

April 30, 1940.

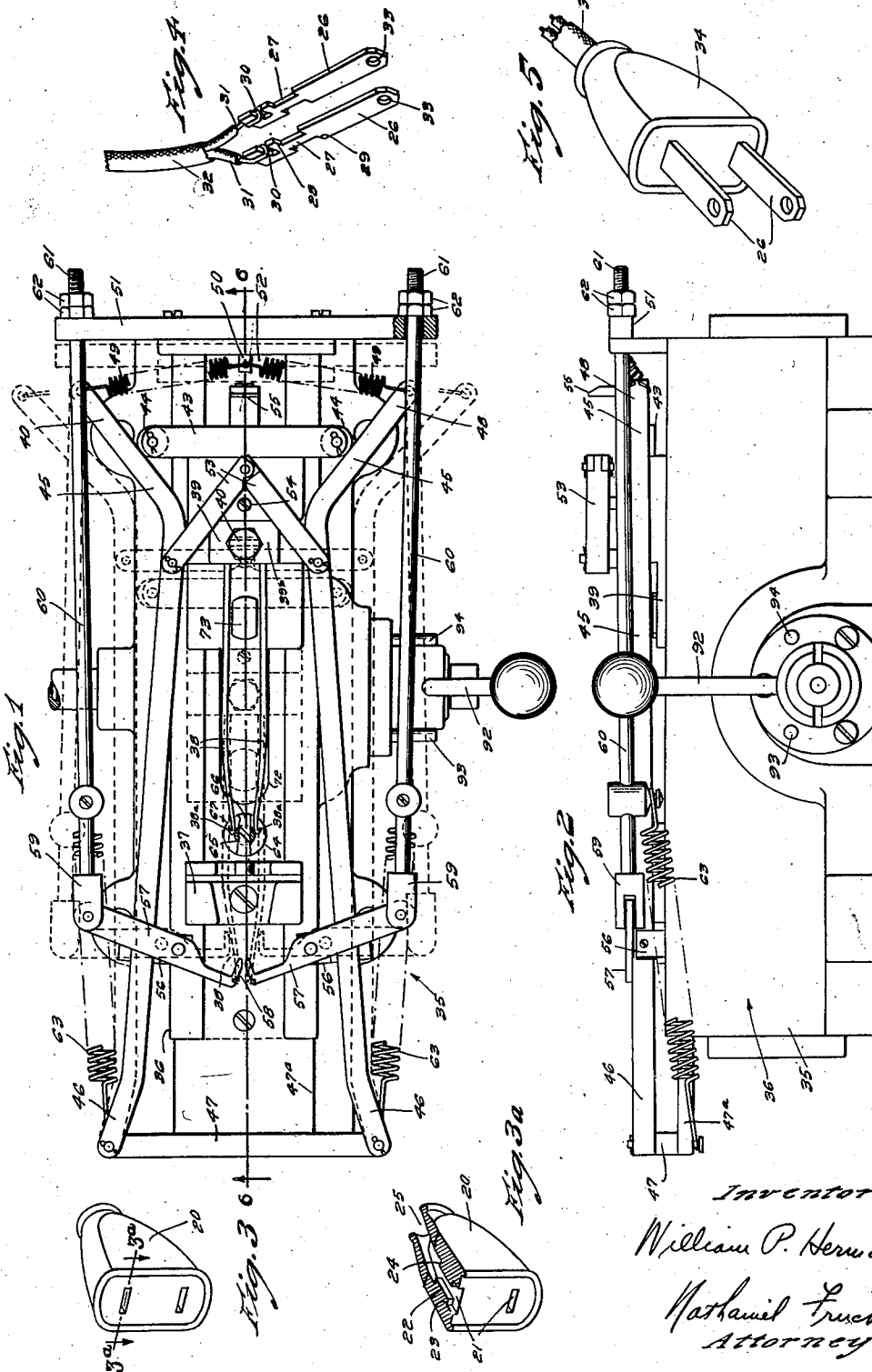
W. P. HERMAN

2,198,966

CONNECTOR PLUG ASSEMBLY APPARATUS

Filed Sept. 8, 1936

3 Sheets-Sheet 1



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April 30, 1940.

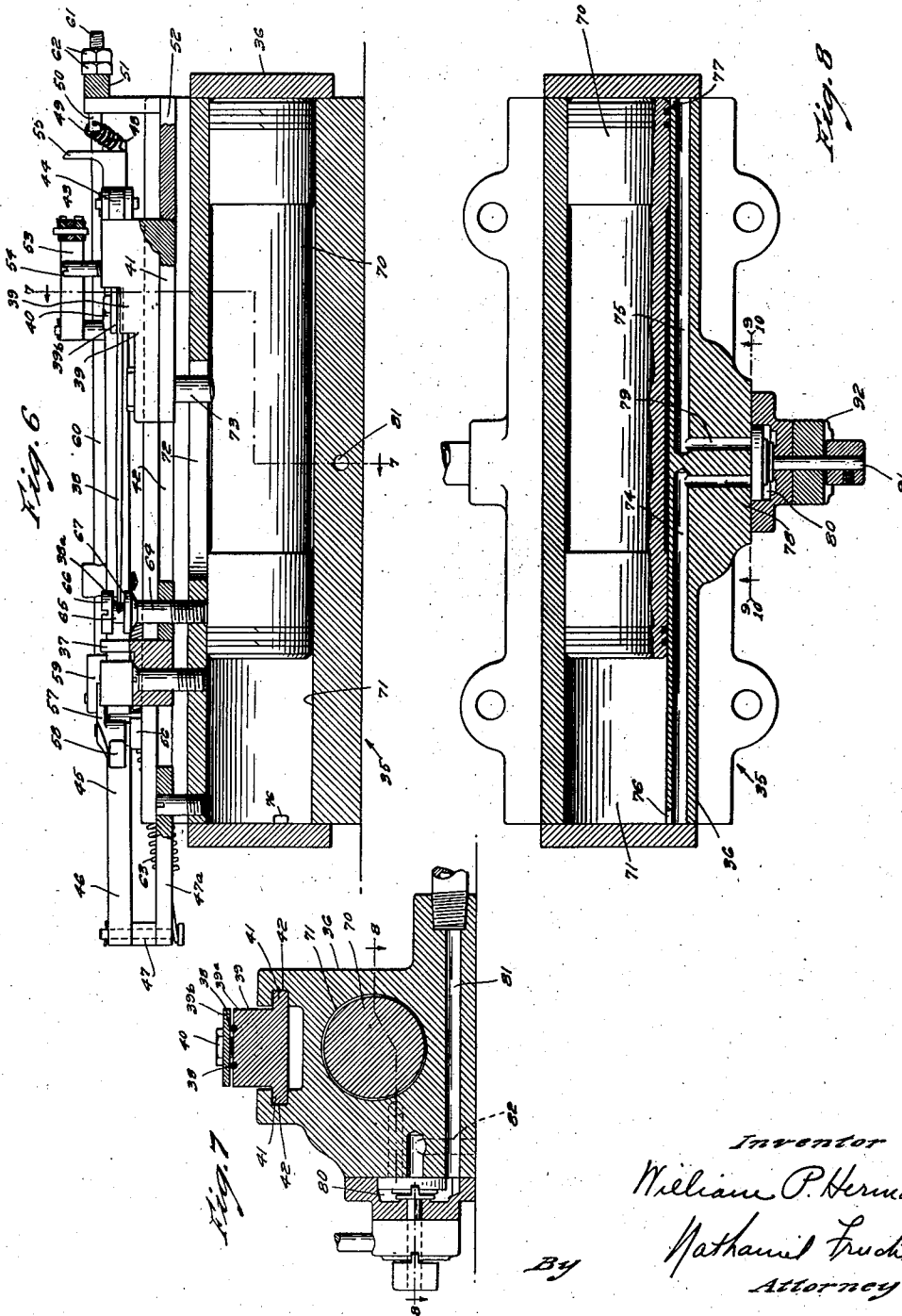
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CONNECTOR PLUG ASSEMBLY APPARATUS

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CONNECTOR PLUG ASSEMBLY APPARATUS

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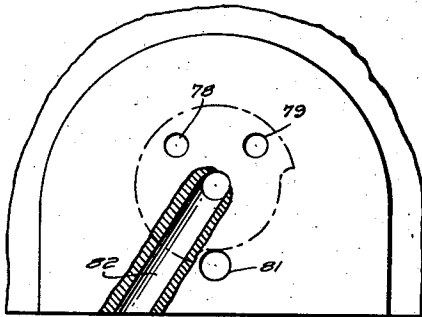


Fig. 9

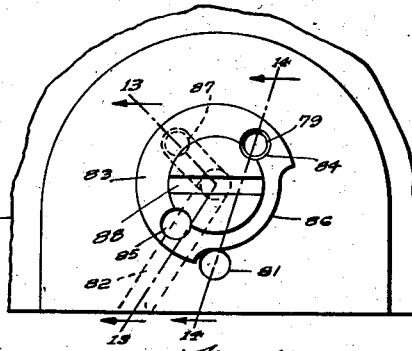


Fig. 10

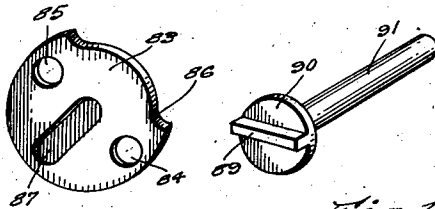


Fig. 11

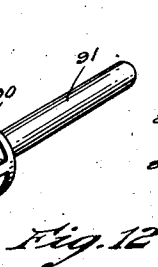


Fig. 12

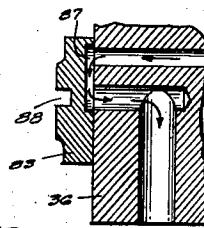


Fig. 13

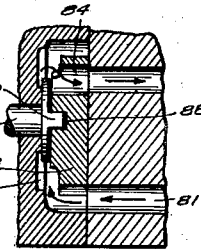


Fig. 14

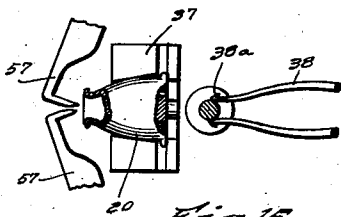


Fig. 15

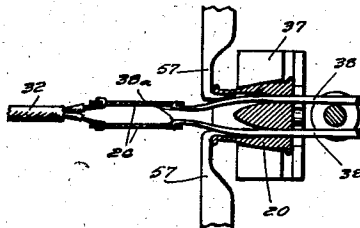


Fig. 16

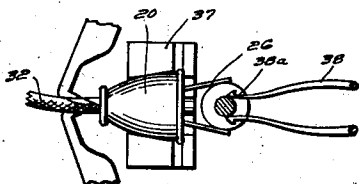


Fig. 17

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UNITED STATES PATENT OFFICE

2,198,966

CONNECTOR PLUG ASSEMBLY APPARATUS

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Application September 8, 1936, Serial No. 99,848

16 Claims. (Cl. 29—84)

My present invention relates to the manufacture of connector plugs, and has particular reference to apparatus for assembling contact prongs in plug bodies.

It is the principal object of my invention to provide a simple and readily operated apparatus for assembling contact prongs in plug bodies made of resilient material.

It is a further object of my invention to provide structure for holding a plug body and for drawing prongs therethrough into locking engagement therewith.

It is an additional object of my invention to provide an apparatus for inserting prongs having laterally displaced portions in resilient plug bodies having correspondingly shaped recesses, whereby the prongs are securely locked in the bodies.

With the above and other objects and advantageous features in view, my invention consists of a novel arrangement of parts more fully disclosed in the detailed description following, in conjunction with the accompanying drawings, and more specifically defined in the claims appended thereto.

In the drawings,

Fig. 1 is a plan view of the novel apparatus;

Fig. 2 is a side elevation thereof;

Fig. 3 is a perspective view of a preferred form of plug body;

Fig. 3a is a sectional perspective view of Fig. 3 on the line 3a—3a thereof;

Fig. 4 is a perspective view of a prong assembly;

Fig. 5 is a perspective view of an assembled plug;

Fig. 6 is a central vertical section on the line 6—6 of Fig. 1;

Fig. 7 is a section on the line 7—7 of Fig. 6;

Fig. 8 is a section on the line 8—8 of Fig. 7;

Fig. 9 is a sectional detail on the line 9—9 of Fig. 8;

Fig. 10 is a detail view on the line 10—10 of Fig. 8;

Fig. 11 is a perspective view of the novel pressure flow control valve;

Fig. 12 is a perspective view of the operating stem therefor;

Fig. 13 is a sectional detail on the line 13—13 of Fig. 10, showing the flow passageways in the base;

Fig. 14 is a similar view on the line 14—14 of Fig. 10; and

Figs. 15, 16 and 17 are diagrammatic views showing the assembly steps.

It has been found desirable to provide an apparatus for facilitating assembly of prongs hav-

ing laterally displaced portions, forming locking shoulders, in plug bases having corresponding slots or passageways, whereby the displaced portions securely lock the prongs in the bases against removal. The preferred construction of base and of the prongs suitable for assembly therein is shown in my copending application Serial No. 90,042, filed July 11, 1936, and the preferred assembly steps include the soldering of the prongs to the lead wires and the insertion of the prong assembly into the plug base at the wire end thereof.

To this end, I have devised an apparatus in which a plug base may be set, two pull arms then being passed through the base slots or passageways while the base neck is distended; the prong assembly is then secured to the pull arms, and the pull arms are then withdrawn through the plug base to insert the prongs in the base slots or passageways, thus completing the assembly.

Referring to the drawings, the plug base 20 is illustrated in Fig. 3, and has two prong slots or passageways 21, see Fig. 3a, having a narrow portion 22, whereby locking shoulders 23, 24 are provided at each end thereof, the two slots or passageways extending into a common cable receiving neck slot or passageway 25. The prongs 26, see Fig. 4, have reduced portions 27, providing locking shoulders 28, 29 for cooperation with the slot shoulders 23, 24, and having slots 30 at their upper ends for facilitating the soldering of the wires 31 of the cable 32 thereto, and openings 33 at their lower ends for facilitating assembly, as hereinafter described, the assembled plug being as illustrated at 34 in Fig. 5.

Referring now to Figs. 1 and 2, the novel apparatus 35 includes a lower casing 36 which houses the pressure actuating mechanism, and on which the assembly parts are mounted. A plug base is seated in a retaining block 37 mounted on the casing and shaped to receive the base; two resilient pull arms 38 having hook ends 38a are mounted in a carriage 39, which is preferably of two separable parts 39a, 39b locked in gripping relation to the pull arm ends by means of a bolt 40, the carriage having side rails 41 to slide in aligned slots 42 in the casing top, see Fig. 7. The carriage 39 has a cross rod 43 mounted thereon, see Fig. 1, carrying cam rollers 44 at the ends thereof, these cam rollers engaging two bent levers 45 which are pivoted at their front ends 46 to a fixed cross bar 47 mounted forwardly of the casing as by means of side plates 47a; the rear ends 48 of the levers are spring connected

by means of tension springs 49 to a lug 50 secured to a cross plate 51 which is mounted on a rear carriage 52 of similar formation to the carriage 39 and also slidable in the slots 42. Two hinged toggle bars 53, see Fig. 1, are pivoted to the levers 45, and are adapted to be engaged by a contact pin 54 and by a contact plate 55 respectively mounted on the carriage 39 on either side of the toggle bars, as illustrated.

Referring now to the forward portion of Fig. 1, the levers 45 has laterally positioned plates 56 secured thereto, on which fingers 57 are pivoted, the inner ends of the fingers being formed as hooks 58, and the outer ends being pivoted to the front ends 59 of two side rods 60 which have their rear ends 61 extending through large size openings in the cross plate 51 and held against forward movement relative thereto as by nuts 62 threaded on the ends, the front ends 59 being spring connected to the ends of the fixed cross bar 47 by means of tension coil springs 63. A cam pin 64, see Fig. 6, is positioned at the rear of the retaining block, and has a reduced neck 65 around which the ends of the pull arms pass, and circular cams 66, 67 for engagement by the prong ends, as hereinafter described.

The operation of the assembling parts may now be explained. The plug base is seated in the retaining block 37, where it is held against displacement, and the carriage 39 is moved to the left, the pull arms 38 entering into and passing through the base slots or passageways. As the carriage 39 moves, the cam rollers 44 force the levers 45 apart, spreading the toggle bars 53, this spreading being positively assisted by the contact plate 55, whereby the fingers 57 are swung to the dotted line position due to the movement of the pivot plates 56, and thus enter the cable neck opening of the base and spread it; the cross plate 51 shifts forwardly as shown. The initial position of the parts is shown in Fig. 15, and the second position is shown in Fig. 16; the prong assembly is now attached to the pull arms, the hook ends 38a being inserted in the openings 33, and the pull arms are retracted, thus drawing the prongs through the plug base slots or passageways. As the retraction continues, the levers 45 are pulled together by the springs 49, the toggle being broken by contact pin 54, and the fingers 57 move to their initial position; the prong ends engage the cams 66, 67 and are forced laterally to disengage from the hooks 38a, see Fig. 17, whereby the completed assembly is free to be removed from the apparatus.

The above described operation is independent of any specific operating force; it is preferred, however, to utilize compressed air as the operating medium, and the structure therefor is illustrated in Figs. 6 to 14 inclusive.

Referring to Fig. 6, the casing 36 has a piston 70 mounted for reciprocatory movement in a cylinder 71, the piston being piston ringed at both ends. A slot 72 is provided in the upper portion of the cylinder, and a pin 73 extends through this slot and is secured to the carriage 39 and to the piston, whereby movement of the piston produces a corresponding movement of the carriage. Two flow passageways 74, 75 are provided in the cylinder walls, communicating with ports 76, 77 at the ends of the cylinder, and with passages 78, 79 at the center which connect to a valve chamber 80. As best shown in Fig. 7, an air inlet duct 81 leads to the valve chamber, and as shown in Fig. 9, an outlet passage 82 is

provided in the casing. A disk valve 83, see Fig. 11, has two ports 84, 85 adapted to register with the passages 78, 79, a cut away portion 86 for permitting inlet flow through the duct 81, and a recess 87 for communicating the passages 78, 79 with the outlet passages 82.

The valve body has a transverse slot 88 at the rear surface thereof, in which a key 89 on a disk 90 of an operating stem 91 seats, the operating stem having a manually operable handle 92 secured to the end thereof, see Figs. 8 and 2. When the handle 92 is turned to the left, see Fig. 2, the valve is in the position shown in Fig. 10, and inlet air enters the valve chamber, where it forces the valve against the rear surface and the disk 90 against the front surface of the valve chamber to obtain an efficient seal. The inlet air passes through port 84, passage 79, passageway 75 and port 77 to the rear of the cylinder to force the piston and the assembling parts forwardly, the forward end of the cylinder exhausting through port 76, passageway 74, passage 78, recess 87, and outlet duct 82. When the handle is turned to the right, the air flow is reversed, and the piston and the assembling parts are moved rearwardly. Two stop pins 93, 94 are provided on the valve housing to act as limit stops for the handle.

It is thus evident that I have provided a simple, inexpensive apparatus for assembling contact plugs, which has means for spreading the plug end opening apart while passing pull arms through the plug base slots or passageways, and then releasing the end opening after the prongs are drawn through the plug base. The described spring, cam, and toggle parts exert a maximum pressure to obtain the desired results, and the assembled plug has the prongs imbedded and locked therein by the cooperating formation of the prongs and the base slots, and without strain in the rubber or other resilient material of the base.

Moreover, although I have described and illustrated a hand lever for operating the air control valve, it is obvious that a foot lever may be readily adapted for use by any skilled mechanic, and that the spreading finger mechanism may be designed so as to open the base end at more than two points, as for example by exerting opening pressure at four points.

Although I have described a specific apparatus suitable for a specific type of plug assembly, the parts may be designed for other types of contact plugs, the essential feature of the invention residing in the threading of prongs into a resilient plug base by utilizing the resilience of the base itself, whereby the assembled base material is not under internal strain.

The term "slot" or "passageway" as used in the specification and the claims denotes the entire opening through the base including the prong receiving portions 21 and the cable neck portion 25. As illustrated, a Y-shaped slot or passageway is formed, extending through the base, the lower or single recess receiving the cable and the spaced upper recess receiving the prongs.

I claim:

1. In an apparatus of the type described, a retainer device for retaining a base of resilient material having a slot, means for passing a pull arm through said slot, means for withdrawing said pull arm through said slot to pull a contact prong therethrough, and means for distending the slot during the movements of the pull arm.
2. In an apparatus of the type described, a

retainer device for retaining a base of resilient material having a slot, means for passing a pull arm through said slot, means for withdrawing said pull arm through said slot to pull a contact prong therethrough, means for distending the slot during the movements of the pull arm, and means for disengaging said pull arm from said prong after the pulling movement.

3. In an apparatus of the type described, a retainer device for retaining a base of resilient material having a slot, means for passing a pull arm through said slot, means for withdrawing said pull arm through said slot to pull a contact prong therethrough, and means for distending the slot during the movements of the pull arm including spaced fingers adapted to enter into the slot opening of the base.

4. In an apparatus of the type described, a retainer device for retaining a base of resilient material having a slot, means for passing a pull arm through said slot, means for withdrawing said pull arm through said slot to pull a contact prong therethrough, means for distending the slot during the movements of the pull arm including spaced fingers adapted to enter into the slot opening of the base, and means for disengaging said pull arm from said prong after the pulling movement.

5. An apparatus comprising a support, a retainer device on said support adapted to receive a base of resilient material having an opening, a carriage mounted for reciprocating movement on said support, pull arms carried by said carriage and movable through a base positioned in said retainer device, means for distending the base opening, and means for reciprocating said carriage.

6. An apparatus comprising a support, a retainer device on said support adapted to receive a base of resilient material having an opening, a carriage mounted for reciprocating movement on said support, pull arms carried by said carriage and movable through a base positioned in said retainer device, means for distending the base opening, mechanism for operating said means in timed sequence to the movement of said pull arms, and means for reciprocating said carriage.

7. An apparatus comprising a support, a retainer device on said support adapted to receive a base of resilient material having an opening, a carriage mounted for reciprocating movement on said support, pull arms carried by said carriage and movable through a base positioned in said retainer device for pulling contact prongs through said base, means for distending the base opening, fluid operated means for reciprocating said carriage and means for disengaging said pull arms from said prongs after the pulling movement.

8. An apparatus comprising a support, a retainer device on said support adapted to receive a base of resilient material having an opening, a carriage mounted for reciprocating movement on said support, pull arms carried by said carriage and movable through a base positioned in said retainer device, means for distending the base opening, mechanism for operating said means in timed sequence to the movement of said pull arms, and fluid operated means for reciprocating said carriage.

9. An apparatus comprising a support, a retainer device on said support adapted to receive a base of resilient material having an opening, a carriage mounted for reciprocating movement

on said support, pull arms carried by said carriage and movable through a base positioned in said retainer device, means for distending the base opening means carried by the carriage for operating the distending means in timed sequence to the movement of said pull arms, and means for reciprocating said carriage.

10. An apparatus comprising a support, a retainer device on said support adapted to receive a base of resilient material having an opening, a carriage mounted for reciprocating movement on said support, pull arms carried by said carriage and movable through a base positioned in said retainer device for pulling contact prongs through said base, means for distending the base opening means carried by the carriage for operating the distending means in timed sequence to the movement of said pull arms, fluid operated means for reciprocating said carriage and means for disengaging said pull arms from said prongs after the pulling movement.

11. An apparatus comprising a support, a retainer device on said support adapted to receive a base of resilient material having an opening, a carriage mounted for reciprocating movement on said support, pull arms carried by said carriage and movable through a base positioned in said retainer device, fingers movable into the base opening to distend the same, means for moving said fingers in timed relation to movement of the pull arms, and means for reciprocating said carriage.

12. An apparatus comprising a support, a retainer device on said support adapted to receive a base of resilient material having an opening, a carriage mounted for reciprocating movement on said support, pull arms carried by said carriage and movable through a base positioned in said retainer device, fingers movable into the base opening to distend the same, means for moving said fingers in response to movement of said carriage, and means for reciprocating said carriage.

13. An apparatus comprising a support, a retainer device on said support adapted to receive a base of resilient material having an opening, a carriage mounted for reciprocating movement on said support, pull arms carried by said carriage and movable through a base positioned in said retainer device, fingers movable into the base opening to distend the same, means including a second carriage slidable on said support for moving said fingers, and means for moving said carriages.

14. An apparatus comprising a support, a retainer device on said support adapted to receive a base of resilient material having an opening, a carriage mounted for reciprocating movement on said support, pull arms carried by said carriage and movable through a base positioned in said retainer device, fingers movable into the base opening to distend the same, means including a second carriage slidable on said support for moving said fingers, means for reciprocating said first carriage, and means for sliding said second carriage upon reciprocation of said first carriage.

15. In an apparatus for assembling a connector plug of resilient material having a base with a Y shaped passageway therethrough, means for holding said base, means for distending the passageway through said base, means for reciprocating a pair of spaced pull arms through said distended passageways, said pull arms being adapted to pull a pair of contact blades into said passageway, and means for withdrawing the distending means after the pull movement to allow said re-

silient base to return to its normal shape for anchoring said contact blades in said passageway.

16. In an apparatus for assembling a connector plug of resilient material having a base with a Y shaped passageway therethrough, means for holding said base, means for distending the passageway through said base, means for reciprocating a pair of spaced pull arms through said distended passageway, said pull arms being adapted to pull

a pair of contact blades into said passageway, means for releasing said contact blades from said pull arms, and means for withdrawing the distending means after the pulling movement to allow said resilient base to return to its normal shape for anchoring said contact blades in said passageway.

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