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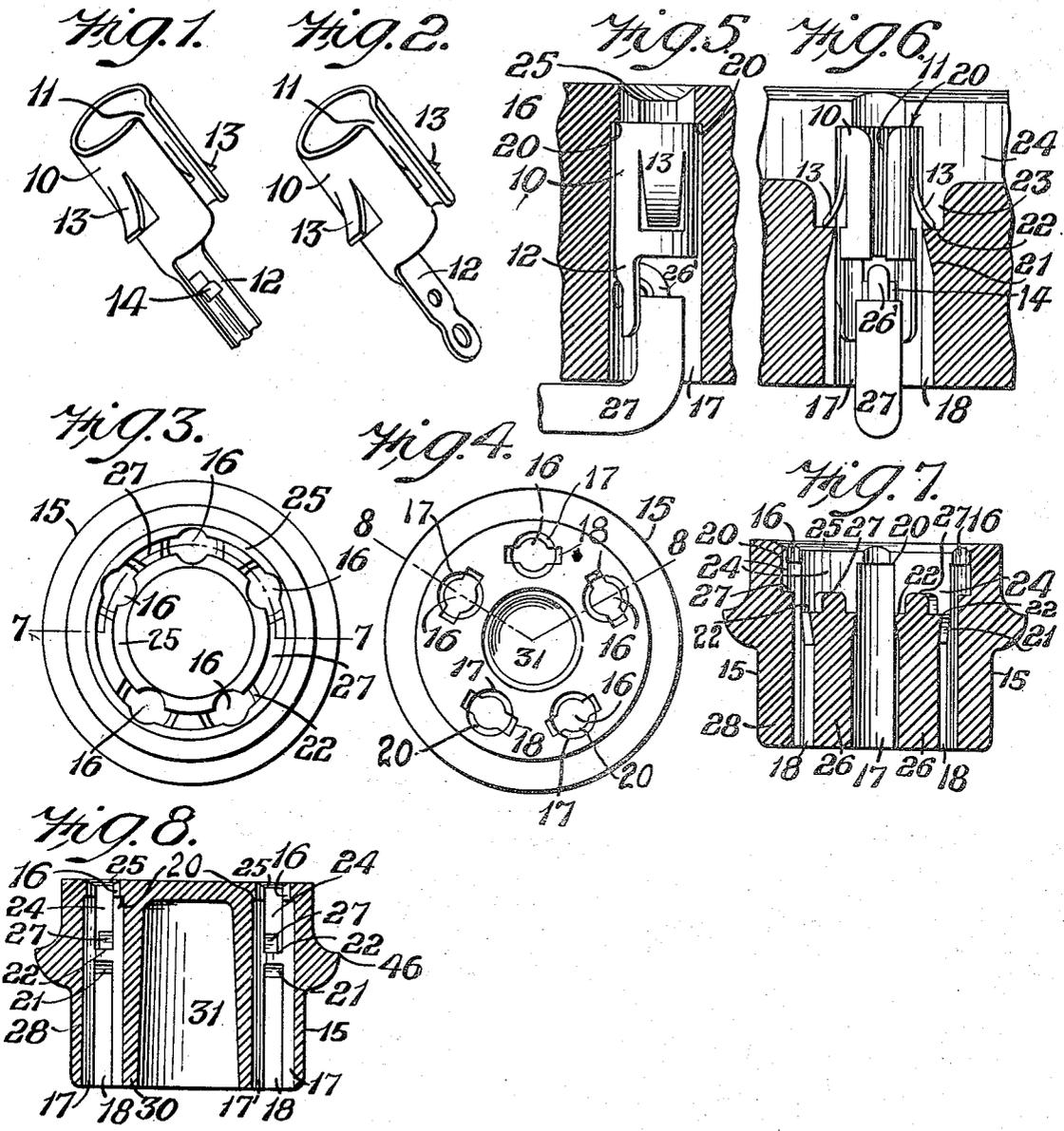
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PLUG-IN SOCKET DEVICE

Filed May 4, 1940

2 Sheets-Sheet 1



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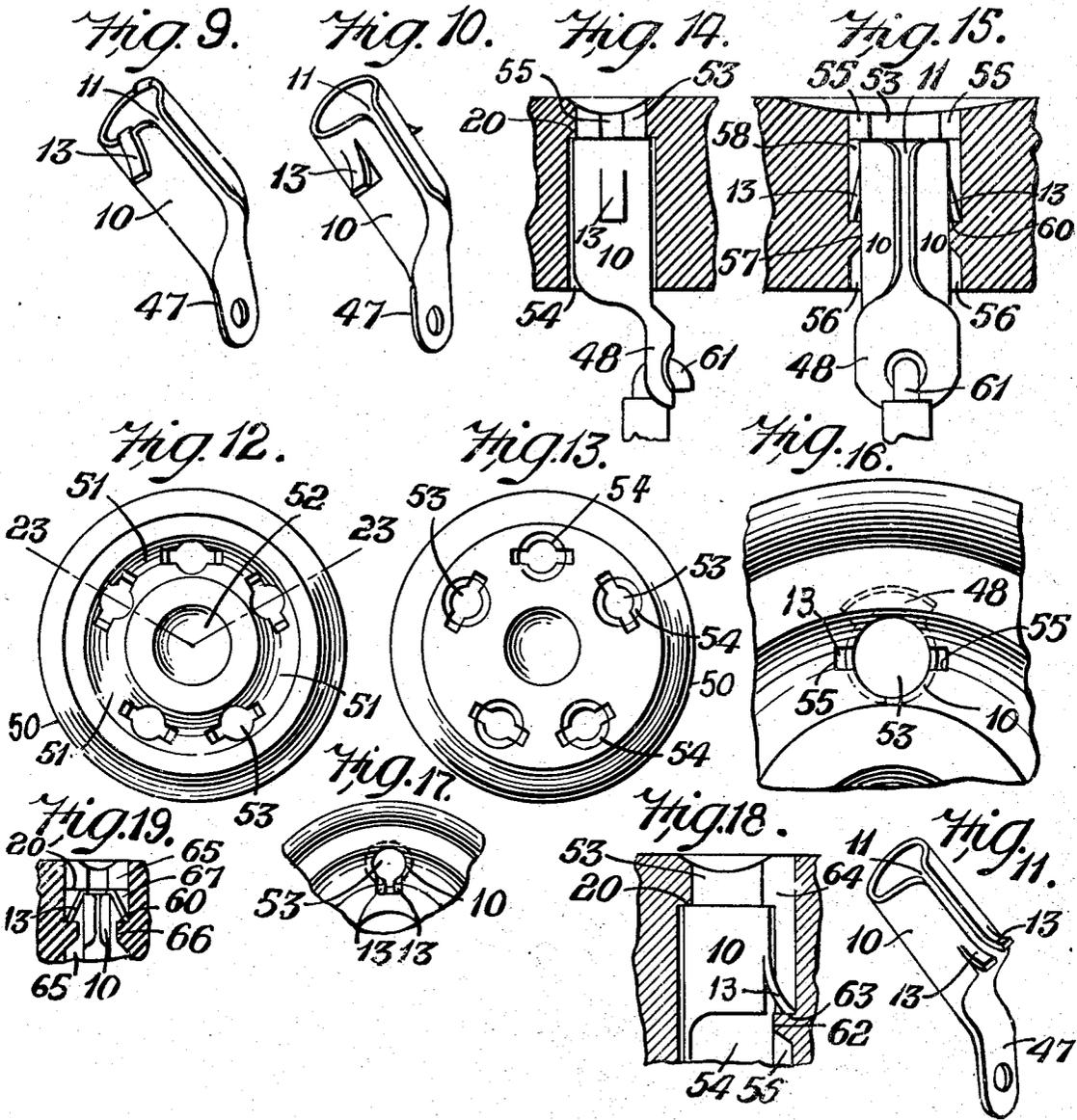
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PLUG-IN SOCKET DEVICE

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This invention relates to sockets for plug-in socket devices.

The invention is not confined to the shape or contour of a separate metallic contact and an insulating base but includes a unit containing both, in a manner that saves time, labor and material.

It is among the objects of this invention; to provide improvements in the art of socket receptacles or bases and in the electrical contacts therefor; to provide socket receptacles and contacts therefor which are readily manufactured with a minimum of material and labor to produce complete units for the reception of plug-in devices; to provide in the non-conducting molded base conducting contacts for plug-in prongs which are so constructed as automatically to be held in place within the base after mere insertion therein; to provide a molded base, with co-acting means for holding the metal contacts in place; to provide female contacts having efficient plural line electrical engagement with a contact prong of a plug-in device; to provide recesses in the insulating base with molded integral barriers between adjacent recesses to prevent leakage between adjacent contacts; to avoid the excessive length, bending and convoluting of the metal contacts; to provide a base having a minimum of plastic material and other objects of the invention which will become evident in the following description and the appended claims.

In the accompanying drawings, forming a part of this description:

Figs. 1 and 2 represent respectively perspectives of two forms of the contacts of the invention adapted to the forms of bases Figs. 4-8, showing the anchoring tongues pressed outward from slots in the body of the metal;

Figs. 3 and 4 represent plans respectively of the top and bottom of the molded base arranged to receive the prong of an electrical plug-in device through the top of the base and also arranged for reception through the bottom of the female contacts;

Fig. 5 represents a fragmentary section along the radial line of that part of the base which receives the contact;

Fig. 6 represents a fragmentary arcuate section of the same with a contact disposed substantially tangentially of the base and across the radial line;

Fig. 7 represents a section of the molded base on the partly arcuate line 7-7, Fig. 3;

Fig. 8 represents a section of the molded base on the line 8-8, Fig. 4;

Figs. 9, 10 and 11 represent respectively per-

spective views of three forms of contacts with the prolongation of the body offset and anchoring tongues located at different positions on the body portion;

Figs. 12 and 13 represent plan views of the top and bottom respectively of a modified molded base adapted to receive the contacts of Figs. 9 and 10;

Figs. 14 and 15 represent fragmentary sections taken on relatively substantially normal lines of the base with contacts of Fig. 10 mounted therein;

Fig. 16 represents a fragmentary plan of the top of the base Fig. 12, showing in dotted lines a contact inserted having a wide prolongation;

Fig. 17 represents a similar plan showing in dotted lines the contact of Fig. 11 in operative position therein;

Fig. 18 represents a fragmentary section with the contact of Fig. 11 inserted in the base;

Fig. 19 represents a similar section, on small scale, with the contact of Fig. 9 in operative position therein.

While the forms of contacts and molded bases in Figs. 1-8, inclusive, differ slightly from those in Figs. 9-19, inclusive, it is simply because different forms of bases are required to accept different forms of contacts, and all fall within the scope of the invention.

In carrying out this invention according to a preferred embodiment, there is provided on the body of the contact a stamped or resiliently projecting part which retracts while being inserted into the base and then springs outward to be locked in place over a supporting or anchoring ledge formed in the base and which provides space for release and a shoulder or stop to limit upward movement and to hold the contact in place.

The contacts are inserted through one face of the molded base and held therein to make electrical contact with the prongs of a tube inserted into the contact through the other face of the base.

Referring to Figs. 1 and 2 the bodies of the female contacts 10 are bent or rolled to generally cylindrical or oval tubular shape leaving the longitudinally extending space 11 which permits expansion thereof while receiving a contact prong with which latter it forms a close plural line contact as is an important feature of such contacts. The prolongation 12 of the contact body 10 provides a soldering terminal having preferably two holes for the attachment of an electrical cable thereto. The electrical connection is

completed when prongs enter the body 10. On each side of the body of the contact is a tongue or detent 13 cut or slitted out of the body 10 and bent outward in a gentle curve and presenting a spring member which can slide through a constricted passage and, when released, can resume its original position to support the contact. Figs. 9, 10 and 11 show similar tongues also designated by the numeral 13 although not identically formed or positioned.

The soldering tail 12 of the body 10 (Fig. 1) may be punched to form an offset 14 bent down and inward to form a single aperture for an electrical wire instead of the usual holes Fig. 2. It will be noted that the soldering tail 12, in the punch of the clip 14, provides a reentrant groove on the tail from the clip 14 to the end of the tail 12 (Fig. 1) so that a wire inserted through the tail will rest in the groove and can there be soldered. (See Fig. 6).

The body of the contact 10 preferably is not a complete or true circular tube; it is broken at the space 11 marking the terminals of the side arms of the contact, and is off-set from a true circle to permit electrical contacts longitudinally along the lines where the body including the side arms grips a prong closely. The particular shape of the body contact may be changed, and is not important herein, so long as the molded base can receive it, and it will take the thrust of a prong, and means are provided for anchoring it within the base.

Figs. 3-8 inclusive relate to the molded base 15 which is adapted to receive and hold the contacts 10 and is made of insulating material as are the other forms of sockets. Such material may be a phenolic condensation product or a more recent product by which varying degrees of resilience can be given to the molded base.

The invention is illustrated as a base adapted to receive an asymmetrical five prong tube, although the number of channels and the position of each is determined by the type of tube and number and disposition of prongs and does not affect the invention herein.

In the form of invention shown in Figs. 3-8 inclusive, the contact base 15 has a plurality of generally axially extending apertures extending completely through the base. The apertures each comprising an upper relatively narrow prong receiving channel or guide 16 of proper proportions as to receive a contact prong, communicating with an enlarged contact-guiding and receiving channel 17 of proper proportion as to receive a female contact, said channels being separated by a short transverse shoulder or stop 20. In the preferred form the prong apertures 16 are disposed in and in part comprise an annular groove 24 having the upper inclined guide surfaces 25. Channel 17 is in communication with lateral guide recesses 18 extending radially from each side of the channel and which extend parallel to the axis of the channel 17, generally normal to both the upper and the lower face of the base from the lower face to a point between the upper and lower faces at which the guide recesses terminate by reason of the inclined or sloped surface 21 leading inwardly radially of the channels 17 substantially to the peripheral surface thereof and defining the supporting or anchoring ledge 22. The latter forms in part the lower surface of the annular groove 24 completed by the raised upstanding separating leakage-minimizing barriers 27 of any desired height within the groove. A solid column 26 of mate-

rial integral with the base lies between longitudinal guide recesses of adjacent contact receiving channels 17.

It will be understood that any of the contacts of Figs. 1, 2 or 10 can be inserted axially from the bottom of the base into the appropriate channel 17 with the tongues or detents 13 aligned with the respective guide recesses 18 in which they will be received as the contact passes upwardly into the base. As the tongues or detents 13 engage the inclined walls 21 they will be bent inwardly against their resilience until they are, momentarily, within the peripheral bounds of the body of the contact, during the further axial movement of the body to bring the lower edges of the detents 13 above the edge of the ledge. As soon as clearance is secured, which is substantially at the same time that the upper end of the contact body abuts or impinges against the stop shoulder 20, the detents spring outwardly, in the clearance afforded by the set back barriers 27, and overlie the ledges 22 to lock the contacts in non-retractible supported position. Obviously the clearance permitting axial floating of the contact in the base after locked insertion may be varied as required.

Although it is preferred to slope surfaces 21 leading to ledge 22, this is not essential as the angular disposition and resilience of the tongues 13 of the contacts is such that they would ride up on any form of protuberance or projection in the guide channel to ultimate reexpansion over the ledge substantially regardless of the angular relation of the surface 21 and the wall of the guide recess 18.

The outer circumferential wall of the molded base is indicated at 23, the inner circumferential wall at 30. A recess 31 in the finished base saves on the material comprising the base. The recess 31 in the finished base, however, may be completely filled without departing from the invention herein. In such case there would be a central island of insulating material between the channels.

In the contacts, Figs. 9, 10, 11, the body portion of the contacts 10 is essentially the same as in Figs. 1 and 2. The prolongation of the body is, however, off-set from the body at 47. The contact may be enlarged laterally at 48 (see Fig. 15). Both the offset and the enlargement minimize capacity effects between contacts and the connectors, soldered or attached thereto at 26' or 61. The prolongation or tail of Fig. 1 may be used as in Fig. 15 so that the conducting wire may be soldered in the reentrant groove.

Referring to Fig. 9, the tongues 13 are formed by tabs extending out of the metal of the body portion 10 and bent outward and downward. In this construction the tongues 13, when inserted in the molded base, cannot be brought into alignment with the body portion. They become parallel to the body portion under pressure and spring outward when released. The tongue 13 of Fig. 10 is the same as in Figs. 1 and 2, but is located higher on the body portion. In Fig. 11 the tongues 13 are each slit from the body adjacent the space 11 and project outward.

Referring to Figs. 12 to 15 inclusive, the top and the bottom respectively of a modified molded base 50 are indicated. The construction of Fig. 12 differs from Fig. 3 in that the annular groove 51 is wide and shallow. The groove 51 cannot provide the deep penetration and annular space of groove 24. In the construction of Fig. 12 there is also a deep central recess 52 for ornamental

purposes. The upper channel 53 has two lateral longitudinal grooves 56. The two sets are separated by inclined guide face 57 leading to ledge 60. The grooves 56 will accept the tongues 13, but the movement of the contact upward is limited by the shoulder 20. The grooves 56 in the channels 54 accept the tongues 13, constrict them at 57, and allow them to spring outward in the space 58 provided by grooves 55 below shoulder 20, and rest on the ledge 60. Thus the contact is located against movement in either direction. The cable connection 61 or 26' passes through hole in the soldering tail prolongation 48 and is locked or soldered therein. If the contact is as shown in Fig. 1 the connector may lie in the groove on the reverse side of the soldering tail so as not to project beyond the lateral periphery of the contact. This is as illustrated in Fig. 5.

It thus appears that the grooves 55 permit the space for the expansion of tongues 13 in the same manner that annular groove 24 provides such space in Figs. 3-8. It will be noted also that the embodiments of the invention in Figs. 18 and 19 have the same characteristic function of longitudinal grooves 64 and 65 as in Figs. 14 and 15, and provide the interval between the termination of longitudinal grooves 55 and 65 before the tongues 13 come to rest on the shoulders or ledges 63 and 60 respectively.

Figs. 17 and 18 represent views of a modified form of base to receive the contact of Fig. 11. The body of said contact readily enters the channel 54 and the single longitudinal channel 56 accepts the two almost parallel juxtaposed tongues 13. The longitudinal channel 56 is constricted by a bevel at 62 leading to a ledge 63 over which the tongues 13 spring outward. The body of the contact 10 is limited in its movement by engaging shoulder 20. In this embodiment the contact 10, when installed, develops a slight lateral thrust, as when a prong is inserted, since it is suspended on two closely adjacent points at one side by the adjacent tongues 13 supported on the ledge 63 at the bottom and on one point at the top by the side wall of the channel 53 just beneath the shoulder 20.

Fig. 19 represents a section, on smaller scale, of the molded base with the inserted contact of Fig. 9. As the tongues 13 of this embodiment are extended from the body of the contact 10, the longitudinal grooves 65 of the channels 53 and 54 are relatively deeper and, when the grooves are constricted at bevel 66, space is left so that both tongues 13 and the body 10 can pass together. After passing the constriction 66 in groove 65 the tongues 13 expand at 67 to rest on ledge 60. As before outward axial movement is limited by the shoulders 20.

In order to release the dies which form the molded base, in the embodiments of Figs. 14, 15, 18 and 19, the longitudinal grooves 55, 64 and 65 respectively are continued along the upper channels 53 to the top face of the molded base on each side of the shoulders 20.

In all of the embodiments of the invention, Figs. 1-19, the contact receiving channels have a greater diameter than the prong receiving channels and thereby provide the stop-shoulder 20. The embodiments of Figs. 9-19 present longitudinal grooves along all channels. In Figs. 1-8 there are no grooves along channels 16 as the annular groove 24 serves the purpose. Groove 24 also affords a guide groove into which prongs are guided through contact with the inclined surface 25, pursuant to which mere rotation of

the tube or other plug-in device with the prongs in the groove 24 will bring the appropriate prongs into aligned juxta-positioned prong apertures to permit proper predetermined operative association of plug-in device and socket. The shallower groove 51 (Fig. 12) has a somewhat similar function. In the embodiments of the invention, Figs. 1 to 8 inclusive, the tongues are released and permitted to spring outward in the space provided by the annular groove 24, and in the embodiments, Figs. 9 to 19, inclusive, the like space is provided by the longitudinal grooves 55, 64, 65 along the channels 53. In all embodiments the stop against downward movement is provided by ledges 22, 60, 63.

When the contacts are inserted through the bottom of the base, and locked in place therein, the complete molded socket is prepared for installation in a panel, or the like either directly, or through the use of a supplemental, supporting device. In this connection, it will be understood that the outer configuration or contour of the base, the number and spacing of the contact apertures, and the moldable materials used, are all matters of no particular moment as far as this invention is concerned and may be varied as required by circumstances.

I claim as my invention:

1. A socket comprising a molded insulating base, having a plurality of prong receiving channels extending inwardly from one face in an annular series, and a plurality of contact receiving channels extending inwardly from the other face in an annular series concentric with the first mentioned series, each having a larger diameter than the respective first mentioned channel, the appropriate respective juxtaposed channels being substantially aligned axially to registering communication therebetween, in combination with a metal electrical contact in each of the second mentioned channels, each contact having a female aperture to receive a prong, a body and a spring member formed on said body, said base having a stop shoulder at the communication of each pair of aligned channels to prevent axial movement of the contact in one direction, an annular groove connecting said series of aligned channels, a lateral recess formed in said base adjacent each pair of aligned channels within said groove and an anchoring ledge within said recess for engagement by said spring member to prevent axial movement of the contact in the other direction.

2. A socket for electrical plug-in devices, comprising a molded base of insulating material having a plurality of channels arranged in an annular series therein entering from one face, each having a contour for admitting a plug-in prong, an annular groove intersecting and connecting said channels, secondary channels each entering from the other face each having a contour for admitting a metal contact and respectively coaxial and communicating with the respective first mentioned channels, in combination with a metal contact in each of the last mentioned channels having lateral supporting lugs, an aperture in the body of each contact adapted to accept a prong, ledges formed in the annular groove to receive the respective lateral supporting lugs and barriers formed in said groove between adjacent ledges to prevent electrical leakage between the lugs of adjacent contacts.

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