Jan. 3, 1961 L. L. GALIN 2,967,219

VIBRATING REED CONTROL DEVICE

Filed May 15, 1959

Fig. 1.

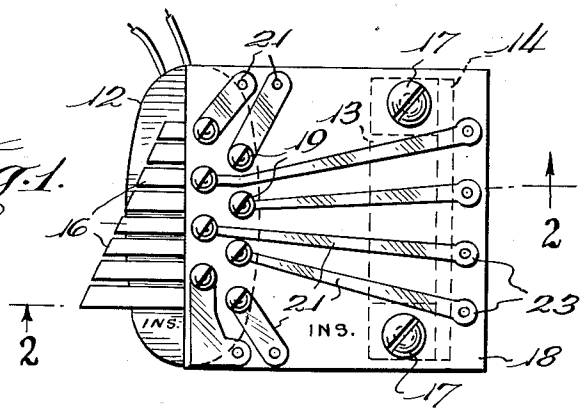


Fig. 2.

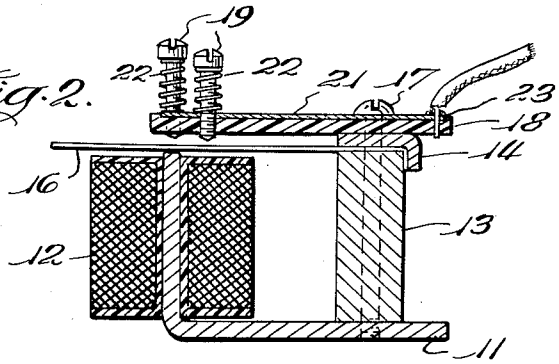
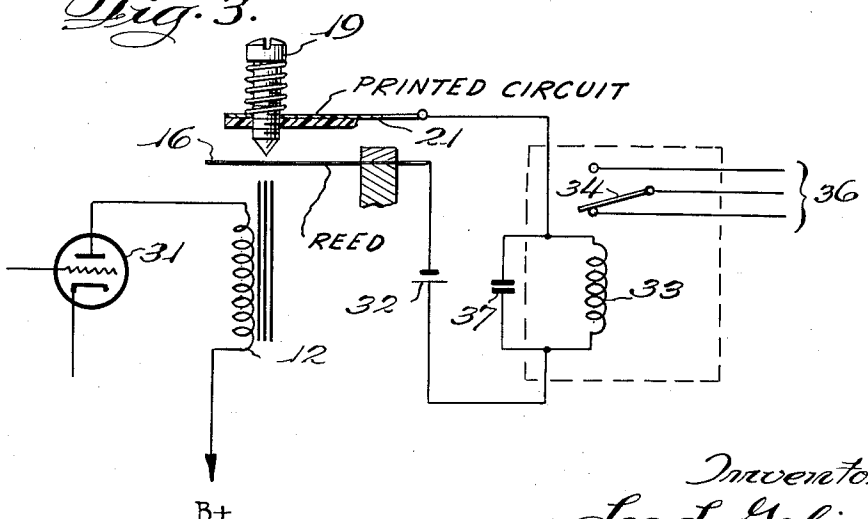


Fig. 3.



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VIBRATING REED CONTROL DEVICE

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4 Claims. (Cl. 200—90)

This invention relates to frequency-responsive devices, and more particularly it relates to vibrating reed control devices of small size and light weight which incorporate a printed circuit.

Frequency responsive control devices in which a vibratile reed is used are known. Such devices commonly employ a number of vibratile reeds each resonant at a different frequency with associated driving means which causes vibration of a selected reed when the frequency of energy impressed by the driving means corresponds to the natural frequency of vibration of the reed, as determined by its thickness and free length in a manner well known to those skilled in the art. In order to effect control of some associated circuit, each reed may be equipped with a contact, which closes when the reed is vibrating. The closing of the contact gives rise to some desired effect, such as the closing of a relay which in turn results in the desired control.

Frequency responsive control devices of this type are useful in applications where size and/or weight limitations are unusually severe. For example, devices of this type are used in radio-controlled model airplanes and boats and also in radio paging systems for doctors in hospitals, key personnel in factories, etc. The present invention permits the construction of frequency-responsive control devices which are lighter, smaller, and yet more reliable in operation and capable of wider control than those heretofore known.

The invention will be better understood from the following detailed description thereof taken in conjunction with the accompanying drawings, in which:

Figure 1 is a plan view of the device of the invention;

Figure 2 is a sectional view of the device of Figure 1 taken along the line 2—2 of Figure 1; and

Figure 3 is a schematic diagram showing one way in which the device can be used.

Referring to Figures 1 and 2, the device of the invention comprises an L-shaped frame 11 made of a metal preferably having low magnetic permeability, such as Armco iron. Around the shorter leg of the frame there is wrapped coil 12 consisting of a large number of turns of fine wire. At the other end of frame 11 is located a small bar magnet 13. Held in cantilever-fashion between the end of magnet 13 and spacer 14 are a number of reeds 16 made of a magnetic material such as steel, the free ends of the reeds projecting over the core of coil 12. The reeds have the same thickness and width but differ in length and are therefore resonant at different frequencies. Other methods of achieving differences in resonant frequency among the reeds, as by varying the thickness instead of the length, may also be used if desired, but are not preferred.

Magnet 13, reeds 16, and spacer 14 are held in fixed relative position by means of mounting screws 17 which also hold mounting board 18 in position over the reeds. Mounting board 18 is made of an electrically insulating

rigid material, suitably a plastic such as Bakelite or polystyrene, and carries a number of electrical contacts 19, one contact being positioned directly over each of reeds 16. Each contact is adjustable perpendicularly of mounting board 18 so as to ensure making contact with its associated reed when the reed is vibrating, while at the same time avoiding any interference with the free vibration of the reed. In the embodiment shown contacts 19 are screws, suitably of brass, which threadedly engage board 18. The length of each contact projecting out of board 18 towards the reeds can readily be adjusted by suitable rotation of the screw.

Carried on the top surface of board 18 is a printed circuit, advisably of copper, produced by conventional and well-known techniques. The circuit comprises a number of individual conductive strips 21, each of which is associated with a particular contact. As shown, each conductor leads from a point at the base of a contact to another point near the periphery of the board.

Surrounding each of contacts 19 is an electrically conductive coil spring 22 which is slightly compressed between the head of the screw and the board 18, thus insuring a positive electrical connection between the contact and the conductive strip 21 on the board at the base of the contact. To this end each conductive strip 21 is preferably made to encircle the base of its associated contact so that it will always be in contact with the spring.

Springs 22 in addition to acting as electrical connectors between the contacts and the conductive strips also serve to inhibit vibration of the contacts and thus prevent any maladjustments that might otherwise occur. Although it is possible to dispense with the electrical function of the springs by having each conductive strip make a direct electrical connection with its contacts, such connection is not as positive as that made with the springs. For this reason and for the additional mechanical advantage provided by the springs, the use thereof is advisable.

The conductive strips 21 are brought out to terminals 23 near the edge of mounting board 18, where connections to external circuits may be easily made by soldering or other suitable means, as shown in Figure 2.

A typical application of the device of the invention is illustrated schematically in Figure 3. Vacuum tube 31 represents the power output stage of a radio receiver. Coil 12 of the device is connected between the plate of this tube and the source of high voltage (B+). In use, the radio receiver picks up a radio signal of a selected frequency which is impressed by means of coil 12 on all the reeds 16. The reed whose resonant frequency corresponds to the frequency of the radio signal then starts to vibrate. Providing the vibration is of sufficient amplitude and depending on the setting of the associated contact 19, the vibrating reed will during portions of its cycle touch contact 19 and thus complete the circuit comprising battery 32 and relay coil 33, thereby energizing the relay and actuating switch 34 to produce a desired effect in any unit connected to lines 36. Capacitor 37 is used in parallel across the relay coil 33 to compensate for the fact that vibrating reed 16 completes the circuit only intermittently. During periods when the circuit is complete, capacitor 37, which has a relatively large value, is charged quickly and discharges through the coil of relay 33 during periods when the circuit is open, thereby maintaining relay 33 in an activated condition.

Each of the reeds 16 of the device of the invention is equipped with a relay circuit similar to that described above. It is evident that selection among these various circuits is possible by control of the frequency trans-

mitted and impressed on the vibratile reeds of the device.

From the above description, it is apparent that there has been provided a control device which is responsive to selected frequencies. The device can be made small and light, thereby making it particularly adaptable for use in radio controlled model airplanes, model boats, paging systems or any other application where selective control among a variety is to be made by radio or the like and where the equipment must be maintained as small and as light as possible.

By the use of printed circuits on the mounting board of the device, it is possible to have a number of contacts mounted thereon without interference. The conductive strips can be made very narrow and curved as desired to avoid accidental short circuits among the various strips. This construction obviates the need for separate conductors which would otherwise be required and which would entail an increase in size and weight because of the necessary fastening means used to hold them in position.

As a further desirable modification of the device of the invention, it is possible to enlarge the mounting board 18 and to mount the relays 33 directly thereon, having all connections between the contacts for the reeds and the relays consist of printed circuits. Thus, all conventional wiring would be eliminated, thereby further decreasing the weight of a complete control system.

The reeds used in the device of the invention may be made individually from suitable sheet metal by conventional cutting operations. Alternatively, however, a preferred method for fabricating the same comprises an adaptation of the method used in making printed circuits. In accordance with this improved method, the group of reeds would be made as a unit, the individual reeds being joined by a transverse juncture at one end. The reeds of a set are made by etching away the undesired parts of a suitable blank of sheet material, in much the same manner as printed electrical circuits are made from a copper clad sheet.

The foregoing detailed description has been given for clearness of understanding only, and no unnecessary limitations should be understood therefrom, as modifications will be obvious to those skilled in the art.

What is claimed is:

1. In a vibrating reed device, a mounting means of electrically insulating material; a plurality of vibratile members having different resonant frequencies, said members being mounted in spaced opposed relationship to said mounting means; means for causing selective vibration of said vibratile members; a plurality of contacts secured in said mounting means, each of said contacts being movable generally perpendicularly of said mounting means and being adapted to make intermittent contact with one of said vibratile members when said member is vibrating; a printed circuit on said mounting means comprising a plurality of conductive strips each of which terminates adjacent one of said movable contacts, and resilient electrically conductive means disposed between said contacts and said conductive strips for making electrical contact therebetween.

2. The device of claim 1 in which each of said contacts comprises a screw having an enlarged head and said resilient means comprises a coil spring encircling said screw between said mounting means and said enlarged head and making electrical contact between said contact and said conductive strip.

3. In a vibrating reed device, a mounting means of electrically insulating material; a plurality of vibratile members having different resonant frequencies, said members being mounted in spaced opposed relationship to said mounting means; means for causing selective vibration of said vibratile members; a plurality of movable contacts secured in said mounting means, each of said contacts being adapted to make intermittent contact with one of said vibratile members when said member is vibrating; a circuit on said mounting means comprising a plurality of conductive strips each of which terminates adjacent one of said movable contacts, and resilient electrically conductive means disposed between said contacts and said conductive strips for making electrical contact therebetween.

4. The device of claim 3 in which said movable contacts are threadedly mounted in said mounting means.

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