United States Patent

[11] **3,580,297**

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[54] **DEVICE FOR TWISTING AND ALIGNING TERMINAL POSTS OF AN ELECTRICAL CONNECTOR**
6 Claims, 8 Drawing Figs.

[52] **U.S. Cl.** **140/149**
[51] **Int. Cl.** **B21f 7/00,**
B21f 1/02
[50] **Field of Search** 140/118,
119, 122, 124, 147, 149; 29/203 (H), 203 (J), 203 (P)

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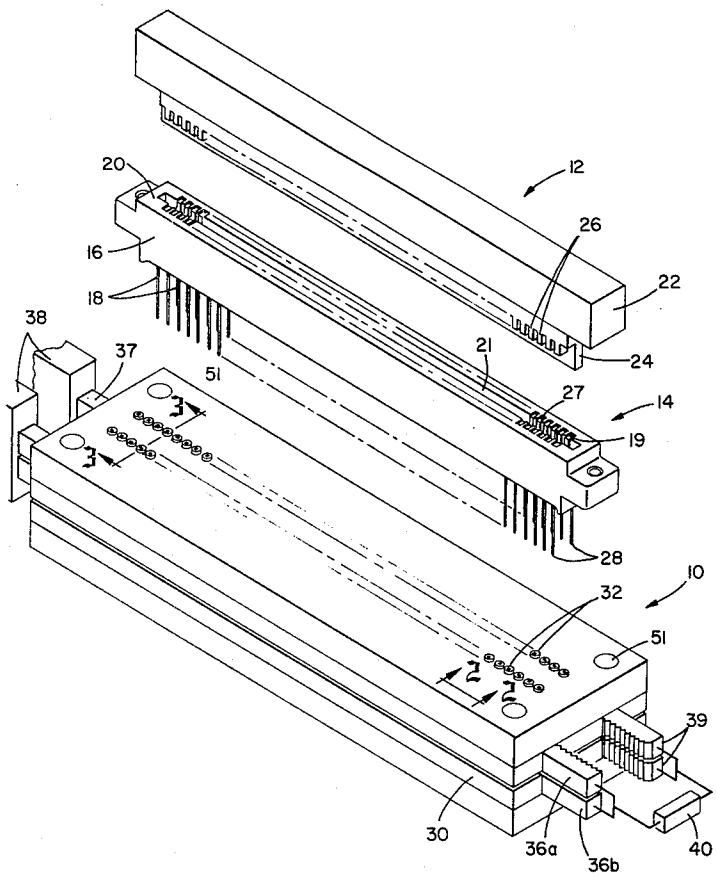
ABSTRACT: A device for twisting as well as aligning the terminal posts of an electrical connector is disclosed. The device comprises a number of tubular elements located to correspond to the terminal posts of a connector and having interior cross sections similar to the cross sections of the posts. Each tubular element has a small pinion gear attached thereto and is located to operate with a rack so that the rack can impart rotational motion to the tubular elements. A second embodiment comprises laterally extending arms connected to the tubular elements which are movable for imparting rotational motion.



3 Sheets-Sheet 1

Fig. 1

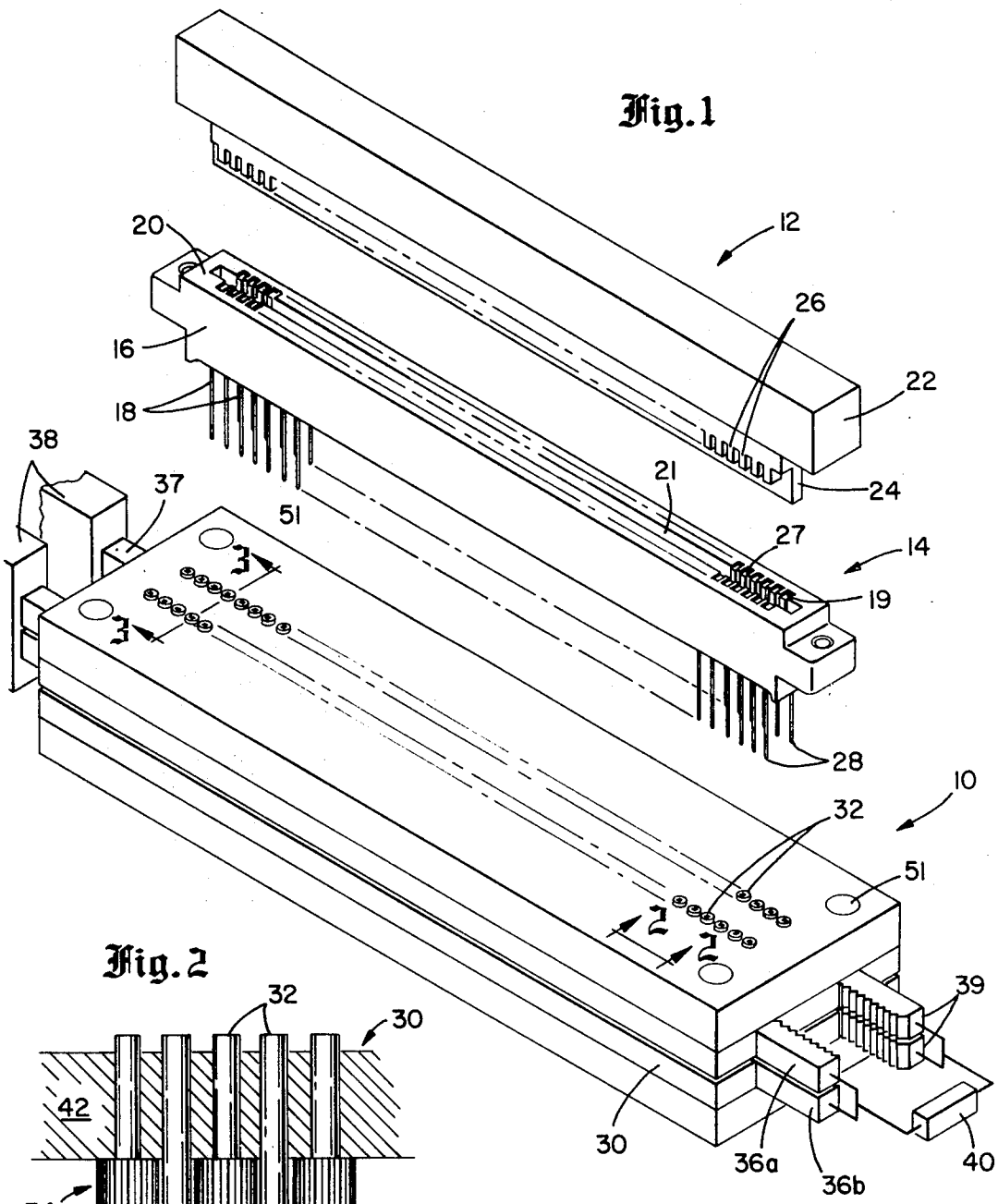


Fig. 2

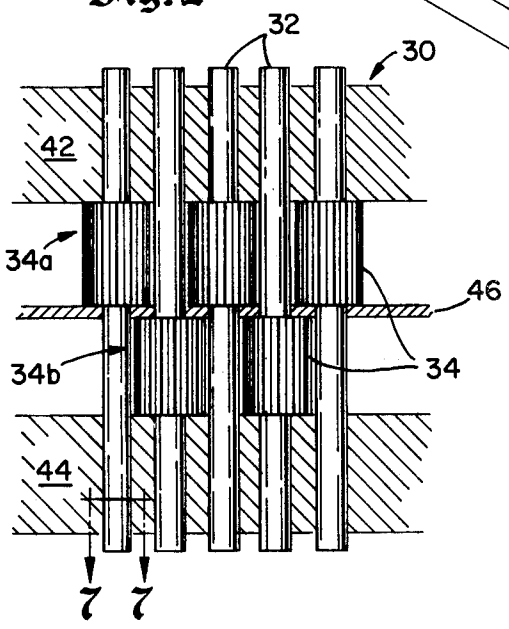


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Fig. 3

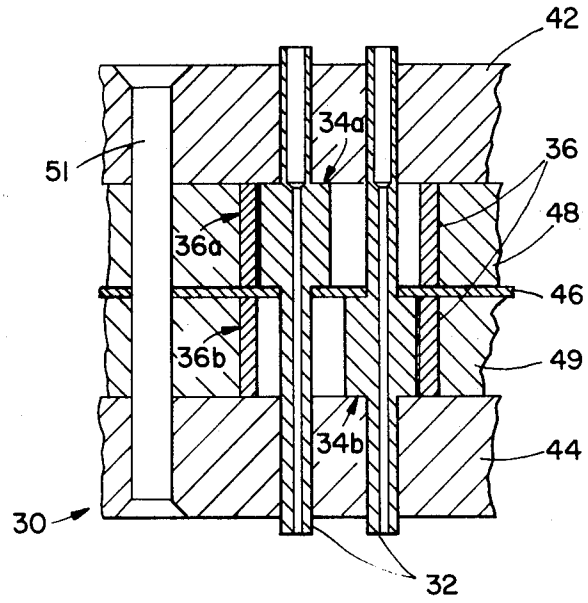

Fig. 4

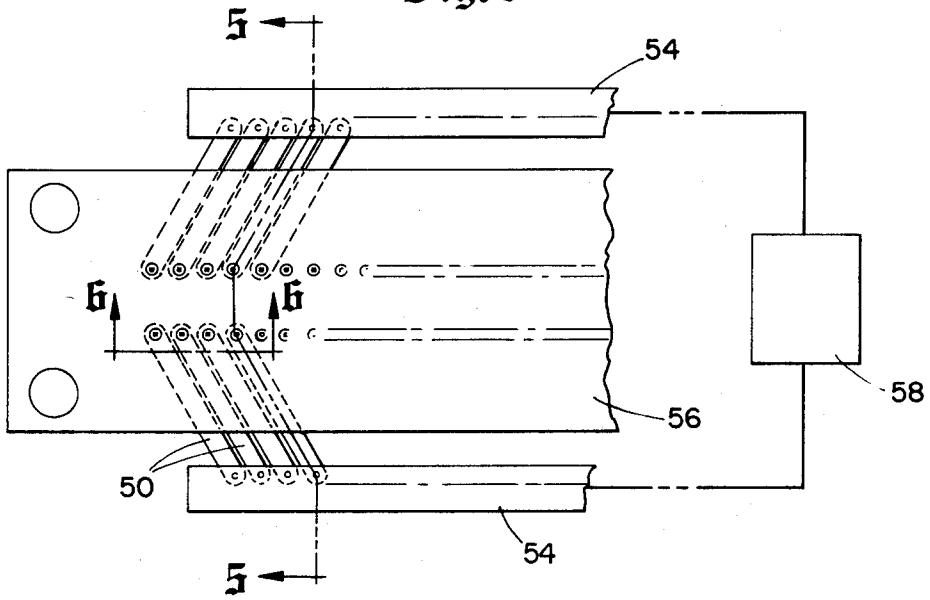

Fig. 7

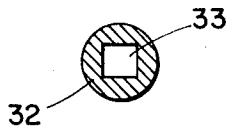

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Fig. 5

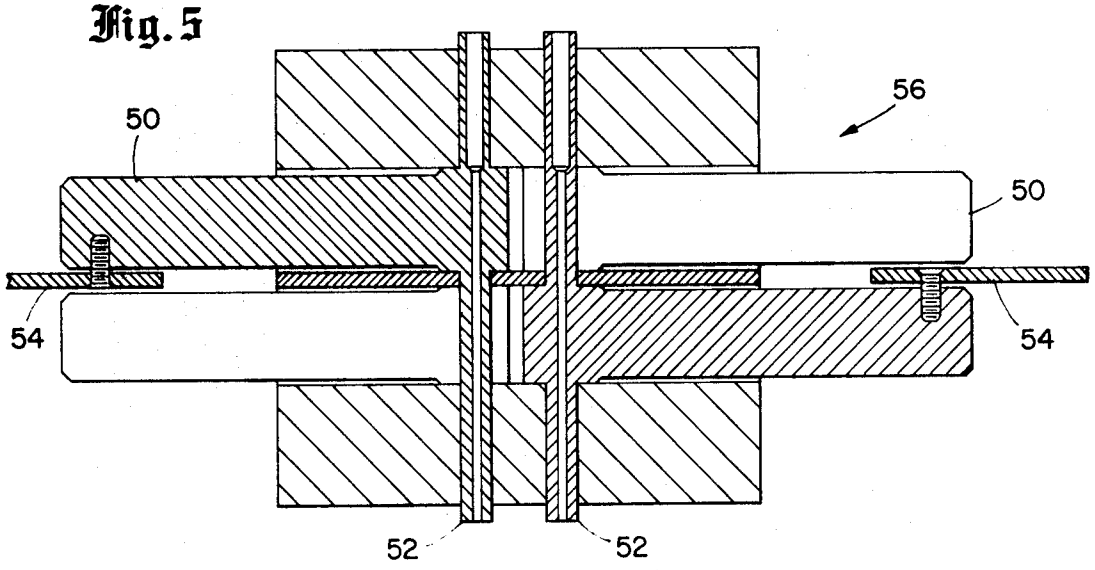


Fig. 6

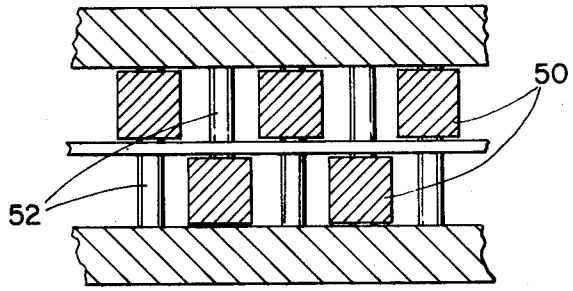
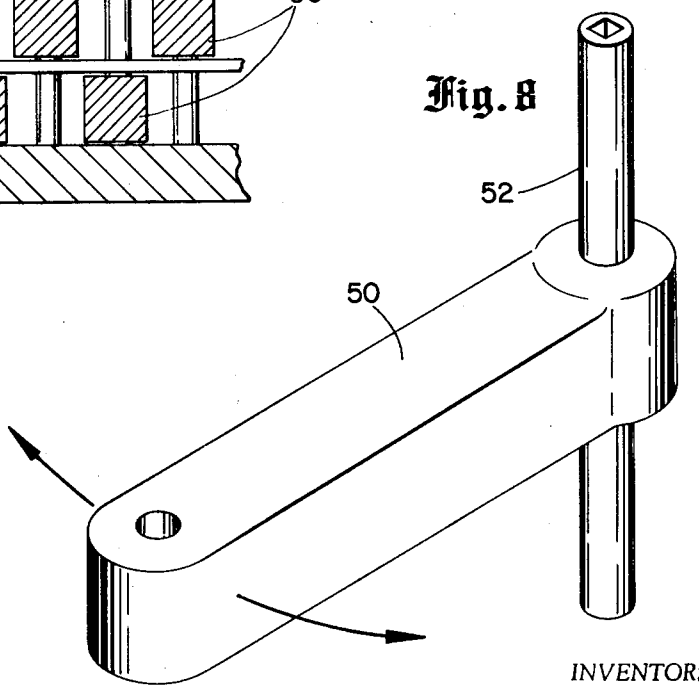


Fig. 8



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DEVICE FOR TWISTING AND ALIGNING TERMINAL POSTS OF AN ELECTRICAL CONNECTOR

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a twisting and aligning device and more particularly to a device for twisting and aligning terminal posts of an electrical connector.

2. Description of the Prior Art

In 1958, a punchcard-controlled machine was introduced on the market place that would automatically strip insulation from a solid wire, properly route it on a wiring panel and then wrap it around the desired terminal post of an electrical connector thereby effecting a solderless wrap interconnection quickly and inexpensively. With the advent of the automatic wire-wrapping machine however came stringent requirements for the locations of the terminal posts. For example, the ends of the posts with which the automatic wire-wrapping machine makes contact must be positioned within a very small tolerance circle having a radius 0.010 inches centered at a true center position. Additionally, the automatic wire-wrapping machine requires that the electrical connector terminal posts must be of sufficient strength to withstand the load that is applied to it during the wire-wrapping operation.

In an effort to meet the stringent requirements of the automatic wire-wrapping operation an electrical connector having twisted terminal posts as more fully described in copending application Ser. No. 760,561 titled ELECTRICAL CONNECTOR WITH TWISTED POSTS assigned to the assignee of the present application, was developed.

SUMMARY OF THE INVENTION

In order to manufacture an electrical connector having the required characteristics the present invention was developed as a device for twisting and aligning terminal posts of the electrical connector and comprising means for engaging the terminal posts and means for rotating the engaging means whereby the terminal posts are twisted and aligned. At the same time the terminal posts are twisted they are confined so as to be straightened. The twist not only anchors the terminal posts but actually strengthens the posts are twisted they are confined so as to be straightened. The twist not only anchors the terminal posts but actually strengthens the posts at their most critical location, that is, that portion of the posts extending immediately away from the base of the connector. Thus the two requirements, strength and straightness, are met and require only one process operation during the manufacture of the electrical connector.

An object of the present invention is to provide a device for twisting terminal posts of an electrical connector.

Another object of the present invention is to provide a device which not only twists terminal posts of an electrical connector but also straightens the posts in a single operation.

Still another object of the present invention is to provide a device for twisting and straightening terminal posts which is simply constructed, inexpensive and easily operated.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a twisting device illustrating the position of an electrical connector before insertion into the twisting device.

FIG. 2 is an enlarged section view taken along line 2–2 of FIG. 1.

FIG. 3 is an enlarged section view taken along line 3–3 of FIG. 1.

FIG. 4 is a plan view of a second embodiment of the invention.

FIG. 5 is an enlarged section view taken along line 5–5 of FIG. 4.

FIG. 6 is an enlarged section view taken along line 6–6 of FIG. 4.

FIG. 7 is a section view taken along line 7–7 of FIG. 2.

FIG. 8 is an enlarged perspective view of a portion of the embodiment shown in FIG. 5.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings wherein like referenced numerals designate like or corresponding parts throughout the several views there is shown in FIG. 1 a view of the twist device **10**, a contact seating bar **12** and an electrical connector **14** illustrated in a position just before inserting the connector into the twisting device **10**.

The connector **14** comprises a plastic base **16** having a plurality of apertures (not shown) into which a plurality of terminal posts **18** is disposed. The terminal posts **18** form bifurcated ends **19** just below a surface **20** in the base **16** and along the periphery of a longitudinal cavity **21**. The longitudinal cavity is adapted to receive the terminal end of a printed circuit board (not shown) at which time the ends **19** of the posts **18** will make electrical contact with the circuitry of the printed circuit board. A more detailed description of the electrical connector is given in copending application Ser. No. 760,561 mentioned above.

Located adjacent and above the electrical connector **14**, as viewed in FIG. 1, is the contact seating bar **12** comprising a block **22** having an elongated male spacer **24** mounted thereto which is designed to be received by the longitudinal cavity **21**. The spacer **24** has laterally extending protrusions **26** which come into abutting engagement with the bifurcated ends **19** of the terminal posts **18** for properly seating the posts in their respective slots **27** formed along the periphery of the cavity **21**. The proper seating of the bifurcated ends **19** insures that the length of the terminal posts **18** will be fully extended downward (relative to the manner in which the drawing is illustrated in FIG. 1). Additionally the spacer **24** is designed to size the bifurcated ends **19** so that the electrical connector **14** will provide the proper resisting forces upon an inserting or withdrawing printed circuit board (not shown).

The twisting device **10** comprises a mounting block **30** comprised of various subblock layers for ease of manufacture and will be described hereinafter. Referring now to FIGS. 2 and 3 which better illustrate elements within the mounting block **30**, there is illustrated a plurality of means for engaging the terminal posts of the electrical connector. The means in the preferred embodiments comprise tubular elements **32** which are aligned in a column parallel to the longitudinal axis of the mounting block **30** in a two-abreast fashion as clearly shown in FIG. 1 (where the upper ends of the tubular elements are shown). The tubular elements are designed to receive the terminal posts in close contact so that the ends **28**, FIG. 1, of the posts are restrained from moving out of position during the twisting operation. As example, a preferred embodiment of an electrical connector has terminal posts with 0.025-inch square cross sections; the tubular elements **32** have square cross-sectioned interiors **33**, FIG. 7, with a side having a 0.029-inch dimension. The tubular elements extend in length about the same distance as the terminal posts so that the terminal posts are restrained along their entire length. However, it is to be noted that the tubular elements could be segmented so as to engage the terminal posts along first end portions as they extend immediately away from the base **16** (about 0.100 to 0.150 inches for a 0.560-inch post) and at second end portions **28**, thereby leaving the central portions (of about 0.400 inches) unengaged.

Means for rotating the tubular elements **32** are provided in the preferred embodiment as shown in FIGS. **1**, **2** and **3** in the form of small pinion gears **34** and racks **36**, FIGS. **1** and **3**. As shown in FIGS. **2** and **3** the pinion gears **34** are alternately disposed in a direction parallel to the longitudinal axis of the block **30** as well as in a direction parallel to the transverse axis of the block. Thus alternate tubular elements **32** have their respective pinions attached at a first or upper location designated **34***a* while the remaining alternate tubular elements **32** have their respective pinion gears **34** disposed at a second

or lower position as depicted in the drawing and designated 34*b*.

The pinions 34 may be made of any suitable material, preferably standard carbon steel, and may be attached to the tubular elements 32 in any suitable fashion, preferably being welded into location. The racks 36 are disposed parallel to the longitudinal axis of the block 30 to correspond to the upper and lower pinion positions 34*a* and 34*b* so as to form a pinion-rack assembly with the upper racks being designated 36*a* and the lower racks being designated 36*b*.

Referring again to FIG. 1 the racks 36 are supported primarily by the mounting block 30 with first ends 37 being guided by alignment blocks 38. The opposite ends 39 are connected to a power source 40, which is diagrammatically illustrated, for causing linear movement of the racks. It is to be noted that the racks may be electrically actuated or actuated by air pressure or hydraulic pressure, whichever is the more suitable power source.

The mounting block 30 as mentioned earlier is layered and comprises a top plate 42, FIGS. 2 and 3, a bottom plate 44 and a supporting middle plate 46. Additionally, each side of the mounting block 30 has cover blocks 48 and 49, FIG. 3, located along both lateral sides of the mounting block 30. The assembly is held together by screws 51, FIGS. 1 and 3. The layered approach allows for simpler manufacturing of the twisting device and for ease of access to the interior tubular elements 32.

Operation of the twisting device is achieved by bringing together the twisting device 10, the electrical connector 14 and the seating bar 12 so that the terminal posts 18 are properly located in their respective tubular elements 32. Then the power source 40 is activated to supply linear motion to the racks 36 which in turn impart rotational motion to the pinion gears 34 causing simultaneous rotation of each of the terminal posts 18. The racks are moved a sufficient linear distance to effect a 90° turn of the tubular elements 32 and thereby a 90° twist to the terminal posts 18. This 90° twist provides sufficient interference between the posts and the apertures in the base 16 so that the posts are braced against any axial load applied to the ends 28 by the automatic wire-wrapping machine. At the same time, by having the tubular elements 32 engage the terminal posts 18, the terminal posts are simultaneously aligned. Thus proper post retention and alignment are achieved in one manufacturing operation.

Referring now to FIGS. 4, 5 and 8, there is illustrated another embodiment of the present invention where the means for rotating the terminal posts engaging means comprises laterally extending arms 50 which are fixedly connected, such as by welding, at one end to tubular elements 52. The tubular elements 52 are similar to the tubular elements 32 of of the FIG. 1 embodiment except that the arms 50 are substituted for the pinion gears 34. The other ends of the laterally extending arms pivotally connect to operating rods 54, one rod disposed along each of the lateral sides of a mounting block 56. The mounting block 56 corresponds to the mounting block 30 in the FIG. 1 embodiment except there are no cover blocks analogous to cover blocks 48 and 49. The operating rods 54 are connected to a power source 58 which functions in an analogous manner to the power source 40 of the FIG. 1 embodiment so that generally linear motion is imparted to the operating rods 54 which in turn impart a rotating motion to the tubular elements 52 by way of the laterally extending arms 50.

Referring now to FIGS. 5 and 6, the alternating positions of the arms 50 are shown and are similar to the placement of the pinion gears 34 in the FIG. 1 embodiment. This arrangement facilitates sufficient clearance to enable close placement of the tubular elements in response to the close placement of the terminal posts in the electrical connector.

As with the FIG. 1 embodiment, the embodiment shown in FIGS. 4, 5 and 6 allows the terminal posts of the electrical connector to be twisted as well as straightened so that the connector meets the requirements placed upon it by the automatic wire-wrapping machine. It is also to be understood that various dimensional and form changes may be made such as exemplified by the two preferred embodiments disclosed herein without departing from the spirit and scope of the invention as defined by the following claims.

We claim:

1. A device for twisting terminal posts of an electrical connector to retain and align said posts therein, comprising:
- means for seating said terminal posts within said electrical connector;
- means for engaging said terminal posts as said posts extend from said electrical connector including driven means; and
- driving means for individually rotating said driven means of said engaging means to twist each terminal post as said posts extend from said electrical connector for retaining said posts within said electrical connector while aligning said posts with said electrical connector.

2. A device as claimed in claim 1, wherein:
- said means for engaging said terminal posts comprise a plurality of tubular means having a cross-sectional opening corresponding to the cross section of said terminal posts;
- said plurality of tubular means is arranged to contact said terminal posts at the points where said terminal posts extend from said electrical connector;
- said driven means comprise gear means having said tubular means passing through the rotational axes thereof;
- said driving means comprise rack means engaging said gear means; and
- additionally comprising power means for driving said rack means to rotate said gear means and tubular means thus twisting said terminal posts at the points where said terminal posts extend from said electrical connector thereby retaining said posts therein and aligning said posts therewith.

3. A device as claimed in claim 1, wherein:
- said means for engaging said terminal posts comprise a plurality of tubular elements having a cross-sectional opening corresponding to the cross section of said terminal posts;
- said plurality of tubular means is arranged to contact said terminal posts at the points where said terminal posts extend from said electrical connector;
- said driven means comprise a plurality of arm means having said tubular means passing through the rotational axes thereof;
- said driving means comprises linkage means connecting said arm means; and
- additionally comprising power means for driving said linkage means to rotate said arm means about the rotational axes thereof thus causing said tubular means to twist said terminal posts at the points where said terminal posts extend from said electrical connector for retaining said posts therein and aligning said posts therewith.

4. A device as claimed in claim 2, wherein:
- said plurality of tubular means is arranged along at least one longitudinal axis corresponding to the longitudinal axis of said electrical connector;
- said gear means are disposed upon said tubular means, which form the rotational axes thereof, in first and second alternating positions; and
- said rack means engages said gear means in said first position for rotating said gear means in one direction and engages said gear means in said second position for rotating said gear means in the same direction thereby twisting said terminal posts in one uniform direction.

5. A device as claimed in claim 4, additionally comprising:
- support means including first, second and third parallel plate means having aligned apertures passing therethrough, in which said plurality of tubular means is rotatively mounted;
- said first and second parallel plate means having said gear means therebetween for forming said first position; and

said second and third parallel plate means having said gear means therebetween for forming said second position.

6. A device for twisting terminal posts in an electrical connector to retain and align said posts therein, comprising:

support means;

engaging means for engaging said terminal posts rotatively mounted within said support means;

said engaging means arranged in a pattern corresponding to the pattern of said terminal posts within said electrical connector for engaging each terminal post at the point where the post extends from said electrical connector; and

driving means for individually rotating each of said engaging means a predetermined amount thus twisting said terminal posts at the point where each post extends from said electrical connector to retain said terminal posts within said electrical connector and to align said terminal posts therewith.