

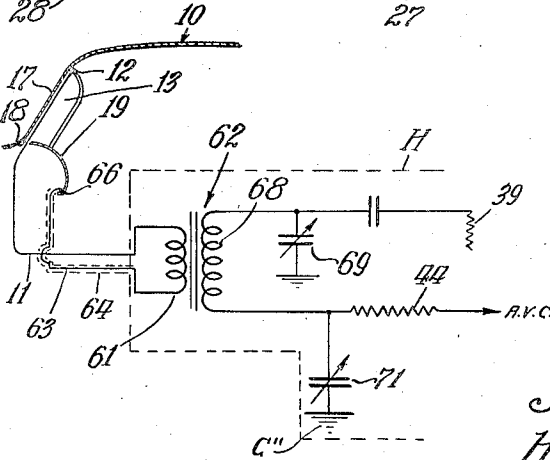
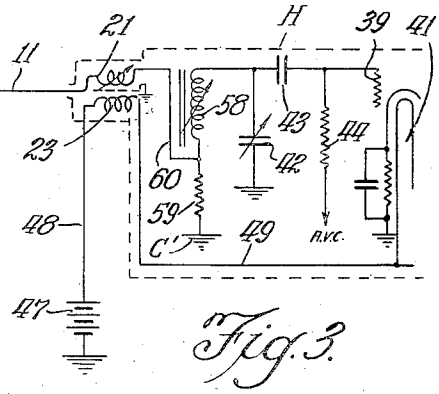
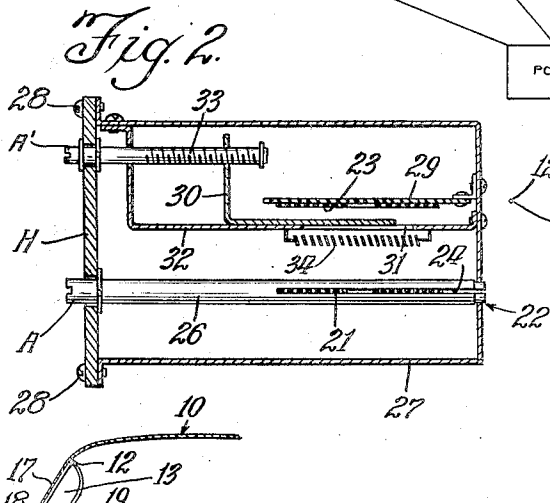
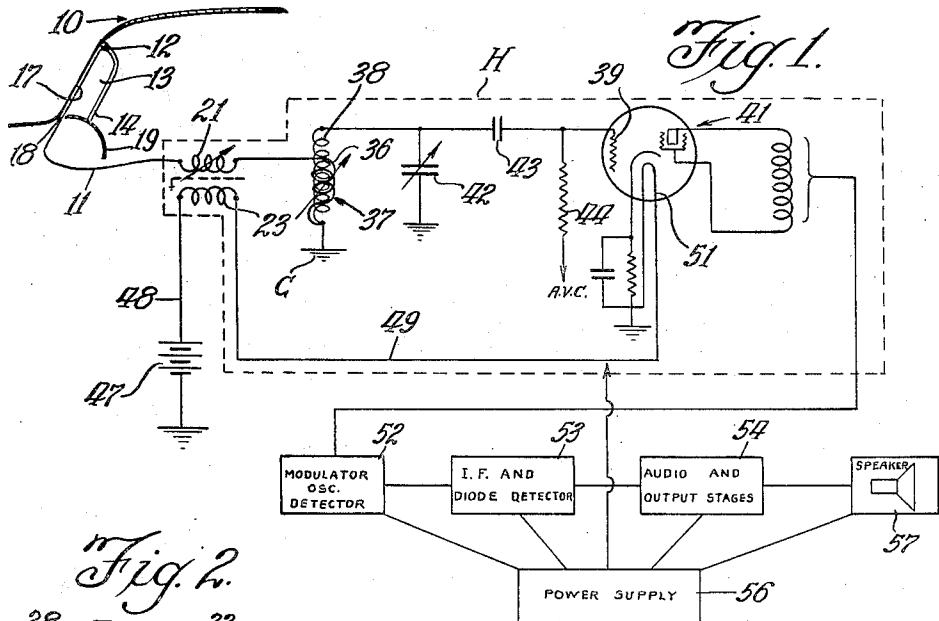
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RADIO RECEIVER SYSTEM

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RADIO RECEIVER SYSTEM

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This invention relates in general to radio receiver systems but more in particular to a radio receiver system which includes a radio receiver portion mounted on a mobile craft having a metal body, and a signal pick up portion which comprises solely the metallic body of the mobile craft.

During the entire history of use of radio receivers on mobile craft such as automobiles, trains, boats, and airplanes there has always been a problem to provide effective signal pick up means in rather limited mounting space, and provide an adequate signal strength at the receiver in the presence, normally, of considerable undesirable electrical interference. Although these problems have been present to a great or to a small degree in all such types of mobile craft, they have been most serious on automobiles, trucks, and the like where available mounting space for an antenna is normally at a minimum. In addition there are the factors of appearance, cost of the antenna or signal pick up means itself, and the cost of installation which at times have created problems.

Satisfactory signal pick up means, so far as the electrical characteristics are concerned, have been provided in the vertical jointed pole type antenna which is mounted on the outside of an automobile body, or at least extends outside and above the automobile body when in full operating position. However, some of the antenna of this type are costly in and of themselves, and in all cases the installation represents quite an item of cost. This often materially increases the cost of the entire radio receiver system installation. In addition to the problem of cost as discussed above, installation of such types requires cutting through the body of the automobile, and in many instances the cut represents a permanent defacement. Furthermore, there has always been criticism of the outside antenna on automobiles from the standpoint of appearance.

Various parts of the automobile such as the bumper, and grille over the front of the radiator have been insulated from the automobile body and employed as antenna, or signal pick up means. However, this installation, to insure that the part is permanently insulated from the body, is expensive, and in general the mass for original pick up purposes is limited.

It is an object of our invention to provide an improved radio receiver system for mobile craft.

Another object is to provide an improved and simplified signal pick up means for the complete

radio receiver system on a mobile craft, which likewise provides a large signal pick up mass.

A still further object of our invention is to reduce material and labor costs in a radio receiver system, particularly as represented in the signal pick up means structure and the installation thereof on a mobile craft; and

Another object of our invention is to provide a radio receiver system for a mobile craft which has no objectionable appearing outside antenna or signal pick-up means.

A principal feature of our invention is the use of the metallic electrical conductor body of mobile craft for picking up signals to be fed to a radio receiver mounted on the mobile craft, and normally within the metallic body itself.

Other objects and features of our invention will be apparent from the following description taken with the drawing in which:

Fig. 1 is a schematic illustration of a complete radio receiver system on a mobile craft.

Fig. 2 is a sectional view of a self contained unit employed in the radio receiver system of Fig. 1 for balancing out undesirable signal impulses which are normally present on the metallic body of a mobile craft so that such undesirable signals are not fed to the radio receiver of the complete system.

Fig. 3 is a fragmentary circuit diagram of a modification of the system of Fig. 1.

Fig. 4 is a fragmentary schematic illustration of a still further modification of the complete radio receiver system of Fig. 1.

In practicing our invention we provide a radio receiver system mounted on a mobile craft having a metal body which is utilized as the sole signal pick-up means for the radio receiver system. The radio receiver portion of the complete radio receiver system is electrically connected in at least one terminal point with said metal body and signals are fed from said body to the input circuit for the radio receiver, and acted upon in the usual manner over the remainder of the receiver circuit. Normally the radio receiver portion is also electrically connected to said metal body to provide a ground connection at a point spaced from said terminal point, or points.

Fig. 1 illustrates diagrammatically the complete radio receiver system on a mobile craft represented, in the illustration, by an automobile having a metal body 10 serving as the antenna portion or signal pick-up means for the system. As illustrated, a lead-in wire 11 is secured to the metal body 10 by suitable terminal means at a point 12. This point may be imme-

diately above the windshield 13 on the body and adjacent the top for the automobile, or more conveniently, the lead-in wire 11 may be secured to the metal frame 14 for the windshield. This is accomplished by loosening a screw which secures the frame 14 to the metal body, and which screw is electrically common to the body. The lead-in 11 can then be carried across or around the windshield to the receiver which is normally mounted below the cowl to the firewall or to the instrument panel of the automobile. If most convenient, the lead-in may be carried below or alongside the usual mullion strip 17 at the dividing point of the windshield. The lead-in 11 extends through a small hole 18 which may be provided in the cowl 19 at the base of the mullion strip, or at any other convenient place and extends from there under the cowl 19 to a connection with the radio receiver. The electrical connection at the point 12 is substantially at the maximum vertical height within and on the automobile and hence normally is at a point of maximum signal strength. Although the connection and installation of the lead-in 11 from the terminal point on the metal body has been described above in some detail, actually, it is understood that this is normally a relatively short lead, and a very simple installation.

In the embodiment of Fig. 1 the lead-in 11 is connected to the primary 21 of a preassembled inductance coil unit 22 which includes the coil 21 and a second coil 23 inductively coupled thereto. Both coils 21 and 23 may be of the "pancake" type and are insulatingly mounted within the unit. The coil 21 is mounted in the slot 24 of an insulating rod 26 which is movably supported at each end in the shielding can 27 for the unit 22. The can provides the complete unit as a preassembly mounted normally within the radio receiver housing by securing it to the housing wall H by screws or the like 28. In this position the rod 26 extends beyond the housing wall and is available for rotation by a screw driver or the like at the head A, as will be explained. The coil 23 is fixedly mounted on an insulating backing 29.

The inductive coupling between the two coils 21 and 23 may be varied by slidably adjusting the metal gate 30 suitably mounted at an aperture 31 in a metal shielding wall 32 between the two coils. The gate 30 is suitably pressed against the wall 32 to maintain a good electrical connection therewith, and prevent rattling or looseness to set up disturbances within the shield. The adjustment of the gate is accomplished by a screw 33 supported within the unit and available outside the housing H for the radio receiver at the head portion A for the screw which may be rotated by a screw driver or the like. In addition to the shielding gate 30 to change the inductive coupling between the coils 21 and 23, an electrostatic shield 34 of the type disclosed in Patent 2,047,159 issued July 7, 1936, is employed.

The coil 21 is in series connection with the primary 36 of the variable iron core inductance unit 37, whose secondary 38 is connected with the grid 39 of the first tube 41 in the first stage in the radio receiver. A trimmer condenser 42 acts to track the tuned circuit with the antenna portion of the radio receiver system, and an isolating condenser 43 is employed to prevent the A. V. C. circuit including the resistance 44 from grounding through the automobile battery 47, or through the secondary 38 of the tuning coil unit 37. The coil unit 37 is connected to ground at a

point indicated by the reference character C. This may be a point on the chassis for the radio receiver which is in turn grounded to the housing H, and the housing H to the automobile body in the usual manner, or other suitable ground connections for the unit 37 may be employed.

In addition to desirable signal impulses picked up by the metallic body 10 and brought to the radio receiver as heretofore described, there are also present on the automobile body, or the metallic body of any other mobile craft of a similar nature, undesirable signal impulses representing high frequency interference originating primarily in the ignition system of the craft. With the battery 47 employed as the source of current for the ignition system of the mobile craft, as well as the A or filament current supply for the radio receiver, the undesirable signal impulses present on the metallic body are also common to the battery 47 circuit. Hence such signal impulses in the battery circuit are of substantially the same phase, and wave shape, as the undesirable signal impulses on the body, or signal pick up means. The undesirable signal impulses are carried over the lead 48 from the battery 47 to the coil 23, and with the coil coupling and phase relation between the coils 21 and 23 properly adjusted by the position of the gate 30 and of the rod 26 and coil 21, the undesirable signal impulses carried to the coil 23 induce a current of opposite phase in the coil 21 to balance out the undesirable impulses carried to the coil 21 from the metallic body of the mobile craft. With the coils 21 and 23 of the flat "pancake" type any movement of the coil 21 as a result of movement of the rod 26 will change the phase relationship therebetween.

The A supply current is carried from the coil 23 through a conductor 49 to the filament 51 of tube 41, and to the filaments of the remaining tubes in the radio receiver circuit as indicated in block diagram in Fig. 1.

A radio receiver circuit beyond the first R. F. tube 41 as illustrated in the representative system includes the modulator-oscillator-detector 52, an I. F. and diode detector 53, and audio and output tube stages represented diagrammatically by the reference character 54. A power supply 56 is provided for the entire circuit, and the signal impulses acted upon in the radio receiver circuit are reproduced at the speaker 57. The entire radio receiver is represented diagrammatically as being housed within the metallic shielding housing H with the coil unit 22, as illustrated in Fig. 2, normally mounted within said housing as previously mentioned.

A modified embodiment of the invention is illustrated diagrammatically in Fig. 3 with the lead-in 11 extending from a terminal point 12 electrically common to the metallic body 10, in the same manner as described with reference to Fig. 1. Likewise the balancing unit 22 is employed and connected in the same manner as previously described. The input circuit of the radio receiver includes a permeability tuning unit comprising a coil 58 and a variable iron core. In series connection with the single coil 58 to a pure resistance 59 connected to ground at a point C' corresponding to point C. A conductor 60 is connected intermediate the coil 58 and resistor 59. With this circuit signal voltage developed across the metal body 10 from points 12 to C' is inserted across the resistor 59, the resistance of which matches the resistance across the two points mentioned.

Hence in the embodiment of Fig. 3, in substantially the same manner as in the embodiment of the invention of Fig. 1, desirable signal impulses represented substantially by the potential between the terminal point and ground on the metal body 10 are fed through the lead-in 11 to the input circuit of the radio receiver. The radio receiver is tuned to the desired frequency by means of the unit including the coil 58, and other similar units if required, in the usual manner.

In practicing our invention we have also found that desirable signal pick up is obtained with a pair of lead-in wires from the metal car body to an aperiodic type of input circuit in the radio receiver portion of the complete receiver system. This embodiment is illustrated in Fig. 4 with the lead-in 11 connected to one side of the low impedance primary 61 of an input coil 62 in the receiver. A second lead 63 is connected to the other side of the coil 61 and carried through a shielded covering 64 to a terminal point 66 preferably at about the same level in the mobile craft as the radio receiver itself, and consequently normally at some point on the cowl 19 of the craft or automobile. The impedance of the metal body 10 of an automobile, is normally low and hence the impedance of the coil 62 is low, with a coil of only three to six turns normally being satisfactory in the input circuit. The secondary 68 of the coil 62 is connected to the grid 39 of the first coil as previously described. In this embodiment for purposes of illustration a variable condenser 69 is shown rather than the permeability tuned unit 37 of the previously described embodiments. It is understood that permeability tuning, or capacity tuning may be employed in any of the embodiments of the invention. The low side of the coil 68 is grounded at C', and a padder condenser 71 is employed to track the antenna circuit with the remainder of the tuned circuit. The signal pick up of the embodiment of Fig. 4 is represented by the potential difference between the terminal points 12 and 66 on the metal body.

It is understood therefore, from the above description, that our invention provides a radio receiver system which does not require an antenna independent of the mobile craft upon which the radio receiver system is mounted, but rather utilizes the metal body itself of such mobile craft. As a result, signal pick up means is immediately available merely by the connection of a wire from the radio receiver to the metal body of the mobile craft. This eliminates costly antenna equipment and costly installation. In addition, there is no outside apparatus detracting from the appearance of the mobile craft, and no defacement of the craft is required in order to provide signal pick up means.

Although the invention has been illustrated and described in its preferred embodiments it is understood that it is not limited thereby, and is limited only by the scope of the appended claims.

We claim:

1. A radio receiver system for an automobile including in combination a metal body for said automobile acting to pick up desirable and undesirable signal impulses and serving as the antenna for the radio receiver system, a radio receiver mounted on the automobile body and grounded thereto, said radio receiver including an input circuit, a lead-in conductor in series electrical connection with said metal automobile body and with said input circuit, a source of cur-

rent supply for said radio receiver which is also the current supply for the automobile, and conductor means connecting said current supply and said radio receiver having a portion thereof inductively coupled to a portion of said lead-in conductor.

2. In a radio receiver system the combination with a radio receiver, of a metal body of a mobile craft comprising the sole antenna for the radio receiver and with said radio receiver carried on said mobile craft and electrically grounded thereto, tuning means for said radio receiver, an inductance coil in series connection with said tuning means, conductor means electrically connecting said metal body and said inductance coil to carry desirable and undesirable signal impulses to said inductance coil, a current supply source electrically common to said mobile craft and to said radio receiver for supplying electric current to both said craft and said receiver, an inductance coil coupled to said first mentioned inductance coil and electrically connected to said current supply source and to said radio receiver, with said second mentioned inductance coil receiving undesirable signal impulses from said current supply source of the same general nature as those carried from said metal body to said first mentioned inductance coil, and with said undesirable signal impulses being balanced out in said coupled inductance coils and said desirable signal impulses being carried from said first mentioned coil to said radio receiver.

3. In a radio receiver system for a mobile craft, the combination with a radio receiver carried on said mobile craft and electrically grounded thereto and having an input circuit, of a metal body for said mobile craft which comprises the sole antenna for the radio receiver and which picks up thereon desirable and undesirable signal impulses, an electric current supply for both said mobile craft and said radio receiver having said undesirable signal impulses electrically common thereto, and unit means for substantially eliminating the undesirable signal impulses but feeding the desirable impulses to said radio receiver, said means including a shielding housing, a pair of inductance coils mounted within said housing with one of said coils being fixedly mounted and means for adjustably mounting said other coil so that the phase relation with said fixed coil may be varied, conductor means intermediate said mobile craft metal body and said adjustable coil, and with said adjustable coil being electrically connected to the input circuit of said radio receiver, conductor means electrically connecting said one coil and said current supply, and additional conductor means electrically connecting said one coil and said radio receiver.

4. A self contained unit for use in a radio receiver system having an antenna portion and a receiver portion to remove undesirable signal impulses from the line carrying desirable signal impulses and undesirable signal impulses from the antenna portion to the receiver portion of said system, said unit including a metallic can open at one end having a metal partition extending substantially longitudinally thereof and said partition having an opening therein, means for varying the size of said opening, and a pair of substantially flat inductance coils with one coil mounted on each side of said partition in alignment with said opening, one of said coils being fixedly mounted in said can, and means for rotatably mounting the other of said coils including an insulating rod rotatably mounted in said can and extending in a direction parallel to the plane of

said fixed coil having a slit at one end carrying said other coil in said slit, with said rod being rotatable outside said can to move said coil thereon into and out of parallel relation with said fixed coil.

5. In a radio receiver system for a mobile craft, the combination with a radio receiver carried on said mobile craft, of a metal body for said mobile craft which comprises the sole antenna for the radio receiver and which picks up thereon desirable and undesirable signal impulses, said radio receiver being electrically grounded to said metal body, an electric current supply for both said mobile craft and said radio receiver having undesirable signal impulses electrically common thereto, and means connected to the metal body and to the radio receiver for substantially eliminating between the metal body and receiver the undesirable signal impulses but carrying the desirable signal impulses to the radio receiver, said means including a pair of coupled inductance coils with one of said coils electrically connected to said metal body and the other of said coils electrically connected to said current supply, and with each of said coils electrically connected to a different part of the radio receiver.

6. In a radio receiver system for a mobile craft having a metal body and having an electrical system thereon including a source of electric current, the combination with a radio receiver for said system, of the metal body of the mobile craft comprising the sole signal pick up means for the radio receiver and picking up desirable signals and undesirable signals, said radio receiver being electrically grounded to said metal body and having an input circuit including a variable iron core inductance coil and a resistance in series connection therewith, and means for carrying signal impulses from said metal body to said input circuit including a conductor electrically connected to

said input circuit intermediate said resistance and said coil, a lead-in extending from a point of electrical connection with said metal body, and a coil unit intermediate said conductor and said lead-in including a first coil in series connection with said lead-in and said conductor, and a second coil coupled to said first coil of said unit and in series electrical connection with said radio receiver and with said source of electric current for said mobile craft which is also the source of electric current for said radio receiver.

7. In a radio receiver system for a mobile craft having a metal body and having an electrical system thereon including a source of electric current, the combination with a radio receiver for said system of the metal body of the mobile craft comprising the sole signal pick-up means for the radio receiver and picking up desirable signals and undesirable signals, said radio receiver being electrically grounded to said metal body and having an input circuit including a variable inductance unit having a pair of series connected coupled coils, a ground connection intermediate said pair of coils, means for carrying signal impulses from said metal body to said input circuit including a conductor electrically connected to said input circuit in series with one of said coupled coils, a lead-in extending from a point of electrical connection with said metal body, a coil unit intermediate said conductor and said lead-in including a first coil in series connection with said lead-in and said conductor, and a second coil coupled to said first coil of said coil unit and in series electrical connection with said radio receiver and with said source of electric current for said mobile craft which is also the source of electric current for said radio receiver.

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