CATHODE-RAY TUBE SEALING APPARATUS

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Application November 17, 1949, Serial No. 127,975

4 Claims. (Cl. 279—1)

This invention relates to apparatus for the fabrication of cathode-ray tubes of the type having an envelope comprising a tubular neck portion of vitreous material such as glass or the like, a metallic conical portion, and a transparent window or viewing plate of glass or similar transparent plastic. More particularly, this invention is directed to an improved mechanism for re-sealably supporting a tubular neck portion of a cathode-ray tube envelope in such apparatus.

Apparatus for sealing together the above-mentioned components of a cathode-ray tube envelope is disclosed in copending application Serial No. 122,231, filed October 19, 1949, in the name of Albert L. Buttino entitled “Cathode-Ray Tube Sealing Apparatus”; and in copending application Serial No. 127,457 filed November 13, 1949, in the name of Arthur J. Harder, Jr., entitled “Cathode-Ray Tube Sealing Apparatus”; both assigned to the present assignee.

The present invention provides a re-sealable mechanism for firmly supporting a tubular member, such as the vitreous neck portion of a cathode-ray tube envelope, in a desired position; and the mechanism may be incorporated into the apparatus disclosed in the aforementioned applications, or similar types of apparatus.

It is accordingly, an object of this invention to provide an improved re-sealable mechanism for firmly supporting a tubular member, such as the vitreous neck portion of a cathode-ray tube envelope, in cathode-ray tube sealing apparatus or the like.

A further object of this invention is to provide an improved supporting mechanism which is simple and convenient to operate, which firmly supports a tubular member in a desired position for sealing or other operations, and which may be quickly triggered to release the tubular member and enable it to be removed.

The features of this invention which are believed to be new are set forth with particularity in the appended claims. The invention itself, however, together with further objects and advantages thereof may best be understood by reference to the following description when taken in conjunction with the accompanying drawings, in which:

Figure 1 shows a supporting mechanism of the present invention incorporated into a cathode-ray tube sealing machine.

Figure 2 shows an enlarged view, mostly in section, of the supporting mechanism of the present invention.

Figure 3 shows a view of the supporting mechanism of Figure 2 taken along the lines 3—3, and Figure 4 shows a view of the supporting mechanism of Figure 2 taken along the lines 4—4.

Reference is now made to Figure 1 wherein the illustrated sealing apparatus is similar in many respects to those disclosed in the aforementioned copending applications. The illustrated apparatus includes a table 20 having a top 21 and a shelf 22. An electrical motor 23 is mounted on the shelf 22 to rotate a drive tube 24 by means of a belt drive 25. The belt drive 25 is coupled to a drive wheel 26 rotatably mounted on tube 24, and motion is translated from the wheel 26 to the drive tube 24 through a frictional clutch arrangement. This clutch arrangement comprises a collar 27 fixed to the tube 24, a pressure spring 28 and a pressure plate 29 holding the spring against the wheel 26 with a predetermined pressure. This arrangement provides a friction drive from the wheel 26 to the pressure plate 29 and, hence, to the drive tube 24. The drive tube 24 has a spindle 30 mounted thereon so that rotation of this tube by the motor 23 causes the spindle to rotate.

A lift tube 31 is mounted coaxially within the drive tube 24 in frictional engagement with the drive tube for rotation therewith, and extends beyond the spindle 30 into a cylindrical cam arrangement 32. The cam arrangement 32 comprises a cylindrical housing 33, a first cylindrical cam 34 fixed to the lift tube 31 by means of a shoulder 35, and a second cylindrical cam 36 engaging the cam 34. The cam 36 is rotatable to give it a variable displacement from the cam 34, for reasons to be described, and may be locked at any selected displacement therefrom by means of a locking rod 37 threaded through cam 36 against the surface of lift tube 31.

A lift arm 38 is mounted under shelf 22 on a pivot 39. One extremity of the lift arm is coupled to a pin 40 carried by the lift tube 31, and the other end of the lift arm 38 is coupled to the plunger 41 of an air cylinder 42, and to the plunger 43 of a hydraulic governor 44. The governor 44 has the function of reducing the speed of travel of the plunger 41 of air cylinder 42, and it operates in well known manner to provide constant low speed to its plunger 43 regardless of the pressure exerted on this plunger by the air cylinder plunger 41 through the arm 38. The downward travel of the plunger 41 and, thus, the upward movement of the lift tube 31, is limited by a bracket 45 and adjusting screw 46.

An air tube 47 is mounted coaxially within the lift tube 31 in frictional engagement with the
lift tube for rotation therewith. A rotary air seal 48 of well known construction is mounted on the lower extremity of the air tube, and air is introduced into the air tube from a source, not shown, through a rubber tube 49. The air tube 47 extends beyond the cam arrangement 32 and through a mechanism 50 to be described in detail hereinafter, which supports the tubular neck 11 of a cathode-ray tube envelope. The tube 47 is fixed to the cylindrical cam 36 by means of a shoulder 51, so that adjustment of the position of cam 36 relative to cam 34 varies the relative displacement of the air tube 47 within the lift tube 31.

A pair of spindle rods 60 are mounted on the spindle 30 and extend upwardly to support an annular bracket 61 at their uppermost extremities. The bracket 61, in turn, serves as a support for the metal cone 60 of a cathode-ray tube envelope. A plurality of gas burners 14 are mounted on a ring 63 surrounding the assembly 10—11, and this ring is supported by collars 64 adjustable mounted on vertically extending guide rods 65. The position of the ring 63 and, hence, of the burner 14 may be adjusted by loosening set screws 66 and moving collars 64 along the guide rods 65.

The operation of the apparatus is as follows: The gas burners 14 are turned off or to a low pilot level. The tubular neck 11 is placed on the supporting mechanism 50 and, in a manner to be described, is firmly held thereon coaxially with the air tube 47 and with its lower end sealed from the atmosphere. The metal cone 60 is placed in the annular bracket 61 and tapped into place so that its axis is in a vertical position and coaxial with the air tube 47. A glass window 12 may be placed in a flange 13 which circumscribes the large upper end of the cone 10.

The rod 37 is loosened and the cam 36 is rotated until the air tube 47 has a longitudinal displacement within the lift tube 31 to provide a distance x (for example, 3") between the upper rim of the flared section 11a and the lower rim of cone 10. The distance x may be established by a feeler gauge or other suitable tool inserted between the neck and the cone. Once the distance x is set up, the rod 37 is tightened. The neck 11 and cone 10 are rotated in unison by means of the motor 23. A soft flame may be played over the flared portion 11a of the neck 11 and when this portion is sufficiently heated thereby, the gas burners 14 are ignited and directed onto the lower portion of the cone 10 to heat locally this portion. At the same time a soft, bushy flame may be played over the top surface of the window 12 to ensure uniform heating of the window.

When the glass rim of the section 11a reaches a plastic state due to heat radiated from the heated lower portion of the cone, air is introduced into the air cylinder 42 causing the lift arm 39 to move against the action of the hydraulic governor 44, in turn causing the lift tube 31 to rise slowly upwardly and to tighten the screw 46 which is adjustable to establish a desired amount of compression of the flared portion 11a and the lower rim of cone 10.

The burners 14 are turned off before the rim of section 11a becomes excessively molten and "runs," so that a satisfactory seal is produced between the neck and the cone. The flange 13 of the cone 10 may now be locally heated by any suitable heating elements to seal the window 12 to the cone. Air is introduced through the rubber tube 45 and rotary air seal 48 into the air tube 47; and, hence, into the interior of the cone 10 to prevent the edge of window 12 from sagging during the window sealing operations. After the edge of the window 12 has reached a plastic state, the heating elements locally heating the flange 13 are turned off, and the edge settles into the flange sealing the window to the cone.

The present invention is directed to the supporting mechanism or neck chuck 50, and may beat understood by reference to Figure 2. As illustrated in Figure 2, the mechanism 50 comprises an annular wedge 70 coaxial with and secured to the air tube 47 by means of a set screw 71, or threaded to the air tube if so desired. A second annular wedge 72 is slidable mounted on and coaxial with the air tube 47 below wedge 70. A third annular wedge 73 is slidable mounted on the air tube below the wedge 72. The wedges 70 and 72 are separated by an annular gap comprising a plurality of arcuate segments 74 which are urged inwardly by means of a circumscibing spring 75 lying in slots 76 formed in these segments. The wedges 72 and 73 are separated by a further wedge comprising a plurality of arcuate segments 77 urged upwardly by means of a circumscibing spring 78 lying in slots 79 cut in these segments. A rubber air seal 80 is mounted coaxially with the air tube 47 directly below the wedge 73 and separates this wedge from a collar 81 slidably mounted on the air tube. A pair of support rods 82 for the neck portion 11 extend radially from the air tube 47 through longitudinal slots 83 in the collar 81.

When no upward pressure is exerted on the collar 81, and it is in a first position, the segments 74 and 77 are forced downwardly due to the action of the segments 74 against the fixed wedge 70. When the supporting mechanism is in this condition the chuck mechanism to rest on the rods 82. When the collar 81 is forced upwardly relative to the air tube 47 to a second position the segments 74 and 77 are forced outwardly against the inside surface of the neck 11 due to the upward movement of the wedges 72, 73 relative to the fixed wedge 70, and the air seal 80 is forced upwardly into the neck 11 sealing the lower end of the neck. When the mechanism 50 is in this latter condition the neck 11 is firmly supported thereby and air sealed at its lower end by the seal 80.

A cylindrical member 84 is slidably mounted on the air tube 47 and this member has a piston-like center portion 85. A further cylinder 88 is supported in fixed relation with the air tube 47 on the cylindrical cam 36, and is mounted coaxially with the piston 85 so that the piston 85 may move the flared portion 11a of the neck 11 into contact with the lower rim of cone 10. The downward travel of the plunger 41 of air cylinder 42 and, thus, the upward travel of the neck 11, is arrested by the screw 46 which is adjustable to establish a desired amount of compression of the flared portion 11a and the lower rim of cone 10.
and urged in a counterclockwise direction by a spring 93. When the arm 88 is forced downward to an extreme position, the latch 91 engages a rod 94 and holds the arm in this position. To return the arm to its extreme upward position, it is merely necessary to release the latch 91 by rotating it in a clockwise direction about its pivot. Therefore, to place the neck 11 over the supporting mechanism 50, the arm 88 is moved downward to its latched position. This removes the pressure from the collar 81 and, as previously described, causes the springs 78, 79 to move segments 74, 77 inwardly and the air seal 80 to move downwardly. The neck 11 may now be placed on the rods 82 and the latch 91 released. The release of latch 91 causes the coil spring 87 to force the member 84 upwardly against the collar 81 which, in turn, causes the segments 74, 77 to spread outwardly to the inside surface of the neck 11 and air seal 80 to move upwardly into the neck. In this manner, the neck 11 is firmly supported by the mechanism 50 coaxially with the tube 47, and the lower end thereof is air sealed by the seal 83. To remove the neck for removal from the chuck mechanism, the arm 88 is merely again moved downward to its latched position.

Figure 3 shows a section of the supporting mechanism 50 taken along the lines 3–3 of Figure 2 and represents clearly the configuration of the segments 77 of the annular wedge.

Figure 4 shows a section of the supporting mechanism 50 taken along the lines 4–4 of Figure 2 and indicates clearly the shape and arrangement of the control arm 86 and latch 91.

This invention provides, therefore, an improved supporting mechanism for cathode-ray tube sealing apparatus or the like, which holds a tubular, neck portion of the cathode-ray tube envelope in a desired position for sealing or other operations, and which may be quickly and easily triggered to release the neck when these operations are completed.

While a preferred embodiment of the invention has been shown and described modifications may be made therein, and it is intended in the appended claims to cover all such modifications as fall within the true spirit and scope of the invention.

I claim:

1. A chuck mechanism for releasably holding a tubular member comprising: a shaft; a first annular wedge secured to said shaft and having a cam surface at one end sloping in one sense; a second annular wedge slidably supported on said shaft and having a cam surface facing said cam surface of said first wedge but sloping in the opposite sense; a third annular wedge, coaxial with but positioned intermediate said first and second wedges, comprising a plurality of arcuate segments presenting a complementary cam surface to said cam surfaces of said first and second wedges and a circumferentially resilient member urging said segments towards the axis of said shaft; a collar slidably mounted on said shaft below said second wedge and having a cam surface facing said cam surface of said first wedge but sloping in the opposite sense; a spring member for driving said collar to said locking position; and a latch for engaging said control arm to secure said collar in said locking position.

2. A chuck mechanism for releasably holding a tubular member comprising: a vertically extending shaft; a first annular wedge secured to said shaft and having a cam surface at its lower end sloping in one sense; a second annular wedge slidably supported on said shaft below said first wedge and having a cam surface facing said cam surface of said first wedge but sloping in the opposite sense; a third annular wedge, coaxial with but positioned intermediate said first and second wedges, comprising a plurality of arcuate segments presenting a complementary cam surface to said cam surface of said first and second wedges and a circumferentially resilient member urging said segments towards the axis of said shaft; a collar slidably mounted on said shaft below said second wedge and having at least one longitudinal slot formed therein; at least one radially extending rod fixed to said shaft and protruding through said slot for supporting a tubular member coaxial with said shaft surrounding said wedges; a cylindrical member slidably mounted on said shaft below said collar and movable between a loading position in which said resilient member drives said second wedge towards said first wedge to force said segments away from said shaft into firm engagement with the inner surface of said tubular member; a spring member for driving said collar to said locking position; a control arm for displacing said collar from said locking position; and a latch for engaging said control arm to secure said collar in said locking position.

3. A chuck mechanism for releasably holding a tubular member comprising: a vertically extending shaft; a first annular wedge secured to said shaft and having a cam surface at its lower end sloping in one sense; a second annular wedge slidably supported on said shaft below said first wedge and having a cam surface facing said cam surface of said first wedge but sloping in the opposite sense; a third annular wedge, coaxial with but positioned intermediate said first and second wedges, comprising a plurality of arcuate segments presenting a complementary cam surface to said cam surface of said first and second wedges and a circumferentially resilient member urging said segments towards the axis of said shaft; a collar slidably mounted on said shaft below said second wedge and having at least one longitudinal slot formed therein; at least one radially extending rod fixed to said shaft and protruding through said slot for supporting a tubular member coaxial with said shaft surrounding said wedges; a cylindrical member slidably mounted on said shaft below said collar and movable between a loading position in which said resilient member drives said second wedge towards said first wedge to force said segments away from said shaft into firm engagement with the inner surface of said tubular member; a spring member for driving said collar to said locking position; a control arm for displacing said cylindrical member from said locking position to said loading position; and a latch for engaging said control arm to secure said cylindrical member in said loading position.

4. A chuck mechanism for releasably holding a
tubular member comprising: a vertically extending shaft; a first annular wedge secured to said shaft; a pair of annular wedges mounted below said first wedge coaxially therewith each comprising a plurality of arcuate segments and a circumscribing resilient member for urging said segments toward the axis of said shaft; a fourth annular wedge slidably mounted on said shaft intermediate said pair of annular wedges; a fifth annular wedge slidably mounted on said shaft below the lower one of said pair of annular wedges; a collar slidably mounted on said shaft below said fourth wedge and having a pair of longitudinal slots formed therein; a pair of radially extending rods fixed to said shaft and protruding through said slots for supporting said tubular member coaxially with said shaft surrounding said wedges; a cylindrical member slidably mounted on said shaft below said collar and movable between a loading position in which said resilient members drive said segments toward the axis of said shaft to permit said tubular member to be placed over said wedges on said supporting rods and a locking position in which said cylindrical member drives said fifth wedge towards said first wedge to force said segments away from said shaft into firm engagement with the inner surface of said tubular member; a spring member for driving said cylindrical member to said locking position; a control arm for displacing said cylindrical member from said locking position to said loading position; and a latch for engaging said control arm to secure said cam in said loading position.

ARTHUR J. HARDER, Jr.

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