

sage bearing tactile icons, and a vibration pattern selector program **140c** enabling a user to select which stored tactile icon to communicate as a message using the mobile phone.

[0031] Still referring to **FIG. 1**, as indicated above, a mobile phone according to the invention need only have a vibration motor **100** or other means of producing a tactile sensation and software means (stored in the mobile phone in a memory **140**) for executing vibration patterns (i.e. for interpreting the vibration patterns to the controller **106** by providing instructions to the controller so that the controller can command the vibration motor accordingly) and for managing vibration patterns (creating them, editing them, saving them or downloading them, and selecting one or another to communicate), as well as a data store of some sort or another for storing vibration patterns (in the memory **140**). In addition, such a mobile phone usually also includes an antenna **102**, a transceiver **104**, and a battery **116** or an accumulator in place of a battery. Instead of either a battery or an accumulator, the mobile phone can use as a source of power a car battery or, when used in a house, external mains power for the house. In addition, the mobile phone usually includes a keypad **108**, a display **110**, a microphone **112**, and a loudspeaker **114**.

[0032] Referring now to **FIG. 2**, various vibration patterns and their associated or logical meaning are illustrated. For each pattern, vibration (at some unspecified frequency greater than 0 Hz) as a function of time is indicated. In the case of imitating the vibratory force that would be caused by a bouncing ball as it bounces to a standstill, a lower frequency vibration would correspond to the bouncing of a larger, heavier ball, such as a basketball, and a higher frequency vibration would correspond to the bouncing of a smaller, lighter-weight ball, such as a ping pong ball or a golf ball. The vibration indicating an alert is usually generated using simple repeating cycles where the motor is on for about 500 ms and then off for about 500 ms in each cycle.

[0033] Vibration pulses of any length can be used for building tactile icons. As mentioned, only the duration of the on and off periods is indicated in **FIG. 2**, and other parameters, such as frequency and amplitude, could also be varied when specifying a vibration pattern/tactile icon. (Although a rotating vibration motor, strictly speaking, has a constant amplitude, the frequency of the vibration can be changed by changing the speed of rotation, and it turns out that the perceived intensity of vibration is proportional to the rotating speed so in that sense the intensity can be changed even for a rotating vibration motor.)

[0034] Referring now to **FIG. 3**, the different ways vibration patterns may vary is indicated, using a coordinate system in which the x-axis represents time and the y-axis represents amplitude (a vibration-producing device capable of varying vibration in both amplitude and frequency being assumed for illustration). A dashed line **208** depicts a vibration pattern in which both the amplitude and frequency are constant, the vibration device being simply turned on and off over and over again at the desired frequency (at least for a period of time). A curve **204** depicts a vibration pattern in which the amplitude is constant but the frequency increases from a low frequency to a high frequency at the end of the pattern. A curve **206** depicts a vibration pattern in which both amplitude and frequency vary. Finally, a dashed line **202** depicts a pattern in which the amplitude increases, but

the frequency remains constant, in this case the frequency being the rate at which the vibration device is turned on and off.

[0035] Referring now to **FIG. 4**, a flowchart of the invention is shown as a method for use by a mobile phone including a first step **401** in which, in response to a tactile sensation pattern (which could either have been received by the mobile phone or which could have been indicated by an indicator or pointer in a message received by the mobile phone, and indicator or pointer that indicates a predetermined tactile sensation pattern known to the mobile phone), and using instructions on how to interpret the tactile sensation pattern, the mobile phone converts the tactile sensation pattern into a control signal, and then, in a second step **402**, based on the control signal, the mobile phone produces a tactile sensation.

[0036] How Tactile Icons are Communicated

[0037] According to the preferred embodiment, tactile icons are communicated between mobile phones (or between a mobile phone and a landline phone) as smart messages, in much the same way as ringing tones and business cards are communicated today. (Ringing tones are today often downloaded by mobile phone users from a web service to personalize the ringing tones of their mobile phones.) In other embodiments, tactile icons are communicated as an attachment to a text message, a picture message, or some other multimedia message.

[0038] In the preferred embodiment, what is communicated as a tactile icon is an on/off pattern, such as indicated in **FIG. 2**, at some specified frequency (and possibly indicating a variation in amplitude during the pattern). In some embodiments, however, a tactile icon selector is all that is communicated, and the receiving mobile terminal creates the vibration pattern predetermined to correspond to the communicated selector.

[0039] Of course the source or the receiver of a tactile icon may, according to the invention, be a device other than a mobile phone, and may be other than a phone at all. For example, a tactile icon can be sent with a PC and be received with a vibrating mouse.

[0040] The mobile phones can, but need not be, equipped with editor software to compose vibration patterns. With a composer one could create personal tactile icons quickly and send them to his or her closest friends.

[0041] Different tactile icons can, but need not be, provided through mobile network based services. For example, tactile icons could be downloaded from a web service, just as ringing tones and logos are downloaded today.

[0042] Tactile icons could also be communicated as a game or as an aspect of a game. For example, an operator could send a rhythm pattern (non-audible) to a customer (who has registered for receiving games) and the task would be to guess the song behind the rhythm.

[0043] How Tactile Icons are Converted to Actual Vibrations Sensible to Users of Mobile Phones

[0044] As already mentioned, a tactile icon can be translated into actual vibration (at any frequency greater than 0 Hz) using an eccentric weight mounted on the axis of a motor **100** under the control of a microcontroller **106** (**FIG.**