Dec. 23, 1969 F. J. QUINCHON 3,485,484

DEVICE FOR THE CIRCULATION AND THE AERATION OF FLUIDS

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Fig 1

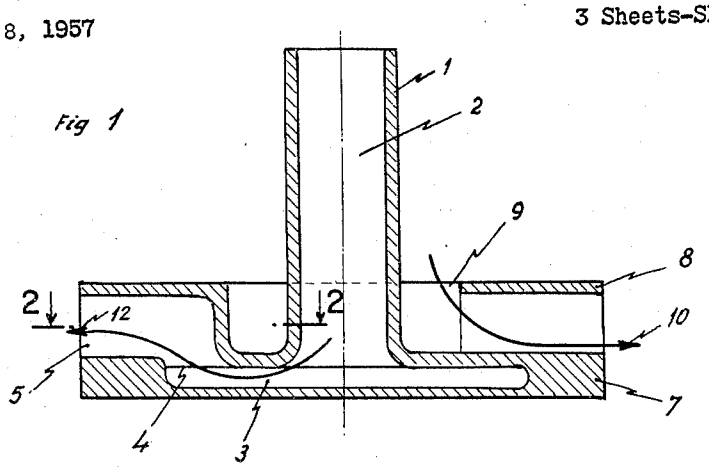


Fig 2

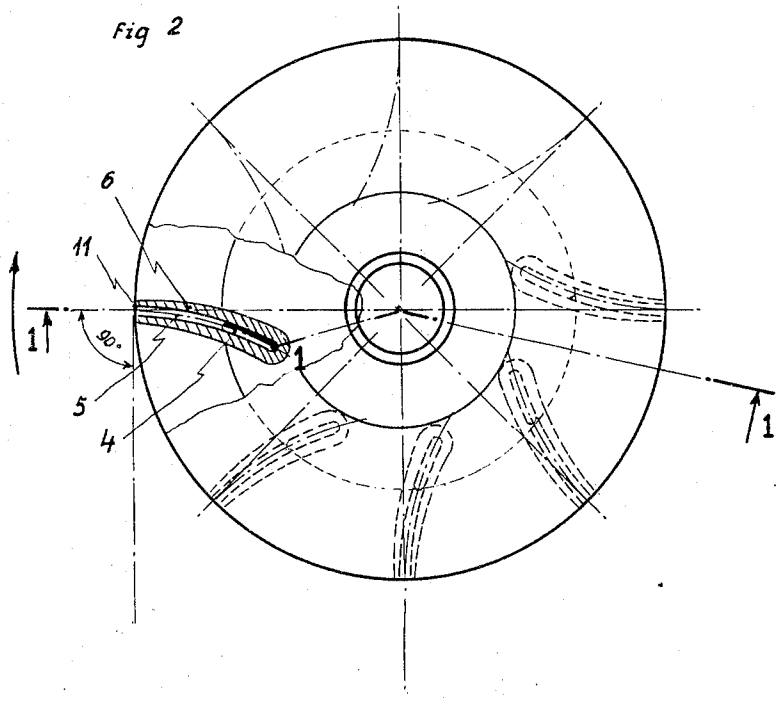
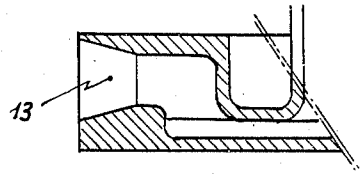


Fig 3



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DEVICE FOR THE CIRCULATION AND THE AERATION OF FLUIDS

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Fig 4

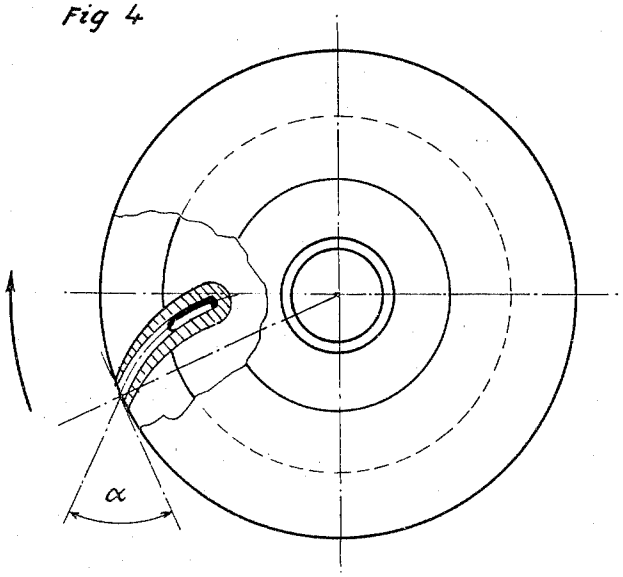
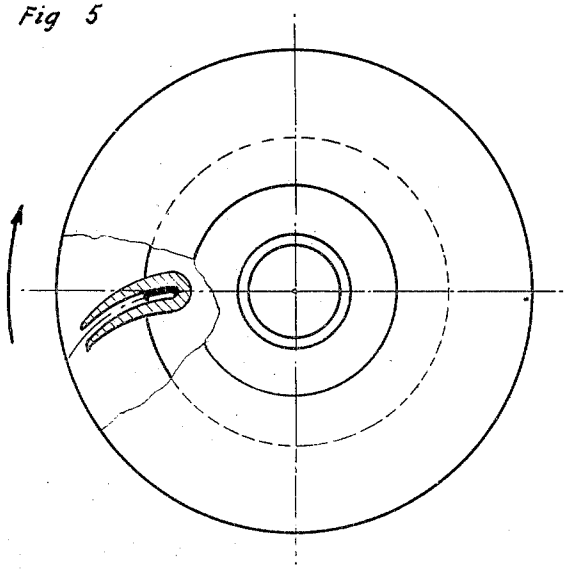


Fig 5



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DEVICE FOR THE CIRCULATION AND THE AERATION OF FLUIDS

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Fig 6

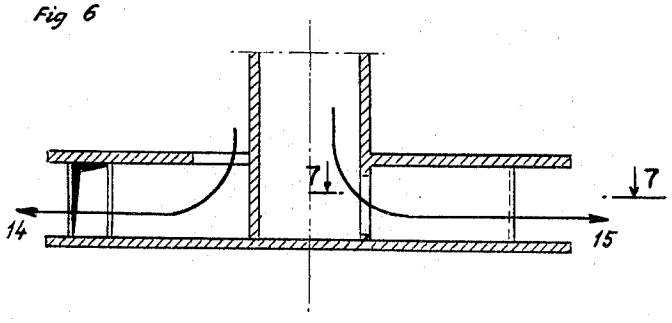
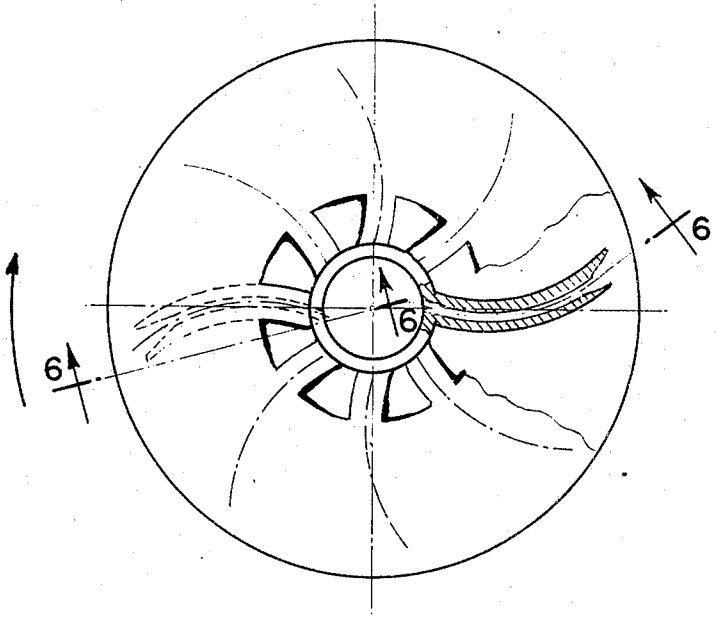


Fig 7



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3,485,484

DEVICE FOR THE CIRCULATION AND THE AERATION OF FLUIDS

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Claims priority, application France, Oct. 20, 1966, 80,911
Int. Cl. F04d 29/26; F04f 5/44
U.S. Cl. 261—87 1 Claim

ABSTRACT OF THE DISCLOSURE

A device for circulating a fluid and for introducing therein an amount of gas in direct proportion to the fluid flow rate. The device comprises a rotor attached to a hollow shaft and provided with a plurality of hollow vanes connecting the hollow shaft to the rotor's periphery. The fluid is circulated by the vanes to produce a depression at the rotor's periphery where the gas is introduced to achieve the desired proportion.

This invention relates to a device of new design and simplified construction for the circulation and aeration of fluids.

Devices for the circulation and the aeration of fluids which comprise a rotor submerged in the fluid are known.

Such devices are used, in particular in flotation processes, for circulating the pulp and introducing the air into it.

In certain known devices, the rotor is a disc provided with ribs or a hub provided with blades. The air required is introduced by cavitation created by the high-speed rotation of the rotor, at the cost of considerable consumption of energy for a given result without the proportion of the volume of air to the volume of pulp being necessarily appropriate to the needs of the flotation.

Devices have thus been developed in which the rotor, attached to a hollow shaft leading to the open air, has ducts open at one end in the shaft and at the other end on the periphery of the rotor. The rotor, whose general shape is that of a circular disc in a plane perpendicular to the shaft, either has ribs at its surface or, at its periphery, a surface generally parallel to the axis of rotation comprising elements which are inclined in relation to a direction tangential to the movement of the rotor. The ribs and, if necessary, the shape of the peripheric surface of the rotor, create a depression around this moving body which sucks in the air necessary for the flotation. The mechanical yield of this device, though better than that of the preceding one, is still mediocre, for the energy involved is used not only for making the pulp circulate, but for creating a considerable agitation of the pulp. Once again there is no exact proportional relationship between the volume of air drawn in and the volume of pulp put into circulation.

The present invention relates to a rotor for flotation machines designed to remedy the above-mentioned disadvantages: this rotor is provided with vanes, disposed between two circular discs whose rational shape enables a large volume of pulp to be circulated for a low consumption of energy. The vanes of this rotor are provided with ducts opening out at one end into the hollow shaft leading to the open air and at the other end to the periphery of the rotor.

The depression around the rotor is created by the speed of ejection of the pulp; the air is thus drawn in in large quantities and proportionally to the rate of input of the pulp. This arrangement ensures excellent flotation. The energy consumption is low, for the pulp circulates within the rotor without turbulence.

The accompanying figures provide a purely indicative example of the embodiment of the present invention.

FIG. 1 is a vertical section through one embodiment of the invention taken along line 1—1—1 of FIG. 2;

FIG. 2 is a top plan view of the embodiment of FIG. 1 partially broken away along line 2—2 of FIG. 1;

FIG. 3 is a vertical section through an alternate embodiment of a vane of the present invention;

FIGS. 4 and 5 are top plan views of further alternate embodiments of the invention, partially broken away;

FIG. 6 is a vertical section through another embodiment of the invention taken along line 6—6—6 of FIG. 7; and

FIG. 7 is a top plan view of the embodiment of FIG. 6 broken away along line 7—7 of FIG. 6.

The rotor according to FIGS. 1 and 2 comprises a hollow drive shaft 1, of which only lower part is shown, and whose central bore 2 communicates by way of the cavity 3 and the holes 4 with the ducts formed by the walls of the vanes 6 connecting the discs 7 and 8. The upper disc has a central hole 9 which allows the pulp to circulate as shown by the arrow 10.

When the rotor rotates, the pulp subjected to the centrifugal action of the vanes 6 is drawn in following the arrow 10 and ejected at high speed, thus producing a depression around the rotor which acting on the orifices 11 of the ducts 5 causes the air to be drawn in following the arrow 12.

It is quite evident that the above arrangements enable the rate of flow of the pulp to be obtained with a low energy consumption, and that it is determined by the shape adopted for the vanes and the speed of rotation of the rotor, that the depression created is in direct relationship to the flow rate and that, in consequence, the rate of flow of the air is in direct relationship to the pulp flow rate, which creates the best conditions for a satisfactory flotation process.

The shape of the vanes and of the ducts must be designed for each particular case of flotation, depending on the characteristics of the pulp to be treated and the proportion of air desired. As a result, the vanes and the ducts may be of shapes other than those represented in FIGS. 1 and 2, without going beyond the scope of the invention.

For example, as shown in FIG. 3, the gas ducts can have a diverging part 13 which improves the suction.

Whilst their average line, as shown in FIG. 2, finishes perpendicularly to the trajectory of the outlet orifice, it can, as shown in FIG. 4, make an angle other than 90°. The vanes may also stop short of the periphery of the discs 7 and 8, as is shown on FIG. 5.

FIGS. 6 and 7 give a diagrammatic representation of an embodiment which conforms to the invention, even though the layout of the ducts is different.

FIG. 6 is a section along the line 6—6—6 and FIG. 7 a plan view with a partial cutaway section along the line 7—7. The arrow 14 shows the path followed by the pulp and the arrow 15 that of the air.

The ducts which are shown horizontal may be inclined and the hollow shaft may be replaced by a solid shaft in the center of a tube, creating an annular air feed space.

The device can be applied to the introduction of diverse gases into diverse fluids. In addition, the suction created by the rotor according to the invention may be effected not only from the outside air but also from piping under pressure.

What is claimed is:

1. A device for circulating a fluid and for introducing therein a gas in increasing quantity in direct proportion to the flow rate of the fluid, said device comprising a hollow shaft and a rotor attached thereto, said rotor comprising two substantially flat discs mounted concentric with said

shaft, a plurality of hollow vanes mounted between said flat discs and having substantially radially directed outlet orifices, one of said discs having an opening concentric with said shaft and immediately adjacent thereto whereby said fluid will pass through said concentric opening and out between said vanes, a cavity formed in said rotor and communicating with said hollow shaft, said vanes having a curved spiral external shape designed to produce a non-turbulent flow of the fluid, and said vanes having therein ducts communicating with said cavity and having a section which increases towards their outlet orifices.

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HENRY F. RADUAZO, Primary Examiner

U.S. Cl. X.R.

103—115; 230—108, 134