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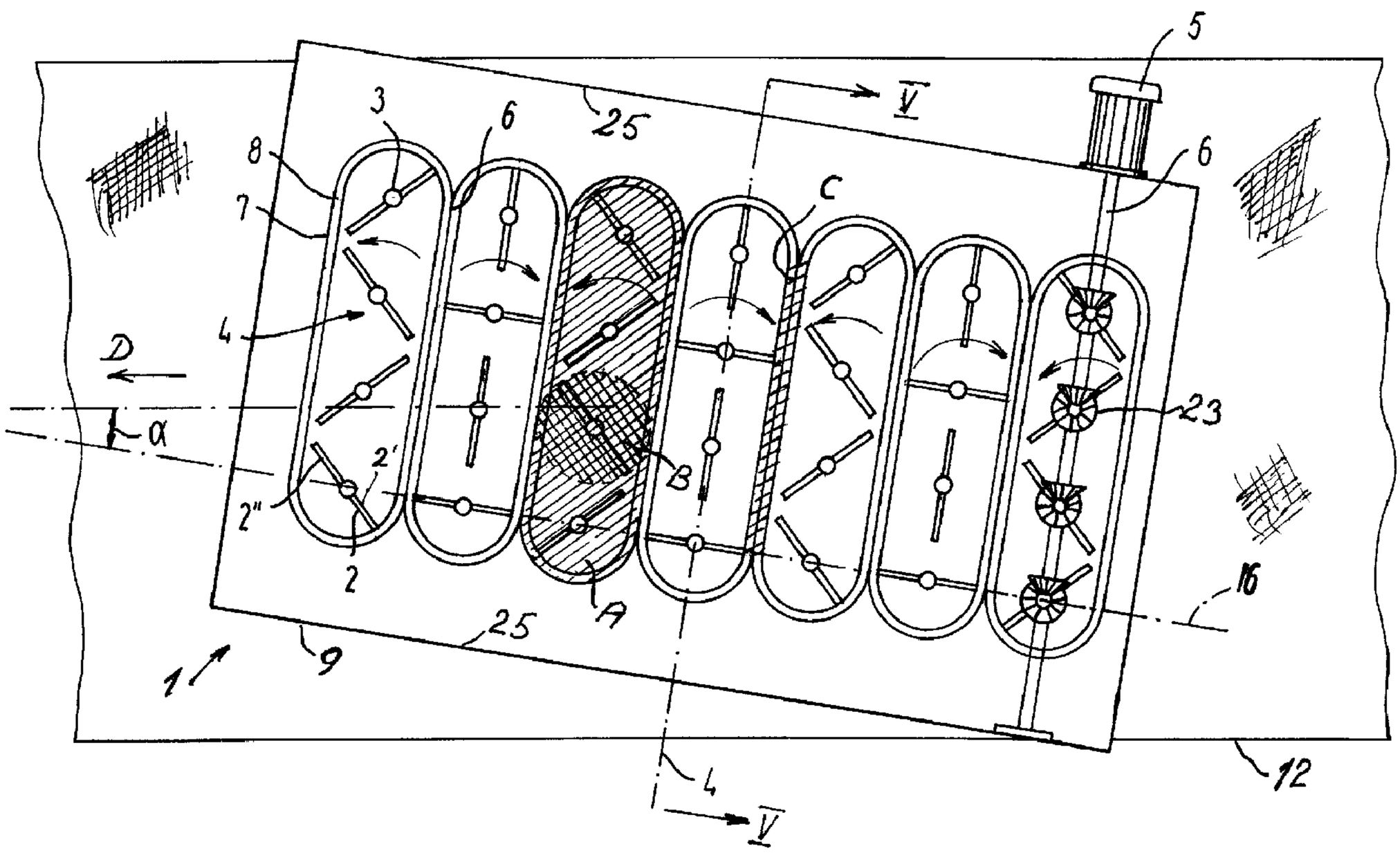

(57) Abrégé/Abstract:
An apparatus for depositing fibres on a wire (12) for the production of primarily paper products. The apparatus comprises, inter alia, the wire (12) and one or more distributors (1), which are diagonal in relation to the wire (12). This minimizes disadvantages which occur when using traditional apparatuses as, in the present invention, impellers (2) mounted in the distributor (1) having the rotating axis of their axles (3) of the impellers (2) of several rows (4) provided along curves (16) with tangents in each point forming an angle between 0° and 90° on the direction of motion (D) of the wire (12) .

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APPARATUS FOR DEPOSITING FIBRES

ABSTRACT

An apparatus for depositing fibres on a wire (12) for the production of primarily paper products. The apparatus comprises, inter alia, the wire (12) and one or more distributors (1), which are diagonal in relation to the wire (12). This minimizes disadvantages which occur when using traditional apparatuses as, in the present invention, impellers (2) mounted in the distributor (1) having the rotating axis of their axles (3) of the impellers (2) of several rows (4) provided along curves (16) with tangents in each point forming an angle between 0^0 and 90^0 on the direction of motion (D) of the wire (12).

Fig. 4

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The present invention relates to an apparatus for depositing fibres on a wire by producing a substantially plane fibrous web on the wire, said apparatus being provided with at least one distributor which comprises a housing, means for supplying fibres, and at least two parallel rows of impellers, which rotate, when in use, mounted on axles which are substantially perpendicular to the wire, said impellers being situated between the supply means and a net behind which the wire is provided in such a manner that the fibres will flow from the supply means via the impellers and the net to the wire.

In the production of napkins and new sanitary products, especially sanitary towels for women and incontinent persons, the possibilities of producing increasingly thin products have increased in recent years. The consumers of course demand that these napkins or sanitary towels have the same absorbency as the previously known, more solid products. Therefore, it is essential to maintain a homogeneous product quality as the product is more optimized in thickness than it was previously. For the manufacture of products of the above-mentioned type, the web is subsequently cut into narrow strips which are used in the final products. The manufacturer of such final products demands that the strips cut from the web have a homogeneous thickness in order to secure homogeneous product quality. The homogeneous product quality is vital to the properties of the products in subsequent treatment, but also in order to secure that the products will occupy the very same volume when packed and not more or less of the packaging volume for the same amount of products.

GB 2,008,638 discloses such an apparatus with several, preferably four, parallel rows of rotating impellers. The rows form a 90^0 angle on the axis along which a wire below extends, and each of the rotating impellers rotates

in its own section of the distributor. A net is situated between the impellers and the wire. This causes a sausage-shaped body of fibres to be formed between the parallel rows, the fibres falling or being sucked gradually from said body down through the net and onto the wire. It appears, however, that problems arise related to keeping a homogeneous thickness profile over the fibrous layer formed on the wire.

SE 467,740 discloses an apparatus that seeks to remedy the above problem. The apparatus used corresponds to the apparatus disclosed in the above-mentioned British publication. The difference consists in the use of a special net with different mesh sizes. The mesh size is larger under the impellers as it has been found that the fibrous layer formed on the wire, especially in the area below the centre of the impellers, will be thinner than elsewhere in the fibrous layer. The disadvantage of the manner in which the Swedish publication seeks to achieve a homogeneous thickness of the fibrous layer on the wire is that it is difficult and involves big expenditures to produce the nets with different mesh sizes. Furthermore, it is necessary to use different nets depending on the types of fibres used for the production of the fibrous layer, and similarly the choice of mesh sizes depends heavily on the size and the density of the fibres.

As it appears from the above, using the prior art apparatuses discussed above, it has previously been difficult to maintain a sufficiently homogeneous product quality because the fibrous layer formed on the wire does not possess the homogeneity of thickness that is required. This has caused the products within the same production line to fail to have the same properties. Besides, the non-homogeneous thickness of the products has had the disadvantage that the product packaging, which has also been optimized along with the optimization

of the products, is bigger than necessary in some cases and too small in other cases.

Thus, it is the object of the present invention to minimize the above-mentioned disadvantages and provide an apparatus for the production of a fibrous web on a wire in which the layer thickness is homogeneous throughout the web.

According to one aspect of the present invention, there is provided an apparatus for producing a fibrous web having a homogeneous thickness, said apparatus comprising: a forming wire which is mounted to move in a straight direction of motion, a distributor positioned adjacent to said forming wire to distribute fibers thereon, said distributor comprising a housing which defines an open end facing said forming wire, a net which is mounted on said housing to cover said open end, means for supplying fibers to said housing, and a plurality of impellers located within said housing and rotatable around axes which extend perpendicularly to a plane formed by said forming wire as said forming wire passes by said open end of said housing, said plurality of impellers being aligned in at least two parallel rows which extend at an angle of greater than 0° and less than 90° to said straight direction of motion of said forming wire, said impellers distributing air-suspended fibers towards and through said net for deposition on said forming wire.

This is achieved by an apparatus of the aforementioned type which is characterized in that the rotating axis of the axles of the impellers of several rows are provide along curves with tangents in each point forming an angle between 0° and 90° on the direction of motion of the wire.

With this apparatus it is possible to achieve considerable improvements of the thickness variation across the fibrous

web formed on the wire. Improvements are achievable at a factor of 2 to 5. Whereas previously it was possible to achieve thickness variations of +/- 5% without the use of especially produced nets, with the apparatus according to the present invention it is now possible to reduce the thickness variation to +/- 1%.

The apparatus according to the present invention is designed in such a manner as to avoid that the centres of the impellers are situated along a curve parallel to the direction of motion of the wire. In this manner it is subsequently minimized that nonhomogeneity occurs in the layer thickness of the fibrous web formed on the wire.

Sausage-shaped bodies of fibres formed between the parallel rows of rotating impellers will still be present as in the prior art. In most cases this is a precondition for the formation of a fibrous layer with a homogeneous thickness. Unlike the prior art apparatuses, however, the

longitudinal axis of the sausage-shaped bodies forms an angle on the direction of motion of the wire. This means that any systematic imperfections in a sausage-shaped body, which are reproduced in each of the sausage-shaped bodies formed between the respective rows of rotating impellers, may indeed be present in the same location relative to the impellers and the sausage-shaped bodies, but not relative to the wire on which the fibrous layer is formed.

According to a preferred embodiment, the rotating impellers are situated in the same plane, however with overlapping sweeping zones. This is achieved by letting the impellers be displaced at an angle with each other in such a manner that, during rotation, the individual parts of an impeller will in turn enter the space between the individual parts of a corresponding adjacent impeller like gear wheels, however without the impellers touching each other. This embodiment reduces the systematic imperfection which occurs in the space between the individual impellers since that space does not exist.

In order to minimize any further imperfections, several distributors, preferably two, may be used according to the preferred embodiment. This increases the production capacity of the apparatus. In apparatuses with several distributors, it is further possible to deposit different types of fibres in the same web on the wire. The distributors of an apparatus with several distributors may be identical and comprise the same number of rows of impellers and be directed in the same direction so that they form the same angle with the wire. Alternatively, however, the distributors may be different with different numbers of impeller rows with different impeller types, and similarly they may be directed in different directions in order to form different angles with the wire.

In order to prevent the fibrous web deposited on the wire from having less thickness in the edge areas than in the middle, the distributor is equipped with a shield. This shield is designed in such a manner that only some of the fibres supplied to the distributor will be transmitted through the net. Only those fibres that are supplied to the part of the distributor located over the wire will be led through the net whereas the remaining fibres which are supplied to the edge areas on each side of the distributor are recirculated.

The invention will now be described in further detail with reference to the attached drawing, in which

Fig.1 shows a distributor seen from above and taken at I - I in fig. 2,

Fig.2 shows the distributor seen from the side,

Fig.3 shows an apparatus seen from the side with a wire, but without its distributor(s),

Fig.4 shows an apparatus according to the invention with two distributors, seen from above,

Fig.5 shows the distributor taken at V - V in fig 1, and

Fig. 6 shows another embodiment for a distributor

Fig. 1, 2 and 5 shows a distributor 1 which is designed in such a manner that suction which is applied by suction means 22 under a wire 12 and under the distributor 1 will supply airsuspended fibres through the distributor in order to deposit the fibres in a layer on the wire.

Inside the distributor 1, impellers 2 are mounted on vertical axles 3, which are seen along these axles in the figure. The vertical axles 3 serve as rotation axles for the impellers 2 and are arranged in parallel rows 4, in the illustrated embodiment seven parallel rows 4 with four impellers 2 are provided in each one. The impellers 2 are rotated by motors 5 which are arranged at each row 4. Each of the motors 5 drives one horizontal axle 6 which drives the impellers 2 via gears 23. As it appears from the illustrated embodiment, the impellers 2 consist of two halves 2' and 2" on either side of the rotation axles 3. Alternatively, the impellers 2 could consist of three or more parts arranged symmetrically around the axles 3. The impellers 2 in each row 4 form a 90^0 angle with the adjacent impeller, so that a certain reciprocal constellation of the impellers will occur for every four rows. The impellers 2 in each row 4 rotate in the same direction, but in the opposite direction of the impellers in an adjacent row. Furthermore, the impellers 2 in each row are arranged in such a manner that the zones swept by the impellers overlap. The impellers are preferably arranged in the same plane, however they might also be arranged in different planes, possibly combined with different impeller designs.

Immediately above the plane in which the impellers rotate, along an edge 7 of a total area A of zones B which are swept by the impellers 2 in each row 4, are inclined plates 8 which lead the fibres from above down towards the impellers 2. Said inclined plates 8 form a vague funnel-shape above the impellers. In the area C, between the two rows 4 of rotating impellers 2 and under the inclined plates 8, a sausage-shaped body of fibres is formed during the rotation of the impellers. It is from this body of fibres that the fibres fall or get sucked down through a net 24 and onto the wire 12. Some fibres

may be collected in lumps or tufts which are sucked out through a duct 26.

Fig. 2 shows the distributor 1 seen from the side. The distributor 1 comprises a housing 9 which surrounds the impellers 2. The distributor 1 is provided with control means 10 for adjusting the distance of the distributor in relation to the rest of the apparatus. The distributor is provided with members for holding and stretching the net 24 which are situated in the plane P inside the distributor 1. The plane which is swept by the impellers 2 is situated immediately above the plane P. The fibres are supplied to the upper part of the distributor through a duct 21.

Fig. 3 shows part of an apparatus with a wire 12 but without distributor(s). The apparatus comprises, inter alia, a frame 13 which consists of several girders. The upper girders 13' are intended for support of the distributor by means of the control means 10 (see fig. 2). The wire 12 extends as an endless band around fixed rolls 14 which rest on lower girders 13". In order for the wire 12 to be continuously kept stretched, in addition to the fixed rolls 14 the apparatus comprises a roll 15 loaded by a spring or other flexible means and keeping the wire taut.

Beneath the wire 12 in the entire apparatus a suction device 22 will be mounted which sucks airsuspended fibres from the distributor, down past the impellers, down through the net and onto the wire. In that end of the apparatus where the final fibrous web runs out, said web is removed from the wire and transmitted for further treatment.

Figure 4 shows an apparatus according to the invention. Two distributors 1' and 1" are arranged above the wire

(not shown). In the shown embodiment the rotating axis of axles 3 of the impellers 2 in the same row 4 are disposed in parallel planes coincident with the parallel rows 4. Furthermore, the rotation axis of axles of the impellers in different rows are also disposed in parallel planes coincident with curves 16 which extend perpendicularly to the rows 4. However, it would be possible to arrange the impellers in such a manner that the parallel rows 4 in which the impellers 2 are disposed form angles in relation to the direction of motion of D of the wire 12. The tangents of the curves 16 or the tangents of the curves 16 with the arbitrary geometrical shape forms in each point angels α and γ, respectively, in relation to the direction of motion of the wire. The angles α or γ that is formed may be between 0^0 and 90^0, preferably however between 0^0 and 15^0. The two distributors 1' and 1" are provided with seven, respectively five, rows 4 of impellers 2, which are arranged in such a manner that they cover an equally big width b of the apparatus.

In fig. 1 the seven parallel rows 4 of impellers 2 are extending at a right angel to the side walls 25 of the housing 9. Said side walls are in this case forming the angel α on the direction of the motion D of the wire 12 whereby the rotating axis of the impellers in the rows 4 simultaneously will be arranged on straight lines forming the same angel α on the direction of the motion D.

In fig. 6 the side walls 25 of the housing 9 extends parallel with the direction of the motion D of the wire 12 and the seven parallel rows 4 of impellers 2 are staggered in the housing 9 in such a way that the rotating axis of the impellers in the rows 4 will be arranged on straight lines forming the angel α on the direction of the motion D. This embodiment gives the apparatus as a whole a finer design than the embodiment shown in fig. 1 and still another advantage is that the

construction shown in fig. 6 can be used expediently for conversion of an existing prior art apparatus to an apparatus according to the invention.

In the figures, all the impellers 2 are illustrated as having the same dimensions sc that the zone B which is to be swept by the impellers is equally big and has the same diameter. Alternatively, the impellers 2 may have different dimensions and different shapes so that the diameter of the zone to be swept is different for different impellers. The combination of the diagonal distributors 1' and 1", the overlapping impellers 2 in each row 4 and the distributors with different numbers of rows but covering the same width b, achieves the object of minimizing systematic imperfections so that the thickness of the fibrous web formed on the wire 12 becomes very homogeneous.

The apparatus according to the invention consists to a great extent of known components, however it is the combination of those in a new manner that results in the substantial improvement of the quality of the final product. The embodiments illustrated in the figures are not to be considered as limitations of the present invention.

In the illustrated embodiments, the apparatus according to the invention has been described with regard to the fact that the apparatus will primarily be used with the wire in a horizontal plane and the impellers rotating around vertical axis. However, it is also possible to use the apparatus more or less inclined.

CLAIMS:

1. An apparatus for producing a fibrous web having a homogeneous thickness, said apparatus comprising:

a forming wire which is mounted to move in a straight direction of motion,

a distributor positioned adjacent to said forming wire to distribute fibers thereon, said distributor comprising a housing which defines an open end facing said forming wire,

a net which is mounted on said housing to cover said open end,

means for supplying fibers to said housing, and

a plurality of impellers located within said housing and rotatable around axes which extend perpendicularly to a plane formed by said forming wire as said forming wire passes by said open end of said housing, said plurality of impellers being aligned in at least two parallel rows which extend at an angle of greater than 0° and less than 90° to said straight direction of motion of said forming wire, said impellers distributing air-suspended fibers towards and through said net for deposition on said forming wire.

2. An apparatus according to claim 1, wherein the parallel rows form an angle of greater than 75° and less than 90° with respect to the direction of motion of the forming wire.

3. An apparatus according to claim 1, wherein the impellers rotate in a horizontal plane when in use and in which the impellers comprise at least two identical impeller

blades, wherein zones which are swept by impellers in a row overlap one another.

4. An apparatus according to claim 3, wherein impellers in a row have differing diameters.

5. An apparatus according to claim 1, wherein the impellers of several rows rotate in the same plane and wherein zones which are swept by impellers of different rows overlap.

6. An apparatus according to claim 1, including control means for adjusting a distance between the distributor and the forming wire and the angle of the distributor and the parallel rows relative to the direction of motion of the wire.

7. An apparatus according to claim 1, including a plurality of said distributors, wherein the parallel rows of one distributor form an angle relative to the direction of motion of the forming wire which is different from the angle relative to the direction of motion of the forming wire formed by the parallel rows of at least one of the other distributors.

8. An apparatus according to claim 1, including a plurality of said distributors, wherein each of the plurality of distributors is provided with different numbers of rows of impellers.

FETHERSTONHAUGH & CO.

OTTAWA, CANADA

PATENT AGENTS

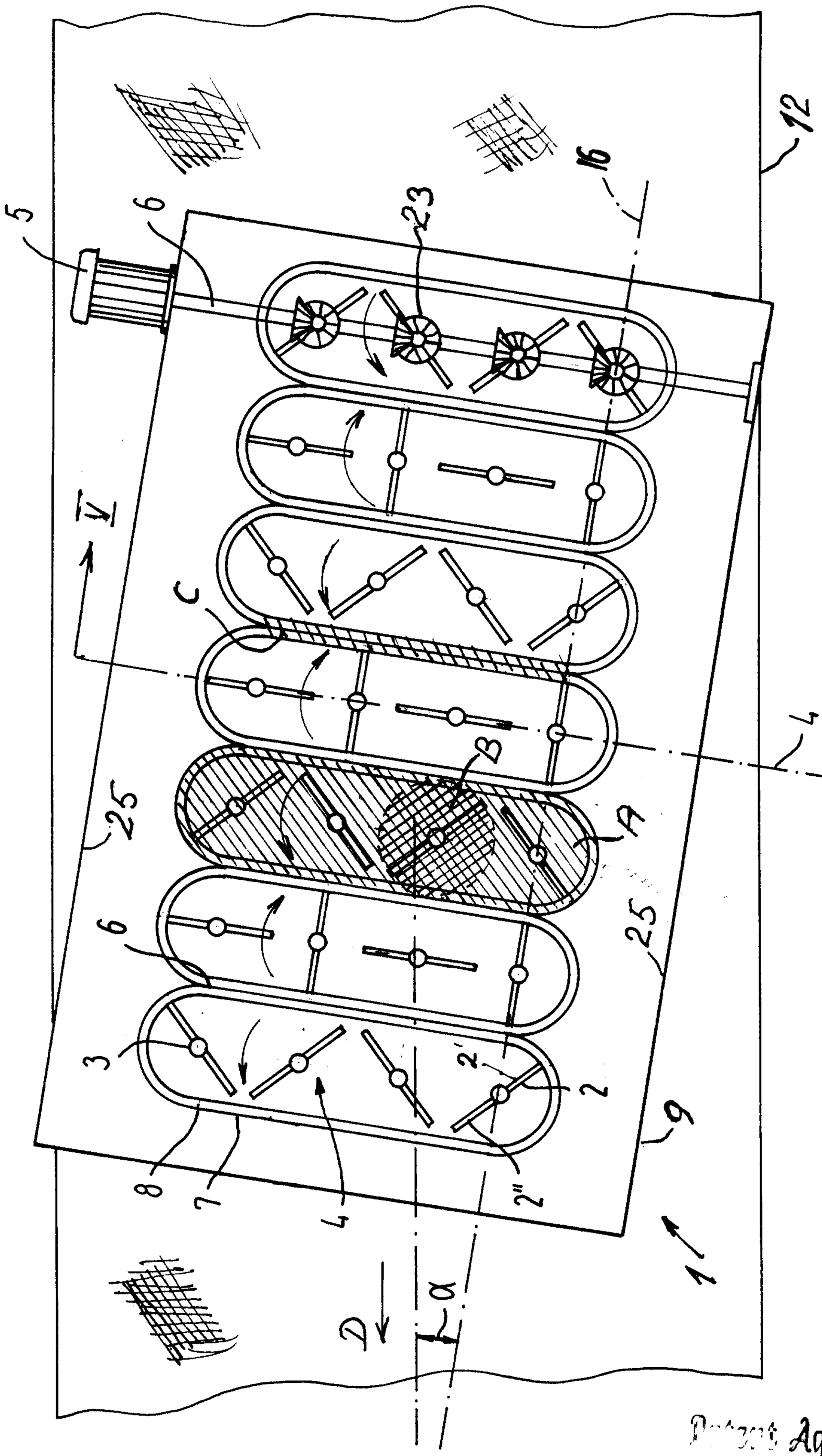

FIG. 1

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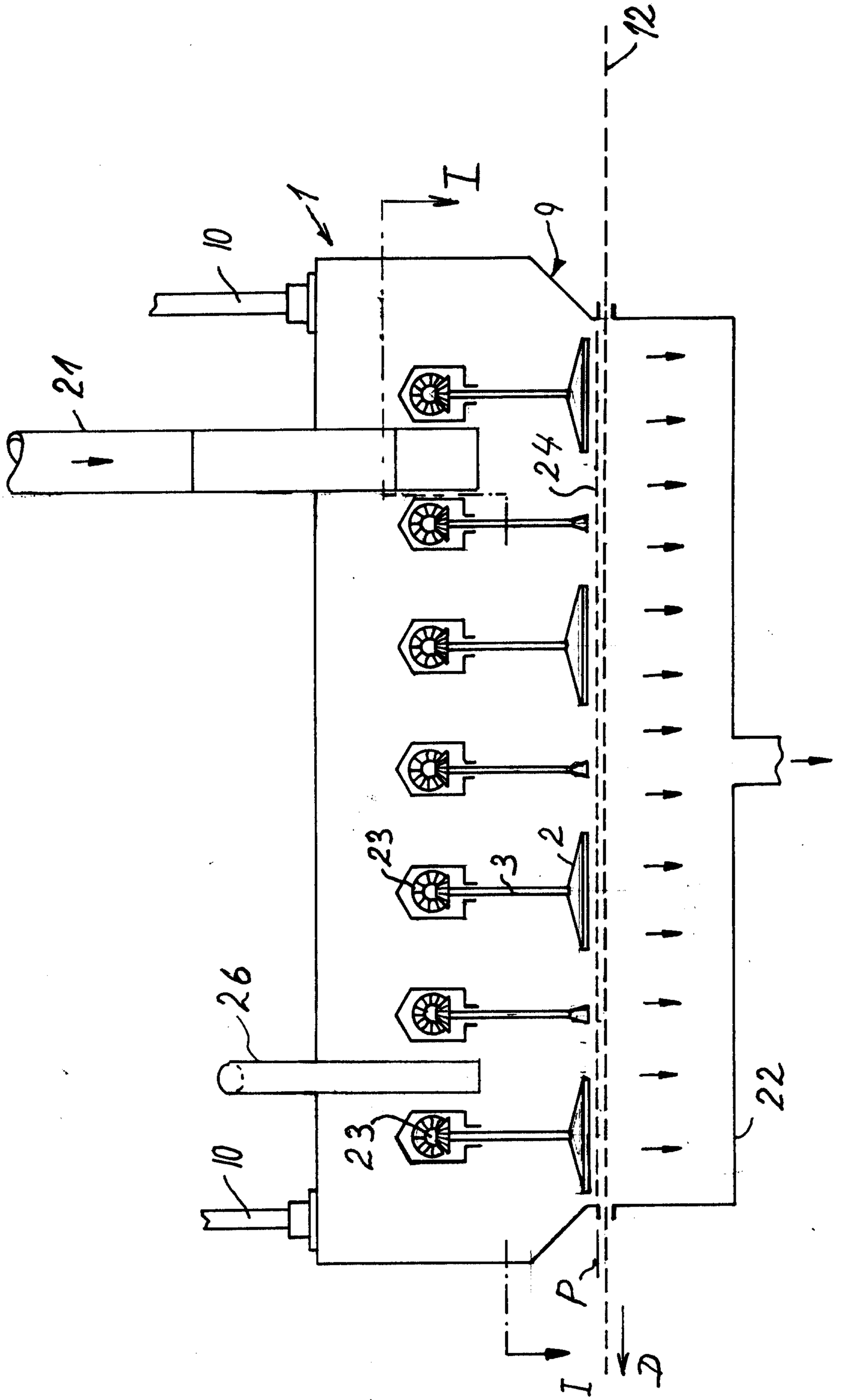

FIG. 2

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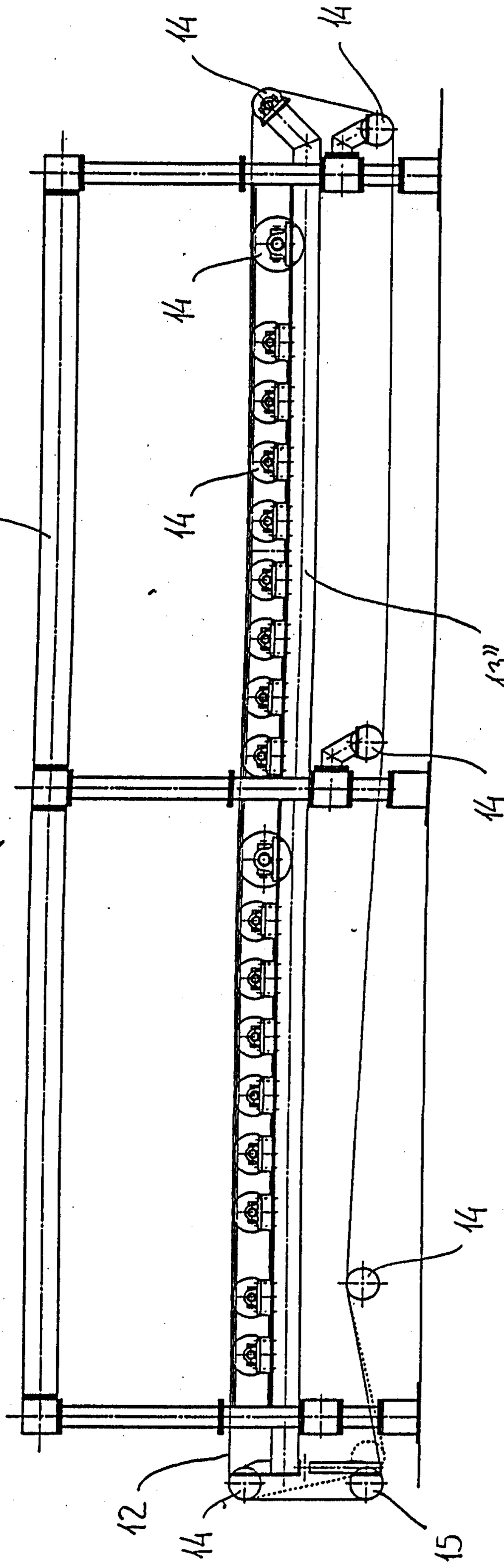

FIG. 3

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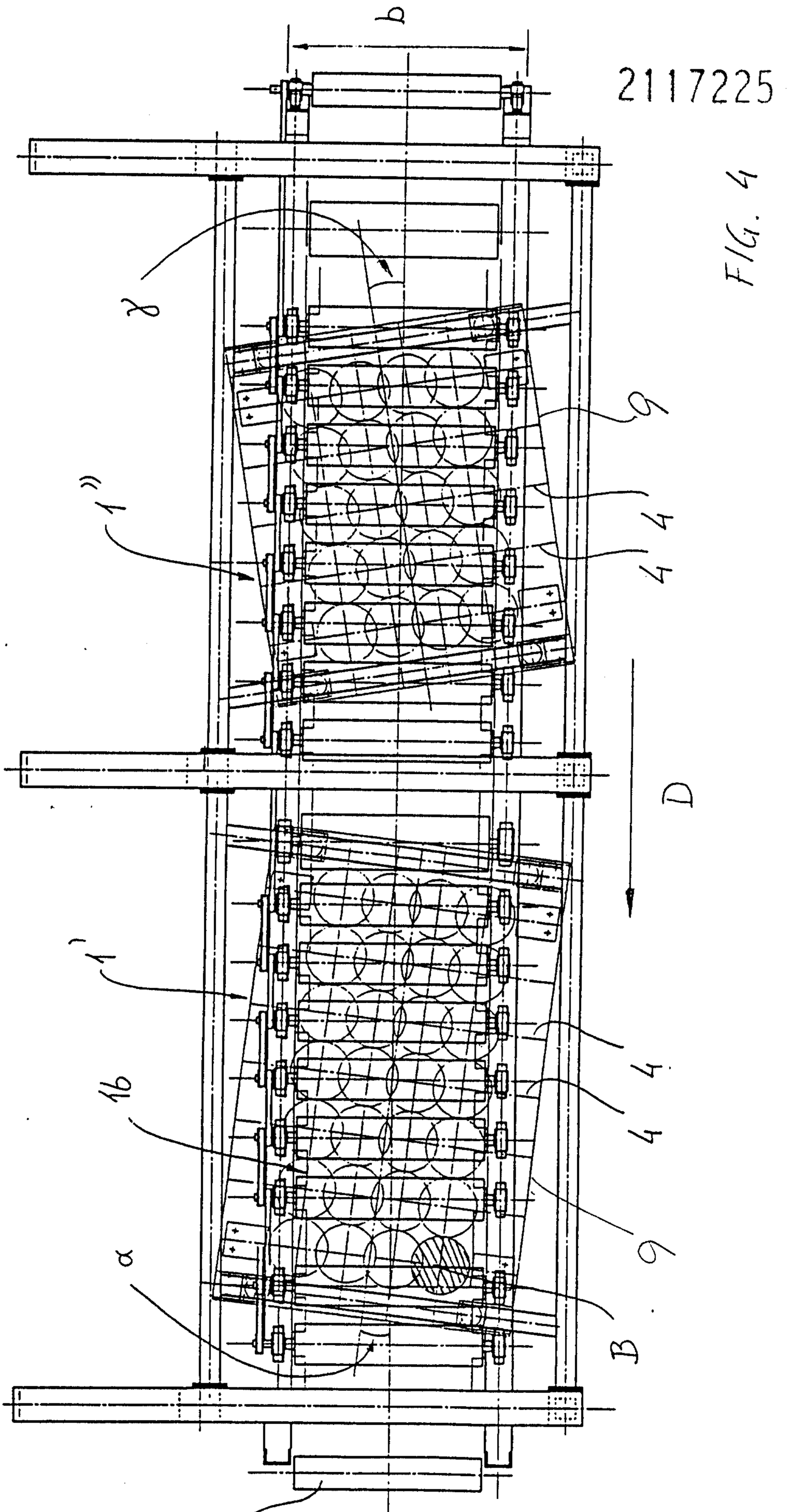

FIG. 4

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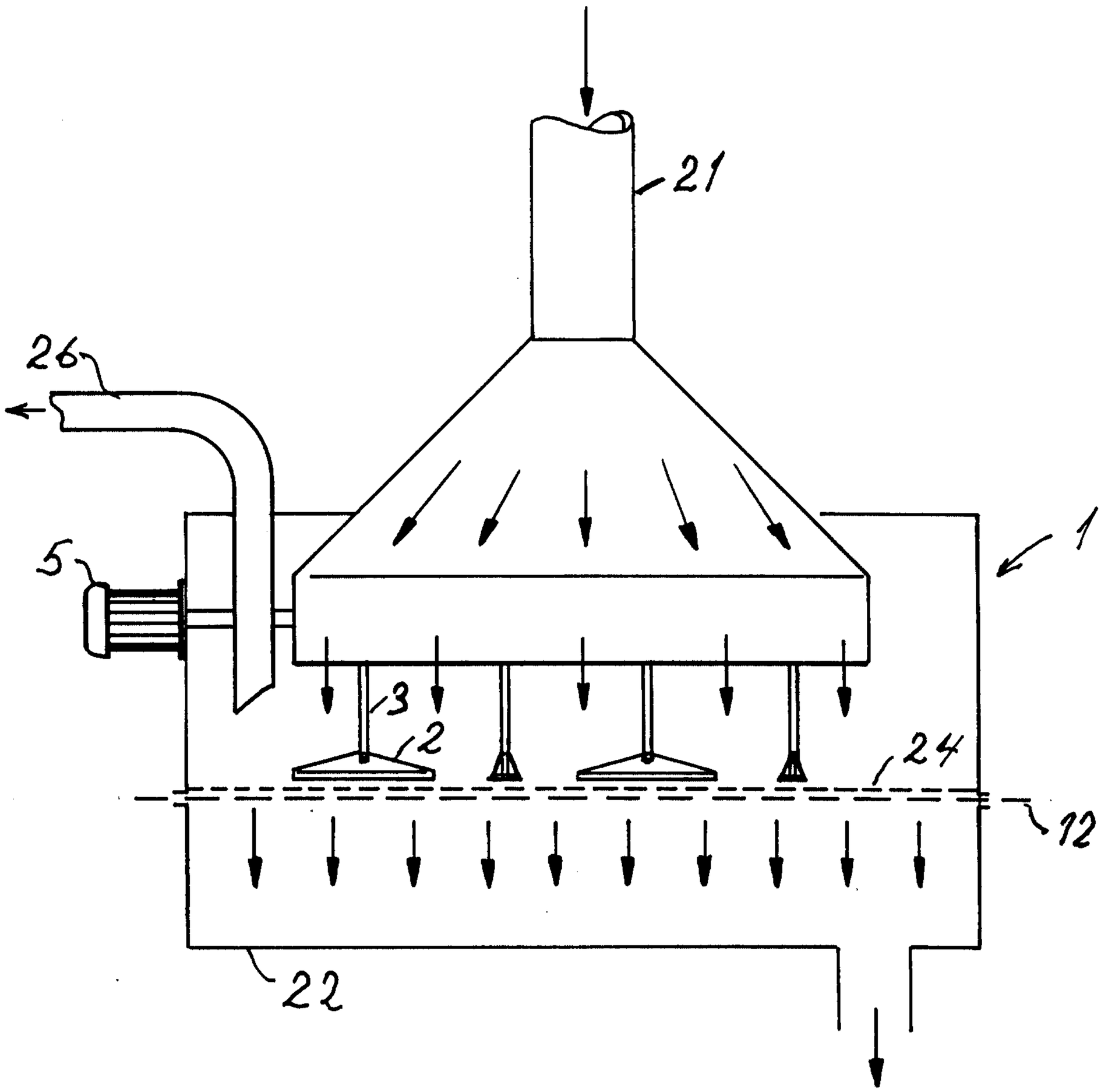

FIG.5

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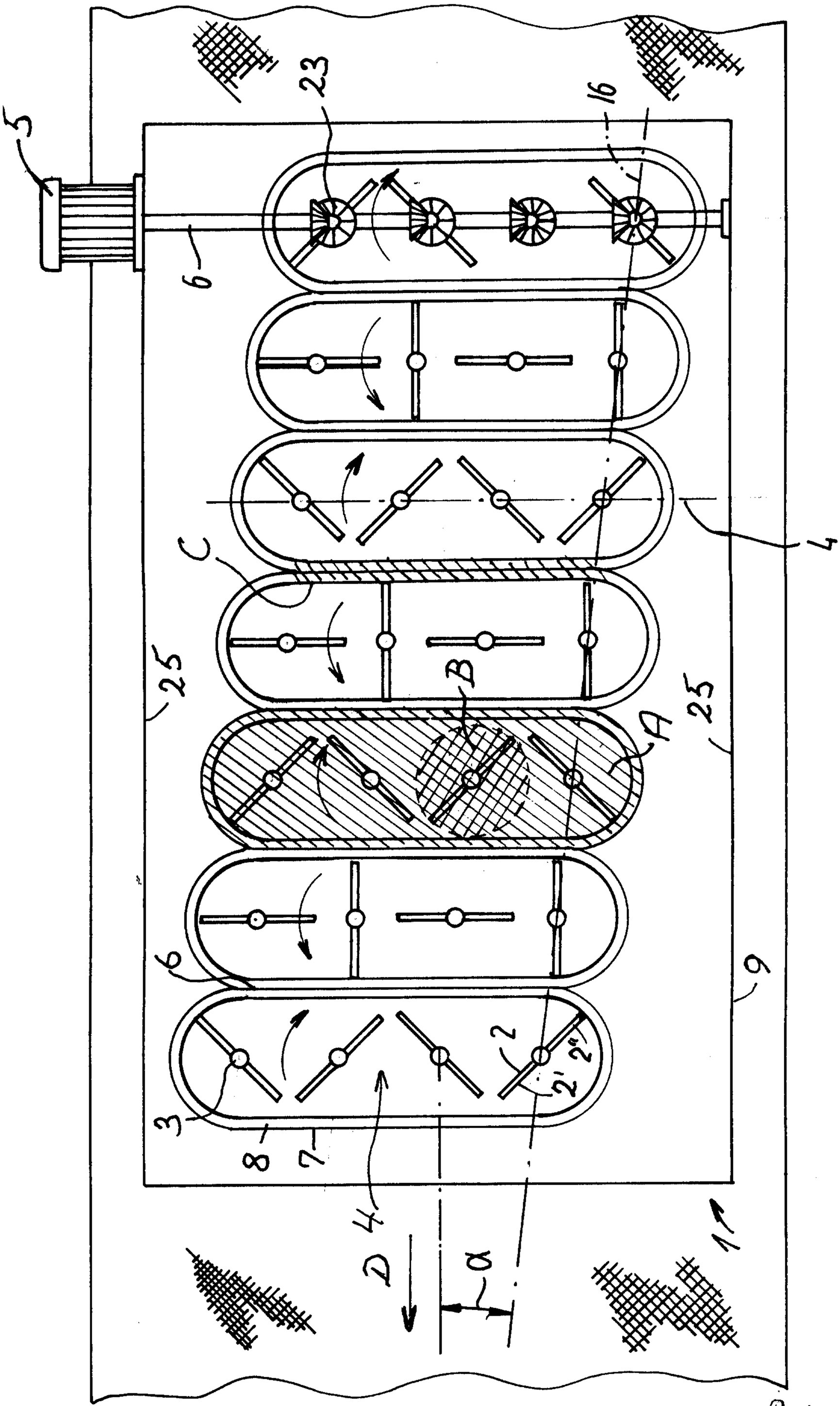

FIG.6

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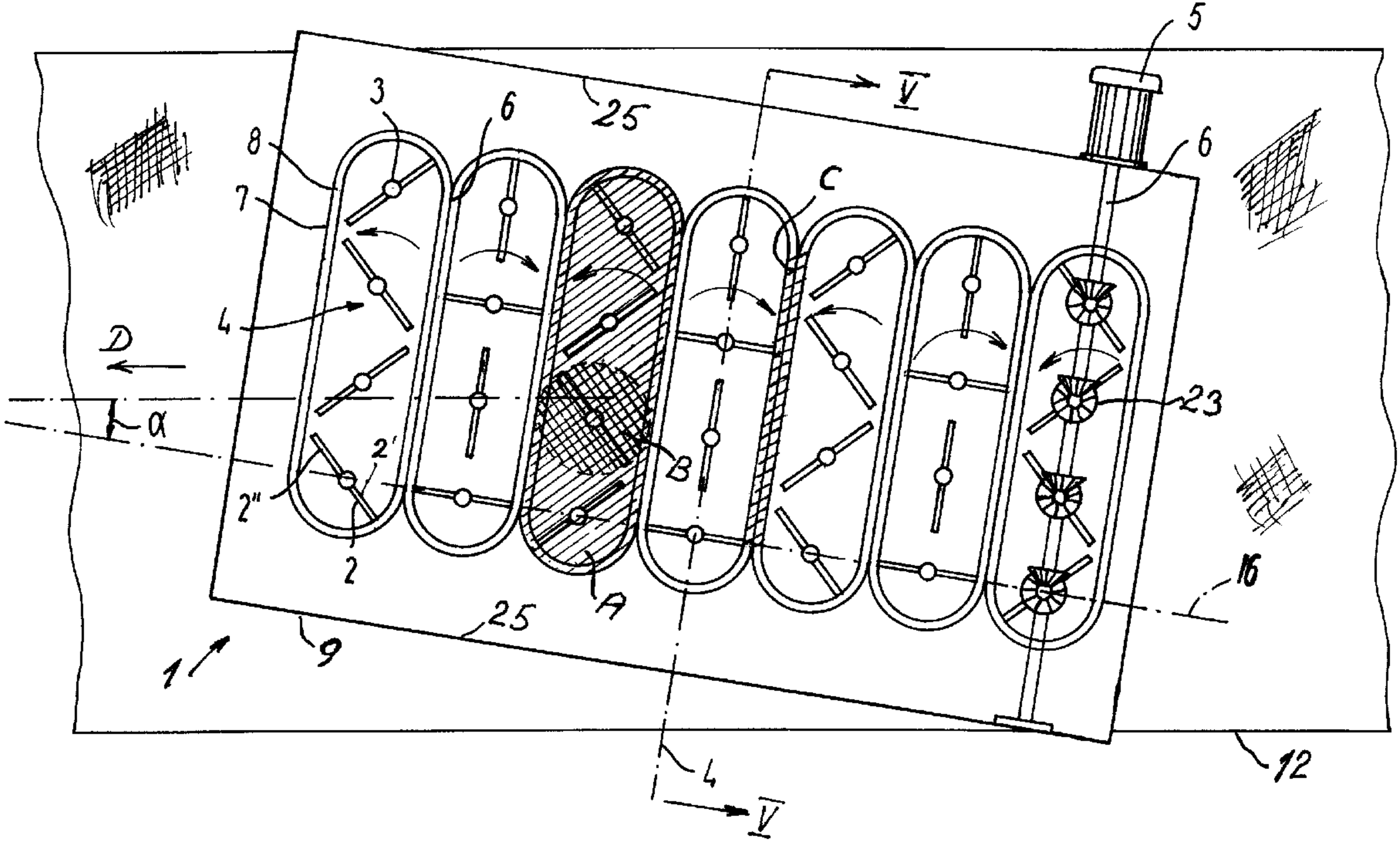
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