March 10, 1959 J. F. PHILLIPS 2,876,668

SEMI-AUTOMATIC MEANS FOR ASSEMBLING CONNECTOR TERMINALS ON WIRES

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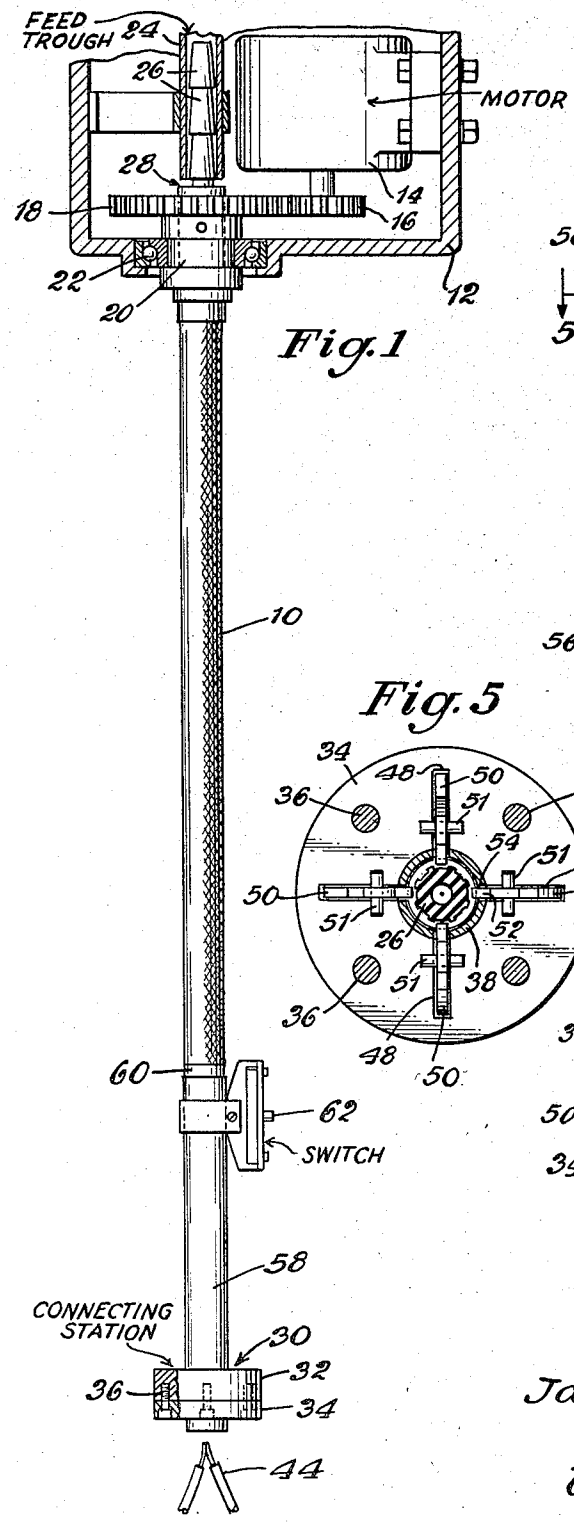


Fig. 1

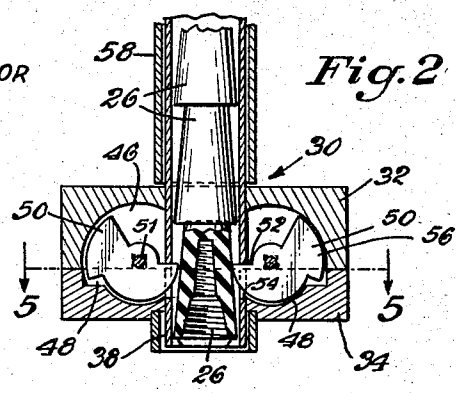


Fig. 2

Fig. 3

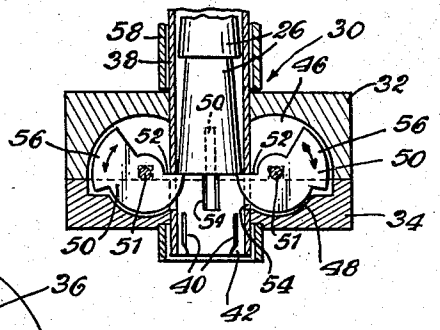
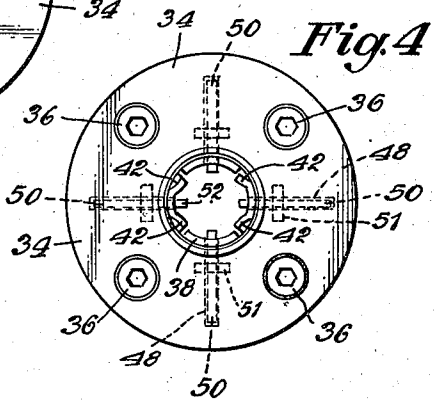


Fig. 5

Fig. 4



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Fig. 6.

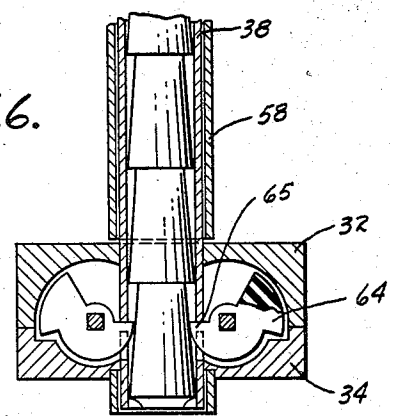
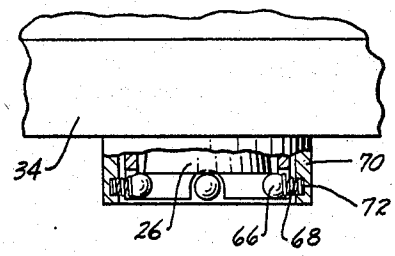


Fig. 7.



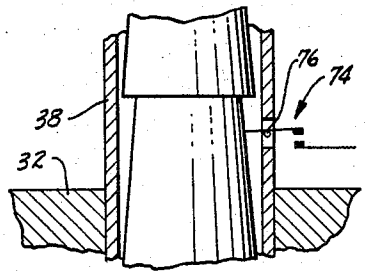


Fig. 8.

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SEMI-AUTOMATIC MEANS FOR ASSEMBLING CONNECTOR TERMINALS ON WIRES

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9 Claims. (Cl. 81—57)

My invention is in the field of mechanism for automatically feeding and rotating wire connectors of the so-called pigtail or screw-on type. These connectors include a shell or cap normally with a tapered exterior and a generally central open bore having a threaded interior to receive a coil or otherwise. This shell or cap can be screwed down over the stripped ends of two or more wires to form a tight effective connection.

My invention is in the nature of an automatic mechanism for feeding such connectors through a tube or the like constructed so that the stripped ends of the wires may be merely inserted into the end of the tube and a power means actuated so that a connector will be automatically turned down over the wires and the connection will be finished when the wires are withdrawn.

A primary object of my invention is a new and improved automatic connector runner or the like designed and constructed to automatically feed screw-on type connectors to a connecting station.

Another object is a runner of the above type which may be manually controlled at the connecting station.

Another object is an automatic connector feeding arrangement in which screw-on type pigtail connectors may be fed by a hopper mechanism.

Another object is a runner of the above type with means to prevent the connector at the connecting station from being pushed back up into the tube.

Another object of my invention is an automatic runner of the above type constructed so that the connectors will not fall out.

Other objects will appear from time to time in the ensuing specification and drawings in which:

Figure 1 is a side view, partly in section, of my automatic runner;

Figure 2 is a sectional view of the connecting station;

Figure 3 is a view similar to Figure 2 but with the connector in a different position;

Figure 4 is a bottom end view of Figure 3;

Figure 5 is a section along line 5—5 of Figure 2;

Figure 6 is a section, similar to Figure 2, of a variant form;

Figure 7 is a side view, partially in section, on an enlarged scale, of a further variant; and

Figure 8 is a partial side view, in section, of still another modification.

In Figure 1 an elongated tube is indicated generally at **10**. The tube may be metallic and is preferably flexible. At its upper end the tube is connected in any suitable manner to a support **12** which may include an electric motor **14** as a power means adapted to drive the tube through suitable gearing **16** and **18**, the gear **18** being mounted on the upper end of the tube through a suitable bushing or collar **20** which is carried by a suitable bearing unit **22** in an opening in the housing.

A suitable hopper, not shown but constructed to feed screw-on type pigtail connectors, may be mounted in the housing. As shown, a feed trough **24** from such a hopper brings connectors **26** one at a time to the open

upper end **28** of the tube so that the connectors are aligned with their open end down. The connectors may be brought down through the flexible tube or conduit by gravity.

The end of the tube is shown as provided with a connecting station **30** which includes upper and lower plates **32** and **34** or the like connected together by a suitable number of screws **36** or otherwise and having an aligned central passage or bore through which the flexible tube extends.

If the flexible tube is of a woven metallic material, a short piece of solid metal tube **38** may be secured, by welding, brazing, or otherwise, to the flexible tube. This short piece serves as a stop mechanism and is longitudinally slotted in a suitable number of places, as at **40**, to divide it into segments. One or more portions of the segments may be turned in, as at **42** in Figure 4, or slightly bent so as to obstruct the passage of the connectors. These tabs or bends formed by the slots are sufficiently flexible so that when the ends of the wires, shown at **44**, are inserted in the end of the tube and the connector is screwed down over the wires, the connector can be easily pulled past the stops or abutments **42**.

The two plates have a number of cavities, shown as four in this case. The cavities each include a circular recess **46** in the upper plate and a somewhat circular but offset or stepped recess **48** in the lower plate. A pawl or chuck jaw **50** is mounted in each cavity on a lateral pin **51** which functions as an axis or pivot so that each jaw may rotate a predetermined amount. The inner end of each jaw has a step at **52** which extends through a suitable slot **54** cut in the piece of pipe on the end of the flexible tube. The shoulder or flat surface **52** projects into the path of the connectors so that the end of the connector will strike the shoulder on the jaw, as shown in Figure 3. The jaws are made of light weight material and can be easily pivoted. The connectors are of such a weight, when stacked in the flexible tube, that they will easily rotate the jaws out of the way as they move down and the bottom connector will always arrive at and be stopped by the turned in abutments or fingers **42** at the open end of the tube. The outer portion **56** of each pawl or jaw serves as a counterweight so that when each connector has passed through the jaws, they will automatically rotate back to the position of Figure 2. The connectors are tapered and may have longitudinal slots on their outer surface, such as in U. S. Patent No. 1,460,624. The chuck jaws are quite thin and will fit into these longitudinal slots so that when the flexible tube is rotated by its power means, the jaws fitting into the slots will cause the connector to rotate. It should be noted that the upper and lower plates fit smoothly around the short piece of solid tubing **38** at the end of the flexible tube **10**, and the plates may be brazed or otherwise connected to this piece of tube if desired. Each chuck jaw rotates until it hits the top of the slot **54** through the tube **38** which positions it for the next connector.

A handle **58** in the form of a metallic tube or otherwise surrounds a part of the flexible tube **10** and some of the short metal tube **38** and rises a suitable distance above it. It may be held between the chuck mechanism and a suitable collar **60** on the tube. In fact, the solid tube or pipe may extend up through the handle with the collar **60** formed at or on its upper end. The handle may carry a suitable button **62** or the like to stop and start the motor **14**.

In Figure 6 I have shown a variant form and like parts are designated by the same reference numerals except as indicated hereinbelow. Normally, connectors of the so-called pigtail or screw-on type have knurls or longitudinal grooves on their outer surface, such as shown generally in U. S. Patent No. 2,749,384. The

dogs 50 in Figures 2 through 5 might be made thin enough, as shown in Figure 5, to fit into the grooves or flutes of such connectors. When the connector is forced back up into the conduit by insertion of the partially stripped wires, as shown in Figure 1, the dogs would fit into these grooves and, upon rotation of the chuck, the connector will be turned down over the wires. However, in some cases it might be preferable to only frictionally engage the connectors, and this may be done by coating or forming the dogs of a material having the general characteristics of rubber or the like. For example, in Figure 6 the dog 64 may be considered to have either a rubber coating or a coating of a material of rubberlike consistency and characteristics, or the dog itself may be considered to be made totally or partially of such material. In any case, when the connectors are forced back up in the tubing or pipe, the sides of the bottom connector will be frictionally engaged by the projecting points 65 of such dogs. When the chuck is rotated, the frictional contact between the dogs and the lowermost connector will be adequate to impart rotation to the connector.

Instead of using turned in portions 42, as in Figure 4, as the detent for releasably holding the lowermost connector, I may use spring pressed balls. For example, in Figure 7 such balls 66 with springs 68 may be mounted in a tubular piece 70 which forms an extension of the chuck. As shown, one end of each spring is mounted in a suitable socket 72 and the other end holds a ball. In Figure 7 it will be apparent that four such spring pressed balls may be used, however, more or less might be employed. The point is that any releasable detenting means might be used, and I find it preferable to use the bent portions 42 in Figure 3 in the interest of economy.

In the variant form shown schematically in Figure 8, I employ a microswitch 74 suitably pivoted at 76 in the tube 38. Instead of using a manually operated switch, such as at 62 in Figure 1, I may provide a microswitch or the like so that when the stripped ends of the wires, such as at 44 in Figure 1, are inserted in the lower end of the chuck, forcing the column of connectors up a slight amount, one of the connectors, preferably the lowest one in the column, wil contact the switch and close the contacts so that the motor 14 in Figure 1 would be automatially energized. Thus, the operator would merely have to insert the wires and the motor would be automatically energized. For purposes of clarity, in Figure 8, I have not shown a handle corresponding to the handle 58 in Figure 1.

The use, operation and function of my invention are as follows:

I provide an automatic connector runner constructed to feed screw-on type pigtail connectors through a tube or the like, preferably flexible. Connectors of this general type are shown in U. S. Patent No. 1,678,752 in which an insulating shell surrounds a coil spring insert. Or the invention might be used with a connector of the type shown generally in U. S. Patent No. 2,749,384 in which the insulating shell itself directly engages the stripped ends of the wires and the coil spring insert is not used. A connector, such as shown in this last patent, is made or molded entirely of plastic. The stripped ends of a plurality of wires to be connected may be inserted into the open end. The power means is then energized which automatically rotates the connector down over the wires. When the power means is shut off, the wire can be pulled out which will draw the connector through the stop mechanism at the end of the tube.

While I have said that the tube is flexible, it could be solid. The surface of the pawls might be serrated or otherwise formed to grip the connectors. Also, the handle mechanism is not vital and the mechanism could be permanently mounted with the electric switch 62 at any suitable location. Some of the important points are that the connectors will not fall out of the end of the tube. Also, when the tube is rotated, the connectors are automatically rotated. Furthermore, when the operator forces the stripped ends of the wires up into the tube, he cannnot push the connectors up because they will not pass through the dogs or pawls which have rotated back to the position of Figure 2.

The mechanism automatically presents and rotates one connector after another. The operator is not required to handle each connector. He merely inserts the wires into the end of the tube and energizes the motor. Thereafter, he withdraws the wire with a connector fully turned down on them. He is not required to handle the connectors and he does not turn them down over the wires manually.

While I have shown and described a preferred form of my invention and suggested various modifications, it should be understood that numerous other modifications and changes can be made without departing from the fundamental theme of the invention. I, therefore, wish the invention be unrestricted except as by the appended claims.

For example, the edges of the pawls or jaws could be coated with rubber or any other suitable non-slip material. Or the pawls may be made of such material such as in Figure 6. Additionally, the power for rotating the connector could be turned on by the slight rearward movement of the connector in the tube when the wires are inserted. For example, a microswitch could be suitably positioned in the tube 38 such as in Figure 8. The bent portions 42 might be spring pressed balls or otherwise such as in Figure 7. The connectors might be shaped other than shown in the drawings. For example, the connector might be hour-glass shaped to fit a particular type of dog or pawl. The grooves on the connector's outer surface might be spiral.

I claim:

1. In a device for automatically feeding and rotating cap type wire connectors of the screw-on open ended variety, an elongated tube adapted to receive connectors at one end and to discharge them at the other, means at the said one end of the tube for supplying connectors to it, a connecting station at the other end of the tube, a stop mechanism at the connecting station adapted to prevent the connectors from falling out but constructed to allow each connector to be manually pulled out when it has been turned down over the stripped end of the wires, and detent means at the connecting station bath for preventing a connector from being pushed back up out of the connecting station and for rotating the connector in the connecting station.

2. The structure of claim 1 wherein the tube is rotatable, and said last mentioned means includes a power means for rotating the tube to rotate the connector at the connecting station.

3. The structure of claim 2 in which the tube is flexible.

4. The structure of claim 3 characterized by and including a handle on the tube at the connecting station, the handle being freely rotatable relative to the tube so that when the tube is rotated to screw the connector on the stripped ends of the wires, the handle can be held stationary.

5. The structure of claim 4 in which the detent means includes a plurality of equally spaced, laterally pivoted, counterweighted chuck jaws, the jaws as a group including means to prevent the connector in the connecting station from being pushed back up in the tube and also to bear against the tapered sides of the connector in the connecting station so that when the tube is rotated, the chuck jaws will cause the connector in the connecting station to rotate.

6. The structure of claim 5 characterized by and including a manually operable switch on the handle so that the power means rotating the tube is controlled at the handle.

7. In a device for automatically feeding and rotating

a pigtail type wire connector of the screw-on open ended type, an elongated tube adapted to receive such connectors at one end and to discharge them at the other, a connecting station at the said other end of the tube, a stop mechanism at the connecting station adapted to prevent the connectors from falling out of the connecting station, but constructed to allow each connector to be manually pulled out when it has been turned down over the stripped ends of the wires, and means at the connecting station separate and spaced from the stop mechanism for both preventing a connector from being pushed back up out of the connecting station and also for rotating the connector in the connecting station.

8. The structure of claim 7 wherein said last mentioned means includes a plurality of peripherally spaced, freely pivoted, counterweighted chuck jaws.

9. In a device for automatically feeding and rotating a wire connector of the screw-on open ended type, a tube adapted to receive such connectors at one end and to discharge them at the other end, a connecting station at the said other end of the tube, a stop mechanism at the connecting station constructed to prevent the connectors from unauthorizedly falling out of the connecting station,

but constructed to allow each connector to be pulled out when it has been turned down over the stripped ends of the wires, means at the connecting station separate and spaced from the stop mechanism for preventing connectors from being forced back out of the connecting station but allowing connectors to move therethrough in one direction, and an interlock at the connecting station separate from the stop mechanism for rotating the connector to screw it down on the stripped ends of the wires.

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