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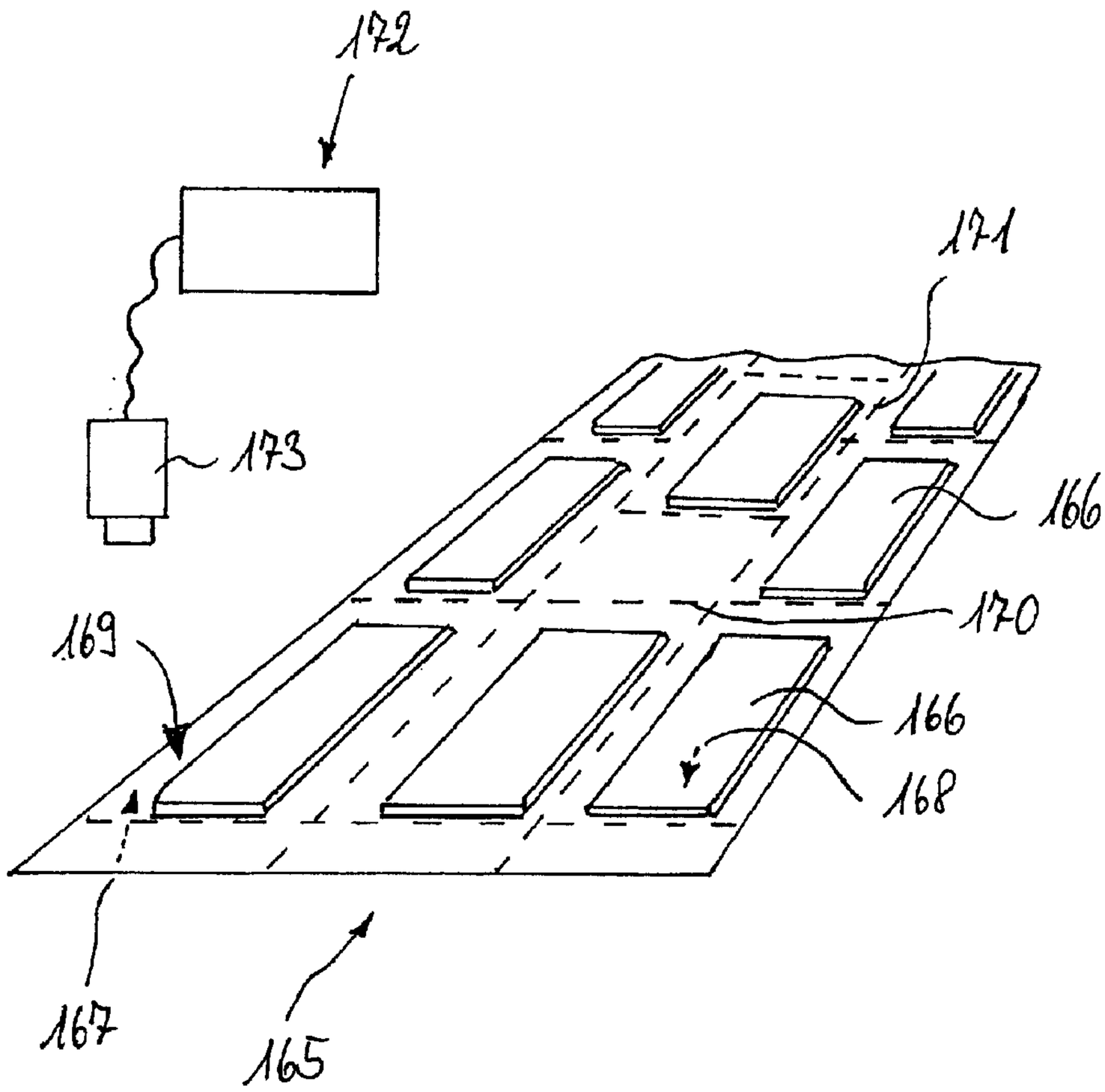

(57) Abrégé/Abstract:
The invention relates to a method for the production of a laminate with at least one powder layer, whereby said powder layer is produced continuously. An adhesive (164) is applied at least in strips on a first layer (167), whereby the adhesive (164) is applied

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(57) Abrégé(suite)/Abstract(continued):
transverse to a direction of movement of the first layer (167), between layers of powder arranged separately from each other. A second layer (169) is continuously introduced to the first layer (165) such that the first (165) and the second (169) layers surround the powder layer (168). The invention further relates to a device for the continuous production of a laminate.

ABSTRACT

The invention relates to a method for the production of a laminate with at least one powder layer, whereby said powder layer is produced continuously. An adhesive (164) is applied at least in strips on a first layer (167), whereby the adhesive (164) is applied transverse to a direction of movement of the first layer (167), between layers of powder arranged separately from each other. A second layer (169) is continuously introduced to the first layer (165) such that the first (165) and the second (169) layers surround the powder layer (168). The invention further relates to a device for the continuous production of a laminate.

Translation

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METHOD AND DEVICE FOR PRODUCTION OF A NUMBER OF LAMINATES

The invention relates to a method of producing a laminate with at least one powder layer, wherein a first layer is supplied to a second layer, and wherein at least the powder layer is applied to the first layer. In particular, an absorbent sheet is continuously produced by means of at least one layer of an absorbent material. Furthermore, an apparatus is made available for producing a laminate. The apparatus comprises at least one first feed device for supplying a first layer, a second feed device for supplying a second layer, and a feed device of an absorbent material for arranging at least one powder layer between the first and the second layer.

In the manufacturing field of hygienic products, the following art is known: EP 0 429 393 A2 discloses a method, wherein absorbent pads are produced for taking up body fluids in hygienic products. The method described therein permits producing in continuous operation any shape of absorbent pads without a time-consuming stacking of partial layers. For obtaining a profile in this process, excessive material is removed by suction and again returned. A cutting edge permits separating the thus-produced

absorbent pads. EP 0 860 158 A1 discloses a method of producing an absorbent sheet, which includes an absorbent layer. A first layer, preferably of an airlaid material, receives by overlaying a second layer, preferably of the same material, with an absorbent material being arranged between these two layers. Both the first and second layers are continuously combined. Subsequently, this absorbent sheet is cut, with the cut edges of both the first and the second layer being spread apart for applying an adhesive as a binder to these end surfaces.

Proceeding from these references of the art, it is an object of the present invention to provide both a method and an apparatus for facilitating an automatic production method and for being simultaneously able to minimize both the time that is required for producing a finished produce and the materials that are to be used.

According to one aspect of the present invention, there is provided a method for continuously producing a laminate with at least one powder layer, wherein a first layer is supplied to a second layer along a longitudinal direction, and wherein the powder layer is applied to the first layer continuously in strips neighbouring to each other along the longitudinal direction, and wherein, before arranging the second layer on the powder layer and the first layer, a portion of each of the strips of the powder layer is removed from the first layer, thereby producing powder layers that are separated from one another.

According to a further aspect of the present invention, there is provided an apparatus for continuously producing a laminate, wherein the apparatus comprises at least one first feed device for supplying a first layer, a second feed device for applying a second layer, and a powder feed device, for arranging at least one powder layer between the first layer and the second layer, characterized in that a material removing device is arranged for removing powder from powder strips in defined locations from the first layer following a feed device under which the first layer is directed to receive the powder strips whereby the powder strips are fed from a mixture unit to the feed device before supplying the second layer to the first layer for producing interruptions along a length of the powder strips.

According to a further aspect of the present invention, there is provided a laminate with at least one first layer, a second layer, and a powder layer, which is arranged between the first layer and the second layer, characterized in that a transverse seal comprises at least in part a different binder than a longitudinal seal.

The method of the invention for producing a laminate with at least one powder layer provides for supplying a first layer to the second layer and for applying at least the powder layer to the first layer. Before arranging the second layer on the powder layer and on the first layer, a portion of the powder layer is removed from the first layer, thus producing powder layers that are arranged separated from one another.

Preferably, a binder is arranged at least in the form of strips between the separated powder layers for producing a transverse seal of the laminate.

A further development provides for applying by means of a first binder feed device, a first binder to the first layer in the longitudinal direction for producing a longitudinal seal, and by means of a second binder feed device a second binder to the second layer for producing a transverse seal, when the second binder comes into contact with the first layer.

It is preferred to use at least as one component of the powder layer a material that is capable of influencing at least a direct environment of the laminate. The direct environment may be gaseous, for example, air, and/or also liquid, for example, water. An influence may be exerted in many ways. Components may be released from the laminate, for example, perfumes or other substances, which may act upon one of more objects that surround the laminate. In this instance, the laminate has a dispensing function. The laminate is also capable of taking up, in particular absorbing or adsorbing liquids, particles, odors, or the like. One embodiment provides that at least one absorbent is used as ingredient of the powder layer, and that the laminate is produced as an absorbent sheet. A further embodiment provides that at least one odor influencing material is used as ingredient of the powder layer. Another embodiment provides that at least one detergent is used as ingredient of the powder layer. In addition, it is possible that the laminate has a plurality of functions, for example, releasing perfumes and detergents, or releasing detergents and taking up and storing certain liquid and gaseous components in the

environment. In general, the laminate may simultaneously include a storage function, in particular an adsorbing function together with a dispensing function.

The powder in use may contain different ingredients. Likewise, the powder may have different grain sizes. For example, it is possible to use powders of different sizes, for example, from about the factor 5 to 10. They may be premixed and then be supplied to the first layer, or they may also be supplied in different regions of the first layer. A further embodiment provides for applying to the first layer with the powder layer or in the place thereof, a material having a different geometric configuration. This material may be, for example, fibrous materials, or even small spherical structures or hollow bodies.

In the following, the invention is described in greater detail by way of example with reference to an application as an absorbent sheet, without however limiting the following description to absorbent sheets. Rather, it is possible to apply all subsequent further developments, characteristics, and configurations to all other embodiments that have been described in the foregoing and will be described in the following. An absorbent sheet produced in accordance with the invention and comprising at least one absorbent layer provides that the absorbent sheet is continuously produced. A first layer is supplied to a second layer so that the first and second layers surround at least one absorbent containing layer. A binder is arranged at least in the shape of strips transversely to a direction of movement of the first layer, so as to be positioned between absorbent layers that are arranged

in separated relationship for producing a transverse seal of the absorbent sheet.

A further development of the method provides that prior to applying the binder, a portion of the absorbent-containing layer is removed from the first layer. It is then possible to arrange, in particular apply the binder without disturbing binder particles to a thus-cleared section of the first layer. This facilitates joining, preferably bonding the first layer to the second layer. In addition, it is avoided that microcracks appear in the seal that is formed by this kind of joining, when tensile and/or shearing forces act upon a product subsequently made from the absorbent sheet. A tearing or opening of the per se closed product is avoided. Preferably, the binder is used to produce a transverse seal of the absorbent sheet. Moreover, there exists the possibility of continuously producing in addition to the transverse seal a longitudinal seal of the absorbent sheet. According to a further development, there also exists the possibility of producing both the transverse and the longitudinal seal by one and the same binder, for example, by applying it all over to the surface of the first layer. A further embodiment provides for furnishing a first metering unit for a transverse seal and a second metering unit for a longitudinal seal. This makes it possible to use for the respective seal different types and quantities of binders.

According to a further development, the binder is discontinuously supplied at least in part, preferably only in defined regions. This means, for example, that on the first layer, the binder is located only in a certain section. This section may form a transverse seal or also a longitudinal seal. It is

likewise possible that one or more absorbent layers are at least covered or also interspersed with binders. To this end, it is possible to arrange the binder, for example, between different superposed absorbent-containing layers.

According to a further embodiment of the invention, at least one portion of the seal is mechanically produced, with the binder forming a mechanically acting engagement between the first and the second layer. A mechanical bonding is possible by means of carding, embossing, folding, or in any other way, with the material of the first layer, for example, engaging or adhering to the material of the second layer. To this end, one embodiment of the invention provides for a calender with a first and a second roll. The first roll is, for example, a smooth roll. The second roll is an opposite roll with a contoured surface, in particular an engraving roll. By means of the surface contour, the first and the second layer are interconnected at least in part in accordance with the contour. Preferably, at least one absorbent layer is completely sealed. The selection of the surface contour permits defining the geometry of the seal. A further development provides for using two rolls, which are both structured, in particular in such a manner that the one roll partially engages the other. With that, it is possible to form, for example, three-dimensional seals.

A further development provides that the first and/or the second layer include at least components that effect an adhesion under pressure and/or heat. These components may be, for example, adhesive fibers, which are included in at least one layer. Furthermore, it is possible that at least one of the layers that are

to be combined includes bicomponent fibers, which enable a surface bonding. According to a further embodiment, a thin adhesive film extends between the first and the second layer. The adhesive film interconnects the two layers. The adhesive film may be fed in wide strips lengthwise or also crosswise for facilitating a longitudinal or transverse seal. If the first and second layers are advanced through a calender, they will be sealed in accordance with the surface structure and the arrangement of the adhesive.

A further embodiment provides that an adhesive is applied at least in part to the second layer, which is subsequently fed to the first layer carrying the absorbent layer. This makes it possible to use in particular a binder applicator that is in contact with the layer, and arranges thereon at least one strip of the binder. According to a further development, a transverse and/or longitudinal strip of the binder is applied to the first layer and/or the second layer. Subsequently, at least one absorbent layer is applied preferably to the binderfree region of the layer. In this manner, it is possible to realize in particular a transverse seal of the laminate.

The binder may be used, in particular applied to a layer in a wet or a dry state. Likewise in this manner, a binder can be applied, for example, by the rotary machine printing or the screen printing technique. Besides a solid strip of a binder, it is also possible to use bonding centers, bonding lines, or other geometries. Furthermore, the binder may be applied by means of a spraying process, for example, spiral spraying. Another embodiment provides for the use of a fiber spraying device. This spraying device permits positioning adhesive fibers between the first

and the second layer for producing a seal. In particular for producing a seal, one may use a so-called "hot-melt" adhesive, which has in a heated state a higher viscosity that at room temperature, and which can therefore be applied in particular via jets. For example, it is possible to use a hot-melt adhesive on the basis of caoutchouc.

According to a further embodiment, it is possible to use as binder a fusible film. Preferably, the fusible film is at least vapor permeable, in particular fluid permeable. To this end, the fusible film may be perforated, for example, in a suitable mechanical or chemical way. Furthermore, it is possible to use a fusible web. Under pressure or heat, both the fusible web and the fusible film join the first layer to the second layer in desired locations.

For providing a seal, it is preferred to apply an adhesive in a quantity from about 1 to 7 g/m^2, in particular about 3 to 4 g/m^2. The applied powder, in particular the absorbent may be in an amount from about 30 g/m^2 to about 500 g/m^2, preferably from about 50 g/m^2 to 300 g/m^2.

An additional embodiment provides in an absorbent sheet not only for a mechanical sealing, but also a sealing by means of a different binder. For example, the transverse seal may be realized mechanically, and the lengthwise seal by applying an adhesive.

By arranging the binder in strips, preferably by applying it in strips crosswise to the direction of movement, a subsequent sealing becomes possible in a following step, without having to cut open the absorbent sheet one more time. Rather, it is possible to produce a thus-made absorbent sheet continuously and

to subdivide it each time accordingly. Separate absorbent layers can be advanced to a subsequent processing step, for example, in a sealed, coherent state. For example, it is possible to wind or store the absorbent sheet as disclosed, in particular in WO98/57877, WO98/58864, WO99/59907 and WO00/53513. A further method of depositing the material is disclosed in WO98/18706.

When depositing the absorbent sheet, it is preferred to see that folds are present only in regions that contain no absorbent layer. To this end, an absorbent layer is detectable, for example by means of a CCD camera, via a capacity measurement, or by means of a marking, which is furnished to the absorbent sheet mechanically or otherwise. For example, a sensor device supplies a signal to the depositing device, which causes, for example, a folding of the absorbent sheet by correspondingly reversing the direction of the deposit. When storing the absorbent sheet on a roll, it is preferred to operate with different tensions that act upon the absorbent sheet. The tensile forces are different and in particular dependent on the takeup speed as well as the respective loading state of the takeup drum. In this case, it is an object to avoid in particular a too loosely wound roll of the absorbent sheet.

A further variant of the method provides that the first and second layers are cut only after the absorbent layer has been totally sealed. This measure has the advantage that no absorbent material is able to escape, and that it is possible to process from the absorbent sheet in a continuous operation and according to predeterminable parameters, absorbent pads that are made ready for use in further processing. Furthermore, a preceding complete sealing makes it possible to process the absorbent sheet to a finished product in-line with a subsequent further processing step. On the other hand, it is also possible to store the absorbent sheet after its production and to make the required dimensions in a location of further processing. To this end, the absorbent sheet is advantageously provided with corresponding marking means, such as, dyed zones, metallic inlays or overlays, or similar detectable means, which can be actively or passively identified via a corresponding detecting device on the further processing apparatus, for example, for recognizing the position.

The above-described method makes it possible to deposit on the one hand the not yet separated, but already sealed absorbent layers. On the other hand, it makes it possible to store completely sealed and spaced absorbent layers, and to supply them subsequently to a further processing step, in which the sealed absorbent layers are separated from one another at least in part or also completely.

A further embodiment of the invention provides for depositing the individual, separated, and sealed absorbent layers and for supplying individual absorbent sheets to further processing. For example, while the individual absorbent sheets are jointly

transported, they are already separated from one another in their packaging for transportation. It is possible to store, preferably stack the individual absorbent sheets in magazines such that they can be used in a further processing line, in particular directly from the magazines.

Another possibility in the production of absorbent sheets consists on the one hand in superposing not only one, but a plurality of absorbent layers. These layers may be of the same material or also of different materials. The latter makes it possible to achieve, for example, a purposeful fluid transportation within the absorbent layers by means of selecting the absorbent to be used and its behavior. Likewise, it is possible to separate a plurality of overlying absorbent layers from one another, for example, by another layer, an adhesive film, or the like. With the use of substances or other powder materials that are to be released from the laminate, it is likewise possible to provide a layered structure for special effects.

On the other hand, there exists the possibility of arranging adjacent absorbent layers in offset relationship in the transverse direction. This alternating arrangement permits producing on the one hand, for example, differently long absorbent sheets in side-by-side relationship. It is also possible that, for example, applicators for binders or the absorbent itself, as well as a suction device for excessive binder material operate more accurately, since adjacent contours are less affected in the course of processing.

According to another embodiment, it is also possible to form an absorbent sheet by a plurality of strips, which extend side by side and are not separated

from one another. This makes it possible that, for example, one or more absorbent sheets are folded one on top of the other to thus form an absorbent pad. In this case, a seal is preferably realized by a folding plane.

Furthermore, the invention makes available an apparatus for continuously producing a laminate, in particular an absorbent sheet. The apparatus comprises at least one feed device for supplying a first layer, a second feed device for supplying a second layer, and a powder feed device, in particular a feed device of an absorbent, for arranging between the first layer and the second layer at least one powder layer, in particular an absorbent layer. The apparatus includes a material removing device, preferably in the form of a suction device for removing in particular by suction a powder, in particular absorbents in defined locations from the first layer, before feeding the second layer to the first layer for purposes of creating interruptions along a length of absorbents.

According to a further independent apparatus for continuously producing a laminate, in particular an absorbent sheet with at least one first feed device, a second feed device, and a powder feed device, in particular a feed device for absorbents, it is possible to arrange on the first layer at least one crossbar transverse of the direction of movement, for forming a boundary surface for a powder layer, in particular an absorbent that is to be applied. The crossbar is designed such as to keep a surface on the first layer free for forming a part of a transverse seal of the laminate, preferably the absorbent sheet.

Another, independently proposed apparatus for continuously producing a laminate, preferably an

absorbent sheet, comprises at least one first feed device for feeding a first layer, a second feed device for feeding a second layer, and a powder feed device, preferably a feed device of absorbents for arranging between the first and the second layer at least one powder layer, preferably an absorbent layer. The powder feed device is followed by a binder feed device, which is adapted for applying discontinuously a binder to the material.

A further independent apparatus for continuously producing a laminate, preferably an absorbent sheet, comprises at least one feed device for a first layer, a second feed device for a second layer, and a powder feed device, which arranges a powder on the first layer at least before the second feed device advances the second layer to the first layer. A binder feed device for producing a transverse seal is arranged relative to the second feed device such that a binder can be applied to one side of the second layer, which is subsequently joined to one side of the first layer that receives a powder layer. As powder, one may use for example, an absorbent material.

Individually or jointly integrated in a production line for combining the first layer, the second layer, and at least the one powder layer, in particular the absorbent layer, the proposed apparatus can be used serially connected one time or several times. This integration enables a continuous production of the laminate, preferably an absorbent sheet. At the same time, one or more corresponding steps are taken, which subsequently result in that the powder layers of the laminate, or the absorbent layers of the absorbent sheet are sealed. In this manner, it is made possible to provide different production steps

within a production line and apparatus. This permits saving equipment and time, which would otherwise be required for these steps in processing stations not integrated in the apparatus.

In the following, the invention is again described in greater detail with reference to an absorbent sheet, without however excluding the further above described applications, further developments, or characteristics, which contain other functions of an applied powder. Rather, it is possible to use the further developments that are described by means of an absorbent sheet, also for absorbent pads, absorbent cloths, scented pads, scented cloths, as well as for detergent pads or detergent cloths.

A further development provides that a depositing device follows, which receives, for example, absorbent layers that are interconnected but yet separated by complete seals. Preferably, the depositing device includes detection means, which permit distinguishing sections of the absorbent sheet with and without an absorbent layer. Depending on the quality of the absorbent sheet, this makes it possible to deposit it in a controlled manner.

Furthermore, the invention provides an absorbent sheet with at least one first layer, a second layer, and an absorbent layer, with the absorbent layer being arranged between the first and the second layer. A transverse seal of the absorbent sheet comprises a different binder than a longitudinal seal. According to a further development of the absorbent sheet, a force that is to be applied for destroying a transverse seal is greater than a force that needs to be applied in the case of a longitudinal seal, or vice versa. For example, a force from at least 20 N/m^2 to 25 N/m^2 will

be needed for obtaining a destruction. If thermoplastics are used for providing seals, it will be advantageous to measure a heat-sealing strength, which is preferably in a range of more than 2 N/15 mm in a heat-sealing range from about 50°C to 180°C. In particular, attempts are made to reach values of more than 6 N/15mm, preferably a maximum of more than 9 N/15mm before a total destruction of the seal. As testing method, one may use, for example, the spring test, or also the top wave DTC.

Preferably, the absorbent sheet includes at least one marking means, which permits detecting, for example, a manufactured line, for example, a cut, a folding line, a start and/or end of an absorbent containing layer, a position indication of the absorbent sheet as a reference point for a further processing line, as well as others. One or more marking means may be arranged in the absorbent containing layer, in a seal, or also in one of the layers.

Furthermore, the invention provides for a suction device in an apparatus for continuously producing a laminate, in particular an absorbent sheet. The suction device is designed and constructed such that it defines at least one location for removing by suction the powder, preferably absorbent material on a first layer by way of opening or closing a suction component of the suction device.

Further advantageous configurations and developments of the laminate, usable powders, manufacturing methods, etc. are described in greater detail in the following. The described details and the characteristics that are given with respect to the individual devices as regards both production and

materials in use, parameters, marginal conditions, structures, components, and their interaction, as well as explanations, can also be applied in general to other apparatus and methods of the invention, whether or not they have been described above or will be described in the following. In particular, they can be combined with the above or below described embodiments to additional advantageous further developments. In the drawing:

Figure 1 shows a continuous belt that is provided with slots;

Figure 2 shows the belt of Figure 1 installed in a first apparatus for continuously producing an absorbent sheet;

Figure 3 shows a second apparatus for continuously producing an absorbent sheet;

Figure 4 shows a third apparatus for continuously producing an absorbent sheet;

Figure 5 shows a fourth apparatus for producing an absorbent sheet, with the device comprising a drum;

Figure 6 shows a fifth apparatus with a drum, which has recesses in its surface;

Figure 7 shows a sixth apparatus with a belt, which has recesses;

Figure 8 shows a seventh apparatus with a hollow cylinder with variable suction openings;

Figure 9 shows an eighth apparatus, which includes, for example, a hollow cylinder of Figure 8;

Figure 10 is a sectional view of a hollow cylinder, as shown, for example, in Figure 8;

Figure 11 shows a suction channel, as can be used, for example in a device of Figure 9;

Figure 12 is a schematic view of an embodiment of a suction intake opening;

Figure 13 shows a ninth apparatus for producing an absorbent sheet;

Figure 14 shows a tenth apparatus for producing an absorbent sheet;

Figure 15 shows an eleventh apparatus for producing an absorbent sheet; and

Figure 16 is a schematic top view of an absorbent sheet with a detection unit.

The following explanations essentially relate to the embodiment of an absorbent sheet, without however being limited thereto. Rather, they deal with only a possible use of the laminate or the usable powder layers and their functions.

Figure 1 illustrates a belt **1**, which advances over a first roll **2** and a second roll **3**. The belt **1** is provided with slots **4**. The slots **4** extend transversely to a direction of movement of the belt **1**. Preferably, the belt **1** is made of a plastic material, which is reinforced, for example, by means of fiber inlays. The slots **4** contained in the belt **1** extend through the belt **1**. According to a further development, the material adjacent the slot **4** in belt **1** is at least in part reinforced, so that no cracks develop, when tensions act upon the belt **1**.

Figure 2 illustrates a first apparatus **5** for producing an absorbent sheet as a laminate. The first apparatus **5** comprises the first roll **2**, the second roll **3**, and the belt **1**, as are shown in Figure 1. Furthermore, the first apparatus **5** comprises a third roll **6** and a fourth roll **7**. A second belt **8** extends over the third roll **6** and fourth roll **7**. Preferably, the second belt **8** is a screen belt. However, it may

also have no openings, but a closed surface **9**. The surface **9** of the second belt **8** continuously receives a layer, which in turn receives a powder layer, in the present embodiment an absorbent layer **10**. Preferably, both the belt **1** and the second belt **8** move at the same speed, so that the absorbent layer **10** advances in the direction of the arrow. A hollow space **11** formed by the belt **1** as well as the first roll **2** and the second roll **3** is adapted for receiving a suction device **12**. The suction device **12** is schematically indicated and may be realized by means of a box-type structure arranged in the hollow space **11**. In the box-type structure, a pressure prevails, which is lower than, for example, the ambient pressure. It is therefore possible to remove by suction the material of the absorbent layer **10** that is arranged in the direct vicinity of the slots **4**. To this end, the second belt **8** is preferably at least in part porous or otherwise air-permeable. According to a further embodiment, in a second hollow space **13** that is formed by the third roll **6**, the fourth roll **7**, and the second belt **8**, an overpressure is applied at least in part, so that the material of the absorbent layer **10** that is to be removed by suction, also enters the suction device **12**. However, the suction device **12** itself need not be arranged in the first hollow space **11**. Instead, it may also be located in the second hollow space **13**.

Furthermore, there exists the possibility that the removal by suction occurs over a wider range, so that the slots **4** cover a longer distance through the suction device **12**. This makes it possible to lift and permanently remove the material from the second belt **8**, preferably with little pressures. According to a further development, which is here not described in

greater detail, there exists the possibility of operating within the suction device with at least one pressure gradient. For example, as the slots **4** pass through the suction device **12**, the pressure will increase or decrease. In this process, the decrease or increase of the pressure may occur suddenly. This is made possible, for example, by means of a pressure reducer as well as via different pressure connections on the suction device **12** itself.

Figure 3 shows a second apparatus **17** for continuously producing an absorbent sheet as a laminate. A depositing belt **14** that extends over a first roll **15** and a second roll **16** continuously receives the absorbent layer **10**. The second apparatus **17** includes a suction device **18**, which is arranged above the depositing belt **14**. The suction device **18** comprises a system of rolls **19**, over which suction attachments **20** advance. The suction attachments **20** are interconnected via a guide system that comprises a first connection belt **21** and a second connection belt **22**. Preferably, the respective spacing between suction attachments **20** is variable. Likewise, the first and second connection belts **21, 22** are realized such that they permit inserting additional suction attachments **20**. The suction attachments are guided by means of the roll system **19** along an upper path **23** opposite to a direction of movement of the depositing belt **14**. After being deflected by means of the roll system **19**, the suction attachments **20** advance along a lower path **24** in the same direction as the direction of movement of the depositing belt **14**. In so doing, a lower opening **25** of a suction attachment **20** comes to slowly approach the absorbent layer **10**. The suction attachment **20** comprises, for example, a suction stub **26** arranged at

an end opposite to the lower opening **25**. The suction stub **26** connects to a vacuum unit not shown in greater detail. As a result of the slow approach of the lower opening **25** to the depositing belt **14**, the material in the direct vicinity of the lower opening **25** is removed by suction. Preferably, the suction device **18** is arranged such the lower end **25** moves forward as far as the depositing belt **14**. This ensures that the absorbent layer **10** is totally removed in this region. The extent of the removal by suction of the absorbent layer directly adjacent the lower opening **25** can be adjusted via different parameters. These include, for example, the circulation speed of both the depositing belt **14** and the system of rolls **19**, an adjustment of the respective speeds (it is also possible to adjust a speed difference between the depositing belt **14** and the suction attachments **20**), the configuration of the lower opening **25**, for example, additional suction openings at least along the length of the suction attachment **20** that engages the absorbent layer **10**, an air volume flow as well as a volume itself that is removed by suction, a gas permeability of the depositing belt **14**, a preprocessing of the absorbent layer **10** (for example, same may be present as a loose powder of a different grain diameter consistency, as prebonded absorbent material, as well as, for example, in the form of interconnected grains, in particular bonded grains, preferably as a solidified layer). In the apparatus shown both in Figures 3 and 2, surfaces coming into direct contact with the absorbent layer **10** are made such that the absorbent layer **10** does not remain stuck to these surfaces, when these surfaces are cleared from the absorbent layer **10**. This occurs, for example, by way of a corresponding selection of the material of the

surface, a corresponding surface improvement, for example, in the form of a coating. In particular, it is attempted that in comparison with the absorbent layer **10**, the tendency to adhesion of this surface is smaller than a strength and with that an integrity of the absorbent layer **10** on at least its surface, in particular also over the entire material cross section of the absorbent layer **10**.

Figure 4 shows a third apparatus **27** for producing an absorbent sheet as a laminate. In the same way as the second apparatus **17** shown in Figure 3, the apparatus **27** realizes the idea of a partial surface contact of a suction device with the absorbent layer **10**. Preferably, this partial surface contact is limited to a suction device in the form of a suction attachment. Figure 4 shows a configuration, in which the material of an absorbent layer **10** advances on a conveying belt **28** in the direction of the arrow. The third apparatus **27** also includes a circulating suction device **29**. The suction device comprises a first conveying roll **30**, a second conveying roll **31**, and a guide belt **32**. Inserted into the guide belt **32** are suction stubs **33**, which are guided by the guide belt **32** over conveying rolls **30, 31**. In this process, they come into contact with the absorbent layer **10**. In an interior **34**, a suction box **35** is arranged. Once the suction stubs **33** come into contact with the suction box **35**, the material of the absorbent layer **10** located in the region of the suction stubs **33** is removed by suction. Advantageously, the suction box **35** is designed and constructed such that suction discontinues, before the suction stubs **33** are no longer in contact with the absorbent layer **10** or the conveying belt **28**. This avoids that material of the absorbent

layer **10** could still be removed laterally, or even fall back, when the suction stubs **33** are raised by advancing along the second conveying roll **31**. Preferably, the suction stubs **33** of Figure 4, and likewise, for example, in other technical further developments, devices engaging or adjoining the absorbent layer **10**, have such geometry that an edge region **36** remains very largely undamaged. A corresponding configuration, for example, in conical, rounded, convex, tapered, or other fashion makes it possible to obtain an accurately defined edge region **36** within the absorbent layer **10** after completing the removal by suction.

Figure 5 shows a fourth apparatus **37** for producing an absorbent sheet as a laminate. In the place of a circulating belt, the fourth apparatus **37** comprises a drum **38** for removing material of the absorbent layer **10** by suction. The drum **38** is a hollow cylinder, whose outer edge **39** accommodates inserts **40**. In the place of the inserts **40**, the drum surface may also be provided with bores or correspondingly shaped projections. Preferably, a portion of the inserts **40** projects from the surface of the drum **38** and is thus able to engage the absorbent layer **10**. The interior of the drum **38** accommodates a suction device **41**. The suction device **41** comprises a first boundary **42** and a second boundary **43**. At their respective ends **44**, the boundaries **42, 43** sealingly engage an inner surface **45** of the drum **38**. Via a discharge channel **46**, the material removed by suction from the absorbent layer **10** reaches preferably a further processing station, where the material can be prepared and again returned to the process. Both the first boundary **42** and the second boundary **43** are preferably adjustable, whereby the removal by suction or the extent thereof is adjustable.

Arrows indicate this adjustability. Preferably, the inserts **40** extend lengthwise, parallel to the axis of the drum **38**. According to a further development, they have a geometry of the type which enables a portion of the inserts **40** that comes first into contact with the absorbent layer **10** to cut out material from the absorbent layer **10**. This will be especially advantageous, when the absorbent layer **10** already exhibits a certain strength on its surface, for example, by a preceding solidification as can be achieved by heating. Furthermore, an outer surface **47** of the drum **38** may be configured such that it has an embossing effect on the surface of the absorbent layer **10**. For example, it is thus possible to shape the surface of the absorbent layer **10**. This shape may be, for example, convex, concave, wavy, zigzagged, or otherwise, as is indicated by a dashed line along a section **48** of the absorbent layer **10**. This first section **48** is separated from a following second section **49** in a direction transverse to the direction of movement of a conveying belt **50** that carries the absorbent layer **10**. The still coherent absorbent layer **10** upstream of the drum **38** exhibits breaks **51** because of the suction. These breaks **51** may extend both in the longitudinal direction and in the direction transverse to the direction of movement of the belt **50**.
Preferably, the breaks **51** are realized such that no absorbent material is present on the belt **50** in these areas. As in the case of the foregoing apparatus, the conveying belt **50** may also be air-permeable. A further possibility consists in providing a multilayered belt **50**, with each of these layers having a different porosity. In particular, the porosity decreases from the layer coming into direct contact with the absorbent

layer **10** to the farthest removed layer. Likewise, the conveying belt **50** may be configured such that it possesses a type of carrier layer, which is in a position to ensure the necessary strength characteristics for a long lasting operation. Further layers on or around this carrier layer may have additional functions: for example, an improved acceptance of the absorbent layer, a satisfactory permeability, and a channel effect of air passing therethrough, etc.

Figure 6 shows a fifth apparatus **52** for producing an absorbent sheet as a laminate. The fifth apparatus **52** comprises an application drum **53**. A surface **54** of the application drum **53** may be smooth. In particular, it may also be roughened or, however, contain depressions. An absorbent material **56** is supplied to the surface **54** or the depressions via an absorbent layer feed device **55**. The absorbent material may be fed continuously or discontinuously, so that preferably sections of absorbent material **56** develop, which are separated from one another. For example, an application roll **57** of the absorbent layer feed device **55** may be subdivided, so the absorbent material **56** undergoes a separation not only in the transverse direction, i.e., parallel to an axis of the application drum **53**, but also in the circumferential direction thereof, for example, in the form of gaps. Preferably, the absorbent material **56** is applied at least in the direct vicinity of the highest point of the application drum **53**. In particular, an application may also occur somewhat before this point **58**. This ensures that the material is uniformly applied to the application drum **53**. Preferably, not too far from the application of the absorbent material **56**, a first layer **60** is supplied

to the application drum **53** via a feed device **59**, and brought into contact with the absorbent material. With the use of contact rolls **61** it is ensured that both the absorbent material **56** and the first layer remain in their position. Preferably via a binder feed device **62**, a binder is applied to the first layer **60** such that the binder comes to lie crosswise to a direction of movement of the first layer **60** between disconnected layers of absorbent material. Subsequently thereto, a second layer not shown in greater detail is applied to the first layer **60** and the absorbent material **56**. The thus produced absorbent sheet is transversely sealed in locations that have received a binder via the binder feed device **62**.

A further development of this fifth apparatus **52** provides that a second binder feed device **63** follows the absorbent layer feed device **55**. It is likewise possible to arrange the second binder feed device **63** in the direction of movement of the application drum **53** upstream of the absorbent layer feed device. Furthermore, a layer feed device **64** shown in phantom lines, supplies to a layer material **65** an absorbent material **56** or a binder material. Subsequently, the first feed device **59** supplies the second layer **66**, so that the application drum **53** advances an absorbent sheet **67**. Preferably, this sheet already includes transverse and longitudinal seals. To this end, for example, the second binder feed device **63** may be in a position to supply the binder not only in a discontinuous fashion, but rather permits in certain sections also a continuous supply of the binder material. If different binders are to be used for transverse and longitudinal seals, a binder feed device not shown in greater detail is provided in addition,

for example, upstream or downstream of the second binder feed device **63**. This allows separate binder feed devices, which can be operated in accordance with the type of binder with different pressures and temperatures.

Figure 7 shows a sixth apparatus **68** for producing an absorbent sheet as a laminate. This apparatus uses a belt **69**, which may have a roughened surface. A surface roughening results in that an absorbent **72** supplied by a feed device **71** is deposited continuously or, as shown, partially on the belt **69** and subjected there to a satisfactory adhesion. Furthermore, the belt **69** may contain recesses **70**, which receive the absorbent material **72**. Excessive material may be guided, for example, into the interior of the belt **69**. To this end, the belt **69** may be constructed, for example, in the fashion of a mesh lattice, so that the absorbent **72** can settle only on correspondingly provided surfaces. It is likewise possible to remove excessive absorbent material **72** by suction. Downstream of the absorbent feed device **71** is a layer feed device **73**. Via the layer feed device **73**, it is possible to supply a first layer **74** to the belt **69**. Contact rolls **75** see to it that the absorbent material **72** remains in position on the first layer, when being transferred from a large roll **76** toward a subsequent separation roll **77**. As preferably in all solutions that have a direct contact between the absorbent material or absorbent layer or layers, it is preferred to configure the separation roll **77** such that a separation of a surface in contact with the foregoing does not lead to the destruction of the desired arrangement of the absorbent layer relative the one or the two layers. Preferably, an adjustment roll **78** follows the

separation roll **77**. Both the separation roll **77** and the adjustment roll **78** are adapted for displacement relative each other, in particular in such a manner that a separation angle **79** can be adjusted. An adequate tension in the belt **79** may be provided by means of equalization rolls, which are not shown in detail. A supply of binder material not shown in detail occurs, for example, after the first layer **74** leaves the separation roll **77**.

Figure 8 shows a preferred solution. Shown is a schematic view of a seventh apparatus **80** for producing an absorbent sheet as a laminate, with the apparatus comprising a hollow cylinder **81** with variable suction openings **82**. The suction opening **82** extends over a sector angle **83**. This sector angle **83** is adjustable by displacing first blocking segments **84** and second blocking segments **85**, which are arranged in the hollow cylinder **81**. Both the blocking segments **84** and the blocking segments **85** are interconnected, so that an inner cylinder is arranged for rotation in the hollow cylinder **81**. The inner cylinder with blocking and suction segments rotates, while the remaining elements are preferably stationary. By adjusting the first and second blocking segments **84, 85**, it is possible to change the open sector angle **83**. Along the open sector angle **83**, a connection is established between a discharge component **86** and an intake component **87**, which permit controlling the amount of an absorbent **88** that is to be removed by suction from a first layer **89**. Furthermore, the kind of suction can be influenced, for example, via an applied pressure **90**, via a length **91** of the discharge component, via a length **92** of the intake component **87**, via a spacing **93** between the absorbent **88** and a suction opening **94** of intake component **87**, their

geometries, and other parameters. Furthermore, the suction behavior is defined by the geometry of the suction opening **94**, by the development of a possible pulsation, by a configuration of a conveying belt **95** for a first layer **89**, as well as other parameters. The conveying belt **95** comprises, as shown, openings **96**. Preferably, it is a screen belt. The openings **96** facilitate a passage of air through the first layer **89** and thus a removal by suction of absorbent material **88**. The apparatus **80** permits adjusting the suction. By varying, for example, the circumferential speed of hollow cylinder **81** as a function of the belt speed or segment adjustment in the inner cylinder, the apparatus **80** can be adapted to different lengths and widths of the absorbent material, as well as production speeds. The speed of the inner cylinder is determined from a reciprocal value, which is formed from the number of paired segments multiplied by an interval time. The interval time indicates the ratio of a length of absorbent material added by a length of an absorbent-free zone that follows in the direction of movement of the belt, to the speed of the belt.

Figure 9 shows by way of example an enlarged cutout view of an apparatus **97** for producing an absorbent sheet as a laminate. Into this apparatus **97**, it is possible to integrate, for example, the seventh apparatus **80** of Figure 8. From a first unwinding station **98**, a first layer **99**, and from second unwinding station **100**, a second layer **101** are supplied to a further processing line. Furthermore, in the place of the first and second unwinding stations **98, 100**, it is also possible to run an in-line process for producing the unwound layers. This means that the material of the first or second layer **99, 101** is produced directly

before a further processing. A first layer **99** receives an absorbent layer **10** via an absorbent material feed device **102**, which connects to a mixing unit **103**. The mixing unit **103**, for example, a rotary mixer, in turn connects to supply bins **104**. The supply bins **104** store, for example, different materials for the absorbent layer, which are mixed according to a predeterminable formulation, and applied as absorbent layer **10** by means of the feed device **102**. For example, the supply bins **104** may store, alone or also in blends, superabsorbents, cellulose, binders, additives, fragrances, zeolite, and fiber material. The supply bins **104** may also store further, normally usable materials alone or in blends. A further advantage of the arrangement of one or more supply bins is that the continuous process can proceed without interruption for refilling correspondingly suited material by switching the feed line from one supply bin to another. After applying the absorbent layer **10** to the first layer **99**, same advance to the seventh apparatus **80**. There, the absorbent material is removed from the first layer in selected areas. Besides a removal by suction, there also exist other possibilities, such as, for example, a mechanical stripping of a portion of the absorbent layer **10**. To be able to adjust in the case of a removal by suction a uniform suction pressure, the latter is, for example, controlled. To this end, one may use a throttling system, in particular, also a bypass solution. The bypass solution is used to deliberately generate a partial airflow, which is used to facilitate the supply of powder to a cyclone **106**. It is also possible to realize in a speed controlled manner a vacuum-generating unit **105**, for example, a fan. According to one development, the absorbent

material that is removed by suction is separated from the suction air current, for example, via a separator, which is illustrated in the present embodiment by the cyclone **106**. After a corresponding preparation, the thus recovered absorbent material is again returned to the cycle.

After removing absorbent material by suction from the absorbent layer **10** according to the embodiment of Figure 9, the first layer **99** advances into a heating zone **107**. For example, in the case of feeding a polymer material to the absorbent material **72**, the there occurring heat transfer causes the absorbent material to soften, or to even melt. As a result, the grains of the absorbent material adhere to one another and form a stable layer of the absorbent material on the first layer **99**. Furthermore, a corresponding heating moreover results in that the absorbent layer adheres to the surface of the first layer **99**. In a modification of the apparatus **97** not shown in greater detail, a heating occurs in a heating zone **107** before the absorbent layer **10** is in part removed from the first layer **99**. Preferably, the removal is caused in particular by means of mechanical action. To this end, for example, a correspondingly shaped roll or surface, which is guided, for example, by a revolving belt, cuts into the absorbent layer **10**, and removes it in a desired area. A precured absorbent layer **10** has the advantage that forces, which act upon this layer, may be greater, before an unwanted disturbance occurs in the remaining areas of the absorbent layer.

In Figure 9, the heating zone **107** is followed by a first binder feed device **108** and a second binder feed device **109**. In the direction of movement of the first layer **99**, the first binder feed device **108**

applies a first binder, which leads in the further course because of its transversal arrangement to a longitudinal seal between the first and the second layer **99, 101**. To this end, the first binder is applied in a space that is preferably free from absorbent material. The second binder feed device **109** applies a second binder to the first layer **99**. The second binder is applied in such a manner that it leads to a transverse seal in an absorbent sheet **110**. Both the first and the second binder may be applied by spraying, by a direct contact of an application head, or otherwise. A further possibility of applying the second binder consists in wetting the second layer **101** accordingly. For example, this may occur with a roll as a third binder feed device **111**, which is provided with application surfaces. According to a further embodiment, the surface of the third binder feed device **111** includes elevations that are wetted with a binder at a rotational speed, which is synchronized with the advance of the first layer **99**. Subsequently, the binder is applied to the surface of the second layer **101**. In particular with this solution, it is made possible that the third binder feed device **111** is in constant contact with the second layer **101**.

After applying one or the other binder, the first layer **99** and the second layer **101** are laminated with the absorbent layer **10** arranged between them to an absorbent sheet **110** by means of a pressure unit **112**, in this instance a calender. The calender may be structured at least on one roll surface. The structure has, for example, the task to shape and/or seal the absorbent layers. According to the illustrated embodiment, the absorbent sheet **110** becomes storable by way of a takeup unit **113**. Furthermore, a further

development makes it possible to advance the absorbent sheet **110** directly to a further processing apparatus, in which the absorbent sheet is divided both lengthwise and crosswise into individual absorbent packets. The individual absorbent packets not shown in greater detail are used in products, such as, for example, hygienic articles, wipes, oil absorbing cloths, or others.

Figure 10 is a schematic, axially sectioned view of the hollow cylinder **81** of Figure 8. For its inner hollow core **113**, through which a vacuum is made available to intake **87**, the hollow cylinder **81** comprises a bearing **114**. For example, the bearing **114** is arranged, respectively, on a first end face **115** and a second end face **116**. A connection **117** to a vacuum-generating unit not shown in greater detail is provided, for example, via a corotating rotary passageway **118**. The rotary passageway **118** is made gastight, so that no leakage whatsoever will occur while transmitting the vacuum. In order that over a length **119** of the hollow cylinder the same vacuum is applied all over at the same time, the inner hollow core **113** preferably comprises valve-type fittings so that a minimum vacuum is uniformly applied after opening the intake and starting the removal of absorbent material. In this manner, it is possible to produce absorbent layers **10**, which may have any desired length **120**, for example, between 45 mm and 181 mm. It is easy to produce longer layers of absorbent material. A spacing **121** in the longitudinal direction between absorbent layers can be progressively adjusted. This spacing ranges preferably from 60 mm to 25 mm. A width **122** of the absorbent layers can be adjusted in any desired manner, and ranges, for example, from 6 mm

to 50 mm. Exact dimensions of the absorbent layers are dependent on different parameters. They are influenced on the one hand by the later end use of the product, the production speed, the used materials, as well as their thickness that is to be applied. For example, it is possible to arrange absorbent layers continuously over a width **123** of the first layer of 100 cm and larger. The indicated dimensions can also be achieved by means of the other apparatus and methods.

Figure 11 shows a further embodiment of a suction device, which uses a channel **124** that can be employed in an apparatus of Figure 9. The suction channel **124**, which has, for example, a length from 200 to 800 mm, is arranged above a first layer, and connects to a vacuum feed line **126**. The vacuum feed line **126** has, for example, a diameter **127**. The suction channel **124** in turn has a height **128**. Preferably, the height **128** of the suction channel **124** is greater by a factor from 1.5 to preferably 4 than the diameter **127**. The length **125** of the suction channel **124** in turn is longer, preferably by the factor 1.1, in particular 1.3 and higher, than the width **129** of the used first layer. The pressure prevailing in the suction channel **124** or via the vacuum feed line **126**, is likewise controlled via a magnetic valve. This valve permits a fast opening or closing in a range of less than 5 seconds, in particular in a range from 50 ms to 4 ms.

Figure 12 is a schematic view of an embodiment of a suction opening **130**. In the illustrated embodiment, a mask **132** is arranged above the absorbent layer **10**, and thus above a first layer **131**. Preferably, the mask forms a diaphragm, and prevents with its gap **133** that in the course of a suction, more material of the absorbent layer **10** is

removed than necessary. The mask permits an exact separation between zones that are to be cleared by suction, and zones that remain untouched, in particular by the absence of a false flow resulting from an airflow of the environment. Furthermore, the mask **132** allows in a further embodiment that a certain pressure, for example, a vacuum or a mechanical pressure is exerted on the absorbent layer **10**. Preferably, the gap **133** is somewhat smaller than the suction opening **130**. In other embodiments, however, the gap **133** may also be larger. The suction opening **130** in turn may be made conical with an inside diameter **134** that can increase or decrease in the direction of the flow. This depends on whether or not it is intended to obtain a high or a low suction speed directly on the absorbent layer **10**.

Figure 13 shows a further device for producing an absorbent sheet. This apparatus employs again a hollow cylinder **135**, which accommodates an inner hollow cylinder **136**. The inner hollow cylinder **136** comprises a suction channel **137**, through which a vacuum can be applied to suction openings **138** of the hollow cylinder **135**. To this end, the hollow cylinder **135** rotates about the inner hollow cylinder **136**. Arranged in facing relationship with the hollow cylinder **135** are a first opposite roll **139** and a second opposite roll **140**. Preferably, the hollow cylinder **135**, the first opposite roll **139**, and the second opposite roll **140** are arranged such that a first layer **141** that carries an absorbent layer **10**, is displaced toward the opposite rolls **139, 149**. This results in a force of pressure on the absorbent layer **10**, whereby preferably only material is removed from the absorbent layer **10**, which is arranged in direct facing relationship with a suction opening **138**. The pressure

that is exerted by the position of the hollow cylinder **135** relative the two opposite rolls **139, 140**, is adjustable, preferably by changing the position of at least one of these three rolls. To avoid that absorbent material adhering to a surface of the hollow cylinder **135** is entrained by same, a cleaning device **142** is arranged on the hollow cylinder **135**. This device permits cleaning the surface of the hollow cylinder **135**, for example, by means of mechanical action, by compressed air, or other possibilities. The dropping material is collected and removed by the cleaning device **142**. Moreover, the surface of the hollow cylinder **135** may be coated, so that a tendency to adhesion, in particular vis-à-vis grainy materials is extremely reduced. Downstream of the cleaning device **142** is a binder feed device **143**, which permits applying a binder to the first layer **141** in part or all over its surface.

Figure 14 shows a further embodiment of an apparatus for producing an absorbent sheet. In the case of this apparatus it is shown by way of example that it is also possible to revamp an existing production line with an apparatus of this type for producing an absorbent sheet and in particular for a partial application of absorbent material. As schematically indicated, the apparatus is compactly accommodated in a frame structure. In accordance with correspondingly available space within a production line, it is therefore possible to install the apparatus as a module at a later date. Via a revolving belt **144**, which has openings **145**, an absorbent material **146** is applied to a first layer **147**. The belt **144** is provided with crossbars **148**, which are in contact with the first layer **147**. The crossbars **148** partially cover the

surface of the first layer **147**. A feed device **149** distributes the absorbent material **146** via the belt **144** over the first layer **147**. The material that comes to lie on the crossbars is distributed to a desired height by means of a spreading device **150**, for example a brush, a wiper, or the like. Subsequently, the belt **144** is raised at a slight angle of inclination **151** from the first layer **147** and the absorbent layer **10** distributed thereon. The angle of inclination **151** is preferably from 5° to 35°. Thereafter, the belt **144** is freed from possibly adhering particles by means of a cleaning device **152**. The cleaning device **152** may use, for example, suction or even ultrasound. To collect particles that drop from the belt **144**, a collection device **154** is arranged in the region of a deflection **153**. Moreover, one may compact the absorbent layer **10** in the present apparatus in the same way as is done in the above described apparatus, for example, by exerting pressure by means of rolls, or also by exerting pressure via the spreading device **150**. A further possibility of compacting results from a corresponding vibratory compacting. A corresponding vibration can be generated, for example, by means of ultrasound.

Figure 15 shows a further embodiment of an apparatus for producing an absorbent sheet. Likewise, this apparatus is adapted for later installation as a module in an already existing production line. A suction belt **156** extends over four guide rolls **157**. The flexible suction belt **156** is preferably laser cut and preferably comprises cutouts **157**, which preferably extend transversely to the direction of movement of the suction belt **156**. According to an embodiment not shown in greater detail, the suction belt **156** comprises cutouts, which are neither transverse nor parallel to

the direction of movement, but rather extend at an angle therewith. Likewise, it is possible that the cutouts **157** have not only parallel extending edges, but also curvatures, i.e., concave or convex shapes. This applies not only to the cutouts in a suction belt **156**. Rather, it is possible to find again such a geometry mirror-inverted in the absorbent layer **10** on a first layer **162**. This makes it possible to realize with the absorbent layer **10** for different uses not only a rectangular cross section. Rather, such a configuration also permits geometrical shapes, such as, for example, a longitudinal distribution of absorbent material similar to an hourglass, or conical, convex, and other shapes. The suction belt **156** advances on the absorbent layer **10**. A suction device **158** removes the material of the absorbent layer **10** adjacent the cutouts **157**. The suction device **158** may be constructed in one piece or, however, as shown, from two or more modules. Furthermore, the suction device **158** may completely extend all over a region. Furthermore, it is possible, as shown in the present embodiment, that suction occurs in two separated regions. Downstream of the suction device **158** is a delivery roll **159** that is constructed as a grooved roll. Same creates in cooperation with the upstream guide roll **155** of the suction belt **156** extending in this intermediate section, the possibility of exerting a contact pressure via the suction belt **156** upon the first layer and, thus, likewise upon the absorbent layer **10** arranged therebetween. From the delivery roll **159**, the suction belt **156** is raised from the absorbent layer **10** at a small angle by means of a subsequent guide roll **155**. A cleaning of the suction belt **156** is performed, for example, as shown, by a brush roll **160**. This cleaning device is assisted by a

further cleaning, for example, by means of ultrasound and/or suction. In addition, a vibratory plate **161** is associated both to the guide roll and to the brush roll **160**. On the one hand, the vibratory plate **161** collects particles that drop from the suction belt **156**. On the other hand, when properly suspended, the vibratory plate is in a position to shake at the same time the passing absorbent material on the first layer **162**. Downstream of the vibratory plate **161** is a binder feed device **163**. A supplied binder **164** is, for example, a binder that melts only at high temperatures.

Figure 16 is a schematic view of an absorbent sheet **165** as a laminate. The absorbent sheet **165** comprises four absorbent pads **166**, preferably of a structure that includes a first layer **167**, an interposed absorbent layer **168**, and a subsequent layer **169**. However, the absorbent pads **166** may also comprise a plurality of such structures, one on top of the other, or they may possess a plurality of absorbent layers **166**. This is possible, for example, by folding the absorbent sheet **165**, or by a multiple layering. Furthermore, the absorbent pads **166** are provided with both a transverse seal **170** and a longitudinal seal **171**. Preferably both the transverse **170** and the longitudinal seal **171** are uninterrupted, i.e., continuous. According to a further development, the transverse seal **170** and the longitudinal seal **171** are individually or jointly interrupted, in part also in defined locations.

Furthermore, Figure 16 shows a detection unit **172**. A sensor **173** is in a position to receive actively or passively a signal from the absorbent sheet **165**, which can subsequently be evaluated by the detection unit **172**. The received signal is able to provide information, for example, about a cutting plane for

both a transverse cut and a longitudinal cut through the absorbent sheet for separating the absorbent pads **166**. To this end, the absorbent sheet may comprise markings, such as, for example, grooves, colorations, or the like. It is likewise possible to detect an elevation of the absorbent sheet **165**, so that it is possible to obtain information about the location, in which an absorbent layer **168** is present, and about the location, in which it is absent. Furthermore, by illuminating the absorbent sheet **165** and by subsequently performing a light-dark comparison, for example, by means of evaluating images of a CCD camera, it is possible to conclude therefrom the distribution of the absorbent layer **168**, and to then obtain corresponding data. According to a further development, the detecting unit is used to detect the applied binder. Moreover, the just described detection unit **172** and different detection possibilities can be used not only for performing cuts through the absorbent sheet **165**, but also permit, for example, controlling the position of the absorbent sheet **165** in the course or at the beginning of a further processing step, for example, when depositing it by means of a packaging unit to a form for transportation, or also in a processing line for making an end product. As illustrated, it is possible to arrange the absorbent layers with respect to their transverse seals not only parallel, but also in an alternating fashion.

Furthermore, the invention permits packing the individual absorbent sheets separated from one another to a form for transportation. In a further processing station, this will then make it possible to incorporate the individual absorbent pads in a purposeful manner in or on the end product. For

example, in the field of hygiene and incontinence, it will thus be possible to position, for example, in a diaper, the absorbent pads in different ways to conform with the sex-specific location of the genitals.

The proposed method as well as the apparatus and laminates are suitable for processing a large variety of materials. Suitable for both a first and a second layer are, for example, woven materials, as well as paper, nonwovens, in particular airlaid materials, films, or other thin-sheet materials, as well as, single-layer or multilayered material blends. As a powder, one uses alone or in mixtures, for example, an absorbent material, such as SAP, black carbon, zeolite, interspersed with polymeric or other materials. In particular, it is possible to use the laminates that can be produced in accordance with the invention, for example, as absorbent pads, as dispenser pads, as scented pads, as cloth, for example, in the following applications: hygienic articles, such as, for example, sanitary pads, diapers, or absorbent pads for weaning in the case of nursing mothers, incontinence products, such as, absorbent inserts, food processing, for example, in the case of meat pads as well as food packaging, absorber pads, in particular for industrial products, such as oil absorption, absorption of liquids, in particular leakage fluids, furthermore for wash pads for use in washing machines, which include, for example, fragrances and/or detergents, for medical needs, in the case of blood-absorbing materials, such as in operating rooms, in the case of coverings, cleaning materials for operating rooms and surgical garments, for garments, garment cleaning agents as a whole, at the same time also for use in wash cloths, cloths, towels, wipes in housekeeping, for transporting

food, for frozen goods, for merchandise that may have fluid losses, as barriers for plugging holes by swelling, in the construction of buildings for protecting against penetration of moisture, in particular also for collecting moisture in ambient air, for example, in the case of dry storage of electronic components or optical devices, both as substrate and as cover.

CLAIMS

1. A method for continuously producing a laminate with at least one powder layer, comprising directing a first layer along a longitudinal direction to a second layer; applying powder to the first layer continuously along the longitudinal direction to form several longitudinally extending continuous powder strips adjacent to one another; before applying binder to the first layer and before arranging the second layer on the powder layer and the first layer, removing portions of each of the continuously applied powder strips from the first layer, thereby producing powder layers that are separated from one another and which are arranged one after another in the longitudinal direction.

2. Method of claim 1, characterized in that a binder is arranged at least in strips between separated powder layers for producing a transverse seal of the laminate.

3. Method of claim 1 or 2, characterized in that at least one binder feed device is used for applying to the first layer a first binder in the longitudinal direction for producing a longitudinal seal, and that a second binder feed device is used for applying to the second layer for a second binder for producing a transverse seal upon contact of the second binder with the first layer.

4. Method of claim 2 or 3, characterized in that for the transverse seal, a longitudinal seal of the laminate is continuously produced.

5. Method of any one of claims 1 to 4, characterized in that the binder is arranged at least in part discontinuously.

6. Method of any one of claims 2 to 5, characterized in that at least one portion of the seal is mechanically produced, with the binder producing a mechanically acting bond between the first and the second layer.

7. Method of any one of claims 1 to 6, characterized in that an adhesive is applied at least in part to the second layer, which is subsequently supplied to the first layer carrying the powder layer.

8. Method of any one of claims 1 to 7, characterized in that the first layer and the second layer are cut only after having totally sealed the powder layer thereby providing individual, separated and sealed powder layers.

9. Method of claim 8, characterized in that the individual, separated and sealed powder layers are deposited, and individual laminates are supplied to further processing.

10. Method of any one of claims 1 to 9, characterized in that completely sealed and spaced powder layers are stored in a coherent manner and subsequently supplied to further processing, in which the sealed powder layers are separated from one another at least in part.

11. Method of any one of claims 1 to 10, characterized in that as an ingredient of the powder layer, at least one material is used that is in a position to influence at least a direct environment of the laminate.

12. Method of any one of claims 1 to 11, characterized in that as an ingredient of the powder layer, at least one absorbent material is used, and that the laminate is produced as an absorbent sheet.

13. Method of any one of claims 1 to 12, characterized in that as an ingredient for the powder layer at least one odor-influencing material is used.

14. Method of any one of claims 1 to 13, characterized in that as an ingredient of the powder layer at least one detergent is used.

15. Method of any one of claims 1 to 14, characterized in that with the powder layer or in the place thereof, a material of a different geometric configuration is applied to the first layer.

16. Apparatus for continuously producing a laminate, wherein the apparatus comprises at least one first feed device for supplying a first layer along a longitudinal direction, a second feed device for applying a second layer along said longitudinal direction, and a powder feed device, for applying powder to the first layer continuously along the longitudinal direction to form several longitudinally extending continuous powder strips adjacent to one another, characterized in that a material removing device is arranged for removing powder from the powder strips in defined locations from the first layer following a feed device under which the first layer is directed to receive the powder strips, whereby the powder strips are fed from a mixture unit to the feed device before supplying the second layer to the first layer for producing interruptions along a length of the powder strips.

17. Apparatus of claim 16, characterized in that a depositing device is arranged downstream, which receives the individual or interconnected powder layers that are separated from one another by being totally sealed.

18. Apparatus of claim 16 or 17, characterized in that the apparatus, comprises detection means, which permit distinguishing sections of the laminate with and without a powder layer.

19. The apparatus of claim 16, wherein the material removing device comprises a suction device.

20. The apparatus of claim 18, wherein the detection means is integrated to a depositing device.

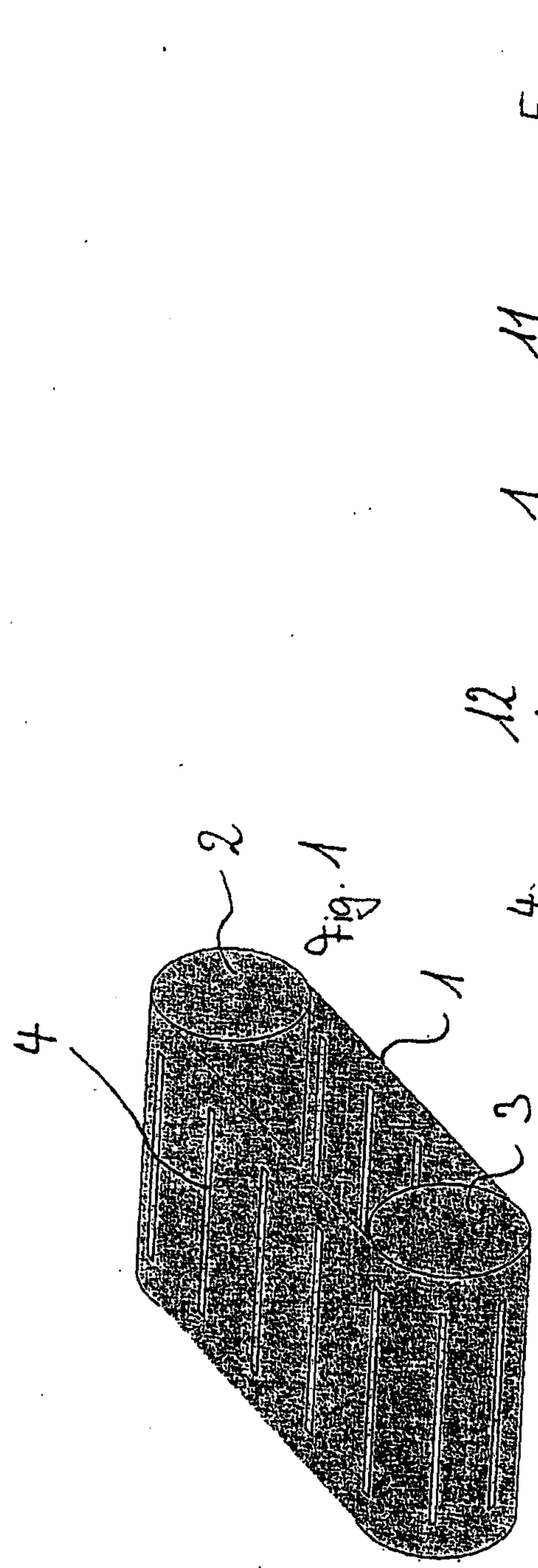


Fig. 1

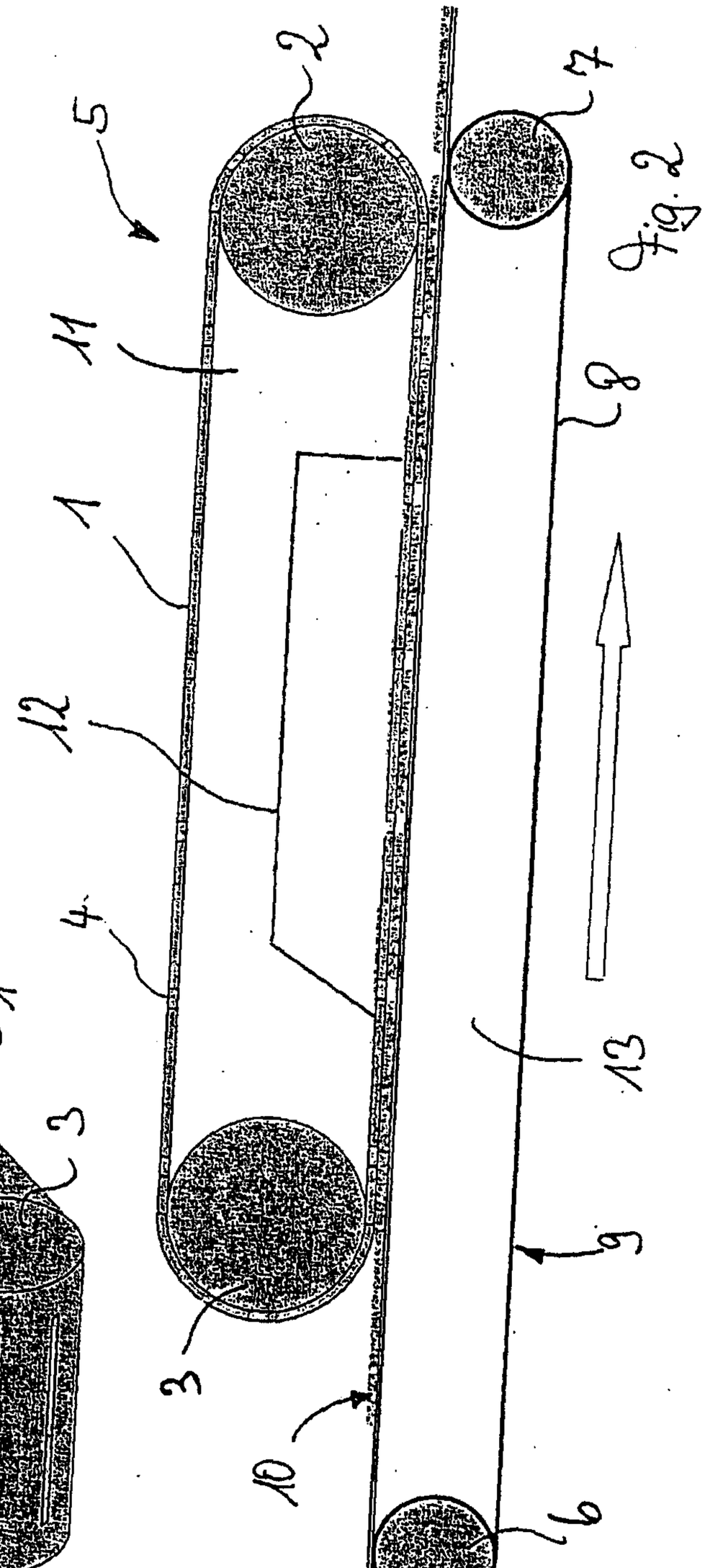


Fig. 2

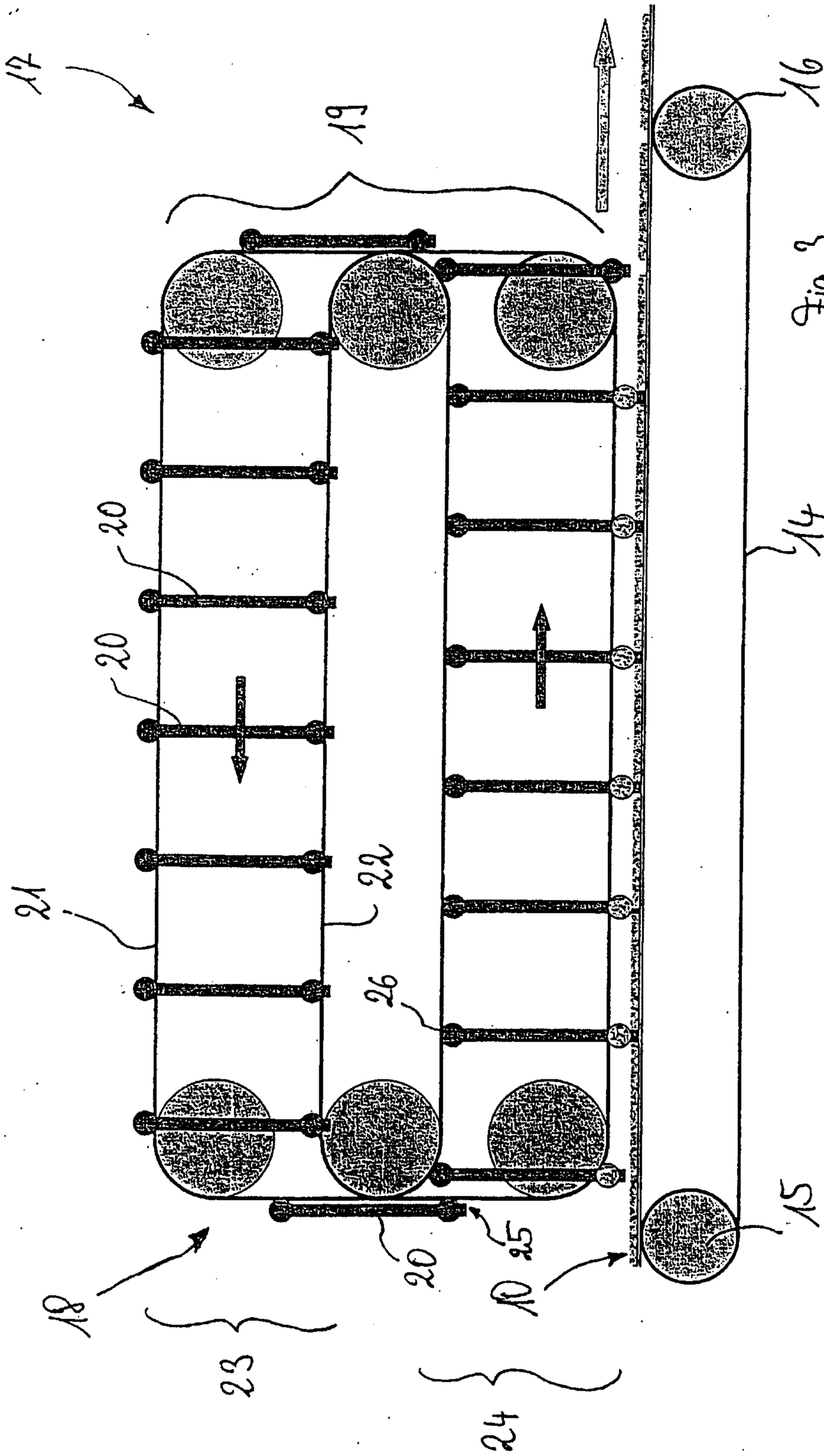


Fig. 3

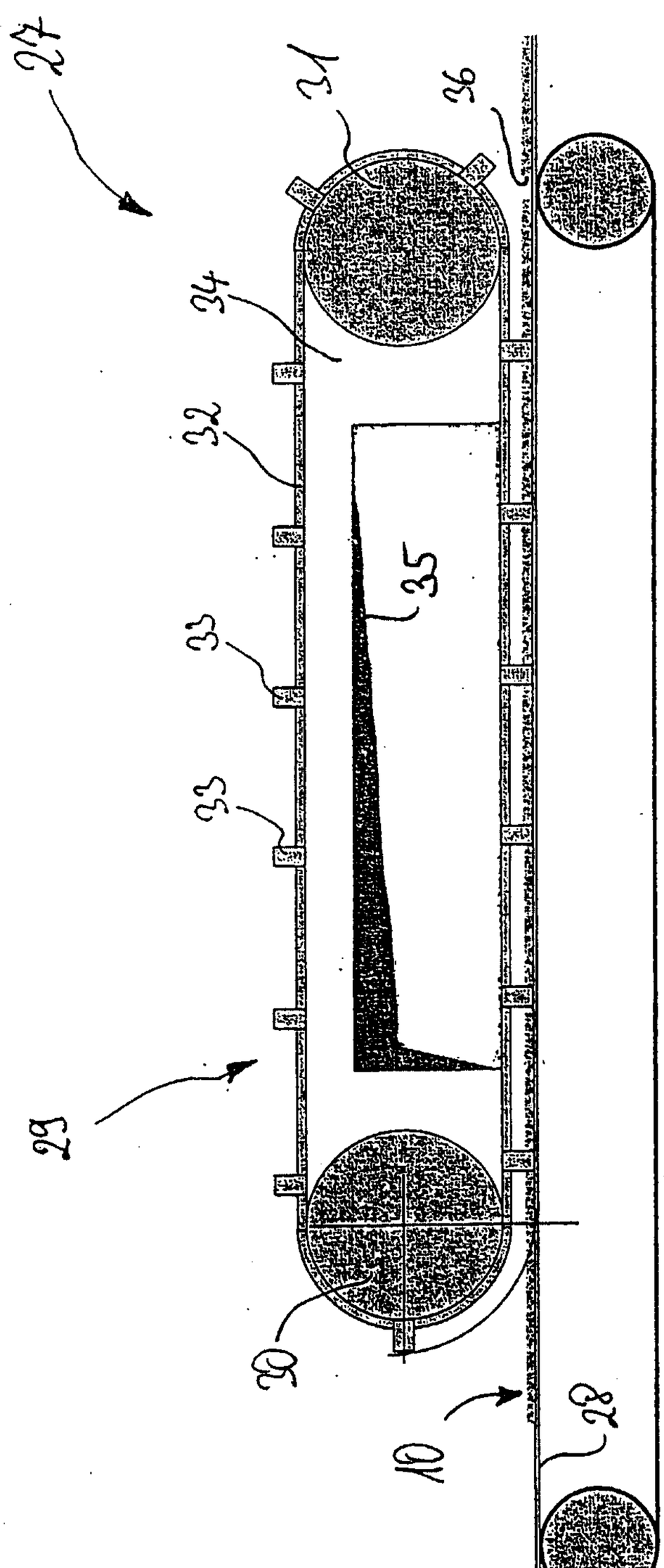


Fig. 4

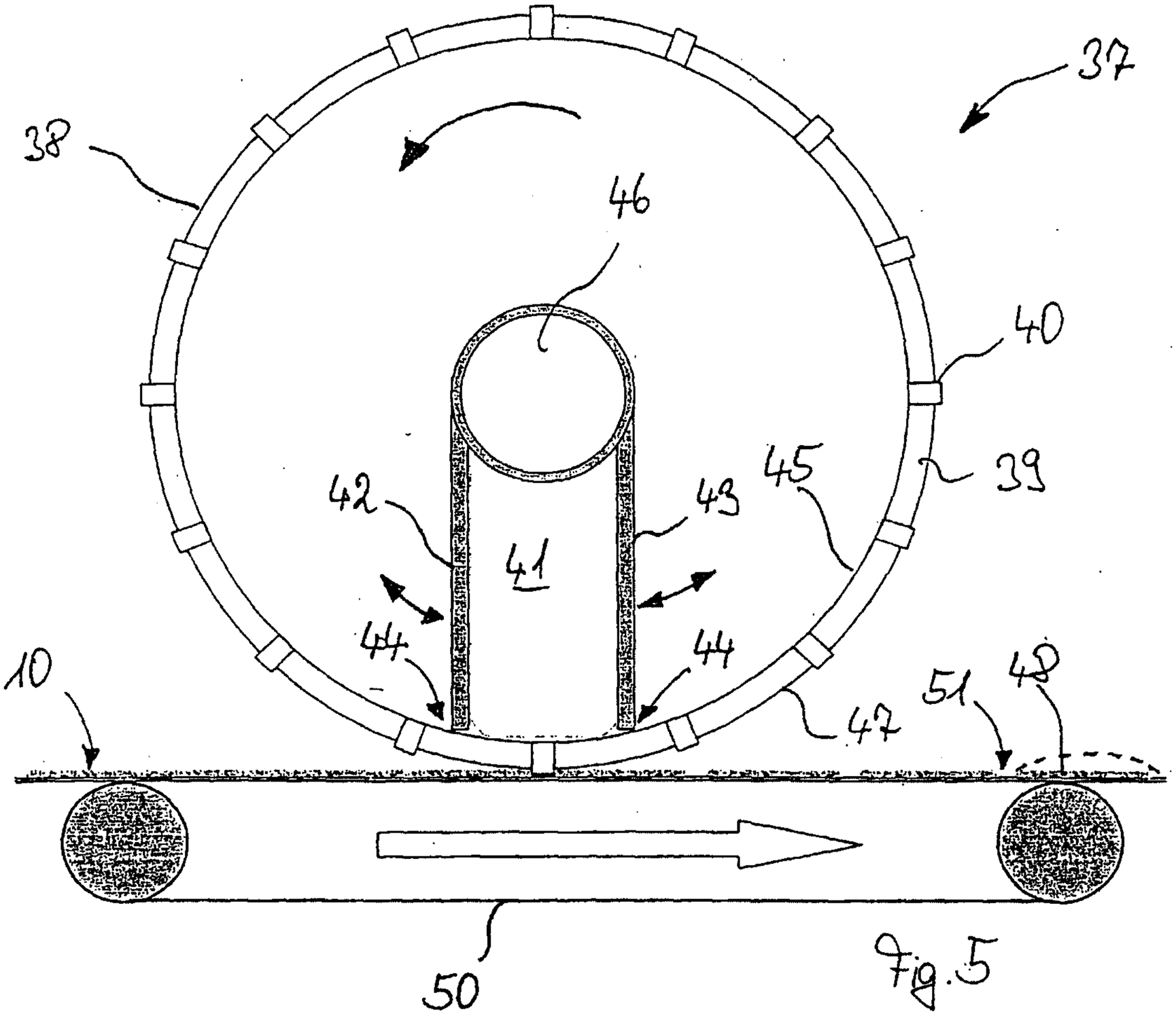


Fig.5

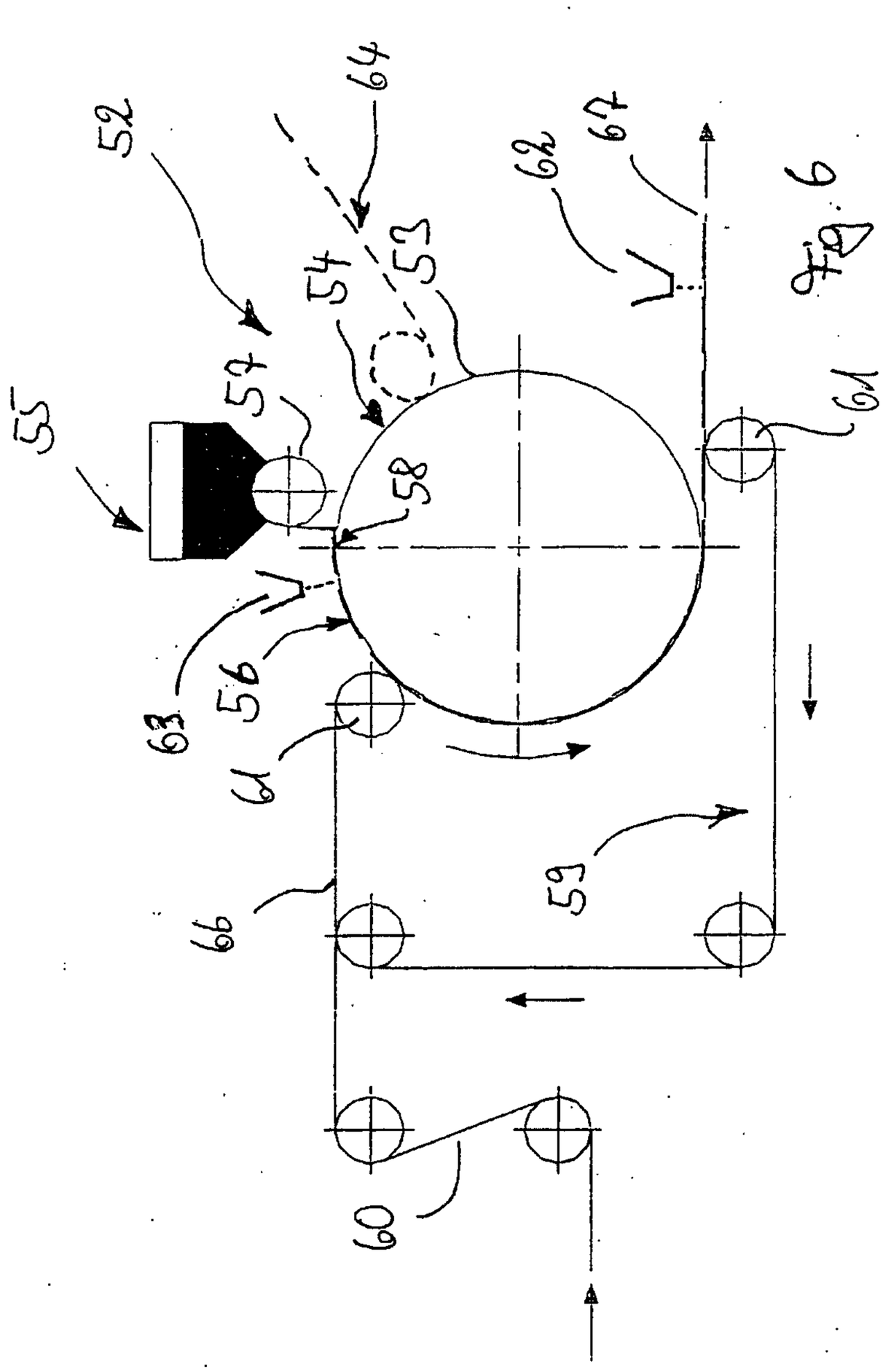


Fig. 6

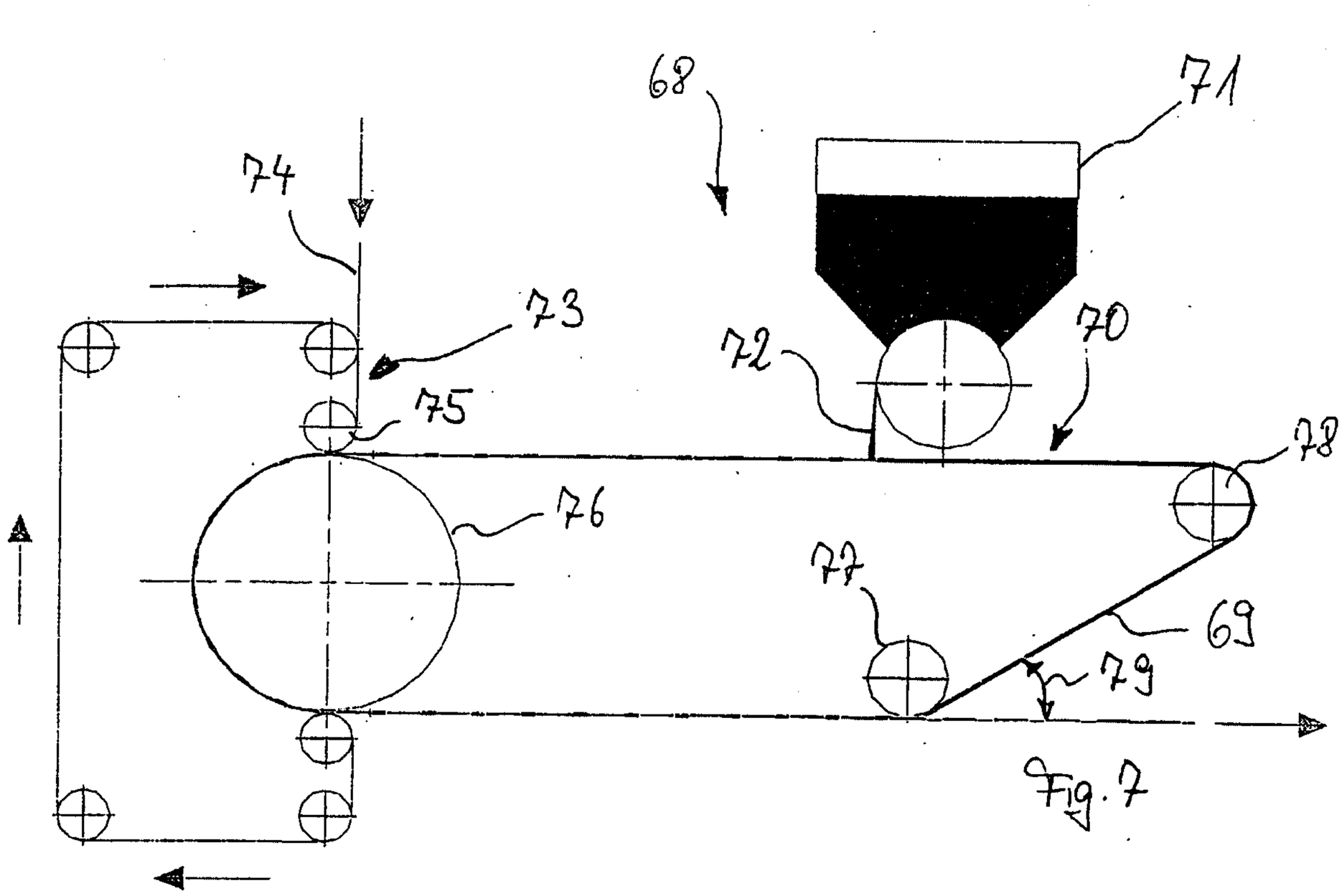


Fig. 7

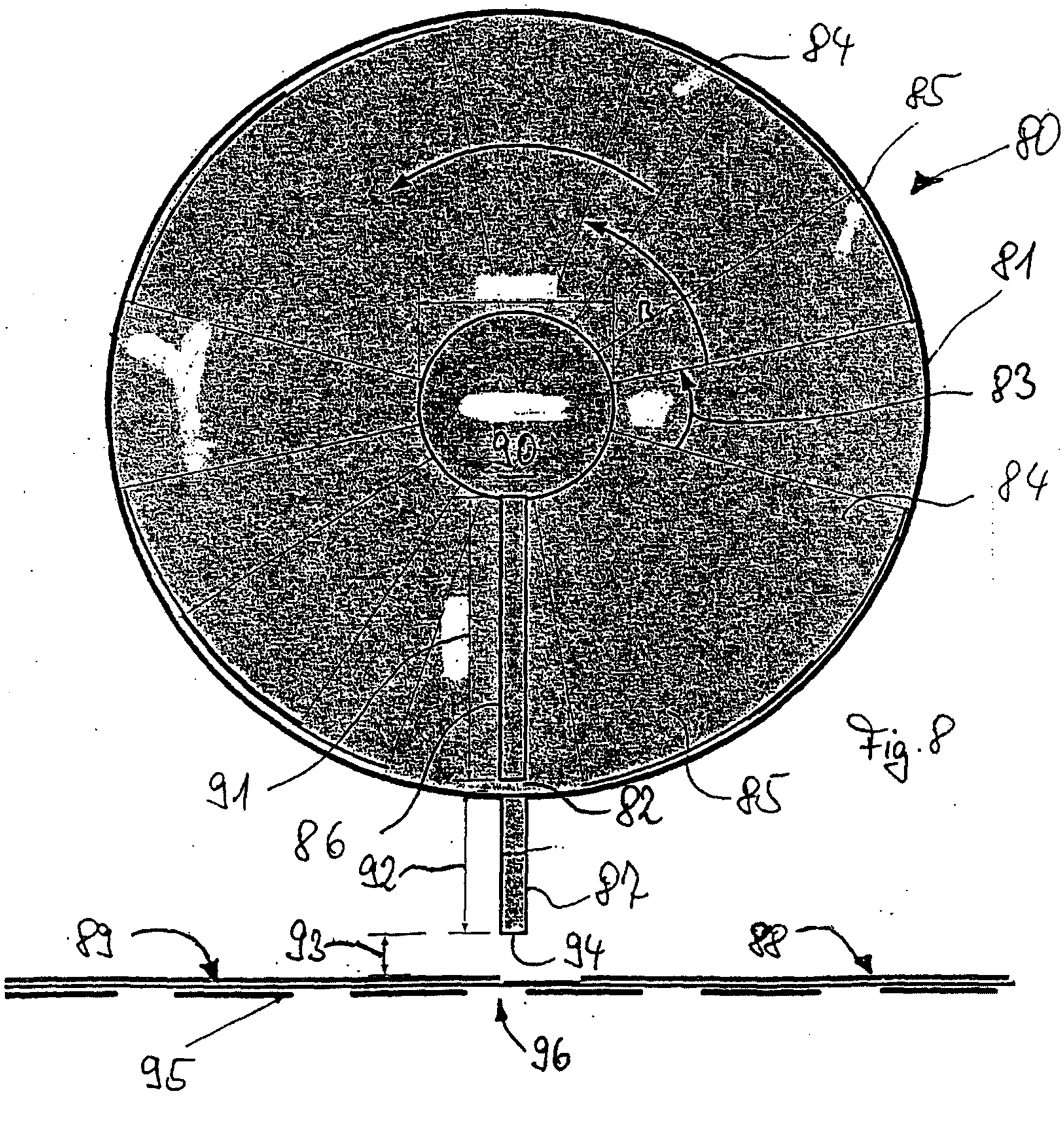


Fig. 8

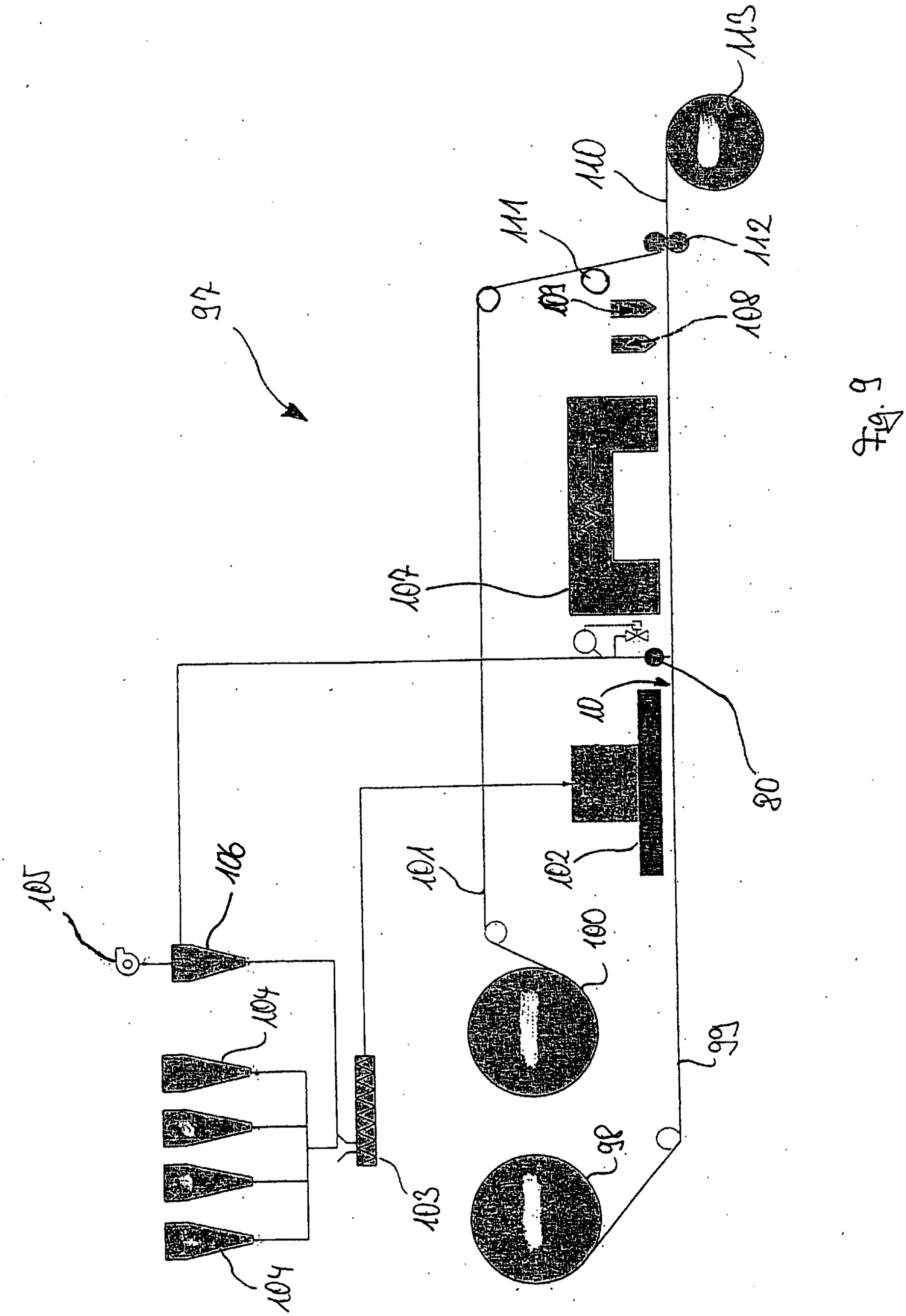


Fig. 9

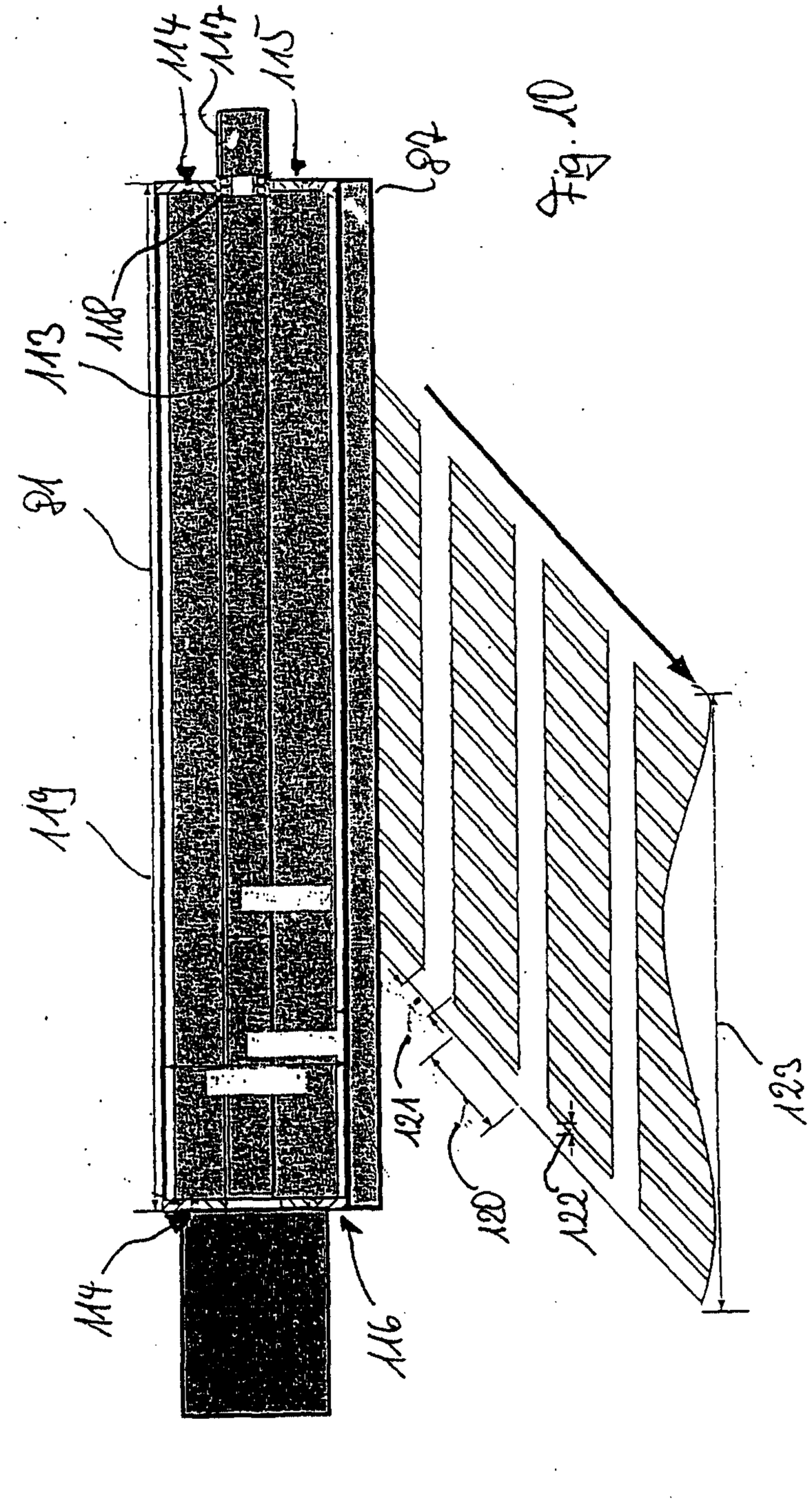


Fig. 10

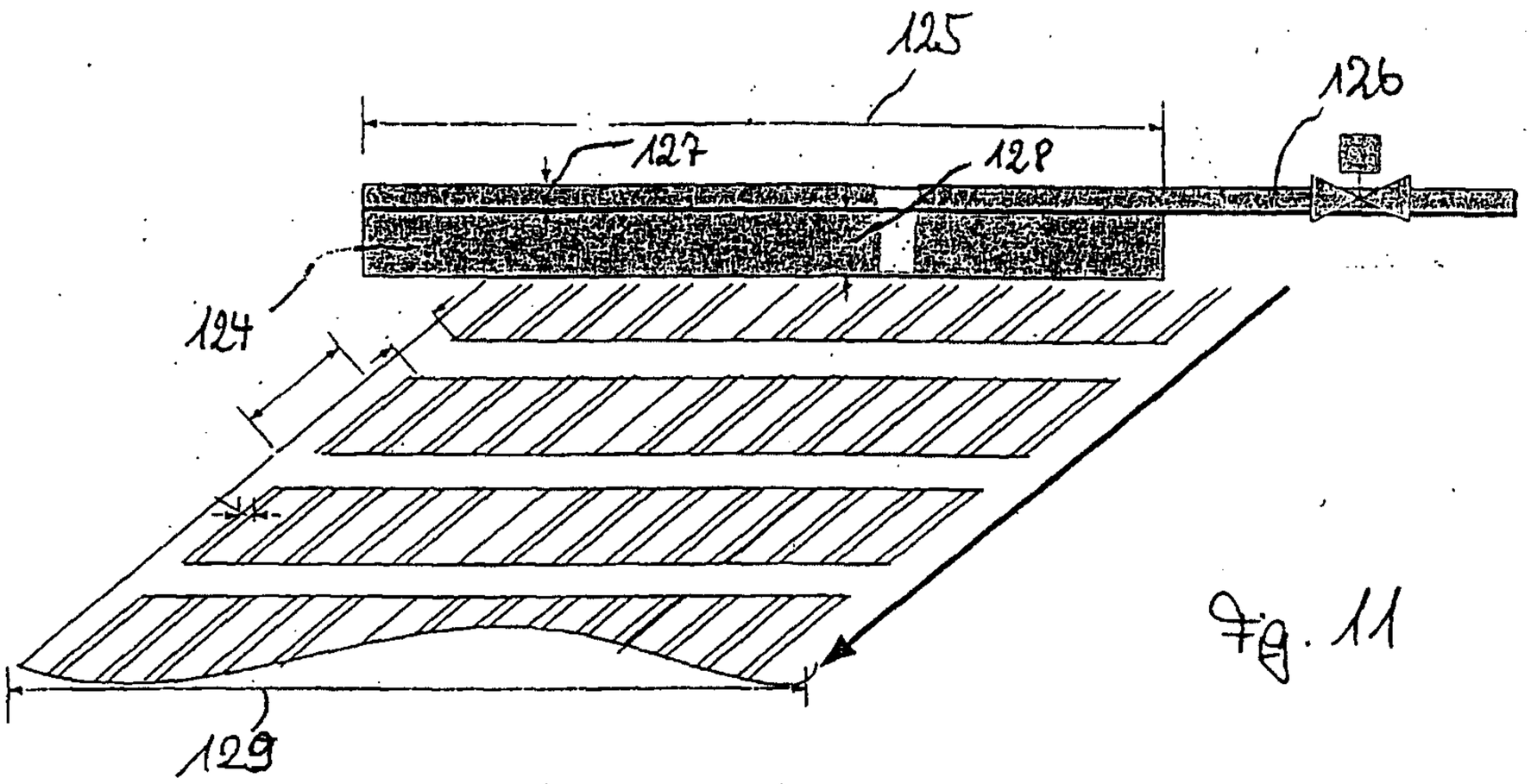


Fig. 11

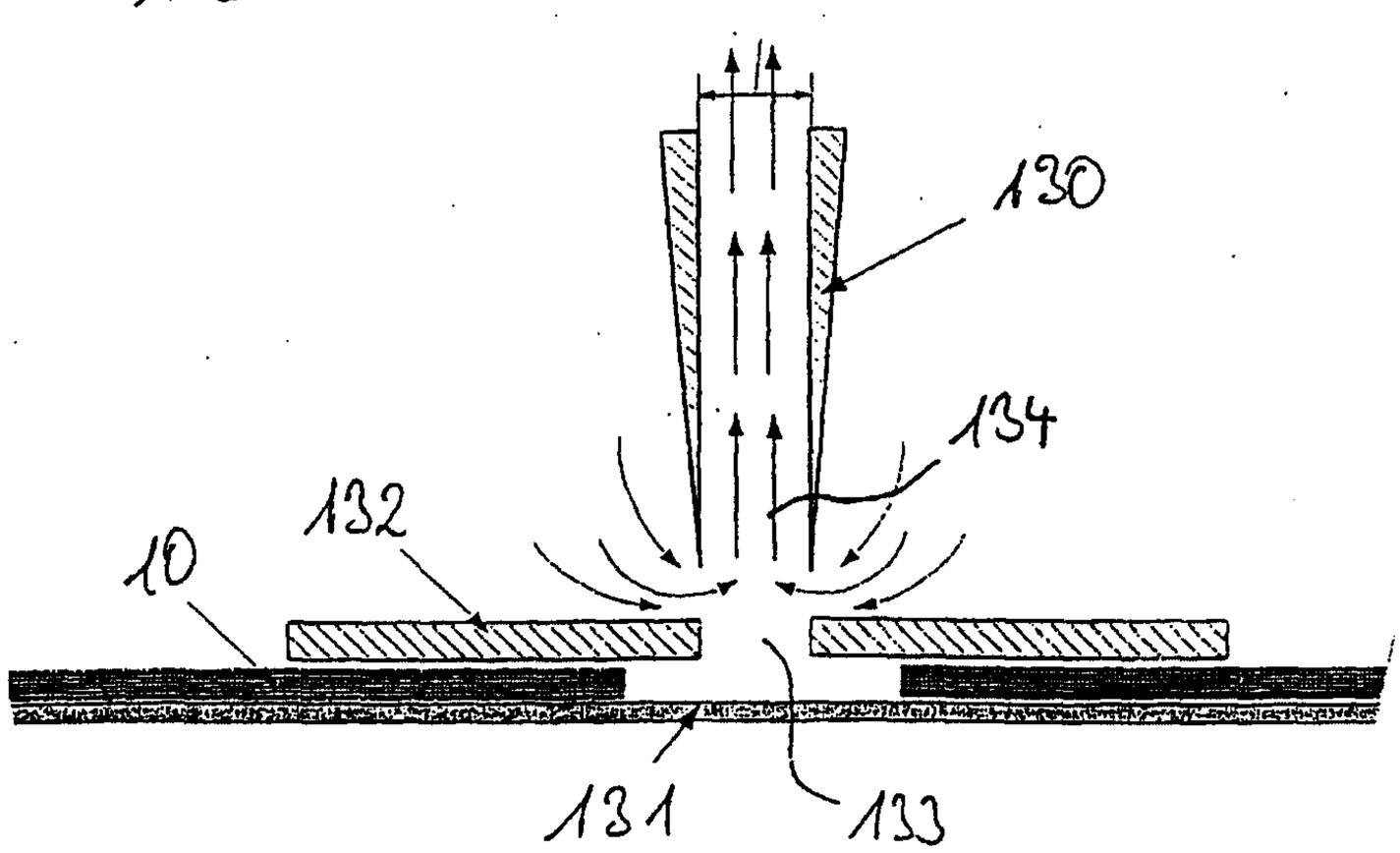


Fig. 12

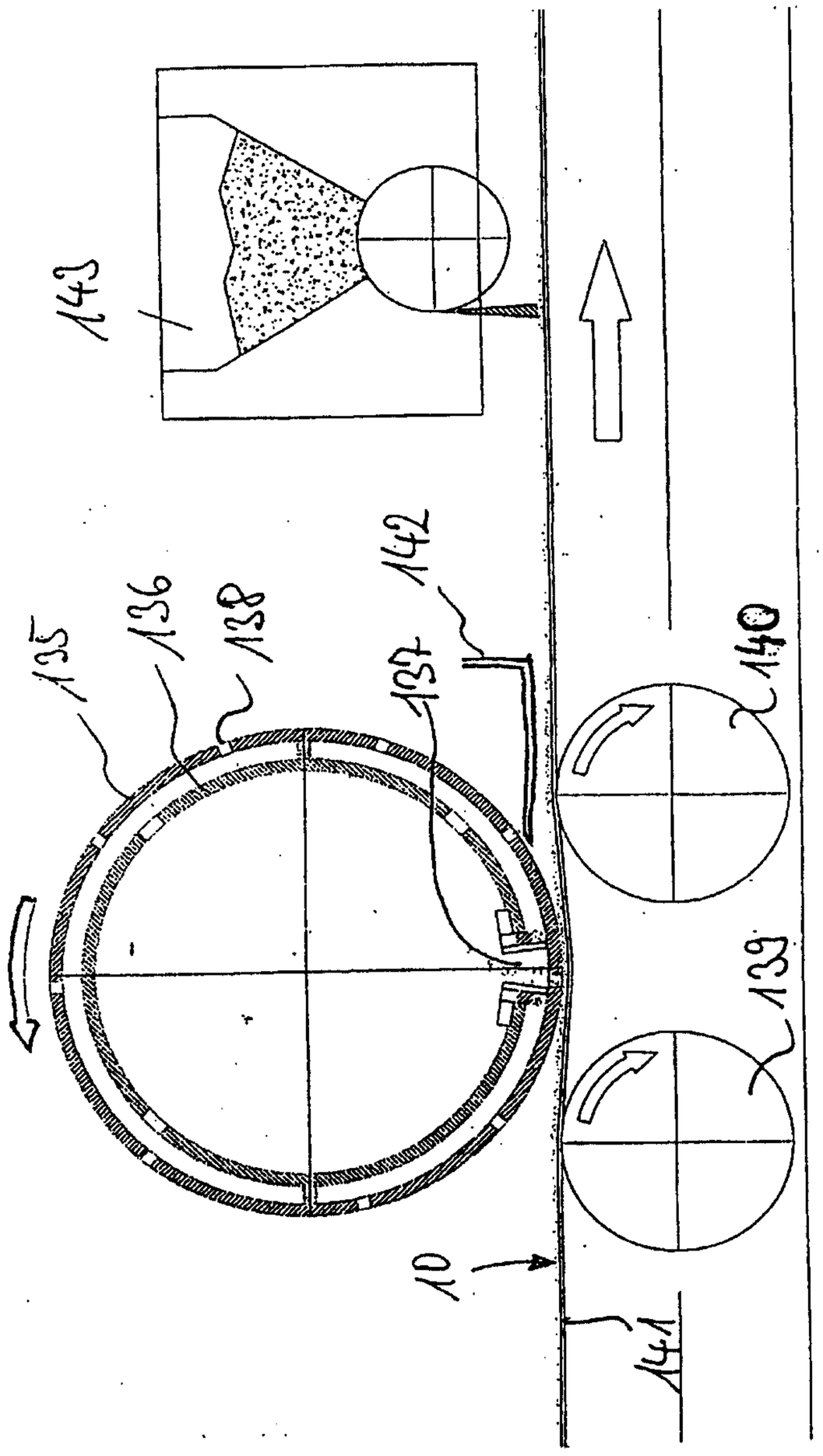


Fig. 13

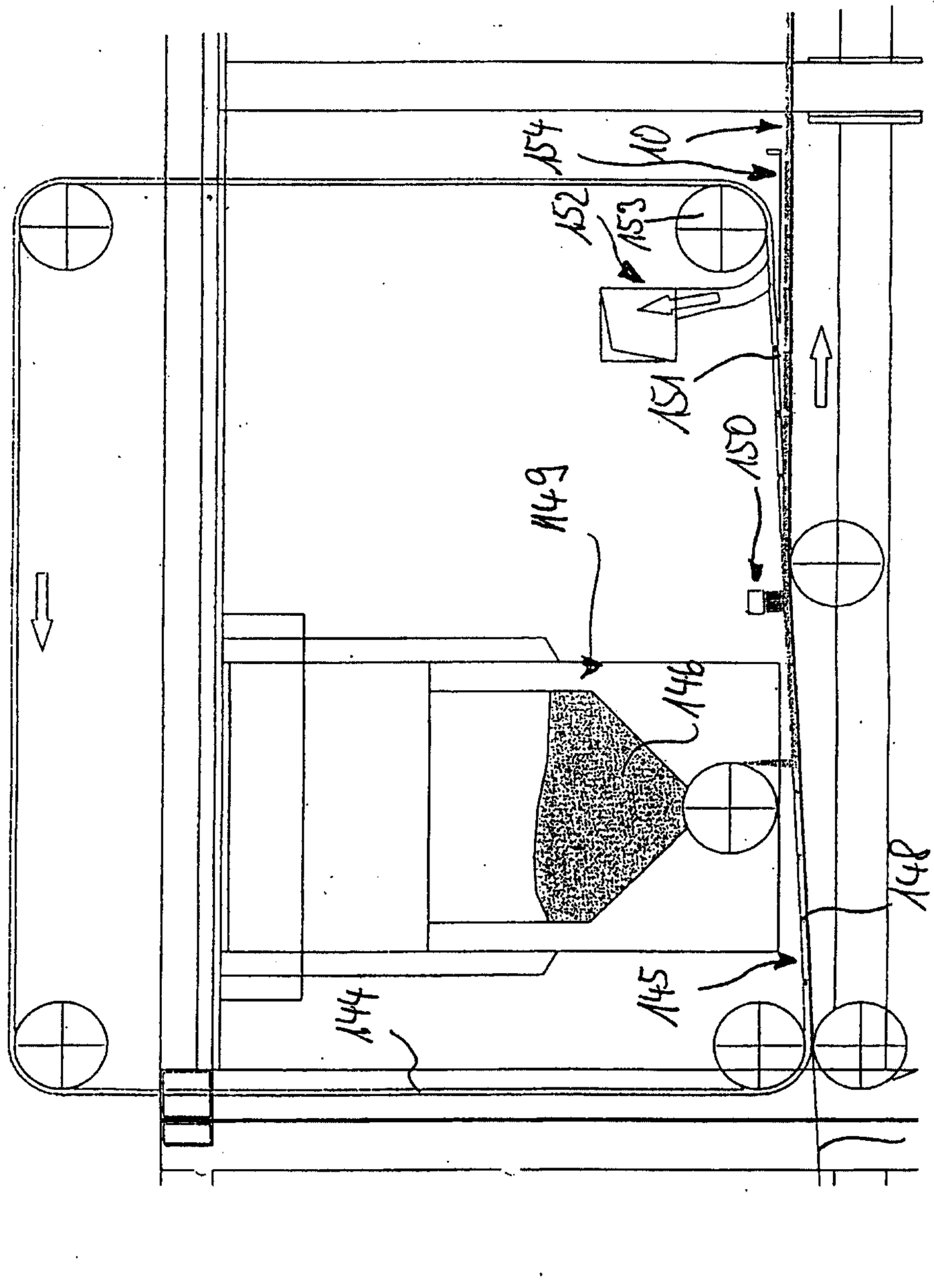


Fig. 14

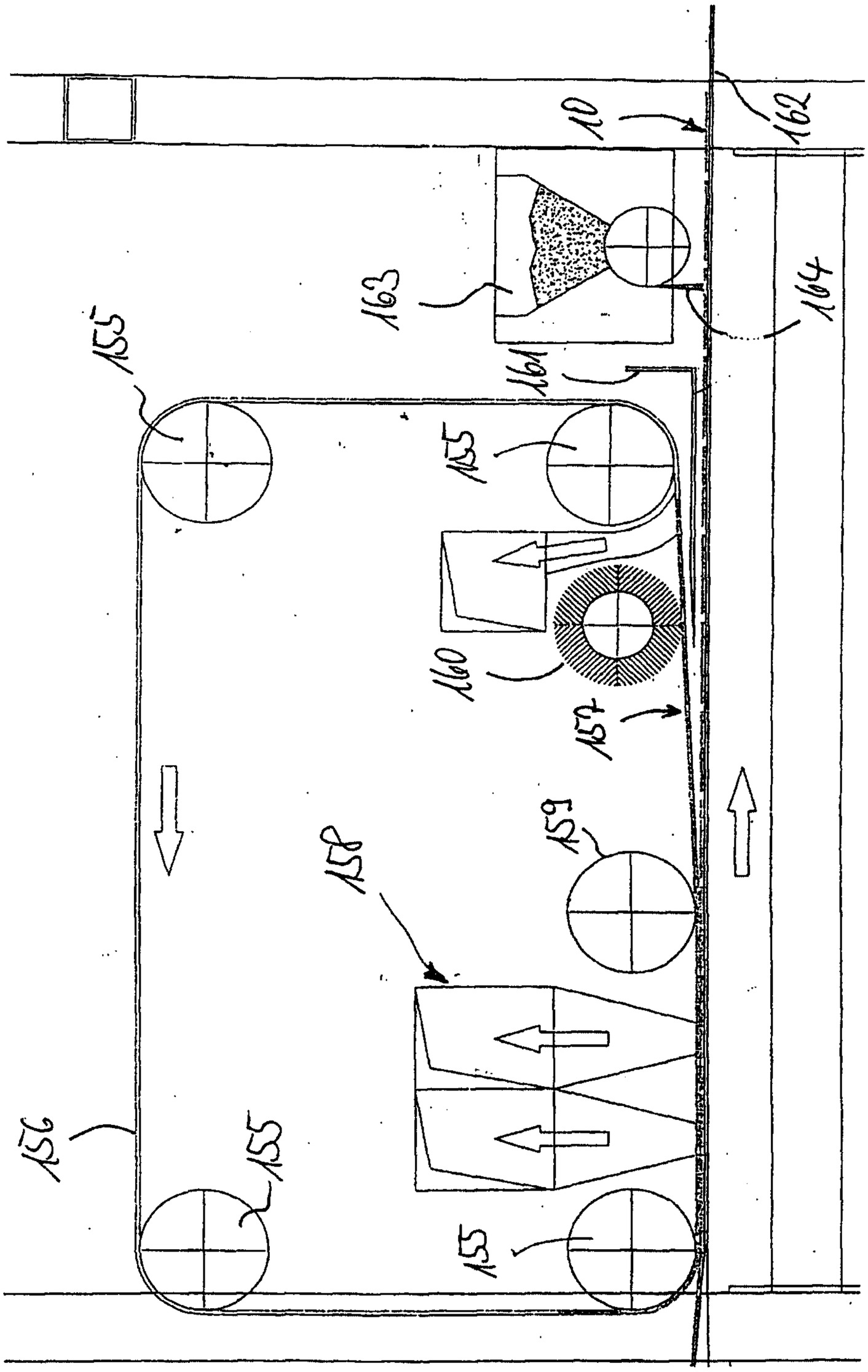


Fig. 15

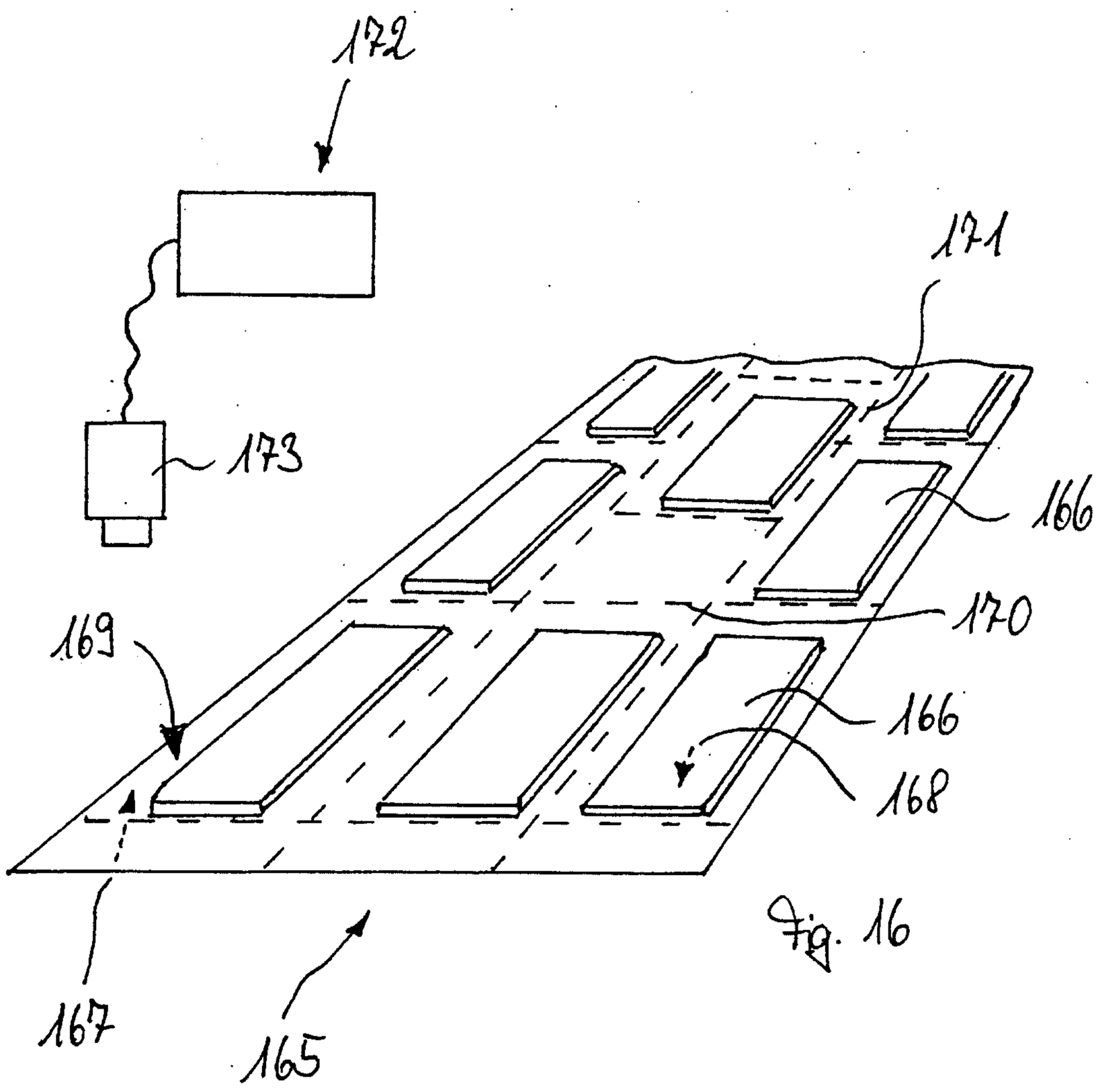
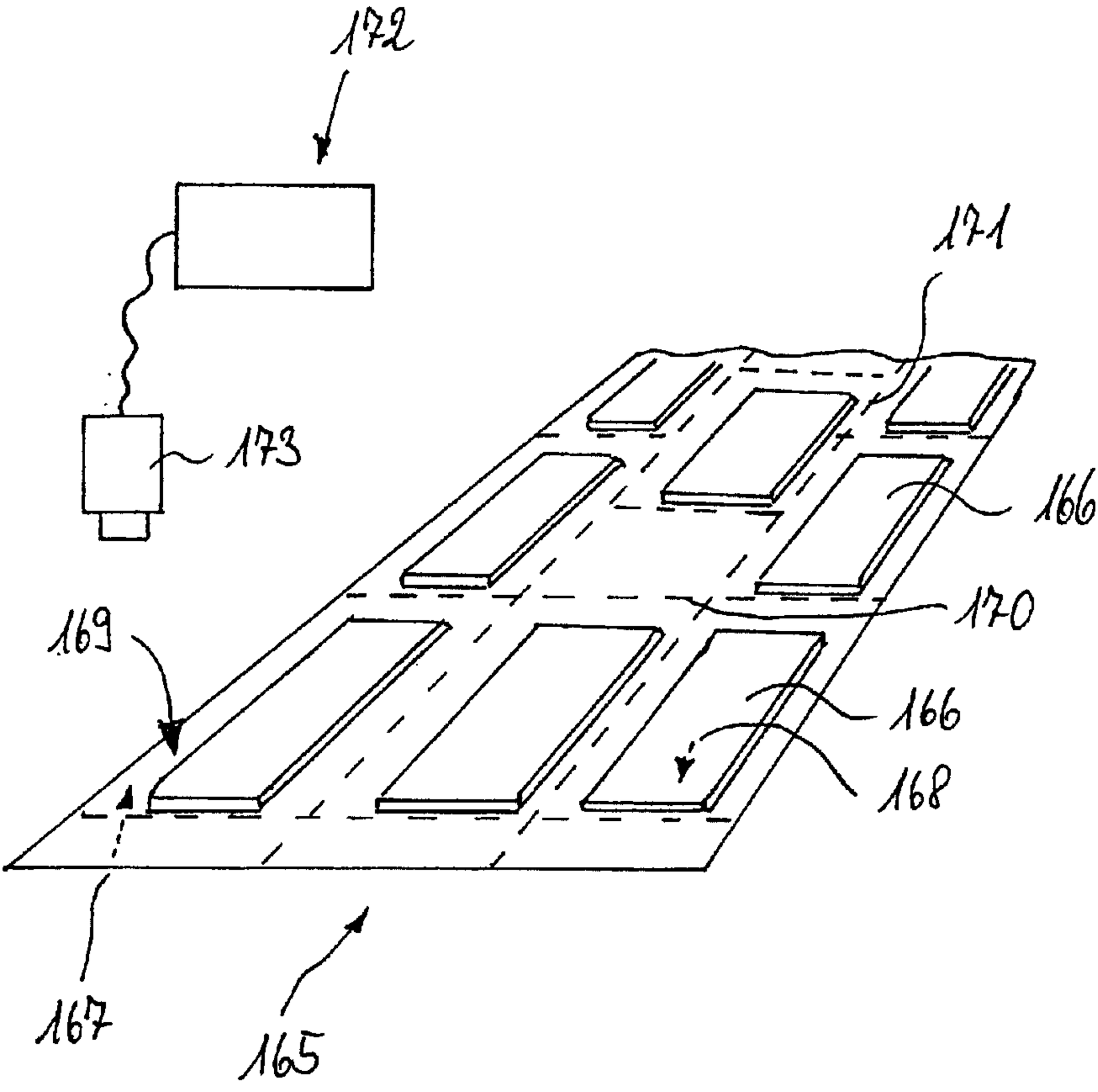


fig. 16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