Aug. 18, 1936. H. M. ERDMANN ET AL 2,051,764

MACHINE FOR SEALING AMPULES OR THE LIKE

Filed Sept. 7, 1935 3 Sheets-Sheet 1

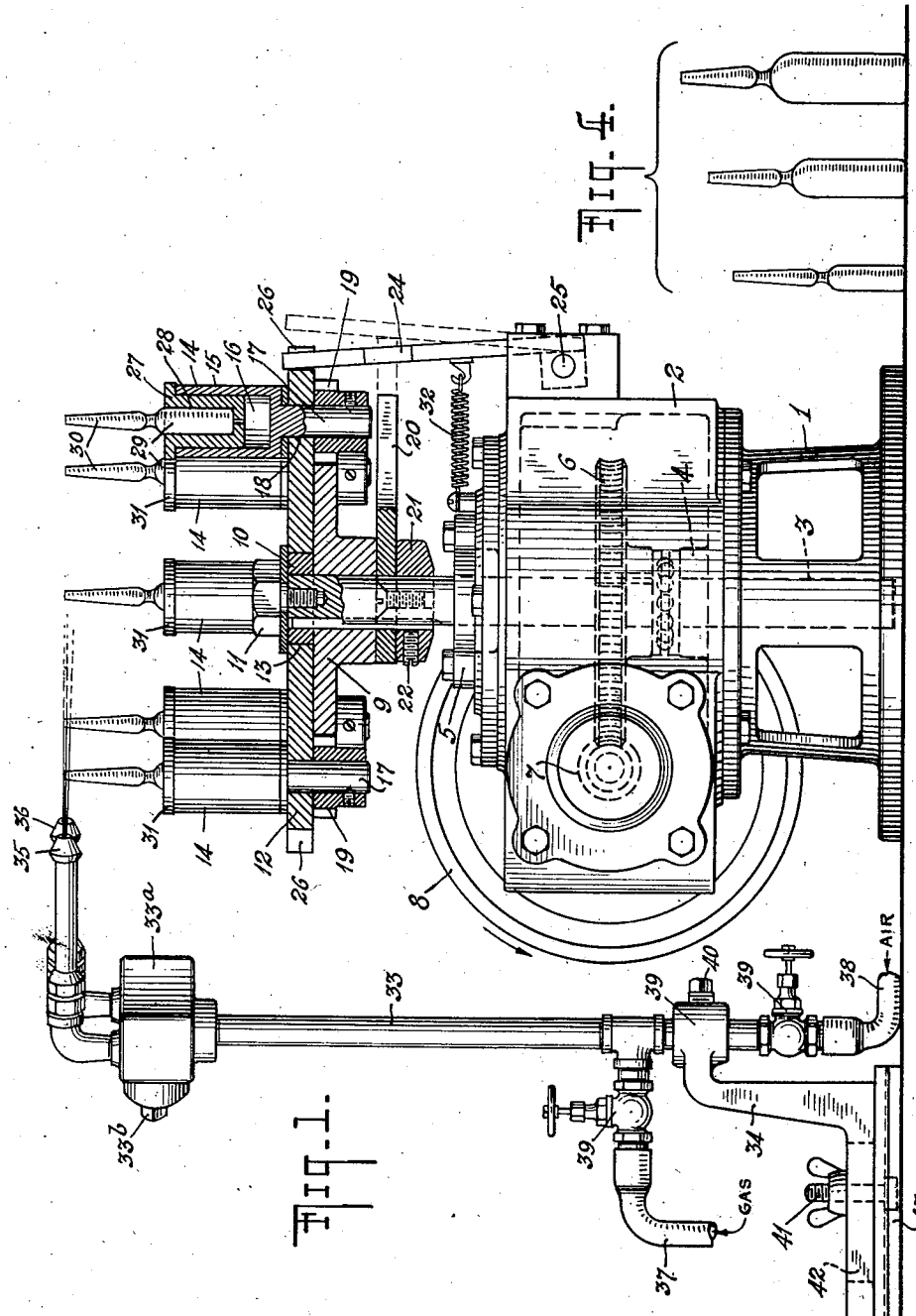


FIG. 1.

FIG. 4.

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MACHINE FOR SEALING AMPULES OR THE LIKE

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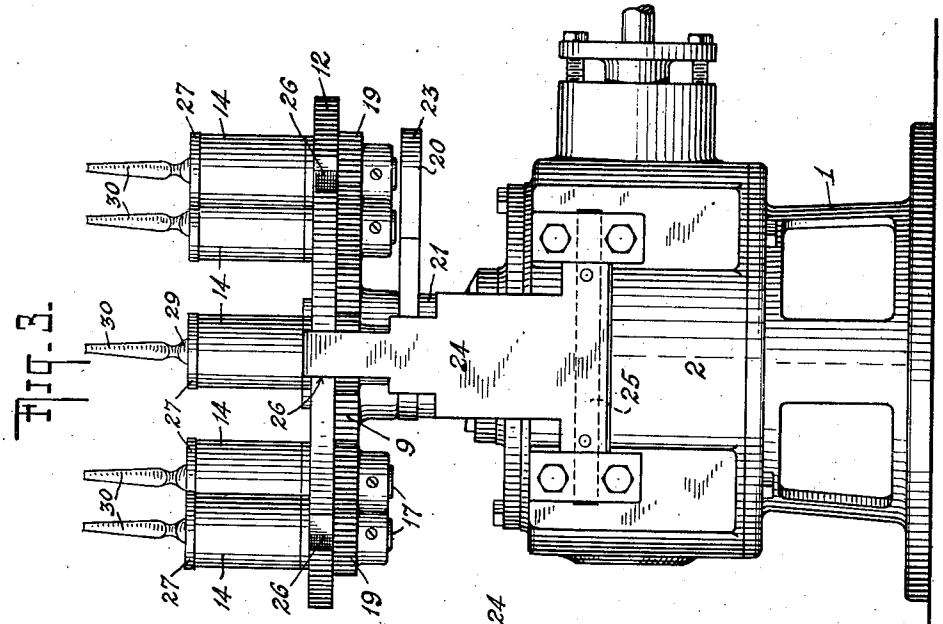


Fig. 1.

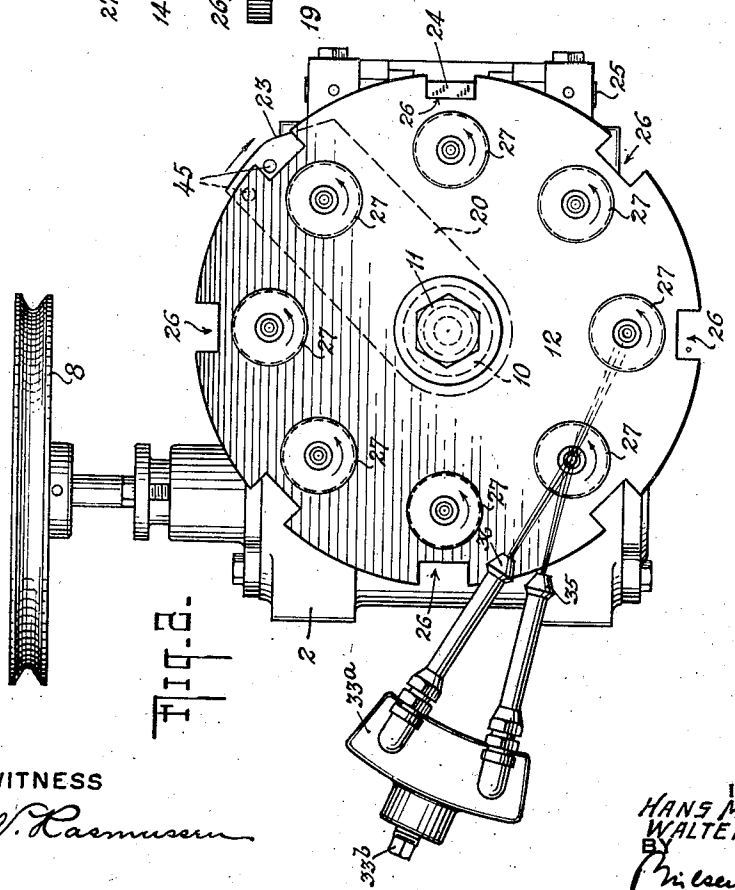


Fig. 2.

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MACHINE FOR SEALING AMPULES OR THE LIKE

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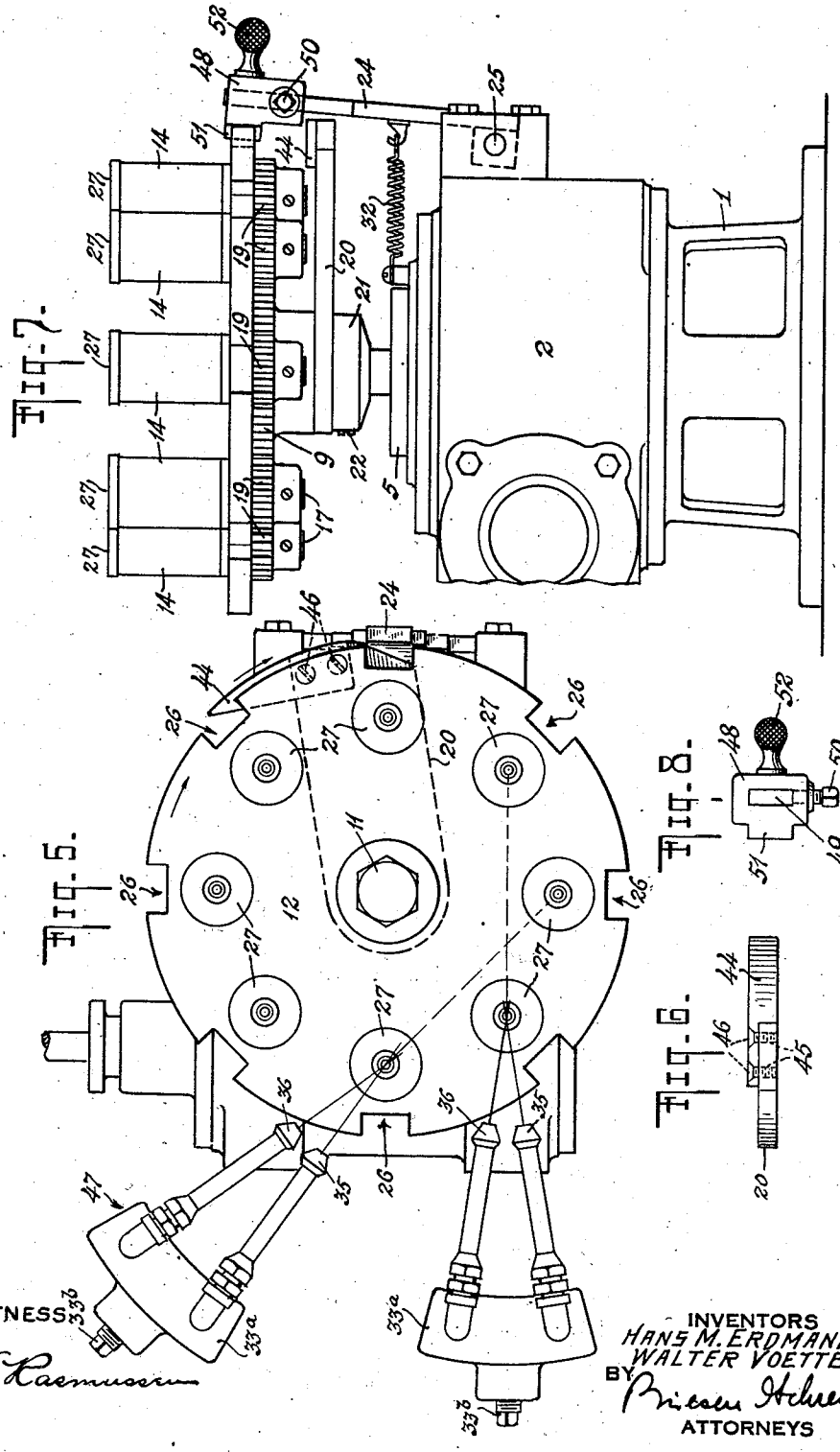


FIG. 7.

FIG. 5.

FIG. 8.

FIG. 6.

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MACHINE FOR SEALING AMPULES OR THE LIKE

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Application September 7, 1935, Serial No. 39,516

3 Claims. (Cl. 226—80)

This invention relates to a machine for sealing ampules and like containers made of glass and is intended primarily for sealing ampules containing medicinal, therapeutic and prophylactic agents in liquid form. Such ampules are usually of exceedingly small size, in many instances holding a fraction of an ounce and having comparatively thin walls, particularly in the long neck thereof, which neck, for the purpose of obtaining access to the contents of the ampule, is broken by snapping off the upper portion thereof. Such ampules, by reason of the frailty thereof and by reason of the necessity for keeping the contents thereof from contamination, must be handled with great care and the sealing operation must be complete in order to exclude the admission of air or foreign substances. This invention is intended for effecting such sealing operation under the conditions set forth.

In the drawings, Fig. 1 is an elevation of the machine partly in section, with the table in locked position; Fig. 2 is a top plan view thereof; Fig. 3 is an elevation of the machine; Fig. 4 shows three ampules of various sizes adapted to be sealed in said machine; Fig. 5 is a plan view of a modification of the machine showing an attachment, whereby the machine may be equipped with two burners and the table stopped after each burner has sealed an ampule; Fig. 6 is an end face view of the attachment of Fig. 5; Fig. 7 is an elevation similar to Fig. 1, showing an attachment whereby the revolution of the table may be controlled by hand, and Fig. 8 is a top view of said attachment.

The sealing machine is preferably mounted upon a base 1, having bolted thereon a gear box 2, through which passes a shaft 3, suitably mounted in bearings 4 and 5, whereby the shaft is held in vertical position and supported to rotate. A worm gear 6, is secured to the shaft 3 and engages the worm 7, which in turn is driven from the driving wheel 8, driven by a suitable driving device such as an electric motor through a suitable belt (not shown). The driving gear 9 is keyed to the shaft 3 and partakes of the movement thereof at all times. A suitable collar 10, is secured by means of the screw 11 to the shaft 3 and also partakes of the movement of the shaft 3 at all times, which collar 10, is provided for the purpose of holding and centering a table or disk 12. The table or disk 12 has a central aperture 13 therein, through which the shaft 3 extends, thereby permitting the disk 12 to rotate about the shaft 3. The disk 12 rests upon and frictionally engages the top surface of the driving gear 9. A multiplicity of cups 14 are circumferentially arranged on the top surface of the table 12, each cup comprising a tubular wall 15 having a well 16 therein and a stub shaft 17, which passes through an aperture 18 in the table 12. A gear 19 is secured to each stub shaft 17, the teeth of which mesh with corresponding teeth on the large gear 9. An arm 20 is secured to the shaft 3 by means of the collar 21 and the screw 22, which arm 20 partakes of the continuous movement of the shaft 3. The arm 22, at its outer edge, is provided with a cam or bevelled surface 23, which is adapted to engage the dog 24, which normally is drawn inwardly by the spring 32 and which is pivotally mounted at 25 in order that under the influence of the cam surface 23, the dog 24 may be pushed outwardly each time the arm 20 contacts with it. The table 12 is provided with a series of recesses 26, positioned in the circumferential edge of the table 12, one recess being provided opposite each cup 14. Each cup 14 is provided with an ampule holder 27 machined to snugly fit into a well 16. Each ampule holder is provided with a cylindrical opening 28, of such diameter and depth so as to loosely hold the body 29 of an ampule, with the neck 30 of the ampule extending beyond the upper surface of the ampule holder. Each ampule holder is provided with a collar 31 for the purpose of supporting the ampule holder upon the cup 14. Each machine is supplied with ampule holders of varying depths of cylindrical openings 28 and of varying diameter in order to accommodate and function with ampules of different lengths and diameters. The wells 16 may directly carry ampules, provided the ampules are of a size to fairly fit the wells, such an ampule being illustrated by the largest ampule shown in Fig. 4. Inasmuch as the ampule holder 27 may be readily lifted from the wells 16, and the outside diameters of all the holders are the same, the machine may be equipped with any desired size of ampule holder best suited to accommodate the particular size of ampule being sealed.

Suitable heat producing means are positioned to one side of the machine in order to deliver heat at the tip edges of the ampule necks. It is preferred to utilize a heating device adapted to burn illuminating gas for this purpose. The heating device comprises a tube 33, which is adjustably secured by means of the bracket 34, to one side of and in proximity to the sealing machine. A pair of burners 35 and 36 have communication with the tube 33 and are positioned with respect to the path of the tubes of the ampules so that the flame issuing therefrom will be projected into the path of the tips of the

ampules. It is preferred to provide the top end of the tube 33 with a manifold 33a, upon which the burners 35 and 36 are mounted and adjusted. A plug 33b closes an opening into the manifold 33a, which opening is provided for the purpose of mounting a burner thereon in the event the tube 33 should be mounted horizontally. Gas is supplied to the tube 33 and the burners 35, 36, through the tubing 37 and air under pressure is supplied to the tube 33 through the tubing 38. Suitable valves 39 are introduced between the tubing 37 and 38 and the tube 33 in order to regulate the amount of gas and air in order to produce a Bunsen flame at each of the burners 35 and 36. Adjustment of the burners 35 and 36 is obtained through the collar 39 and set screw 40 and adjustment toward and away from the machine is obtained through the thumb screw 41 sliding in a groove 42 in the base 43 of the bracket 34, which base 43 has a fixed position.

It is preferred to so adjust the double burners 35 and 36 so that their Bunsen flames will impinge each other at approximately the point at which the tip of the ampules meets said flames.

The operation of the device is as follows: The sealing machine as represented in the drawings, is about one-half of its actual size, affording a compact arrangement for the ready introduction and withdrawal of the ampules by hand from the holders. The driving shaft 3 constantly rotates under the influence of the worm gear 6 and worm 8. The cam arm 20 and the gear 9 being fixed to the shaft 3, partakes of the continuous motion of the shaft 3. The table or disk 12 moves intermittently and its periods of motion and stoppage are controlled by the position of the dog 24. When the dog 24 is in one of the recesses 26, the table is held against movement and when the dog 24, under the influence of the cam arm 20, is pushed out of the recess, the table 12 will rotate under the influence of the shaft 3 by contact and frictional engagement of the bottom surface of table 12 and the top surface of gear 9. When the dog 24 is in a recess 26, slippage occurs between the collar 10 and the wall of the recess 13. Inasmuch as the spring 32 tends to draw the dog 24 inwardly, the dog 24 will always fall into the next advancing recess as soon as the recess and the dog are in alignment. Consequently, with each revolution of the cam arm 20, the dog 24 will be pushed from a recess and the table will advance one step until the next recess and dog 24 are in alignment, whereupon the interengagement thereof will cause the table to be held stationary. During the movement of the table, the cups 14 do not revolve upon their stub shafts 17 but merely travel with the table, with the gears 19 and the gear 9 intermeshed. At the moment that the dog 24 enters a recess, the table ceases to rotate, but the cups revolve under the influence of the continuously revolving gear 9. Inasmuch as the ampules carried by the cups 14 pass through the path of the Bunsen flames, the ampule immediately in line with the Bunsen flame, has its tip within the flame and inasmuch as the cups are then revolving, the ampules will revolve and the tip of the ampule in the Bunsen flame will be exposed to the heat of the Bunsen flame at all portions thereof. The Bunsen flame is so direct that it shall not only seal the tip immediately within the flame but the tip of the next succeeding ampule will also be preliminarily heated by the projected flame in its direction. The ampules travel successively toward the Bunsen flame and each ampule comes within the flame and is sealed while being turned, and the next immediate ampule is given a preliminary heating, to avoid breakage thereof, as would be the case if it were projected into the Bunsen flame in its cold condition. It is preferred to revolve each holder a multiplicity of times while within the flame, the number of revolutions depending upon the length of time required to effect sealing of the ampule tip.

The ampules, after being sealed, are permitted to remain in their holders during one or two intermittent motions of the table in order that they will be turned during the cooling stage. The sealed ampules may be removed by the attendant with a pair of forceps, by grasping them at the base of the neck, where the neck is slightly contracted. Upon the removal of each sealed ampule, the attendant inserts an unsealed ampule in the empty holder, preferably during the period of rest of the table. The machine has a large capacity inasmuch as it is functioning continuously and the ampules are securely sealed with a solid bead-like formation at the tip end of the ampule. During the entire operation, the mouth end of the open ampule is not contacted by any foreign substance and consequently there is no opportunity for contamination of the contents.

It has been found that it is preferable, at times, to speed up the production of the machine and also, at times, to practically make each sealing operation of an ampule a carefully supervised operation. In order to make provision for both of these conditions, attachments are provided for the machine whereby two burners may be used (see Figs. 5 and 6) for the purpose of speeding up production, and hand control of the machine is provided by an attachment (see Figs. 7 and 8) in order to carefully control the sealing of each ampule.

In order to utilize two burners and to seal two ampules substantially simultaneously, the cam surface or bevel 23 of the cam arm 20 is lengthened so that it will hold the dog 24 out of engagement with every other recess 26. Consequently, the table will stop after two ampules have passed a given point. The lengthening of the cam or bevel 23 is preferably accomplished by adding an additional segment 44 to the cam arm 20. For this purpose, two screw holes 45 are provided in the cam 20 (see Fig. 2) and the additional segment 44 may be secured thereto by screws 46. In order to operate the machine as herein described, it is necessary to provide an additional burner unit 47, which is an exact duplicate of the unit shown in Fig. 1. The additional heating unit is set alongside the first unit in order that it will seal every other ampule and preheat every other ampule, the direction of the Bunsen flame sealing one ampule, and preheating the next alternate ampule, being illustrated by the full and dotted lines in Fig. 5.

In order to control the starting and stopping of the machine by hand, for the purpose of carefully supervising the sealing of each ampule, an attachment 48, illustrated in Figs. 7 and 8, is provided, which attachment is removably secured to the free end of the dog 24 by the slot 49 and the set screw 50. The inner face of the attachment 48 is provided with a tooth 51, which fits into the recesses 26 and its opposite side is provided with a finger piece 52 by which the operator may withdraw the tooth 51 from out of the recesses. The operator, by this arrangement, may

retain an ampule under the flame for such a period of time as the operator deems sufficient to thoroughly seal the ampule. In order to retain a given ampule under the flame, the operator permits the tooth 51 to remain in the recess, controlling the position of the particular ampule being sealed, and when such ampule is sealed to the satisfaction of the operator, the tooth 51 is manually withdrawn by pulling on the finger piece 52, whereupon the table will revolve and carry the next ampule toward the burner. When the next ampule to be sealed approaches the flame of the burner, the operator releases the finger piece 52, whereupon the tooth 51 slides into the next approaching recess, stops the revolution of the table, and sets up the rotation of the individual holders. The dog 24 is retained out of the range of the arm 20 by the attachment 48 when the operator manually manipulates the same to permit the table to revolve.

We claim:

1. In a machine for sealing ampules or like containers, in combination, a vertically extending shaft, means to drive the shaft, a driving gear mounted upon said shaft and adapted to partake of the movement of said shaft, a vertically rotating carrier resting on said gear, a multiplicity of ampule holders mounted upon said carrier and adapted to hold ampules with their tips directed upwardly, a driven gear, having connection with each ampule carrier, and meshing with said driving gear, said carrier having a multiplicity of recesses arranged circumferentially of said carrier an arm mounted on said shaft, a dog having movement toward and away from said carrier and adapted, in its movement toward said carrier, to enter a recess, the rotating arm, partaking of the movement of said shaft and adapted, during its rotation, to move said dog out of a recess, said carrier being held against movement when said dog is in engagement with the recess and said gears being adapted to axially rotate said ampule holders when said dog is in engagement with the recess, heating means adapted to deliver heat into the path of movement of said ampule tips, said ampule holders rotating axially while the ampule tips are within the sphere of said heating means.

2. In a machine as defined in claim 1 in which the heating means are located outside of the path of movement of said carrier and adapted to direct a Bunsen flame simultaneously toward the path of movement of a plurality of advancing ampules.

3. In a machine as defined in claim 1 in which the heating means comprise a plurality of burners located outside of the path of movement of said carrier and adapted to direct Bunsen flames simultaneously toward the path of movement of a plurality of advancing ampules.

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