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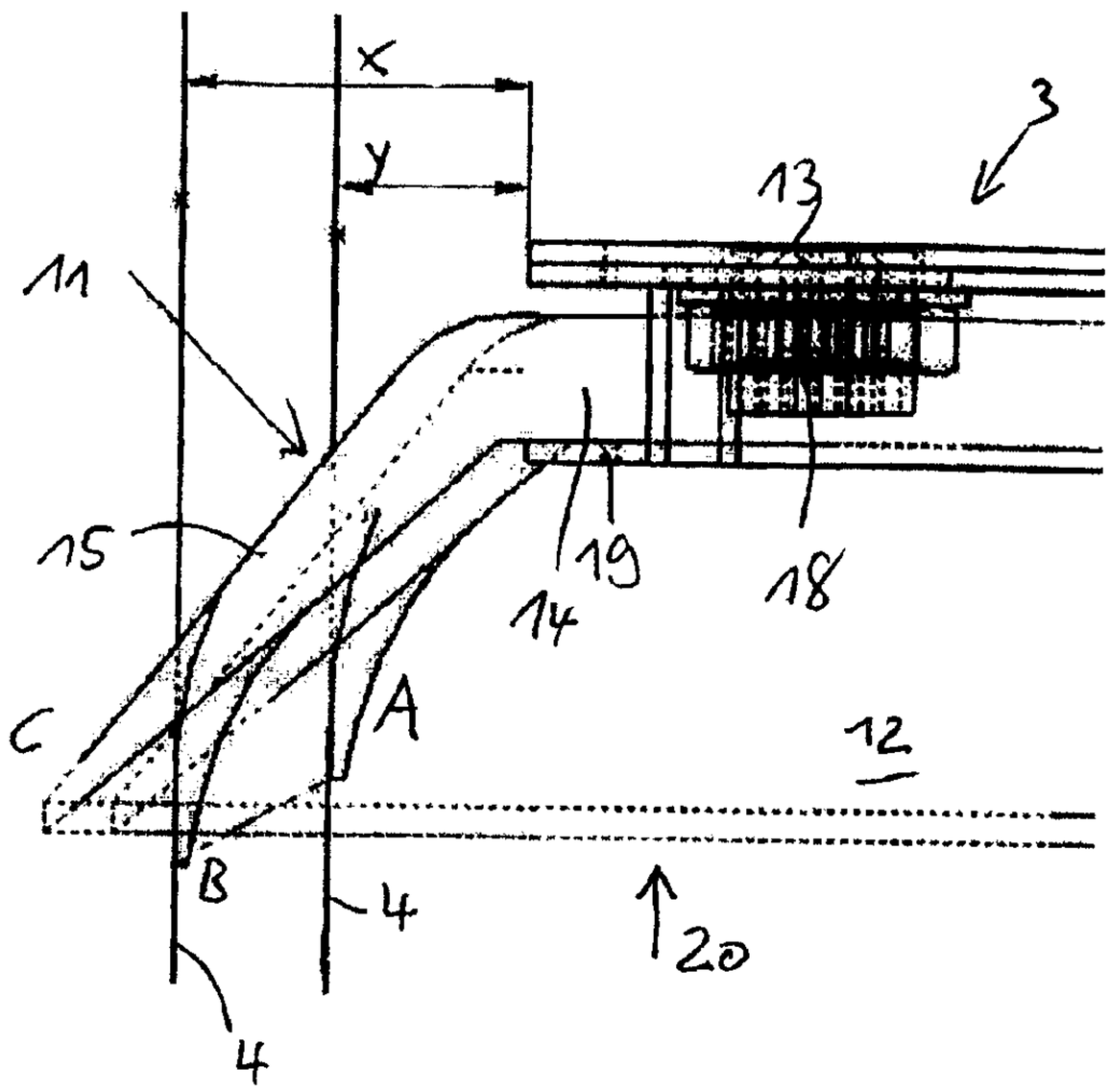
(54) Title: FLUSHING DEVICE FOR A CHANNEL, ESPECIALLY A SURGE FLUSHING DEVICE FOR A WASTE WATER CHANNEL



(57) Abrégé/Abstract:
The invention relates to a flushing device for a channel (12), especially surge flushing for a waste water channel with a flushing blade (3) that can be moved essentially perpendicular to the flow direction (20) of the liquid in the charnel. The movement occurs between a lowered position in which the flushing blade contacts an arc-shaped wall area of the channel wall (4), related to the channel cross section and a raised position, in which the flushing blade releases at least one part of the channel cross section. According to the invention, it is provided that the flushing blade has an elastic gasket (11) in its area that comes in contact with the channel wall, whereby the gasket has a base section (14) held in the flushing blade element (13) of the flushing blade and a lip section (15) located outside the flushing blade element for contact on the channel wall (4), whereby the lip cross section is pointed opposite to the flow direction of the liquid, starting from the base section.

Abstract

Flushing device for a channel, especially a surge flushing device for a waste water channel

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The invention relates to a flushing device for a channel (12), especially surge flushing for a waste water channel with a flushing blade (3) that can be moved essentially perpendicular to the flow direction (20) of the liquid in the channel. The movement occurs between a lowered position in which the flushing blade contacts an arc-shaped wall area of the channel wall (4), related to the channel cross section and a raised position, in which the flushing blade releases at least one part of the channel cross section.

According to the invention, it is provided that the flushing blade has an elastic gasket (11) in its area that comes in contact with the channel wall, whereby the gasket has a base section (14) held in the flushing blade element (13) of the flushing blade and a lip section (15) located outside the flushing blade element for contact on the channel wall (4), whereby the lip cross section is pointed opposite to the flow direction of the liquid, starting from the base section.

(Figure 7)

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Flushing device for a channel, especially a surge flushing device for a waste water channel

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European Patent Application 04 029 029.8

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Description

The invention relates to a flushing device for a channel, especially a surge-flushing device for a waste-water channel with a flushing blade that can be moved essentially perpendicular to the flow direction of the liquid in the channel, between a lowered position in which the flushing blade contacts an arc-shaped wall area of the channel wall, related to the channel cross-section and a raised position, in which the flushing blade releases at least one part of the channel cross-section.

A surge-flushing device for a waste-water channel of the type named at the beginning is known from EP 1 219 753 A2. In it, a flushing blade is used that can swivel and is mounted so that it is sealed with respect to the channel wall, is automatically controlled and is designed with a plate shape. In a mostly empty channel, even with low waste water flow, this creates banking and allows it to proceed as a flushing surge. The flushing blade is guided to and in the channel by a lever mechanism. A closure is provided that holds the flushing blade in the lower position and that is unlocked by a mechanism controlled from the head water to release the flushing blade.

This document describes that the contour of the flushing blade, designated as a flushing flap, is formed in such a way that sealing is caused with respect to the channel base and to the lateral channel walls. In this case, an absolute seal is not absolutely necessary. It is adequate if the gasket is designed in such a way that a defined backwater occurs in front of the flushing flap as a result of the inflow. It is also conceivable to provide the waterway of the channel in the area of the flushing flap with a stop for the gasket, against which the flushing flap contacts and/or which acts as a seal along its contour in the lowered position.

A surge-flushing device for a waste water channel of the type named at the beginning is also known from EP 1 475 484 A2. In that case, a further development of the surge flushing device according to the first-named document is described. It is distinguished in that a lift element works together with the lever arms of a parallel lever, connected in force and movement, for actuating the flushing flap / flushing blade. In the flushing operation, the flushing flap is driven out over the water level in the channel by the lift element. Because of this, the skimming wall effect on the flushing flap is eliminated and the floating substances that are carried along on the water surface in the waste water flow can pass the flushing flap unimpeded.

The objective of the invention is to further develop a flushing device of the type named at the beginning in such a way that a sealed closure between the flushing blade and the channel wall is ensured in all backwater operating statuses of the banking blade, especially with a high banking of liquid in the channel.

The objective is solved with a flushing device of the type named at the beginning, in that the flushing blade has an elastic gasket in its area that comes in contact with the channel wall, whereby the gasket has a base section held in a flushing blade element of the flushing blade and a lip section located outside the flushing blade element to contact the channel wall, whereby the lip section is pointed opposite the flow direction of the liquid, starting from the base section.

In regards to the present invention, the designation channel wall is understood not only as the side wall area of the channel wall, but also the floor area of the channel wall.

The flushing device according to the invention ensures a high degree of sealing between flushing blade and channel wall. This is the basic prerequisite for banking adequate liquid in the channel in front of the flushing blade to initiate the subsequent flushing process, especially the surge flushing process. The latter requires a fast raising of the flushing blade and thus a sudden release of the water quantities that are banked in front of the flushing blade. The water quantities held back by the flushing blade cause a considerable force to act on the flushing blade. This necessarily has the consequence that the position of the flushing blade changes slightly relative to the channel wall when the flushing blade is actually fastened in the floor area of the channel walls, but is slightly pushed by the liquid masses in its upper end area. It is equally conceivable that the flushing blade is moved slightly away from the channel wall in its section assigned to the floor area. However, this must not lead to a case in which a slot develops between the flushing blade and the channel wall, especially a slot that increases continuously depending on the water pressure. This would result in a case where the liquid would flow out between flushing blade and channel wall without the desired flushing effect.

Under consideration of this, the design according to the invention of the flushing blade with gasket leads to a case in which the lip section contacts the channel wall with prestress that is greater, the higher the pressure that occurs in the liquid, which leads to the lip section being pressed against the channel wall with higher pressure. The pressure acts on the lip section, which is pointed opposite the flow direction of the liquid, starting from the base section of the gasket. With the elastic gasket, the base section thus serves as the mounting of the gasket in the flushing blade element, while the lip section takes over the actual sealing function.

It is considered especially advantageous if the flushing blade is designed with a plate shape, while in the area of the face side of the flushing blade, it has a holder for the base section. Naturally the flushing blade could also have a shape other than a plate shape, e.g. as a hollow body, in order to utilize the uplift of the flushing blade when the flushing blade is raised. It is important for the present invention that the gasket that is provided for contact with the channel wall is continuously active in the area of the flushing blade.

It is considered especially advantageous if the flushing blade is designed in such a way that it has an arc shape, and especially a semi-circular shape, in its area that acts together with the channel wall. The upper end of the flushing blade thus has an essentially horizontal edge that extends downward from the semi-circular contour of the flushing blade. As a consequence, a flushing blade designed in this way acts together with a channel that has a cross section with a semi-circular shape.

In construction, the flushing device is especially designed in such a way that the channel wall that can be brought into active connection with the flushing blade is a component of a metal wall that is formed by a channel insert part, which consists especially of stainless steel. In this way, the gasket works together with a metal wall area of the channel. Because of this, a smooth surface of the wall part is ensured and thus a favorable prerequisite for a good seal between flushing plate and channel wall.

According to a special embodiment of the invention, it is provided that the side wall areas of the channel wall that can be brought into active connection with the flushing blade are slightly convergent to the floor area of the channel walls. The effect achieved here is that the flushing blade is largely lowered into the channel without the gasket of the flushing blade contacting the channel wall. Just before the flushing blade reaches the completely lowered position, it contacts the side wall areas because the side wall areas of the channel walls are arranged so that they are slightly convergent. Because of this, on one hand the force is significantly reduced during lowering and lifting of the flushing blade and on the other, the elastic gasket is not stressed. The flushing blade exercises its sealing function only shortly before it reaches the completely lowered position and in the completely lowered position of the flushing blade.

Since the flushing device according to the invention depends on precise arrangement of the gasket with respect to the channel wall, it is suggested that the gasket be mounted in the flushing blade element so that it can be adjusted. It is especially understood that an adjusting capability of the gasket exists in radial direction with an arc-shaped or circular shaped design of the flushing blade.

The gasket is distinguished by a defined Shore hardness, whereby this is especially true for the lip section. It is considered advantageous if the Shore hardness of the gasket is 40 to 70. The

sealing lip is provided with a Shore hardness in the named low range if a relatively small diameter of the channel wall has to be closed by the flushing blade. With an average diameter of the channel wall, preferably a Shore hardness of 60 is used and with a large diameter a Shore hardness of 70. Apart from this, the Shore hardness of the gasket should be lower with lower water pressure than with higher liquid pressure that has to be managed.

According to a special characteristic of the invention, it is provided that the elastic gasket is designed so that it is straight before installation in the flushing blade element and the elastic gasket is pulled into a curve during installation on the flushing blade element. In this way, the elastic gasket can be manufactured very easily as a straight, longish construction element, the gasket cross section of which is formed by the base section and the lip section. The gasket is not deformed to a curve until it is mounted on the flushing blade element and is stronger toward the inside, with higher stiffness, which means that with the lip section, it is pointed more strongly opposite the flow direction of the liquid.

The geometric dimensions of the flushing blade with gasket are to be adapted according to the channel wall. In particular, it is conceived that, in lowered position of the flushing blade, the sealing lip with its lip section more curved on the channel wall opposite the flow direction with prestress and/or with respect to its initial position, which is the straight arrangement of the sealing lip. The diameter of the base section of the gasket is less than the diameter of the channel wall; the diameter of the lip section is greater than the diameter of the channel wall.

Basically the gasket could also be designed in such a way that, starting from the base section, it has another lip section in flow direction behind the lip section. This can extend exactly radially or also diagonally, seen in flow direction of the liquid. In this case, the sealing of the gasket would occur not only in the area of the lip section opposite the flow direction of the liquid, but also over the last named lip section(s). However, this is the lip section that extends opposite the flow

direction of the liquid. Only this causes the advantageous consequences because of the effect of the water pressure.

Further characteristics of the invention are explained in the subclaims, the description of the figures and the figures themselves, whereby it should be noted that all individual characteristics and all combinations of individual characteristics represent other designs according to the invention.

Another embodiment will be described in more detail in the following with reference to the drawings. They show:

Figure 1 shows a cross section through the device, in longitudinal direction of the channel in the lower position of the flushing blade,

Figure 2 shows a view of the device according to Figure 1, on the head water side, perpendicular to the channel profile, seen in flow direction,

Figure 3 shows a cross section through the device, in longitudinal direction of the channel with flushing blade released, in suspended state,

Figure 4 shows a view of the device according to Figure 3, on the head water side perpendicular to the channel profile, seen in flow direction,

Figure 5 shows an illustration of the channel with channel wall and flushing blade found in lowered position,

Figure 6 shows a three-dimensional view of the arrangement according to Figure 5, seen diagonally from the top,

Figure 7 shows a cross section through the sealing area between flushing blade and wall, shown for different positions of the lip section of the gasket,

Figure 8 shows a cross section through the gasket before the gasket is drawn up into a curve.

Figures 1 to 4 show a waste-water channel 1 with a flushing blade 3, which can also be designated as a flushing flap, guided to and in the channel by lever arms 2 and 2a of a parallel lever. The flushing blade 3 is mounted sealed against channel wall 4. In the lower position of flushing blade 3, it is held tight by a closure 5 that is not shown in more detail here so that the incoming waste water (dry weather inlet) can back up in front of the flushing shield 3. When a defined backup water level is reached, the flushing blade 3 is actuated from the head water level to release the flushing surge by way of a control mechanism 6 that is not shown in more detail. In front of flushing blade 3, a lift element 7 is mounted, which is designed e.g. as two pipe parts lying parallel to each other, whereby the control mechanism operated by the float moves between the pipe parts.

The flushing blade 3 is connected by way of the rotary bearings 9 and 9a with hinge mounting to lever arms 2 and 2a, which can be swiveled on the fixed rotary bearings 8 and 8a. On the lever arms 2 and 2a, the rotary bearings 9b and 9c are fastened parallel to the rotary bearings 8, 8a and parallel to the rotary bearings 9, 9a. On the rotary bearings 9b and 9c, a vertically oriented operating rod 10 is mounted, which at its lower end holds a lift element 7 that is tightly connected to operating rod 10. However, the lift element 7 can also be designed so that it is elongated toward the top so that it works together, with force and movement connection, without operating rod 10, directly by way of rotary bearings 9b, 9c with lever arms 2, 2a.

In this case, the rotary bearings 9, 9a, 9b and 9c, and the rotary bearings 8, 8a, 9b and 9c form a shifting rhomboidal force parallelogram.

Figures 5 to 8 show the structure of the elastic gasket 11 forming a component of the flushing blade 3 and its mounting in the flushing blade element 12, as well as the interaction of gasket 11 and channel wall 4.

The flushing blade element 12, which consists of metal, has a semi-circular base shape with respect to the channel cross section, whereby a rectangular section is connected at the top on the semi-circular section. The cross section of channel 12, as can be seen best in Figure 5, is designed according to this semi-circular design with straight sections connected on top.

The gasket 11 has a base section 14 held in the flushing blade element 12 and a lip section 15 located outside the flushing blade element 13. The latter is used for contact with the channel wall 4. The base section 14 has a thickness that remains uniform along the flow direction 16 of the liquid and is thus designed in a ring shape. The lip section 15, which narrows conically starting from base section 14, is connected to the base section 14. For example, the lip section 15 encloses an angle α of about 140° with the base section 14. The length of the lip section 15 is e.g. approximately four times as large as the length of the base section, related to the radial extension of base section 14. The end of the lip section 15 turned away from the base section 14 is designed so that it is blunt with a face surface 16 that runs parallel to the face surface 17 of the base section 14 turned toward the flushing blade element 13, related to the condition of the gasket 11 before installation on the flushing blade element 13. By means of an adjusting device 18 that has screws connected with the flushing blade element 13 and a pressure plate designed so that it is curved according to the edge contour of the flushing blade element 13, the base section 14 is held in the flushing blade element 13 and can be pointed radially outward in it.

In order to make the drawing clear, Figure 6 shows the gasket 11 over only a short length to show its contact with the channel wall 4. The flow direction of the liquid through the channel is indicated by the arrow with reference number 20.

Figure 7 shows different bending positions of the lip section 15 and thus the sealing situation between gasket 11 and channel wall 4, whereby two positions of the channel wall 4 are shown. With a distance y of the flushing blade element 13 from the channel wall 4, the lip section 15 is curved more with respect to the base section 14, according to version A. In this case, the distance y is, e.g. 20 mm. If the distance between the flushing blade element 13 and the channel wall 4 is greater, e.g. according to the dimension x, less curvature occurs between base section 14 and lip section 15, according to version B. The distance x is, e.g. 35 mm. If the lip section 15 does not contact the channel wall 4 at all, the relaxed position of the gasket 11 according to variation C occurs, which basically corresponds to the position according to the illustration in Figure 8.

It is clear, especially from the illustration in Figure 5, that the side wall areas 21 converge. The consequence of this is that, during lowering of the flushing blade 3, the gasket 11 does not contact the channel wall 4 at first, but only contacts it shortly before the lowest position is reached. During further lowering of the flushing blade 3 into the completely lowered position, the position of the lip section 15 according to version A is reached. Because of the elasticity of gasket 11, in this position, it presses with especially high force against channel wall 4 with distance dimension y. If the flushing blade 3 is raised slightly, especially as a result of the high liquid pressure that is present, this results in the displacement of the flushing blade 3 into the position according to variation B as in Figure 7. Even in this case, a seal between flushing blade 3 and channel wall 4 would be ensured by the gasket 11, not least because the relatively high water pressure that acts in flow direction 20 presses the lip section 15 against the channel wall 4 with an additional force.

The channel wall 4, which works together with gasket 11, is especially designed of stainless steel. The channel section assigned to this channel wall represents a separate channel insert part.

WE CLAIM:

1. A surge flushing device for wastewater systems, comprising:

a wastewater channel having an arc-shaped wall portion; a flushing blade element having an arc-shaped marginal portion thereof configured geometrically similar to said wall portion of said channel;

a blade support linkage pivotally connected with said blade element and rotatably suspending said blade element generally above said wall portion of said channel, and configured to pivotally shift said blade element in a direction generally perpendicular to the direction of flow in said channel between a fully lowered, closed position, and a fully raised, open position, such that in said fully lowered, closed position, said marginal portion of said blade element is disposed a spaced apart distance from said wall portion of said channel;

a gasket having a base portion thereof supported along said marginal portion of said blade element, and a flap-shaped, elastically deformable lip portion thereof protruding generally radially outwardly from said base portion and said marginal portion of said blade element when in said fully lowered, closed position; said lip portion having a thickness that tapers outwardly to a free terminal tip area which directly abuts and engages said wall portion of said channel when said blade element is in said fully lowered, closed position, thereby elastically flexing said terminal tip area into a curved shape which opens outwardly in a direction opposite to the direction of flow in said channel and resiliently urging said terminal tip area radially outwardly against said wastewater channel with a predetermined force to selectively form a secure seal therebetween; and

an adjustable holder mounted on said marginal portion of said flushing blade element, and detachably retaining said base portion of said gasket therein to permit radial adjustment of said gasket relative to said flushing blade to insure secure sealing contact between said lip portion of said gasket and said wall portion of said channel.

2. A device as set forth in claim 1, wherein: said wall portion of said channel includes a portion thereof made from metal which contacts said gasket.

3. A device as set forth in claim 2, wherein: said adjustable holder is configured such that when said flushing blade element is in said fully lowered, closed position, said gasket is radially adjusted to contact said wall portion of said channel with said predetermined force.

4. A device as set forth in claim 2, wherein: said adjustable holder includes an adjustment device with fasteners connected with said flushing blade element, and a pressure plate configured so that the same is curved according to said marginal portion of said flushing blade element.

5. A device as set forth in claim 4, wherein: said flushing blade element has a generally semicircular shape which conforms with the arc-shaped wall portion of said channel.

6. A device as set forth in claim 5, wherein: said channel includes opposite sidewalls which engage mating portions of said flushing blade element in said fully lowered, closed position, and are tapered to converge toward a base area of said channel.

7. A device as set forth in claim 6, wherein: said lip portion of said gasket has a Shore hardness in the range of 40 to 70.

8. A device as set forth in claim 7, wherein: said flushing blade element and associated gasket can be lowered slightly into said channel in a direction opposite to the direction of flow in said channel.

9. A device as set forth in claim 8, wherein: said gasket has a generally linear initial configuration before installation on said flushing blade element, such that said gasket is deformed into a curved configuration during installation on said flushing blade element.

10. A device as set forth in claim 1, wherein: said adjustable holder is configured such that when said flushing blade element is in the fully lowered position, said gasket contacts said wall portion of said channel in a pre-stressed condition.

11. A device as set forth in claim 1, wherein: said adjustable holder includes an adjustment device with fasteners connected with said flushing blade element, and a pressure plate configured so that the same is curved according to said marginal portion of said flushing blade element.

12. A device as set forth in claim 1, wherein: said channel includes opposite sidewalls which engage mating portions of said flushing blade element in said fully lowered, closed position, and are tapered to converge toward a base area of said channel.

13. A device as set forth in claim 1, wherein: said lip portion of said gasket has a Shore hardness in the range of 40 to 70.

14. A device as set forth in claim 1, wherein: said flushing blade element and associated gasket can be lowered slightly into said channel in a direction opposite to the direction of flow in said channel.

15. A device as set forth in claim 1, wherein: said gasket has a generally linear initial configuration before installation on said flushing blade element, such that said gasket is deformed into a curved configuration during installation on said flushing blade element.

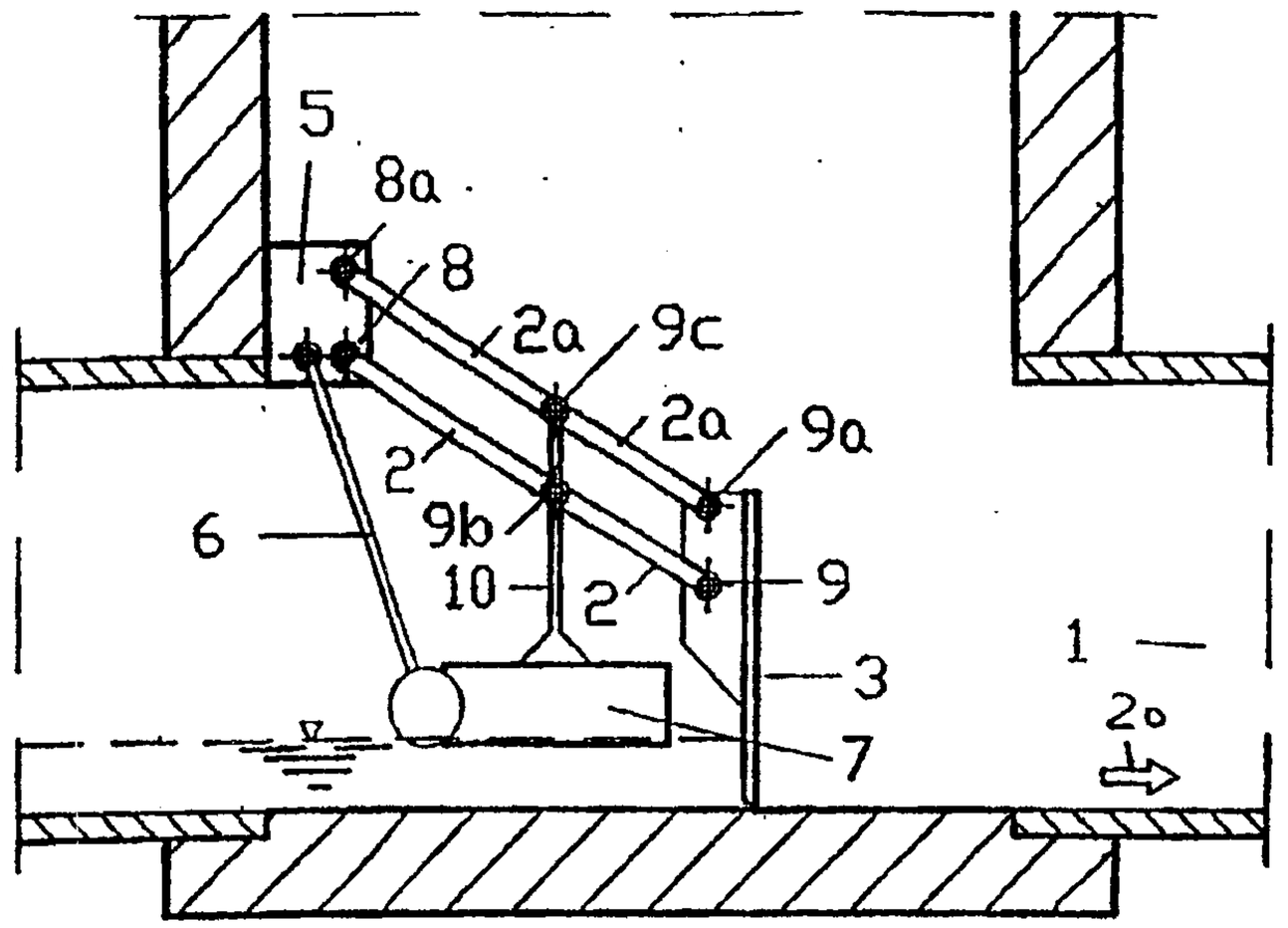

FIG.1

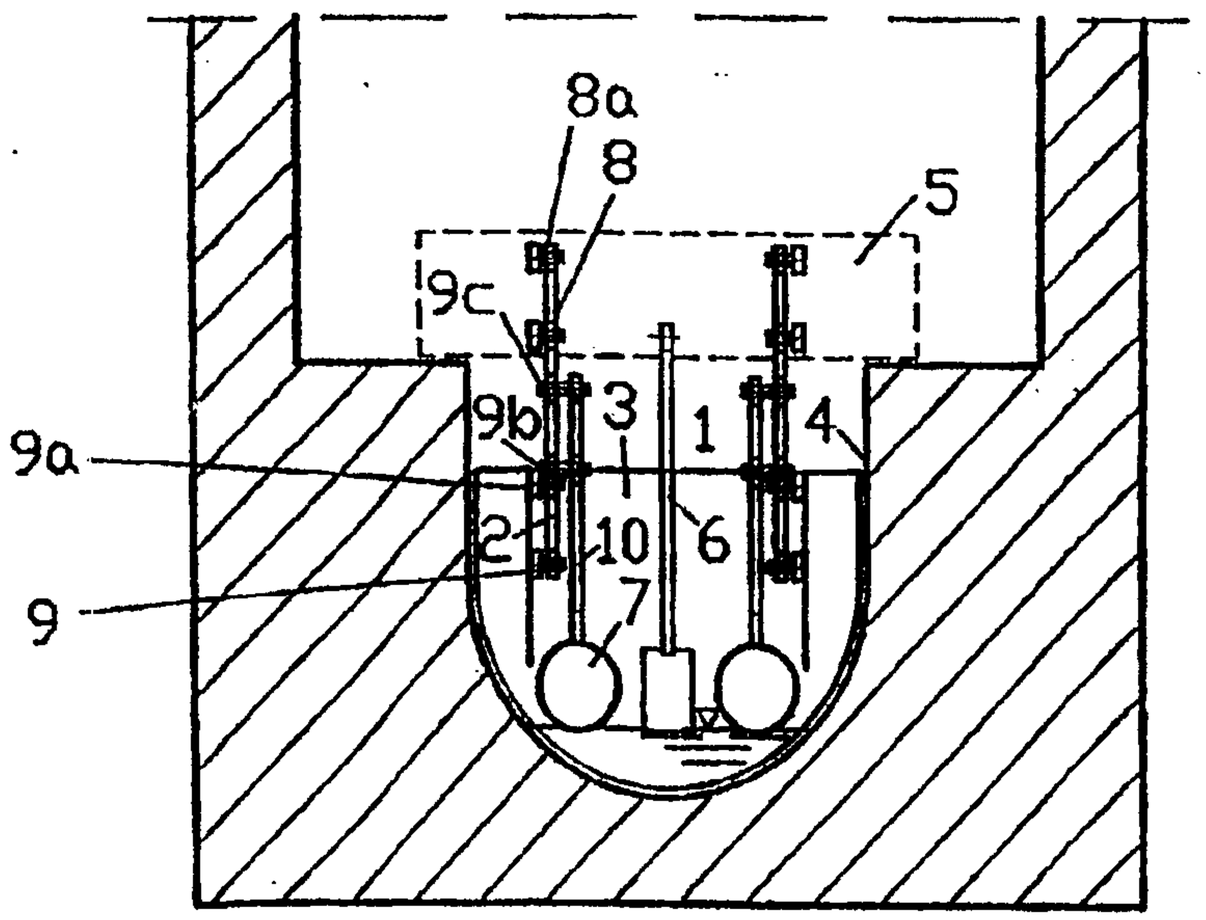

FIG.2

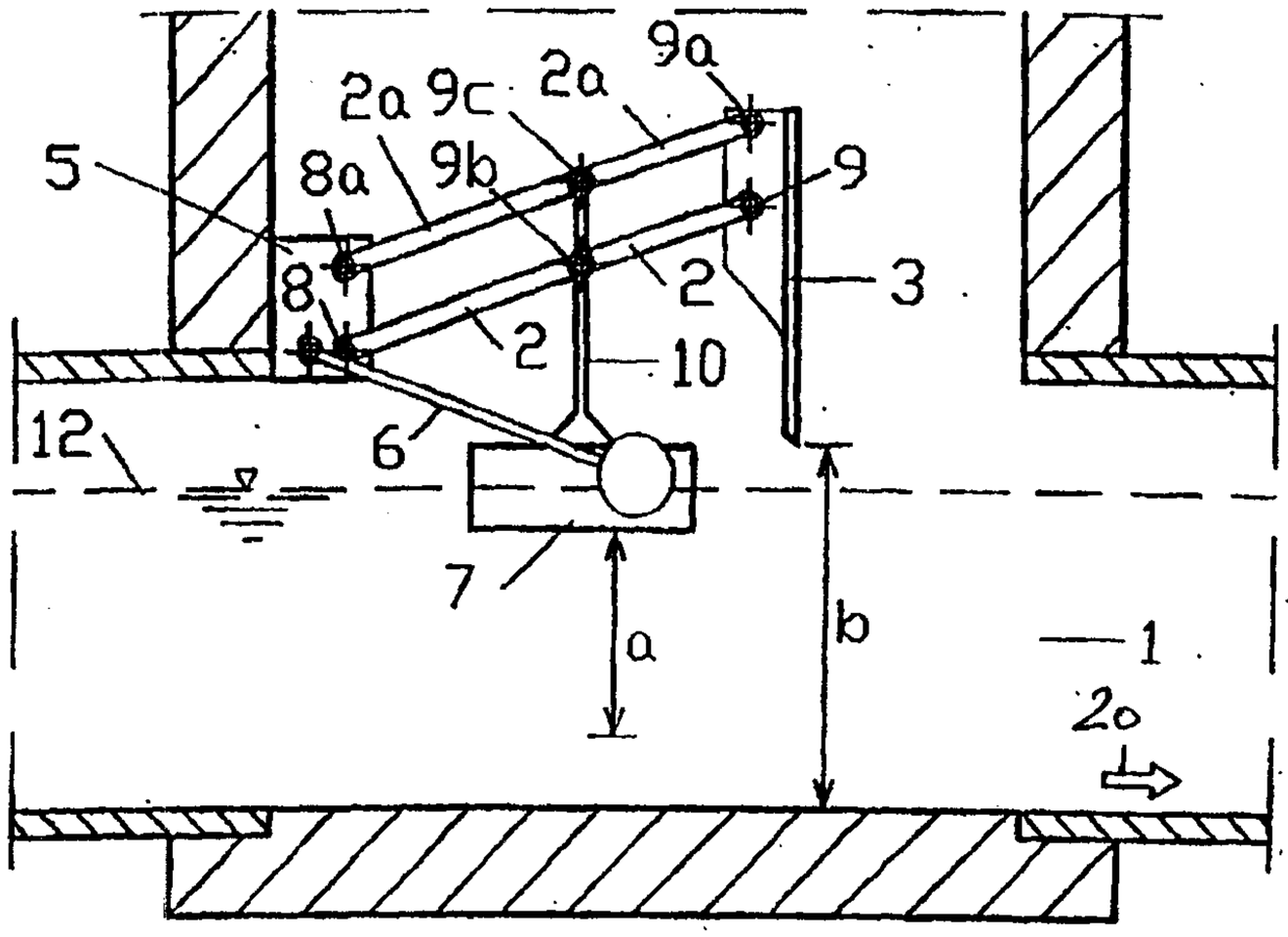
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FIG. 3

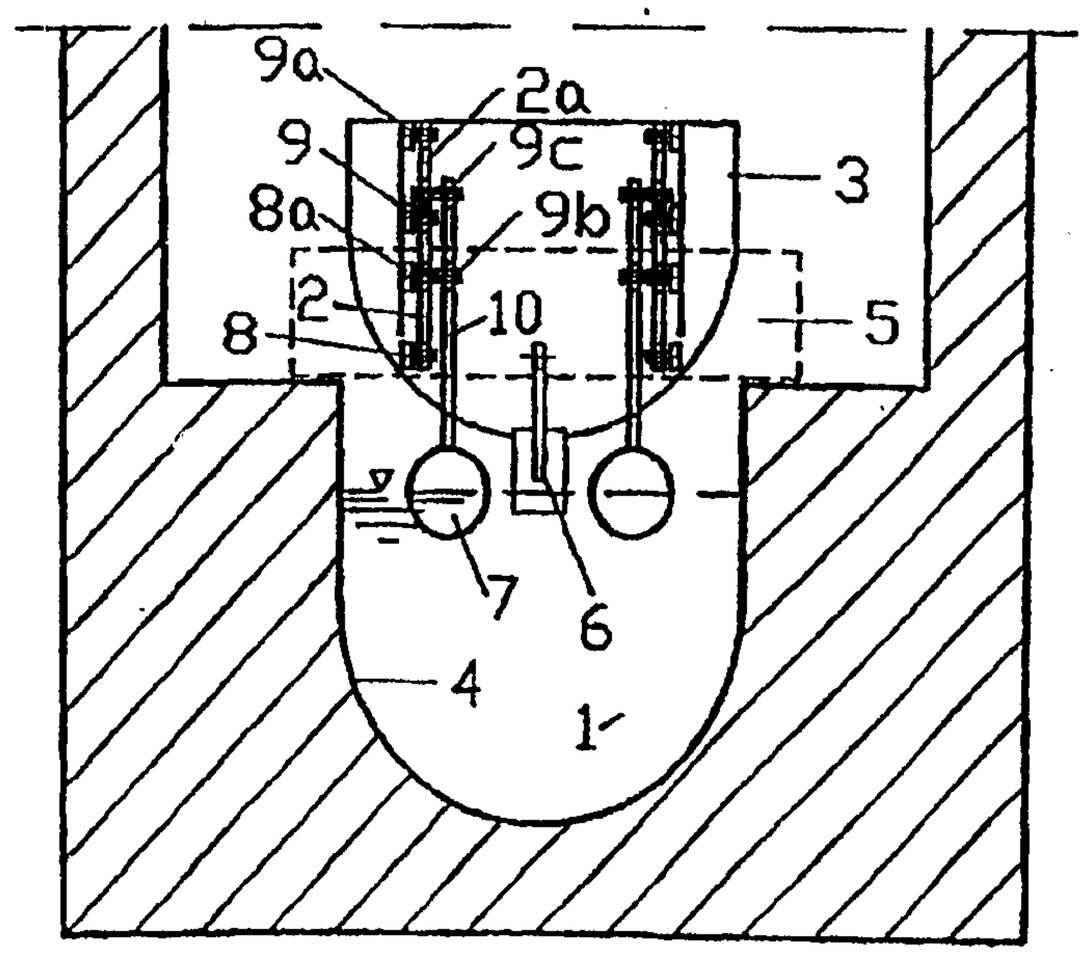
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FIG. 4

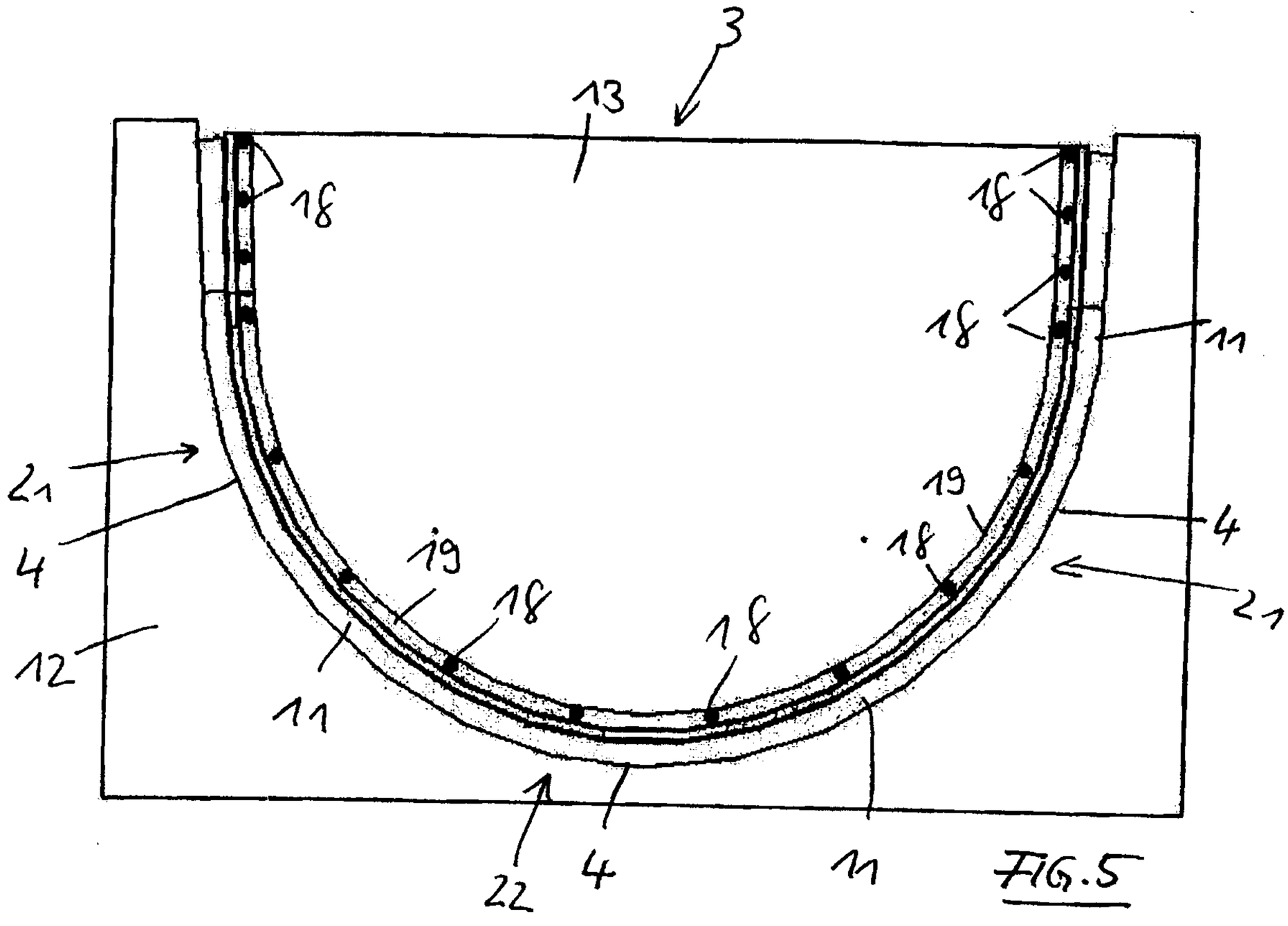


FIG.5

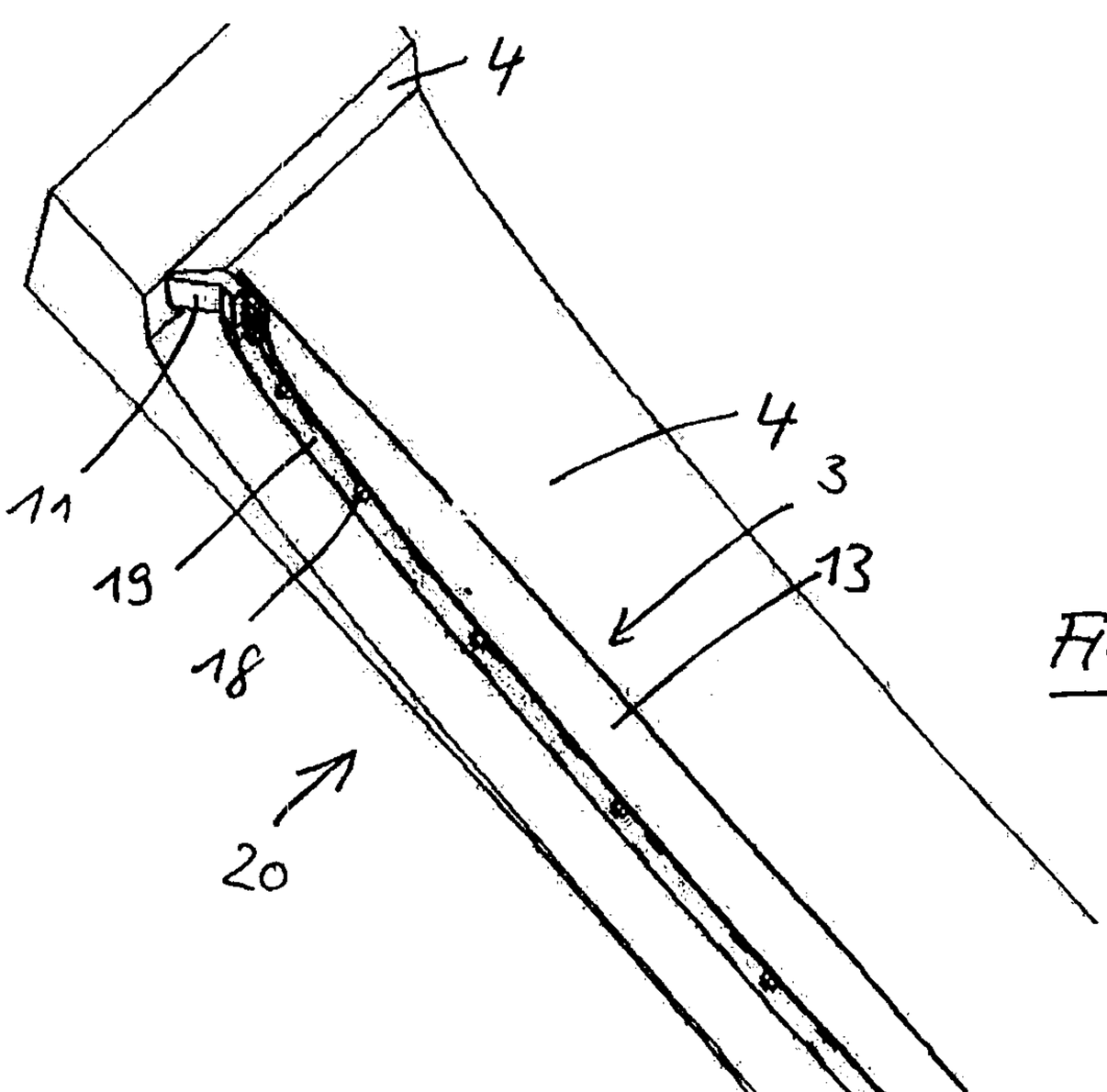


FIG.6

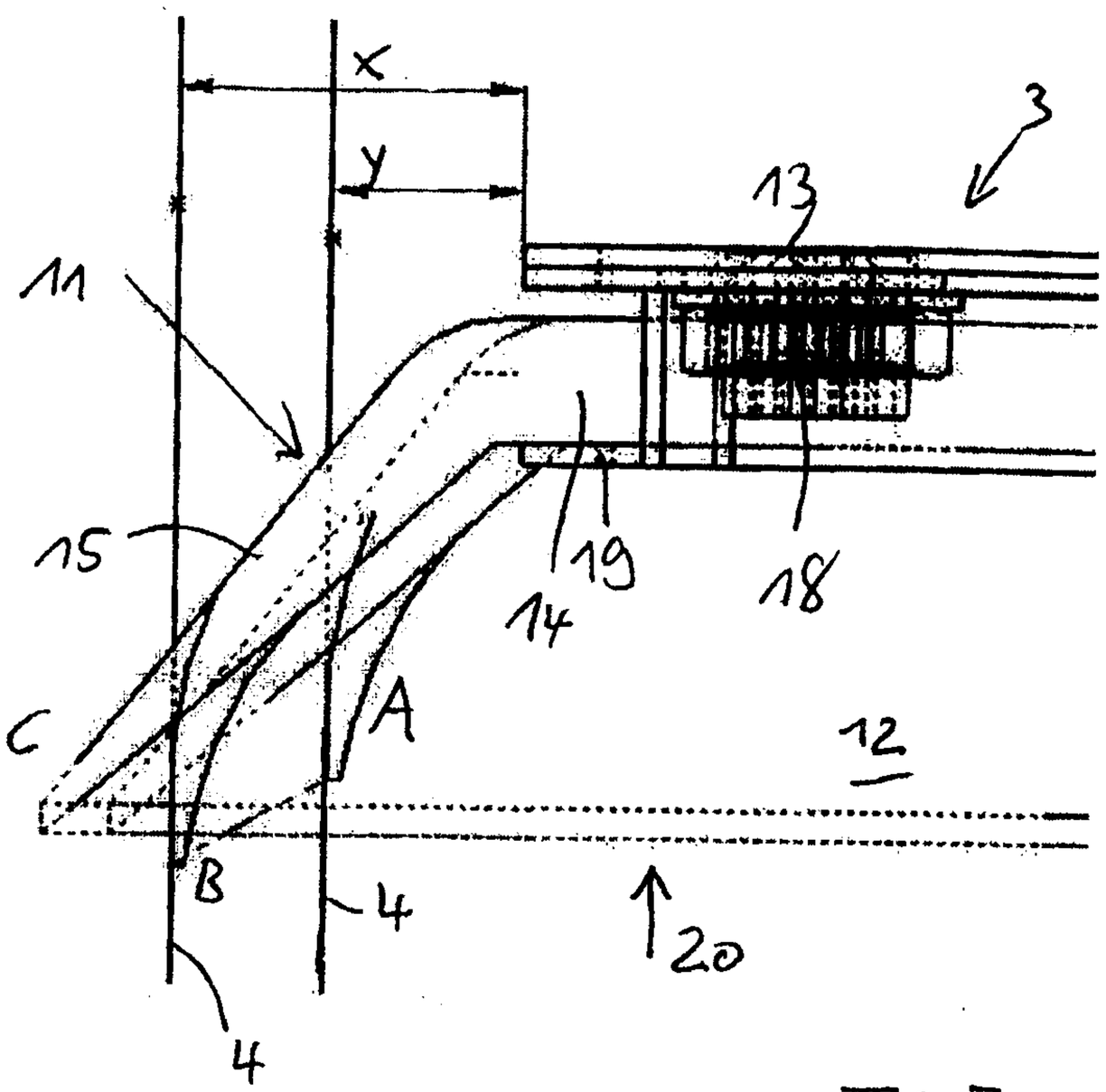


FIG. 7

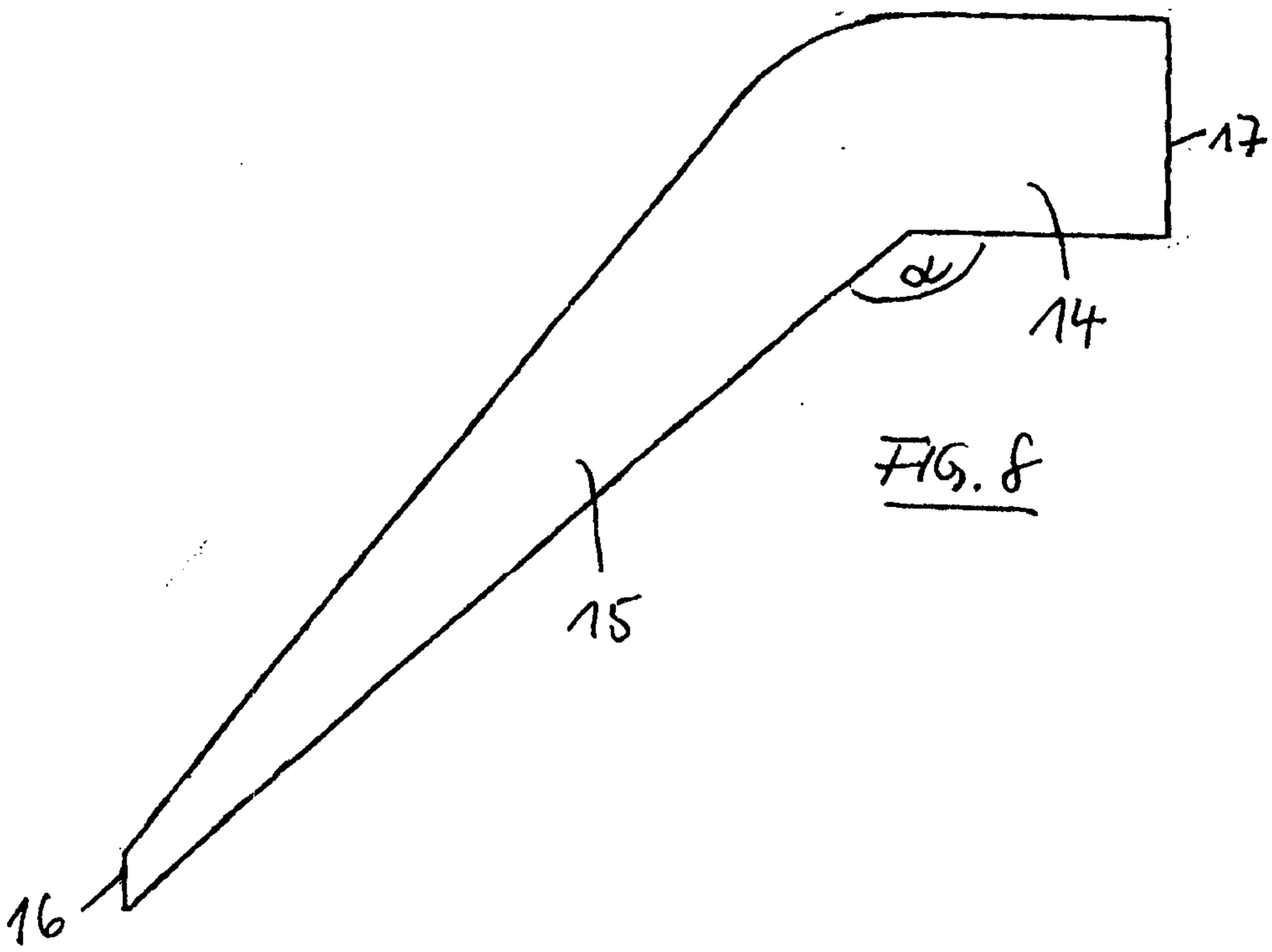
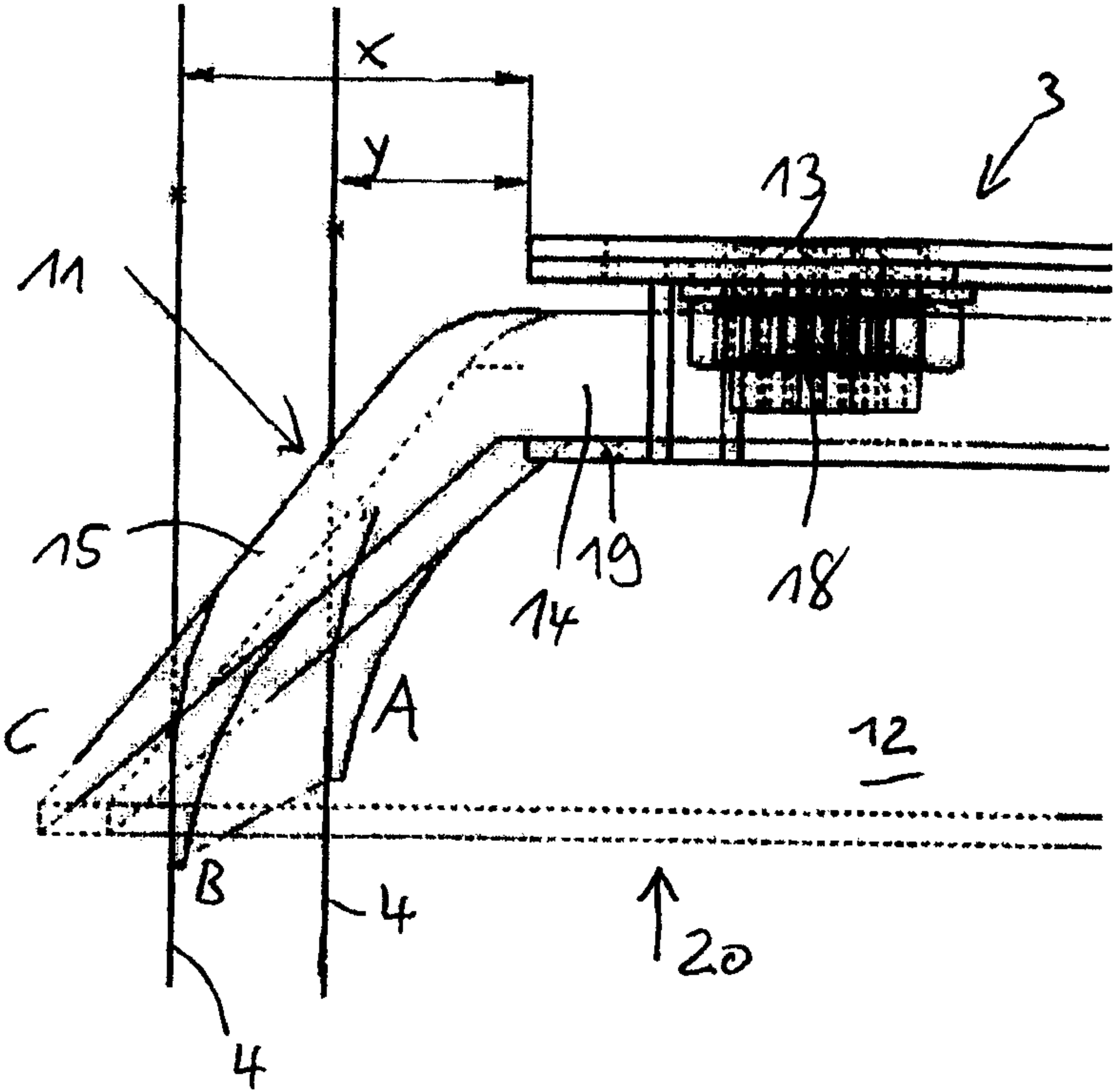


FIG. 8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