

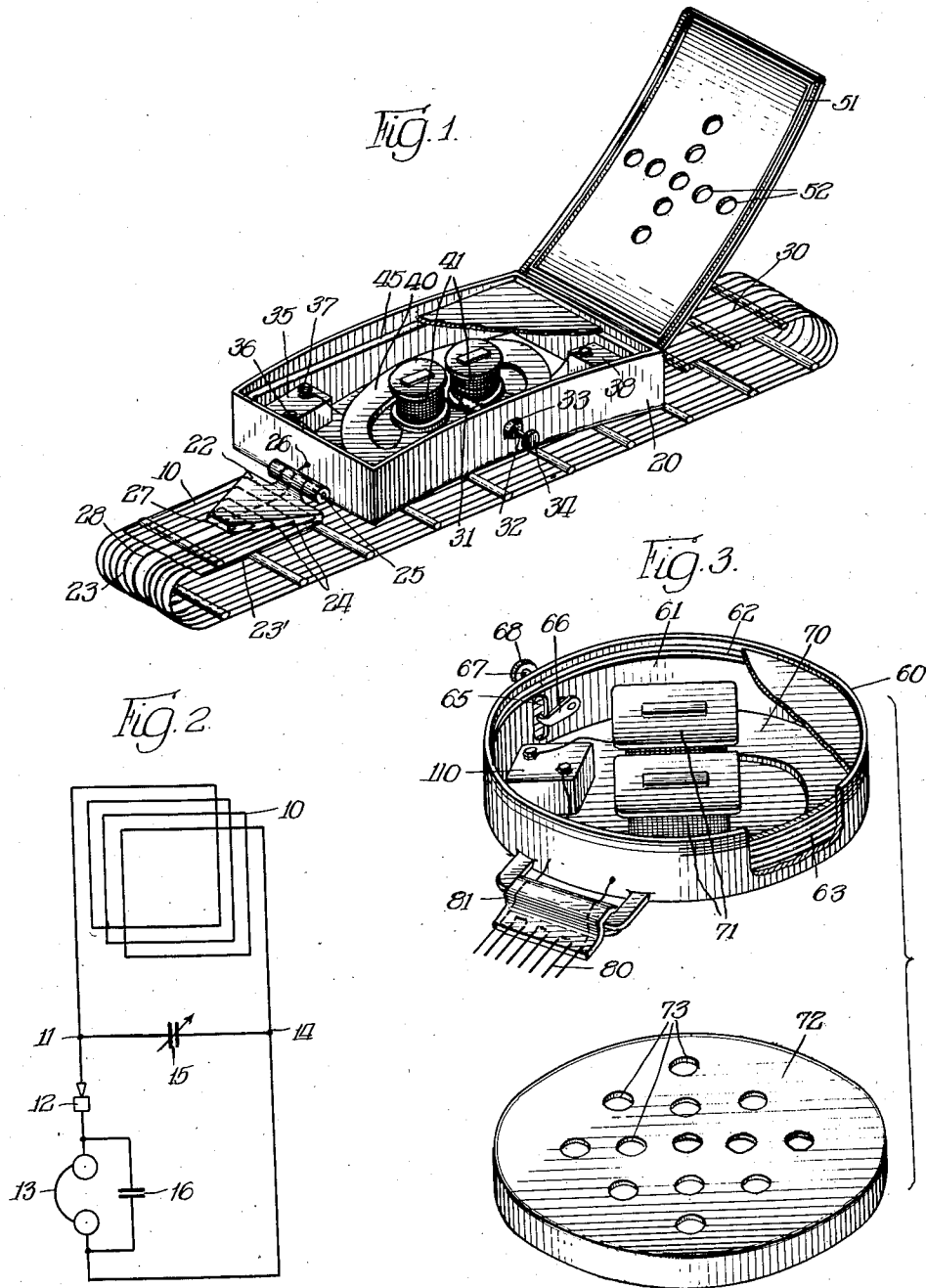
Sept. 16, 1941.

A. N. REBORI ET AL
MEANS FOR RADIO COMMUNICATION

2,255,897

Filed Dec. 24, 1937

2 Sheets-Sheet 1



Inventors:
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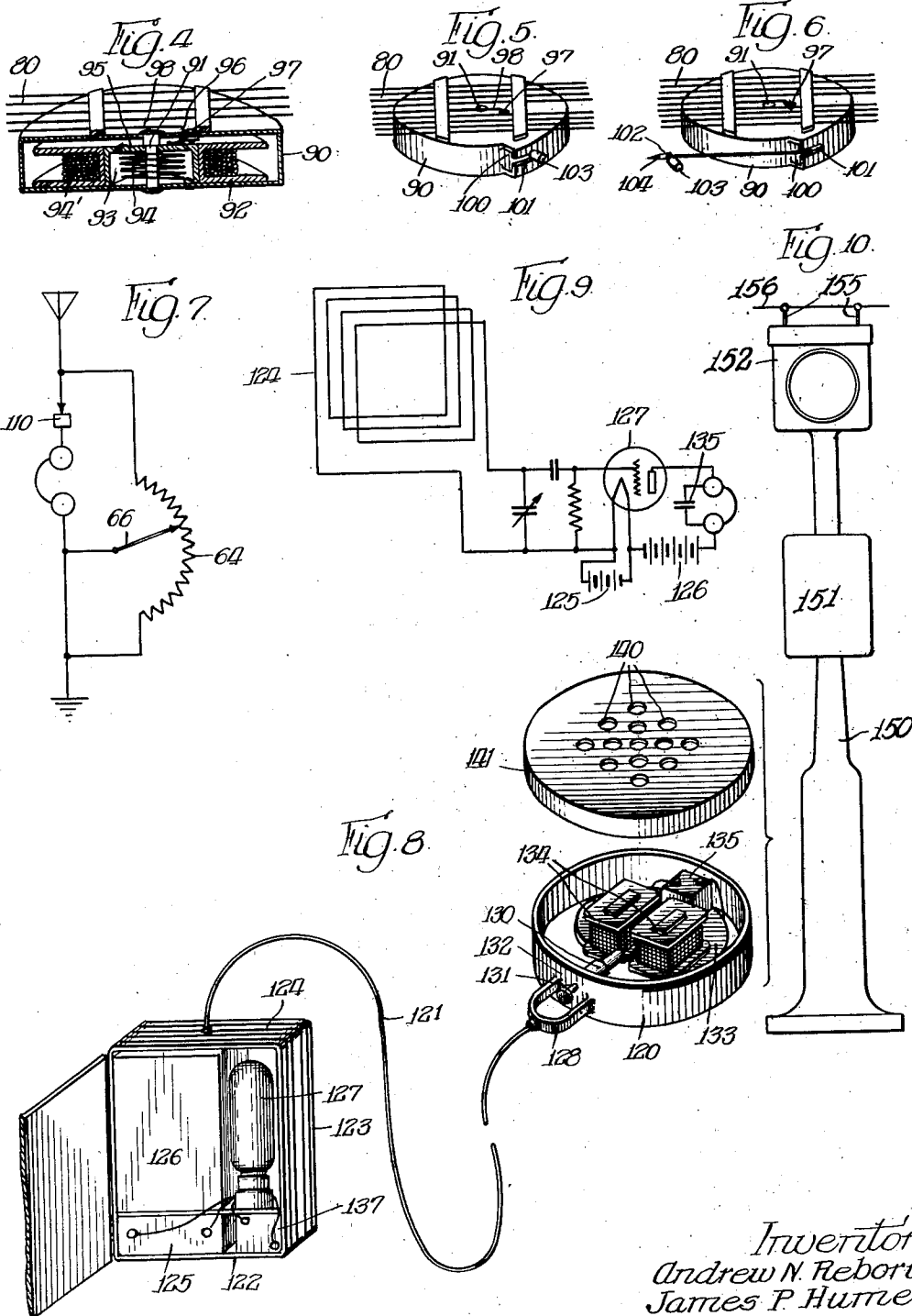
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UNITED STATES PATENT OFFICE

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MEANS FOR RADIO COMMUNICATION

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1 Claim. (Cl. 250-14)

This invention relates to communication systems employing radio transmitting and receiving apparatus, and is characterized as employing receiving apparatus consisting of small self-contained portable units adapted to be carried on the person of the user, either on the wrist or in a pocket, in substantially the manner that watches and similar articles are carried by the user.

The invention is further characterized as being applicable to the transmission and reception of all sorts and types of radio communications and is particularly useful as when applied to a time telling system which can be employed for transmitting and receiving continuous time telling announcements which may be audible to the user of the receiving apparatus when the receiving phone of his set is placed close to his ear. This invention may also be employed for police and military uses as well as for entertainment purposes, but the embodiment of the invention here illustrated is one which is particularly adapted for use as a time announcing system.

This form of the invention contemplates the establishment at various localities, such as for instance, in each of the major cities throughout the United States or other countries of the world, broadcasting stations having a particular assigned wave frequency which may become and be known as the time telling radio frequency. Such stations can be placed at various locations which may be spaced one from the other more or less depending upon the sending strength of the particular broadcasting stations involved.

In some instances, in order to make possible an audible reception with the relatively insensitive receiving apparatus, it is contemplated that various sending stations may be scattered throughout the locations of a single city and may perhaps be located in the street in housings provided on posts such as lamp posts, and the like. This type of broadcasting unit will also serve well for systems in any particular city for the distribution of communications to the police, fire departments, military officers and other persons of official capacity.

With broadcasting stations so established and functioning throughout the cities of the world, this invention next contemplates the wide distribution of radio receiving apparatus of a very small self-contained, portable type which will be sufficiently sensitive to receive the radio communications emanating from at least one of the various broadcasting stations without requiring any large, cumbersome or expensive equipment but rather only a compact and nice appearing device which in size and character, will be comparable to that of a watch adapted to be carried either on the wrist or in the pocket in the manner now common with such time pieces.

Accordingly, it is an object of this invention to provide a communicating system of the type referred to and to further provide radio transmitting and receiving apparatus which is small, compact, portable and self-contained and which is sufficiently sensitive to receive the intended radio communications and yet which is capable of being carried on the wrist or in the user's pocket in the manner now common with watches.

This invention contemplates radio receiving units which employ crystal detectors as well as those which employ one or more detecting and amplifying tubes. It is further contemplated that the receiving apparatus employed be equipped with, either, suitable means to serve as an antenna with a suitable ground connection, or a loop which will not necessitate the establishment of a ground connection for the reception of the radio signals. Due to the reduced strength of the signal resulting from the use of a loop as compared to that of an antenna and ground connection, in some instances, it will be desirable to utilize with a loop, a detector and amplifying tube instead of a crystal detector as in this way the strength of the signal may be increased to the point of providing a clearly audible signal. On the other hand, in instances where the broadcasting station has sufficient strength and is sufficiently close at hand, satisfactory and audible signals may be received with a loop in conjunction with a crystal detector without requiring the necessity of ground connections or amplifying and detecting tubes and the attendant battery or batteries. However, various combinations of these elements are contemplated for the present invention and certain illustrations thereof are hereinafter disclosed merely by way of example.

As applied to a device adapted to be mounted on the wrist of the user, it is also an object of this invention to provide means constituting a suitable antenna constructed into the band supporting the apparatus on the wrist. This antenna means may serve alone or it may serve through its contact with the body of the user, as means for connecting the body of the user with the receiving apparatus whereby the user's body may serve as additional antenna means.

This invention will be more clearly understood by referring to the accompanying drawings in which:

Figure 1 is an enlarged perspective view of a radio receiving apparatus constructed in accordance with this invention and adapted to be mounted on the wrist of the user in a manner similar to the mounting of wrist watches;

Figure 2 is a wiring diagram showing the hook-up for the receiving set shown in Figure 1;

Figure 3 is an enlarged perspective view of a modified form of the invention, adapted to be

mounted on the wrist of the user, which has means for contacting the body of the user whereby the body of the user serves in the capacity of an antenna and which also has a wire establishing a ground connection;

Figure 4 is an enlarged perspective view partly in cross section of a reel for the ground wire illustrated in Figure 3;

Figures 5 and 6 are enlarged perspective views showing the exterior of the reel illustrated in Figure 4, and particularly the means for accommodating the end of the ground wire;

Figure 7 is a wiring diagram showing the hookup for the receiving apparatus illustrated in Figure 3;

Figure 8 is an enlarged perspective view of a modified form of the invention which is constructed in size and shape like a man's pocket watch and chain, and with which a detecting tube is employed together with the necessary batteries for the detecting tube.

Figure 9 is a wiring diagram showing the hookup for the receiving apparatus illustrated in Figure 8;

Figure 10 is an elevational view of a type of transmitting station which may be placed on the street in the practice of this invention and which may be in the form of a lamp or other street post of the customary type having a housing for the necessary mechanism and an aerial preferably adjacent the top thereof.

By referring to Figures 1 and 2 of the drawings it will be noted that the form of the invention here illustrated employs a receiving apparatus which is very simple in principle and construction and which consists of a loop 10 having one of its ends 11 connected to a crystal detector 12. The detector 12 is in turn connected to an ear phone 13, the other terminal of which is connected to the opposite end 14 of the loop. Extending across the ends of the loop is a variable condenser 15 which may be utilized for tuning the receiving set to the particular frequency desired. Further, a condenser 16 is preferably employed across the ear phone to permit the passage of current of radio frequency. This form of the invention is preferably embodied in a device constructed somewhat similar to that shown in Figure 1 whereby it is of substantially the size and shape of an ordinary wrist watch.

In the form of invention illustrated in Figure 1 the set comprises a housing 20 which may be of insulating material such as any of the known molding compounds or it may be of metal lined with a suitable insulating material. As illustrated this casing is preferably of the arched or curved shape so as to conform to the contour of the wrist of the wearer and is equipped at each end with a holding bracket 22.

In this form of the invention a loop is provided as a part of the band or strap which serves to hold the device on the wrist of the wearer and as here illustrated this band comprises an insulating strip 23 and a plurality of runs of a suitable wire 24 which are disposed in such manner through the holes 25 in the bracket 22 as to constitute a loop antenna. The bracket 22 at one end of the device is hinged or otherwise unremovably secured to the casing as at 26 whereas the bracket 22 at the other end is removable by any suitable connection or clasp. The wire 24 originates in the casing and passes through the end wall thereof as at 26 and extends longitudinally through an opening 27 on the bracket 22 so as to form the central wire 28 of the loop.

Thereupon the wire 28 passes to the opposite bracket through one of the lateral holes and back again until a completed loop of any desired number of wires is provided with an end 30 which passes back through the end wall of the casing into the interior thereof.

Mounted in the casing as at 31 there is a suitable condenser consisting of two telescoping metallic tubes one of which is mounted on the stem 32 for adjustable movement on the bearing 33 and operable by means of the handle 34. It will be noted that this stem and handle are placed on the casing at the location which corresponds to the location on watches usually occupied by the customary winding stem. In this particular illustration however, the handle would be moved axially in and out to effect the desired adjustment of the condenser instead of being rotated in the manner of winding a watch.

Also within the casing is a fixed crystal detector 35 having suitable terminals 36 and 37 and in addition, a small by-pass condenser 38 adapted to be connected across the terminals of the ear phone. The ear phone is provided of usual construction and consists of a pair of horse shoe magnets 40 and a pair of solenoids 41 mounted substantially as illustrated in the drawings. Inside of the casing there is provided a ridge 45 on which a suitable diaphragm is mounted in such position that it may be influenced by the solenoids and thus form therewith an ear phone.

A cover member is preferably provided for the casing 20 which may be of any suitable material and which has a rim 51 on the under surface thereof for engagement with the edge of the phone diaphragm whereby the same is tightly held when the cover is closed. This cover may be provided with pleasing design preferably constructed to include holes 52 or other openings which will permit a better transmission of the sound from the diaphragm to the outside of the device.

With a device of this kind it is contemplated that various degrees of tuning may be permitted according to the needs of the particular case but in the interest of making the device small and compact, it will be desirable in many instances to so construct the receiving mechanism that it will be more or less permanently tuned to a predetermined frequency whereby only a minor corrective adjustment will be required by a trimmer condenser 15. It will of course be understood that the parts shown in the housing 20 will be suitably connected by wires to complete the hookup in the manner represented by the wiring diagram in Figure 2.

Inasmuch as this form of the invention is provided with a loop and utilizes a crystal detector, it will be necessary that the signals received be quite strong in order that they may be heard. If greater strength is required in any particular system it is contemplated that additional broadcasting outlets may be established throughout various locations in the city, either through broadcasting stations of the type now in common use or through the instrumentality of devices connected to a central station and located in street posts or similar means, like that illustrated in Figure 10. This form of the invention will be particularly desirable in cases where the communicating system is employed for police, fire, military and other uses.

Referring now to the form of invention illustrated in Figure 3, it will be noted that a case 60 is provided preferably of insulating material

which may be of any desired shape. In this instance the device is also shown as being adapted to be mounted on the wrist of the user in the manner of a wrist watch and as here shown may be round in shape, rather than rectangular. Here again the case may be of any suitable material such as molded insulating compounds or it may be of metal suitably lined or otherwise provided with the necessary insulation. When the case is made of an insulating material as here illustrated, it may be provided with a ring 61 also of insulating material and of less height than the side wall of the casing and of less diameter so as to provide an annular space 62 which is occupied by a coil composed of a number of turns of very small wire 63 providing a tuning coil 64 of the type illustrated in Figure 7. The ring 61 is preferably provided with a slot 65 through which is exposed a portion of the wires of the coil 64 which may be stripped bare at the location of the slot so as to enable a good electric contact to be made therewith. A contact member 66 is provided mounted on a stem 67 which stem is pivotally mounted in the side wall of the casing in the manner shown. The stem 67 is provided with a turning knob 68 constructed and located in a manner similar to the winding stem of the usual type of wrist watch.

The stem 67 is insulated from the adjacent wires at the place where the stem passes through the annular space 62. This construction provides a satisfactory tuning adjustment due to the fact that the oscillation of the stem 67 by means of the knob 68 causes the deflected end of the contact member 66 to move in engagement with the bare portions of the wires of the coil 64.

Also mounted in the casing are magnets 70 and solenoids 71 constituting the necessary elements of an ear phone which are adapted to cooperate with a disk which will be supported on the upper edge of the ring 61 with its under surface in operative association with the poles of the solenoids 71.

The casing of this device is adapted to be closed by a cover 72 which may be held thereon by screw threads or any other suitable form of attachment. This cover serves to engage the upper edge of the disk at the location of the ring 61 so as to hold the same in the manner common in ear phone construction. This cover is also provided with suitable decorations preferably including opening 73 through which the sound waves may more readily pass.

This device is held on the wrist by means of a suitable strap or band 80 of any suitable construction but which is preferably unremovably connected at one end of the device and removably connected at the other. This construction enables the device to be readily applied to and removed from the wrist of the user. In this case the band 80 may be made up of a plurality of wires properly connected through the connector 81 with the interior of the casing so as to form an antenna. In some instances however, it may be desirable to increase the antenna action by additionally employing the body of the user which can be brought into connection by contact between the antenna wires of the band 80 and the wrist of the wearer. Where an antenna is employed either with or without the body of the wearer being connected, it may be desirable to provide a ground connection and whereas this may be provided through any suitable connecting wire it is preferable to have an extensible ground wire which may be mounted in the manner il-

lustrated in Figures 4 to 6 inclusive, on the band 80, on the under side of the wrist or in other words, the side opposite from that on which the watch-like receiving device is worn.

This mechanism comprises a cylindrical housing 90 having a central pivot 91 and a reel 92 mounted thereon. The central pivot and reel are so constructed as to provide a space 93 adjacent the hub which is provided with a torsional spring 94 whereby the reel may automatically rewind the ground connecting wire.

Mounted on the reel is a length of fine wire 94' which has its inner end electrically connected at the location of the hub to a metallic plate 95 on the upper surface of the reel. A brush 96 is in engagement with the plate 95 whereby an electric connection is maintained between the brush and the ground wire while the reel is free to rotate. The brush 96 is connected to a terminal 97 which is connected by a suitable wire 98 disposed in the band 80 to the proper mechanism mounted on the interior of the casing 60, all in accordance with the wiring diagram shown in Figure 7.

As shown in Figures 5 and 6, the reel casing 90 which is preferably formed of insulating material has an outlet 100 provided with a slot 101. This outlet provides a housing for the terminal member 102 which has a handle 103 and a metallic prong or point 104 which is in electrical contact with the ground wire 94'. When the reel winds in the ground wire, the end 102 is caused to occupy the space within the outlet member 100 with the handle 103 disposed in the slot 101 in the manner illustrated in Figure 5. This completely houses the prong 104 and avoids the liability of the user being inadvertently pricked thereby.

When it is desired to make a ground connection it is merely necessary to grasp the handle 103 and pull the same out of the outlet housing so as to unwind the reel and place the same in engagement with a suitable ground connection to complete the circuit in the usual manner. In this operation the connection need only be made temporarily during the time that the time message or other communication is being received. Here, like in the other modification some adjustment or tuning is possible through the coil 64 and the tuning device having the contact 66 in contact with the coils.

Mounted within the casing 60 is also a fixed crystal detector 110 which is connected by suitable wires to one of the poles of the ear phone and also to the coil 64 and an aerial connection in the manner illustrated in the wiring diagram of Figure 7. There is also a suitable wire which connects the opposite end of the ear phone to the adjustable contact 66.

From the above description it will be clear that this device provides a receiving set in form and size similar to an ordinary wrist watch which will receive radio communications in the manner described. Whereas this illustration shows an antenna which may also include the body of the user together with a ground connection, it is apparent that this form of invention may also be employed with a loop of the type illustrated in connection with the modification in Figure 1 in those cases where the signal received is of sufficient strength and intensity to justify the same.

A still further modification of the invention is represented in Figures 8 and 9, which consists of a housing 120 mounted on one end of the flexible element 121 and a second housing 122,

mounted on the opposite end of said flexible element 121. This device is preferably constructed of size and shape to resemble an ordinary vest pocket watch and chain together with some device on the other end of the watch chain. Whereas the receiving apparatus here illustrated may be constructed in the manner already illustrated in Figures 1 and 3, respectively, it is here shown as employing a receiving set having a detector tube instead of a fixed crystal detector. In this way amplification can be obtained so as to strengthen the signal received with an ordinary loop. This form of the invention is desirable in those cases where a ground connection is either impracticable, undesirable, or cannot be made.

The casing 122 comprises a rectangular frame piece 123 of insulating material on which is mounted a plurality of turns of fine wire 124, constituting a loop. Mounted within the rectangular frame and housed therein by insulating wall pieces are a plurality of batteries, 125 and 126 and a small electronic tube 127. The battery 125 is the customary "A" battery which serves to illuminate the electronic tube 127 and battery 126 is the customary "B" battery for the receiving set. This portion of the apparatus including the loop is suitably connected through very fine insulated wires which collectively form the flexible connection or chain-like element 121 which is attached at its other end to a ball 128 on the other portion 120 of the device.

The portion 120 of the device is somewhat similar to that previously described in connection with the other modifications of the invention in that it includes an adjustable condenser 130 consisting of two telescopic metallic tubes one of which is adjustable by connection to the slidable stem 131 which passes through a slide bearing provided in the side wall of the casing of the device 132. Casing 132 is preferably made of insulating material and also serves as a housing for the permanent magnets 133 and solenoids 134 for the ear phone. This device also includes a condenser 135 adapted to be connected across the ear phones and a grid leak 137 which may be mounted in either the housing 132 of the portion 120 or within the portion 122 according to the circumstances of the particular case. As here illustrated, the grid leak is mounted in the housing 122 at a location adjacent the acorn tube, and as illustrated, in the wiring diagram of Figure 9. To complete the ear phone, a disk is provided in the usual manner and held in place on the top edge of a ledge of the casing 132 by the cover for the casing. The sound disk is so mounted as to be in operative association with the poles of solenoids 134. The cover may be constructed as illustrated in Figure 8, having a surface preferably provided with holes 140 therein for assisting the outward passage of the sound waves and having a flange 141 which may be screw threaded or otherwise secured to the casing 132. The side wall of the casing 122 may preferably be opened so as to readily insert new "A" and "B" batteries when necessary.

By referring specifically to Figure 10, it is noted that the transmitting mechanism may consist of a suitable post 150 having a housing 151 located thereon which may house suitable radio transmitting mechanism, and also a housing 152 adjacent the upper end which may include cer-

tain transmitting mechanism and may, if desired, include a street lamp, traffic light or other mechanism usually carried by posts of this type. On the upper portion there may be suitable insulating supports 155 constituting a mounting for the conducting element 156 which will serve as a transmitting antenna for the purpose herein explained.

From the above description it will be apparent that the applicants have provided various types of radio receiving equipment which are portable, compact and self-contained and which can be carried by the user in a manner substantially similar to the manner of carrying watches, that is to say, either on the wrist or in the vest or other pockets of the user's clothes.

This invention enables for the first time, the construction of radio receiving equipment in a neat, nice-appearing, compact form whereby the same may enter the field of jewelry and personal articles which may be worn or carried on the person. In other words, aside from the highly useful function of this type of device it is intended that the same be so constructed that the receiving sets referred to will be items of highly pleasing appearance which are so compact and so small that their use will be widely accepted for the purposes intended.

This invention is not to be limited by the particular illustrations here given nor by the particular wiring diagrams illustrated as it will be apparent to those skilled in the art that various modifications may be made without departing from the spirit of the invention here disclosed. Accordingly, the forms of the invention disclosed and illustrated are to be considered as merely illustrative and the limitations of the invention are to be determined only from the appended claim.

In the device illustrated in Figure 8, it is to be understood that the flexible connecting element 121 may also be provided with suitable wires constituting an antenna for the receiving device, which antenna may or may not have electrical connection with the hand of the user so as to include the body of the user as a part of the antenna means.

We claim:

A complete, self-contained and portable radio receiving device adapted to be attached to and completely carried on the wrist of the user, and comprising a housing constructed and shaped to be held on the wrist, earphone means, detecting means and tuning means mounted in said housing, and manually operable means extending from said housing in a position accessible for operation by the user in a manner similar to the winding stem of an ordinary wrist watch, said manually operable means being connected to said tuning means for selectively adjusting the same, and antenna means in the form of a wrist strap attached to said housing and being adapted to surround the wrist of the user and thereby to serve as a mechanical attaching means for holding said housing in such position that the user, by movement of his arm, may lift said device to his ear so that relatively weak sound waves emanating from said earphone means may be rendered audible to said user.

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