Aug. 12, 1941. J. FLAWS, JR 2,252,498

APPARATUS FOR FEEDING GLASS FLARES

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Fig. 1.

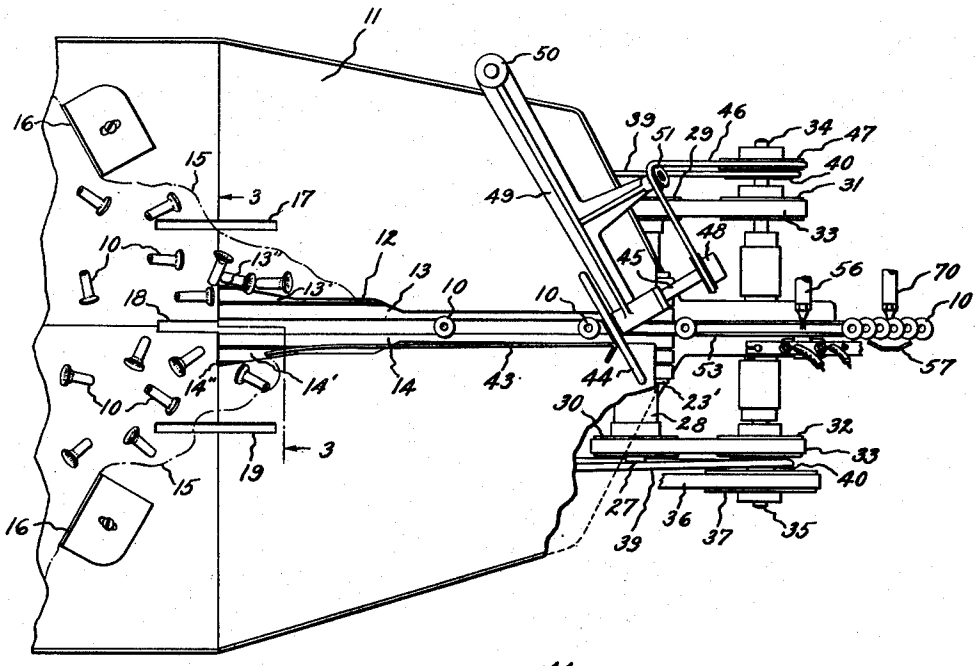
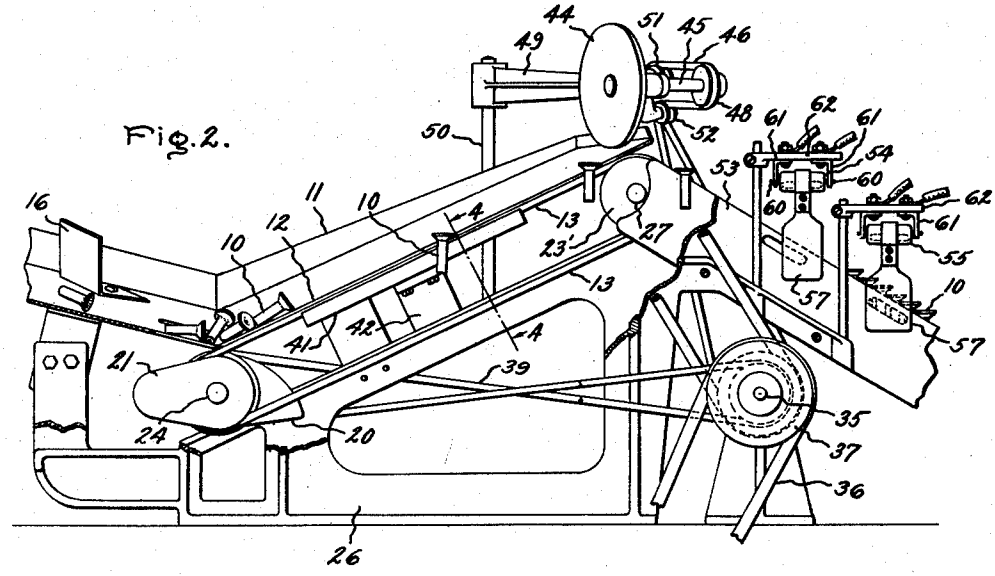


Fig. 2.



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Fig. 3.

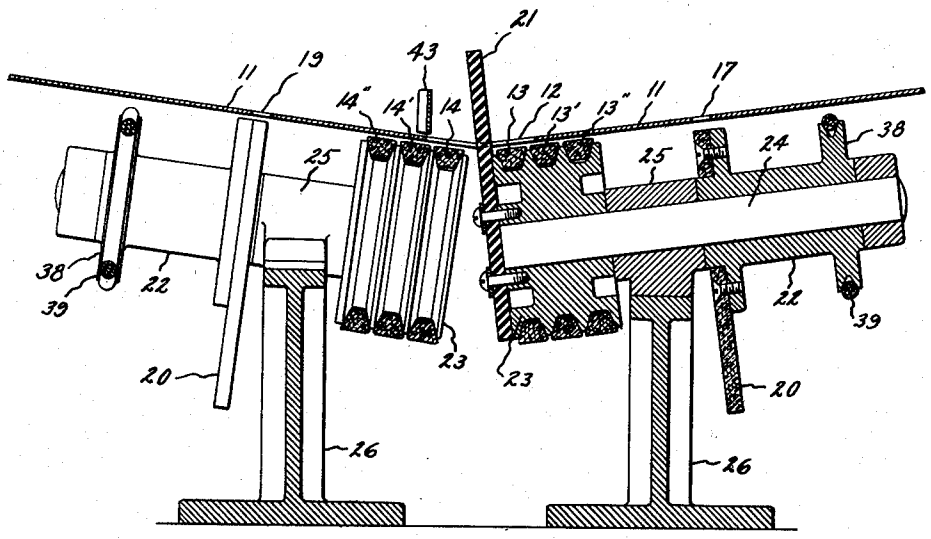


Fig. 4.

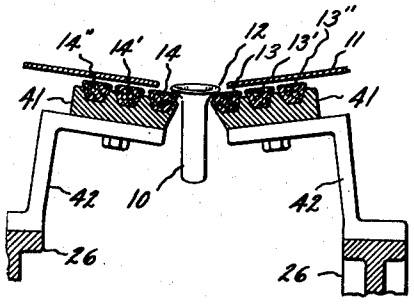
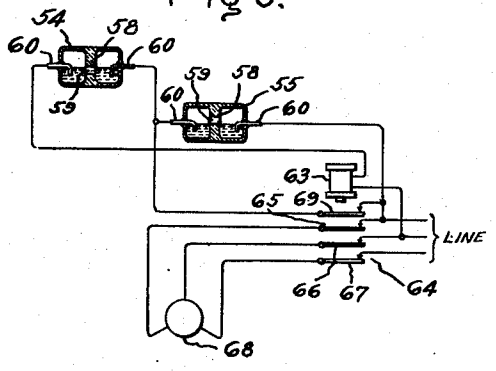


Fig. 5.



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UNITED STATES PATENT OFFICE

2,252,498

APPARATUS FOR FEEDING GLASS FLARES

John Flaws, Jr., East Cleveland, Ohio, assignor to General Electric Company, a corporation of New York

Application April 27, 1939, Serial No. 270,434

8 Claims. (Cl. 198—30)

My invention relates to apparatus for feeding light and fragile articles, and more particularly to apparatus for feeding flared lengths of vitreous tubing used in the manufacture of stems for lamps, radio tubes and other sealed vitreous electrical devices. Such lengths of tubing are known as flares and are used in a considerable range of lengths and sizes, some of which are very difficult to feed on existing apparatus.

One object of my invention is to provide apparatus for feeding large numbers of flares satisfactorily between intervals of manual attention at higher rates of speed than heretofore. Another object of my invention is to provide apparatus for feeding the longer flares and other sizes thereof heretofore found difficult to feed entirely independently of manual attention. Still another object of my invention is to provide apparatus in combination with such feeding apparatus for periodically discontinuing the operation of said feeding apparatus when a reserve of flares has accumulated. By so doing all possibility of the flares piling up and blocking the feeding operation is obviated and excessive agitation and possible breakage of the flares is avoided. Other features and advantages of my invention will appear from the following detailed description of a species thereof and from the accompanying drawings.

In the drawings Fig. 1 is a plan view of a flare feeding apparatus comprising my invention; Fig. 2 is a side elevation thereof with the near side of the hopper and the adjacent portion of the feeding means broken away; Fig. 3 is a section through the apparatus along line 3—3 of Fig. 1 in the direction indicated; Fig. 4 is a section along line 4—4 of Fig. 2 in the direction indicated; and Fig. 5 is a wiring diagram of the control means therefor, the mercury switches 54 and 55 being shown in section and the section through the partitions 58 being taken in a plane at an angle to the vertical to show the openings 59 therein.

As shown in Figs. 1 and 2, the apparatus is in the process of feeding flares 10 from the hopper 11 which is provided with inclined bottom sections causing said flares 10 to gradually advance to and fall through the central opening 12 therein to the moving belts 13 and 14 located therebelow. The capacity of the hopper 11 is limited and for long uninterrupted feeding periods it is preferred that a large deep box having an opening along the bottom of one side be mounted at the upper left end of said hopper 11 so as to spill the flares 10 thereon.

The bottom of the hopper 11 slopes downwardly both from the ends and the sides toward the opening 12 and the flares 10 issuing from the box at the left end pass in a stream of gradually reducing width and thickness to the opening 12 and the area thereabout. The stream of flares 10, as indicated by the dot-dash line 15, first engages the guides 16 which tend to confine and reduce the width thereof and then passes over the openings 17, 18 and 19 respectively which give the agitators 20, 21 and 20 (Fig. 3) access thereto. Each of the outermost agitators 20 is mounted on a hub 22 which is turned in a counter-clockwise direction so as to repeatedly swing upward through the openings 17 and 19 and engage the opposite sides of the stream reducing it in width still further whereas the center agitator 21 is rotated in a clockwise direction so as to periodically swing upward through the opening 18 in the hopper 11 and distribute the flares 10 of the centermost part of the stream over the lower portion of the belts 13 and 14. In this manner relatively few flares 10 are allowed to remain on the belts 13 and 14 at one time although they are advanced thereto as needed and any bridging effect thereof is quickly broken down. In this instance the outer agitators 20 are made of leather whereas the center agitator 21 is made of soft gum rubber to assist in shifting the flares 10 and prevent any breakage.

The main body of the stream of flares 10 passes into the end of the opening 12 in the hopper 11 and onto the belts 13 and 14 and the belts 13'—13'' and 14'—14'' at opposite sides thereof in a very disarranged manner and are carried upward and to the right by the motion thereof. The belts 13 and 14, as shown, are spaced from each other a distance equal to the width of the tubular portion of the flares 10 and at this moment a few of the flares 10 fall down therebetween so that they are supported by the flanged portion which rests on the upper surface of said belts 13 and 14. The remainder of the flares 10 being out of alignment with the belts 13 and 14 do not fall down therebetween and are carried therewith. The belts 13'—13'' and 14'—14'' are mounted close to their respective feeding belts 13 and 14 and, like said belts 13 and 14, extend around the sheaves 23—23 below the center portion of the hopper 11 and the sheaves 23'—23' below the right end thereof. In each case sheave 23 idles and is fastened to a shaft 24 carried in the bearing 25 mounted on one half of the frame 26, and sheave 23' is driven and is fastened to a shaft 27 carried in the bearing 28 fastened to the same side of the frame 26. The shafts 24 and 27

are so located below the hopper 11 that the belts lie at the same angularity as the front and rear sections of the right end of the bottom thereof so that the flares 10 have a tendency to shift and roll into position between the feeding belts 13 and 14 and hold said belts close below the section of the bottom of the hopper 11 at opposite sides of the opening 12. The agitator 21 is mounted on one of the lowermost sheaves 23 so as to be supported and turned thereby.

Additional rolling motion is also created in the flares 10 by a difference in speed of movement of the belts at opposite sides of the opening 12 as the pulleys 29 and 30 on the ends of the shafts 27—27, and the corresponding driving pulleys 31 and 32 are of such size as to cause the far belts 13, 13' and 13'' to move faster. In every instance the surface of the belts is of cotton impregnated with rubber although best results are sometimes obtained by providing small raised rubber protuberances along the inside edge of the slower moving feed belt 14. The pulleys 29—30 and 31—32 are caused to drive each other by the belts 33—33 and are driven from the two sections 34 and 35 of the drive shaft which are jointed together at the center by a universal joint (not shown). The drive shaft in turn is driven by an electric motor and a speed reducer in the conventional manner through the belt 36 and the pulley 37 and actuates the agitators 20—20 by means of the pulleys 38 (Fig. 3) on the supporting hubs 22 therefor, the belts 39 and the pulleys 40 on the opposite sections 34 and 35 thereof. In this instance a difference in speed between the belts 13 and 14 of ten per cent is found desirable and the pulleys 29, 30, 31 and 32 are made of such size to produce this difference. Additional means are also provided in the grooved blocks 41—41 (Fig. 4) which are fastened to the frame 26 by the arms 42—42 for supporting and keeping the center portions of the belts 13, 13', 13'', 14, 14', and 14'' in place.

The opening 12 in the hopper bottom gradually narrows down in width until substantially only that portion of the belts 13 and 14 needed to carry the flares 10 is exposed. A partition 43 is provided along the side of the opening 12 adjacent the slow speed belt 14 to keep the flares from sliding off and piling up to one side thereof. In most instances all the flares are properly arranged between the belts 13 and 14 before they are carried half way out of the hopper 11, but some flares may ride on those held by the belts 13 and 14 and be carried into engagement with the clearing wheel 44. The clearing wheel 44, which is preferably made of soft gum rubber, is mounted just above the path of movement of flares 10 properly positioned between the belts 13 and 14 and turns in a clockwise direction (Fig. 2) so as to push off all the flares not correctly held thereby and projecting above the usual path of movement. The clearing wheel 44 is turned through the shaft 45 on which it is mounted which in turn is driven from the back section 34 of the drive shaft through the belt 46 and pulleys 47 and 48. The shaft 45 is held by the arm 49 which is mounted on the rod 50 extending from the far side of the frame 26 and which supports the angularly set idler sheaves 51 and 52 for redirecting the belt 46.

The flares 10 are carried up beyond the end of the hopper 11 and the clearing wheel 44 and over the ends of the plates that form the guideway 53 by the movement of said belts 13 and 14 which then pass down and under the sheave 23'. The guideway 53 is mounted in a downwardly sloping position to cause the flares 10 to be advanced therealong by gravity and forms the usual method of carrying the flares 10 to machines for making stems for lamps, radio tubes and the like. Machines of this type can receive the flares 10 only at definite intervals and some means such as that disclosed in Patent 1,597,439, which issued August 24, 1926, to Fagan et al., is preferably provided for releasing the flares from the lower end of the guideway 53. As the feeding interval of my apparatus is not uniform, a reserve of flares 10 is normally kept in the guideway 53 as a constant source of supply and the rate of the feeding operation is greater than the rate the flares 10 are used. This method of operation necessitates some form of control means such as that provided for shutting off the feeding apparatus when a sufficient reserve supply is provided for a short period of operation and for starting the apparatus when the supply is low.

The control means shown is of the type disclosed in my application Serial No. 270,435 of even date, and comprises the mercury switches 54 and 55 which are located to one side of the guideway 53 opposite the positions taken by the endmost flare 10 when the reserve supply thereof is sufficient and low respectively, and the feeding apparatus must be stopped and started. At the moment shown, the supply is being replenished and the jet of air given off by the nozzle on the pipe 56 passes through opening in one plate of the guideway 53, crosses the path of movement of the flares 10, through the other plate of the guideway 53 and strikes the vane 57 attached to the mercury switch 54, thereby tipping it so that an electrical circuit therethrough is completed. The mercury switch 54 corresponds to mercury switch 55 and, as shown in Fig. 5, consists of a sealed vitreous envelope divided by a partition 58 having an opening 59 therein to one side of the center and the terminal elements 60 at opposite ends thereof on the longitudinal axis thereof which dip into the mercury pools at both sides of said partition 58. The switches 54 and 55 are supported by the terminal elements 60 which lie in holes in the metal angular pieces 61 extending from the supporting arm 62 of insulating material and which make electrical contact therewith. The mercury switch 54 functions as a holding means for the circuit, energizing the solenoid 63 of the relay switch 64 which draws the armatures 65, 66 and 67 against their contacts completing the three-wire three-phase circuit from the line to the driving motor 68 of the feeding apparatus. The force of the air jet against the comparatively light weight vane 57 causes the switch to be turned so that the opening 59 passes below the surface of the mercury pools and they flow together completing the circuit therethrough. If the air jet is blocked from the vane 57 for any length of time the weight thereof is sufficient to turn it and the switch 54 so that the opening 59 is above the level of the mercury pools and the circuit therethrough is broken.

When the flares 10 have collected in the guideway 43 until the jet of air from pipe 56 is blocked off from the vane 57 of switch 54, the vane 57 swings down turning the switch 54 so that the circuit to the solenoid 64 is broken and the armatures 65, 66, 67 and 69 move away from their contacts breaking the line circuit to the motor 68 and said switch 54. The operation of the feeding apparatus is interrupted in this manner and

does not start again until the supply of flares 10 has been reduced so that the jet of air from pipe 70 strikes the vane 57 attached to switch 55 as the movement of the armature 69 breaks the line circuit to switch 54 and causes it to be disconnected. When switch 55 is turned so as to be closed, switch 54 is also closed and the line circuit to the solenoid 63 of relay switch 64 is energized moving the armatures 65, 66 and 67 to a position connecting the line to the motor 68 and causing the feeding apparatus to operate. Armature 69 is also moved at this time so that it completes the line circuit to switch 54 placing it in control of all further operations of the apparatus. Further operations are repeat cycles of those already described.

In some instances the flares 10 are not delivered by the guideway 53 at sufficient height and the opposite ends of the guideway 53 are separated and mounted at different levels and a lifting conveyor is inserted therebetween. In such instances the conveyor is operated at the same rate as the machine using the flares 10 and a single mercury switch operated by an air jet directed across the path of movement of said flares 10 on the endmost portion of the guideway may be used to control its operation.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. Feeding apparatus for vitreous flares comprising a hopper adapted to hold a quantity of the flares and having an opening in the bottom thereof to allow them to escape, agitating means engaging the flares at opposite sides of the said opening in the hopper, means between said agitating means for agitating and distributing the flares to all parts of said opening, a pair of spaced parallel belts mounted below said opening in position to receive the flares therebetween, and means for moving said belts in the same direction at different rates of speed to cause the flares falling thereon to be shifted and orientated so that they fall down between said belts with their flared ends uppermost.

2. Feeding apparatus for vitreous flares comprising a hopper adapted to hold a quantity of the flares and having an opening in the bottom thereof to allow the flares to escape, a pair of spaced parallel belts mounted below said opening in position to receive the flares therebetween, means for moving said belts in the same direction at different rates of speed to cause the flares falling thereon to be shifted and orientated so that they fall down between the belts with their flared ends uppermost, and a partition attached to the bottom of said hopper along an edge of the said opening therein substantially parallel to the direction of movement of said belts for assisting in the orientation and feeding of the flares.

3. Feeding apparatus for vitreous flares comprising a hopper adapted to hold a quantity of the flares and having an opening in the bottom thereof to allow the flares to escape, agitating means engaging the flares at opposite sides of the said opening in the hopper, means between said agitating means for agitating and distributing said flares to all parts of said opening, a pair of spaced parallel belts mounted below said opening in position to receive the flares therebetween, means for moving said belts in the same direction at different rates of speed to cause the flares falling thereon to be shifted and orientated so that they fall down between said belts with their flared ends uppermost, a partition attached to the bottom of the hopper along an edge of the said opening therein substantially parallel to the direction of movement of said belts for assisting in the orientation and feeding of the flares, a wheel mounted over said belts at one end of the said opening in the hopper at an angle to their direction of movement for intercepting flares extending above their normal position, and means for rotating said wheel to cause the intercepted flares to be pushed from said belts back into the hopper.

4. Feeding apparatus for vitreous flares comprising a hopper adapted to hold a quantity of the flares and having an opening in the bottom thereof to allow them to escape, a pair of spaced parallel belts mounted below said opening in position to receive the flares therebetween, means for moving said belts in the same direction at different rates of speed to cause the flares falling thereon to be shifted and orientated so that they fall down between said belts with their flared ends uppermost, a guideway in longitudinal alignment with said belts at the extremity thereof for receiving said flares, said guideway being inclined so as to feed said flares therealong by gravity, and control means located adjacent said guideway for causing the belt driving means to be rendered inoperative when said guideway becomes filled with flares and for causing said belt driving means to again become operative as the supply of flares therein becomes partly exhausted.

5. Feeding apparatus for vitreous flares comprising a hopper adapted to hold a quantity of the flares and having an opening in the bottom thereof to allow them to escape, a pair of spaced parallel belts mounted below said opening in position to receive the flares therebetween, means for moving said belts in the same direction at different rates of speed to cause the flares falling thereon to be shifted and orientated so that they fall down between said belts with their flared ends uppermost, a guideway in longitudinal alignment with said belts at the extremity thereof for receiving said flares, said guideway being inclined so as to feed said flares therealong by gravity, and control means located adjacent said guideway and comprising means at two spaced locations therealong for directing a jet of air across the path of movement of the flares, movable vanes located at the opposite side of said guideway in the path of the air jets, and means controlled by movement of said vanes for causing the belt driving means to be rendered inoperative when both air jets are intercepted by flares and for causing the said belt driving means to again become operative as said flares move away and the air jets strike and move said vanes.

6. Feeding apparatus for vitreous flares comprising a hopper adapted to hold a quantity of flares and having an elongated opening in the bottom thereof to allow said flares to escape, the bottom portions of said hopper being convergent at both sides toward said opening, a pair of spaced parallel belts mounted below said opening one at each side thereof in position to receive said flares therebetween, the upper surface of said belts being inclined at substantially the same angle as the said convergent bottom portions of said hopper and means for moving said belts in the same direction at different rates of speed to cause the flares falling thereon to be shifted and orientated so that they fall down between said belts with their flared ends uppermost.

7. Feeding apparatus for vitreous flares comprising a hopper adapted to hold a quantity of

flares and having an elongated opening in the bottom thereof to allow said flares to escape, the bottom portions of said hopper being convergent at both sides toward said opening, a pair of spaced parallel belts mounted below said opening one at each side thereof in position to receive said flares therebetween, the upper surface of said belts being inclined at substantially the same angle as the said convergent bottom portions of said hopper and means for moving said belts in the same direction at different rates of speed to cause the flares falling thereon to be shifted and orientated so that they fall down between said belts with their flared ends uppermost, and a partition at the bottom of said hopper extending along the edge of the said opening therein adjacent the more slowly moving belt for assisting in the orientation and feeding of the flares.

8. Feeding apparatus for vitreous flares comprising a hopper adapted to hold a quantity of the flares and having an elongated opening in the bottom thereof to allow them to escape, rotary agitating means engaging the flares at opposite sides of the said opening in the hopper, a separate rotary agitator means between said first-mentioned agitating means and rotatable in a direction opposite to that of said first-mentioned means for agitating and distributing the flares to all parts of said opening, a pair of spaced parallel belts mounted below said opening in position to receive the flares therebetween, and means for moving said belts in the same direction.

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