June 7, 1949. W. R. JONES 2,472,747

BASE SHIELD

Filed Dec. 17, 1946

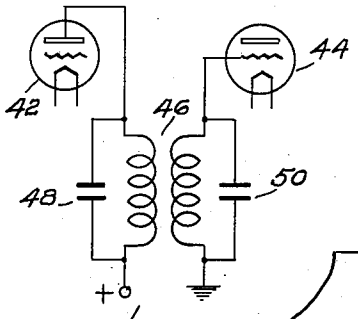


FIG. 6

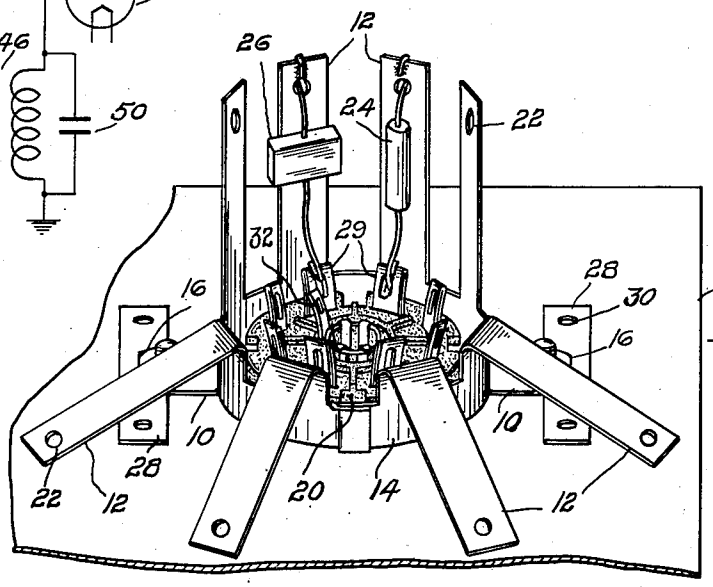


FIG. 3

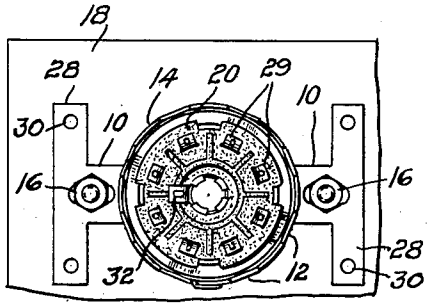


FIG. 1

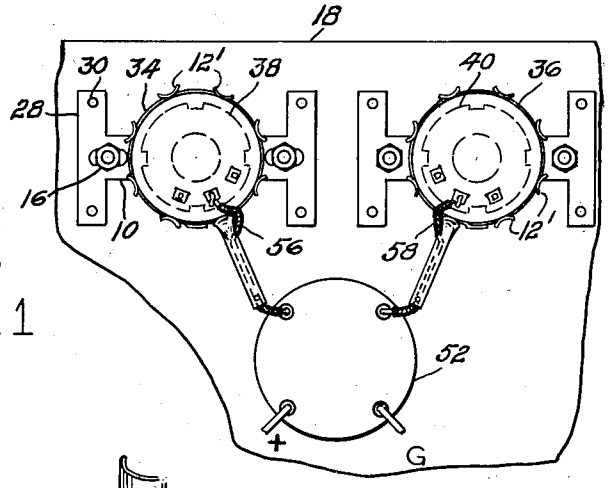


FIG. 4

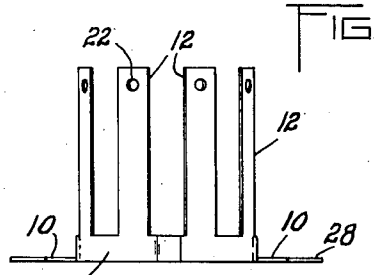


FIG. 2

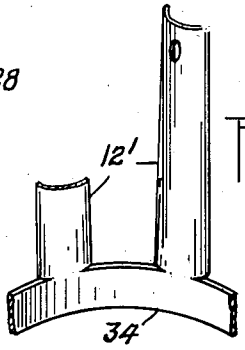


FIG. 5

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2,472,747

BASE SHIELD

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8 Claims. (Cl. 174—35)

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This invention relates to electronic circuits, and has for its object the provision of novel shielding structures.

In order to prevent undesirable interaction between the field at various points in high-gain amplifiers it has long been the custom to enclose such components as radio tubes and high-frequency coils in shielding cans. Another practice frequently used to minimize interaction of fields has been the provision of numerous terminals on the chassis so that leads of minimum length may be used for connecting various circuit components to "ground." The present invention proposes a shielding cage combining the merits of both the shield can and the grounding terminals. A better understanding of this invention will be gained from the following disclosure of a preferred embodiment thereof and from the drawings wherein:

Fig. 1 is a view of one form of novel shielding cage associated with a socket for an electronic tube, being a bottom view of its supporting chassis;

Fig. 2 is an elevation of one form of novel shield alone;

Fig. 3 is a perspective of this form of shielding cage during wiring operations;

Fig. 4 is a bottom view of a chassis showing circuit application of a modification of the shielding cage in Figs. 1 to 3;

Fig. 5 is an enlarged detail of the cage in Fig. 4; and

Fig. 6 is a wiring schematic of the circuit application in Fig. 4.

Referring now to Figs. 1 to 3, a metal shielding cage is shown, made of copper or some other metal to which soldered connections may readily be made. The shielding cage includes extensions 10 by means of which the cage may be secured to the chassis, a more or less continuous series of strips 12 normally projecting away from the chassis, and a ring 14 connecting strips 12 to each other and to extensions 10. In Fig. 1 the shielding cage is shown secured by nuts 16 to a chassis 18 in association with socket 20 for a radio tube. The term "radio" tube is here used in its commercial sense, extending to circuit components used not only where radiant energy from antennae is involved but to oscillators, video amplifiers, audio amplifiers, combinations thereof, and to all circuit applications where the interaction of electromagnetic or static fields is to be limited by shielding.

In the illustrated example there are eight strips 12, each of which has a hole 22 so that a resistor

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24 or a condenser 26 will always have a grounding terminal adjacent its socket terminal 28, socket 20 being of the octal variety. In Fig. 3, a few of the eight strips 12 are bent so as to make the socket terminals accessible for assembling and soldering the resistors, condensers, and any other circuit leads required. These bent strips 12 ordinarily are to be restored to their original condition extending away from the chassis. Preferably strips 12 are of substantial width, compared to the spaces therebetween and in that arrangement they are substantially as effective as a complete shield for the stray fields which might otherwise induce voltages into the circuit components and wiring connected to the tube (not shown) in the socket. The tube is conventionally shielded.

Portions 10 for securing the shielding cage to the chassis may be provided with lugs 28 having holes 30 and providing additional grounding terminals. The socket illustrated is of the "lock-in" variety providing a grounding terminal 32 for the central electrically conductive shielding base of the radio tube. One of the grounding terminals 28 may be bent away from the chassis, and a short lead may be connected between grounding terminal 32 and a grounding terminal 28.

In Figs. 4 to 6 there is shown a slight modification of the cage in Figs. 1 to 3. In Fig. 4 two stages of a high-frequency amplifier are physically illustrated, and these are diagrammatically shown in Fig. 6. A pair of shielding cages 34 and 36 are shown associated with sockets 38 and 40, respectively, for tubes 42 and 44, which tubes are coupled by transformer 46 having condensers 48 and 50 for resonating the primary and secondary windings. This circuit is entirely conventional, and is used to illustrate an application of the grounding cage. Interstage transformer 46 and condensers 48 and 50 are contained within a shielding can 52 (Fig. 4) which is mounted on top of the chassis, the bottom of which is shown. Insulated leads 56 and 58 carrying signal currents have frequently led to costly difficulties in equipment manufacture. Frequently it is necessary to shield even short lengths of lead or to bend them in unpredicatable arrays to reduce interaction from stage to stage. Using the present shielding cage the shielding of short leads such as 56 and 58 becomes very simple. The grounding strips 12' which together comprise a cage are in this form curved convexly inward so that when any given strip 12' is bent so as to lie parallel to the chassis it will constitute a grounding shield for a short lead, coacting (to complete

the shield) with the grounded chassis itself. The remainder of the numerous strips 12' being erect will nonetheless constitute an effective cage for the enclosed socket terminals, and for the components associated with that socket and arranged within the cage. In both illustrated forms of the invention the length of the strips is approximately equal to the socket diameter, in contrast to short grounding lugs forming part of known sockets, which lugs have no appreciable shielding effect.

The shielding cage is primarily useful in connection with radio tube sockets. Circuit applications other than that illustrated, and applications of the shielding cage to components other than radio tube sockets, will occur to those skilled in the art. The fact that the strips are not connected to each other at their extremities makes it possible for them to be bent away from the socket terminals for easy circuit-assembly, and also avoids troublesome coupling due to common grounding paths and ground loops. Further features of the invention, its applications, and modifications of the illustrative embodiments will occur to those skilled in the art.

What I claim is:

1. The combination of a generally circular socket having multiple terminals with a grounding and shielding cage surrounding said socket and having approximately as many strips as the socket has terminals, said strips being wide in comparison to their spacing and being approximately as long as the socket diameter.

2. The combination of a socket having a circular array of terminals with a grounding and shielding cage having a conductive strip extending axially away from the socket adjacent each socket terminal for a minimum distance equal to the diameter of the terminal array.

3. The combination of a socket having an array of terminals extending from one face, and a combined grounding and shielding cage about said socket comprising a large number of conductive strips spaced close to each other in relation to their width and extending substantially perpendicularly away from said face.

4. The combination with a socket for a radio tube or like device having multiple terminals on one side thereof for connection in a circuit, of a grounding ring surrounding said socket and having concave conductive strips adapted to be bent to partially encase a circuit lead to one of said terminals.

5. The combination according to claim 4 wherein a plurality of relatively long and closely spaced concave strips extend away from said side and encircle the socket.

6. A combined grounding and shielding cage comprising a generally circular series of parallel conductive strips connected to each other only at one end and extending from their connection for a minimum length approximately equal to the cage diameter.

7. A combined grounding and shielding cage according to claim 6 wherein said strips are outwardly concave.

8. A shielding structure comprising a grounding ring and at least one shielding strip extending axially away from said ring and being concave outward, adapted when appropriately bent to partially encase a circuit lead.

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