July 22, 1952 E. R. ANDRE 2,604,247

DEFOAMER FOR BOTTLING MACHINES

Filed March 3, 1948 2 SHEETS—SHEET 1

Fig. 1

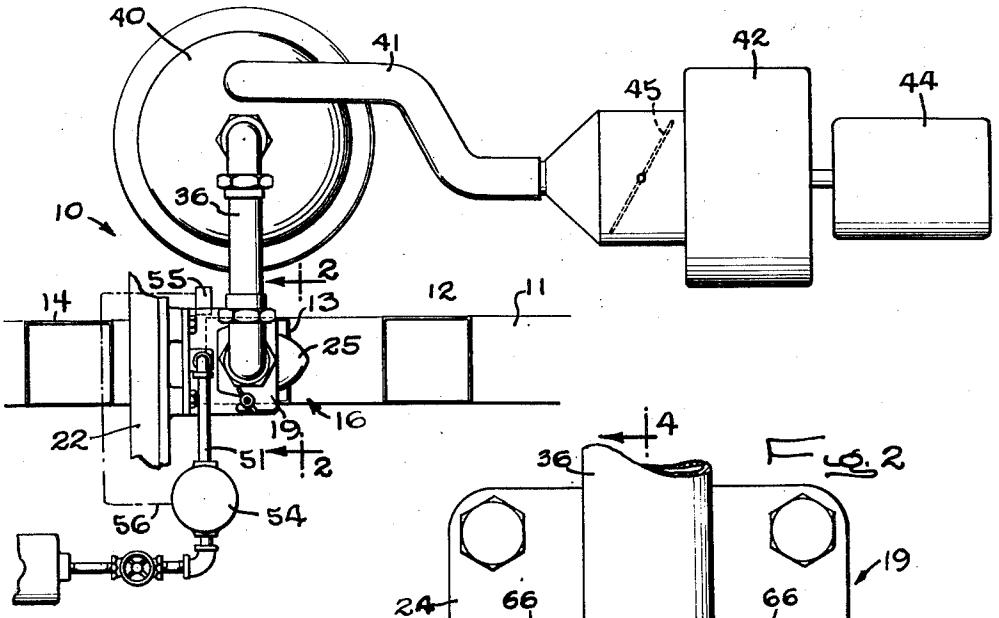


Fig. 2

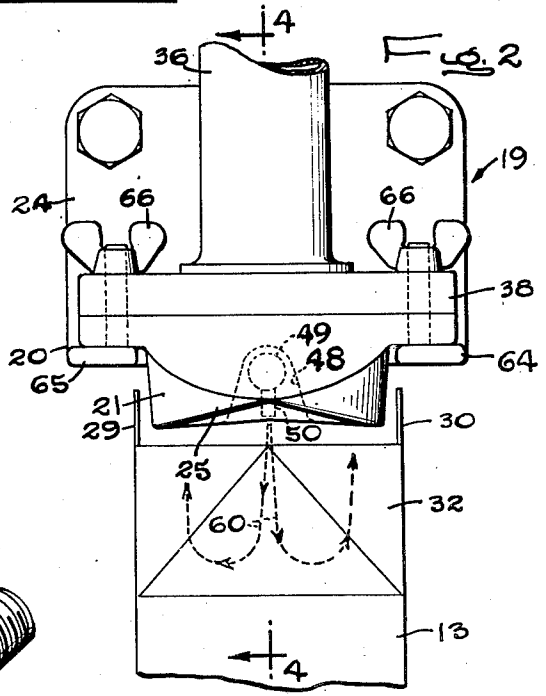
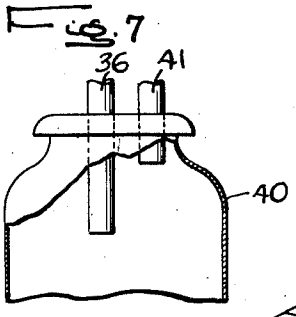


Fig. 7



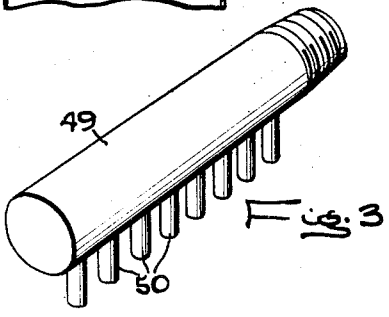


Fig. 3

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Fig. 4

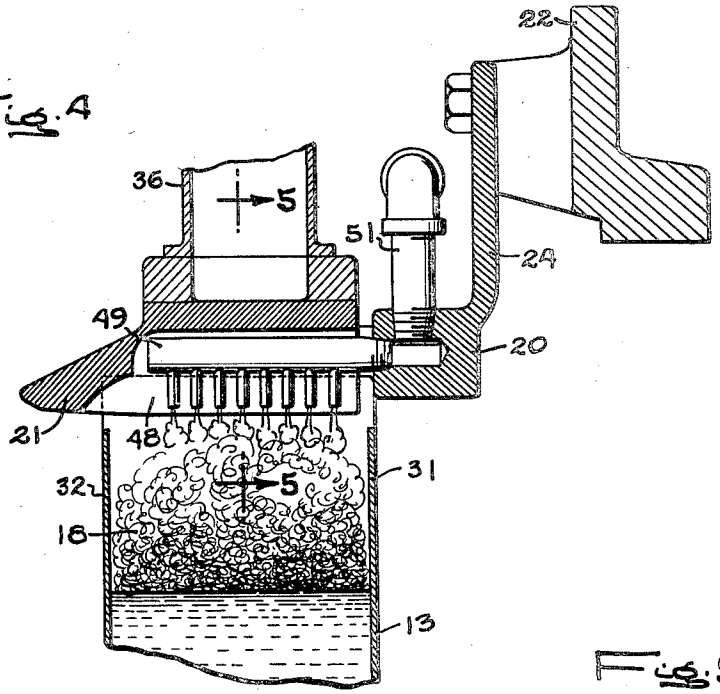


Fig. 5

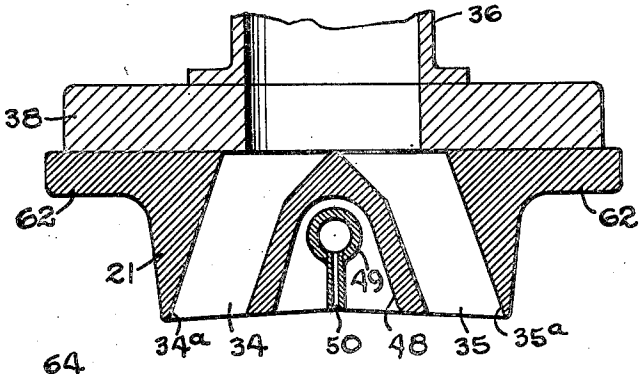
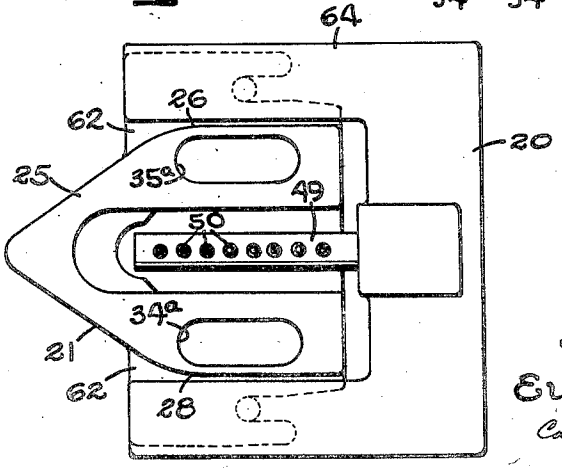


Fig. 6



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DEFOAMER FOR BOTTLING MACHINES

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9 Claims. (Cl. 226—68)

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The present invention relates to defoamers and more particularly to a device for removing foam from milk in a high production carton or bottle filling machine.

The primary object of the present invention is to provide an improved defoamer utilizing vacuum for quickly and positively removing the head of foam from a carton of milk. It is a more detailed object to provide a device of the foregoing type which applies a displacing pressure to the foam, the pressure and vacuum cooperating in a novel manner to effect substantially instantaneous and complete removal.

It is another object to provide a defoamer for use with cartons having closure flaps in which steam is employed as a foam displacing agent and which is so constructed that the steam is of increased effectiveness in softening up the flaps preparatory to closing and sealing them.

It is a further object to provide a defoaming head for flap-type cartons which not only encloses the top of the carton during the defoaming operation, but which is constructed to cooperate with the flaps to automatically guide the carton into proper position in the defoaming station.

It is still another object to provide a defoamer which may be quickly and easily installed on new or existing bottling machines without any substantial modification thereof, which is simple and straightforward of construction, and which may be easily dismantled for purposes of cleaning and sterilization.

Other objects and advantages of the invention will be apparent form the following detailed description taken in connection with the accompanying drawings, in which:

Figure 1 is a general plan view of the defoaming set up showing the apparatus in relation to the moving cartons of milk in a bottling machine.

Fig. 2 is a detailed view in elevation of the defoaming head taken along 2—2 of Fig. 1.

Fig. 3 is a fragmentary enlarged view of the steam nozzle block.

Fig. 4 is a transverse sectional view of the defoaming head taken along lines 4—4 of Fig. 2.

Fig. 5 shows a transverse section of the defoaming head and taken along lines 5—5 of Fig. 4. This figure brings out the arrangement of steam and vacuum passages.

Fig. 6 is a bottom view of the defoaming head as it is presented to the tops of the successive cartons.

Fig. 7 is a fragmentary elevational view of the separator disclosed in Fig. 1.

While the invention is susceptible of various

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modifications and alternative constructions and uses, I have shown in the drawings and will herein describe in detail one embodiment of the invention. It is to be understood, however, that I do not intend to limit the invention by such disclosure, but aim to cover all modifications and alternative constructions and uses falling within the spirit and scope of the invention as expressed in the appended claims.

In order to meet production schedules it is necessary in modern types of bottling machines to fill the cartons at a rate which causes considerable turbulence and the consequent formation of a head of thick foam. Such foam, when forced out of the carton during the closing operation, not only interferes with the closing and heat sealing of the carton, but in addition, makes it difficult to keep the cartons and bottling machine clean and sanitary. In the past steam has been employed to alleviate foam difficulties but prior devices have not enabled complete removal of the foam efficiently and at a rate sufficient to keep up with high speed filling machines.

Referring to Figure 1, the improved defoamer indicated generally at 10 is seen in plan view applied to a bottling machine having a conveyor 11 conveying spaced cartons of milk 12, 13 and 14. These cartons are assumed to be travelling to the left as viewed in this figure, the central carton 13 being located at the defoaming station 16. Prior to arrival at the defoaming station the cartons are filled from a milk reservoir at a rate which is sufficient to cause turbulence and the formation of foam in the upper portion of the carton as indicated at 18 (Fig. 4).

Positioned immediately above the cartons in their path of movement is a defoaming head 19 which is disclosed in Figs. 2 and 4. This head includes a frame 20 and a head member 21, the two being fastened together as a rigid unit when the defoaming head is in normal use. The frame 20 is supported on the bottling machine by any desired means, for example, a cross member or bracket 22 to which it may be bolted by a depending plate 24.

In carrying out the invention the head member 21 includes a flap separating and orienting portion in the form of a tapered shoe 25 which is pointed in the direction of the carton source. Preferably the portion 25 flares smoothly into the side walls 26, 28 of the head member, the latter being spaced apart a distance which is slightly less than the normal spacing of the flap on the milk carton. As shown in Fig. 2 such flaps include a "tuck in" flap 29 and a "bend over"

flap 30, which extend above the triangularly creased side panels 31, 32. It will be apparent then that as the carton 13 is moved by the conveyor 11 both of the flaps 29, 30 will be guided along the edges of the head member 21 and the cartons will be bodily positioned preparatory to removing the foam.

In practicing the invention in one of its aspects the head member 21 includes downwardly projecting passages 34, 35 having orifices 34*a*, 35*a* respectively which are elongated and which extend along the opposite edges of the milk carton 13. These passages lead to a suction pipe 36, a flange 38 on such suction pipe forming an airtight connection with the head member 21.

Turning now to the source of vacuum for the passages 34, 35, it will be seen that the suction pipe leads to a separator 40 (Figs 1 and 7). The separator may, if desired, consist of a conventional milk can having connections made to the top thereof for the suction pipe 36 and an evacuating hose 41 leading to an exhauster. In the present instance I prefer to use a centrifugal exhauster 42 driven by a motor 44, the degree of vacuum produced in the evacuating hose being regulated by means of a manually adjustable damper 45.

With regard to the operation of the device thus far described, a carton 13 filled almost to the top with milk and the remainder with foam 18 moves into the space directly under the head member 21. The latter is so constructed and positioned so that the space 46 is just sufficient for clearance and the carton top is effectively closed off. Under such circumstances, applying a relatively large head of vacuum at the orifices 34*a*, 35*a* produces a sharp drop in the pressure in the top portion of the carton thereby expanding the gas bubbles of which the foam is composed. Upon expansion such gas bubbles occupy many times the volume that they do at atmospheric pressure and, consequently, the foam expands into the passages 34, 35 and into the suction pipe 36. The latter, in cooperation with the piston-like action of the induced air flow causes the foam to be deposited in the separator 40. In the separator further expansion takes place, the bubbles breaking to produce solid milk which collects in the bottom of the can, and the air formerly entrained in the bubbles is conveyed through the evacuating hose 41 and through the exhauster. This action alone has been found to remove a great deal of the foam entrapped in the upper part of the cartons enabling the latter to be closed without squeezing the foam out over the machine and carton.

In accordance with a more detailed aspect of the invention means are provided for admitting pressure fluid into the top of the carton at a point adjacent to the suction orifices. In this way the foam in addition to expanding through the orifices 34, 35 and being removed by induction is positively forced to a point adjacent the suction orifices and into such orifices thereby enabling removal to be more complete. I have found that steam, under pressure, performs very effectively, in cooperation with the vacuum means, to remove the foam. In order to admit steam into the head member 21, the latter is preferably channelled out as at 48 (Figs. 5 and 6) to provide a recess in which a nozzle block 49 is mounted. As shown in the detailed view of Fig. 3 the nozzle block 49 has a plurality of vents 50. The latter projects downwardly approximately to the plane of the vacuum orifices, although some variation in the latter dimension is permissible. The nozzle block is preferably stationarily mounted in the frame 29 by a threaded connection or the like leading to a steam line 51.

The foam may be ejected even more rapidly by causing the steam to be admitted through the line 51 in puffs synchronized with the movement of the carton 13 rather than continuously. To this end a normally closed solenoid valve 54 is in series with the line 51. Preferably the solenoid 54 is instantaneously operated as an incident to the carton moving into the defoaming station, for example by means of a limit switch 55 and an electrical connection 56. The length or duration of the puffs may, of course, be made adjustable either by modification of the solenoid valve 54 or by means interposed in the line 56, which will be apparent to one skilled in the art.

The action of the steam in removing foam may be observed with reference to Fig. 2 in which the approximate lines of steam flow are indicated at 60. These lines proceed vertically downward dividing at approximately the surface of the liquid to flow reversely toward the vacuum orifices 34*a*, 35*a*. It will be apparent then that the puff of steam is effective to sweep the foam generally along the lines 60 and directly into the region of the greatest vacuum. The flow is turbulent and a certain amount of scavenging results. Since the steam is at a high temperature the air in the bubbles is expanded to an even greater degree than occurs with vacuum alone. Tests have shown that the combination of vacuum and steam removal disclosed above removes the foam more completely than any prior art method known to the present inventor.

An additional advantage derived by the use of the steam jet is to soften the wax or paraffin with which the carton is impregnated thus enabling the successive inwardly folding operation to be performed without danger of cracking the impregnant and spoiling the seal. Due to the flow of steam in the approximate path 60 (Fig. 2) caused by the applicant's improved construction, all four walls of the box-like space above the milk are uniformly heated. Because the foam is more completely evacuated by the initial portion of the admitted steam, the insulating effect resulting from residual foam is eliminated, and the steam is enabled to circulate the walls of the carton evenly and directly. Since the puff of steam is normally of short duration the steam may be considerably hotter than is possible if the steam were flowing continuously. Also, the amount of heating effect desired may be precisely controlled by merely varying the duration of the puff, the pressure of the steam, or the size of the nozzles 50.

In accordance with one of the more detailed structural aspects of the invention, it will be noted that the present construction facilitates removal of the defoaming head member 21 for purposes of cleaning and sterilization and also for enabling access to the nozzle block 49 contained therein. In the present instance this is accomplished by including on the head member 21 lateral extensions or wings 62 and by forming the frame 29 into a horizontal U formation, the sides 64, 65 of the U extending forwardly to serve as shelves for the wings 62. This enables the head member 21 to be slid into place reducing the work of dismantling to a minimum. Provision is also made for clamping the head member 21 into place under the flange 38 on the suction pipe 36. Conveniently, this may be ef-

fected by studs which extend upwardly from the frame 20 and which carry wing-nuts 66 or the like at the outer ends thereof.

In view of the foregoing it will be seen that novel and efficient means are provided for not only guiding the cartons into a defoaming station but for removing the foam so quickly that the carton need not pause in its path of movement. The apparatus is therefore ideally suited for application for already installed bottling machines wherein the containers are moved either intermittently or continuously. It will be apparent to one skilled in the art that the invention is by no means limited by the particular type of container shown but is obviously applicable to other similar types of containers presenting an open mouth in which the space above the liquid is covered with foam.

I claim as my invention:

1. In a defoaming device for removing foam from milk or the like and adapted for attachment to a bottling machine in which the containers are progressively moved into a defoaming station, the combination comprising a defoaming head, said head including vacuum and pressure apertures together with means for applying vacuum and pressure thereto, said apertures being so positioned with respect to one another that the fluid from the pressure aperture causes displacement of the foam into the region of the vacuum aperture, and means actuated as an incident to the arrival of a container under said defoaming head for initiating a puff of pressure fluid.

2. In a defoaming device for removing milk foam from the tops of cartons of the type having upstanding closure flaps thereon and in which the cartons are transported by a conveyor during the filling process, the combination comprising a defoaming head said head being constructed to substantially enclose the tops of successive ones of said cartons, said head including vacuum apertures extending along the sides thereof and connected to a source of vacuum, said apertures serving to reduce the pressure in the enclosed tops of the containers and thus cause expansion of the foam through said apertures, and means for applying high temperature steam to said foam to increase the degree of foam expansion.

3. In a defoaming device for removing foam from the tops of successive fibreboard cartons having walls and sealing flaps impregnated with paraffin or the like, the combination comprising a defoaming head adapted for positioning above successive ones of said cartons, said head including a row of steam orifices directed downwardly toward said foam, means for withdrawing the foam displaced by the steam emitted from the orifices, said orifices being distributed in said defoaming head so that the flaps on said cartons are subjected to a uniform blast of steam as an incident to removing the foam, said steam being of sufficient high temperature to soften said flaps and prevent cracking of the impregnant upon immediately successive folding thereof.

4. In a defoaming device for removing foam from the tops of successive fibreboard cartons having walls and sealing flaps of material impregnated with wax or the like, the combination comprising a defoaming head adapted for positioning above successive ones of said cartons, said head including a row of alined steam orifices directed downwardly toward said foam centrally within said head, means for withdrawing the foam displaced by the steam emitted from the orifices, said orifices being distributed in said defoaming head so that the flaps on said cartons are subjected to a uniform blast of steam as an incident to removing the foam, said steam being of sufficiently high temperature to soften said flaps and prevent cracking of the impregnant upon immediately successive folding thereof.

5. In a defoaming device for removing foam from the tops of milk cartons having flaps thereon adapted to be separated for purposes of filling but to be bent inwardly to close the carton, the combination comprising a defoaming head, said head including means for pneumatically removing the foam from the top of the milk, said defoaming head including a pointed shoe directed upstream with respect to the direction of movement of said cartons and positioned to wedge apart said flaps as an incident to a carton being advanced to a position under said head.

6. In a defoaming device for removing foam from the tops of milk cartons having flaps thereon adapted to be separated for purposes of filling but to be bent inwardly to close the carton, the combination comprising a defoaming head, said head including a head member positioned to project downwardly between said flaps and having a downwardly directed vacuum orifice for pneumatically removing the foam from the top of the milk, a horizontally U-shaped supporting frame, said head member including laterally extending wings for engaging the opposed legs of said U-shaped frame, and means for clamping said wings on said frame for retaining said head member in position while permitting easy intentional removal thereof for purposes of cleaning.

7. In a defoaming device for removing foam from the tops of partially filled milk cartons as the latter are conveyed in a bottling machine, a head including elongated vacuum apertures spaced to lie above the carton within the confines of the lateral edges thereof, an elongated source of steam longitudinally arranged midway between said vacuum apertures, said source of steam including one or more downwardly directed nozzles so that the steam is directed downwardly toward the surface of the milk rebounding upwardly in a U-shaped path to carry the entrapped foam into the region of the elongated vacuum orifices.

8. In a defoaming device for removing foam from the tops of cartons partially filled with milk as such cartons are continuously advanced in a bottling machine, the combination comprising a defoaming head, said head being constructed and arranged so as to substantially enclose the tops of said cartons as the same are advanced through the machine, said head including continuously operating vacuum means for withdrawing said foam, and means for applying a sudden puff of steam from said head automatically upon the arrival of the carton to a position directly below said head, said combined steam and vacuum removing said foam substantially instantaneously without the necessity for bringing the cartons to a stop below said head.

9. In a defoaming device for removing foam from a partially filled carton of milk or the like, the combination comprising a defoaming head, said head including vacuum and pressure apertures together with means for applying vacuum and pressure respectively thereto, said pressure aperture being so positioned that the fluid from the pressure aperture is discharged downwardly

into the carton toward the surface of the milk, said vacuum aperture being positioned laterally of the pressure aperture in the region of resulting upward reverse flow of the pressure fluid from the carton.

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