Aug. 16, 1949. J. L. PUJOL Y FONT 2,479,024

APPARATUS FOR HEAT SEALING THE OPEN ENDS OF AMPOULES

Filed Oct. 30, 1944 2 Sheets-Sheet 1

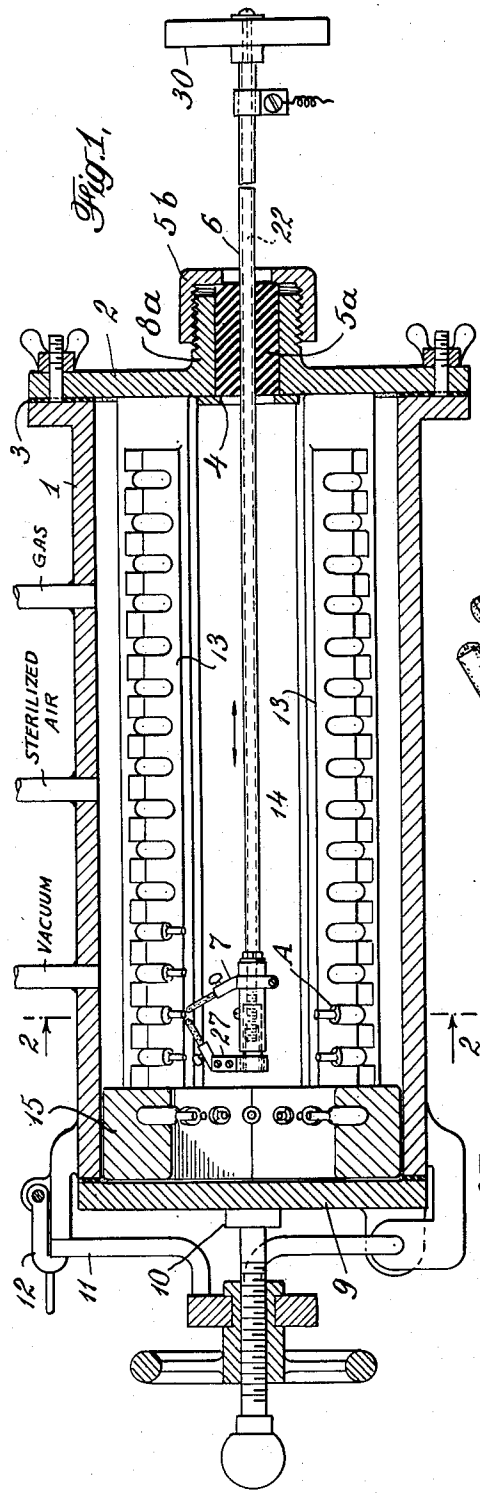


Fig. 1.

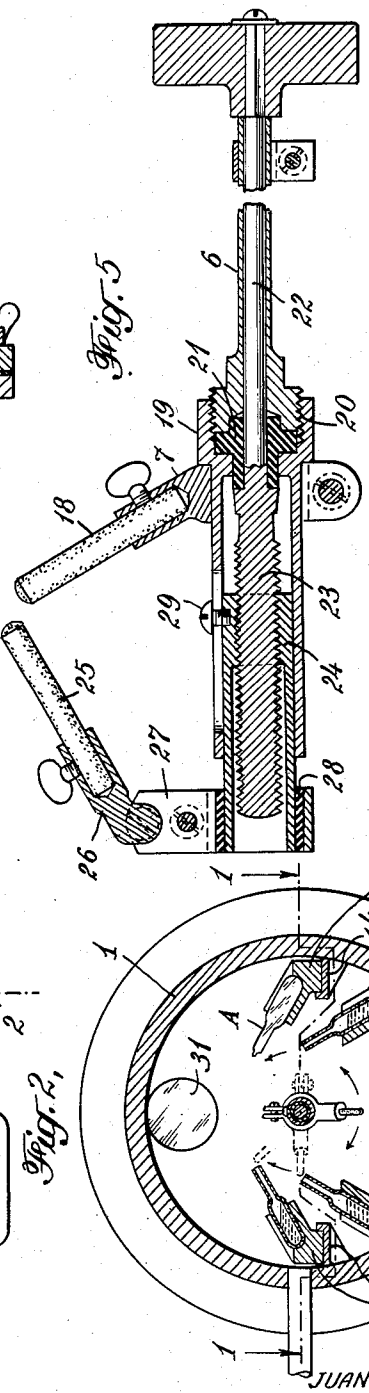


Fig. 5

Fig. 2.

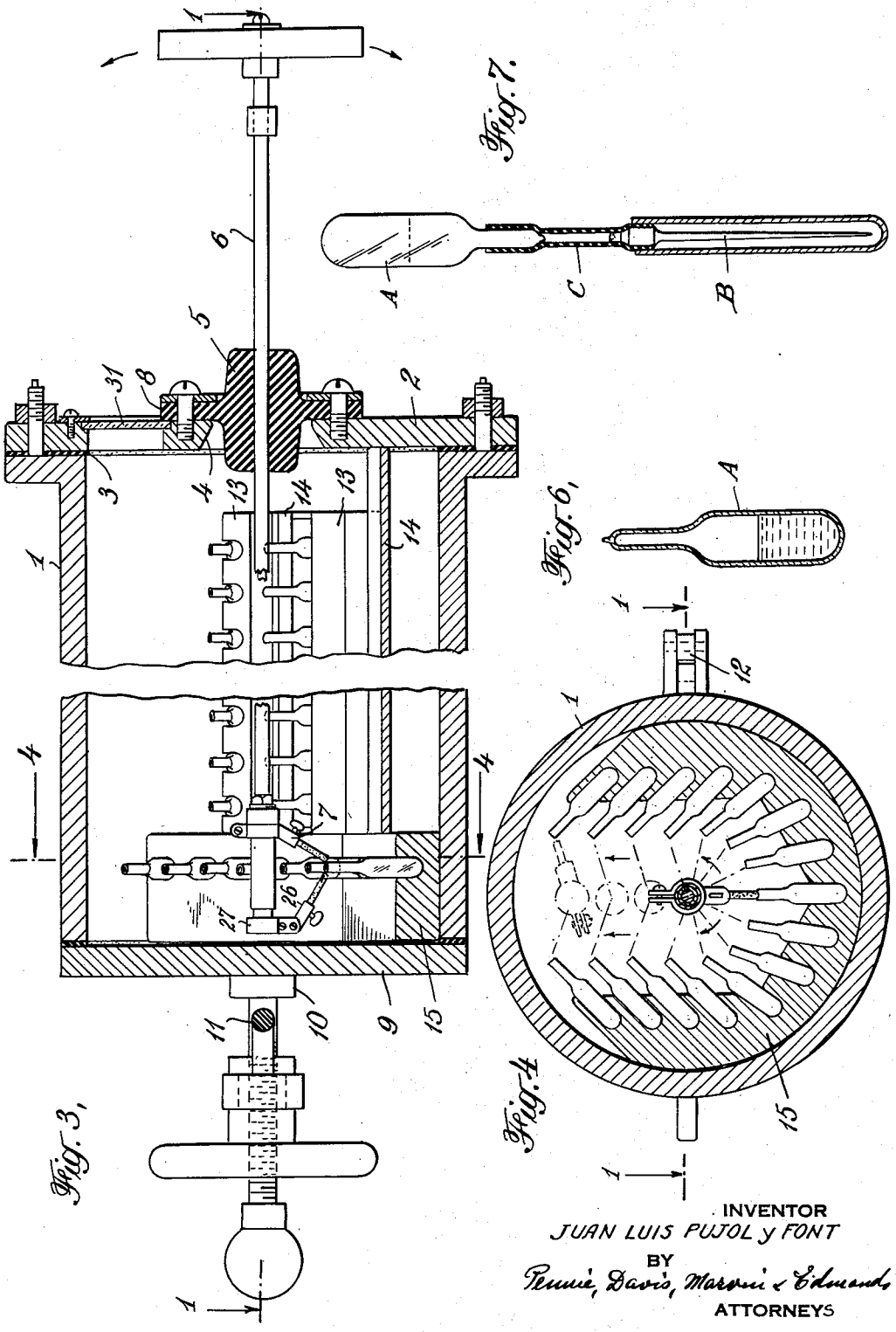
INVENTOR
JUAN LUIS PUJOL y FONT

BY
Pennie, Davis, Marvin & Edmonds
ATTORNEYS

Aug. 16, 1949. J. L. PUJOL Y FONT 2,479,024

APPARATUS FOR HEAT SEALING THE OPEN ENDS OF AMPOULES

Filed Oct. 30, 1944 2 Sheets-Sheet 2



INVENTOR
JUAN LUIS PUJOL y FONT
BY
Pennie, Davis, Marvin & Edmonds
ATTORNEYS

Patented Aug. 16, 1949 2,479,024

UNITED STATES PATENT OFFICE

2,479,024

APPARATUS FOR HEAT SEALING THE OPEN ENDS OF AMPOULES

Juan Luis Pujol y Font, Newark, N. J.

Application October 30, 1944, Serial No. 561,115

4 Claims. (Cl. 226—82.2)

1

This invention relates to improvements in apparatus for sealing ampoules containing gas under pressure and is specifically a modification of the apparatus for this purpose disclosed in my Patent No. 2,361,413, dated October 31, 1944.

The primary object of the present invention over the structures disclosed in my said pending application is to provide a structure wherein the capacity of the apparatus, that is, the number of ampoules which can be sealed upon a single charging of the apparatus, is substantially increased.

A further object of the invention is to simplify the construction of the apparatus and to more certainly prevent gas leakage.

A further object of the invention is to provide an improved heating arc structure the advantages of which will hereinafter be more fully pointed out.

In the accompanying drawings I have illustrated a preferred embodiment of my improved apparatus. In the said drawings:

Fig. 1 shows the apparatus in longitudinal horizontal section;

Fig. 2 is a transverse section on line 2—2 of Fig. 1;

Fig. 3 is a vertical longitudinal sectional on a somewhat larger scale than the apparatus shown in Figs. 1 and 2;

Fig. 4 is a transverse section on line 4—4 of Fig. 3;

Fig. 5 is an enlarged sectional view of the heating arc;

Fig. 6 is a sectional view showing the sealed ampoule; and

Fig. 7 shows the ampoule as it is assembled in a complete hypodermic syringe.

As described in my co-pending application, the ampoules sealed in the machine forming the subject-matter of this application contain, in addition to the liquid medicament, a gas under pressure sufficient to discharge the medicament from the ampoule into the tissues of the body when the neck of the ampoule is broken. The gas may be air but is preferably an inert gas such as nitrogen.

In use the ampoule A is assembled as shown in Fig. 7 with a hypodermic needle B connected by a piece of flexible tubing C of rubber or other suitable material. A piece of filtering material, such as absorbent cotton or the like, is included in the tube between the needle and the ampoule. In use the neck of the ampoule is crushed between the fingers after the needle is inserted and the compressed gas will force the contents of the ampoule through the needle. The needle is enclosed in a special cover as shown, and the assembly has been found most useful in actual practice, particularly for emergency use where the facilities for sterilization are limited or where time does not permit the preparation of a sterilized, charged hypodermic syringe in the usual manner.

2

The apparatus shown in my co-pending application has been found satisfactory in practice for the sealing of ampoules but its capacity is somewhat limited and care had to be exercised to prevent leakage of air into the apparatus when under vacuum and leakage of gas from the apparatus when under pressure.

In my improved apparatus I have increased its capacity, reduced the air and gas leakage and improved the heating arc structure.

The apparatus as shown consists of a drum or cylinder 1 having pipe connections, as indicated, for a vacuum pump, a source of sterilized air and a source of gas under pressure, respectively. The drum is closed at one end by a plate 2 clamped against a gasket 3 to provide a gas-tight joint. The plate 2 has a central opening 4 adjacent which is supported a rubber guide member 5a for the supporting rod 6 of the heating arc 7. This guide member 5a consists of an elongated sleeve of rubber having a central opening snugly fitting the guide rod 6. The sleeve 5a fits tightly in an externally threaded bushing 8a projecting axially from the end plate 2. A threaded cap 5b holds the sleeve 5a against displacement. The rubber of the sleeve 5a is sufficiently soft to permit the rod 6 to be angularly shifted out of its normal position axially of the drum, but is stiff enough to normally maintain a position with its bore in alignment with the axis of the drum so that the operator may easily maintain the rod in axial position as it is shifted from ampoule to ampoule, as will be later described.

In Fig. 3, I have shown a somewhat modified form of guide for the rod 6. The sleeve 5 here shown has an integral flange 8, which is attached directly to the metal of the end wall 2. In both structures the rod 6 is guided in an axial direction but may be shifted angularly to a slight extent.

The other end of the drum is closed by an end plate 9 also provided with a gas-tight gasket against which it is clamped by a screw-operated plunger 10 carried by a hinged frame 11 which is normally held in place by a latch 12. The end-closing structure is the same as disclosed in my above-mentioned co-pending application and is designed to permit the end of the drum to be quickly opened and closed and to provide a quickly

applied gas-tight seal. The ampoules to be sealed are supported in removable frames or trays 13 supported on shelves or brackets 14 attached to the inner cylindrical wall of the drum. Additional ampoules are also supported in a removable frame 15 adapted to fit within the drum immediately adjacent the end plate 9. In the arrangement shown, four removable frames 13 are employed each carrying a row of ampoules extending longitudinally of the drum.

The pockets in which the ampoules are mounted are so arranged that the open ends of the ampoules in each frame or tray are in alignment parallel with the axis of the drum and at a distance from the axis of the drum corresponding to the distance of the arc from the axis so that the arc may be shifted from ampoule to ampoule by sliding movement of the guide rod 9 in the hub of the guide 5 and without angular movement of the rod.

The shelves 14 do not extend the full length of the drum 1 but end a sufficient distance from the end plate 9 to provide a space to receive the carrier 15 which, as shown, consists of a ring-like frame having a series of pockets positioned to support a number of ampoules with their open ends positioned in the same transverse plane so as to be successively sealed by shifting the arc in a transverse plane instead of in a longitudinal path. As shown, the axes of the pockets for the ampoules in the frame 15 are arranged in the same transverse plane normal to the axis of the drum. It will be obvious, however, that the pockets might be otherwise arranged. For example, the frame 15 might be a disk of proper diameter and with the pockets for the ampoules on the face of the disk so that the ampoules project from the face of the disk upwardly and toward the opposite end of the drum.

The heating arc mechanism disclosed in the present application presents certain improvements over the heating arc disclosed in my former application. As in the former application, the arc is supported at the end of a hollow rod 6 which in turn is mounted for sliding movement in a supporting guide carried by one end of the drum. One electrode 18 of the arc is attached directly to a hollow sleeve 19 to which the rod 6 is attached by means of an enlarged threaded joint 20. During the sealing operation the hollow rod 6 and sleeve 19 move in unison but the threaded joint 20 permits the parts to be detached to receive a rubber guide piece 21 for the inner rod 22 the rotation of which serves to adjust the carbons of the arc toward and away from each other.

The rod 22 is provided with an enlarged threaded end 23 which is threaded in a sleeve 24 projecting beyond the sleeve 19 and to which the second carbon 25 of the heating arc is attached. The holder 26 for the carbon 25 is pivotally supported on a clamp 27 which surrounds the end of the sleeve 24 and is insulated from it by a sleeve 28 of mica or other suitable insulating material. The carbons 18 and 25 may be adjusted axially in their respective holders so that with the pivotal movement of the holder 26 the proper adjustment of the heating arc may be obtained with carbons of varying length.

The sleeve 24 is held against rotation by a set screw 29 working in a slot in the sleeve 19 attached to the hollow rod 6. By this arrangement the rotation of the inner rod 22 by means of the handle 30 attached to the end which projects beyond the hollow rod 6 adjusts the carbons

toward and away from each other for the purpose of striking and trimming the arc. By this arrangement no relative longitudinal movement of the rod 22 and the hollow rod 26 is required to strike and trim the arc. I have found that a rubber guide member such as 21, with an elongated sleeve fitting snugly on the rod 22 provides a simple and satisfactory means for preventing gas leakage from the inside of the drum to the outside through the space between the rod 22 and the hollow rod 6. The guide sleeve member 21 grips the inner rod 22 with sufficient friction for the two rods to move together when manipulated for the purpose of moving the arc from ampoule to ampoule, and when it is desired to turn the rod 22 with respect to the hollow rod 6 for the purpose of striking or trimming the arc it is only necessary to grasp the rod 6 with the hand and hold it against rotation.

I have found that the elongated rubber bearing 5 or 5a, makes a better gas-tight joint with the rod 6 than a stuffing box of conventional construction, as shown in my copending application. The stuffing box, in order to be gas-tight, requires that the packing be compressed to such an extent that it required considerable effort to effect the longitudinal movement of the rod. The elongated bearing prevents leakage of the gas by the expanding of the contact surface, rather than by the pressure contact. If the surface of the hollow rod 6 be slightly lubricated, as by occasional rubbing with an oiled rag, the heating arc will be readily moved back and forth in the sleeve. Moreover, the flexibility of the supporting flange permits a slight longitudinal movement of the rod and bearing together, which greatly facilitates bringing the arc into accurate registry with the neck of the ampoule.

In operation the end closure 9 is open and the trays 13 and carrier 15 which have previously been filled with unsealed ampoules are positioned within the drum. The closure 9 is then clamped against the end of the drum and the vacuum pump set in operation to exhaust the air from the drum. Sterile air is then admitted to the drum and is in turn exhausted. This operation may be repeated two or three times to insure the removal of contaminated air from within the drum and the open-ended ampoules. The inert gas, for example, nitrogen, which has also been sterilized, is then admitted to the drum under the desired pressure. The gas may be cut off or the gas cock left open in order to maintain the gas under the desired pressure during the sealing operation.

In sealing the ampoules supported in the frames 13 the heating arc 7 is preferably shifted longitudinally from ampoule to ampoule and then, by a rotary motion of the rod, brought into proper proximity to the neck to instantly melt the glass and seal the tip of the ampoule. During the sealing operation the operator observes the movement of the arc with respect to the successive ampoules through the observation window 31 in the end closure 2 of the drum. While no angular movement of the heating arc such as permitted by the flexibility of the rubber of the guide 5 is necessary in the sealing of the ampoules supported in the carriers 13, this facility for slight angular movement is quite advantageous in that the ampoules are not formed with such precision that their open ends are accurately aligned, and the angular movement of the guide permitted by the flexibility of the disk 9 allows the operator to shift the arc transversely as occasion may require.

After the ampoules in the several carriers 13

have all been sealed the arc 7 is shifted to a position adjacent the end closure 9, as shown in Fig. 3, and then, by a combined rotary and angular movement, shifted from ampoule to ampoule in the carrier 15 until such ampoules have also been sealed.

The operation moves fast enough for one trimming of the arc to ordinarily be sufficient for each charge of ampoules, but if required the arc may be readily trimmed by holding the hollow rod with one hand and turning the knob 30 with the other to shift the carbons toward or away from each other. The trimming operation can be observed through the window 31 and when the arc is restored to proper operation the sealing will be continued. To speed up the operation of the apparatus a number of trays 13 and carriers 15 are provided so that when one charge of ampoules is sealed the trays and carriers may be removed from the drum and a new set of previously loaded trays and carriers inserted in their place. By this arrangement the sealing operation is practically continuous and the capacity of the apparatus correspondingly increased.

The term "rubber" as used in the appended claims is not intended to include only materials formed of caoutchouc, but includes also other materials having the general properties of rubber.

It will be understood from the foregoing specification that I have described a preferred embodiment of the improvements constituting the subject-matter of this application, but it will nevertheless be understood that the structure therein disclosed may be variously modified without departing from the scope of the appended claims.

I claim:

1. In an apparatus of the class described, the combination of a drum having connections to be charged with a gas under pressure, means for supporting a number of ampoules in prearranged position within said drum, a heating arc for sealing said ampoules, a support for said arc comprising a hollow rod, and a gas-tight bearing for said rod in one wall of said drum permitting longitudinal and rotary movement of said rod therein, said arc comprising an electrode mounted on said hollow rod, a second rod within said first rod, a gas-tight bearing between said rods so as to permit relative rotary movement of said rods, a second electrode supported by said hollow rod for movement toward and away from said first electrode, and operating connections between said second rod and said last mentioned electrode.

2. In an apparatus of the class described, the combination of a drum having connections to be charged with a gas under pressure, means for supporting a number of ampoules within said drum with their ends to be sealed aligned longitudinally of the drum, a gas-tight bearing member in one wall of the drum having an elongated bearing and guiding opening extending therethrough in a direction substantially parallel to the aligned ends of ampoules on the supporting means, heating means for sealing the ampoules, and a support for the heating means comprising a rod mounted in said elongated bearing and guiding opening for both rotary motion and guided movement longitudinally of the drum substantially parallel to open ends of ampoules on the supporting means, said bearing member permitting a limited angular movement of the rod with respect to the drum.

3. In an apparatus of the class described, the combination of a drum having connections to be charged with a gas under pressure, means for supporting a number of ampoules within said drum with their ends to be sealed aligned longitudinally of the drum, means for supporting other ampoules within the drum with their ends to be sealed in the same plane substantially normal to the axis of the drum, a gas-tight bearing member in one wall of the drum having an elongated bearing and guiding opening extending therethrough in a direction substantially parallel to the aligned ends of ampoules on the first supporting means, heating means for sealing the ampoules, and a support for the heating means comprising a rod mounted in said elongated bearing and guiding opening for both rotary motion and guided movement longitudinally of the drum substantially parallel to open ends of ampoules on the first supporting means, said bearing member permitting a limited angular movement of the rod with respect to the drum.

4. In an apparatus of the class described, the combination of a drum having connections to be charged with a gas under pressure, means for supporting a number of ampoules within said drum with their ends to be sealed aligned longitudinally of the drum, a gas-tight bearing member, said bearing member comprising a rubber body extending through an opening in one end of the drum and a flange extending from said body and attached to the wall of the drum surrounding said opening, said rubber body having an elongated bearing and guiding opening extending therethrough in a direction substantially parallel to the aligned ends of ampoules on the supporting means, heating means for sealing the ampoules, and a support for the heating means comprising a rod mounted in said elongated bearing and guiding opening for both rotary motion and guided movement longitudinally of the drum substantially parallel to open ends of ampoules on the supporting means, said bearing member permitting a limited angular movement of the rod with respect to the drum.

JUAN LUIS PUJOL Y FONT.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,225,980	Loepsinger	May 15, 1917
1,276,987	Stockton	Aug. 27, 1918
2,131,762	Smith	Oct. 4, 1938
2,310,923	Bean	Feb. 16, 1943

FOREIGN PATENTS

Number	Country	Date
418,955	Great Britain	Nov. 2, 1934