

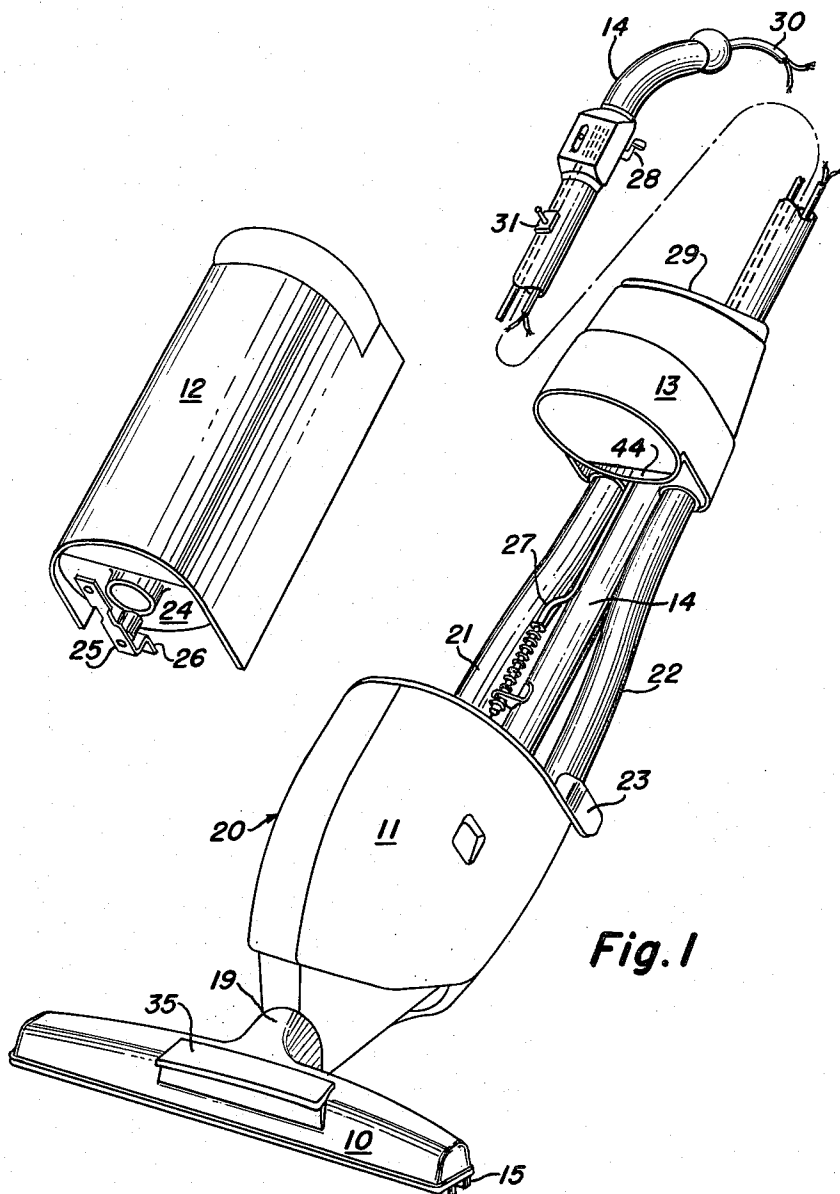
July 25, 1961

D. C. KRAMMES
SUCTION CLEANING DEVICE

2,993,223

Filed June 19, 1959

3 Sheets-Sheet 1



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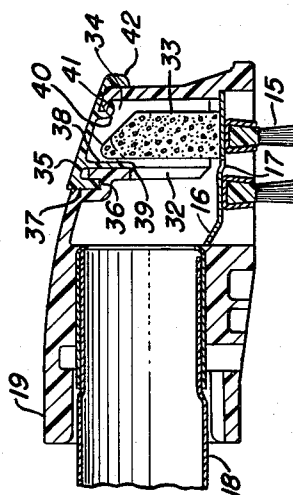
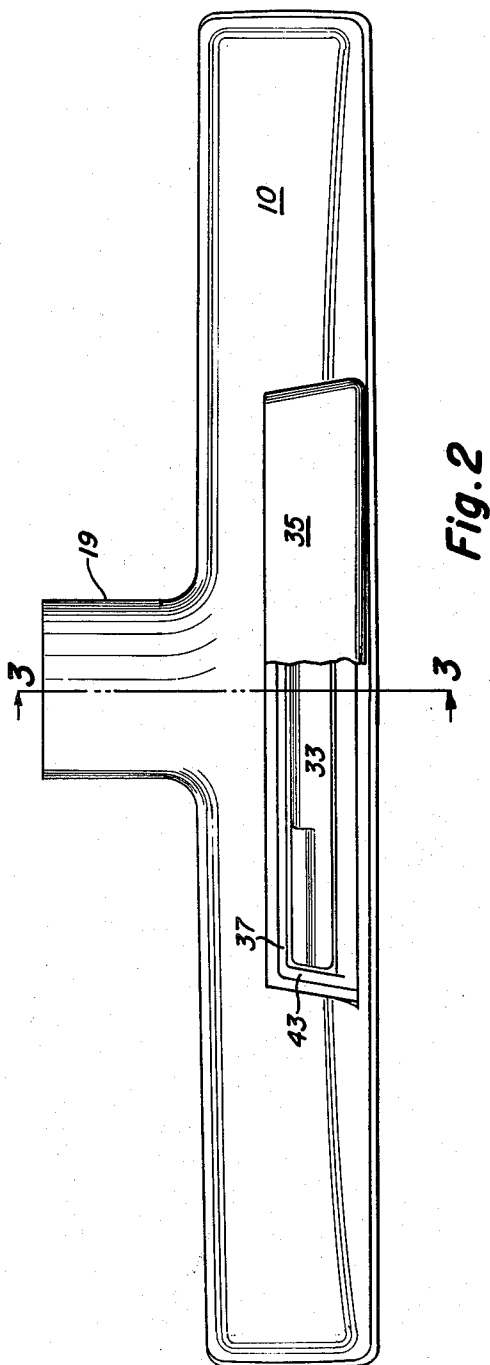
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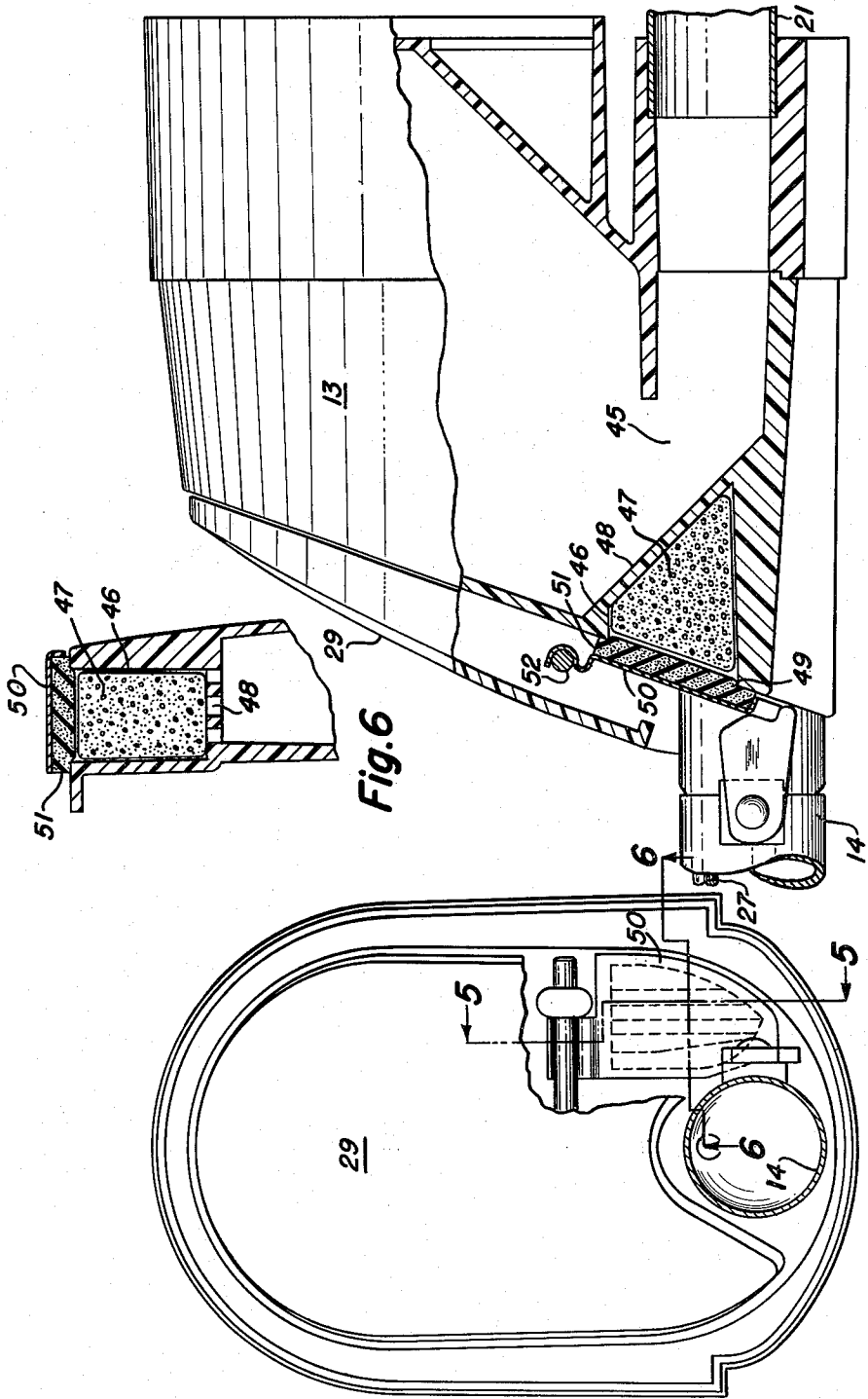


Fig. 5

Fig. 4

Fig. 6

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SUCTION CLEANING DEVICE

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6 Claims. (Cl. 15—320)

The present invention relates to a suction cleaning device and more particularly to means for inhibiting or suppressing the formation of suds or foam in a unitary floor scrubber having all of the necessary adjuncts for dispensing a clean detergent solution onto a floor or other surface to be scrubbed, for scrubbing the detergent over the floor to dissolve and loosen the dirt and grime thereon and then to dry the floor by removing the dirty detergent solution from the floor by means of a suction air stream.

In its broader sense the present invention relates to inhibiting foam or suds in a moving air stream which carries a liquid having a tendency to form foam or suds. According to the invention, that is done by means of a defoamant cake having an active defoaming agent dispersed throughout a normally solid carrier which is soluble in the liquid to be treated. The defoamant cake is placed in the moving wet air stream so that the liquid contacts the cake and slowly dissolves the carrier to slowly release the defoaming agent into the air stream and thus into contact with the liquid to be treated to inhibit the formation of foam or to suppress foam already formed.

The invention is disclosed herein as applied to a suction scrubbing apparatus which includes a scrubbing suction nozzle, a storage tank for clean detergent solution, means for dispensing the detergent solution to the nozzle, a motor-fan unit for drawing a suction on the nozzle to pick up the dirty detergent solution after the scrubbing operation, a separator for separating the dirty detergent solution from the suction air stream and a tank for receiving the dirty detergent solution from the separator.

In the machine of the present invention, the motor-fan unit is intended to be in operation at all times during operation of the machine. The suction passage of the machine is vented to atmosphere and clean detergent solution dispensed onto the floor through the suction nozzle and spread around over the floor by moving the machine about as the liquid detergent is dispensed. With the suction passage still vented to atmosphere, the detergent solution is then scrubbed about over the floor by means of the bristled suction nozzle, to loosen dirt and grime from the floor. If the floor has been waxed some of the wax may also be removed. The vent in the suction passage is then closed to cause suction to be applied at the suction nozzle whereby the dirty detergent solution is sucked up by the suction nozzle and carried by the suction air stream into the separator.

In thus scrubbing certain waxed floors, by the use of certain detergents, suds and foam tend to form in great volume which adversely affects the operation of the machine in an obvious manner.

It is an object of the present invention to prevent the formation of such foam regardless of the wax or soap combination present during the scrubbing operation.

According to the present invention, the previously described defoamant cake is placed in the detergent laden suction air stream at any point before it reaches the separator. According to the preferred form of the invention the defoamant cake is placed in the suction nozzle where it will be contacted by the dirty detergent solution carried by the suction air stream during the suction pick up or drying operation, long before it reaches the separator.

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However, according to the broader aspects of the invention, the defoamant cake may be placed at any point in the suction air stream where it will be contacted by the dirty detergent solution carried by the air stream.

Also, according to the invention, the defoamant cake may be positioned in any moving air stream which carries a potentially foaming liquid or a liquid in which a foam has already formed.

Other objects and advantages of the present invention will become apparent as the description proceeds when taken in connection with the accompanying drawings in which:

FIG. 1 is a perspective view of the appliance of the present invention with the detergent tank removed,

FIG. 2 shows the suction nozzle of the machine of the present invention partly broken away to show how the defoamant cake is positioned,

FIG. 3 is a sectional view of the nozzle of FIG. 2 taken on line 3—3 thereof,

FIG. 4 is a plan view of the top of the water separator, partly broken away, to show how a defoamant cake, according to a modification of the invention, is mounted,

FIG. 5 is a sectional view of the modification of FIG. 4 taken on line 5—5 thereof and,

FIG. 6 is a segmental sectional view taken on line 6—6 of FIG. 4.

Referring to FIG. 1 of the drawings, the scrubbing machine of the present invention includes a combined scrubber and suction nozzle 10, a motor-fan unit 11, a combined clean and dirty detergent tank 12, a liquid separator 13 and a propelling handle 14.

The nozzle 10 includes two rows of spaced apart bristles 15 which are secured to a bottom plate 16 (FIG. 3) having a narrow suction slit 17. The bristles 15 are relatively stiff and in effect form the suction mouth for the nozzle 10.

The suction tube 18 (FIG. 3) is detachably connected to the extension 19 of the nozzle by a well known bayonet connection by which the nozzle 10 may be removed by rotating it 180° and moving it axially of the tube 18.

The suction tube 18 extends through the split motor housing 20 and its upper end is connected to the wet suction tube 21. The manner in which that is done and the manner by which the suction circuit, including the separator 13, is connected to the suction side of the motor-fan unit is more clearly shown by my co-pending application Serial No. 754,093 filed August 8, 1958.

The tube 21 communicates with the upper left hand side of the separator 13 and the dry suction tube 22 connects the upper right hand side of the separator 13 to the suction side of the motor-fan unit 11, all as shown by my aforementioned application Serial No. 754,093. The interior construction of the separator is also shown in that application.

The tank 12 is clamped between the upper end of the motor-fan unit 11 and the lower end of the separator 13 by means of a clamp 23 which need not be described in detail herein.

The tank 12 forms a reservoir for the clean detergent solution and also a reservoir for the dirty detergent as it is collected. A flexible bag is removably mounted on the top interior of tank 12 and, when empty, floats on top of clean detergent. As the clean detergent is dispensed and the dirty detergent collected, the bottom end of the flexible bag moves downwardly as the level of the clean detergent is lowered so that the dirty detergent as it is collected occupies the space in tank 12 formerly occupied by the clean detergent. The arrangement is shown in my co-pending application Serial No. 652,565 filed April 12, 1957.

The bottom 24 of the tank 12 is provided with a valved opening normally closed by a spring valve 25 having an

extension 26 adapted to be contacted by a control rod 27 actuated by a control lever 28 at the top of handle 14. The lid 29 for the separator 13 is pivoted to the separator 13 at its rear end. It is opened and closed by the control lever 28. The manner by which the control lever operates to open valve 25 and to open and close lid 29 is more fully disclosed by my copending application Serial No. 753,900 filed August 8, 1958.

The machine is supplied by electric current by an electric cord 30 connected to the switch 31 and to the motor-fan unit 11 in any manner known to the art.

The handle 14 houses the control rod and the electric cord 30. It extends downwardly through a bore in the rear of the separator 13 and forms a support for that vessel. At its lower end the handle 14 is rigidly attached to the motor-fan unit and in effect forms the supporting backbone for the entire apparatus.

As shown by FIG. 3, the interior central portion of the nozzle 10 is divided into a plurality of compartments by downwardly extending spaced apart fingers 32 which form a support for a defoamant cake 33 which rests upon the bottom plate 16 in the front central portion of the nozzle 10.

The cake 33 may be inserted into the pocket 34 through an opening in the top of the nozzle 10 which is normally closed by a removable closure or lid 35 which is preferably made of flexible plastic material so as to form a good seal about the edges of the opening in the nozzle 10.

At its rear end the lid 35 is provided with a downwardly extending rib 36 which fits in a groove 37 formed in the top wall of nozzle 10. Forwardly of the rib 36 the lid 35 is formed with a plurality of locking tabs 38 having hooked ends 39 which fit between the spaced fingers 32 to hold the rear end of lid 35 in place. Adjacent its forward edge, the lid 35 is formed with a plurality of downwardly extending locking tabs 40 which fit beneath a ledge 41 of the top wall of nozzle 10. Forwardly of the tabs 40 the lid 35 is formed with a downwardly extending rib 42 which fits closely against the front wall of the nozzle 10 as shown in FIG. 3. The rib 42 serves as a hand hold for removing the lid 35 and also extends along the ends of lid 35 to fit into grooves 43 formed in the top wall of the nozzle 10 as shown by FIG. 2.

To apply the lid 35, its rear end is pressed downwardly to push the rib 36 into the groove 37 and to position the hooked ends 39 of tabs 38 in the space between fingers 32 which locks the rear end of the lid in place. The front end of the lid 35 is then pressed downwardly which snaps the tabs 40 beneath the ledge 41 to lock the lid 35 in place and form a seal about its entire periphery. That operation is easily accomplished since the lid 35 is flexible.

To remove the lid it is merely necessary to lift up on the rib 42 to release the tabs 40 from beneath the ledge 41 and to then sort of pivot or rotate the lid upwardly and rearwardly.

The defoamant cake 33 is in a stable normally solid form and comprises an active defoaming agent preferably a liquid silicone dispersed in a water soluble carrier preferably a water soluble wax. An emulsifying agent for the silicone is also preferably dispersed in the wax along with the silicone so as to be in contact therewith.

The soluble wax is slowly dissolved or eroded away upon contact with water so as to expose the silicone and emulsifier whereupon the silicone thus exposed immediately forms an emulsion with the water to thus release the active defoaming agent.

It is to be noted from FIG. 3 that the defoamant cake 33 is positioned above and adjacent to the suction slit 17 and that the fingers 32 are positioned to the rear of the slit 17. Thus as liquid and air are drawn upwardly at a comparatively high velocity, the liquid will be splashed about and come into contact with the defoamant cake 33.

Operation of FIGS. 1-3

The motor-fan unit 11 is energized by actuation of the switch 31. The control lever 28 is then actuated to open lid 29 and vent the suction line and to open the valve 25 and dispense clean detergent solution onto the floor. The detergent solution may be spread about by moving the machine about and spreading the solution by means of the bristles 15.

The control lever 28 is then actuated to close valve 25 while the lid 29 remains open so that no suction will be applied at the nozzle 10. The machine is then vigorously moved about and the bristles 15 applied to the floor to scrub the detergent solution about to loosen dirt and grime and dissolve it into the solution.

After the floor is thoroughly scrubbed the control lever 28 is actuated to close the lid 29 so that the suction of the motor-fan unit is applied at the nozzle 10. The bristles 15 will form a narrow suction mouth and the dirty solution will be drawn beneath the lower ends of the bristles 15 and through the end openings. The suction applied to the area between the two rows of bristles will lift the dirty solution from the floor into the suction air stream.

As the mixed air and dirty detergent solution passes through the suction slit 17 its velocity will be increased and it will be projected upwardly into the interior of the nozzle 10. The machine of the present invention, under such conditions, handles 18 cubic feet of air per minute and will normally pick up from 165 to 195 c.c. of dirty solution per minute.

The detergent solution is a solution of soap in water which tends to form foam and suds. As the mixture of detergent, air and water is projected through the suction slit 17 it is splashed about and the water comes into contact with the defoamant cake 33 and slowly dissolves or erodes away the soluble wax carrier to expose the active defoaming agent in contact with the emulsifier which immediately forms an emulsion of the silicone with the water and suppresses any foam present or inhibits the formation of foam if none is present.

After leaving the nozzle 10, the mixture of air, water, soap and emulsified defoamer passes through suction tube 18, the wet suction tube 21, the separator 13 and the dry suction tube 22 to the eye of the motor-fan unit 11. In the separator 13 the dirty detergent solution is separated from the suction air stream and drips through opening 44 into the dirty detergent bag in the top of tank 12. Should the suction air stream contain foam or suds as it enters the separator 13 it would soon render that vessel inoperative and at least a portion of the dirty detergent solution would be carried over to the motor-fan unit 11 and eventually flow back onto the floor.

That is prevented by the action of the defoamant cake in suppressing foam already formed and in inhibiting the potential formation of foam in the suction air stream.

When the defoaming effectiveness of the defoamant cake has been substantially reduced it is replaced by another similar defoamant cake as explained above.

It is to be understood that it is not essential that the components of the defoamant cake be those above described but that any active defoamant may be used dispersed in a water soluble carrier. The defoamant described above is one that has been found to be very effective and long lived in the machine according to the present invention.

FIGS. 4 to 6 disclose a modification of the invention applied to the same general type of machine as that of the first modification but in which the defoamant cake is positioned in the suction air stream at a point just before it enters the separation chamber of the separator 13.

As shown by FIG. 5 the wet suction tube 21 communicates with the interior of the separator 13 by means of an inlet passage 45 in the side wall of the separator 13. Immediately above the opening 45 is a pocket 46 for receiving a defoamant cake 47. The walls forming the

bottom of pocket 46 are provided with numerous openings 48 through which water from the suction air stream is projected before it enters the interior proper of the separator 13.

The pocket 46 is provided with an access opening 49 5 closed by a door 50 having a sealing member 51 which seals the interior of pocket 46 against air leakage when the door 50 is closed.

The door 50 is located beneath the separator lid 29 and the pad 51 is held in sealing engagement with the 10 edges of opening 49 by the pin 52 pressing downwardly on lid 50 when the separator lid 29 is closed during the suction pick-up periods, which is the only time a seal need be provided.

The lid 50 may be raised for the replacement of the 15 defoamant cake 47 by first opening the separator lid 29 and then removing the lid 50.

Operation of FIGS. 4-6

The operation of the machine is carried out in the 20 same manner as before. As the mixture of air, water and detergent leaves the upper end of pipe 21 it is moving at quite a high velocity and the water and detergent droplets are impinged against the bottom wall of the pocket 46 and some of the water droplets will pass 25 through the openings 48 into contact with the defoamant cake 47 and slowly dissolve or erode it to release the active defoaming agent into contact with the water to suppress any foam already present and to inhibit foam- 30 ing in the separator 13.

From the foregoing it can be seen that the present invention provides a simple and inexpensive way by which foaming and suds forming in an air stream carrying a liquid having an inherently foaming characteristic may be suppressed and/or inhibited.

It can also be seen that the present invention provides 35 a scrubber and suction pick-up drier having a suction air stream carrying a mixture of air, detergent and water with a simple way by which any foam formed will be suppressed and any incipient tendency for foam to form 40 will be inhibited.

While I have shown and described but two embodiments of my invention it is to be understood that those 45 embodiments are to be taken as illustrative only and not in a limiting sense. I do not wish to be limited to the particular structure shown and described but wish to include all equivalent variations thereof except as limited by the scope of the claims.

I claim:

1. A detergent solution pick-up appliance comprising, a suction nozzle, suction creating means, means forming a suction flow path between said nozzle and said suction creating means, said suction nozzle being formed to pick up detergent solution in the air stream flowing therethrough whereby a mixture of air and detergent solution enters said air flow path through said nozzles, a liquid separator in said suction flow path for removing said detergent from said mixture, and a foam inhibitor in said air flow path ahead of said separator and positioned for contact with said mixture, said inhibitor being in the form of a body including an active defoaming agent dispersed in a normally solid water soluble carrier whereby said active defoaming agent is released as said mixture contacts said body to dissolve said carrier.

2. An appliance according to claim 1 in which said foam inhibitor body is positioned in said air flow path where said mixture is flowing at a high velocity so as to impinge against said body to aid in the release of said active defoamant.

3. An appliance according to claim 1 in which said body is positioned in said nozzle immediately above its entrance in a position to be contacted by said mixture as it enters said nozzle.

4. An appliance according to claim 3 in which said body is positioned in a pocket in said nozzle and a removable closure for said pocket for ready access to said body.

5. An appliance according to claim 1 in which said body is positioned in said air flow path at the entrance to said separator.

6. An appliance according to claim 5 including a receiving pocket formed in the wall of said separator in 35 which said body is positioned for contact with said mixture before it enters said separator and a removable closure for said pocket for ready access to said body.

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