Jan. 16, 1968 J. W. BENNETT 3,364,427

APPARATUS FOR MAINTAINING THE EFFECTIVE SIGNAL STRENGTH OF A TRANSMITTER

Filed Oct. 23, 1965 2 Sheets-Sheet 1

FIG. 1

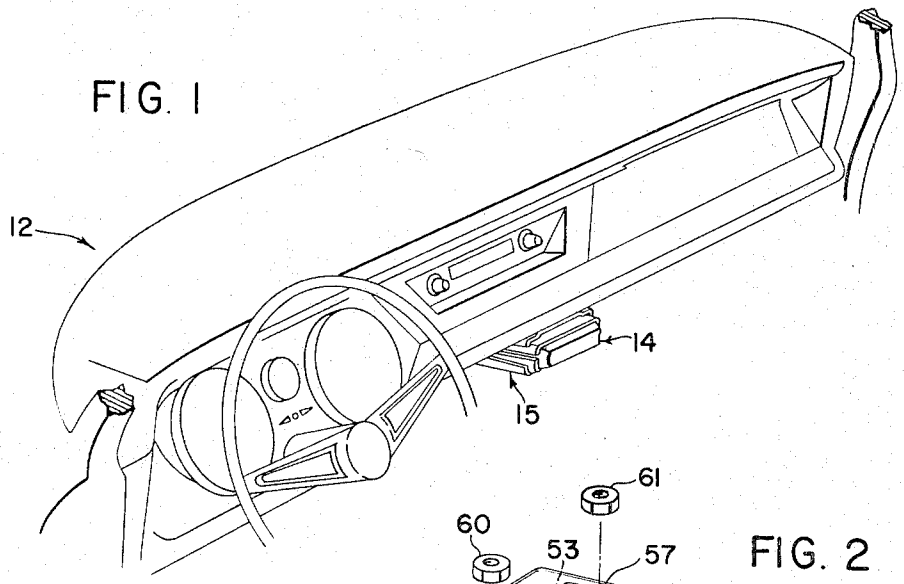
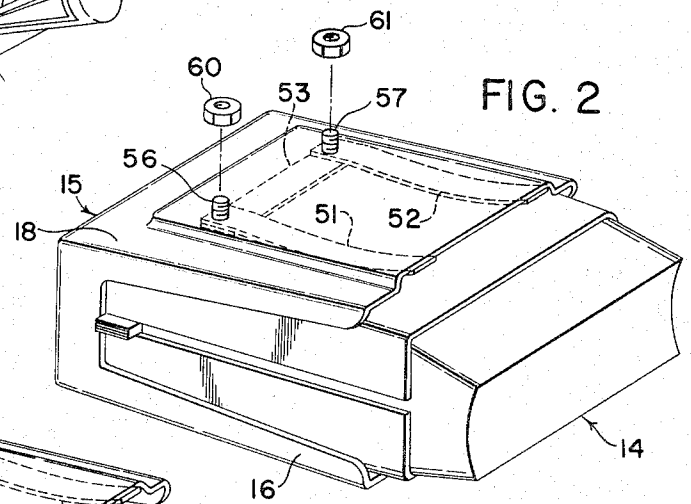


FIG. 2



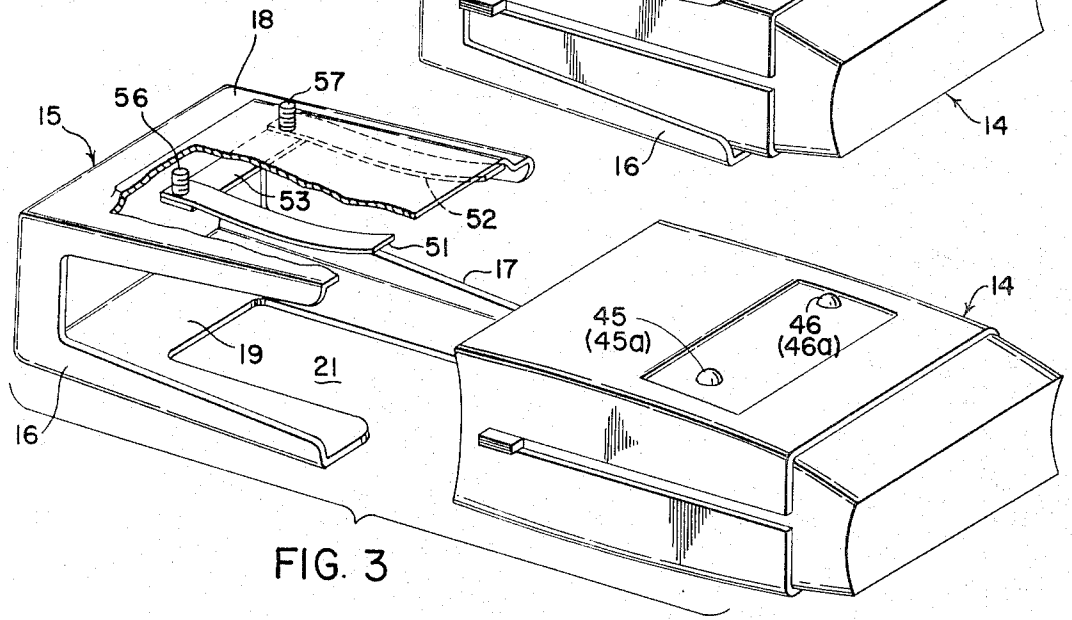


FIG. 3

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APPARATUS FOR MAINTAINING THE EFFECTIVE SIGNAL STRENGTH OF A TRANSMITTER

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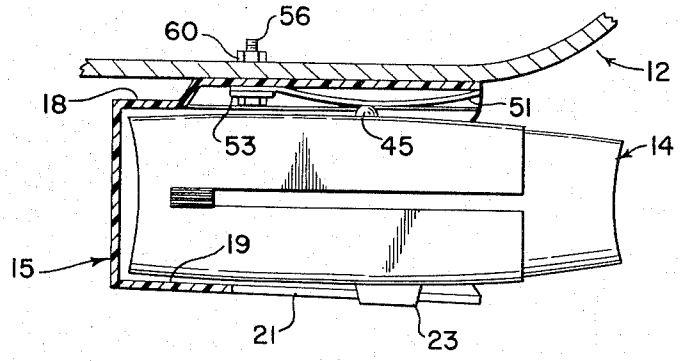
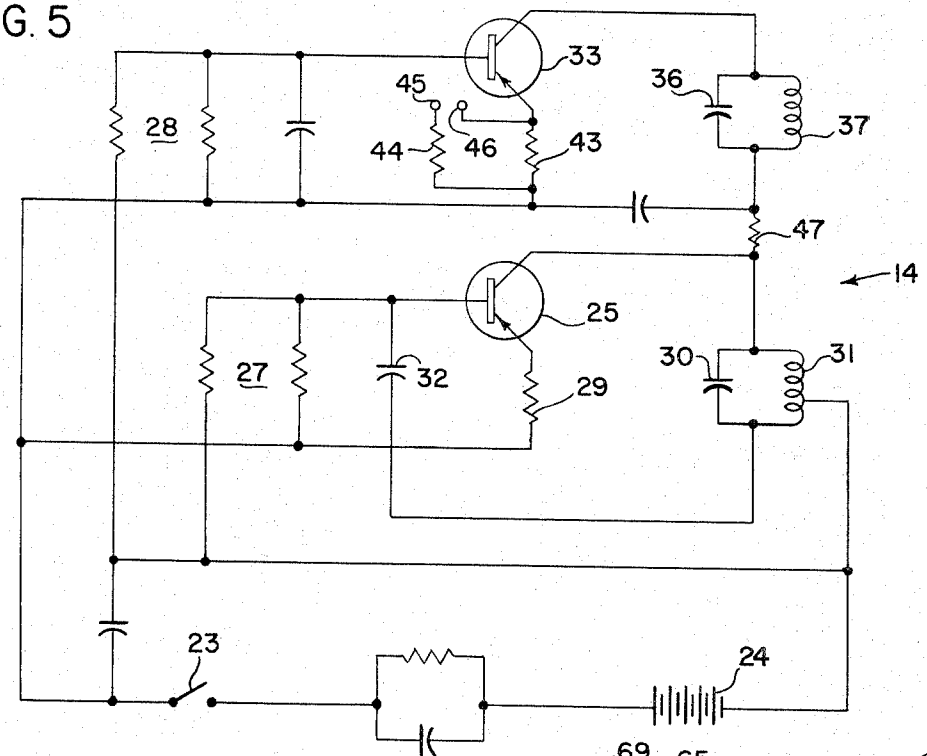


FIG. 4

FIG. 5



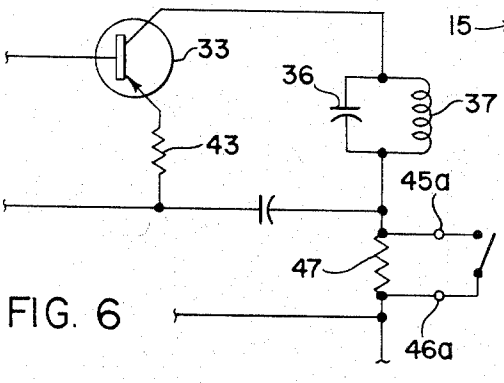


FIG. 6

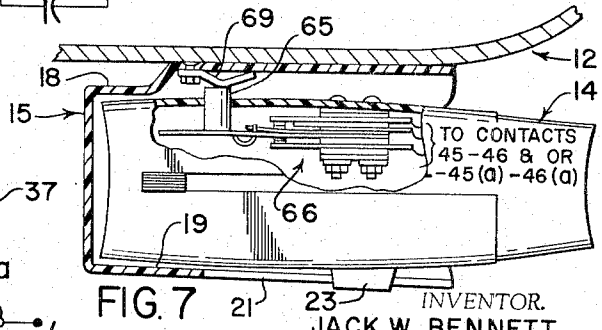


FIG. 7

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APPARATUS FOR MAINTAINING THE EFFECTIVE SIGNAL STRENGTH OF A TRANSMITTER

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Filed Oct. 23, 1965, Ser. No. 503,728
9 Claims. (Cl. 325—105)

ABSTRACT OF THE DISCLOSURE

Means are disclosed for modifying the electrical operating characteristics of a portable signal transmitter so that the transmitted signal is substantially the same regardless of whether the transmitter is vehicular-mounted or hand-carried. A receptacle is provided in the vehicle with metallic shorting bars. Normally-open contacts are provided in circuit with selected components in the output stage of the transmitter. Upon insertion of the transmitter into its receptacle, selected impedances in the output stage of the portable signal transmitter are either bypassed or varied in magnitude to achieve the desired result. In an alternative embodiment, a biased push button is connected to contacts so that when the transmitter is inserted into the receptacle, the push button is actuated to achieve the above-described effect.

This invention relates to portable transmitters and more particularly, to means for substantially equalizing the signal transmitted irrespective of whether the transmitter is vehicular mounted or hand carried.

This invention is intended to be used with automatic garage door operators of the type employing a low power transmitter to control the operation of a radio receiver mounted within the garage. The radio receiver in turn controls, by way of an appropriate relay system, the operation of a suitable garage door electric operator. In a majority of instances in the past, the transmitter was usually permanently mounted on the vehicle. In addition, a suitable antenna, appropriately connected to the transmitter, was provided. Lastly, a push button for actuation of the transmitter was provided on the dashboard of the automobile. A button conveniently located at the garage or in the home was also necessary to actuate and operate the garage door if the car was already parked in the garage.

It can be appreciated that a portable transmitter, which could be easily removed from the car, would be desirable to eliminate the necessity of having a separate, and different, actuation source, such as a garage or home mounted button. Accordingly, upon parking the car in the garage the portable transmitter can be carried into the home for subsequent operation of the garage door, or a second transmitter could be kept in the home for out-of-car usage. Also with the greatly increasing number of two-car families the use of a portable transmitter, which can be transferred from one car to the other, would result in considerable savings over the necessity of having a permanently mounted transmitter in each car. Furthermore, in the event one car is sold and another purchased, all that is required is to transfer the portable transmitter to the newly-acquired vehicle. There is no need or requirement to become involved with any electrical wiring in the old or new car, as has been the case in the past.

However, it has been found that a vehicle mounted transmitter has a considerably reduced range of operation when compared with a transmitter that has been removed from the vehicular confines. The difference in range may reasonably be explained by the fact that the

vehicle structure acts as a shield and absorbs or reflects the transmitted signal. Or more generally, the signal generated by the transmitter is altered by the vehicle shielding to reduce its effectiveness. In any event, it is desirable that the vehicle mounted transmitter have a minimum range of several hundred feet. It is, of course, necessary that a transmitter capable of generating a signal that has an effective range of several hundred feet when positioned inside an automobile, be, at the same time, unobjectionable to FCC provisions when used outwardly thereof. While it may have been possible to design a transmitter which has the desired range, while vehicularly mounted, and is also capable of automatically providing a signal having the FCC approved characteristics when used outwardly thereof, it was felt that it would be safer and easier to design the signal transmitter for FCC regulation compliance outside of the vehicle and provide automatic means for increasing the signal strength, within FCC limits, when the transmitter is used within the vehicle or signal radiation limiting means.

Accordingly, as was mentioned hereinabove, since a signal transmitted by a given transmitter has considerably greater range outside of the vehicle than inside, it is necessary to utilize effective design principles to insure against any objectionable results occurring by such use. It is, therefore, an object of this invention to provide a transmitter capable of vehicular or portable use, having an effective range from either position of use that is far greater than most other commercially available types of transmitters and yet is compatible with FCC regulations.

It is another object of this invention to provide equally allowable levels of signal radiation, for a given portable transmitter, irrespective of the use of the transmitter within a vehicle or radiation limiting enclosure, or outside the vehicle or radiation limiting enclosure.

It is still another object of this invention to provide circuitry which automatically assures that the signal level of a transmitter, both outwardly and inwardly of a vehicle or signal limiting enclosure, is within allowable FCC limits.

It is yet another object of this invention to provide automatic signal adjusting circuitry, which is totally enclosed within the transmitter and, therefore, not subject to human manipulation, thus to assure that signal levels of a transmitter which is capable of use both within and without a vehicle or signal limiting enclosure are within permitted FCC limits.

It is still a further object of this invention to provide a signal adjusting circuit which is automatic in operation and, therefore, not dependent upon human memory or manipulation to bring it into effect.

It is still a further object of this invention to automatically increase the signal generated by a transmitter upon mounting of the transmitter in a suitably designed transmitter mounting device positioned at a convenient location inside the vehicle.

It is still a further object of this invention to provide means which automatically increase the strength of the transmitted signal by varying the power generated by the oscillator stage of the transmitter.

To the accomplishment of the foregoing and related ends, this invention then consists of the means hereinafter fully described and particularly pointed out in the claims, the following description setting forth in detail the approved means of carrying out the invention, such disclosed means, however, constituting but an example of the various ways in which the principles of the invention may be used.

In the drawings, wherein like reference numerals indicate like parts, in the various views:

FIG. 1 is a broken-away perspective view of a conventional automobile dashboard having a transmitter re-

movably secured to an appropriate bracket permanently affixed thereto;

FIG. 2 illustrates a transmitter mounted into its associated receptacle, and brings out the working relationship of the transmitter to the receptacle mounted shorting bars under these conditions;

FIG. 3 illustrates a fragmentary, broken-away view of the receptacle of FIG. 2, and the shorting contacts carried by the transmitter which cooperate with the shorting bar carried by the receptacle;

FIG. 4 is a side elevational view of FIG. 2, with parts of the receptacle being broken away, to clearly bring out the exact working relationship between the contact means carried by the transmitter and the shorting bar carried in the receptacle;

FIG. 5 is a schematic diagram of a conventional transmitter which has been modified to permit automatic signal strength variation depending upon its use inside or outside of a vehicle;

FIG. 6 illustrates an alternate mode by which the transmitter of FIG. 5 may be modified to automatically adjust the signal level generated thereby; and

FIG. 7 illustrates an alternate mode from that of FIGS. 2, 3 and 4 to accomplish a transmitter signal equalization regardless of in-car or out-of-car use.

Turning now to my invention, and first briefly described, it includes a transmitter for the generation of an amplitude modulated radio frequency signal. The transmitter is modified by my unique signal level altering means to insure that the signal transmitted will be of comparable magnitude regardless of its use inside or outside an automobile. The signal altering means includes normally open contacts in circuit with selected components in the output or oscillator stage of the transmitter. The normally open contacts cooperate with a contact completing circuit means carried by a transmitter receptacle. Accordingly, upon insertion of the transmitter into the receptacle during in-car usage of the same, the amplitude of the signal generated will automatically be varied to be comparable with the signal level of the transmitter during out-of-car usage.

Turning now to FIG. 1, we see that the numeral 12 refers to a customary automobile dashboard having the usual instrument panel and steering assembly. Mounted in an accessible operating position proximate the driver is transmitter 14. Transmitter 14 is shown to be securely positioned within a suitable receptacle 15. Receptacle 15 is better illustrated in FIGS. 2 and 3, reference being made thereto. As illustrated, receptacle 15 has a longitudinal dimension substantially greater than its transverse dimension, and generally conforms to the over-all dimensions of the transmitter to be housed therewithin. The lateral walls 16 and 17 of receptacle 15 are generally U-shaped to add to the resiliency of the receptacle. The receptacle is made of plastic and, accordingly, possesses an inherent level of pliability. The over-all transverse dimension of receptacle 15 is slightly less than that of transmitter 14; however, because of the inherent pliability of the receptacle, and, as well, due to the designs of side walls 16 and 17, a force fitted insertion of transmitter 14 thereinto is permitted.

As shown in FIG. 1, side 18 is fastened in a suitable manner to the undersurface of dashboard 12. Side 19, see FIG. 3, which is not attached to the dash 12, is provided with a window segment 21. It is by way of opening 21 that the push button 23 shown in FIG. 4 is exposed to the driver for manual operation thereof, upon the transmitter 14 assuming a mounted position within receptacle 15.

It should, of course, be appreciated that receptacle 15 could be attached on or under the dash 12, as shown in FIG. 1, or as an alternative mode could be clipped onto a sun-visor by any appropriate means. In either case, regardless of where the receptacle is secured, transmitter 14 is easily mountable within the receptacle during car use by merely inserting the same therewithin. Upon leaving the car the transmitter is easily removed for portable use.

Turning now to FIG. 5, there is disclosed the over-all circuit diagram of transmitter 14. Since, in the main, the operation of FIG. 5 is conventional and well known, it is felt that nothing would be gained by detailed treatment of the operation thereof. Instead, an over-all description will be made at this point, with particular emphasis and detail of attention paid to my unique modifications.

Switch 23 is illustrated as an single pole, single throw switch in FIG. 5. In reality, switch 23 takes on a spring biased normally opened push button form as illustrated in FIG. 4. Button 23 is all that need be operated in order to open, close, or stop movement of the door, or to reverse the direction of the door travel. Upon momentary closure of switch 23 a signal is transmitted for energization of a receiver at the garage (not shown). Energization of the receiver, in turn, activates the garage door operator to commence the door opening operation. The opening of the door can be stopped at any point by merely depressing button 23 again. Finally, to reverse the direction of the door travel, all that is required is momentary switch closure by a third momentary depression of button 23.

Battery 24 provides the only source of power necessary for generation of a signal by the transmitter. Transistor 25, which is a PNP type transistor, forms with its associated collector, emitter and base circuitry a transistorized version of a Hartley-type oscillator circuit. Proper base and emitter biasing of transistor oscillator 25 is achieved by biasing resistor arrangement 27, emitter resistor 29, and the circuit connections as shown in FIG. 5, to battery 24. In addition, the connection of proper negative biasing potential to the collector of transistor 25 is achieved by operatively connecting it, by way of inductance coil 31 and appropriate leads, to the negative terminal of battery 24.

Transistor 33 is a PNP type transistor and forms with its associated collector, emitter, and base circuitry a transistorized version of a Colpitts-type oscillator. Proper base and emitter biasing for transistor oscillator 33 is achieved by the biasing resistor arrangement 28 and emitter resistor 43, along with other appropriate circuit connections to battery 24 as illustrated in FIG. 5. In addition, the connection of proper negative biasing potential to the collector of transistor 33 is accomplished by connection of its collector to the negative terminal of battery 24 by way of the series circuit consisting of inductance coils 37 and 31 and resistor 47.

Returning to our discussion of the Hartley-type oscillator we note that the collector of transistor 25 is provided with an inductance having a differentially settable tap to provide the necessary and desired amount of feedback voltage. Basically coil 31 functions as an autotransformer, and feedback voltage of the desired magnitude to sustain oscillation is, accordingly, achieved. As shown in FIG. 5, the feedback from the tank circuit, made up of condenser 30 and autotransformer 31, is achieved by way of feedback condenser 32. In this manner the feedback signal is coupled from the collector to the base with 180° phase shift.

The "tone" of the signal generated by transistor oscillator 25 is determined by the tank circuitry parameters consisting of condenser 30 and inductance 31. As is well known in the prior art, different "tone" signals are desired for garage door operators to permit units to be used by neighbors with no interference or unreliability. Accordingly, a tone modulation frequency which is selectively settable to a predetermined figure is desirable. This frequency of the tone modulation signal is changeable by merely removing a plug-in unit which consists of coil 31 and condenser 30 and inserting a new unit. It is, of course, necessary that the tone modulation frequency, as established by condenser 30 and conductance coil 31 be matched with a similar plug-in unit at the garage

mounted receiver. In practice it has been found that by use of various plug-in units for condenser 30 and inductance 31 a range in tone modulation frequency from 8.2 kilocycles to 14.4 kilocycles is obtainable.

The tone modulated signal generated by Hartley oscillator transistor 25 is then fed to the input circuit of Colpitts oscillator 33 by a circuit arrangement as shown in FIG. 5. Colpitts oscillator 33 is appropriately arranged to generate a radio frequency carrier signal. By suitably selecting the components of the tank circuit made up of condenser 36 and inductance 37 of output stage 33, it has been found that a range of radio frequency signals from 230 to 290 megacycles is obtainable. It is, of course, obvious that the radio frequency level may be varied by merely modifying or selectively arranging condenser 36 and inductance 37. In the usual Colpitts-type oscillator the signal from the tuned collector is coupled back to the input circuit by either a direct connection from the collector circuit, or a 180° phase shift can be attained if a feedback condenser is utilized. We have found that appropriate operation is obtained if the feedback from the collector tank circuit is achieved by way of the inter-electrode capacitance between the collector and base electrodes of transistor 33.

In this manner, as is adequately treated in prior art publications, a signal will be generated at the collector of transistor 33, which is in effect the result of a series modulation of the radio frequency signal generated by transistor 33 with the tone modulation frequency generated by the Hartley oscillator transistor 25. In reality, it can be stated that the tone modulated signal generated by the Hartley oscillator upon being fed to the input circuit of the radio frequency carrier transistor 33 will amplitude moderate the signal generated to result in an amplitude modulated radio frequency carrier signal being generated at the collector of transistor 33.

The amplitude modulated electrical impulse signal generated by the transmitter 14 is effective upon receipt at the receiver mounted in a garage to energize the same and result in closure of appropriate relay circuitry for the operation of the associated garage door operator.

With the circuit arrangement as shown in FIG. 5, an amplitude modulated radio frequency signal will be transmitted upon closure of push button 23. It should, of course, be appreciated that pulse coded or frequency modulated signals may also be used, and are within the intended scope of this invention. Moreover, it has been found that if the transmitter is hand carried, that is utilized in its portable mode of operation outside the car, the signal generated is effective for a range of well over several hundred feet. It should, of course, be appreciated that the range of the transmitter must be within the tolerable limits as established by Federal Communication Commission standards and regulations. It is therefore necessary to limit the range of a transmitter to the acceptable limits as established by the FCC. Now, as has been explained hereinabove, a transmitter may have a given substantial range when used in the portable mode of operation outside the car, and have a substantially reduced range when used inside the automobile. This difference in range is undesirable for a number of obvious reasons.

My invention has made it possible to increase the amplitude of the transmitted signal when used inside the automobile to the point whereby the effective transmission range is equal to that obtained with the transmitter used outside of the car, and still not result in violation of FCC regulations. It should be appreciated that my invention in no way modifies or alters the operation of transmitter 14 when it is being utilized in an out-of-car, portable mode. I accomplish these desirable ends by a modification of the circuitry of FIG. 5. The modification is such that the output signal generated by the circuitry of FIG. 5 is unaffected when used in a portable mode of operation, but, at the same time, the signal is automatically increased upon insertion of the transmitter 14 into receptacle 15.

Looking to FIG. 5 we see that one mode of increasing the effective range and amplitude of the signal generated by oscillator 33 is to vary the impedance in the emitter circuit of the radio frequency signal generator transistor 33. By varying the transistor emitter impedance the operating point of the transistor is changed and, accordingly, the magnitude of the signal generated is also varied.

FIG. 5 illustrates a resistor 44 having one end connected to the lower terminal of emitter resistor 43. The other end of resistor 44 terminates in a terminal numbered 45. The upper terminal of resistor 43 is connected to terminal 46 by an appropriate lead. As shown, resistor 44 is not connected in parallel circuit with emitter resistor 43 because of the open connection that exists between terminals 45 and 46. Terminals 45 and 46 of FIG. 5 are extended through the casing of transmitter 14 and terminate in metallic protrusions or contacts 45 and 46 as shown in FIGS. 3 and 4.

Looking to FIGS. 2, 3 and 4, we see, securely fastened, by way of mounting screws 56 and 57 and nuts 60 and 61, to the mounting side 18 of receptacle 15, a set of metallic shorting bars. The metallic shorting bars cooperate, in a manner to be described in more detail hereinafter, with the metallic contacts 45 and 46 to result in the placement of resistor 44 in parallel with resistor 43, to thus vary the impedance in the emitter circuit of the output stage transistor 33, upon insertion of the transmitter 14 into receptacle 15. As shown, shorting bars 51 and 52 are arcuately formed. In this manner a firm positive connection between contacts 45 and 46 and arcuate members 51 and 52 is insured. Transverse bar 53 provides the means for completing the circuit path between terminals 45 and 46.

As can be appreciated, upon insertion of transmitter 14 into receptacle 15, metallic contacts 45 and 46 will be placed in closed circuit by way of the metallic shorting bar assembly comprising arcuate strips 51 and 52 and the transverse bar 53. This results in resistor 44 being placed in parallel circuit with emitter resistor 43. As a result, the emitter impedance of transistor 33 is reduced, and due to the change in operating conditions of transistor 33 an increase in magnitude of the output signal results. Accordingly, actuation of the garage door operator is possible from a point substantially equal to that achieved under out-of-car use, without violation of any FCC regulations.

Upon leaving the car the party will remove transmitter 14 from receptacle 15 to result in an open circuit between terminals 45 and 46. The open circuit condition removes resistor 44 from its parallel relationship with resistor 43 and results in only resistor 43 being in the emitter circuit. The removal of parallel resistor 43 obviously results in an increase in impedance over the in receptacle use of the transmitter. The removal of parallel resistor 44 results in the operation of transistor 33 as per its original design and transmitter 14 accordingly accomplishes a garage door operation from a substantial distance without violation of FCC regulations during out-of-car use.

I can accomplish the desired result of increasing the amplitude modulated radio frequency signal for in-the-car use of transmitters, while at the same time not modifying their out-of-car performance by an alternate mode or scheme. More particularly, as shown in FIG. 5, operating potential is applied from the negative terminal of battery 24 by way of the series circuit comprising coil 31, resistor 47, and inductance coil 37 to the collector of transistor 33. Under these circumstances a predetermined amount of collectors potential is applied to the collector of transistors 25 and 33. In accordance with the collectors potential applied, a given operating point of the transmitter is established. Now, as has been explained, the parameters of circuit 5 have been selected to insure an efficient signal transmission range, within FCC regulations, for portable, out-of-car use. The same transmitter under in-car use

conditions will have its effective transmission range considerably reduced.

In order to increase the effective signal range for in-car use so that it will be comparable with its out-of-car range, as has been explained, the emitter-base bias operating point of oscillator 33 may be changed. In addition, an alternate scheme entails the changing of the collector potential of oscillator 33. The means to accomplish this can best be illustrated by reference back to the unique manner I have devised of placing resistor 44 in parallel with emitter resistor 43 upon insertion of transmitter 14 into the receptacle 15. Reference is also made to FIG. 6. In order to show the similarity in operation, I have labeled the terminals provided on opposite ends of resistor 47 as 45_a and 46_a. It should be appreciated, that in a manner similar to the hereinabove description, these terminals are connected to metallic protrusions or contacts 45 and 46 shown in FIGS. 3 and 4. Therefore, upon insertion of transmitter 14 into receptacle 15, normally opened contacts 45_a and 46_a will be closed by the action of receptacle-mounted arcuate bars 51 and 52 and transverse bar 53. Accordingly, during in-receptacle use of the transmitter, resistor 47 will be electrically shorted out of the collector circuit, and an increase in potential at the collector of transistor 33 will result. As a result of the increase in collector potential, we also experience an increase in the amplitude of the signal generated by oscillator 33. In this manner the signal strength of transmitter 14 is substantially increased to result in an improved effective transmission range and, accordingly, makes the in-car range comparable with that of the transmitter in its out-of-car use. It should, of course, be appreciated that a combination of the two modes hereinabove described may be utilized to increase the transmitter effective range for in-car use.

Looking now to FIG. 7, we find still another alternate means for increasing the effective range of transmitter 14 during in-car use. As shown, a push button 65 is mounted on the wall of transmitter 14 and projects therethrough. Actuation of button 65 is effective to result in closure of the contacts associated with switch 66 mounted along an inside wall of transmitter 14. Suitable leads are connected from terminals 45–46, or 45_a–46_a, or from both, to appropriate contacts of switch 66. Accordingly, activation of switch 66 will result in placement of resistor 44 in parallel with emitter resistor 43, or in shorting out collector resistor 47, or both. The result of this action is, of course, as explained hereinabove, to increase the signal strength of the amplitude modulated radio frequency signal generated by transmitter 14.

It is, of course, necessary to insure that the arrangement of FIG. 7 is automatically effective to increase the radio frequency signal of transmitter 14 during in-car use, and is not effective during out-of-car use. To this end it can be seen that button 65 is activated by an uplifted switch actuator 69 that is mounted on the inside of the receptacle 15. It should be appreciated that actuator 69 lies along the path of travel that the transmitter will take upon insertion into receptacle 15 and, accordingly, will be effective to actuate button 65.

Upon removal of the transmitter from receptacle 15 button 65 will resume its original position and therefore switch 66 will revert to its normally open state. This, of course, results in removal of resistor 44 from the emitter circuit of the transistor 33, reinsertion of resistor 47 into the collector circuit of transistor 33, or both.

Various other schemes involving receptacle mounted plugs, switch actuators, etc. and transmitter mounted jacks, switches, etc. may be utilized to accomplish the desirable end of increasing the signal strength of the amplitude modulated signal generated by transmitter 14 during in-the-car use of the transmitter, and automatically removing the same to accomplish a normal operation of the transmitter and circuitry during out-of-car use. While it will be apparent that the embodiments of the invention herein disclosed are well calculated to fulfill the objects of the invention, it will be appreciated that the invention is susceptible to modification, variation, and change without departing from the proper scope or fair meaning of the appended claims.

I claim:

1. Apparatus for maintaining the effective signal strength of a transmitter for in and out-of-car use comprising, an electrical signal transmitting device, said electrical signal transmitting device including an output oscillator stage having input and output circuit means, said output circuit means of said output stage including an impedance, shorting means operatively connected across said impedance, said shorting means being in a normally opened position, and means for closing said normally opened shorting means during in-car use to bypass said impedance and alter the electrical operating conditions of said output oscillator stage, said transmitter thus having an effective in-car signal range substantially equal to its out-of-car range.

2. Apparatus for maintaining the effective signal strength of a transmitter for in and out-of-car use comprising, a signal transmitter having an output oscillator stage enclosed within a housing, said transmitter generating a signal having a predetermined out-of-car range, said output oscillator stage having input and output circuits, a circuit including an impedance means and a normally open pair of contacts connected across said input circuit means of said output oscillator, said normally open pair of contacts projecting outwardly of the transmitter housing, and means carried by a receptacle into which the transmitter housing is inserted during in-car use for bridging said normally open pair of contacts to thus place said impedance in circuit with said input circuit means to thereby alter the electrical operating characteristics of said oscillator during in-car use and thus maintain the effective range of said transmitter during in-car use to be substantially equal to its out-of-car range.

3. Apparatus for maintaining the effective signal strength of a transmitter for in-car receptacle use and out-of-car use comprising, oscillator means for generating a modulated signal, a signal generating stage including a transistor having base, emitter, and collector electrodes, circuit means operatively connecting said oscillator means to said signal generating stage, the signal generated having a predetermined out-of-car range, a source of operating potential, impedance biasing elements for said base and emitter electrodes including an emitter resistor connecting said last mentioned electrodes to said source of operating potential, means including a collector resistor connecting said collector electrode to said source of operating potential, a second impedance, a normally opened switch, said normally opened switch connecting said second impedance in parallel circuit with said emitter resistor, and means for closing said normally opened switch contacts carried by a receptacle into which said transmitter is mountable, such that said normally opened switch closes in response to insertion of said transmitter into said receptacle during in-car use to maintain the effective range of the said transmitter during in-car use to be substantially equal to its out-of-car use.

4. Apparatus for maintaining the effective signal strength of a transmitter for in-car receptacle and out-of-car use comprising, oscillator means for generating a tone modulated signal, a radio frequency signal generating stage including a transistor having base, emitter, and collector electrodes, circuit means operatively connecting said oscillator means to said radio frequency signal generating stage, a source of operating potential, impedance biasing elements for said base and emitter electrodes including an emitter resistor connecting said last mentioned electrodes to said source of operating potential, means including a collector resistor connecting said collector electrode to said source of operating potential, a second impedance, a normally opened switch, said

normally opened switch connecting said second impedance in parallel circuit with said emitter resistor, and means for closing said normally opened switch contacts carried by said receptacle into which said transmitter is mountable, such that said normally opened switch closes in response to insertion of said transmitter into said receptacle during in-car use to maintain the effective range of the said transmitter during in-car use to be substantially equal to its out-of-car use.

5. Apparatus for maintaining the effective signal strength of a transmitter for in-car and out-of-car use comprising, a radio frequency output transistor stage including base, emitter, and collector electrodes, said stage generating an amplitude modulated radio frequency signal of predetermined characteristics and having a pre-established effective range under out-of-car use conditions, a source of operating potential, biasing impedance means including a collector resistor operatively connecting said electrodes of said output stage to said source of operating potential, a pair of normally open contacts operatively connected across said collector resistor, said pair of normally open contacts extending outwardly of the casing of said transmitter, and contact bridging means carried by a receptacle into which said transmitter is inserted during in-car use of the same closing said pair of uormally open contacts upon insertion of said transmitter thereinto, resulting in the maintenance of the effective range of said transmitter during in-car use to be substantially equal to its out-of-car use.

6. Apparatus for maintaining the effective signal strength of a transmitter for in-car and out-of-car use comprising, a radio frequency output stage including input and output circuits, said stage generating an amplitude modulated radio frequency signal of predetermined characteristics and having a pre-established effective range under out-of-car use conditions, a source of operating potential, biasing impedance means including an input resistor and an output resistor operatively connecting the respective circuits of said output stage to said source of operating potential, a pair of normally open contacts operatively connected across said resistance in said output circuit of said output stage, said pair of normally open contacts extending outwardly of said transmitter for closure thereof, and contact bridging means carried by the receptacle into which said transmitter is inserted during in-car use of the same closing said pair of normally open contacts upon insertion of said transmitter thereinto, resulting in the maintenance of the effective range of said transmitter during in-car use to be substantially equal to its out-of-car use.

7. Apparatus for maintaining the effective signal strength of a transmitter for in-car and out-of-car use comprising, a radio frequency output transmitter stage having input and output circuits, said stage generating an amplitude modulated radio frequency signal of predetermined characteristics and having a pre-established effective range under out-of-car use conditions, a source of operating potential, biasing impedance means including an input resistor and an output resistor operatively connecting said respective circuits of said output stage to said source of operating potential, a normally off push button operated switch having a first pair of normally open contacts operatively connected across said collector resistor, a second resistor, said normally open push button operated switch having a second pair of normally open contacts operatively connecting said second resistor across said input resistor of said input circuit, said push button operated switch being biased in a direction extending outwardly of the transmitter casing in its off position and assuming a position inwardly thereof in its on position, and actuating means carried by a receptacle into which said transmitter is inserted during in-car use of the same closing said normally off switch by movement of its push button inwardly of said transmitter casing upon insertion of said transmitter thereinto, to thus close its associated first and second normally open pairs of contacts and thus maintain the effective range of said transmitter during in-car use to be substantially equal to its out-of-car use.

8. Apparatus for maintaining the effective signal strength of a transmitter for in-car and out-of-car use comprising, a radio frequency transistor output stage having emitter, base and collector electrodes, said stage generating an amplitude modulated radio frequency signal of predetermined characteristics and having a pre-established effective range under out-of-car use conditions, said transmitter mounted within a receptacle during in-car use of the same, a source of operating potential, biasing impedance means including an emitter resistor and a collector resistor operatively connecting said respective electrodes of said output stage to said source of operating potential, means including a second resistor and a pair of normally open contacts operatively connected across said emitter resistor for varying the emitter resistance of said output stage, and transmitter mounted contact closing means bridging said contacts upon insertion of said transmitter into said receptacle to result in the maintenance of the effective range of said transmitter during in-car use to be substantially equal to its out-of-car use.

9. Apparatus for maintaining the effective signal strength of a transmitter for in-vehicle and out-of-vehicle use comprising: A signal transmitter having an output oscillator stage, said oscillator stage including components preselected to provide a signal having a predetermined out-of-vehicle range, means for varying the effective impedance of selected components in said output stage during in-vehicle use, said means including normally-open contacts mounted on said vehicle which are in circuit with said selected components when said transmitter is mounted in said vehicle, and means connected across said normally-open contacts during in-vehicle use to vary said impedance in such a manner to maintain the effective range of said transmitter at a substantially predetermined level.

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