Oct. 7, 1958 G. WINTRISS 2,855,579

SOCKET FOR SUB-MINIATURE ELECTRONIC DEVICE AND MANUFACTURE OF SAME

Original Filed Oct. 22, 1954 3 Sheets-Sheet 1

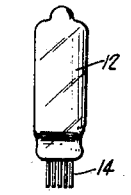


Fig. 1.

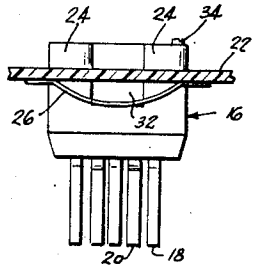


Fig. 2.

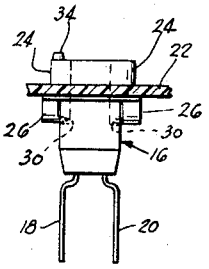


Fig. 3.

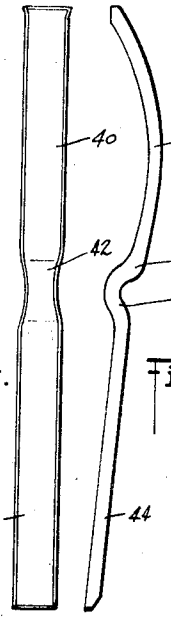


Fig. 4.

Fig. 5.

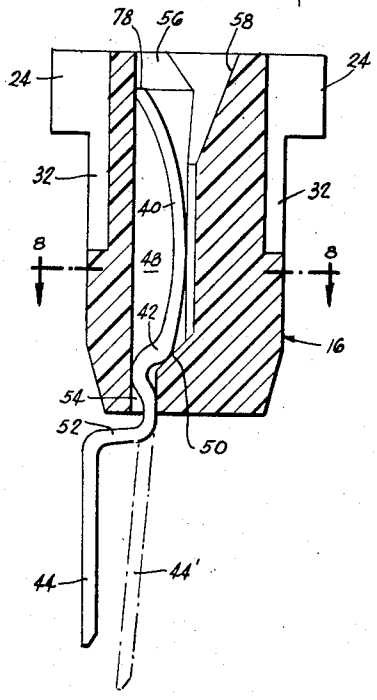


Fig. 7.

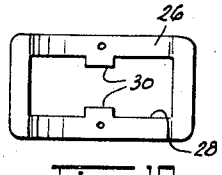


Fig. 10.

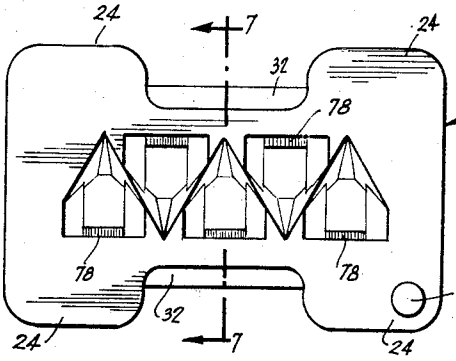


Fig. 6.

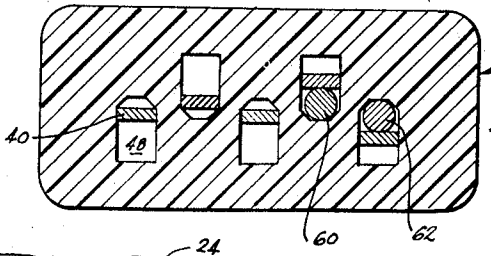


Fig. 8.

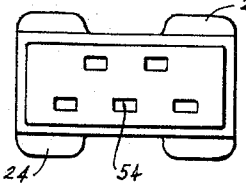


Fig. 9.

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SOCKET FOR SUB-MINIATURE ELECTRONIC DEVICE AND MANUFACTURE OF SAME

Original Filed Oct. 22, 1954 3 Sheets-Sheet 2

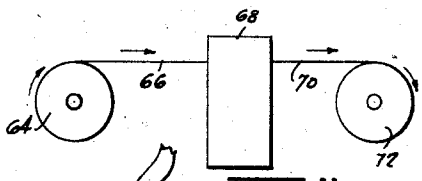


Fig. 11.

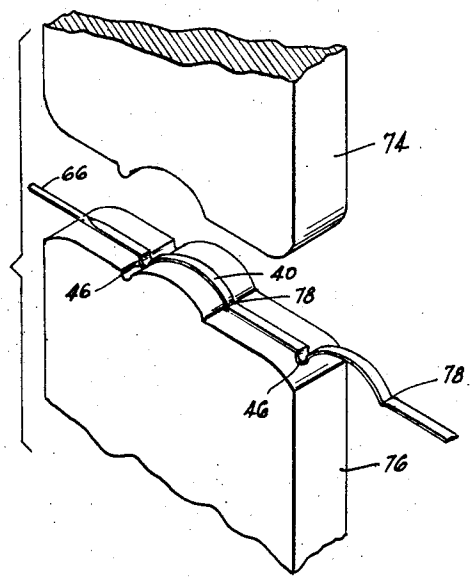


Fig. 12.

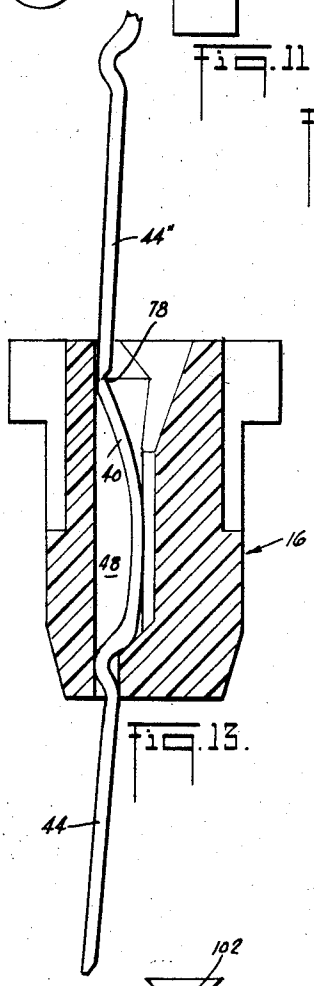


Fig. 13.

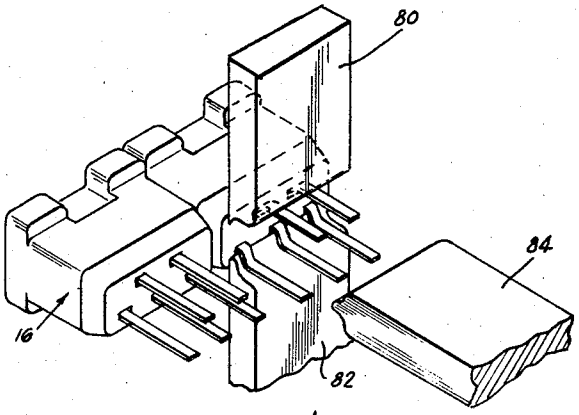


Fig. 14.

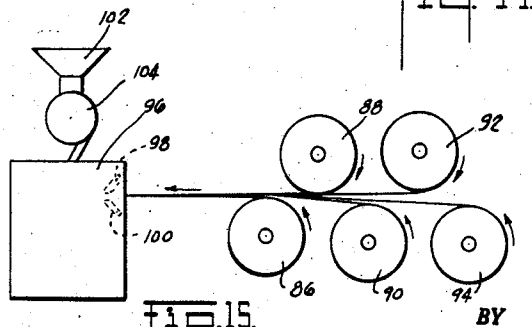


Fig. 15.

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SOCKET FOR SUB-MINIATURE ELECTRONIC DEVICE AND MANUFACTURE OF SAME

Original Filed Oct. 22, 1954 3 Sheets-Sheet 3

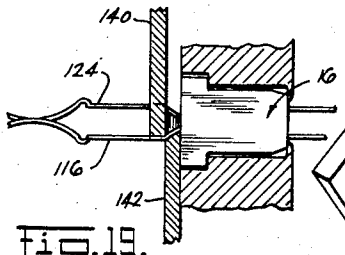


Fig. 19.

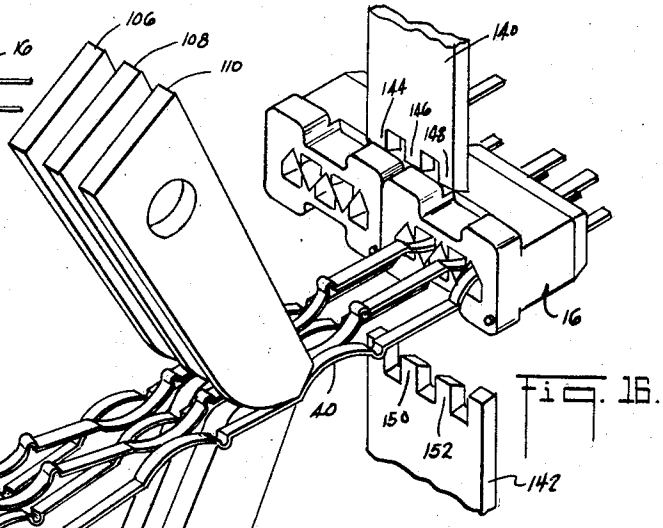


Fig. 16.

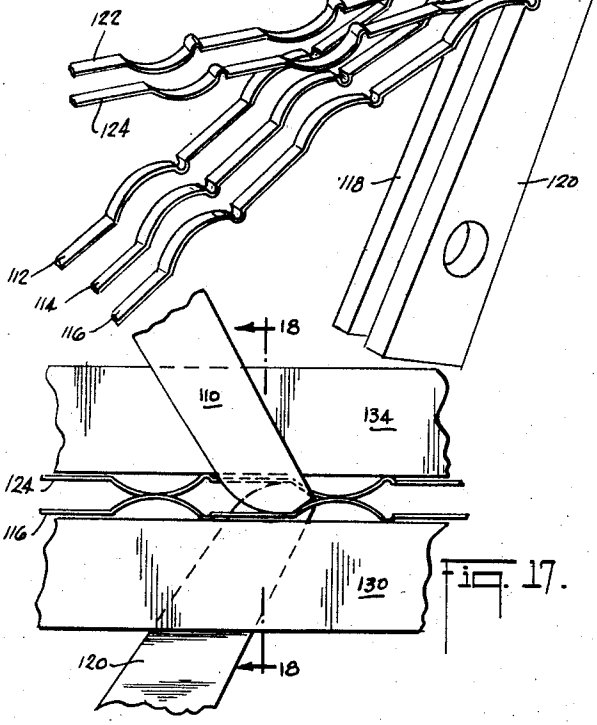


Fig. 17.

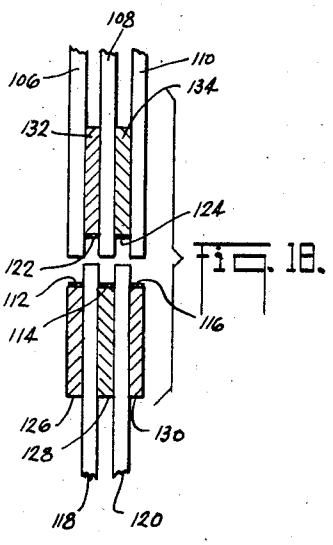


Fig. 18.

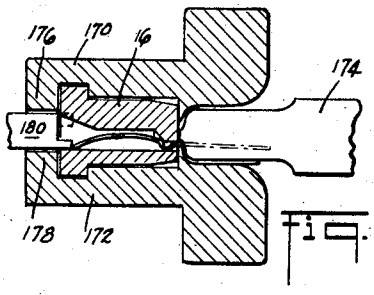


Fig. 20.

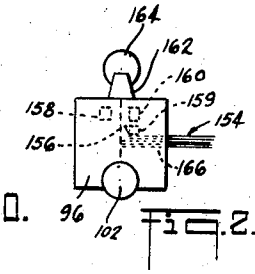


Fig. 21.

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United States Patent Office

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SOCKET FOR SUB-MINIATURE ELECTRONIC DEVICE AND MANUFACTURE OF SAME

George Wintriss, Carversville, Pa., assignor to Industrial Hardware Manufacturing Co., Inc., New York, N. Y., a corporation of New York

Division of application Serial No. 463,958, October 22, 1954. Divided and this application September 28, 1955, Serial No. 537,122

6 Claims. (Cl. 339—192)

This invention relates to electrical sockets, particularly for electronic devices such as radio tubes, and more especially to sub-miniature tubes, transistors, and the like.

In electronics manufacture there is a strong trend toward miniaturization, including the miniaturization of tubes and the use of transistors which are even smaller. This has led to a corresponding miniaturization of the socket for detachably receiving the prongs of such devices. The primary object of the present invention is to generally improve sockets for receiving the prongs of sub-miniature electronic devices, and to generally improve the method of manufacture of the same.

A typical socket comprises a molded insulation base having a plurality of passages each holding a metal contact. Heretofore the metal contacts have been made and handled individually, and it has been a laborious and painstaking task to load the base with the contacts, the latter often being handled with tweezers. The contact includes a so-called "tail" or soldering lug portion, and this has been manually twisted to hold the contact in the base, thus again adding to the labor cost. One form of contact has been stamped in bifurcated shape, out of flat sheet metal. Such flat stamped contacts have been found to quickly lose their "retention" or grip on the pin inserted therein, after a number of insertions.

Other contacts have been of the so-called "single wire type," including a convex spring portion at one end, and a tail at the other. Such contacts have been formed out of flat wire, which might seem inexpensive, but these contacts have nevertheless proved to be highly expensive because it is necessary to heat treat and temper the same. Moreover, the contacts are preferably coated with a corrosion-resistant metal, typically silver, and this must be added as a separate operation after heat treatment of the contact. Such contacts have also had the disadvantage of being too weak at critical points, so that they are not strongly anchored in the base.

The main object of the present invention is to overcome the foregoing difficulties and disadvantages, and to provide an improved socket characterized by low cost and good retentivity. The socket is further improved by the provision of large entrant openings to more readily receive the prongs of the sub-miniature tube or other device, because the said prongs are so slender that they are frequently bent or displaced slightly away from proper position.

A further object is to provide an improved manufacturing process in which single wire contacts are employed, yet there is no need to heat treat the same. Even more important, there is no need to handle the individual contacts, and instead the operator works with a continuous wire. Moreover, the improved process is of such character that it facilitates a change from manual to complete mechanization or automatic assembly of the socket.

The present application is directed to and claims the socket. The manufacturing process is not claimed herein, it being claimed in my copending parent application, Serial No. 463,958, filed October 22, 1954, of which the present application is a division.

To accomplish the foregoing general objects, and other more specific objects which will hereinafter appear, my invention resides in the socket elements and manufacturing steps, and their relation one to another, as are hereinafter more particularly described in the following specification. The specification is accompanied by drawings, in which:

Fig. 1 is a front elevation of a flat sub-miniature tube having five prongs;

Fig. 2 is a front elevation of a socket embodying features of my invention, and shows a fragmentary section of a chassis plate receiving the socket;

Fig. 3 is an end elevation of the same;

Fig. 4 is a front elevation, shown to enlarged scale, of a contact of the single wire type, modified in accordance with my invention;

Fig. 5 is a side elevation of the same;

Fig. 6 is a plan view of the molded insulation base;

Fig. 7 is a section taken approximately in the plane of the line **7—7** of Fig. 6;

Fig. 8 is a horizontal section taken approximately in the plane of the line **8—8** of Fig. 7, and shows the contacts with and without prongs bearing against the same;

Fig. 9 is a bottom view of the molded insulation base, without contacts;

Fig. 10 shows the rectangular lock ring which anchors the socket in the chassis;

Fig. 11 is a schematic view explanatory of the coining of the continuous series or wire-of-contacts;

Fig. 12 is a perspective view showing the coining operation;

Fig. 13 shows how the end contact of the coined wire is inserted in the base before separating the contact from the wire;

Fig. 14 is a perspective view explanatory of the method of bending the tails of the contacts;

Fig. 15 is a schematic view explanatory of the process for fully automatic assembly of the socket;

Fig. 16 is a perspective view, drawn to enlarged scale, at the feed pawls and cutting blades;

Fig. 17 is a side elevation showing how the feed pawls cooperate with stationary rails;

Fig. 18 is a section taken approximately in the plane of the line **18—18** of Fig. 17, but with the upper and lower parts separated for clarity;

Fig. 19 is a vertical section further explanatory of the cutting blades;

Fig. 20 is a partially sectioned fragmentary view explanatory of the mechanism for bending the tails of the contacts; and

Fig. 21 is a schematic plan view of a part of the assembly apparatus shown in Fig. 15.

Referring to the drawing, and more particularly to Fig. 1, I there show a flat sub-miniature tube **12** having a series of five prongs **14** at its lower end. These prongs are disposed in a plane, rather than a circle, and are relatively thin wires, rather than stiff prongs as in the so-called miniature tubes, which are much larger. I am here describing my invention as applied to a socket having five contacts, but it will be understood that the same improvements and method steps are applicable to sockets having a lesser or greater number of contacts for receiving a lesser or greater number of prongs.

Referring now to Figs. 2 and 3 of the drawing, the socket is here shown drawn to enlarged scale, and comprises a molded insulation base **16** having upright passages therethrough receiving metal contacts of the single wire type. The lower ends of the contacts act as tails or soldering lug portions, and these are shown at **18** and **20** in the drawing, it being understood that succeeding tails are bent in opposite direction, or, in other words,

that alternate tails are bent in the same direction, with the intermediate tails bent in opposite direction.

The socket is secured in a chassis plate **22** by preliminarily forming a rectangular hole in the chassis plate, said hole being dimensioned to receive the body portion of the socket. The socket is dropped down from above, and cannot pass through the chassis because the base is enlarged at the top, as indicated at **24**. In the present case there are four such enlargements or projections, as is better shown in Figs. 6 and 7.

The socket is held in the chassis by means of a rectangular retainer ring **26**. This is a metal stamping shaped as is best shown in Fig. 10. The rectangular opening **28** within the ring is dimensioned to receive the body portion **16** of the insulation base. However, there are a pair of inwardly projecting fingers **30** dimensioned to be received in recesses **32** formed at the sides of the base. The center portion of ring **26** is bowed downward, as shown in Fig. 2 except that the initial bend is even greater than there shown. It will be understood that after the socket has been inserted in the chassis the ring **26** is forced upward from beneath, and is partially flattened during this operation until the locking tabs **30** snap into the recesses **32**, thus anchoring the socket securely on the chassis. To insure proper orientation of the socket when inserting the same in the chassis, and even earlier when loading the base with contacts, the base may be provided with a small projection or pin **34** located in one corner.

The contact used in the socket is shown in Figs. 4 and 5, which are drawn to even larger scale. The contact comprises a convex spring portion **40**, a stop portion **42** located at the lower end of the spring portion **40**, and a tail or soldering lug portion **44**. The spring portion **40** is preferably of flat section, and the same applies to the tail portion **44**. The stop portion **42** is preferably narrower and thicker than the rest of the contact. The contact is preferably made of a resilient and highly conductive material, for example, beryllium copper, and is preferably coated with a corrosion-resistant coating, for example silver. In a typical case the flat portions **40** and **44** have a thickness of $^{11}/_{1000}$" and a width about three times the thickness, whereas the stop portion **42** has a thickness around the bend **46** of $^{15}/_{1000}$" and a much greater thickness at the upper part **42** of the bend.

The location of the contact within the base will be understood from inspection of Fig. 7 of the drawing. The main part of the passage through the base is shown at **48**. This receives the convexed or spring portion **40** of the contact. It will be understood that the initial convexity is greater than that permitted in passage **48**, so that the spring portion is somewhat flattened and preloaded, even before insertion of a tube prong. Downward movement of the contact is limited by the relatively thick and rigid stop portion **42**, which bears against a preferably sloping ledge **50** near the lower end of passage **48**. The tail portion **44'** initially projects below the base **16** as shown in broken lines, but is bent to provide a shoulder **52** and a soldering lug portion **44**. Thus the contact is anchored against upward movement, as when a tube is withdrawn from the socket.

It will be understood that successive contacts are reversed in direction, that is if one contact is convex toward the right, as shown in Fig. 7, the immediately adjacent contact on either side will be convex toward the left. Therefore the passage **54** is offset relative to the passage **48**, and referring to Fig. 9, which shows the five narrow or rectangular tail passages like the passage **54**, it will be seen that three of the passages are displaced downward, while the intermediate two passages are displaced upward, and this, of course, corresponds to the reversal of the position of the contacts in the base.

Referring now to Figs. 6 and 7, it may be explained that the passages **48** are divergently enlarged at their upper ends to more readily receive the tube prongs. The divergent nature of this enlargement will be seen at **56** and **58** in Fig. 7, and in Fig. 6 it will be seen that the entrant end of each passage becomes a pentagon which is nearly triangular. The succeeding triangles are reversed in position so that the intermediate triangles fit between the alternate triangles, and the material left between triangles is reduced to a sharp edge, thus making the entrant passages of maximum size despite the close spacing of the prongs. In Fig. 6 the uppermost end **78** only of each contact is shown, in order not to confuse or obscure the showing of the enlargement of the passages at the upper end, and the upper end of the contact is marked by vertical hatching. This is sufficient to show the alternating or reversed positioning of adjacent contacts.

Referring now to Fig. 8 of the drawing, the main body **48** of the passage through the base is a six-sided figure in which three sides form a rectangle dimensioned to receive the contact spring **40**, while the remaining three sides form a trapezoidal portion too small to receive the spring. In the absence of tube prongs the passages and springs assume a position somewhat as shown in the three lefthand passages, it being understood that the spring **40** is attempting to move upward; that the next spring is attempting to move downward; and that the next spring is attempting to move upward, and so on. When a tube is inserted, its prongs displace or flatten the springs somewhat, as shown by the prongs **60** and **62**. The prong **60** flattens its spring upward, and similarly the prong **62** flattens its spring downward. Of course, in practice all five prongs are inserted at once, and the showing in Fig. 8 is fictional in that respect. Also the prong diameter has been exaggerated in Fig. 8, and in practice the prongs all lie in one plane when inserted in the socket.

The method of making my improved socket may be described with preliminary reference to Fig. 11. A reel **64** of wire is provided, and the wire **66** is fed through a suitable apparatus **68** for coining the same to form or shape the contacts. However, the contacts are not severed from one another, and instead remain connected end-to-end to form a continuous series or chain of connected contacts **70**, which could be utilized as they leave the coining mechanism **68**, but which more conveniently are reeled up on a reel **72** for later use. When the contact wire is reeled as here shown, the contacts are preferably coined and reeled with the spring portions leading the tail portions, so that subsequently they may be unreeled for use with the tail portions foremost.

The coining operation is shown in schematic perspective in Fig. 12. The wire **66** is initially a round wire, and it is generally flattened by the coining operation. This has the advantage of work hardening the material, and thereby imparting increased resilience to the material, without requiring heat treatment. For this purpose the wire **66** need not necessarily be a round wire, the only requirement being that it be initially narrower and thicker than the finished contacts, but a round wire is most commonly available and least expensive, and the ability to use a round wire is one of the advantages of my process. In the specific case here shown the wire is initially a round wire having a diameter of 0.020".

The coining dies **74** and **76** serve to not only flatten the wire but also to form the desired convexity **40** for the spring portion, and the reverse bend **46** at the stop portion. It will be understood that the contact is narrower and thicker at the part **46**, and particularly thick at the leading end of this part corresponding to the part **42** in Figs. 5 and 7. This increased thickness is important in order to provide a positive or solid stop against downward movement of the contact when a prong is inserted, and also helps increase the resilience or spring action of the contact by giving it a somewhat cantilever action about its lower end.

Finally, the coining operation preferably includes a notching and consequent weakening of the wire between one contact and the next. This is best shown at **78** in

Fig. 13, in which it will be seen that the lower end or tip of tail 44'' is beveled immediately adjacent the upper end of spring portion 40 of the adjacent contact, thus providing a necked or weakened connection between the two. This facilitates subsequent separation of the individual contacts. In the specific case here shown the thickness at the break-off point is about 0.006, particularly for hand loading, whereas the thickness of the tail is 0.011 as previously mentioned.

The socket may be assembled by a method next described with reference to Fig. 13 of the drawing. The operator has at hand a supply of the molded bases **16**, and a reel of contact wire. The wire is fed tail foremost through a passage **48** in the socket until the contact assumes the position shown in Fig. 13, whereupon the socket and wire are bent relative to one another to break the wire at the point **78**. The tail portion 44'' is next inserted into another passage of the base and the contact broken free, and so on until the passages are filled. In practice the operator will ordinarily first fill the three alternate passages in which the wire faces one way, and thereupon turn the base over (or twist the wire) to fill the remaining two intermediate passages. The orientation pin **34** previously referred to (Figs. 2, 3 and 6) helps the operator know which way to insert the wire, by a sense of touch alone, and without having to study the base after selecting one from a pile.

When the base has been loaded with the contacts the socket is complete except for deformation of the tails to form a shoulder. These may be individually bent, or individually twisted, but I prefer to bend all five tails at once, and for this purpose I provide a fixture comprising two guide blades **80** and **82**, and a forming blade **84**. The blade **84** moves horizontally towards the socket and spreads the tails apart. Such a blade might alone be sufficient to bend the tails, but it is preferred not to work directly against the insulation material of the base. For this reason the guides **80** and **82** are provided. The lower edge of guide **80** reaches the top tails, and the upper edge of guide **82** reaches the bottom tails. These edges receive the force of the bending blade **84** when it moves toward the socket, thus bending all five tails at once, and without subjecting the insulation material to any breaking strain.

As so far described the assembly operation is partially manual and partially mechanized, but my present improvement in which the contacts are kept connected end-to-end in a continuous wire greatly facilitates complete mechanization of the assembly operation, by a method next described. Referring to Fig. 15, I provide five reels of contact wire **86**, **88**, **90**, **92** and **94**. The contact wire is drawn from the top of three of the reels **86**, **90**, **94**, while the other two reels **88** and **92** are reversed and the contact wire is drawn from the bottom thereof, in order to suitably orient the five wires relative to the base of the socket. The five wires are fed toward an assembly station in an apparatus **96** by five feed pawls, two of which are schematically indicated at **98** and **100**. The molded bases are poured into a suitable hopper **102**, and are sorted and fed downward in uniform orientation by conventional rotating hopper means indicated at **104**. The sockets descend to a horizontal track where they are moved end to end in a direction transverse to the drawing.

Referring now to Fig. 16 it will be seen how three upper pawls **106**, **108**, **110** bear against the three lower wires **112**, **114**, **116** while at the same time two lower pawls **118** and **120** bear against two upper wires **122**, **124**, thus feeding five wires at once into a single base **16**. In practice the wires are supported on the side opposite the pawls, as shown in Fig. 17, and for this purpose narrow rails may be provided, there being three such rails **126**, **128** and **130** (Fig. 18) beneath the three lower wires **112**, **114** and **116** to receive the force of the three upper pawls **106**, **108** and **110**, and there being two upper rails **132** and **134** above the two upper wires **122**, **124** to receive the force of the two lower pawls **118** and **120**. These lower pawls are reciprocated between the lower stationary rails, and similarly the upper pawls are reciprocated between or around the upper stationary rails. The upper and lower parts have been vertically separated somewhat in Fig. 8, to clarify the drawing. In the arrangement here shown the pawls bear against the upper end portions of the convex or spring portions **40** of the contacts, as shown in Fig. 17, but the pawls could be shaped and designed to bear against some other desired part of the contact wire.

With the full mechanization here shown the inserted contacts are preferably severed rather than broken from the continuous wire. For this purpose the initial insertion of the contacts is preferably made slightly incomplete at the time of the severing operation, because the contacts are severed by oppositely moved vertical cutting blades **140**, **142** (Fig. 16). One of these, in this case the blade **142**, is disposed adjacent the top face of the insulation base **16**. The other blade **140** is displaced slightly and comes into shearing action with the blade **142**, as shown in Fig. 19. Thus no strain is placed on the insulation material. In order that all five wires be cut simultaneously the blades are preferably notched or castellated, as is best shown in Fig. 16. Thus the parts **144**, **146** and **148** of blade **140** which are to cut the lower three wires, pass between and around the upper two wires, and similarly the parts **150** and **152** of blade **142**, which cut the upper two wires, pass between the lower three wires. Of course, the advance parts of blade **140** cooperate with the notched parts of blade **142**, and similarly the advance parts of blade **142** cooperate with the notched parts of blade **140**. The depths of the notches preferably correspond to the normal vertical spacing between the upper and lower wires at the parts therealong, which are to be severed, so that all five wires are simultaneously severed without significant displacement or bending of the wires.

To complete the insertion of the contacts it is merely necessary to bear against the five short projecting ends, thus moving them inward until they no longer protrude from the top of the insulation base.

Referring to Fig. 20, the sockets **16** are moved through a guide track formed by upper and lower guide members **170** and **172**. These include edge portions at the bottom end of the base against which the tails are bent by a horizontal bending punch **174**. The punch corresponds to the part **84** in Fig. 14, and the guide edges against which the tails are bent correspond to the edges of the guides **80** and **82** in Fig. 14. The top end of base **16** is held by rail portions **176** and **178**. Immediately ahead of the bending operation a pusher finger **180** moves to the right to finish the insertion of the contact. There are five such fingers for the five contacts, and all move simultaneously. In fact, a single member **180** may be used for all five contacts, the end of this member being provided with three lower projections and two upper projections in appropriate staggered relation to bear against the ends of the five contacts and thus finish the insertion of the same. A lower projection is shown in solid lines and an upper projection is shown in dotted lines.

If desired the contacts may be preliminarily moved inward from the position shown in Fig. 19, until they are flush with the top of the base, and this may be done by a sloping guide wall which converges toward the top of the base and which acts as a plow against which the ends of the contacts bear as the base is moved along its guide track from one station to the next. When it is desired that the upper ends of the contacts be disposed somewhat below the top of the base, as here shown in Figs. 7 and 13 of the drawing, it is the pusher **180** which then serves to complete the insertion of the contacts.

Referring now to Fig. 21 of the drawing, this is a highly schematic plan view of the assembly apparatus

96 previously shown in Fig. 15. The part 102 represents the hopper for receiving the insulation bases. The five wires coming into the apparatus from the five reels are indicated at 154. The feed dogs are located at 166. The track or path along which the insulation bases are moved edge to edge (as in Fig. 16) is indicated at 156. The station for inserting and severing the wires is immediately at the ends of the wires 154. The bending of the tails is accomplished at a subsequent station designated 158. Prior to this operation the severed contacts may be further inserted until flush, at station 159, and then simultaneous with the said tail bending operation the insertion of the contacts may be completed by means indicated at 160. The station 159 may be simply a sloping wall against which the projecting ends of the contacts bear, the said wall converging toward the top of the base. The completed sockets fall down a chute 162 into a suitable box or container 164.

It is believed that my improved socket for sub-miniature tubes and like electronic devices, and the method of manufacture of the same, as well as the advantages thereof, will be apparent from the foregoing detailed description. The tube prongs are readily inserted in the socket because of the large entrant openings, which occupy the entire available space. In fact, the plastic material left between adjacent openings is reduced to a sharp edge. The contacts are of the single wire type, but have a good spring action, without requiring heat treatment. This results from the cold working, and from the variable thickness of the material. The usual specified retention force for a single contact on a single prong is ½ oz. The present contact has an initial retention of 5 oz., and even after indefinitely prolonged insertion and removal of a prong the drop in retention at most is to 2½ oz., which still is five times the specified treatment.

Each contact is securely locked in the base by a heavy stop at the inside, and a bent shoulder at the bottom. The contacts are coated with a non-corrosive coating, but at minimum expense because the wire initially used is coated, and the coining operation does not destroy the coating. The contacts, although tiny, need not be handled individually, and instead are handled as a part of a continuous wire, thus greatly facilitating manual loading of contacts into the base, and also making feasible fully automatic loading. All of the contacts required for a single socket may be loaded simultaneously, and all of the tails may be bent simultaneously, thus greatly speeding the manufacture of the socket.

It will be understood that while I have shown and described the invention in a preferred form, changes may be made without departing from the scope of the invention, as sought to be defined in the following claims. In the claims the reference to the pin passage having facets in trapezoid relation at one side is not intended to exclude the use of a larger number of facets which in the ultimate would constitute a curve of large radius.

I claim:

1. A socket comprising a molded insulation base having a plurality of passages each receiving a metal contact, said contacts being of the single wire type and comprising a convex spring portion, and having a tail or soldering lug portion extending from below the base, said passages being generally rectangular in cross-section to receive the convex spring portion and to permit flattening thereof, except that the passage wall at the convex side of said spring portion has facets in trapezoid relation to provide partial clearance to aid reception of a contact pin which is greater in diameter than the trapezoid height or clearance.

2. A socket comprising a molded insulation base having a plurality of passages each receiving a metal contact, said contacts being of the single wire type and comprising a convex spring portion, and having a tail or soldering lug portion extending from below the base, said passages being generally rectangular in cross-section to receive the convex spring portion and to permit flattening thereof, except that the passage wall at the convex side of said spring portion has facets in trapezoid relation to provide partial clearance to aid reception of a contact pin which is greater in diameter than the trapezoid height or clearance, alternate passages and contacts being reversed, and the trapezoid facets being so related that pins received therein may be in alignment.

3. A socket for receiving the prongs of a sub-miniature electronic device, said socket comprising a molded insulation base having a series of passages, spring contacts of the single wire type disposed in said passages and having tails extending from beneath the base for soldered connections, said passages being generally rectangular in cross-section, alternate passages and contacts being reversed, and the passages being so related that pins received therein may be in alignment, each of said passages being enlarged at its upper end to generally triangular configuration, with succeeding triangles reversed in position so that intermediate triangles fit between alternate triangles, whereby the entrant passages are of maximum size despite the close spacing of the contacts.

4. A socket for receiving the prongs of a sub-miniature electronic device having a row of aligned prongs, said socket comprising a molded insulation base having a series of passages, spring contacts of the single wire type disposed in said passages and having tails extending from below the base for soldered connections, said passages being generally rectangular in cross-section and being closed at the bottom except for a slot at the outer wall to pass the tail, alternate passages and contacts being reversed, and the alternate passages and contacts being oppositely offset whereby the tails are further offset and the passages and contacts are so related that pins received therein may be in alignment.

5. A socket for receiving the prongs of a sub-miniature electronic device, said socket comprising a molded insulation base having a series of three or more parallel passages disposed side by side approximately in a line, spring contacts disposed in said passages and having tails extending from below the base for soldered connections, each of said passages being slopingly enlarged at its upper end to generally triangular configuration, with succeeding triangles reversed in position and nested together so that intermediate triangles fit between alternate triangles, there being only a thin edge between adjacent reversed triangles whereby the entrant passages are of maximum size despite the close spacing and small size of the passages.

6. A socket comprising a molded insulation base having a plurality of passages therethrough each receiving a coined metal contact, said coined contacts being of the single wire type and comprising a convex flat spring portion, a stop portion, a shoulder portion and a tail or soldering lug portion, said stop portion being located at the lower end of the spring portion, said stop portion being narrower and thicker than the spring portion, and being sidewardly offset and located inside an abutting subjacent portion of the base to prevent downward movement of the contact, said shoulder portion being located beneath a superjacent portion of the base to prevent upward movement of the contact, and said tail or soldering lug portion extending from the shoulder portion.

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