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E. E. YEO ET AL

2,818,159

SEALING HEAD ORIENTING APPARATUS

Filed Aug. 17, 1955

3 Sheets-Sheet 1

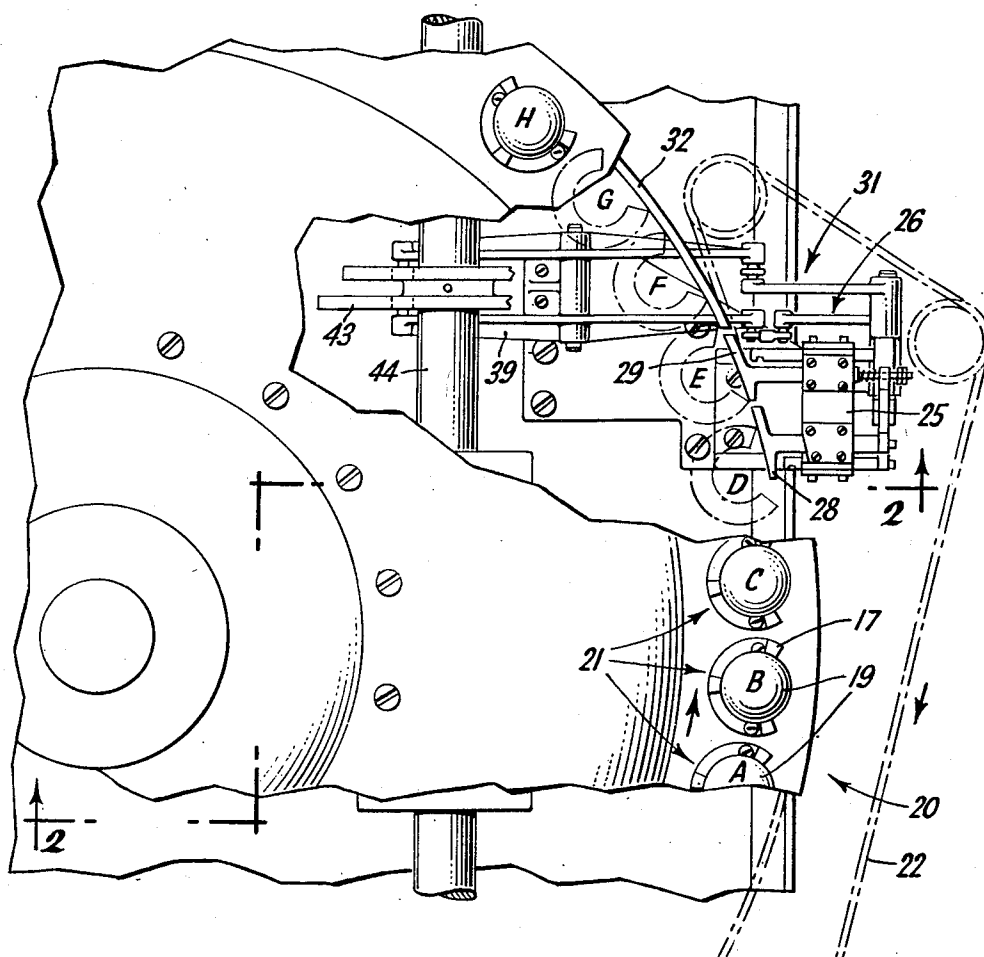


Fig. 1

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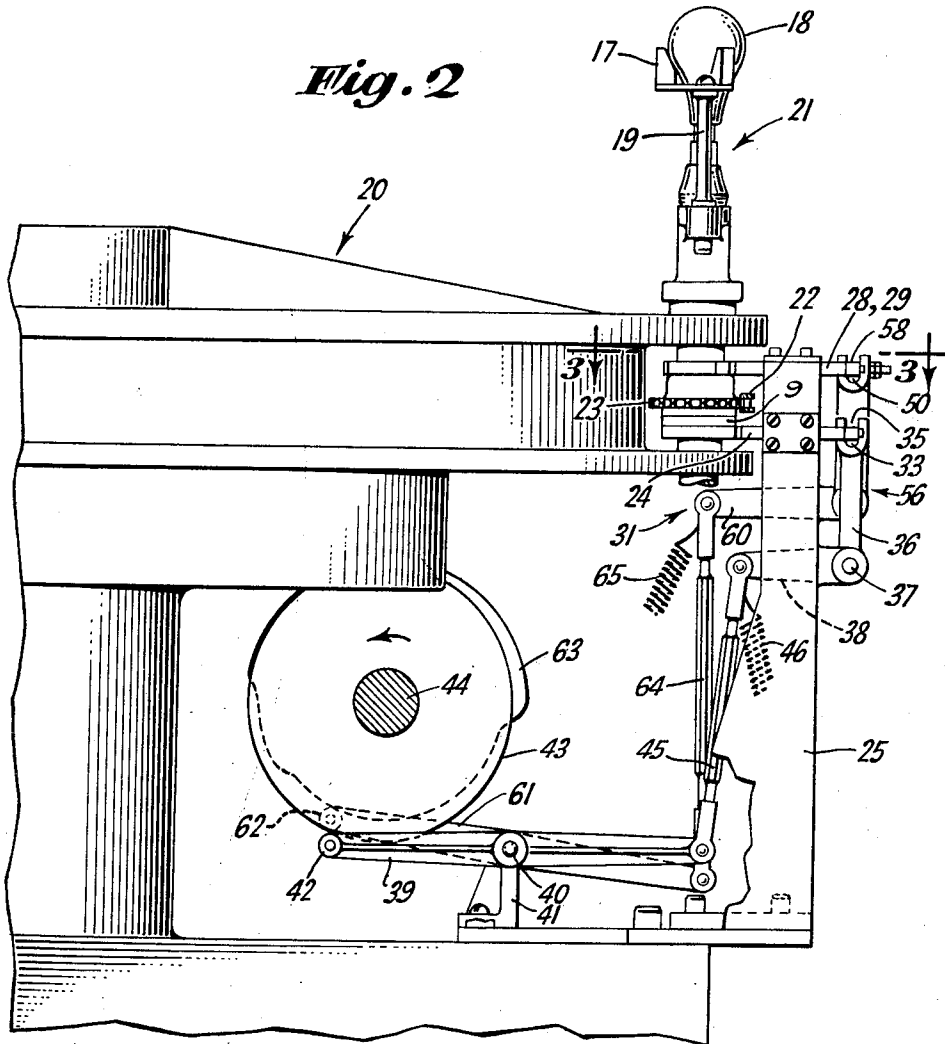
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3 Sheets-Sheet 2



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3 Sheets-Sheet 3

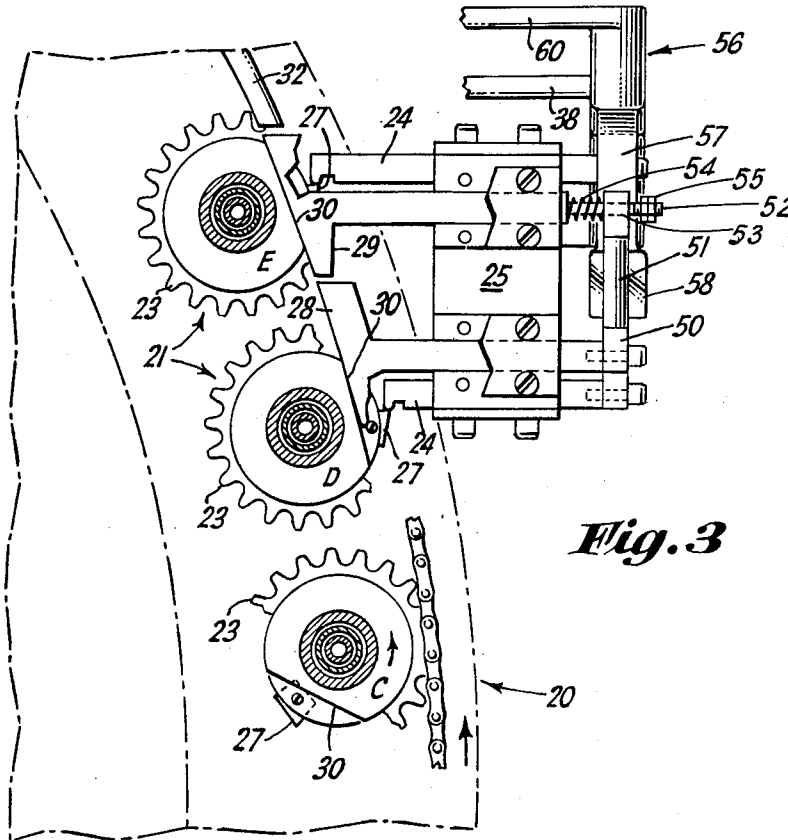


Fig. 3

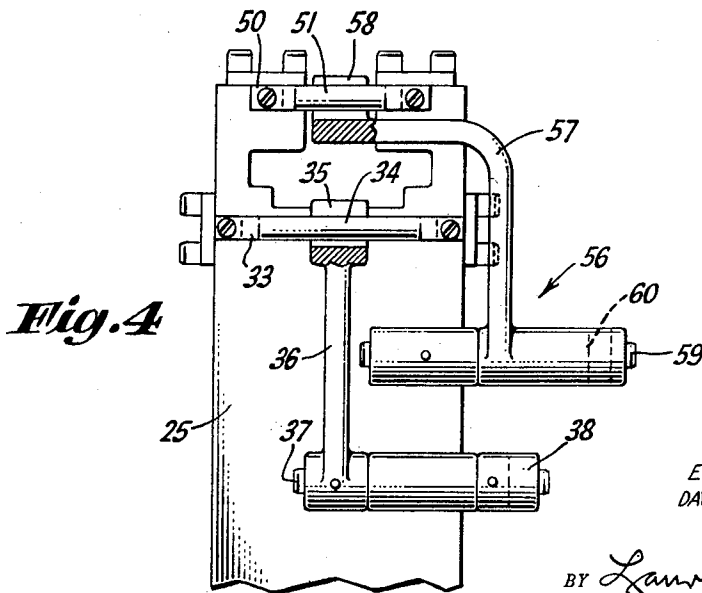


Fig. 4

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1

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SEALING HEAD ORIENTING APPARATUS

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4 Claims. (Cl. 198—33)

This invention relates to automatic machinery for manufacturing electric lamps and the like, and particularly to machines in which the lamp is rotated during a portion of its travel in the machine and the rotation stepped during another period of the travel. Such action generally occurs in apparatus for sealing a flared glass stem to the open neck of a lamp bulb as a closure member therefor. The bulb and stem are rotated together during the first portion of the sealing operation and the rotation is afterward stopped for the application of a mold to shape the seal.

However, the lamp must be stopped in a particular orientation, because lead-in wires ordinarily extend outward from the stem, and their position must be fixed for subsequent operations on the lamp, such as the bending and cutting of the wires, the threading of a wire through a contact base, and the soldering, welding or otherwise affixing of said wires to the base contacts. The orientation is additionally important when a fuse is used in one lead-in wire, because the lead-in wire containing the fuse generally needs to be attached to a particular one of the base contacts.

The stem, usually called a "mount" when it includes lead-in wires and a filament connected thereto, can be received from a previous machine in a particular orientation, and the sealing apparatus must then control the orientation in which the lamp after sealing is delivered to subsequent apparatus for performing additional operations upon it. In this way, the orientation of the lead-in wires can be controlled throughout the lamp-making process, thereby making possible the complete automation of lamp-making machinery from the feeding of the bulbs, stem flare, lead-in wires, exhaust tube and filament, to the removal of the completed lamp from the machine. The speed at which lamp-making machines operate can thus be greatly increased in such an integrated unit, because of the elimination of manual operations such as feeding of parts, threading of lead-in wires through the base, and transfer of lamps or parts from one machine to another.

In an integrated lamp-making unit, a series of operations are performed successively on the lamp parts at a series of fixed positions or stations, the machine indexing from one station to another. In such a case, the time of dwell in each station is determined by the longest time of dwell necessary in any station. The molding station is one of the stations requiring the longest dwell, because of the large number of successive steps performed there, and because sufficient time has to be provided for the glass to solidify in the mold so that it will retain its shape when the mold is removed.

It will therefore be readily appreciated that even slight reductions in the time required for the molding operation can effect substantial improvements in production rates. Thus, in a sealing machine requiring eight-tenths of a second for each indexing motion and two seconds of dwell or a total time of 2.8 seconds from the start of

2

one index to the start of the next, production will be at the rate of 1285 units per hour on a single index machine. If the dwell time is reduced by four-tenths of a second, a sealing machine single-indexed every 2.4 seconds will produce at the rate of 1500 units per hour, a net gain of 215 units per hour.

The holder for the bulb and mount on a sealing machine is generally referred to as a head, and heretofore orienting devices for such heads have been located at the molding station, with a consequent delay between the arrival of a head at the molding station and the closure of the mold. The delay was necessary to permit the head to be stopped in position for molding. To avoid such delay, the head-orienting device can be located at the station preceding the molding station so that the head is already oriented when it arrives at the molding station. However, this practice is unsatisfactory when conventional head-stopping devices are used at the head-orienting station.

In the usual mechanism of that type, the head is stopped by the engagement with a fixed track of a projection on the spindle to which the head is attached, and this would stop the rotation of the head relatively early in the dwell at the head-orienting station. Hence if burners were provided at that station, the heat therefrom, instead of being distributed around the circumference of a rotating lamp neck would be concentrated on a small portion of a fixed lamp neck, with consequent damage to the lamp. On the other hand, the omission of burners from the head-orienting station would allow the glass to cool, losing the plasticity required for molding.

The present invention overcomes both such difficulties by allowing the heads to rotate until the latter part of the dwell time at the head-stopping station, and only then ending the rotation. In the particular embodiment later described, this is accomplished by a cam-actuated finger which engages a projection on the head when the rotation is to be stopped. A short, movable track-like guide then engages a flat on the head to insure proper orientation after the head is stopped. On indexing of the machine, the flat leaves the movable track member, to ride along a fixed track which maintains orientation during further movement of the sealing head.

Although the speed of the machine, in the sense of the number of stations through which a lamp or its parts is moved per hour, is limited by the dwell time required in the station of longest dwell, we have found that the number of lamps produced per hour can nonetheless be increased greatly by having a given operation performed on two or more lamps simultaneously, and then indexing the machine correspondingly through two or more stations at once. We have found that the performance of a particular operation upon two lamps simultaneously, with consequent double-indexing, that is, indexing through two stations at a time, is especially effective in cooperation with automatic apparatus for transferring lamps from one machine to another during manufacture. Some aspects of the invention can be used with the single-indexing customary in the art, but double-indexing greatly increases the speed of production, permitting a production rate of 3000 lamps per hour, for example, with only 1500 indexing motions. The usual single-index machine would only produce half as many lamps with the same number of indexing motions.

In double-indexing machines, a so-called "lost-motion" mechanism can be used in the linkage which actuates the movable track members to maintain fixed orientation of heads leaving the station while allowing heads arriving at the station to continue rotating. The burners directed onto the lamp neck to heat the same, can therefore be continued in operation without damage to any particular

spot on the lamp, because the rotation distributes the heat over the circumference of the bulb neck, and is not stopped until just before the bulb leaves the station.

Further objects and novel features of our invention will be clarified from a detailed description of a preferred embodiment of our invention with particular reference to the accompanying drawings in which:

Figure 1 is a plan view of our apparatus shown adjacent a segment of a sealing machine turret;

Figure 2 is a view of our apparatus in side elevation taken along line 2—2 of Figure 1;

Figure 3 is a plan view of our apparatus in enlarged scale taken along line 3—3 of Figure 2;

Figure 4 is a fragmentary end view of our apparatus showing bell-cranks for actuating arresting fingers and movable track members.

In Figure 1, several sealing heads indicated at 21 and each comprising a bulb seat 17 supporting a lamp 18 and in turn supported by a pair of posts 19, are rotatably mounted at the periphery of a sealing machine turret indicated at 20. For convenience of reference, the stations occupied by the various heads 21 in Figs. 1 and 3 have been identified by letters A through H. It is believed that the operation of our apparatus will be more clearly understood if it is first explained that turret 20 employs a double index motion, that is, heads 21 are moved each time a distance equal to the space between alternate heads. Thus the head 21 shown at station A will be moved successively to stations C, E, G, etc., while the head 21 shown at station B will be indexed in turn to stations D, F, H, etc. A roller chain 22 suitably driven in a manner now shown is in engagement with a sprocket 23 on each head 21 at station A through E in the drawings and serves to rotate the heads 21 in a counter-clockwise direction (Figs. 1-3) through a slip clutch 9 (Fig. 2). It is intended that molding apparatus not shown, but of a type used in the art, be provided at stations F and G. It will also be understood that suitable burners are furnished at stations D and E.

The general arrangement of our apparatus shown at stations D and E which precede molding stations F and G comprises a pair of fingers 24 slidably mounted in base 25 and actuated by a linkage indicated at 26. Each of the heads 21 is provided with a suitably affixed projecting member 27 engageable by its respective finger 24 at one of the head positioning stations D and E, to stop the rotation of the heads 21. After the rotation of the heads 21 has been arrested, movable track or guide members 28 and 29 also slidably mounted in base 25 are moved inwardly toward the center of the turret 20 by a cam actuated mechanism indicated at 31, each engaging a flat 30 on the head 21 at its respective station. Guides 28 and 29 serve to maintain orientation of the heads 21 for the remainder of the dwell and during part of the index motion of the turret 20 until the flats 30 move into engagement with a fixed track 32 which extends to subsequent stations where it is necessary to maintain orientation of heads 21.

We will now proceed with a more detailed description of the fingers 24 and their associated actuating linkage 26 which moves the fingers 24 into and out of engagement with the members 27 of the heads 21 during a dwell period of the turret 20. The fingers 24 are linked together at their outer ends, away from the turret 20, by a cross-bar 33, seen in Figure 4, having a cylindrical center section 34 engaged by a slot 35 in the upper end of a generally vertically disposed lever 36. At its lower end, the lever 36 is fast on a pivotally mounted shaft 37 to which a generally horizontal crank arm 38 (seen in Figure 2) is also fixed. Beneath turret 20 a lever 39, pivoted upon a shaft 40, supported in a bracket 41, is provided at its inner end with a follower 42 in contact with an actuating cam 43 mounted on a shaft 44, which makes one complete revolution during each indexing cycle of the turret 20. A link rod 45 pivotally con-

nected to the outer end of the lever 39 and the inner end of the arm 38 transmits the motion of the lever 39 to the arm 38. A tension spring 46 fastened to the inner end of the arm 38 and suitably anchored to the base 25 urges the follower 42 into contact with the cam 43.

The movable guides 28 and 29 and their actuating mechanism 31, which we have provided for maintaining orientation of the heads 21 at stations D and E after the fingers 24 have been withdrawn from their head stopping position, will now be described with particular reference to Figures 2-4. The guides 28 and 29 are slidably mounted in base 25 and each is movable between an inward position abutting a flat 30 on a head 21 and an outwardly retracted position out of contact with any part of the head 21. A cross bar 50 having a cylindrical center section 51 is fast on the outward end of the guide 28. On the other hand between the guide 29 and the bar 50 there is a lost motion mechanism comprising a stud 52 fixed to the outer end of the guide 29 and free to move in a hole 53 in the bar 50; a spring 54 compressed between the guide 29 and the bar 50 and urging the guide 29 inwardly into contact with the flat 30 of the head 21 at station E; and a pair of check nuts 55 which adjustably limit the spacing between the bar 50 and the guide 29. Motion is supplied to the guides 28 and 29 by a mechanism comprising a bell crank indicated at 56 (Fig. 4) having a vertical arm 57 provided at its upper end with a slot 58 which engages the cylindrical section 51 of the cross bar 50. The bell crank 56 is pivoted on a shaft 59 and includes a generally horizontal arm 60 (Fig. 2) which is coupled to an actuating linkage comprising a lever 61 pivotally mounted on the shaft 40 and carrying at its inner end a follower roll 62 in contact with a cam 63 which is fixed to the aforementioned shaft 44. A link rod 64 pivotally connected to the outer end of the lever 61 and the inner end of the arm 60 transmits the motion of the lever 61 to the bell crank 56. A spring 65 connected to the arm 60 at one end and anchored to the base 25 at the other urges the follower roll 62 into contact with the cam 63.

Although our apparatus is adapted to being employed in conjunction with sealing machines driven at a wide range of speeds, it is believed that its operation will best be appreciated from an example in which specific rates are given for purposes of illustration only. Thus it is to be assumed that the turret 20 is indexed 1500 times per hour or once each 2.4 seconds and that motion and dwell periods are .8 and 1.6 seconds respectively. It may also be assumed for purposes of this illustration that the heads 21 are being driven by the chain 22 at a speed of 150 revolutions per minute, each revolution taking .4 second and permitting four complete revolutions during each dwell period of the turret 20. It is not intended to imply from this example that four revolutions of the heads 21 are required during each dwell of the turret 20. In practice, the rotational speed of the heads 21 is chosen to assure adequate distribution of heat from associated burners while at the same time minimizing undue displacement of the lamps 18 carried in heads 21 when the heads 21 are stopped suddenly.

Our apparatus operates to stop the rotation of the heads 21 at stations D and E in a period of time normally elapsing during 1½ revolutions of the heads 21. Thus in the hypothetical case under consideration .6 second is required at the latter part of the dwell period of the turret 20 for the operation of our apparatus and the heads 21 are allowed to rotate during the first full second of the dwell. Then the fingers 24 are moved inwardly by their associated actuating linkage to their head arresting position with .6 second of the dwell remaining. During the next .4 second the member 27 on each head 21 comes to a stop against its respective finger 24. Meanwhile guides 28 and 29 move inwardly and after the passage of the .4 second required to arrest the rotation of the heads 21 each con-

tacts the flat 30 on its respective head during the .2 second remaining before the start of the index motion of the turret 20. After the flats 30 have been engaged by the guides 28 and 29, the fingers 24 are withdrawn out of engagement with the members 27.

It will be found convenient for purposes of clarity in describing the action of the guides 28 and 29 during the index motion of the turret 20 to designate the heads shown in Figures 1 and 3 at stations E, D, and C as the first, second and third head respectively. Shortly after the turret 20 starts to move the flat 30 on the first head 21 slides into contact with the fixed track 32. The second head 21 is then moving into engagement with the guide 29 as the third head 21 approaches the guide 28. The relative lengths and positions of the guides 28 and 29 is such that the second head is retained against rotation by the guide 29 before the third head can contact the guide 28. At this point, the bell crank 56 is revolved part way in a clockwise direction (Fig. 2) withdrawing the guide 28 which is fixed to the cross-bar 50 and thereby allowing the third head to continue rotating. The guide 29, however, remains in contact with the flat 30 on the second head, under the inwardly directed force of the spring 54. As the index motion of the turret 20 continues, the flat 30 on the second head moves into contact with the track 32 before the third head which is still rotating can touch the guide 29. After the second head is secured against rotation by sufficient engagement of its flat 30 with the fixed track 32, the bell-crank 56 is pivoted further in a clockwise direction. In its resultant outward motion, cross bar 50 contacts the check nuts 55 on the stud 52, thereby forcing the guide 29 outwardly away from its head orienting position and permitting the third head 21 to continue rotating as it arrives at station E. It will be understood that in the same motion of the turret which carried the third head 21 from station C to station E, the adjacent head 21 occupying station B (Fig. 1) at the commencement of the indexing cycle is moved to station D. With the fingers 24 and the guides 28 and 29 retracted, the heads 21 at stations D and E continue to rotate until our apparatus is again actuated to repeat its head positioning operation.

From the foregoing description of a preferred embodiment, of our invention, various modifications within the scope and spirit of our invention will be apparent to those skilled in the art. For example, the guides 28 and 29 may be actuated by separate mechanisms. On the other hand, some aspects of our invention can be used with a single index machine if desired. It is therefore not intended that the invention be limited to the particular arrangement of parts illustrated and described but rather to rely upon the definitions of the invention provided by the appended claims.

What we claim is:

1. In a lamp sealing machine having a turret and a plurality of rotatively driven heads mounted at regular intervals on said turret, said heads being moved intermittently by said turret to a plurality of stations, apparatus at one of said stations for angularly orienting each said head, said apparatus comprising releasable means for arresting the

rotation of the said head in a pre-determined orientation; movable guide means for engaging said positioned head to prevent further rotation; a fixed track thereafter engageable by the said oriented head whereby said orientation is maintained as the said head is moved by said turret to subsequent stations; and means for moving the said arresting means and the said guide means in required time sequence.

2. Apparatus for angularly orienting rotatable heads mounted on an intermittently movable turret and carried thereby to a plurality of stations, said apparatus comprising: a projecting member on each said head; a finger at one of said stations, said finger being slidable between an inward and a retracted position and engageable in its inward position by the said member to arrest the rotation of the same in a predetermined orientation; means for thereafter maintaining the said arrested head in said predetermined orientation during the motion of said turret including a substantially flattened surface on each head, said surface having a fixed position relative to the said projecting member, a guide also movable between an inward and a retracted position and engageable in its inward position by the said surface; a fixed track also engageable by the said surface during the motion of said turret; and means for actuating the said slide and the said guide in predetermined time relation.

3. Apparatus for angularly orienting two adjacent rotatively driven heads on a sealing machine turret provided with a double index motion, said apparatus comprising means for arresting the rotation of said heads in predetermined positions at a first and second station; means for retaining each said positioned head against further rotation including a movable guide at each said station, a fixed track at subsequent stations and a generally flattened surface on each head engageable by said guide and said track; and means for actuating said arresting means and said guide in required time sequence.

4. Apparatus for angularly orienting two adjacent rotatively driven heads on a sealing machine turret provided with a double index motion, said apparatus comprising means for arresting the rotation of said heads in predetermined positions at a first and second station; means for retaining each said positioned head against further rotation including a movable track section at each said station, a fixed track at subsequent stations, and a flat surface on each head engageable by said tracks; means for moving said track sections into and out of engagement with said flat surfaces including a lost motion mechanism whereby the track section at said first station is withdrawn to permit continuing rotation of a head arriving at the positioning station while the track section at the second said station maintains engagement with a head moving toward subsequent stations; and means for actuating said arresting means and said moving means in required time sequence.

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