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2,357,925

COMBINED REED AND RELAY DEVICE

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Fig. 1.

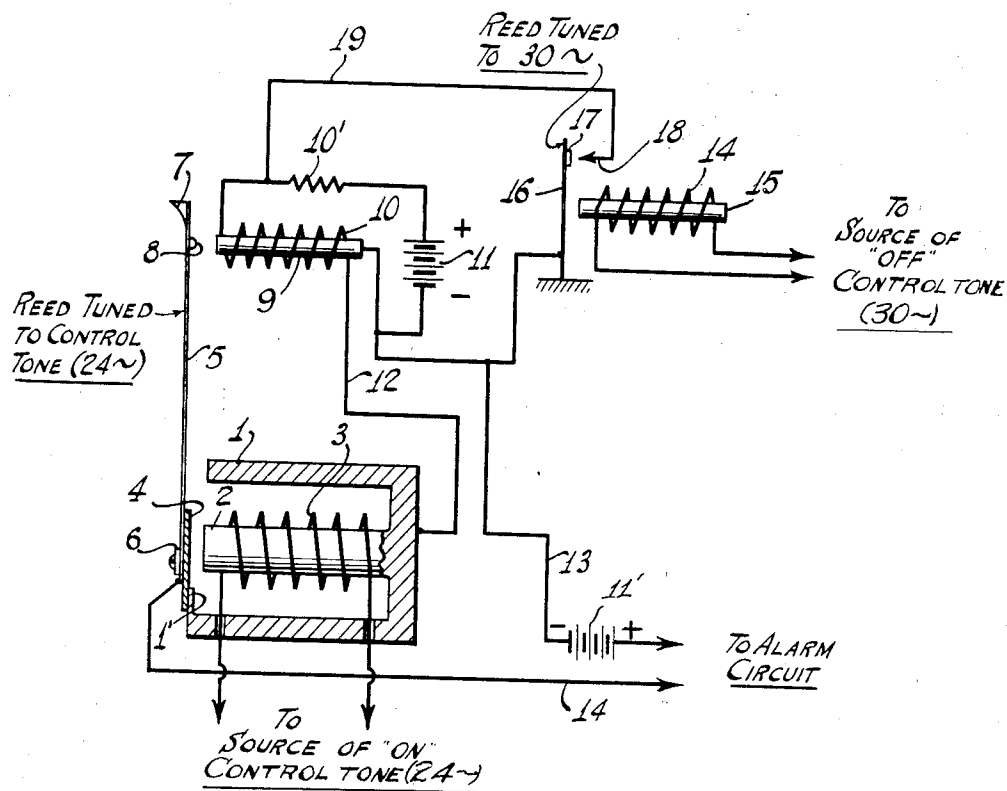


Fig. 2.

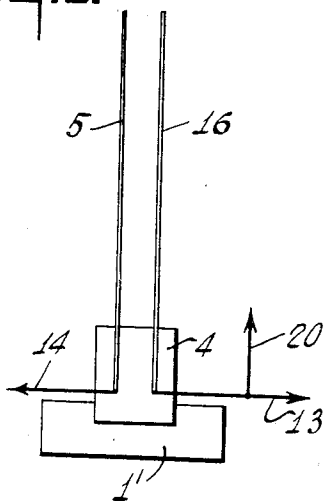
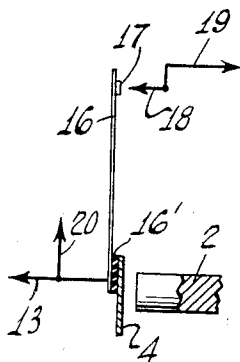


Fig. 3.



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COMBINED REED AND RELAY DEVICE

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Application August 7, 1942, Serial No. 453,933

1 Claim. (Cl. 177—353)

My present invention relates to tuned reed devices, and more particularly to a tuned reed device which concurrently functions as a relay.

In application Serial No. 403,736, filed July 23, 1941, by H. B. Deal, and in my copending application Serial No. 432,549, filed February 25, 1942, there are shown radio alarm systems of the so-called "alert" type. In these systems selective reeds, tuned to predetermined control tones, function to close respective electromagnetic relay circuits. These relay circuits are energized from the receiver power circuit, and utilize special contact elements and switches.

It is one of the main objects of my present invention to conserve relay contacts and power in a receiver of the "alert" type, by providing a selective reed device which is constructed simultaneously to function as a relay for closing an alarm circuit.

Another important object of my invention is to provide a selective reed, tuned to a control frequency, which functions as a relay device, and thereby is applicable to radio alarm receivers of the compact type where space requirements prevent the inclusion of an auxiliary relay.

Another important object of my invention is to provide a mechanical resonator which concurrently functions to close a work circuit through the vibratory element of the resonator thereby eliminating the usual relay circuit which is energized by the actuation of the vibratory element.

Another object of my invention is to provide a frequency-responsive reed which closes an electromagnet circuit upon actuation of the reed; closing of the circuit simultaneously closing a work circuit through the reed per se.

Still other objects of my invention are to improve generally the simplicity and efficiency of reed-responsive circuits, and more especially to provide a combined reed and relay device which is economically manufactured and assembled.

The novel features which I believe to be characteristic of my invention are set forth in particularity in the appended claim; the invention itself, however, as to both its organization and method of operation will best be understood by reference to the following description taken in connection with the drawing in which I have indicated diagrammatically several circuit organizations whereby my invention may be carried into effect.

In the drawing:

Fig. 1 shows one embodiment of the invention, certain parts being sectioned,

Fig. 2 shows the rear view of a modified form of relay device,

Fig. 3 shows an end view, partly sectioned, of the modification of Fig. 2.

Referring, now, to the drawing, I have shown an electromagnet device comprising a magnetic yoke 1 whose central core 2 has wound about it a coil 3. There is provided an armature 4 made of resilient magnetic material. The armature 4 may be a strip of spring steel whose lower end is soldered, or welded, to the lower lip 1' of yoke 1. Armature 4 is actuated by core 2 as current flows through coil 3. It is to be clearly understood that the electromagnet 4—2—3 may be constructed in any well known manner, other than schematically represented herein. The armature 4 and yoke 1 are shown in section; the shapes of these elements are unimportant. Of course, the armature should be of such construction that the armature can be periodically displaced about a mean position as the control current flows through coil 3. The yoke 1 will be insulated from the chassis on which it rests.

The current flowing through coil 3 may be of a predetermined frequency, say 24 cycles. It may be derived from the detector of a radio receiver. The latter may receive modulated carrier waves which include the 24 cycle note as a modulation component. As explained in the aforesaid Deal application (or in my aforementioned application), one frequency on the carrier represents an "on" signal so far as the receiver alarm circuit is concerned. A different frequency, for example 30 cycles, corresponds to "off" signal. In actuating the alarm circuit the transmitter applies the "on" control frequency to the carrier. At the receiver the process of demodulation provides the control frequency at the detector output terminals.

The control frequency current may be amplified. It is then applied to coil 3 for energizing the electromagnet and vibrating the armature 4. The armature has secured to it a highly selective reed 5. The reed has its lower end secured to the armature as shown at 6. Of course, the lower end of reed 5 may be soldered to armature 4. The free end of reed 5 is weighted, as at 7, so as to provide sharp mechanical resonance to 24 cycles. In other words, and as well known to those skilled in the art of constructing reeds, the reed 5 will move with the armature 4 as a unit should the latter be actuated by currents other than 24 cycles. However, when the current flowing through coil 3 has the exact frequency of 24 cycles, the resonant frequency of reed 5, the

reed will vibrate with a high degree of amplitude relative to its lower pivot point. The inner face of the reed carries a contact point 8. The latter is arranged in alignment with the end of core 9.

A coil 10 is wrapped around core 9. One end of coil 10 is connected to the positive terminal of a direct current source 11, such as a small battery, of relatively low power but sufficient to magnetize core 9 and hold reed 5 against it. Resistor 10' is arranged in series with coil 10 to prevent complete shorting of source 11 when coil 10 is shorted. The negative terminal of source 11 returns to the opposite end of coil 10 over a path comprising core 9, contact 8, reed 5, armature 4, yoke 1 and lead 12. It will now be seen that actuation of the reed 5 at its resonant frequency causes the contact 8 to touch the core 9. Normally, and in the absence of 24 cycle current, any motion of armature 4 causing motion of reed 5 will not be of sufficient angular amplitude to permit contact between point 8 and the core 9.

However, when the 24 cycle "on" modulation tone is applied to the carrier for setting off the remote receiver alarms, the receiver detector will provide the 24 cycle control current to coil 3. Reed 5 will vibrate in a wide arc and cause electrical contact between point 8 and core 9. This will close the electrical circuit through coil 10 and cause source 11 to energize the latter. As a result the core 9 will "freeze" the reed 5 in position magnetically. Any desired form of work circuit, such as an alarm circuit, may be completed through reed 5. Thus, one line 13 of the alarm circuit, which may contain a suitable current source such as the battery 11', is shown connected to the right end of core 9, and the opposite line 14 is shown connected to the fixed end of reed 5, the alarm circuit being completed as follows: one side of source 11', line 13, core 9, closed contact 8, reed 5, line 14, through the alarm device (not shown) and back to the other side of the source.

It will now be seen that when the contact point 8 is magnetically retained against core 9, the alarm circuit will be closed through the path traced above. The alarm circuit may include a visual current indicator, such as a lamp, or it may include an audible device, such as a buzzer, bell or siren. Further, the alarm circuit may include any of the devices referred to in my aforesaid application or in said Deal case. The specific nature of the circuit closed through reed 5 and core 9 is not material to the present invention.

When the "off" signal is applied to the carrier, the signal being a 30 cycle tone, the detector at a receiver provides 30 cycle current. This current is caused to flow through the coil 14 of an electromagnet relay core 15. A second reed 16 is arranged so as to vibrate in response to the flow of 30 cycle current through coil 14. The reed 16 is sharply resonant to 30 cycles; the reed 16 is schematically represented since those skilled in the art are fully aware of the manner of constructing sharply tuned reed devices. The free

end of reed 16 carries contact point 17 which is arranged to contact fixed point 18. Of course, the reed 16 vibrates in a wide arc sufficient to permit electrical contact between 17 and 18 solely in response to flow of 30 cycle current through coil 14.

Point 18 is connected by lead 19 to the positive side of the source 11 through resistor 10'. The negative terminal of source 11 is connected by lead 20 to the ground. Hence, closure of reed switch 17-18 results in short-circuiting of the source 11. The coil 10 is, therefore, de-energized, and core 9 will release the free end of reed 5. As a result the alarm circuit through reed 5 will be opened. Of course, any other arrangement can be employed to short, or partially short, coil 10 upon actuation of the "off" reed 16. If desired, actuation of reed 16 could energize a coil whose flux is opposite to the flux of coil 10. When the flux is neutralized, the reed 5 will be released. Additionally, the freeing of the "on" reed by mechanical means, such as tapping, is feasible.

The electromagnet 14-15 may be dispensed with, and the 30 cycle control modulation may be applied to coil 3. Further, the reed 16 may be secured at its lower end to the spring steel armature 4, as shown in Figs. 2 and 3. In Fig. 2 reeds 5 and 16 are shown spaced. An insulation spacer 16' (Fig. 3) may secure the lower end of reed 16 to the armature 4. The core 2, in this modification, vibrates armature 4. If the current flow through coil 3 is of 24 cycles, then reed 5 will vibrate and close the circuit described in Fig. 1. If the current flowing through coil 3 is of 30 cycles, then reed 16 vibrates to close its shorting circuit. The numerals shown in Figs. 2 and 3 correspond to those of Fig. 1.

While I have indicated and described several systems for carrying my invention into effect, it will be apparent to one skilled in the art that my invention is by no means limited to the particular organizations shown and described, but that many modifications may be made without departing from the scope of my invention, as set forth in the appended claim.

What I claim is:

In combination a first reed tuned to a first control frequency, an electromagnet energized by currents of said control frequency for vibrating said reed, means operated by the reed when its amplitude of vibration reaches a predetermined amplitude for closing an alarm circuit, a second electromagnet positioned with respect to the reed to maintain the reed in its alarm circuit-closing position when said second electromagnet is energized, a circuit for said second electromagnet closed by said reed when its amplitude of vibration reaches said predetermined amplitude, a second reed tuned to a second frequency different from said first frequency, means energized by currents of said second frequency for vibrating said second reed, and means operated by the second reed for deenergizing said second electromagnet and thereby release the first reed.

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