

March 6, 1928.

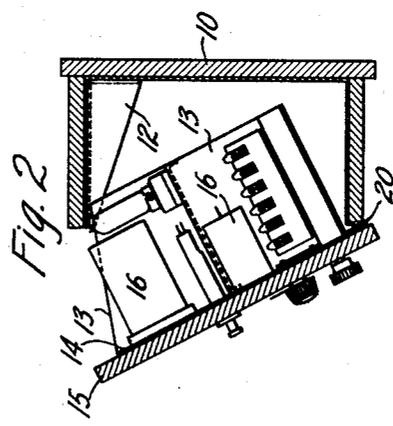
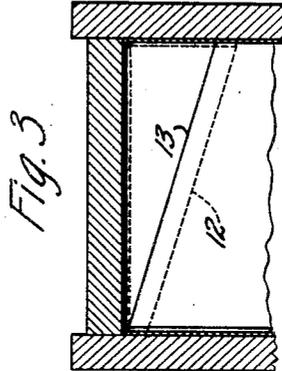
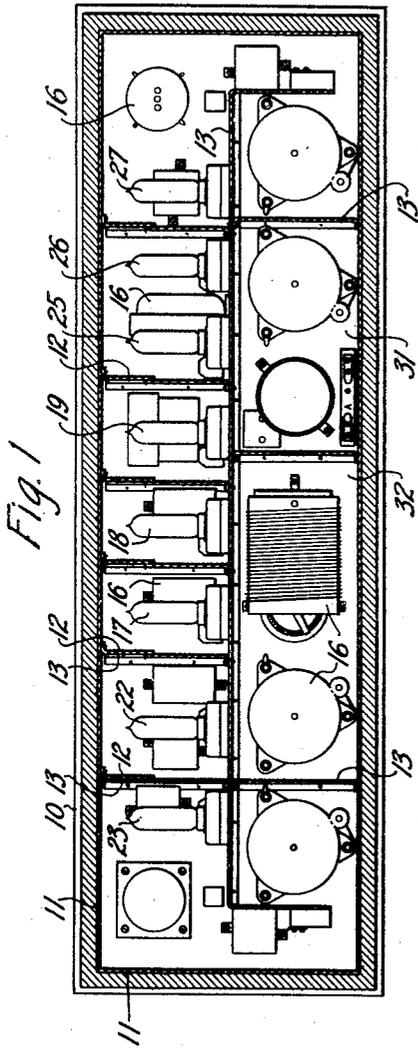
1,661,535

A. HADDOCK

ELECTRIC SHIELDING

Filed Oct. 23, 1924

2 Sheets-Sheet 1



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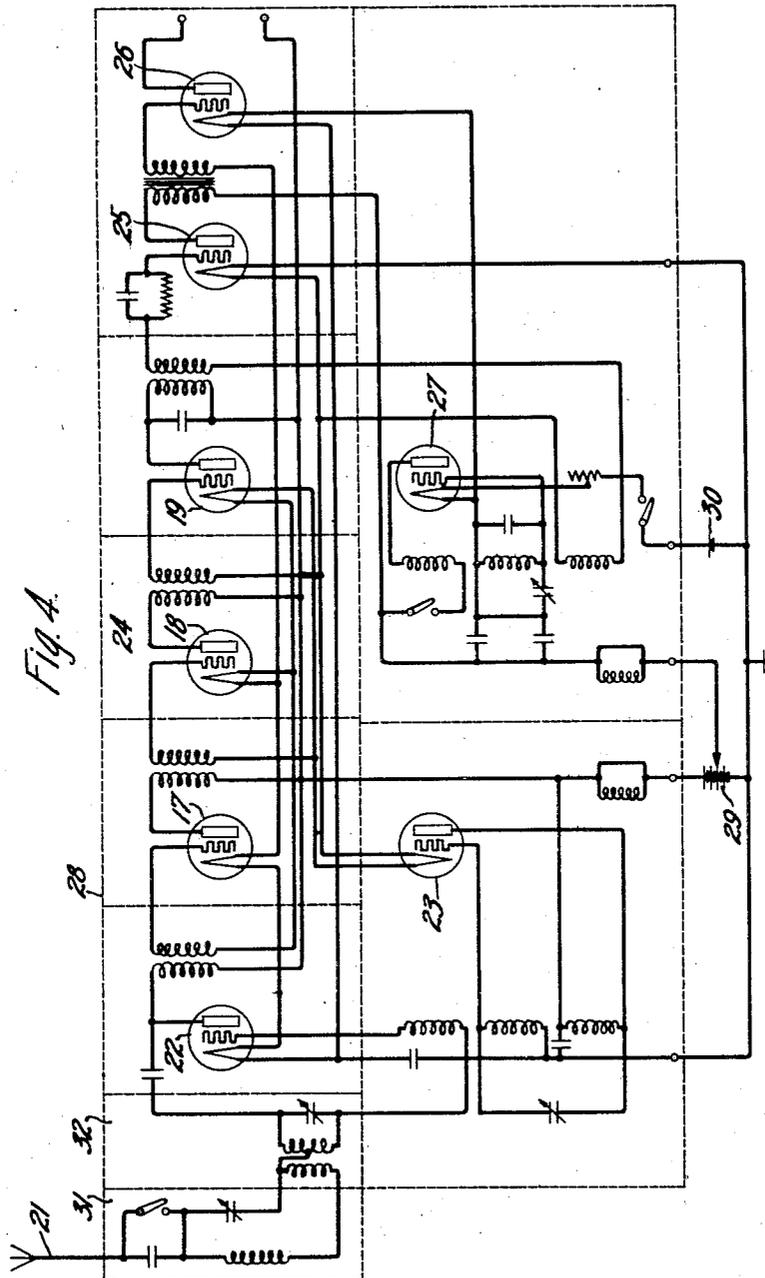
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# UNITED STATES PATENT OFFICE.

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## ELECTRIC SHIELDING.

Application filed October 23, 1924. Serial No. 745,323.

This invention relates to electric shielding and more particularly to the shielding of radio systems including space discharge tubes.

5 When an amplifying system comprises space discharge tubes arranged in tandem, a difficulty in the operation of the system arises from the fact that disturbances may be introduced therein in various ways. For  
10 example, parasitic oscillations may be generated by virtue of regeneration caused by the amplified energy in the output path of one tube being supplied to the input path of a preceding tube. Again, undesired extraneous waves picked up by one portion of the  
15 circuit may be so amplified and transmitted to other portions of the system, as to cause serious interference with desired energy or waves. It is known that disturbances  
20 brought about by the above, as well as other causes, may be reduced by shielding certain elements of the system. The present invention provides an improved shielding arrangement for space discharge type systems.  
25 An object of the invention is to prevent disturbance to desired waves in a space discharge tube system.

Another object is to prevent energy from being fed back from one stage of a multi-stage amplifier to other stages tending to produce parasitic oscillations or singing.

30 A further object is to shield the several elements of a radio receiving system in such manner as to render the apparatus compact and accessible.

An additional object is to improve the mounting of radio apparatus.

40 A feature of the invention relates to a cabinet with a cover, each having a shielding lining and shielding flanges cooperating to produce closed shielded compartments.

Another feature relates to means for mounting radio apparatus upon the cover of a cabinet whereby, when the cover is  
45 closed, the apparatus is completely surrounded by shielding material and cooperating flanges on cover and cabinet form closed shielding compartments, each including a portion of the apparatus.

50 Another feature relates to means for increasing the accessibility of shielded radio apparatus which comprises a support includ-

ing flanges on the cover and cabinet in which the apparatus is mounted.

In this invention, the hinged cover of a cabinet forms a mounting and insulating  
55 panel for radio apparatus. The inside of the cover and the sides and bottom of the cabinet are completely lined with conducting diamagnetic sheets except for small openings  
60 that are provided to enable the insertion of conductors for making connection between apparatus enclosed by the cabinet and apparatus outside of the cabinet. Plates or  
65 flanges of conducting material are attached to the inside of the cover and extend with their planes perpendicular thereto and upon these plates and on the cover itself, the apparatus is mounted. Similar flanges are  
70 mounted within the cabinet and arranged to cooperate with the flanges upon the cover, when the latter is closed, to form closed compartments for shielding certain portions  
75 of the apparatus from disturbances from other portions and for shielding all the apparatus from external disturbances. Control handles for adjustable parts are provided upon the face of the cover. In the drawings:

80 Fig. 1 is a front sectional view of the cabinet illustrating the position of the shielding plates and flanges and the general arrangement of the radio apparatus within the compartments formed thereby.

85 Fig. 2 is an end section illustrating the mounting of the apparatus upon the cover and the position of the shield material upon the top, bottom and back of the cabinet.

90 Fig. 3 is an enlarged view of a portion of an end section illustrating the manner in which the flanges cooperate.

95 Fig. 4 is a circuit diagram of a radio receiving system including apparatus as illustrated in Figs. 1 and 2 and shows how the parts of the circuit are separated by shielding material.

Like reference characters are used throughout the various figures of the drawings to indicate like parts.

100 Fig. 1 shows a cabinet 10 having its sides, ends and bottom lined with conducting sheets 11 of diamagnetic material, flanges 12 of triangular shape as illustrated more clearly in Fig. 2 are attached at intervals along

one side of the cabinet 10 and extend with their planes at right angles to the side upon which they are mounted. Other flanges 13 are mounted upon the cover or panel 15 as shown in Figs. 1 and 2. The flanges 12 and 13 are so arranged that when the cover is closed they take positions as illustrated in Figs. 1 and 3 their edges closely adjacent to each other and overlapping. The edges of the flanges on the cabinet are arranged to overlap with those on the cover in order to insure a complete closure of the shielding compartments formed by the flanges and the shielding lining 11 upon the sides and bottom of the cabinets and the lining 14 upon the inside of the cover 15.

By providing flanges on the cabinet as well as on the cover the size of the flanges on the cover may be reduced to allow the apparatus to be more compactly mounted and to render it more readily accessible. Radio apparatus 16 is shown positioned within the several compartments in such manner as to be substantially completely surrounded by shielding material. The radio apparatus includes the three space discharge tubes 17, 18 and 19 of a high frequency amplifier and it is to be noted that each of these space discharge tubes is included within its own individual compartment. By virtue of this fact, energy is prevented from being fed back from the output path of one tube to the input path of either of the other tubes and accordingly the generation of parasitic oscillations or singing is prevented.

In the end section illustrated in Fig. 2, the manner in which flanges and the radio apparatus are mounted upon the cover or panel 15 is more clearly illustrated. The cover 15 is attached to the cabinet 10 by means of hinges 20, which are preferably of conducting material in electrical connection with the shielding lining on the cover 15 and on the inside of the cabinet 10. By so arranging hinges 20, electrical connection between the lining on the cover and that upon the cabinet is insured. The cover 15 in this figure, is shown partly opened in order to illustrate the advantages gained by providing flanges both upon the cover and upon the cabinet. It is apparent from the consideration of this figure that the arrangement of this invention promotes compactness and strength in the mounting of the radio apparatus and renders it readily accessible.

In Fig. 3, a portion of an end section is illustrated with the cover closed. The flanges 13 on the cover overlap the flanges 12, on the cabinet in such manner as to insure complete closure between the two.

In Fig. 4, a radio receiving circuit including the radio apparatus shown in Figs. 1 and 2 is illustrated. This circuit comprises an antenna 21 tuned and coupled to the in-

put circuit of a detector 22 by means of apparatus in compartments 31 and 32. The detector 22 is supplied with high frequency waves from a local oscillator 23. The output circuit of the detector 22 is coupled to the input circuit of a high frequency amplifier 24 having three stages, each including one of the space discharge tubes 17, 18 and 19. The output circuit of the high frequency amplifier is coupled to the input circuit of a second detector 25 which is in turn coupled to a low frequency amplifier 26. A second oscillator 27 is arranged to supply waves to the input circuit of detector 25. Batteries 29 and 30 are provided for supplying space current and filament heating current to the tubes of the system. The dotted lines 28 indicate the compartments formed by the shield conductors described in connection with Figs. 1, 2 and 3. It will be noted that the tubes 17, 18 and 19 are shown included in individual enclosed compartments. The antenna 21 and the batteries 29 and 30 are positioned outside of the cabinet and are connected to apparatus within the cabinet by conductors extending through the small openings therein already mentioned.

Although this invention has been illustrated and described in connection with certain specific embodiments, it is to be understood that it is limited only as indicated by the scope of the amended claims.

What is claimed is:

1. A cabinet for a radio receiving set comprising a container lined with shielding material, a closure therefor, shielding material on the inner face of said closure, means for supporting the receiving apparatus carried by said closure, and shielding flanges upon the container and closure.

2. A cabinet for a radio receiving set consisting of a plurality of apparatus units comprising a container lined with shielding material, a closure therefor provided with shielding material on its inner face, and shielding plates mounted on said closure and container, said plates extending at right angles to the surface of said closure and one side of said container, and means secured to said closure, between said right angular plates, for supporting said apparatus units.

3. A cabinet for a radio receiving set consisting of a plurality of apparatus units comprising a container lined with shielding material, a closure therefor provided with shielding material on its inner face, and shielding plates positioned on said container and closure, said plates cooperating with each other to produce closed shielding compartments for said units.

4. A cabinet for a radio receiving set consisting of a plurality of apparatus units which comprises a container lined with shielding material, a cover for said container also lined with shielding material, said cover

forming a mounting panel for units of radio equipment, said closure and container having projecting flanges arranged to cooperate in pairs to form closed shielding compartments for said units.

5 5. A radio receiver comprising a cabinet having a hinged cover, the cover and cabinet being lined inside with shielding material, a high frequency amplifier comprising a  
10 plurality of space discharge tubes in tandem, mounted upon said shielded cover, said cover and cabinet carrying shielding flanges whereby when said cover is closed, said tubes

are included in individual closed shielding compartments. 15

6. A radio receiver comprising a plurality of units of radio apparatus mounted upon a metallicly lined cover of a metallicly lined cabinet, said cover and cabinet being provided with mounting and shielding  
20 flanges which cooperate to substantially enclose said units in separate compartments.

In witness whereof, I hereunto subscribe my name this 21st day of October, A. D. 1924.

ARTHUR HADDOCK.