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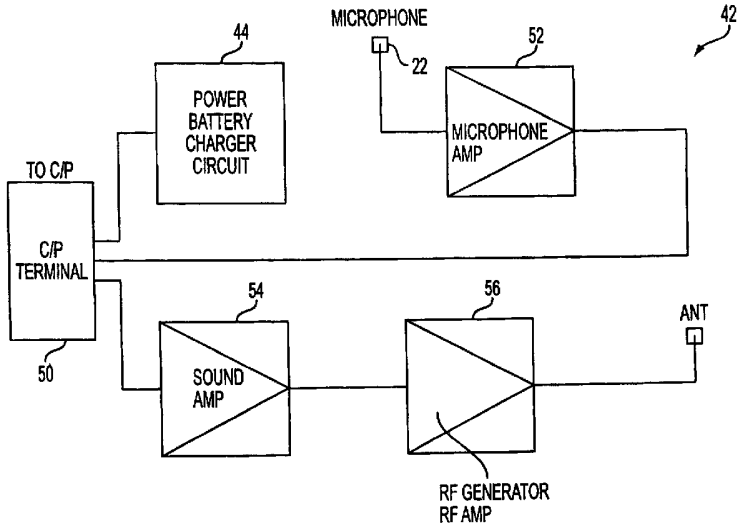
(54) Title: PLUG AND PLAY DUAL FM HANDS-FREE CAR KIT



(57) Abstract: A hands-free mobile telephone kit, including a device including an audio-FM converter and a FM transmitter circuit. The device is connected to a mobile telephone. The mobile telephone having its own speaker system. The device is configured to receive, convert and transmit a first signal received by the mobile telephone from a remote signal source connected over a mobile connection to the mobile telephone, to a FM receiver of an audio system for subsequent audio transmission over a speaker system connected to the audio system. The device is further configured to receive and transmit the first signal for audio transmission over the speaker system of said mobile telephone. The device further includes a switch for selecting between enabling the speaker of the mobile telephone and the speaker system of the audio system. The device includes an audio interface connected to the first microphone for receiving said first signal, and said FM transmitter for receiving the frequency information, receiving the first signal from the audio interface, and transmitting the first signal at the selected frequency based on the frequency information to the FM receiver.

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PLUG AND PLAY DUAL FM HANDS-FREE CAR KIT

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to cellular telephone accessories, and particularly to accessories that permit hands-free use of a cellular phone in an environment such as in an automobile, and that work in synergistic relationship with pre-existing automobile audio technology.

The Prior Art

The cellular telephone is becoming an increasingly attractive option for persons who wish to communicate with business or personal acquaintances even though they are away from their home or office telephone. Cellular telephones are often

efficiently used when a person is traveling between two destinations that each have conventional telephone capabilities. The most common scenario is a person traveling to work from home or vice-versa, or when traveling between two business destinations. Such traveling typically involves driving a car.

For an automobile having a manual transmission, two hands are required for manipulating the controls, i.e., one for steering and one for shifting gears. Even for an automobile with an automatic transmission, it is recommended to have two hands on the wheel at all times. Cellular telephones, like any other telephones, include a handset with a microphone and a speaker so that the user may, respectively, speak with and listen to the person at the other end of a call by holding the telephone in one hand. Of course, when a person is holding a cellular telephone in one hand, only one other hand remains free for manipulating the controls of the automobile such as the steering wheel and the stick shift. It is recognized in the present invention that it is desired that a person be able to talk on a cellular telephone while having two hands free to properly manipulate the controls of an automobile.

A disadvantage of using a cellular telephone handset is that only two persons can typically participate in a single call, without one person relaying to a third person what a person at the other end is saying or without handing the telephone back and forth between persons. If a cellular telephone were simply held or set down on a seat between two persons both wishing to

communicate with the person at the other end, neither of the two persons would be able to effectively hear, nor would the person at the other end be able to hear either of the two persons without everyone shouting excessively. It is desired to be able to hold a "conference call" through a cellular telephone connection in an automobile.

Wireless subscribers carry out their day to day business from their cars, from the job site, while walking along the airport concourse, and just about anywhere their signals are accessible.

Additionally, the popularity of the speakerphone, for both mobile and fixed telephones has grown steadily. The speakerphone feature enables users to conduct other tasks while carrying on a conversation without having to hold the instrument to their ear. In the car, the user can drive with preferably with both hands on the wheel and both eyes on the road. At home or in the office, the user can carry on other tasks while also carrying on a conversation.

Thus, it is no surprise that since the introduction of the cellular telephone service, the number of wireless telephone subscribers has increased steadily. Today, the number of wireless telephone subscribers is staggering and still growing rapidly. In fact, many households have multiple wireless telephones in addition to their conventional land-line services. Additionally, the popularity of speakerphones has grown as well. Almost every office telephone includes a speakerphone feature in today's

modern workplace.

SUMMARY OF THE INVENTION

In the invention, a hands-free cellular telephone kit includes a device. The device is connected to a cellular or mobile telephone and a microphone is built into the device. The device receives, amplifies and retransmits through a speaker a communication from another cellular telephone user during a cellular telephone call.

Using the microphone, the device further retransmits a communication to the other cellular telephone user. The device advantageously permits these cellular telephone communications when the cellular telephone is positioned away from the user.

The hands-free mobile telephone kit has a device for use with a mobile telephone with a speaker system. The device is configured to receive, convert and transmit a first signal received by the mobile telephone from a remote signal source connected over a mobile connection to the mobile telephone, to a FM receiver of an audio system for subsequent audio transmission over a speaker system connected to said audio system. The device is further configured to receive and transmit the first signal for audio transmission over the mobile telephone. The device includes an audio-FM converter and a switch for selecting between enabling the speaker system of the mobile telephone and the speaker system of the audio system. An audio interface is connected to a microphone for receiving the

first signal. The device has a FM transmitter for receiving the frequency information, for receiving the first signal from the audio interface, and for transmitting the first signal at a selected frequency based on the frequency information to the FM receiver.

The device also receives and transmits the first signal for audio transmission over the speaker of the mobile telephone.

The transmitter is configured for transmitting at a selected one of a plurality of available FM frequencies for transmitting the first signal to the FM receiver. Also, the transmitter is configured for transmitting at a selected one of a continuous range of available FM frequencies for transmitting the first signal to the FM receiver.

The device is further configured to attach to the mobile telephone.

In the hands-free kit, the switch is configured to perform the a selection between enabling the speaker system of the mobile telephone and the speaker system of the audio system during a mobile connection without breaking the mobile connection.

Further scope of applicability of the present invention will become apparent from the detailed description given hereinafter. However, it should be understood that the detailed description and specific examples, while indicating preferred embodiments of the invention, are given by way of illustration only, since various changes and modifications within the spirit

and scope of the invention will become apparent to those skilled in the art from this detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

A preferred structural system embodiment and preferred subcomponents of this invention are disclosed in the accompanying drawings in which:

Figure 1 is a perspective view of a plug and play dual FM hands-free car kit in accordance with the present invention;

Figure 2 is a perspective view of the plug and play dual FM hands-free car kit attached to a cellular telephone according to the present invention;

Figure 3 is a perspective view of the plug and play dual FM hands-free car kit attached to a cellular telephone and connected for use to the cigarette lighter in an automobile in accordance with the present invention;

Figure 4 is a block diagram of the plug and play dual FM hands-free car kit as set forth in the present invention; and

Figure 5A and 5B are schematic diagrams of the circuitry of the plug and play dual FM hands-free car kit in accordance with the present invention

DESCRIPTION OF THE INVENTION

Although only one preferred embodiment of the invention is explained in detail, it is to be understood that other embodiments are possible. Accordingly, it is not intended that the invention is to be limited in its scope to the details of construction and arrangement of components set forth in the following description or illustrated in the drawings. The invention is capable of other embodiments and of being practiced or carried out in various ways. Also, in describing the preferred embodiment, specific terminology will be resorted to for the sake of clarity. It is to be understood that each specific term includes all technical equivalents which operate in a similar manner to accomplish a similar purpose.

As shown in Figure 1, the plug and play dual FM hands-free car kit is shown as a single device 10. The device 10 is a radio transmitter. It is designed and manufactured not to exceed the emission units for radio frequency (RF) energy set by the Federal Communications Commission(FCC)of the U.S. Federal Government. These limits are part of a comprehensive guidelines and establish permitted levels of RF energy for the general populations. The guidelines are based on standards that were developed by independent testing labs.

The device 10 has a number of connections. The first connection is the input and output connector or modular jack 12 which is connected to a cellular telephone. The impendence is set between 16-32 ohms. A one touch button 14 for talk/end and privacy is positioned on the front face 16 of the device 10. On

one of the sides is an extended microphone jack 18 and a privacy earphone jack 20. The earphone impedance is set between 16-32 ohms. The device 10 includes a built-in microphone 22 and a LED indicator 24. At the opposite end of the modular jack 12, is a round connector 26 for plugging the device 10 into a standard lighter plug.

Figure 2 illustrates the device 10 connected to a modular cable 28. Also, there is a dual RF switch 30 which can be set to either channel one indicated by numeral 32 or channel two generally indicated by numeral 34. The FM frequency for channel one is 87.9 MHz. The FM frequency for channel two is 88.5 MHz ± 80kHz. The modular cable 28 is connected to a cellular or mobile telephone, indicated by numeral 36.

In Figure 3, the device 10 is connected to the modular jack 12 and the telephone cable 28 to the cellular or mobile telephone 36. At this point the radio 38 of the automobile is preset to a designated FM memory (87.9 or 88.3) station 40. When it is time to make or receive a telephone call, the radio is tuned to the preset station 40 and "SEND" is pressed on the cellular telephone 36. With the built-in microphone 22, talking and listening is done totally hands free.

Figure 4 illustrates the block diagram of the circuit of device 10.

In Figures 5A and 5B, the circuit is schematically presented.

For the charging and comparison circuit 44, R9 controls

the charging of the electric current. The charging current is 220mA ± 20mA

U4 is a DC-DC converter which uses a step down method to change the power source from the vehicle battery (not shown) at 12 volts to +5 volts which is an ideal voltage for a cellular telephone. The operating voltage for the device is 9V to 28V.

L9 and C36 are for removing maximum AC ripple from the cellular telephone charging voltage of +5 volts.

R32, R58 and Q5 are used to adjust the output voltage. The charging voltage is through D6 and this is for charging the telephone battery.

For the comparison part, if the voltage from both ends of R34 is different, the output voltage of U5 gets lower and that makes the LED indicator 12 go to red. It receives a signal from D2 which indicates that charging is in progress.

Alternatively, if the voltage from both ends are the same, the output voltage of U5 gets higher and the LED indicator 12 is green from D2 which is on and indicates the completion of charging.

The electric current separation circuit is indicated by reference numeral 46 and +12 voltages are used to make an electric current for charging the battery. A +5 VA is divided to provide a comparison power and hands free power.

The ground separation circuit 48 is for dividing a ground for charging and a ground for a hands free system.

The input, output connector 50 uses a signal in and out

connector which is connected with the cellular telephone directly to perform the function of this system.

With reference to Figure 5B, numeral 52 generally indicates the microphone amplification circuit. The voice signal is amplified first at U1A, is amplified at U1B second time and that amplified signal is transferred to IN, OUT connector.

The caller voice signal amplification circuit 54 receives the other party (caller)'s voice signal through IN/OUT connector and removes noise on C15 and R52. This circuit also amplifies that signal on U1C and sends it to RF launching and amplification circuit 56. Additionally, part of this signal is sent to a noise removal circuit 58 and suppresses the noise, for example a howling sound from MIC signal and caller signal. The microphone impedance is Omni Directional at 2.2Kohm and the microphone sensitivity is set to -44 ± 3dB at 1kHz.

The RF launching and amplification circuit 56 launches the necessary frequency, makes a transmittable frequency using R2, D4, X1, Q1. The signal from R51 of 54 is changed in this circuit and transmitted wireless amplified FM frequency from Q2, Q6 with the voice signal through AT1.

At the noise removal circuit 58, a suppression of the noise like a howling sound from MIC signal and the other party's voice signal occurs. The audio frequency response is about 100Hz to 20kHz ± 3dB.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous

modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and, accordingly, all suitable modifications and equivalents may be resorted to, falling within the scope of the invention.

The claims

1. A hands-free mobile telephone kit having a device for use with a mobile telephone with a speaker system, said device being configured to receive, convert and transmit a first signal received by said mobile telephone from a remote signal source connected over a mobile connection to the mobile telephone, to a FM receiver of an audio system for subsequent audio transmission over a speaker system connected to said audio system, and said device is further configured to receive and transmit said first signal for audio transmission over said mobile telephone, said device comprising:

an audio-FM converter and a switch for selecting between enabling said speaker system of said mobile telephone and said speaker system of said audio system, an audio interface connected to a microphone for receiving said first signal, and a FM transmitter for receiving the frequency information, receiving said first signal from said audio interface, and transmitting said first signal at a selected frequency based on the frequency information to the FM receiver.

2. The hand-free kit of claim 1, wherein said device receives and transmits said first signal for audio transmission over said speaker of said mobile telephone.

3. The hands-free kit of claim 1, wherein the transmitter is configured for transmitting at a selected one of a plurality

of available FM frequencies for transmitting the first signal to the FM receiver.

4. The hands-free kit of claim 1, wherein the transmitter is configured for transmitting at a selected one of a continuous range of available FM frequencies for transmitting the first signal to the FM receiver.

5. The hands-free kit of claim 1, wherein said device is further configured to attach to said mobile telephone.

6. The hands-free kit of claim 1, wherein said switch is configured to perform said selecting between enabling said speaker system of said mobile telephone and said speaker system of said audio system during a mobile connection without breaking the mobile connection.

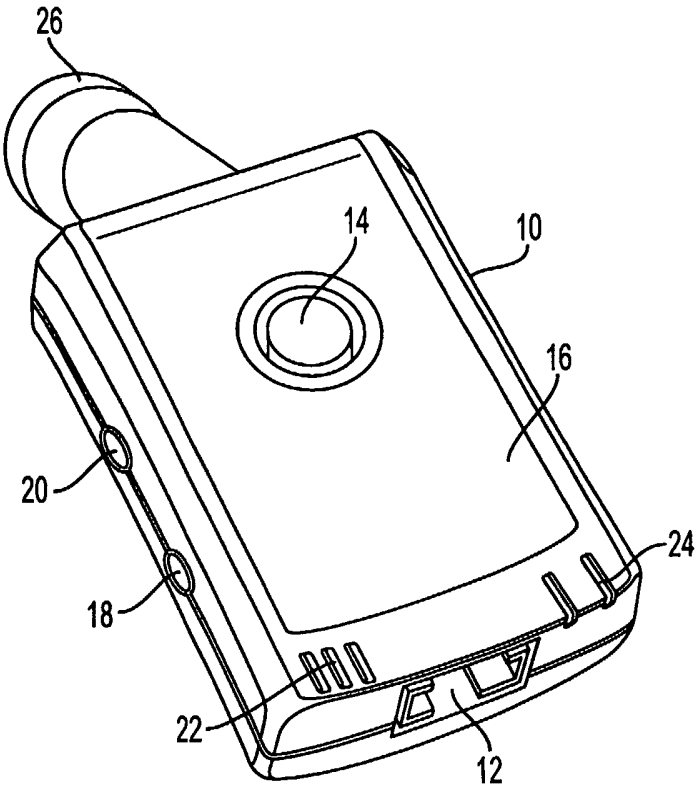

FIG. 1

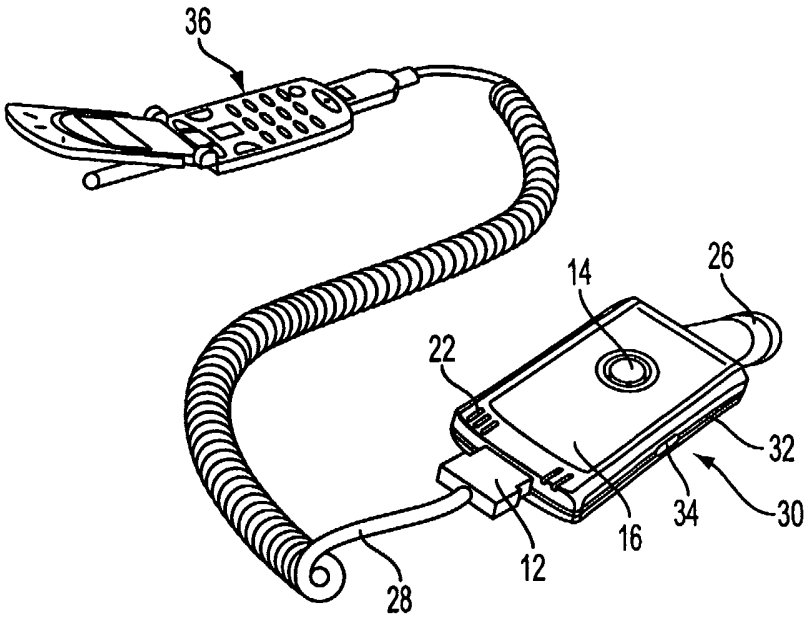

FIG. 2

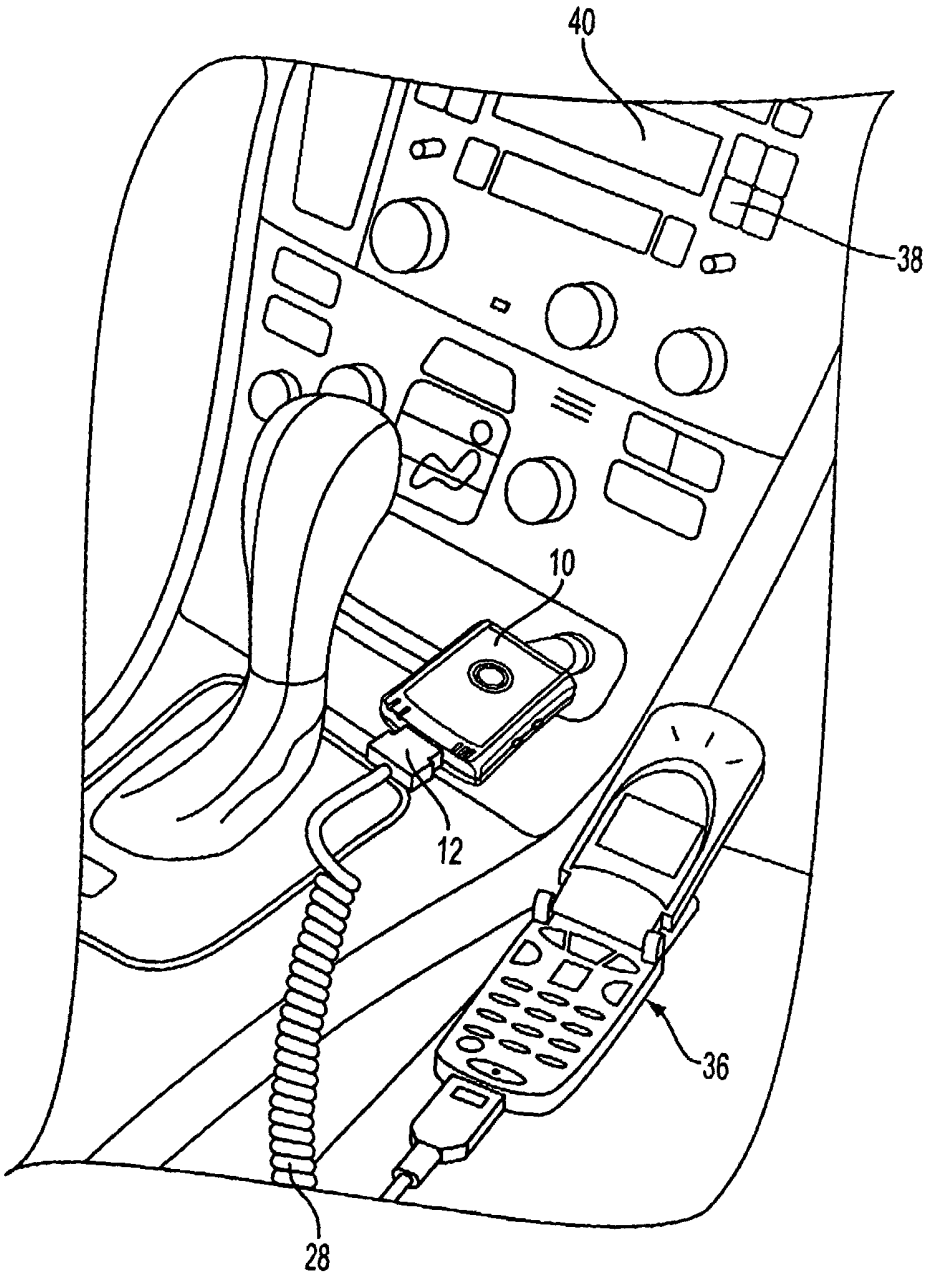

FIG. 3

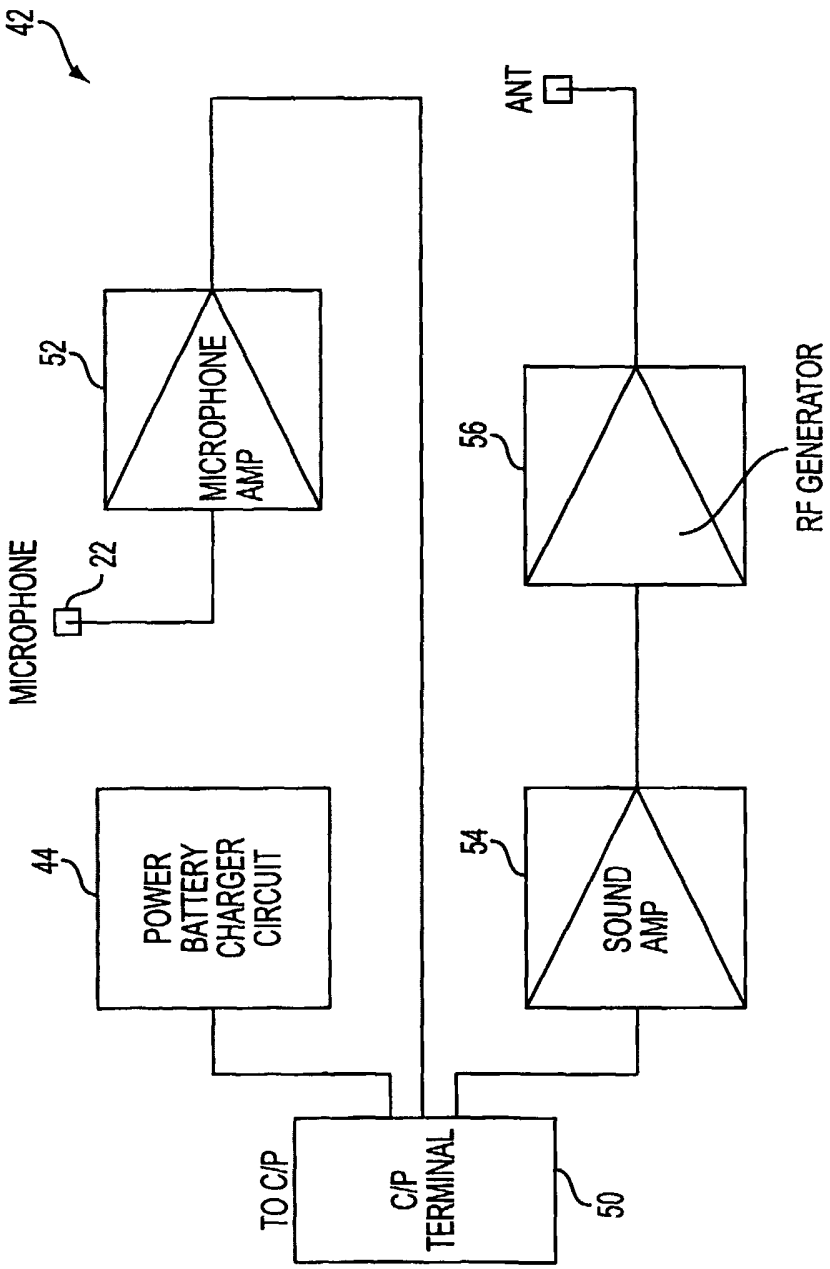
42
ANT
52
MICROPHONE AMP
56
RF GENERATOR RF AMP
MICROPHONE
22
44
POWER BATTERY CHARGER CIRCUIT
54
SOUND AMP
TO C/P
C/P TERMINAL
50

FIG. 4

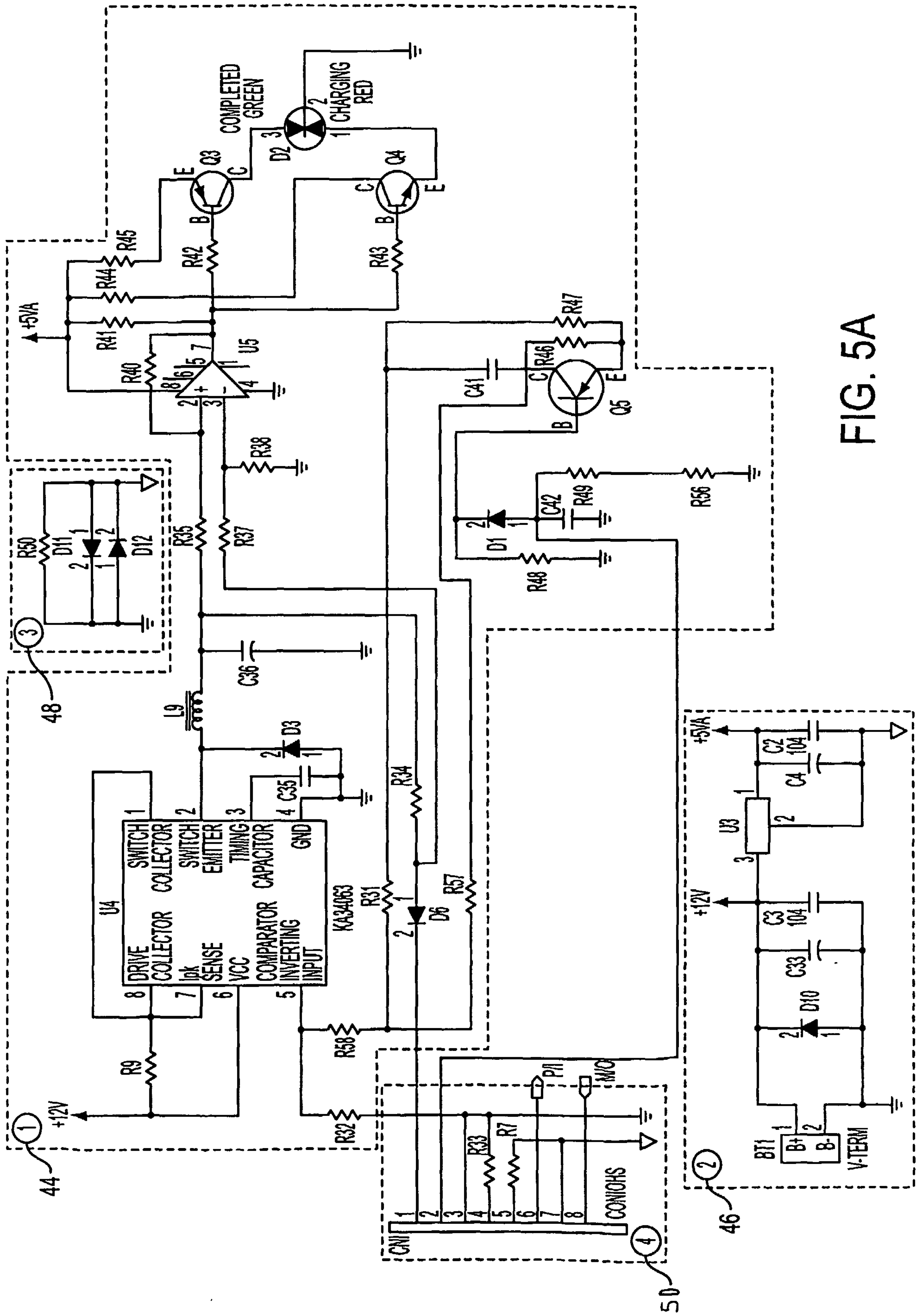
COMPLETED GREEN
CHARGING RED
D2
Q3
Q4
Q5
U5
+5VA
U4
SWITCH COLLECTOR
SWITCH EMITTER
TIMING CAPACITOR
GND
DRIVE COLLECTOR
Ipk SENSE
VCC
COMPARATOR INVERTING INPUT
KA34063
+12V
BT1
B+
B-
V-TERM
CN1
CON1OHS
P/I
I/M/O
U3
L9
44
46
48
50

FIG. 5A

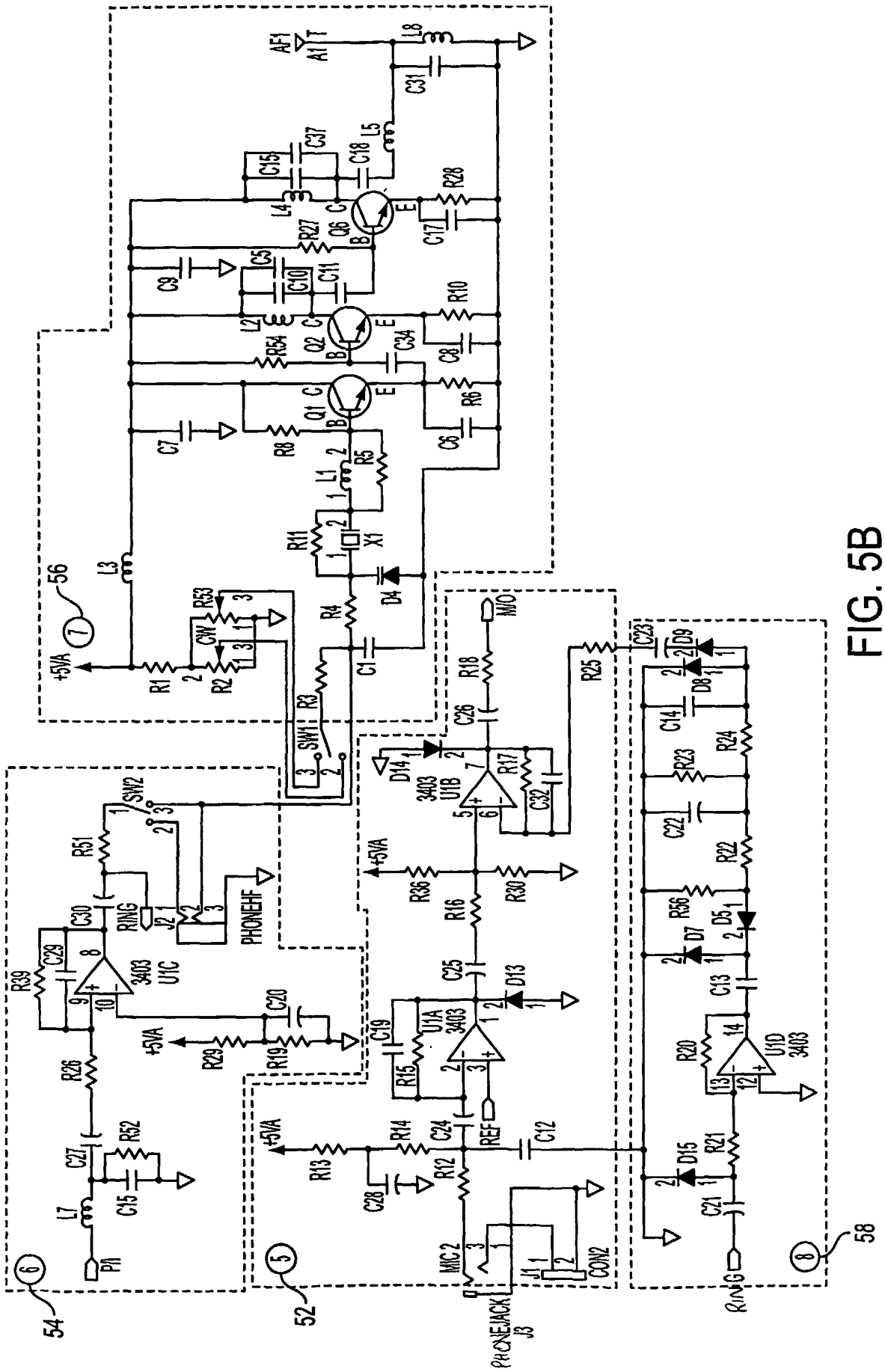
AF1
A1
T
L8
C31
L5
C37
C15
C18
L4
R28
Q6
R27
C17
C5
C9
C10
C11
R10
L2
Q2
R54
C34
C8
Q1
R6
C7
R8
C6
L1
R5
R11
X1
L3
D4
56
R53
CW
R4
C1
+5VA
R1
R2
R3
SW1
MIC
C26
R18
R25
C23
D9
D14
U1B
3403
R17
C32
SW2
R51
R36
R30
C30
RING
J2
PHONEHF
C29
U1C
3403
R39
C20
+5VA
R29
R19
C19
U1A
3403
R15
R16
C25
D13
R26
C27
R52
C15
L7
P1
R13
R14
C24
REF
C12
C28
R12
MIC2
J1
CON2
PHONEJACK
J3
54
52
58
C14
D8
R24
R23
C22
R22
R56
D5
D7
C13
R20
U1D
3403
R21
D15
C21
RING

FIG. 5B