April 15, 1952 C. H. WILMOT 2,593,081

APPARATUS FOR ASSEMBLING CONNECTOR PLUGS

Filed Aug. 25, 1948 2 SHEETS—SHEET 1

Fig. 1

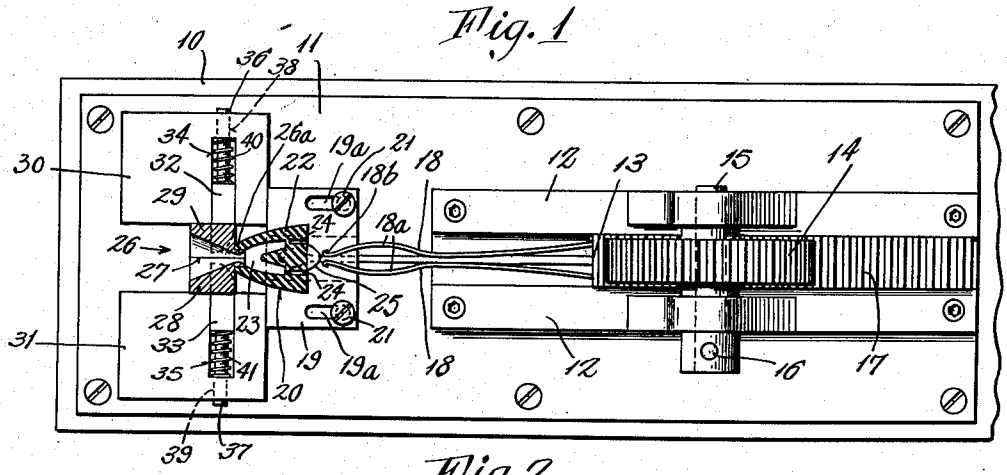


Fig. 2

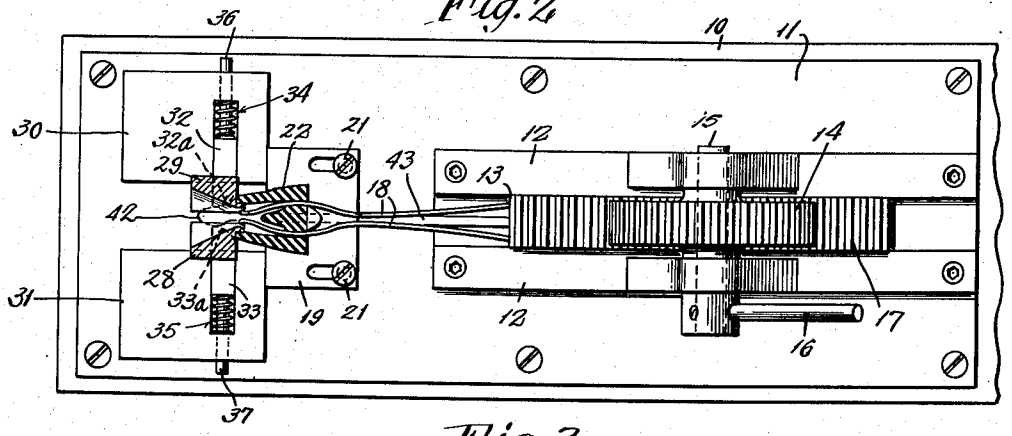
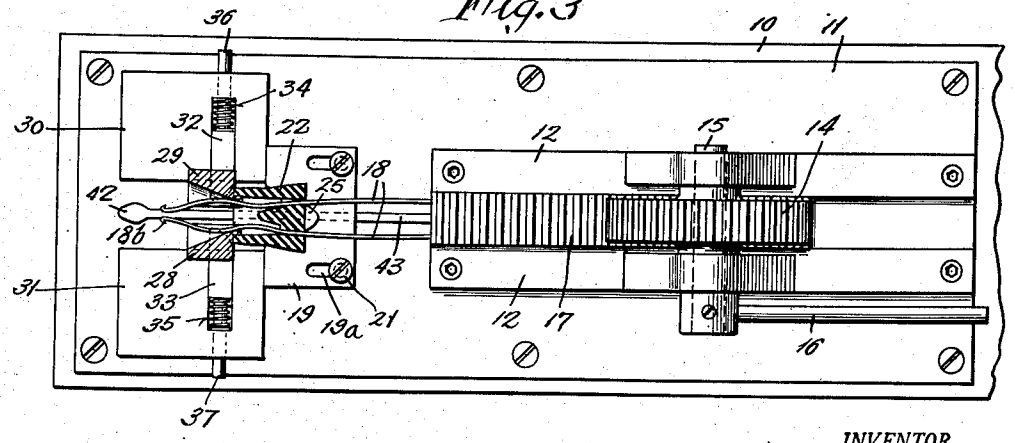


Fig. 3



INVENTOR.
Charles H. Wilmot
BY
Johnson and Kline
ATTORNEYS

April 15, 1952 C. H. WILMOT 2,593,081

APPARATUS FOR ASSEMBLING CONNECTOR PLUGS

Filed Aug. 25, 1948 2 SHEETS—SHEET 2

Fig. 4

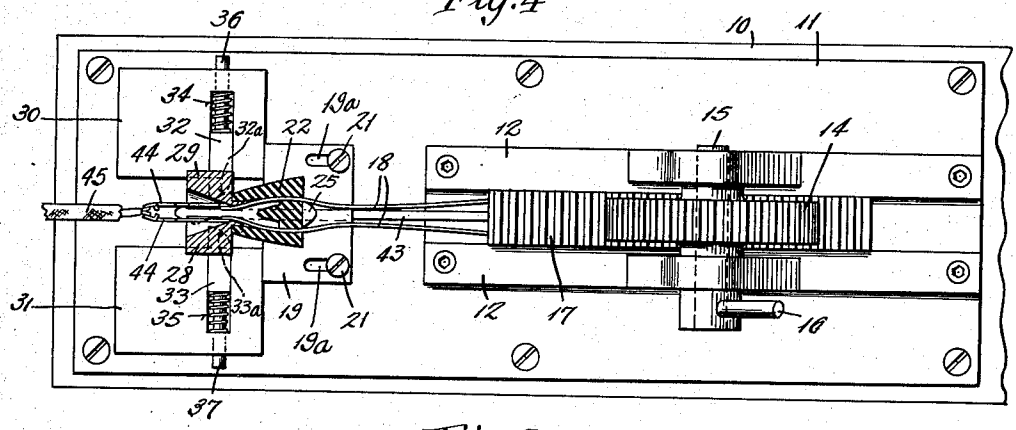


Fig. 5

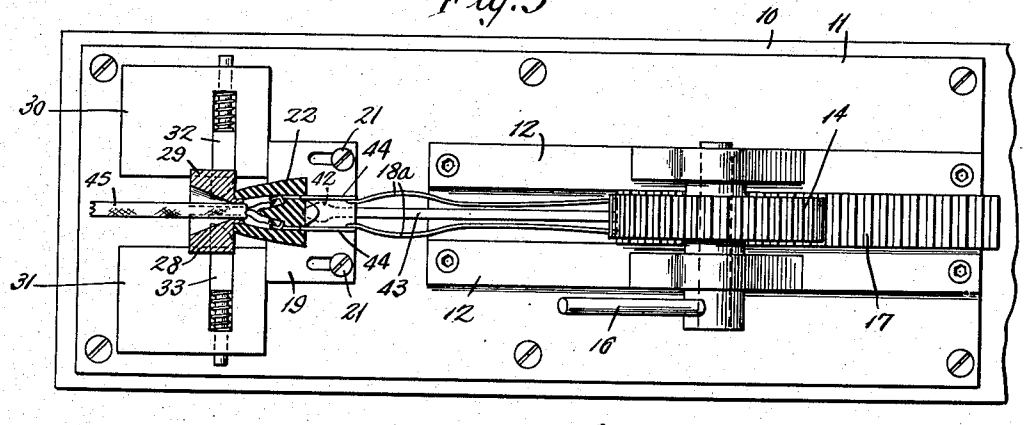
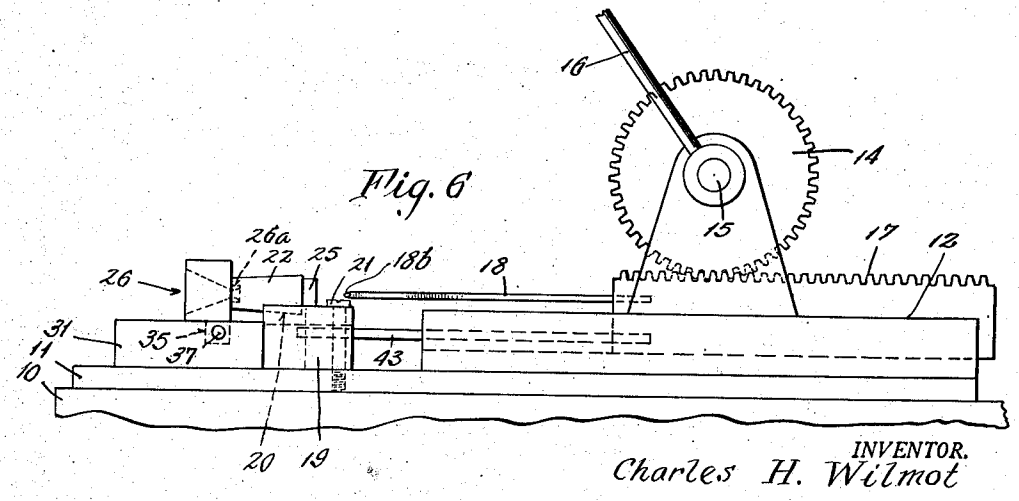


Fig. 6



INVENTOR.
Charles H. Wilmot
BY
Johnson and Kline
ATTORNEYS

Patented Apr. 15, 1952 2,593,081

UNITED STATES PATENT OFFICE

2,593,081

APPARATUS FOR ASSEMBLING CONNECTOR PLUGS

Charles H. Wilmot, Gales Ferry, Conn., assignor to The Plastic Wire & Cable Corporation, Jewett City, Conn., a corporation of Connecticut

Application August 25, 1948, Serial No. 46,016

4 Claims. (Cl. 29—206)

1

This invention relates to machines for assembling electrical connector plugs and more particularly to a machine for assembling the contacts, which have been attached to conductors, with a body of resilient material having preformed passageways for receiving and positioning the contacts and attached conductors.

Heretofore in assembling contacts and conductors with the plugs, the neck of the plug adjacent the base of the plug would be engaged by the needles for drawing in the contacts as the same were inserted through the passages of the plug. Engagement of the needles with the walls of the base aperture, however, many times caused damage to the walls. This type of assembly also had the disadvantage that the insulation on the connector cord would engage the end of the plug and would strip back as the contacts are pulled in position.

An effort was made to avoid these difficulties by providing pivoted fingers which were moved into the base aperture and separated to stretch the neck and hold it out of contact with the needles during their passage through the body to pull the contacts and connector cord in place and to hold the neck open until the cord had passed into the apertures to avoid the stripping of the insulation. This, however, was unsatisfactory in that the fingers which were automatically inserted in the base aperture to spread the neck had a tendency, due to forceful operation on the neck, to rip the body and tear the base adjacent the aperture.

The present invention overcomes these difficulties by providing a guide means which protects the plug body during the insertion of the contacts and cord therein and which has guide surfaces for leading the connector cord and contacts into the opening providing a smooth passage therefor.

This is accomplished according to the present invention by providing guide means which extends within the opening to be engaged by the pulling needles as the same pass therethrough. The guide means being disposed between the walls of the aperture and the needles will protect the walls against damage incident to the movement of the needles through the plug and the guide means will protect the insulation on the cord as it passes into the base aperture and thereby preventing it from being stripped during this operation. The guide means can be used in connection with the manual insertion of the contacts or with machine insertion where the needles are actuated by a power operator.

2

In the preferred form of the invention the guide means is a funnel-shaped guide which is split longitudinally and has a neck portion which is inserted in the base opening of the plug and is provided with an inner surface which will receive the ends of the needle within the neck portion so that the two portions of the guide can be spread thereby. The guide also has a large mouth portion into which the cord moves and is guided thereby through the narrow portion and into the body of the plug.

In order to insure that the needles will at all times enter the guide means, it is at present preferred to provide means for temporarily spreading the guide means slightly to insure that the opening in the guide means will be wide enough to receive the needles as they pass through the plug body. As soon as the needles are in the body, the means becomes inoperative to spread the guide means which are thereafter spread by the action of the needles. This temporary spreading means also will support the guide means and prevent the guide means from returning to normal position after the needles have left the same and while the contacts and connector cord connected thereto move into the body.

A feature of the invention is the novel apparatus whereby the contacts are assembled with the body without damage thereto in which the body is spread by the needles while at the same time being protected by the guide of the present invention.

Other features and advantages of the invention will be apparent from the specification and claims when considered in connection with the drawings in which:

Figure 1 shows a view of the machine embodying the present invention with the guide means inserted in the base and the needles in starting position.

Fig. 2 shows a view similar to Fig. 1 with the guide means slightly spread and the needles passing into the opening of the guide. The amount of spread given to the body is exaggerated in this view so that the position of the needles may be better seen.

Fig. 3 shows a view similar to Fig. 1 with the needles completely extended through the body and the guide means spread thereby.

Fig. 4 is a view similar to Fig. 1 with the needles on the return stroke.

Fig. 5 is a view similar to Fig. 1 with the contacts and connector cord in final position.

Fig. 6 is a side view of the machine.

As shown in Fig. 1 the machine comprises a

base 10 having a base plate 11 mounted thereon and provided with ways 12 for supporting the needle-operating slide 13. This slide may be driven by the usual hydraulic or manually operated power means. In the herein illustrated form of the invention, it is operated by a manually operated gear 14 mounted on a shaft 15 and rotated by a handle 16. The gear meshes with a rack 17 formed on the top of the slide 13 so that by rotating the gear the slide 13 is caused to reciprocate in the ways 12. The slide 13 has projecting from its forward end a pair of contact or blade-inserting members or needles 18 having plug spreading portions 18*a* intermediate their ends and at their forward end hooks 18*b* to which the contacts are connected to be withdrawn into the body.

A support 19 is mounted on the base 11 and has a cavity 20 therein for receiving the plug body. The support 19 is provided with slots 19*a* and is secured to the base by screws 21 so that it may be adjusted on the base to accommodate plug bodies of different lengths.

The plug body 22 as shown in section has a central aperture 23 and a pair of contact or blade-receiving slots 24 therein. The support is also provided with a spreader cam 25 to engage the ends of the blade-inserting members, as they move toward engagement with the plug, and spread the same and guide them into the slots.

The guide means of the present invention is illustrated as comprising a body 26 which is divided or split longitudinally at 27 to provide two parts 28, 29. The body has a reduced neck 26*a* which is adapted to be inserted in the central aperture or the base opening of the plug body and is provided with a funnel bore therethrough having a large mouth at its outer end and terminating in a small mouth in the reduced portion 26*a*. The two parts are carried by supporting members 30, 31 disposed at the end of support 19. The parts are mounted for movement toward and away from one another by being secured to blocks 32, 33 slidable in slots 34, 35 in members 30, 31 and are guided therein by pins 36, 37 slidable in apertures 38, 39. The two parts are normally urged together by light springs 40, 41.

It will be noted that the mouth of the bore in the guide which extends into the body of the plug is flared outwardly so as to facilitate the reception of the ends of the blade-inserting members 18. In order to insure that the blade-inserting members will at all times enter the mouth, the present invention provides means for temporarily spreading the guide parts in timed relation to the movement of the blade-inserting members. One such means is herein illustrated as comprising a cam 42 carried on extension 43 mounted on slide 13 to be moved with the blade-inserting members. The cam 42 engages the ends 32*a*, 33*a* of the slides and moves them apart slightly as the carriage moves forward. In the present preferred form of the invention, the width of the cam 42 is sufficient to open the neck without substantial spreading of the plug. As soon as the needles are between the slides, the bowed portion 18*a* thereof engages the walls of the guides and acts to spread them.

The functioning of the structure will probably be better understood by carrying through the operation of assembling a pair of contacts, herein illustrated as blade contacts such as used to form a male connector plug, and a connector cord with a plug body. As shown in Fig. 1, the first step in the assembly comprises inserting the plug

body into the cavity 20 on the support with the portion 26*a* of the guide in position in the central aperture of the plug body. The handle 16 is rotated to the rear causing the slide 13 to be moved forwardly. As the slide moves forwardly cam 42 engages the blocks 32, 33 and moves the guide parts 28, 29 apart slightly, as shown in Fig. 2, to insure the entrance of the needles between the guide parts. As noted previously, the spread has been exaggerated in this view in order to clearly show the position of the ends of the blade-inserting members or needles 18 between the guide parts. Continued movement of the handle causes the needles to pass through the guide parts and the portions 18*a* thereof will spread the guide parts, as shown in Fig. 3, and at the same time spread the neck of the plug to enable the contacts and connector cord to be moved therein. At the end of the forward stroke, the ends of the needles project beyond the guide as shown in Fig. 3 and the contacts 44 and connector cord 45 are readily attached to the hooks 18*b*. The handle is then operated in the reverse direction withdrawing the needles and pulling the contacts and attached connector cord through the guide and into the body as shown in Fig. 4. It will be noted in Fig. 4 that the member 42 is about to engage the ends of the blocks and temporarily support the guide parts as the needles move out of engagement therewith to hold said guide parts against movement into engagement with one another. This forms a passage therethrough and into the plug body for the connectors and connector cord attached thereto, protecting the same against contact with the end of the body and thus eliminating the stripping of the insulation from the cord.

After the contacts have been pulled into final position, as shown in Fig. 5, the needles return to the position of Fig. 1 and are released from the blades. The contact plug is then withdrawn from the support and pulled from the end of the guide means and removed from the machine. Since the guide means are pressed together by very light springs the grip on the connector cord is not sufficient to strip the insulation from the conductors during this removal.

It will be apparent from the foregoing that a novel and improved method of assembling the connector plug is provided by the present invention, which method insures less damage to the plug and cord and greatly facilitates the assembling operation. It is also apparent that the guide member of the present invention protects the walls against damage by the needles as the walls are spread by the movement of the needles and guides and leads the connector cords into position in the body without danger of stripping the insulation therefrom.

Variations and modifications may be made within the scope of this invention and portions of the improvements may be used without others.

I claim:

1. A machine for assembling a double terminal connector cord having a contact blade secured to each terminal within a connector plug of resilient material formed with a central aperture extending from the rear of said plug within said body and merging with spaced blade-receiving slots extending from within said base to the front of said plug comprising a plug holder; spaced blade-inserting members mounted in front of said plug; means on each of said members for securing a blade thereto; means for reciprocating said members to move the same simultaneously through

said slots and aperture to the rear of said plug and withdrawing them for pulling a contact blade into each of the spaced slots; a guide comprising two parts, each having a portion extending into the central aperture to overlie the side wall thereof, means mounting said parts for lateral movement with respect to said aperture; means operated in advance of the blade-inserting members to spread said guide parts to receive the members between them with said portions of the guide extending into the central aperture lying between the wall and member, said last-named means being thereafter inoperative; and divergent portions on said members to engage said portions of the guide and spread said parts to a greater extent when the members are moved through the said portions to receive the blades, said portions of the guide also protecting the walls of the aperture from damage by the members during movement of the members therethrough and during passage of the blades into the plug by the blade pulling movement of said members.

2. A machine for assembling a double terminal connector cord having a contact blade secured to each terminal within a connector plug of resilient material formed with a central aperture extending from the rear of said plug within said body and merging with spaced blade-receiving slots extending from within said base to the front of said plug comprising a plug holder; spaced blade-inserting members mounted in front of said plug; means on each of said members for securing a blade thereto; means for reciprocating said members to move the same simultaneously through said slots to the rear of said plug and withdrawing them for pulling a contact blade into each of the spaced slots; a guide comprising two parts, each having a portion extending into the central aperture; spring means urging said parts together; opening means operated in timed relation with the movement of the blade-inserting members and operative only during part of the movement of said members to temporarily spread said guide parts to receive the members between them; and bowed portions on said members engaging said portions on said guide parts to spread said parts to a greater extent to open the aperture sufficiently to receive the blades, said opening means temporarily separating said guide parts after the members move out of contact therewith during the pulling of the blades into the plug by said members.

3. A machine for assembling a double terminal connector cord having a contact blade secured to each terminal within a connector plug of resilient material formed with a central aperture

extending from the rear of said plug within said body and merging with spaced blade-receiving slots extending from within said base to the front of said plug comprising a plug holder; spaced blade-inserting members mounted in front of said plug; means on each of said members for securing a blade thereto; means for reciprocating said members to move the same simultaneously through said slots and aperture to the rear of said plug and withdrawing them for pulling a contact blade into each of the spaced slots; a guide comprising a body having a tubular neck portion at one end to extend into the central aperture of the plug and a wide funnel-shaped mouth at the other end to receive and guide the blades and attached connector cord into the plug, said guide body being divided along a vertical plane into two parts, means mounting said parts for lateral movement with respect to said aperture; means operated in advance of the blade-inserting members to spread said guide parts to receive the members between them with said neck portions lying between the wall and member, said last-named means being thereafter inoperative; and divergent portions on said members to engage said neck portions and spread said parts to a greater extent when the members are moved through the said neck portions to receive the blades, said neck portions protecting the walls of the aperture from damage by the members during movement of the members therethrough and during passage of the blades into the plug by the blade pulling movement of said members and said funnel-shaped mouth guiding the blades to the plug during the pulling movement of said members.

4. The invention defined in claim 1 wherein common manually actuatable means actuates the means operated in advance of the blade inserting members for spreading the guide parts and the means for reciprocating the blade inserting members.

CHARLES H. WILMOT.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
463,473	Beam	Nov. 17, 1891
979,438	Courtney	Dec. 27, 1910
2,169,777	Wertzheiser	Aug. 15, 1939
2,198,966	Herman	Apr. 30, 1940
2,231,348	Reutter	Feb. 11, 1941
2,278,176	Herman	Mar. 31, 1942
2,281,479	Chirelstein	Apr. 28, 1942