

TERMINAL UNIT OF A MOBILE COMMUNICATION SYSTEM

BACKGROUND OF THE INVENTION

The present invention relates to a terminal unit of a mobile communication system and, more particularly, to a terminal unit of the type having a vibrating device for alerting the user to an incoming call.

A mobile communication system extensively used today includes a radio pager, portable radio telephone, cordless telephone or similar terminal unit. It has been customary with such a terminal unit to alert the user to an incoming call by an alert tone which is generated by a speaker or similar sounder installed in the unit. A current trend, however, is toward the replacement of the sounder with a vibrating device such as a miniature motor in order to avoid the alert tone which is simply an annoyance to persons around the user. The vibrating device is associated with the terminal unit in such a manner as to vibrate and thereby inform the user of the arrival of a call. If the casing of the terminal unit is great enough to accommodate the vibrating device, the latter is accommodated in the former. If otherwise, the vibrating device is accommodated in an adapter which is connected to the casing of the terminal unit. The

problem with the vibrating device incorporated in the casing is that the vibration cannot be surely imparted to the user due to the size of the casing, often failing to alert the user to an incoming call. Likewise, the vibrator housed in the adapter is not satisfactory since the vibration thereof cannot be sufficiently imparted to the user depending on the size of the adapter. In the light of this, the vibrator may be mounted on the outer periphery of the casing or that of the adapter to transmit the vibration thereof directly to the user. Although this kind of scheme may successfully alert the user by vibration and promote easy mounting and dismounting of the vibrator, it increases the overall dimensions of the terminal unit.

SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide a terminal unit of a mobile communication system which surely imparts the vibration of a vibrator to the user even when the unit has a relatively large casing, thereby informing the user of the reception of a call without fail.

It is another object of the present invention to provide a generally improved terminal unit of a mobile communication system.

An embodiment will be described below of a terminal unit of a mobile communication system having a vibrating device for alerting the user of the terminal unit to an incoming call by

vibration, a vibration source included in the vibrating device is mounted on a single member of the terminal unit which is positioned, when the terminal unit is put on a part of the user's body, closest to that part of the user's body.

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BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects, features and advantages of the present invention will become more apparent from the following detailed description taken with the accompanying drawings in which:

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Fig. 1 is an external perspective view of a prior art terminal unit of the type using a vibrating device;

Fig. 2 is an external perspective view of a terminal unit with a vibrating device embodying the present invention;

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Fig. 3 is an exploded perspective view of the vibrating device and a fixing member included in the illustrative embodiment;

Fig. 4 is a fragmentary section showing a vibration source of the vibrating device of the embodiment which is mounted on the fixing; and

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Fig. 5 is an external perspective view of the body of the terminal unit to which the fixing member carrying the vibrating device therewith is fixed.

DESCRIPTION OF THE PREFERRED EMBODIMENT

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To better understand the present invention, a brief reference

will be made to a conventional terminal unit of a mobile communication system of the type using a vibrating device, shown in Fig. 1. As shown, the terminal unit, generally 10, has a body 12, a belt clip or similar fixing member 14 hinged to the outer periphery of the casing 12, and a vibrating device implemented with a miniature motor 16 and accommodated in the body 12. When the unit body 12 is too small to accommodate such a vibrating device therein, an adapter 18 accommodating a miniature motor 16a therein is connected to the casing 12 in a direction indicated by an arrow A in the figure. When the terminal unit 10 receives a call from a remote station, the motor 16 incorporated in the unit body 12 or the motor 16a incorporated in the adapter 18 is caused to vibrate to inform the user of the unit 10 of the reception of the call. The drawback with this configuration is that the unit body 12 accommodating the motor 16 or the adapter 18 accommodating the motor 16a has such a size that the vibration often fails to reach the user, as discussed earlier.

Referring to Fig. 2, a terminal unit of a mobile communication system embodying the present invention is shown and generally designated by the reference numeral 20. As shown, the terminal unit 20 has a body 22, a belt clip or similar fixing member 24 rotatably mounted on the outer periphery of the body 22, and a soundless vibrating device 26 mounted on the fixing member 24. The vibrating device 26 includes a miniature

motor, for example, and alerts the user to an incoming call by vibration in place of sound. Fig. 3 shows in an exploded perspective view the fixing member 24 removed from the unit body 22, and the vibrating device 26. The vibrating device 26
5 is made up of a miniature motor, piezoelectric element, electromagnetic vibrating element or similar vibration source 28, terminals 30a and 30b implemented with leaf springs, and a connector 32 interconnecting the vibration source 28 and terminals 30a and 30b. The fixing member 24 has a flat body
10 34 having a predetermined thickness and constituting a belt clip. A pair of hinges 36 and 38 protrude from one of opposite major surfaces of the clip body 34 and have respectively through holes 36a and 38a for receiving a pin 40. Recesses 42 and 44 are formed in that surface of the clip body 34 where the hinges 36
15 and 38 are provided. The recesses 42 and 44 receive the connector 32 of the vibrating device 26 and the vibration source 28, respectively. A projection 46 also extends out from the clip body 34 to form a space between the clip body 34 and the unit body 12, so that the user's belt may be passed therethrough
20 when the terminal unit 20 is put on the belt. The recesses 42 and 44 may be replaced with openings formed throughout the clip body 34. A flat cover 48 prevents the connector 32 and vibration source 28 from slipping out of the recesses 42 and 44, respectively. Specifically, as shown in Fig. 3, the cover 48 has
25 openings 50a and 50b and notches 52a and 52b. The openings

50a and 50b allow the terminals 30a and 30b of the vibrating device 26 to protrude therethrough into contact with an electric circuit provided on the casing 12. The notches 52a and 52b receive respectively the hinges 36 and 38 extending out from the clip body 34. Fig. 4 shows the vibrating device 26, particularly the vibration source 28 thereof, which is fixed in place by the cover 48.

Referring to Fig. 5, the body 12 of the terminal unit 20 has a casing 12a on which the fixing member 24 with the vibrating device 26 is mounted. A pair of hinges 54 and 56 are provided on one of opposite major surfaces of the casing 12a and have respectively through holes 54a and 56a for receiving the pin 40. Connecting terminals 58a and 58b are positioned on the same surface of the casing 12a as the hinges 54 and 56. The leaf springs or terminals 30a and 30b of the vibrating device 26 protruding through the openings 50a and 50b of the cover 48 are respectively held in contact with the connecting terminals 58a and 58b, whereby the vibration source 28 is electrically connected to the electric circuit incorporated in the unit body 12. In assembly, after the hinges 36, 38, 54 and 56 have been aligned, the pin 40 is inserted into the holes 36a, 38a, 54a and 56a of the hinges. As a result, the fixing member or belt clip 24 loaded with the vibrating device 26 is hinged to the unit body 12. If desired, an arrangement may be made such that the terminals 30a and 30b resiliently bias the fixing member 24

counterclockwise about the pin 40, as indicated by an arrow B.

In summary, in the illustrative embodiment, a vibrating source constituting a vibrating device is received in a recess formed in the body of a flat belt clip. Moreover, the clip body
5 is thin enough to surely impart the vibration of the vibration source to the user who wears the terminal unit. Specifically, since the vibration source is mounted on a particular member of the terminal unit which is positioned closest to the user's body, the vibration is surely transmitted to the user's body with no
10 regard to the size of the unit body. ~~In this sense, the particular member mentioned above is not limited to the belt clip which is adapted to fix the terminal unit to the user's belt.~~

Various modifications will become apparent to those skilled in the art after receiving the teachings of the present disclosure
15 without departing from the scope of the invention, as defined in the appended claims given a purposive construction.



CLAIMS

1. A terminal unit of a mobile communication system, the terminal unit having vibrating means for alerting a user of the terminal unit to an incoming call by feeling the vibration of the vibrating means, in which a source of the vibration to be felt is arranged on a ~~single member of the terminal unit for mounting on a~~ belt clip by which the unit may be attached to a user's belt, the belt clip having a flat body which is provided with means for retaining the source of the vibration to be felt in such a position that when the user wears the terminal unit the source of the vibration is close to the user's body.

2. A terminal unit as claimed in claim 1, in which the belt clip further includes a connector retaining portion provided on one major surface of the flat body of the belt clip for retaining a connector which is included in the vibrating means for connecting the vibration source to an electric circuit of the terminal unit.

3. A terminal unit as claimed in claim 2, in which the vibration source retaining means and the connector retaining portion each includes a recess for receiving an associated one of the vibration source and the connector



respectively.

4. A terminal unit as claimed in claim 3, in which the belt clip further includes a cover for retaining the vibration source and the connector in their respective recesses.

5. A terminal unit as claimed in claim 4, in which the cover includes openings through which terminals in the form of leaf springs are passed to make contact with connecting terminals provided on a casing of the terminal unit, whereby the vibration source is connected to the electric circuit of the terminal unit via the connector.

6. A terminal unit as claimed in claim 1, in which the vibration source of said vibrating means is a miniature motor.

7. A terminal as claimed in claim 1, in which the vibration source of the vibrating means is a piezoelectric element.

8. A terminal as claimed in claim 1, in which the vibration source of the vibrating means is an electromagnetic vibrating element.

9. A terminal unit as claimed in claim 1 substantially as described herein with reference to Figs. 2 to 5 of the accompanying drawings.
