April 14, 1953 W. H. GREATBATCH, JR 2,635,131

SPRING LOCK SOCKET

Filed April 4, 1951

Fig. 2

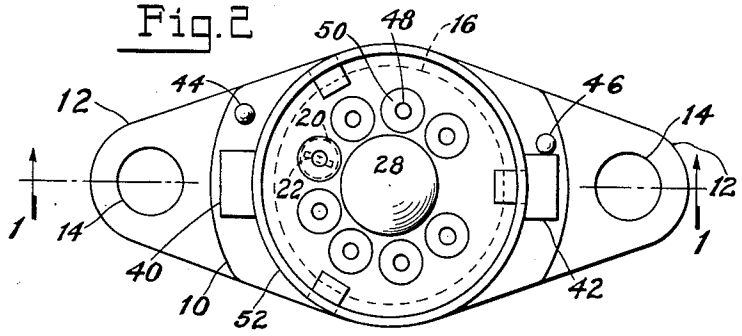


Fig. 1

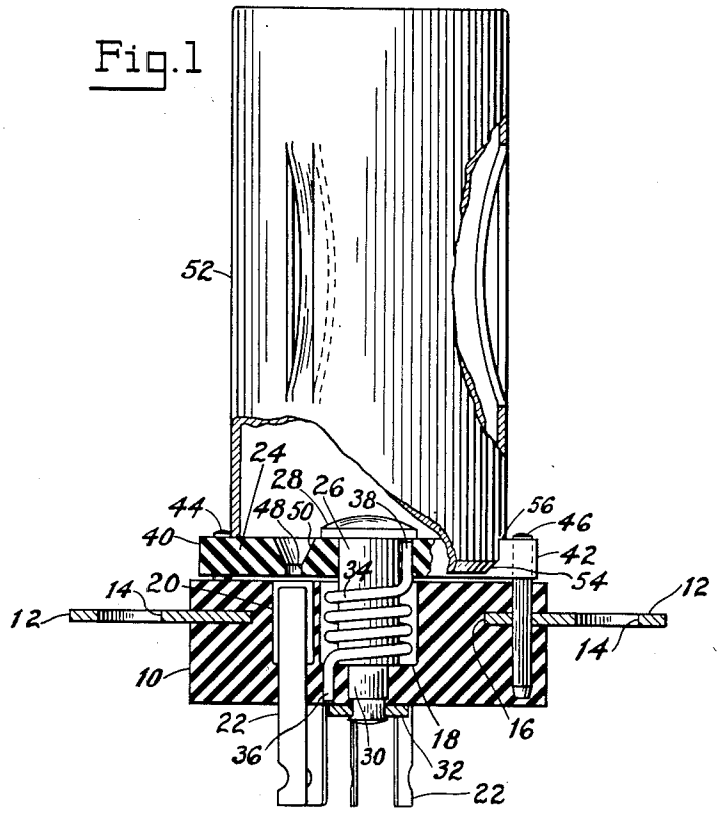
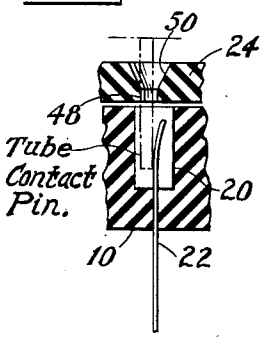


Fig. 3



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SPRING LOCK SOCKET

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13 Claims. (Cl. 173—328)

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This invention relates in general to electrical socket connectors and is more particularly described as a spring lock socket. It may have a general application to connectors in which prongs or pins are inserted into holes having resilient leaf type springs, but the invention is described more particularly as it relates to sockets and connectors for radio tubes, especially the smaller or subminiature tubes. The present sockets are intended for use where shock, vibration and other mechanical hardships are encountered.

A previous method of holding a tube in the socket depends upon a spring gripping action in conjunction with each pin or prong. When this principle is applied to the reduced pins of subminiature tubes, which may be wires of the order of seventeen one-thousandths of an inch in diameter, some difficulties are encountered. When the spring gripping action is of sufficient strength to hold the tube in the socket, it becomes so difficult to force the tube into the socket that deformation of the pins can easily take place. If the gripping springs are reduced in strength or are out of the paths of the pins, the pins may fail to make an electrical connection with the springs or the tube may be expelled from the socket when conditions of shock or vibration are present.

Another method of connecting tubes in a circuit is to solder the wire pins or leads permanently in the circuits. Such structural techniques have been necessary in many applications where there is shock and vibration, but the inconvenience and impracticability of this method is apparent.

The present invention comprises means for resiliently maintaining the pins or prongs in electrical contact with the contact fingers of a socket without requiring a close fit between the pins and fingers and without danger of deforming the pins in inserting them.

Important objects of the invention are, to provide a positive locking action to secure the tube in place by a radial shear motion on the contact members, to easily insert and remove the contact members without danger of deforming them, to physically and electrically shield the contact members, and to provide resistance to shock, vibration and to separation of the contact members from the socket.

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Other objects of the invention will appear in the specification and will be apparent from the accompanying drawings, in which Fig. 1 is a sectional view of a spring lock electronic tube socket in accordance with the invention; Fig. 2 is a top view of the socket shown in Fig. 1; and Fig. 3 is a sectional detail of the engagement of a tube pin with one of the electrical contact blades.

The invention comprises two major sections connected together and spring rotated through a small angle to cause the shearing action which locks a tube in the socket and engages resilient leaf spring conductors in the contact portion.

Referring now more particularly to the drawings, a tube socket for miniature tubes is shown in enlarged detailed views, and although this construction is particularly adapted for miniature electronic tubes, it may also be used without substantial modification for other types of electrical connecting sockets. A socket base 10 of insulating material is provided with a mounting bracket 12, preferably a metal plate projecting oppositely beyond the ends of the base 10 and having openings 14 in ears extending at opposite sides from the base. At the center of the plate within the base is an opening 16 and the plate may be cast or molded within the base which projects on both sides of the plate, in a well-known manner. The plate may also be secured to the upper face of the base by inserting fastening screws or rivets through the plate into the base.

At the center of the base within the opening 16 of the bracket plate are a central recess 18 extending from the upper surface of the base and a number of surrounding openings 20 spaced around the outside of the recess 18. These openings extend entirely through the base and are adapted to receive spring contact blades 22 therein inserted through the base block from the bottom side thereof and each projecting into one of the openings 20 where the extremity of the blade end will have space for a resilient spring movement.

A rotatable disk 24 of insulating material is mounted at the top of the base 10 by an axle rivet 26 extending centrally through the disk and having a head 28 which engages the top of the disk, a reduced portion 30 which extends through the bottom of the base, the reduced portion extend-

ing through a metal washer 32 below the base and the lower end of the rivet projection peened over the bottom of the washer to hold the disk and base together but permitting a rotatable movement of the disk relative to the base. Surrounding the rivet in the recess 18 is a coil spring 34 having one extremity 36 engaging the base and another extremity 38 engaging the disk and tending to rotate them relatively to each other.

At the opposite sides of the disk are projections 40 and 42 adapted to engage corresponding stop pins 44 and 46 which are inserted into the base through the bracket plate 12 and project above the surface of the base substantially the height of the disk in the paths of the projections 40 and 42 thereof.

Extending through the disk 24 surrounding the rivet head 28 are a number of holes 48 corresponding to the openings 20 in the base 10, each of these holes 48 having a tapered top opening 50 so that the pins or contacts from an electronic tube may be engaged more easily and guided through the holes 48.

Extending upwardly from disk 24 is a tube shield 52 adapted to extend around an electronic tube inserted in the socket to guide and protect the tube, and the lower end of this shield may be secured to the disk in any suitable manner, as by providing an inward flange 54 at the lower end except for an interrupted portion 56 spanning each opposite projection 40 and 42, the flange being inserted in the disk or otherwise secured thereto in any suitable manner to prevent the shield from turning relatively to the disk so that the disk may actually be turned by grasping and rotating the shield relatively to the base which ordinarily is fixed in position.

To insert an electronic tube in this socket, it is merely necessary to rotate the disk 24 by means of the tube shield 52 against the torque of the spring 34 until the stop 44 is engaged by the projection 40 or the pin holes 48 of the disk are in alignment with the openings 20 of the base. As the pin holes are tapered and enlarged, compared to the contact pins of the tubes, no difficulty is encountered in placing the tube in the socket. When they are thus in alignment, the pins are inserted into the openings 20 against the resilient contact blades 22 without any deformation of the pins and because the spring tension of the socket is opposed by the counter rotation of its coil spring 34. When the pins of an electronic tube have thus been placed in the socket, the shield 52 and the upper disk are released and the coil spring 34 develops the appropriate radial shear action to lock the tube securely in place by engaging the blades 22 with the contact pins.

The tube shield has a limited movement determined by engagement of the projections 44 and 46 respectively, the spring 34 normally holding the projection 42 against the pin 46 and the shield 52 being rotated reversely or against the coil spring 34 until the projection 40 engages the stop pin 44. By rotating the disk and the shield reversely until the holes 48 register with the openings 20 of the base, and no further than the engagement of the projection 40 with the pin 44, the projecting contact pins of an electronic tube may be inserted freely in the socket and into engagement with the spring blades 22, insuring a continued electrical connection between the tube contact pins and the conductor blades 22 when the tube shield is released allowing the spring 34 to press the inserted contact pins against the resilient contact blades.

Actually when the spring 34 presses the disk 24 relative to the base by the radial sheer motion the contact pins are tightly pinched in place against the opposite upper and lower sharp edges of the base and disk holes respectively to securely lock the tube in the socket. The advantages of this socket are that there is a positive locking action securing a tube in place by the radial sheer motion induced by the spring 34 causing a resilient electrical connection to be made and maintained at all times between the inserted electronic contact pins and the resilient contact blades. By tapering the tops of the holes in the disk the electronic tubes are inserted and removed without danger of deformation of the pins, the tube being thus physically and electrically shielded and providing the maximum resistance to the separation of the tube from the socket due to shock and vibration.

While a preferred construction of the invention has been described in some detail, it should be regarded as an illustration or sample and not as a restriction or a limitation, as many changes may be made in the construction, combination and arrangement of the parts without departing from the spirit and scope of the invention.

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or thereof.

I claim:

1. A spring lock electrical socket comprising a base having a plurality of socket openings with contacts therein, a disk connected to the base adapted for rotary movement having a plurality of holes therethru opposite the surface of the base containing the holes corresponding with the openings, means limiting the movement of the disk to register the holes with the socket openings for receiving tube terminal pins therein, and spring means connecting the base and the disk to press tube terminal pins against the said contacts to force the tube terminal pins into pressing electrical engagement with the contacts under the tension of said spring and to lock the tube securely in the socket.

2. A spring lock electrical socket for tubes having a plurality of projecting connectors comprising a base with openings having contacts therein, a disk having holes therethrough corresponding with the openings of the base, means pivoting the disk on the base, the holes having tapered outer openings to guide tube connectors thereinto, spring means tending to press the disk relative to the base and to resiliently bind the tube connectors against the contacts when the disk is moved to register the holes with the openings to receive the connectors therethrough and the disk released to the action of the spring.

3. A spring lock socket for electronic tubes having a plurality of projecting connectors, comprising a base with a plurality of openings having contacts therein, a disk having holes corresponding with the openings located opposite the openings in said base, means pivoting the disk on the base, a spring tending to rotate the disk on the base to force the tube terminal pins into electrical engagement with the said contacts under the tension of said spring, projections from the disk and means for a limiting rotation of the disk on the base engaged by the projections to limit the rotation of the disk to a

position where the openings in the base and the holes in the disk overlie each other, and a tube shield secured to the disk and extending outwardly around a tube with its connectors engaged by the disk and base, the shield providing protection for a tube and means for turning the disk upon the pivoting means.

4. A spring lock socket for electronic tubes having a plurality of projecting connectors, comprising a base with a plurality of openings having contacts therein, a disk having holes corresponding with the openings, means pivoting the disk on the base, a spring tending to rotate the disk on the base, projections from the disk and means for limiting rotation on the base engaged by the projections to limit the rotation of the disk so that the holes in said disk and the openings of said base overlie each other, a tube shield having a lower flanged end secured to the disk with omitted portions spanning the disk projections, and the tube providing means for rotating the disk against the spring.

5. In a spring lock socket for electronic tubes having a plurality of pin connectors projecting from one end, a disk having a plurality of holes through which tube pins are inserted, a base having a pivot connecting the disk rotatably thereto, stop means on the base engaged by the disk to limit rotation thereof, a tube shield secured to and extending around the said holes and outwardly from the disk, a mounting plate secured to the base having attachment ends projecting outwardly therefrom and having a central opening through which said pivot extends, a plurality of openings corresponding with the holes and in the base around the pivot and within the central opening of the plate, contacts in the openings and extending through the base, and resilient means around the pivot tending to rotate the base openings out of register with the disk holes, the disk movable by the shield to register the holes and openings, and the resilient means pressing tube pins inserted in the openings against the contacts to retain a tube in the socket and to maintain electrical connections with the contacts.

6. In a spring lock socket for electronic tubes each having a plurality of pin connectors projecting from one end, a base having a central recess and a pivot therein, a pluraility of pin openings in the top of the base surrounding the recess and contacts in the openings extending through the bottom of the base, a plate secured to the base and having opposite attachment projections and a central opening through which the said recess and the pin openings project, a disk rotatable upon the pivot and having pin holes therethrough corresponding with the base pin openings, stop means comprising projections from the disk and stop pins insertable in the base through the plate and engaged by the projections adapted to prevent rotation of the disk in one direction past the position where the disk holes overlie the base openings, spring means tending to move the disk holes and the pin openings out of register and to tighten inserted tube pins against the contact blades, and means secured to the disk to surround a tube and to move the disk against the spring means.

7. A spring lock electrical socket comprising a base having a plurality of socket openings with contacts therein, a disk connected to the base for rotary movement having a plurality of holes therethru corresponding with the openings, the disk being rotatable to register the holes with

the openings for receiving tube terminal pins inserted therein, and spring means connecting the base and the disk to press inserted tube terminal pins against the contacts and against opposite upper and lower sharp edges of the base openings and the disk holes respectively to securely lock the tube in the socket.

8. A spring lock socket for a connector device having a plurality of projecting pins comprising a base with a plurality of openings having contacts therein, a rotatable disk overlying the openings of said base having holes corresponding with the said openings, means for pivoting the disk on the base, said contacts in said base having a contact surface at right angles to the path in which said disk is rotatable, a spring tending to rotate the disk on the base to press the pins of the connector device against said contact surface under the tension of said spring.

9. A spring lock socket for an electronic tube having a plurality of projecting pins comprising a base with a plurality of openings having contacts therein, a rotatable disk overlying the openings of said base having holes corresponding with the said openings, means for pivoting the disk on the base, said contacts in said base having a contact surface at right angles to the path in which said disk is rotatable, a spring tending to rotate the disk on the base to press the pins of the electronic tube against said contact surface under the tension of said spring, and a tube shield secured to the disk for rotation therewith and surrounding the space to be occupied by said tube, the shield providing protection for a tube and means for turning the disk upon said pivot means.

10. A spring lock socket for a connector device having a plurality of projecting pins comprising a base with a plurality of openings having contacts therein, a rotatable disk overlying the openings of said base having holes corresponding with the said openings, means for pivoting the disk on the base, said contacts in said base having a contact surface at right angles to the path in which said disk is rotatable, a spring tending to rotate the disk on the base to press the pins of the connector device against said contact surface under the tension of said spring, means for limiting the rotation of said disk to a position where said openings in said base and the holes in said disk overlie each other.

11. A spring lock socket for an electronic tube having a plurality of projecting pins comprising a base with a plurality of openings having contacts therein, a rotatable disk overlying the openings of said base having holes corresponding with the said openings, means for pivoting the disk on the base, said contacts in said base having a contact surface at right angles to the path in which said disk is rotatable, a spring tending to rotate the disk on the base to press the pins of the electronic tube against said contact surface under the tension of said spring, means for limiting the rotation of said disk to a position where said openings in said base and the holes in said disk overlie each other, whereby the connector pins of the electronic tube may be inserted in the socket without damage thereto.

12. A spring lock socket for an electronic tube having a plurality of projecting pins comprising a base with a plurality of openings having contacts therein, a rotatable disk overlying the openings of said base having holes corresponding with the said openings, means for pivoting the disk on the base to press the pins of the electronic tube in engagement with said contacts under the ten-

sion of said spring, and a tube shield secured to the disk for rotation therewith and surrounding the space to be occupied by said tube, the shield providing protection for a tube and means for turning the disk upon said pivot means.

13. A spring lock socket for an electronic tube having a plurality of projecting pins comprising a base with a plurality of openings having contacts therein, a rotatable disk overlying the openings of said base having holes corresponding with the said openings, means for pivoting the disk on the base, said contacts in said base having a contact surface at right angles to the path in which said disk is rotatable, and a tube shield secured

to the disk for rotation therewith and surrounding the space to be occupied by said tube, the shield providing protection for a tube and means for turning the disk upon said pivot means.

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