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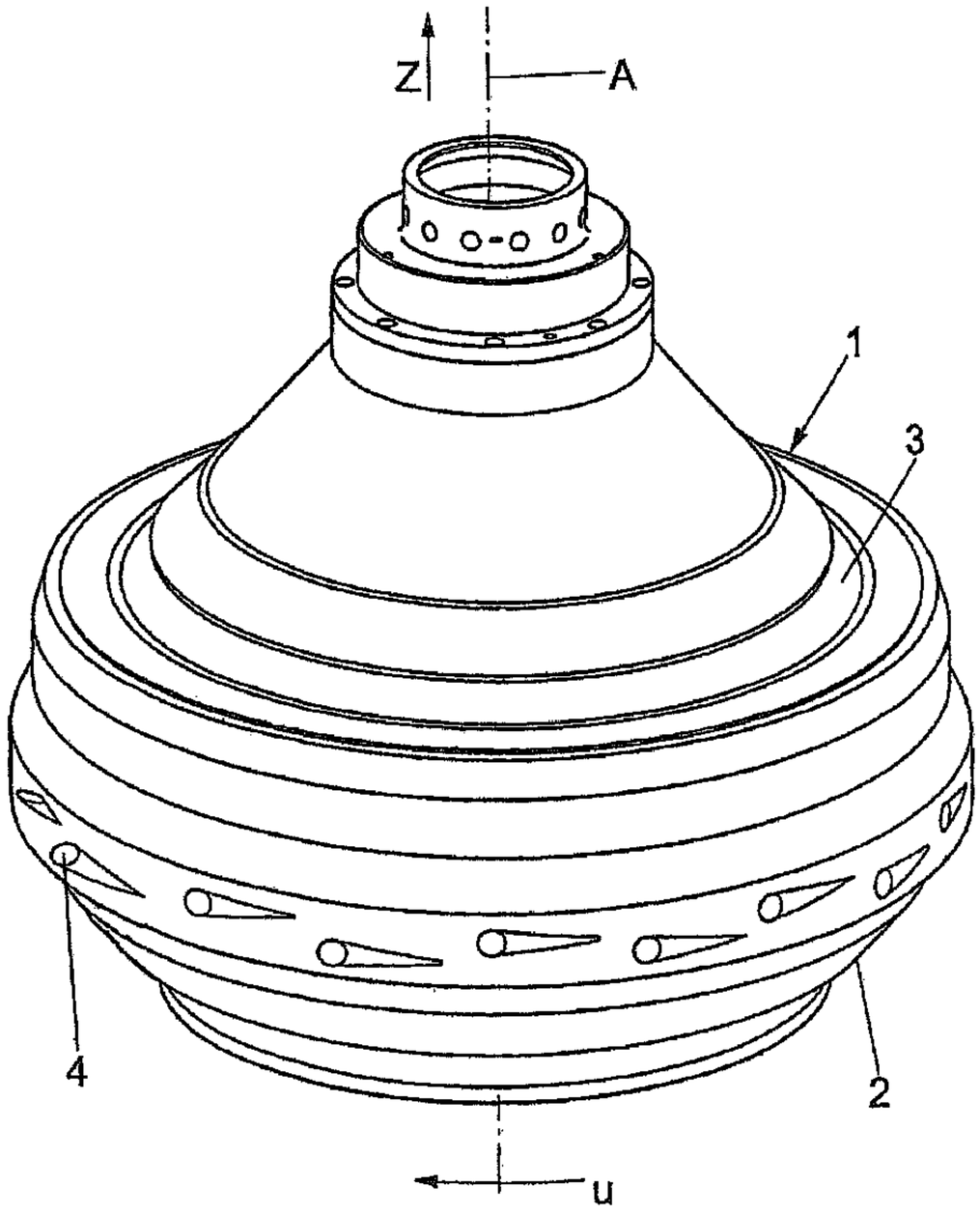
(54) Titre : CENTRIFUGEUSE, EN PARTICULIER SEPARATEUR, DOTEE DE TUYERES DE SORTIE DE SOLIDE
(54) Title: CENTRIFUGE, ESPECIALLY SEPARATOR, WITH SOLID DISCHARGE ORIFICES



(57) Abrégé/Abstract:
A centrifuge, especially separator, with a centrifuging drum (2) which is rotatable about a preferably vertical axis of rotation (D) and has a drum jacket provided with at least one or a plurality of solid discharge orifices which have bores (7) with discharge orifices (10) is characterized in that the bores (7) are arranged completely or partly in vertical direction at different heights (Z axis).

ABSTRACT

A centrifuge, especially separator, with a centrifuging drum which is rotatable about a preferably vertical axis of rotation (D) and has a drum jacket provided with at least one or a plurality of solid discharge orifices which have bores with discharge orifices is characterized in that the bores are arranged completely or partly in vertical direction at different heights (Z axis).

CENTRIFUGE, ESPECIALLY SEPARATOR, WITH SOLID DISCHARGE ORIFICES

The invention relates to a centrifuge having a centrifugal drum rotatable about an axis of rotation, especially a separator having a centrifugal drum rotatable about a vertical axis of rotation, according to the preamble of Claim 1.

A separator of this type is known from U.S. Patent Document US 3,108,952. Solids discharge orifices are arranged in a mutually angularly offset manner in the exterior jacket of the centrifugal drum in the area of the largest inside diameter of the centrifugal drum. Orifice bodies are in each case inserted into bores of the drum jacket, which orifice bodies do not extend radially to the outside but are oriented in an inclined fashion with respect to the respective radial direction in order to utilize the acceleration effect of the product phase exiting from the orifices, which reduces the energy required for rotating the centrifugal drum.

Since the discharge orifices are arranged inclined with respect to the radial direction, at least a certain portion of the product stream exiting from the discharge orifices may strike the exterior drum jacket or collide with this jacket, which may result in considerable wear of the exterior drum jacket.

In particular, as a result of erosion, grooves may form in the exterior drum jacket, which become deeper and

longer over time and therefore limit the useful life of the drum.

U.S. Patent Document US 2,695,748 shows a similar state of the art. The discharge orifices illustrated in that document in each case consist of a first sleeve with a bore extending centrically through the sleeve from the interior radially to the outside. The first sleeves are inserted into the bores of the drum jacket. A second sleeve is in each case screwed into them in their end region at an angle with respect to the radial direction, which second sleeve also has a centric bore, so that the product phase exiting from the centrifugal drum is first guided through the first sleeve radially to the outside and then through the second sleeve, from which it exits in an inclined manner with respect to the radial direction against the rotating direction of the separator.

From U.S. Patent Document US 2,695 748, it is also known to insert the first sleeve also at an angle with respect to the radial direction into a bore of the drum jacket. At its outer end, the sleeve closes off approximately flush with the exterior side of the centrifugal drum, which has the result that behind the discharge of the sleeve with the orifice, the product stream in a recess of the centrifugal drum can strike against the drum jacket and may erode it. A projection engaging in a groove of the centrifugal drum is used for fixing the first sleeve to the centrifugal drum.

A similar construction is shown in U.S. Patent Document US 2,060,239.

For solving this problem, it was suggested in German Patent Document DE 202 19 551 of the above-mentioned type to arrange at least one protection element against wear made of a hard metal in each case on the drum jacket in the area of the solids discharge orifices, and/or to construct a coating of a ramp in the exterior drum jacket. These measures cause additional expenditures.

From Austrian Patent Document AT 9622 B, a centrifugal drum is known which, in the vertical direction, is divided several times by disks into individual centrifugal spaces of a respectively biconical contour, on whose largest inside diameter discharge openings are constructed in each case.

Concerning the state of the art, reference is also made to French Patent Document FR 1,598,924 A which shows a separator having a drum which in sections has several jackets.

In addition, German Patent Document DE 36 19 298 shows a disk separator having a biconical drum interior, on whose largest inside diameter solids discharge orifices are constructed. By way of tubes which, at an axially offset position of the drum situated "higher" in the vertical arrangement and radially farther inside, lead out of the drum, in addition, a product phase, which contains only a few solids, can be guided out of the drum from a radius situated farther in the interior. As a result, a product phase of a different nature is discharged through tubes than through the solids discharge orifices.

It is an object of the invention to prolong the service life of the drum by means of simple devices.

The invention achieves this object by means of the object of Claim 1.

Accordingly, the bores are completely or at least partly arranged in the axial or preferably vertical direction at a different height (Z-axis) in the solids discharge orifices in the area of the largest inside diameter in the centrifugal drum which is conical or biconical on the inside.

Advantageous further developments are contained in the subclaims.

According to the invention, it is advantageous that the recesses or indentations in the drum jacket which, related to the rotating direction of the drum, are situated in each case behind the discharge orifices and which, as a result of the increasing wear when in use, become increasingly longer, can reach a much greater length in the circumferential direction before they reach the respectively next discharge orifice in the circumferential direction, than when all of the discharge openings are situated at only one vertical height (Z-axis parallel to the axis of rotation).

By means of the invention, an effective protection against wear of the separator drum is implemented in a simple manner, by means of which the service life of the drum or of the part of the drum which has the discharge

openings can be increased. This is usually the bottom part of the drum.

It is also advantageous that, as desired, this measure for the protection against wear can also be combined with additional measures for the protection against wear, such as coatings or elements for the protection against wear, in the area of the discharge openings.

The invention is mainly suitable for separators whose centrifugal drums have a vertical axis of rotation and which, on the inside and/or outside, have a single-cone or biconical construction, the solids discharge orifices having orifice bodies which are preferably arranged in the area of the largest diameter of the centrifugal drum, in particular, are inserted into the latter from the outside.

The invention can particularly advantageously be used in the case of separators whose discharge openings are arranged to be offset toward the inside by a distance relative to the largest outer circumference or outside diameter of the centrifugal drum, and which each have a groove-type indentation or recess as an extension of the discharge openings in the drum jacket which, as a rule, have a wedge-shaped further development, so that the solids can exit at a flat angle which, if possible, approximates a tangent.

Further developments are conceivable within the scope of the invention.

The discharge openings are preferably situated in the circumferential direction alternately in two mutually parallel planes which are oriented perpendicular to the vertical or to the Z-axis and, in the circumferential direction, are arranged alternately in the first plane and in the second plane, which results in a particularly effective protection against wear.

In the case of a particularly simple variant, the position and orientation of the actual bores remain unchanged, and only the respective orifice bodies are oriented slightly differently, so that their discharge openings are in each case preferably situated completely at different planes perpendicular to the vertical line.

This has the special advantage that neither the bores nor the orifice bodies per se have to be changed in comparison to known constructions. It is only necessary to orient the orifice bodies in a different manner.

An analogous effect could be achieved by the use of different orifice bodies which are provided with differently oriented bores but are mounted in an identical fashion.

According to a further - particularly preferred embodiment -, however, the inlet openings and also the interior mouths of the openings are, as previously, still situated at a common vertical height. As a result, - and this is particularly advantageous -, at least the contour of the drum interior, as previously, still does not have to be changed.

In contrast, the bores themselves have a different orientation - for example, in the circumferential direction, alternately diagonally upward and diagonally downward relative to the z-axis - whereby at least the discharge openings of the orifice bodies screwed into the bores are situated at a different vertical height.

In a simple fashion, a greater vertical offset of the area of the discharge opening can thereby also be achieved than by the sole measure of the different orientation of the orifice bodies in the openings. Naturally, these two measures can also be combined so that, if necessary, they complement one another according to the invention.

It is advantageous for the discharge openings so lead to the outside in an annular area of the drum in which the drum jacket has a constant diameter.

According to a further variant, the bores are situated completely - thus also in the area of their interior inlet opening - at a different vertical height, which also has the advantage according to the invention but requires a new contouring of the interior drum jacket, so that the above-mentioned variant shown as an example in Figure 2 is preferable.

It is also conceivable to arrange the openings in the circumferential direction in three or more different planes.

In the following, embodiments are described in detail by means of the drawing, whereby further advantages of the invention will also be explained.

Figure 1 is a perspective view of a separator drum;

Figure 2 shows different views and areas of a drum bottom part;

Figure 3 is a view of conceivable outlines of the wear at the drum bottom part from Figure 2;

Figure 4 is a view of an enlargement of a cutout of an area X of Figure 2a; and

Figure 5 is a schematic diagram illustrating the operating principle of a further variant of the invention.

Figure 1 is a perspective view of a separator drum 1 with a vertical axis of rotation A (see also Figures 2 and 3). In the following, the vertical height at the drum relative to the axis of rotation A is called "Z" (see Figure 2). The rotating direction is marked by the arrow U.

The separator drum 1 has a drum bottom part 2 and a drum top part 3 which form an exterior drum jacket of biconical geometry. Embodiments with single-cone drums or non-conical drums can also be implemented according to the invention. In addition, the drums may have a single-cone or biconical construction with respect to their interior.

A separating disk stack having separating disks is preferably inserted into the separator drum 1.

The separator drum 1 also has an inlet pipe (not shown here) and liquid outlets (also not shown here). It is preferably further developed at least as a two-phase machine (solids phase, liquid phase) or as a three-phase machine (solids, liquid, liquid). Furthermore, it is preferably continuously operated and, in particular, also preferably continuously discharges the solids phase.

The separator drum 1 - here, its drum bottom part 2 - is provided with several discharge orifices. For this purpose, at least two, preferably several openings, particularly bores 4, penetrate the separator drum 1. These bores 4 are again preferably formed in the area of the largest diameter (see Fig. 2) of the drum and penetrate the drum jacket from the drum interior to the outside. Preferably, a sleeve-type orifice body 5 is in each case inserted, for example, screwed into each of the bores 4 (see, for example, Figures 2 and 4). This permits the solids to be discharged from the drum interior.

According to Figure 2, the drum bottom part 2 has a recess 6, for example, in the area in which it is penetrated by the openings 4, radially in front of each opening 4, which recess 6 tapers toward the outside in the direction of the openings 4. As a result, the buildup of solids segments (or "sediments"? translator) between the orifice bodies 5 is minimized.

The orifice bodies 5 are in each case provided with a bore 7 extending from the drum interior in the direction of the drum exterior, which bore 7 preferably extends in a first bore section 8 at first essentially in the radial direction from the inside to the outside and then changes into a bore section 9 oriented at an angle with respect to the first bore section 9 (Figures 2, 4).

The discharge opening 10 of the bore section 9 is in each case preferably oriented at an angle with respect to the radial direction R such that the angle α between the radial direction and the discharge opening 10 or the second bore area 9 is preferably equal to or smaller than 90°. In particular, it amounts to between 45° and 90°.

Since the orifice bodies 5 on the outside close off essentially flush with the outer edge of the drum jacket 1, the discharge opening 10 is in each case offset toward the interior relative to the largest outer circumference or diameter of the centrifugal drum or of the drum jacket.

Correspondingly, on the manufacturer's side, groove-type indentations or recesses 11 in each case formed at an angle with respect to the radial direction as an extension of the second bore section 9 are already constructed in the drum jacket, so that the product phase exiting from the discharge orifices, if possible, will spray past the drum jacket on the outside.

However, in the case of this method of construction, a portion of the solids (see solids S in Figure 4) exiting from the discharge orifice 2 will strike the drum

jacket again and could - depending on the product to be processed - cause an erosion of the drum jacket, particularly in the exterior area of the recess 11 as well as also farther in the circumferential direction. Because of this erosion, the groove-type indentation 11 may possibly lengthen over time (compare Figures 2 and 3).

It is therefore provided that the bores 7 of the orifice bodies 5 (and possibly also the bores 4 in the drum jacket which receive the orifice bodies 5) are situated completely or at least in the area of their discharge openings 10 in the vertical direction not in one plane but in at least two or more mutually different planes E1, E2.

Thus, at least the discharge openings 10 are situated in two mutually parallel planes which are oriented perpendicular with respect to the vertical or to the Z-axis. As a result, they are arranged in the circumferential direction alternately in the first plane and in the second plane. This is visible particularly in Figure 2d.

Figure 5 outlines that, in another variant, although the discharge openings 10 are situated in one plane, the bores or areas in front of the discharge openings 10 are oriented such that the solids are emitted in different directions diagonally upward and downward, so that the service life is also prolonged.

Furthermore, the inlet openings 12 of the bores 7, in contrast, are preferably situated in a common plane

with respect to the drum axis, so that the contour of the interior jacket of the separator drum does not have to be changed by the measure of arranging the discharge openings 10 in at least two or more different planes.

This results in the advantage that the recesses 11 behind a discharge orifice 10a, which become increasingly long as a result of wear when in use, may reach a much greater length in the circumferential direction before, against the rotating direction, they reach the respectively next discharge orifice in the circumferential direction, than if all the discharge orifices 10 were situated in only one plane (Figure 3).

Many different further developments are conceivable within the scope of the invention.

In one variant, the position and orientation of the actual bores 4 are left unchanged and, in each case, only the orifice bodies are oriented in a slightly different manner, so that their discharge orifices 10 will be situated in different planes with respect to the vertical line Z.

According to the embodiment of Figures 1 to 3, the inlet openings 12 or the interior mouths of the openings 4 are situated, as previously, at a vertical height. Then - and this is particularly advantageous -, at least the contour of the drum interior, as previously, does not have to be changed.

In contrast, the bores 4 themselves are oriented differently - for example, in the circumferential

direction, alternately diagonally upward and diagonally downward relative to the interior mouth, whereby at least the discharge openings 10 of the orifice bodies screwed into the bores 4 will be situated at a different vertical height (planes E1, E2; see Figure 2).

This variant is illustrated in the attached Figures 2 and 3, among others. In this fashion, a greater vertical offset of the area of the discharge opening 10 than as a result of the sole measure of the different orientation of the orifice body 5 in the openings 4 can also be achieved in a simple manner. However, these two measures can naturally also be combined, so that, as required, they complement one another according to the invention.

It is also advantageous for the discharge openings 10 to lead to the outside in an annular area 13 of the drum in which the drum jacket has a completely or essentially constant diameter.

List of Reference Symbols

Separator drum	1
Drum bottom part	2
Drum top part	3
Bores	4
Orifice body	5
Recess	6
Bore	7
Bore sections	8, 9
Discharge opening	10
Groove-type indentation	11
Inlet openings	12
Annular area	13
Planes	E1, E2
Angle	α
Axis of rotation	A
Vertical height	Z
Solids	S

CLAIMS:

1. Centrifuge having a centrifugal drum (2) rotatable about an axis of rotation (D), particularly a continuously operating separator having a centrifugal drum (2) rotatable about a vertical axis of rotation (D), which rotatable drum (2) has a single-cone or biconical construction in the interior and is provided in the area of its largest inside diameter with at least one or more solids discharge orifices having bores (7) with discharge openings (10),
characterized in that the bores (7) in the solids discharge orifices in the area of the largest inside diameter in the centrifugal drum (2), which has a single-cone or biconical construction on the inside, are arranged completely or at least partially in the axial or preferably in the vertical direction at a different height (Z-axis).

2. Centrifuge according to Claim 1,
characterized in that the bores (7) are arranged at least in the area of their discharge openings (10) at a different height (Z-axis) in the vertical direction.

3. Centrifuge according to Claim 1,
characterized in that the bores (7) are oriented and aligned such that the solids phase exits from the discharge openings (10) at least in two different directions.

4. Centrifuge according to one of the preceding claims,

characterized in that the discharge openings (10) are situated in at least two or more mutually different planes which are aligned perpendicularly with respect to the axis of rotation (A) of the drum.

5. Centrifuge according to one of the preceding claims,
characterized in that the discharge openings (10) are situated in the circumferential direction alternately in two mutually different planes (E1, E2) which are oriented perpendicular to the axis of rotation (A) of the drum.

6. Centrifuge according to one of the preceding claims,
characterized in that the solids discharge orifices have orifice bodies which preferably are arranged in the area of the largest diameter of the centrifugal drum.

7. Centrifuge according to one of the preceding claims,
characterized in that the solids discharge orifices are formed by orifice bodies (5) which are inserted into openings (4) in the drum jacket extending through the drum jacket from the inside to the outside, and in that the orifice bodies (5) are each provided with the bore (7) extending from the drum interior in the direction of the drum exterior.

8. Centrifuge according to one of the preceding claims,
characterized in that the orifice bodies (5) are each inserted differently into the bores (4) in such a manner

that their discharge openings (10) in each case lead out in different vertical planes.

9. Centrifuge according to one of the preceding claims,
characterized in that, in a first bore section (8), the bores (7) first extend essentially in the radial direction from the inside to the outside and then change to a bore section (9) oriented at an angle with respect to the first bore section (8), and in that the discharge openings (10) of the bore section (9) are preferably each aligned at an angle with respect to the radial direction.

10. Centrifuge according to one of the preceding claims,
characterized in that the discharge openings (10) are each offset toward the inside relative to the largest outer circumference or diameter of the centrifugal drum or of the drum jacket, as a lengthening of the second bore section (9), a groove-type indentation or recess (11) being constructed in the drum jacket (1), which indentation or recess (11) is formed at an angle with respect to the radial direction.

11. Centrifuge according to one of the preceding claims,
characterized in that the inlet openings (12) of the bores (7) and/or of the bores (4) are situated in a common plane or at a vertical height relative to the drum axis.

12. Centrifuge according to one of the preceding claims,

characterized in that, in the circumferential direction, the bores (4) are alternately oriented diagonally upward and diagonally downward relative to the inside orifice.

13. Centrifuge according to one of the preceding claims,
characterized in that the bores (4) and the bores (7) of the orifice bodies (5) are constructed completely at a different vertical height (z).

14. Centrifuge according to one of the preceding claims,
characterized in that the discharge openings (10) are constructed in an annular area of the drum bottom part (3) which has a constant diameter.

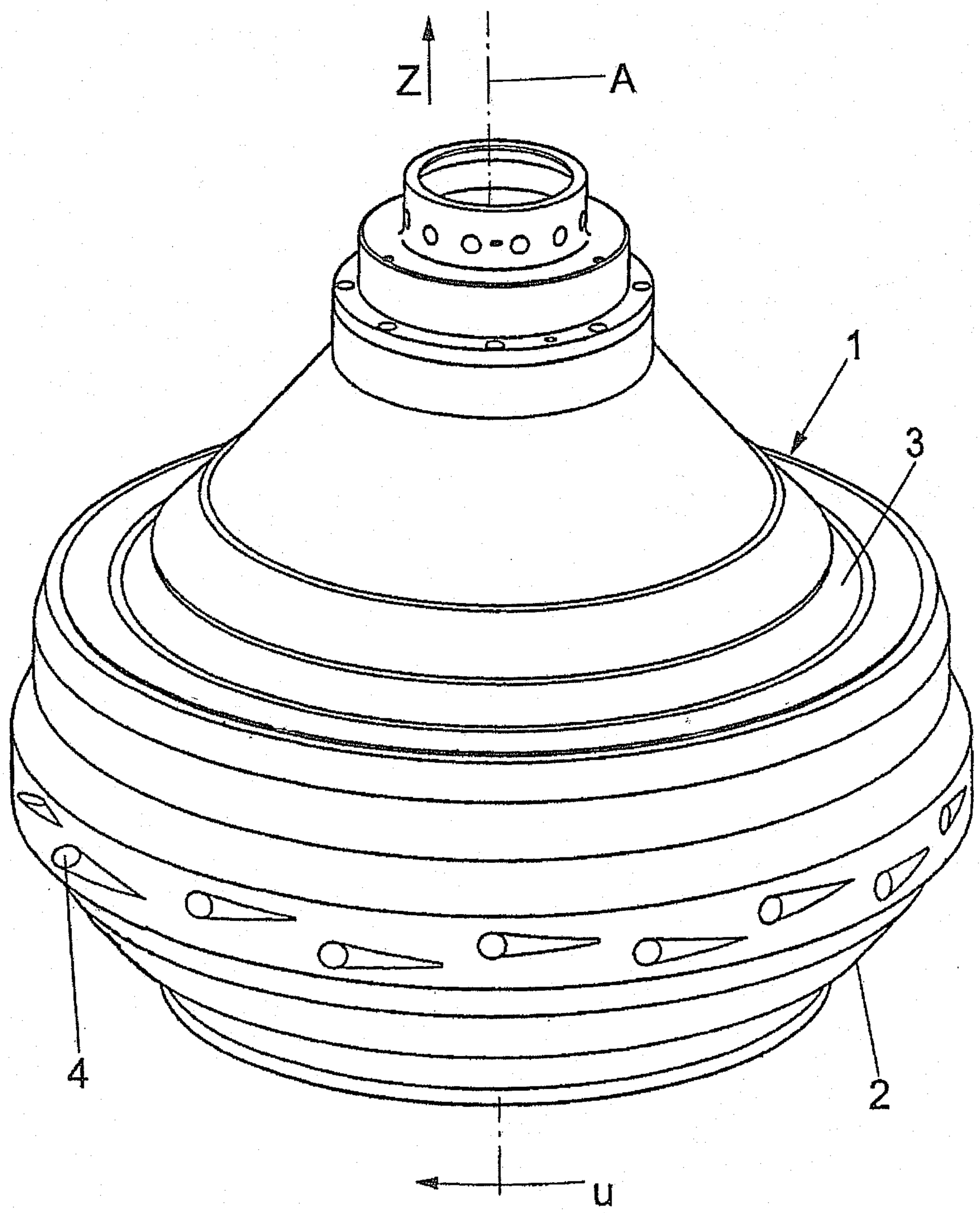


Fig. 1

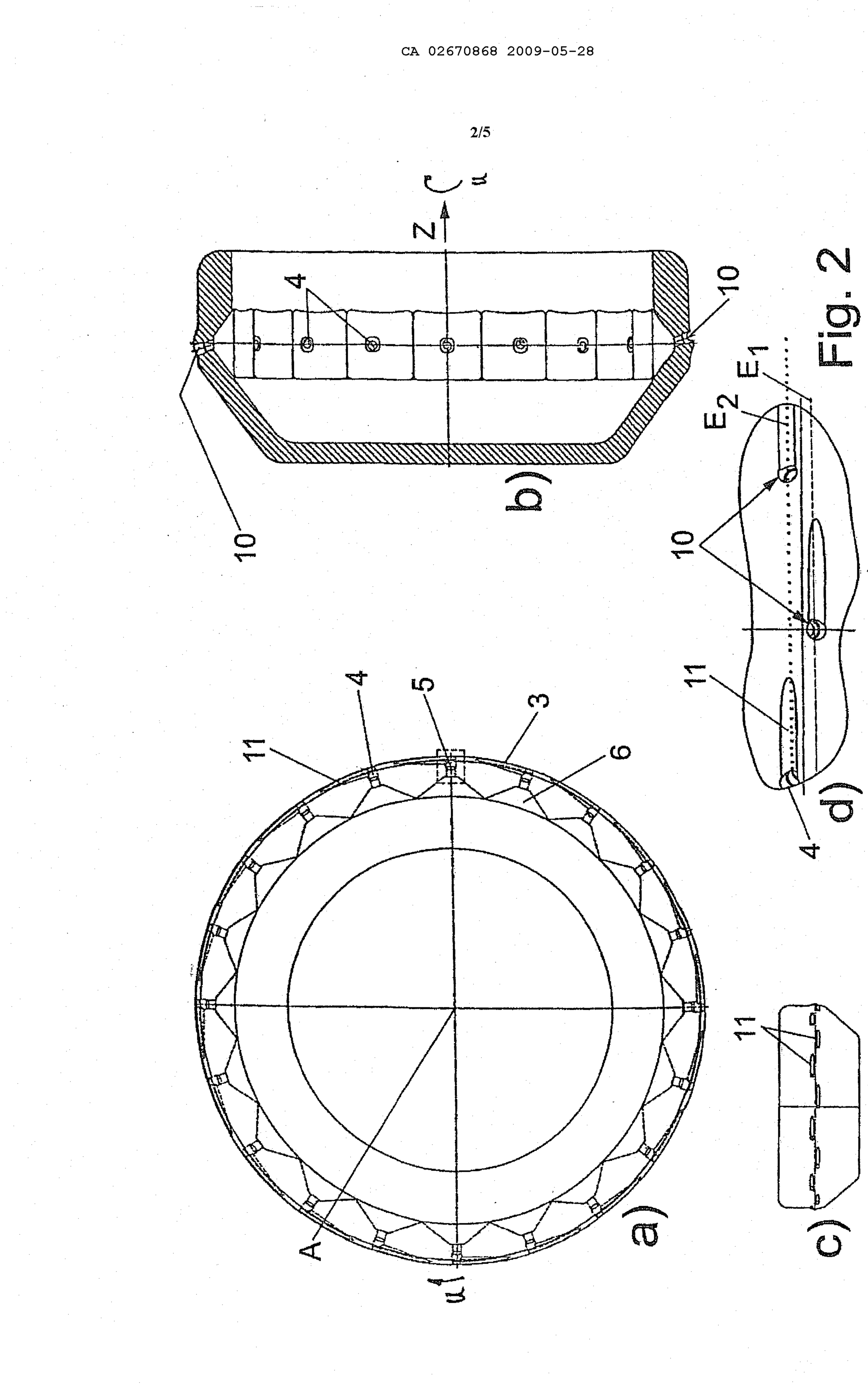


Fig. 2

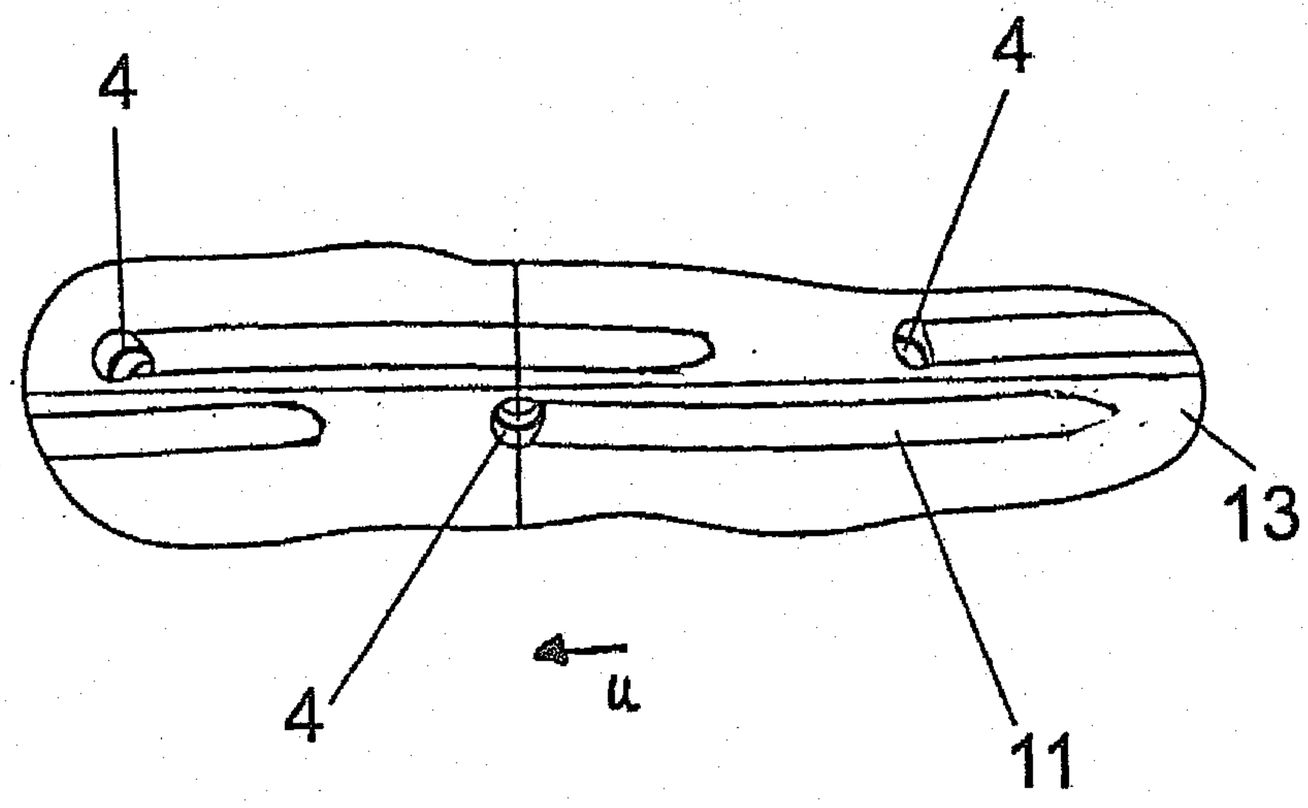


Fig. 3

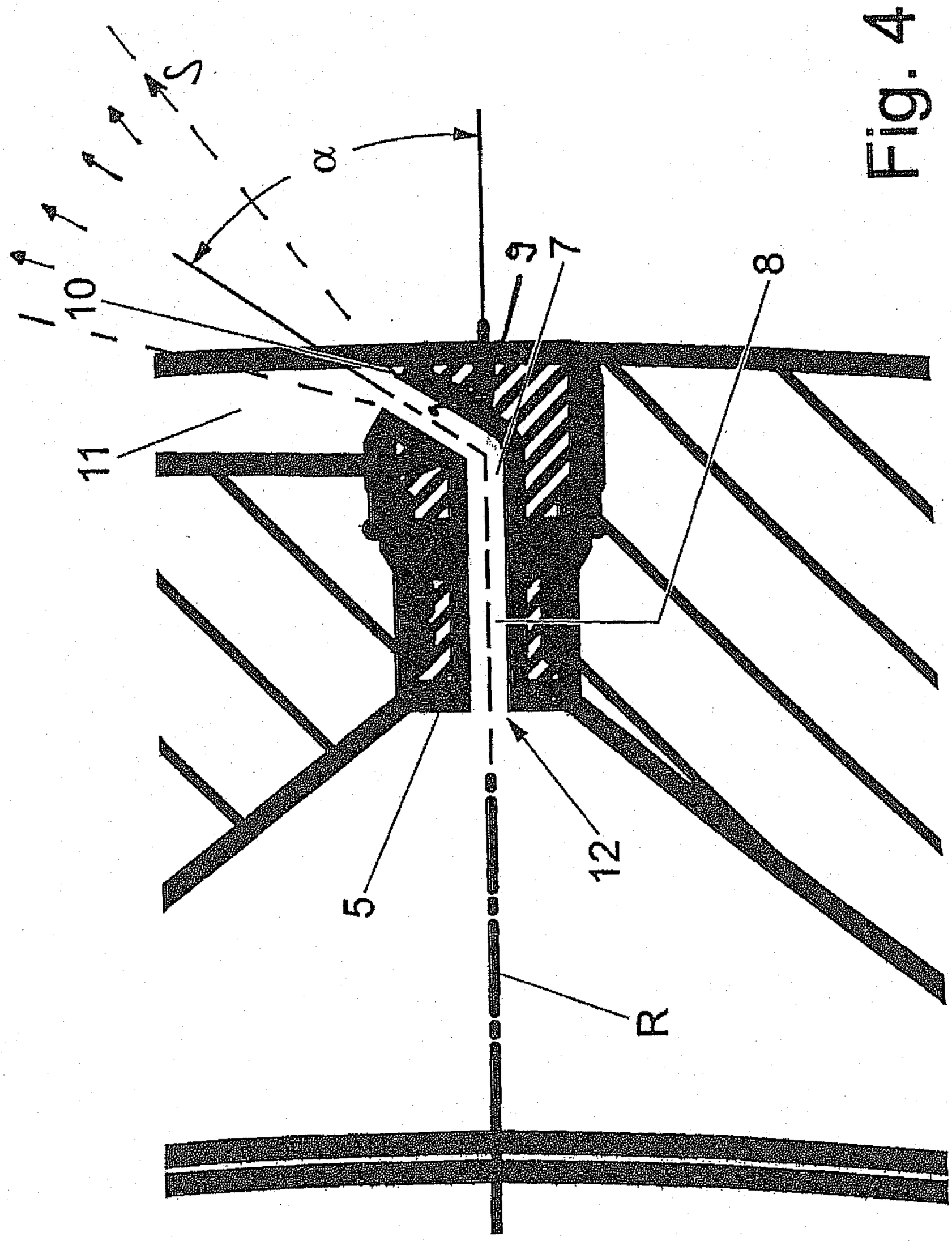


Fig. 4

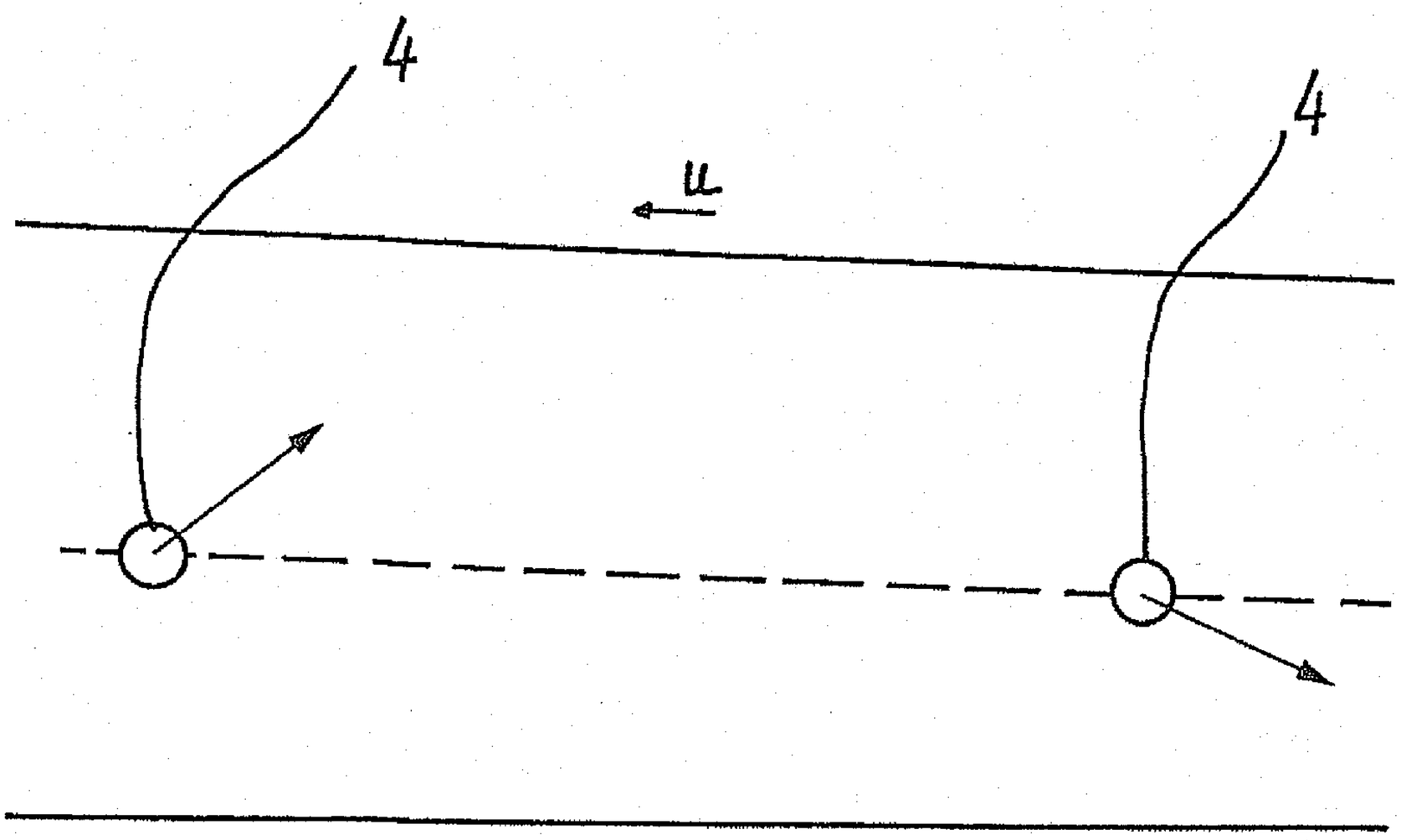


Fig. 5

Z
A
1
3
4
2
U