(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 154 901**
A2

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **85102247.5**

(22) Date of filing: **28.02.85**

(51) Int. Cl.⁴: **B 01 F 3/12**, B 01 F 7/02

(30) Priority: **28.02.84 PL 246465**

(43) Date of publication of application: **18.09.85**
Bulletin 85/38

(84) Designated Contracting States: **AT BE DE FR GB IT NL**

(71) Applicant: **Zaklady Produkcji Urzadzen Mechanicznych im. Janka Krasickiego "ELWO", ul. Bielska 44, Pszczyna (PL)**
Applicant: **Biuro Studiow i Projektow Energetycznych "ENERGOPROJEKT", ul. Jesionowa 15, Katowice (PL)**

(72) Inventor: **Saternus, Antoni, ul. Bojszowska 68, Tychy-Bierun Stary (PL)**
Inventor: **Miczek, Ludwik, ul. Wyspianskiego 18 a, Pszczyna (PL)**
Inventor: **Bartnik, Mieczyslaw, ul. Brzozowa 8, Gliwice (PL)**

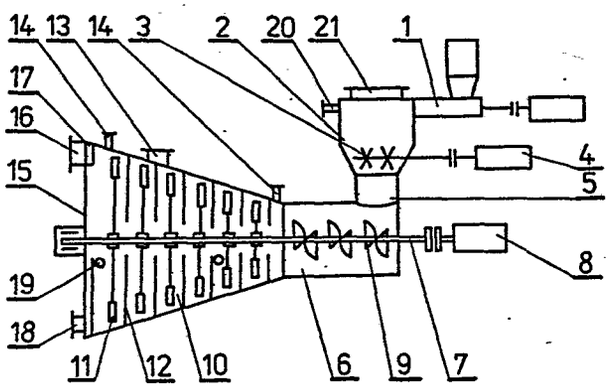
(74) Representative: **Füchsle, Klaus, Dipl.-Ing. et al, Hoffmann . Eitle & Partner Patentanwälte Arabellastrasse 4, D-8000 München 81 (DE)**

(54) Flow mixer.

(57) The subject of the invention is a flow mixer for mixing fine-grained and dusty solid materials with water in a continuous manner. The mixer according to the invention comprises a feeder (1) for batching ash in a continuous manner, a moisturing chamber (2), a homogenization chamber (6) and a fluidization chamber (10).

The moisturing chamber (2) preferably has a slow-speed mixer (3), whereas the homogenization chamber and the fluidization chamber are set after each other axially and have a common shaft (7) with advancing and homogenizing-mixing members (9, 11). The fluidization chamber (10) is in the form of the frustrum of cone or cylinders of increasing diameters.

The mixer has separate drives (4, 8), water supply stub-pipes (14, 20), bottom ash supply stub-pipe (13) and an inspection manhole (21).



EP 0 154 901 A2

FLOW MIXER

The present invention relates to a flow mixer for mixing fine-grained and dusty solid bodies with water, e.g. for mixing of fly ash and bottom ash with water in a continuous manner.

The presently known devices for mixing ash with water in a continuous manner include constructions of the mixer, flushing, and ejector type and cyclically operating mechanical mixers. Mixers are composed of a chamber in which ash flushed by a water stream is supplied by gravitation.

Such flushing apparatus comprises a passage through which water flows continuously, and a stub-pipe above the passage, through which fly ash is charged. Mixers and flushing apparatus serve for mixing ash with water in concentrations of from several parts up to a dozen or so parts of water per 1 part of ash. Cyclically operating mixers are composed of a mixing chamber provided with one or several rotational shafts on which mixing members are mounted, which are in the form of leaves, blades or bars performing conforming or contrary rotary motion.

Through the charging stub-pipe, ash is fed in measured batches and through another stub-pipe a strictly determined batch of water is supplied.

The mixer mixes the received components and after a preset time it is emptied of the obtained suspension. The mixing cycle restarts from the beginning. In mixers of

this type, the concentrations achieved are of the order of 0.5 up to several parts of ash per one part of water.

An inconvenience of these mixers is the necessity of using retention tanks of big capacity in hydraulic transport installations and a large number of mixers working in cycles offset in relation to one another.

So far, continuously working mixers in which a mixture of high ash concentration can be obtained have not been known.

An object of the invention is to provide a continuously working mixer which does not require retention tanks of big capacity, and does not require mixers other than one working and one stand-by mixer.

It is desirable to build such a mixer so that the load of drives is as much compensated as possible during operation thereof.

According to one aspect of the invention, there is provided a flow mixer for continuous mixing of fine-grained or dusty materials with water, characterised by: a batching feeder for supply of the material; a moisturizing chamber arranged to receive and moisten the material from the feeder; a homogenizing chamber arranged to receive the material from the moisturizing chamber and to provide a more homogeneous mixture; and a fluidization chamber arranged to receive the material from the homogenizing chamber and to add further liquid for producing a fluidized mixture.

The mixer according to another aspect of the invention is composed of a feeder batching dry ash in a continuous

manner, a moisturing chamber which can be provided with a slow-speed mixer of arbitrary design, a homogenization chamber and a fluidization chamber. Outlets from particular chambers join directly the inlet to the subsequent chamber. The homogenization chamber and the fluidization chamber are placed axially one after the other and have a shaft in common on which homogenizing-mixing and pushing-through members in the form of leaves, blades and worms are mounted. The homogenization chamber is in the form of a cylinder and is set horizontally. The fluidization chamber is in the form of the frustrum of cone or in the form of subsequently placed cylinders of increasing diameters. The normal section of the fluidization chamber increases continuously or step-like in the direction of the mixture flow. Members mounted on the shaft have the flat surfaces inclined at an angle of 5° - 30° in relation to the normal plane of the shaft axis.

To the jacket of the moisturing and fluidization chambers stub-pipes for connecting water pipelines and stub-pipes of inspection holes are built. Besides, a stub-pipe enabling the supply of granular bottom ash is connected to the jacket of the fluidization chamber. The fluidization chamber is closed by a cover wall which has in its upper fragment an outlet stub-pipe. To the outlet stub-pipe from the internal side an outflow control element is built-on. In the lower fragment the cover wall has a tapping stub-pipe. The shaft passing through the homogenization and the fluidization chambers in places of passing through the small and big cover walls have a water seal. The shaft of the batching feeder, of the slow-speed mixer in the moisturing chamber and the working shaft in the homogenization and fluidization chambers have separated drives.

For a better understanding of the invention, and to show how the same may be carried into effect, reference will now be made, by way of example, to the single Figure of the accompanying drawing which shows in lateral sectional view a preferred embodiment of mixer according to the invention.

The mixer has a batching feeder 1, a moisturing chamber 2 in which a slow-speed mixer 3 driven by a drive unit 4 is provided. The outlet of the moisturing chamber 2 joins an inlet 5 of an homogenization chamber 6 in which a shaft 7 is provided driven by a drive motor 8. On the shaft 7 worm segments 9 are mounted. To the homogenization chamber 6 a fluidization chamber 10 is connected, in which the shaft 7 carries mixing and advancing members 11. On the jacket of the fluidization chamber 10, stopper or blocking members 12, a stub-pipe 13 to supply bottom ash, and water stub-pipes 14 are provided. The larger end wall 15 of the fluidization chamber has an outlet stub-pipe 16 with an outflow control element 17, and a tapping stub-pipe 18. Besides, the fluidization chamber 10 has a sample collection stub-pipe 19. The moisturing chamber has a water stub-pipe 20 and an inspection manhole 21.

The mixer operates in the following way: The batching feeder 1 having its own drive unit as illustrated, feeds dry ash to the moisturing chamber 2. At the same time, water is supplied to the said chamber 2 through the stub-pipe 20. In the chamber 2, ash is wetted and mixed by means of the mixer 3. In turn, the mixture which is still very heterogeneous passes through the inlet 5 to the homogenization chamber 6 wherein it is pressed in order to remove air, and mixed and forced through by the worm segments 9. In the said chamber 6, the mixture is

homogenized and gains a dense plastic consistency. Next, the mixture passes to the fluidization chamber 10 in which water supplied by the stub-pipe 14 causes its conversion into the fluid state.

At the same time the mixing and advancing members 11 and stopper or blocking members 12 produce turbulent whirling of the mixture, the intensity of which increases in the axial direction as the internal diameter of the chamber increases. In the final stage, full discharge of electrostatic charges and full wetting of the ash grain surface occurs, as a result of which the mixture gains the properties of a heavy liquid. To the mixture thus produced, bottom ash is fed by the stub-pipe 13. The mixture of water and dust with possible addition of bottom ash flows out through the outlet stub-pipe 16.

The mixture according to the invention can be applied both in hydraulic transport systems and in technological lines at the preparation of mixtures and suspensions of different media and substances.

0154901

Claims:

1. A flow mixer for continuous mixing of fine-grained or dusty materials with water, characterised by:

a batching feeder (1) for supply of the material;

a moisturizing chamber (2) arranged to receive and moisten the material from the feeder (1);

a homogenizing chamber (6) arranged to receive the material from the moisturizing chamber (2) and to provide a more homogeneous mixture; and

a fluidization chamber (10) arranged to receive the material from the homogenizing chamber (6) and to add further liquid for producing a fluidized mixture.

2. A mixer according to claim 1 wherein said homogenizing chamber is provided with a plurality of notably drivable worm segments (9).

3. A mixture according to claim 1 or 2 wherein said fluidization chamber (10) is substantially frusto conical, and increases in diameter in the direction of material flow.

4. A mixer according to any one of claims 1 to 3 wherein said fluidization chamber comprises a plurality of axially spaced rotatably mounted mixing members (11).

5. A mixer according to claims 2 and 4 wherein said worm segments (9) and said mixing members are mounted on a common shaft (7).

6. A flow mixer appropriated for mixing fine-grained and dusty solid materials with water in a continuous manner, characterised in that it has a batching feeder (1) whose outlet joins a moisturing chamber (2) preferably provided with a slow-speed mixer (3), the outlet of

the moisturing chamber joining an inlet (5) of a cylindrical chamber (6) in which a shaft (7) is provided with homogenizing and advancing members in the form of separately mounted worm segments (9), whereas the outlet of the cylindrical chamber (6) joins the inlet of a fluidization chamber (10) in the form of the frustum of cone or a series of mutually connected cylinders of increasing diameters, the cross-section of the said chamber increasing gradually or step-wise in the horizontal direction of the shaft, and on the shaft mixing members (11) being provided, which are in the form of bars, blades or leaves of length increasing as the internal diameter of the chamber increases, the end wall (15) of the fluidization chamber having an outlet stub-pipe (16) having an outflow control element (17), and water supply stub-pipes (14) and (20) and an inspection manhole (21) and a sample collection stub-pipe (19) being provided on the jacket of the moisturing chamber and the fluidization chamber, and an inlet stub-pipe (13) for bottom ash or other granular material being provided on the jacket of the fluidization chamber, and blocking members (12) being provided in the radial direction.

7. A flow mixer according to claim 6, wherein the batching feeder (1), the slow-speed mixer in the moisturing chamber (2), and the shaft (7) with homogenizing members (9), and pushing-through and mixing members (11), have separate, independent drives (4,8), the circumferential velocities of the ends of mixing members (11) on the shaft (7) being preferably from 2 to 12 m/s.

8. A flow mixer according to claim 6 or 7 wherein the pushing-through and mixing members (11) have flat surfaces inclined at the angle of from 5° to 30° in relation to the normal plane to the axis of the shaft (7).

0154901

9. A flow mixer according to claim 6, 7 or 8 wherein the ratio of the diameter of the maximum section to the diameter of the minimum section of the fluidization chamber (10) is within the range of from 1 to 4.

0154901