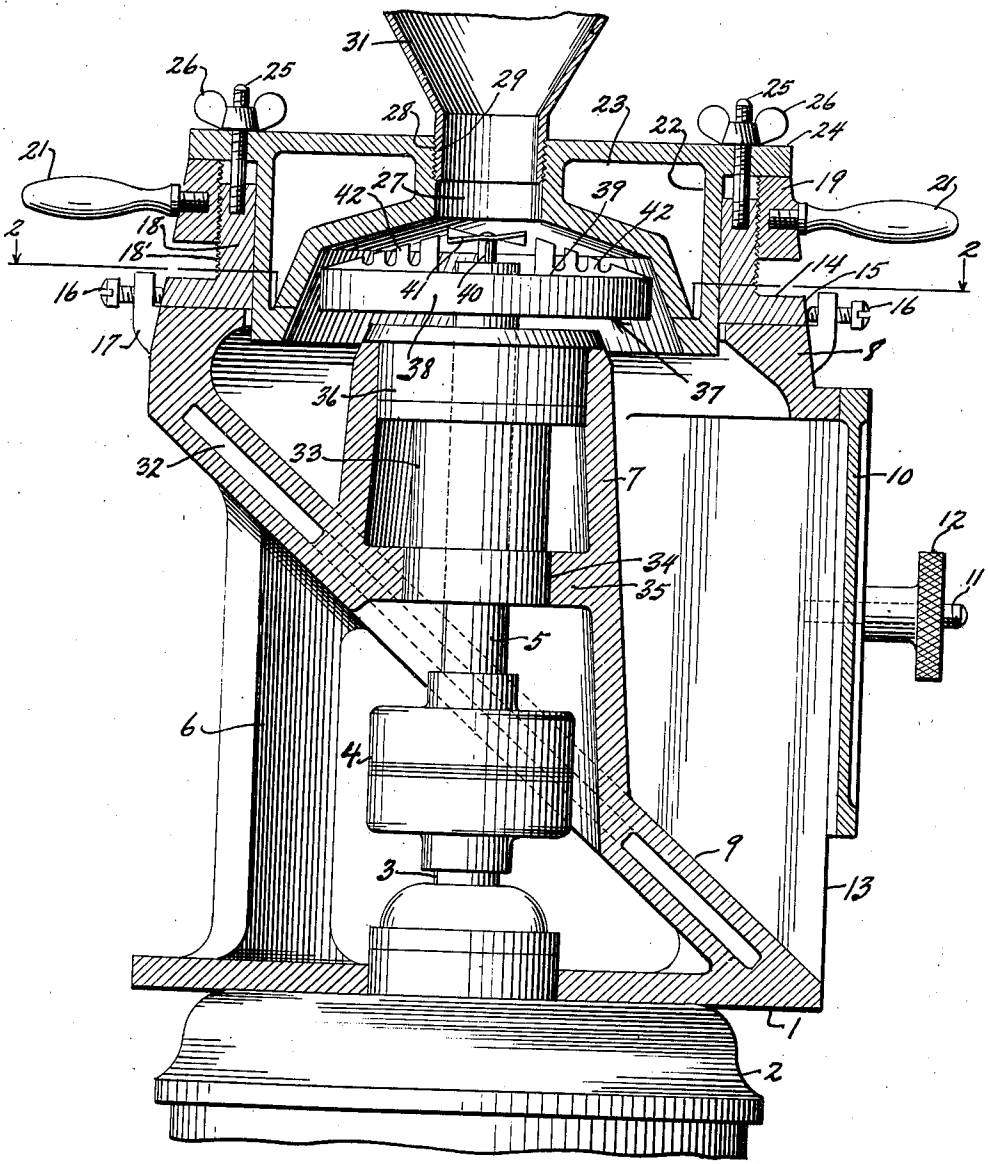
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MILL

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FIG. 1.



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FIG. 2.

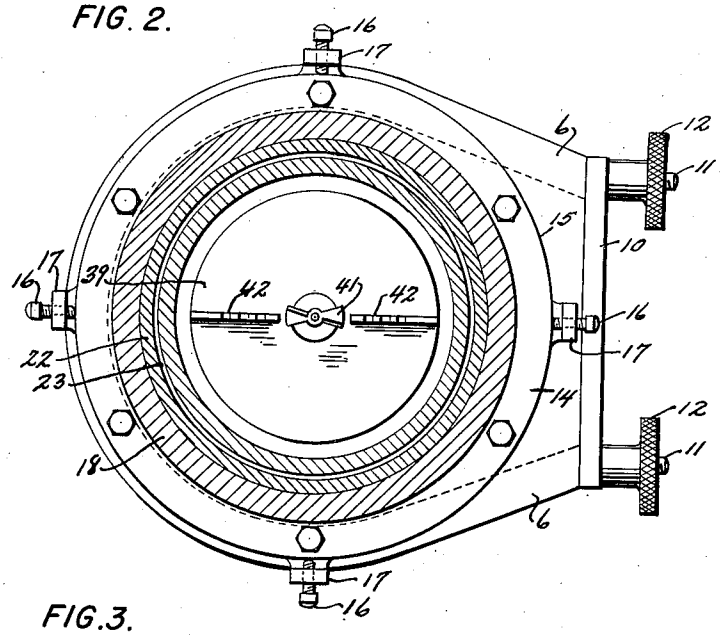


FIG. 3.

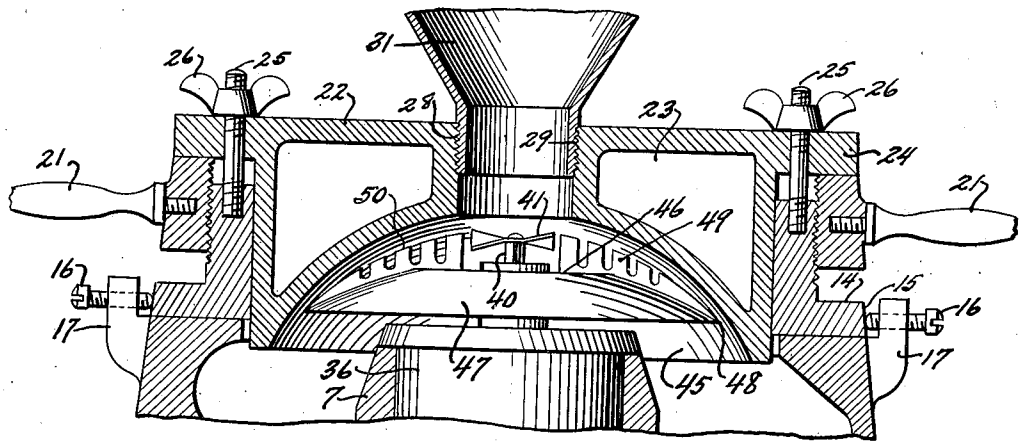
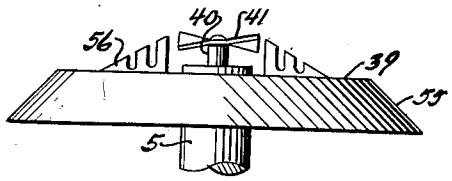


FIG. 4.



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UNITED STATES PATENT OFFICE

2,266,652

MILL

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Original application June 9, 1937, Serial No. 147,369. Divided and this application April 8, 1940, Serial No. 328,565

1 Claim. (Cl. 259—8)

My invention relates to means for making emulsions and is peculiarly adaptable for mixing mayonnaise or water phase emulsions containing very high percentages of oil, though the device and the method employed is not exclusively adapted for these purposes.

The present application is a division of my copending application, Serial Number 147,369, filed June 9, 1937.

An object of the invention is to permit of a ready mix of water phase emulsions having a high percentage of oil without danger of breaking down the initial rough mix.

A further object of the invention is to provide a device which will quickly accomplish the desired emulsification within a short time and which will give a product which is smooth and uniform.

Yet another object of the invention is to provide a mechanism which is simple and durable, easy to repair and replace, and which is readily adjustable to the varying operating conditions necessitated in treating mixtures of differing characteristics.

I employ a stator and a rotor surface. The surface of the stator is relatively adjustable with respect to the rotor. In the particular type of mill shown, the rotor surface is held fixed with respect to movement along its axis of rotation and the stator surface is adjusted to determine the clearance between the rotor and the stator. The rotor surface is provided with projections which, in the present instance, I have shown as slotted blades and near the axis of rotation of the rotor there is located a spinner which tends to disperse the rough mix and to direct it towards the periphery of the spinning rotor. The emulsification is accomplished by reason of the rotating surface of the rotor, the projections comprising the slotted blades and the action of the spinner.

The time of treatment is determined by the amount of clearance between the adjacent stator and rotor surfaces. With a wide clearance the time of treatment is somewhat small; with a close clearance the time of treatment may be larger. The amount of clearance desired is determined by the type of material treated, desirable qualities of final emulsion and other factors.

In order to make my invention more clearly understood, I have shown in the accompanying drawings means for carrying the same into practical effect without limiting the improvements in their useful applications to the particular constructions, which, for the purpose of explanation, have been made the subject of illustration.

In the drawings:

Figure 1 represents an elevation partly in section showing the operating parts of one form of my mill;

Figure 2 is a view taken along line 2—2 of Fig. 1, looking in the direction of the arrows;

Figure 3 is a sectional view, partly broken away showing another form of my mill employing a different type of rotor;

Figure 4 is a side elevation of a form of rotor employing slotted blades of less length than the other forms shown.

Referring to the drawings my emulsion mill comprises a base 1 which may rest on a casing 2 of an electric motor. The electric motor is provided with a shaft 3 which is coupled by means of a coupling 4 (the details of which are not shown) to a rotor shaft 5.

The base 1 of the mill is provided with upright members 6 which may be cast with the base, and which are adapted to support a structure comprising a central annular supporting member 7 and an annular upper stator supporting surface 8.

There may be formed integral with the base 1 and the supports 6 a sloping discharge surface 9 down which the finished emulsion is adapted to slide to a proper receptacle. The discharge surface 9 is encased in the support casing which is provided with an opening covered by front plate 10. The front plate 10 is held in place by means of projecting bolts 11 which fit through apertures in the front plate 10 and which are suitably held in the side supports 6. Knurled holding nuts 12 which fit over the bolts 11 and against the plate 10 permit the plate 10 to be readily removed so that the sloping discharge surface 9 of the mill can be cleaned and the other parts of the mill properly sterilized and cleaned. It is to be noted that there is an opening 13 provided below the cover plate 10 which permits ready egress of the treated emulsion.

On the support surface 8 is adapted to rest an annular member 14. The annular member 14 is provided with an outwardly sloping surface 15 which centering screws 16 are adapted to contact. The holding screws 16 are adapted to fit into brackets 17 through which they pass. The annular member 14 can be centered by adjusting the screws 16 so as to provide a proper and uniform clearance between the stator and rotor surfaces. In the form of mill shown, the clearance between the stator and rotor can also be kept uniform by adjusting the stator, the rotor remaining fixed.

The annular member 14 is provided with an upward extending annular extension 18 which is

screw threaded as indicated at 18'. There is provided a collar 19 which is interiorly screw threaded to engage these screw threads 18'. Handles 21 are provided for turning the collar 19 which will cause it to move either up or down on the member 18 depending upon the direction of rotation given the collar through the handle 21.

Fitting down within the upwardly extending member 18 is a stator casting 22 which is provided with a water jacket space 23 and an annular flange 24. The annular flange 24 rests on the collar 19 and the stator may be raised or lowered by raising or lowering collar 19. When adjustment of the stator vertically has once been satisfactorily obtained, the adjustment is fixedly maintained by tightening bolts 25 which are screw threaded into the member 18 and which project through apertures in the flange 24 of the stator casting 22.

The bolts 25 have wing nuts 26 on their ends and when the adjustment of the stator has once been completed and the wing nuts tightened the assembly will be maintained in the desired position.

There is a central aperture 27 provided in the stator casting. The aperture 27 is screw threaded as indicated at 28 and into this screw threaded portion 28 is adapted to fit screw threaded neck 29 of the feeding funnel 31 through which the mix may be poured. Suitable means for passing cooling or heating fluid through water jacketed space 23 of the stator casting can be provided. Likewise, the discharge surface 9 of the mill is adapted to be water jacketed as indicated by water jacketed apertures 32 which are shown in the drawings. Suitable means for circulating either cooling or heating fluid through these apertures 32 may be provided. This construction is not shown in the drawings.

The rotor shaft 5 is journalled in a journal supporting structure 33, the details of which are not shown. This journal supporting structure 33 passes through aperture 34 in a supporting web 35 of the member 7. The upper end of the rotor shaft 5 is journalled in a supporting structure 36 which fits within the upper part of the member 7. The details of this journal assembly are not given as such details have been previously described in other co-pending applications.

At the upper end of the rotor shaft 5 is found a rotor 37 which has a flat upper surface and is provided with an annular surface 38 which is substantially at right angles to the flat upper surface 39. Coaxial with the rotor shaft 5 and mounted on the upper flat surface 39 of the rotor is located a spinner comprising an upstanding member 40 having propeller blades 41. Also located on this surface are radially positioned notched blades 42. These blades, in the form shown in Figure 1, extend from a position near the axis of rotation to the upper periphery of the rotor. The height of these notches is graduated, the highest being situated near the axis of rotation. This construction assists the rotor in preparing rapidly a fine dispersion.

A relatively small clearance is provided between the frusto-conical surface of the stator and the edge formed by the flat surface 39 and the annular surface 38. This clearance can be adjusted to meet desired conditions. The adjustment acts as a valve to retain the material a sufficient length of time to accomplish the desired purpose and therefore determines the length of the period of treatment. Moreover, the material in passing through this final critical clearance is smoothed out and a more finely divided dispersion of the particles is obtained than is obtained in the working chamber alone provided by the head.

This is of particular advantage, for instance, in making mixes such as mayonnaise where the final critical clearance serves to smooth out any undisintegrated pieces of egg yolk, and in some cases gives a more finely divided dispersion of the particles than is obtained in the head alone. However, the emulsion is actually made in the mixing chamber or head of the mill by the whirling action of the rotor and the stirring action of the spinner and slotted blades. After passing the critical clearance, the material is rapidly discharged from the mill.

In certain types of emulsions, such as, for instance, in mayonnaise, it is found that the treatment must conform to a well defined process. It is to be understood that in other types of material which may be treated the process can be varied. Where mayonnaise is to be prepared by the mill, the mixing is accomplished by preparing a preliminary mixture of eggs, vinegar and seasoning by means of a beater, to which is slowly added the required amount of oil while the beating is continued. This pre-mix is a more or less rough emulsion in the water phase, and is passed through the mill which completes the emulsion.

In the case of mayonnaise, however, if the pre-mix is fed to the mill while it is in motion, as soon as the rough emulsion hits the spinner it is immediately broken down. I have found that the mill must be approximately filled with pre-mix before the rotor is started in motion, and that the rough emulsion pre-mix must not be allowed to initially contact the spinner when it is moving at high speed within the chamber, comprising the working head of the machine. If, on the other hand, the mill is filled with pre-mix before the rotor is started in motion, the emulsion can be satisfactorily completed. However, if the pre-mix is fed into the machine before the rotor has started and the working head is full of pre-mix, and then the rotor is started, quantities of the pre-mix may be indefinitely fed into the working head while the rotor is rotating and the process can be conducted as a continuous process, with satisfactory results.

When other emulsions than mayonnaise are made, the materials to be mixed may be usually put on the rotor surface while it is rotating at a high rate of speed and it is not necessary to cover the rotor surface with the materials before starting the rotor.

In normal operation, the spinner blades and rotor may approximate 3600 revolutions per minute.

The size and length of the slotted blades determine to a large extent the output. The smaller the blade, the smaller the output. A short blade causes a reduced output and a long blade an increased output.

I have shown several types of rotor and stator arrangements which are comprised within the spirit of my invention.

In Figure 3 I have shown a form of mill in which there is a stator surface 45 which is rounded and downwardly sloped. The rotor is provided with a flat upper portion 46 and a rounded downwardly sloping surface 47. Here the clearance between the stator and rotor surfaces occurs at the outer edge 48 of the rounded sloping rotor surface 47. In this form of mill there are provided

notched blades **49** which extend at their outer edge **50** approximately to the outer edge of the rounded sloped surface **47**.

In Figure 4 I have shown a form of rotor which is provided with a flat upper surface **39** provided with a sloped surface **55**. Mounted on the surface **39** is the spinner **41** and there is also shown lateral notched blades **56** of greatly reduced length. In this form, the outer edge of the blades **56** is relatively remote from the upper edge of the frusto-conical sloped surface **55**, of the rotor.

While I have shown and described the preferred embodiment of my invention, I wish it to be understood that I do not confine myself to the precise details of construction herein set forth, by way of illustration, as it is apparent that many changes and variations may be made therein, by those skilled in the art, without departing from the spirit of the invention, or exceeding the scope of the appended claim.

I claim:

In a mechanism for forming an emulsion such as mayonnaise, a stator member including a frusto-conical recessed portion, a cylindrical disk-shaped rotor disposed in said recessed portion in spaced relation therefrom, the top of said rotor lying in a horizontal plane, an opening in the stator member directly above said rotor surface through which the material for forming the emulsion is fed, said opening being of relatively small area compared to the area of the upper surface of the rotor, a spinner having blades inclined from the horizontal centrally mounted on and rotating with said rotor, said spinner being positioned directly below the said opening and said blades being designed to draw the material through said opening onto the upper surface of the rotor, two series of diametrically opposed, radially aligned, vertical teeth of varying heights mounted on the said rotor, said teeth having openings therebetween of varying area throughout the radial length thereof, each of said series of teeth extending outwardly from said spinner and being in substantially the same horizontal plane therewith, said teeth progressively decreasing in height outwardly from said spinner, means to selectively adjust the distance from said rotor and stator, and motor driven means to motivate said rotor and spinner, said means being driven by a high speed motor.

WILLIAM A. McLEAN.