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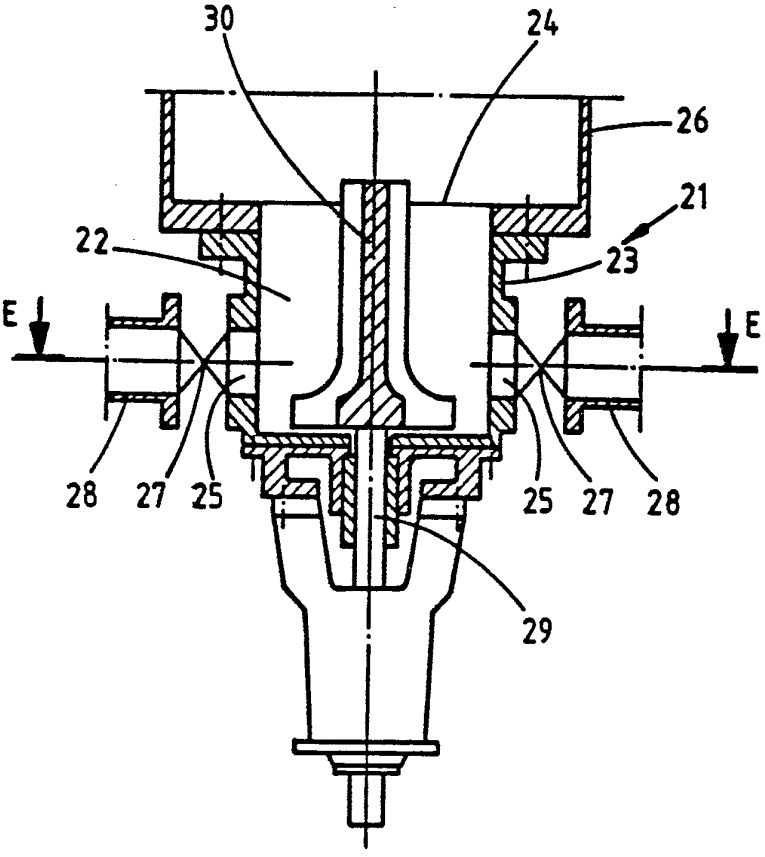
(54) Title: METHOD AND APPARATUS FOR DIVIDING AND UNITING THE FLOWS OF HIGH-CONSISTENCY FIBRE SUSPENSIONS

(57) Abstract

To prevent clogging of the distributor (21) the fibre suspension is caused to flow into a space (22) connecting the inlet and the outlet flows, where a turbulent flow extending to the valves (27) regulating the discharge flow is created. The distributor (21) comprises a vortex chamber (22) provided with an inlet (24) and outlets (25) and with regulating valves (27) connected to the outlets and disposed at a short distance from the outlets. According to a preferred embodiment of the invention, a rotor (30) provided with vanes (31) is disposed in the vortex chamber.



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METHOD AND APPARATUS FOR DIVIDING AND UNITING THE FLOWS OF HIGH-CONSISTENCY FIBRE SUSPENSIONS

The present invention relates to a method and an apparatus for dividing and uniting the flows of high-consistency fibre suspensions.

The pulp industry often requires that fibre suspension is conveyed from a vessel or a pipe continuously or intermittently divided evenly or in a desired manner to several different places, e.g. from a storage tank to two or more processing devices. When the consistency of the suspension is low, i.e. up to approx. 5 per cent, no problems arise, but when the consistency is higher there is little free liquid between the fibres and the fibres form a fibre network the situation is quite different.

When the consistency is high, e.g. from 8 to 15 per cent, the fibre suspension forms a strong fibre network and dividing and uniting fibre suspensions in a pipe line is often impossible without special measures. When a high-consistency fibre suspension arrives at a junction point in the pipe line, the fibre network may be too strong to be dispersed. It is possible that the fibre network sticks to a part of the pipe which results in precipitation and clogging of the pipe line. When one branch of the pipe line is not in use and is closed by a valve, the portion of the pipe preceding the valve is easily clogged and does not open when the valve is opened.

Because of the strong fibre networks, high-consistency pulp flows from branch pipes can not be combined in a pipe line. Without special measures the fibre networks prevent two flows of a smaller diameter from forming a

flow with a larger diameter.

The above problems in dividing and uniting the flows are avoided by subjecting the flow to such an intensive field of shear forces that the bonds between the fibres are broken and a turbulent flow is created where no fibre networks preventing the division and combination of the suspensions exist. The shear forces can be created by the geometry of the junction point or by a rotor.

The object of the present invention is to provide a method and an apparatus by which the flow of a fibre suspension of the consistency of 5 to 20 per cent can be divided and united in a controlled manner.

The use of turbulence to disrupt fibre bonds is previously disclosed e.g. in Finnish patent no. 51116 and Finnish patent application no. 781071.

The former of these publications discloses a pulp distributor connected to a sheet formation device in which the flow is accelerated in a tapering portion of a pipe and is caused to impinge at high speed agains a wall which forces the flow radially outwards to the outlets disposed around the impingement area.

The latter of the publications discloses a device for removing pulp from a vessel in which a pump connected to the outlet of the pulp vessel is provided with a rotor extending into the vessel.

The main charcteristic feature of the present invention is that the fibre suspension is caused to flow into a space uniting the inlet and the outlet flows in which space a vortex flow is created to prevent a still pocket-

like state of the suspension.

The vortex flow is preferably created by a rotor.

The apparatus for carrying out the invention is characterized by a vortex chamber provided with inlets and outlets.

The invention is described in detail below with reference to the accompanying drawings which illustrate preferred embodiments of the apparatuses for carrying out the method of the invention.

Fig. 1 is a longitudinal cross section along line B-B of the distributor of fig. 2.

Fig. 2 is a section along line A-A of fig. 1.

Fig. 3 is a section along line D-D of fig. 4 illustrating an other embodiment of a distributor.

Fig. 4 is a section along line C-C of Fig. 3.

Fig. 5 is a section along line F-F of fig. 6 illustrating a third alternative embodiment of a distributor.

Fig. 6 is a section along line E-E of fig. 5.

Fig. 7 is a section along line H-H of fig. 8 illustrating a fourth embodiment of a distributor.

Fig. 8 is a section along line G-G of fig. 7.

In the distributor 1 illustrated in figures 1 and 2, the numeral 2 refers to a vortex chamber the wall 3 of which

is provided with an inlet 4 and outlets 5. An inlet pipe 6 is connected to the inlet, the outlets are provided with regulating valves 7 to which outlet pipes 8 are connected. The regulating valves are disposed at a short distance from the inner surface 9 of the vortex chamber (<d/2, where d is the diameter of the outlet 5). Fibre suspension is supplied via the inlet pipe 6 at a high velocity (>3m/s) to the vortex chamber 2 in which turbulence preventing the formation of fibre networks is created by the changes of direction caused by the small volume, the expansion of flow and the angular shape of the chamber even if some of the valves were closed. A major part of the kinetic energy of the fibre suspension is tranformed into turbulent energy. The higher the velocity of the inlet flow and the smaller the vortex chamber is, the greater is the intensity of the turbulence and its disrupting effect on the fibre bonds.

The fibre suspension is removed from the vortex chamber through the regulating valves and is supplied through the branch pipes 8 to process devices which are not illustrated. The valves can be used for regulating the fibre suspensions flows to the process devices as required. The diameter of the branch pipes can be equal, as illustrated in the drawings, or unequal. The vortex flow extending to the inlets of the valves prevents plugs from being formed in front of the valves when they are closed.

The distrubutor 11 illustrated in figures 3 and 4 is equal to the embodiment of figures 1 and 2 with the exception of its vortex chamber 12 the shape of which is different.

The distributor 21 illustrated in figures 5 and 6

comprises a cylindrical vortex chamber 22 provided with an inlet 24 to which an inlet pipe 26 is connected. A vortex chamber wall 23 shows four outlets 25 disposed at an equal distance from each other, to which the outlet pipes 28 are connected through regulating valves 27. A rotor 30 provided with vanes 31 is disposed in the vortex chamber. The shaft 29 of the rotor is mounted on bearings and the rotor rotated by known methods.

The desired turbulent flow is created by rotating the rotor. The range of the rotor is approx. 6 R where R is the distance of the vane outer edge from the shaft center line.

In the distributor 41 illustrated in figures 7 and 8 the position of the inlet pipe 46 and the outlet pipe 48 in relation to the rotor 50, and the shape of the vortex chamber 42 and the rotor are different from those of the embodiment illustrated in figure 5 and 6, but its operation principle is the same.

The invention is also applicable for feeding several fibre suspension flows into a vortex chamber and discharging them as one flow.

The invention is not limited by the embodiments illustrated here as examples only, but it can be applied and modified within the scope of protection defined by the patent claims. E.g. an apparatus according to the invention may comprise a plurality of inlet pipes and a plurality of outlet pipes.

We claim:

1. A method of dividing and/or uniting flows of high-consistency fibre suspensions, characterized by supplying the fibre suspension to a space uniting the inlet and the outlet flows, and by creating turbulent flow in said space.

2. A method as recited in claim 1, characterized in that the fibre suspension is caused to flow into a space uniting the inlet and the outlet flows, in which space a turbulent flow extending to the valves regulating the discharge flow is created.

3. A method as recited in claim 2, characterized in that some of the valves regulating the flow are closed.

4. A method as recited in claim 1 or 2, characterized in that the turbulent flow is created by a rotor.

5. An apparatus for dividing and/or uniting flows of high-consistency fibre suspensions, characterized by a vortex chamber provided with inlets and outlets.

6. An apparatus as recited in claim 5, characterized by a vortex chamber provided with inlets and outlets, and regulating valves connected to the outlets and disposed at a short distance from the outlets.

7. An apparatus as recited in claim 5 or 6, characterized by a vortex chamber provided with a rotor.

8. An apparatus as recited in claim 7, characterized by a rotor provided with vanes.

9. An apparatus as recited in any of the claims 5 through 8, characterized by an inlet and a plurality of outlets.

10. An appataus as recited in any of the claims 5 through 8, characterized by a plurality of inlets and an outlet.

11. An apparatus as recited in any of the claims 5 throug 8, characterized by a plurality of inlets and a plurality of outlets.

12. An apparatus as recited in claim 9 or 11, characterized in that the diameters of the outlets are unequal.

13. An apparatus as recited in claim 10 or 11, characterized in that the diameters of the inlets are unequal.

14. An apparatus as recited in any of the claims 5 through 13, characterized in that the cross section of the vortex chamber is circular.

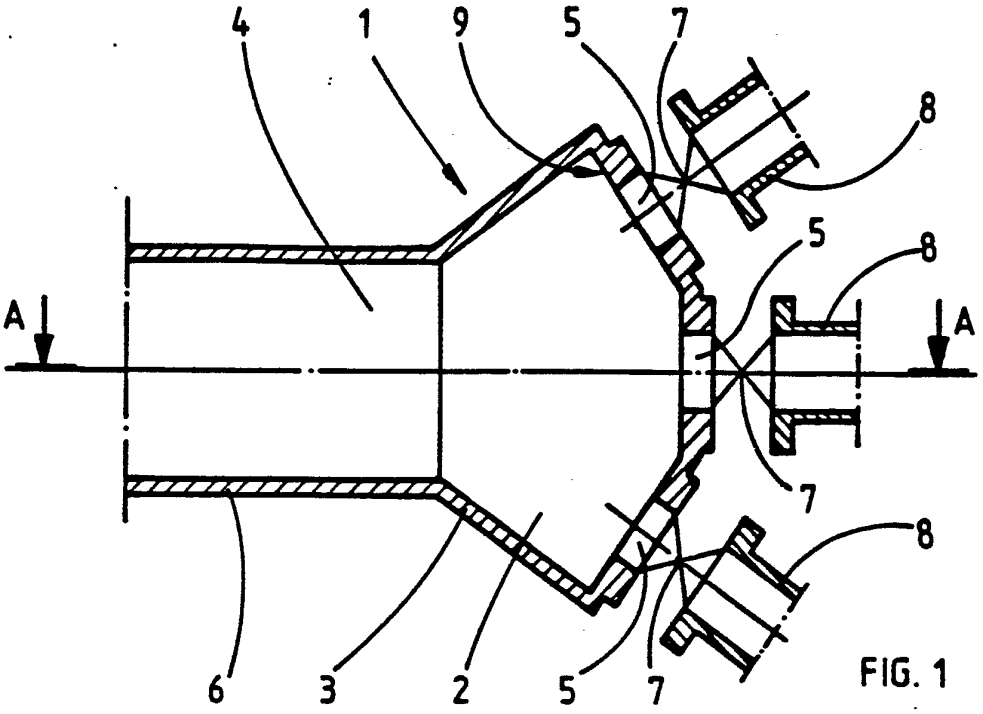

FIG. 1

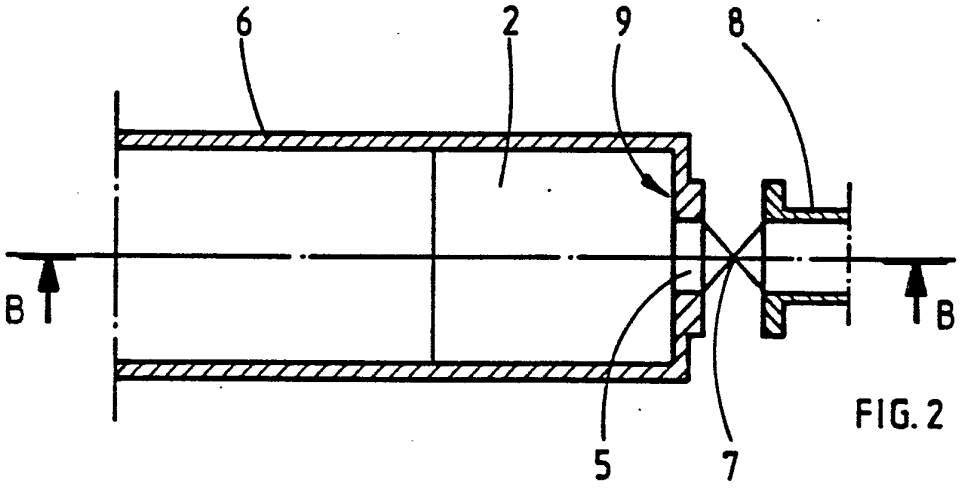

FIG. 2

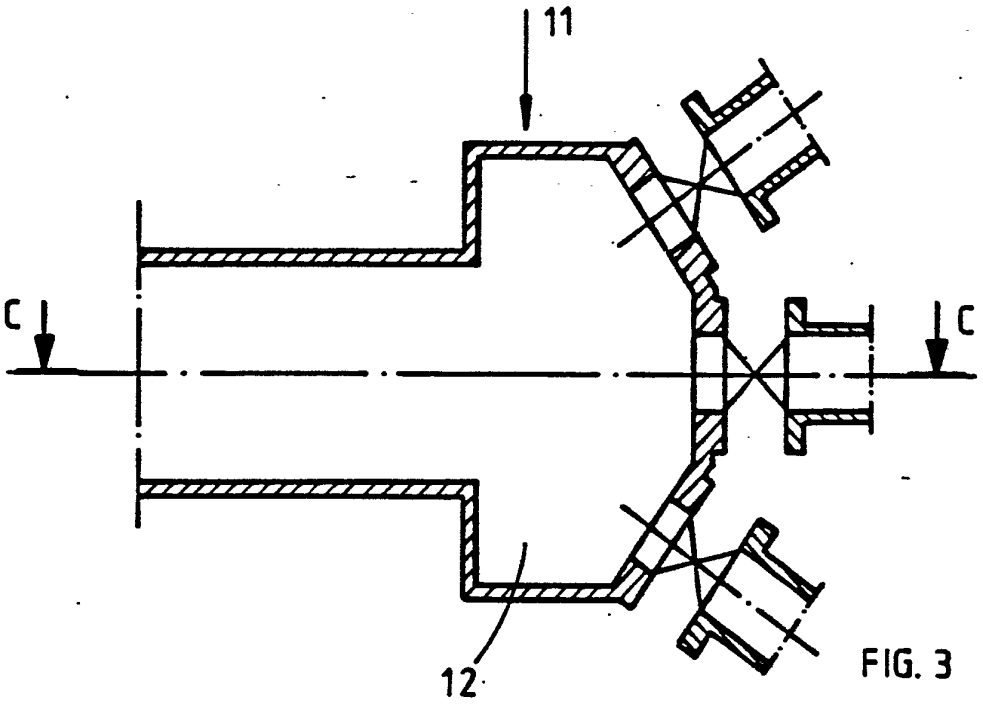

FIG. 3

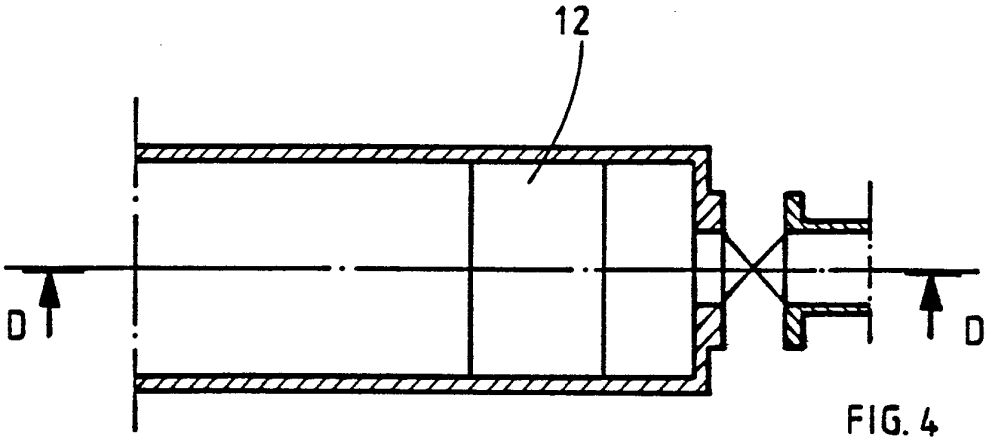

FIG. 4

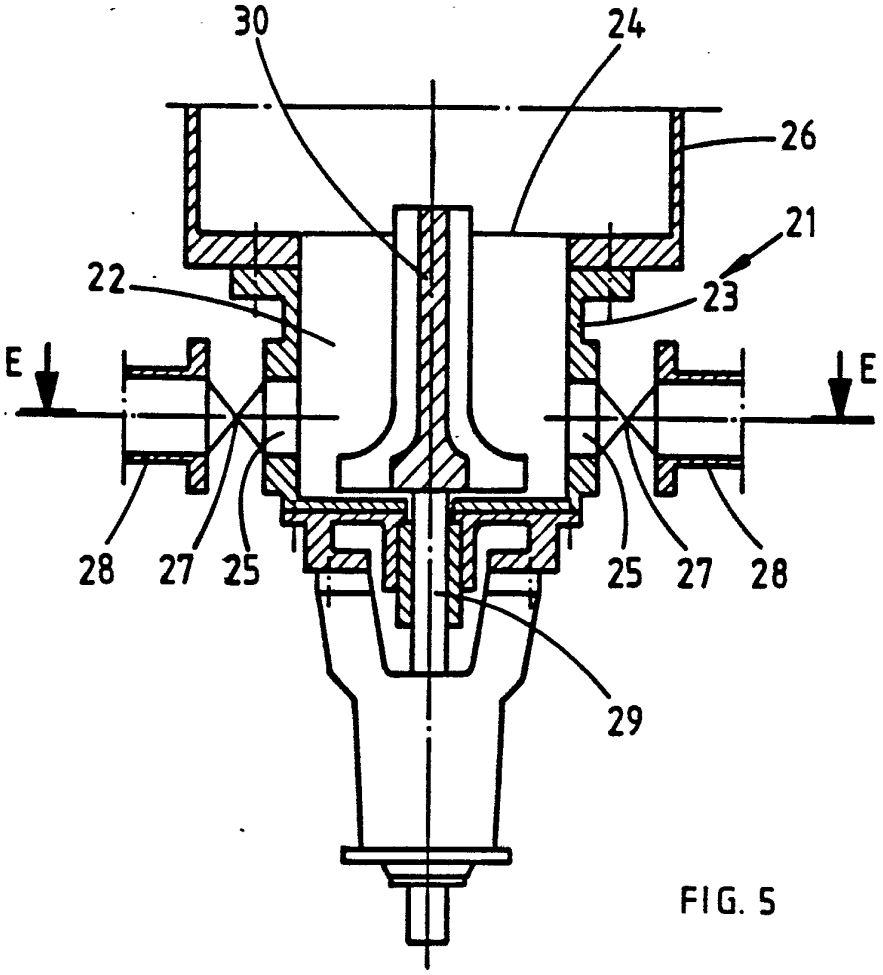
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FIG. 5

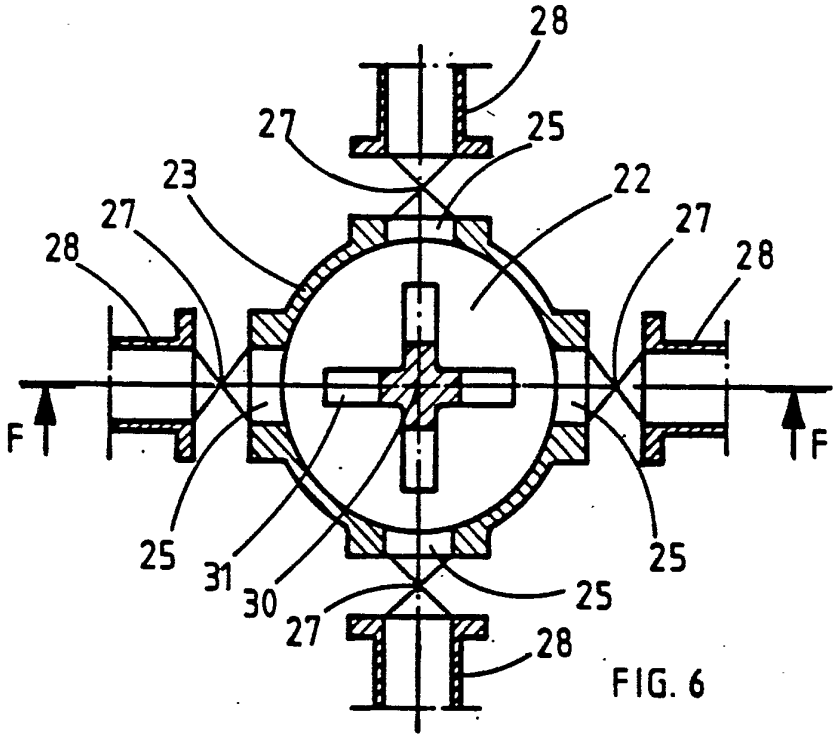
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FIG. 6

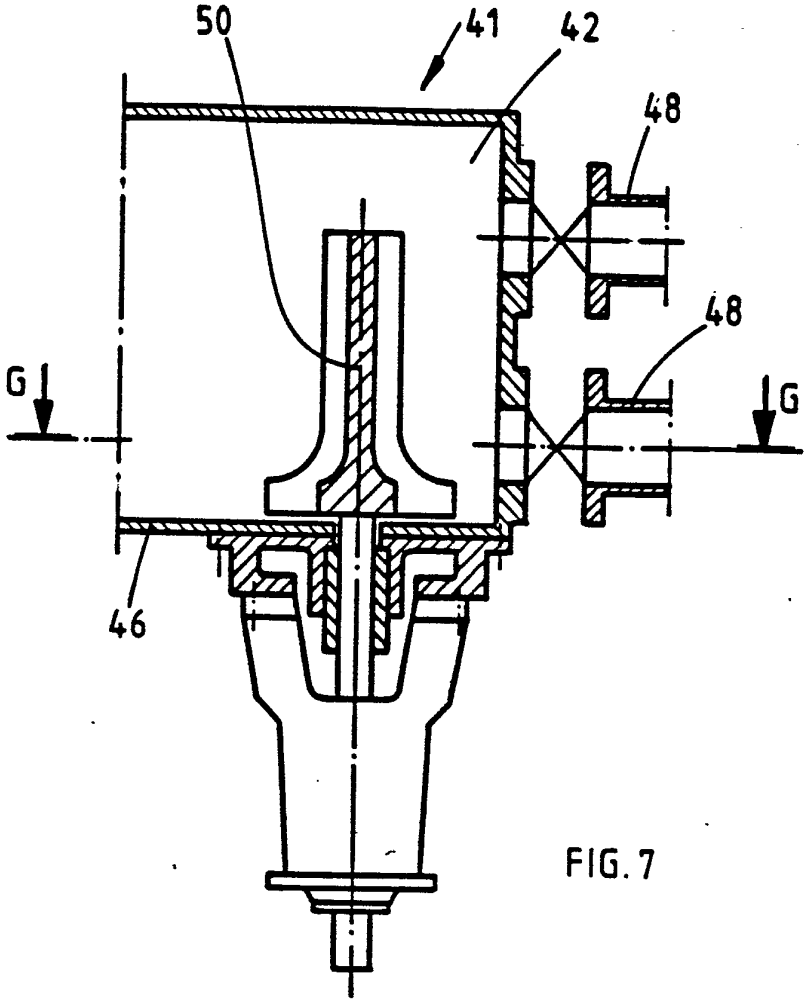

FIG. 7

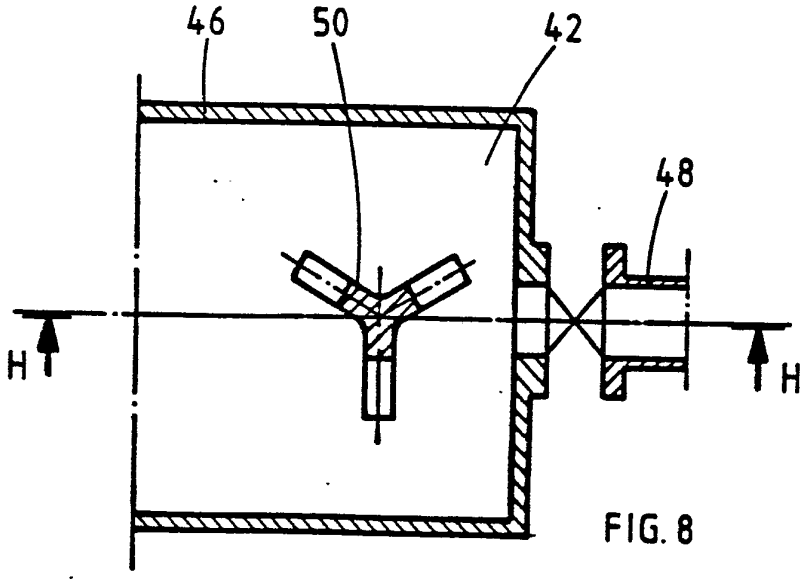

FIG. 8

INTERNATIONAL SEARCH REPORT

International Application No PCT/FI86/00005

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC 4

D 21 F 1/02, 1/06

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
IPC 4	D 21 F 1/02, /06
US Cl	162:212, 216, 336, 339, 341, 342, 343

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [8]

SE, NO, DK, FI classes as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category [10]	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
X	SE, B, 434 169 (UNILEVER NV) 9 July 1984 & WO, 83/00173 GB, 2113266 US, 4522687	1
X	US, A, 3 622 450 (ST. ANNE'S BOARD MILL COMPANY) 23 November 1971 & FR, 2012275 DE, 1930795 GB, 1228385 SE, 361691	1

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IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
1986-04-11	1986 -04- 21
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