Jan. 29, 1957 J. SCHNEIDER 2,779,574

MIXING OR STIRRING DEVICES

Filed Jan. 7, 1955 2 Sheets-Sheet 1

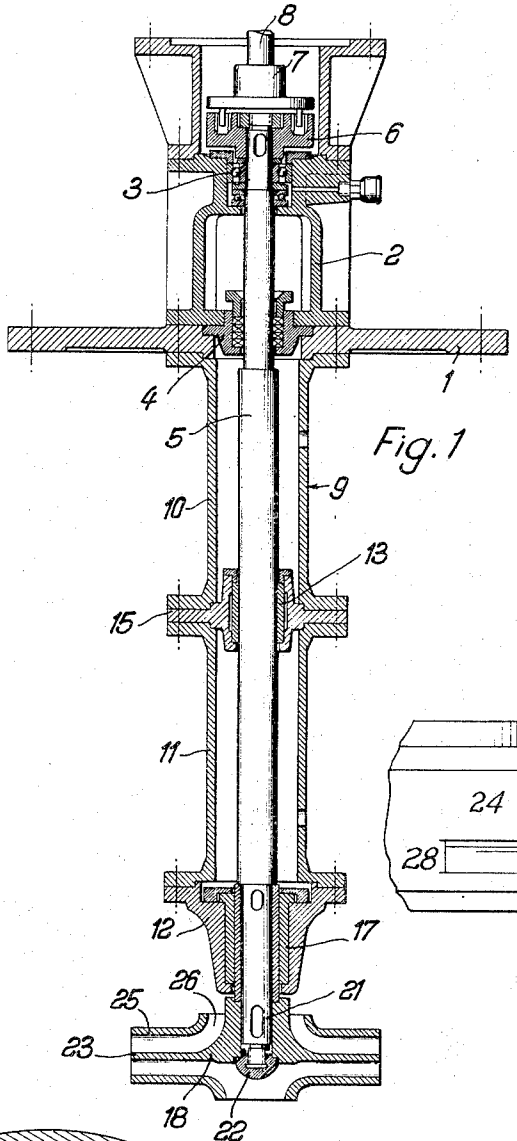


Fig. 1

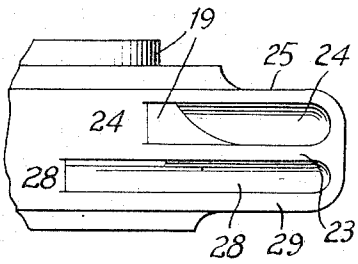


Fig. 8

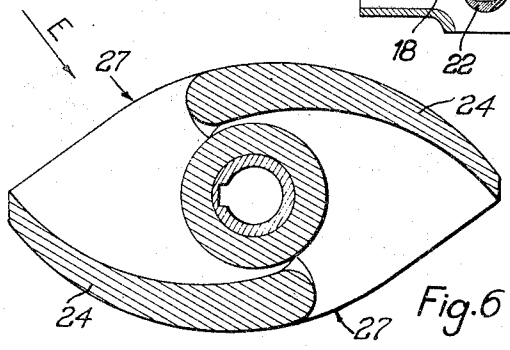


Fig. 6

Inventor:
Joachim Schneider
by
Stevens, Davis, Miller & Mosher
his attorneys

Jan. 29, 1957 J. SCHNEIDER 2,779,574

MIXING OR STIRRING DEVICES

Filed Jan. 7, 1955 2 Sheets-Sheet 2

Fig. 3

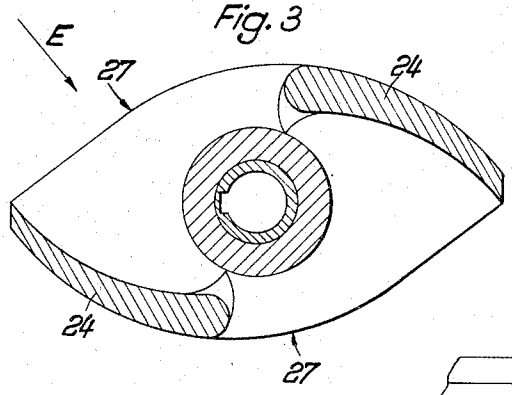


Fig. 5

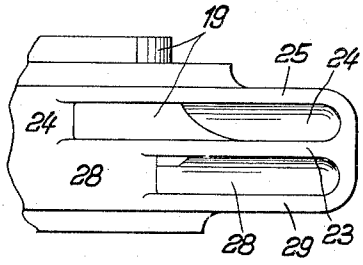
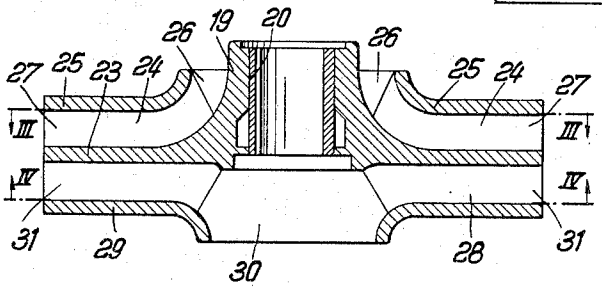


Fig. 2



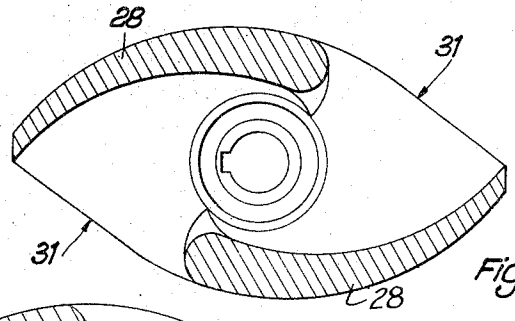


Fig. 4

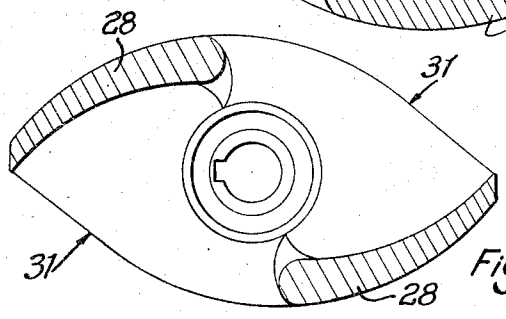


Fig. 7

Inventor:
Joachim Schneider
by
Stevens, Davis, Miller & Mosher
his attorneys

United States Patent Office 2,779,574 Patented Jan. 29, 1957

2,779,574

MIXING OR STIRRING DEVICES

Joachim Schneider, Wiesbaden-Schierstein, Germany

Application January 7, 1955, Serial No. 480,524

8 Claims. (Cl. 259—134)

This invention relates to mechanical mixing or stirring devices.

Stirrers are used, particularly in the chemical industry, but also in other branches of industry, for the purpose of mixing, stirring and circulating liquids of different consistency and specific gravity. The stirrers are constructed as fork, blade or propeller stirrers. The greater number of these constructions permit mixing in one direction only, unless the direction of rotation is changed. In addition, these stirrers usually run in a bearing in the bottom of the agitator vessel, which has frequently caused difficulties in practice. Stirrers of this type are usually driven through gears or belt pulleys.

The main object of the present invention is to provide a new mixer by means of which smooth running of the mixer is ensured with long driving shafts. A further object of the invention is to provide an improved mixture by a new construction of the stirring arrangement.

The invention finally aims at new constructions of rotary mixers, in which an improved mounting of the mixer shaft with an improved stirrer or mixer head is obtained.

Accordingly the invention provides a rotary mixer comprising in combination a support member, a dependent tube secured to said support member, a shaft mounted for rotation in said tube and having a mixer blade secured to the lower end of said shaft, said tube having at the lower end thereof a bearing above said mixer blade.

Two forms of construction of the invention will now be described by way of example with reference to the accompanying drawings in which:

Figure 1 shows a longitudinal section through a complete mixer,

Figure 2 shows a longitudinal cross section through a blade of the mixer,

Figure 3 shows a section on the line III—III in Figure 2,

Figure 4 shows a section on the line IV—IV in Figure 2,

Figure 5 shows a partial elevation of the mixer blade seen in the direction of the arrow E in Figure 3, and

Figures 6, 7 and 8 are views similar to Figures 3, 4 and 5, respectively, of a modified form of the invention.

In the embodiment illustrated in Figures 1–5, a supporting flange **1** is provided, which carries two ball bearings **3**, **3** in a stuffing box housing **2** disposed above said flange. A shaft packing indicated generally by numeral **4** is also provided in the flange **1** and may be a stuffing box packing. If necessary, a sliding ring packing may be provided instead of a stuffing box packing, particularly in the case of higher pressures. **5** indicated a driving shaft for the stirrer blade, said shaft being disposed vertically and carrying at its upper end a jaw coupling part **6**, which may co-operate with a jaw coupling part **7** on a driving shaft **8**. It is possible to couple the shaft **5** directly to a driving motor, particularly a vertical motor (not illustrated) without a gear being interposed.

A shaft-protecting tube, which bears the general reference **9** and which consists, in the exemplified embodiment illustrated, of a plurality of parts **10**, **11** and **12** which are connected together by flanges, extends downward from the supporting flange **1**. At an intermediate point of the shaft-protecting tube **9**, a sliding bearing indicated generally by numeral **13** is provided and is secured by the flange connection indicated generally by **15**. Furthermore, a sliding bearing indicated generally by numeral **17** is disposed in the lower part **12** of the shaft-protecting tube. The shaft **5** is thus mounted at three points **3**, **13** and **17** in the embodiment illustrated.

The shaft **5** mounted in this manner carries at its lower end a mixer blade which is indicated generally by the reference numeral **18** and the individual parts of which are described hereinafter with reference to Figures 2 to 5.

The mixer blade has a body part **19** with an internal bush **20**, which can be placed over the lower end **21** of the vertically mounted shaft **5** and secured there by using a head threaded nut **22** or the like.

The mixer blade indicated generally by numeral **18** is constructed in the embodiment illustrated as a self-contained, double-flow mixer blade having blades running in the same directions. In cross-section, its shape diverges from the circular, as may be seen particularly from the presentation in Figures 3 and 4. The mixer blade has a middle transverse wall **23** which carries, on one side thereof oppositely disposed mixer blade members **24**, **24** whose cross-sectional shape may be seen clearly from Figure 3. The blade members **24** are closed off at their upper ends by a wall **25** integral therewith. In this wall a co-axial annular inlet **26** is provided for the material to be mixed. The mixer blade is open at the peripheral side at **27**, so that the material to be mixed, which enters at **26**, is struck by the blade members **24**, **24** and re-emerges at the periphery from the outlet slots **27**, **27**.

The blade arrangement on the underside of the transverse wall **23** is of similar construction. Blade members **28**, **28** (Figure 4) are provided, which run in the same direction as the blades **24**, **24** and the blade members **28**, **28** are closed off at their lower end by an integral wall **29**. In this lower wall an inlet aperture **30** is provided for the material to be mixed, and its total cross-section corresponds approximately to the cross-section of the annular inlet **26**. The blade members **28**, **28** on the underside of the transverse wall **23** have a profile as shown in Figure 4 for example. The material to be mixed is in this case guided in a manner corresponding to that with the blade members described above, and it enters from below through the aperture **30** and after being struck by the blade members **28**, **28** re-emerges from the mixer blade at the periphery at **31**.

As is clear from Figures 3 and 4, the cross-sections of the outlets **31** of the lower set of blade members **28**, **28** are smaller than the outlet cross-sections of the set of blade members **27**, **27**. The construction may also be selected so that the reverse obtains, the shorter blade members having a larger outlet cross-section being disposed at the bottom and the longer blade members with the smaller outlet cross-section being disposed at the top of the mixer blade, as shown in Figures 6 and 7.

As a result of the above characterised construction of the mixer blade the advantage is provided that, when the mixer operates, the medium or material to be mixed or stirred is simultaneously sucked in from above and below the mixer blade **18**. As a consequence of the different lengths of the blade members **24**, **24** on the one hand and **28**, **28** on the other hand, and similarly, as a consequence of the different outlet cross-sections of the two sets of blade members, the partial mixtures flowing out of the outlets **27** and **31** respectively have different velocities, and as a result of these different velocities a third mixing is effected at the outlets of the

blade, said third mixing merging, as a result of the construction of the blade, into a pulsation perpendicular to the shaft of the mixer, rotation of the material being capable of being reduced or practically eliminated.

During rotation of the mixer blade **18** a suction effect is created at inlets **26** and **30** and solid particles deposited at the base of the vessel accommodating the material to be mixed, or suspended substances floating on the surface of the material to be mixed are in each case drawn into the inlets **26**, **30** of the mixer blade and intimately mixed with the main medium.

The mixer according to the invention further has the advantage that the direction of rotation of the mixer blade need not be changed, irrespective of whether the material is sucked in from above or below.

A rotary mixer according to the invention is capable of being used for the intensive mixing of media of the most diverse kinds, for example:

Acids and liquors of all kinds
Liquids with solids
Liquids with viscous media
Sludges of all kinds
Cellulose and paper pulps
Liquids with air

I claim:

1. A rotary mixer comprising in combination a support member, a shaft mounted for rotation on said support member and bearings for the shaft, a mixer blade secured to the shaft and having a non-circular cross section, said mixer blade comprising a unitary hollow body with an upper and lower wall and having a partition element interposed between the walls to define upper and lower separate passages in the body transverse to the axis of rotation of said mixer blade, said passages having opposite inlet openings formed in the mixer blade near the axis of rotation and outlet openings formed in the mixer blade adjacent the periphery thereof, the two passages within the mixer blade having a different cross section.

2. A rotary mixer according to claim 1, characterized in that the cross section of the upper passages is larger than the cross section of the lower passages.

3. A rotary mixer according to claim 1, characterized in that the cross section of the lower passages is larger than the cross section of the upper passages.

4. A rotary mixer according to claim 1, characterized in that the outlets from the lower passages on the lower side of the mixer blades have a cross section larger than the outlets of the upper passages on the upper side of the mixer blade.

5. A rotary mixer according to claim 1, characterized in that the outlets from the upper passages on the upper side of the mixer blade have a cross section larger than the outlets of the lower passages of the lower side of the mixer blade.

6. A rotary mixer according to claim 1, characterized in that the length of the blade elements on the upper side of the partition element in the mixer blade is less than that of the blade elements on the lower side of said partition element.

7. A rotary mixer according to claim 1, characterized in that the length of the blade elements on the lower side of said partition element is less than that of the blade elements on the upper side of said partition element.

8. In a mixer, a blade of ellipse-like shape in cross section and comprising a unitary hollow body with an upper and lower wall and having upper and lower passages of different cross sections defined therein by a further wall therein transverse to the axis of rotation of said mixer blade and blade elements perpendicular to said transverse wall at either side thereof, the inlets to said passages being concentric with the axis of rotation of said mixer blade and the outlets from said passages being disposed at the periphery of said mixer blade, said blade elements on one side of said transverse wall extending in the same direction as those on the other side thereof.

References Cited in the file of this patent

UNITED STATES PATENTS

127,030	Daniels	May 21, 1872
2,635,860	McLeob	Apr. 21, 1953
2,684,273	Fears et al.	July 20, 1954