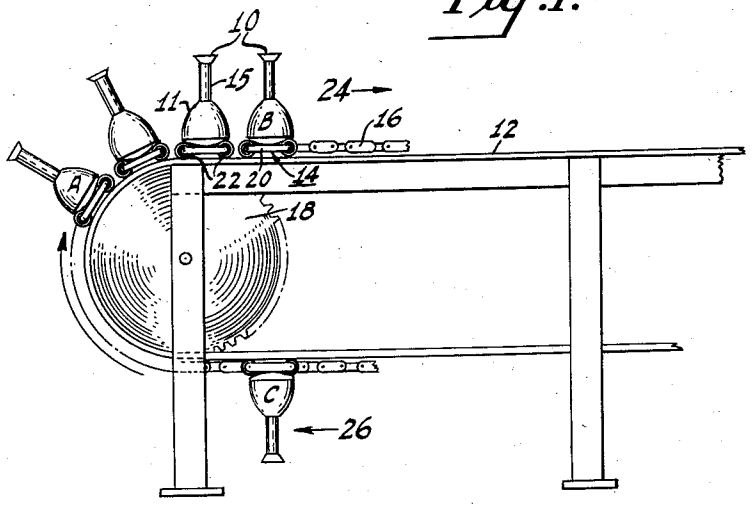
June 9, 1959 I. M. MILLOY 2,889,917

APPARATUS FOR CONVEYING ARTICLES IN CLOSE SPACED RELATIONSHIP

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Fig. 1.



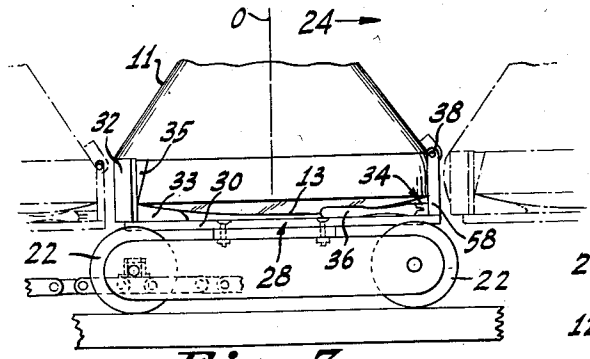


Fig. 3.

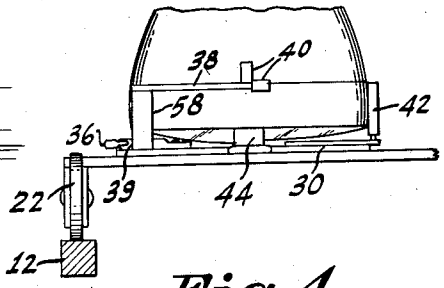


Fig. 4.

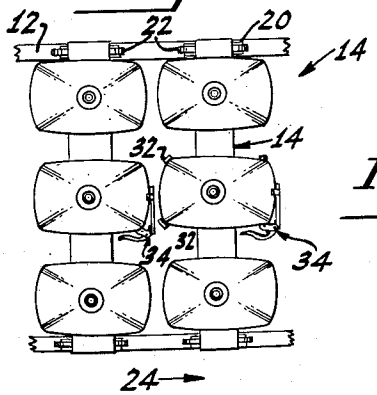


Fig. 2.

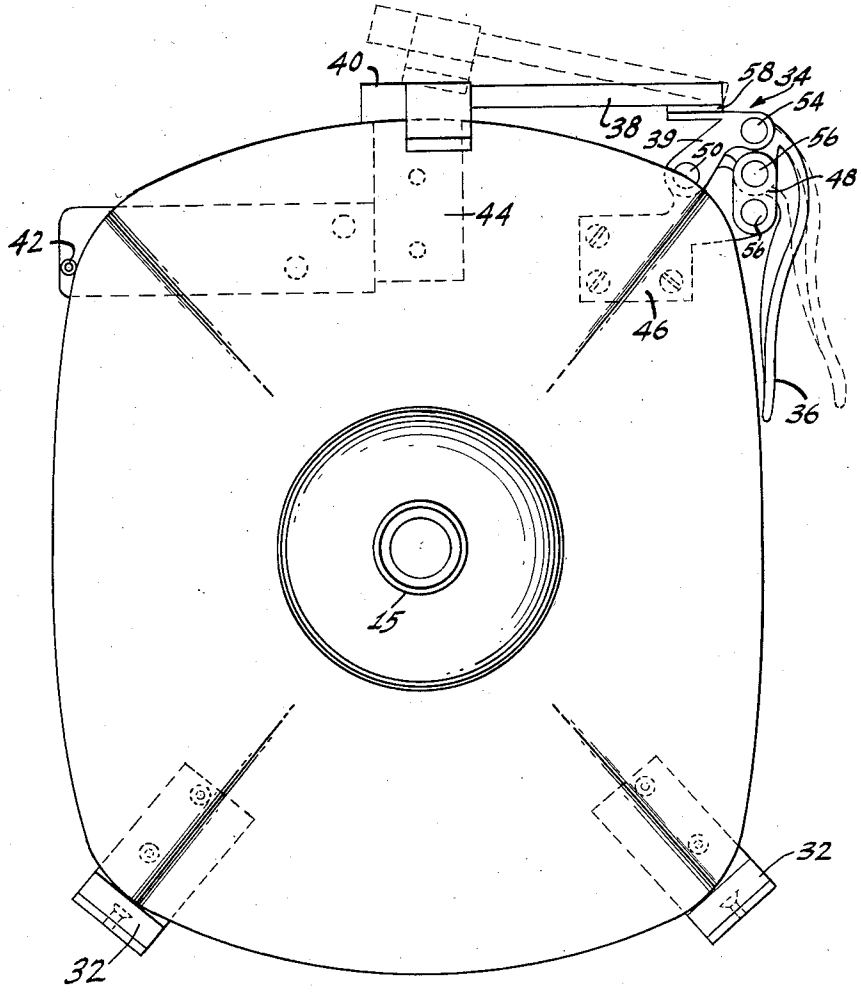
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Fig. 5.



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United States Patent Office 2,889,917 Patented June 9, 1959

2,889,917

APPARATUS FOR CONVEYING ARTICLES IN CLOSE SPACED RELATIONSHIP

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Application November 30, 1954, Serial No. 472,120
3 Claims. (Cl. 198—179)

This invention relates to apparatus for settling phosphor screens in cathode ray tubes and more particularly to novel means for securing bulbs on an endless conveyor movable along a predetermined path.

One type of apparatus to which this invention applies utilizes a conveyor consisting of a plurality of interconnected carriages mounted on an endless movable belt or chains. The carriages are provided at their opposite ends with trucks having rollers which engage and roll along a stationary endless track disposed adjacent to the chains and extending in the same direction as the chains. The chains are driven over sprockets located at each end of the conveyor and traverse an upper course in one direction and a lower course in the opposite direction. The carriages are provided with platforms for holding the cathode ray tube bulbs in rows with the face down and neck up. They traverse, in columns, stations at which various liquid ingredients and phosphors in suspension are added. As they slowly proceed in an undisturbed travel the phosphors settle out and form a screen on the inside of the face plates.

In the above apparatus, the platform or holder has heretofore been provided with two or more fixed stops for engaging the bulb at points about its periphery, and clamping has been effected by means of a screw type clamp located at another point and lying wholly within the space separating one bulb from a neighboring bulb in the same column.

One disadvantage of using such a screw type clamp is that the clamp occupies an unnecessarily large amount of space. Therefore, the number of bulbs which can be accommodated at any one time on a conveyor of given length is unduly limited.

Another disadvantage is that the screw type clamp may loosen due to vibration. This may prevent the quiet settling of phosphors and produce a defective screen.

Still another disadvantage arising from the clamp lying wholly within the space between the bulbs is that the knob or handle is not easily accessible for loading and unloading.

Furthermore, clamping and unclamping a screw type clamp is time consuming.

It is therefore an object of this invention to provide an apparatus for settling phosphor screens in cathode ray tubes and more particularly for improved means for securing closely spaced bulbs on an endless conveyor and which means occupies a minimum of space between the bulbs.

It is a further object to provide an improved apparatus for more securely holding bulbs on a conveyor against vibration.

It is a further object to provide an apparatus for securing bulbs on a conveyor, which apparatus permits the bulbs to be clamped and unclamped in one simple motion.

It is a further object to provide an apparatus for securing closely spaced bulbs on a conveyor and having clamping means easily accessible to the operator.

The foregoing and related objects are achieved in accordance with the invention by providing a bulb holding

apparatus having fixed stops to engage the bulbs at spaced points on the periphery of the bulb, and having a quickly releasable clamp for securing the bulb against the fixed stops. One feature of the clamp is that it has an actuating handle located outside the space between the bulbs. Another feature is that the clamp has an elongated clamping arm extending into the space between the bulbs and requiring a minimum of space for pivoting. Both of these last features make it possible to more closely space the bulbs because space between the bulbs need only be wide enough to accommodate the clamping arm which swings through only a small angle.

The novel features which are believed to be characteristic of this invention are set forth with particularity in the appended claims. The invention itself will best be understood by reference to the following description taken in connection with the accompanying two sheets of drawings in which:

Fig. 1 is a partial side elevation of a conveyor on which a plurality of bulbs are carried in closely spaced fashion in accordance with the invention;

Fig. 2 is a plan view of the bulbs on the conveyor;

Fig. 3 is a side elevation of a carriage with bulb holding apparatus constructed in accordance with the invention;

Fig. 4 is an end view of a bulb mounted on the carriage of Fig. 3; and,

Fig. 5 is a plan view of a bulb and its holder.

Referring to Fig. 1, there is shown one type of apparatus to which this invention is applicable. Only so much of the apparatus is shown, by way of example, as will provide a basis for understanding the invention. The particular apparatus shown is used in the process of settling phosphor screens in cathode ray tubes. It consists of a conveyor for carrying a plurality of cathode ray tube bulbs 10 along an endless track 12. A plurality of carriages, shown generally at 14, are attached at each end to an endless belt or chain 16 driven over rollers or sprockets, one of which is shown at 18.

Referring to Figs. 1 and 2 the carriages 14 are provided at their opposite ends with trucks 20 having rollers 22 which engage and roll along the stationary endless track 12 disposed adjacent to the chain 16 and extending in the same direction as the chain 16. The carriages 14 are provided with platforms, as will appear below, for holding the cathode ray bulbs 10 in rows, as they traverse, in columns, an upper course and a lower course in the direction of the arrows 24 and 26 as shown.

Viewing the closely spaced bulbs from a side elevation as they travel in a transverse direction indicated by the arrow 24 as shown in Fig. 1, and in more detail in Fig. 3, each bulb comprises a conical portion 11 having a face plate 13 closing the large end of the conical portion 11, and a tubular neck portion 15 (broken away in Fig. 3) closing the small end of the conical portion 11. Each bulb is supported on its associated platform or holder 28 at its face plate end and with its longitudinal axis O normal to the path of travel.

As shown in Figs. 3, 4 and 5, the platform or holder 28, constructed in accordance with the invention consists of a base 30 having a plurality of fixed stops 32 mounted thereon to engage the face plate end of the bulb at spaced points around its periphery, and a quickly releasable clamp 34 mounted on said base 30 to secure the bulb against the fixed stops 32. The clamp has an actuating handle 36 located outside the space between adjacent bulbs lying in the same column and an elongated clamping arm 38 extending into the space between these same adjacent bulbs. The clamping arm 38 terminates in a pair of rubber fingers 40 which engage its bulb at a peripheral point spaced from the fixed stops 32.

The fixed stops 32 are angular in shape and have a bot-

tom portion 33 covered with cushioning material for engaging the face plate 13 and an upright portion 35 likewise covered with cushioning material to engage the bulb sides. A third fixed stop or upright locating pin 42 is also provided with cushioning material to engage the bulb side. The pin 42 allows the bulbs to be properly oriented on loading, especially when the bulbs are rectangular in shape, as shown. The face plate 13 is supported on the base 30 by cushioning material at a location 44 spaced from the fixed stops 32 and directly below the clamping arm 34.

The clamp 34 is a quickly releasable clamp and may comprise one of the type known as a toggle clamp. As shown in Fig. 5, the clamp has a support element 46 which is fixed to the base 30 and which supports the actuating handle 36, a pivoting member 39 carrying the clamping arm 38, and a link 48 by way of two fixed pivot points 50 and 52 and two movable pivot points 54 and 56. In the position shown in Fig. 5 by the solid lines, the clamp is in the locked position. To unlock the clamp 34 it is merely necessary to make one movement of the handle 36 in the direction of the dotted lines. When this is done the point 56 on the link 48 and handle 36 moves slightly to the right, the point 54 on the handle 36 and the member 39 moves downward and to the right, and the elongated arm 38 pivots about the point 50 and moves outwardly from the bulb 10 as shown in the dotted lines. The bulb is then released from the holder. Movement of the handle back to the locked position places the points 52, 56, and 54 in vertical alignment, clamps the bulb firmly with a force in a direction parallel to the path of travel of the bulbs, and locks the clamp securely.

In order to provide clamping of the bulb at the desired point which is spaced slightly from the base 30, an offset member 58 is connected between the member 39 and the clamping arm 38, as shown in Figs. 3, 4 and 5.

Referring to Figs. 2–5 again, it is seen that only the clamping arm 38 occupies the space between adjacent bulbs, the actuating handle 36 being located to one side and out of the space between the bulbs. The bulbs can therefore be placed closer together than is the case where the actuating means also is positioned within the space between the bulbs, such as with screw type clamps, for example.

In order to allow the clamping arm to move freely without interference from an adjacent bulb, the bulbs are preferably loaded and unloaded on the conveyor in a substantially horizontal position as indicated in Fig. 1 at the position A. That is, a position is selected on the conveyor where the bulbs or carriages are making their turn between the lower and upper course of travel. In this position adjacent bulbs have their axes tilted with respect to one another, and the spacing between bulbs is then greater than is the case when the bulbs are all upright or inverted, as in the positions B and C.

In this manner then, the clamping arm 38 can be moved freely for loading and unloading. Also the handle 36 is readily accessible to the operator because it is located in a position where the spacing between bulbs is not critical, that is, the spacing between the columns. It is the spacing between the rows of the bulbs which is critical and which determines the number of bulbs which can be placed on a machine of given length.

After the bulbs are loaded and are moved to a position, such as at B, in Fig. 1, the gap between the bulbs is closed, and the clamping arm is no longer free to move. The toggle action locks the clamp securely against vibrations, and any tendency of the arm to move is further resisted by an adjacent bulb. The spacing between bulbs is so close that the clamping arm cannot move.

Thus it is seen that the apparatus of the invention permits closer spacing between bulbs, holds the bulbs more securely, and permits ease in clamping and unclamping.

What is claimed is:

1. A conveyor apparatus comprising at least two carriages movable in a given direction one behind the other, means on said carriages adapted to engage and fix a workpiece on its respective carriage, said means comprising a clamp adapted to engage a workpiece on its side next to the adjacent carriage and mounted for movement in a horizontal plane between said carriages and in said direction through a predetermined distance between clamping and unclamping positions, and an endless conveyor having upper and lower rectilinear courses and arcuate courses connecting the ends of said rectilinear courses, said carriages being mounted on and extending outwardly from said conveyor, said carriages being relatively closely spaced in said one direction so as to confine said clamp in a space between workpieces which is less than said predetermined distance of movement of said clamp when said carriages are carried in said rectilinear courses, said carriages being angularly disposed when carried on said arcuate courses, whereby the spacing between said workpieces in said one direction is increased for permitting movement of said clamp through said predetermined distance.

2. A conveyor apparatus comprising at least two carriages movable in a given direction one behind the other, means on said carriages adapted to engage and fix a workpiece on its respective carriage, said means comprising a clamp provided with an arm adapted to engage a workpiece on its side next to the adjacent carriage and pivotally mounted for movement in a horizontal plane between said workpieces and in said direction through a predetermined distance between clamping and unclamping positions, and an endless conveyor having upper and lower rectilinear courses and arcuate courses connecting the ends of said rectilinear courses, said carriages being mounted on and extending outwardly from said conveyor, said carriages being relatively closely spaced in said one direction so as to confine said arm in a space between workpieces which is less than said predetermined distance of movement of said arm when said carriages are carried in said rectilinear courses, said carriages being angularly disposed when carried on said arcuate courses, whereby the spacing between said workpieces in said one direction is increased for permitting movement of said arm through said predetermined distance.

3. A conveyor apparatus comprising at least two carriages movable in a given direction one behind the other, means on said carriages adapted to engage and fix a workpiece on its respective carriage, said means comprising a clamp provided with an elongated arm adapted to engage a workpiece on its side next to the adjacent carriage, said clamp lying and moving in a horizontal plane between said work pieces, said clamp also including a handle pivoted to one side of said arm for actuating movement of said arm in said direction through a predetermined distance between clamping and unclamping positions, and an endless conveyor having upper and lower rectilinear courses and arcuate courses connecting the ends of said rectilinear courses, said carriages being mounted on and extending outwardly from said conveyor, said carriages being relatively closely spaced in said one direction so as to confine said arm in a space between workpieces which is less than said predetermined distance of movement of said arm when said carriages are carried in said rectilinear courses, said carriages being angularly disposed when carried on said arcuate courses, whereby the spacing between said workpieces in said one direction is increased for permitting movement of said arm through said predetermined distance so as to release said bulb.

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