May 12, 1959 C. G. REYNARD 2,886,336

TOGGLE ACTUATED BULB CLAMP

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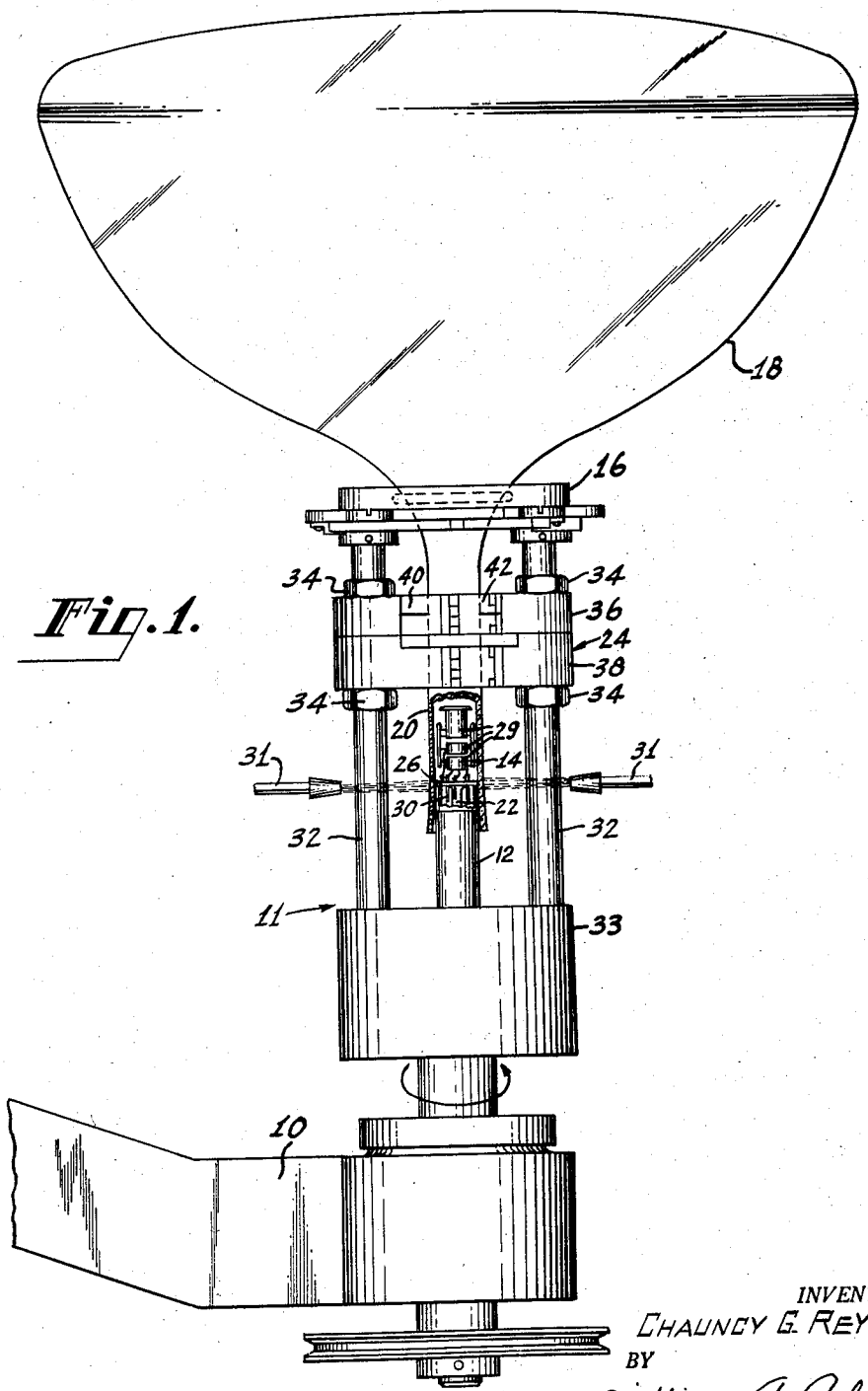


Fig. 1.

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Fig. 2.

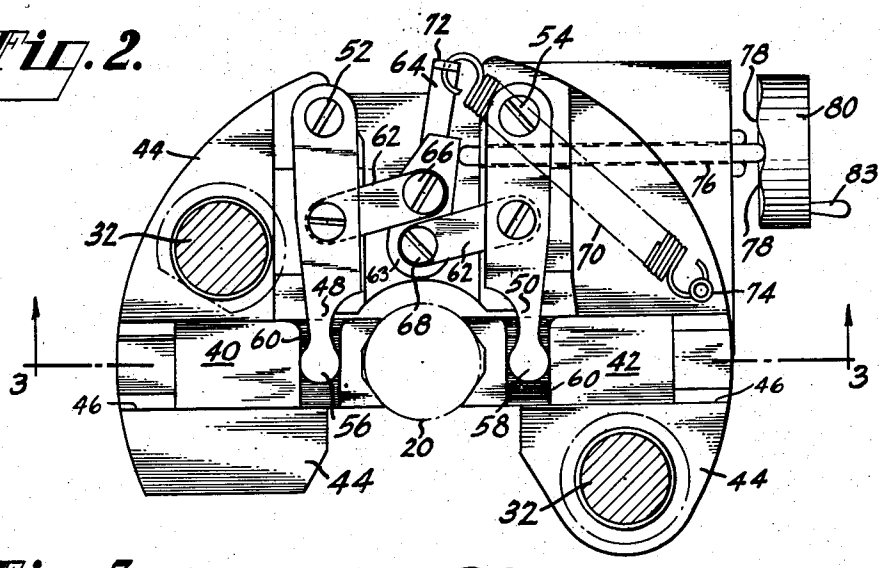
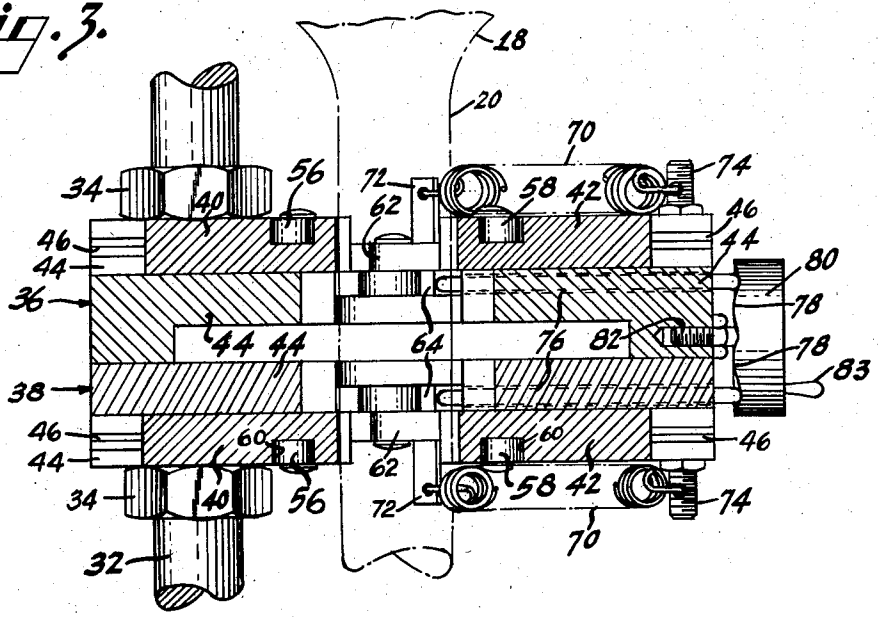


Fig. 3.



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Fig. 4.

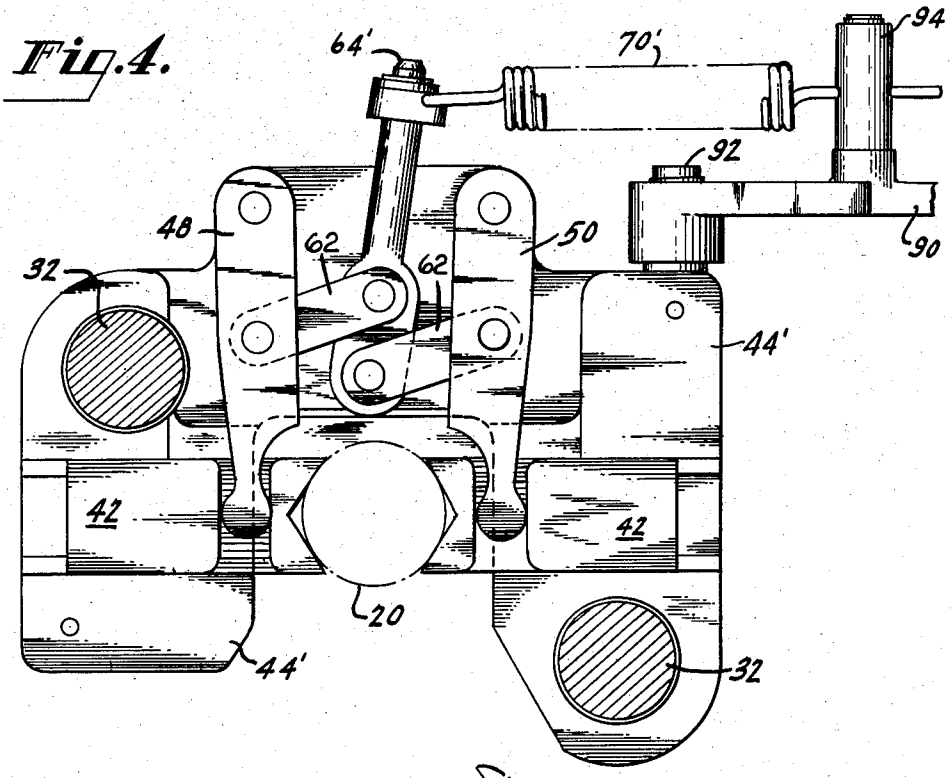
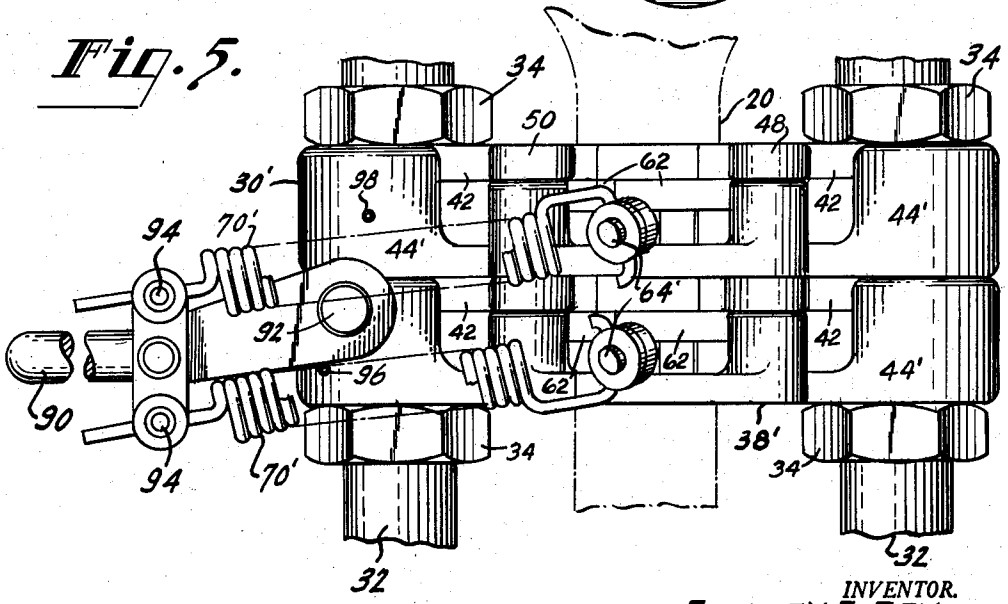


Fig. 5.



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TOGGLE ACTUATED BULB CLAMP

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10 Claims. (Cl. 279—118)

This invention relates to stem sealing-in machines for joining together the glass stems and envelopes of radio tubes, cathode ray tubes and the like.

Normally, electronic tubes having glass envelopes are fabricated from a glass envelope and a glass stem member, which is used to close the envelope. In many cases, the glass stem consists of a flat disk of glass having a central aperture therethrough. Sealed around the aperture at one side of the center of the glass stem disk is a long glass tube, which is used in the final processing of the tube as an exhaust tubulation, through which the tube envelope is evacuated. To the opposite side of the glass stem disk from which the glass tubulation extends, there are normally mounted electrode structures, which function within the evacuated envelope during tube operation. The electrodes are mounted on the stem prior to its being joined to the tube envelope. The sealing of this glass stem to the tube envelope normally consists of inserting the glass stem into a tubular portion of the envelope to a point where the envelope closely fits around the periphery of the glass stem. Sealing fires directed onto the envelope wall at this point will soften the glass of the envelope and cause it to flow and join with the heated periphery of the glass stem, so as to hermetically seal the envelope wall to the glass stem completely around the periphery of the stem. After this seal or seal-in has been made, the tube envelope is evacuated through the glass tubulation and sealed off.

Normally, a sealing machine is used to insert the glass stem into the envelope and to automatically seal the stem to the envelope wall. Such "sealing-in" machines comprise a rotatable turret, which is indexed intermittently from one position to another. The turret includes support means for holding the glass envelope and the stem in aligned positions. The operator loads an envelope and a stem into the holding means in a loading position. The intermittent rotation of the turret carries the bulb and stem structures from one position to the other for processing until the final seal has been made.

Sealing-in machines used in cathode ray production utilize a bulb supporting means, which includes a clamp for clamping around the cathode ray bulb neck portion to hold the bulb in vertical alignment with a stem pin or chuck, which supports the glass stem to be sealed into the cathode ray tube neck. Bulb clamping means, which have been used on cathode ray tube sealing-in machines, have not been always adaptable to variable conditions, which occur during stem sealing operation. It is desirable that such bulb clamping means be automatically adjustable to compensate for envelope neck portions of varying diameters. Many envelopes which are processed by the sealing-in machines are those which have been salvaged from scrapped tubes or are reprocessed bulbs, in which the original glass stems have been broken out of the bulb and a new glass neck portion has been spliced to the envelope. In such cases, the glass neck of the cathode ray tube may be eccentric to the center line of the bulb. Also it may have a taper, or the neck itself may be somewhat out-of-round. It is desirable, in such cases, that the clamping means be such that when a bulb neck which is out-of-round is clamped for sealing-in, the neck will remain coaxial with the center line of the stem chuck regardless of whether it is clamped on a large or small diameter.

Therefore, an object of this invention is to provide a novel clamping means for use with a sealing-in machine for electronic tubes.

Another object of the invention is to provide a novel clamping structure for use with a sealing-in machine for cathode ray tubes.

A further object of the invention is to provide a novel clamping means which is automatically adjustable to tubes having varying diameters at the region to be clamped.

The invention is in a clamping device for use with a sealing-in machine for cathode ray tubes. The clamp includes a pair of aligned jaws which are slidable for relative movement toward each other along a common axis. A toggle linkage connects both jaws to a tension spring for closing the jaws upon the work article. A manually operated release lever is utilized to open the jaws for removing the work article from the sealing-in machine.

Figure 1 is an elevation view of a chuck including the stem pin and bulb supports and utilizing the novel clamping arrangement, according to the invention;

Figure 2 is an enlarged view of a portion of the chuck shown in Figure 1 and including the novel clamping device;

Figure 3 is a sectional view of Figure 2 along the section line 3—3; and

Figures 4 and 5 are, respectively, a plan and side view of a modification of the invention of Figure 1.

Figure 1 discloses a chuck or head which includes structure for supporting tube parts in position for processing during the operation of a sealing-in machine. The sealing-in machine consists of a turret structure **10**, only partially shown in Figure 1. The turret carries a plurality of chucks or heads **11**, shown in Figure 1. Each chuck **11** consists of a vertical spindle **12** for supporting a stem assembly **14** and a bulb support **16** for supporting a glass bulb portion **18** of a cathode ray tube. The bulb support **16** is in turn supported by a pair of bulb holder posts or rods **32** which are mounted parallel to each other and to the axis of the spindle **12**. Posts **32** are fixed for simultaneous rotation about the axis of spindle **12** so as to rotate bulb **18** and thus provide a uniform heating of the seal portions of neck **20** during the sealing-in operation. Bulb **18** also includes a tubular neck portion **20**.

The stem assembly **14** for a conventional cathode ray tube consists of a glass disk **26** having a central aperture and to one side of which is sealed the glass tube **22** concentric with the central aperture of disk **26**. On the opposite side of disk **26** from the glass tubulation **22** is mounted an electrode structure consisting of a plurality of electrodes **29** fixed in a rigid assembly and mounted by lead wires or other means to a plurality of lead pins **30** sealed through the glass disk **26** in a ring arrangement concentric with the disk **26** and adjacent to its periphery.

The chuck **11** is loaded by an operator by inserting the glass exhaust tubulation **22** of the stem assembly **14** into a center aperture of the spindle **12**. The cathode ray tube bulb **18** is inserted neck downwardly upon the support **16** and then clamped into a fixed position aligned with the spindle **12** by a clamping means **24**.

After loading the tube parts, the chuck or head **11** is rotated by turret **10** from one position to another to perform the sealing-in operation of the tube. This consists of the neck **20** of bulb **18** being exposed to sealing fires from a plurality of burners **31** directed at the region of the neck to which disk **26** is to be sealed. Upon the neck **20** being heated to a high temperature, spindle **12** is auto-

matically actuated to carry stem 14 up into the neck. Further intense heating of the glass neck 20 in the position shown in Figure 1, causes the glass of the neck to flow and seal to the glass disk 26 around its periphery. The sharp gas flames of fires from burners 31, in this position, cut off the end of the lower end of tube neck 20 which drops down over the spindle 12 and is discarded at subsequent positons of the head 11. The seal between neck 20 and stem 26 is annealed, and at the final position of turret rotation, the tube 18 is unloaded by the operator.

It is necessary, in the sealing-in operation, that the bulb assembly 18 be rigidly and accurately held in alignment with the stem supporting spindle 12. If certain tolerances of alignment are not maintained, a bulb neck portion 20 misaligned with the spindle 12, will either be broken as the spindle 12 moves into the neck 20, or a gun electrode assembly will be sealed into the neck at an off-center position relative to neck 20. A positive clamping means is necessary to maintain the tube neck 20 in its aligned position with spindle 12, as the bulb 16 is carried from successive positions, during the sealing-in operation. It is necesary that the clamp hold the neck 20 at spaced points along the neck so as to prevent any tilting caused by the excessively top-heavy weight of the large bulb 18 or due to any jerkiness produced by the operation of the machine. This is particularly true when the neck portion 20 is out-of-round or is tapered for any reason of fabrication. Thus, it is preferable that the clamping means comprises at least two clamps spaced axially along the neck 20 and which operate independently of each other, so that if there is any difference of neck dimensions, a firm clamping action will be maintained at each of the two spaced points. Furthermore, it is desirable to be able to operate such a clamping means with a single lever so that the operator can load and unload the bulbs 18 onto the head 11 with a minimum of effect and time.

In accordance with the invention, a novel clamping means 24 is fixed to the bulb support posts 32 at the desired position by lock nuts 34. Clamp 24 consists of two portions 36 and 38, which are identical, although oppositely disposed for clamping neck 20 in alignment with the spindle 12. Each clamp portion 36 and 38 includes a pair of jaws 40 and 42 slidably mounted in a block 44. Jaws 40 and 42 are fixed within a slide 46 of block 44 for movement toward and away from each other along a common axis. Movement of the jaws is provided by a pair of actuating levers 48 and 50, each of which are pivotally mounted at one end at 52 and 54 respectively, on block 44. The other ends of levers 48 and 50 comprise cylindrical heads 56 and 58 respectively and which are disposed in slots 60 of the respective jaws 40 and 42. One link arm 62 ties each of the actuating levers 48 and 50 to a single operating lever 64. The linkage arms 62 are pivotally fixed to both of the respective actuating levers 48 and 50. Also, the linkage arms 62 are pivotally fixed respectively at 66 and 68 to the operating lever 64. The points 66 and 68 are longitudinally spaced along the length of lever 64 and adjacent to one end 63 of lever 64. A tension spring 70 is fixed to the other end 72 of lever 64 and to a fixed pin 74 of the clamp block 44.

Spring 70 urges the operating lever 64 in a clockwise direction, as shown in Figure 2, to pull the operating levers 48 and 50 and hence the respective jaws 40 and 42 toward each other to close the jaws. The tension of spring 70 is adjusted so that the neck 20 of the tube bulb is firmly gripped when the bulb 18 is loaded into chuck 11.

Clamp portion 38 consists of the same parts, as described and shown in Figure 3, for portion 36. Thus, two pairs of jaws of the clamping device 24 will tightly grip the neck 20 of the cathode ray tube bulb at axially spaced areas so as to hold the neck 20 in alignment with the spindle 12.

The two jaws 40 and 42 of each pair of jaws move synchronously with the other and since only a single spring means 70 is used for each pair of jaws, the pressure applied by the jaws of each pair is equal. Furthermore, a tube neck which may be out-of-round, when clamped by the jaws 40 and 42, will remain coaxial with the center line of the spindle 12 regardless of whether it is clamped on a large or small diameter. Also, a neck which is tapered will be firmly gripped by the two pairs of jaws since the clamping action of each pair of jaws is completely independent of the clamping action of the other pair. That is, with a tapered neck, the jaws of the bottom unit 38 will move in toward the center line farther than the jaws of the top unit 36 or vice versa. This keeps the neck 20 vertical to the center line.

A single operating lever is used to open the two pairs of jaws for removing a workpiece or in loading the machine with a new bulb. Movement of the operating levers 64, of each clamping unit, in a counter-clockwise direction against the action of springs 70 respectively, is provided by a pin 76 slidably mounted in each block 44 and having a rounded head abutting the lever arm 64 between the pivot points 66 and 72. Pins 76 are moved longitudinally by cam surfaces 78 respectively formed in a metal wheel 80 rotatably mounted on a shaft 82 fixed to block 44. A manually operable hand-lever 83 is utilized to turn wheel 80 about its shaft 82. A small turn of wheel 80 moves the cam surfaces 78 over the rounded ends of pins 76 in contact with wheel 80, so as to simultaneously force pins 76 inwardly against the respective operating levers 64 to move the operating levers in a counter-clockwise rotation and thus to open the two pairs of jaws of both units together.

The clamping units 36 and 38 are accurately mounted in alignment with the spindle 12. This is done by loosening lock nuts 34 on posts 32 so that both units 36 and 38 may be moved normal to the axis of spindle 12. An arbor (not shown) is temporarily mounted vertically in the spindle 12 so as to determine the center line of spindle 12 between the jaws 40 and 42 of each clamping unit. The jaws are released to clamp the arbor and to automatically center themselves relative to the arbor and the center line of spindle 12. The two units are then fixed to their mounting posts 32 in these positions by tightening the lock nuts 34. The clamping units are released from the arbor by the actuation of the manual lever 82 and the arbor is removed.

Some advantages of the novel clamping arrangement have been set forth above. However, the clamping device described also lends itself to the use of different size neck portions 20 on the same machine and allows continuous operation of the machine without the necessity of delay for readjustment or change of clamping elements to compensate for changes in neck sizes. Thus, the clamping device has universal adaptation for workpieces having neck portions falling within a dimensional range. The use of a pair of clamping units as described, will enable the sealing-in machine to be loaded by the operator without giving undue attention to aligning the bulb neck portions 20 with spindle 12. The floating arrangement of the pairs of jaws 40 and 42 automatically centers the neck with the center line of spindle 12. Furthermore, since the pressure of the jaws 40 and 42 on portions of neck 20 is established by the tension spring 70, this clamping action has a resiliency, which is not present in a fixed clamp. This eliminates undue breakage of the glass parts which occurs when the clamps are rigidly fixed with no resilience to compensate for vibration and jerking produced by the machine during tube operation.

Figures 4 and 5 show a modification of the clamping device of Figures 1–3. The same reference numerals are used in Figures 4 and 5 to indicate structure identical to that of Figures 2 and 3. Prime numbers are used to indicate structures in Figures 4 and 5, which are similar in design or function to structures in Figures 2 and 3.

In the device of Figures 4 and 5 the manually operating means for opening and closing the clamp jaws **42** consists of a crank handle **90**, which is pivotally mounted at **92** to one of the clamp blocks **44'**. The two clamp blocks **44'**, each have an operating lever **64'**, which is similar in design and identical in function to the operating levers **64** of the structure shown in Figures 2 and 3. That is, pivotal movement of each operating lever **64'** opens and closes the respective clamp jaws **42**, as described above. Each operating lever **64'** is moved into jaw-closing position by a tension spring **70'** connected between the free end of each operating lever **64'** and one of two studs **94** mounted on the crank handle **90**. The studs **94**, as shown in Figures 4 and 5, are positioned beyond the pivot point **92** from the free ends of operating levers **64'**.

The movement of handle **90** is limited by a pair of stop lugs **96** and **98**. The position of handle **90**, in Figure 5, is one in which the springs **70'** have their maximum tension as the handle rests against the stop lug **96**. In this position, the jaws **42** are locked against the bulb neck **20**. Also, the tension of springs **70'** holds handle **90** against stop lug **96** in the locked position. To open the jaws, handle **90** is rotated clockwise from its position shown in Figure 5 until it contacts the stop lug **98**. This rotational movement of handle **90** relieves the tension of springs **70'**, and the springs themselves act to push the operating levers **64** in a counter-clockwise direction, in Figure 4, to positively open the jaws **42**. Thus, it can be seen that as the jaws **42** are closed, the clamping action of the jaws is increased as the handle **90** is rotated from the position of stop lug **98** to the position of stop lug **96**. Furthermore, as shown in Figure 5, springs **70'** exert on handle **90** a toggle action, since the handle **90** goes past a center point into the locked position against stop lug **96**.

The fact, that the jaws **42** have increased clamping tension on them as they move toward each other into clamping position, differentiates the operation of the clamping device of Figures 4 and 5 from that of Figures 2 and 3. Thus, the bulb neck **20** is gripped by the jaws **42** with their maximum clamping force by the device of Figures 4 and 5, while in the device of Figures 2 and 3, the clamping action is provided by a relaxing spring so that the clamping action of jaws **52** is by a spring force something less than maximum. Furthermore, the toggle locking action of springs **70'** on operating handle **90** is an advantageous feature and permits more positive locking of the jaws by the operator.

What is claimed is:

1. A clamping device comprising a support, a pair of jaws aligned on a common axis and slidably mounted for relative movement along said common axis, a pair of actuating levers pivotally mounted on said support, and each of said actuating levers having one end connected directly to a different one of said jaws, an operating lever, a pair of linkage arms each pivotally connected to a respectively different one of said actuating levers and to said operating lever, a spring connected in tension between one end of said operating lever and said support to normally urge said aligned jaws toward each other.

2. A clamping device comprising a support, a pair of jaws aligned on a common axis and slidably mounted for relative movement along said common axis, a pair of actuating levers pivotally mounted on said support, and each of said actuating levers having one end connected directly to a different one of said jaws, an operating lever, a pair of linkage arms each pivotally connected to a respectively different one of said actuating levers and to said operating lever, a spring connected in tension between one end of said operating lever and said support to normally urge said aligned jaws toward each other, and manually operable means to move said operating lever against the tension of said spring to open said jaws.

3. A clamping device comprising a support, a pair of jaws aligned on a common axis and slidably mounted for relative movement along said common axis, a pair of actuating levers pivotally mounted on said support, each of said actuating levers having one end directly connected to a different one of said jaws, an operating lever, a pair of linkage arms each pivotally connected to a respectively different one of said actuating levers and to said operating lever, a spring connected to said operating lever to normally urge said lever in one direction to close said jaws, and manually operable means on said support for moving said operating lever in another direction to open said jaws.

4. A clamping device comprising a support, a pair of jaws aligned on a common axis and slidably mounted for relative movement along said common axis, a pair of actuating levers pivotally mounted on said support, and each of said actuating levers having one end directly connected to a different one of said jaws, an operating lever, a pair of linkage arms each pivotally connected to a respectively different one of said actuating levers and to said operating lever, a spring connected in tension between one end of said operating lever and said support to normally urge said aligned jaws toward each other, and manually operable means to move said operating lever against the tension of said spring to open said jaws, said manually operable means including a rod having one end in contact with said operating lever and a structure in contact with the other end of said rod for forcing said rod against said operating lever.

5. A clamping device comprising a support, a pair of jaws aligned on a common axis and slidably mounted for relative movement along said common axis, an operating lever, linkage means connecting said jaws to said operating lever, a spring connected in tension between one end of said operating lever and said support to normally urge said aligned jaws toward each other, and manually operable means to move said operating lever against the tension of said spring to open said jaws, said manually operable means including a rod having one end in contact with said operating lever and a manually operable device including a cam surface in contact with the other end of said rod for forcing said rod against operating lever.

6. A clamping device comprising a support, a pair of jaws aligned on a common axis and slidably mounted for relative movement along said common axis, an operating lever, linkage means connecting said jaws to said operating lever, a spring connected to said operating lever, and means for tensioning said spring to normally urge said aligned jaws toward each other.

7. A clamping device comprising a support, a pair of jaws aligned on a common axis and slidably mounted for relative movement along said common axis, an operating lever, actuating levers, linkage means connecting said actuating levers to said operating lever, a handle pivotally mounted on said support, a spring connected between said operating lever and said handle for tensioning said spring to normally urge said aligned jaws toward each other.

8. A clamping device comprising a support, a pair of jaws aligned on a common axis and slidably mounted for relative movement along said common axis, an operating lever, actuating levers, linkage means connecting said actuating levers to said operating lever, a handle pivotally mounted on said support, a spring connected between said operating lever and a point on said handle offset from the pivot point of said handle whereby rotation of said handle away from said operating lever will tension said spring to normally urge said aligned jaws toward each other.

9. A supporting chuck for a sealing machine, said chuck comprising a pair of support rods, a pair of

clamps supported by said rods, each of said clamps including a pair of jaws aligned on a common axis and slidably mounted for relative movement along said common axis, said common axes being parallel to each other, actuating levers, an operating lever mounted on each clamp, linkage means connecting each operating lever to a respective pair of said actuating levers, an operating handle pivotally mounted on one of said clamps, a pair of springs, each spring having one end connected to a different one of said operating levers and the other ends of said springs connected to said operating handle.

10. A supporting chuck for a sealing machine, said chuck comprising a pair of support rods, a pair of clamps adjustably supported by said rods, each of said clamps including a pair of jaws aligned on a common axis and slidably mounted for relative movement along said common axis, said common axes being parallel to each other, a pair of actuating levers pivotally mounted on each clamp, each of said actuating levers having one end directly connected to each one of said jaws, an operating lever mounted on each clamp, linkage means connecting

each operating lever to the pair of actuating levers mounted on the same clamp, a handle pivotlaly mounted on said support, a pair of springs each spring connected between a different one of said operating levers and a point on said handle offset from the pivot point of said handle, whereby rotation of said handle away from said operating levers will tension said springs to normally urge said aligned jaws toward each other.

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