April 7, 1970 H. W. SCHICK 3,504,416

MACHINE FOR ASSEMBLING WIRES INTO ELECTRICAL FIXTURES

Filed May 1, 1967 3 Sheets-Sheet 1

FIG. 1

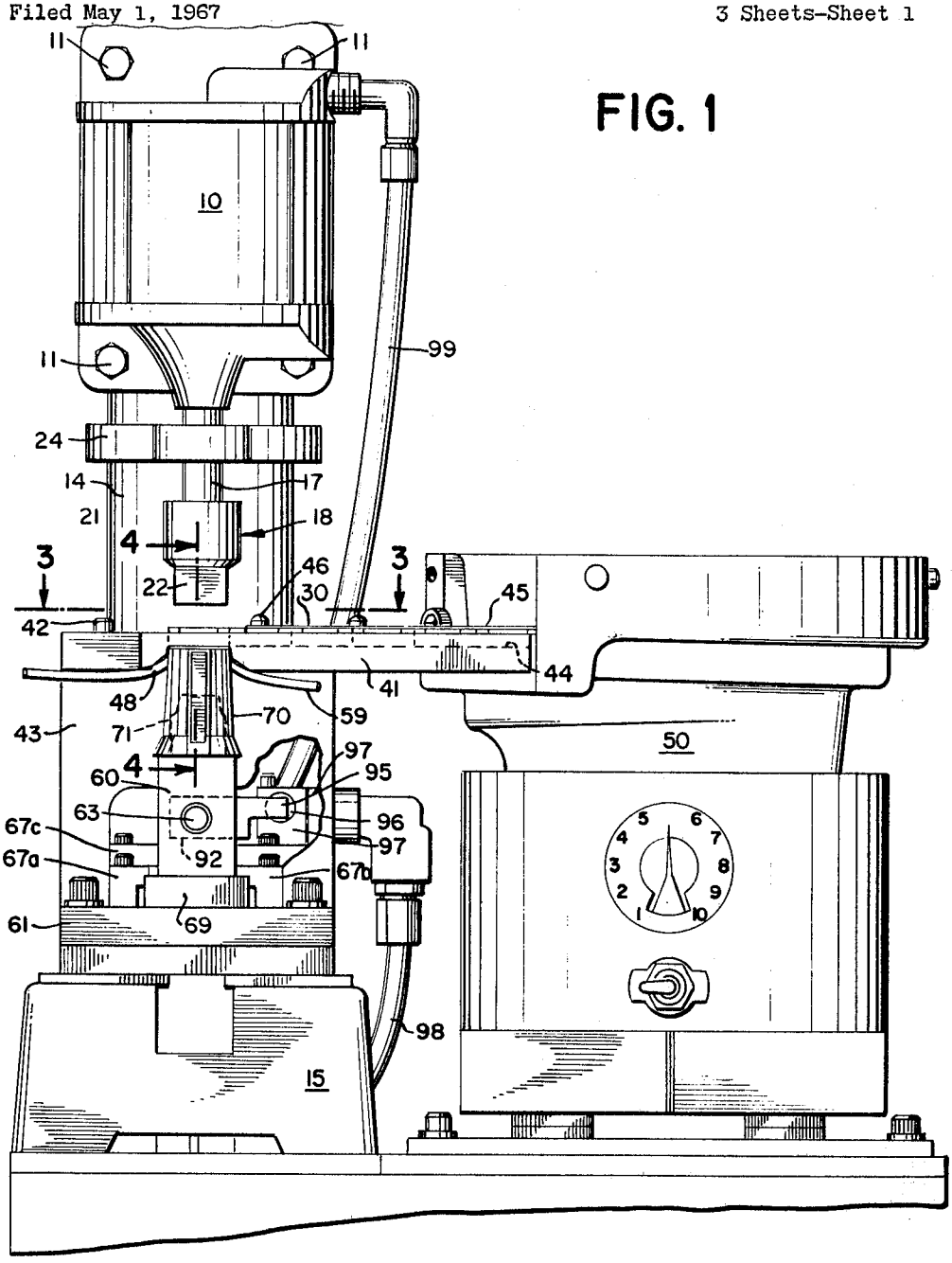

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FIG. 2

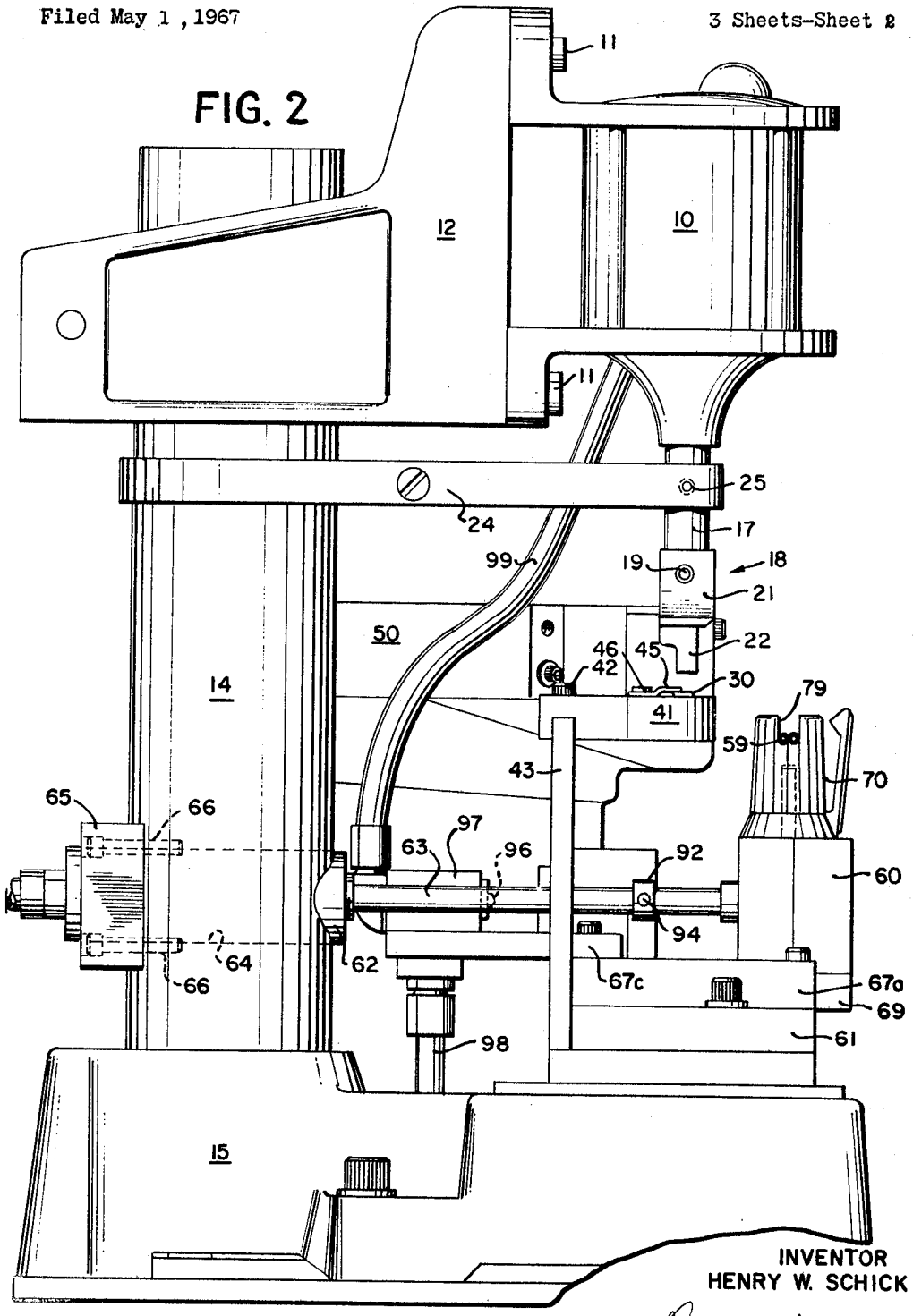

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FIG. 3

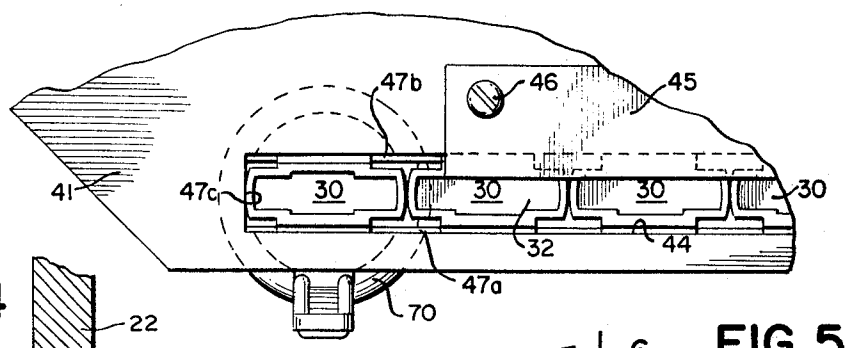


FIG. 4

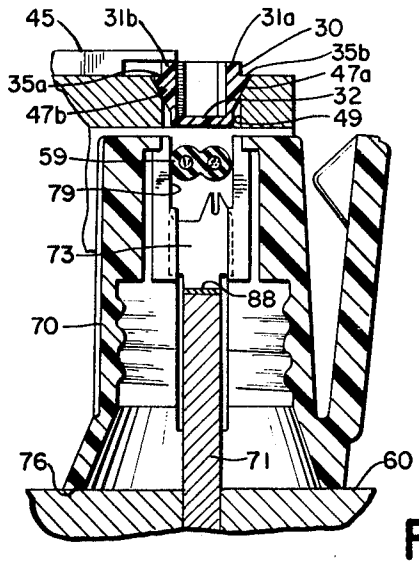


FIG. 5

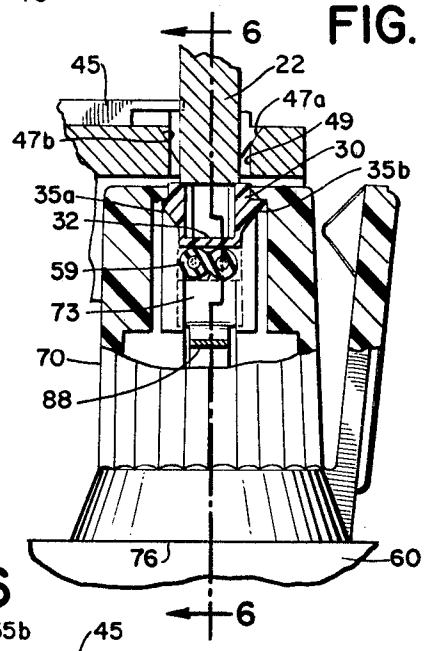
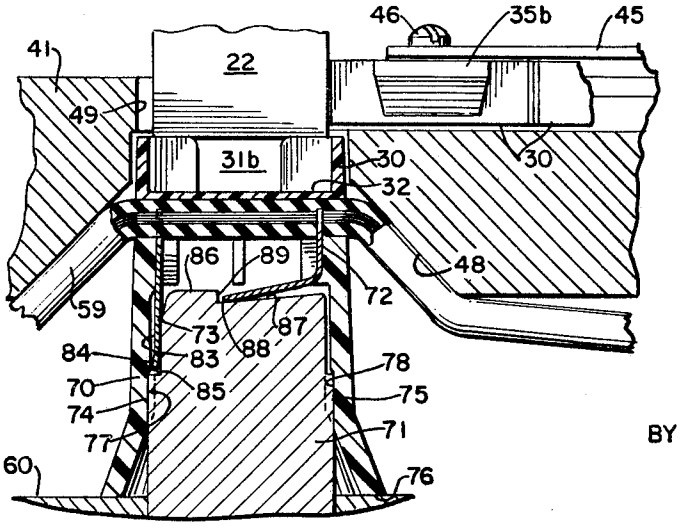


FIG. 6



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MACHINE FOR ASSEMBLING WIRES INTO ELECTRICAL FIXTURES

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U.S. Cl. 29—203 9 Claims

ABSTRACT OF THE DISCLOSURE

A machine for assembling current carrying wires into electrical fixtures in which a ram presses a resilient wire-retaining insert member through an opening in a support structure of the machine and into locking engagement with a suitable wire-holding channel in the electrical fixture which is positioned at an assembly station beneath the support structure with the channel in the fixture aligned with the opening in the support structure, the ram preferably being actuated by the movement of the fixture to the assembly station.

This invention relates to automatic assembly machines in general, and, more particularly, to a simple but effective machine for assembling wires into electrical fixtures such as light sockets. In many types of electrical lighting systems, for example, Christmas tree lighting sets and certain types of outdoor lighting sets, the contact members of a large number of light sockets must be electrically connected to a pair of current carrying wires.

In a conventional manufacturing operation where the light sockets and wires are assembled manually, the cost of the manual labor amounts to a relatively large share of the total manufacturing cost of the lighting system. Therefore it is apparent that effecting savings in the labor portion of the manufacturing costs, such as by the use of automatic assembly machines, would be highly desirable. Consequently, there has been a long-felt need in the art for a simple but effective machine for assembling wires into light sockets.

It is an object of this invention to provide a simple and effective machine for assembling wires into light sockets or other electrical fixtures.

Another object of this invention is to provide a machine for assembling wires into light sockets of the type comprising a husk member and a wire-retaining insert member.

According to the above and other objects the present invention provides an assembly machine for pressing a pair of electrical wires and a wire-retaining insert member into a suitable channel formed in the base of a light socket husk so that electrical contacts mounted in the husk pierce the insulation of the electrical wires to make an electrical connection with the conductors therein and so that the wire-retaining insert snaps into locking engagement with the base of the husk. The assembly machine includes an insert supporting device for releasably supporting a partially resilient insert member. In a preferred embodiment of the invention the insert supporting device includes a structure having an opening therethrough whose dimensions are slightly less than the dimensions of the resilient insert member so as to support the insert member and yet permit said insert member to be forcibly driven through the opening. The assembly machine of the present invention also includes a husk support which is movable from a loading station to an assembly station adjacent the insert supporting device. A ram is provided for driving the insert member through the opening in the support structure into a channel formed in the base

of the husk member. In accordance with a preferred embodiment of the invention the ram is automatically actuated in response to the presence of the husk supporting means at its assembly station. Also, if desired, the assembly machine of the present invention can be provided with automatic feeding of the insert members into position in the insert support structure. Further, the husk supporting device can be automatically moved from its loading station to its assembly station.

Other objects and advantages of the present invention will be apparent from the following detailed description and accompanying drawings which set forth the principles of the invention and, by way of example, the best mode contemplated for applying that principle.

In the drawings:

FIG. 1 shows a front elevational view of the assembly machine of the present invention including a device for automatically feeding insert members to the insert supporting structure;

FIG. 2 shows a side elevational view of the assembly machine of FIG. 1;

FIG. 3 is an enlarged view looking in the direction of line 3—3 of FIG. 1 showing the insert supporting structure;

FIG. 4 is an enlarged cross-sectional view showing the husk member and husk supporting means at the assembly station prior to the actuation of the ram means along line 4—4 of FIG. 1;

FIG. 5 is an enlarged cross-sectional view as in FIG. 4 showing the relationship of the parts after the actuation of the ram means; and

FIG. 6 is a cross-sectional view taken along the line 6—6 of FIG. 5.

One type of light socket which is particularly well adapted for use in Christmas tree lighting sets and for other applications of a similar nature is described in U.S. Patent No. 3,372,362 of the present inventor, filed Oct. 6, 1965 and issued March 5, 1968 and assigned to the same assignee. This socket is shown in FIGS. 1–6 and is described in greater detail in the aforesaid application. While the assembly machine of the present invention is described for use with this type of socket, it should be understood that it also can be used for assembling other types of sockets to the current carrying wires.

Referring to FIGS. 1–6 the socket comprises a husk member **70** having a channel **79** formed in the base thereof for receiving both a pair of current carrying wires **59** and a resilient wire-retaining insert member **30** which is of open construction having side walls **31***a* and **31***b* and bottom **32** as shown in greater detail in FIGS. 4 and 5.

A pair of electrical contact members **72** and **73** are mounted within the husk member **70**, preferably by force fit, so as to provide electrical contact with a light bulb properly inserted into the socket. The ends of the electrical contact members **72** and **73** protrude into the channel **79** and have one or more barbs or points for piercing the insulation of the wire. Each pointed end is located so as to be capable of piercing the insulation of only one of the wires and make contact with the current carrying conductor therein. Electrical contact is made by inserting the cover member into the channel **79** thereby forcing the wires **59** onto the sharpened ends of the respective contact members **72** and **73** so that the insulation is penetrated and electrical contact is made. The wire is retained in position by means of the insert member **30** which is provided with locking tabs **35***a* and **35***b* which snap into locking engagement with the bottom wall if the husk member when the insert member is driven into the channel **79**.

Referring now to FIGURES 1 and 2 for a more detailed description of the structure of the assembly ma-

chine of the present invention, a spring-return air cylinder **10** is mounted, as by bolts **11**, on a bracket **12** which is in turn mounted or clamped on a cylindrical standard **14** which projects upward from base **15** of the assembly machine. Air cylinder **10** together with bracket **12**, standard **14** and base **15** may be of the type manufactured by the Airmite Corporation and designated Airmite AP4. Air cylinder **10** operates a reciprocating ram **17**, the end of which has a driver piece **18** attached thereto by one or more set screws **19**. Driver piece **18** includes a body portion **21** which encloses and is attached to the lower end of ram **17**, and an operating portion **22** which may be specially shaped for proper coaction with insert member **30** of the light socket to be assembled. A member **24** is fastened to ram **17** by means of set screw **25** and extends substantially heorizontally to embrace standard **14** so as to prevent ram **17** from twisting on its axis during operation.

The insert members **30** for the sockets are supported for assembly by a horizontal support piece **41**. Support piece **41** is secured by screws **42**, for example, to the top of a vertical piece **43** which is mounted on the base **15** of the assembly machine. A track or channel **44** is formed into the upper surface of horizontal piece **41** for accepting insert members **30** from vibrator swirl feed mechanism **50**. Vibrator swirl feed mechanism **50** may be of a type well known to those skilled in the art such as, for example, the vibrator swirl feed mechanisms manufactured by the Syntron Corporation.

As shown more clearly in FIG. 3, insert members **30** are fed along track **44** in end to end relation by the action of the feed mechanism pushing additional insert members into the track. A plate **45** is mounted on the upper surface of horizontal piece **41** by, for example, screws **46**, and extends partially over channel **44** to form a lip to prevent the insert members **30** from being jiggled or bounced out of track **44** by vibration resulting from the operation of vibrator swirl feed mechanism **50** and ram **17**.

As shown more clearly in FIG. 4, the side walls **47***a* and **47***b* forming track **44** are chamfered or beveled in order to conform to the slanted sides **33***a* and **33***b* of insert members **30**. Track **44** terminates in a blind wall **47***c* forming an assembly station at which a depression **48** formed in the lower surface of horizontal piece **41** meets track **44** to form an opening or driver passageway **49** through piece **41**. The resilient or deformable insert members **30** may be driven through opening **49** by the action of ram **17**. More particularly, as shown in FIGS. 4 and 5 operating portion **22** of driver piece **18** is sufficiently wide to engage the tops of both side walls **31***a* and **31***b* of insert member **30**, spanning the open space therebetween and allowing side walls **31***a* and **31***b* to flex inward freely. In response to the downward force of operating piece **22**, the downwardly tapered surfaces **33***a* and **33***b* of side walls **31***a* and **31***b* coact with the chamfered or beveled edges **47***a* and **47***b* of track **44** to cam the resilient side walls **31***a* and **31***b* of insert member **30** inward so as to permit insert member **30** to pass through the driver opening **49** in insert supporting piece **41**. Operating portion **22** of driver piece **18** passes through driver opening **49** without obstruction. It will be apparent to those skilled in the art that supporting piece **41** with track **44** and driver opening **49** provides an extremely simple and reliable means for supporting insert members **30** and yet permitting them to be driven directly into channel **79** in husk **70**.

As shown in FIG. 2 a husk supporting member **60** rests on a raised portion **61** of base **15** and is movable from a loading position station (position shown in FIG. 2) to an assembly position station immediately beneath the driver passage **49** of horizontal insert supporting piece **41**. In the preferred form of the present invention, husk supporting member **60** is moved from the loading station to the assembly station by means of a double-acting air cylinder **62** whose shaft **63** is connected to the husk supporting member. Air cylinder **62** is mounted within an opening **64** in cylindrical standard **14** and is retained in position by a bracket **65** which is secured to standard **14** by bolts **66**, for example. Husk supporting member **60** rides in a pair of guide rails **67***a* and **67***b* which guides it from the loading station to the assembly station. Rails **67** are mounted on a raised portion **61** of base **15** which slidably engages the lower portion **69** of husk supporting member **60** as it travels between its stations. A crosspiece **67***c* mounted on guide rails **67***a* and **67***b* serves to stop husk supporting member **60** at its assembly station so that channel **79** of husk **70** is precisely located beneath driver opening **49** in insert supporting piece **41**. An index piece **71** shown in FIG. 1, is mounted on the upper surface of husk supporting member **60**. Piece **71** serves to ensure the precise angular positioning of the husk member **70** of the light socket to be assembled. The precise angular positioning of husk **70**, relative to driver passage **49**, is ensured by the coaction of sides **74** and **75** of index piece **71** with complementary grooves **77** and **78** formed in the interior surface of husk **70**. If the machine operator places husk **70** on support member **60** in the proper angular orientation, sides **74** and **75** of index piece **71** will slip easily into the complementary grooves **77** and **78** formed in the interior surface of husk **70** thus allowing the husk to drop all the way down onto piece **71** so that the open mouth **76** of husk **70** will be seated firmly against the upper surface of support member **60**. On the other hand, if the angular orientation of husk **70** is not correct, sides **74** and **75** of index piece **71** will catch against the interior surface of husk **70** thus preventing the mouth **76** of husk **70** from becoming fully seated against the upper surface of support member **60**. This condition will alert the machine operator to re-orient husk **70** to the correct angular position for the assembly operation.

In the preferred form of the present invention shown in FIG. 6, index piece **71** also serves to maintain the proper positioning of electrical contacts **72** and **73**, which are preferably mounted by force fit within husk **70**, during the assembly operation. More specifically, as shown in FIG. 6, side **74** of index piece **71** is provided with a notch **83** to accommodate electrical contact **73**. The end **84** of electrical contact **73** abuts the end **85** of notch **83** so that electrical contact **73** is prevented from being dislodged by the downward pressure of wire **59** during the assembly operation. Similarly, the top **86** of index piece **71** is provided with a downwardly sloping surface **87** to accommodate the bent portion of electrical contact **72** which is to contact the bottom of the bulb base. The end **88** of contact **72** abuts the end wall **89** of surface **87** of index piece **71** so as to maintain contact **72** in position during the assembly operation.

Referring again to FIG. 2, a collar **92** is adjustably mounted on shaft **63** by set screw **94**. Collar **92** has a lateral projection **95** (FIG. 1) for contacting an operating button **96** of air valve **97**. Collar **92** is so positioned along shaft **63** that when the husk supporting member **60** is at its operating station, lateral projection **95** of collar **92** operates control **96** of air valve **97** admitting air under pressure from a reservoir, not shown, through air hoses **98** and **99** to air cylinder **10**. When air is admitted ram **17** is actuated to drive insert member **30** into channel **79** of husk member **70** of the light socket to be assembled.

In operation, the machine operator places light socket husk member **70** in position on husk supporting member **60**. Hook portion **78** of husk member **70** is preferably oriented outward as shown in FIG. 2 or, alternatively, inward as long as successive light socket husk members **70** are all oriented the same way. The consistent orientation of the light socket husk member **70** ensures that all of the electrical contact members **73** of a set of sockets

will be connected to the same lead of wire **59** while all of the other electrical contact members **72** will penetrate the other lead. This arrangement establishes polarity for all contact members as required by the standards of the Underwriters Laboratory for household wiring systems.

The machine operator is aided in the precise angular orientation of husk member **70** by the coaction of the sides **74** and **75** of index piece **71** with complementary grooves in the interior surface of husk member **70** as has been explained in greater detail herein above.

After husk member **70** has been properly seated on husk supporting member **60**, the machine operator lays the dual-conductor wire **59** into channel **79** in the base of husk member **70**, taking care not to twist wire **59** between one socket and the next. Usually the two leads of wire **59** are of different colors to help establish proper polarity for the set of sockets.

After husk **70** and wire **59** have been properly positioned the machine operator presses a button, lever, or foot pedal (not shown) to admit air under pressure via air hose **90** to double-acting air cylinder **62**. The resulting action of air cylinder **62** is to draw shaft **63** inwards until husk supporting member **60** abuts cross piece **67***c*. At this point husk supporting member **60** is properly located at its assembly station beneath opening **49** of insert supporting piece **41**. Preferably, there is a resilient, over-travel connection such as a spring (not shown) between shaft **63** and the husk supporting member **60**. When husk supporting member **60** stops against cross-piece **67** shaft **63** over-travel and lateral projection **95** of collar **92** operates button **96** of air valve **97** to admit air under pressure to spring-return air cylinder **10**. The resulting downward stroke of ram **17** brings operating portion **22** of driver piece **18** into engagement with insert member **30** located at the drive opening **49** thus driving the insert member **30** through the drive opening **49** in insert supporting piece **41** as has been explained in greater detail herein above.

The continued downward stroke of operating piece **22** drives insert member **30** into channel **79** in the base of husk member **70**. The downwardly tapered surfaces **33***a* and **33***b* of side walls **31***a* and **31***b* coact with the edges **34***a* and **34***b* of channel **79** to squeeze the side walls of the insert member **30** until the parts snap into the fully assembled position shown in FIG. 5. In some cases, the walls on either side of channel **79** give slightly to facilitate the fastening of the insert member. As shown in FIG. 5, insert **30** is retained in the assembled position by the engagement of locking surfaces **35***a* and **35***b* with the interior surfaces of the buttom wall base of husk **70**.

After insert member has been driven into the assembled position within channel **79** of husk **70** the machine operator releases the button, or lever, or foot pedal (not shown) thus causing double acting air cylinder **62** to return husk supporting member **60** to its loading position. Before the husk supporting member **60** starts to move toward its loading station the over-travel connection of shaft **63** to member **60** causes shaft **63** and the lateral projection **95** of collar **92** to move slightly to release control **96** of air valve **97**. This releases the pressure from air cylinder **10** and ram **17** returns to its original position in response to the action of the spring return mechanism permitting member **60** to move. The husk supporting member **60** returns to its loading station and the machine operator removes the assembled wire and socket combination and places a new husk member in position for the next assembly operation.

While a manual operation for placing the husks **70** on the supporting member **60** has been described, it should be understood that this also can be done automatically or semi-automatically. For example, in my co-pending application S.N. 635,230, filed concurrently herewith, and entitled Apparatus for Orienting Articles, which is assigned to the same assignee, a system is disclosed for orienting husks of the type shown herein to predetermined angular position. The oriented husks can be transported by a suitable conveyor system onto the supporting member **60**.

Although the principles of the present invention have been illustrated by reference to the structure and operation of a specific machine for assembling wires into light sockets, it will be appreciated by those skilled in the art that certain changes may be made without departing from these principles. For example, the assembly machine of the present invention may be adapted to assemble items other than electrical light sockets. Further, hydraulic or mechanical means may be substituted for the air cylinders employed in the preferred embodiment. In addition it will be apparent to those skilled in the art that other modifications and adaptations of the apparatus may be made without departing from the spirit and scope of the invention as set forth with particularity in the appended claims.

What is claimed is:

1. An assembly machine for assembling an electrical fixture to a current carrying wire, said electrical fixture comprising a resilient insert member and a husk member having an opening for receiving said current carrying wire and said insert member, said assembly machine comprising:

an insert supporting structure for releasably supporting said insert member, said insert supporting structure having an opening therethrough, the dimensions of said opening being slightly less than the dimensions of said resilient insert member so as to support said insert member and yet permit said insert member to be driven through said opening by said ram means;

means for supporting said husk member;

means for moving said husk supporting means from a loading station to an assembly station adjacent said insert supporting structure with the wire receiving opening of the husk located in line with the opening of the insert supporting structure;

ram means for releasing said insert member from said insert supporting structure and driving said insert member into said opening in said husk member, and

ram actuation means for controllably actuating said ram means.

2. An assembly machine of the type described in claim **1** wherein said husk supporting means includes index means for engaging said husk member to place the insert receiving opening in the proper angular orientation for assembly of the insert member.

3. An assembly machine as set forth in claim **1** further comprising, structure for holding a plurality of insert members, and means for sequentially feeding said insert members to said insert supporting means with the same relative orientation.

4. An assembly machine as set forth in claim **3** wherein said insert members have a recess bounded by at least two upstanding walls and said feeding means orients each said insert member fed to said insert supporting structure with its said recess facing said ram means.

5. An assembly machine as in claim **4** wherein said ram means spans the upstanding walls of said insert member so as to permit said walls to flex inward as said insert member is driven through the opening in said insert supporting structure.

6. An assembly machine as in claim **5** wherein the portion of said ram means engaging the insert member recess is generally rectangular.

7. An assembly machine for assembling an electrical fixture to a current carrying wire, said electrical fixture comprising a wire-retaining insert member having resilient walls with locking members thereon and a husk having an opening formed in its base for receiving said wire and said wire-retaining insert member, said assembly machine comprising:

an insert supporting means having an opening therethrough, the dimensions of said opening being slightly

less than the dimensions of said resilient insert member so as to support said insert member and permit said insert member to be forcibly driven through said opening,

means for supporting said husk member base upward,

means for moving said husk supporting means from a loading station to an assembly station immediately beneath the opening in said insert supporting means,

an index piece mounted on said husk supporting means to maintain said husk member in the proper angular orientation for assembly of the insert member thereto,

ram means for driving said insert member through said opening in said insert supporting means into said opening in said husk member so that the locking means engage the bottom wall of the husk member, and

means for actuating said ram means upon movement of said husk supporting means to the assembly station.

8. An assembly machine as in claim **7** wherein the locking members on the insert member have tapered side walls and sides of said opening in said insert supporting means are tapered to conform to the tapered side of said locking members.

9. An assembly machine as in claim **8** wherein said index piece is provided with a pair of recesses for receiving the interior ends of electrical contact members mounted in said husk so as to prevent said electrical contacts from becoming dislodged during the assembly operation.

References Cited

UNITED STATES PATENTS

2,438,642	3/1948	Martin	29—235
3,199,182	8/1965	Harris et al.	29—211 X

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U.S. Cl. X.R.

29—206, 235