

April 28, 1942.

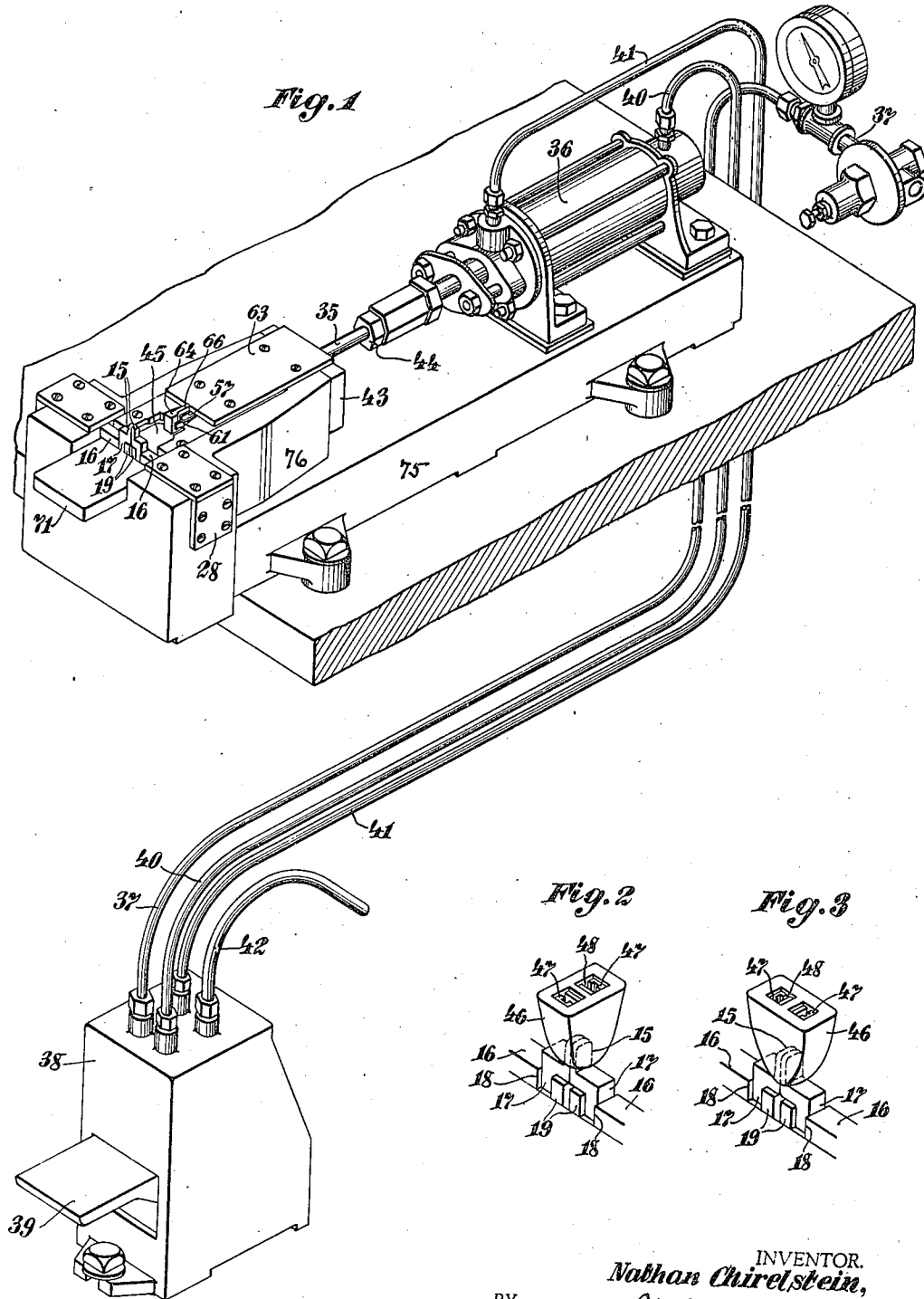
N. CHIRELSTEIN

2,281,479

ATTACHMENT PLUG ASSEMBLING MACHINE

Filed March 13, 1940

3 Sheets-Sheet 1



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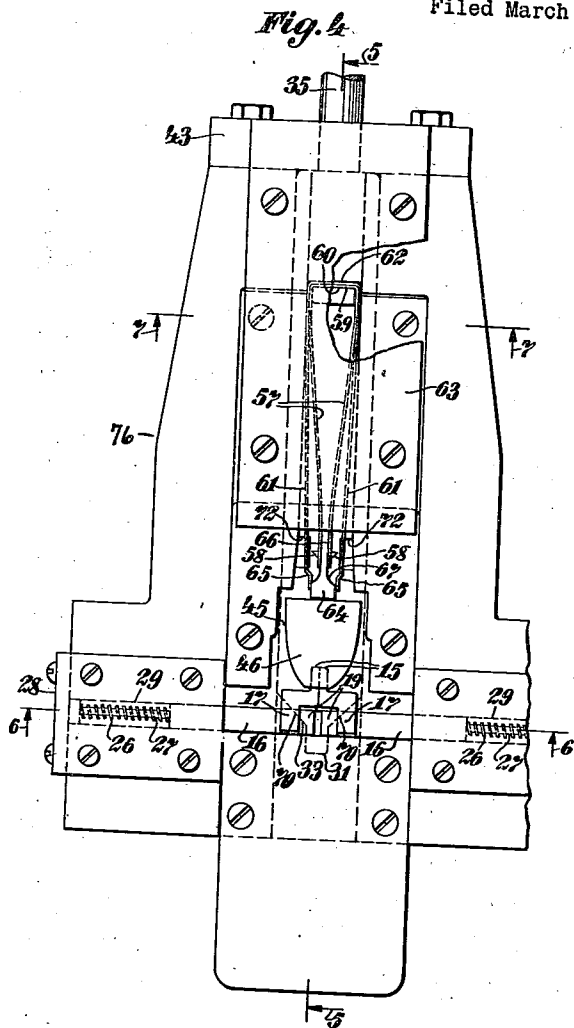
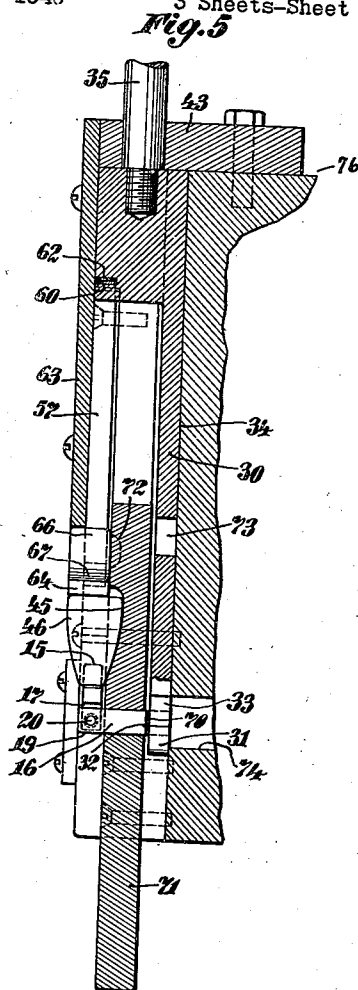
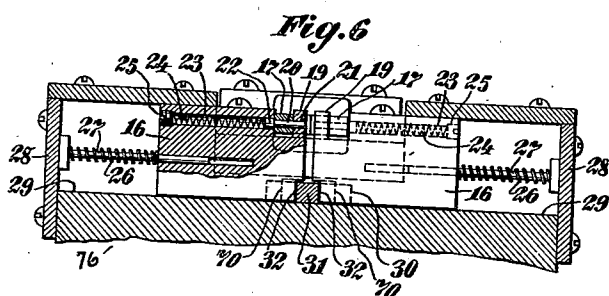
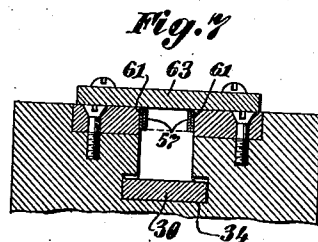
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Fig. 8

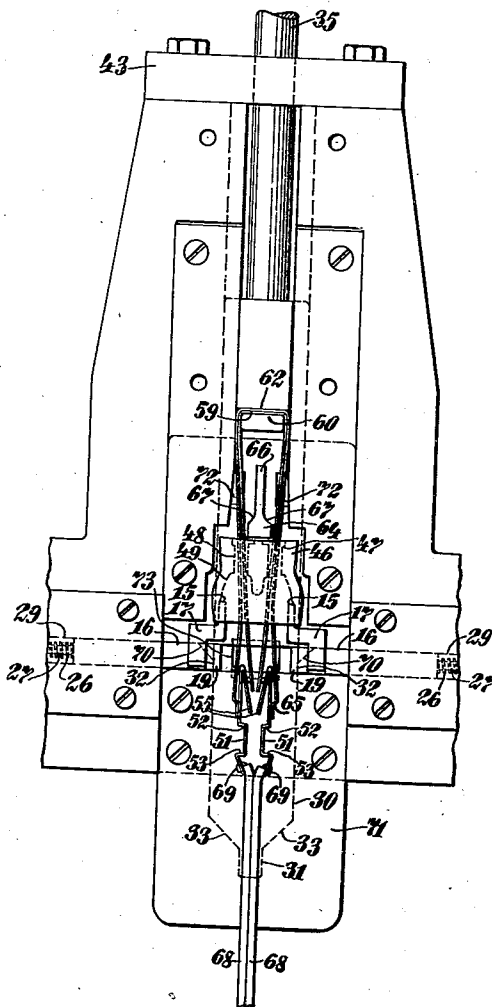


Fig. 9

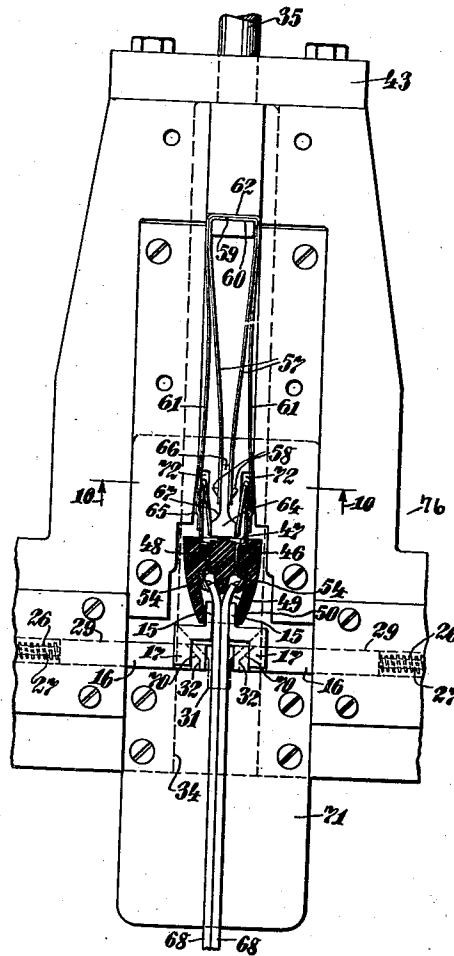


Fig. 11

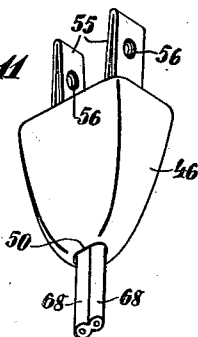
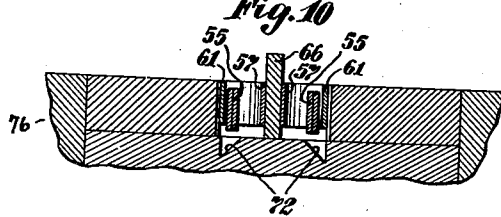


Fig. 10



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2,281,479

ATTACHMENT PLUG ASSEMBLING MACHINE

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Application March 13, 1940, Serial No. 323,656

7 Claims. (Cl. 29—84)

The invention herein disclosed relates to the assembling of the wires and contact blades in the caps or body members of electric attachment plugs and particularly those in which the caps are of molded rubber.

Broad objects of the invention are to provide simple, practical and efficient mechanism for rapidly assembling such parts.

Further special objects are to accomplish the assembling of the plug parts with a minimum of strain and wear on the parts or on the machine and thus to enable a relatively light and inexpensive form of mechanism to accomplish all the purposes of the invention.

The foregoing and other desirable objects are attained by the novel features of construction, combinations and relations of parts hereinafter described, illustrated in the accompanying drawings and broadly covered in the claims.

In the drawings, there is shown one of the practical commercial embodiments of the invention, but as this illustration is primarily for purposes of disclosure, it will be realized that structure may be modified and changed in various ways, all within the true intent and broad scope of the invention.

Fig. 1 is a perspective view of the machine.

Figs. 2 and 3 are diagrammatic views showing how the rubber plug cap is slipped over the spreader fingers in one position and then turned a quarter way around to line it up for the spreading action.

Fig. 4 is a broken plan view showing the plug and spreader fingers rocked down into the operating cavity in the machine.

Fig. 5 is a broken longitudinal sectional view on substantially the plane of line 5—5 of Fig. 4.

Fig. 6 is a broken cross-sectional view substantially on the line 6—6 of Fig. 4.

Fig. 7 is a broken cross-section as on line 7—7 of Fig. 4.

Fig. 8 is a broken plan similar to Fig. 4, showing the spreader fingers separated to stretch the plug and the needles as having advanced through the opened up plug passages into position for the blades to be caught thereon.

Fig. 9 is a like view, but showing the needles withdrawn and the blades seated in the plug cap, the latter appearing in section and still engaged on the spreader fingers.

Fig. 10 is an enlarged broken sectional detail as on line 10—10 of Fig. 9.

Fig. 11 is a perspective view of a completed, assembled connector plug.

In the general view, Fig. 1, the machine is

shown as comprising first a pair of spreader fingers 15, 15, adapted to enter the cord passage in the back of a molded plug cap and pivotally mounted in opposing relation on the inner ends of the relatively separable slides 16, 16. These fingers are illustrated as having laterally offset and substantially parallel base portions 17, pivotally entered in the slots 18, 18, in the upper edges of the slides, thus to provide solid end portions 19, 19, to brace and support the fingers in the plug spreading and opening movement.

To yieldingly hold the spreader fingers in various positions of adjustment, they are shown in Fig. 6 as pivoted on the pins 20, guided in passages 21, in the ends 19, of slides 16, and having heads 22, slidable in the bores 23, into engagement with the base portions 17, of the fingers and yieldingly held so by springs 24, in said bores, retained by the closure screws 25. This construction permits the spreader fingers to turn up or down on the slides and causes them to be yieldingly retained in either of such relations.

The spreader slides or "doors" 16 are yieldingly pressed toward each other by the springs 26, on guide rods 27, carried by and projecting inward from the removable side plates 28, closing the outer ends of the transverse channel 29, in which the slides operate.

Opening of the transverse spreader slides or doors 16 is effected by a longitudinally operating slide 30, having a forward narrowed end 31, projecting through the notched lower edges 32, of the doors and inclined wedge shoulders 33, operating as cams to force the doors apart.

The wedge slide 30 is shown as operating in a longitudinal guide channel 34, and as actuated by the rod 35, connected with a piston operating in the power cylinder 36.

In the present disclosure, power is furnished by compressed air supplied through line 37, to a foot valve 38, which, when the pedal 39 is depressed, furnishes air through line 40, to one end of the cylinder and when depressed the next time, delivers air through line 41, to the opposite end of the cylinder, exhausting air from the inactive end of the cylinder each time through an exhaust line 42.

The stroke of the power piston is limited to accurately control the movement of the operating slide 30, and to prevent injury to the piston from striking the heads of the cylinder, by provision of a solid striker plate 43, at the back of the machine engageable at one side by the end of the slide (Fig. 5) and engageable at the opposite side

by an abutment nut 44, adjustable on the combination slide and piston rod 35.

In the retracted position, Figs 4 and 6, the reduced tongue 31, on the end of the slide by its entry between the doors 16, positions the latter with the spreader fingers in engagement and located centrally of the plug cap receiving cavity 45. In this position, with the fingers standing up as in Fig. 1, the parts are ready to receive the plug cap. The plug cap or body member here illustrated is like that covered in the Chirelstein Patent 2,187,489, January 16, 1940, and comprising a block 46, of rubber or other suitable resilient insulating material molded with spaced seats 47, at the front end of the same, straight, substantially parallel narrow passages 48, extending from such end seats into the chamber 49, and cord passage 50, extending from said chamber through the back of the body. The contact blades for this particular plug, as shown in Figs. 8 and 9, are of the same width throughout and substantially straight except for the slight transversely extending U-bends 51, in the intermediate portions of the same, which provide the shoulders 52, to engage the seats 47, on the end of the plug body and shoulders 53, to abut the surfaces 54, at the inner ends of the blade receiving passages 48. These blades also are shown as having intumed reversely bent spring end portions 55, with openings 56, therein. This relation of parts effects a secure positioning and interlocking of the contacts in the plug body and at the same time, affords a construction, which under the stretching action of the spreader fingers, opens up the plug body, so that the blades can be introduced by a straight through movement.

Fig. 8 shows the spreader fingers separated and the plug body stretched open for the straight entry of the contact blades.

Insertion of the blades is effected in the present machine by a pair of so-called "needles" which are projected through the opened plug passages and then, after the contacts are temporarily engaged therewith, withdrawn to pull the contacts into position, at which time, the spreader fingers then permit the plug body to snap closed over the inserted blades.

The blade pulling needles are designated 57, and are shown as the side arms of a U-shaped piece of spring strip metal carrying near the free ends of the same, the small projecting points 58, to enter the openings 56, in the spring ends of the blades.

The needle strips 57, are tensioned toward each other as shown in Fig. 9, by the integral connecting back or bridge portion 59, and these needles are attached to the slide by having this back portion entered in the cross slot 60, in the top of the slide.

To temporarily retain the blades engaged on the short pins 58, a second U-shaped spring strip is shown, disposed about the U-shaped needle piece, having inwardly tensioned side arms 61, projecting beyond the needles and connected by a back portion 62, seated in the same slot 60, in the top of the slide. These two U-shaped spring clips nest one within the other as shown and are held in place by simply engaging the loop ends of the same in the cross slot of the slide, the cover plate 63, secured over the slide retaining them in this relation.

The spring needles 57, and the spring guards 61, at the outer sides of the same are held properly spread to pass freely through the widened

passages 48, in the stretched plug by an interposed stationary post 64. In the fully retracted position, Fig. 4, the inwardly bent tips 65, of the guard fingers 61, rest against the sides of this post, with the points of the needles collapsed in more closely spaced relation against the reduced portion 66, of the post. This reduced or thinned portion is shown connected with the wider head portion of the post by inclines 67, which enable the needles to collapse away from the guard fingers in the retractive movement of the slide.

Operation

With the slide retracted and the spreader fingers 15, standing up as in Fig. 1, the plug cap 46, is engaged over these fingers, usually by engaging the cord passage 50, the long way, over the fingers as in Fig. 2, and then rotating the plug a quarter turn as in Fig. 3, in which latter relation the plug and fingers are rocked downward, thus to carry the plug down in the operating cavity 45, with the front end of the same up against or closely adjacent the guide post 64, Figs. 4 and 5.

Pressure on the foot pedal 39, then throws the air or other fluid into the back end of the power cylinder 36, causing the piston to snap the slide 30, forwardly from the Fig. 4 to the Fig. 8 position. In this movement, the inclines 33, on the slide, acting against the inclines 70, on the doors, thrust the doors apart, causing the spreader fingers 15, on the inner ends of the doors to stretch the plug and fully open up the passages 48, so that the needles 57, and guard fingers 61, can advance freely through said passages.

With the needles and guard fingers projecting from the distended plug as in Fig. 8, the contacts are then caught over the pointed spurs 58, of the needles, usually by simply forcing the wedge-like spring points of the blades up between the needles and the spring fingers at the outer sides of the same. At such time, the wires 68, will usually have been soldered to the terminal portions of the blades at 69, so that such wires can be used as an aid in positioning and engaging the blades over the spurs of the needles. As a further aid for so engaging the parts, the machine is shown provided with a small table 71, in front of and underlying the projecting needles 57, and guard fingers 61.

With the blades thus temporarily connected with the needles, the foot pedal 39, is again operated and this time the power fluid admitted to the front end of the cylinder by piping 41, snaps the slide backward, pulling the needles and attached blades back through the still opened gates 16, to a position approaching that shown in Fig. 9, the blades being substantially fully drawn up into the plug body at the time when the retracting slide 30, drops the doors closed, permitting the spreader fingers to let the elastic plug body snap closed over the inserted shank portions of the contact blades.

In retracting to the position shown in Fig. 9, the spring needles 57, collapse over the reduced back portion of the post 64, thus to withdraw the pins 58, thereon from engagement in the openings 56, in the spring tips of the contact blades.

The plug then fully assembled and simply frictionally retained in the machine, may be removed by simply jerking the attached wires 68, upward away from the spreader fingers 15, such action having the effect of pulling the plug entirely off and clear of such fingers. This move-

ment also will usually have the effect of rocking the spreader fingers back into the upstanding position, Fig. 1, ready to receive the next plug cap.

To overcome any tendency and to positively prevent the plug prongs from hanging on the needle spurs 58, a construction like that shown in Fig. 10 is preferred, in which downwardly and outwardly sloping cams 72, are provided in the bottom of the operating cavity at opposite sides of the post 64, and in position to be engaged by the tips of the spring prongs, as they would pivot downward, if temporarily caught on the needle spurs 58. In such case, the upward pull on the wires would cause the plug to swing about such spurs as pivots and the tips of the prongs then to rotate downward over such cam surfaces, which would operate automatically to spread the prongs away from and out of engagement with the needle spurs.

To afford clearance for any small cuttings or chips that might result from operation of the machine, the operating slide is shown as having an opening 73, therethrough which, in the projected position of the slide, will register with an opening 74, down through the base of the machine, in line with the assembly cavity.

By stretching the elastic plug cap and thus opening up the blade passages so that the needles can pass straight through and draw the blades back into position for the plug body to close over the blades, the machine makes it possible to commercially assemble a plug like that shown, in which the blades have offset portions to engage side shoulders at opposite ends of the blade receiving passages. Furthermore, this preliminary or preceding opening up of the plug passages enables a relatively light form of construction to be used for going through the expanded passages and picking up the contact blades. The so-called needles used for this purpose simply have to be projected through the opened up passages and then pull the contact blades into the position where the stretched cap can be released to close over the shanks of the blades. The only load imposed on the needles thus is the light tension of drawing the contacts and attached wires up into position. The needles consequently can be of light strip stock and all in one continuous U-formation. Also, since no rocking or swinging movements are required and since the needles are not obliged to force open the plug or to follow any sinuous passages therein, such needles can be quite thin, flexible and resilient instead of being more bulky as would be the case if they had to be rigid and non-yielding. The spring guards in association with the needles as shown in Fig. 8, provide a means for positioning or aiding in the associating of the contact blades with the needles, constituting the pulling devices. The underlying shelf 71, also is of considerable aid in enabling the quick engagement of the blades with the prongs of such pulling devices.

The machine may be very simply constructed. In the illustration, a single base casting 75, provides the foundation and support for all the parts. The head construction 76, at the front end of the base carries the longitudinal and transverse guideways for the slide 30, and the transversely acting spreader doors 16, operated thereby. The power cylinder is shown mounted on the back end of the base. The machine in this form is thus a single unit which can be set

up by simply bolting it down on a work bench or the like.

The power cylinder provides a desirable means for operating the machine, particularly as to speed of action but other power means may be substituted, or if so desired, the machine may be operated by hand or foot power, through the medium of suitable actuating connections provided for the purpose.

What is claimed is:

1. In a machine of the character disclosed, the combination of spreader slides opposed end-to-end, means for effecting relative separation and approach of said slides and spreader fingers pivotally mounted on said opposed slides and projecting therefrom to enter the cord passage in the end of a stretchable plug cap and the pivotal mounting of said spreader fingers on said slides permitting the rocking of a plug cap engaged thereon from a position with said plug cap standing in one plane to a position with said plug cap standing in another plane angularly related to the first.

2. In a machine of the character disclosed, the combination of spreader slides opposed end-to-end, means for effecting relative separation and approach of said slides and spreader fingers pivotally mounted on said opposed slides and projecting therefrom to enter the cord passage in the end of a stretchable plug cap, said slides having notches in the edges of the same adjacent said opposing ends and said spreader fingers having base portions pivotally fitting in said notches and thereby supported and reinforced by the material of the slides at opposite sides of said notches.

3. In a machine of the character disclosed, the combination of a slide having a notch across the edge of the same and a pair of U-shaped spring yokes disposed one about the other and having the looped end portions of the same seated in said cross notch in the slide, the arms of the inner yoke having means for temporary holding engagement with the blades for an attachment plug and the arms of the outer yoke overstanding the arms of the inner yoke to retain attachment plug blades so engaged with said arms of the inner yoke.

4. In a machine of the character disclosed, the combination of a spring yoke provided with means for temporary holding engagement with the blades for an attachment plug and a second spring yoke about said first spring yoke for retaining plug blades so engaged.

5. A machine for assembling contact blades in elastic attachment plug caps having each a cord passage and communicating blade receiving passages and comprising separable slides mounted in opposed end to end relation, spreader fingers on the opposing ends of said slides to enter the cord passage of an elastic plug cap and over which such a plug cap may be so engaged, a contact blade seating slide mounted to operate substantially at a right angle to said spreader finger slides, means carried by said contact blade seating slide for effecting separating movement of said spreader finger slides and consequent stretching of a plug cap engaged over said spreader fingers, thin flat substantially straight strips carried by said contact blade seating slide in line with the blade receiving passages of a plug cap engaged on said spreader fingers and provided with means for effecting temporary attachment of contact blades thereto and spring guard strips overlying said first mentioned strips for

confining attachment blades in such temporarily attached relation.

6. A machine for assembling contact blades in elastic attachment plug caps having each a cord passage and communicating blade receiving passages and comprising separable slides mounted in opposed end to end relation, spreader fingers on the opposing ends of said slides to enter the cord passage of an elastic plug cap and over which such a plug cap may be so engaged, a contact blade seating slide mounted to operate substantially at a right angle to said spreader finger slides, means carried by said contact blade seating slide for effecting separating movement of said spreader finger slides and consequent stretching of a plug cap engaged over said spreader fingers, thin flat substantially straight strips carried by said contact blade seating slide in line with the blade receiving passages of a plug cap engaged on said spreader fingers and provided with means for effecting temporary attachment of contact blades thereto and guards overlying said strips for holding contact blades so attached thereto.

7. A machine for assembling contact blades in elastic attachment plug caps having each a cord

passage and communicating blade receiving passages and comprising separable slides mounted in opposed end to end relation, spreader fingers on the opposing ends of said slides to enter the cord passage of an elastic plug cap and over which such a plug cap may be so engaged, a contact blade seating slide mounted to operate substantially at a right angle to said spreader finger slides, means carried by said contact blade seating slide for effecting separating movement of said spreader finger slides and consequent stretching of a plug cap engaged over said spreader fingers and thin flat substantially straight strips carried by said contact blade seating slide in line with the blade receiving passages of a plug cap engaged on said spreader fingers and provided with means for effecting temporary attachment of contact blades thereto, said spreader fingers being pivotally mounted on the opposing end portions of said separable slides and movable from a position with a plug cap engaged thereon in line with said contact blade engaging strips, angularly to a position out of the range of movement of said strips.

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