of two electrical output devices to be energized, such as turn indicator signals, comprising a relay having an operating coil and an armature carrying two separate pairs of contacts arranged for simultaneous opening and closure; a periodic interrupter comprising a bimetallic strip, normally closed contacts operated thereby, and a heating coil in series with said last-named contacts, all enclosed within a gas-tight envelope; a selective control switch for selecting the output device to be pulsated, means for completing a circuit from the poles of a source of current through said interrupter and said operating coil in series to open and close both said pairs of contacts in synchronism, means controlled by said control switch for completing a circuit from one pole of said current source to the first contact of a selected one of said pairs of contacts, and to said operating coil, and an output circuit from each of the second contacts of said pairs of contacts connected to an output device and thence to the other pole of said source, whereby said output devices may be selectively pulsated by a single interrupter and relay in a circuit independent of the circuits supplying said devices.

2. A periodic electric circuit interrupting switch arrangement for selectively pulsating either of two external electrical devices comprising, in combination: a bimetal circuit interrupter enclosed in a gas-tight envelope, with a heating coil in radiant heating relation thereto and contacts operated by said bimetal; a single relay having an operating coil connected in series with the contacts and the heating coil of said interrupter and independent pairs of external circuit controlling contacts under the control of said coil; and a selector switch for connecting said series circuit, and simultaneously a selected one of said contact pairs, to a source of operating current.

3. An arrangement in accordance with claim 2, including a differential relay having a common coil center-tap, the ends of the differential relay coil being bridged between corresponding contacts of the contact pairs, the center-tap being connected to said source, and an indicating circuit controlled by said differential relay.

4. An arrangement in accordance with claim 3, in which said differential relay controls an indicating lamp.

5. An arrangement in accordance with claim 3, including a casing having a closure plate, with the coil of said single relay mounted within said casing below said closure plate, and the armature of said relay mounted resiliently above said closure plate.

6. An arrangement in accordance with claim 5, in which the contacts of said single relay are mounted within said casing, and means passing through an aperture in said plate for operating said contacts from said armature.

7. An arrangement in accordance with claim 6, in which the spring resiliently mounting the armature is of magnetic material such as steel, and is in magnetic flux transmission relationship to the yoke of the single relay.

8. An arrangement in accordance with claim 7, including a lug in magnetic flux transmitting relation between the armature of said single relay and the yoke thereof.

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