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Schnöring et al.

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[54] **APPARATUS FOR PRODUCING EMULSIONS OR SUSPENSIONS**

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[30] **Foreign Application Priority Data**

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[51] **Int. Cl.** **B01f 7/16**

[58] **Field of Search** 259/DIG. 30, 7, 8, 259/23, 24, 9, 10, 25, 26, 96, 6, 22; 415/157, 158

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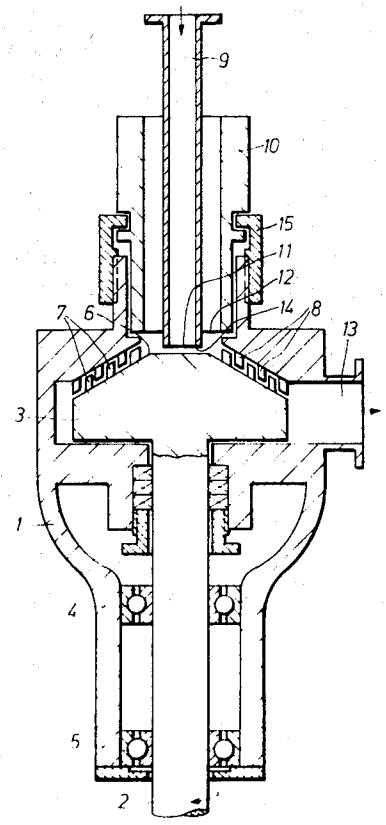
[57] **ABSTRACT**

For the production of emulsions or suspensions, a centrifugal homogenising machine is used which has a rotor, an end face of which has rings formed with recesses. The rings revolve between similar rings arranged on the housing, the emulsion being introduced through at least two supply pipes arranged concentrically of one another towards the end surface of the rotor.

3 Claims, 2 Drawing Figures



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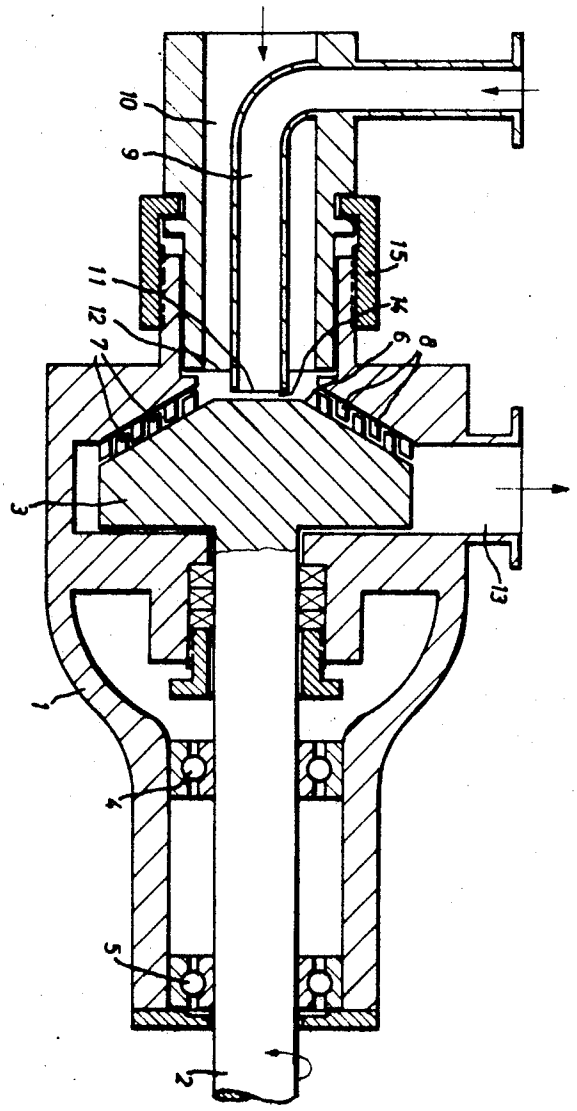

FIG. 1

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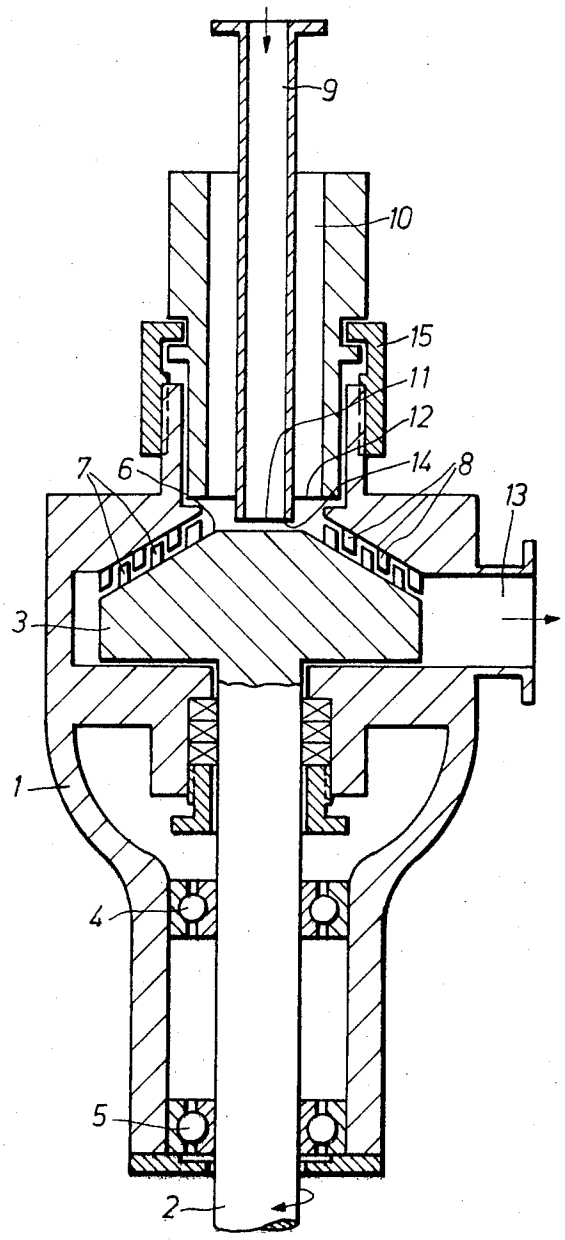

FIG. 2

APPARATUS FOR PRODUCING EMULSIONS OR SUSPENSIONS

The present invention relates to an apparatus for the production of emulsions or suspensions, consisting of a centrifugal homogenising machine, which is constructed from a housing, in which is arranged a rotor, the end face of which is formed with rings having recesses. The rings rotate between similar rings arranged on the housing and a supply pipe opens centrally against the end face of the rotor.

Emulsions and suspensions are normally produced in a form in which two or more liquids are stirred together.

In the case where an emulsion is formed, the two liquid phases are immiscible, whereas with the formation of a suspension, the two substances in certain circumstances react wholly or partially with one another to form a solid substance, which is then suspended in the residual liquid.

The quality and particularly the stability of an emulsion or suspension is characterized by the size of the drops or grains and by the spectrum of the drop or grain sizes. Depending on the intended use, different grain sizes with a corresponding grain size spectrum are required.

In accordance with the present-day state of the art, emulsions and suspensions are produced by one of the liquids being wholly or partially introduced into a container equipped with a mixing member and by then adding the other liquid or liquids.

The disadvantage of this procedure is that the residence time of the components to be mixed and of the products being formed therefrom differs in length. As a consequence, a difference is produced in the number of actions on the individual volumetric elements by the mixing member. From experience, these differences in the number of impacts can assume values of several orders of magnitude. The shorter the total residence time which has to be maintained, the more serious is the effect of this difference.

Particularly when producing suspensions or emulsions with small grain sizes, a short residence time is necessary, in order to prevent grain size displacements which are caused by "Oswald ripening", i.e. growth of the large particles at the expense of the small particles because of dissolution and crystallization.

It is also known that the number of nuclei per unit of volume is also determined by the oversaturation effects produced with the combining of one of the phases, and that after nucleus formation has occurred from the over-saturated solution, further addition of solutions contributes predominantly to the growth of the already formed nuclei or crystals, and thus reduces the number of the individual parts which are formed, such as nuclei, droplets, crystals.

It is known that such emulsions or suspensions produced in various ways as described can be after-treated in so-called homogenising machines, both piston-type homogenising machines and so-called centrifugal apparatus, in order to obtain a comminution of the oversize particles which are formed. However, this process has the disadvantage of a relatively high expenditure and also the disadvantage that the process can only proceed batchwise. In addition, the division of the particles once they are formed is only possible with relatively high energy consumption.

It is the object of the present invention to obviate the disadvantages of the prior known apparatus. This is obtained by using a centrifugal homogenising machine as initially referred to, which machine is characterized by at least two supply pipes arranged concentrically of one another.

The effect achieved in this way is that the homogenising machine as known per se can be supplied with at least two phases, which are very satisfactorily mixed together by the rotational movement and by the beating action on the openings of the rotating rings.

It has proved to be particularly advantageous to make the gap between the mouth of the supply pipes and the rotor adjustable.

It is advantageous for the gap for each supply pipe to be separately adjustable. The product entering centrally into the machine is accelerated radially by the rotation of the rotor and is subjected to high shearing, deflecting and cavitation forces between the rotating and stationary rings, which comprise, for example, teeth, holes, pins and the like.

By the coaxial supply of the two components, it has been found in connection with tests for the production of suspensions and emulsions that a considerable technical advance can be produced as regards the degrees of fineness of the grains and the grain size spectrum.

Suspensions and emulsions can be produced in an extremely short time with the apparatus of the invention, under conditions which can be accurately controlled.

Another particular advantage consists in the continuous operation of the apparatus. As a result of the adjustability of the gap between the mouth of the supply pipes and the end face of the rotor, it is possible substantially to determine the size of grains in the suspensions to be produced.

The apparatus according to the invention is to be more fully explained by reference to one constructional example shown in a drawing:

FIG. 1 is an elevation in section of one embodiment of the invention; and

FIG. 2 is an elevation in section of another embodiment according to the invention.

In the figures, like reference characters refer to corresponding parts.

A shaft **2** of a rotor **3** is mounted in bearings **4** and **5** in a housing **1.** An end face **6** of the rotor is formed with ribs or toothed rings **7,** which rotate between the ribs or toothed rings **8** fixedly arranged on the housing **1.** The two phases from which the emulsions or suspension is to be formed are supplied through supply pipes **9** and **10,** the discharge openings **11** and **12** of which are directed concentrically and centrally towards the end face **6** of the rotor **3.** The two phases are accelerated radially and the actual suspending or emulsifying action takes place in the region of the toothed rings **7** and **8.** The prepared emulsion or suspension leaves the apparatus through a discharge pipe **13.** The gap **14** between the rotor and the outlet ends **11** and **12** of the supply pipes **9** and **10** is adjustable by means of an adjusting screw **15.** In the embodiment of FIG. **1,** the gap between the supply pipes and the rotor is adjustable by moving the supply pipes as a unit; in FIG. **2** the adjustment can be made by moving each pipe separately.

We claim:

1. In a centrifugal homogenizing machine for the production of emulsions or suspensions of one material in another material, comprising:

a. a housing,

b. a rotor rotatably mounted in the housing, and having an end face coaxial with the rotor, rotor ribs projecting axially outwardly from the end face, in concentric and spaced relation defining recesses between successive ribs,

c. housing ribs mounted on the housing projecting into the rotor recesses for cooperation of the rotor and housing ribs for the homogenizing upon rotation of the rotor,

d. two supply pipes disposed for concentric introduction, respectively, of said materials centrally towards the end face of the rotor for passage of the material between the rotor and housing ribs, said supply pipes being axially spaced from the end face of the rotor providing a gap between the supply pipes and the end face,

e. a housing outlet for effluent from between the rotor and housing ribs,

the improvement which comprises:

f. said supply pipes being adjustably mounted on the housing permitting adjustment of the axially extended gap between the supply pipes and end face of the rotor.

2. Machine according to claim **1,** the mounting of the supply pipes on the housing being for movement of the supply pipes together to adjust said gap.

3. Machine according to claim **1,** the supply pipes being separately adjustable as aforesaid.

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