PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : H04M 1/60

A1

(11) International Publication Number: **WO 98/53584**

(43) International Publication Date: 26 November 1998 (26.11.98)

(21) International Application Number: PCT/EP98/02739

(22) International Filing Date: 11 May 1998 (11.05.98)

(30) Priority Data:
TO97A000427 20 May 1997 (20.05.97) IT

(71)(72) Applicants and Inventors: RAIA, Salvatore [IT/IT]; Corso Caio Plinio, 62, I–10127 Torino (IT). BISCUOLA, Davide [IT/IT]; Via Giacomo Dina, 38/8, I–10137 Torino (IT).

(74) Agents: ROBBA, Pierpaolo et al.; Interpatent, Via Caboto, 35, I–10129 Torino (IT).

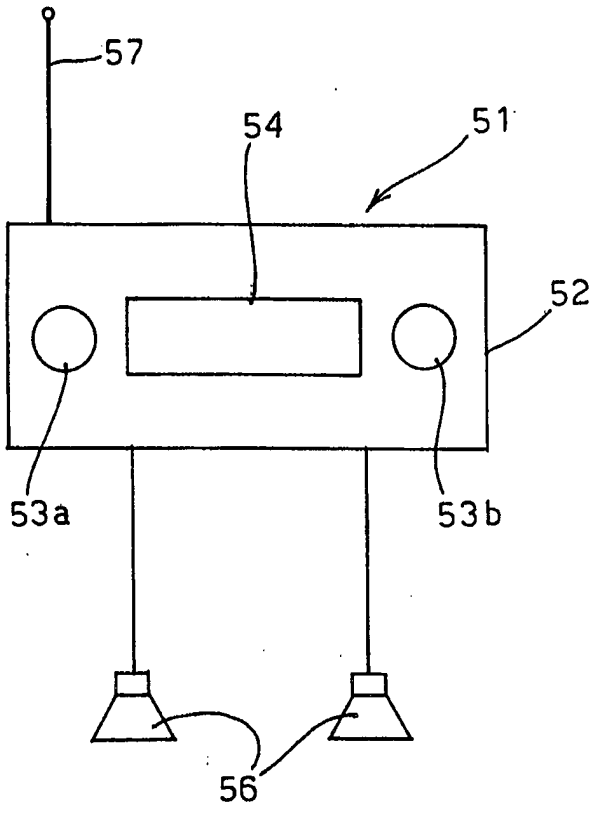
(81) Designated States: AL, AU, BA, BB, BG, BR, CA, CN, CU, CZ, EE, GE, GW, HU, ID, IL, IS, JP, KP, KR, LC, LK, LR, LT, LV, MG, MK, MN, MX, NO, NZ, PL, RO, SG, SI, SK, SL, TR, TT, UA, US, UZ, VN, YU, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).

Published
With international search report.
Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(54) Title: A CORDLESS HANDSFREE TELEPHONE SET

(57) Abstract

The invention concerns a cordless telephone set (1) comprising a housing (2) containing a power supply unit, a receiver transmitter unit for allowing telephone calls, a loudspeaker (8), a microphone (9) and circuitry for the working of said telephone set, further comprising a handsfree unit, fed by the same power supply and comprising an auxiliary radio transmitting unit (11) for broadcasting the telephone audio signal received from said telephone set.



FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	**ES**	Spain	**LS**	Lesotho	**SI**	Slovenia
AM	Armenia	**FI**	Finland	**LT**	Lithuania	**SK**	Slovakia
AT	Austria	**FR**	France	**LU**	Luxembourg	**SN**	Senegal
AU	Australia	**GA**	Gabon	**LV**	Latvia	**SZ**	Swaziland
AZ	Azerbaijan	**GB**	United Kingdom	**MC**	Monaco	**TD**	Chad
BA	Bosnia and Herzegovina	**GE**	Georgia	**MD**	Republic of Moldova	**TG**	Togo
BB	Barbados	**GH**	Ghana	**MG**	Madagascar	**TJ**	Tajikistan
BE	Belgium	**GN**	Guinea	**MK**	The former Yugoslav Republic of Macedonia	**TM**	Turkmenistan
BF	Burkina Faso	**GR**	Greece			**TR**	Turkey
BG	Bulgaria	**HU**	Hungary	**ML**	Mali	**TT**	Trinidad and Tobago
BJ	Benin	**IE**	Ireland	**MN**	Mongolia	**UA**	Ukraine
BR	Brazil	**IL**	Israel	**MR**	Mauritania	**UG**	Uganda
BY	Belarus	**IS**	Iceland	**MW**	Malawi	**US**	United States of America
CA	Canada	**IT**	Italy	**MX**	Mexico	**UZ**	Uzbekistan
CF	Central African Republic	**JP**	Japan	**NE**	Niger	**VN**	Viet Nam
CG	Congo	**KE**	Kenya	**NL**	Netherlands	**YU**	Yugoslavia
CH	Switzerland	**KG**	Kyrgyzstan	**NO**	Norway	**ZW**	Zimbabwe
CI	Côte d'Ivoire	**KP**	Democratic People's Republic of Korea	**NZ**	New Zealand		
CM	Cameroon			**PL**	Poland		
CN	China	**KR**	Republic of Korea	**PT**	Portugal		
CU	Cuba	**KZ**	Kazakstan	**RO**	Romania		
CZ	Czech Republic	**LC**	Saint Lucia	**RU**	Russian Federation		
DE	Germany	**LI**	Liechtenstein	**SD**	Sudan		
DK	Denmark	**LK**	Sri Lanka	**SE**	Sweden		
EE	Estonia	**LR**	Liberia	**SG**	Singapore		

"A CORDLESS HANDSFREE TELEPHONE SET".

The present invention relates to a cordless telephone set such as for example a portable telephone set of the type used in a cellular telephone network.

In the mobile telephone systems the are presently known compact portable telephone sets through which it is possible to place and receive calls within a cellular telephone network, for example in accordance with the GSM system.

The telephone sets presently used in cellular mobile telephone systems are generally enclosed in small size prismatic housings or cases that can be easily held in the hand palm.

For such reason such compact portable telephone sets are also called "palmar" telephones.

Outside the housing there are generally provided an alphanumeric keyboard, a display on which the numbers and the codes selected through the keyboard are shown, a first opening located in correspondence of a microphone contained in the housing, a second opening located in correspondence of a loudspeaker contained in the housing and a length of whip antenna.

Inside the housing, further to the above mentioned microphone and loudspeaker, there are housed the operating circuitry of the cordless telephone set and a power supply unit comprising one or more (generally rechargeable) batteries.

Such circuitry further comprises a low power receiver transmitter unit for communicating, through the antenna provided in the telephone set and the antennas - fixed on ground and/or

provided on-board of satellites - of the cellular telephone network, with other users of the telephone network.

The portable handheld units of the above mentioned type are generally designed for personal use and must be kept near the user's head for an effective usage, since otherwise the voice from the loudspeaker of the telephone set would not be audible to the user, and the microphone of the telephone set would not receive a sufficient level of acoustic power to be transmitted.

In order to allow using of such telephone sets even at a certain distance from the user, and particularly without the need to hold the apparatus in the hand, e.g. when driving a car, or in order to allow a number of people in a room to listen and talk through a single telephone set, suitable amplifying devices known as add-on hand-free modules have been developed.

Such handsfree module or devices are of particular advantage when at least one person involved in a conversation is driving a car since the driver can freely conversate through the portable telephone set without holding this latter in his hands.

Such handsfree devices generally comprise an audio amplifier, a loudspeaker for radiating acoustic power into the air, and a microphone that is more sensible than those usually housed in portable telephone sets. As an alternative to using a more sensible microphone, a small microphone can be attached at the end of a flexible support or on other holding means, and thus can be positioned near the user's mouth to let the user's hands free.

Additionally the handsfree devices need to be connected to the portable telephone set through a small cable equipped

with a suitable connector.

This cable connection allows the transmission of the audio (voice) signals from the telephone set to the loudspeaker of the amplifying device, and from the microphone of the amplifying device to the telephone set.

This electric connection is usually established through either a proper pendant connector or a connector housed within a fixed base to which the portable telephone set can be attached.

Therefore the use of a hand-free device has the drawback that the portable set must be inserted into a connector or attached to a fixed base or adapter unit.

For this reason using such an add-on device is often annoying, particularly for short-duration and frequent calls since the telephone set must be frequently inserted into and extracted from the connector for being used both inside and outside the vehicle.

The above fixed bases or adapter units for handsfree use of the portable telephone have a further drawback in that they are permanentely installed inside the motor car, often by skilled personnel, and therefore they cannot be easily removed and transferred to other vehicles.

A further drawback again deriving from the need to establish an electric connection between the portable telephone set and the handsfree device comes from the fact that such frequent in and out pluggings wear out the connector and rapidly impair its reliable connection and often lead to its breaking or malfunction.

WO 96/32783 discloses an interfacing device between a portable telephone and a car radio receiver that converts the

audio signal of the portable telephone set into an RF radio signal adapted to be received by the antenna of the car radio receiver so that it can be reproduced through the loudspeakers of the car radio receiver.

This way the relatively weak acoustic signal from the small loudspeaker of the portable telephone set, is amplified and can be heard in the car compartment without need to hold the telephone set near the user's ear.

The interfacing device disclosed in WO 96/32783 is preferably housed within a fixed base that is adapted to receive the telephone set.

This base unit or housing is provided with a further electric connector for the connection to the telephone set.

A first object of the present invention is therefore to solve the technical problem of allowing the combined use of a portable telephone set with a radio receiver - such as for example a car radio receiver - without inserting the telephone set into an adapter unit or connecting the telephone set to a connector.

The above and other objects are accomplished through the telephone set of the invention, as claimed in the attached claims.

Advantageously the telephone set according to the invention can be used near any radio reveiver set, e.g. a car radio receiver, tuned on an assigned frequency determined by an auxiliary radio transmitter associated with the telephone set, without having to connect the portable set to an electric connector or attach it to a fixed base mounted in the car.

Therefore the telephone set according to the invention

can be used for carrying out telephone conversations inside the car compartment by placing it over the dashboard or securing it to a support or an arm, with such support or arm being inexpensive and adapted to be easily fitted to and unfitted from different vehicles, since no electric connection to the vehicle is required.

The above and other objects of the invention will become evident from the following description of a preferred embodiment thereof, reference being made to the attached drawings in which:

Fig. 1 schematically illustrates a cordless telephone set, and more particularly Fig. 1a is a front view, Fig. 1b is a rear view, and Fig. 1c shows a car radio receiver;

Fig. 2 illustrates a telephone set according to a first embodiment of the invention as seen from the rear and with the cover removed;

Fig. 3 is a block diagram of a first portion of an electric circuit inside the telephone set according to the invention;

Fig. 4 is a block diagram of a second portion of an electric circuit inside the telephone set according to the invention;

Fig. 5 illustrates an alternative embodiment of the telephone set in Figura 2;

Fig. 6 comprises three perspective views of an external add-on hand-free module according to present invention;

Fig. 7 illustrates an antenna disposed inside the addidional module of Figura 6;

Fig. 8 is a block diagram of an electric circuit housed in the additional module.

With reference to Fig. 1a a cordless telephone set 1 comprises a housing 2, an alphanumeric keyboard 3, a display 4, for displaying the numbers and the codes selected through (digitated on) the keyboard 3. In the housing there are provided a first small opening 5 for a microphone and a second opening 6 in correspondence of a loudspeaker both of which are located inside the housing 2, and an antenna 7.

Inside the housing 2, in addition to the above mentioned microphone and loudspeaker, there are located the typical circuits of a cordless telephone set such as a low power receiver transmitter unit for exchanging communications through the antenna 7 provided in the telephone set 1 and fixed and/or satellite antennas so that users of the cellular telephone network can communicate with each other.

Fig. 1b further schematically illustrates the back of the telephone set 1, with a power supply unit or battery 21, provided with a leaf connector 20 usually used also for recharging the battery.

Still referring to Fig. 1, and particularly to Fig. 1c, there is further schematically shown a conventional FM radio reveiver set 51 comprising a case 52 housing the typical circuits of an FM radio reveiver, an antenna 57 and a pair of loudspeakers 56.

In the front panel of case 52 there are shown control means 53a and 53b for controlling the functions of the radio set, respectively a knob 53a for adjusting the sound volume and a tuning knob 53b, with the information concerning the tuned frequency, as well as other operating information, being displayed on a display 54.

As better shown in the first embodiment illustrated in Fig. 2, the telephone set 1 according to the invention further comprises a board 10 carrying the electronic components of an auxiliary radio transmitting unit 11.

Such auxiliary radio transmitting unit 11 serves to radio broadcast through a dedicate antenna 12, the audio frequency signal that usually should be applied to the loudspeaker 8 inside the housing 2, adjacent the opening 6 in the front of the housing 2 as shown in Fig. 1. In Fig. 2, the loudspeaker 8 is only schematically shown since as a matter of fact it is disposed within the housing 2 adjacent the opening 6 in the front panel of housing 2 as shown in Fig. 1.

Advantageously the auxiliary radio transmitting unit 11 is provided with a flexible antenna 12 disposed in a dedicated seat peripherally formed in the wall of the housing 2.

Consequentely the antenna 12 is disposed outside the shielding protecting the cicuitry 14 of the telephone set from electromagnetic interferences (EMI), this circuitry 14 being visible in the view partially cut away of Fig. 2 through opening 13 in the board 10.

A switch 16 that can be actuated from outside the housing 2, is provided for inhibiting the working of unit 11 when it is not desired to send out the voice signal by using the auxiliary radio transmitting unit.

Preferably, the audio frequency signal taken from the terminals of loudspeaker 8 is amplified by an amplifier 15 before being applied to unit 11.

The auxiliary radio transmitting unit 11 can for example comprise a FM reactance modulator provided with a quartz

oscillator adapted to oscillate at a frequency selected so as its radio carrier is located within an FM radio band comprised between 86 and 108 MHz.

As an alternative, the auxiliary radio transmitting unit 11 can employ a PLL oscillator, easily programmable for oscillating at different frequencies.

This way the user can select, for example through the telephone keyboard, a frequency not in use in the 86 - 108 MHz band as a transmission frequency of the auxiliary unit, and tune the radio receiver on it.

Moreover the FM modulator power is preferably low so that the broadcast signal can be received only by a radio receiver 52 being immediately near the telephone set, thus ensuring the privacy of the conversations.

With reference to Fig. 3 there is illustrated a preferred embodiment of the amplifier circuit 15 and of the auxiliary radio transmitting unit 11 where the audio frequency signal is taken in correspondence of the leads that apply said signal to loudspeaker 8 in telephone set 1 (input 110, Fig. 3).

In the circuit shown in Fig. 3, reference 111 indicates a ferrite bead, 112 a capacitor having a value of 1 μF, 113 a 100 kα resistive potentiometer for adjusting the level of the signal to be amplified by the operational amplifier 114.

Reference 115 further indicates a 100 nF capacitor, 116 a 4.7 nF capacitor, 117 a 10 kα resistor, and 118 a 1 Mα resistor.

The signal amplified by the operational amplifier 114 is applied through a 82 kα resistor 119 to a varicap 130 of the auxiliary radio transmitting unit unit 11.

Advantageously such auxiliary radio transmitting unit unit radio 11 comprises an NPN transistor 131, resistors 132, 133 and 134, respectively of 10 kα, 47 kα and 330 kα, a capacitor 135 (56 pF), capacitors 136, 137, 138, 139 and 140 (27 pF), a 6-10 pF variable capacitor 141, and a 100 nF capacitor 142.

The circuit of unit 11 further comprises an 86,625 MHz quartz 143, a 100 μH inductance 145 and an RF choke coil 146 directly formed on board 10 and connected to the antenna 12.

A power supply circuit 17 is further provided for feeding both the amplifier 15 and the auxiliary radio transmitting unit 11 unit.

Still with reference to Fig. 3, said power supply circuit 17 comprises an input terminal 150 to be connected to the existing supply line, typically a 6V terminal of the telephone set, a ferrite bead 151, a voltage regulator 152, capacitors 153, 154 and 155 having respectively the values of 10 μF, 10 nF and 1 μF, and a 2.7 kα resistor 156.

Again in accordance with the invention and with reference to Fig. 2, the telephone set 1 comprises an amplifier 18, for amplifying the signal generated by microphone 9 of the apparatus 1.

Thanks to an amplifier 18 the telephone set according to the invention is sensitive even to low level sounds and can allow a conversation even when located at a distance of 1.5-2 m from the talker.

Amplifier 18 further comprises a suppression circuit of signals from the microphone 9, of the type commonly used in handsfree devices of the prior art to prevent annoying echoing

effects.

The suppression circuit blocks the audio signal from the microphone 9 when an input audio signal is present to the loudspeaker 8.

This way the sound reproduced through the loudspeakers of the radio reveiver set, for example the one shown in Fig. 1 and indicated with reference 52, is prevented from being applied again to the telephone line after it has been received by the microphone 9.

With reference to Fig. 4, the telephone set according to the invention further comprises a circuit 60 for generating a radio signal adapted to control the operation of radio receiver sets such as the one indicated with reference 51 in Fig. 1, that are provided for being used in the Radio Data System (R.D.S.).

As it is known, the radio receiver apparatuses, particularly those be used on board of vehicles, are provided with R.D.S. functions that allow for example the automatic tuning of the receiver on stations transmitting audio information concerning traffic, while the driver is listening to an audio cassette or a CD player.

Thanks to the circuit illustrated in Fig. 4, the telephone set according to the invention is able to switch the working of the radio reveiver set, upon receiving the call ringing signal, so as to automatically actuate the radio tuner through which the user receives the telephone conversation.

Preferably, the circuit di Fig. 4 comprises a switch 61 that is opened when the ringer of the telephone set 1 is actuated, and starts a counter 62 the output signal of which is applied to a quartz modulator for generating a carrier signal

having a predetermined frequency (57 kHz in the European R.D.S. system) to be transmitted to amplifier 15 in correspondence of the node 59.

The circuit of Fig. 4 further comprises capacitors 63 (10 nF), 64 (2.2) μF, 65 (100 nF), 66 (10 nF), 67 (33 pF) and 68 (47 nF), resistors 69 (10 kα), 70 (from 220 kα to 1 Mα), 71 (2.7 kα), 72 (1 Mα) and 73 (10 kα), a varicap 78 and a variable capacitor 79 with a capacity adjustable from 10 to 60 pF.

A 10 kα potentiometer 74 is further provided on the output of counter 62, and two NAND logic gates 75 and 76 are connected to the output of the 57 kHz quartz 77.

At nodes 80a and 80b the circuit 60 is connected to a 5V power supply circuit, non shown.

Coded information can be transmitted to a radio reveiver set 51 enabled to receive R.D.S. standard, and are shown on the display 54 in form of graphical characters, through the input 81 of circuit 60.

According to an alternate embodiment of the above described telephone set, schematically shown in Fig. 5, the telephone set 1 further comprises an auxiliary radio receiver unit 90 operating at a frequency F_2 that is different from the operating frequency F_1 of the auxiliary radio transmitting unit 11. Frequency F_2 is preferably in the band from 300 to 400 MHz used by wireless microphone.

Through said auxiliary unit radio receiver 90 the radio signal sent for example by a separate wireless microphone 91 provided with an inner battery and an antenna 92, is received and applied to circuit 14 of the telephone set for being transmitted along the telephone line.

This way a wireless microphone 91 can advantageously be positioned near the user's head, for example in correspondence of the breast pocket, to capture the user's voice during a telephone conversation.

In this modified embodiment the telephone set can for example be contained in a circular shape housing and provided with a wrist strap for being employed as a wrist telephone.

Fig. 6 illustrates a second embodiment of the handsfree apparatus according to the present invention. More particularly the three perspective views of Figs. 6a, 6b and 6c, show an external additional handsfree module 31 adapted to be coupled with a cordless telephone set such for example the one shown in Fig. 1.

The additional module 31 comprises a case 32 housing the electronic circuits implementing the handsfree device and sending the radio signal to the car radio receiver.

On a side of the case there is fitted a male connector with a plurality of contacts 33 to be inserted into a female connector 19 of the cordless telephone set 1. The connector 19 is a standard connector present in the lower portion of all cellular portable telephones and is usually aimed to interfacing the telephone set with external devices.

Near the connector 33 there is positioned a device 34 with tabs one of which is elastic for stably hooking the additional module 31 to the housing 2 of the telephone set 1, and a contact pin 35, adapted to make a contact with a blade or leaf 20 on the battery 21 of the telephone set 1, as shown in Fig. 1b.

The case 32 further contains a microphone 36 with a

small circular opening on one of the case narrow side and a ringer 37 on the rear side of the case.

Fig. 7 shows the additional module of Fig. 6 incorporating an antenna 38 disposed inside the module in a peripheral position. More particularly the antenna 38 is located within a groove formed to this aim in the housing wall, for transmitting the signal from the telephone set 1 to the car radio receiver 51.

Fig. 8 is a block diagram of an electric circuit embodying the handsfree circuit contained in the additional module 31.

The diagram of Fig. 8 comprises four main blocks, one of which is described hereinbelow.

In the first block A there is shown the circuit diagram of the female connector 19, located in the lower portion of the cellular telephone. The connector 19 has 10 pins, numbered from 1 to 10, from right to left.

A 50 kα resistore R1 is connected between pin No. 4 of the connector and the ground, together with pins No. 1, 6 and 9. These connections are necessary for switching the telephone set 1 in a mute condition in respect of its inner microphone, the inner loudspeaker and the ringer, thus switching the telephone into the handsfree condition of use.

A second block B illustrates the electric diagram of an operational amplifier amplifying the signal from the microphone 36 located inside the additional module 31.

An operational amplifier U1A, of the LM358 type, supplied with a 3V voltage on pin No. 5 of the telephone connector 19, applies an amplified low frequency signal to pin

No. 8 of the same connector.

More particularly the circuit diagram depicted in block B comprises:

- a 22 kα resistor R2 providing a reference voltage to the operational amplifier U1A;
- a 3.3 μF capacitor C1 to stabilize the reference voltage of the operational amplifier;
- a 10 kα resistor R3 feeding the piezoelectric microphone.
- a capacitor C2 receiving the signal from the microphone 36, that filters it and galvanically insulates it from the inverting input of the operational amplifier U1A;
- a 10 kα resistor R4 for cutting the extreme frequencies so that the signal can reach the amplifier with an attenuated level;
- a 1 Mα resistor R5 and a 220 pF capacitor C3, parallely connected to feedback the operational amplifier, thus setting the amplifier gain, and further operating like a low pass filter for the passage of frequencies between 3 and 5 kHz;
- a 4.7 μF capacitor C4 connected to the output of the operational amplifier for galvanically insulating the microphone amplifier from the internal circuits of the telephone set;
- a 470 α resistor R6, in series with the capacitor C4, attenuates the signal and matches it to the input of the telephone set 1.

The third block C shows the electric diagram of a transmitter incorporating a FET transistor FET with grounded gate.

The audio signal to be transmitted is taken from pin No. 7 of the connector 19 and applied to a modulator for being

frequency modulated. An oscillator generates a frequency modulated signal that is sent to the radio receiver by a bobbin or coil on an air core. Thanks to this device the described transmitter does not require an antenna.

The transmitter is fed by a 6V voltage supplied by the battery 21 of the telephone through the contact pin 35 in the case 32 of the module.

In particular the components of this diagram are listed hereinbelow:

- a 1 nF capacitor C5 connectiung to ground the spurious RF signals RF that might be present in input;
- a 100 nF capacitor C6 galvanically insulating the circuits of the telephone set from those of the transmitter;
- a 47 kα resistor R7 and a 22 kα resistor R8 attenuating the low frequency audio signal and applying it to a diode D1 of the BAS 16 type;
- a diode D1 acting like a Varicap diode, i.e. a diode with a capacity that changes as a funtion of the voltage applied across its terminals, and modulating the signal from the oscillator;
- a 47 pF capacitor C7 that together with the diode D1 forms the frequency modulator;
- a coil L1 formed by 8 coilsin air, a 10 pF capacitor C10 and a 22 pF capacitor C11 that constitute the tuning oscillator circuit;
- a 10 pF capacitor C8 and a 5-30 pF variable capacitor C9 to adjust the transmission frequency from 87,5 to 108 Mhz;
- a transistor T1, of the BF245 type, that oscillates and generates a radio frequency signal that is radiated through the coil L1;

- a 100 kα resistor R9 and a10 nF capacitor C14 connecting to ground the gate terminal of transistor T1;
- a 100 μH impedance L2 connecting to ground the source terminal of transistor T1;
- a 100 nF capacitor C12 connecting to ground the RF signals from the oscillator so as to suppress any interference in the integrated circuit U2 stabilizing the power supply voltage and lowering it from 6 Volts to 5 Volts.

The fourth block D illustrates the electric diagram of a ringer circuit.

The circuit comprises an integrated circuit U3, of the NE556 type, and a buzzer BUZ.

The integrated circuit U3 comprises a double oscillator, with a first IC U3A being a timer set to about 3 seconds, the second IC U3B being an oscillator generating a frequency of about 1 kHz that after being amplified by transistor TR1, is applied to the buzzer BUZ.

When the telephone set is receiving a call, then a 3.6 V voltage is applied to pin 4 of the integrated circuit U3 that drives for about 3 seconds the 1 kHz oscillator that in turn generates the buzzer sound.

This way the user is warned of an incoming call and can fix the car radio receiver 51 to the handsfree function by tuning it to the proper frequency.

On the other hand this tuning can be automatically accomplished by providing in the additional module 31 a suitable circuit taking advantage of the possibilities of an R.D.S. system, such as for example the circuit shown in Fig. 4 and already described.

CLAIMS

1. A cordless telephone set comprising a housing (2) containing a power supply unit, a receiver transmitter unit allowing for telephone conversations, a loudspeaker (8), a microphone (9), circuits for the proper operating of said telephone set, and further comprising a handsfree unit, characterised in that said handsfree unit is fed by said power supply unit and comprises an auxiliary radio transmitting unit (11) for broadcasting the telephone audio signal received from said telephone set.

2. A telephone set as claimed in claim 1, characterised in that said handsfree unit is located inside the housing (2) of said telephone set.

3. A telephone set as claimed in claim 2, characterised in that said telephone audio signal is taken from the terminals of said loudspeaker (8).

4. A telephone set as claimed in claim 1, characterised in that said handsfree unit is located within an additional module (31) disposed outside said housing (2) and connected to the telephone set by electric connecting wires o mechanical and electric connectors.

5. A telephone set as claimed in claim 4, characterised in that said additional module (31) is provided with an electric connector (33) for matching a connector (19) provided in the lower portion of the telephone set.

6. A telephone set as claimed in claim 5, characterised in that said additional module (31) provides for at least a contact pin (35) adapted to make contact with a connecting leaf or blade (20) in the power supply unit (21) of the telephone

set.

7. A telephone set as claimed in claims 2 or 4, characterised in that the signal generated by said auxiliary radio transmitting unit (11) is a frequency modulated signal in the 86 - 108 MHz band.

8. A telephone set as claimed in claim 7, characterised in that said auxiliary radio transmitting unit (11) is an FM modulator comprising a grounded gate FET transistor (T1), the frequency of said modulator being selectable in the 86-108 MHz band.

9. A telephone set as claimed in claim 8, characterised in that the radio signal from said auxiliary radio transmitting unit (11) is broadcast through an air core coil (L1) present in said FM modulator.

10. A telephone set as claimed in claim 8, characterised in that the radio signal from said auxiliary radio transmitting unit (11) is broadcast through an internal antenna (38).

11. A telephone set as claimed in claim 7, characterised in that said auxiliary radio transmitting unit (11) is an FM reactance modulator provided with a quartz oscillator (130) oscillating at a frequency of 86.625 MHz and radiating through an antenna.

12. A telephone set as claimed in claim 11, further provided with an amplifier (15) amplifying said received telephone audio signal.

13. A telephone set as claimed in claim 7, characterised in that said auxiliary radio transmitting unit (11) is an FM modulator employing a PLL programmable frequency generator, oscillating in the 86-108 MHz frequency band and radiating

through an antenna.

14. A telephone set as claimed in claims 2 or 4, further comprising a wireless microphone (91) equipped with a radio transmitter unit, and an auxiliary radio receiver unit (90) adapted to receive through an antenna the signal transmitted by said wireless microphone (91), the operating frequency of said auxiliary radio receiver unit (90) and wireless microphone (91) being different from the operating frequency of said auxiliary radio transmitting unit (11).

15. A telephone set as claimed in claim 14, characterised in that the signal received from said auxiliary radio receiver unit (90) is a frequency modulated signal comprised in a band from 300 to 400 MHz.

16. A telephone set as claimed in claims 2 o 4, characterised in that said handsfree unit comprises a microphone the output signal of which is amplified by an operational amplifier.

17. A telephone set as claimed in any preceding claims characterised by further comprising a circuit (60) for generating a coded radio signal for controlling the operation of a radio receiver set designed for using the Radio Data System (R.D.S.).

18. A telephone set as claimed in claim 17, characterised in that said coded radio signal controls the automatic switching on of the radio tuner, by emulating the signal of a traffic information broadcast programm.

19. A telephone set as claimed in any preceding claims, wherein said telephone set is adapted for use in a cellular telephone network.

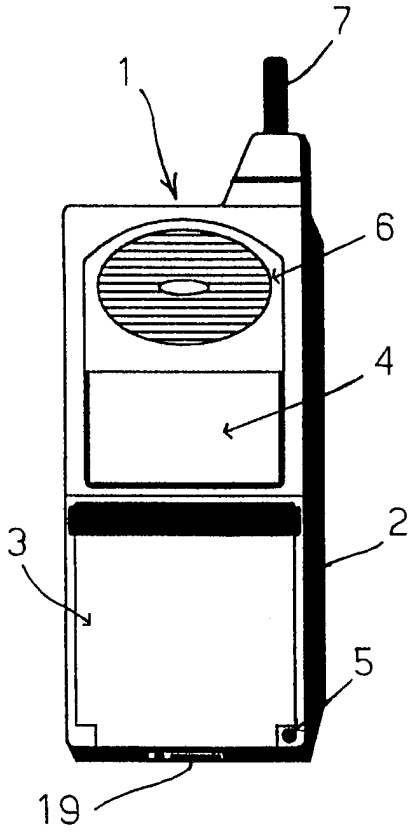


FIG. 1a

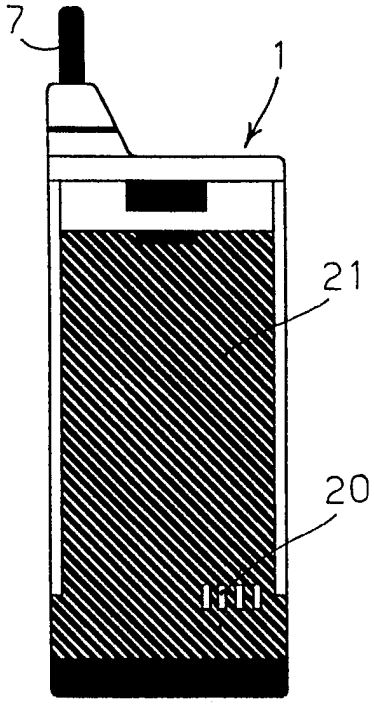


FIG. 1b

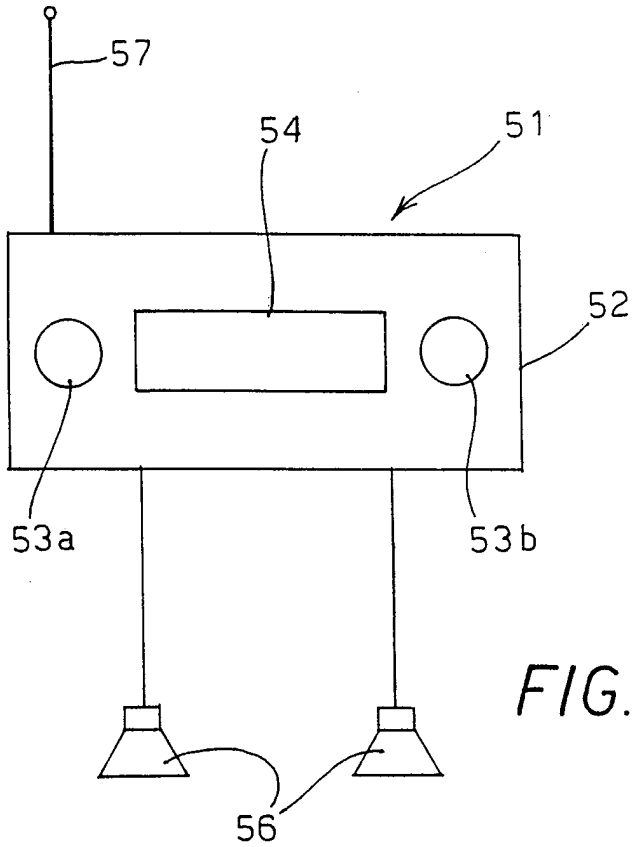


FIG. 1c

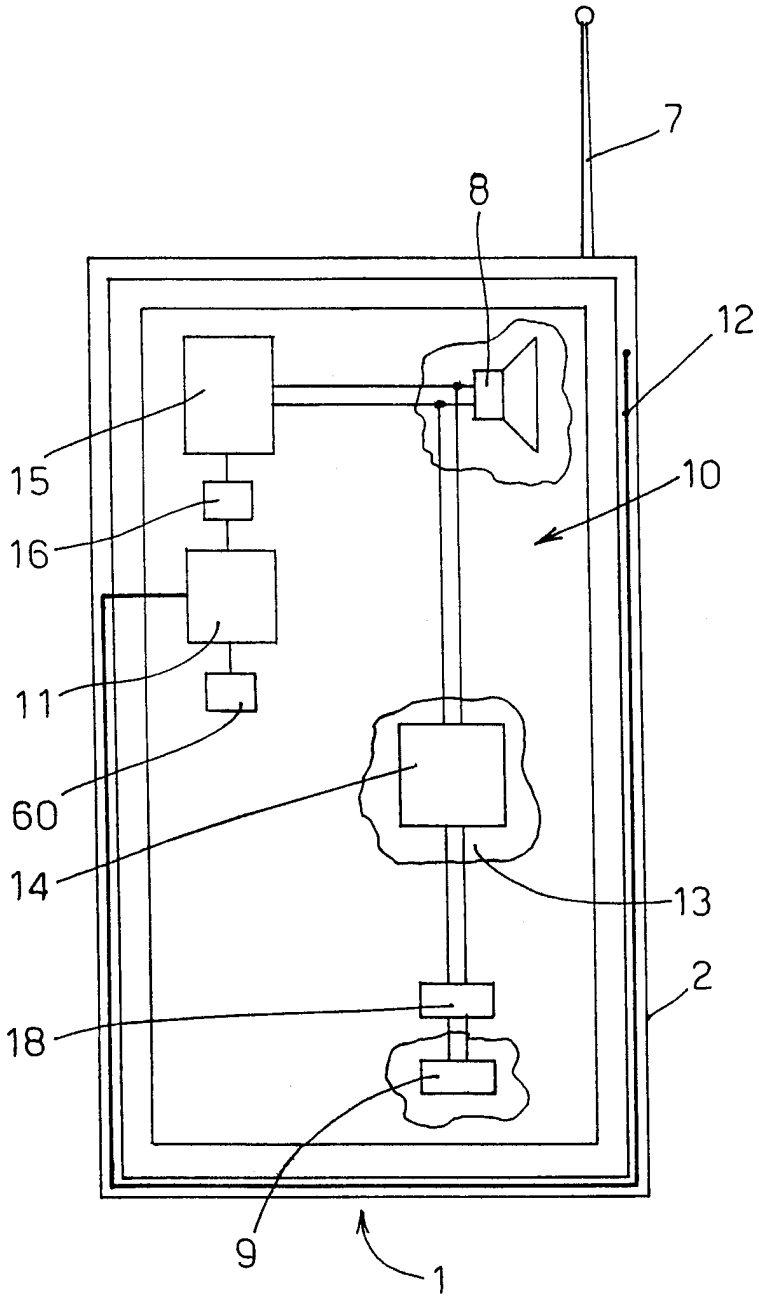


FIG. 2

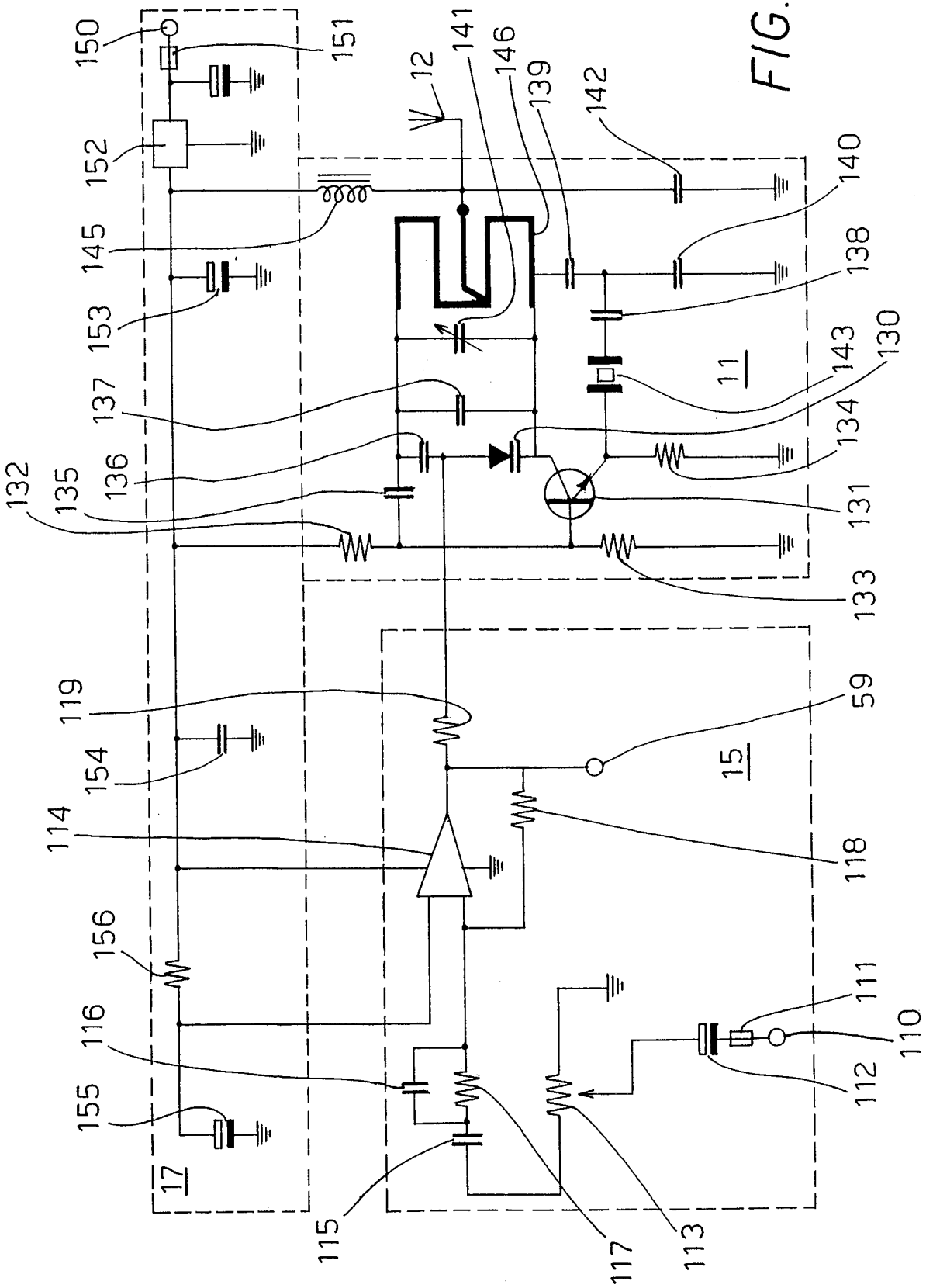

150
151
152
145
153
137
136
135
132
12
141
146
139
142
140
138
143
130
134
131
133
11
119
154
114
156
116
155
59
15
118
111
110
112
17
115
117
113

FIG. 3

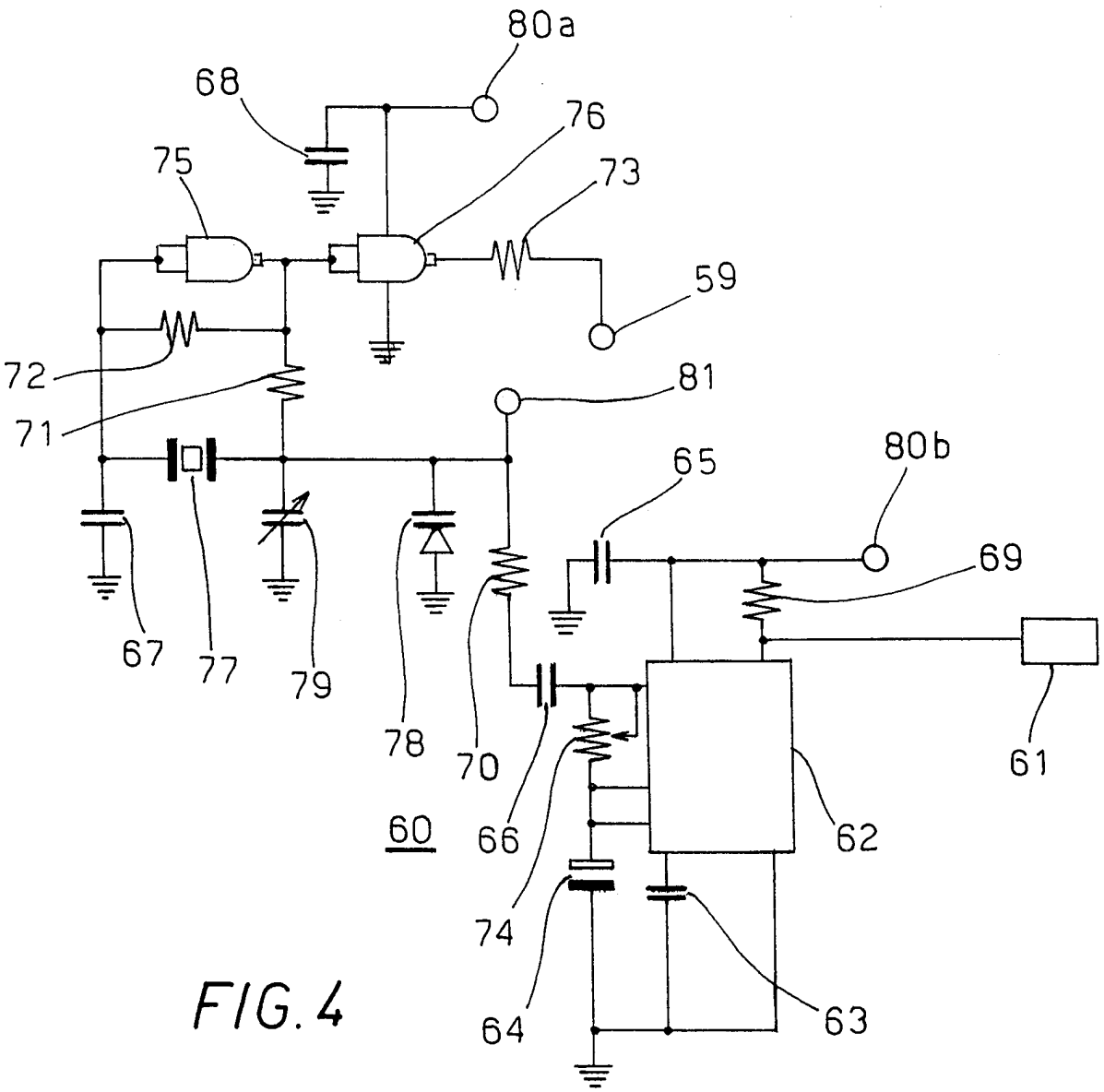

80a
68
76
75
73
59
72
81
71
65
80b
69
67
77
79
78
70
61
60
66
62
74
64
63

FIG. 4

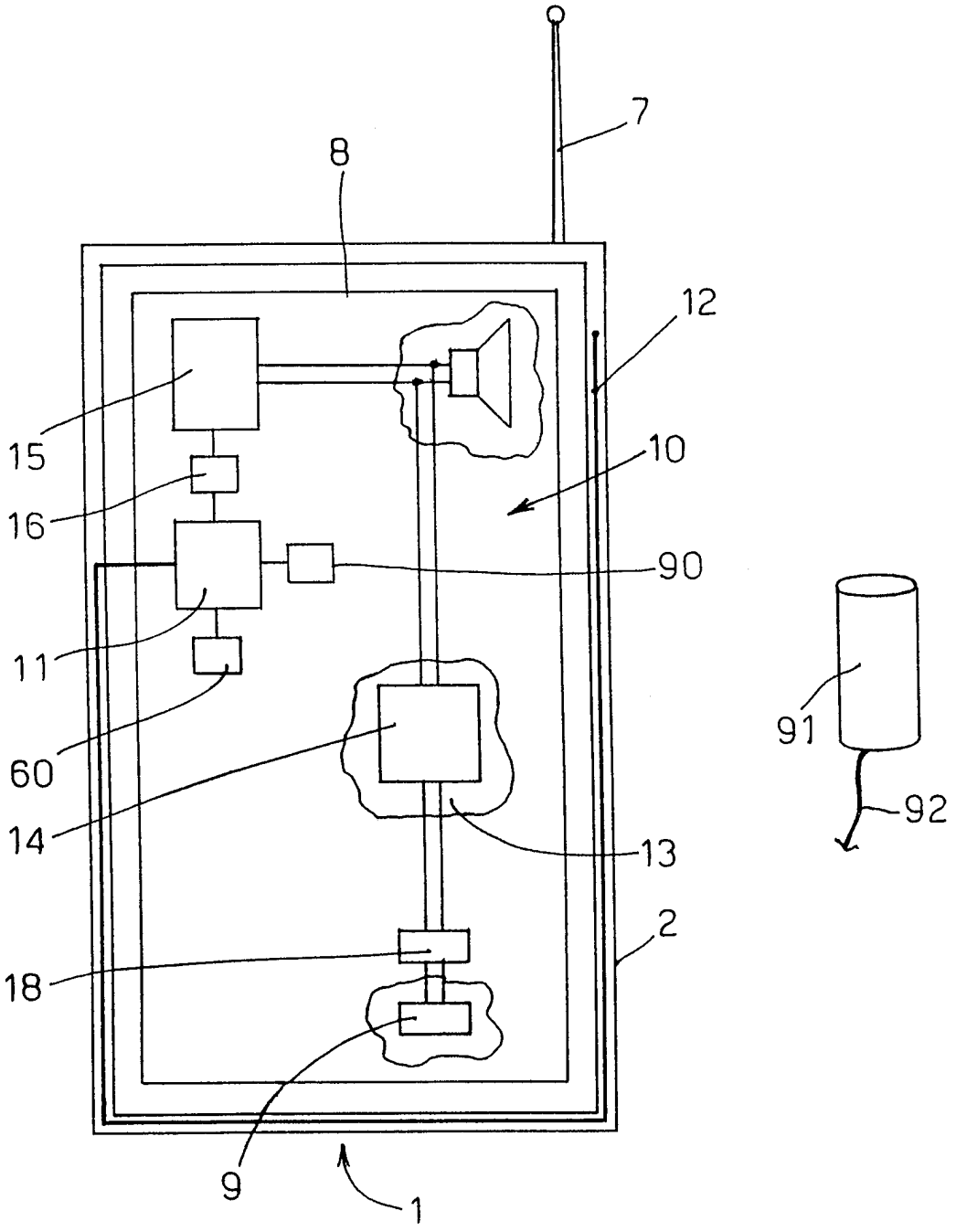


FIG. 5

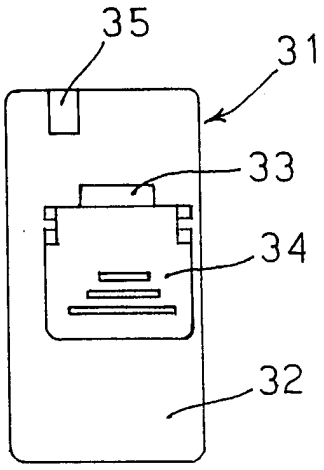


FIG. 6a

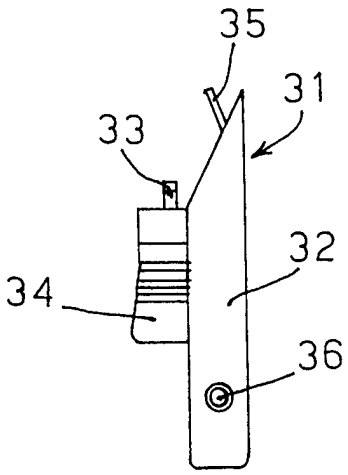


FIG. 6b

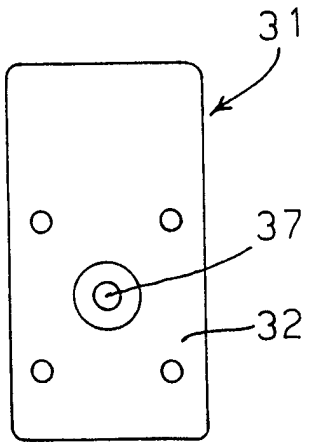


FIG. 6c

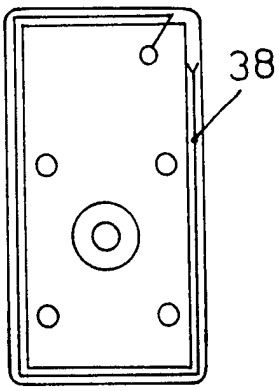


FIG. 7

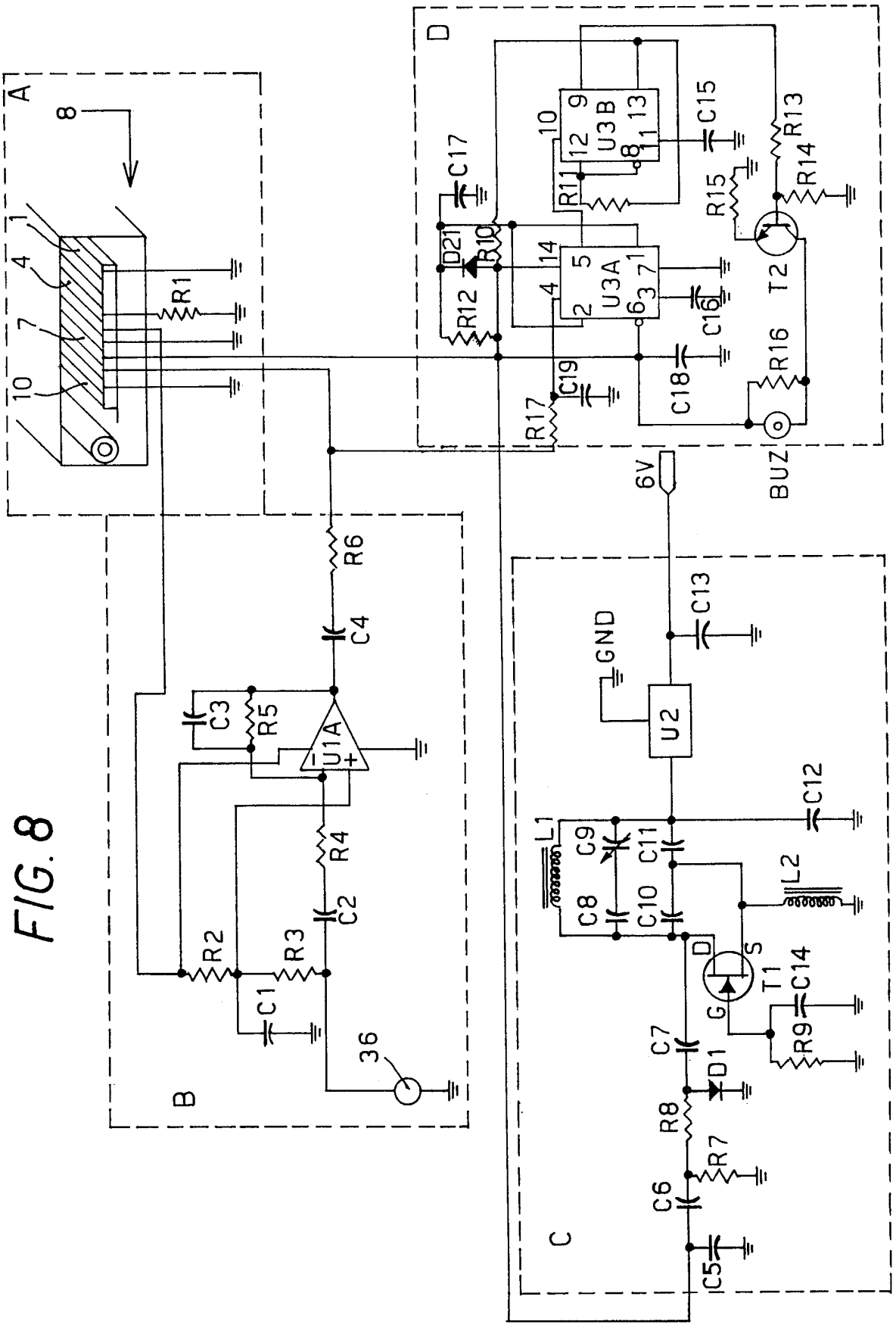

A
B
C
D
8
1
4
7
10
R1
R2
R3
R4
R5
R6
C1
C2
C3
C4
U1A
36
6V
GND
C13
U2
C12
L1
C9
C11
C8
C10
L2
D
S
G
T1
C14
R9
C7
D1
R8
R7
C6
C5
C17
D21
R10
R11
R12
U3B
U3A
C15
R13
R14
R15
T2
C16
R16
C18
C19
R17
BUZ

FIG. 8

INTERNATIONAL SEARCH REPORT

Inte ional Application No
PCT/EP 98/02739

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H04M1/60

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 H04M H04B H04Q B60R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 97 13332 A (SHEPLIND PTY LTD ;CROSS TERENCE JOHN (AU)) 10 April 1997 see the whole document ---	1-19
X	EP 0 760 569 A (GEFFEN SAMUEL ;TAMIR GIORA (US); TAMIR BARUCH (US)) 5 March 1997 see column 6, line 17-38 see column 7, line 16 - column 8, line 30 see column 10, line 54 - column 11, line 42 see figures 3-5,12,13 ---	1-19
X	GB 2 264 613 A (PIONEER ELECTRONIC CORP) 1 September 1993 see abstract; figures 1,9 --- -/--	1

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
21 October 1998	26/10/1998

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Golzio, D

1

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Int ional Application No
PCT/EP 98/02739

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 335 276 A (THOMPSON E EARLE ET AL) 2 August 1994 see abstract; figures 2,4,5,10 see column 16, line 62 - column 17, line 11 -----	1

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

Int tional Application No
PCT/EP 98/02739

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9713332 A	10-04-1997	AU 6979796 A	28-04-1997
EP 0760569 A	05-03-1997	US 5568538 A	22-10-1996
		EP 0862309 A	02-09-1998
		CN 1170327 A	14-01-1998
GB 2264613 A	01-09-1993	NONE	
US 5335276 A	02-08-1994	NONE	