Aug. 20, 1957 J. M. COZZOLI 2,803,257

AMPUL WASHING DEVICE

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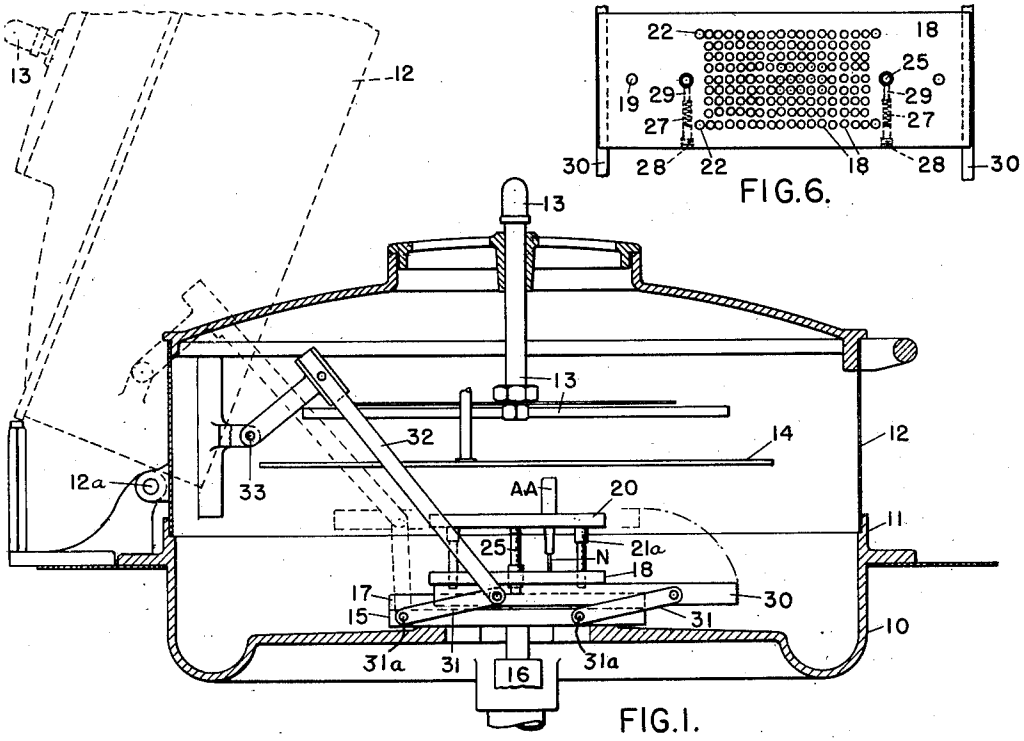


FIG.1.

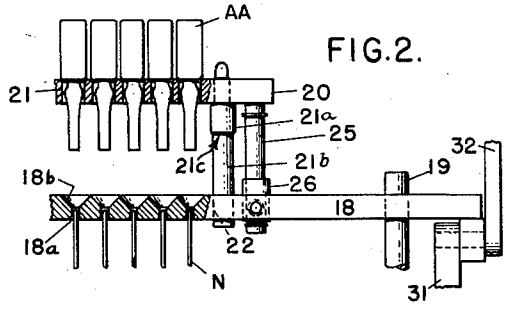


FIG.2.

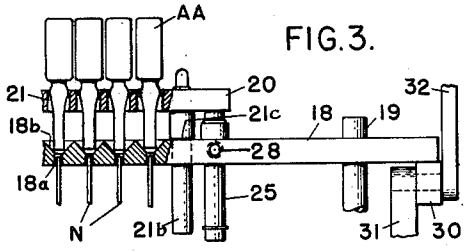


FIG.3.

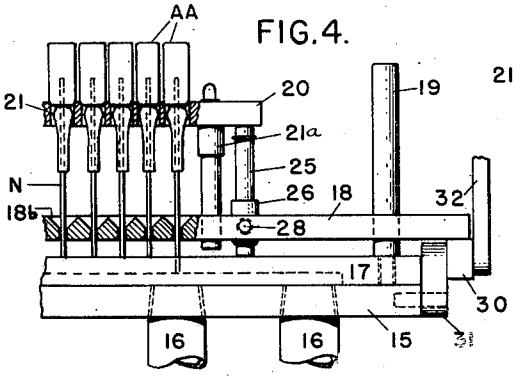


FIG.4.

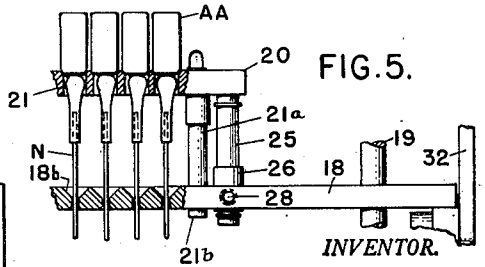


FIG.5.

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AMPUL WASHING DEVICE

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4 Claims. (Cl. 134—143)

This invention relates to apparatus for washing small ampuls, vials, tubes and the like, but more especially ampuls, and is concerned more particularly with a means for registering the open ends of the containers with their respective washing jets prior to telescoping and after registration and telescoping has been achieved to dissociate the ampul ends from the registering means to facilitate thorough washing of the tip ends and to prevent contamination thereof.

At the present time washing of ampuls, tubes and the like is carried out either by an immersion method wherein the container is submerged in a bath and the liquid caused to enter by evacuating the air and later expelled by evacuating the liquid or by centrifugal force, or by inserting a tubular needle into the ampul or tube and injecting a washing agent which later, in most cases, is expelled by air pressure. This invention primarily concerns apparatus adapted to carry out the last mentioned method of washing which employs one or more needle jets whose ends as well as the ends of the ampuls must be brought into substantial concentricity before telescoping of the one with the other can be achieved. Various means have been provided for establishing needle- and container-mouth registering and a common expedient being to employ a needle-guide plate which surrounds and guides the needle. The needle-guide plate is also provided with cone-shaped recesses on one side, the axes of the cones being aligned with those of the needles.

In one form of ampul washing machine, such as typified in the patent to Cozzoli No. 2,671,457, the washing needle is vertically disposed and the cone plate or ampul-end registering plate is relatively movable in the direction of the axis of the needle. Another plate which confines the ampul open-end-down is placed over the cone plate and lowered until the open end of the ampul settles in the cone and centers itself by gravity. With the ampul end centered in the cone, the cone plate is also lowered and the needle which has been guided continually by the plate is caused to project through the plate and into the ampul. When the ampul has been properly telescoped by the needle one or more washing agents is injected into the ampul to effect the cleaning thereof. Also a washing agent is usually applied to the exteriors.

At the completion of the washing operation and on elevating the plate the ampul again settles down in the cone thus immersing the tip end in a pool of wash water. The aim of the present invention is to hold the ampul out of contact with the cone after telescoping has been achieved so that during the subsequent internal and external washing operations the ampul end may be thoroughly flushed with the washing agents and not allowed thereafter to contact the cone plate or to stand in a pool of drain water. The primary aim of this invention is the avoidance of recontamination of the ampul after it has undergone a cleaning process.

A further aim of this invention is to provide a simple means that may be readily applied to washing machines and which will operate to permit ampul centering in the

first instance but which will, after centering and telescoping of the ampul and needle, operate to hold the ampul out of engagement with the centering means not only during the cleansing process but after completion of the cleansing process and the untelescoping operation while the ampul may be draining prior to removal and drying.

Other objects and advantages will be in part indicated in the following description and in part rendered apparent therefrom in connection with the annexed drawings.

To enable others skilled in the art so fully to apprehend the underlying features hereof that they may embody the same in the various ways contemplated by this invention, drawings depicting a preferred typical construction have been annexed as a part of this disclosure and, in such drawings, like characters of reference denote corresponding parts throughout all the views, of which:

Figure 1 of the drawings is a side view of a portion of a washing machine embodying this invention, parts of the machine being illustrated in full lines in one position and certain parts in dotted lines in another position.

Fig. 2 is an enlarged view of a portion of the apparatus illustrating the parts in the position they assume when a rack of unwashed ampuls is first placed in the washing machine.

Fig. 3 illustrates the relative positions of ampul and needle after centering and prior to telescoping.

Fig. 4 illustrates the position of an ampul relative to its centering cone on completion of the telescoping operation.

Fig. 5 illustrates the held-out position of the ampul as the needle is withdrawn, which held-out position is maintained until the Fig. 2 position is reached at which time the rack of processed ampuls may be removed and replaced by a rack of unwashed ampuls.

Fig. 6 is a plan view of portions of the apparatus.

Referring more particularly to Fig. 1 the portion of the machine illustrated comprises a basin member **10** that has a flanged rim **11** within which fits a hinged cover **12**. The cover carries an outside-wash assembly indicated at **13** and a hold-down screen **14** whose functions will later be explained.

Centrally of the basin is a valve plate **15** to which one or more process lines **16** may be connected. To the top of the plate **15** is a removably mounted combination manifold and needle plate **17**. In the instant exemplification the needle plate **17** is equipped with a bank of 144 needles N whose interiors communicate with the manifold and by which the processing mediums may be injected into the ampul interiors. Mounted for vertical movement axially of the needles is a second plate member **18**, hereinafter referred to as a centering plate but which may also be regarded as a guide plate or a cone plate. The plate **18** is provided with a bank of openings **18*a*** which correspond in number and spacing to the needle arrangement. The lower portions of the openings closely but slidingly guide the needles and the upper portion of the openings flare outwardly and form cone recesses **18*b*** whose apices are coincident with the needle axes. During vertical movement of the plate **18** the plate is guided on pins **19** located outside the needle bank. When in a loading position the plate **18** assumes an elevated position adjacent the outer ends of the needles (Figs. 2 and 3) whereat the ends of the needles are withdrawn from the cones **18*b*** but remain guided in the through openings **18*a*** provided in the body of the plate. This position may be termed the loading position.

With the centering plate **18** in loading position, a previously-loaded plate of ampuls is placed thereon. The ampul-handling plate is designated **20** and comprises a perforated member whose holes **21** therein conform in number and spacing to that of the needles N. The

holes in the plate are adapted to contain ampuls AA in inverted position, each hole being large enough to receive the stem end of an ampul but not the body portion. The body portions of the ampuls shoulder on the rims of the holes and hang small-end down. Leg standards **21***a* positioned about the margins of the plate **20** serve to maintain the plate elevated and the stem ends of the ampuls out of contact with a work-table surface on which a loaded plate may be placed. Additionally the leg standards function as registration guides for the plate when the latter is placed upon the machine. To that end each leg standard **21***a* is formed with a reduced guide portion **21***b* that terminates into a shoulder **21***c*. The centering plate **18** is formed with a set of complementary holes **22** located to receive the reduced portions of the leg standards. When the handling plate **20** is placed upon the centering plate **18** with the guides **21***b* in registry with holes **22** it may be gently lowered until contact is made by shoulder **21***c* with the surface of the centering plate. The shoulders **21***c* are, it will be noted, located upwardly from the tip ends of the ampuls in the plate so that upon lowering the plate the tip ends of the ampuls first enter the cone recesses **18***b* and are guided thereby into concentricity with the needles, see Fig. 3. Preferably each ampul should elevate slightly as indicated in Fig. 3 which will indicate bottoming and centralization.

Thereafter the two plates **18** and **20** are lowered as a unit and the processing needles N enter the respective ampuls. Ordinarily a subsequent raising of the plates to the position illustrated in Fig. 3 to withdraw the needles would cause the cleansed ampuls to again settle back into the cone recesses where they are likely to become recontaminated either by contact with the centering plate or by being allowed to stand in a pool of wash water that collects in the cone recesses.

To obviate such possibilities it is proposed to provide simple means operative to permit centralization of the tip ends of the ampuls upon loading and telescoping of the ampuls with the jets but operative upon reverse operation to prevent engagement with the cones in the centering plate. A preferred means for accomplishing those ends comprises a pair of friction-retained stop-pins **25** mounted preferably in the centering plate **18** for endwise movement. The stop-pins **25** extend parallel to the needle and ampul axes and a portion thereof extends from above the plate **18** and a portion below the plate **18**. The stop pins are located in the plate **18** so as to be engaged by the handling plate **20** as well as themselves to engage the needle (or jet) plate **17**, preferably outside the needle bank. The stop-pins should be shorter in length than the over-all travel of the centering plate, but should be longer than the length that the ampuls would normally telescope the needles.

To obtain increased guiding means for the stop-pins **25** bushings **26** may be inserted in the plate **18**. Individual spring means **27** housed in the plate **18** and backed up by screws **28**, are provided to urge a clamp pin **29** yieldingly into engagement with the sides of the stop-pins. The springs are tensioned to maintain the stop-pins in one or another shifted position with sufficient pressure to enable them to carry a reasonable load such as the weight of a handling plate **20** and a charge of ampuls without slipping. However, the springs are not tensioned to a degree that will prevent slipping the pins end-wise under the urge of the operator, nor are they tensioned sufficiently to support the weight of the centering plate **18**.

In the position illustrated in Fig. 2, the stop-pins **25** are in an upwardly-slid position so that their top ends are engaged by the handling plate **20** before the tip ends of the ampuls engage the cone recesses **18***b* in the centering plate. However, as the handling plate **20** is gently lowered further by the operator, the stop pins **25** which are now in abutting relation with the underside of the handling plate **20**, are manually urged downwardly through their friction guides **26** and caused to project more from the underside of the plate **18**. During this manual lowering of the handling plate the latter is guided by the stem ends **21***b* in the apertures **22** of the plate **18**. The lowering of the handling plate **20** relative to the plate **18** is continued until the shoulders **21***c* of the leg standards abut the plate **18** at which time the open ends of the ampuls will have become fully centered in the cones **18***b* (Fig. 3). Thereafter the plate **18** is lowered. In this instance the hood **12** is moved toward closed position which, as hereinafter explained, effects a lowering of the centering-plate-supporting rails **30** and the assembly carried thereby thus causing the needles N to enter the centered ends of the ampuls.

Continued lowering of the assembly brings the lower ends of the projecting stop pins **25** into engagement with the surface of the stationary plate **17** whereby to arrest the descent of the pins and the handling plate **20** resting thereon. Downward movement of the rails **30** and centering plate **18** continues relative to plate **20** and stop pins **25** until the hood is completely closed and this final movement causes the centering plate to move beyond or away from the ends of the ampuls (Figs. 1 and 4 position) and the open ends of the ampuls hang clear of and out of engagement with the walls of the cone recesses **18***b*. In this manner the centering and telescoping of a bank of ampuls with a bank of needles is conveniently achieved and after telescoping has been attained the centering means is automatically withdrawn from engagement with the ampuls. With the parts in this relation the washing process is performed.

After the washing process has been completed, upward movement of the plate **18** carries the extended, friction-held stop-pins also, and the latter carries the handling plate **20** so that the spatial relation existing between the ends of the ampuls and the cone recesses during the processing is maintained during the elevating and needle-extracting operation. In this way the ampul ends from which fluid drains during the washing and after the washing agents have been shut off, remain suspended and out-of-contact with the conical recesses as well as out of contact with any residual washing agent that may adhere to the surface of the centering plate or in the conical recesses thereof.

Upon arrival of the centering plate again to its loading position, Fig. 2, the handling plate and its charge of ampuls is lifted out of the guide holes **22** and off the tops of the stop-pins **25**, and sent to a drying or sterlizing oven, or set aside to await such further processing as may be desired.

In the instant embodiment of the invention, relative movement between the needles and the ampuls for telescoping purposes is effected by a system of rails and linkages connected with the hinged hood **12** and operated by the closing and opening movement of the latter. To that end a pair of parallel rails **30** are provided adapted to underlie and support the centering plate **18**, one at each side. The centering plate **18** is initially placed upon the guide posts **19** and rests of its own weight upon the rails **30**. Each of the rails **30** is pivotally connected to the free ends of a spaced pair of rigid links **31** whose other ends are pivotally connected as at **31***a* to a stationary part of the machine, for example, to one end of the process plate **15**. When the links **31** are in an approximately horizontal position as shown in full lines in Fig. 1, the rails are "down" and when the links **31** stand approximately vertical the rails are "up." Movement of the rails **30** is effected by movement of the hood **12** through the medium of another pair of links **32** that are pivoted at their one ends to the hood at an axis point **33** offset from hinge pivot **12***a* of the hood and at their other ends to the respective rails **30**. The links **32** are proportioned in length and their pivotal connection with the hood so located with respect to the hinge axes **12***a* and **31***a* that when the hood is down or closed the rails

30 are down, and when the hood is opened (dotted line position Fig. 1) the rails 30 are up. Though the elevating rails move in an arcuate path, the guide posts 19 constrain the plate 18 which by gravity rests upon the rails to a vertical movement paralleling the axes of the needles N.

The elevating arrangement herein disclosed is representative and other forms of plate raising and lowering means may be resorted to without effecting the functioning of the hold-out pins 25.

Without further analysis the foregoing will so fully reveal the gist of this invention that others can, by applying current knowledge, readily adapt it for various utilizations by retaining one or more of the features that, from the standpoint of the prior art, fairly constitute essential characteristics of either the generic or specific aspects of this invention and, therefore, such adaptations should be, and are intended to be, comprehended within the meaning and range of equivalency of the following claims.

Having thus revealed this invention, I claim as new and desire to secure the following combinations and elements, or equivalents thereof, by Letters Patent of the United States:

1. In an ampul washing machine having a bank of washing needles adapted to be telescoped with ampuls to be washed, a relatively movable needle-and-ampul-centering plate adapted to centralize ampuls axially with the needles, said centering plate having recesses therein centralized with the needles presenting surfaces contacted by the tip ends of the ampuls for centralizing the ampuls upon a lowering of the tip ends of the ampuls therein, guide means for said centering plate, a handling plate adapted to contain ampuls having apertures therein only large enough to pass the stem ends of the ampuls and not their body portions, the ampuls being positioned in the apertures in the plate in inverted position, interfitting means independent of said guide means provided in part by the handling plate and in part by the centering plate for registering the ampuls with the recesses in the latter when the handling plate containing a bank of ampuls is placed upon the centering plate, means for effecting bodily movement of the handling plate and the centering plate relative to the needles to bring the needles and ampuls into telescoped relation for a washing operation, and means carried by said centering plate operative subsequent to the start of the telescoping operation to effect relative movement between the handling plate and the centering plate in a spreading direction to withdraw the tip ends of the ampuls out of contact with the surfaces of the recesses in the centering plate, said last named means being operative thereafter to maintain the handling plate and the centering plate in said spread apart relation to maintain the tip ends of the ampuls out of contact with the recesses in the centering plate during movement of the centering plate relative to the needles in an untelescoping direction.

2. In an ampul washing machine having a bank of washing needles adapted to be telescoped with ampuls to be washed, a relatively movable needle-and-ampul-centering plate adapted to centralize ampuls axially with the needles, said centering plate having recesses therein centralized with the needles presenting surfaces positioned to be engaged by the tip ends of the ampuls for centralizing the ampuls with the needles when the tip ends of the ampuls are inserted therein, a handling plate adapted to contain ampuls, said handling plate having apertures therein only large enough to pass the stem ends of the ampuls and not their body portions, the ampuls being positioned in the apertures in the plate in inverted position, guide means for the centering plate, additional guide means comprising shaft elements carried by the handling plate and cooperating shaft-receiving apertures formed in the centering plate for registering the ampuls with the recesses in the latter when the handling plate containing a bank of ampuls is juxtaposed with the centering plate, means for effecting relative movement between the centering plate and handling plate assemblage and the needles to bring the needles and the centralized ampuls into telescoped relation for a washing operation, and stick-slip means carried by the centering plate and operative prior to the completion of the ampul-needle telescoping operation to effect relative movement between the handling plate and the centering plate in a spreading direction so as to withdraw the tip ends of the ampuls out of engagement with the surfaces of the recesses in the centering plate, said last named means being operative thereafter to maintain the handling plate and the centering plate in said spread apart relation to maintain the tip ends of the ampuls out of contact with the recesses in the centering plate during movement of the centering plate relative to the needles in an untelescoping direction.

3. The combination of claim 2 in which said stick-slip means comprises a plurality of shaft members mounted in the centering plate for axial movement in a direction parallel to the needle axes and being positioned in the centering plate within the margins of the handling plate whereby during the relative movement between the centering plate and the needles in effecting the telescoping operation the handling plate abuts the ends of the shaft members and its movement arrested thereby.

4. In an ampul washing machine having a plate containing a bank of washing needles adapted to be telescoped with ampuls to be washed, a needle-and-ampul-centering plate adapted to centralize ampuls axially with the needles, a handling plate adapted to contain a bank of ampuls in inverted position, said centering plate having recesses centralized with the needles presenting surfaces adapted to be contacted by the down-turned tip ends of the ampuls for centralizing the ampuls with the needles when the tip ends of the ampuls are placed therein, means for effecting relative movement between the centering plate and the needles to bring the needles and centralized ampuls in telescoped relation for a washing operation, the improvement comprising stop means carried by the centering plate operative subsequent to the start of the telescoping operation to effect relative movement between the handling plate and the centering plate in a spreading direction so as to withdraw the tip ends of the ampuls out of contact with the surfaces of the recesses in the centering plate and means normally operative to maintain the handling plate and the centering plate in the last mentioned spread apart relation during relative movement between the ampuls and the needles in an untelescoping direction so that the ampuls are maintained in a position out of engagement with the recesses in the centering plate.

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