

13

received either in the unit 5P or in the unit 5C within said time slot, thereby enabling the geographic two-dimensional position of P1 to be calculated and evaluated and therewith enabling corresponding information to be sent to the circuit board 2' via the conductor 6d.

FIG. 5 is a schematic plan view illustrating the function shown in FIG. 3, and also shows activation of a surface section 12 in the same way as that earlier described with reference to a narrow pointer 9 and its tip 9a.

The surface section 12 is represented by the number 3, and the display unit 3 has been allocated a first display surface section 31, represented by the keypad of the mobile telephone apparatus T with its rows and columns of keys or buttons, and a second display surface section 32, represented by the presentation surface of said mobile telephone apparatus T.

Thus, the possibility of co-ordinating both the first display surface section 31 and the second display surface section 32 within one and the same display unit 3 lies within the concept of the invention.

It should be noted in this respect, with reference to FIG. 7, that a marked surface section, such as a number-presenting surface section 12', may be diffuse and cover two or more light pulse receiving units, for instance units 5'B, 5'C, 5'D and 5'E, and four light pulse receiving units 5Q, 5P, 5O and 5N active against opposing light pulse emitting units 4'G, 4'F, 4'E, 4'D and 4K, 4L, 4M, 4N respectively, and that a correct indication may also be obtained even though all of said receivers indicate the absence of light pulse related signals or shadows within their respective time slots.

In this case, the calculating unit 6 is able to sort out peripheral units, in the present case the units 5Q, 5N and 5'B, 5'E respectively, with the aid of a calculating circuit 6c, and therewith deliver a clearer evaluation of the position P1 via the units 5P, 5O and 5'C, 5'D, in accordance with the spot markings in FIG. 7.

FIG. 4 shows a pulse plan applicable to the time-wise distribution of the light pulses, said plan being adapted to save energy and to increase intensity and light strength.

As a result of this pulse structure, each of the light pulse emitting and angled units 4 and 4' respectively will be actuated solely for a short period of time and within an allocated time slot.

During the short time slot t0-t1, in which a light pulse emitting unit, such as the unit 4L, is actuated, the calculating unit 6 ascertains, via an associated pulse receiving circuit 5aP, whether or not a light pulse has been received on an oppositely located receiver 5P. The time point for said evaluation is referenced U.

Immediately after the status of the receiver 5P has been read, the light pulse emitting unit 4L concerned is extinguished at the end of a time slot t0-t1.

Disturbances that may be caused from ambient light can be suppressed, by temporarily increasing the intensity of each of the selected light pulse emitting units 4, 4'.

Thus, as will be seen from FIG. 6 in combination with FIG. 7, in respect of conditions where two or more side-related light pulse receiving units 5Q, 5P, 5O, 5N and associated pulse receiving circuits indicate simultaneously the absence of light pulses, the calculating unit 6 functions, with the aid of internal calculating circuits, such as circuit 6c, to interpret this information to mean that the intended geographical position P1 shall be considered to be located between the points, or consist of the most probable points, that are representative via said corresponding pulse receiving circuits.

Thus, FIG. 4 shows that each light pulse emitting unit shall be ignited over only a short time slot or pulse time, e.g. 10 μ s, with an electric current higher than 1A, with a subsequent

14

pause to a time point t2, which may be adapted to more than 100 times the chosen pulse time t0-t1.

Also shown in FIG. 4 is that the emission time or time slot t0-t1 for the unit 4L begins (t0) slightly before the activated reception time (t1) for the unit 5P, and that an idling time t1-t3 is caused to lapse prior to activation of an adjacent unit 4K within its time slot, where after the unit 5Q is immediately activated.

The same applies to the unit 4J and to the unit 5R and also remaining units, these latter units not being shown in FIG. 4.

With the intention of saving energy, a lower idling time frequency (t0-t2) can be chosen and only one unit, 4L, used. When the light pulse is broken, the display unit 3 is activated via a circuit 62, in accordance with the FIG. 4 pulse plan.

The light pulse emitting units are activated, via associated pulse generating circuits 4a, 4a', sequentially in a consecutive order or are selectively positioned in a predetermined order, and the corresponding light pulse detecting units 5, 5' can also be activated in said predetermined order, via the circuits 5a, 5a'.

FIG. 8 shows that a plurality of light pulse emitting units, referenced 4J, 4K and 4L, are adapted to send light pulses during a chosen time duration and during respective time slots, and that only one light pulse receiving unit 5R is adapted to be activated in this respect, so as to allow anticipated or expected light pulses to be received during said chosen time duration and within said time slots, and therewith allow occurring light pulses and shadowed light pulses to be registered so as to enable the geographical position of a more diffuse point, such as the point P1', to be evaluated.

Although not shown, it is obvious that a plurality of light pulse receiving units 5P, 5Q and 5R could be adapted to receive consecutively during a chosen time duration a plurality of light pulses emitted in time slots from solely one light pulse emitting unit, for instance the unit 4L, and to adapt the light pulse receiving units to be activated to receive anticipated light pulses during said chosen time duration and therewith allow occurring light pulses and shadowed light pulses to be registered.

FIG. 9 shows a more realistic and practical application of the principles for activating a "key" or "button" indicated in FIG. 6.

FIG. 10 illustrates a further practical application of the principles indicated in FIG. 6 for activation of another key or button for actuation of another mobile telephone function.

In this case, the display unit 3 with its upper surface 3a is actuated by a surface section of the thumb of the user, namely the thumb surface that faces inwards towards the palm of the user's hand, said surface therewith covering a large part of the surface section of the upper surface 3a.

In this regard, FIG. 9 shows that the surface section of the thumb 90 will shadow the column-related units 5R, 5Q, 5P and 5O and also the row-related units 5'C, 5'D, 5'E, 5'F and 5'G, and that the calculating circuit 6c functions to establish the key or button (8) that has been actuated, from this pattern of shadowed light pulses.

In this respect, FIG. 10 shows that the surface section of the thumb 90 will shadow the column-related units 5S, 5R and 5Q and also the row-related units 5'D to 5'H, and that the calculating circuit 6e is adapted to establish which button or key (6) has been actuated, from the pattern of shadowed light pulses.

The invention has been described with reference to sending short light pulses in the IR range.

The pulse technique enables stronger or weaker signals to be generated with the aid of a calculating circuit 6f so as to