

Nov. 26, 1946.

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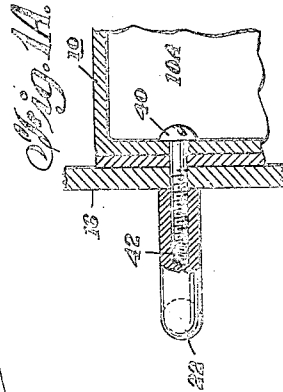
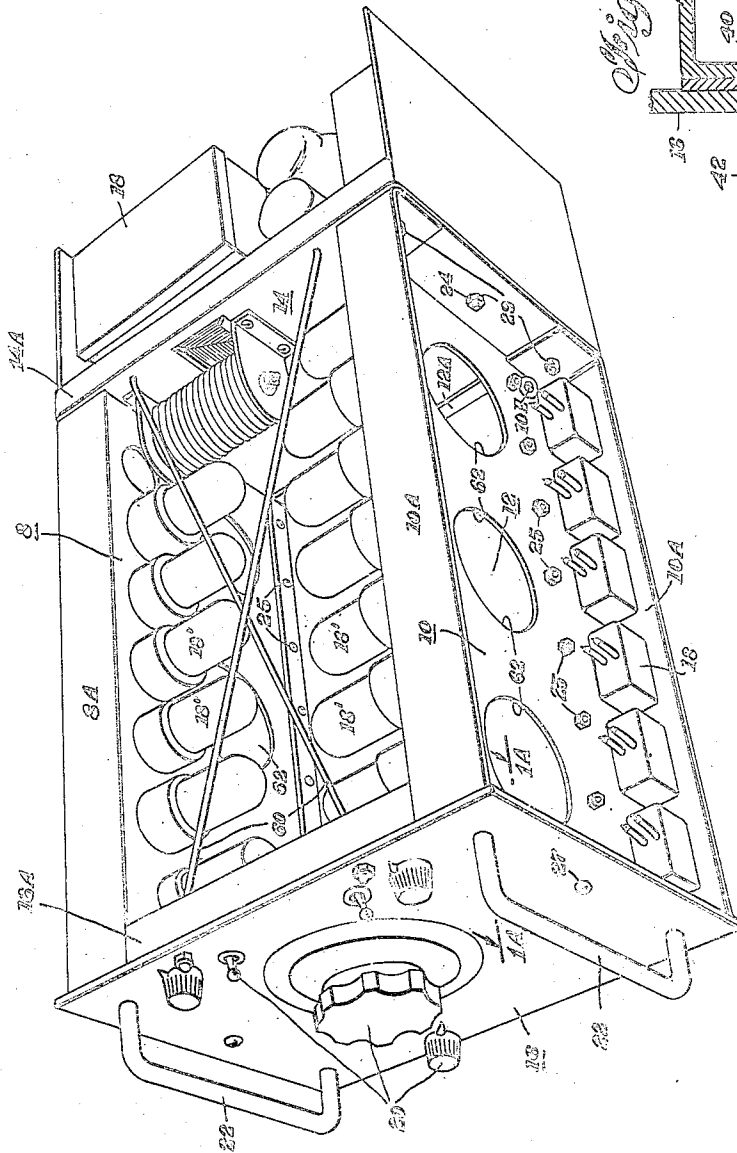
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RADIO ASSEMBLY

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3 Sheets--Sheet 1

Fig. 1.



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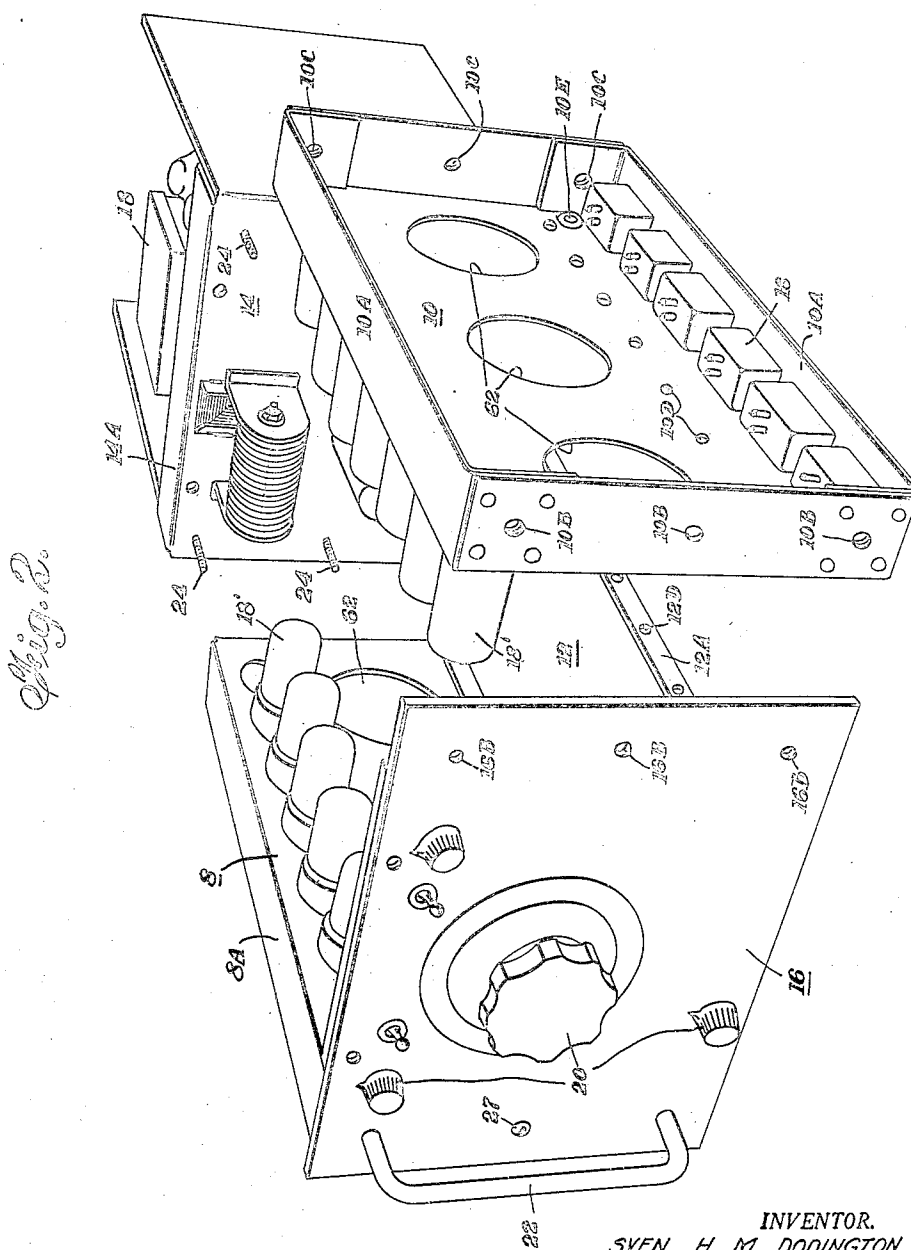
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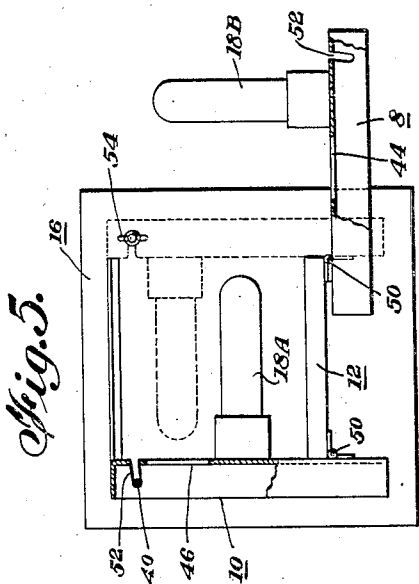
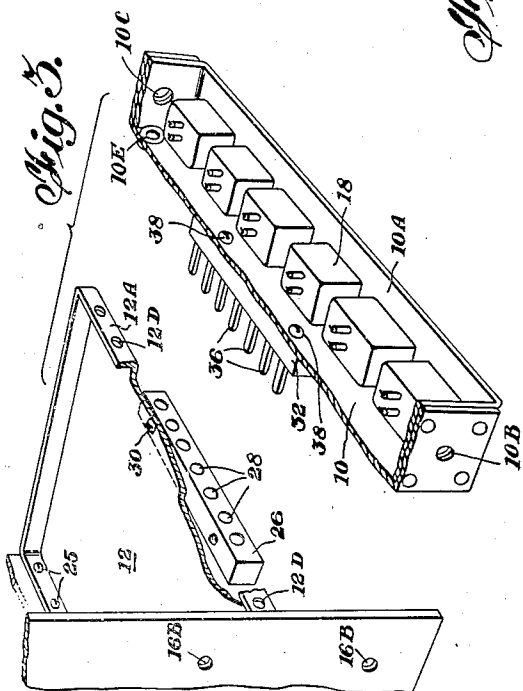
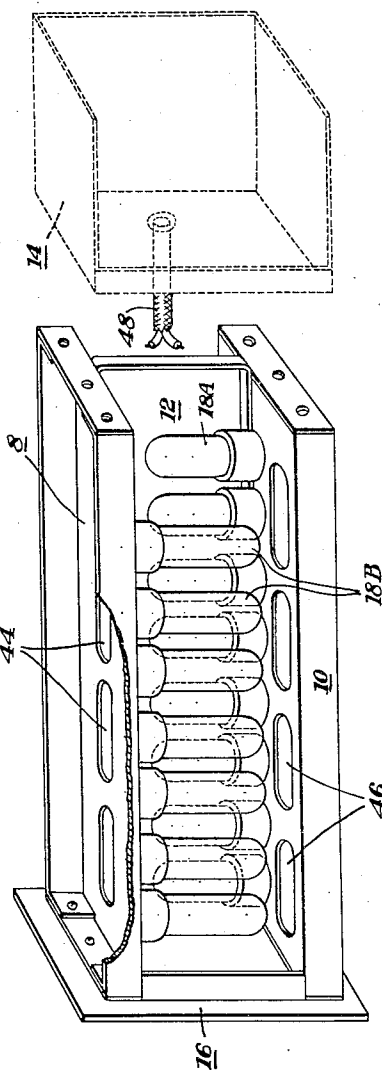


Fig. 4.



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RADIO ASSEMBLY

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3 Claims. (Cl. 250-16)

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The present invention relates to radio assemblies and more particularly to an assembly of parts forming a radio transmitter, receiver or other similar apparatus.

It is highly desirable in manufacturing radio equipment to make the assembly as compact as possible. In fact there are numerous occasions upon which the overall dimensions of the equipment are strictly limited, as for example, on board airplanes or other vehicles in which space is usually at a premium. However, these space limitations, in making compactness a requisite, raise a number of problems that require solution. These include (1) the design of the assembly so that the various units are physically segregated in accordance with functional characteristics, for example, respective parts of the detector, amplifier, power unit, etc. being grouped together; (2) overcoming the undesirable crowding of parts and wiring resulting from the desire for compactness; (3) ease and speed of assembly; (4) accessibility for prompt inspection and repair. Other problems may be raised in specific instances but the ones mentioned will serve as a broad illustration of the factors involved.

In conventional practice, a single chassis is usually employed for large assembly jobs such as a transmitter or receiver. This procedure is cumbersome and time consuming to the factory workers because of the difficulty involved in assembling and wiring thereon numerous parts in compact arrangement. In addition to the difficulty of assembling the parts, the compactness of the assembly permits but one or possibly two persons to work on it at a time. Furthermore, such compact assembly jobs render it exceedingly difficult to repair and/or replace parts, since to remove a particular member for repair or replacement, other parts and wiring must usually be disturbed.

Accordingly the present invention has as one of its principal objects the provision of a radio assembly in which each of the above-mentioned problems has been solved.

Another object of the invention is substantially to increase the amount of space available for mounting the parts and equipment on a radio chassis the overall dimensions of which fall within predetermined limits.

A further object of the invention is to provide a chassis construction by which radio equipment may be conveniently assembled in sub-assemblies according to function, and the sub-assemblies then mounted together.

A still further object of the invention is to pro-

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vide means whereby any portion of a radio assembly may be quickly and easily reached for inspection or repair.

Other objects and advantages of the invention will be apparent from the following detailed description to be read in conjunction with the accompanying drawings, in which:

Fig. 1 is a perspective view of a radio assembly in accordance with the present invention;

Fig. 1A is a sectional view of a portion of Fig. 1 along the line indicated;

Fig. 2 is a view of Fig. 1 showing several of the sub-chassis members separated from the assembly;

Fig. 3 is a perspective view of a plug and socket assembly designed for use with the structure of Fig. 1;

Fig. 4 is a perspective view of a modification of Fig. 1 with the radio parts arranged to provide for greater compactness; and

Fig. 5 is a rear elevational view of a modification of the structure of Fig. 4 showing hinged sub-chassis members.

In Figs. 1 and 2 are shown a plurality of sub-chassis members 8, 10, 12, 14 and 16. These sub-chassis members are preferably made of sheet metal by known cutting and stamping operations. Each member comprises a rectangular panel having its edges flanged, as generally shown at 8A, 10A, 12A, 14A and 16A, these side flanges acting to stiffen the panels and also to provide a space in which small parts and wiring may be disposed and shielded, as will be hereinafter brought out. The side flanges of several of the panels are secured together at the corners of the panel by some preferred means such as welding, this construction acting to add rigidity to the structure.

On both the top and bottom surfaces of several of the panels 8, 10, 12, 14 and 16 are mounted radio parts and wiring, generally indicated as 18 in the drawings, to form a number of sub-assemblies. The sub-assembly on sub-chassis 8 may comprise, for example, a pulse amplifier, while the sub-assembly on sub-chassis 10 may similarly comprise an intermediate frequency amplifier. The functional radio parts shown, as well as their number and grouping, is merely given by way of illustration, as obviously other circuit units would necessitate other equipment. In general, however, it may be said that the tubes, coils, transformers and other large radio parts are preferably mounted on the top surface of the sub-chassis members, while the smaller parts such as resistors, condensers and wiring are dis-

posed on the bottom surface. The bottom surface of the sub-chassis members may be either side of these members, but, as illustrated in the drawings, I refer to the portion of the member lying between the side flanges as the bottom surface.

The above arrangement of parts is particularly true of the side sub-chassis members 8 and 10. On the other hand, member 14 has been illustrated as comprising a power unit, the particular requirements of which necessitate placing certain of the parts outside the enclosure formed by the members. However, this condition exists only for this type of unit, and for other circuit portions the larger apparatus included therein could be grouped on the inner surface of the sub-chassis 14 in a manner similar to that of the members 8 and 10. The sub-assembly on sub-chassis 14 comprises the control means for the assembly, these control means being generally indicated at 20 in the drawings.

As above stated, the sub-assemblies may comprise certain definite stages of the radio apparatus, such as a detector stage, amplifier, etc., or may comprise any radio parts that may be most readily and conveniently associated together as a unit. Each of these units or sub-assemblies may be assembled as hereinbefore stated by a different workman.

A description will now be given of the principle of assembling the sub-chassis members, each of which has been provided, as above mentioned, with radio parts and wiring as a sub-assembly. The required sub-assemblies which, in the present instance, are five in number, are positioned in spaced-apart angular relationship as best shown for several of the members in Fig. 2. Sub-chassis member 12 is preferably disposed to lie in a substantially horizontal plane. Sub-chassis members 8, 10, 14 and 16 are disposed in substantially vertical position adjacent the respective flanged edges 12A of the member 12. Although five sub-chassis members have been illustrated, it will be clear that either or both members 12 and 14 may be dispensed with, and also that another sub-chassis member, parallel to member 12, may be provided to form a completely enclosed box-like structure.

Each sub-chassis member is provided with means for securing it in rigid relationship to its adjoining sub-chassis members. This is accomplished in the embodiment shown by a plurality of screws and bolts respectively receivable in a plurality of openings formed in adjoining members. For instance in Fig. 2 the sub-chassis member 10 is provided with a plurality of openings in the flanges thereof designated as 10B and 10C. In the panel portion of the member a series of openings 10D are formed.

Still referring to this sub-chassis member 10, it will be seen that when this member is brought into close relationship with the sub-chassis member 12, the openings 10D in member 10 will line up with the openings 12D in the flanged portion 12A. It will also be seen that openings 10B in the flanged portion 10A will line up with a series of openings 16B which are provided in the panel portion of sub-chassis member 16. A plurality of bolts 25 (Fig. 1) are passed through openings 10D and 12D to secure the panel portion of member 10 to the flanged portion 12A of member 12. A bolt 27 similarly passes through the center opening 10B into the center opening 16B of member 16 to secure the flange 10A to the panel 16. Sub-chassis member 8 is secured in a manner

similar to that described to both members 12 and 16.

In order to provide means for grasping the assembly or carrying it from place to place, a pair of handles 22 are provided. These handles 22 each have a pair of threaded openings 42 in the portions thereof adjacent the panel 16. This can best be seen by reference to Fig. 1A. A pair of screws 40 are respectively receivable in the two side openings 10B, and these screws project through side openings 16B and into the threaded openings 42 in handle 22. By means of this construction it will be seen that the handles 22 serve a double purpose, that is, they provide means for conveniently grasping the assembly and in addition they provide means for additionally securing together the sub-chassis members 8, 10 and 16.

Sub-chassis member 14 is provided with two series of bolts 24, as best shown in Fig. 2. One series of bolts 24 is aligned with openings 10C in flange 10A of member 10, and the other series of bolts 24 is associated with three openings (not shown) in flange 8A. Thus sub-chassis 14 can be brought up to the other members so that bolts 24 project through openings 10C and the corresponding openings in flange 8A. Nuts 29 (Fig. 1) threadably engaging these bolts tend to secure rigidly together members 8, 10 and 14.

It will thus be seen that the whole assembly is now rigidly joined together as a unit. However, it will be clear that by removing the necessary bolts or screws, any one of the sub-assemblies can be separated from the remaining units for inspection or repair. In the embodiment of the invention shown, a pair of cross braces 60 are employed to strengthen the assembly against twisting or distortion.

As hereinbefore stated, the larger parts and circuit elements are positioned on the top surface of the sub-chassis members. Thus, as shown in Figs. 1 and 2, these elements such as tubes 18' project inwardly toward the center of the box-like structure constituting the assembly so as to substantially fill the enclosure. However, it is intended that the sub-chassis members 14 and 16 be of sufficient width so that a space will exist between the inwardly-projecting radio parts of the sub-assemblies mounted on sub-chassis members 8 and 10. This is brought out in Fig. 1, in which a space exists between the two rows of tubes, thus permitting access to the lower part of the interior of the structure. No radio parts have been illustrated as being mounted on sub-chassis member 12 in Figs. 1 and 2, but this is solely because the particular circuit illustrated in these figures does not require further parts in addition to those mounted on the remaining members. However, it will be clearly understood that if additional circuit portions are necessary, the sub-chassis member 12 may be equipped with such parts in a manner similar to that described for sub-chassis members 8 and 10.

The spaces formed by the flanged portions 8A and 10A respectively of sub-chassis members 8 and 10, including the lower surface of the panel portions of such members are designed to enclose the smaller radio parts and wiring, including those elements which in radio constructions are normally electrically connected or joined together by soldering or other similar means. Thus a majority of such connections in the sub-assemblies 8, 10 and 12 are accessible from the exterior of the assembly, and can readily be inspected or repaired without the necessity of removing any of the screws or in any other way separating the

various sub-chassis members themselves. As hereinbefore stated, due to the nature of the power unit illustrated as constituting sub-chassis member 14 many of the larger parts of this sub-assembly have been illustrated as extending outwardly from the panel itself instead of inwardly as is the case with the other chassis members just described. However, as before stated, this is entirely due to the nature of this particular circuit portion, and in other circumstances the structure shown in Figs. 1 and 2 can readily be changed to have these elements extend toward the interior of the assembly.

Sub-chassis member 13 comprises the control portion of the assembly. The various dials and other control elements, generally indicated at 20, must, of necessity, be mounted so as to be capable of actuation from the exterior of the unit. For this reason any circuit connections between the controls will be on the interior surface of member 13. However, such circuit connections are readily accessible through the opening formed by the various vertical sub-assemblies.

It has been stated that each of the sub-assemblies is wired as a unit. Therefore, only one cable or other connection is necessary between the various sub-assemblies when the complete unit is assembled. One example of such a connection between the sub-assemblies is shown in Fig. 4 in which a cable 43 is shown extending from an opening in subchassis 14 to each of the sub-chassis members 8 and 10 through an opening in the panel portion of the latter below the line to which the flanged portion 12A is attached. In Fig. 2 an opening 13E in member 13 is shown to receive this cable. A similar opening exists in panel 8. Further circuit connections may be made between the sub-chassis member 16 and one or more of the other sub-assemblies depending on the type of circuit employed.

Due to the fact that considerable heat is generated as the result of tube operation and from other circuit elements in most radio apparatus, a plurality of openings 62 are provided in members 8 and 10 so as to provide adequate ventilation for the interior of the assembly.

It is apparent that a structure such as has been described is usually well suited for use for circuits in which a cathode ray tube is utilized. It will be clear that such a cathode ray tube (not shown) can be placed within the assembly so that the screen of the tube will be positioned approximately at the point now occupied by dial 20 of member 13. The conical body of the tube will then extend centrally toward the rear of the assembly, or in other words toward member 14. The radio apparatus now mounted on sub-chassis members 8 and 10 would surround this cathode ray tube, so that practically all the space within the interior of the assembly would be utilized.

In Fig. 3 is shown a modification of the structure of Figs. 1 and 2 in which any necessary connections between the sub-chassis members are automatically made when such units are joined together. This is accomplished by means of a number of plug and socket elements. On sub-chassis member 12 is secured a support 25, this support being rigidly held against the under surface of the member by means of a plurality of screws 30. Within and positioned by support 25 are a plurality of sockets 23. Support 26 is recessed as shown from the flanged portion 12A.

On the surface of sub-chassis member 10 is positioned another support 32 secured to the member by means of a plurality of screws 38. Within and

supported by member 32 are a plurality of plugs 36 designed for respective engagement with the sockets 23 of support 26. When the sub-chassis member 13 is brought against sub-chassis member 12, as hereinbefore described, the plugs and sockets will become respectively associated so as to establish any desired connections between these two sub-chassis members. Of course, similar plug and socket connections can be provided between sub-chassis members 8 and 12, 14 and 12 and 16 and 12. Thus no wiring of any sort will be necessary when the various sub-chassis members are assembled to form the complete structure.

In Fig. 4 is shown an alternative construction by which the width of the total assembly can be considerably diminished. This is accomplished by vertically offsetting the larger radio parts, such as tubes 18A and 18B, so that they lie in planes one above the other. Oppositely disposed to each such plane of tubes or other apparatus are two series of openings 44 and 46 respectively cut out of members 8 and 10. Thus when the sub-chassis members 8 and 10 are brought together, these openings 44 and 46 permit access to be had to the radio parts 18A and 18B so that replacement or repair thereof can be made through these side openings in the assembly rather than through the top as was the case in the structure of Figs. 1 and 2 and at the same time permit proper ventilation. Due to the offset position of the parts 18A and 18B the two members 8 and 10 can be placed much closer together than would otherwise be the case. If desired, the openings 44 and/or 46 can be formed as one large opening rather than several small ones.

In Fig. 5 is shown an alternative form of construction in which the sub-chassis members 8 and 10 are hinged on the sub-chassis member 12 so that such members 8 and 10 can be lowered into parallel relationship with member 12 by rotation about the hinges 50. In this construction a U-shaped opening 52 is provided in flanged portion 10A to replace the upper opening 10B, and also a small portion is cut out of the surface of member 10 adjacent thereto. Similar changes are made in member 8. Thus by merely loosening one of the screws 40, and without completely withdrawing such screw from the opening 42 of handle 22, the sub-chassis members 8 and 10 can be selectively lowered to any angular position relative to sub-chassis member 12, thereby permitting ready access to the interior of the assembly. If desired, the screws 40 of Fig. 1A can be replaced by a pair of wing nuts 54 as shown in Fig. 5 to permit easier operation of the securing means.

It will be readily apparent from the foregoing description that my invention makes it possible to assemble and wire the numerous parts of a radio transmitter, receiver, or other radio apparatus, in sub-assemblies and to combine these sub-assemblies into a single unit. By this method of assembling radio parts a large number of operators may work on a single apparatus, one or more workers assembling the parts of each sub-assembly. This method also facilitates mass production of radio apparatus and insures better workmanship for compact devices, since the cumbersome nature of numerous parts closely associated is largely avoided. Besides facilitating the manufacture of this type of compact apparatus, my invention enables the removal of sections of the apparatus for repair and replacement purposes without disturbing adjacent parts other than disconnecting the single cable or other connection to the section the removal of which is desired. In

the plug and socket modification shown even this latter step is unnecessary.

It is apparent that the increase in surface available for mounting the parts varies with the number of sub-chassis members utilized, this number being normally between three and six. If the members are of the same dimensions, three sub-chassis members together will provide about 150% more available space than a conventional base having an area equal to one of the members. Each additional sub-chassis member employed, of course, adds to this total.

It will also be seen that due to the upright nature of a majority of the sub-chassis members, it is possible to change the wiring connections or remove any of the parts mounted on such members without turning the assembly on its side as would be the case with conventional units that are mounted on a horizontal base. This eliminates any possibility of breakage or other damage to the apparatus that might occur when the assembly is turned from its normal position.

While I have described above the principles of my invention in connection with specific apparatus, and particular modifications thereof, it is to be clearly understood that this description is made only by way of example and not as a limitation on the scope of my invention as set forth

in the objects of my invention, and the accompanying claims.

I claim:

1. A radio assembly chassis in the form of a box like structure, having side and other walls including a bottom wall, said bottom wall and a plurality of said side walls each comprising a flat, flanged, rectangular sub-chassis member, means including the flanges for securing said members together with the spaces included by the flanges facing outward, radio parts mounted on the inside face of said members and radio parts and wiring mounted on the outside thereof within said flange spaces, all said radio parts and wiring mounted on each said sub-chassis members constituting a substantially complete circuit unit.

2. An assembly chassis according to claim 1 in which one wall of the box is constituted by a control panel and there is means for securing flanged portions of adjacent sub-channel members to said panel.

3. An assembly chassis according to claim 1 wherein one wall of the box is constituted by a control panel and the side sub-chassis members adjacent to said panel are pivotally mounted to the bottom wall member and means is provided for locking them in closed position.

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