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E. E. YEO ET AL

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LAMP MOUNT TRANSFER APPARATUS

Filed May 1, 1956

4 Sheets-Sheet 1

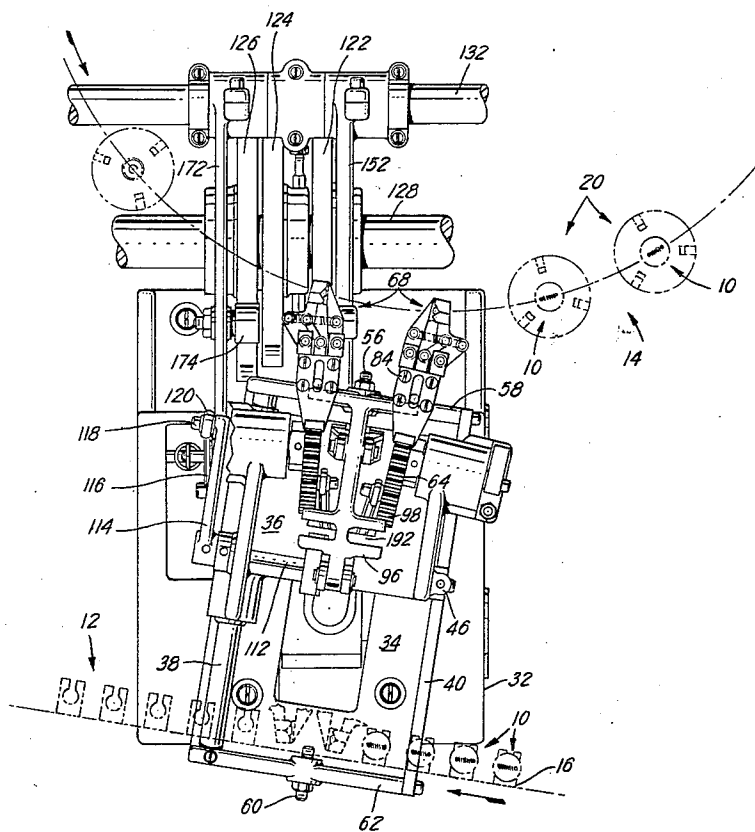


Fig. 1

INVENTORS

DAVID P. DROWN
JAMES P. O'BRIEN
ERNEST E. YEO

BY

Lawrence Brown,
ATTORNEY

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E. E. YEO ET AL

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4 Sheets-Sheet 2

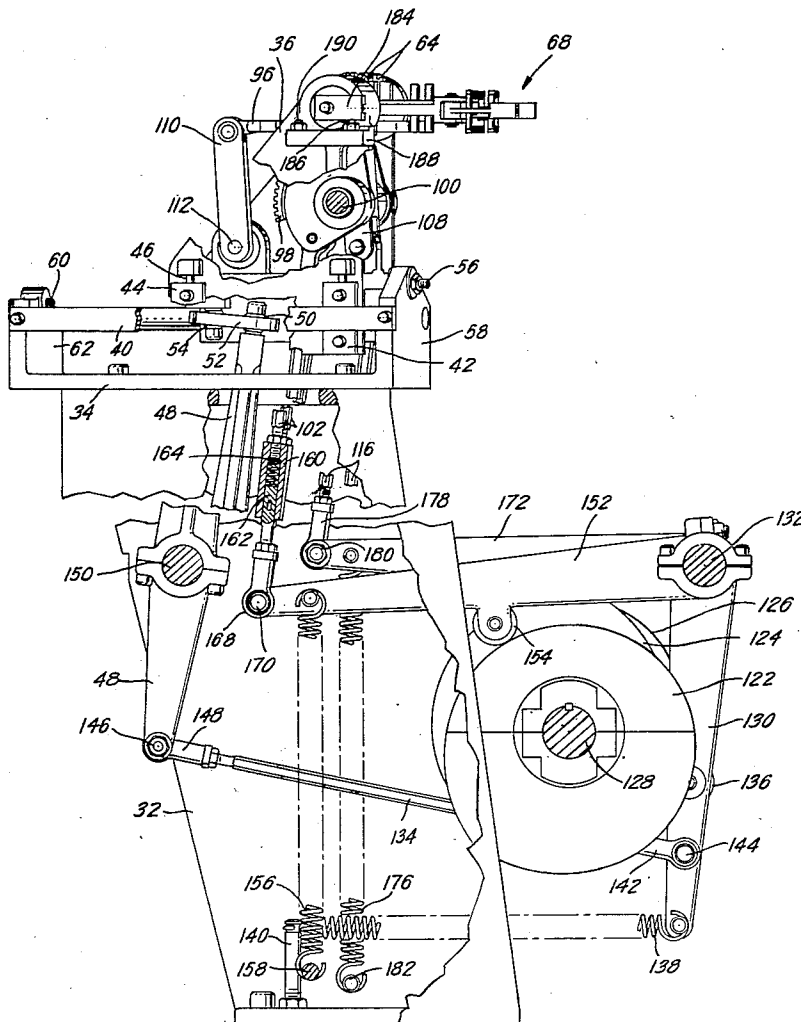


Fig. 2

INVENTORS
DAVID P. DROWIN
JAMES P. O'BRIEN
ERNEST E. YEO

BY

Lammie Burns,
ATTORNEY

May 27, 1958

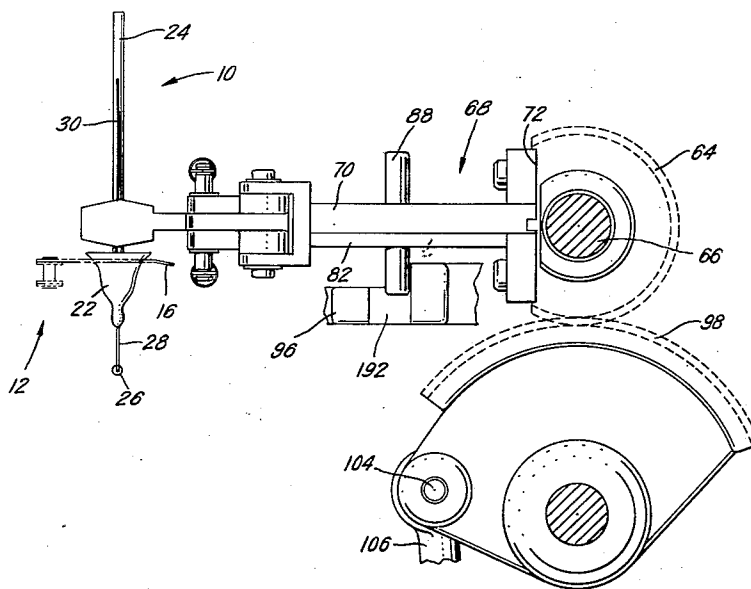
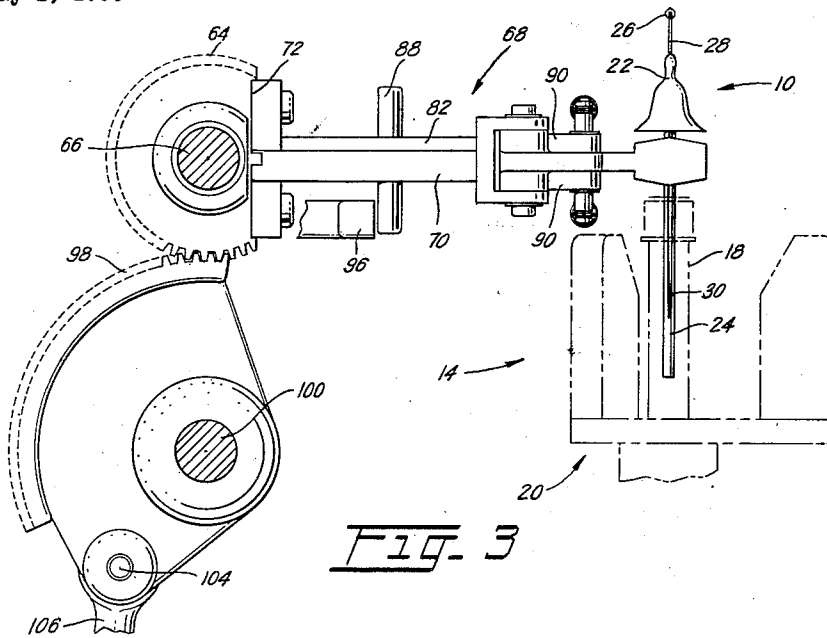
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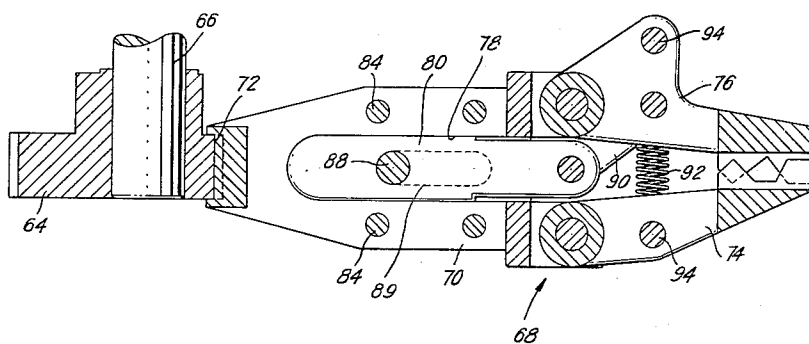


Fig. 5

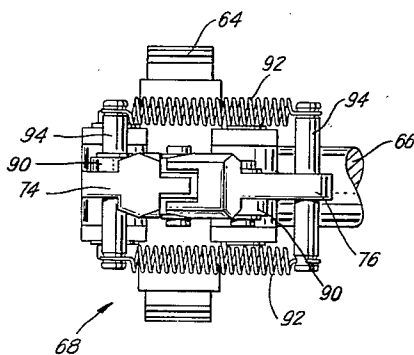


Fig. 6

BY

INVENTORS
DAVID P. DROWN
JAMES P. O'BRIEN
ERNEST E. YEO

Lawrence B. Borne
ATTORNEY

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2,836,313

LAMP MOUNT TRANSFER APPARATUS

Ernest E. Yeo, Wenham, and David Patterson Drown and James P. O'Brien, Beverly, Mass., assignors to Sylvania Electric Products Inc., Salem, Mass., a corporation of Massachusetts

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2 Claims. (Cl. 214-143)

This invention relates to apparatus for transferring electric lamp mounts from a supply of the latter to a machine in which the mounts are further processed. Such mounts are generally glass structures, each of which includes a flared portion intended to be sealed to the neck of the bulb and a body or stem portion which extends from the flared portion and supports the lamp filament on a pair of lead-in wires sealed therethrough. An exhaust tube depends from the body between the lower end portions of the lead-in wires. Since such mounts are extremely fragile articles, their transfer at high speeds is difficult of successful accomplishment.

Nonetheless, our invention is particularly directed to providing automatic apparatus for loading lamp mounts at high speed into the heads of a lamp sealing machine.

It will be appreciated that since mounts are extremely fragile articles, it is necessary to avoid or limit forces which might deform, distort or otherwise damage them. Such forces may often be negligible at low operating speeds yet be very damaging in high speed apparatus which may, for example, deliver 60 or more mounts per minute to a sealing machine. In addition, it is necessary to maintain angular orientation of the mounts to permit exhaust and basing machines to be coupled with the sealing machine by automatic transfer mechanisms.

In a mount-making machine, mounts are conveniently fabricated in filament-down position. The mounts are discharged from the machine onto conveyors which carry the mounts also in filament-down position in order to retain the original orientation provided by the machine. However, the sealing operation on a sealing machine is most conveniently performed with the mounts disposed in filament-up position. It is therefore necessary that the mounts after being picked up from such conveyors be inverted before being deposited into heads of sealing machines.

A further problem occurs whenever two mounts are transferred simultaneously from a conveyor to a sealing machine. The mounts are carried on such a conveyor in relatively close-spaced relation to allow a maximum carrying capacity for a given length of conveyor. On the other hand, the heads of a sealing machine are of such form and size that they must be spaced a considerably greater distance apart. It is therefore necessary that a mount transfer apparatus which simultaneously loads two mounts onto a sealing machine provide a change in spacing between the two mounts during the transfer movement. It is accordingly an object of our invention to improve lamp-making efficiency by providing mount transfer apparatus in which angular orientation of the mounts is retained.

Another object is to provide such apparatus in which mount distorting and deforming forces at high speeds are either limited or eliminated.

A further object is to provide mount transfer apparatus which inverts the mounts in transit from a filament down to a filament up position.

It is still another object to provide apparatus which in simultaneously loading two mounts on a sealing machine

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compensates for the different spacing required between the mounts on a conveyor and in the machine.

These and other objects are achieved in accordance with our invention by a mount transfer apparatus which includes a pair of clamping assemblies each mounted for pivotal motion about a shaft. The two shafts which are mounted on a slidable carriage are angularly disposed with respect to one another. Because of this angular relation of the shafts, the assemblies are closer together at their mount pickup station than at the delivery station. By employing a combination of the pivotal motion of the assemblies and a sliding motion of the carriage, the path over which a mount must travel is considerably shorter than a single circular arc between the pickup and delivery stations. This shorter path allows the transfer to be accomplished at a consequently slower speed during an equal time interval and accordingly lessens forces which might otherwise distort, deform or disorient the mount. Each clamp assembly includes a pair of pivotally mounted jaws urged into closed mount gripping relation by suitable springs. A movable yoke is coupled to the jaws for actuating them to close about a mount at the pick-up station and to open for releasing the mount into the head of the sealing machine.

The foregoing and additional objects, advantages and novel features will more fully appear from the following description in connection with the accompanying drawings in which:

Figure 1 is a plan view of a mount transfer apparatus according to our invention;

Figure 2 is a view of the apparatus in side elevation;

Figure 3 is a fragmentary view of the apparatus in side elevation showing a mount being delivered to a lamp sealing machine;

Figure 4 is a view in side elevation of the portion of our apparatus shown in Fig. 3 but showing a mount being picked up from a supply conveyor;

Figure 5 is a view in horizontal section of a pair of jaws for holding a mount during transfer;

Figure 6 is a view in end elevation of the jaws shown in Fig. 5.

Turning now to the drawings, we will describe an apparatus according to our invention employed for transferring mounts indicated at 10 from a conveyor indicated at 12 to a lamp sealing machine shown fragmentarily and schematically at 14. On the conveyor 12 each mount 10 is carried on a clip 16 disposed in spaced relation with adjacent clips 16 along the length of the conveyor. Our apparatus simultaneously picks up two mounts 10 from the conveyor 12 and deposits each mount in a mount pin 18 of a sealing head indicated at 20 on the machine 14. The mount 10, as shown in Fig. 4, includes a flare tube 22, an exhaust tube 24 which extends upwardly from the flare tube and a filament 26 mounted on a pair of support wires 28 depending from the flare tube. Lead-in wires 30 extend upwardly adjacent the exhaust tube 24 and are electrically connected to the support 28.

The apparatus is supported on a pedestal 32 and includes a slide base 34 upon which a reciprocable carriage 36 is slidably mounted on a cylindrical rod 38 and a guide bar 40 of rectangular cross section. The rod 38, fixed on the base 34, is slidably fitted into a suitable bore in the carriage 36. The bar 40, similarly fixed on the base 34, is engaged by slide plates 42, 44 mounted on the carriage 36. The plates 42 are fixedly secured to the carriage 36 but each of the plates 44 is adjustable vertically by means of an adjusting screw 46 for a sliding fit with the bar 40 and to compensate for wear. A reciprocating motion is imparted to the carriage 36 by a generally vertical lever 48 having a spherical upper end 50 connected by a link 52 to a spherical stud 54 mounted to the underside of the carriage. The travel of the carriage 36 is limited at its inward end adjacent the machine

14 by a stop screw 56 threaded into inner end wall 58 of the base 34 and at the outward end by a similar screw 60 threaded into the outer end wall 62.

Each of a pair of clamp assemblies indicated at 68 is supported on a pinion 64 mounted on the inner end of a horizontal shaft 66. In order to change the spacing between the mounts 10 carried by the two assemblies 68, the shafts 66, with which the assemblies pivot, are journaled in angular orientation with respect to one another in the horizontal plane. Since the two shafts 66 are provided with like actuating means which operate simultaneously and the clamp assemblies 68 are also alike, this description for the sake of simplicity, will proceed as though a single shaft and clamp assembly were involved. It will be appreciated, however, that everything which is said concerning the shaft and the clamp assembly 68 situated to the left of Figure 1 is equally applicable to the shaft and clamp assembly illustrated at the right of the same figure. As shown in Figs. 3-5 the clamp assembly 68 includes an elongated body 70 fast at its inner end to a flattened surface 72 on pinion 64, an inner jaw 74 and an outer jaw 76 pivotally mounted on the outer end of the body 70. Slot 78, formed in the upper surface of the body 70, is provided with a jaw actuating slide 80 reciprocable therein. Cover 82 is secured to the body 70 by screws 84. A stud 28, secured to the slide 80, extends downwardly through longitudinal central slot 89 in the body 70 and upwardly through a similar slot not shown in the cover 82. The outward end of the slide 80 is coupled to each of the jaws 74, 76 by a pair of links 90. The jaws 74, 76 are urged into closed, mount gripping relation by a pair of tension springs 92 extended between pins 94 which are fixed on the jaws. The jaws 74, 76 are actuated to pick up and to release mounts by an outward motion of the slide 80 effected by means of a yoke 96, shown fragmentarily in Figs. 3 and 4, which engages the stud 88.

The transfer of a mount 10 is effected in our apparatus by a combinations of two motions, one of which is a pivoting of the clamp assembly 68 about the axis of the shaft 66 and the other, a sliding motion of the carriage 36. The pivoting motion is imparted to the clamp assembly 68 by a gear sector 98 meshed with the pinion 64. The sector 98 is fixed on a shaft 100 which is journaled in the carriage 36 below and in parallel relation with the shaft 66. The sector 98 is oscillated by a link rod 102 which is pivoted to the sector by means of a spherical connection between stud 104 secured to the sector and rod end 106.

The yoke 96 is pivotally connected at its forward end to the upper end of a generally vertical link 108. At its lower end, the link 108 is pivoted on the carriage 36. The yoke 96 is also pivoted on the upper end of a lever 110 at its rearward end. The lever 110 is fixedly mounted at its lower end upon a horizontal shaft 112 which is journaled in the carriage 36. An oscillating motion is imparted to the lever 110 through a crank 114 fixed to the outer end of the shaft 112. The crank 114 is coupled at its free end to the upper end of a connecting rod 116. A spherical surface on stud 118, which is securely mounted on the free end of the crank 114, is engaged by a complementary surface in rod end 120.

The above-described motions are actuated by cams 122, 124 and 126 each fixed to shaft 128, seen in Figs. 1 and 2. The shaft 128 is part of the sealing machine 14 and makes one revolution for each index motion of the latter. The index motion moves each head through an arc equal to the distance between alternate heads. It is thus seen that at the end of each index motion a head 20 without a mount 10 is positioned in mount receiving relation with each clamp assembly 68 as shown in Fig. 1.

A generally vertical arm 130 which is pivoted at its upper end upon a rocker shaft 132, is coupled at its lower end to the lever 48 by a connecting rod 134. Cam

follower 136 is mounted on the arm 130 and maintained in engagement with the cam 124 by a spring 138 which is supported under tension between the lower end of the arm 130 and a post 140 mounted on the pedestal 32. The rod 134 is connected at one end to the arm 130 by means of a spherical coupling including a rod end 142 fitted to an appropriate surface of stud 144. At the other end of the rod 134 a similar arrangement includes a stud 146 and a rod end 148. The lever 48 is pivoted on shaft 150 which is supported on the pedestal 32.

The link rods 102 are reciprocated vertically by an actuating mechanism which includes an arm 152 and the cam 122. The arm 152 is pivoted at one end on the shaft 132 and carries a cam follower 154 which is maintained in contact with the cam 122 by a tension spring 156 connected between an anchor post 158 on the pedestal 32 and the free end of the arm 152. Each of the rods 102 is coupled to the arm 152 through a yielding coupling including an outer sleeve 160, a plunger 162, and a spring 164. The sleeve 160 is adjustably fixed on the lower end of a rod 102. The plunger 162 is retained in the sleeve 160 by a pin and slot arrangement, not shown, which allows the plunger a limited motion in the sleeve against the bias of the compression spring 164. A rod end 168, having a spherical internal surface, is adjustably secured to the outer end of the plunger 162 and is swivelled on a stud 170 mounted on the free end of the arm 152. The upper end portions of the rods 102 pass through suitable openings in the top surface of the pedestal 32, in the slide base 34 and in the carriage 36 and are connected each to its related sector 98 as already described.

Motion is supplied to the arm 114, which actuates the yoke 96 for controlling the jaws 74, 76 by the cam 126, which is mounted on the shaft 128. A rocker arm 172 pivotally mounted on the shaft 132 carries a cam follower 174 which is maintained in contact with the cam 126 by a spring 176. The rod 116 is connected to the arm 172 by a rod end 178 coupled to a stud 180 which is fixed to the free end of the arm. The spring 176 is under tension between the arm 172 and a post 182 mounted on the pedestal 32.

We will now describe a complete operating cycle of our apparatus commencing at the time that a pair of mounts 10 is delivered each to its mount pin 18. Although the mounts 10 are delivered in pairs, each by a clamp assembly 68, it will be found convenient in the following description to consider a single clamp assembly delivering a single mount at a time. In order to locate the mount 10 in registration with the mount pin 18, the carriage 36 abuts the screw 56 and finger 184 is in contact with stop screw 186 for positioning the assembly 68 generally horizontally. When the mount 10 is thus located in the delivery position the jaws 74, 76 are opened to allow the flare tube 22 of the mount to pass downwardly between them. The mount pin 18 is raised to receive the mount 10 to a level just below the lower surface of the jaws 74, 76 by a conventional cam-actuated elevator mechanism, well known in the art and not shown in the drawings. The opening of the jaws 74, 76 is accomplished by the yoke 96 which contacts the stud 88 to move the slide 80 outwardly against the bias of the springs 92. The operation of the jaws 74, 76 may be simplified by retaining them in the open position after the delivery of a mount 10 until the next mount is picked up from the conveyor 12. The slide 80 is accordingly urged outwardly, against the bias of the springs 92, past the point of maximum jaw opening. This point is reached when the two links 90 are aligned transversely with respect to the line of motion of the slide 80. After the point of maximum jaw opening is passed, the force exerted by the springs 92 is translated by the links 90 into further outward motion of the slide 80. The outward motion of the slide 80 under the influence of the springs 92 is arrested when the pin 88 reaches the outer end of

the slot 89. Thereafter, until the stud 88 is urged inwardly by the yoke 96, the jaws 74, 76 remain in almost fully opened position.

The yoke 96 is actuated to open the jaws 74, 76 by a pivotal motion of the shaft 112 in a clockwise direction, as shown in Fig. 2. The pivotal motion is provided by the cam 126 which imparts a suitable counter-clockwise movement to the arm 172. The movement of the arm 172 is coupled by means of the rod 116 to the crank 114 which translates this motion into the necessary pivoting of the shaft 112.

After the delivery of a mount 10 to the mount pin 18 has been completed, the clamp assembly 68 is moved from the delivery position shown in Figure 3 to the pick-up position shown in Fig. 4. The movement of the assembly 68 to the mount pick-up position at the conveyor 12 consists of two separate motions which occur concurrently. One of these is a sliding motion of the carriage 36 in an outward direction away from the machine 14 and the other is a pivotal motion of the assembly 68 in a counter clockwise direction about the axis of the shaft 66 as seen in Figure 3. The pivotal motion is effected by the sector 98 which is in toothed engagement with the pinion 64. The sector 98 is pivoted in a clockwise direction through an arc of about 45° by the rod 106 which is moved upwardly as seen in Figure 2. The upward stroke of the rod 106 is provided by the cam 122 through the arm 152 to which the rod is connected. A telescoping motion of the plunger 162 within the sleeve 160 against the bias of the spring 164 at the upward end of the stroke of the rod 106 provides bias to maintain the finger 184 in engagement with stop screw 190 at the end of the counter-clockwise motion of the shaft 66. Although the start of the sliding motion of the carriage 36 and the pivotal motion of the assembly 68 are approximately simultaneous, it has been found advantageous to complete the pivotal motion of the assembly before the sliding motion of the carriage is terminated. At the end of the pivotal motion of the assembly 68, the stud 88, through which the jaws 74, 76 are controlled, extends downwardly into a slot 192 formed in the yoke 96.

The sliding motion of the carriage 36 toward the pick-up station is actuated by a counter-clockwise pivoting of the lever 48 as seen in Figure 2. The lever 48, which is connected to the carriage by the link 52, receives its pivotal motion from the rod 134 which is connected to the arm 130. The cam 124 provides the necessary motion to the arm 130 through the follower 136.

Since the jaws 74, 76 have been locked open at the delivery station and the pivotal motion of the assembly 68 is completed before the end of the sliding movement of the carriage 36, the open jaws approach a mount 10 on the conveyor 12 in a horizontal direction. During a brief pause of the assembly 68 at the pick-up station, the jaws 74, 76 are closed about the exhaust tube 24 of the mount 10 just above the flare tube 28. Closure of the jaws 74, 76 is effected by the yoke 96 which is actuated during the pause through the mechanism already described for opening the jaws. The stud 88 is engaged by the outer surface of the slot 192 in the yoke 96 to retract the slide 80 inwardly. As the slide 80 moves inwardly the jaws 74, 76 first open slightly against the bias of the springs 92 until the two links 90 are in alignment with one another. After this point has been passed, the force of the springs 92, translated by the links 90, causes the slide 80 to move inwardly until the stud 88 contacts the inward surface of the slot 192. The relatively slow retracting speed of the yoke 96 permits the jaws 74, 76 to close gently about the exhaust tube 24. The gentle closure is important in avoiding breakage of fragile glass parts. During the subsequent motion of the mount 10 toward the mount pin 18, the mount is retained firmly in the jaws 74, 76 by the tension of the

springs 92, thereby avoiding displacement of the mount in transit.

After the jaws 74, 76 have closed about the exhaust tube 24, the carriage 36 begins its return motion toward the machine 14. In order to provide clearance between the filament 26 and the mount clip 16, it is necessary that the pivoting of the assembly 68 be delayed until after the carriage 36 has started its return stroke which is effected by the lever 48 through the mechanism described above for the motion of the carriage toward the conveyor 12. The clockwise pivotal motion of the assembly 68 is actuated by the same means which has been described for the movement in the opposite direction and is so timed with the motion of the carriage 36 that the path of the filament 26 clears the clip 16.

Upon arrival at the delivery station, the mount 10 is released into the mount pin 18, as already described, and our mechanism thereafter repeats its operating cycle.

What we claim is:

1. Lamp mount transfer and inverting apparatus comprising: a horizontally reciprocable carriage; a pair of generally horizontal shafts journaled in said carriage with their axes angularly oriented with respect to one another; a mount clamping assembly on each of said shafts, each said assembly including an elongated body, having one end secured to one of said shafts, and a pair of opposed jaws spring loaded into closed mount gripping relation, pivotally mounted on the other end of said body, each assembly being pivotable about the axis of its related shaft in a generally vertical plane angularly disposed with relation to the plane in which the other assembly is pivotable, each assembly being movable between a pick-up station and a delivery station, said assemblies being spaced apart a different distance in each said station; means for reciprocating said carriage between said stations; means for oscillating said assemblies through about 180 degrees in timed relation with the reciprocation of said carriage whereby each said assembly is in the pick-up station at one extreme of said reciprocation and of said oscillation and in the delivery station at the other extreme of said motions; and means for actuating said jaws to close about a mount received in each assembly at the pick-up stations and to open at the delivery stations to release said mounts, whereby spacing between the two mounts is altered and each mount is inverted in transit.

2. In combination with a lamp-sealing machine having a plurality of heads successively indexed in pairs each to a delivery station, mount transfer and inverting apparatus comprising: a reciprocable carriage; a pair of generally horizontal shafts journaled in said carriage with their axes angularly oriented with respect to one another; a mount clamping assembly on each of said shafts, each said assembly including an elongated body having one end secured to one of said shafts and a pair of opposed jaws pivotally mounted on the other end of said body and spring loaded into closed mount-gripping relation, each assembly being pivotable about the axis of its related shaft in a generally vertical plane angularly disposed with respect to the plane in which the other assembly is pivotable, each assembly being movable between a pick-up station and said delivery station, said assemblies being spaced apart a different distance in each said station; means for reciprocating said carriage between said stations; means for oscillating said assemblies through about 180 degrees in timed relation with the reciprocation of said carriage whereby each said assembly is in the pick-up station at one extreme of said reciprocation and of said oscillation and in the delivery station at the other extreme of said motions; and means for actuating said jaws to close about a mount received in each assembly at the pick-up stations and to open at the delivery stations to release said mounts into the heads of said machine, whereby spacing between the

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two mounts is altered and each mount is inverted in transit.

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