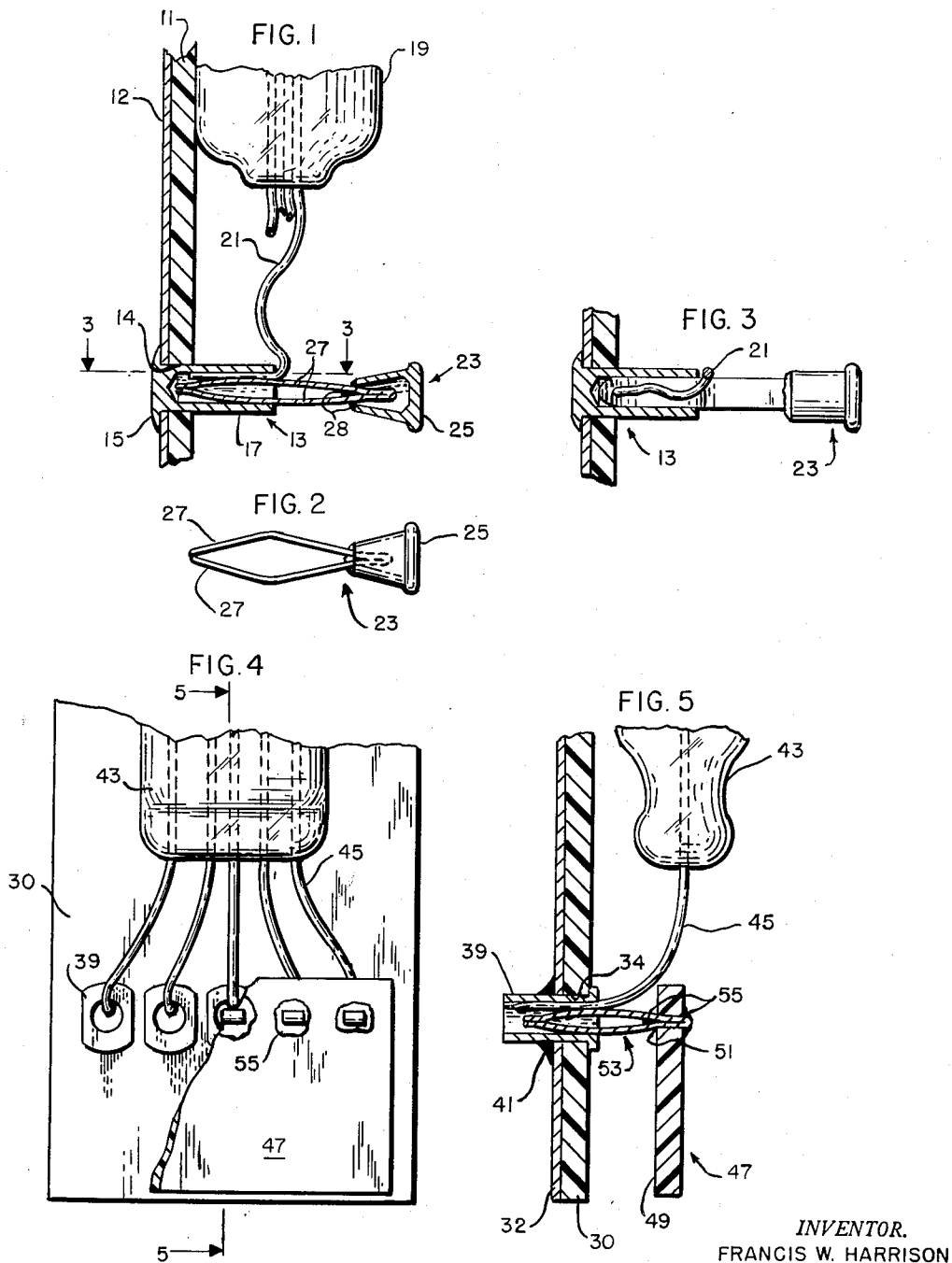


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ELECTRICAL CONNECTOR

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ELECTRICAL CONNECTOR

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1 Claim. (Cl. 339—198)

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The present invention relates to the assembly of miniature tubes to printed circuits. In the assembly of printed circuits, it is necessary that the leads of miniature tubes be secured to the printed circuitry formed on the chassis of the printed circuit assembly.

In the past, various methods and devices have been used to accomplish this end. One method used was to solder the fine flexible tube leads to the printed circuitry. Such method has been found objectionable in that in the event of the failure of any one tube or tubes the task of removing and severing the solder connection was difficult and often destructive to the remainder of the printed circuitry.

In an attempt to overcome the disadvantages of such types of connections, various tube sockets have been devised for use in securing leads of subminiature tubes. Typical of such is an electrical socket for miniature tubes including basically a spring-like contact having two resilient arms wherein the lead or prong of the tube is forced between the resilient arms, making contact through but a small portion of the entire length of the resilient arms.

It has been found that in the utilization of a socket of the type described above, considerable difficulty is encountered in the insertion of the extremely fine flexible leads which usually have a diameter of from .015 to .019 inch. It has been found that the wire leads, due to their flexibility, do not readily lend themselves for insertion into conventional sockets such as described above. It has also been discovered that such a socket due to its form of construction provides only low mechanical retention and small electrical contact between the lead wires and the socket. It has also been found that considerable flaking of the contacts occurs during insertion and withdrawal of the wire leads, which has proven to have a deleterious effect.

The primary object of this invention is to provide a connector for the fine leads of miniature tubes wherein the leads of such tubes can be easily inserted and electrically secured in said connector.

Another object of the present invention is to provide a connector for the leads of miniature tubes which will provide good electrical contact over a relatively large surface.

Another object of the invention is to provide a connector that will permit good mechanical contact between the wire leads and the connector.

The invention can best be understood from the following description to be read in view of the accompanying drawing in which:

Figure 1 is a cross sectional view showing the connector, its associated spring retention pin in position within the connector and a partial elevational view of a miniature tube;

Figure 2 is an elevational view of the spring retention pin alone, removed from the connector;

Figure 3 is a view partly in section and partly in elevation taken along the line 3—3 of Figure 1;

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Figure 4 is a top view of a modified form of the invention, showing the multi-unit connector, and

Figure 5 is a view partly in elevation and partly in section taken along the line 5—5 of Figure 4.

While the invention herein will be described as serving as a connector for miniature tubes in printed circuitry wherein it serves as a means for mechanically and electrically securing the thin flexible leads of said tubes, it is to be understood that the connector can have other applications.

Referring to the modification shown in Figures 1, 2 and 3 of the drawing, there is shown a chassis 11 of non-conductive material, the underside of which is provided with a section of printed circuitry shown at 12. Extending transversely through and rigidly fixed in an opening 14 in the chassis 11, and making electrical contact with the printed circuitry 12 is a stud 13 made of a conductive material such as brass or copper. The stud 13 is held in place by being forced into and through opening 14 in the chassis 11 which has a diameter slightly smaller than that of the stud 13. Electrical engagement between the stud 13 and the circuitry 12 is effected by placing the stud through a cutout in the printed circuitry, which cutout is in register with the opening 14. The stud 13 comprises a rounded knob portion 15, which intimately engages the printed circuitry making electrical contact therewith and a tubular shank portion 17.

Secured or adjacent to the top side of the chassis 11 is a miniature tube 19. The method of affixing, retaining or securing the tube 19 in position forms no part of this invention and is therefore described in no further detail. Extending from the base of the tube 19 are a number of leads, one of which is shown as 21. As pointed out above, the leads of such tubes are made of extremely fine flexible wire of from .015 to .019 inch in diameter which are required to be brought into electrical contact with the printed circuitry on the underside of the chassis. This is accomplished by inserting the lead 21 into the tubular shank portion 17 of the stud 13. This can be easily accomplished as the diameter of the shank portion of the stud is many times greater than that of the lead 21. For retaining the lead 21 within the tubular shank portion of the stud and firmly wedging the lead against the inner surface of said stud, there is provided a retaining pin 23. The pin 23 comprises a head portion 25 and two opposing flat metallic flexible spring arms 27. The arms 27 are preferably made of a single strip of springy metal which is medially bent, at which point it is confined in the head portion 25 by any suitable means such as a blob of solder 28 which also aids in keeping the arms 27 apart. Due to the nature of the spring arms 27, said arms together normally assume a diamond shape as shown in Figure 2. However, when the pin 23 is inserted into the tubular shank portion 17, as shown in Figure 1, the arms will exert pressure against the lead 21, thereby confining the lead securely within the tubular shank portion of the stud.

In the modification shown in Figures 4 and 5, there is shown the connector of the present invention as applied to a multi-connector unit. In the specific embodiment shown in Figures 4 and 5, the chassis 30 carries a section of printed circuitry 32 on its underside. Positioned within openings 34 of the chassis 30, preferably aligned in some definite configuration to suit any particular need, are a plurality of metal grommets 39, held by a blob of solder 41, which electrically engage the printed circuitry 32 through cutouts in the circuitry as pointed out above. A miniature electronic tube 43 is shown affixed to the chassis 30 by any conventional means. Extending from the bottom of the tube are a plurality of fine metallic leads 45 such as are common to such types of tubes as described supra. For electrically connecting the leads 45 to the

printed circuitry on the underside of said chassis, the various leads are placed in appropriate grommets 39. For holding the leads securely within the grommets 39, there is provided a bar 47 which utilizes generally the same basic principle as was used in securing a single and separate lead as was described in connection with Figure 1. The retention bar comprises a plate 49 made of a non-conductive material such as plastic, and having a series of openings 51 in which are rigidly secured a number of spring pins 53 similar in design to the pins 23. The pins 53 differ slightly from pins 23 in omitting the head portion 25, and in lieu thereof the medial bent portion of the arms is confined within an opening in the plate 49 by separate blobs of solder 55 which also serve to keep the arms of the pins apart. It will be obvious that for any particular installation the pins 53 will assume the same configuration in the plate 49 as the grommets 39 in chassis 30. After the leads of the tube are placed into the grommets 39, the pins 53 are placed into respective grommets 39 and the leads will be confined by the pressure exerted by the arms of the pin upon the leads of the tube.

What is claimed as new is:

For electrically engaging the relatively fine leads of an electronic tube to an electric circuit, means comprising a panel, a plurality of electrically conductive grommets mounted in said panel and in electrical engagement with said circuit, and a detachable bar having a plurality of pins secured thereto and extending therefrom for securing said leads within said grommets, each of said pins comprising two elongated spring-like arms which when confined in each of said grommets exert pressure against substantially the entire length of said lead confined in said grommet.

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