July 3, 1956 J. E. WARD 2,753,098

DEFOAMER

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FIG. 2

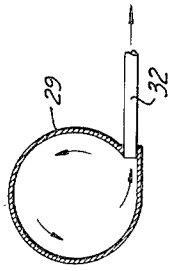

FIG. 1

FIG. 3

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DEFOAMER

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This invention relates to defoaming devices and in particular to devices of this kind which may be used in conjunction with milk packaging and processing equipment.

In the packaging of milk wherein the milk is poured into fiber containers, the rate or speed with which the containers can be filled and ultimately sealed has been limited by the foam produced during the filling operation. It has been found that a clear limitation is imposed on the packaging facilities by the quantity of foam produced and the foam must be removed from the container in some manner, for if the foam is not removed, either a tight seal will not be obtained or the container will be caused to bulge.

It is an object of this invention to provide a device of this character which is particularly adapted to be used in connection with the filling and sealing of cartons of milk.

It is a further object of this invention to provide a defoaming device which is adapted to be placed in a conventional filling and sealing line without disturbing the conventional equipment.

It is a further object of this invention to provide a device of this kind and character which recovers the foam and returns the same in a closed circuit to the filling mechanism whereby further sterilization, pasteurization and other handling of the same are limited or eliminated.

Other objects and advantages of this invention will appear from the following specification taken in conjunction with the accompanying drawing in which:

Figure 1 illustrates my defoaming equipment when the same is placed in the conventional filling and sealing line.

Figure 2 is a cross-sectional detail taken along the line 2—2 of Figure 1.

Figure 3 is a cross-sectional detail taken along the line 3—3 of Figure 1.

As illustrated in the drawings, the formed cartons are positioned upon a movable belt 10, and are retained thereby in any suitable manner as, for example, by the upwardly extending retaining lips 11. The cartons are advanced either step by step or continually depending upon the equipment involved. The cartons are formed at station 12, filled at station 13, defoamed at station 14 and sealed and chilled at station 16, from which point they are led to a suitable zone for their packing and ultimate delivery.

As illustrated in Figure 1, a carton 17 is positioned at station 13 where it is filled. The filling equipment consists of a milk storage tank 18 into which milk is adapted to be introduced through the line 19 after having been sterilized, homogenized or otherwise treated. Milk passes from the tank 18 through the line 21 and valve 22 and is introduced through nozzle 23 into the carton 17. The valve 22 may be one of any of several types but is a metering valve which permits the passage of a predetermined amount, as for example a quart, pint, or two quarts, of milk and then interrupts the flow into the carton. However, the milk as it is introduced into the carton 17 tends to mix with air and forms a substantial body of foam which lies on top of the milk.

As the belt 10 advances the carton 17 to the station 14, the upper lips of the carton 17 engage the lower surface of a flat plate 26 which is provided with an orifice 27 and which is, through the line 28, in communication with a vacuum chamber 29. Vacuum is communicated to the chamber 29 from a vacuum pump 31. As illustrated in Figure 3 the vacuum line 28 enters the vacuum chamber 29 tangentially, for reasons more fully to be hereinafter described. It will also be apparent from Figure 2 that the line 32 to the source of vacuum 31 leaves the tank 29 tangentially. Because of frictional engagement between the upper lips of the carton 17 and the lower surface of the plate 26, a vacuum is imposed upon the area in the carton 17 above the milk with the result that the foam is drawn upwardly through the line 28 into the chamber 29. When the foam has been removed by the vacuum, the carton is then moved to the station 16 where sealing and chilling and further operations are conducted.

Operation of the device may be briefly described as follows: After the milk has been introduced into the carton 17 in a predetermined amount, and foam has been formed on the surface of the milk, the carton is moved to the station 14. The foam is drawn upwardly through the orifice 27 and the line 28 into the vacuum chamber 29. By virtue of the tangential positioning of the line 28 with respect to the circular tank 29, the foam will engage the inner side walls of the tank 29. Because the exhaust line 32 is near the top of the tank 29 and the intake line 28 is near the bottom, it is apparent that an upwardly directed cyclone effect will occur whereby the liquid portion of the foam will tend to engage the side walls of the tank 29. As the foam engages the inner side walls of the tank 29, the liquid tends to adhere to the side walls and the gas or air is drawn outwardly through the exhaust line 32. When the liquid engages the side walls of the tank 29 and the foam is thus broken, the liquid travels downwardly along the side walls and gathers at the bottom of the chamber 29 from which it flows by gravity, through line 33 to the chamber 18. It will be noted that the line 33 enters the chamber 18 at a point substantially below the normal level of the milk within that chamber. Were this not so, the vacuum would be transmitted to the chamber 18. It is obvious that the milk in the bottom of the chamber 29 prevents the vacuum from being communicated to chamber 18.

It should be noted that the line 28 enters the chamber 29 at a point above the level of the milk in the chamber 18. It is obvious that this is also a requirement for, were it not so, milk would be transferred from the chamber 18 through the line 33, the tank 29 and the line 28 into carton 17.

By forcing the foam against the side walls of the chamber 29 the foam is broken. By introducing the foam into the chamber tangentially as illustrated in Figure 3 and by further enhancing the tangential effect by exhausting the chamber 29 tangentially, so to speak, the foam is rapidly and effectively broken.

By varying the degree of vacuum within the chamber 29, it is possible effectively to handle milks of various densities, as for example, cream, whole milk, skim milk, etc. However, I have found that my defoamer may be successfully operated with either or any of these products.

It is apparent from the foregoing that I have produced a simple defoaming device which effectively breaks foam produced by the pouring of the liquid into the carton. Furthermore I have produced a device which permits the return of the milk forming the foam to the filling apparatus without the necessity of human intervention, further

pasteurization, further sterilization, or, in fact, any processing of any kind. In this manner all requirements with respect to the sanitary handling of milk are complied with and the loss of milk because of the creation of foam is effectively eliminated. Furthermore, my device permits rapid operation of conventional filling and sealing equipment inasmuch as there is no delay between the filling and sealing operations to permit the foam to disintegrate naturally.

I claim:

1. In combination with a milk carton filling machine having a liquid storage tank with its lower end connected to a filling spout, a defoaming device adapted to withdraw foam from the open end of the filled milk carton and to separate said foam into its components and return the liquid components to the storage tank comprising means for engaging the open end of the filled milk carton, a foam breaking tank, pipe means connecting the carton engaging means to said foam breaking tank, said pipe means entering said foam breaking tank tangentially, vacuum means connected to the upper portion of said foam breaking tank to cause an upwardly directed cyclone of air to be created within said foam breaking tank to cause the foam to be drawn from the carton into the foam breaking tank and into the cyclone of air which causes the foam to engage the side walls of said foam breaking tank to cause breaking up of the foam with the liquid component of the foam falling downwardly along the side walls thereof and the air component of the foam being drawn into the vacuum source, and conduit means leading from the bottom of the foam breaking tank to said storage tank, the foam breaking tank being so positioned with respect to said storage tank that the level of the milk in the foam breaking tank is below the inlet pipe in the foam breaking tank and that the pipe leading from the foam breaking tank to the storage tank is filled with milk.

2. In combination with a milk filling machine having a liquid storage tank with its lower end connected to a filling spout, a defoaming device for removing foam from the filled milk carton and separating the foam into its components and returning the liquified milk to the storage tank comprising means for engaging the open end of the filled milk cartons, a foam breaking tank, inlet pipe means connecting the carton engaging means to said foam breaking tank, said inlet pipe entering said foam breaking tank tangentially substantially above the bottom of the tank, vacuum means, a pipe connecting said vacuum means to said foam breaking tank, said last named pipe entering the upper end of said foam breaking tank tangentially to create a swirling current of air therein to cause the foam to be drawn from the carton into the foam breaking tank and into the swirling current of air which causes the foam to engage the side walls of said foam breaking tank to cause breaking up of the foam with the liquid component of the foam falling downwardly along the side walls thereof and the air component being drawn upwardly through the vacuum means, and a pipe leading from said foam breaking tank to said storage tank, said foam breaking tank being positioned relative to said storage tank to allow the milk to flow by gravity from the foam breaking tank into the storage tank, the level of the milk in the foam breaking tank being at a level below the inlet pipe and the pipe connecting the foam breaking tank to the storage tank being filled with milk.

3. A defoaming device as in claim 2 wherein said means for engaging the open end of the filled milk carton comprises a flat plate engaging the open end of the filled milk carton, and an orifice in said plate connected to the inlet pipe, the orifice being adjacent the foam floating on the milk in the filled milk carton.

4. In a device for filling cartons with a liquid which has a tendency to foam during the filling operation, a storage tank, metering means connected to said storage tank for filling said cartons with a predetermined quantity of liquid, a foam breaking tank of circular cross-section, piping means connecting the bottom of said foam breaking tank to said storage tank, means for engaging the open end of the filled milk carton, inlet pipe means connecting the carton engaging means to said foam breaking tank, said inlet pipe entering said foam breaking tank tangentially near the bottom thereof, and a source of vacuum connected to the top of said foam breaking tank to cause an upwardly directed cyclone of air to be created within said foam breaking tank to cause the foam floating on the liquid in the carton to be drawn from the carton into the foam breaking tank and into the cyclone of air which causes the foam to engage the side walls of said foam breaking tank to cause breaking up of the foam with the liquid component of the foam flowing downwardly along the side walls thereof and into the storage tank and the air component of the foam being drawn upwardly into the vacuum source.

5. A device as in claim 4 wherein the means for engaging the open end of the carton comprises a flat plate adapted to rest on the open end of the carton, and an orifice in said flat plate connected to the inlet pipe, the orifice overlying the foam floating on the liquid in the carton.

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