May 10, 1938. L. ROUSH ET AL 2,116,541

METHOD FOR AERATING LIQUIDS

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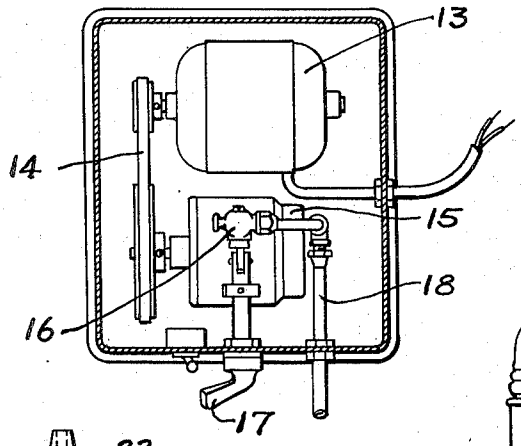
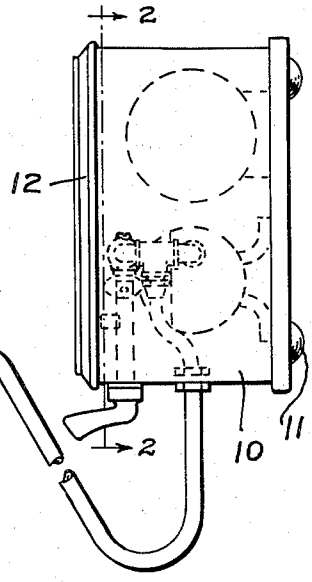


Fig. 2



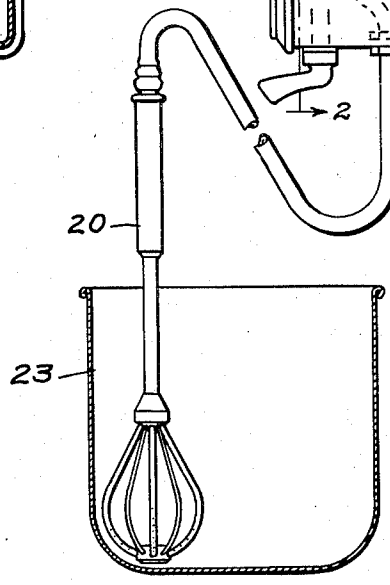


Fig. 1

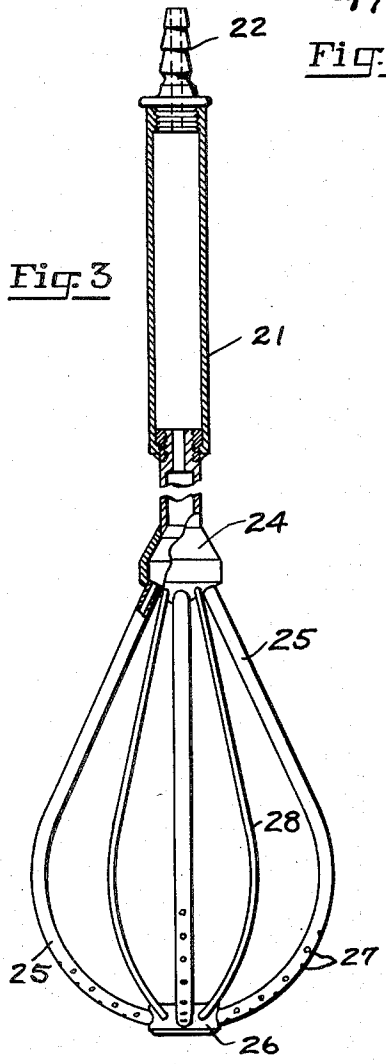


Fig. 3

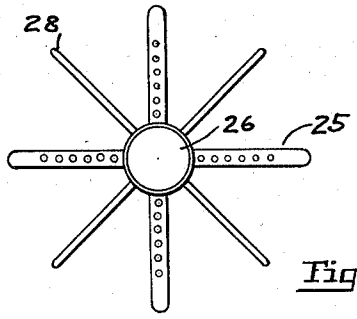


Fig. 4

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METHOD FOR AERATING LIQUIDS

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5 Claims. (Cl. 99—60)

This invention relates to the aeration of liquids, and more particularly to the aerating or whipping of cream.

It is the principal object of the invention to provide a simple and effective method of introducing air into the liquid in minute streams of finely divided bubbles; and to provide simple and effective apparatus for carrying out such method.

Other objects and advantages of the invention will be apparent from the description and claims set out below, and from the accompanying drawing.

In the drawing, in which like characters indicate like parts throughout the several views thereof,

Fig. 1 is a view in elevation of apparatus constructed and arranged for carrying out the method of the present invention;

Fig. 2 is a sectional view of a portion of the apparatus on the line 2—2 of Fig. 1;

Fig. 3 is an enlarged elevational view of another portion of the apparatus, parts being broken away to more clearly show the construction thereof; and

Fig. 4 is an end elevational view of the device shown in Fig. 3.

In Patent No. 1,852,267 issued to Lee Roush and assigned to the same assignee as this application, there is shown an apparatus and method adapted for producing whipped cream, in which air is passed under pressure through the interstices in a porous stone to introduce the air into the liquid in minute streams of finely divided bubbles. It has been found, as part of the present invention, that if the air is caused to escape through openings in a movable member while the member is moved so as to suitably accelerate the separation of the bubbles as the air escapes, a suitably fine division of bubbles into such minute streams of finely divided bubbles can be secured without the necessity of having the openings of such minute size, especially where the openings are arranged so that the movement of the perforated member additionally helps to accelerate fine bubble formation.

The drawing discloses a form of apparatus which lends itself quite satisfactorily to this suitably fine bubble formation. In the embodiment of the invention thus illustrated, there is shown a housing 10 supported upon resilient supporting members 11 and having a removable cover portion 12. The housing is preferably substantially rectangular in form and within the housing there is positioned an electric driving motor 13. The motor is mechanically coupled by means of a belt drive 14 to an air pump 15. The air pump may be of any suitable construction such as to supply air under suitable pressure for use in the aerating process. The outlet of the pump is provided with a control valve 16 having an extended operating handle 17 positioned on the exterior of the housing 10, air being supplied under controlled pressure to a conduit 18. The conduit 18 extends through the housing 10 and is formed of suitable flexible material to provide for the ready manipulation thereof.

An air distributing structure indicated generally at 20 is attached to the conduit 18, such distributing means comprising a non-flexible supporting tube 21 having a tapering connection 22 for removably receiving the end of the flexible conduit 18. The supporting tube 21 is of sufficient length to permit its being grasped in the hand of the operator, and also extends downwardly into a container indicated at 23. Adjacent the lower end of the tube 21 there is positioned an air distributing frame comprising an enlarged head portion 24 within which are fastened a plurality of curved tubular members 25 which are in communication with air tube 21. The members 25 are fastened together at their lower ends in a connecting member 26 and are preferably curved to conform substantially to the inner wall surface of the container 23 with which they are to be used so that the structure may be made to approach the side and bottom walls of the container closely, leaving no inaccessible areas.

Adjacent their lower ends the tubes 25 are provided with a series of holes 27 from which the air is adapted to be introduced into the body of the liquid within the container 23, the arrangement of the openings in the walls of the tubes 25, and their sizes in coordination with air pressure, being such that as the tubes are moved through the cream the escaping air is caused to form into bubbles of smaller size than would be true if the tubes were stationary. That is, as the tubes move the forming bubbles are separated more quickly from the issuing stream of air than would otherwise be the case—the effect of the movement being to accelerate the tendency of the air in the cream to form into separated bubbles so that finer bubbles result. The frame structure is also provided with stirring arms 28, spaced alternately with the tubular members 25, to provide additional stirring action during the use of the device.

The operation of the device is as follows. A liquid to be aerated is placed in the container 23,

and the motor 13 is started to drive the air pump and to supply air under pressure to the air distributing means 20. The air distributing means is then placed in the body of the liquid, the tubular members 25 being moved closely adjacent the bottom of the container, and air introduced from the perforations 27 into the body of the liquid. During the supplying of air thereto, the air distributing structure 20 is moved manually throughout the body of liquid, such movement being highly effective to accelerate the bubble separation in the aerating process. Air supplied under pressure to the tubular members is discharged from the perforations thereof, the perforations effecting an initial control over the size of the air streams. It is thus found to be unnecessary to form the perforations of minute size approximating the dimensions of the fat globules, as the desired minute streams of finely divided bubbles, such as those disclosed in the above referred to Roush patent, are produced in accordance with the present invention as a result of the movement of the tubular members through the liquid during the aeration process. The movement of the tubular members effects a snapping off of the individual bubbles before they have had an opportunity to become objectionably large, and consequently a series of these minute bubbles is formed. This operation has been found quite effective to produce aeration of a liquid, such for example as in the whipping of cream, and effects such aeration in an extremely simple manner. The formation of the structure provides for its close approach to the walls of the container so that there is no body of untreated or unwhipped cream.

Control of the aeration process is afforded by means of the air pressure control handle 17, providing for the supplying of controlled air pressure to the air distributing means. Further control also results from the rate of movement of the air distributing means through the liquid, more rapid movement tending to cause the production of bubbles of smaller size.

While the process and apparatus herein described constitute preferred embodiments of the invention, it is to be understood that the invention is not limited to this precise process and apparatus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. Process of aerating a liquid footstuff, such as the whipping of cream which comprises introducing air into the liquid in streams of predetermined small size, and simultaneously effecting relative movement between the liquid and said streams to effect control of the formation of bubbles and to introduce the air into the liquid in minute streams of finely divided bubbles capable of effecting the desired whipping action themselves, the movement being incapable of effecting a whipping action.

2. Process of aerating a liquid foodstuff, such as the whipping of cream, comprising introducing air into the liquid foodstuff in fine streams at a plurality of points in the liquid spaced over a substantial area of the container and closely adjacent the bottom thereof, and producing movement of the liquid relative to said fine streams such as to carry the fine streams into the entire body of the liquid and to accelerate the tendency of the fine streams to form into minute streams of finely divided bubbles, the movement itself being insufficient to effect the whipping action.

3. Process of aerating a liquid foodstuff, such as the wripping of cream, comprising introducing air into the liquid in fine streams from an air distributing member, and moving the member slowly throughout the body of liquid to accelerate the tendency of the fine streams to form into separate minute bubbles and to effect complete aeration of the entire body of liquid, the movement being so controlled as to avoid substantial mechanical aeration or whipping.

4. Process for the aeration of liquid foodstuffs, such as the whipping of cream, which comprises supplying air under pressure to an air distributing member located within the liquid adapted to distribute air in fine streams, and simultaneously moving said air distributing member through the liquid at a controlled rate to accelerate the tendency of the air streams to form into separate finely divided bubbles capable of producing aeration of the foodstuff by themselves, the movement being sufficiently slow so that no substantial mechanical aeration or whipping occurs.

5. Process for the aeration of liquid foodstuffs, such as the whipping of cream, which comprises introducing air into the liquid in streams of predetermined size from an air distributing member located within the liquid, and effecting a slow relative movement between said member and the liquid such that no substantial mechanical aeration is produced, said movement providing for reducing the size of the formed bubbles to such fine size that the whipping action is produced by the bubbles themselves.

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