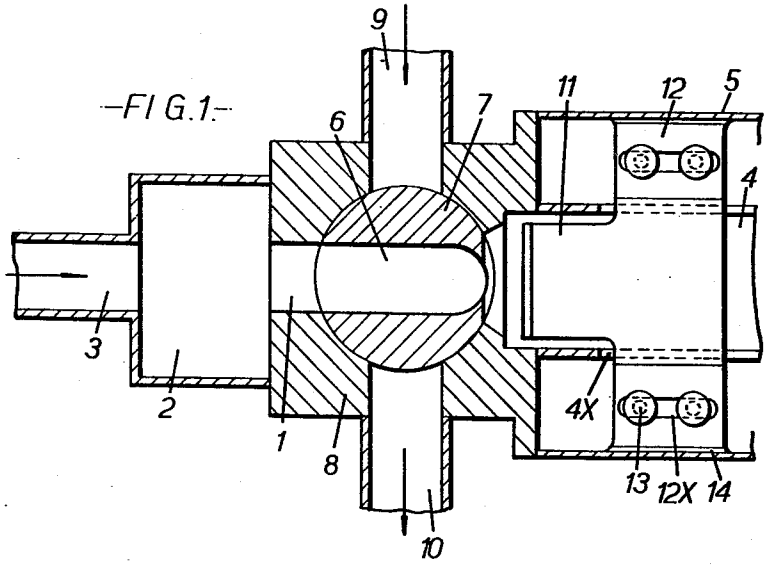
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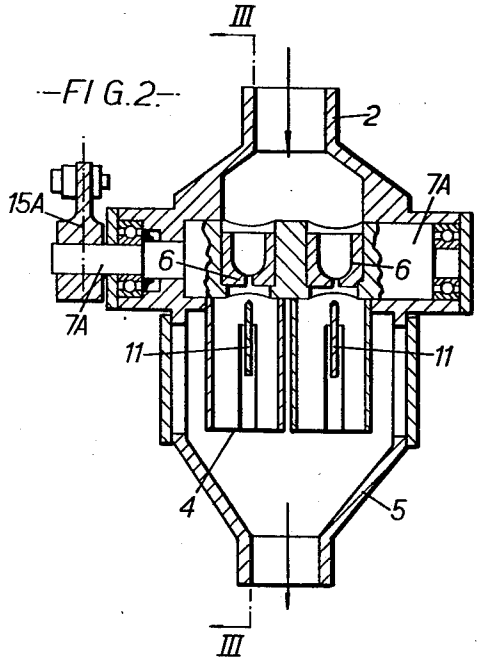
APPARATUS FOR THE MECHANICAL PRODUCTION OF ACOUSTIC VIBRATIONS FOR USE IN DISPERSION OR LIKE PROCESSES

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—FIG. 1—



—FIG. 2—



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FIG. 3

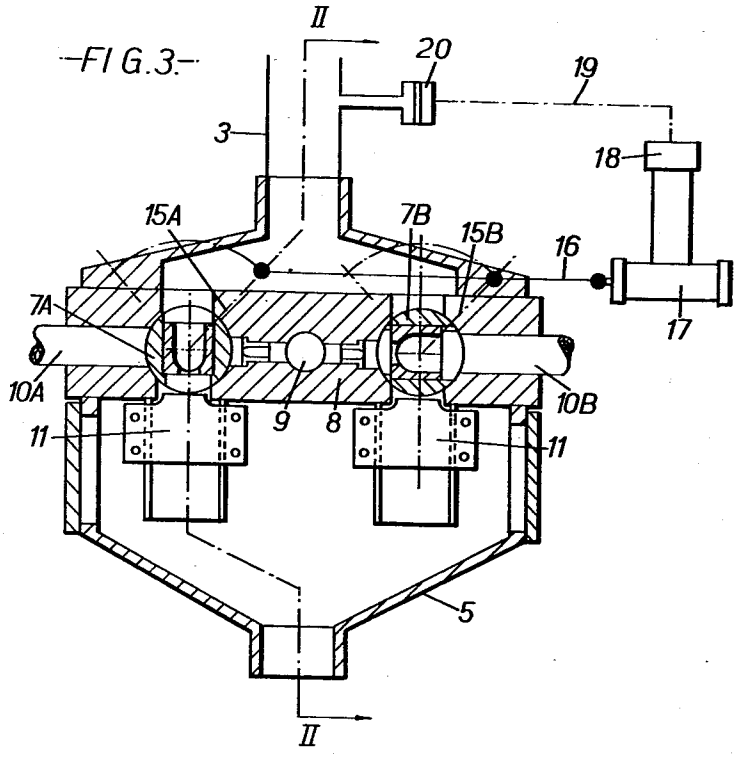
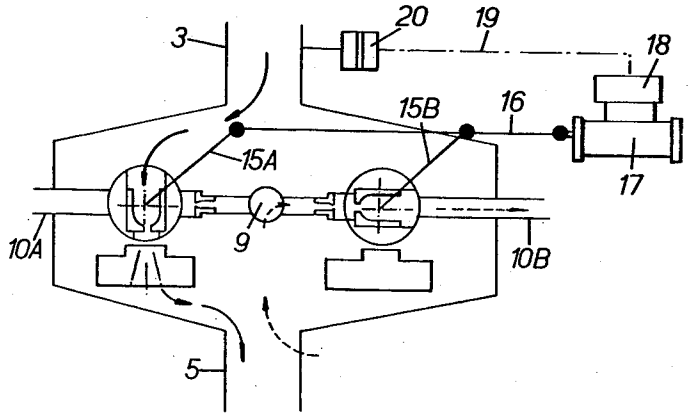


FIG. 4



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FIG. 5.

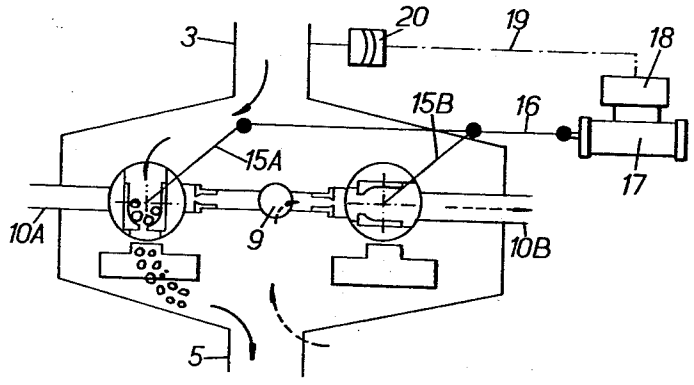
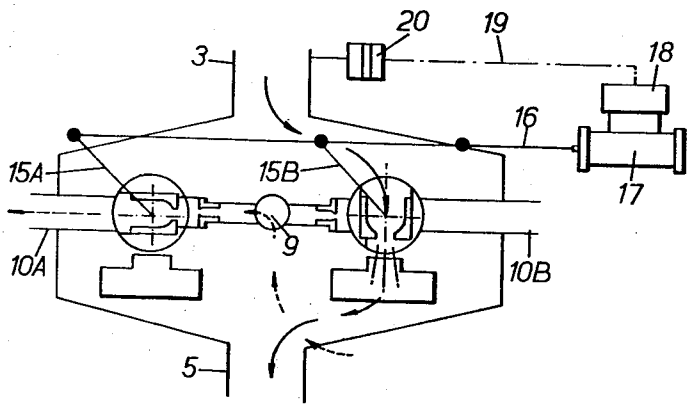


FIG. 6.



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APPARATUS FOR THE MECHANICAL PRODUCTION OF ACOUSTIC VIBRATIONS FOR USE IN DISPERSION OR LIKE PROCESSES

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6 Claims. (Cl. 259—4)

ABSTRACT OF THE DISCLOSURE

Method and apparatus for mechanical production of acoustic vibrations and dispersing fibrous systems in a liquid by said vibrations comprising a piping system conveying fibre-bearing liquid rendering pressure to a plurality of whistles in parallel with said pipe, each of the whistles being independently turned off by means which closes the whistles to the passage of liquid in the piping system and reverse flushing means to clear the jet outlet of one whistle while another whistle is kept operative.

This invention relates to apparatus for the mechanical production of acoustic vibrations for use in processes where dispersions or like preparations of substances are to be made.

An apparatus for this purpose embodying a so-called liquid whistle has been described in the specification of my Patent No. 2,657,021 and this has found a large number of practical uses where its operation has been satisfactory. However, I have found that this apparatus has certain limitations particularly where the process involves the opening out of mineral or vegetable fibres by dispersing them in a liquid. It was found that very large quantities of liquid had to be used and the apparatus had to be fitted into a pipeline. But a greater difficulty arose from the blocking of the jet-producing structure by fibres which were deposited in a criss-cross fashion until eventually the jet outlet was completely blocked. Attempts to cure this fault by changing the shape of the jet outlet were unsuccessful.

I have, therefore, evolved an improved apparatus which constitutes the present invention and which comprises a plurality of so-called liquid whistles arranged in parallel in the pipe system carrying the fibre-bearing liquid, means for closing each whistle to the passage of said liquid and for passing a flushing fluid in the reverse direction through the jet structure of said whistle to clear its jet outlet, and means for keeping at least one whistle always in operation to maintain the flow of fibre-bearing liquid. The arrangement is such that the stream of liquid can be directed through either or any one of the whistles at choice and preferably will be such that this change-over will automatically produce flushing of the jet outlet which was previously in use.

According to a further feature of the invention, in order to cope with the large quantity of liquid to be processed and to reduce the likelihood of the support structure for the vibratory blade becoming blocked by fibres, not only are the sizes of the jet outlet and blade increased, but the manner of mounting the blade is modified by locating its support means outside the resonant bell or other conduit or passage through which the liquid passes on leaving the jet outlet.

In order that the invention may be fully and clearly comprehended, the same will now be described with reference to the accompanying drawings, wherein:

FIGURE 1 illustrates in cross section part of an apparatus according to the invention, showing a liquid whistle with a rotatable jet structure, in its operating position;

FIGURE 2 illustrates on a smaller scale and in cross section a similar arrangement to that in FIGURE 1, but with two pairs of whistles mounted in parallel upon two rotatable shafts, the section being taken generally on the line II—II in FIGURE 3;

FIGURE 3 is a cross-sectional view taken on the line III—III in FIGURE 2, and indicating diagrammatically means for detecting a blockage and means for changing over to the other pair of whistles and for cleaning the blocked ones;

FIGURES 4–6 illustrate diagrammatically the operation of the apparatus according to the invention.

In the arrangement shown in FIGURE 1, two liquid whistles are arranged in parallel, that is side by side (one behind the other as viewed in the figure), their inlet ends **1** communicating with a common inlet manifold **2** to which is coupled a pipe **3** carrying the fibre slurry or fibre-bearing liquid and their delivery ends, in the form of cylindrical resonant bells or tubes **4**, projecting into a common discharge manifold **5**.

Each jet structure **6** is mounted on a common shaft **7** in a housing **8** in which it can be rotated through 90° to bring it either in line with the axis of the jet outlet as shown in FIGURE 1, or alternatively in line with an inlet port **9** and outlet port **10** in the housing for the flow of flushing fluid, for example, high pressure water. The two jet structures are set on the shaft **7** at 90° to one another so that when one is in its operating position as in FIGURE 1, the other is in its flushing position, and vice versa.

The vibratory blade or wedge as described in the specification of my aforesaid patent was of uniform width and was supported by a structure contained within the surrounding resonant bell. In developing the apparatus of the present invention I found it necessary to use blades or wedges which were both thicker and which had a longer cantilever length than those previously employed. Furthermore, the blade supporting structure, when contained within the resonant bell, was found to form an obstruction on which fibrous matter could gather. According to the present invention, therefore, each blade **11** has a tongue portion projecting towards the jet structure, but is supported externally of the bell **4** by wing portions **12** which extend through longitudinal slots **4X** in the bell and which are secured by screwed studs **13** passing through slots **12X** in the wing portions into lugs **14** formed on or secured to the manifold **5**. This method of mounting the blade also permits it to be adjusted axially relative to the jet structure for varying the action of the whistle, the rotary mounting of the jet structure rendering its axial adjustment inconvenient.

By the above described arrangement of rotary jet structures, when one jet becomes blocked sufficiently to render it inefficient, it can be flushed out, the second jet meanwhile taking its place, and thus continuous and efficient operation of the apparatus is ensured. Means for enabling this change-over to take place automatically when it becomes necessary will be described with reference to the apparatus of FIGURES 2 and 3.

The arrangement of FIGURES 2 and 3 is similar to that of FIGURE 1 and like parts to those in FIGURE 1 are given like reference numerals. However, the jet structures are mounted in pairs on two shafts **7A**, **7B** which are linked by arms **15A**, **15B** to a rod **16** actuated by the ram of a pneumatic cylinder **17** to which air is supplied through a solenoid-operated valve **18**. The solenoid is energised through an electrical connection **19** by a pressure-actuated switch **20** which may be of the diaphragm type and which communicates with the inlet pipe **3**.

In FIGURES 4 and 5 the jet structures are in the positions shown in FIGURE 3, the flow of the fibre-

bearing liquid being indicated by full-line arrows through the jet structures in shaft 7A whilst the jet structures in shaft 7B are in the flushing positions with inlet 9 communicating with outlet 10B. When a partial or complete blockage of one or both of the jets in use as is indicated in FIGURE 5 causes a predetermined rise in pressure of the liquid in pipe 3, that is upstream of the jets, the pressure switch 20 operates to cause both shafts to be rotated through 90° to the positions shown in FIGURE 6 where the jet structures in shaft 7B are brought into operation while the blocked jets have been simultaneously brought to the flushing position and are cleared by the flow of flushing fluid from inlet 9 to outlet 10A. The flushing water may be supplied at high pressure from a pump (not shown) which can be started and stopped automatically by any suitable control device, and it will be noted that the flushing water is forced through the jets in the reverse direction to that of the flow of fibre-bearing fluid therethrough. Preferably, however, the flushing water is continuously being pumped through whichever jet structure or structures is or are temporarily out of operation.

By adjusting the pressure value at which switch 20 operates, the permissible degree of partial blockage of the jets in operation before the change-over is made can be chosen to suit the requirements of the apparatus in any particular installation.

It is to be understood that two whistles only may be used, one operating at a time, or there may be two sets with two or more in each set.

Whilst the herinbefore described embodiments of the invention have been mentioned merely by way of example, it is to be understood that other suitable embodiments may be evolved for carrying out the invention and that protection is hereby claimed for all such embodiments within the scope of the appended claims.

I claim:

1. In apparatus for the mechanical production of acoustic vibrations for producing dispersions of fibrous substances in a liquid, the combination of a pipe system for conveying said fibre-bearing liquid under pressure, a plurality of liquid whistles arranged in parallel in said pipe system, means for rendering inoperative each whistle independently by closing it to the passage of said liquid, means for passing a flushing fluid under pressure in the reverse direction through the jet structure of each said whistle when so rendered inoperative to clear its jet outlet, and means for keeping at least one of said whistles always in operation to maintain the flow of said fibre-bearing liquid through said pipe system.

2. In apparatus for the mechanical production of acoustic vibrations for producing dispersions of fibrous substances in a liquid, the combination called for by claim 1, including means associated with the jet structures of all said whistles for moving at least one of said structures at a time into its inoperative position to be flushed and for causing simultaneous movement of another jet structure from its inoperative to its operative position to maintain the flow of said fibre-bearing liquid.

3. In apparatus for the mechanical production of acoustic vibrations for producing dispersions of fibrous substances in a liquid, the combination of a pipe system for conveying said fibre-bearing liquid under pressure, a plurality of liquid whistles arranged in parallel in said pipe system with their jet structures mounted for rotary movement, at least one of said jet structures being offset angularly around its axis of rotation in relation to another of said jet structures, means for rotating at least one of said jet structures between its operative position and an inoperative position and for simultaneously rotating another of said jet structures, and means for passing a flushing fluid under pressure in the reverse direction through each of said jet structures when in its inoperative position to clear its jet outlet, thereby keeping at least one of said whistles always in operation to maintain the flow of said fibre-bearing liquid through said pipe system.

4. In apparatus for the mechanical production of acoustic vibrations for producing dispersions of fibrous substances in a liquid, the combination called for by claim 3, wherein said means for rotating said jet structures includes a pressure-sensitive device sensitive to the increase in pressure produced in said fibre-bearing liquid upstream of said whistles by the blocking of said operative jet structure.

5. In apparatus for the mechanical production of acoustic vibrations for producing dispersions of fibrous substances in a liquid, the combination called for by claim 3, wherein each said liquid whistle has a vibratory blade located within a resonant bell but supported upon a support structure which is located externally of said bell and which is thereby clear of the flow of said fibre-bearing liquid, said blade extending through its said bell and being secured to its said support structure by adjustable means arranged to permit the distance of the blade edge from the jet outlet to be adjusted.

6. A method of opening out fibres by dispersing them in a liquid with the aid of a liquid whistle, which method includes passing the fibre-bearing liquid under pressure through at least one of a plurality of said whistles arranged in parallel, using the increase in pressure produced in said fibre-bearing liquid up-stream of said whistle by the blocking of the jet structure of the one whistle to cause the flow of said liquid to be transferred to another of said whistles and to cause a flushing fluid to be passed under pressure through the jet structure of the blocked whistle to clear it while the dispersion operation continues.

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