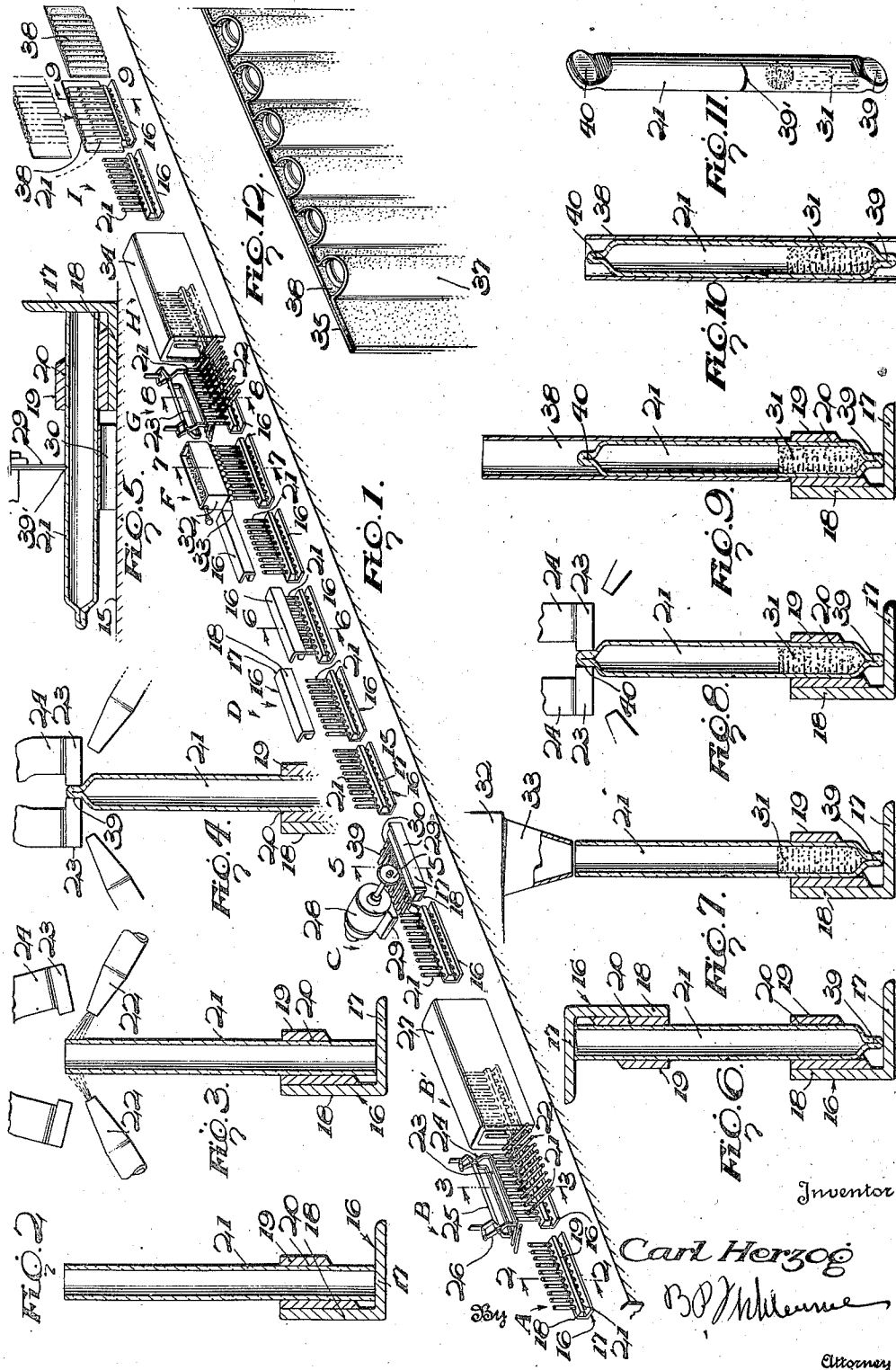


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METHOD OF SEALING ONE END OF OPEN ENDED  
TUBE, FILLING THROUGH REMAINING OPEN  
END, AND SEALING REMAINING OPEN END  
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## UNITED STATES PATENT OFFICE

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METHOD OF SEALING ONE END OF OPEN  
ENDED TUBE, FILLING THROUGH RE-  
MAINING OPEN END, AND SEALING RE-  
MAINING OPEN END

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2 Claims. (Cl. 226-19)

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My invention relates to a method of filling and closing or sealing glass tubes for forming ampuls or phials, and to a method of filling and closing or sealing ampuls or small glass phials.

An important object of the invention is to provide a method of the above-mentioned character which will effect a substantial economy in the manipulation of the glass tubes, ampuls or phials.

A further object of the invention is to provide a method of the above-mentioned character for substantially simultaneously closing or sealing the ends of a plurality of glass tubes, ampuls or phials.

A further object of the invention is to provide a method of the above-mentioned character whereby a plurality of glass tubes are substantially simultaneously manipulated to successively close corresponding ends of the tubes, introduce the filling in the tubes, close the opposite ends of the tubes, and then introduce the closed tubes into a carton.

A further object of the invention is to provide a method for closing the end of the tube without producing waste glass exteriorly of the closed end.

Other objects and advantages of the invention will be apparent during the course of the following description.

In the accompanying drawings forming a part of this application and in which like numerals are employed to designate like parts throughout the same,

Figure 1 is a perspective view of an apparatus employed in the practice of any method,

Figure 2 is a transverse vertical section taken on line 2-2 of Figure 1,

Figure 3 is a similar view taken on line 3-3 of Figure 1, showing the forming jaws open,

Figure 4 is a similar view, parts broken away, showing the forming jaws closed and the flame lowered or turned off,

Figure 5 is a similar view taken on line 5-5 of Figure 1, parts broken away,

Figure 6 is a similar view taken on line 6-6 of Figure 1,

Figure 7 is a similar view taken on line 7-7 of Figure 1,

Figure 8 is a similar view taken on line 8-8 of Figure 1,

Figure 9 is a similar view taken on line 9-9 of Figure 1,

Figure 10 is a central vertical longitudinal section through the ampul and phial, held within a pocket of the carton,

Figure 11 is a perspective view of the completely closed or sealed filled ampul or phial,

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Figure 12 is a perspective view of the carbon holding the ampuls or phials.

In the drawings, wherein for the purpose of illustration is shown a preferred embodiment of apparatus which may be employed in the practice of the method, the numeral 15 designates a horizontal support, preferably in the form of a long table top, arranged table high. The several units of the apparatus are mounted upon or adjacent to this table top, and the work progresses longitudinally of the table top.

Station A is the starting point of the method. At this station, one or more multiple holders or magazines 16 are provided, supported upon the table top 15 in an upright position. Each magazine includes an angle including a horizontal base 17 and a vertical side 18, and a bar or body portion 19 is rigidly secured to the vertical side 18 and has equidistantly spaced vertical cylindrical openings 20, for receiving vertically arranged glass tubes 21, from which the ampuls or phials are to be formed. Each tube 21, at the beginning of the method, has both ends open. The vertical openings 20 are in alignment and form a row and these openings hold the tubes 21 in a straight group or row. The tubes do not turn within the openings 20 when their ends are being heated, to plasticize the same, as no means are provided for turning the tubes, but the tubes may be turned upon their longitudinal axes within the openings 20 when they are horizontally arranged and being scored or cut. This turning may be effected manually. The tubes 21 extend vertically or outwardly beyond the bar 19 for a substantial distance, when the magazine is in an upright position, as shown.

At the next station B, is arranged a means for heating and plasticizing the upper ends of the vertical tubes 21. This means comprises, Figures 3 and 4, a pair of gas burners 22, which are disposed upon the opposite sides of each tube 21, beneath and near the upper end of the tube. These burners are preferably inclined and converge upwardly and are disposed to direct the flames upon the opposite sides of the upper end of the tube 21. At station B, means is also provided for closing or sealing the heated or plasticized upper end of the tube 21. This means comprises a pair of opposed generally horizontal pinching or pressing jaws 23, arranged at an elevation to properly engage with the upper open ends of the tubes 21. These jaws are moved laterally to the opened and closed positions by any suitable means. The jaws are carried by levers 24, pivoted upon a support 25, and operated

by toggle links 26. The jaws 23 may be manually or automatically moved to the opened or closed positions. The jaws 23 are disposed upon the opposite sides of the straight group or row of tubes 21, and when moved inwardly, will simultaneously engage the upper ends of all of the vertical tubes 21, pinching or pressing closed the plasticized upper ends.

At the next station B' is an annealing housing 27, supported upon the table 15 and extending longitudinally thereof.

At the next station C is a scoring or cutting device to weaken the tubes locally so that they be readily broken in use. This scoring device comprises a motor 28, driving a vertical rotating scoring wheel 29, arranged near, above, and spaced from the table top 15. At this station, the table top may be provided with a longitudinally extended leaf spring 30, for a purpose to be described.

Station D may be regarded as extending from station C to station F.

At station F, a multiple loading or filling device is provided, for simultaneously introducing the chemical or filling 31 into the open upper ends of the row of ampuls or phials. This device comprises a hopper 32, having a depending vertical row or outlet spouts 33, arranged and equidistantly spaced for registration with the vertical ampuls or phials 21, when the row of phials is brought into position beneath the filling device.

At the next station G is means to heat and plasticize the upper ends of all of the ampuls or phials and to pinch or press close the upper ends. The heating and pinching means are identical with that shown and described at station B, and includes the burners 22 and jaws 23 and associated elements.

At the next station H is an annealing house 34, identical with the annealing house 27. The next station I is arranged forwardly of the station H.

At the station I, a carton is provided, including a flat sheet 35 and a corrugated sheet 37, forming pockets 38, receiving the filled and closed ampuls or phials 21. The sheets are secured together by glue or cement, as is customary. The pockets extend transversely of the carton and are vertical when the carton is arranged on edge.

The practice of the method in connection with the apparatus thus described is as follows:

The glass tubes are inserted within the openings 20 of the magazine and are held thereby vertical in a longitudinal row, and the base 17 of the magazine is mounted upon the table top 15. The tubes may be simultaneously fed into the openings 20. Any suitable number of filled magazines may be accumulated at station A. The magazine is now moved longitudinally upon the table top 15 and is preferably retained parallel with the longitudinal axis of the table top, and is moved to station B. The row of tubes 21 is now disposed between the open jaws 23 and is parallel therewith. These jaws extend across the entire length of the row of tubes. The gas is now turned on and the burners 22 provide flames which are projected upon the opposite sides of the upper end of each glass tube 21. When the upper ends of the glass tubes are heated so that they are suitably plasticized, the gas may be turned off in whole or in part and the opposed jaws 23 are moved inwardly and engage with the opposite sides of all tubes 21 in the row, thereby simultaneously pinching or pressing closed or sealed all ends of the plasti-

cized tubes 21. This pressing or pinching action produces a flat closed end or seal 39. No excess glass is produced exteriorly of the closed end, to be severed or removed therefrom as occurs in the drawing action, thus effecting a saving in the cost of material. To remove any strain caused by the pinching operation, it is desirable to anneal the tubes. The magazine holding the vertical row of tubes 21 having their upper ends closed or sealed, is now fed longitudinally through the annealing housing 27. One or more of the magazines filled with tubes 21 having their upper ends closed, are accumulated between station B' and C, adjacent to station C. At station C, the magazine is arranged upon its side 18, and the row of glass tubes 21 are now held horizontally, and the magazine is advanced longitudinally to bring the glass tubes 21 beneath the scoring wheel 29. The glass tubes or ampuls 21 pass over the spring 30 and are raised by this spring into an engagement with the scoring wheel 29. The glass tubes or ampuls are manipulated by the operator and while being fed longitudinally of the table top 15, may be turned by the fingers upon their longitudinal axes, to regulate the length of the scores or cuts, and may also be depressed by the fingers to regulate the depth of the scores or cuts. The scoring wheel 29 engages the tubes 21 and forms the scores or cuts 39' upon the tubes, Figures 1 and 11, and these scores or cuts are arranged between the ends of the tubes, near their longitudinal centers, as shown. After passing beneath and beyond the grinding wheel 29, the magazine, with the ampuls or phials thus treated, is restored to the vertical position, so that its base 17 rests upon the table top 15, station D. The closed ends of the row of ampuls or phials are now arranged uppermost. The next step in the method is to apply a magazine to the upper closed ends of the row of phials and a magazine 16 is positioned above the upper closed ends of the row of phials and to move downwardly upon the upper closed ends which enter the openings 20. The row of phials now has its lower ends held within one magazine and its upper ends held in an identical magazine. The thus assembled unit of the phials and magazines is now inverted and the magazine receiving the then upper open ends of the ampuls or phials is removed. It is thus seen that a row of vertical ampuls or phials is provided, having their bottoms closed and their tops open. The magazine carrying these phials is now shifted longitudinally to be brought beneath and in registration with the spouts 33 of the hopper 32. The phials are equidistantly spaced and are spaced to register with the spaced tubular spouts 33. The filling or chemical 31 is now simultaneously fed into the open ends of the ampuls or phials. The filling or chemical is, of course, introduced into the ampuls or phials in a measured amount. The filling or chemical may be a powder, liquid, or any desired material. The next step in the method is to shift the magazine carrying the vertical row of filled ampuls or phials to station G. The vertical row of ampuls or phials is now brought between the jaws 23, which are open, and all of the tubes have opposite sides of their upper open ends heated by the flame from the burners 22, and these upper open ends are plasticized. The jaws 23 move inwardly the closed position and simultaneously pinch or press close the upper plasticized ends of all of the tubes of the ampuls or phials 21, forming flat closed ends 40. The next step in the method is to anneal the ampuls or phials, and this is effected by

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passing the magazine and completely closed or sealed phials through the annealing housing 34. After passing through the annealing housing, any suitable number of magazines filled with completely closed ampuls or phials may be accumulated at station I. A carton is now arranged above and near the vertical row of closed or sealed phials and is brought down over the same, all of the ampuls or phials 21 entering the pockets 38, Figure 9, the phials and pockets being suitably spaced so that they register. This action forces the pockets 38 over the major portion of the length of the ampuls or phials, which now project downwardly below the lower edge of the carton for a short distance, Figure 9. The carton and phials 21 inserted therein are moved upwardly to remove the lower ends of the phials from the openings 20, and they are now shifted downwardly so that the lower ends of the ampuls or phials engage with the table top 15, Figure 10, thus completing the insertion of the ampuls or phials into the carton.

It is thus seen that a plurality of glass tubes is held in a group or row, throughout the entire method, from the closing of the first ends of the tubes to form the ampuls or phials to the introduction of the filled closed ampuls or phials into the pockets of the carton. This saves a great deal of time and work. While the method is well adapted to be practiced in the closing of the first ends of the tubes for forming the ampuls or phials, yet this step may be omitted, and the method practiced by using ready-made ampuls or phials. While it is preferred to introduce the ampuls or phials, in the group or row formation, into the pockets of the carton, this step may also be dispensed, where a different method of packing or shipping is desired. The method may also be practiced for closing or sealing the ends of a group of glass tubes for forming ampuls or phials having open ends, which are not subsequently plasticized and pinched closed. The open ends of these ampuls or phials will then be closed by means of stoppers or the like.

Having thus described my invention, what I claim is:

1. The method of filling and sealing glass tubes which are originally open at both ends, comprising holding a plurality of glass tubes open at both ends in spaced relation and generally vertical by inserting the same in spaced openings of a shiftable first holder, shifting the holder to a first position and applying heat to the upper extremities of all of the glass tubes to plasticize the same, pinch closing the upper plasticized extremities of all tubes, shifting the holder and tubes held therein to a second position, applying a second holder having spaced openings to the upper

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pinch closed extremities of the tubes at the second position, inverting the two holders applied to the tubes as a unit, removing the then upper holder for uncovering the upper open ends of the tubes, shifting the remaining holder and tubes therein to a third position, introducing material into the upper open ends of the tubes, shifting the remaining holder and filled tubes therein to a fourth position, heating the then upper extremities of all tubes at the fourth position to plasticize the same, pinch closing the plasticized upper extremities of all tubes, and then removing all tubes from the remaining holder.

2. The method of filling and sealing glass tubes which are originally open at both ends, comprising holding a plurality of glass tubes open at both ends in spaced relation and generally vertical by inserting the same in spaced openings of a first holder, applying heat to the upper ends of the glass tubes while they are within the holder to plasticize the same, pinch closing the upper plasticized ends of the tubes, applying a second holder having spaced openings to receive the tubes to the upper pinch closed ends of the tubes after such pinch closed ends having sufficiently cooled, inverting the two holders applied to the tubes as a unit, removing the then upper holder for uncovering the upper open ends of the tubes, introducing material into the upper open ends of the tubes, heating the then upper ends of the tubes to plasticize the same, pinch closing the plasticized upper ends of the tubes, and then removing the tubes from the remaining holder.

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