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DEVICE FOR MIXING AND HOMOGENIZING

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FIG. 1

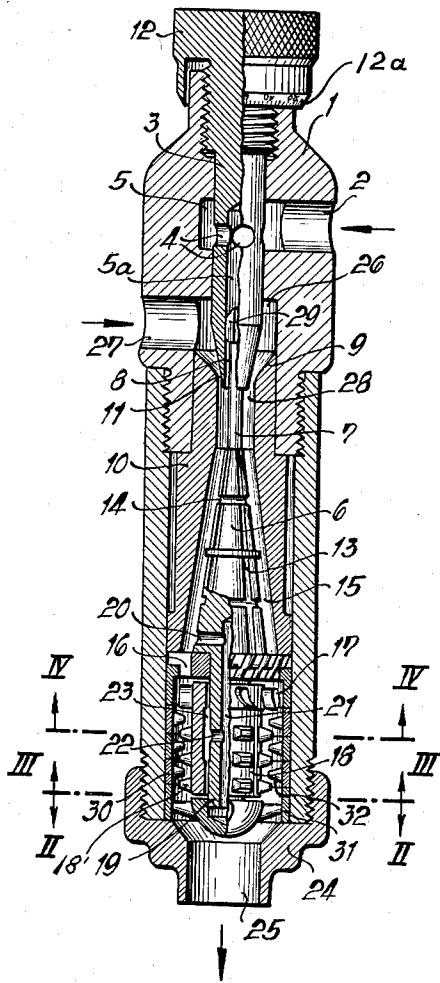


FIG. 2

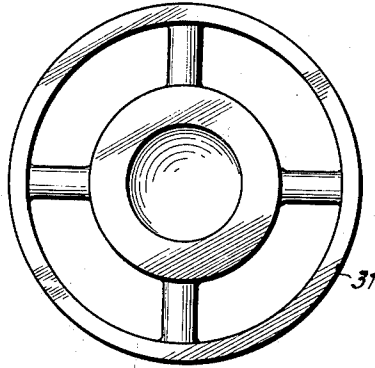


FIG. 3

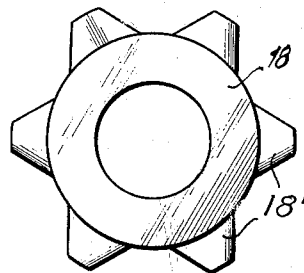
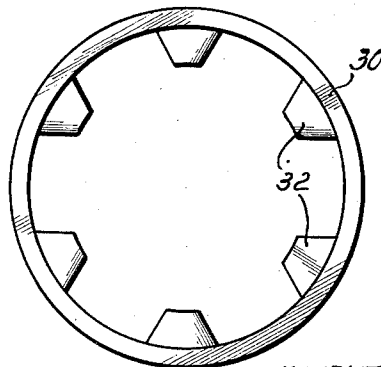


FIG. 4



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DEVICE FOR MIXING AND HOMOGENIZING

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8 Claims. (Cl. 259—8)

The present invention relates to a device for mixing and homogenizing, especially for making water-oil emulsions. The device involved in the present case works in conformity with the principle of an injector or jet pump.

As is well known, injectors or jet pumps are adapted to operate in such a way that, while making use of the energy of flow of one fluid medium, they draw in a further fluid medium. Such devices are generally suitable to a great extent for intermixing liquids. However, if a very intimate inter-mixture is required in which the particle size of the fluid mediums is reduced to such an extent that a stable mixture will be obtained, as required for purposes of homogenizing, injectors or jet pumps of customary design do not suffice but require additional equipment.

For purposes of obtaining a better swirling motion or turbulence, it has been suggested to equip diffusers of jet pumps with baffle plates. According to another suggestion made heretofore for purposes of increasing and refining the mixing process of the flowing component and of the component to be admixed, two tubular coaxially arranged bodies are provided with a plurality of fine openings. Such devices, however, have the drawback that the rate of flow and the mixing proportion cannot be varied.

There is also known a device in which such variation of the rate of flow and of the mixing proportion is possible. According to this device, slots are provided in telescopically superimposed tubes which can be adjusted so as to overlap to a variable extent. This type of adjustment, however, does not allow the mixing proportion to be maintained constant. The heretofore known mixing devices mentioned above have the drawback that they cannot bring about a very intimate mixture nor an automatic control or adjustment of the mixing proportion.

It is, therefore, an object of the present invention to provide a mixing and homogenizing device which will overcome the above mentioned drawbacks.

It is another object of this invention to provide an improved mixing and homogenizing device which will make it possible to produce a stable homogeneous liquid the composition of which is variable in conformity with the desired purpose of the liquid.

It is also an object of this invention to provide a mixing and homogenizing device which will be simple in construction and operation and will be relatively cheap to produce.

These and other objects and advantages of the invention will appear more clearly from the following specification in connection with the accompanying drawing, in which:

Fig. 1 illustrates, partly in longitudinal section and partly in view, a homogenizing device according to the present invention.

Fig. 2 is a section taken along the line II—II of Fig. 1 and illustrates in view on a larger scale than that of Fig. 1 a bearing ring for the striking mechanism.

Fig. 3 is a section taken along the line III—III of

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Fig. 1 and likewise on a larger scale than that of Fig. 1 shows a view of the striking mechanism with the striking projections pertaining thereto.

Fig. 4 is a section taken along the line IV—IV of Fig. 1 and on a larger scale than the latter illustrates a view of a ring provided with inwardly extending cams for cooperation with the striking projections of the striking mechanism shown in Fig. 3.

General arrangement

The mixing and homogenizing device according to the present invention which, while not being limited to, is particularly suitable for the production of oil-water emulsions. It is characterized primarily in that the driving jet for injecting the pressure fluid and drawing in the medium to be admixed is followed by a diffuser which in its turn is followed by a homogenizing device in form of a rotatable striking mechanism. The combination and arrangement of these parts in the manner outlined makes it possible to produce a stable adjustable homogeneous liquid the composition of which may be varied in conformity with the desired purpose for which the mixture is to be used.

According to a further development of the invention, the diffuser is provided with a stationary core which together with a cylindrical part extends into the bore of the driving jet and with the latter forms an annular passage or clearance. Such an arrangement eliminates that part of the jet in the diffuser which otherwise would pass freely to the core and which does not mix very well with the draw-in fluid medium. The cylindrical portion of the diffuser core is provided with a rib-like guiding head by means of which said cylindrical part of the diffuser core is journaled in the driving jet and allows the passage of the fluid medium.

A further important feature of the arrangement according to the present invention consists in that the proportion of the fluids to be intermixed can be varied. This may be accomplished in accordance with the present invention by arranging the driving jet adjustable in longitudinal direction and providing the same with adjusting means therefor so as to be able to vary the ring slot nozzle or annular narrow passage for drawing in the additional liquid. From the above, it will be evident that the core of the diffuser expediently has first a cylindrical cross section and subsequently an increasing cross section in the direction of flow similar to the diffuser, so that the conical portion of the diffuser core forms a truncated cone substantially coextensive with the inner wall of the diffuser.

Structural arrangement

Referring now to the drawing in detail, the mixing and homogenizing device comprises a housing 1 having a bore 2 for admitting fluid under pressure. Arranged in housing 1 is a driving nozzle 3 with a bore 5a in longitudinal direction of the nozzle 3. The nozzle 3 furthermore comprises transverse bores 4 communicating with an annular chamber 5 extending around nozzle 3 and communicating with the pressure fluid inlet bore 2. A diffuser core 6 provided with a cylindrical portion or extension 7 has the latter extend into the front end of the longitudinal bore 5a so as to form with bore 5a an annular passage 8. Cylindrical extension 7 has its front end provided with a rib-like guiding head 29 by means of which the diffuser core 6 rests in the driving nozzle. The front end of nozzle 3 is cone-shaped so as to form with the mouth 9 of a diffuser 10 an annular narrow passage 11. This passage 11 may be varied by longitudinally displacing the driving nozzle 3. This may be effected by means of a nut 12 provided with a dial 12a and connected to nozzle 3.

For purposes of improving turbulence, the outer portion of the conical diffuser core part is provided with longitudinal and/or transverse ribs or grooves. These longitudinal ribs or grooves are designated with the reference numeral 13, whereas the transverse grooves or ribs are designated with the reference numeral 14.

It has been found that the fluid mixture for producing a stable emulsion of a long life has to pass through a homogenizing device. Expediently, the surface of the homogenizing device upon which the fluid acts corresponds to the free annular cross section formed by the inner diffuser wall and the surface of the diffuser core. The fluid mixture leaving the said annular cross section actuates a driving wheel which drives the homogenizing device comprising a rotatable striking mechanism. In further development of the present invention, the mean diameter of said driving wheel corresponds substantially to the mean end diameter of the annular cross section of the diffuser. For purposes of lubricating the homogenizing device, the bearing surfaces of the rotatable part of the striking mechanism communicate through bores with the annular cross section of the diffuser.

Specifically referring again to the drawing, the cross section of the annular passage 15 around the diffuser core leads to a guide wheel or guiding apparatus 16. A turbine wheel 17 provided with a striking mechanism 18, which may be integral with the turbine wheel 17, is rotatably journaled on a stationary shaft 19 which may be connected to the diffuser core or form an integral part thereof. For purposes of lubricating the rotatable body composed of the turbine wheel and the striking mechanism 18, bores 20, 21, 22 are provided which lead to an annular chamber 23. From here the emulsion distributes itself over the running surfaces. The striking mechanism 18 is provided with outwardly extending projections 18' which in cooperation with inwardly extending projections 32 of a plurality of rings 30, which are superimposed upon each other, will assure a thorough intermixing of the substances forming the respective mixture. The arrangement furthermore comprises a ring 31 carrying one of the two bearings for the striking mechanism 18 and also comprises a cap 24 with a bore 25 for discharging the emulsion.

Operation

The operation of the device according to the present invention is as follows:

Pressure fluid intended as part of the emulsion to be produced enters the device according to the invention through bore 2 and passes through annular chamber 5, and transverse bores 4 into the longitudinal bore 5a from where the fluid passes into the annular passage 8. Inasmuch as the path of the fluid has its narrowest cross section in said annular passage 8, it will be obvious that the fluid will have its highest speed in this passage. The pressure fluid thus leaves the annular passage 8 at a very high speed with the result that a pressure below atmospheric pressure will be created in the annular chamber 26. Due to this sub-atmospheric pressure, the second liquid to be admixed to and intermixed with the pressure fluid admitted through the bore 2 will be drawn in through bore 27. The two liquids meet in the annular chamber 28. The mixing ratio or proportion may be varied by displacing nozzle 3 in longitudinal direction thereof by means of the adjusting screw 12 thereby increasing or decreasing the ring slot passage 11. The mixture then passes through the annular chamber 15 formed by the inner conical wall of diffuser 10 and the outer surface of diffuser core 6. From said annular chamber 15, the mixture flows to the guiding apparatus 16 by means of which the liquid is conveyed to the turbine wheel 17. The turbine wheel will then due to the energy of the fluid acting upon said turbine wheel rotate and at the same time actuate the striking mechanism 18. This striking mechanism will split the drops of the

liquid mixture to such an extent and so fine that a homogeneous liquid will result which then is discharged through bore 25.

It is, of course, to be understood that the present invention is, by no means, limited to the construction shown in the drawing but also comprises any modifications within the scope of the appended claims.

What we claim is:

1. In combination in a device for mixing and homogenizing liquids: a housing having a first inlet for admitting liquid under pressure forming a first component of the liquid mixture to be produced, and also having a second inlet for admitting a second liquid forming a second component of the liquid mixture to be produced; an ejector nozzle having a discharge mouth and also having a longitudinal bore communicating with said first inlet and leading to said discharge mouth; said housing having a cylindrical chamber with a discharge outlet forming a narrow annular passage surrounding the discharge mouth of said nozzle and communicating with said second inlet; a diffuser having a stationary core comprising a cylindrical portion extending into said longitudinal bore of said nozzle and defining with said longitudinal bore an annular passage, said diffuser also comprising a tubular portion surrounding said diffuser core in spaced relationship thereto so as to define therewith annular passage means having an inlet portion and an outlet portion, said inlet portion being adjacent to said narrow passage and said nozzle mouth to receive liquid from both said cylindrical chamber and said nozzle mouth for intermixing the same; fluid operable actuating means arranged adjacent said diffuser outlet and operable by the liquid leaving said outlet and a striking mechanism including a rotatable striking member drivingly connected to said fluid operable actuating means and adapted to receive intermixed liquid from said fluid operable actuating means for splitting up the liquid particles of said intermixed liquid; said striking mechanism also including a discharge for discharging the liquid intimately intermixed thereby.

2. In combination in a device for mixing and homogenizing liquids: a housing having a first inlet for admitting liquid under pressure forming a first component of the liquid mixture to be produced, and also having a second inlet for admitting a second liquid forming a second component of the liquid mixture to be produced; a jet having a discharge mouth and also having a longitudinal bore communicating with said first inlet and leading to said discharge mouth; said housing having a cylindrical chamber adjacent to the discharge mouth of said jet and communicating with said second inlet; a diffuser having a stationary core comprising a cylindrical portion extending into said longitudinal bore of said jet and defining with said longitudinal bore an annular passage, said stationary core also comprising a cone-shaped portion connected to said cylindrical portion and increasing in diameter away from said cylindrical portion; said diffuser also comprising a tubular portion surrounding said diffuser core in spaced relationship thereto so as to define therewith annular passage means having an inlet portion and an outlet portion; said tubular portion forming with the outer wall of said discharge mouth a tapering annular passage communicating with said cylindrical chamber and tapering toward the passage means between said tubular portion and said stationary core; said jet being adjustable relative to said tubular portion to thereby vary the narrowest cross section of said annular tapering passage; said inlet portion of the annular passage means of said diffuser being adjacent to said tapering annular passage and said jet mouth to receive liquid from both said tapering annular passage and said jet mouth for intermixing said liquids; fluid operable actuating means arranged adjacent said outlet portion and operable by the liquid received from said outlet portion, and a striking mechanism

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nism including a rotatable striking member drivingly connected to said fluid operable actuating means and adapted to receive intermixed liquid from said diffuser for splitting up the liquid particles of said intermixed liquid; said striking mechanism also including a discharge for discharging the liquid intimately intermixed thereby.

3. A mixing and homogenizing device according to claim 2, in which the inner wall of the tubular portion conforms in shape to the outer contour of said core so as to define therewith annular cone-shaped passage means.

4. A mixing and homogenizing device according to claim 2, in which the cone-shaped portion of said stationary core is provided with transverse ribs.

5. A mixing and homogenizing device according to claim 2, in which the cone-shaped portion of said stationary core is provided with transverse grooves.

6. In combination in a device for mixing and homogenizing liquids: a housing having a first inlet for admitting liquid under pressure forming a first component of the liquid mixture to be produced, and also having a second inlet for admitting a second liquid forming a second component of the liquid mixture to be produced; an ejector nozzle having a discharge mouth and also having a longitudinal bore communicating with said first inlet and leading to said discharge mouth; said housing having a cylindrical chamber with a discharge outlet forming a narrow annular passage surrounding the discharge mouth of said ejector nozzle and communicating with said second inlet; a diffuser having a stationary core comprising a cylindrical portion extending into said longitudinal bore of said ejector nozzle and defining with said longitudinal bore an annular passage, said diffuser also comprising a tubular portion surrounding said diffuser core in spaced relationship thereto so as to define therewith annular passage means having an inlet portion and an outlet portion, said inlet portion being adjacent to said narrow passage and said ejector nozzle mouth to receive liquid from both said cylindrical chamber and said ejector nozzle mouth for intermixing the same; turbine means including a guiding apparatus therefor arranged adjacent said outlet portion, said turbine means being operable by the liquid received by said guiding apparatus from said outlet portion and passing through said guiding apparatus into said turbine means and a striking mechanism including a rotatable striking member rotatably connected to said turbine and adapted to receive intermixed liquid from said turbine means for splitting up the liquid particles of said intermixed liquid; the surface of said rotatable striking member to be acted upon by the intermixed liquid received from said turbine means corresponding to the area defined by the outer surface portion of the diffuser core adjacent said striking member and by the inner surface portion of the

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tubular diffuser portion adjacent said rotatable striking member; said striking mechanism also including a discharge for discharging the liquid intimately intermixed thereby.

7. In combination in a device for mixing and homogenizing liquids: a housing having a first inlet for admitting liquid under pressure forming a first component of the liquid mixture to be produced, and also having a second inlet for admitting a second liquid forming a second component of the liquid mixture to be produced; a jet having a discharge mouth and also having a longitudinal bore communicating with said first inlet and leading to said discharge mouth; said housing having a cylindrical chamber with a discharge outlet forming a narrow annular passage surrounding the discharge mouth of said jet and communicating with said second inlet; a diffuser having a stationary core comprising a cylindrical portion extending into said longitudinal bore of said jet and defining with said longitudinal bore an annular passage, said diffuser also comprising a tubular portion surrounding said diffuser core in spaced relationship thereto so as to define therewith annular passage means having an inlet portion and an outlet portion, said inlet portion being adjacent to said narrow passage and said jet mouth to receive liquid from both said cylindrical chamber and said jet mouth for intermixing the same; fluid operable actuating means arranged adjacent said outlet portion and operable by the liquid received from said outlet portion, and a striking mechanism including a rotatable driven wheel drivenly connected to said fluid operable actuating means and adapted to receive intermixed liquid from said fluid operable actuating means; said striking mechanism also including a rotatable striking member connected to said driven wheel for rotation thereby and operable in response to its rotation to split up the liquid particles of said intermixed liquid; said striking mechanism furthermore including a discharge for discharging the liquid intimately intermixed thereby.

8. A mixing and homogenizing device according to claim 7, in which the mean diameter of the driven wheel corresponds substantially to the mean end diameter of the cross section of said annular passage means adjacent said driven wheel.

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