United States Patent

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[54] **VIBRATORY ALERTING DEVICES**
15 Claims, 5 Drawing Figs.

[52] **U.S. Cl.** **340/311,** 340/407
[51] **Int. Cl.** **H04r 23/00**
[50] **Field of Search** 340/311, 407

[56] **References Cited**
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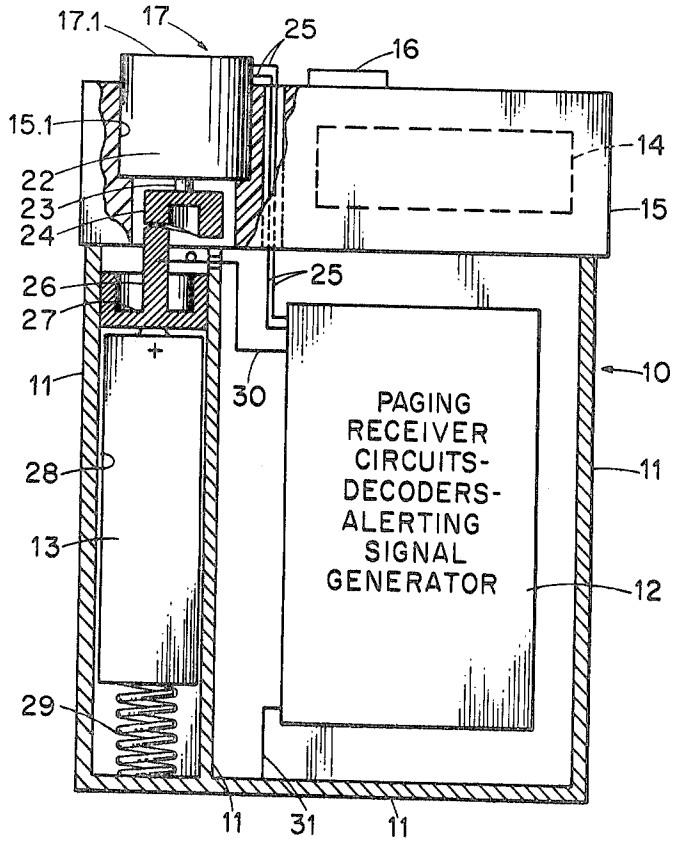
ABSTRACT: A vibratory alerting device is fitted with a linearly driven vehicle which causes the device to vibrate in unison with it when an alerting signal is received.



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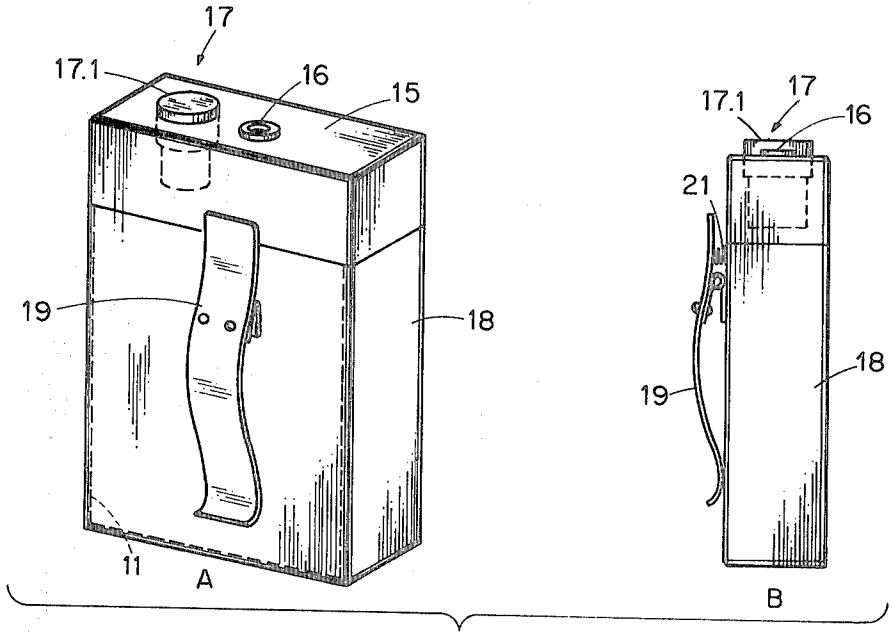

Fig. 1.

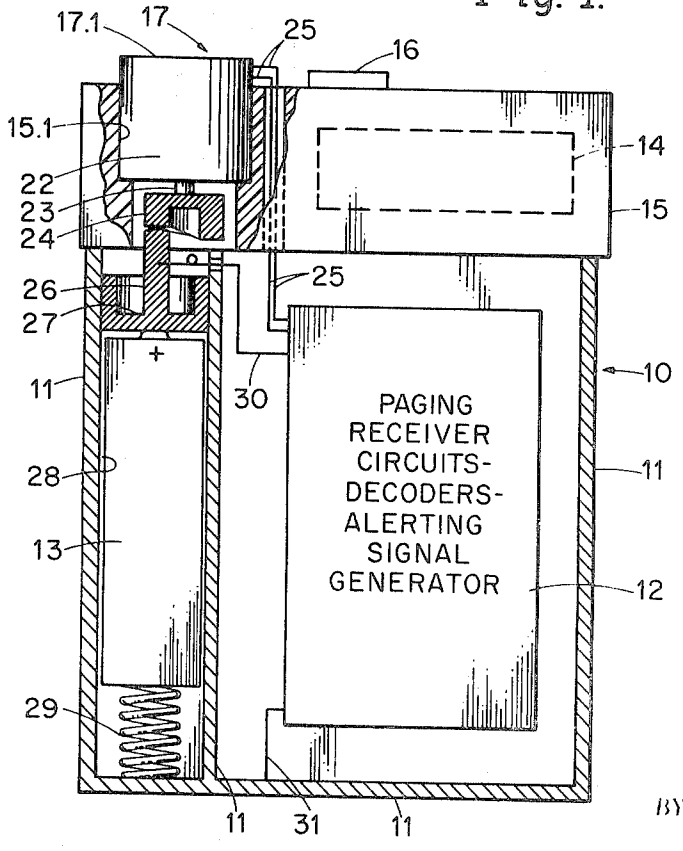

Fig. 2.

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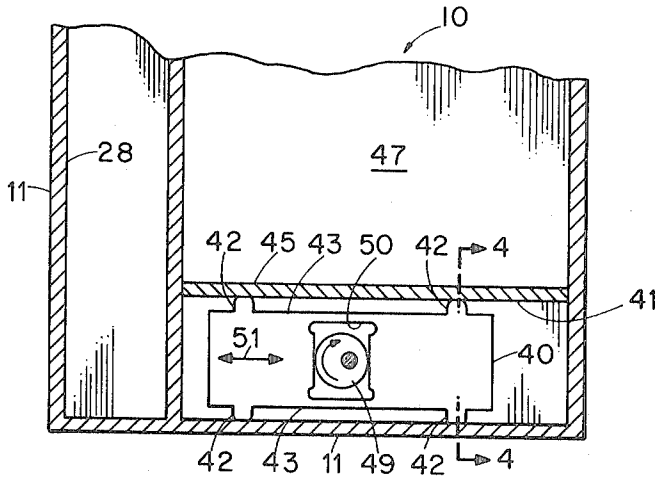

Fig. 3.

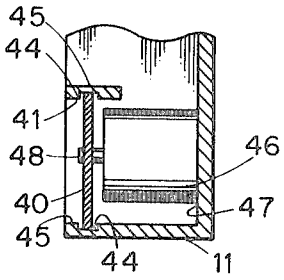

Fig. 4.

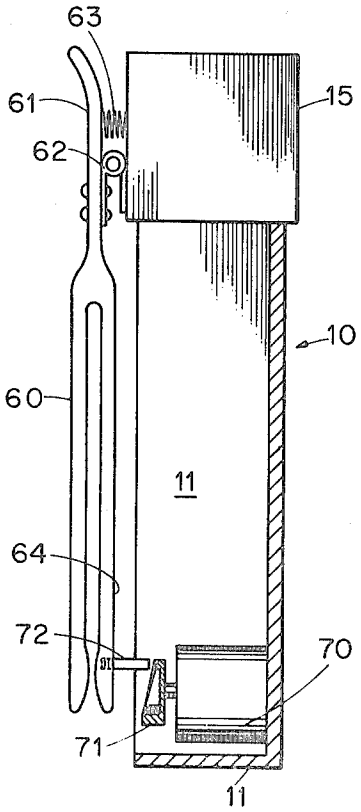

Fig. 5.

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VIBRATORY ALERTING DEVICES

BACKGROUND OF THE INVENTION

This invention relates to vibratory alerting devices, for example to paging receivers of the kind which can be carried on the person of a user. Customarily, such receivers are small enough to fit into a shirt pocket, or to be clipped to the belt holding up a person's trousers.

Paging receivers are now in use employing an audible alerting signal. This has disadvantages when the user wants to avoid alerting or disturbing other persons. Substitution or addition of a visual alerting signal (e.g. a flashing light) does not entirely solve the problem, for the attention of the user cannot always be assured, nor can the user be certain to avoid alerting other persons. The present invention solves the problem with an alerting device employing an invisible vibratory alerting signal, which has unique advantages not afforded by audible or visible alerting signals.

According to the present invention a rigid supporting structure, which contains or supports means (e.g. radio receiver) to provide an alerting signal, has affixed to it normally inactive vibrator means constrained to be movable only in a substantially linear path relative to the structure, and employs the alerting signal to activate the vibrator means. When the vibrator means is activated the entire structure is set into forced vibration in unison with the vibrator means, and if it is being carried on the person of a user only the user feels the vibration and, therefore, only the user is alerted to the calling signal.

A feature of the invention is that the alerting signal may be provided by a battery-operated radio receiver, and battery can simultaneously be used as the vibrator means. In Lsuch a case, the battery holder is used to constrain the battery to be movable only in a linear path, and when activated it is caused to oscillate in that path against a resilient member, such as a spring. An independent oscillatable mass can otherwise be used. Another feature of the invention is that a linearly oscillatable link can be used to rock a pocket clip about a hinge attachment to the supporting structure, so that the entire structure is oscillated relative to a person wearing it.

Several embodiments of the invention are described in this specification, illustrating a variety of preferred ways to practice the invention. The description, which follows, refers to the accompanying drawings, in which:

FIG. 1 shows two external views, A and B, of a paging receiver according to the invention;

FIG. 2 is a partly sectional schematic illustration showing the location of parts in FIG. 1;

FIG. 3 is a fractional sectional view of another embodiment of the invention;

FIG. 4 is a partial section along line 4—4 in FIG. 3; and

FIG. 5 schematically illustrates a partial end section of another embodiment of the invention.

Referring now to FIGS. 1A and B and FIG. 2, the alerting device is a paging receiver, comprising a rigid supporting structure 10 (FIG. 2) which supports within its framework 11 the prior art electronic and electromechanical components 12 which perform the radio receiver, filter and decoder, and alerting signal generator functions. Since these are prior art components, they will not be described. Also supported in the structure 10 are a power source (i.e., battery) 13 and an antenna 14. The top part 15 of the structure 10 is also an outer part of the housing of the receiver, and contains a phone jack 16, and a vibrator means 17. As is shown in FIG. 1A and B, a cover 18 fits slidably over the framework 11 to enclose the parts 12, 13 supported in it, and completes the outer housing of the receiver. A clip 19 hinged to the cover 18 is spring urged as by a spring 21 to hold the receiver in a pocket or to a belt (not shown).

The vibrator means 17 may, as shown in FIG. 2, comprise an electric motor 22 having a rotatable shaft 23 with an end cam 24 on it. A cover 17.1 covers the motor 22, and a pair of wires 25 which carry the alerting signal from the alerting signal generator in the parts 12 to the motor 22 are connected

to the motor under this cover. The motor is normally at rest; that is, inactive; and it is activated, that is, caused to spin the shaft 23, when the alerting signal is applied to it. A cam follower 26 engages the end cam and follows the cam in directions parallel to the axis of the shaft 23. The cam follower includes a contactor 27 for one electrode (the positive electrode as illustrated) at one end of the battery 13, which also fits piston fashion into one end of the battery compartment 28. The other electrode at the other end of the battery is contacted by a spring 29 which in turn makes negative electrode contact to the framework 11. A wire 30 connects the cam follower 26 to the parts 12, and the follower is obviously electrically conductive so that the battery can provide electric energy to the parts 12. A second wire 3 connects the parts 12 to the framework 11. The cam follower causes the battery 13 to vibrate in a linear path against the spring 13 at a frequency determined by the speed of rotation of the motor 22. As is taught in my copending application, Ser. No. 766,781 filed Oct. 11, 1968, a low frequency of vibration, below audible, such as 5 cycles per second, may be advantageously used. The walls of the compartment 28 constrain the battery to be movable only in a substantially linear path relative to the structure 10, or the framework 11. The battery forces the structure to vibrate in unison with it when the motor 22 is activated, and thus functions as not only the source of electric energy for the receiver, but also the mass of the alerting vibrator means 17. The motor 22 is rigidly engaged with the top part 15 of the structure 10; for example, the top part may be of a plastic material and the motor 22 press fitted into a bore 15.1 in the top part.

FIGS. 3 and 4 show an alternative form of linear vibrator employing a mass 40, other than the battery, in a housing 41. The mass is a plate of flat material having projections 42 on opposite edges 43 for engaging grooves 44 in walls 45 of the housing 41, so that the mass can slide back and forth in these grooves, in the housing. The mass is thereby constrained to be movable only in a substantially linear path relative to the structure 10. A motor 46 is mounted on a backwall 47 of the framework 11 (see FIG. 4) and its shaft 48 drives an eccentric cam 49 in a yoke 50 in the form of an aperture in the plate 40; a yoke or positive-motion cam is thus provided linking the plate 40 with the motor 46. The motor thereby drives the plate 40 back and forth, as illustrated by the doubled-headed arrow 51, when the motor is activated. It will be understood that the motor 46 may be connected to electrical circuits in the same manner as the motor 22 in FIG. 2.

In FIG. 5 a clothespinlike clip 60, for attaching to the pocket or other part of the clothing of a person, is connected near one end 61 via a hinge 62 to the top part 15 of the structure 10. A spring 63 located between the end portion 61 and the top part 15, beyond the hinge, biases the clip so that the second end 64 is urged toward the structure 10. As illustrated, the cover 18 (not shown) is removed and the framework 11 is exposed. A motor 70 mounted in the framework is fitted with an end cam 71, and a push rod 72, engaged at one end in the clip near the second end 64 extends to the cam surface to function as a cam follower. When the motor is activated the clip is caused to oscillate about the axis of the hinge 62, against the spring 63, by the linear oscillation imposed upon the push rod 72 by the end cam 71. The push rod is constrained to execute motion in a linear path. A hole (not shown) may be provided in the cover 18 (shown in FIG. 1) for passage of the push rod 72 when the cover is in place on the embodiment of FIG. 5. To install or remove the cover it is necessary only to lift the second end 64 of the clip 60 away from the framework 11 far enough so that the cover can pass by the free end of the push rod.

What is claimed is:

1. A personal paging device having a supporting structure within a casing intended to be carried by a person, a component of said paging device being carried by said supporting structure and having a predetermined mass, radio-receiving means in said casing to provide an alerting signal, normally in-

active linear vibrator motive means responsive to said alerting signal and effective when energized to vibrate said component in a predetermined path relative to said structure, and means coupling said component to said structure for causing said structure to vibrate.

2. A device according to claim 1 in which said vibrator motive means vibrates said component at a subaudible frequency.

3. An alerting device according to claim 1 in which said vibrator means includes a mass supported by said structure, said motor means is supported by said structure, and said mass is coupled to said motor means.

4. A device according to claim 1 in which said component is supported within said structure, and said structure includes means for confining said component in said path within said casing.

5. A device according to claim 4 in which said means to provide said alerting signal includes electric energy cell means for providing power for said radio-receiving means, and in which at least one electric energy cell is located in said supporting structure and is coupled to said vibrator motive means for executing reciprocal motion, whereby to serve simultaneously as a source of power for said electrical circuit means and as said component.

6. A device according to claim 5 including resilient means supported in said structure at one end of the locus of travel of said cell and piston means at the other end of said locus of travel for holding said cell between them, and wherein said vibrator motive means is arranged to reciprocate said piston in said path.

7. A device according to claim 4 in which said vibrator motive means includes a rotatable shaft, and cam means to couple said component to said shaft.

8. A device according to claim 7 in which the axis of rotation of said shaft is substantially parallel to said path and said cam means consists essentially of an end cam on said shaft and a follower for coupling said cam to said component.

9. A device according to claim 7 in which the axis of said shaft is substantially perpendicular to said path and said cam means consists essentially of a positive-motion cam cooperatively engaged in a yoke which is fixed relative to said component.

10. A device according to claim 6 in which said vibrator motive means includes a rotatable shaft, the axis of rotation of which is substantially parallel to said path, with an end cam on said shaft for reciprocating said piston in said path.

11. A device according to claim 1 in which said component includes an elongated member pivotally affixed near one end to said casing externally thereof, said vibrator motive means is supported by said structure within said casing, and said elongated member is coupled near its other end to said motive means through a movable link, said elongated member including fastening means for attaching said structure to another body.

12. An alerting device a according to claim 11 in which said motor means is supported within said structure and said fastening means is a clip for attaching said structure to the clothing of a person carrying said device, whereby reciprocal motion of said link in said path causes said structure to vibrate relative to said person.

13. A vibratory alerting device comprising a supporting structure, electrically operated signal processing means in said structure for providing an alerting signal, electric-energy-cell means for providing power to said signal processing means, housing means for holding said cell means in said structure, and motor means responsive to said alerting signal for imparting to said cell means vibratory motion within said housing means.

14. An alerting device according to claim 13 in which said vibratory motion is in a substantially linear path.

15. An alerting device according to claim 14 in which said housing means has resilient means at one side and said motor means is effective at an opposite side, said cell means is held between said resilient means and said opposite side, and said motor means imparts to said cell means reciprocal motion in said path against said resilient means.

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