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EMULSIFIER

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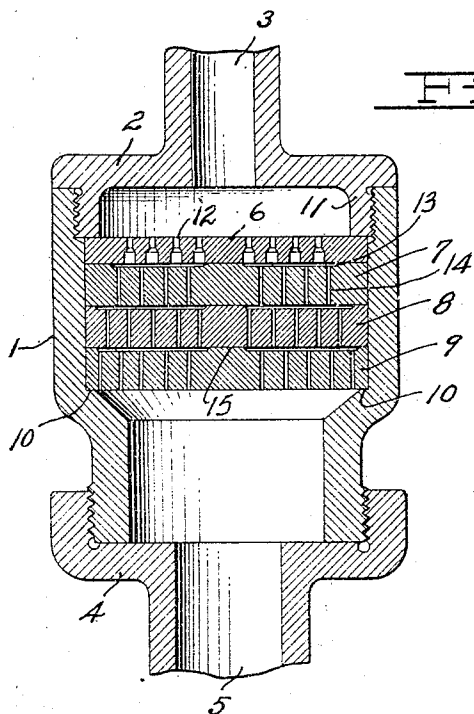


Fig. 1.

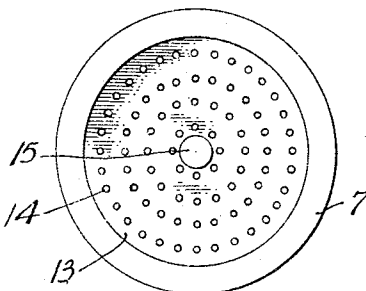


Fig. 3.

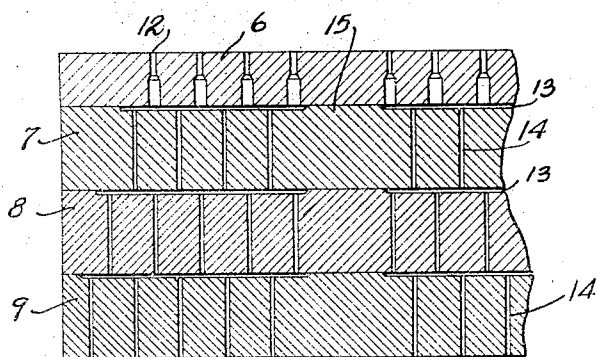


Fig. 2.

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EMULSIFIER

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3 Claims. (Cl. 99-265)

This invention relates to emulsifying heads, and the purpose of the invention is to provide a means for emulsifying various liquids and is particularly adapted for the emulsification of milk to provide a product that is stable in that the butter fat does not separate from the body of the liquid in the form of a coagulated mass.

Various means have heretofore been devised for this general purpose and usually are of a form in which the liquid is forced between closely opposed surfaces to cause the liquid to flow in thin film and are somewhat ineffective due to the fact that fat globules are merely flattened and not disrupted.

The object of this invention is to provide a device in which the liquid that is to be emulsified is forced under pressure in very fine streams, which streams in their progress through successive sections of the device discharge against flat surfaces and change in the direction of flow to again pass in fine streams to discharge against another flat surface and again change in direction of flow to thereby secure what may be termed a "bombardment" of the liquid constituents to cause a practically complete disruption of fat globules.

A feature of this invention resides in the provision of a series of finely apertured plates through which the liquid is passed in succession and this liquid assembles in a thin film between the plates, as is provided for by the construction of the succeeding plates, and is there changed in its direction of flow to again pass through a second and succeeding series of films and streams to finally discharge in emulsified condition from the device.

It is also a feature and object of the invention to provide a comparatively inexpensive mechanical structure for producing the above described results.

The preferred form of the device embodying my invention is shown in the accompanying drawing in which—

Fig. 1 is a cross sectional view of an emulsifying device embodying my invention.

Fig. 2 is an enlarged section of a series of plates showing the relationship of the apertures in and recesses between the successive plates forming the flow path of the liquid.

Fig. 3 is a plan view of one of the recessed plates.

In Fig. 1 is shown an emulsifying head embodying my invention which comprises a hollow body 1, a cap 2 at the upper end having a conduit like portion 3 providing an inlet to the body

through which fluid may be introduced. The body also has a cap member 4 at the discharge end having an outlet conduit 5 for the emulsified liquid. The cap 2 is threaded into the upper end of the body to engagement with the end plate 6 of a series of plates 6, 7, 8 and 9 but the number of plates may be even more or less than what is here shown, more being required for such liquids as are more difficult to emulsify. The plate 9 at the outlet end of the body rests on a ledge 10 of the casing and the cap member 2 has a threaded flange 11 engaging the plate 6 at the inlet end by means of which portions of the surfaces of the plates are held in pressure contact for which purpose these plates are provided with finished contacting surfaces to prevent a flow of fluid between the same.

The end plates 6 and 9 are respectively spaced from the inlet and outlet openings of the body providing an inlet and an outlet chamber. The end plate 6 of the series has a series of fine apertures 12 preferably regularly arranged in concentric circles and opening through the upper surface of the plate 6 and these apertures below the upper surface open through the bottom surface of the plate by a larger diameter portion as is shown in the sectional view Fig. 2. The second plate 7 and the succeeding plates have a ring like recess 13 in the upper face thereof and thus liquid which is forced under pressure from the inlet conduit 3 into the device passes through the apertures 12 and then into a recess in the face of the next plate when the streams unite in a thin film. The plate 7 and the succeeding plates having the similar recesses 13 in the upper faces also have fine concentrically arranged apertures 14 extending through each of the plates and the succeeding plates are so located in respect one to the other as to offset or misalign the apertures—that is, the apertures 12 of the plate 6 discharge streams of liquid against the second plate between apertures 14 thereof. By this arrangement, the fluid cannot pass in continuous streams through the device but in passing through the plate 6 into the recess 13 of the plate 7 are required to flow at a right angle to the direction in which the fluid is flowing in the apertures of the plate 6 and then again change and flow at a right angle to the direction of flow in the recess 13 of the plate 7 to a similar recess in a succeeding plate and this right angled change in direction of flow is rapid in the passage of liquid through the series of plates.

It is to be noted that, as the fluid passes through the apertures 12 of the plate 6, they

strike against the flat face of the succeeding plate 8 and this provides what I have termed a "bombardment" of the liquid in discharging through the successive plates. The succeeding plates and the form and relationship thereof therefore first force the fluid into very fine streams in which the fat globules are to some degree disrupted and to some degree elongated and then they pass under pressure into the recess 13 which changes their direction of flow abruptly and tends to cause disruption of fat globules. This is repeated a number of times to complete the breaking up of the fat globules and consequent emulsification of the liquid.

15 In the preferred construction of the device, the apertures 12 in the plate 6 at the entrance end are about .020 of an inch in diameter and the apertures through the remaining plates of the series are approximately of the same diameter and while here shown as being of uniform diameter through the plates 7, 8 and 9, they may be enlarged at the discharge end if desired after the manner shown in plate 6. The plates 7, 8 and 9 are recessed in their upper surfaces to a depth 25 of five to seven thousandths of an inch and provide for quite minute streams of fluid passing through the plates and a very thin film of fluid between successive plates wherein bombardment takes place as well as a change in direction of 30 flow. The recesses are preferably ring like in form having a central portion 15 in the same plane as the peripheral portion of the plate. The recessed plates thus support the contacting plate peripherally and centrally.

35 From the foregoing description, it is believed evident that the device is of simple and inexpensive character and may be varied in size to correspond with the amount of liquid to be discharged to the device per unit of time and that the various features and objects of the invention 40 are attained by the structure described.

Having thus briefly described my invention, its utility and mode of operation, what I claim and desire to secure by Letters Patent of the United States is—

45 1. An emulsifying head comprising a chambered member having an inlet and an outlet, a series of metal plates arranged in succession in

surface contact in the chambered member, all the plates having apertures extending therethrough at a right angle to their contacting surfaces and with the apertures of one plate out of alignment with apertures of the succeeding plate, 5 each of the plates, except the first, having the face thereof in contact with a preceding plate recessed slightly whereby the streams discharging through a preceding plate strike against an impervious surface and then change in direction of 10 travel in a thin film under pressure to pass through the apertures of the recessed plate.

2. An emulsifying head comprising a chambered member having an inlet and an outlet, a series of plates secured in surface contact therein with the end plates thereof in spaced relation 15 respectively with the inlet and outlet, each of the said plates having a series of small diameter apertures therethrough and so arranged that the apertures of one plate are out of alignment with 20 those of a succeeding plate, each of the plates, except the first, having a shallow recess in its surface toward the inlet side of the chamber providing a construction in which the liquid passes in a series of minute streams to each of the recesses in succession wherein the streams unite in a thin film and discharge therefrom through the 25 apertures of the plate.

3. An emulsifying head comprising a chambered member having an inlet and outlet, a series 30 of metal plates therein arranged in succession in surface contact, all of the plates having apertures extending therethrough at a right angle to the contacting surfaces with the apertures of successive plates respectively out of alignment, means 35 for supporting the plates in pressure contact, the two end plates of the series being spaced respectively from the inlet and from the outlet providing chambers on the respective inlet and outlet sides, the face of each plate in contact with 40 the other having recesses of ring like form providing a central and a peripheral portion for contact with the preceding plate, said apertures and the recesses of the plate functioning to cause an abrupt change in the direction of flow of 45 liquid through the device to thereby emulsify the liquid passing to the outlet.

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