Oct. 28, 1941. C. H. JUDISCH ET AL 2,260,323

CONNECTOR PLUG

Filed Feb. 18, 1938

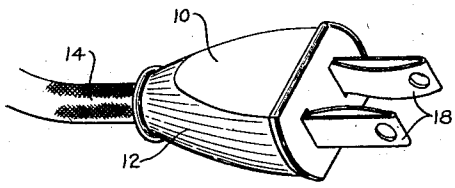


FIG. 1

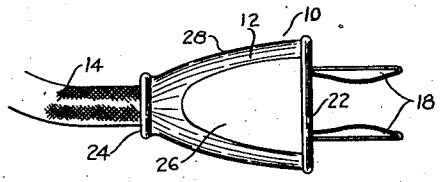


FIG. 2

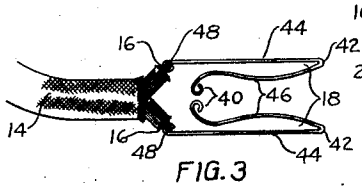


FIG. 3

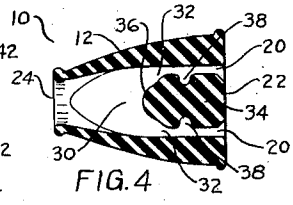


FIG. 4



FIG. 6

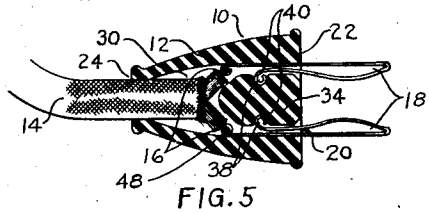


FIG. 5

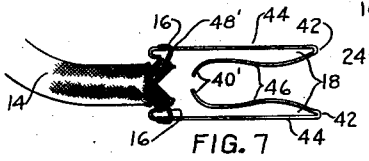


FIG. 7

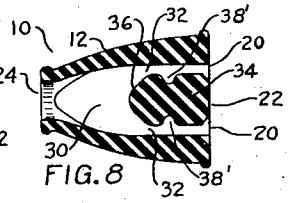


FIG. 8

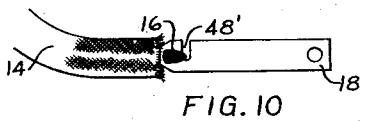


FIG. 10

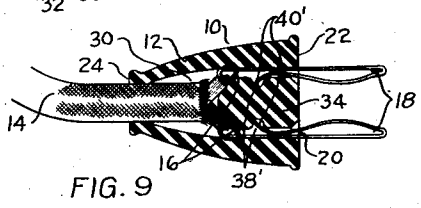


FIG. 9

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CONNECTOR PLUG

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Application February 18, 1938, Serial No. 191,219

12 Claims. (Cl. 173—361)

Our invention relates to improvements in connector plugs, preferably of the type having a double leaf spring blade to form a positive contact with its individual retaining socket, and of a type which may be readily assembled by forcibly inserting the spring blades directly within said plug and provided, due to the inherent construction of the spring blade employed with a resiliently expansible lock operative on insertion of the blade within the plug to become permanently self-locking within the plug.

A further object of our invention is to provide a plug structure into which the blades may be readily pushed or pulled until they have assumed a self-locking position, namely, one in which if a resilient plug be employed and the neck thereof spread open, a direct line will be formed between each blade slit and the enlarged central aperture in the neck to permit the direct insertion of the spring blade within the plug to a permanent self-locking position, thereby providing a structure having a substantially straight passage for the insertion of the spring blades within the plug and a structure of plug which can be easily removed from the mold as it is provided with no enlarged interior portions which the mold may fill up and from which it is difficult, often impossible to remove the mold.

A further object of our invention is to provide a new structure of molded plug which is relatively cheap, seamless and easy to mold.

A further object of our invention is to provide a novel structure of spring blade comprising two integrally attached leaves or legs to give inherent resiliency in the blade itself for positive contact with the blade socket and one which may be made by simple bending operations from strip material.

A further object of our invention is to provide a blade having a novel type of means for attaching a terminal thereto.

A further object of our invention is to provide a novel type of plug with assembled blades and cord in which the assembly operation is extremely simple, and can be readily accomplished on the improved type of machine and in accordance with our improved method shown in application S. N. 190,456, filed February 14, 1938, for Method of and apparatus for assembling contact blades in connector plugs.

These and such other objects of our invention as may hereinafter appear will be best understood from a description of the accompanying drawing.

In the drawing, Fig. 1 is a perspective view of our improved connector plug assembly.

Fig. 2 is a side elevation thereof.

Fig. 3 is a side elevation of a plurality of spaced blades each having a terminal of a multi-terminal connector cord connected thereto in disassembled position prior to insertion within our improved plug and

Fig. 4 is a vertical sectional view taken through our improved plug, Figs. 3 and 4 together forming a disassembled view of the blades in a position aligned, upon the spreading of the neck of the plug, with the blade slits in the plug for the ready assembly of the blades within the plug.

Fig. 5 is a vertical sectional view of the parts shown in Fig. 3 and 4 after they have been assembled, the blades and cord being shown in elevation.

Fig. 6 is an end elevation of the parts shown in Fig. 3.

Figs. 7, 8, 9 and 10 are views identical to those shown in Figs. 3–6 of a different embodiment of our invention employing a slightly different type of means for attaching each terminal to the longer leg or leaf of the blade and with the inner end of the shorter blade provided with a slightly different type of means for locking it within the groove in the plug.

In the drawing, wherein like characters of reference indicate like parts throughout, **10** generally indicates a connector plug assembly constructed in accordance with our invention.

Said assembly includes the one piece body **12**, the multi-terminal cord **14** having the plurality of terminals **16** and the spring blades **18** for each respective terminal adapted to extend from and be permanently locked within suitable slits **20** therefor in said plug body **12**.

The one-piece body **12** is preferably molded of resilient material, such as rubber and has a base **22**, a hollow neck **24** and in our preferred shape shown has the flat side walls **26** and end walls **28** tapering from said base **22** to said neck **24**, although if desired the body may be made of any shape, but preferably if the blades are to be assembled in accordance with our improved method described in our aforesaid application, S. N. 190,456, filed February 14, 1938, for Method of and apparatus for assembling contact blades in connector plugs, the neck **24** is preferably of smaller size than the base **22** and the plug is constructed of resilient material such as rubber so that the neck **24** may be stretched to form a continuous line for the insertion of each blade **18**, comprising each individual blade inserting

slit 20 and the enlarged central aperture 30 enlarged or stretched for this purpose. As stated, the plug is provided with the central aperture 30 extending from said neck to within said body 12 and the longitudinal slits 20 extending from said base and connected to said aperture, in our preferred embodiment for ease of assembly of the blades 18 within the body, having the inner ends 32 thereof terminating directly within said central aperture 30. The separator 34 is provided to positively separate and insulate each terminal within the plug. The slits 20 thus extended longitudinally on each side of said separator 34 which may terminate in the wedge shaped inner end 36 within said central aperture 30. In accordance with the teachings of our invention, the inner portion of the wall of each slit is provided with a substantially hemi-tubular groove 38 extending transversely thereof for a purpose to be described, although if desired the groove may be of any desired shape to contain the expansible self-locking end 40 of the spring leaf blade 18. If desired, however, the groove 38 may be formed in the outer portion or any other portion of the walls of the slit 20 other than in the inner portion as shown.

As stated, our invention also includes a spring contact blade of novel type which may be readily formed of flat resilient conducting strip material which may be readily bent upon itself at the outer end 42 thereof to form two legs or leaves 44 and 46 respectively, which may be either substantially adjacent to each other, or be bowed from each other as shown, to compress when inserted within the blade socket in the plug receptacle to form a positive contact within said blade socket due to the inherent resilient tendency of the legs to expand to uncompressed bowed position. One leg, in the preferred embodiment shown, the outer leg, terminates at the inner end of its respective slit in means adapted to have a cord terminal secured therein, in the preferred embodiment, comprising the tubular loop 48 through which the cord terminal 16 may be inserted, and clamped within, without the necessity of soldering or the use of screws or other separate attaching means, by mere compression of said loop, although any other type of means, such as the hole 48' in the embodiment shown in Figs. 7–9 may be employed and the cord terminal may be retained in position therein by soldering it thereto. The other leg, in our preferred embodiment, the inner leg 46 is provided with an inner end also extending within the slit 20 and terminating in self-locking means 40 adapted to be contained within its respective groove 38, in our preferred embodiment comprising the rolled-over tube 40 adapted to be contained substantially within the hemi-tubular groove 38 in the inner wall of the slit 20 for positively retaining the blade 18 in its respective slit. In the embodiment shown in Figs. 7–9, said means may merely comprise a projection 40' adapted to register in a groove 38' in the slit wall. The outer portion of the longer leg 44 extends vertically outwardly and the outer portion of the integral shorter leg 46 is bowed relative to said longer leg 44 beyond the plug to provide the inherent resiliency of the spring blade when assembled, exterior of the plug to provide a positive contact within the blade socket in the plug receptacle, the legs or leaves compressing during entry within the blade socket to firmly retain the plug assembly to the plug receptacle. However, the legs or leaves 44 and 46 may be relatively bowed to each other in any fashion, each being curved if desired or the longer or shorter leg being curved and the other straight as shown.

As stated hitherto, the positions of the legs may be reversed to have the shorter leg provided with means for locking it within the slit 20 on the outside and the leg adapted to be attached to the cord terminal 16 on the inside. We have shown in Figs. 7–10 a construction having an alternative type of means 48' comprising a hole 48' in the longer leg for brazing, soldering or spot welding a cord terminal thereto and an alternative type of expansible or locking projection 40' on the inner end of the shorter leg registering within its respective groove 38' to secure the composite blade within its respective slit 20.

It is thus obvious that the spring construction of the blade provides two important features, (1) it permits the two leaves or legs exterior of the plug to be relatively bowed to form a positive contact within the blade socket and (2) it provides a self-expansible or self-locking structure which may be compressed during passage of both legs simultaneously through the restricted portion of the plug slit 20 during assembly so that the expansible portion 40 or 40' may inherently resiliently expand within its respective groove 38 or 38' to provide a blade which is self-locking after assembly within the plug.

As stated hitherto, the plug is preferably constructed with the ends of the slits 20 discharging directly into the central aperture 30 so that the blades may be readily inserted through the stretched or unstretched neck 24 thereof until the self-locking portions 40 or 40' thereof come opposite their respective grooves 38 or 38' when the inherent resiliency of the spring legs or leaves causes them to relatively expand locking tightly enough for all practical purposes, by the mere forcible insertion of the blades 18 within the slots 20 during assembly.

It is understood that our invention is not limited to the specific embodiments shown and that various deviations may be made therefrom without departing from the spirit and scope of the appended claims.

What we claim is:

1. A connector plug assembly comprising a resilient one piece body having a base, a hollow neck, said body tapering from said base to said neck, a central aperture extending from said hollow neck to within said body and longitudinal slits extending from said base and having inner ends terminating within said aperture, the inner portion of the wall of each slit having a substantially hemi-tubular groove therein, a multi-terminal connector cord contained within the central aperture having each terminal thereof projecting outwardly to the inner end of each slit, and spring contact blades, each formed of flat resilient conducting material bent upon itself to form two legs having the outer ends thereof integrally joined together, the longer leg terminating at the inner end of its respective slit in a tubular loop having a cord terminal secured within and extending substantially vertically outwardly and the integral shorter leg being bowed inwardly relative to said longer leg beyond said plug and having an inner end also extending within said slit and terminating in a rolled over tube contained within the tubular groove in the inner wall of the slit.

2. A connector plug assembly comprising a resilient one piece body having a base, a hollow neck, a central aperture extending from said hol-

low neck to within said body and longitudinal slits extending from said base and connected to said aperture, the inner portion of the wall of each slit having a groove therein, a multi-terminal connector cord contained within the central aperture having each terminal thereof projecting outwardly to the inner end of each slit, and spring contact blades, each formed of flat resilient conducting material bent on itself to form two legs having the outer ends thereof integrally joined together, the longer leg terminating in an inner end at the inner end of its respective slit in means connecting one of said cord terminals to said leg inner end, said longer leg extending substantially vertically outwardly and the integral shorter leg being bowed inwardly relative to said longer leg beyond said plug and having an inner end also extending within said slit and terminating in a projection contained within and engaging the walls of the groove in the inner wall of the slit to anchor said blade within said plug against axial movement in either direction.

3. A connector plug assembly comprising a one piece body having a base, a hollow neck, a central aperture extending from said hollow neck to within said body and longitudinal slits extending from said base and connected to said aperture, the wall of each slit having a substantially hemitubular groove therein, a multi-terminal connector cord contained within the central aperture having each terminal thereof projecting outwardly to the inner end of each slit, and spring contact blades, each formed of flat resilient conducting material bent upon itself to form two legs having the outer ends thereof integrally joined together, one of said legs terminating at the inner end of its respective slit in a tubular loop having a cord terminal secured within, sail legs extending substantially vertically outwardly and being bowed relative to each other beyond said plug and the other of said legs having an inner end also extending within said slit and terminating in a rolled over tube contained within the tubular groove in the wall of the slit.

4. A connector plug assembly comprising a one piece body having a base, a hollow neck, a central aperture extending from said hollow neck to within said body, longitudinal slits extending from said base and connected to said aperture, the wall of each slit having a groove therein, a multi-terminal connector cord contained within the central aperture having each terminal thereof projecting outwardly to the inner end of each slit, and spring contact blades, each formed of flat resilient conducting material bent upon itself to form two legs having the outer ends thereof integrally joined together, one of said legs terminating in an inner end at the inner end of its respective slit in means connecting one of said cord terminals to said leg inner end, said legs extending substantially vertically outwardly and being bowed relative to each other beyond said plug and the other of said legs having an inner end also extending within said slit and terminating in a projection contained within and engaging the walls of the groove in the wall of the slit to anchor said blade within said plug against axial movement in either direction.

5. A connector plug assembly comprising a one piece body having a base, a hollow neck, a central aperture extending from said hollow neck to within said body, longitudinal slits extending from said base and having inner ends terminating within said aperture, the wall of each slit having a groove therein, a multi-terminal connector cord contained within the central aperture having each terminal thereof projecting outwardly to the inner end of each slit, and spring contact blades, each formed of flat resilient conducting material bent upon itself to form two legs having the outer ends thereof integrally joined together, one of said legs terminating in an inner end at the inner end of its respective slit in means connecting one of said cord terminals to said leg inner end, said legs extending substantially vertically outwardly and being bowed relative to each other beyond said plug and the other of said legs having an inner end also extending within said slit and terminating in a projection contained within and engaging the walls of the groove in the wall of the slit to anchor said blade within said plug against axial movement in either direction.

6. A connector plug assembly comprising a one piece body having a base, a hollow neck, a central aperture extending from said hollow neck to within said body and longitudinal slits extending from said base and connected to said aperture, the wall of each slit having a substantially hemitubular groove therein, a multi-terminal connector cord contained within the central aperture having each terminal thereof projecting outwardly to the inner end of each slit, and spring contact blades, each formed of flat resilient conducting material bent upon itself to form two legs having the outer ends thereof integrally joined together, one of said legs terminating at the inner end of its respective slit in a tubular loop having a cord terminal secured within, said legs extending substantially vertically outwardly beyond said plug and the other of said legs having an inner end also extending within said slit and terminating in a rolled over tube contained within the tubular groove in the wall of the slit.

7. A connector plug assembly comprising a one piece body having a base, hollow neck, a central aperture extending from said hollow neck to within said body, longitudinal slits extending from said base and connected to said aperture, the wall of each slit having a groove therein, a multi-terminal connector cord contained within the central aperture having each terminal thereof projecting outwardly to the inner end of each slit, and spring contact blades, each formed of flat resilient conducting material bent upon itself to form two legs having the outer ends thereof integrally joined together, one of said legs terminating in an inner end at the inner end of its respective slit in means connecting one of said cord terminals to said leg inner end, said legs extending substantially vertically outwardly beyond said plug and the other of said legs having an inner end also extending within said slit and terminating in a projection contained within and engaging the walls of the groove in the wall of the slit to anchor said blade within said plug against axial movement in either direction.

8. A connector plug assembly comprising a resilient one piece body having a base, a hollow neck, a central aperture extending from said hollow neck to within said body and longitudinal slits extending from said base and connected to said aperture, the inner portion of the wall of each slit having a groove therein, a multi-terminal connector cord contained within the central aperture having each terminal thereof projecting outwardly to the inner end of each slit, and spring contact blades, each formed of flat resilient conducting material bent on itself to

form two legs having the outer ends thereof integrally joined together, the longer leg terminating in an inner end at the inner end of its respective slit in means connecting one of said cord terminals to said leg inner end, said longer leg extending substantially vertically outwardly and the integral shorter leg being bowed inwardly relative to said longer leg beyond said plug and having an inner end also extending within said slit, one of said legs having a projection contained within and engaging the walls of the groove in the inner wall of the slit to anchor said blade within said plug against axial movement in either direction.

9. An attachment plug comprising a resilient body having a pair of spaced contact blade positioning slots in one side of said body, one wall of each slot having a notch therein; and a contact blade disposed in each slot, each blade comprising a return bent elongate strip of spring metal providing a contact portion projecting beyond the end of the plug and having two legs integrally joined at the outer end of said contact portion, one leg being bowed away from said other leg which is substantially straight, the bowed leg being shorter in length than the other leg and terminating in a projection lying within the notch in the slot and engaging the walls of the notch to hold the blade against longitudinal movement in either direction in said slot.

10. A connector plug of the type described, comprising a one-piece body having a pair of contact-positioning slots formed therein, said slots converging to form a recess open at the opposite side of said body, one wall of each slot having a notch formed therein; and a pair of contacts each having a conductor secured thereto, said contacts being simultaneously insertable through the recess and into said slots, each of said contacts comprising a strip of spring metal having one end thereof bent upon itself, the returned end being bowed outwardly with respect to the other end and terminating short of the other end in a projecting means received within the notch formed in the wall of each slot and holding the contact against movement therein.

11. A connector plug of the type described, comprising a one-piece body having a pair of passageways formed therein, said passageways converging to form a recess open at the opposite side of said body, one wall of each passageway having a notch formed therein; a pair of contacts each having a conductor secured thereto, said contacts being simultaneously insertable through the recess and into said passageways, each of said contacts comprising two legs of spring metal, the outer leg of the contacts being substantially straight and disposed in parallel relationship, the inner legs having rear portions adjacent the plug body arranged in forwardly diverging relationship and beyond said diverging portions, front portions of converging form, each inner leg being integrally joined to its outer leg at the outer end of said contacts; and means carried by one of the legs of each contact received within the notch of each passageway for holding the contacts against longitudinal movement in the passageways.

12. A connector plug of the type described comprising a one-piece resilient body having a pair of passageways formed therein, said passageways converging to form a recess open at the opposite side of said body; a pair of contacts each having a conductor secured thereto, said contacts being simultaneously insertable through the recess and into said passageways, each of said contacts comprising two legs of spring metal, the outer legs of the contacts being substantially straight and disposed in parallel relationship, the inner legs having rear portions adjacent the plug body arranged in forwardly diverging relationship and beyond said diverging portions, front portions of converging form, each inner leg being integrally joined to its outer leg at the outer end of said contacts; and means formed on said contacts for interlockingly engaging with means carried by the walls of the slots for holding the contacts against longitudinal movement in either direction in the slots.

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