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(54) **HYDRODYNAMIC DISPERSER**

(57) The invention relates to the field of producing and homogenizing disperse systems with a liquid medium, specifically for producing emulsions with a set concentration of components, for example hydrofuel components, and can be used in the fuel, energy, oil-processing and other sectors of industry. The technical result consists in producing a hydrodynamic disperser which makes it possible to introduce acoustic oscillations of different frequencies into a liquid, said frequencies being selected by means of manual adjustment without the disperser being dismantled, as well as in increasing the quality of the emulsion produced with the aid of the disperser by virtue of the fact that the hydrodynamic disperser com-

prises a body, a nozzle and a resonance plate, which is fixed in such a way as to be capable of moving towards the nozzle, the fastening elements of said resonance plate being arranged on the nozzle, wherein the nozzle comprises a slotted head and is in the form of a pipe with a flange, in which a threaded sleeve is fixed firmly, with a threaded plunger being passed through said threaded sleeve, the outer end of said threaded plunger being sealed on the inner side and on the outer side of a guide channel, and being provided with wrench flats, wherein the outer end of the threaded plunger is fixed with a nut.

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Description

[0001] The invention relates to the field of producing and homogenizing disperse systems with a liquid medium, specifically for producing emulsions with a prespecified concentration of components, for instance, hydro-fuel components, and can be employed in fuel, energy, oil processing and other sectors of the industry.

[0002] An apparatus to process liquids as per USSR Author's Certificate No. 101112 (cl. 12e) is known, which consists of a receptacle to where the liquid to be processed is fed at a high velocity through a nozzle, and an oscillator that produces ultrasonic oscillations in the liquid. As the oscillator, a plate with sharpened edges is used, placed in front of the nozzle outlet in the direction of the jet of the medium being processed and vibrating under the pressure of the medium. The plate is made adjustable relative to the nozzle.

[0003] A shortcoming of the above apparatus is the impossibility of introducing acoustic oscillations of varying frequency into the liquid.

[0004] Also, a method for preparation of the emulsion, a system and a device for implementation of the method are known (Russian Federation patent No. 2223815 (cl. B 01 F 11/00, 2004) taken as a prototype by the applicant. The emulsion preparation method comprises pre-processing of components and further mixing of the components in the first hydrodynamic disperser, with the mix so prepared exposed to the effect of an acoustic field. The emulsion preparation system comprises a main line of the first component, a main line of the second component, an emulsion line with the first hydrodynamic disperser whose outlet is connected with the inlet of an additional hydrodynamic disperser, and a mixer located at the inlet of the first hydrodynamic disperser. The hydrodynamic disperser consists of a body, a nozzle and a resonance plate fixed in such a way as to be capable of moving towards the nozzle, with the fastening elements of said resonance plate arranged on the nozzle.

[0005] The proposed technical solution is aimed at creating a hydrodynamic disperser that makes it possible to introduce acoustic waves of varying frequency into the liquid. Said frequencies are selected by means of manual adjustment without dismantling the disperser. One more objective of the invention is improvement of the quality of the emulsion produced with the help of the disperser.

[0006] The required technical results are achieved owing to that the hydrodynamic disperser comprises a body, a nozzle, and a resonance plate attached so as to be capable of moving towards the nozzle, with the fastening elements arranged on the nozzle. Also, the nozzle includes a slotted head and is made in the form of a pipe with a flange where a threaded sleeve is firmly fixed, with a threaded plunger passed through said threaded sleeve, the outer end of said threaded plunger sealed off on the inner side and on the outer side of the guide channel, and having wrench flats, wherein the outer end of the threaded plunger is fixed with a nut.

[0007] The hydrodynamic disperser is depicted in figures, where FIG.1 is a hydrodynamic disperser with a nozzle adjustment device (axial section); FIG.2 is construction unit I in FIG.1, nozzle adjustment device (axial section); FIG.3 is view A in FIG.1, slotted head.

[0008] The hydrodynamic disperser is made as follows. The hydrodynamic disperser comprises the body 1, the nozzle 2 with the slotted head 3, and the resonance plate 4, the nozzle 2 made movable for adjustment purposes whereas the resonance plate 4 is firmly fixed.

[0009] The nozzle 2 is placed in the guide channel 5 with the capability of moving and adjusting the nozzle relative to the resonance plate 4, while the resonance plate 4 is firmly fixed on the guide channel 5 by means of supports 6. The slotted head 3 of the nozzle 2 is made replaceable and fixed in the nozzle 2 to prevent rotation or dropout. The nozzle 2 is fitted with an outlet translation/adjustment device rigidly connected with the nozzle 2 and arranged inside the guide channel 5, while the drive arrangement of the device is arranged on the outer surface of the guide channel 5. To this end, the nozzle 2 is made in the form of a pipe with a flange 7 wherein the threaded sleeve 8 is firmly fixed, through which the threaded plunger 9 is passed. One end of the threaded plunger 9 is placed inside the guide channel 5 and butts against its vertical wall and the other end goes outside and made, for instance, with wrench flats. This being the case, the external end of the threaded plunger 9 is sealed off on both inner and outer sides of the guide channel 5 and is fixed with the nut 10 used, while in operation, for alignment and adjustment of the nozzle outlet, as well as for prevention of inadvertent falling-out.

[0010] The hydrodynamic disperser performs as follows.

[0011] When a single-component jet (mazuth, diesel, water), water-diesel emulsion or a water/mazuth mixture is ejected in the hydrodynamic disperser from the nozzle 2 via the slotted head 3, hydrodynamic cavitation accompanied by intense ultrasonic oscillations takes place due to the high velocity of the jet and impingement inside the body 1 of the hydrodynamic disperser.

[0012] When the flow of a single-component emulsion or a mixture of emulsion components runs against the sharp edge of the resonance plate 4 in the zone of such hydrodynamic cavitation, there oscillations are generated that penetrate to the surrounding medium. If the nozzle 2 is adjusted by shifting it relative to the resonance plate 4 to the state of resonance with the oscillations in the flow of mixtures (emulsion), intense acoustic oscillations necessary for dispersal of particles are produced. The resonance plate 4 is also affected by the jet ejected via the slotted head 3 of the nozzle.

[0013] The hydrodynamic disperser (each of the primary ones, 10 and 17, and the main one, 26) is made so as to ensure the capability of setting up the operation mode under conditions of a low-frequency and high-frequency fields. Such setting-up is performed by moving the nozzle 2 relative to the resonance plate 4, due to

which the frequency of the acoustic field can be changed.

[0014] For the setting-up, the nozzle 2 has a translation/adjustment device whose drive arrangement is made in the form of a threaded plunger 9. The outer end of the threaded plunger 9 is made with wrench flats and fixed in the guide channel 5 with the nut 10. To adjust the outlet of the nozzle 2 relative to the resonance plate 4, one has to back the nut 10 off by as many turns as is required to shift the nozzle 2 (calibrated). After that, the threaded plunger 9 with the threaded sleeve rigidly connected with the flange 7 of the nozzle 2 is rotated by means of a wrench. Rotation of the threaded plunger 9 results in linear translation of the threaded sleeve 8. It operates as a screw pair that moves the nozzle 2 by moving the flange 7.

[0015] The above design of the hydrodynamic disperser allows easy frequency tuning without dismantling the disperser itself.

[0016] The technical result consists in creating a hydrodynamic disperser that makes it possible to introduce acoustic waves of varying frequency into the liquid. Said frequencies are selected by means of manual adjustment without dismantling the disperser. Also, an improved quality of the emulsion so produced is achieved.

Claims

1. The hydrodynamic disperser comprising a body (1), a nozzle (2), and a resonance plate (4) fixed so as to retain the capability for moving towards the nozzle (2), with the fastening elements arranged on the nozzle (2), **characterized in that** the nozzle (2) comprises a slotted head (3) and is made in the form of a pipe with a flange (7) in which a threaded sleeve (8) is firmly fixed, with a threaded plunger (9) passed through the sleeve (8), the outer end of said threaded plunger (9) sealed off on the inner side and on the outer side of the guide channel (5) and made with wrench flats while the outer end is fixed with a nut (10).

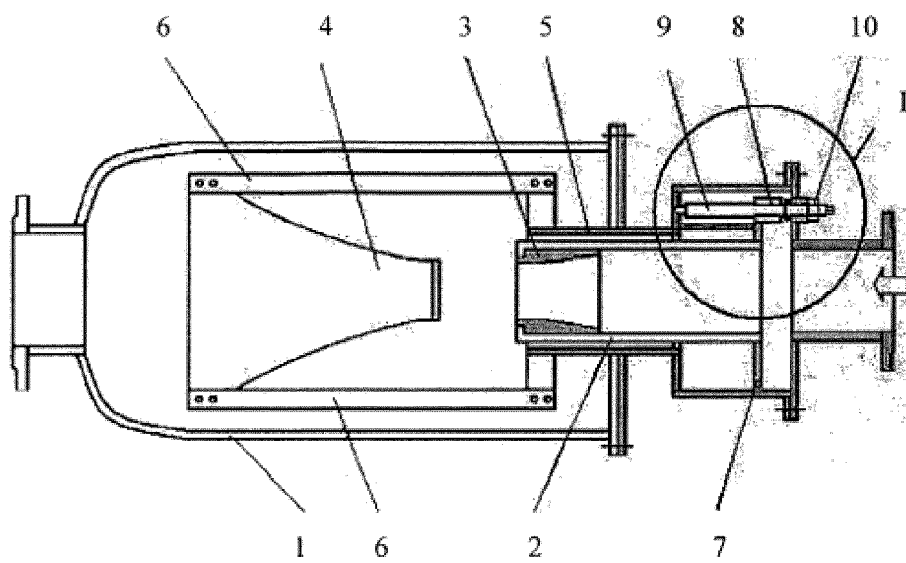


Fig. 1

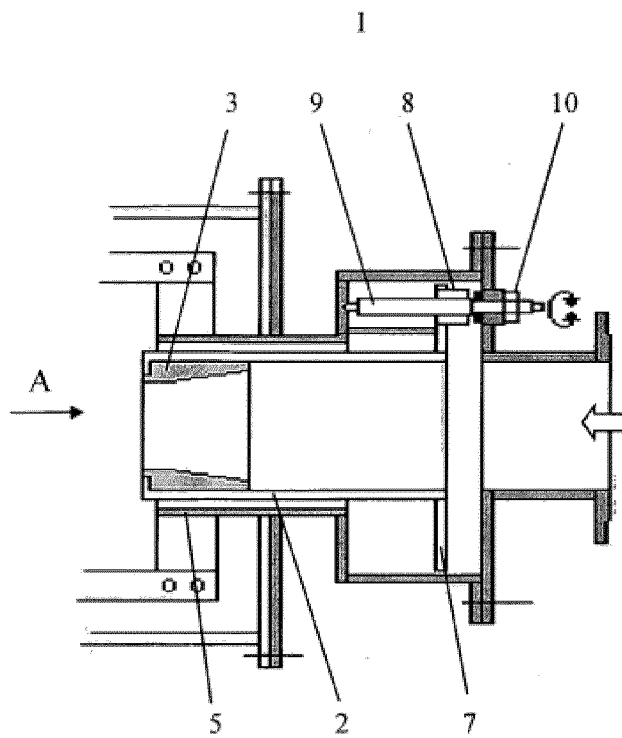


Fig. 2

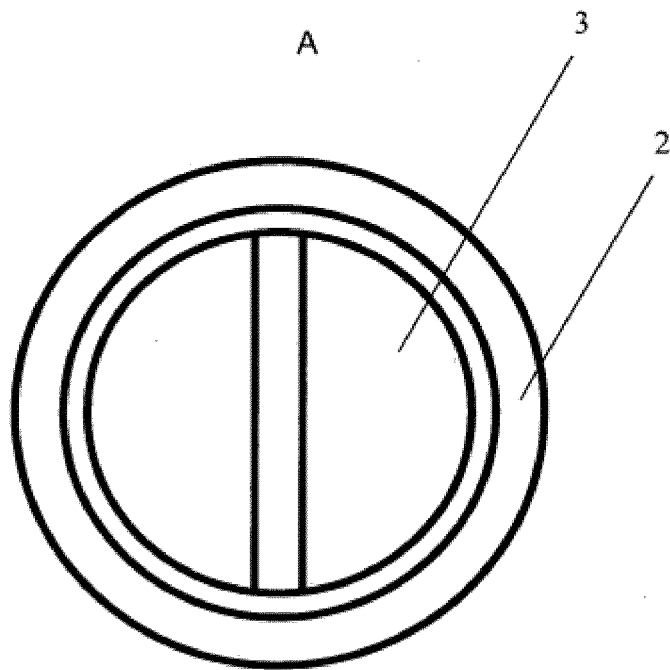


Fig. 3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/RU 2010/000327

A. CLASSIFICATION OF SUBJECT MATTER			B01F 11/00 (2006.01)
According to International Patent Classification (IPC) or to both national classification and IPC			
B. FIELDS SEARCHED			
Minimum documentation searched (classification system followed by classification symbols)			
B01F 3/00-3/10, 11/00-11/02			
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched			
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)			
C. DOCUMENTS CONSIDERED TO BE RELEVANT			
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	
A	SU 959816 A (CHILISAISKY FOSFORITNY RUDNIK) 28.09.1982, column 2, lines 12-21, column 3, lines 13-18, figure 1	1	
A	US 3176964 A (SONIC ENGINEERING CORPORATION) 06.04.1965, column 3, lines 36-51, figure 1	1	
A	RU 26197 U1 (SALATOV VYACHESLAV GRIGOREVICH et al.) 20.11.2002, the claims, figure 1	1	
☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.			
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family			
Date of the actual completion of the international search		Date of mailing of the international search report	
19 November 2010 (19.11.2010)		25 November 2010 (25.11.2010)	
Name and mailing address of the ISA/		Authorized officer	
Facsimile No.		Telephone No.	

Form PCT/ISA/210 (second sheet) (July 1998)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- RU 101112 [0002]
- RU 2223815 [0004]