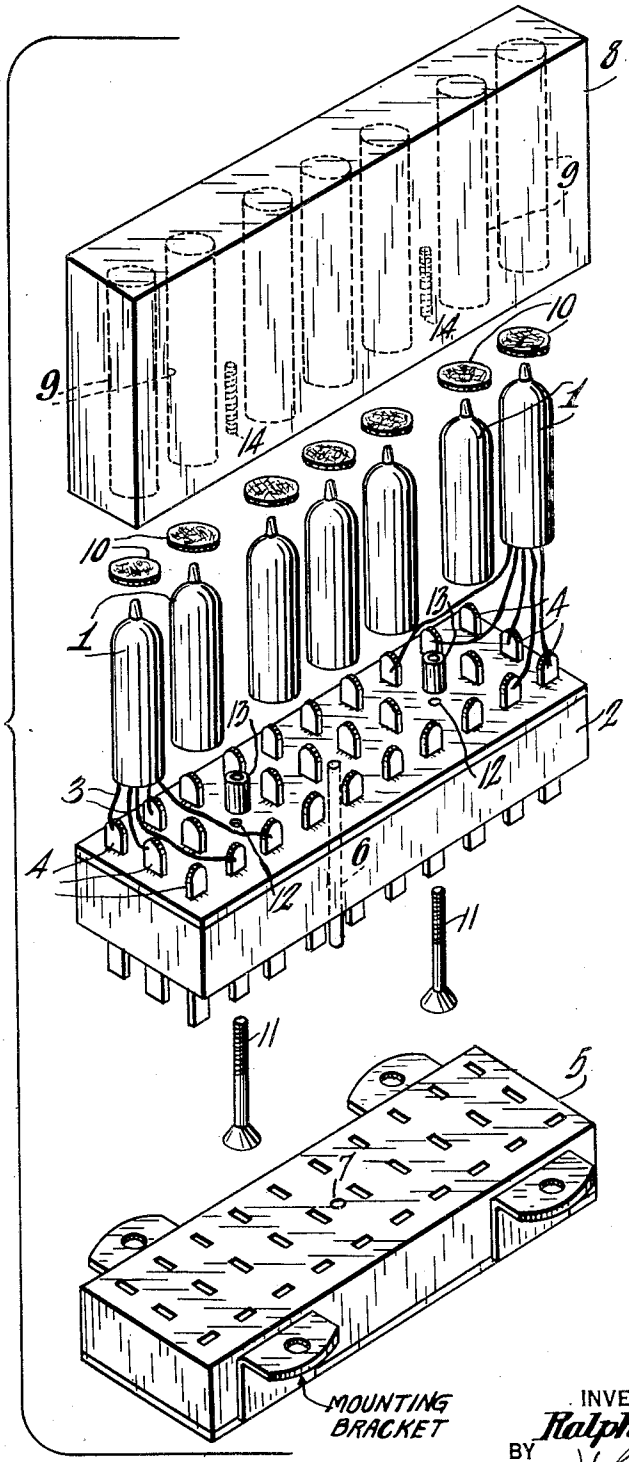
March 7, 1950 R. C. KENNEDY 2,499,589

TUBE MOUNTING

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Fig. 1.



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Fig. 2.

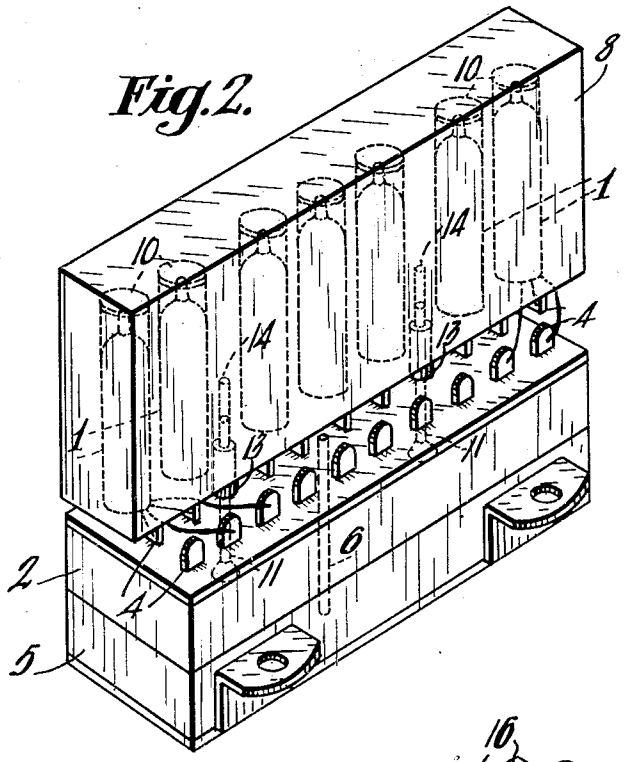
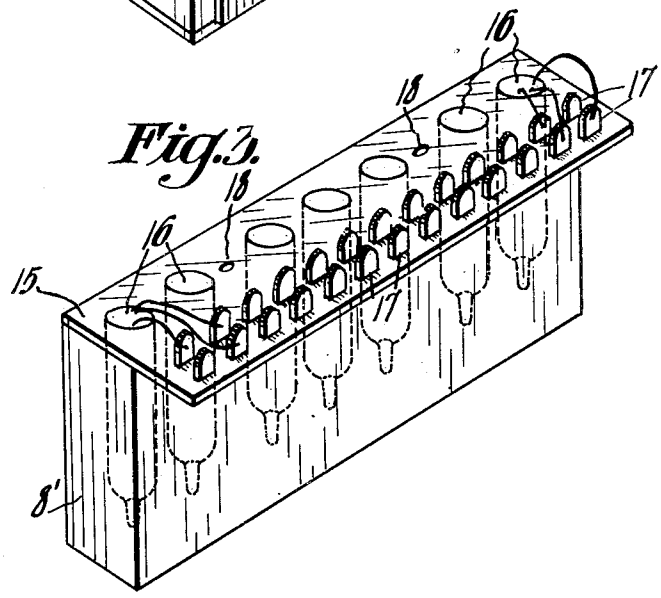


Fig. 3.



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TUBE MOUNTING

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6 Claims. (Cl. 250—27.5)

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This invention relates to mountings for sub-miniature tubes.

Sub-miniature tubes have recently been developed and generally have a length of approximately 1½ inches and a diameter of approximately ⅜ of an inch. These tubes, at the present time, have no terminal pins, but merely wires which extend through the base of the tube and connect to the electrodes within the glass envelope of the tube. Difficulties are experienced in attempting to mount these tubes and to connect the terminal leads to external circuits. It has been the practice in the past, when using these tubes in the nose of an explosive shell, to rigidly mount the tube by embedding it in wax. Tubes have been used in this way in connection with the now well known "proximity fuse" for detonating a shell at a predetermined distance from an object. When it is attempted to use these sub-miniature tubes in radio sets, it is not feasible to embed these tubes in wax and problems arise involving the mounting of these tubes, their shielding, and electrically connecting the tubes to associated circuits.

An object of the present invention is to provide a novel mechanical construction for mounting a plurality of sub-miniature tubes on a multi-terminal plug, so as to provide a compact, lightweight and portable assemblage. Another object of the present invention is to provide a mounting and terminal construction for a plurality of sub-miniature tubes, which also functions to shield the tubes from each other and from external electrostatic fields.

A further object is to provide an extremely compact and lightweight mounting arrangement for a plurality of sub-miniature tubes, which can be carried in a person's pocket, and which can be readily replaced as an integral unit, quickly and easily.

A more detailed description of the invention follows in conjunction with the drawing wherein:

Fig. 1 illustrates an exploded view of the various elements which make-up one embodiment of a mounting assemblage for a plurality of sub-miniature tubes, in accordance with the invention;

Fig. 2 illustrates the assembled elements of Fig. 1, ready for use in an electronic device whether a transmitter, receiver, amplifier, or measuring instrument; and

Fig. 3 illustrates an alternative construction of a mounting for a plurality of sub-miniature tubes, in accordance with the invention.

Referring to Figs. 1 and 2 in more detail, there

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are shown a plurality of sub-miniature tubes (electron discharge devices) 1 arranged side by side in the same straight row and mounted upon the male element 2 of a multi-terminal plug. Each of these sub-miniature tubes 1 has a length of approximately 1½ inches and a diameter of approximately ⅜ of an inch, although it should be understood that the invention is independent of the physical size of the sub-miniature tubes. These tubes have a number of electrodes and may be used for performing various functions such as rectification, amplification, detection, or the production of oscillation. From the base or bottom of these tubes are a plurality of terminal leads 3 which connect with the electrodes within the glass envelopes of the tubes. These terminal leads 3 are shown soldered to the metallic terminals 4 of a molded Bakelite multi-terminal male plug element 2. Not all of the terminal leads from the tubes 1 are shown connected to the terminals 4, in order not to unduly complicate the drawing, but it should be understood that all of the tubes 1 have their electrodes connected through terminal leads 3 to different ones of the terminals 4.

Terminals 4 extend below the bottom of the male element 2 for insertion into the socket apertures of the female plug element 5. Obviously, the socket apertures in the plug element 5 are correspondingly positioned with the terminals 4 of the male plug element 2. In order to assure the proper orientation or positioning of the two plug elements 2 and 5, there is provided an index or guide pin 6 of a larger size and a different shape from the terminals 4, and which is adopted to fit into the correspondingly dimensioned hole 7 in the female plug element 5.

A metallic rectangular shaped block 8, made of non-ferrous material such as aluminum, copper, brass, or any other suitable material, is used to rigidly hold the tubes 1 in position and to shield them from one another and from external electrostatic fields. To achieve this result, block 8 is provided with a plurality of parallel bored holes 9 arranged in the same straight row and having such dimensions as to accommodate the tubes 1 within these holes. It is preferred that the length of the bores 9 be just sufficient to permit the tubes 1 to be inserted for their entire length, and that the diameter of the bores 9 be just sufficient to permit a snug fit for the tubes.

In order to prevent vibration of tubes 1 to reduce microphonics, there are provided small sponge rubber cushioning inserts 10 which are placed within the bores 9 at the uppermost or

closed ends. These inserts 10 will thus be in contact with the tips of the tubes 1 when the tubes are inserted into the metallic block 8.

In order to securely fasten the block 8 in proper spaced relation to the multi-terminal plug, there are provided a pair of elongated screws 11 which are insertable through apertures 12, 12 in the male plug element 2 from the bottom, and a pair of threaded holes 14 in the metal block 8. The washers 13, 13 assure the fact that the block 8 is properly spaced from the multi-terminal plug so that the bottom of the block 8 does not contact the terminal leads 3 nor exert excessive downward pressure upon the tubes 1.

Fig. 2 illustrates the multi-terminal construction when completely assembled for use in an electronic device. In one embodiment actually constructed and successfully employed as an audio amplifier, the tubes were of the 1W5 and 1V5 types manufactured by the Sylvania Electric Products Corporation. These tubes were of the pentode type. The width of the block 8 was 3½ inches, the depth of this block was slightly less than ½ an inch while the length of the block was slightly less than 1¾ inches. The multi-terminal plug which was used is known as a Howard B. Jones molded Bakelite plug and had an overall dimension for the male and female elements taken together of 3¼ inches by 1 inch by 1 inch, disregarding the projecting portions of the terminals above and below the plug. The terminal connections on the multi-terminal plug extended about a ¼ of an inch above and ¼ of an inch below the plug. The entire assemblage shown in Fig. 2, including metallic block 8, seven sub-miniature tubes, and multi-terminal plug 2, 5 weighed about 7½ oz. It will thus be seen that the mounting and shield construction for the sub-miniature tubes is extremely compact and lightweight, and can be easily carried in a person's pocket.

An advantage of the mechanical construction of the present invention lies in the fact that an entire assemblage of tubes can be simply and easily replaced merely by removing that portion of the mounting which includes the tubes 1 and the male plug element 2. Thus, if there is a defective tube in a radio set it will only take a matter of seconds to replace an entire set of tubes, and will avoid the laborious task of searching for a particular defective tube and attempting to resolder and replacing the defective tube.

Fig. 3 shows an alternative arrangement for mounting sub-miniature tubes in spaced relation and for shielding them from one another and from external electrostatic fields. In Fig. 3, there is shown a rectangular metallic block 8' which may be similar to the metallic block 8 of Figs. 1 and 2.

Positioned at that end of the metallic block in which the tubes are inserted, is an insulating strip 15 having holes 16 which have the same diameter and register with the holes in the metallic block 8'. The insulating strip 15 also is provided along one edge with a plurality of terminals 17 to which the electrode leads extending from the bases of the tubes can be soldered. Leads to the external circuits can also be connected to these terminals 17. In order to fasten the insulating strip 15 to the metallic block 8', there are provided holes 18 through which suitable screws can be inserted. Obviously, the metallic block 8' also has holes of similar size registering with the holes 18 but which are threaded to accommodate the screws.

The sub-miniature tubes have not been shown in Fig. 3 in the interest of simplifying the drawing, but it will be understood that these tubes are insertable into bores 16 so that their tips extend downward while their bases are very slightly raised above or flush with the insulating strip 15. It is also preferred that suitable sponge-like cushioning inserts 19 be used at the bottom of the bores in the block 8' which accommodates the sub-miniature tubes, in order to prevent movement of the tubes within the metallic block and reduce microphonics.

The construction of Fig. 3 avoids the necessity for using a multi-terminal plug such as is shown in the embodiment of Figs. 1 and 2. A disadvantage of the arrangement of Fig. 3 is that it does not permit the rapid interchange of all of the tubes as a unit which is an advantage of the construction of Figs. 1 and 2.

Although the mounting construction has been shown in the drawing as accommodating a plurality of sub-miniature tubes arranged in a single row, it should be understood that the invention is not limited to such a construction since, obviously, the sub-miniature tubes can be spaced in parallel rows or even around a circle and the metallic block 8 can be suitably bored to accommodate the particular positioning of the sub-miniature tubes. The block 8 may thus be of any suitable shape; for example, cylindrical which would be the preferred arrangement where the tubes are arranged in a circle. If the block 8' is cylindrical, it would be preferred that it be in the form of a hollow cylinder of sufficient thickness to permit the tubes to be inserted into the bores, the hollow central portion of the block serving to minimize the weight.

What is claimed is:

1. A mounting construction for a plurality of sub-miniature electron discharge devices of the type which is devoid of rigid terminal prongs or pins, comprising a non-ferrous block having a metallic surface and provided with a plurality of spaced parallel bores therein whose widths are slightly larger than the widths of said devices for snugly accommodating said devices substantially completely within the bores, said bores being open at one end only, and vibration cushioning material located at the closed ends of said bores for reducing microphonics in said sub-miniature devices, and a plurality of raised terminal connections for fixed association with the electrode terminals of said devices, said raised terminal connections being substantially parallel to the longitudinal axes of said devices.

2. A mounting construction for a plurality of sub-miniature electron discharge devices of the type which is devoid of rigid terminal prongs or pins, comprising a block having a non-ferrous metallic surface and provided with a plurality of spaced bores therein whose widths are slightly larger than the widths of said devices for snugly accommodating said device substantially completely within the bores, said bores being open at one end only, and insulating material secured to said block at the open ends of said bores, said insulating material having terminals for connection with the leads extending from the envelopes of said devices.

3. A mounting construction for a plurality of sub-miniature electron discharge devices, comprising a block having a non-ferrous metallic surface and provided with a plurality of spaced bores therein whose widths are slightly larger than the widths of said devices for snugly accom-

modating said devices substantially completely within the bores, said bores being open at one end only, and insulating material secured to the block at the open ends of said bores and having apertures registering with the opening in said bores, said insulating material also having terminal connections.

4. A mounting construction for a plurality of sub-miniature electron discharge devices, comprising a metallic block having a plurality of spaced bores therein whose widths are slightly larger than the widths of said devices for snugly accommodating said devices substantially completely within the bores, a multiple terminal plug at one end of said block, and means rigidly securing said block to said plug in spaced relation thereto.

5. A mounting construction for a plurality of sub-miniature electron discharge devices, comprising a block having a metallic surface and provided with a plurality of spaced bores therein whose widths are slightly larger than the widths of said devices for snugly accommodating said devices substantially completely within the bores, said bores being open at one end only, vibration damping material located at the closed ends of said bores, a multiple terminal plug near said one end of said block, and means rigidly securing said block to said plug in spaced relation thereto, said means including spacing washers.

6. A compact, lightweight, portable and easily

replaceable sub-miniature tube assemblage, comprising a plurality of sub-miniature tubes of the type which is devoid of rigid terminal prongs or pins, and in physically parallel relation and similarly mounted at one end upon a multiple terminal element, said element comprising the male portion of a multiple terminal plug, a metallic block having a plurality of spaced bores therein for snugly accommodating said tubes substantially completely within said bores, and means rigidly securing said block to said terminal element in spaced relation thereto.

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