Dec. 24, 1935. J. F. DONOVAN ET AL 2,025,579

EXHAUSTING AND GAS FILLING MACHINE

Filed Oct. 12, 1934 2 Sheets-Sheet 1

Fig. 1.

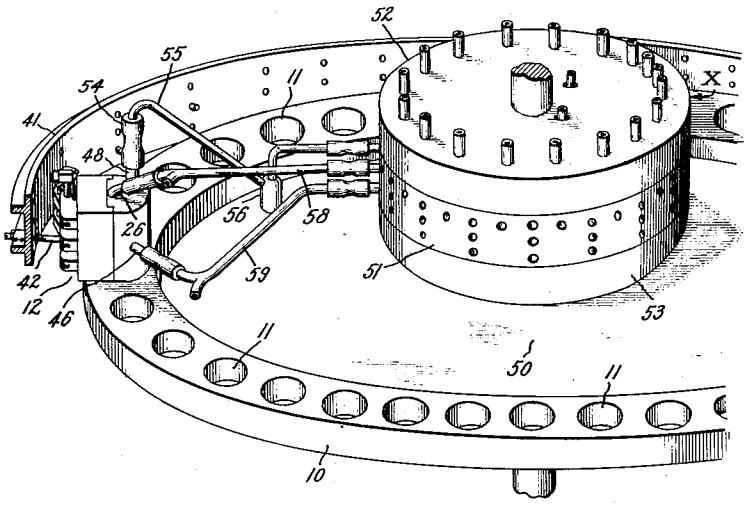


Fig. 2.

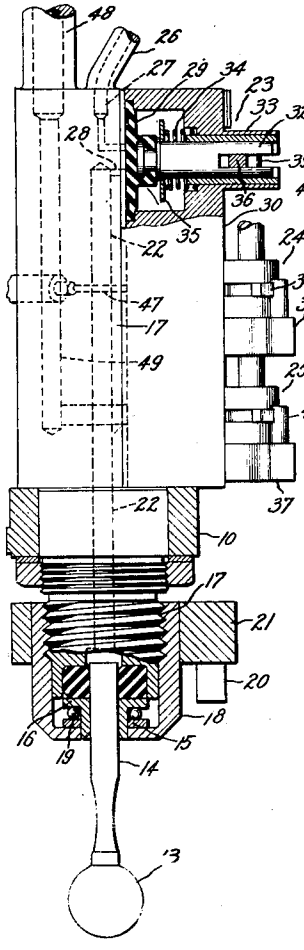


Fig. 3.

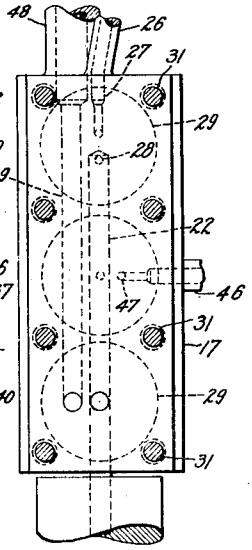
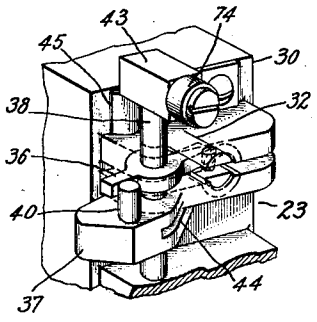


Fig. 4.



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Fig. 5.

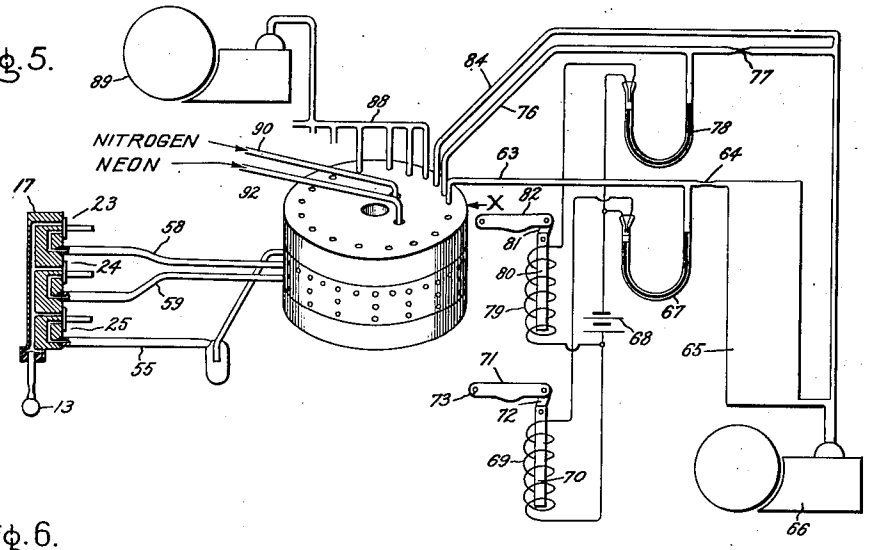


Fig. 6.

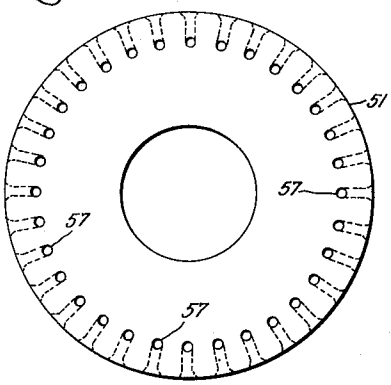


Fig. 7.

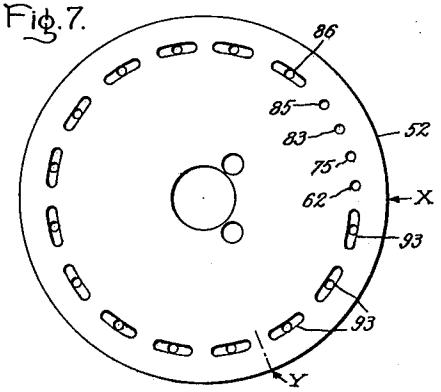


Fig. 8.

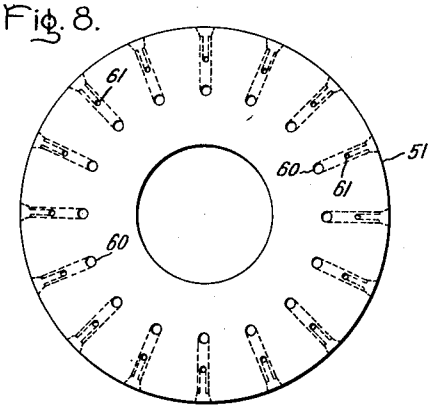
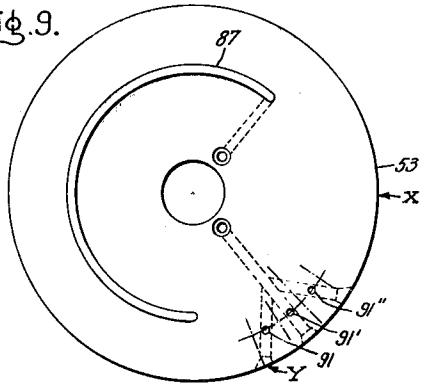


Fig. 9.



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UNITED STATES PATENT OFFICE

2,025,579

EXHAUSTING AND GAS-FILLING MACHINE

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Application October 12, 1934, Serial No. 748,070

4 Claims. (Cl. 176—2)

Our invention relates to machines for exhausting and gas-filling devices such as electric lamps which comprise a bulb or other receptacle. Heretofore such a machine, which comprises a rotary turret carrying a series of heads at its periphery, each adapted to receive one of the aforesaid devices, has been provided with a single rotary valve for controlling the distribution of the filling gases to the devices and the conduction of the exhausted gases away therefrom. As contrasted with such an arrangement, the machine of our invention is provided not only with a main distributing valve, which may be rotary as before, but also with separate valves for each head. More specifically we provide a plurality of valves for each head, certain of which accommodate the exhaust and others the gas filling of the device carried thereby. One advantage of our construction is that we avoid the necessity of changing the gaseous content of long passages during the cycle of exhaust, gas-filling etc., to which each device is subjected. Various other features and advantages of our invention will appear from the description which follows of a species thereof and from the accompanying drawings, the scope of our invention being indicated in the appended claims.

In the drawings, Fig. 1 is a diagrammatic perspective view of a turret, an exhaust head thereon and a rotary valve therefor of the exhaust machine of our invention; Fig. 2 is a side elevation partly in section of the exhaust head of our machine; Fig. 3 is a side view of the body of the exhaust head; Fig. 4 is a perspective view partially in phantom of a portion of the valve control mechanism for the exhaust head; Fig. 5 is a schematic view of our machine; and Figs. 6, 7, 8, and 9 are plan views of the sections of the rotary valve, specifically the upper face of the middle rotary valve section, the lower face of the top section, the lower face of the middle section, and the top face of the bottom section.

In the drawings, and particularly in Fig. 1, is shown diagrammatically the turret 10 of an exhaust machine of our invention which has apertures 11 about the periphery thereof adapted to hold an exhaust head 12. In this instance but one exhaust head is shown which is provided with a single port, as shown in Fig. 2, into which a lamp or other device is inserted for proper connection to the machine. The lamp 13 is connected to the exhaust head through the exhaust tube 14 which is inserted into the aperture in the ferrule 15 and washer 16. After insertion of the exhaust tube, washer 16, which is preferably of rubber, is compressed by the ferrule causing it to expand sideward, making a gas-tight joint between the exhaust tube and the body 17 of the head. The compression is brought about by rotation of the sleeve 18 which is screwed on the threads of the body 17 and engages the ferrule through ball bearing 19. Rotation of the sleeve is produced by mechanism (not shown) engaging pin 20 on the collar 21 which is attached to the sleeve.

A vertical passage 22 in the head connects to the open end of the exhaust tube and is connected through valves 23, 24, and 25 to the argon, nitrogen and exhaust lines. The argon enters the body of the head through pipe 26 and passes into passage 27 which terminates in the face of said body adjacent the terminus of passage 28. Passage 28 leads to passage 22 and, like passage 27, is closed off by the diaphragm 29 which is clamped to the face of the body by block 30. The diaphragm is preferably of rubber and, as indicated in Fig. 3, is circular in shape. The block 30 is held against the face of the body by screws 31 and engages a small area around the rim of the diaphragm holding it securely in place, closing off the center portion of the diaphragm. The diaphragm is attached to an end of rod 32 which lies in the bushing 33 in block 30 and pushes said diaphragm against the body so that the passages 27 and 28 are securely blocked up. Spring 34, located between the block and a washer 35 on said rod, keeps the rod in this position. When the flow of gas from passage 27 to 28 is desired, the center of the diaphragm is pulled back so said gas can pass from passage 27 to the chamber formed below the diaphragm and hence to passage 28. The opening movement of the rod is produced by turning of lever 36 and block 37 which are located, as shown in Fig. 4, on shaft 38. Lever 36 works in a slot in block 30 and rod 32 against pin 39 in said rod and is engaged by pin 40 of block 37. At intervals at which the valve is open, block 37 is engaged by the end of a bolt in the stationary track 41 about the turret 10. In the instance shown in Fig. 1, the lower valve 25 is open since the bolt 42 in track 41 is located against the end of the block 37 controlling said valve. The turret in this particular instance is indexed intermittently and the bolts in track 41 are generally located at the rest positions as the rest period of the turret is sufficient for the required fluid exchange through the valve.

Means are provided for keeping the valves of any head closed for the complete rotation of the turret as would be required to keep the lines clean

if the head held a leaking lamp or was not filled. This means consists of block 43 on the end of shaft 38 which, if pushed downward, carries the blocks 37 mounted thereon to a lower position. In this position the pins 40 are below levers 36 and do not engage them when the blocks are moved. The blocks 37 are each fastened to shaft 38 by a spring clip (not shown) in slot 44 of the block which engages a portion of the shaft of reduced section. The leaf spring 45, which is fastened to the block 30, frictionally engages block 43 causing it to remain in whatever position it is placed.

The nitrogen passes into the body of the head through pipe 46 and passage 47, whereas the vacuum line is connected thereto through pipe 48 and passage 49. The neon, nitrogen and exhaust lines are coupled to the machine heads through the three-section rotary valve 50, the middle section 51 of which moves with the turret and the upper and lower sections 52 and 53 of which are stationary. In this instance pipe 48 is connected through hose 54 to pipe 55 having the oil trap 56 located therein, and pipe 55 in turn connects through another section of hose and pipe to one of the apertures 57 in the top surface of the middle rotary valve section 51 shown in Fig. 6. Each of the turret heads is represented by a similar pipe line connected to separate apertures in the rotary valve. Pipes 26 and 46 of the turret head are connected through hose to pipes 58 and 59 respectively which are connected to like pipes extending from an adjacent turret head and to apertures 60 and 61 respectively in the lower surface of the middle section 51 of the rotary valve. This structure provides a single pipe for a pair of turret heads for both the nitrogen and neon.

The machine has a definite order of operation which starts as the lamp is inserted in the turret head adjacent position x of the rotary valve. In this position the specific aperture 57 connected to the head lies under a solid part of the upper section 52 of the rotary valve and apertures 60 and 61 lie over solid portions of the lower section 53 of the valve. As the head is indexed to the next position, aperture 57 passes into and out of alignment with aperture 62 in the valve section 52, and a bolt in the track 41 causes valve 25 of the turret head to be opened during the period the apertures are aligned. As indicated diagrammatically in Fig. 5, the aperture 62 is connected through pipe 63, restriction 64 and chamber 65 to the exhaust pump 66. Should the lamp be properly connected and not defective, no further action will result, but if the port is open, or the lamp leaks badly, the atmospheric pressure of the air in pipe 63 on the lamp side of the restriction 64 will cause the leak detector 67 to operate. The leak detector consists of a tube having a chamber at one end which is closed off by mercury and into which two wires extend. Near atmospheric pressure in pipe 63 causes the mercury to touch both wires bridging the gap therebetween and completing a circuit through battery 68 and solenoid 69. The armature 70 of the solenoid is moved swinging cam 71 to which it is connected through link 72 about pin 73 causing it to engage roller 74 (Fig. 4) on the exhaust head. The shaft 38 is lowered by this action disengaging the turret valve operating mechanism as described. Any leak into the turret head is therefore detected and the head kept closed so that leakage and contamination may not result.

The next index of the turret carries the aperture 57 in and out of alignment with aperture 75 which is connected through pipe 76 and restricton 77 to exhaust pump 66. A bolt in track 41 causes turret head valve 25 to be open while the apertures are aligned. Another leak detector 78 is attached to this pipe line which is connected so as to complete the electrical circuit between battery 68 and solenoid 79. The solenoid moves the armature 80 which is connected through link 81 to cam 82 which is adapted to engage roller 74 on the exhaust head disengaging the valve operating mechanism as in the previous instance. The next index, the third, opens and closes valve 25 and passes aperture 57 over aperture 83 which is connected through pipe 84 directly to pump 66. On completion of this index the aperture 57 lies below a solid portion of the top section 52 of the rotary valve and the lamp has been exhausted by the preliminary pump 66.

The fourth index carries aperture 57 across the aperture 85 in upper section 52 of the rotary valve while valve 25 is held open. The next index carries aperture 57 into alignment with aperture 86 in the upper section 52 of the rotary valve and aperture 60 into alignment with groove 87 in the lower section 53 of the rotary valve. The latter index also opens valve 25 through engagement with a bolt in track 41 while the remaining turret head valves remain closed. Apertures 85 and 86 are connected through pipe 88 to exhaust pump 89 so the lamp is further exhausted. Groove 87 is connected through pipe 90 to a supply of nitrogen at pressure and by taking the described position only results in placing the line to valve 23 at said pressure. The next index, the sixth, allows valve 25 to be closed, valve 23 to be opened and carries aperture 57 under a solid portion of the upper valve section 52. The valve 23 is opened by a bolt in track 41 and allows nitrogen to pass into the lamp. The following indexes cause the lamp to be exhausted and flushed out with nitrogen repeatedly in a like manner until the turret head takes a position opposite Y of the rotary valve. These actions are brought about by manipulation of valves 25 and 23 by bolts in track 41 and by passage of aperture 57 over duplications of aperture 86 which are connected to the final exhaust pump 89. The groove 87 in the lower valve section assures connection of nitrogen to the head at all positions taken thereby during these operations.

At position Y no operations take place since all apertures in the middle valve section 51 are located over solid portions of the upper and lower sections 52 and 53 respectively of said valve. On the three following indexes the aperture 61 in the middle valve section passes over the apertures 91, 91', and 91'' which are connected through pipe 92 to a supply of neon. While the apertures are aligned, valve 24 is held open by bolts in track 41. Since one nitrogen and neon line leads to a pair of heads, the location of these operations vary with each exhaust head of the turret. Aperture 57 at alternate positions, after leaving position Y, passes under apertures 93 in the upper valve section but produces no result since valve 25 is not opened. These apertures are placed therein to balance the valve and to permit other exhausting cycles to be set up. After passing the neon filling locations, the lamp is removed. A stationary cam (not shown) is placed ahead of position X which engages roller 74 on the turret head and lifts the valve operat-

ing mechanism into operative position if it is not so located.

While reference has been made in this description to neon and nitrogen, it will be obvious that these are only examples and that argon and other gases may be used as well, as our machine is adapted for the use of any desired gas filling or degree of exhaust.

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

1. A machine for filling with gas a hollow device which comprises a turret; a head on said turret provided with an exhaust port; means comprised by said head for making a gas-tight connection with a portion of said hollow device inserted in its exhaust port; a rotary valve mounted on the axis of the turret having one section adapted to rotate with said turret and a stationary section which is connected to sources of vacuum and of two gases, said sections being apertured for the distribution of the vacuum and the gases; a plurality of valves mounted adjacent said exhaust port and connected to said port and to the apertures in the movable section of said rotary valve; and means located about the periphery of the turret for actuating said plurality of valves in connection with the rotation of the turret and rotary valve to cause the hollow device to be exhausted from one source, alternately gas filled and exhausted repeatedly from other sources and finally gas filled from a third source.

2. A machine for gas filling a hollow device which comprises a turret; a plurality of heads, each provided with an exhaust port, mounted on said turret at the periphery thereof; means comprised by each of said heads for making a gas-tight connection with a portion of one of said devices inserted in its exhaust port; a rotary valve comprising three disc-shaped sections mounted one above the other on the axis of the turret with faces of the top and bottom sections in engagement with corresponding faces of the middle section and making a gas-tight seal therebetween, the middle section being adapted to rotate with the turret and provided with a plurality of apertures constituting a plurality of concentric series in the faces thereof, and the top and bottom sections being stationary and provided with a plurality of series of apertures in the faces thereof in engagement with the middle section which register with the apertures in the latter and which are connected to sources of gas and vacuum; a plurality of valves mounted adjacent each of the exhaust ports and connected thereto; piping for connecting said valves to the apertures in the movable section of the rotary valve; and means located about the periphery of the turret and engaged by the said valves for causing their operation in proper time relation to the rotation of the middle section of the rotary valve so that the hollow device is first exhausted, then alternately gas filled and exhausted repeatedly and finally gas filled.

3. A machine for exhausting a hollow device which comprises a turret, a head on said turret providing an exhaust port, means associated with said head for making a gas-tight connection to a portion of the hollow device, inserted in said exhaust port, a rotary valve mounted on the axis of the turret having one section adapted to rotate with said turret which is connected to sources of vacuum and gas and which is apertured for their distribution, a pair of valves mounted adjacent said exhaust port and connected to said port and to the movable section of said rotary valve, means for operating said pair of valves, means for detecting leakage of said port and the device therein and means operated by said detection means for disconnecting the valve operating means.

4. An exhaust head for an exhaust machine comprising a body having a pair of passages therein terminating at one face thereof, means for connecting one of said passages to a device to be exhausted, a valve mounted thereon consisting of a diaphragm mounted over the termini of said passages, a block attached to the body clamping the rim of said diaphragm to the face thereof, means for forcing the diaphragm against the face of the body to close off said passages and means for lifting the center portion of the diaphragm to provide a passage between the termini of said passages to permit passage of gas to and from the device to be exhausted.

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