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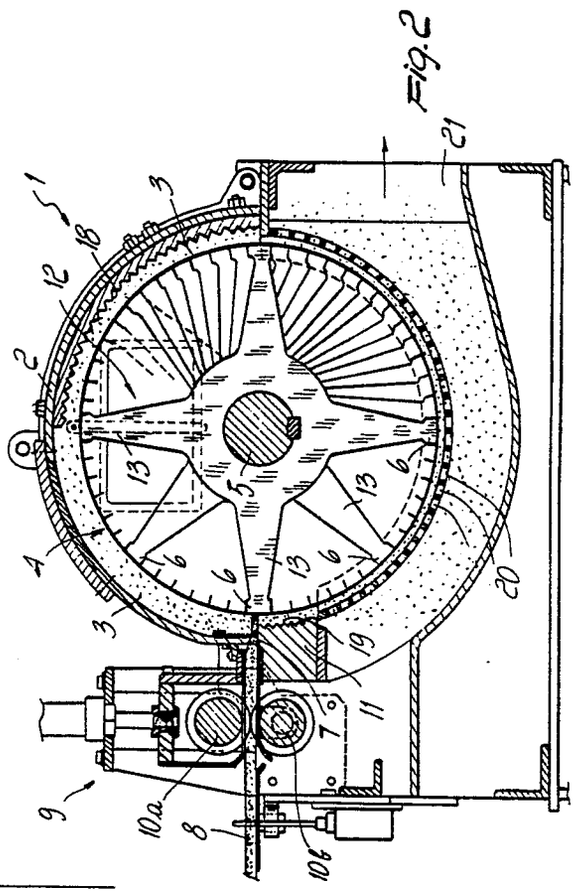
(54) Machine for the dry defibering of fibrous cellulosic material and the like, particularly for preparing absorbent masses for disposable diapers and the like.

(57) The present invention relates to a machine for the dry defibering of fibrous cellulosic material and the like, particularly for preparing absorbent masses for disposable diapers and the like. The machine comprises a containment body (2) which internally defines a substantially cylindrical chamber (3) in which a rotor (4) is accommodated and made to rotate around its own axis and which is provided with a plurality of hammers (6) to strike the material (8) to be processed which is introduced into the chamber (3) in a direction which is substantially radial to the rotor (4) through a feed port (7). In the machine according to the invention, the hammers (6) of the rotor (4) are arranged around the axis of rotation along a cylindrical helix.

Fig.2



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MACHINE FOR THE DRY DEFIBERING OF FIBROUS CELLULOSIC MATERIAL AND THE LIKE, PARTICULARLY FOR PREPARING ABSORBENT MASSES FOR DISPOSABLE DIAPERS AND THE LIKE.

The present invention relates to a machine for the dry defibering of fibrous cellulosic material and the like, particularly for preparing absorbent masses for disposable diapers and the like.

Mills for the dry defibering of fibrous cellulosic material or the like for preparing absorbent masses for disposable diapers are known. Generally, these machines comprise a containment body which internally defines a substantially cylindrical chamber provided with at least one feed port for introducing in the chamber the material to be processed which, usually, is packaged in bands a few millimeters thick. The containment body also has a plurality of output ports suitably sized for the discharge of the defibered material. Inside the substantially cylindrical chamber a rotor is accommodated, which is generally composed of a main shaft which is rotatably supported by the containment body and which can be operated with a rotary motion about its own axis, which generally coincides with the axis of the chamber. The main shaft of the rotor supports a plurality of fixed or oscillating hammers which are arranged along the generatrix lines of a cylindrical surface the axis of which is the main shaft axis. With the rotation of the latter, the material introduced through the feed port is struck by the hammers which break the band of material and drag the detached portions along in their motion. During this motion, the portions of material are defibered more and more finely until their discharge through the outlet ports is possible. To facilitate the flow of the outgoing material, aspiration can be provided at the outlet ports.

These known kinds of machines, however, have some disadvantages.

The main one lies in the excessive noise produced by these machines during their operation. In practice, the impacts of the hammers on the material to be defibered, which is fed on an abutment opposite to the hammers, cause a noise which is intolerable for the personnel operating in the close neighborhood of the machine. To achieve acceptable working conditions, it is necessary to provide adequate soundproofing systems which however have a significant adverse effect on the overall costs of the apparatus.

Furthermore, the stresses which must be withstood by the bearings on which the main shaft of the motor is mounted have a cyclic behaviour which causes strong vibrations, such vibrations significantly reducing the potential life of the bearings.

Another disadvantage, still related to the cyclic impacts of the hammers on the material to be processed, is the need for great power in the phase of the impact of the hammers with the material to be defibered and for a significantly reduced power in the operating phase which extends between two consecutive impacts. This fact forces the use of high-power electric motors which are not used optimally.

The main object of the present invention is to eliminate the above described disadvantages by providing a machine for the dry defibering of cellulosic material which has a tolerable noise level during its operation and which allows a better use of the power installed.

Within the scope of this aim, an object of the invention is to provide a machine which achieves a more gradual contact between the hammers and the material to be processed, so as to reduce the vibrations and therefore to extend the life of the bearings of the shaft of the main motor.

This aim, as well as this and other objects which will become apparent hereinafter, are achieved by a machine for the dry defibering of fiberous cellulosic material and the like, particularly for preparing absorbent masses for disposable diapers and the like, comprising a containment body defining a substantially cylindrical chamber accommodating a rotor controllable in rotation about its own axis and provided with a plurality of hammers, said containment body being provided with at least one feed port for the introduction into said chamber of the material to be processed in a direction which is substantially radial to said rotor, as well as with outlet ports for the discharge of the processed material, characterized in that said hammers are arranged around said axis of rotation according to a cylindrical helix.

Further characteristics and advantages of the invention will become apparent from the description of a preferred, but not exclusive, embodiment of a machine according to the invention, illustrated only by way of non-limitative example in the accompanying drawings, where:

Fig. 1 is a lateral partially cut-away cross-section elevation view of the machine according to the invention;

Fig. 2 is a cross section of Fig. 1, taken along the axis II-II thereof.

With reference to the above described figures, the machine according to the invention, generally indicated by the reference numeral 1, comprises a containment body 2 which internally defines a chamber 3 which is substantially cylindrical and in

which a rotor 4 is accommodated and is substantially composed of a main shaft 5 which is arranged substantially coaxially with the chamber 3 and supports a plurality of hammers 6. The containment body 2 has, along its lateral surface, a feed port 7 through which the material to be defibered in a band 8 is fed into the chamber 3 in a direction which is substantially radial with respect to the rotor 4.

Proximate to the feed port 7, in fact, a traction assembly 9 of a known kind is mounted, which is substantially composed of a pair of opposite and counter-rotating rollers 10a and 10b which push the band 8 through the feed port 7.

At the outlet of the feed port 7 into the feed chamber, an abutment bar 11 is mounted, on which the band 8 rests and which opposes the action of the hammers 6.

The hammers of the rotor are carried by a set of wheels 12 which are rigidly coupled to the main shaft in a longitudinal direction, each of which has a plurality of spokes 13, four in the case illustrated, which extend radially. At the free end of each of these spokes a hammer 6 is fixed in a known manner.

According to the invention, the hammers of the rotor 4 are arranged around the axis of the main shaft according to a cylindrical helix. In the embodiment illustrated there is an arrangement according to a cylindrical helix with four origins coaxial to the main shaft.

To provide the rotor, it is possible to have the main shaft fitted with a single tab for all the wheels, offsetting every time by a preset angle the seat of the tab on the wheels with respect to a reference position, e.g. the position of the seat of the tab of one of the end wheels.

Advantageously, furthermore, the pitch of the helix substantially matches the length of the set of wheels so as to have an excellent continuity in the contact between hammers and material to be defibered.

By way of indicative, and non-limitative example, by providing a rotor with a set of 68 wheels with four spokes there will be an offset angle between a wheel and a wheel contiguous thereto equal to 1° 19′ 24″ and, considering a speed of rotation of the main shaft of 3000 rpm there will be a hammer/band of material contact every 0.0001 sec.

Each hammer can have two counterposed cutting edges, so as to allow the operation of the machine in both directions of rotation.

The rotor can be operated in a known manner, e.g. by means of an electric motor, not illustrated, which is connected by means of belts to a pulley 15 which is associated to an end of the main shaft which is supported proximate to its two ends by two bearings 16 and 17.

To achieve a good defibering of the material, dentellated regions 18 and 19 are provided on the internal surface of the chamber 3, on which regions the portions of material removed from the band 8 by the hammers are dragged.

The containment body 2 has, in a lower region thereof, outlet ports 20 for the discharge of the defibered material. These outlet ports are connected with a transport channel 21 which can be connected with an aspiration device to remove the material from the machine.

After what has been described, the operation of the machine according to the invention is evident.

The band 8 of the material to be defibered is conveyed into the chamber 3 by the rollers 10a and 10b while the rotor is made to rotate around its own axis. The band 8 is struck by the hammers 6 which cause portions of material to detach and which drag these portions continuing the defibering thereof until they emerge from the outlet ports 20.

In practice, it has been observed that the machine according to the invention fully achieves the intended aim, since, by obtaining a more gradual contact of the rows of hammers with the band of material to be processed, a significant reduction in noise is achieved. This gradual contact causes a power absorption which is much more constant with respect to machines of the known kind and allows a reduction in the power installed. Experimental tests have indicated, for the machine according to the invention, a reduction in energy consumption equal to approximately 20% with respect to a similar machine of the prior art.

A further advantage is that of achieving a reduction in the vibrations of the main shaft of the rotor and therefore a greater life for the bearings which support it.

Furthermore, by virtue of the graduality of the contact between the hammers and the material to be processed and in the subsequent dragging of the portions removed from the band of material, it is possible to obtain a finished product with fibers of greater consistency and therefore better quality.

The machine thus conceived is susceptible to numerous modifications and variations, all of which are within the scope of the inventive concept; furthermore, all the details may be replaced by technically equivalent elements.

In practice, the materials employed, as well as the dimensions, may be any according to the requirements and to the state of the art.

Claims

1. Machine for the dry defibering of fibrous cellulosic material and the like, particularly for preparing absorbent masses for disposable diapers and the like, comprising a containment body defining internally a substantially cylindrical chamber accommodating a rotor controllable in rotation about its own axis and having a plurality of hammers, said containment body having at least one feed port for the insertion in said chamber of the material to be processed in a direction which is substantially radial to said rotor, as well as outlet ports for discharging the processed material, characterized in that said hammers (6) are arranged around said axis of rotation according to a cylindrical helix.

2. Machine according to claim 1, characterized in that said cylindrical helix has at least two origins.

3. Machine according to claim 1, characterized in that said cylindrical helix has an axis coinciding with said axis of rotation.

4. Machine according to one or more of the preceding claims, characterized in that said rotor (4) comprises a main shaft (5) supporting a set of wheels (12) rigidly coupled in rotation with said main shaft (5) and arranged side by side longitudinally to said main shaft (5), each of said wheels (12) having spokes (13) supporting said hammers (6), the spokes (13) of one of said wheels (12) being angularly offset with respect to the spokes (13) of the wheel (12) contiguous thereto.

5. Machine according to one or more of the preceding claims, characterized in that said helix has a pitch which is substantially equal to the length of said set of wheels (12).

6. Machine according to one or more of the preceding claims, characterized in that said chamber (3) has regions (18, 19) of its surface which are dentellated.

7. Machine according to one or more of the preceding claims, characterized in that said hammers (6) have two counterposed cutting edges.

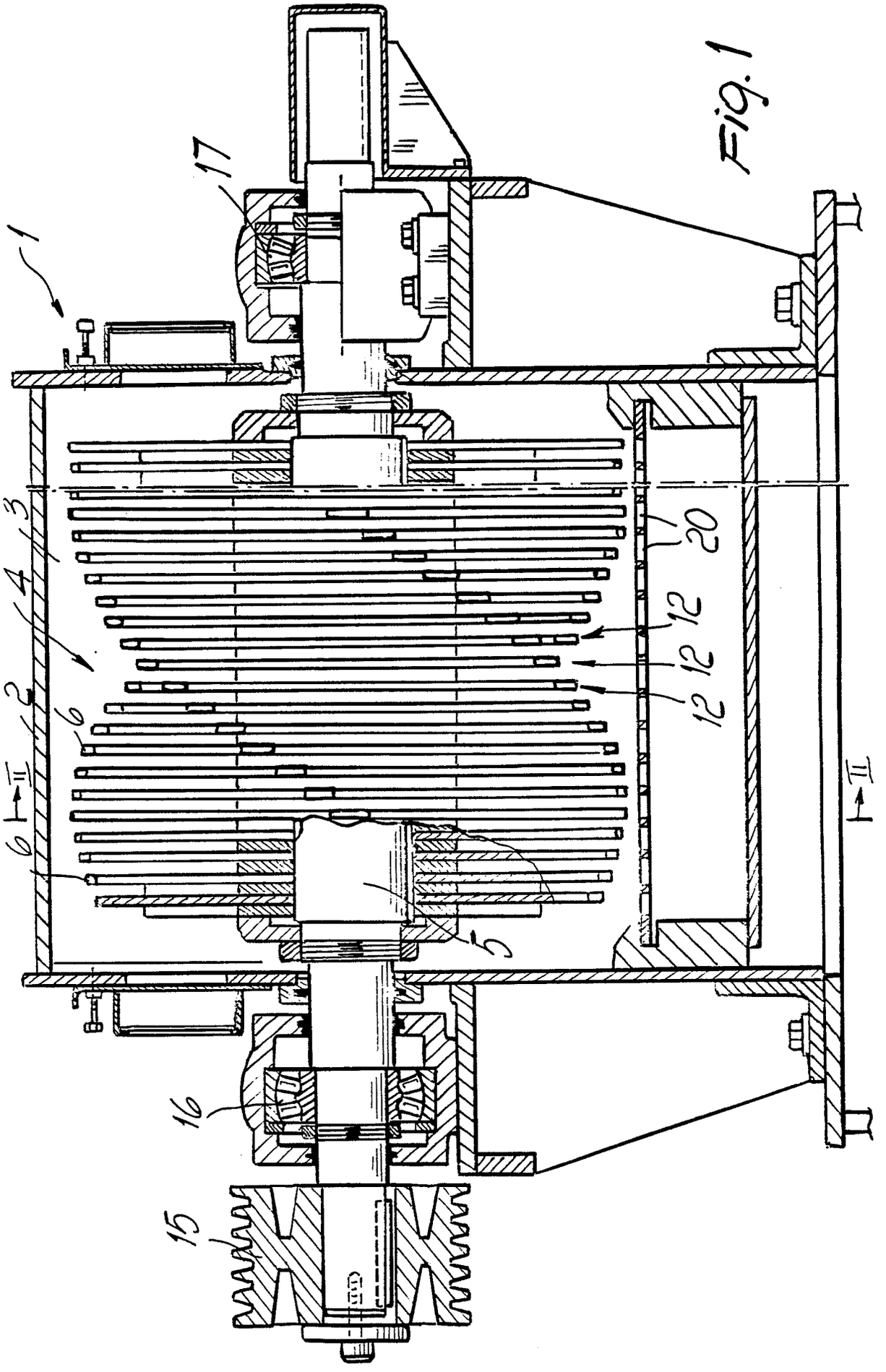

Fig. 1

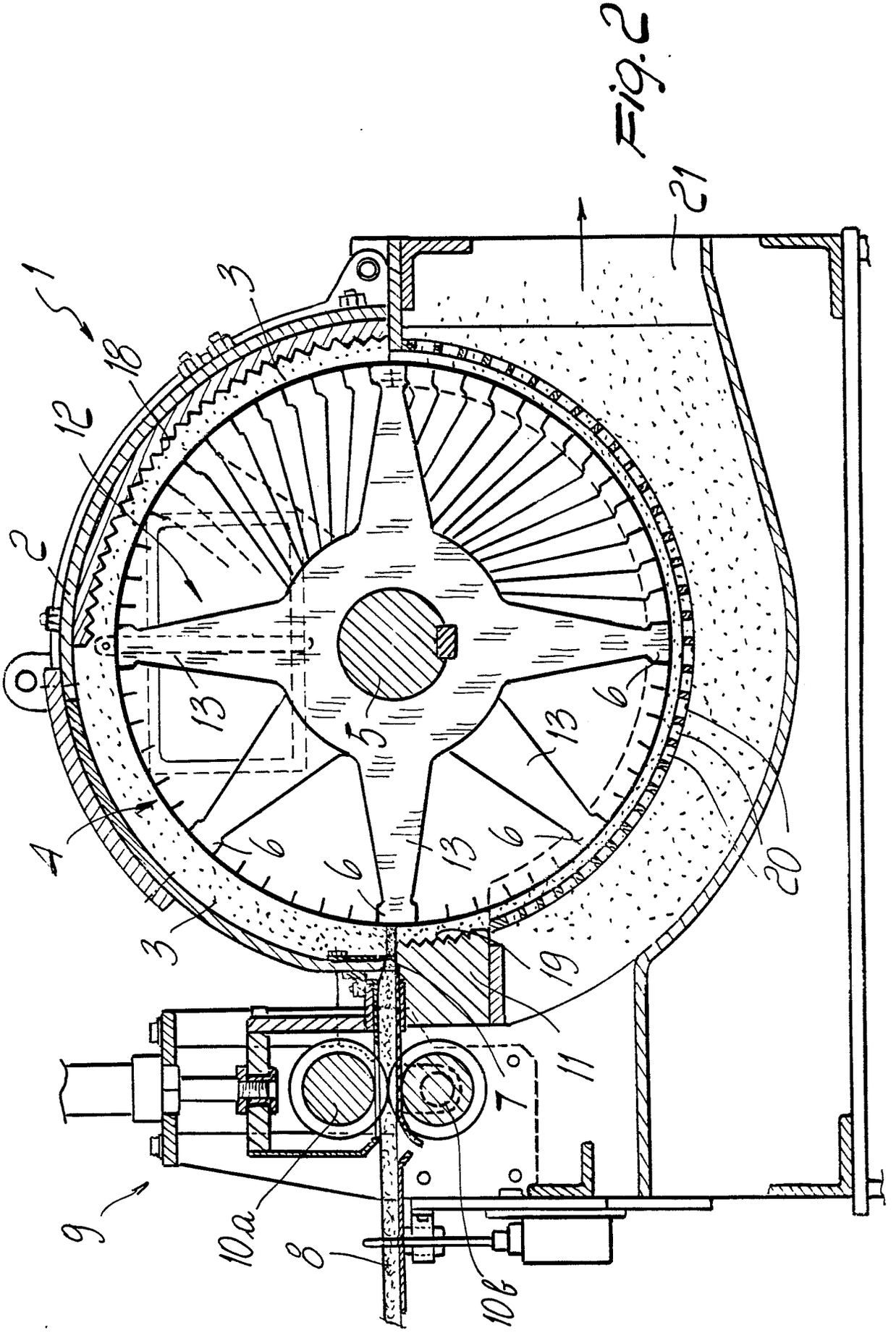

Fig.2

European Patent Office

EUROPEAN SEARCH REPORT

Application number

EP 87 10 0633

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
X	US-A-1 949 534 (DOYLE) * Whole document *	1-4,6	D 21 B 1/06 D 21 H 5/26
X	FR-A-2 158 824 (PROCTER & GAMBLE) * Whole document *	1-4	
A	US-A-3 755 856 (BANKS) * Whole document *	1-4	
A	US-A-3 236 723 (WHITESIDE) * Whole document *	1-3	
A	US-A-4 030 865 (KOBAYASHI) * Whole document *	1,6	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

D 21 B
D 21 D
D 21 H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	22-10-1987	DE RIJCK F.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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