April 9, 1946. C. Z. MONROE 2,398,189

FLAME DEFOAMER

Filed Feb. 21, 1944 2 Sheets-Sheet 1

FIG. 1.

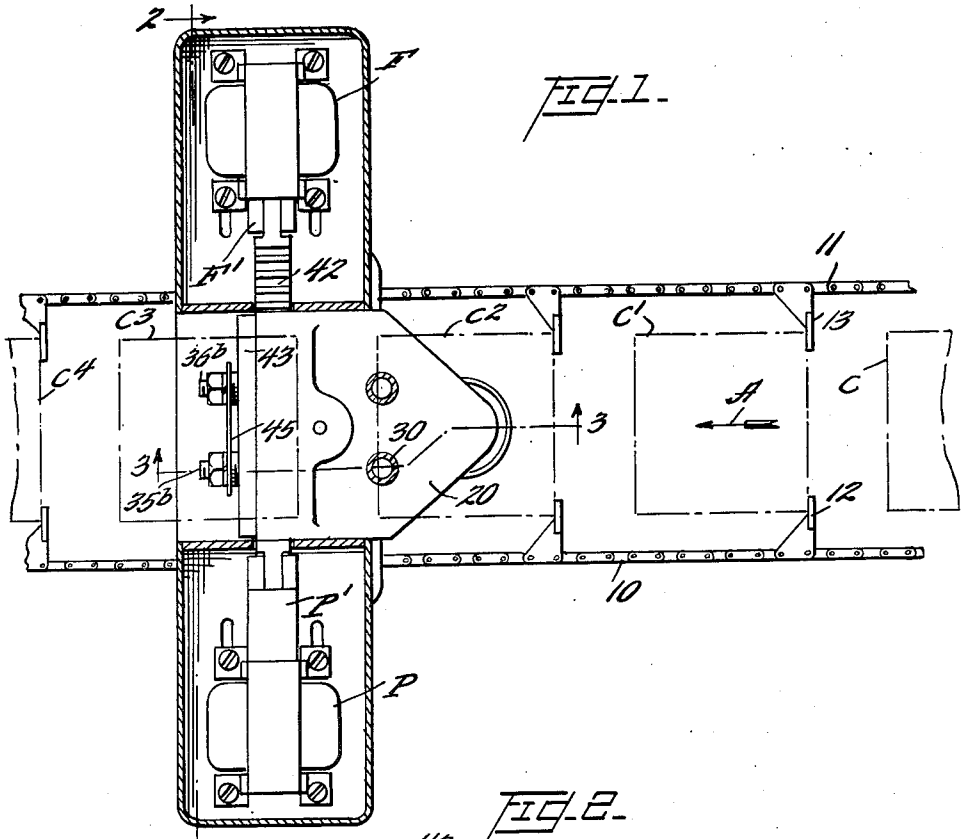
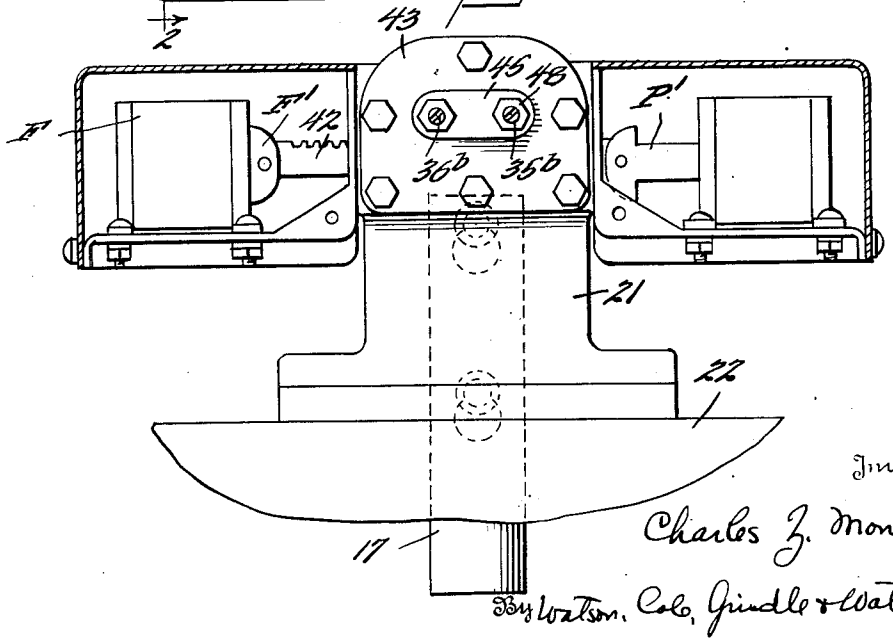


FIG. 2.



Inventor

Charles Z. Monroe

By Watson, Cole, Grindle & Watson

Attorneys

April 9, 1946. C. Z. MONROE 2,398,189

FLAME DEFOAMER

Filed Feb. 21, 1944 2 Sheets-Sheet 2

FIG. 4.

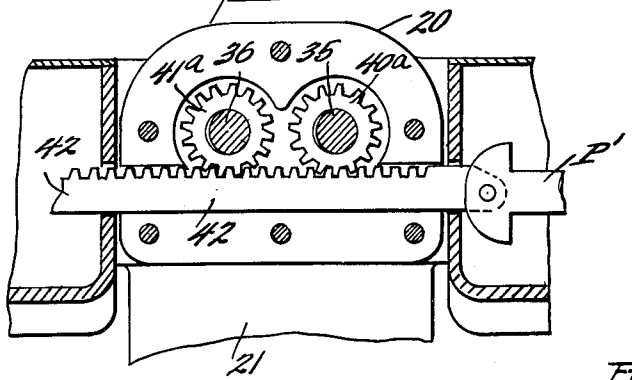


FIG. 3.

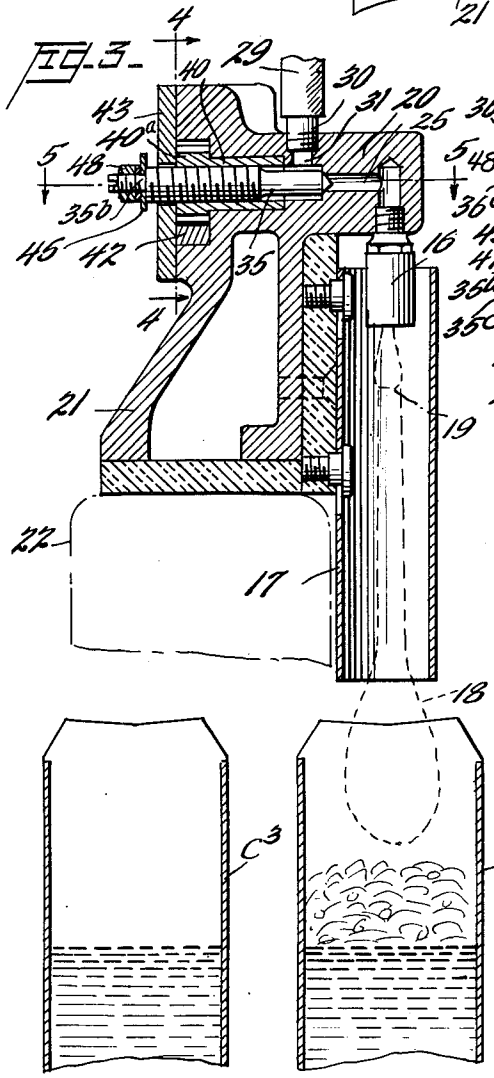


FIG. 5.

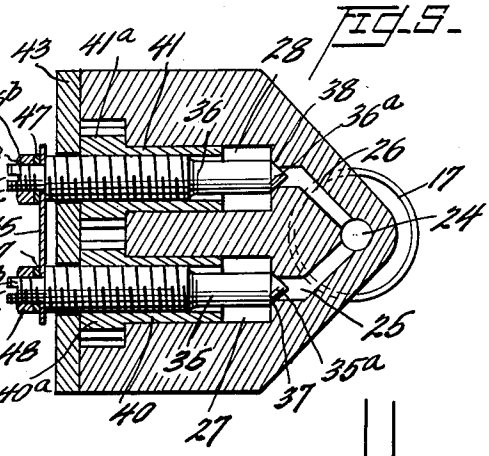
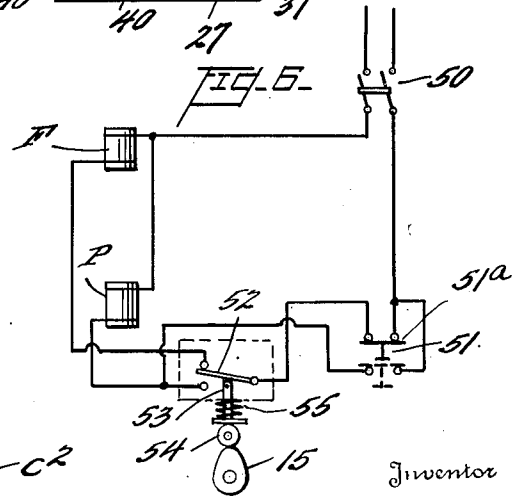


FIG. 6.



Inventor

Charles Z. Monroe

By Watson, Cole, Grindle & Watson

Attorneys

Patented Apr. 9, 1946 2,398,189

UNITED STATES PATENT OFFICE

2,398,189

FLAME DEFOAMER

Charles Z. Monroe, Detroit, Mich., assignor to The American Paper Bottle Company, Toledo, Ohio, a corporation of Ohio

Application February 21, 1944, Serial No. 523,312

4 Claims. (Cl. 252—361)

This invention relates generally to methods of and apparatus for charging containers with liquid. More precisely defined, the invention comprises an apparatus for and method of dissipating a body of foam resting upon the surface of a body of liquid which has been freshly introduced into a container.

In the packaging of liquids in containers, by means of automatically operating machines, the problem of foam disposal is frequently met with. Certain liquids, for instance milk, tend to foam when agitated. Naturally any such foaming liquid is considerably agitated when poured into a container for packaging. Before the container can be closed the foam must either be allowed to subside as a result of natural causes or must be dissipated by means especially provided for that purpose. In Patent No. 2,328,372, issued August 31, 1942, to Julius E. Wollenweber, there is disclosed and claimed a novel apparatus for and method of dissipating foam which has been caused to form upon the upper surface of a body of milk or other foaming liquid in a paper container, as a result of the charging operation. The method and apparatus of the patent have proven to be eminently satisfactory and have been widely utilized. The foam dissipating agent of the patent comprises steam, a jet of which is projected downwardly into the mouth of a freshly charged container, steam having been found to accomplish the desired results without causing contamination of the liquid contents of the container.

In accordance with the present invention the use of steam is dispensed with and, in lieu thereof, a flame is projected downwardly into the mouth of the freshly charged container. The flame is, of course, intensely hot and any body of foam whose proximity it reaches is almost instantly dissipated. The action of the flame in eliminating the foam is very much more rapid than the action of steam and a very considerable layer of foam upon the upper surface of a body of liquid such as milk, and which has just been charged into a container, may be almost instantaneously dissipated by the projection of the flame into the mouth of the container. The intense heat of the flame boils away or volatilizes a portion of the film-like wall of each bubble of foam which it approaches, thus causing instantaneous collapse of that bubble. It is only necessary to project the flame into a container for an instant in order to achieve the desired result and, even though the container be fabricated of paper, it will remain undamaged because of the instantaneous action of the flame, any paraffin or other similar coating covering the container walls likewise remaining unaffected or, in any event, not being melted due to the heat of the defoaming flame.

When used as one element of an automatic paper bottle forming, charging and sealing apparatus the defoaming device permits speeding up of production from the entire apparatus in any case where the container charging step has been the limiting factor insofar as rapidity of operation is concerned.

The invention may have various embodiments and in the accompanying drawings one apparatus which has been found to be entirely suitable is illustrated and described, by way of example.

In the drawings:

Figure 1 is a top plan view, partially broken away, of portion of a machine for the packaging of liquids, with which machine the improved foam dissipating means has been combined, certain portions of the apparatus of Figure 1 having been broken away in order that interior elements may be more clearly perceived.

Figure 2 is a section on line 2—2 of Figure 1;

Figure 3 is a section on line 3—3 of Figure 1;

Figure 4 is a section on line 4—4 of Figure 3;

Figure 5 is a section on line 5—5 of Figure 3; and

Figure 6 is a diagram of circuits in which the electromagnetic means for actuating the defoaming apparatus is diagrammatically illustrated.

The novel defoaming apparatus is adapted to be placed in immediate proximity to a charging apparatus by means of which liquid may be introduced into containers passing in succession along a conveyor. Such charging apparatus, comprising no portion of the present invention, is not illustrated and it need only be stated that the containers C, C′, C^2, C^3, and C^4, indicated by chain lines, and in plan, in Figure 1, and containers C^2 and C^3 of which series are shown in vertical section, and in full lines, in Figure 3, are fabricated of paper, have their collapsible upper ends open, and that each of them has been recently charged with liquid such as milk, to the approximate level indicated in Figure 3. The containers in positions C and C′ will, under such circumstances, contain substantial bodies of foam upon the upper surfaces of the charges of liquid, and likewise the container in position C^2 will be partially foam filled until the operation of the defoaming means now to be described. The containers in positions C^3 and C^4 contain no foam,

the defoamer having instantaneously acted to dissipate such foam during the period of time in which the container occupied position C^2. The containers are advanced from right to left (Figure 1) in the direction of the arrow A, by a conveyor which is only partially illustrated since any type of conveyor for effecting the advancement of the containers, preferably with a step-by-step motion, may be employed.

In Figure 1 conveyor chains are indicated at 10 and 11, respectively, and container-engaging pushers projecting laterally from these chains, respectively, are indicated at 12 and 13. The chain-advancing means is not illustrated and any suitable mechanism for intermittently advancing the chain may be employed. The flame projecting means is synchronized with the conveyor and the cam 15, shown in Figure 6 of the drawings, is one element of the mechanism by means of which the flame projector is caused to operate in such synchronism, the cam revolving on its axis through 360° during the time that the conveyor advances a container from one position to the next subsequent position, i. e., from position C to position C'. Any suitable mechanism may be employed to effect the simultaneous operation of the conveyor and cam 15, the details of such mechanism being unimportant and therefore not being shown.

As it reaches position C^2 each successive container, partially foam filled and having its upper end still fully open, comes directly beneath a flame projecting nozzle 16 and a flame hood 17 disposed coaxially with the nozzle and extending downwardly from the nozzle to a point just above the container top. During the time that each such container is so positioned a flame will be projected downwardly from the nozzle, through the hood 17, and into the open mouth of the container, such an elongated flame being indicated in dotted lines, at 18, in Figure 3. The effect of this flame is to instantly dissipate the foam which it closely approaches and so rapid is its action that the foam resting upon the upper surface of the body of milk in a container of the type described, and which body of foam may be of substantial depth, is instantaneously eliminated. The flame size is then instantaneously decreased until it approximates the size of the small flame indicated at 19 in Figure 3. After this retraction of the flame the conveyor advances and a fresh container placed underneath the nozzle 16, whereupon the flame is again projected and retracted, the sequence of operations being repeated for each container advanced by the conveyor to and past the defoaming point.

The flame is projected and retracted in this manner by regulating the flow of combustible gas and combustion supporting air to nozzle 16 and the novel mechanism for accomplishing this will be described. It will be observed that nozzle 16 depends from a block 20 which is integral with and supported by a bracket 21 mounted upon a horizontally extending supporting bridge 22. Formed in block 20 and extending to the nozzle 16 is a gas and air mixing chamber 24 and communicating with this chamber is a channel or duct 25 for combustion supporting air and a second channel or duct 26 for a combustible gas. The duct or channel 25 is in communication with a chamber 27 and the duct or channel 26 communicates with a chamber 28. Combustible gas under desired pressure is conducted to chamber 27 from a source of supply by means of a suitable tube, as for instance tube 29 shown in Figure 3, the end of the tube being connected to a nipple 30 permanently secured in a recess formed in the top of block 20 above chamber 27 and a port 31 bringing chamber 28 into communication with the nipple 30 and tube 29. The air chamber 28 at the terminal end of duct 26 is in communication with a suitable source of air under pressure. Except insofar as impeded and controlled by valves now to be described air and gas may flow freely from chambers 27 and 28 to mixing chamber 24 and thence, after having been intermingled, to the nozzle 16.

Control valves are indicated at 35 and 36, respectively, and are seen to be elongated needle valves disposed in parallelism. Each valve has a conical end surface adapted to seat against a frusto-conical surface encircling the entrance of the duct 25 ore 26 with which it is associated, the conical valve surfaces being indicated at 35*a* and 36*a*, respectively, and the frusto-conical valve seats at 37 and 38, respectively. Each valve projects through and is supported by a cylindrical sleeve, these sleeves being indicated at 40 and 41, respectively. Sleeve 40 is rotatably supported with a relatively close fit in a prolongation of cylindrical air chamber 27, sleeve 40 and valve 35 forming, as a matter of fact, one end of this chamber. The outer end of sleeve 40 is enlarged and comprises a gear or pinion portion 40*a*. The bore of this sleeve is threaded and the outer surface of needle valve 35 is correspondingly threaded so that these two parts will move axially with relation to each other, when relatively revolved. Sleeve 41, which supports needle valve 36, is similarly formed and supported, the outer end of this sleeve also being enlarged and comprising a gear portion 41*a*.

The teeth of gears 40*a* and 41*a* do not intermesh but the teeth of each gear does mesh with the teeth of a horizontally disposed longitudinally reciprocable rack 42. Rack 42 slides in a horizontal recess formed in the bracket 21 just below gears 40*a* and 41*a* and is retained in this recess by means of a cover plate 43. Cover plate 43 likewise retains sleeves 40 and 41 in the positions in which these sleeves are shown in Figure 5, the associated needle valves extending outwardly through cylindrical apertures formed in the cover plate. The outer end of the needle valve 35 has an axially extending spindle-like projection 35*b* which is exteriorly threaded and the end of this axial projection 35*b* is transversely slotted as at 35*c*, for the reception of a screw driver or other adjusting tool. A bridging element 45 connects the needle valves 35 and 36, this element having circular apertures to receive the reduced projections 35*b* and 36*b* of the valves. Lock washers are indicated at 47 and lock nuts at 48, respectively. When the lock nuts 48 are tightened, as shown in Figure 5, both needle valves are held against rotation. Either may be rotated relatively to the other, however, if the associated lock nut is loosened, rotation being effected by means of a tool inserted in the slot 35*c* or, in the case of needle valve 36, in slot 36*c*.

It will readily be perceived that when rack 42 is moved toward the right (Figure 4), the sleeves 40 and 41 will be simultaneously revolved in the same direction through equal angles (counterclockwise). Counterclockwise rotation of these sleeves will effect simultaneous and equal axial movements of the two needle valves and the conical valve surfaces of these valves will recede from the associated seats, thus permitting both gas and air to flow to the mixing chamber 24. Move-

ment of the rack in the opposite direction would cause the needle valves to approach the seats and diminish the flow of gas and air. The needle valves are so adjusted, initially, with respect to the seats with which they cooperate that small streams of gas and air respectively flow to the mixing chamber when the valves are fartherest advanced toward closed position and, as a result of this adjustment, a stream of combustible gas at least sufficient to support the pilot flame 19 is allowed to flow at all times.

Any suitable means for reciprocating the rack 42 may be employed but I prefer to employ electromagnetic means, including the solenoids P and F, to the armatures P' and F' of which the ends of the rack 42 are pivotally connected. When solenoid F is energized the rack is drawn in such direction as to cause the valves to simultaneously open and an elongated flame to be projected downwardly into a container positioned below the nozzle. When the solenoid F is de-energized and the solenoid P energized the rack 42 is moved in the opposite direction and the valves are moved toward closed position, the flame being reduced to pilot size. In Figure 6 a diagram of circuits for supplying energizing current selectively to the solenoids P and F is illustrated. In this diagram the main switch controlling the supply of current to the machine is indicated at 50 and a magnetic switch at 51. A mechanically operable switch is indicated at 52 and to this switch is connected a plunger 53, carrying a roller 54 which engages the cam 15, a compression spring 55 maintaining the roller 54 in contact with the cam 15 at all times. When the cam 15 reaches the approximate position in which it is shown in Figure 6 the plunger 53 and switch blade 52 are in their uppermost positions and the circuit which includes solenoid F is energized, causing an elongated flame to be projected from the nozzle 16. As soon as the cam 15 has advanced somewhat the roller 54 begins to descend and almost instantly the circuit through solenoid F is broken and a circuit which includes solenoid P is established, the flame being instantly reduced to pilot length.

As previously explained, the cam 15 is operated in synchronism with the conveyor which advances the containers and the elongated foam-consuming flame is projected only when the conveyor is stationary, all possibility of contact between the flame and any container wall being eliminated. The magnetic switch diagrammatically ilustrated at 51 in Figure 6 incudes a movable contact member 51*a* which occupies the position in which it is shown in full lines (Figure 6) when the conveyor driving motor (not illustrated) is in operation. When this motor stops the contact member 51*a* will move to the position in which it is shown in dotted lines, thus cutting out switch blade 52 and energizing the circuit which includes solenoid P, thus insuring that the pilot only is burning while the machine is inactive.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. Apparatus for dissipating foam present upon the surface of a body of liquid in a freshly charged container, comprising in combination, a downwardly directed flame-projecting nozzle an open ended tubular flame hood axially aligned with the nozzle, a gas and air mixing chamber in communication with said nozzle, ducts for gas and air respectively, leading to said mixing chamber, valves controlling the flow of gas and air through said ducts, respectively, and means for simultaneously opening and closing said valves, the flame being projected through and beyond the flame hood when said valves are opened.

2. Apparatus for dissipating foam present upon the surface of a body of liquid in a freshly charged container, comprising in combination, a downwardly directed flame-projecting nozzle, a gas and air mixing chamber in communication with said nozzle, ducts for gas and air respectively, leading to said mixing chamber, needle valves mounted for axial movement, one such valve being associated with each such duct and adapted to control the flow of gas or air therethrough, and means for simultaneously moving said valves axially.

3. The combination set forth in claim 2 in which the valves are interconnected and relatively adjustable axially.

4. Apparatus for dissipating foam present upon the surface of a body of liquid in a freshly charged container, comprising in combination, a downwardly directed flame-projecting nozzle, a gas and air mixing chamber in communication with said nozzle, gas and air ducts leading to said mixing chamber, a needle valve associated with each duct and adapted to control the flow of gas or air therethrough, two internally threaded sleeves each mounted for rotation about a fixed axis, the needle valves being externally threaded and the thread of each interengaging with the internal thread of a sleeve, and means for simultaneously rotating said sleeves.

CHARLES Z. MONROE.