June 8, 1965 W. C. KENT 3,187,418

ASSEMBLY AND STAKING APPARATUS

Filed April 30, 1963 6 Sheets-Sheet 1

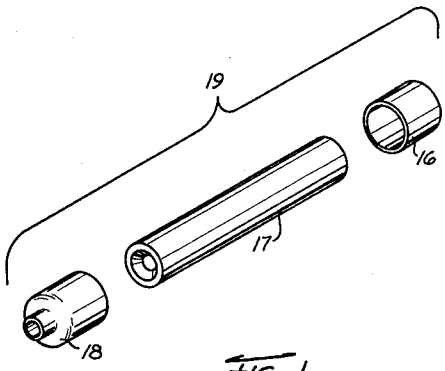

FIG. 1

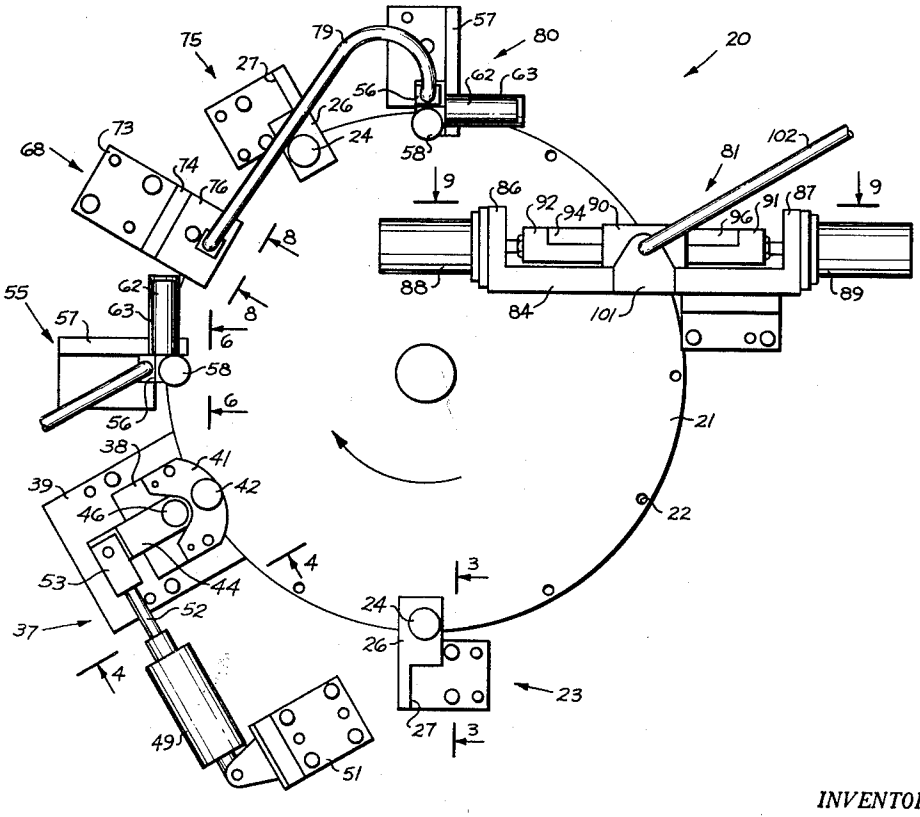

FIG. 2

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ASSEMBLY AND STAKING APPARATUS

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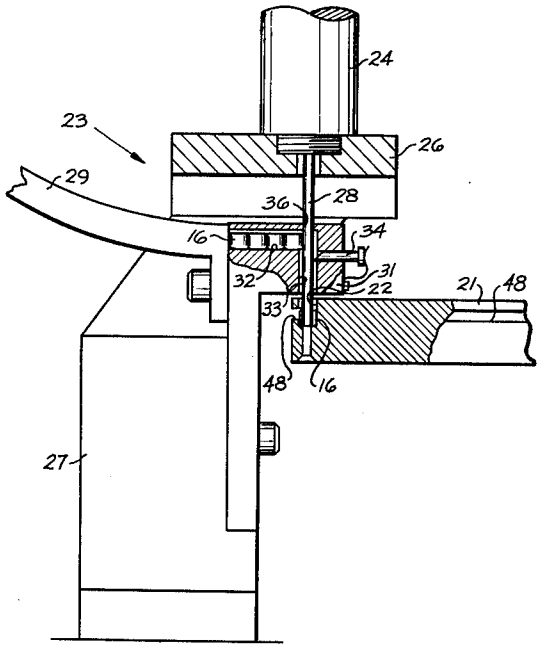

FIG. 3

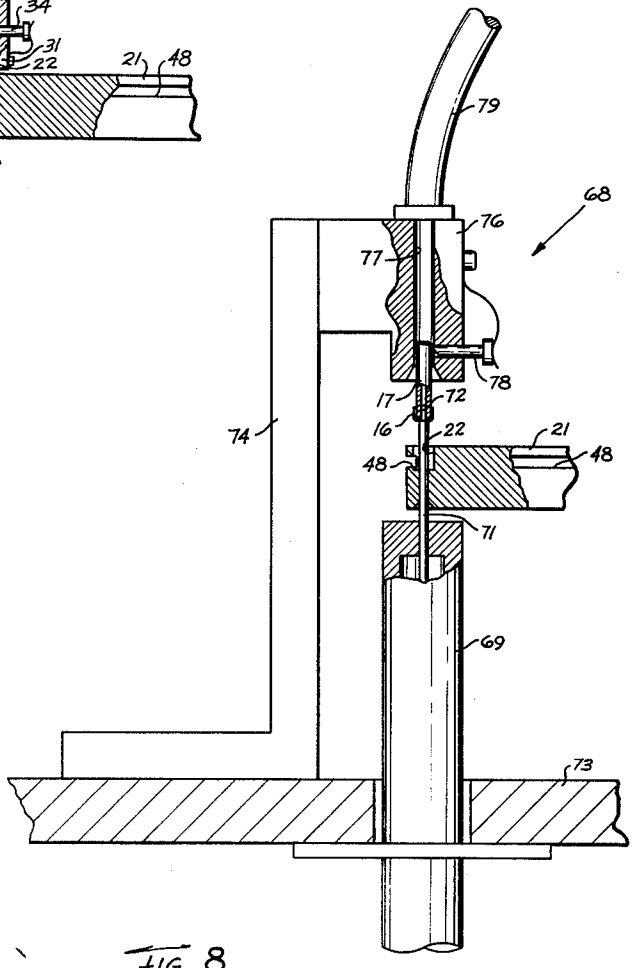

FIG. 8

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ASSEMBLY AND STAKING APPARATUS

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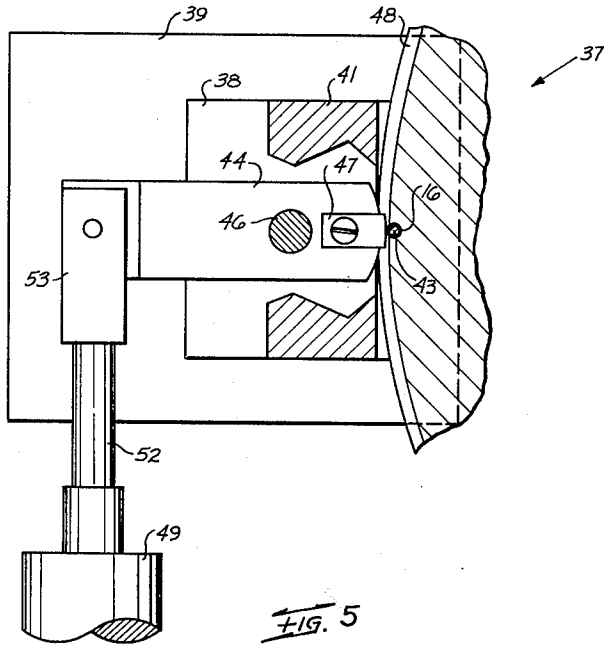

FIG. 5

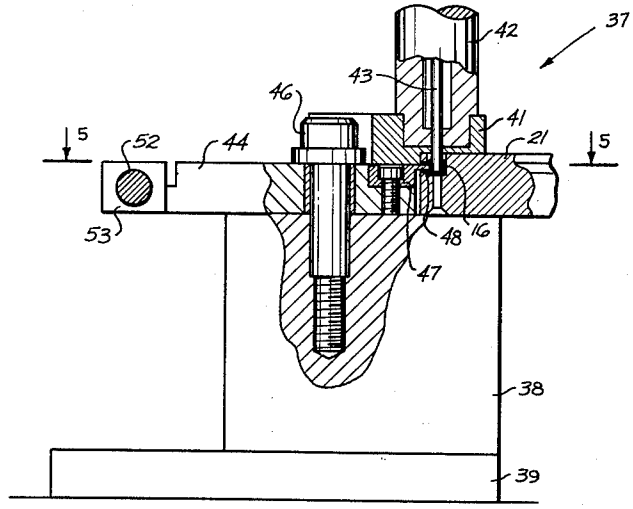

FIG. 4

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ASSEMBLY AND STAKING APPARATUS

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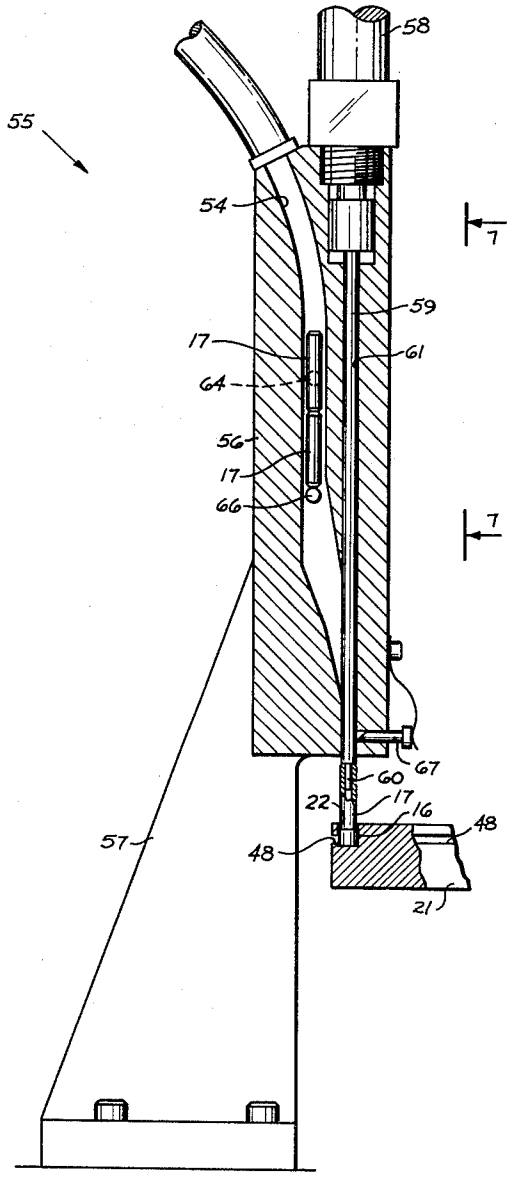

FIG. 6

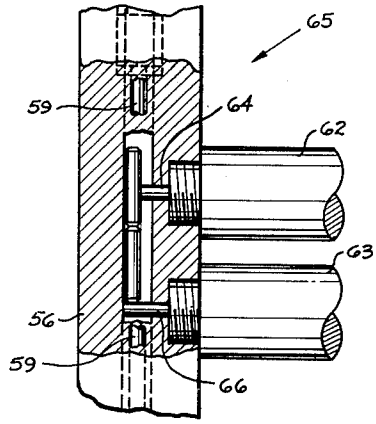

FIG. 7

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ASSEMBLY AND STAKING APPARATUS

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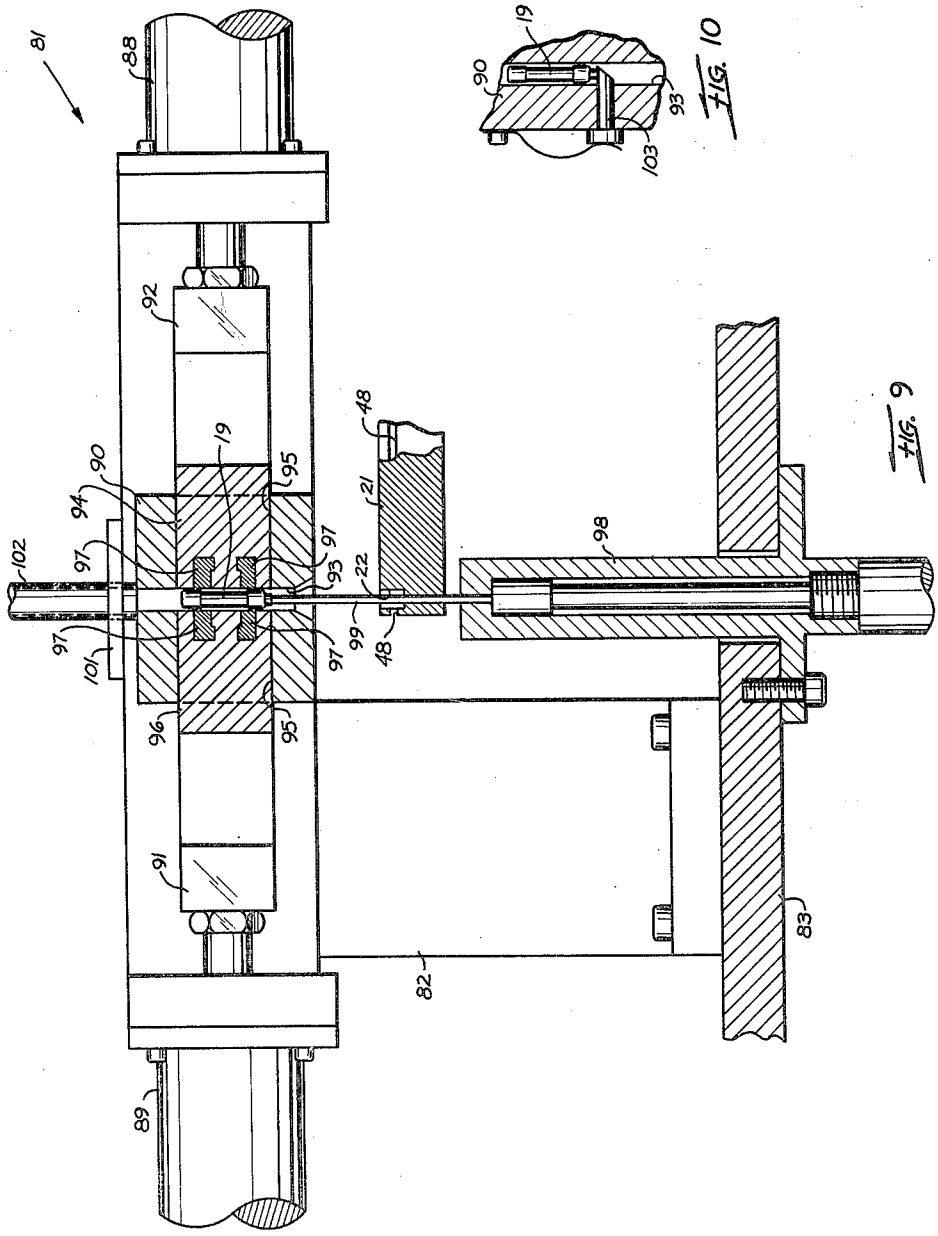

FIG. 9

FIG. 10

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ASSEMBLY AND STAKING APPARATUS

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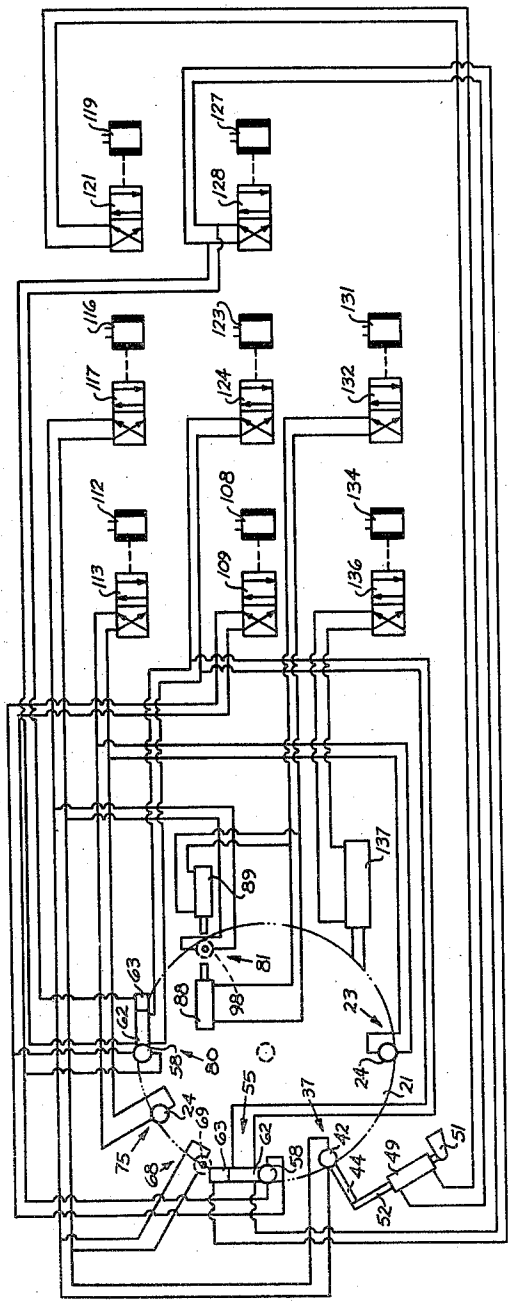

FIG. 11

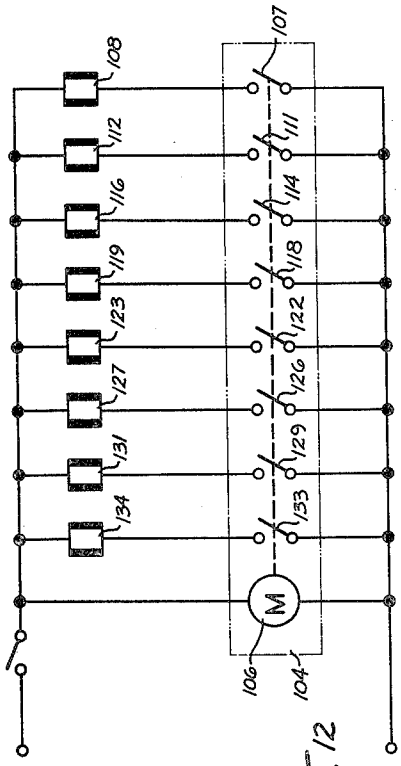

FIG. 12

United States Patent Office 3,187,418 Patented June 8, 1965

3,187,418

ASSEMBLY AND STAKING APPARATUS

William C. Kent, Gahanna, Ohio, assignor to Western Electric Company, Incorporated, New York, N.Y., a corporation of New York

Filed Apr. 30, 1963, Ser. No. 276,952
11 Claims. (Cl. 29—203)

The invention relates to an assembly and staking apparatus and particularly relates to an apparatus for assembling a cylindrical sleeve with closures on opposite ends thereof and to the staking of the closures to the sleeve to provide a subassembly for a fuse body.

It is an object of this invention to provide new and improved apparatus for assembling cylindrical bodies with closures on opposite ends.

Another object of the invention is the provision of apparatus for staking assembled closures to a cylindrical body.

With these and other objects in view, the present invention contemplates an apparatus for inserting one end of a cylindrical sleeve into a cup-like closure and thereafter inverting the assembled closure and sleeve and inserting the opposite end of the sleeve into another cup-like closure to provide an assembled unit. Subsequently, each closure is staked to the cylindrical sleeve simultaneously to provide a subassembly of a fuse body.

Other objects and advantages of the invention will appear from the following detailed description of a specific embodiment thereof when read in conjunction with the appended drawings in which:

FIG. 1 is an exploded view showing a cylindrical sleeve having a pair of cup-like closures which are to be assembled on opposite ends of the sleeve to provide a subassembly for a fuse body;

FIG. 2 is a plan view of a plurality of work stations positioned adjacent to the periphery of an indexing turntable;

FIG. 3 is a view taken along line 3—3 of FIG. 2 with parts broken away for clarity showing the insertion of a cup-like closure into a receptacle on an indexable turntable;

FIG. 4 is a view taken along line 4—4 of FIG. 2 with parts broken away for clarity showing a die-stamping device in engagement with the previously positioned closure in the turntable whereby fuse-type designations are stamped on the closure;

FIG. 5 is a sectional view taken along line 5—5 of FIG. 4 showing the mechanism for the die-stamping device;

FIG. 6 is a view taken along line 6—6 with parts broken away for clarity showing the feeding of a cylindrical sleeve into the previously positioned closure in the turntable;

FIG. 7 is a view taken along line 7—7 of FIG. 6 with parts broken away for clarity showing an escapement mechanism for permitting a single fuse body to be fed into the previously positioned closure;

FIG. 8 is a view taken along line 8—8 of FIG. 2 with parts broken away for clarity showing the feeding of the assembled sleeve and closure into a vacuum line to be drawn away from the turntable;

FIG. 9 is a view taken along line 9—9 of FIG. 2 with parts broken away for clarity showing a staking device for staking the closures to the opposite ends of the cylindrical sleeve and further shows means for positioning the assembled fuse body into a vacuum line for withdrawing the assembly subsequent to the staking operation;

FIG. 10 is a partial view of a spring-loaded plunger for holding the subassembly within the staking device;

FIG. 11 is a diagrammatical view showing a pneumatic

control system for the assembly and staking apparatus, and

FIG. 12 is an electrical control circuit for the assembly and staking apparatus.

Referring to FIG. 1, a closure such as an end cap 16 having an opening located centrally in the base thereof is to be positioned on and staked to one end of a cylindrical sleeve 17 which is composed of an insulating material such as a ceramic or phenol fiber. A second closure, such as an end ferrule 18, having an opening centrally located at the base thereof with an outwardly extended reduced portion is positioned on and staked to the opposite end of the sleeve 17 to provide a subassembly 19 for a fuse body. As shown in FIG. 2, an assembly and staking apparatus, generally designated by the reference numeral 20, is provided with a carrier such as an indexable turntable 21 which is formed with a plurality of countersunk apertures 22 radially positioned adjacent to the peripheral edge of the table. A cap-feeding device, generally designated by the reference numeral 23, as shown in FIGS. 2 and 3, is positioned at a first work station adjacent to the table 21 and is provided with an air cylinder 24 positioned on a support arm 26 of a vertical stand 27 wherein the air cylinder is provided with a piston rod 28 extending therefrom. A lower end of a chute 29, which is connected at the upper end thereof to a vibratory hopper (not shown), is attached to the stand 27 and is positioner to feed serially caps 16 into a guide block 31 attached to the stand. The guide block 31 is provided with a horizontal passageway 32 for receiving the caps 16 wherein the caps subsequently fall singly by gravitational force into a vertical passageway 33. A spring-loaded plunger 34 is slideably positioned within the guide block 31 and is inserted transversely into the vertical passageway 33 to preclude the free fall of the caps 16. The guide block 31 is further provided with an aperture 36 which is aligned with the vertical passageway 33 to receive and allow slideable passage to the piston rod 28 therethrough. As a single cap 16 rests against the spring-loaded plunger 34, the air cylinder 24 is actuated to lower the piston rod 28 through the aperture 36 and into subsequent engagement with the cap 16. Continued downward movement of the piston rod 28 urges the spring-loaded plunger outwardly against the biasing action of the spring and permits the piston rod 28 to deposit the cap 16 into one of the apertures 22 of the turntable 21 which is aligned beneath the passageway 33. Thereafter, the air cylinder 24 is deactuated and the piston rod 28 is retracted upwardly, leaving the cap 16 deposited in the aperture 22 and permitting the spring-loaded plunger 34 to be inserted transversely into the vertical passageway 33, whereby another cap 16 falls by gravitational force onto the plunger 34.

As shown in FIGS. 2, 4 and 5, a die-stamping device, generally designated by the reference numeral 37, is mounted on a support 38 and a base 39 which is positioned adjacent to the periphery of the turntable 21 at a second work station. An upper extension 41 of the support 38 supports an air cylinder 42 which has a piston rod 43 extending downwardly therefrom to engage the previously positioned cap 16 to preclude vertical movement of the cap within the aperture 22 but to permit rotational movement therein about the cap axis. A die holder 44 is attached to the support 38 by a headed pin 46 to permit rocking movement of the holder about the pin relative to the support. One end of the die holder 44 is provided with a die insert 47 which is inserted into a peripheral slot 48 formed in the turntable 21 contiguous with the countersunk apertures 22. The die insert 47 is formed with an impression of indicia respresentative of the particular type of fuse which the subassembly 19

is to subsequently form a part thereof. An air cylinder 49 is pivotally attached to a support 51 and has a piston rod 52 extending therefrom for supporting a stepped connecting link 53 which is attached to the opposite end of the die holder 44 for pivotal movement therewith. As the turntable 21 is indexed to locate the previously positioned cap 16 beneath the piston rod 43, the air cylinder 42 is actuated to lower the piston rod into engagement with the cap to prevent the cap 16 from moving vertically during the die-stamping operation. Thereafter, the air cylinder 49 is actuated to rock the die holder 44 about the pin 46, whereby the impression formed on the die insert 47 is roll-stamped into the cap 16. The air cylinders 42 and 49 are then deactuated, whereby the rocking motion of the die holder 44 ceases and the piston rod 43 is drawn upwardly away from the stamped cap 16.

At a third work station, as shown in FIGS. 2 and 6, the cylindrical sleeves 17 are fed from a hopper (not shown) into a guideway 54 formed in a sleeve-feed device, generally designated by the reference numeral 55, which is provided with a feed block 56 and a stand 57 positioned adjacent to the turntable 21. An air cylinder 58 is mounted on top of the feed block 56 and is provided with a piston rod 59 with a reduced guide extension 60 on the free end thereof. The piston rod 59 extends downwardly from the air cylinder 58 and is slideably positioned within a passageway 61 formed in the feed block 56 where the passageway is contiguous and converges at a common exit with the guideway 54 of the lower end thereof. As shown in FIG. 7, a pair of air cylinders 62 and 63 are provided with piston rods 64 and 66, respectively, which extend transversely into the guideway 54 and cooperatively function as an escapement mechanism 65. Initially, the piston rod 66 of the air cylinder 63 is inserted transversely into the guideway 54, thereby precluding downward travel of any of the sleeves 17 which are in the guideway. In this manner, a first sleeve 17 will rest upon the rod 66 and the subsequent sleeves will come to rest on the immediately preceding sleeve. Thereafter, the air cylinder 62 is actuated to transversely insert the piston rod 64 into the guideway 54 to engage and clamp the second sleeve 17 against the walls of the guideway. As the turntable 21 is indexed to position the previously positioned cap 16 directly beneath the piston rod 59, the air cylinder 63 is operated to retract the piston rod 66 from within the guideway 54, thereby allowing the first sleeve 17 to fall by gravitational force into the area of the passage 61 which is contiguous with the guideway 54 adjacent to the common exit. A spring-loaded plunger 67, which is slidably mounted in the block 56 and inserted transversely into the passageway 61, precludes the downward fall of the first sleeve 17. Thereafter, the air cylinder 58 is actuated and the piston rod 59 is lowered, whereby the guide extension 60 is inserted into the central opening of the sleeve 17. Continued downward movement of the rod 59 urges the sleeve 17 past the spring-loaded plunger 67, whereby the sleeve is inserted into the open end of the positioned cap 16. Subsequently, the air cylinder 58 is deactuated and the piston rod 59 is retracted upwardly away from the area where the guideway 54 converges with the passageway 61. The air cylinder 63 is then actuated to insert transversely the piston rod 66 into the guideway 54, whereafter the air cylinder 62 is deactuated to withdraw the piston rod 64 from the guideway, thereby releasing the second sleeve 17 so that the sleeve falls by gravitational force and comes to rest upon the rod 66. Each succeeding sleeve 17 thereafter slides within the guideway 54 by gravitational force and comes to rest on the immediately preceding sleeve. The air cylinder 62 is then actuated to insert the piston rod 64 into the guideway 54, whereby a third sleeve 17 is clamped against the walls of the guideway. In this manner, the sleeve-feed device 55 is conditioned for a subsequent feeding cycle.

As shown on FIGS. 2 and 8, the table 21 is indexed to a fourth work station wherein a sleeve-cap-inverter device, generally designated by the reference numeral 68, is provided for removing the previously assembled sleeve 17 and cap 16 from the table. As shown in FIG. 8, an air cylinder 69, having a piston rod 71 with a guide pin 72 at the free end thereof, is positioned within a support plate 73 adjacent to the underside of the table 21 and in alignment with the countersunk apertures 22. A vertical stand 74 is mounted on the support plate 73 and supports an overhead receiver block 76 having a passageway 77 in alignment with the aperture 22 of the table 21. Subsequent to the positioning of the assembled cap 16 and sleeve 17 above the air cylinder 69, the air cylinder is actuated to raise the piston rod 71 into engagement with the assembled sleeve and cap, whereby the guide pin 72 is inserted within the apertures of the cap and sleeve and thereafter urges the assembled cap and sleeve into engagement with a spring-loaded plunger 78, which is slideably mounted in the block 76 and transversely inserted into the passageway 77. Continued upward movement of the piston rod 71 urges the assembled cap 16 and sleeve 17 into the passageway 77, whereafter the piston rod 71 is retracted downwardly from within the passageway and the spring-loaded plunger 78 is urged transversely into the passageway to preclude the downward gravitational fall of the assembled cap and sleeve. A flexible tubing 79 is attached to the receiver block 76 and is aligned with the passageway 77, whereafter a vacuum source (not shown) is actuated to withdraw the assembled cap 16 and sleeve 17 from within the passageway and into the tubing.

As shown in FIG. 2, a ferrule-feeding device 75 is positioned at a fifth work station adjacent to the sleeve-cap-inverter device 68 and is provided with substantially identical structure as the cap-feeding device 23 for feeding and inserting the ferrule 18 into the aperture 22 previously occupied by the assembled cap 16 and sleeve 17. Thereafter, the table 21 is indexed so that the aperture 22, containing the ferrule 18, is positioned at a sixth work station subjacent to a sleeve-cap-feeding device 80, which is connected to the opposite end of the flexible tubing 79. In this manner, the previously assembled cap 16 and sleeve 17 are inverted and fed into the feeding device 80 so that the free end of the sleeve 17, containing the previously assembled cap 16 at the opposite end, is inserted into the ferrule 18 in the same manner that the sleeve was inserted into the cap. It is to be noted that the vacuum source, utilized in drawing the assembled cap 16 and sleeve 17 through the flexible tube 79 and into the sleeve-cap-feeding device 80, is not shown.

As shown in FIGS. 2 and 9, a staking device, generally designated by the reference numeral 81, is mounted on a vertical stand 82 supported by a base plate 83 at a seventh work station. The staking device 81 is provided with a U-shaped support 84 having legs 86 and 87 for supporting a pair of air cylinders 88 and 89, respectively. A stationary slide support 90 is attached to the U-shaped support 84 between the legs 86 and 87, and supports a pair of opposed sliding bars 91 and 92 for sliding movement within passageways 95 therein. In addition, the slide support 90 is provided with a transverse passageway 93 which is aligned with the aperture 22 of the table 21. The slide bars 91 and 92 are provided with inserts 94 and 96, respectively, each of which support a pair of pointed staking blades 97 which are aligned in opposing fashion with the pair of staking blades of the opposite insert. An air cylinder 98 is attached to the base plate 83 beneath the turntable 21, and is provided with a piston rod 99 which is aligned with the aperture 22 of the table and the passageway 93 of the slide support 90. A brace 101 is attached to the U-shaped support 84 adjacent to the slide support 90, and supports a flexible tubing 102 which is aligned with the passageway 93 and is attached to a vacuum source (not shown) for withdrawing the completed

subassembly 19 from the staking device 81. As the table 21 is indexed to a position whereby the subassembly 19 is beneath the passageway 93, the air cylinder 98 is actuated to raise the piston rod 99 into engagement with the subassembly, thereby urging the subassembly into the passageway. As the subassembly 19 is urged into the passageway 93, a spring-loaded plunger 103 (FIG. 10), which is positioned transversely in the passageway, is urged outwardly from within the passageway to allow the continued upward movement of the subassembly. Thereafter, the air cylinder 98 is deactuated and the piston rod 99 is withdrawn from within the passageway 93, whereby the spring-loaded plunger 103 is inserted transversely into the passageway to preclude the downward gravitational fall of the subassembly 19. Subsequently, the air cylinders 88 and 89 are actuated to slide the bars 91 and 92 within the passageways 95 of the slide support 90, whereby the opposed pointed staking blades 97 engage the cap 16 and the ferrule 18 on opposite sides thereof to stake the cap and the ferrule to the sleeve 17. Subsequently, the air cylinders 88 and 89 are deactuated, and the staking blades 97 are withdrawn from engagement with the cap 16 and the ferrule 18, and the vacuum source (not shown) is actuated to withdraw the assembled and staked subassembly 19 through the flexible tubing 102 and from the staking device 81, whereby the subassembly is deposited in a receptacle (not shown).

As shown in FIG. 12, a timing mechanism 104 is provided with a motor 106 for operating a camming system (not shown), whereby a plurality of contacts of the timing mechanism are cam controlled, thereby energizing a corresponding plurality of solenoids to control the pneumatic operation of the assembly and staking apparatus 20. During a cycle of operation of the apparatus 20, a series of caps 16 are positioned in a corresponding series of apertures 22 for the subsequent insertion of sleeves 17 therein, ferrules 18 are positioned in apertures 22 previously occupied by a sleeve-cap assembly and a subassembly 19 is positioned within an aperture 22 adjacent to the staking device 81. Assuming that the assembly and staking apparatus 20 has completed at least one cycle of operation whereby the caps 16, ferrules 18 and subassembly 19 are positioned in the apertures 22 as described, the following operational description is illustrative of the sequential operation of the various controlling air cylinders for the apparatus. Referring to FIGS. 11 and 12, all air cylinders are assumed to be at a rest position. Thereafter, rotational movement of the motor 106 results in the cam closing of a contact 107 of the timing mechanism 104 whereby a solenoid 108 is energized. As the solenoid 108 is energized, an air valve 109 is opened to supply pneumatic pressure to the sleeve-feeding air cylinder 58 of the sleeve-feeding device 55 whereupon one end of the sleeve 17 is fed into engagement with the open end of the prepositioned cap 16 as previously described. In addition, the sleeve-cap-feeding air cylinder 58 of the feed station 80 is operated to feed the opposite end of the inverted sleeve 17 into engagement with the open end of the ferrule 18. Shortly thereafter, and during the period when the air cylinders 58 are operated, a switch 111 is cammed closed to energize a solenoid 112 whereby a valve 113 is opened so that the air cylinders 24 of the cap-feeding device 23 and the ferrule-feeding device 75 are simultaneously operated to feed a cap 16 and a ferrule 18, respectively, into apertures 22 of the table 21. In addition, a switch 114 is cammed closed simultaneously with the closing of the switch 111 to energize a solenoid 116, whereby a valve 117 is opened to supply pneumatic pressure to air cylinders 42, 59 and 98 simultaneously. As air cylinder 42 is actuated, the free end of the piston rod 43 is positioned within the open end of the cap 16 to cooperate with the die-stamping device 37 to roll-stamp a fuse designation on the cap. Further, as the air cylinder 69 is operated, the piston rod 71 urges the assembled sleeve 17 and cap 16 into the passageway 77 of the sleeve-cap-inverted device 68, whereby the sleeve-cap assembly is withdrawn from the device through the flexible tube 79. In addition, the operation of the air cylinder 98 urges the piston rod 99 upwardly into engagement with the assembly 19, whereby the assembly is positioned within the staking device 81 for a subsequent staking operation.

Continued operation of the motor 106 rotates the camming system, whereby a switch 118 is cammed closed shortly after the switches 114 and 111 are closed, thereby energizing a solenoid 119 so that an air valve 121 is opened. As the valve 121 is opened, pneumatic pressure is supplied to the air cylinder 49 to rock the die-stamping device 37, whereby a fuse designation is impressed in the cap 16. Simultaneously with the closing of the switch 118, a switch 122 is cammed closed to energize a solenoid 123, whereby a valve 124 is opened to supply pneumatic pressure to the air cylinders 62 of the escapement mechanisms 65 for the sleeve-feeding device 55 and the sleeve-cap-feeding device 80. As the air cylinder 62 of the sleeve-feeding device 55 is actuated, the piston rod 64 is extended transversely into the guideway 54 and engages and clamps the second sleeve 17 of the serially aligned sleeves against the walls of the guideway to preclude the free-fall downward movement of the sleeve and of each subsequent sleeve. Simultaneously, the air cylinder 62 of the sleeve-cap-feeding device 80 projects the piston rod 64 transversely into the guideway 54 and engages and clamps the second assembled cap 16 and sleeve 17 against the walls of the guideway in the same manner, thereby precluding downward movement of the assembled sleeve and cap and also precluding the downward movement of each subsequent assembled sleeve and cap. Simultaneously thereafter, the switches 107 and 111 are cammed open whereby the valves 109 and 113, respectively, are closed to deactuate the air cylinders 58 of the sleeve-feeding device 55 and the sleeve-cap-feeding device 80, and also the air cylinders 24 of the cap-feeding device 23 and the ferrule-feeding device 75. As the switches 107 and 111 are cammed open, a switch 126 is cammed closed to energize a solenoid 127, whereby an air valve 128 is opened. As the air valve 128 is opened, the air cylinders 63 of the sleeve-feeding device 55 and the sleeve-cap-feeding device 80 are actuated to withdraw the piston rod 66 which was previously inserted into the guideway 54 to support the first sleeve 17 and first sleeve-cap assembly, respectively. In this manner, the sleeve 17 and the sleeve and cap assembly, which previously rested on the piston rod 66, are allowed to fall through the respective guideways 54 and into the passageway 61, whereby continued downward movement is precluded by the spring-biased plunger 67. In this manner, the sleeve 17 of the feed device 55 and the sleeve-cap assembly of the feeding device 80 are positioned for engagement by the piston rod 59 for subsequent insertion into the cap 16 and the ferrule 18, respectively, as previously described.

Thereafter, the switch 114 is cammed open, whereby the valve 117 is closed to remove the pneumatic pressure from the air cylinders 42, 69 and 98 of the die-stamping device 37, the sleeve-cap-inverter device 68 and the staking device 81, respectively. As the air cylinder 42 is deactuated, the piston rod 43 is withdrawn from within the open end of the cap 16 subsequent to the die-stamping operation. Further, as the air cylinder 69 is deactuated, the piston rod 71 is withdrawn from within the passageway 77, whereby the previously inserted assembled sleeve 17 and cap 16 are precluded from downward movement by the spring-loaded plunger 78. Thereafter, a suction is applied through the flexible tube 79 to withdraw the assembled sleeve 17 and cap 16 through the flexible tube as previously described. Upon the deactuation of the air cylinder 98, the piston rod 99 is withdrawn from within the passageway 93 of the U-shaped support 84, whereby the subassembly 19 is precluded

from downward movement by the spring-loaded plunger **103**.

Subsequently, a switch **129** is cammed closed to energize a solenoid **131**, whereby a valve **132** is opened to supply pneumatic pressure to the air cylinders **88** and **89** of the staking device **81**. Upon the actuation of the air cylinders **88** and **89**, the pairs of opposed, pointed staking blades **97** are urged into engagement with the cap **16** and the ferrule **17**, respectively, whereby the cap and the ferrule are staked to the sleeve **17**. As the switch **129** is cammed closed, a switch **133** is simultaneously cammed closed, whereby a solenoid **134** is energized to open a valve **136**. As the valve **136** is opened, pneumatic pressure is supplied to an air cylinder **137** for indexing the table **21** in the direction of the arrow (FIG. 2) so that the previously positioned fuse elements may be subsequently inserted into other elements as previously described. In addition, vacant apertures **22** are positioned adjacent to the cap-feeding device **23** and the ferrule-feeding device **75** for the subsequent reception of a cap and a ferrule, respectively. Shortly thereafter, the switch **118** is cammed open, whereby the air valve **121** is closed to remove the pneumatic pressure from the air cylinder **49** so that the die-stamping operation is completed. In addition, the switch **126** is cammed open simultaneously with the opening of the switch **118**, whereby the valve **128** is closed to remove the pneumatic pressure from the air cylinders **63** of the escapement mechanism **65** associated with the sleeve-feeding device **55** and the sleeve-cap-feeding device **80**. In this manner, the piston rods **66** are inserted transversely into the guideways **54** of the feeding stations **55** and **80**, respectively. Thereafter, the switch **122** is cammed open to close the valve **124**, whereby the air cylinders **62** of the sleeve-feeding device **55** and the sleeve-cap-feeding device **80** are withdrawn from the guideways **54** thereof. Thus, the sleeves **17** and the sleeve-cap assemblies, which are aligned within the respective guideways **54**, fall through the guideway due to gravitational force until the previously clamped sleeve and sleeve-cap assembly come to rest upon the piston rods **66** which are transversely positioned within the respective guideways **54**. Subsequent to the opening of the switch **122**, switches **129** and **133** are cammed open, whereby the valves **132** and **136**, respectively, are closed. As the valve **132** is closed, the air cylinders **88** and **89** are deactuated to withdraw the opposed pairs of pointed staking blades **97** from engagement with the staked subassembly **19**, whereafter the vacuum source (not shown) is actuated to withdraw the completed staked subassembly through the flexible tube **102**, whereby the assembly is deposited into a receptacle (not shown). As the valve **136** is closed, pneumatic pressure is removed from the air cylinder **137** and the table indexing operation ceases. The entire system is now in a normal state of rest where, upon subsequent cammed closing of the switch **107**, a new cycle will begin.

It is to be understood that the above-described apparatus is simply illustrative of the application of the principles of the invention. It will be observed that various changes and modifications may be made therein without departing from the spirit and scope of the invention.

What is claimed is:

1. Apparatus for assembling a pair of elements having openings for receiving the ends of an elongated member, which comprises:

means for inserting the elongated member into an opening of one of the elements,

means for inverting the assembled elongated member and the element,

means for inserting the opposite end of the elongated member into an opening of the second of the pair of elements, whereby the pair of elements are assembled with the elongated member, and

means for supporting the inserting and inverting means in a cooperative relationship.

2. Apparatus for assembling and staking a pair of elements having openings for receiving the ends of an elongated member, which comprises:

means for inserting the elongated member into an opening of one of the elements,

means for inverting the assembled elongated member and the element,

means for inserting the opposite end of the elongated member into an opening of the second of the pair of elements, whereby the pair of elements are assembled with the elongated member,

means for staking each element to the elongated member, and

means for supporting the inserting, inverting and staking means in a cooperative relationship.

3. Apparatus for assembling a first and second element having openings for receiving the ends of an elongated member, which comprises:

a carrier having a plurality of spaced apertures,

means for inserting the first element into an aperture in the carrier,

means for inserting one end of the elongated member into an opening of the first element positioned within the carrier aperture,

means for removing the assembled member and element from the carrier,

means for depositing a second element in the carrier aperture previously occupied by the assembled member and first element,

means for inverting the assembled member and first element,

means for inserting the opposite end of the inverted, elongated member into an opening of the second element, whereby the first and second elements are assembled with the elongated member, and

means for supporting the carrier and the inserting, removing, depositing and inverting means in a cooperative relationship.

4. Apparatus for assembling and staking a first and a second element having openings with opposite ends of an elongated member, which comprises:

a carrier having a plurality of spaced apertures,

means for depositing the first element into the carrier aperture,

means for inserting one end of the elongated member into an opening of the first element positioned within the carrier aperture,

means for removing the assembled member and element from the carrier,

means for depositing the second element in the carrier aperture previously occupied by the assembled member and first element,

means for inverting the assembled member and first element,

means for inserting the opposite end of the inverted, elongated member into an opening of the second element, whereby the first and second elements are assembled with the elongated member,

means for removing the assembled elements and elongated member from the carrier aperture,

means for staking the elements with the elongated member,

means for moving the carrier between the depositing, inserting, inverting, removing and staking means, whereby the elements are assembled and staked with the elongated member, and

means for supporting the carrier and the depositing, inserting, removing, inverting and moving means in a cooperative relationship.

5. Apparatus for assembling a cap and a ferrule with opposite ends of a cylindrical sleeve, which comprises:

a carrier having a plurality of apertures therein,

a first work station adjacent to the carrier having means for singly feeding the caps into the apertures of the carrier,

a second work station adjacent to the carrier and spaced from the first work station having means for singly feeding the cylindrical sleeves into the caps positioned in the carrier apertures,

a third work station adjacent to the carrier spaced from the second work station having means for removing the assembled sleeve and cap from the carrier aperture and inverting the assembly,

a fourth work station adjacent to the carrier spaced from the third work station having means for singly feeding the ferrules into the apertures of the carrier previously occupied by the assembled sleeve and cap,

a fifth work station adjacent to the carrier spaced from the fourth work station having means for feeding the opposite end of the inverted, assembled sleeve and cap into the ferrule positioned in the carrier aperture,

a sixth work station adjacent to the carrier spaced from the fifth work station having means for removing the assembled sleeve, cap and ferrule from the carrier aperture and staking the cap and ferrule to the sleeve,

means for periodically indexing the carrier to position the apertures thereof adjacent to the plurality of work stations whereby the cap and ferrule are assembled and staked with the sleeve, and

means for supporting the carrier, the work stations and the indexing means in a cooperative relationship.

6. Apparatus according to claim **5**, in which the first work station comprises:

a guide block having a passageway therein for receiving singly caps from a cap supply wherein the passageway is spacially aligned with the carrier aperture,

an air cylinder having a piston rod extending into the passageway of the guide block, and

means for actuating the air cylinder, whereby the piston rod engages the singly fed cap in the passageway of the guide block and urges the cap from the passageway into the aperture of the carrier.

7. Apparatus according to claim **5**, in which the second work station comprises:

a feed block formed with a first and second passageway which converge at a common exit spacially positioned above the apertures of the carrier,

the first passageway provided with a plurality of serially arranged sleeves fed from a sleeve supply,

an escapement mechanism attached to the feed block for feeding singly the sleeves through the first passageway to the common exit,

an air cylinder having a piston rod extending into the second passageway in axial alignment with the common exit for engaging and urging the positioned sleeve into the cap previously positioned in the carrier aperture, and

means for actuating the escapement mechanism and the air cylinder, whereby the sleeve is fed to the common exit and the piston rod urges the sleeve into the cap positioned in the carrier aperture.

8. Apparatus according to claim **5**, in which the third work station comprises:

a receiver block having a passageway therein axially aligned and spaced from the apertures of the carrier,

an air cylinder spacially positioned subjacent to the carrier having a piston rod axially aligned with the apertures of the carrier for engaging the assembled sleeve and cap and raising the assembly into the passageway of the receiver block,

means for removing the assembled sleeve and cap from the block passageway and inverting the assembly, and

means for actuating the air cylinder, whereby the piston rod urges the assembled sleeve and cap into the block passageway.

9. Apparatus according to claim **5**, in which the fourth work station comprises:

a guide block having a passageway therein for receiving singly ferrules from a ferrule supply wherein the passageway is spacially aligned with the carrier aperture,

an air cylinder having a piston rod extending into the passageway of the guide block, and

means for actuating the air cylinder, whereby the piston rod engages the singly fed ferrule in the passageway of the guide block and urges the ferrule from the passageway into the aperture of the carrier.

10. Apparatus according to claim **5**, in which the fifth work station comprises:

a feed block formed with a first and second passageway which converge at a common exit spacially positioned above the apertures of the carrier,

the first passageway arranged for receiving serially the inverted assembled sleeve and cap therein,

an escapement mechanism attached to the feed block for feeding singly the inverted assembled sleeves and caps through the first passageway to the common exit,

an air cylinder having a piston rod extending into the second passageway in axial alignment with the common exit for engaging and urging the sleeve and cap assembly toward the previously positioned ferrule, whereby the open end of the sleeve is inserted into the ferrule, and

means for actuating the escapement mechanism and the air cylinder, whereby the assembly is fed to the common exit and the piston rod urges the open end of the sleeve into the ferrule in the turntable aperture.

11. Apparatus according to claim **5**, in which tthe sixth work station comprises:

a staking device spacially positioned above the carrier having a passageway axially aligned with the carrier apertures for receiving the assembled sleeve, cap and ferrule therein,

an air cylinder subjacent to the carrier having a piston rod axially aligned with the apertures of the carrier for engaging and urging the sleeve, cap and ferrule assembly into the passageway of the staking device,

a pair of air cylinders having piston rods extending therefrom,

a pair of staking blades attached to the free ends of each piston rod positioned in opposition to the pair of staking blades attached to the other piston rod for transverse insertion into the passageway of the staking device,

means for actuating the air cylinders, whereby the pairs of opposed staking blades are inserted into the passageway of the staking device and engage the cap and ferrule on opposite sides thereof so that the cap and the ferrule are staked to the sleeve, and

means for removing the staked sleeve, cap and ferrule assembly from the staking device.

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