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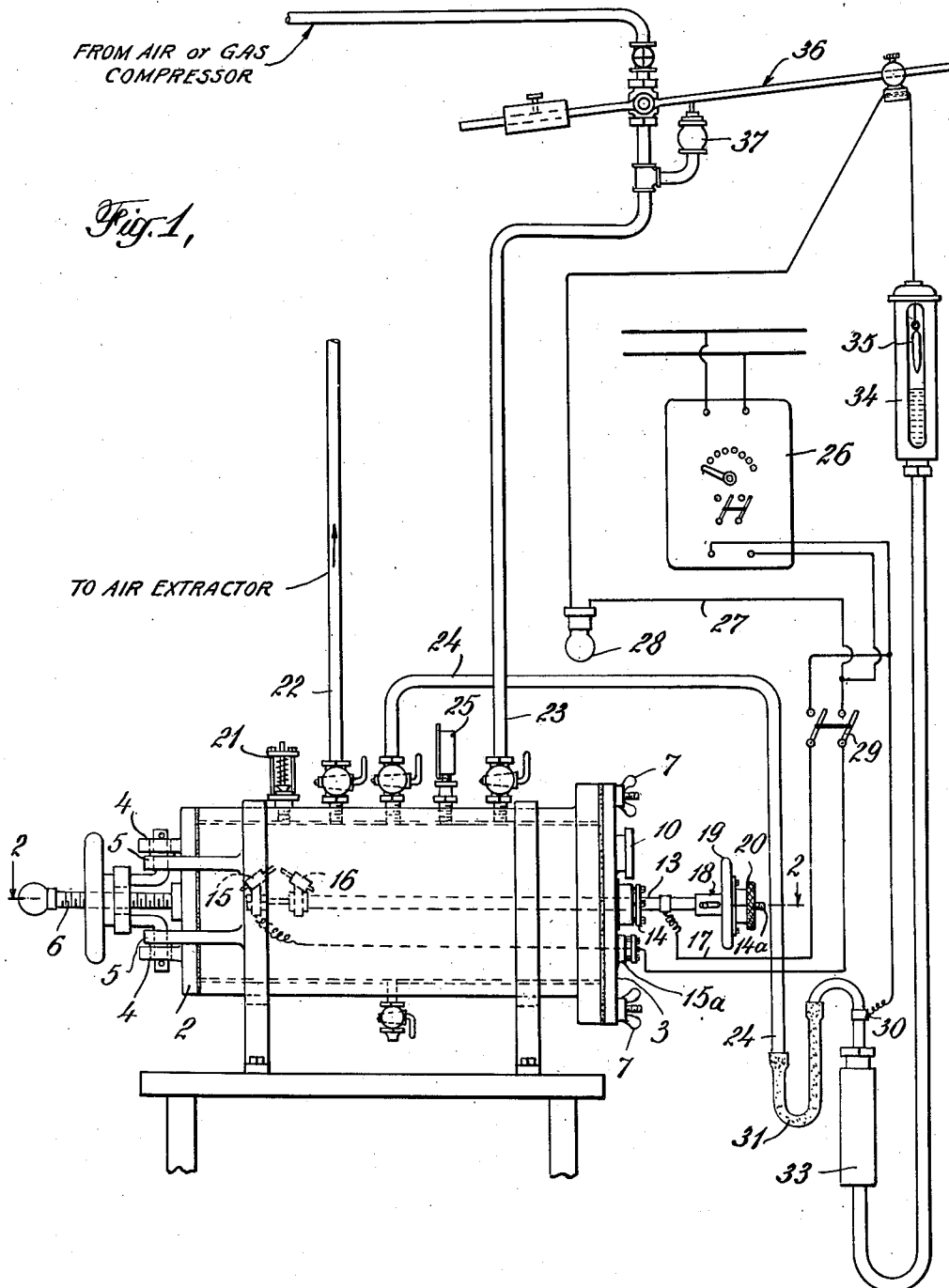
J. L. PUJOL Y FONT

2,361,413

METHOD AND APPARATUS FOR MAKING AMPULES CONTAINING COMPRESSED GAS

Filed April 7, 1941

2 Sheets-Sheet 1



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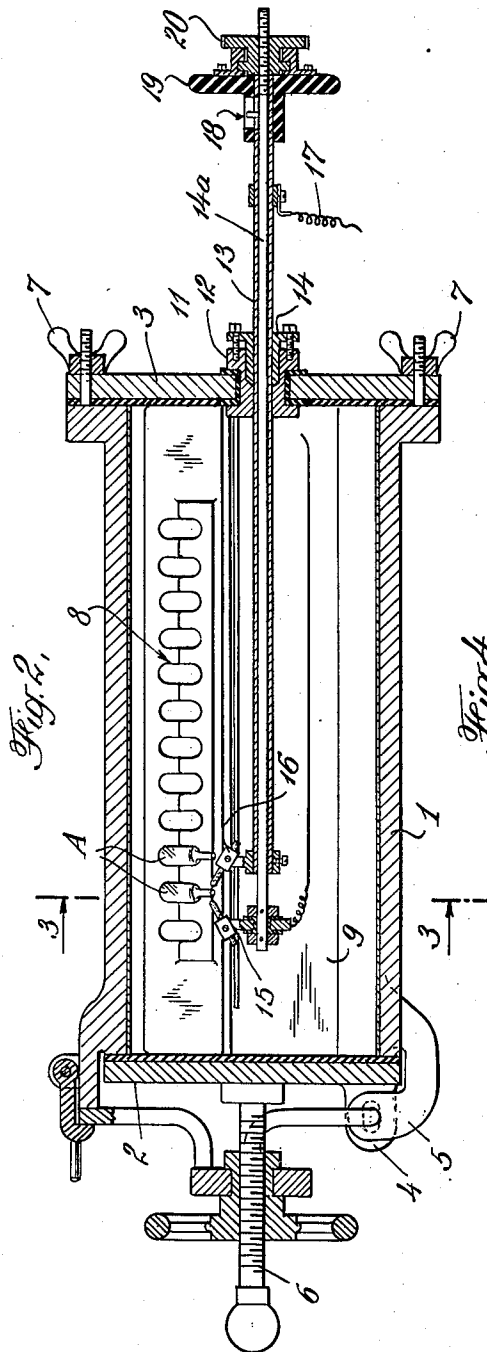


Fig. 4.

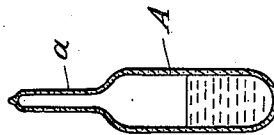


Fig. 3.

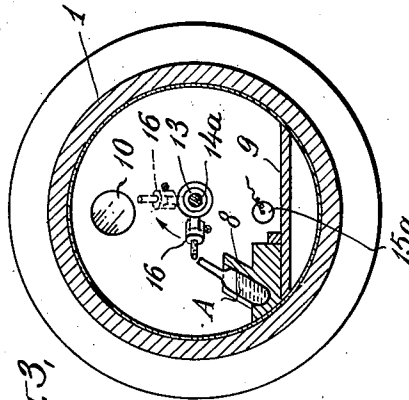
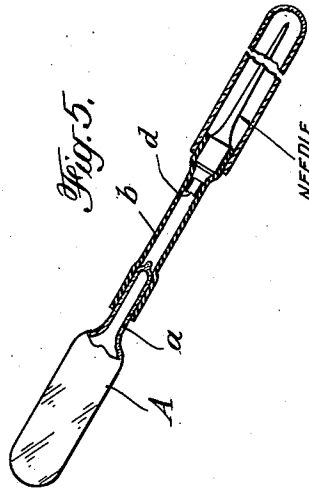


Fig. 5.



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UNITED STATES PATENT OFFICE

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METHOD AND APPARATUS FOR MAKING
AMPOULES CONTAINING COMPRESSED
GAS

Juan Luis Pujol y Font, Altos, Habana, Cuba

Application April 7, 1941, Serial No. 387,281
In Cuba June 28, 1940

8 Claims. (Cl. 226—20)

The present invention has for its object an improved or new method and machine for the sealing by fusion of glass, of glass receptacles which contain liquid and which are filled with a gas under pressure, thus obtaining receptacles of liquid subjected to pressure of a gas, which can be applied in various industries such as perfumery or medicine.

In the accompanying drawings I have illustrated a machine of the preferred design for carrying out my invention and in said drawings;

Fig. 1 is a side elevation of the machine with the pipe connections and the electrical appurtenances shown diagrammatically;

Fig. 2 is a longitudinal section through the pressure cylinder of the machine;

Fig. 3 is a cross section of the pressure cylinder;

Fig. 4 is a detail view of the sealed article made by the process and machine constituting my present invention; and

Fig. 5 is a sectional view showing the manner of using the article for hypodermic injection.

The machine consists essentially of a cylindrical drum or pressure chamber 1 of sufficient thickness to withstand the pressure of the gas with which the glass receptacles are to be charged. The machine selected for illustration is designed particularly for the manufacture of ampoules containing a liquid medicament to be introduced hypodermically so that no syringe is required for administering the dose. The finished ampoule A shown in Fig. 4 contains the necessary quantity of medicament for a single administration which partially fills the ampoule, the balance of the ampoule being taken up by an inert gas under pressure. At one end the ampoule is provided with a narrow neck *a* which is sealed by fusion in the machine illustrated. On use a short section of rubber tubing *b* (see Fig. 5) connects the sealed neck of the ampoule with a hypodermic needle *c*. After the needle is inserted the physician, by pressing the rubber tube, can break off the sealed tip of the neck of the ampoule, whereupon the compressed gas expands and forces the liquid through the needle. A screen *d* in the rubber tube prevents any glass from getting into the needle.

The cylinder 1 is provided at each end with removable doors 2 and 3, respectively. The door 2 is hinged on brackets 4 projecting beyond the end wall, and also hinged on the brackets is a frame 5 carrying a clamping screw 6 for compressing the gasket between the door and the end wall of the cylinder. This structure is pro-

vided to facilitate the opening and closing of the door, as it is through this door that the glass receptacles are charged into the cylinder and removed. The door or head 3, which need not be opened in the ordinary operation of the machine, may be clamped against its seat by clamping screws 7.

The chamber is preferably provided on its inner surface with an insulated coating to prevent short circuit by accidental contact between the chamber wall and the electrical conductors used in carrying out the process. Within the chamber along one wall is a rack 8 in which the ampoules or other glass receptacles to be sealed are supported in the manner indicated, with their necks extending upwardly but inclined away from the wall of the cylinder. The supports are so arranged that the necks of the ampoules when properly positioned are arranged in a row longitudinally of the drum to one side of the axis of the drum. The rack 8 is supported on a plate 9 extending across the bottom of the drum so that it may be removed and changed with a fresh lot of ampoules after each sealing operation.

The cover 3 contains a peep hole of glass, mica or other material of suitable strength and transparent and of a color which absorbs ultraviolet or other rays that might injure the sight, and through which one can look into the inside of the chamber. This peep hole is marked with the number 10 in the drawings.

Almost in the middle of the cover 3 there is an opening 11 in which is seated a sleeve 12, insulated from the cover 3 as shown. Fitted to slide in the sleeve 12 is a metal tube 13, a stuffing box 14 being provided to prevent leakage of gas. Fitted in the tube 13 is a rod 14a, which projects beyond the tube at both ends. Attached to the inner end of the rod by a properly insulated support is a holder 15 for one of the carbons of an electric arc, to which current is conveyed by a cable which passes through a suitably sealed insulator 15a in the head 3. The holder 16 for the other carbon of the arc is attached to the adjacent end of the tube 13 to which current is conveyed from a cable 17 attached to the tube near its outer end.

A pin and slot connection 18 is provided between the sleeve 13 and rod 14a to permit a relative longitudinal movement of the tube and rod while holding them against relative rotary movement. A hand wheel 19 of ebonite is attached to the end of tube 13 and mounted for rotation on the outer face of the wheel 19 is knurled knob 20 which is threaded on the end of rod 14a.

By this arrangement the carbons may be brought together and separate to strike and adjust the arc and the whole assembly including the arc may be shifted axially of the drum 1 and also rotated in the sleeve 12 to bring the arc into and out of proximity to the necks of the ampoules to be sealed and also shifted from ampoule to ampoule of the row mounted in the rack.

To the upper part of the chamber three tubes are connected by means of cocks. There is also a safety valve 21. One of the tubes 22 is connected to a vacuum pump, not shown. Tube 23 is connected to a gas or air compressor or a flask of compressed gas, while the third tube 24 is connected to a mercury tank the operation of which will be explained later. There is also a pressure gauge 25. In the lower part of the drum is a tap to allow the gas to escape before opening the cover 2.

From a rheostat 26 comes the electric current. The negative electrical conductor wire has a branch 27 which runs to a bulb 28 and also by means of a switch 29 passes through the insulator 15a to the carbon holder 15. The positive electrical conductor wire goes to the tube 24 at the point 30. Between said point and the tubing which goes to the machine, there is a tube of rubber or other insulating material 31 which serves to insulate the machine from this contact. The said wire also has a branch which by the switch 29 makes contact with the carbon holder 16.

There is a small receptacle 33 connected to the tube 24 and the tube continues until it joins with another glass receptacle 34. This receptacle 33 and tubing are full of mercury which transmits the positive electricity, the mercury reaching up to about the half of the glass receptacle 34. Within the receptacle 34 there is a plumb bob 35 which by means of a conductor wire is connected to the bulb 28. Said wire passes through a little tube attached to a balance device 36. When a certain pressure exists in the chamber, the gas causes the mercury to rise until it makes contact with the plumb bob and by this means with the bulb which remains lighted.

The arm of the balance device rests on a support 37 connected with the gas pressure line and provided with a release mechanism, not shown, designed to release the support when the pressure in the gas line exceeds the predetermined maximum to thereby lift the plumb bob out of contact with the mercury to break the circuit through the indicating lamp. Thus, the lamp will remain lighted only when the gas pressure in the cylinder is within the predetermined limits.

In operation the ampoules, after being partially filled with the desired liquid, are arranged in the rack 8 in the manner shown in the drawings. The door 2 is then closed and clamped against the end wall of the cylinder by means of clamping screws 6. The valve from the vacuum line 22 is then opened and the air exhausted from the cylinder. The tank is then connected to the pipe 23 from the gas compressor and when the pressure in the tank as indicated by the gauge 25 reaches approximately the desired value, the switch is closed, thereby energizing the conductors leading to the arc lamp within the cylinder.

By manipulating the knob 20 the rods 14a will be shifted longitudinally to bring the carbons into contact and strike the arc, which may be observed through the peephole 10. When the arc is properly adjusted and the bulb 28 indicates that the pressure is within the desired limits, the

operator, by means of the hand wheel 19, shifts the arc into position adjacent the first ampoule in the row supported in the rack 8. Until this time the arc is positioned with its carbons above the supporting tube 13, as shown in dotted lines in Fig. 3. After the arc is burning to the satisfaction of the operator and has been shifted to bring it opposite the first ampoule in the rack, the hand wheel 19 is turned to approximately 90° to thereby bring the arc into close proximity to the end of the neck of the ampoule, as illustrated in solid lines in Fig. 3. The heat of the arc almost instantly fuses the glass at the end of the neck, thereby sealing the ampoule with its charge of liquid and compressed gas. By means of the hand wheel 19 the rod is turned back to its original position to thereby move the arc away from the ampoule which has been sealed and allow the glass to cool and solidify.

The supporting tube 13 is then shifted longitudinally to bring the arc opposite the second ampoule in the rack which is sealed in the same manner, and so on throughout the entire row.

To facilitate in the proper positioning of the arc during the sealing operation, the tube 13 may be marked with scale lines indicating the positions of the successive ampoules. Also, stops may be provided to limit the rotative movement of the arc.

For different size ampoules, different racks may be provided with the pockets positioned so as to bring the ends of the necks to be sealed into the same position in the drum. Because of the light 28 the operator can give his entire attention to the manipulation of the arc as the light will be extinguished in the event the pressure falls below or goes above the desired working limits.

It will be understood, of course, that the structure illustrated may be modified in various ways without departing from the scope of the invention as defined in the appended claims.

I claim:

1. The method of sealing glass ampoules containing a liquid and a gas under pressure, which comprises supporting within a chamber a plurality of ampoules each containing the liquid to be sealed therein with the necks thereof which are to be sealed arranged in substantial alignment, filling the chamber with the desired gas under the desired pressure, moving a heating element in a predetermined, fixed, guided direction in substantial parallelism with the aligned necks of the containers to bring it successively opposite the necks of the several ampoules to be sealed, and moving the heating element, when opposite the successive ampoules, in a predetermined, fixed, guided direction to bring the heating element into sealing position to thereby fuse the glass of the necks of the ampoules into seals.

2. The method of sealing glass ampoules containing a liquid and a gas under pressure, which comprises supporting within a chamber a plurality of ampoules each containing the liquid to be sealed therein with the necks thereof which are to be sealed arranged in substantial alignment, filling the chamber with the desired gas under the desired pressure, moving a heating element in a predetermined, fixed, guided direction in parallelism with the aligned necks of the containers to bring it successively opposite the necks of the several ampoules to be sealed, and, when the heating element has been brought opposite the successive ampoules, moving it through

an arc in a predetermined, fixed, guided direction to bring it into sealing position to thereby fuse the glass of the necks of the ampoules into seals.

3. The method of sealing a glass ampoule containing a liquid and a gas under pressure, which comprises supporting the ampoule containing the liquid to be sealed therein in a chamber, filling the chamber with the desired gas under the desired pressure, moving a heating element in a predetermined, fixed, guided direction to bring it into a position opposite the neck of the ampoule, and, thereafter, moving the heating element in a predetermined, fixed, guided direction towards the neck of the ampoule to bring it into sealing position to thereby fuse the glass of the neck of the ampoule into a seal.

4. Apparatus for making sealed ampoules containing a liquid and a gas under pressure, comprising a gas-tight chamber, means for supporting an ampoule containing the liquid with its end unsealed within the chamber, a sealing unit comprising a support projecting through the wall of the chamber, and a heating element carried thereby within the chamber, means for moving the heating element in two predetermined, fixed, guided directions, one to bring it to a position adjacent the ampoule, and the other to move it, when in a position adjacent the ampoule, towards and away from the neck of the ampoule.

5. Apparatus for making sealed ampoules containing a liquid and a gas under pressure, comprising a gas-tight chamber, means for supporting an ampoule containing the liquid with its end unsealed within the chamber, a sealing unit comprising a support projecting through the wall of the chamber, and a heating element carried thereby within the chamber, means for reciprocating said heating element in a predetermined, fixed direction to bring it to a position adjacent the ampoule, and means for oscillating the heating element in a predetermined, fixed direction when in a position adjacent said ampoule to move it into and out of sealing position with respect to the neck of the ampoule.

6. Apparatus for making sealed ampoules containing a liquid and a gas under pressure, com-

prising a gas-tight chamber, means for supporting a plurality of ampoules containing the liquid within the chamber with their ends unsealed and in substantial alignment, a sealing unit comprising a support projecting through the wall of the chamber, and a heating element carried thereby within the chamber, means for moving said heating element in a predetermined, fixed, guided direction in substantial parallelism with said row of ampoules, and means for moving the heating element, when in a position opposite any particular ampoule, towards and away from said ampoule to bring it into and out of sealing position.

7. Apparatus for making sealed ampoules containing a liquid and a gas under pressure, comprising a gas-tight chamber, means for supporting a plurality of ampoules containing the liquid within the chamber with their ends unsealed and in substantial alignment, a sealing unit comprising a support projecting through the wall of the chamber, and a heating element carried thereby within the chamber, means for reciprocating said heating element in a predetermined, fixed direction along the aligned ampoules, and means for oscillating said heating element in a predetermined, fixed direction, when opposite any particular ampoule, toward and away from the aligned ampoules.

8. Apparatus for making sealed ampoules containing a liquid and a gas under pressure, comprising a gas-tight chamber, means for supporting an ampoule containing the liquid and its end unsealed within the chamber, a sealing unit comprising a support projecting through the wall of the chamber, and a pair of spaced electrodes carried thereby within the chamber, means outside of the chamber for moving one of said electrodes relative to the other, means for moving said electrodes in two predetermined, fixed, guided directions, one to bring the electrodes to a position adjacent said ampoule, and the other to move said electrodes, when in a position adjacent the ampoule, toward and away from the ampoule.

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