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SELECTIVE RELAY

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Fig. 1.

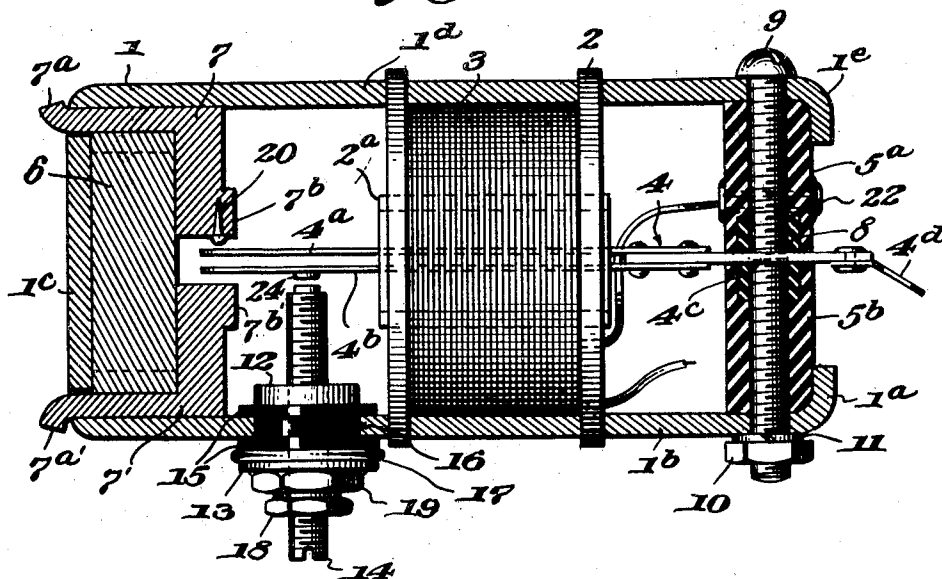


Fig. 2.

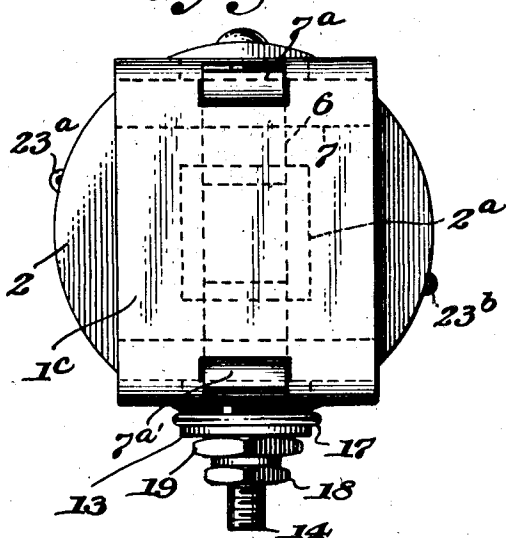
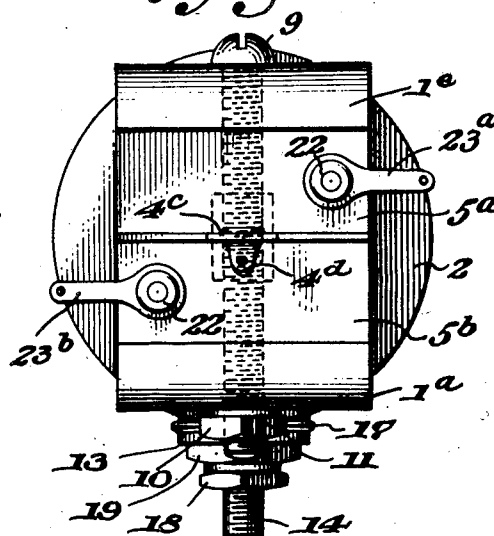


Fig. 3.



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SELECTIVE RELAY

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6 Claims. (Cl. 200—90)

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This invention relates to a relay suitable for use in selective signalling systems or more particularly to a selective signalling device for mobile equipment using a vibrating reed in the mobile receiver.

It is therefore an object of the invention to provide a relay having a vibrating reed which has a natural frequency of vibration and which is so constructed that it is responsive to signals having a frequency corresponding to the natural frequency of the reed. A further object resides in providing a relay with a fixed magnet having a vibration amplifying effect to permit the attainment of large vibration amplitude with very low energizing power. Another object resides in the interchangeability of the vibrating reed to different natural resonant frequency to thereby cover a considerable range of resonant frequencies by changing the metal thickness of the reed.

Further objects will be apparent from the following description when considered in connection with the accompanying drawing.

The drawing shows a preferred form of the relay as an example in which:

Figure 1 is a longitudinal sectional view of the relay, certain elements being shown in elevation,

Fig. 2 is an end elevation of the left end of the relay of Fig. 1, and

Fig. 3 is an end elevation of the right end of the relay of Fig. 1.

In both Figs. 1 and 2, one of the solder terminals of the relay has been omitted for simplicity of showing.

Referring to Fig. 1 of the drawing, the relay is formed of a U-shaped frame or housing 1 preferably consisting of a strip of non-magnetic metal, such as brass, of uniform thickness and width and having an inwardly bent end portion 1a, a straight side portion 1b, a yoke portion 1c, a second straight side portion 1d and a second inwardly bent portion 1e. The two side portions 1b and 1d are each provided with a longitudinal slot near the center thereof to receive a spool 2 carrying the relay winding or coil 3. The spool 2 is provided with a tubular core 2a of square section, Fig. 2, and a vibrating reed 4 of the relay is mounted to extend through the center of the square tube 2a.

The reed 4 is formed of two magnetic strips 4a and 4b preferably of soft iron and preferably riveted on opposite sides of a strip of spring brass or bronze or steel 4c which forms a hinge element.

The spring 4c is securely clamped between two blocks 5a and 5b of suitable insulating material, which are mounted between the two side arms 1b and 1d of the frame 1. The two blocks 5a and 5b are clamped together by means of a screw 9 which passes through aligned holes formed in the ends of the frame sides 1b and 1d and through holes formed in the blocks 5a and 5b

and through a hole formed in the spring member 4c. A clamping nut 10 is threaded on the other end of the screw 9, with a spring washer 11 interposed. An insulating sleeve 8 surrounds the screw 9 and passes through the hole formed in the spring member 4c and is located in counterbores formed in the blocks 5a and 5b. This sleeve 8 serves to insulate the reed from the screw 9. The spring member 4c extends beyond the blocks 5a and 5b, and a terminal element 4d is secured to the end of the spring member 4c, Fig. 1.

A permanent magnet 6, preferably in the form of a round bar, is provided inside of the yoke portion 1c of the frame and is positioned between two pole pieces 7 and 7'. These pole pieces 7 and 7' are composed of magnetic material and preferably of soft iron and are formed in an L-shaped section. The ends of the magnet 6 are preferably received in circular sockets formed in the horizontal portions of pole pieces 7 and 7', and the pole pieces and the magnet are locked within the frame by means of relatively thin and narrow extensions 7a and 7a' formed on the pole pieces and extending through slots formed in the relay frame 1 near the ends of the yoke portion 1c. Locking of the parts together is secured by bending over the ends of the extensions as shown in Fig. 1. The pole tips 7b and 7b' of the pole pieces 7 and 7' are spaced apart, and the free ends of the reed strips 4a and 4b extend into the space between these pole tips. The reed strip 4b is provided with a contact member 24 which is arranged to engage the end of a threaded contact stud 14 mounted in a hole formed in the frame side portion 1b. This stud is adjustable to and from the reed armature by threaded engagement with a bushing 12 which is insulated from the frame of the relay by means of insulating washers 15 and an insulating bushing 16. The contact stud 14 is also provided with a pair of nuts 18 and 19 and a washer 13.

The terminals of the coil 3 are connected to a pair of terminals 23a and 23b mounted on the outer face of insulating blocks 5a and 5b respectively by means of hollow eyelets 22. The signal currents for operating the relay are supplied to these terminals 23a and 23b. The circuit to be controlled by the relay would for example include a source of low voltage and would be connected to terminal 4d on the reed 4 and to the contact stud 14. When the coil 3 is energized by alternating current, the free end of the reed strips 4a and 4b will be magnetized with one polarity during one alternation and will be attracted to the pole piece of opposite polarity, while during the next alternation the polarity of the reed strips will be reversed and they will be attracted to the opposite pole piece. Thus, the free end of the reed tends to vibrate in synchronism with the alternating current supplied to coil 3. When the frequency

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of the current corresponds to the natural frequency of the reed, the amplitude of vibration of the reed will be sufficient to cause the reed piece 4b to remain in contact with the inner end of contact stud 14 for a substantial period of time during each cycle of vibration, and thus the relay responds selectively to a current of a predetermined frequency. By changing the natural frequency of the reed, as by substituting for reed strips 4a and 4b similar strips of greater thickness, the reed may be made sensitive to a different frequency.

An escutcheon pin 20 formed of non-magnetic material is inserted in the face of pole piece 7 to prevent the reed strip 4a from coming in direct contact with the face of pole piece 7.

It is thus clear from the foregoing that when an alternating current flows in the coil 3, the vibrating reed becomes magnetized in alternate directions. If on the positive half of the A. C. cycle the free end of the reed becomes a north magnetic pole, it will be repelled by the north pole of the magnet and attracted to the south pole. For the negative part of the A. C. cycle the free end of the reed will become a south pole which is now repulsed by the south pole of the magnet and attracted by the north pole. If the frequency of magnetization of the reed by the coil is the same as the natural vibrating frequency of the reed, the latter will vibrate in the air gap and the vibration amplitude will increase until the reed contact point strikes the fixed contact. The vibration amplitude will then be the total of the distance between the contact and vibrating reed.

Due to the vibration amplifying effect of the fixed magnet the unit is capable of attaining large vibration amplitude with very low energizing power. This is particularly important in battery energized systems wherein the relay is controlled by a vacuum tube because high systems sensitivity can be obtained with relatively few tubes.

It is possible to change the natural resonant frequency of the vibrating reed to cover a considerable range of resonant frequencies by changing the metal thickness of the reed, by changing other dimensions of the reed, the weight distribution of the reed, the stiffness of the hinge spring or by other well known means. Also, although I have shown the reed as comprising two strips 4a and 4b, a reed consisting of a single strip may be employed.

By mounting the reed co-axially with the energizing coil as shown, a relay which is simpler to manufacture and which is more compact and lighter in weight than other types of selective relays can be obtained.

While I have shown a particular embodiment of my invention for the purposes of illustration and description, changes and modifications therein will be apparent to those skilled in the art without departing from the scope of my invention.

I claim as my invention:

1. A relay particularly for selective signalling comprising a frame, a resilient member insulatingly clamped at one end to said frame, a reed including two parallel strips of magnetizable material clamped at one end thereof to opposite sides of said member, the other end of said reed being free to vibrate, a permanent magnet secured in said frame adjacent said other end of said reed and having a pair of spaced pole pieces between which said reed vibrates, means for preventing said reed from coming into direct contact with the pole pieces of said magnet, and a

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coil secured in said frame positioned between said member and said means, said coil surrounding said reed and vibrating same in resonance with its natural period.

2. A relay particularly for selective signalling as claimed in claim 1, wherein said means for preventing said reed from coming into direct contact with the pole pieces of said magnet comprise a non-magnetizable material attached to the face of the first of said pole pieces of said magnet and with which material one of the strips of said reed cooperates, a first contact attached to the other of the strips of said reed, a second contact insulatingly attached to said frame adapted to engage said first contact when said reed is energized at its resonant frequency and adjusted to prevent said reed from striking the second of said pole pieces.

3. A relay particularly for selective signalling as claimed in claim 2, wherein said contacts are in contact for a substantial period of time during each cycle of vibration whereby the relay is responsive selectively to a current of a predetermined frequency.

4. A relay particularly for selective signalling as claimed in claim 1, wherein a tubular core is provided between said coil and said reed, said reed passing through said core with minimum clearance.

5. A relay particularly for selective signalling as claimed in claim 1, wherein said reed is of a magnetizable material having high permeability and low retentivity.

6. A relay particularly for selective signalling comprising a U-shaped frame, a pair of insulating blocks clamped between the open ends of said frame, a permanent magnet in the closed end of said frame, with its ends facing the sides of said frame, a pair of L-shaped pole pieces within said frame, the first portions of each of said pieces being disposed between the respective ends of said magnet and the sides of said frame, said pieces being provided with an integral extension lug at the ends of the first portions thereof, each lug protruding through an aperture in the closed end of said frame and being bent to secure said pieces within said frame, said pole pieces forming a gap between the ends of the second portions thereof, said second portions retaining said magnet against the closed end of said frame, a vibrating reed clamped between said blocks extending toward the closed end of said frame, said reed vibrating in the direction of both sides of said frame, within the gap formed by said pole pieces and a coil secured in said frame positioned between said blocks and said pole pieces, said coil surrounding said reed and vibrating same in resonance with its natural period.

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