Sept. 1, 1942. R. M. GARDNER ET AL 2,294,400

LAMP EXHAUST OVEN

Filed July 20, 1940 3 Sheets-Sheet 1

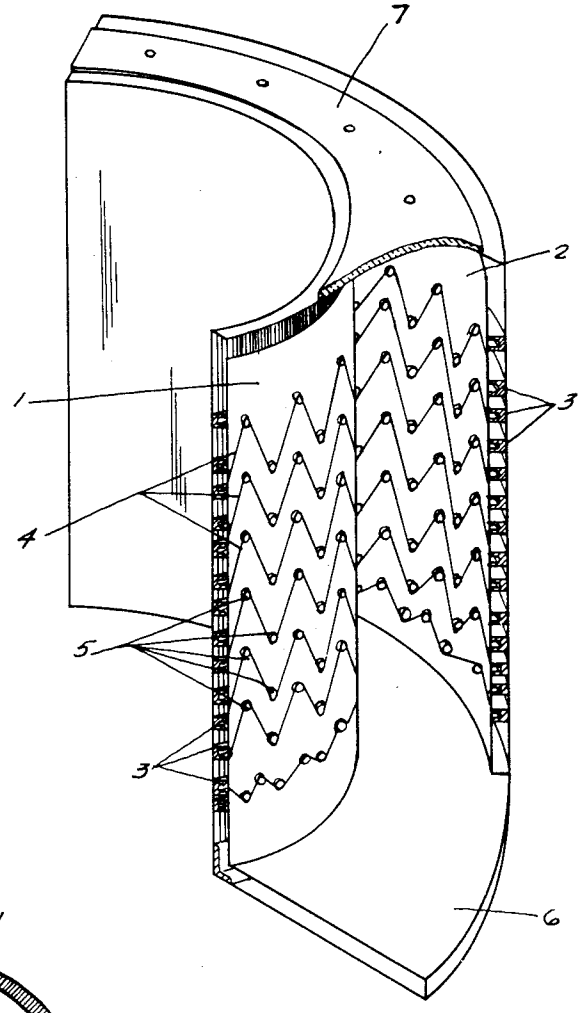


FIG 1

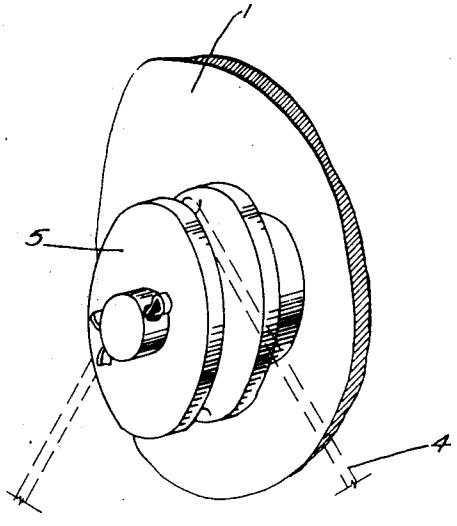


FIG 2

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LAMP EXHAUST OVEN

Filed July 20, 1940 3 Sheets-Sheet 2

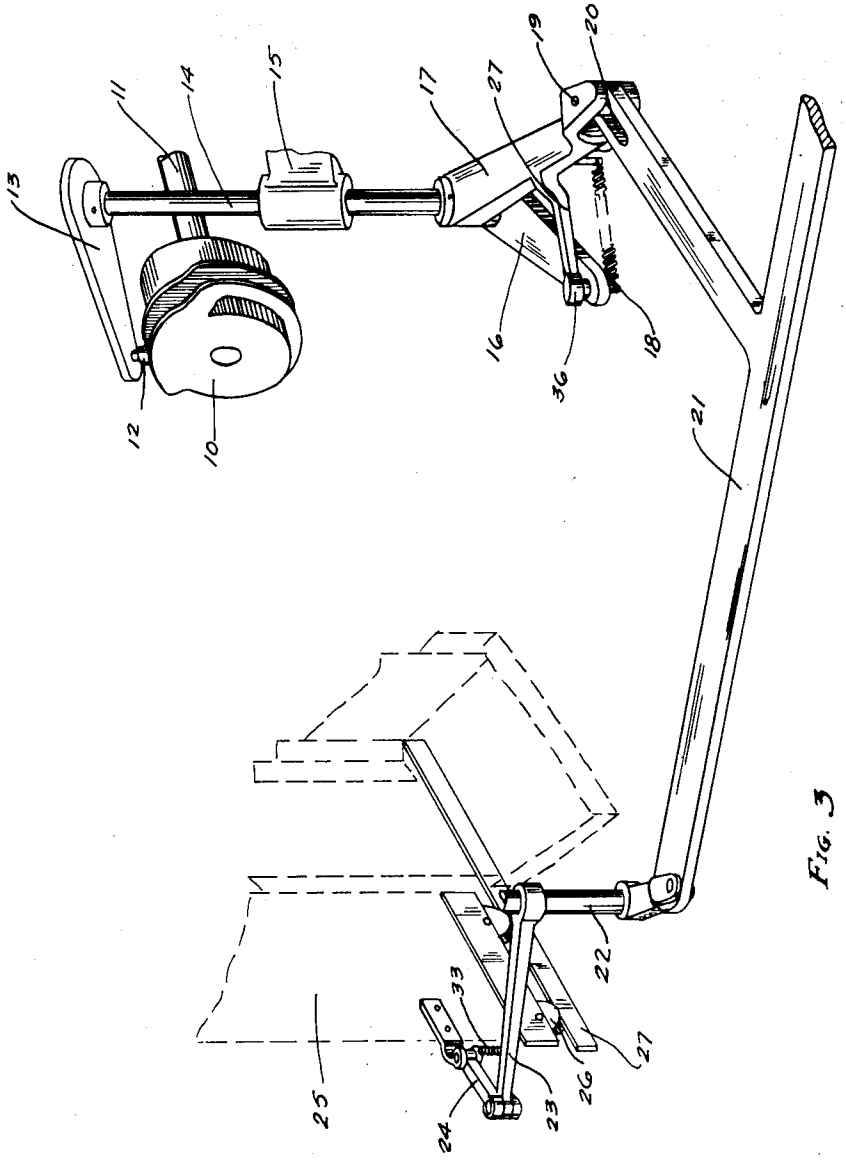


FIG. 3

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LAMP EXHAUST OVEN

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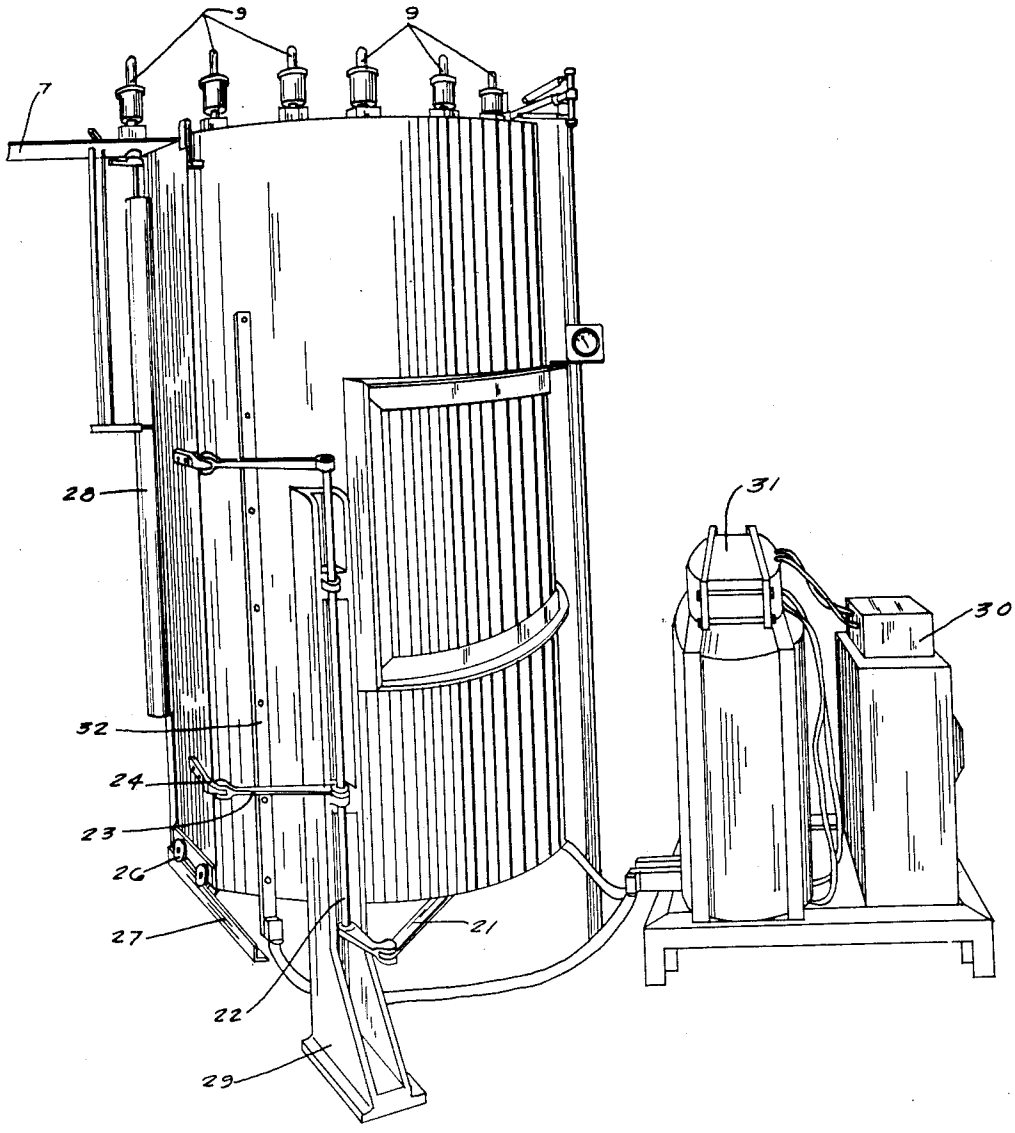


FIG. 4

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UNITED STATES PATENT OFFICE

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LAMP EXHAUST OVEN

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Application July 20, 1940, Serial No. 346,618

4 Claims. (Cl. 219—35)

This invention relates to a heating oven for lamps and more particularly to a heating oven for electric gaseous discharge lamps, especially those having a fluorescent coating.

An object of this invention is to provide a suitable means for heating fluorescent lamps while they are in the process of being exhausted.

Another object of this invention is to provide a suitable heating means for assisting in the removal of volatile gases especially those that are volatile at high temperatures from fluorescent lamps while they are being exhausted.

A further object is the obtaining of a high purity atmosphere in a fluorescent lamp when it is exhausted.

Another object is to provide, a suitable means for heating fluorescent lamps that will be inexpensive and readily adaptable to the exhausting machine.

Another object is to provide a means for heating fluorescent lamps that will assist in obtaining a quick exhaust thereby increasing the speed with which the lamps may be exhausted.

Other advantages and features of this invention will be apparent from the specifications which follow taken in conjunction with the several views of the drawings in which:

Figure 1 is a front perspective view of the oven partly in section.

Figure 2 is a detailed view of one of the heating element insulators.

Figure 3 is a schematic diagram of the oven door operating mechanism.

Figure 4 is a side perspective view of the heating oven and its auxillaries.

Similar reference characters refer to similar parts throughout the several views of the drawings and in the specification which follows.

The walls 1 and 2 of this oven are made of 22 gauge cold rolled steel, chrome plated and polished on both sides. Each wall consists of two spaced sheets of this steel, the surfaces of both sides of each sheet being chrome plated and highly polished. The two sheets forming each wall are spaced and supported by a series of channel iron supports 3. The heating element consists of a network of nichrome wire 4 or some similar high resistance wire running along both of the inside walls of the oven and supported thereon and insulating therefrom by a plurality of insulators 5, made of lava or some similar material and located at various places over the walls of the oven and bolted thereto through the series of channel iron sections 3 running between the two separate sheets which form each wall.

The floor, 6, of the oven is merely a lateral extension of the inner wall. Although the oven could be made in one piece, it is better to have the floor and one of the walls made from one section of metal and the other wall from another section. If, in conjunction with this type of construction, a small clearance is provided at the point where the separate oven section meets the floor, no difficulty will be encountered due to thermal expansion.

The roof of the oven consists of a transite board turret 7 which indexes with the machine. This turret extends completely around the cycle of the machine. This turret 7 of transite board or some similar insulating material serves a twofold purpose; it helps to prevent a loss of heat from the oven and it aids in preventing radiant heat from striking the exhaust heads. Excessive heat from the oven would have a deleterious effect on all parts and connections especially those of rubber located in the exhaust heads.

An oven of the type described is one that is easy and cheap to construct and yet is best suited for our purposes. By using a chrome plated highly polished steel for the walls and floor, radiated heat is practically eliminated. Expansion is amply provided for. The oven is not hermetically sealed. The sides of the oven are suspended and not fixed to a base frame thus providing for expansion to take place in a downward direction and thereby not interfering with the indexing of the machine. The oven is maintained at a temperature safely below the temperature at which the glass which forms the lamp would melt or collapse.

Since the lamps, during the exhausting cycle, move in and then out of this heating oven, it is preferable to provide doors at the entrance and the exit thereof to avoid the great loss of heat and drafts that would be experienced if no doors were used. Figure 3 shows the means by which the doors of the oven are automatically opened just before the machine has finished its indexing motion and automatically closed just after the machine has finished its indexing motion. There is one of these doors at each end of the machine and they are both activated by the same mechanism.

The activating force is provided through the cylindrical positive action cam 10, on the cam shaft 11. As shown in Figure 3, the oven door is open. As the cam 10 rotates, the cam roller 12 attached to the cam follower 13 will follow along the track provided therefor on the cam 10. The cam action and the machine indexing are

synchronized so that when the machine has finished an indexing motion, the contour of the cam is such that the cam roller 12 moves to the right. When it does this, it causes the shaft 14 to which the cam follower 13 is attached to rotate in a clock-wise manner. This shaft 14 is held in place by the frame 15 and at its lower extremity has two links concentric therewith, the lower link 16, being permanently attached thereto and the upper link 17 floating thereabout. This clockwise motion of the shaft 14 results in a similar motion on the part of the fixed link 16 attached thereto. The turning of the link 16 results in a tension on the spring 18 connecting the fixed link 16 and the floating link 17. This will tend to pull the floating link 17 and cause it also to turn in a clock-wise manner.

If the machine does not index properly, or there is an obstruction in either door preventing the door from being closed, the floating link 17 will be restrained and, as a result, the spring 18 will remain under tension until the obstruction is removed. This precautionary measure serves as a safety device to protect the entire door mechanism from being strained or thrown out of alignment.

The arcuate motion of the floating link 17 is transferred through the pin 19 and the elongated slot 20 in the arm 21 into the linear motion of this arm. This motion of the arm 21 towards the left results in the clock-wise motion of the shaft 22 to which it is attached. This shaft 22, in turn, transmits this clock-wise motion through the fixed lever 23 and the floating link 24 to close the door. The spring 33 connecting the lever 23 and the link 24 serves as a guiding means to keep the floating link 24 in an efficient operating position. The oven door 25 is made of a metal similar to that from which the oven itself is fashioned and is mounted on the wheels 26 which move on the track 27.

The oven door 25 opens just before the machine indexes. This opening is accomplished when the cam roller 12, following the contour of the cam 10 moves to the left. When it does this, it causes the shaft to which the cam follower is attached to rotate in a counter-clockwise manner. This motion of the shaft 14 will result in a similar counter-clockwise motion on the part of the fixed link 16 on which the stud 36 is mounted. As the fixed link 16 moves in a counter-clockwise manner, the stud 36 thereon will strike the finger 27 projecting from the floating link 17. The stud 36 pressing against the finger 27 and moving in a counter-clockwise manner will force the floating link 17 to move in a similar manner. The counter-clockwise motion of the floating link will be transmitted through the pin 19 in the elongated slot 20 and result in a rearward motion of the arm 21. This motion to the right of the arm 21 will result in a counter-clockwise motion of the shaft 22 to which it is attached. The fixed lever 23 and the floating link 24, connected to the shaft 22 and activated by the counter-clockwise motion thereof, will draw open the oven door 25.

The need for a heating means for gaseous discharge lamps, and especially for fluorescent lamps, while they are being exhausted, are many. The surface conditions in a fluorescent lamp are substantially and essentially different from those encountered in incandescent lamps. There is an exceptionally large surface area to contend with.

To try to obtain a high purity vacuum in a fluorescent lamp without some means of heating the lamp while it is being evacuated would be a practical impossibility. There are many surface conditions for which suitable provision must be made in order to obtain a high purity vacuum in a fluorescent lamp. By passing the lamp through a heating oven while the lamp is being exhausted, the absorbed and adsorbed gases and vapors from the fluorescent material and the glass are thereby removed. Moisture and other gases from the air in the lamp are also removed. By appling heat to the lamp, not only are the gases and the moisture which are mechanically held in the lamp removed but those that are chemically held, for example the hydrates, are also removed.

Figure 4 shows the general assembly of the oven. It shows a lamp 28 in the position which a lamp assumes just prior to the time when the oven door opens and allows the lamp to enter the oven with the indexing of the machine. The pedestal 29 serves as the frame from which the outside wall of the oven is suspended. As pointed out above, the walls and the floor of the oven are not firmly fixed and rigidly mountes on any framework but are held in a suspended manner to provide for expansion due to the heat generated in the oven. A pedestal or brace, similar to pedestal 29 is mounted on the machine base proper and the inside wall and floor which forms one piece is suspended therefrom. Thus when the floor of the oven expands, it is not prevented from so doing by reason of any rigid mounting.

The switch box 30 and transformer 31 through the bus bars 32 provide the means for heating the oven.

What we claim is:

1. An oven for heating electric discharge lamps during exhaust, said oven comprising: two parallel curved walls and a floor, each of said walls comprising two sheets of polished heat-reflecting metal spaced apart by a series of metal channels; insulators projecting from said walls; electrical heating elements held by said insulators and spaced from said walls thereby; a movable turret roof of heat insulating material located at the top of said walls; two doors, one at each end of said oven walls; and, means for sliding said doors transversely to the oven walls.

2. An oven for heating electric discharge lamps during exhaust, said oven comprising: two walls and a floor of heat-reflecting metal, said floor being a lateral extension of one of said walls and being spaced from said other wall to permit thermal expansion thereof; a plurality of insulators projecting from said walls; electrical heating elements held by said insulators and spaced from said walls thereby; a series of exhaust heads; a moveable turret roof of heat-insulating material below said series of exhaust heads and through which said lamps may be connected to said exhaust heads, and which is located between said walls at the top thereof and moveable therethrough; doors at the entrance and exit of said oven; and means for opening and closing said doors.

3. An oven for heating electric discharge lamps during exhaust, said oven comprising: two walls and a floor of heat-reflecting metal, said floor being a lateral extension of one of said walls; a plurality of insulators projecting from said walls; electrical heating elements held by said insulators and spaced from said walls thereby; a movable turret roof of heat insulating material through which said lamps are suspended; doors at the entrance and exit of said oven; and

means for opening and closing said doors, said opening and closing being synchronized with the movement of said movable turret roof.

4. An oven for heating electric discharge lamps during exhaust, said oven comprising: two parallel curved walls and a floor, each of said walls comprising two sheets of polished heat-reflecting metal spaced apart by a series of metal channels; a plurality of insulators projecting from said walls; electrical heating elements held by said insulators and spaced from said walls thereby; a heat-insulating movable turret roof through which said lamps are suspended; doors at the entrance and exit of said oven; and means for opening and closing said doors, said opening and closing being synchronized with the movement of said movable turret roof.

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