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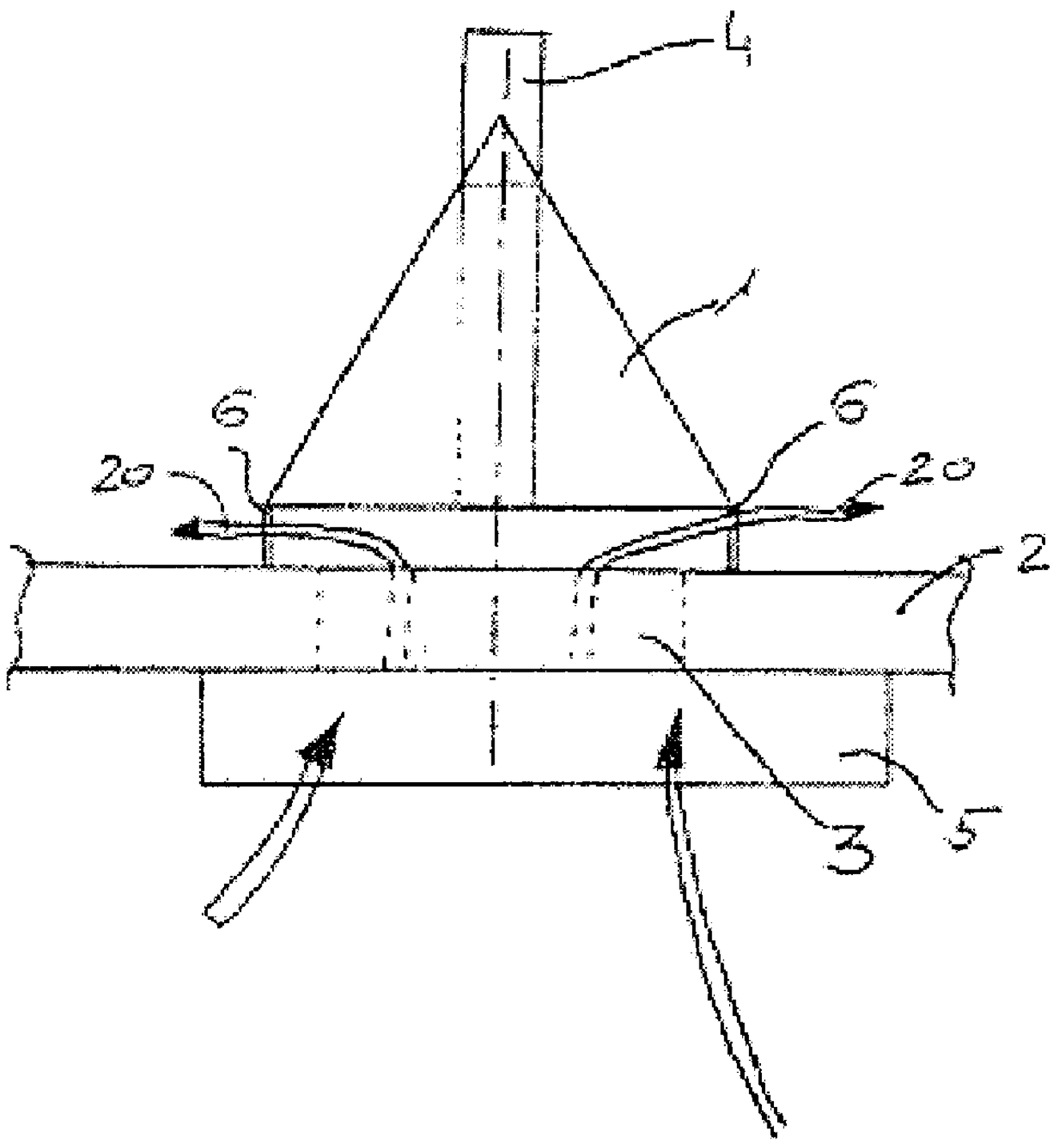
(54) **Titre : FOND DE SOUFFLAGE POUR UN APPAREIL DE FLUIDISATION**
(54) **Title: FLOW ACCEPTING BASE FOR A FLUIDIZING APPARATUS**



(57) **Abrégé/Abstract:**
The invention relates to a flow accepting base (12) for a fluidizing apparatus (9) with through-openings (3) and deflector plates (1) arranged so as to cover said through-openings. The invention is characterized in that the deflector plates (1) are elongated and are

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(57) **Abrégé(suite)/Abstract(continued):**
arranged longitudinally in the fluidized bed apparatus (9), parallel to the main direction of flow (19) of the product, above the through-openings (3) in the base plate (2) and have spacers (6) which form an outflow cross section at the periphery of the deflector plate (1) for the fluidizing gas, wherein the base through-openings (3) may be advantageously formed with an elongated cross section. This achieves good fluidization of the material at the same time that it is transported.

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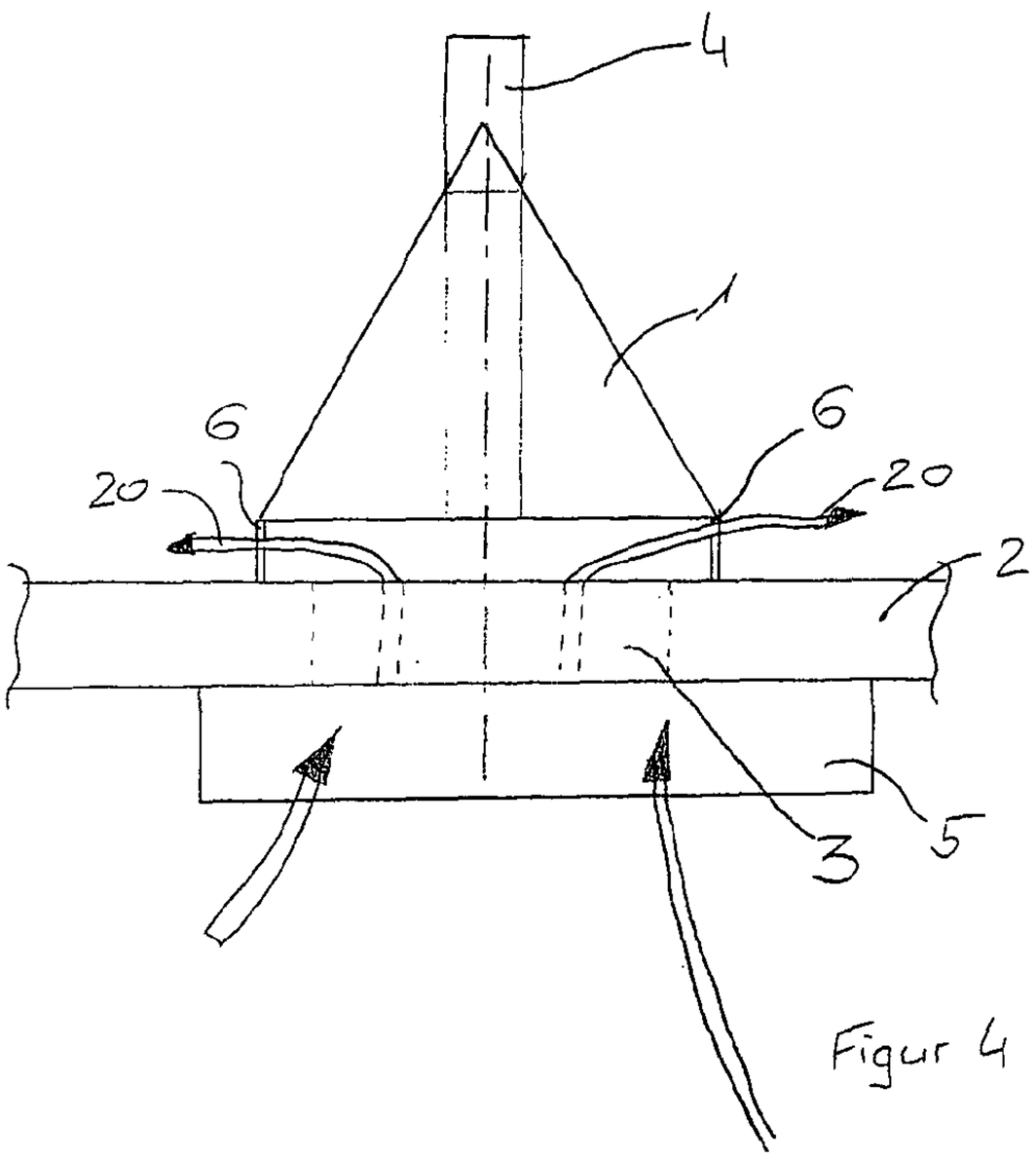
(54) **Title**: FLOW ACCEPTING BASE FOR A FLUIDIZING APPARATUS

(54) **Bezeichnung** : ANSTRÖMBODEN FÜR EINEN FLUIDISIERUNGSAPPARAT



Figur 4

(57) **Abstract**: The invention relates to a flow accepting base (12) for a fluidizing apparatus (9) with through-openings (3) and deflector plates (1) arranged so as to cover said through-openings. The invention is characterized in that the deflector plates (1) are elongated and are arranged longitudinally in the fluidized bed apparatus (9), parallel to the main direction of flow (19) of the product, above the through-openings (3) in the base plate (2) and have spacers (6) which form an outflow cross section at the periphery of the deflector plate (1) for the fluidizing gas, wherein the base through-openings (3) may be advantageously formed with an elongated cross section. This achieves good fluidization of the material at the same time that it is transported.

(57) **Zusammenfassung**: Die Erfindung betrifft einen Anströmboden (12) für einen Fluidisierungsapparat (9) mit Durchtrittsöffnungen (3) und überdeckend darüber angeordneten Umlenkleisten (1). Sie ist dadurch gekennzeichnet, dass die Umlenkleisten (1) länglich ausgebildet und längs im Fließbettapparat (9), parallel zur Hauptströmungsrichtung (19) des Produkts, oberhalb der Durchtrittsöffnungen (3) der Bodenplatte (2) angeordnet sind und Abstandshalter (6) aufweisen, die einen Ausströmquerschnitt am Umfang der Umlenkleiste (1) für das Fluidisierungsgas bilden, wobei die Bodendurchtrittsöffnungen (3) vorteilhafterweise mit länglichem Querschnitt ausgeführt sein können. Damit wird eine gute Fluidisierung des Gutes bei gleichzeitiger Förderung erzielt.

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Flow accepting base for a fluidizing apparatus

The invention relates to a flow accepting base for a fluidizing apparatus with through-openings and deflection strips arranged thereabove in an overlapping manner.

In fluidized-bed systems (fluidizing apparatuses), bulk materials are treated (dried, cooled, conditioned, …). The material to be treated passes into the apparatus, is fluidized and conveyed statistically to the overflow. The underflow serves for draining and discharging coarse material. The fluidizing is effected by the gas which is conveyed by the blower into the air box and flows uniformly through the flow accepting base into the layer of product. The gas leaves the apparatus by way of the dust removal unit, sucked up by a blower.

Flow accepting bases with an extremely wide variety of designs are used for uniformly distributing the quantitative flow of gas in fluidized-bed apparatuses. The flow accepting bases combine one or more functions in order to make stable operation of the apparatus possible. These are, inter alia:

- Uniform distribution of the gas flow over the surface, even in the case of locally different counterpressures in the fluidized bed as a consequence of bubble formation, secondary currents, etc.
- Separation of gas compartment (air box) and layer of product, in particular prevention of the trickling of product into the gas compartment.
- Avoidance of dead surfaces through which gas does not flow, since accumulations of product which can be thermally damaged and participate only inadequately in the product exchange of the fluidized bed arise there.

- Conveyance of particles which, on account of their size, cannot be adequately fluidized and fall onto the flow accepting base.

The uniform gas distribution is achieved in that the flow accepting base has a pressure loss which is adequate in relation to the variations in pressure which occur in the layer of product. Ideally, this is achieved by acceleration of the flow with as little loss as possible, i.e. by converting the pressure energy into kinetic energy as completely as possible, so that a maximum transfer of momentum to the particles takes place (CH 629394).

In practice, pressure losses of 50-300 daPa are often used, since they represent a good compromise between operational reliability and energy demand. This means that the flow accepting bases used have a free cross section through which flow passes of typically 0.5-15% of the entire surface area.

This is realized by sieve bases, sintered bases, perforated bases or punched bases, the free cross section of which is finely distributed over the entire surface, or by nozzle bases, in which the free cross section is concentrated over a few nozzles.

During operation, product should not be expected to trickle through given a correctly dimensioned pressure loss and openings which are not excessively large. During shutdown, however, this must be ensured by the geometry, such as for example very small openings (dependent on the particle diameter, but often < approx. 0.2 mm in the case of perforated bases, sieve bases and punched bases), which, particularly in cycle gas operation, however, tend to form blockages, or instances of overlapping (corresponds to greater than

the cone of bulk material) of the openings with disks, strips, etc. (cf. EP 0103708, CH 629394). Self-closing nozzles, too, are known for example from column technology (gas/liquid fluidized bed).

During operation, however, product settles on these overlaps, since these surfaces lie on the slipstream side. This is prevented by mounting displacement bodies on these surfaces (cf. EP0215327; EP 0103708). As a result, greater effort is required and, if strips lie transversely to the main conveying direction of the product, there will be additional resistance when conveying coarse material.

There are solutions for conveying inadequately fluidized coarse material which have been implemented technically. The conveying can be assisted mechanically firstly by causing the entire fluidized-bed apparatus or only the air boxes or flow accepting bases to vibrate. In order to avoid this considerable outlay on design and further disadvantages, a pneumatic conveying action is achieved by appropriately forming the flow accepting base.

- In the case of punched sheet metal bases, asymmetric tools produce a hole which is open on one side and out of which the gas flows obliquely forward and upward, and thus exerts a transfer of momentum parallel to the base on the particles (brand names, inter alia, Conidur, Coniperf).
- In the case of nozzle bases with rotationally symmetrical gaps, the gas generally already flows parallel to the base plate, but in all directions. By closing off at least half of the gap with a suitable shim, any desired outflow direction and thus conveying direction can be set.

- In the case of nozzle bases with covered transverse gaps, the conveying direction is predefined fixedly by the arrangement of the gaps. The conveying is obstructed by the cover strips lying transversely, however.

The flow accepting bases according to the prior art have disadvantages, however, that are avoided by the configuration according to the invention:

- For manufacturing reasons, punched bases have only small sheet thicknesses, and are therefore sensitive to wear and temperature and limited in terms of application.
- The momentum of the gas flow emerging at high speed is reduced by the fluidized bed after a few centimeters; a large number of appropriately closely distributed nozzles are needed to maintain conveying, which means additional outlay and more obstacles.
- Nozzle bases with transverse gaps tend to form deposits on the cover strips, and it is not possible to mount displacement bodies without further obstructing the conveying.

The aim of the invention, therefore, is to provide a flow accepting base which, in addition to good mixing and turbulence, also brings about conveyance of the coarse material.

This is achieved, according to the invention, in that the deflection strips have an elongate form, are arranged longitudinally in the fluidized-bed apparatus, parallel to the main direction of flow of the product, above the through-openings in the base plate and have spacers which form an outflow cross section at the periphery of the deflection strip for the fluidizing gas, wherein the base through-openings can

advantageously be formed with an elongate cross section.

These measures achieve good fluidization of the coarse material, while at the same time providing conveying properties thereof.

An advantageous development of the invention is characterized in that the spacers are in the form of guide plates. This makes targeted conveying of the product flow possible.

An expedient configuration of the invention is characterized in that the spacers, in the form of guide plates, impart a direction of flow on the fluidizing gas which is parallel to the base plate and has a component in the main direction of flow of the product. The treatment of the material, e.g. drying, cooling, etc., can thus be controlled in a targeted manner.

An advantageous development of the invention is characterized in that the guide plates form an angle (α), wherein the angle (α) can advantageously be an acute angle and is, for example, between 30° and 90°. The extent of conveying can thus be set expediently.

It has proved to be particularly expedient if a pressure loss of 40-500 daPa is set for the base plate through which flow passes by the height of the spacers. It is thereby possible to achieve a particularly good compromise between operational reliability and energy demand.

Advantageously, the spacers are in the form of separate intermediate pieces with guide plates which form channels, as a result of which it is easily possible to

adapt the desired pressure loss and the flow rate of the gas by changing the channel height.

An expedient configuration of the invention is characterized in that the deflection strips have a prism-like configuration, wherein the prisms can be mounted like a triangle and with the point upward, and the point angle is advantageously between 10° and 130°, for example between 50° and 70°. By virtue of the prism form, deposition of the material on the deflection strips is virtually prevented and thus the operating time of the fluidizing apparatus is increased significantly.

The prism-like deflection strips can be fastened to transverse strips underneath the base plate. It has proved to be particularly expedient if the prisms are fastened to webs formed in the base plate.

An advantageous development of the invention is characterized in that the prisms clamp the spacers, in the form of separate intermediate pieces, to the base plate.

The invention will now be described by way of example with reference to the drawings, in which

figure 1 shows a schematic view of a fluidizing apparatus,

figure 2 shows a sectional view through a flow accepting base according to the invention,

figure 3 shows a plan view of a flow accepting base according to the invention as shown in figure 2,

figure 4 shows a cross-sectional view through a flow accepting base as shown in figure 2,

figure 5 shows a cross-sectional view through a further variant of a flow accepting base according to the invention,

figure 6 shows a plan view of a flow accepting base according to the invention,

figure 7 shows a plan view of an arrangement of a flow accepting base according to the invention,

figure 8 shows a plan view of a further variant of a flow accepting base according to the invention, and

figure 9 shows a sectional view through a flow accepting base as shown in figure 8 along the line IX-IX.

Figure 1 shows a fluidized-bed system (fluidizing apparatus) in which bulk materials are treated (dried, cooled, conditioned, …). The material 15 to be treated passes into the fluidizing apparatus 9, is fluidized and conveyed statistically in the product flow direction (arrow 19) to the overflow 18. The underflow 17 serves for draining and discharging coarse material. The fluidizing is effected by the gas which is conveyed by the blower 10 into the air box 11 and flows uniformly through the flow accepting base 12 into the layer of product. A number of deflection strips 1 are arranged above the flow accepting base 12. The gas leaves the apparatus by way of the dust removal unit 13, sucked up by a blower 14.

Figure 2 shows a variant of a flow accepting base according to the invention. It has longitudinally arranged through-openings (nozzles). The deflection of the gas flow parallel to the base plate and the coverage of the through-openings 3 in the base plate 2 of the flow accepting base 12 are effected by deflection strips 1, which are shown here as triangular, prismatic hollow bodies.

The guide plates 6 can be seen in the plan view shown in figure 3, these being arranged above the through-opening 3 and deflecting the emerging gas in the direction of the arrows 20. The opening angle α between two guide plates 6 determines the extent of the conveying. The guide plates 6 can butt against one another at the ends, or extend only as far as the through-opening 3 in the base plate 2, in which case care must be taken to ensure that the gas flow is deflected reliably with an adequate overlap. Figure 4 shows the cross-sectional view through figure 2, where the prism form of the deflection strip 1 can be seen particularly well. The prism-like deflection strips 1 can be fastened to the base plate 2 in a variety of ways, e.g. by means of screws which are inserted through guides 4 and brace the deflection strip 1 against the base plate 2 by way of profiles 5 that lie transversely under the through-openings 3. This variant is suitable particularly for high-temperature applications for absorbing the stresses. Another possibility is to use webs integrated in the base plate 2 instead of the profiles 5, and threaded pieces welded to the deflection strips 1 instead of inserted screws.

The width (length of the base side of the triangle) of the deflection strips 1 is selected in such a way that a region of 20 to 80%, typically about 50%, of the total base width of the fluidized-bed apparatus is covered. The height is advantageously the same as or greater than the corresponding cone of bulk material in order to avoid deposits. The main effect of this arrangement is, however, that a considerably higher gas velocity prevails in the region of the prisms, above the base plate, than in the rest of the region of the fluidized bed. This has the effect that the coarse material which has descended in the region between the

prisms is still fluidized or at least kept moving. By increasing the prism height further up to a multiple of the base side, this region can be extended in order to also control relatively large quantities of coarse material.

With this arrangement, the requirements which are actually incompatible - low fluidizing speed to minimize dust discharge and high fluidizing speed to also convey the coarse material proportion - are realized advantageously in a fluidized bed.

A further variant of the invention is shown in figure 5 and figure 6 (plan view). In order to make it possible to adapt the pressure loss and gas quantities by changing the channel height h, it is advantageous not to weld the guide plates 6 directly to the deflection strips 1, but instead to arrange them on supporting plates 7, which for their part are fastened detachably to the deflection strips 1.

Figure 7 shows an arrangement of the flow accepting base 12 according to the invention, in which the conveying properties of the base are further improved in that a directional component longitudinally in relation to the nozzle is imparted on the outflowing gas in the outflow cross section. The intermediate spaces between adjacent deflection strips 1 form smooth channels on the base plate 2, these running right through the fluidized-bed apparatus 9 from the product inlet 15 to the product discharge 18 in the product flow direction 19. By virtue of a suitable extraction apparatus, e.g. a star feeder or screw conveyor, at the end of the apparatus 9 level with the base plate 2, the moving coarse material is collected and discharged. Subsequent conveying of the coarse material located further forward is assisted by the gas flow components

in the channel direction. The direction of flow of the gas is predefined by guide plates 6 in the nozzle gap.

Figure 8 shows another possible way of fastening the guide plates. Here, the guide plates 6 are fastened to supporting strips 8, and this framework is clamped between the base plate 2 and the deflection strip 1. Figure 9 shows a sectional view of said embodiment along line IX-IX in figure 8.

WE CLAIM:

1. A flow accepting base for a fluidized-bed apparatus with through-openings and deflection strips arranged thereabove in an overlapping manner, wherein the deflection strips (1) have an elongate form and have spacers (6) which form an outflow cross section at the periphery of the deflection strip (1) for a fluidizing gas, wherein base through-openings (3) can advantageously be formed with an elongate cross section, characterized in that the deflection strips (1) are arranged longitudinally in the fluidized-bed apparatus (9), parallel to the main direction of flow (19) above the through-openings (3) in a base plate (2), and the spacers are in the form of guide plates (6), wherein an opening angle (α) is formed between in each case two guide plates (6), wherein the angle (α) can advantageously be an acute angle and wherein the spacers (6), in the form of guide plates, impart a direction of flow (20) on the fluidizing gas which is parallel to the base plate (2) and has a component in the main direction of flow (19).

2. The flow accepting base of claim 1, wherein the angle is between 30° and 90°.

3. The flow accepting base as claimed in claim 1 or 2, characterized in that a pressure loss of 40-500 daPa is set for the base plate through which flow passes by the height of the spacers (6)..

4. The flow accepting base as claimed in any one of claims 1 to 3, characterized in that the spacers are in the form of separate intermediate pieces with guide plates (6) which form channels.

5. The flow accepting base as claimed in any one of claims 1 to 4, characterized in that the deflection strips (1) have a prism-like configuration, wherein the prisms can be mounted like a triangle and with the point upward, and the point angle is advantageously between 10° and 130°.

6. The flow accepting base of claim 5, where the point angle is between 50° and 70°.

7. The flow accepting base as claimed in claim 5 or 6, characterized in that the prism-like deflection strips (1) are fastened to webs in the base plate (2).

8. The flow accepting base as claimed in claim 5 or 6, characterized in that the deflection strips (1) are fastened to transverse strips (5) underneath the base plate (2).

9. The flow accepting base as claimed in any one of claims 5 to 8, characterized in that the deflection strips (1) clamp the spacers (6), in the form of separate intermediate pieces, to the base plate (2).

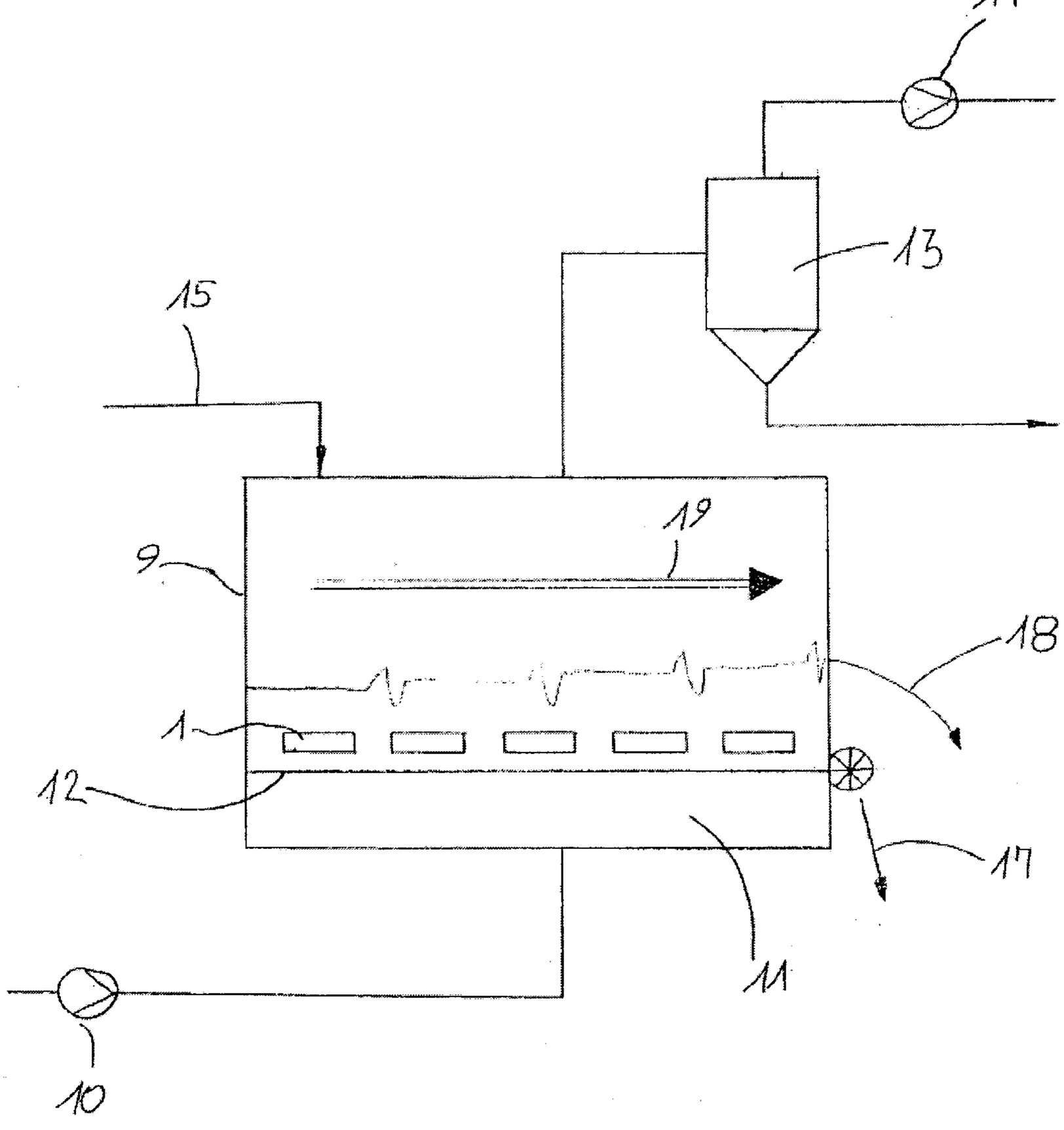


Figure 1

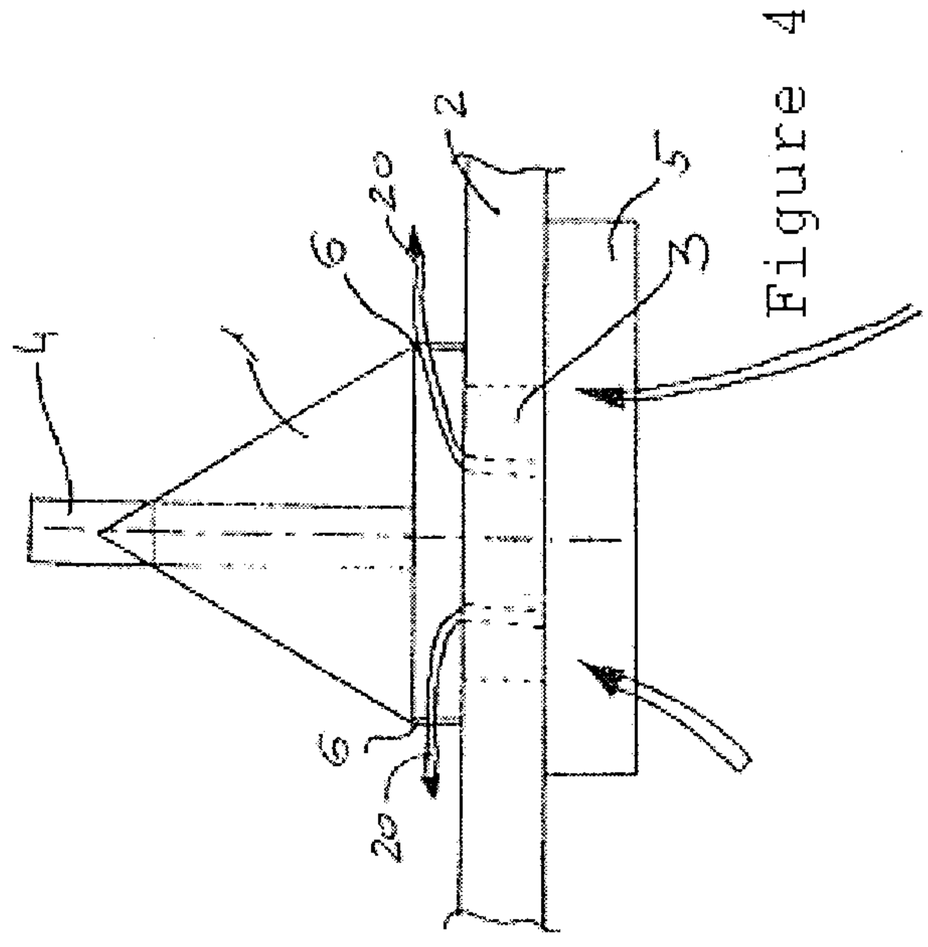


Figure 1

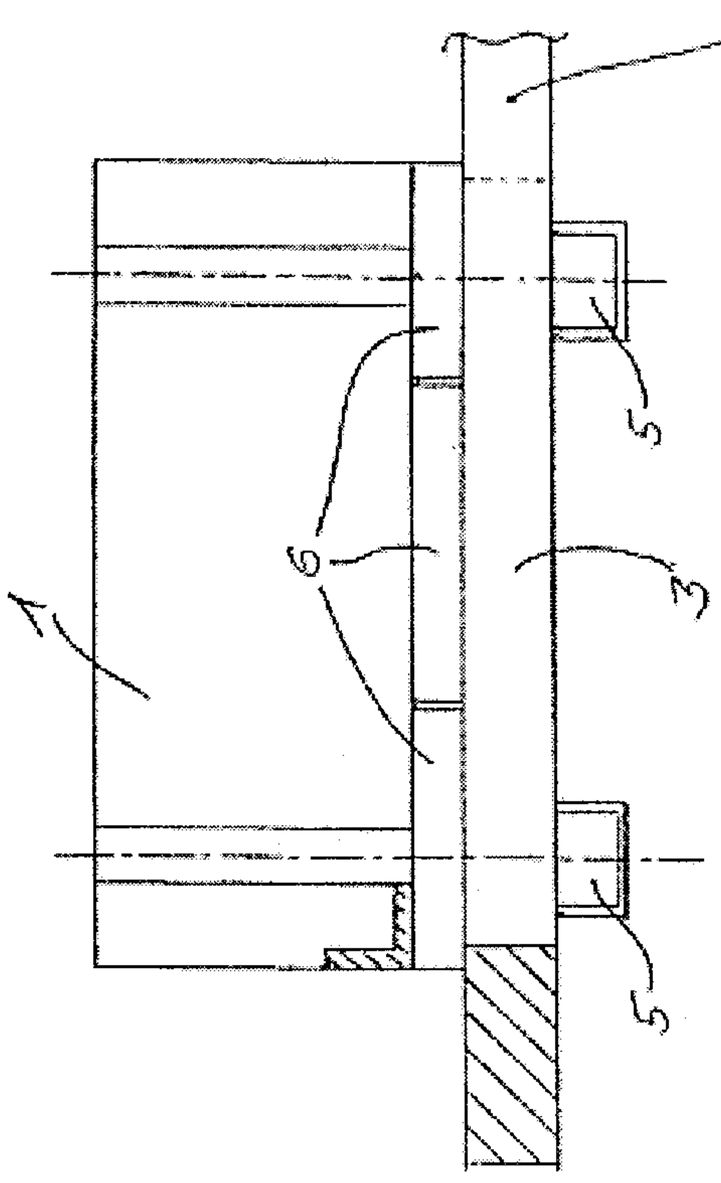


Figure 2

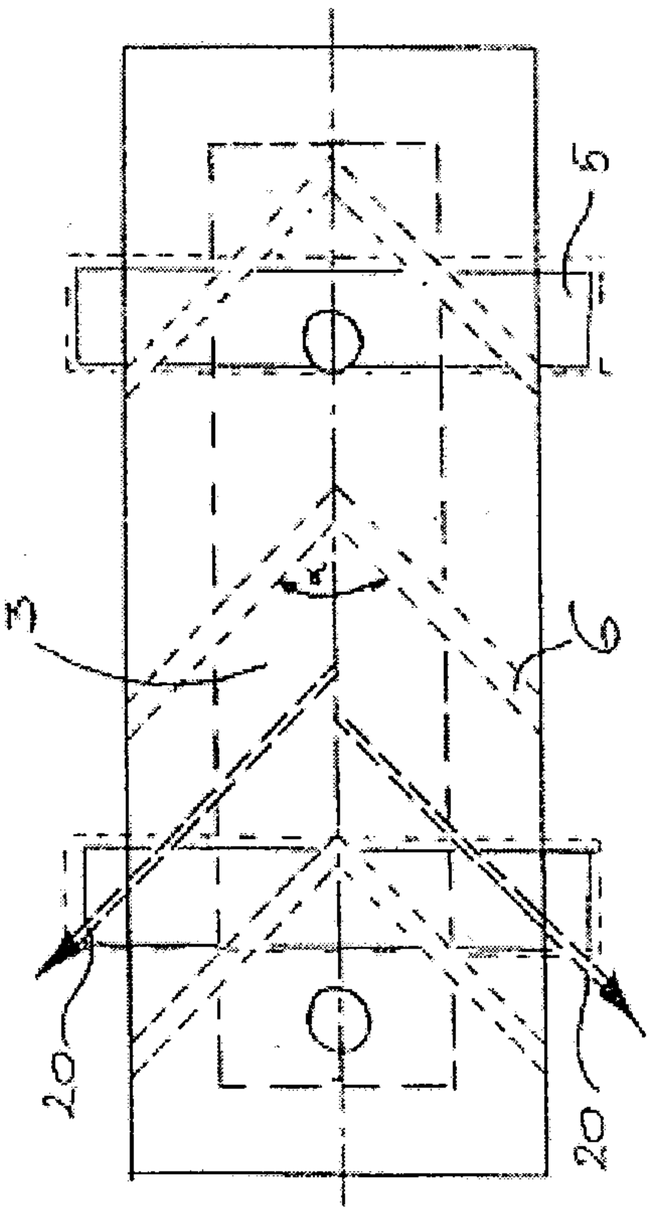


Figure 3

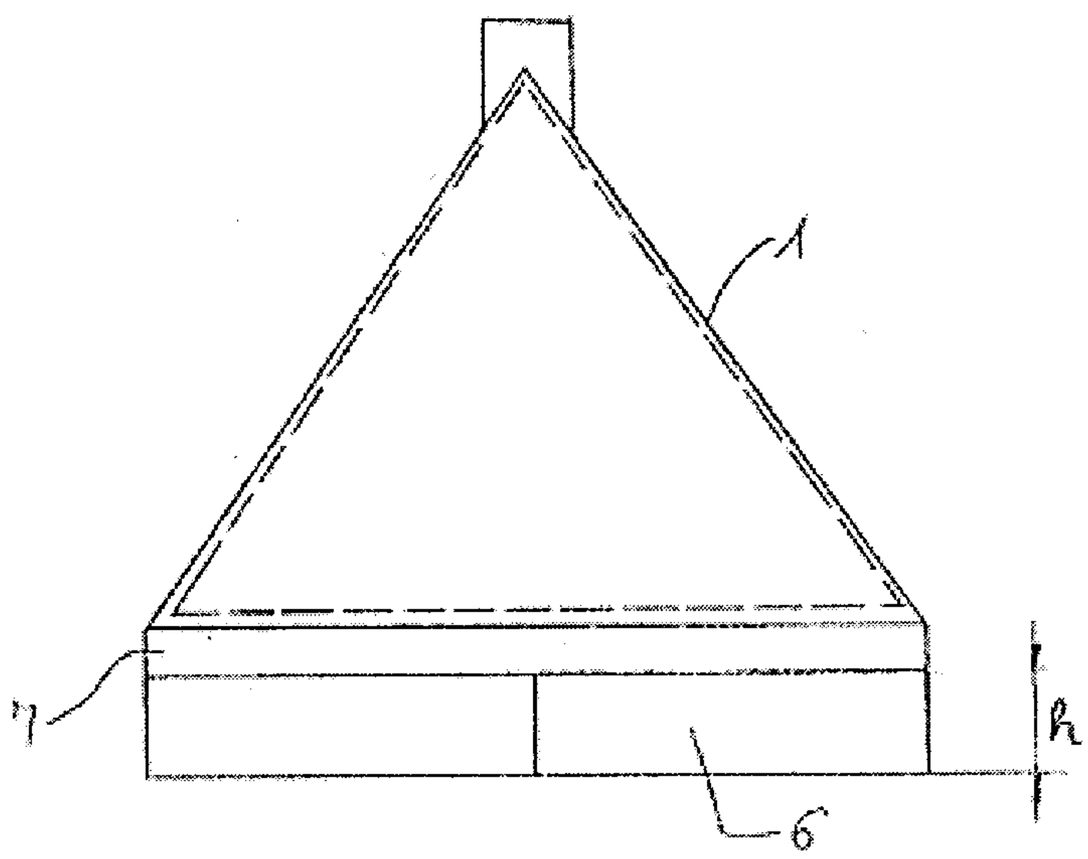


Figure 5

Figure 6

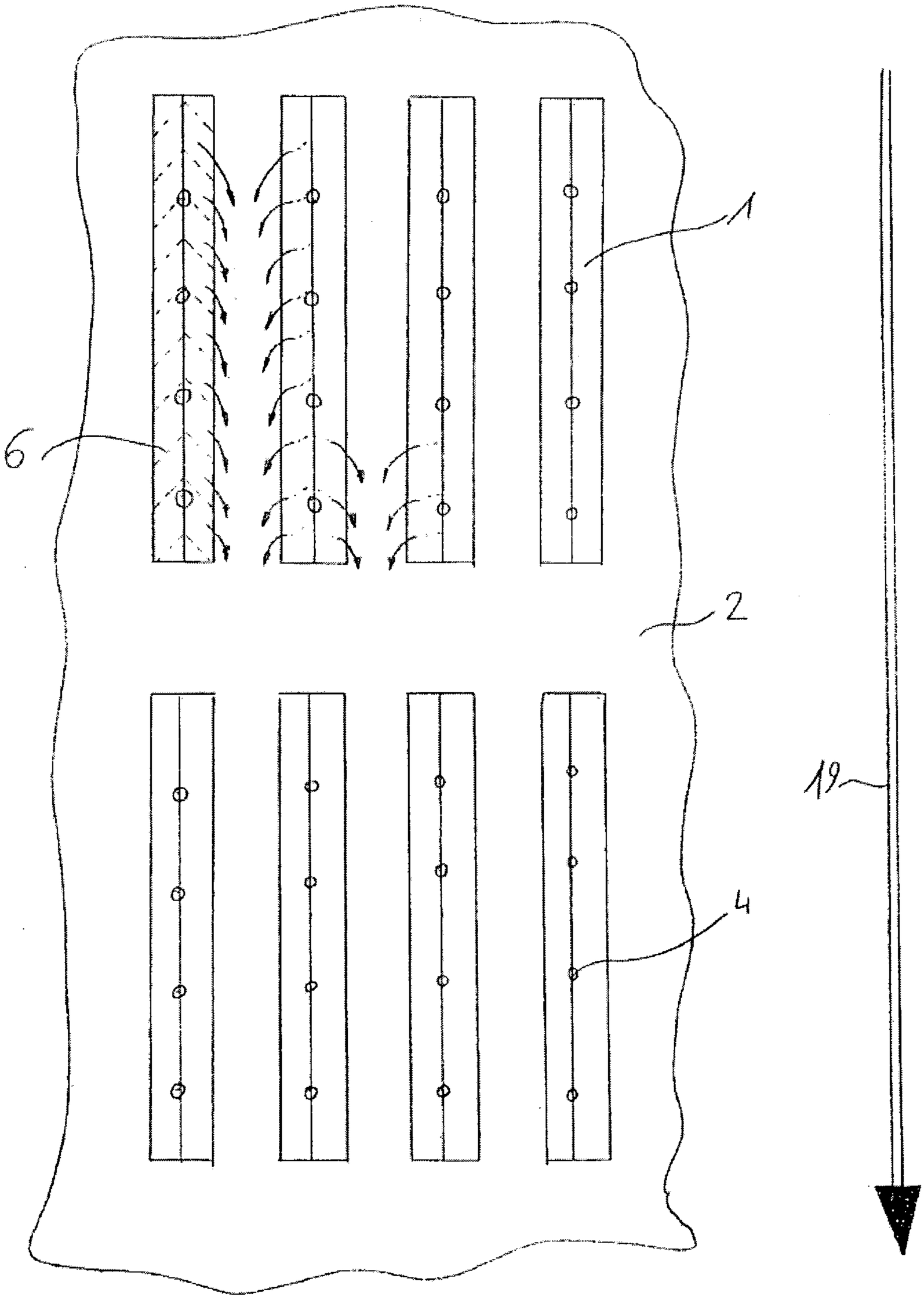


Figure 7

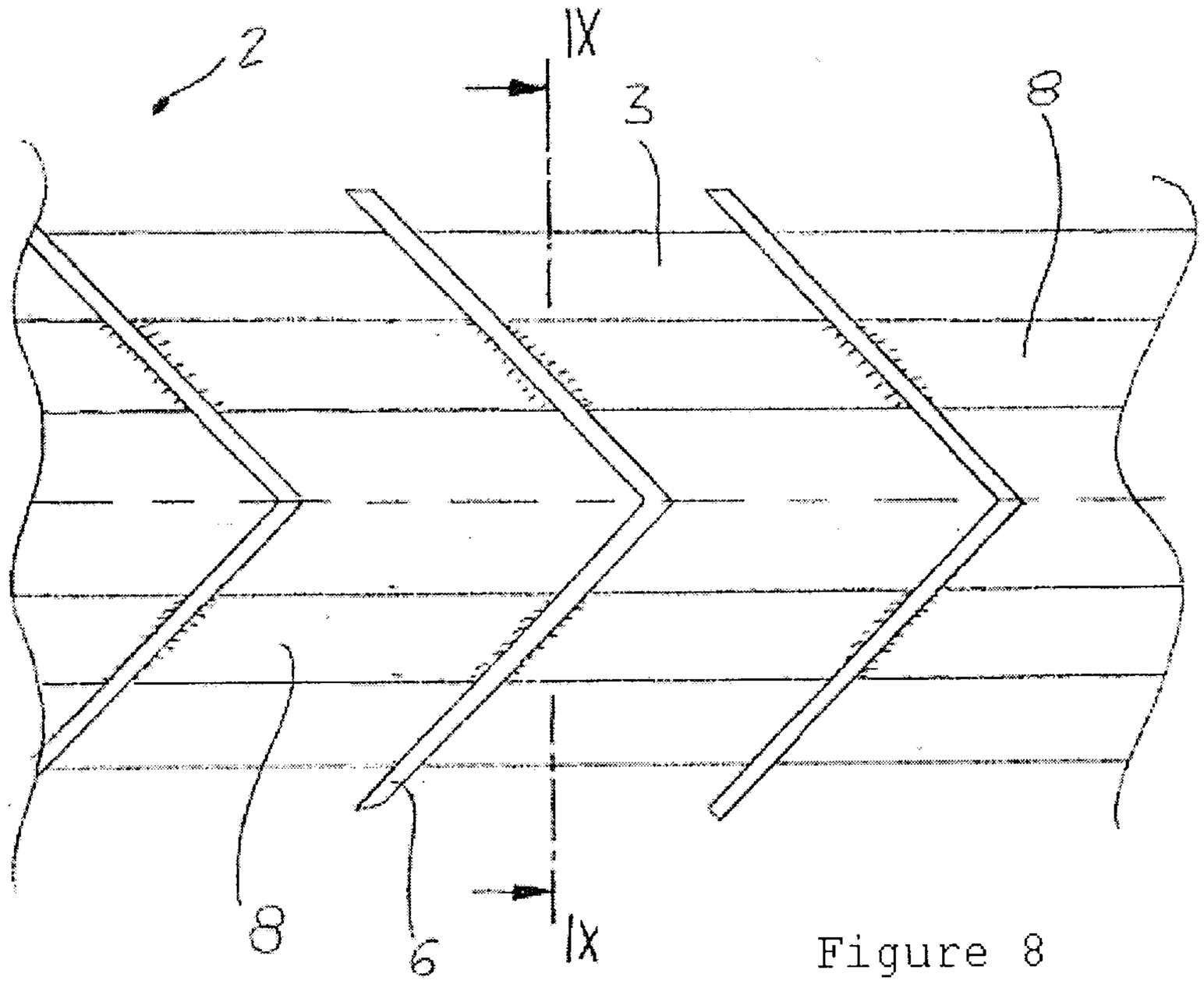


Figure 8

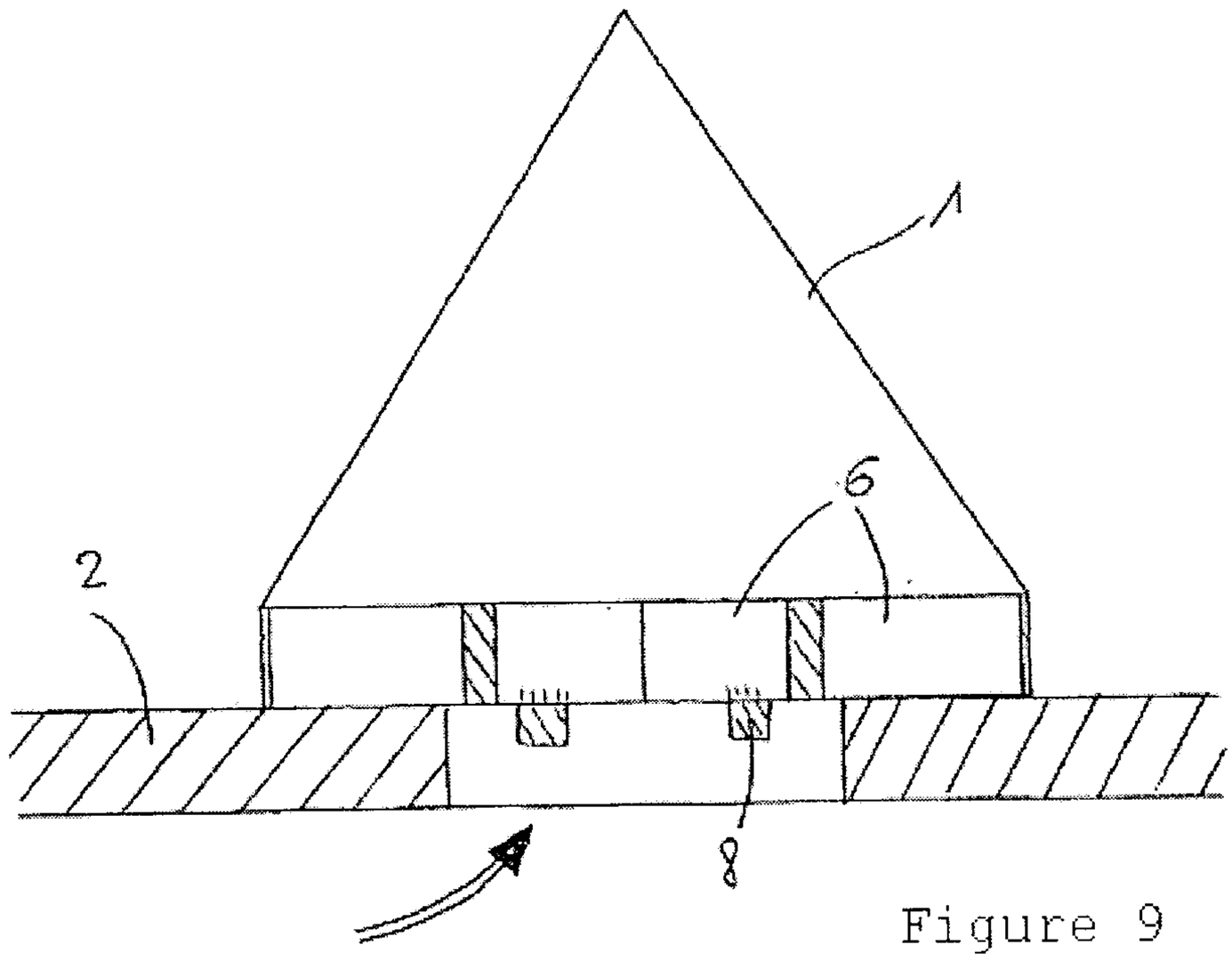
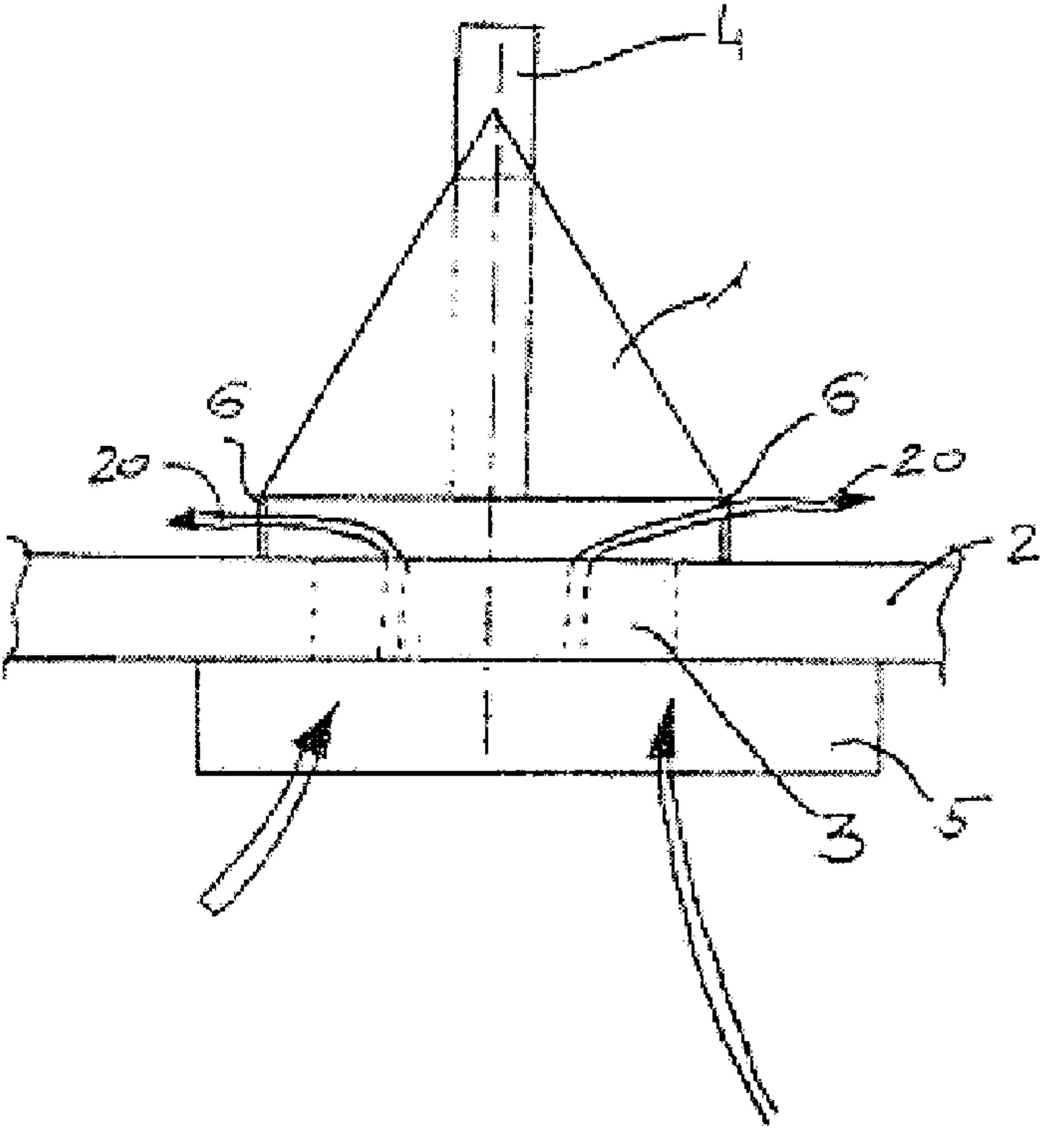


Figure 9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