Nov. 20, 1945. S. PICARD 2,389,454

ELECTRICAL CONNECTOR

Filed July 10, 1943

Fig.3.

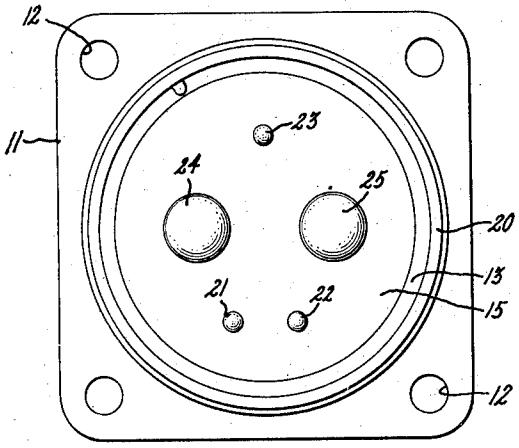


Fig.1.

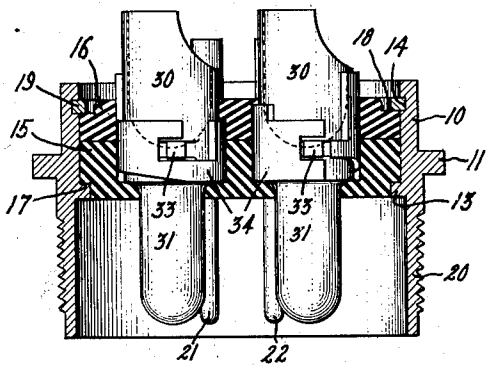


Fig.2.

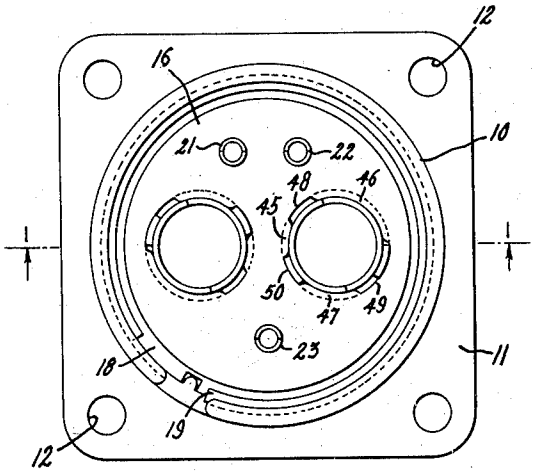
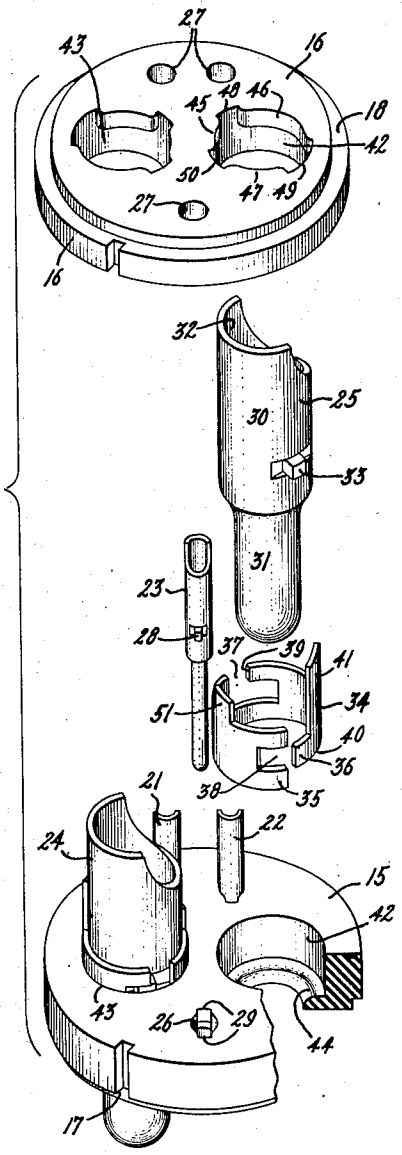


Fig.4.



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UNITED STATES PATENT OFFICE

2,389,454

ELECTRICAL CONNECTOR

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Application July 10, 1943, Serial No. 494,218

9 Claims. (Cl. 173—328)

The present invention relates to electrical connectors of the type including an insulating base made of plastic material, such as a phenolic condensation product, and a plurality of electrical cylindrical contacts detachably secured to the base. The contacts may be in the form of male or female elements to form plugs or receptacles. In certain instances it has been the practice heretofore to solder or otherwise fuse the ends of electrical cables or wires to the hollow ends of such contacts while the latter were assembled with the insulating base. This can be readily done whenever a contact is of comparatively small size requiring a small amount of solder to connect the contact to the bare end of a wire. If, however, the contact or contacts are of large size, for example in the form of pins of a diameter of the order of one-half inch, difficulties are experienced because a substantial amount of solder has to be used to fuse such large diameter pins to correspondingly heavy wires or cables. The large amount of solder and the heating of the cable end and the pin may cause burning or charring of the insulating base.

The object of my invention is to provide an improved construction and arrangement of electrical connectors of the type above specified whereby the aforementioned drawback is overcome. This is accomplished in accordance with my invention by an arrangement which permits easy removal of a large diameter contact from its supporting base and attachment of the contact to the base after it has been fused to a wire or cable. In other words, instead of making the connection between the contact and the cable while the first is assembled with the base, such connection is made while the base and the contact are disassembled. To this end special connecting means are provided between the contact and the base. In a preferred embodiment such connecting means is in the form of a detachable device forming a self-locking bayonet connection with the contact.

For a better understanding of what I believe to be novel and my invention, attention is directed to the following description and the claims appended thereto in connection with the accompanying drawing.

In the drawing Fig. 1 illustrates a sectional view of a connector embodying my invention; Fig. 2 is a top view of Fig. 1 (Fig. 1 is a sectional view along line 1—1 of Fig. 2); Fig. 3 is a bottom view of Fig. 1; and Fig. 4 is an exploded, perspective view of the connector illustrated in Figs. 1 to 3.

The connector comprises a cylindrical casing 10 with an outer susbtantially square flange 11 having openings 12 to facilitate attachment to a wall. The inner surface of the cylindrical casing 10 is shaped to provide an annular flange 13 and an annular groove 14 axially spaced from the flange 13. An insulating base 15 and a top 16 are inserted in and supported on the casing 10. The base 15 has a recess forming a shoulder 17 in engagement with the flange 13. The top 16 has a recess 18 for accommodating a locking spring ring 19 projecting into the groove 14 of the casing 10 and securely locking the base 15 and the top 16 to the casing 10. These elements are angularly positioned relative to each other by a tongue and groove connection formed between them. The base and top serve as a support and holding means for electrical contacts, in the present instance a plurality of pins for connection to corresponding female contacts. The lower portion of the casing has an outer screw-thread 20 whereby the connector or plug upon attachment to a corresponding receptacle may be securely fastened thereto by an outer housing. An arrangement of this kind is more fully disclosed in the copending application of G. B. Benander, Serial No. 480,348, filed on March 24, 1943, and assigned to the same asignee as the present application.

In the present example the connector is of the plug type having five male contact pins of which three pins 21, 22 and 23 are of comparatively small size with a diameter of the order of ⅛ inch and two pins 24 and 25 are of large size with a diameter of the order of ⅜ inch.

The small pins are attached to the base 15 and the top 16 in well-known manner. Each of the small pins projects through aligned openings 26 and 27 in the base and top respectively. Each small diameter pin has two diametrically opposite projections 28 accommodated in diametrically opposite recesses 29 in the upper part of the base 15.

During assembly the pins 21, 22 and 23 are placed into the openings 26 of the base with the projections 28 on the pins located in the recesses 29 of the openings 26. After all pins 21, 22 and 23 are assembled on the base the top 16 is assembled with the base and the pins, the openings 27 forming a sliding clearance with the upper parts of the pins 21, 22, 23. When thus assembled the small diameter pins can no longer be removed from the base and top without first disassembling or removing the top. Therefore, the connection of cables or wires to the small

diameter pins must be made while the latter are assembled with the insulating base. This may be safely done, as pointed out above, because the small amount of solder or like fusing substance does not produce an excessive amount of heat which might injure the plastic material from which the case and top are made.

The large diameter pins **24**, **25** are similar in construction to the small diameter pins. Each has an upper portion **30** and a lower portion or pin proper **31** somewhat smaller in diameter than the portion **30**. The portion **30** is provided with a bore **32** for receiving the bare end of a wire or cable and has a side wall cut away to form a lip in order to facilitate the supply of solder to the bore **32** and thus to establish a firm electrical connection between the pin and the bare end of a cable. The upper portion **30** of each large diameter pin also has two diametrically opposite, lateral projections **33**.

The large diameter pins **24**, **25** in accordance with my invention are secured to the insulating base and top by means including a special bayonet connecting and locking device **34**. The device **34** is essentially in the form of a split ring or ring segment having adjacent, slightly spaced vertical ends or edges **35** and **36**. The ring is shaped to provide two bayonet slots **37** and **38** for receiving the projections **33** of the pin. The slot **37** is formed by an intermediate portion of the ring and has an entrance **39** through the upper edge of the ring. The slot **38** is formed at one end of the ring with an entrance through the edge **35**. The ring portion forming the edge **36** has a height about equal to that of the bayonet slot **38** and faces the latter. From another viewpoint, the ring portion near the edge **36** is cut down on both sides to the lower and upper edges of the slot **38**. In the present example the ring has a lower edge **40** which is substantially spiral, terminating at the level of the lower edge of the slot **38**. From still another viewpoint, the device **34** comprises a substantially cylindrical member, preferably made of sheet metal or like flexible material open at top and bottom and split along the cyinder. Two bayonet slots are formed in the member, one slot extending through the upper edge of the cylindrical member and the other slot extending through a vertical edge of the member. This other slot faces an edge portion or projection of the member which normally precludes insertion and removal of the projections **33** of the pin. In other words, it acts as a lock, preventing or limiting rotary movement of the pin when assembled.

In order to permit assembly or dismantling of the pin and the locking device, the edge portion **36** must be forced away from the entrance to the slot **38**. To this end the upper edge of the locking ring is provided with a vertical, cylindrical projection or tab **41**. Downward force on this projection **41** moves the edge portion **36** away from the entrance to the bayonet slot **38** so that a pin may be lowered into the locking device and the projections **33** of the pin may be rotated into the bayonet slots **37**, **38**. Once the pin is positioned in the locking device and the downward force on the projection **41** is released, the edge portion **36** snaps back into the position shown in the drawing, thus safely locking the pin in the device. Similarly, to dismantle the pin from the locking device, the projection **41** must be forced down to remove the edge portion **36** from the entrance of the slot **38** to permit rotation of the pin projections **33** out of the bayonet and slots **37**, **38**.

The locking device **34** when assembled with the base and top is located in aligned, cylindrical openings **42**, **43** of the base **15** and the top **16** respectively. The base **15** near the lower end of the opening **42** is shaped to provide an inwardly projecting flange **44** for engaging the lower edge of the locking device. Ordinarily the flange **42** engages only a portion of this lower edge **40**. During insertion and removal of the pin, however, when the projection **41** of the locking device is forced downward, the entire lower edge portion of the locking device may engage the annular flange **44**.

The opening **43** in the top is provided with three circumferentially spaced, inwardly projecting ledges **45**, **46** and **47**. The ledges are of uniform radial thickness and have surfaces forming part of a cylinder concentric with the cylindrical opening **43** and having sliding clearance with the outer surface of the pin portion **30**. The ledges **45**, **46** and **47** form three slots **48**, **49** and **50** respectively between them. Each of these slots has certain functions. The slot **50** formed between the adjacent ends of the ledges **45** and **47** is part of a means for angularly locating the locking device. This means includes a cylindrical projection **51** at the upper edge of the locking ring which when assembled is positioned in the slot **50** with its opposite edges forming a snug fit with the adjacent edges of the ledges **45** and **47** respectively, thus definitely locating the locking device on the base and the top. The slot **49** formed between adjacent ends of the ledges **46**, **47** serves to accommodate the projection **41** which when assembled projects through the top **16** (Fig. 1). The circumferential length or width of the projection or tab **41** is about half the circumferential length of the slot **49** so that when assembled part of the slot **49** is free from the tab **41**. This free part of the slot **49** and the slot **48** formed between the adjacent ends of the ledges **45** and **46** constitute entrance openings for the diametrically opposite projections **33** on the pin. The entrance opening **48** is in axial alignment with the entrance **39** of the bayonet slot **37** and the free part of the opening **49** is in axial alignment with the end portion **36** of the locking device.

In order to connect the bare end of a wire or cable to one of the pins **24**, **25** such pin is removed from the base and top by first forcing the tab **41** downward and thereupon rotating the pin with the projections **33** out of the bayonet slots **37**, **38**. The pin may then be moved axially with the projections **33** passing through the slots **48** and **49**. After the pin has been electrically connected to the cable it is reinserted or assembled on the base and top by axial insertion into the device **34** with the pin projections **33** passing through the slots **48**, **49**. During insertion the edge portion **36** may be forced away from the entrance of the bayonet opening **38** by a sufficient downward pressure of the pin itself or, as described above, by a downward force on the tab **41**.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. An electrical connector comprising an insulating base having an opening, a locking device secured to the opening and having bayonet slots, a pin having lateral projections located in the slots and forming a bayonet connection therewith, means on said device for locking one of the projections in one of the slots, and other means on said device for actuating the locking means to permit assembly and dismantling of the pin and the device.

2. An electrical connector having an insulating base with an opening, a split ring member held in the opening forming a bayonet slot, a cylindrical contact member having a projection forming a bayonet connection with the slot of the ring member, and a projection on the ring member facing the slot normally to limit angular movement of the cylindrical contact to retain the latter in the slot, a clip forming a portion of the ring member near said projection and extending through the insulating base for moving the projection away from the slot to permit assembly and dismantling of the cylindrical contact and the ring member.

3. An electrical connector comprising a casing, an insulating base and a top disposed within and supported on the casing, said base and top forming a substantially cylindrical opening therethrough with an inwardly extending flange at one end of the opening and inwardly extending circumferentially spaced ledges at the other end of the opening, a locking device comprising a split ring member disposed within said opening and having portions engaging said flange and ledges respectively, another portion of the ring member being located between two circumferentially spaced ledges to position the ring member angularly, the ring member forming diametrically opposite slots, and a cylindrical contact member with diametrically opposite projections forming bayonet connections with the slots.

4. An electrical connector comprising a casing, an insulating base and a top supported in the casing and forming a substantially cylindrical opening with an inwardly extending flange at one end of the opening and inwardly extending circumferentially spaced ledges at the other end of the opening, a locking device comprising a split ring member disposed within said opening and having portions engaging said flange and ledges respectively, the device having a portion located between two circumferentially spaced ledges to position the ring member angularly in the base and top, the ring member forming diametrically opposite slots, a cylindrical contact member with diametrically opposite projections forming bayonet connections with the slots, and means forming part of the ring member to lock the projections in the slots.

5. An electrical connector comprising a casing, an insulating base and a top supported in the casing and having aligned cylindrical openings with an inwardly extending flange at one end of the openings and inwardly extending circumferentially spaced ledges at the other end of the openings, a locking device comprising a split ring member disposed within said openings and having portions engaging said flange and ledges, the ring member forming diametrically opposite slots, a cylindrical contact member with diametrically opposite projections forming bayonet connections with the slots, means forming part of the ring member to lock the projections in the slots, and a tab formed on the ring member near the locking means extending through the top between two adjacent ledges for actuating said locking means to permit removal of the cylindrical contact member from the ring member through the slots and the spaces between said ledges.

6. An electrical connector comprising a cylindrical casing having an internal flange and a groove axially spaced from the flange, an insulating base made of plastic material disposed within the casing and engaging the flange, a top disposed within the casing and engaging the base, a spring ring disposed in said groove and engaging the top to secure the base and top to the casing, said base and top forming a cylindrical opening with an inwardly projecting flange at the base and inwardly projecting circumferentially spaced ledges at the top, a locking device located in the opening and held between said last mentioned flange and ledges, said locking device comprising a split ring having diametrically opposite bayonet slots, and a cylindrical contact having diametrically opposite projections forming a bayonet connection with the slots.

7. An electrical connector comprising a casing, a base and a top made of plastic material disposed within and secured to the casing, said base and top forming a cylindrical opening with an inwardly projecting flange at the base and inwardly projecting circumferentially spaced ledges at the top, a locking device located in the opening and held between said flange and ledges, said locking device comprising a split ring having diametrically opposite bayonet slots, and a cylindrical contact having diametrically opposite projections forming a bayonet connection with the slots, said ring having a projection located between two ledges to fix the angular position of the ring.

8. An electrical connector comprising a cylindrical casing, a base and a top made of plastic material secured in the casing and forming a cylindrical opening with an inwardly projecting flange at the base and inwardly projecting circumferentially spaced ledges at the top, a device located in the opening and held between said flange and ledges, comprising a split ring having diametrically opposite bayonet slots, a cylindrical contact having diametrically opposite projections forming a bayonet connection with the slots, said ring having a projection located between two ledges to hold the ring in a fixed angular position, one of the bayonet slots having an entrance through the upper edge of the ring and the other slot having an entrance through a vertical edge of the split ring, means formed by the ring for locking one of the contact projections in the last mentioned slot, and a clip formed on the ring and extending between two of said ledges for actuating said last mentioned means to permit assembly and dismantling of the contact and the ring.

9. A device for forming a bayonet connection with a cylindrical member having diametrically opposite projections comprising a split ring having an upper cylindrical edge portion and spaced vertical edge portions, two diametrically opposite slots being formed in the ring, one of the slots having an entrance through a cylindrical edge portion and the other slot having an entrance through one of the vertical edge portions, the other vertical edge portion being closely spaced with said entrance, and a projection formed on the ring for moving the last mentioned edge portion away from the entrance.

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