

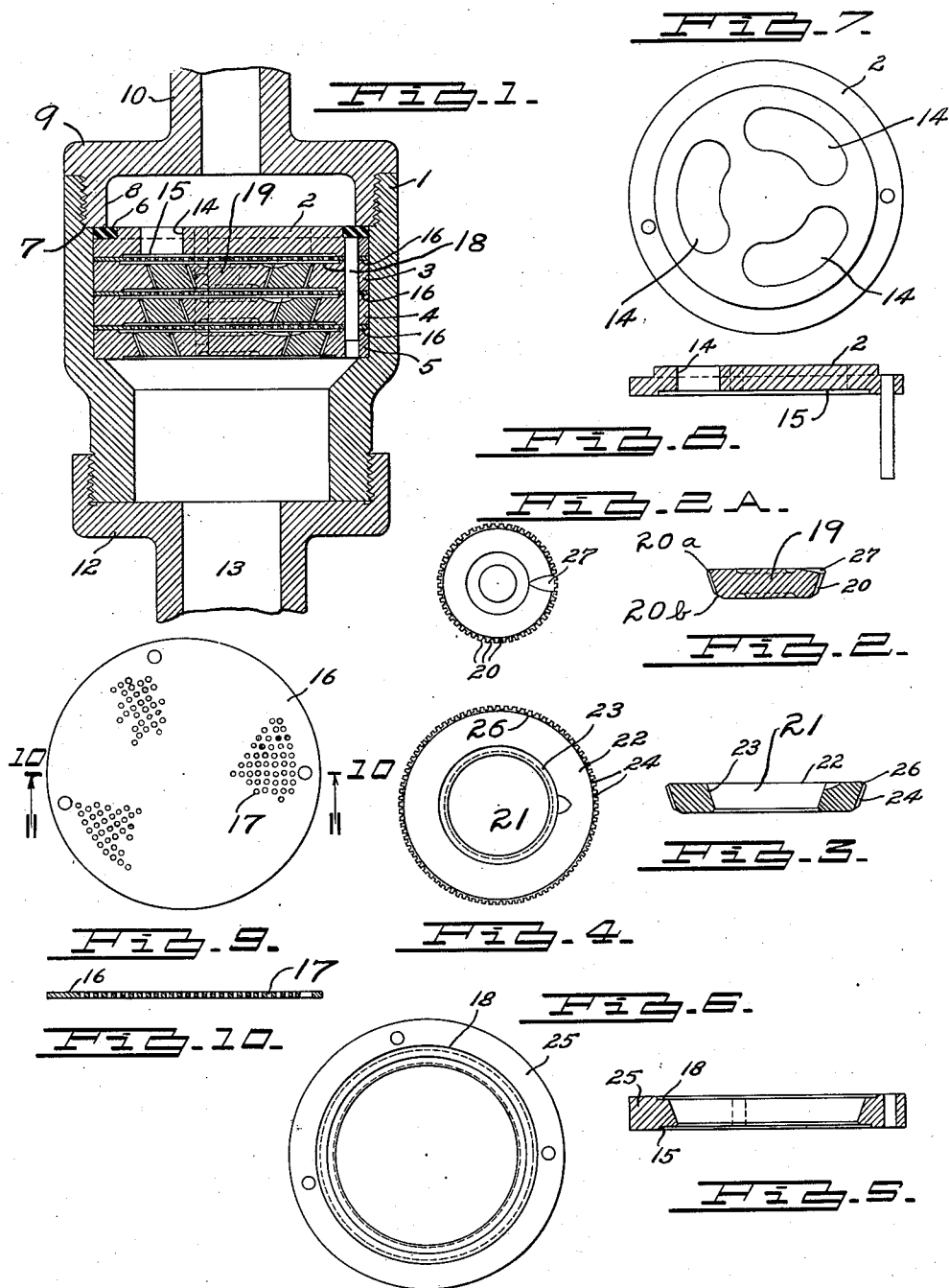
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HOMOGENIZING HEAD

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HOMOGENIZING HEAD

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This invention relates to homogenizing or emulsifying heads, the purpose being to provide a new and improved means for emulsifying or homogenizing various liquids and is particularly adapted for the treatment of milk to produce a lacteal liquid in which the butter fat does not separate from the body of the milk to a material degree.

Apparatus has heretofore been used for this purpose wherein liquid is forced in a thin film between opposed surfaces in which the fat globules are not disrupted but are merely elongated.

An object of this invention is to provide a device through which the liquid to be homogenized is forced under pressure in very fine streams which strike opposed surfaces and are changed in direction of flow through a successive series of elements shaped to provide the necessary passageways and spaces between the elements through which the liquid passes.

It has heretofore been common to provide plates having small apertures through which the milk or liquid under treatment is passed under pressure but such devices are unsatisfactory in use due to the difficulty in cleaning the apertures.

A feature of this invention resides in the provision of a structure which includes a series of composite plates each having an imperforate central portion, an imperforate ring member having a central aperture and an imperforate outer ring, the wall of the apertures in the outer and inner rings being a smooth tapered or cone surface and the periphery of the central member and of the inner ring being formed on a similar taper and provided with a series of fine grooves and fitting the cone surfaces of the respective outer and inner rings and providing apertures lying at a comparatively acute angle to the face of the respective plates. The successive plates have a greater thickness at the periphery than the thickness of the grooved members thereby providing spaces between the plates when assembled, the arrangement of the apertures, plates and spaces providing tortuous passageways and functioning to elongate, contract and bombard fat globules all as is hereinafter described.

These and various other objects and features of the invention are hereinafter more fully described and claimed, and the preferred form of construction of a device embodying my invention is shown in the accompanying drawing in which—

Fig. 1 is a vertical section of an emulsifying device embodying my invention and showing the

series of plates with the ribbed peripheries providing the passageways for the fluid through the head.

Fig. 2 is an edge elevation of the central coned element showing the grooved periphery.

Fig. 2^a is a plan view thereof.

Fig. 3 is a cross section of the ring element having the grooved tapered edge surface.

Fig. 4 is a plan view thereof.

Fig. 5 is a cross section of the outer ring for receiving the grooved element of Fig. 3.

Fig. 6 is a plan view of the outer ring of Fig. 5.

Fig. 7 is a plan view of the first plate of the series.

Fig. 8 is a cross section thereof.

Fig. 9 is a plan view of an apertured separator used between the plates.

Fig. 10 is a cross section thereof on line 10—10 of Fig. 9.

In Fig. 1 is shown the complete emulsifying head which consists of a body 1 in which is provided a series of plates 2, 3, 4 and 5. The upper end of the casing 1 has an annular recess 7 threaded to receive the threaded flange 8 of a cap 9. The flange 8 is wider than the recess of the body in which it is secured and overlies the periphery of a gasket 6 which, as shown in Fig. 1, rests on a peripheral flange of the plate 2. The body is also provided in its mid section with a ledge on which the bottom plate 5 of the series rests and by screwing the cap member in place, the plates are held in pressure contact. The cap member is provided with a central portion 10 with which a conduit may be connected with a source of supply of liquid to be treated and the bottom end of the casing is also threaded to receive a cap 12 having a discharge channel 13 for the treated liquid.

As shown in Fig. 1, the upper plate 2 of the series has a flange of less thickness than the body on which is supported a gasket 6 with which the flange 8 of the cap contacts and this plate 2, as more particularly shown in Fig. 7, has a series of large apertures 14 therein providing for a comparatively free passage of liquid from the inlet through the first plate. The under side of the first plate is recessed as at 15 and when in the assembled relation shown provides for a thin film of liquid distributed over the surface of the second plate 3 of the series which is recessed in both its upper and lower faces. Between these two plates is a thin metal separator 16 which has apertures 17 therein. Thus the liquid passing through the plate 2 may pass through the plate and into the recess 18 on the

upper surface of the composite plate 3 and is distributed in a thin film on the upper surface thereof prior to passing through the plate.

Each composite plate of the series consists of
 5 a central member 19 shown in Fig. 2 in section and is circular in form as shown in Fig. 2^a. This central plate 19 is preferably cone shaped as shown and is formed with a series of grooves 20 in its tapered face in planes parallel with the
 10 axis of the plate. The upper and lower edges of the central member 19 are also inwardly tapered at a comparatively sharp angle to the taper of the grooved face as indicated respectively at 20^a and 20^b.

15 The central member 19 fits the central aperture 21 of a ring member 22 and has a smooth coned surface 23 against which the grooved face of the member 19 engages. The periphery of the member 22 is also grooved as indicated at 24 in the same manner as the central member 19. The
 20 upper edge of the member 22 is likewise inwardly tapered as indicated at 26. The ring member 22 fits in an outer ring 25 which has a cone faced aperture providing a smooth surface against
 25 which the grooved face 24 of the ring member 22 fits. The outer ring member 25 is recessed at its surface as indicated at 18 in Figs. 1 and 5. The composite plate 3 thus consists of the member 19 and the apertured ring member 22 to receive the
 30 same, both of which are of the coned form and grooved at the periphery and these in turn are supported by the ring member 25. The composite plates 4 and 5 are duplicates of the plate 3
 35 and between each of the plates is provided the apertured separator member 16. The upper plate and the outer ring member of composite plates 3, 4 and 5 have three apertures that are aligned and the upper plate may carry at least two rods
 40 which extend through apertures in the outer rings of the composite plates to hold the same in their proper relationship when the parts are assembled as indicated in Fig. 3. A pin (not shown) may be secured in the third aperture of the plate
 45 4 and project beyond the plate surface into the corresponding third apertures of the plates 3 and 5.

Due to the members 19 and 24 having the upper faces coned at the edges, there is a groove 26 and
 50 another groove at 27 at the upper face of the plate which fill with the liquid from the recess 15 for instance, in the plate and from which the liquid passes into the passageways formed by the grooves in the plate portions 19 and 22 of Figs.
 55 2 and 3. Each of the plates 3, 4 and 5 are, as previously stated, of similar construction and fluid entering through the plate 2 and separator 11 to the recess 18 is spread in thin film and passes through the small grooves under high pressure
 60 thereby elongating the fat globules and these again pass into the space between the separator 16 and the under surface of the plate 3 and thence through the separator and to the upper recess in the plate 4, thence through the grooves in the
 65 said plate 4 and likewise through the next plate of the series of which there may be more in number than are here shown. Thus in passing from the inlet to the outlet of the head, the fat globules of the liquid are caused to be stretched in passing
 70 through one plate to the next striking the surface of the separator and there spread in a recess permitting the fat globules to re-form and to again go through the same procedure of elongation,
 75 contraction and bombardment in the striking of

the plate surfaces until the fat globules are so broken up as to form a homogeneous mass.

The apparatus, while useable with any liquids requiring to be homogenized, is of particular importance in the homogenization of lacteal liquids,
 5 particularly milk in which, after treatment, the butter fat particles do not coalesce to such degree as to be separately distinguishable from the other elements of the liquid body.

From the foregoing description, it will be realized that the principal object of the invention
 10 resides in the plate formed of at least two separable parts occupying substantially the same plane and contacting faces of the parts which are so complementally formed that, when assembled,
 15 provide apertures or passages for liquid; that the said contacting surfaces, when the parts are separated, are so exposed as to be readily cleaned as by brushing thus avoiding the difficulties encountered in cleaning the plates hereto-
 20 fore utilized having holes in the body of the plate which, due to the small diameter of the holes, are difficult if not impossible to thoroughly clean, and it is also believed evident that the various other objects and features of the invention herein
 25 disclosed are attained by the structure described.

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

1. In a device for homogenizing liquids, a composite plate having a central disk formed with a series of transverse grooves in its periphery, a ring having an aperture, the wall defining the
 35 aperture being smooth surfaced to receive the central disk and the periphery of the ring being transversely grooved, and a holder for the ring comprising a second ring having an aperture with a smooth surfaced wall against which the grooved
 40 periphery of the first ring seats, the parts, when assembled, providing apertures formed by the ribs between the grooves in contact with the respective seats for the members having the grooves.

2. In a device for homogenizing liquids, a composite plate having a central disk of coned form
 45 and provided with a series of transverse grooves in its periphery occupying planes parallel with the disk axis, a ring having a coned aperture, the wall of which is smooth surfaced and providing a seat for the central disk, the periphery of
 50 the ring being of coned form and transversely grooved in planes parallel with the axis, a second ring having an aperture with a smooth surfaced wall providing a seat for the grooved periphery of the first ring, the parts, when assembled, providing apertures formed by the grooves.

3. In a device for homogenizing liquids, a housing having an inlet and an outlet, a series of plates supported in the housing including at least two
 60 composite plates, each comprising a central disk and two concentric rings in separable relation, the periphery of both the central disk and the inner ring being formed to provide grooves in a plane substantially parallel with the axis of the disk, the wall of the ring against which the
 65 central disk seats and of the second ring against which the periphery of the first ring seats being substantially smooth surfaced and providing apertures through the plate, at least one of the plates having a recess in its surface contiguous
 70 to the surface of the other disk into which the liquid from the apertures passes and spreads as a film prior to passing through the apertures of the next disk.

4. In a device for homogenizing liquids, a se- 75

ries of composite plates, a housing therefor in which the plates are held in parallel relation and from relative displacement, each composite disk comprising a central disk having a cone shaped periphery, a ring having a central coned seat for the central disk and a coned periphery, and a second ring having a coned seat for the periphery of the first ring, the peripheries of both the central disk and first ring being grooved transversely in planes parallel with the axis of the disk and the bases of the cone shaped elements being toward the inlet whereby liquid passing under pressure through the disks maintains the said parts of each disk in their stated relationship, the contiguous faces of the disks being recessed and the assembled disks providing a means for successively separating the liquid into fine streams combining in liquid bodies between the disks as it passes through the several disks of the series.

5. In a device for homogenizing liquids, a housing having an inlet and an outlet, a series of plates supported in the housing including at least two composite plates, means for holding the plates in a relatively fixed relation, each of the plates comprising a central disk and two concentric rings in separable relation, the periphery of both the central disk and of the first ring being of the form of a truncated cone with the bases thereof toward the inlet side of the housing, the first ring of each plate having a smooth surfaced cone seat for the central disk and the second ring having a similar cone seat for the periphery of the first ring, the periphery of the central disk and of the first ring being formed with grooves in planes parallel with the common axis of the assembled plates and providing apertures through which liquids may pass through the plates in succession, the two series of apertures of a preceding plate being respectively aligned with an imperforate portion of the succeeding plate and the surface of each plate on the discharge side being recessed whereby liquid passing through the apertures of the first plate is formed in a film prior to passing through the apertures of the second plate whereby the butter fat globules are first elongated and then permitted to re-form and are again elongated in succession.

6. In a device for homogenizing liquids, a housing having an inlet and an outlet for liquid, a series of plates supported in the housing, means for holding the plates in a relatively fixed relation, each of the plates comprising a central disk and two concentric rings in separable relation, the periphery of both the central disk and the first ring being of the form of a truncated cone with its base toward the inlet side of the housing and the first ring having a central smooth surfaced coned seat for the central disk

and the second ring having a similar coned seat for the periphery of the first ring, the peripheries of both the central disk and the first ring being formed with grooves in planes parallel with the common axis of the assembled plates and providing apertures through which liquid may pass through the plates in succession, an apertured separator plate between said plates, the surfaces of the plate on opposite sides of the separator being recessed whereby liquid passing through the first plate enters the recess and then passes through the separator to a second recess and thence to the apertures of a second and successive plates to the outlet, the disks and rings of the several plates being of the same general dimensions and the coned form of the grooved peripheries of the central disk and ring of the several plates providing apertures in one plate that at the discharge end are misaligned with the inlet end of the apertures of the succeeding plate.

7. In a homogenizing device a chambered body, a plate therein formed of at least two separable parts occupying substantially the same plane and having edge surfaces in contact, the surface of one of the parts in contact with the other having a series of transverse grooves providing apertures for passage of liquid through the plate.

8. In a homogenizing device, a chambered body, a plate therein formed of at least two separable parts occupying substantially the same plane and having edge surfaces in contact, said surfaces being at an angle to the face of the plate and the surface of one of the parts in contact with the other having a series of grooves therein opening at the opposite ends to the opposite sides of the plate and providing apertures for the passage of liquid through the plate.

9. In a homogenizing device a chambered body, a plate therein formed of at least two separable parts occupying substantially the same plane and having edge surfaces in contact, the surface of one of the parts in contact with the other having a series of transverse grooves occupying a plane at a right angle to the surfaces of the plates and providing apertures for passage of liquid through the plate.

10. In a homogenizing device a chambered body, a plate therein formed of at least two separable parts, one of the parts being a section of a cone, the other part having an aperture defined by a wall complementary to the coned face of the first part, the coned face of the first part having grooves therein which, when the parts are assembled, provide apertures for the passage of liquid through the plate.

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