

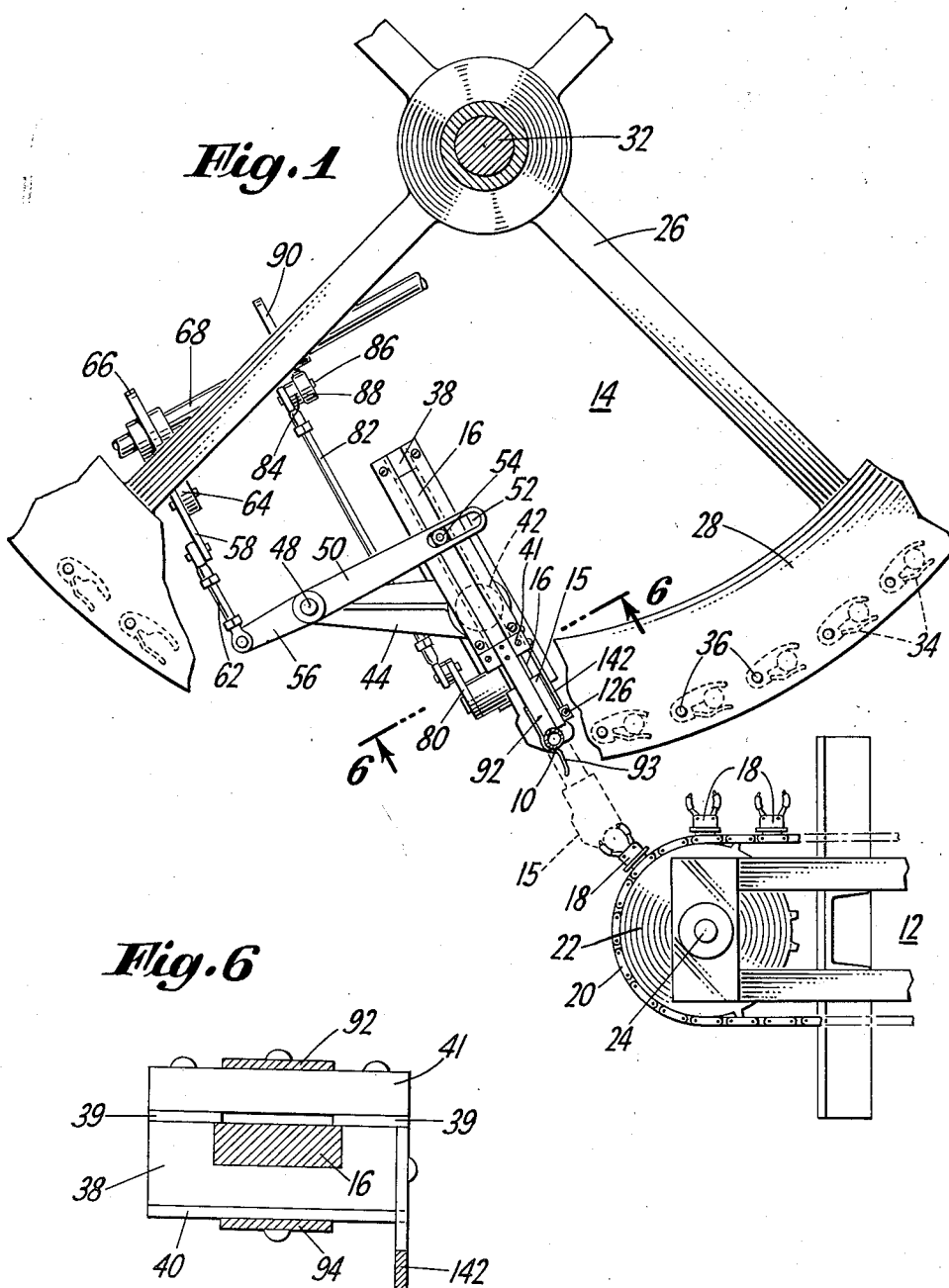
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E. L. MIDGLEY ET AL
ARTICLE TRANSFER APPARATUS

2,665,831

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3 Sheets-Sheet 1



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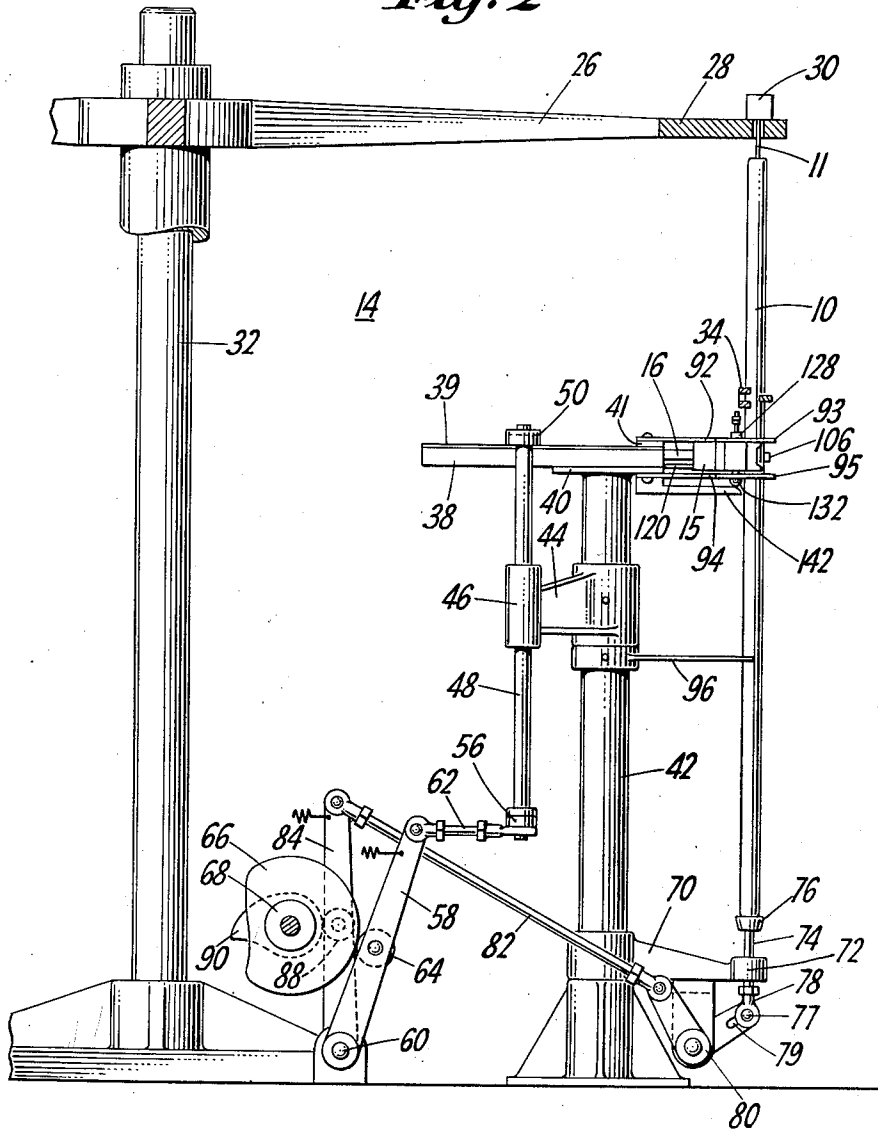
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Fig. 2



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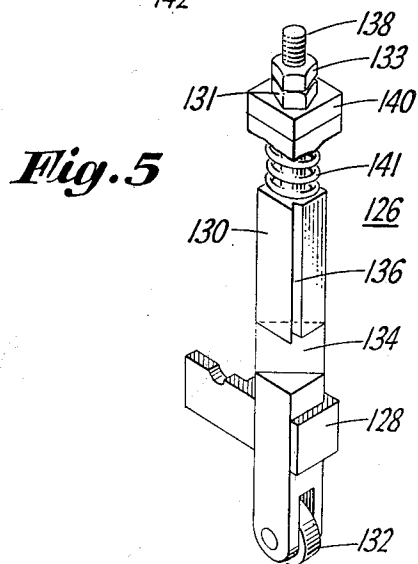
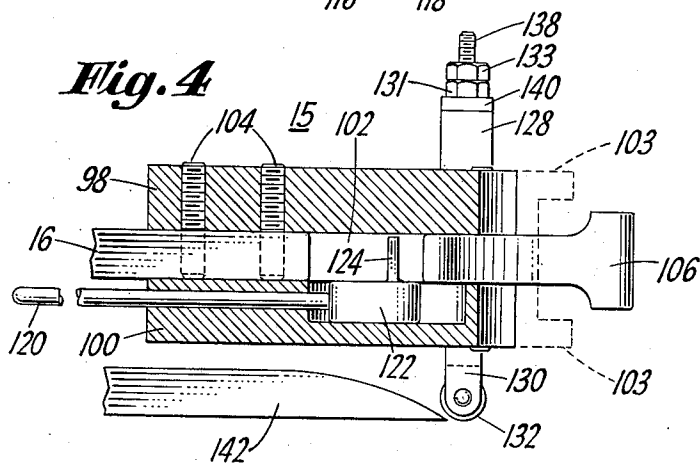
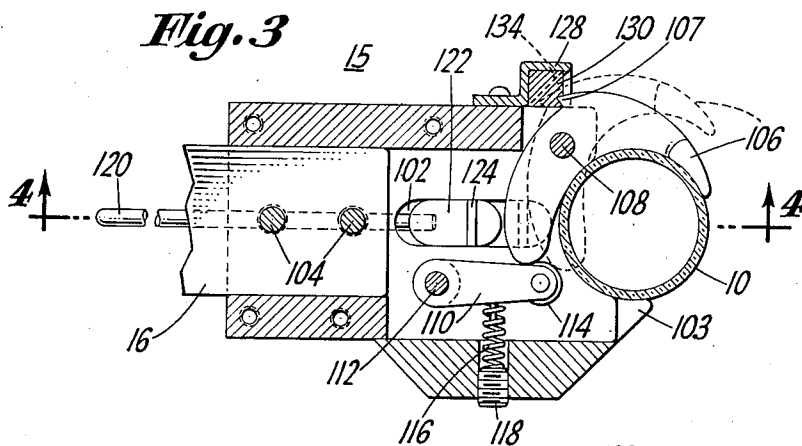
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UNITED STATES PATENT OFFICE

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ARTICLE TRANSFER APPARATUS

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4 Claims. (Cl. 226—20.4)

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This invention relates to transfer apparatus and more particularly to apparatus for transferring elongated tubular articles such as fluorescent lamps from one machine to another.

In the manufacture of fluorescent lamps, elongated glass tubes having a coating of fluorescent material on the inner wall thereof are positioned on a lamp sealing machine where electrode mounts are sealed to the ends thereof. The lamp is then transferred by a conveyor to a lamp exhaust machine where further manufacturing operations are performed thereon. Heretofore it has been the practice to have an operator load the exhaust machine with lamps fed thereto by the conveyor.

An object of this invention is to automatically load lamps on a fluorescent lamp exhaust machine.

Another object is to provide a transfer arm which will automatically load lamps on a fluorescent lamp exhaust machine.

A further object is to provide a transfer arm for unloading fluorescent lamps from a conveyor and feeding them to an exhaust machine.

These and other objects, advantages and features are attained in accordance with the principles of our invention by locating a transfer arm in proximity to both the conveyor from which the lamps are taken and the exhaust machine to which they are fed and providing the arm with actuating mechanisms to effect this transfer. More particularly, in the specific embodiment of our invention shown in the accompanying drawings and described below, the transfer apparatus is a reciprocating arm mounted on the exhaust machine. The arm is provided with a lamp-grasping head thereon which, when the arm is actuated, takes a lamp from the conveyor and carries it to a station on the exhaust machine in register with but spaced from an exhaust head thereon. Thereafter the lamp is moved upwardly into position in engagement with the exhaust head.

In the specific embodiment of this invention shown in the accompanying drawings, Figure 1 is a fragmentary plan view of a lamp exhaust machine, a conveyor and a lamp transfer apparatus associated therewith.

Figure 2 is a side elevational view of the lamp transfer apparatus.

Figure 3 is a horizontal sectional view of the head of the transfer apparatus.

Figure 4 is a sectional view of the head of the transfer apparatus taken along the line 4—4 of Figure 3.

Figure 5 is a perspective view of the device

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for locking the lamp-grasping jaw of the transfer apparatus.

Figure 6 is a sectional view of the transfer arm assembly taken along the line 6—6 of Figure 1.

Referring now to the drawings, particularly Figures 1 and 2 thereof, fluorescent lamp 10 with exhaust tube 11 extending from the upper end thereof is withdrawn from conveyor 12 and fed to exhaust machine 14 by head 15 mounted on transfer arm 16. That portion of the conveyor 12 shown in Figure 1 comprises a plurality of heads 18 mounted on endless link chain 20 driven by sprocket wheel 22 mounted on shaft 24. That portion of the exhaust machine 14 shown in Figures 1 and 2 comprises spider 26, ring plate 28 mounted about the periphery of the spider, and a plurality of exhaust heads 30 mounted on the ring plate. The exhaust heads 30 are indexed to a plurality of work stations by shaft 32 on which the spider 26 is mounted. A lamp-gripping jaw 34, mounted on a rod 36 depending from ring plate 28, is disposed beneath and in register with each exhaust head 30.

The transfer arm 16 is a slide disposed in channel bar 38 mounted on a plate 40 on top of post 42. The channel bar 38 has a pair of plates 39 mounted on the top thereof which partially overlie the transfer arm 16 to retain it therein (Fig. 6). Arm 44, mounted on post 42, has a bearing 46 on the free end thereof, through which shaft 48 extends. Lever 50, mounted on the upper end of shaft 48, has an elongated slot 52 cut therein at the free end thereof in which pin 54 upstanding on arm 16 rides. Lever 56, mounted on the lower end of shaft 48, is connected to lever 58, pivotally mounted at 60, by link 62. Cam roller 64, mounted on lever 58, rides on cam 66 mounted on shaft 68.

Arm 70, mounted on post 42, has a bearing 72 on the free end thereof, through which shaft 74 extends. Shaft 74 has a seat 76 mounted on the top thereof on which the lower end of lamp 10 is disposed during a portion of the lamp transfer operation. Swivel bearing 78 connects the lower end of shaft 74 to an arm of bell crank lever 80 by means of pin 77 which rides in slot 79. Rod 82 connects the other arm of bell crank lever 80 to lever 84 which is pivoted at 86. Cam roller 88, mounted on lever 84, rides on cam 90 mounted on shaft 68. Shaft 68 on which cams 66 and 90 are mounted, is connected through conventional means to the exhaust machine indexing mechanism and is driven thereby, thus insuring the desired synchronization of the exhaust machine indexing with the transferring of the lamp 10 from

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the conveyor 12 to the exhaust machine 14 by the transfer arm 16.

Three lamp guide arms 92, 94 and 96 (Fig. 2) are provided to guide and align lamp 10 in the delivery position on the exhaust machine. Each of the arms is cut away slightly at the free end thereof to receive the lamp 10. Arm 92 is mounted on plate 41 (Figs. 1, 2 and 6) and overlies head 15 of the transfer arm 16. Arm 94 is mounted on plate 40 and lies beneath head 15. Arm 96 is mounted on post 42 intermediate the ends thereof. Resilient finger 93 is mounted on the side of arm 92 and resilient finger 95 is mounted on plate 40 adjacent to guide arm 94.

Referring now particularly to Figures 3 and 4, head 15 is a metal block milled out to define an upper plate 98 and a lower plate 100 with a chamber 102 therebetween. The transfer arm 16 extends into the chamber 102 and the head 15 is secured thereto by screws 104. The front of the head 15 is provided with a crescent-like cutaway with horns 103 on one side thereof to receive the lamp 10. A movable jaw 106 at the other side thereof with a serration 107 cut in the periphery thereof is pivotally mounted at 108 in the lower plate 100 and lies in the chamber 102. Lever 110, pivotally mounted at 112 in the lower plate 100, has a cam roller 114 mounted on the free end thereof which engages jaw 106. Lever 110 is spring loaded by spring 116, the tension of which may be adjusted by screw 118. Rod 120 extends through lower plate 100 into chamber 102. Block 122, with fin 124 upstanding thereon, is secured to the inner end of rod 120.

A locking device 126 (Fig. 5) for locking the jaw 106 in the closed position is slidably disposed in a casing 128 attached to a side of the head 15 (Fig. 3). The locking device 126 comprises a bar 130 which is bifurcated at the lower end thereof with a cam roller 132 supported in the bifurcation. The bar 130 also has a recess 134 and an elongated slot 136 formed therein. A screw 138, which extends down through the casing 128 and into the bar 130, is provided with a spring 141 concentric therewith, the lower portion of the spring being disposed within the bar 130 and the upper portion thereof engaging cap 140. The screw 138 is provided with an adjusting nut 131 and a locking nut 133. Thus the bar 130 is spring loaded with tension adjustable by manipulation of nut 131 to insure positive engagement of cam roller 132 with bar cam 142 which is attached to plate 40 on post 42 and lies beneath head 15 (Figs. 1 and 4).

The operating cycle of the lamp transfer apparatus will now be described, starting with the transfer arm 16 in the rest position, i. e., with the arm 16 fully retracted in the channel bar 38 and the lamp-grasping head 15 disengaged from the lamp 10 so that the exhaust machine 14 can index and carry the lamp which has just been delivered thereto to the next station (Figs. 1 and 2). In the rest position, the jaw 106 in the head 15 is open and the block 122 on the inner end of the rod 120 is advanced as shown in phantom in Figure 3, and the serration 107 of the jaw 106 is disposed in recess 134 out of register with slot 136 in the bar 126 of the jaw locking device 126 (Figs. 3 and 5).

The forward stroke of the transfer arm 16 starts at about the same time as the exhaust machine starts to index, the head 15 of the transfer arm 16 passing through the lamp loading station as soon as the lamp which had previously

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been transferred thereto has moved therefrom. Counter-clockwise rotation of shaft 68 is translated into forward motion of the transfer arm 16 through cam 66, cam roller 64, lever 58, link 62, lever 56, shaft 48, lever 50 and pin 54 (Figs. 1 and 2). As the transfer arm 16 approaches the conveyor 12, a lamp 10 in a head 18 is brought into transfer position by the conveyor. As may be noted in Figure 3, the open jaw 106 of the transfer arm head 15 is the first part of the transfer apparatus to engage the lamp 10 in the head 18 of the conveyor 12. As the forward stroke of the transfer arm 16 continues, the pressure exerted on the jaw 106 by the lamp 10 effects clockwise rotation of the jaw 106 about its pivot 108. When the high point of the jaw 106 moves past cam roller 114, the spring-loaded lever 110 on which the cam roller 114 is mounted snaps the jaw 106 thereby firmly securing the lamp 10 in the head 15. This clockwise rotation of the jaw 106 advances it forward within recess 134 of bar 130 of locking device 126 (Figs. 3 and 5) until serration 107 in the periphery thereof is in registry with slot 136 in the bar 130. Since this bar is spring loaded by spring 141, the bar 130 is pushed downwardly thereby and effects a locking of the jaw 106 in the closed position with serration 107 locked in slot 136. Clockwise rotation of the jaw 106 to the closed position also effects a return of the block 122 from the position shown in phantom to the position shown in solid in Figure 3 since the fin 124 upstanding thereon is in engagement with the jaw 106.

The return stroke of the transfer arm 16 is effected by the same mechanism as that which imparted the forward stroke thereof. Since the force exerted on the lamp 10 by the head 15 of the transfer arm 16 is greater than the force exerted on the lamp by the jaws of the head 18 of the conveyor 12, the head 15 withdraws the lamp 10 from the head 18. As the lamp 10 approaches the loading station of the exhaust machine 14, it strikes the resilient fingers 93 and 95 (Figs. 1 and 2) and deflects them. The cam roller 132 (Figs. 2 and 4) then strikes the bar cam 142, and the bar 130 of the locking device 126 is caused to move upwardly, the rise in the bar cam 142 being great enough to effect disengagement of the serration 107 on the periphery of the jaw 106 with the slot 136 in the bar 130. The serrated portion of the jaw 106 now lies in the slot 134 in the bar 130 and thus the jaw 106 is no longer locked in closed position. As the return stroke of the transfer arm 16 continues, the lamp 10 strikes the lamp guide arms 92, 94 and 96 (Fig. 2) and the previously deflected resilient fingers 93 and 95 snap closed on the lamp. Since the guide arms 92, 94 and 96 are maintained in a fixed position, the lamp 10 can move rearwardly no further. Thus, as the transfer arm 16 continues its return stroke, the pivotally mounted jaw 106 will be rotated counter-clockwise to the open position as shown in phantom in Figure 3 due to the force exerted thereon by the fixed lamp 10. Opening of the jaw 106 is further aided by an auxiliary jaw-opening device comprising rod 120, block 122 and fin 124 (Fig. 3), the rod 120 striking the fixed channel bar 38 (Fig. 2) during the last portion of the return stroke of the transfer arm 16, the remainder of the return stroke effecting advancement of block 122 with fin 124 in engagement with jaw 106 from the position shown in solid to the position shown in phantom in Figure 3.

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The return stroke of the transfer arm 16 has now been completed. The lamp 10 is now moved upwardly to place the exhaust tube 11 in engagement with exhaust head 30 (Fig. 2). Clockwise rotation of shaft 68 is translated into upward movement of shaft 74 through cam 90, cam follower 88, lever 84, rod 82, bellcrank lever 89 and swivel bearing 78. As the shaft 74 moves upwardly, the seat 76 on the top thereof engages the lower end of the lamp 10 and pushes the lamp upwardly until the exhaust tube 11 enters the head 30, the force exerted on the lamp 10 by the resilient fingers 93 and 95 not being great enough to prevent this upward movement. As the shaft 68 continues its clockwise rotation, the return stroke of the shaft 74 is effected, thus withdrawing the seat 76 on the top thereof from contact with the lower end of the lamp 10. With the transfer arm and the lamp push-up mechanism in their rest positions, the exhaust machine lamp gripping jaw 34 is caused to close about the lamp 10 and the exhaust machine 14 is indexed carrying lamp 10 from the loading station and bringing the next exhaust machine head into position to receive a lamp.

What we claim is:

1. Apparatus for automatically transferring an elongated tubular lamp, having an exhaust tube extending axially from an end thereof, from a supply source to an exhaust machine having a head disposed at a lamp-receiving station thereon, said apparatus comprising: a transfer arm; a jaw mounted at an end of said transfer arm for gripping the lamp; means for reciprocating said arm in a horizontal plane between the lamp supply source and the lamp-receiving station on the exhaust machine to pick up a lamp from the supply source and carry it to a position beneath and in register with the head of the lamp exhaust machine at the lamp-receiving station; and means for raising the lamp at the lamp-receiving station on the exhaust machine to move the lamp exhaust tube into the head at the lamp-receiving station.

2. Apparatus for automatically transferring an elongated tubular lamp, having an exhaust tube extending axially from an end thereof, from a supply source to an exhaust machine having a head disposed at a lamp-receiving station thereon, said apparatus comprising: a transfer arm; a jaw mounted at an end of said transfer arm for gripping the lamp; means for reciprocating said arm in a horizontal plane between the lamp supply source and the lamp-receiving station on the exhaust machine to pick up a lamp from the supply source and carry it to a position beneath and in register with the head of the lamp exhaust machine at the lamp-receiving station; a lock on said transfer arm for securing said jaw in gripping engagement with the lamp during the delivery stroke of said transfer arm; and means for raising the lamp at the lamp-receiving station on the exhaust machine to move the lamp exhaust tube into the head at the lamp-receiving station.

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3. Apparatus for automatically transferring an elongated tubular lamp, having an exhaust tube extending axially from an end thereof, from a supply source to an exhaust machine having a head disposed at a lamp-receiving station thereon, said apparatus comprising: a transfer arm; a jaw mounted at an end of said transfer arm for gripping the lamp; means for reciprocating said arm in a horizontal plane between the lamp supply source and the lamp-receiving station on the exhaust machine to pick up a lamp from the supply source and carry it to a position beneath and in register with the head of the lamp exhaust machine at the lamp-receiving station; a lock on said transfer arm for securing said jaw in gripping engagement with the lamp; means for securing said lock after the reciprocating transfer arm has been extended; means for releasing said lock after the reciprocating transfer arm has been retracted; and means for raising the lamp at the lamp-receiving station on the exhaust machine to move the lamp exhaust tube into the head at the lamp-receiving station.

4. Apparatus for automatically transferring an elongated tubular lamp, having an exhaust tube extending axially from an end thereof, from a supply source to an exhaust machine having a head disposed at a lamp-receiving station thereon, said apparatus comprising: a transfer arm; a jaw mounted at an end of said transfer arm for gripping the lamp; means for reciprocating said arm in a horizontal plane between the lamp supply source and the lamp-receiving station on the exhaust machine to pick up a lamp from the supply source and carry it to a position beneath and in register with the head of the lamp exhaust machine at the lamp-receiving station; a lock on said transfer arm for securing said jaw in gripping engagement with the lamp; means, actuated by the closing of said jaw about the lamp at the lamp supply source, to secure said lock; means, actuated by the movement of said transfer arm into the lamp-receiving station on the exhaust machine, to release said lock; and means for raising the lamp at the lamp-receiving station on the exhaust machine to move the lamp exhaust tube into the head at the lamp-receiving station.

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