

(19) **DANMARK**

(10) **DK/EP 3538405 T3**



Patent- og  
Varemærkestyrelsen

(12) **Oversættelse af  
europæisk patentskrift**

- 
- (51) Int.Cl.: **B 60 S 3/00 (2006.01)**
- (45) Oversættelsen bekendtgjort den: **2020-12-14**
- (80) Dato for Den Europæiske Patentmyndigheds bekendtgørelse om meddelelse af patentet: **2020-11-04**
- (86) Europæisk ansøgning nr.: **17797850.9**
- (86) Europæisk indleveringsdag: **2017-11-09**
- (87) Den europæiske ansøgnings publiceringsdag: **2019-09-18**
- (86) International ansøgning nr.: **AT2017000076**
- (87) Internationalt publikationsnr.: **WO2018085868**
- (30) Prioritet: **2016-11-09 DE 102016121482** **2017-04-11 DE 102017107865**  
**2017-07-13 AT 16017 U** **2017-08-18 AT 17817 U**
- (84) Designerede stater: **AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR**
- (73) Patenthaver: **Airffect GmbH, Graben 16 , Habsburgergasse 2/Top 3 und 3A, 1010 Wien, Østrig**
- (72) Opfinder: **PASCHING, Andreas, Gusenleithnergasse 4/11/2/8, 1140 Wien, Østrig**
- (74) Fuldmægtig i Danmark: **Zacco Denmark A/S, Arne Jacobsens Allé 15, 2300 København S, Danmark**
- (54) Benævnelse: **Håndholdt blæseapparat**
- (56) Fremdragne publikationer:  
**DE-A1- 3 618 043**  
**GB-A- 2 416 673**  
**US-A- 6 021 584**  
**US-A1- 2002 129 515**  
**US-A1- 2004 143 990**  
**US-B1- 6 286 228**



## Description

The invention relates to a handheld blower device for the manual pneumatic drying of surfaces by a user of the handheld blower device, with a flat nozzle device for ejecting compressed air from the handheld blower device, a handle region, in particular a handle for manually gripping and guiding the flat nozzle device over the surface to be dried, and a conveying device for conveying the compressed air to the flat nozzle device. US 2002/129515 A1 discloses a device for drying vehicles, comprising a blower, a hose and a portable handheld blower device.

Handheld blower devices in the context of this invention are drying devices for drying wet or damp surfaces, which are guided by hand or manually by a user of the handheld blower device. Wet window panes, wet facades or washed vehicles can in particular be the wet or damp surfaces to be dried. For this purpose, the handheld blower device has a handle region where it can be held by hand by its user. The user grabs the handheld blower device there and guides it manually over the surface. The surface is pneumatically dried in that compressed or pressurized air blows the wetness or moisture present on the surface away from the surface. The air flows out of a flat nozzle device of the handheld blower device. The flat nozzle device directs the air that is ejected from the handheld blower device in a targeted manner onto the surface to be dried.

The invention is based on the object of creating a handheld blower device by means of which an excellent drying result can be achieved. With conventional handheld blower devices, however, a rather matt surface often arises after drying.

This object is achieved according to the invention with a handheld blower device for the manual, pneumatic drying of surfaces by a user, which has a flat nozzle device for ejecting compressed air from the handheld blower device onto the surface to be dried, a handle region, in particular a handle for manual gripping and manual guiding of the flat nozzle device over the surface to be dried, and a conveying device for conveying the compressed air to the flat nozzle device. The flat nozzle device is designed with a flat nozzle and the conveying device is designed with a stationary, in particular stationary, high-pressure blower.

In the handheld blower device according to the invention, the conveying device for conveying compressed air to the movable and manually guided flat nozzle device is designed by means of a high-pressure blower. The high-pressure blower compresses the air with high pressure and delivers it to the flat nozzle device. The invention thus combines a flat nozzle that is easy to move manually and thus individually orientable with a comparatively heavy, rather bulky pressure generator. The design of the high-pressure blower as a stationary device means that the high-pressure blower is accommodated in particular in a housing which is separate from the flat nozzle device and from which

the compressed air can be guided to the flat nozzle device via a flexible connection. According to a preferred embodiment, it is provided here that the conveying device comprises a flexible hose which connects the high-pressure blower to the flat nozzle device. The separate housing can be set up stationary or else be provided with rollers or the like, so that it can be moved from one stationary position to another stationary position.

As the solution according to the invention has shown, with a high-pressure blower according to the invention the amount of air can be provided at the flat nozzle device in an economical manner that is required there for the desired drying function. Furthermore, the flat nozzle device itself can be made sufficiently small and light so that it can still be moved manually by a user of the handheld blower device according to the invention. The solution according to the invention is in clear contrast to conventional drying devices, such as a hair dryer, in which a low-pressure fan or at best a medium-pressure fan with a pressure of less than 10 mbar is used as the conveying device.

However, the solution according to the invention is also in contrast to other conventional drying devices, for example on automobile washing systems, because there the flat nozzle device cannot be moved manually and individually oriented.

The high-pressure blower according to the invention advantageously has a maximum pressure or a maximum counter pressure of greater than 150 mbar, preferably of between 150 and 600 mbar, in particular between 150 and 500 mbar.

The high-pressure blower according to the invention particularly advantageously has a maximum counter pressure of greater than 250 mbar, preferably of between 250 and 450 mbar, in particular of between 250 and 400 mbar.

The current consumption of the high-pressure blower according to the invention is preferably about 400 V and its power consumption is advantageously between 3 and 10 kW, preferably between 5 and 10 kW. The high-pressure blower according to the invention is particularly preferably designed as a side channel compressor. A side channel compressor is actually particularly advantageous in suction operation, but according to the invention it is used in blowing operation. For the invention, the side channel compressor advantageously offers a higher compression and delivery rate than conventional axial or radial fans.

A side channel compressor contains a rapidly rotating impeller. The impeller is arranged at a certain distance from an enclosing housing. This area is called the side channel. The mode of operation is the same as with several radial fans connected in series. The conveyed air flows laterally between the conveying blades of the paddle wheel and is accelerated by the rapid rotation (centrifugal force)

simultaneously in the direction of rotation and outwards into the side channel. This compresses the air. In the side channel, the compressed air reaches the side again between a next cell of conveyor blades. The air rotates between the inlet and the outlet of the side channel compressor several times between the conveyor blade and the side channel and is compressed several times in one revolution of the impeller. The pressure rise is approximately linear over the length of the side channel.

A side channel compressor works wear-free, as no moving part touches the housing. Compared to centrifugal fans, the requirements for the shape of the outlet duct are minimal. With a side channel compressor, a smaller structure can also be achieved, which is particularly advantageous with the solution according to the invention. The solution according to the invention is therefore also advantageously designed with a side channel compressor as a high-pressure blower, which is arranged to be manually movable together with the flat nozzle device of the handheld blower device.

According to the invention, the high-pressure blower is preferably arranged in a stationary manner.

In this context, "stationary" is understood to mean an arrangement in which the high-pressure blower is at least placed on a base and is at most largely horizontally movable thereon. Such a base can in particular be a trolley that can be moved together with the high-pressure blower.

Otherwise, the high-pressure blower according to the invention is preferably arranged in a completely stationary and thus immovable manner. As such, the high-pressure blower can have a large delivery rate and a high delivery pressure.

Furthermore, in the handheld blower device according to the invention with the high-pressure blower, a volume flow through the flat nozzle device of 200 to 1000 m<sup>3</sup>/h, preferably 300 to 850 m<sup>3</sup>/h, preferably 350 to 500 m<sup>3</sup>/h, preferably 350 to 450 m<sup>3</sup>/h, especially 400 up to 420 m<sup>3</sup>/h, is created. Alternatively, a volume flow of 50 to 500 m<sup>3</sup>/h is created with the high-pressure blower through the flat nozzle device. For this purpose, the drive motor of the high-pressure blower is connected to a control device which is set to drive the high-pressure blower to generate a corresponding volume flow.

When drying surfaces pneumatically with the help of compressed air, the difficulty lies in designing the parameters for air application on the surface in such a way that the amount of air applied per unit of time ensures a quick drying result, but the impulse applied by the air flow to the water droplets is not as strong so that the water droplets are atomized. If the water droplets adhering to the surface are atomized or broken up, the resultant water mist can no longer be completely and quickly removed from the surface. This leads to an incomplete drying result and a cloudy surface. Tests have shown that the choice of a suitable flow rate is an important parameter in order to optimize the air application to the surface. According to the invention, it is provided in this context that with the high-pressure

blower through the flat nozzle device a flow velocity of 50 to 300 m/s, preferably 100 to 200 m/s, preferably 100 to 150 m/s, in particular 120 to 130 m/s, is created. This is preferably the speed measured directly at the nozzle outlet. This air flow leads to optimal drying results. The desired flow rate is set for a given volume flow by choosing a nozzle with a suitable outlet area.

A particularly preferred embodiment provides that the high-pressure blower creates a volume flow of 300 to 650 m<sup>3</sup>/h through the flat nozzle device and the outlet area of the flat nozzle is selected to achieve a flow rate of 100 to 200 m/s measured directly at the nozzle outlet.

It is preferably provided that the high-pressure blower creates a volume flow of 350 to 450 m<sup>3</sup>/h through the flat nozzle device and that the outlet area of the flat nozzle is selected to achieve a flow rate of 100 to 150 m/s measured directly at the nozzle outlet.

It is preferably provided that a volume flow of 400 to 420 m<sup>3</sup>/h is created with the high-pressure blower through the flat nozzle device and the outlet area of the flat nozzle is selected to achieve a flow rate of 120 to 130 m/s measured directly at the nozzle outlet.

Since the flat nozzle device is usually not held directly on the surface to be dried, but at a distance (albeit as small as possible), a preferred embodiment provides that with the high-pressure blower through the flat nozzle device, a flow velocity of 40 to 100 m/s, preferably 50 to 90 m/s, preferably 60 to 80 m/s, in particular 70 to 80 m/s, is created, as measured at distance of 7 cm in the flow direction from the nozzle outlet.

The conveying device is preferably also designed with a flexible hose. The hose diameter of the flexible hose is preferably between 30 and 100 mm, preferably between 40 and 100 mm, preferably between 50 and 90, in particular between 50 to 70 mm. The hose length is preferably selected between 5 and 10 m, in particular between 7 and 9 m. With the high-pressure blower according to the invention, a flow velocity of 20 to 100 m/s, preferably 30 to 90 m/s, in particular 60 to 80 m/s, is created in the hose. The hose of this type between the conveying device and the flat nozzle device is comparatively easy to handle and at the same time, together with the flat nozzle device, creates the appropriate counter pressure for the conveyor device according to the invention.

The flow rate of the air at the nozzle outlet is determined by the volume flow and the outlet area of the flat nozzle. An increase in the outlet area leads to an increase in the volume flow. An increase in the outlet area leads to a decrease in the flow velocity. In this context, a preferred embodiment provides that the flat nozzle is designed with a flat nozzle slot which has an outlet area of 500 to 1500 mm<sup>2</sup>, preferably 700 to 1200 mm<sup>2</sup>, in particular 850 to 950 mm<sup>2</sup>.

The flat nozzle device of the handheld blower device according to the invention is created with a flat nozzle which is preferably designed with an outlet width of 100 to 300 mm, preferably 150 to 250 mm, preferably 150 to 200 mm, in particular 175 to 185 mm.

The flat nozzle is particularly preferably designed with an outlet height of 0.5 to 20 mm, preferably 2 to 8 mm, in particular 4 to 6 mm, in particular approx. 5 mm. Such a flat nozzle device is inexpensive to manufacture, easy to handle and at the same time leads to excellent drying results.

The outlet height and the outlet width are preferably selected within the above-mentioned ranges in such a way that the above-mentioned preferred values of the outlet area result.

In order to ensure that an air jet that is as flat and wide as possible is applied to the surface to be dried, it is preferably provided that the flat nozzle is designed with an essentially rectangular flat nozzle slot whose ratio of outlet width to outlet height is from 25 to 60, preferably from 30 to 40, in particular from 33 to 38. As a result, the air can optimally provide a drying effect that is not just punctual. In addition, controlled and uniform properties of the air application can be ensured over the entire area where the air meets the surface. This is especially true if the flat nozzle is held in such a way that the outlet width extends parallel to the surface to be dried.

A handle shell for holding the flat nozzle device by the user can preferably be formed on the flat nozzle. The handle shell can be located on the flat nozzle device in the immediate vicinity of its flat nozzle and thus enables the user of the flat nozzle device to guide and align the flat nozzle precisely. This is particularly important because, as tests according to the invention have shown, the user has to guide the flat nozzle very specifically over the surface to be dried in order to achieve an excellent drying result. With the solution according to the invention, in addition to water droplets, water-dust particles and dust particles alone can be removed from surfaces, so that the respective surface is dried and cleaned.

The flat nozzle device according to the invention is preferably designed with a tube for feeding the compressed air to the flat nozzle and the flat nozzle is also designed with a flat nozzle slot which is inclined at an angle of less than  $90^\circ$  with respect to the longitudinal axis of the tube. The flat nozzle slot oriented in this way deliberately does not extend transversely or at right angles to the longitudinal axis of the tube that carries the compressed air, but is aligned inclined to this longitudinal axis. This means that the air that is brought in is deflected to the side at the flat nozzle. In this way, it is easier for a user of the flat nozzle device to dry both a surface that extends horizontally and to dry a surface that extends vertically. With both surfaces, the flat nozzle designed in this way according to the invention can be brought to the surface in a simple manner so that the water on the surface both is blown away

in the direction of movement and is pushed transversely to the direction of movement to the side to another row to be passed over with the air expelled there.

The flat nozzle slot is particularly preferably oriented inclined at an angle between  $45^\circ$  and  $75^\circ$  with respect to the longitudinal axis of the tube. The flat nozzle slot is particularly preferably oriented inclined at an angle of  $60^\circ$  with respect to the longitudinal axis of the tube. With such an orientation, on the one hand, the surface to be dried is particularly advantageously blown at, if it extends horizontally or vertically and, on the other hand, such a flat nozzle device is particularly easy to handle for the user. In addition, it has been shown that with such an orientation of the flat nozzle slot, the air flowing out there is oriented in a particularly advantageous manner. The air flowing out is then deflected within the flat nozzle in such a way that it exits more strongly on one side of the flat nozzle slot. A particularly strong drying effect occurs on this side of the flat nozzle slot. On the other hand, less air flows out on the other side of the flat nozzle slot, but more and more transverse to the longitudinal axis of the tube. This air creates a lateral flow, by means of which the liquid on the surface to be dried is increasingly pushed to the side.

The flat nozzle slot ends particularly advantageously with one of its two ends within the projection surface of the tube. If one looks at the tube in the direction of the longitudinal axis thereof, the flat nozzle slot ends at a first end within the projection surface, while its other, second end projects beyond the projection surface. The first end is the side on which the air emerges strong and straight and dries accordingly. The second end, on the other hand, forms the side on which the air is strongly deflected, emerges directed to the side and thus pushes the liquid on the surface to the side.

The flat nozzle slot is also advantageously formed on a flat nozzle fan which is designed in the shape of an equilateral triangle. This equilateral shape is obtained when looking from the side onto the flat nozzle device and the associated tube with the flat nozzle arranged on it. With such an equilateral triangular shape, it is achieved that the compressed air coming from the tube is passed straight on in one area of the flat nozzle, namely in the base of the triangular shape, whereas it is deflected comparatively strongly in the tip of the triangular shape.

The flat nozzle device is also preferably again designed with a tube for feeding the compressed air to the flat nozzle and the handle is oriented inclined at an angle of less than  $90^\circ$ , preferably at an angle between  $45^\circ$  and  $75^\circ$ , particularly preferably at an angle of  $60^\circ$ , with respect to the longitudinal axis of this tube. The handle oriented in this way is very comfortable for the user of the flat nozzle device according to the invention to grip and at the same time gives him clear and precise feedback on how the air flows out at the associated flat nozzle and what distances must be maintained there from the surface to be dried.

A preferred embodiment provides that the flat nozzle has at least one partition wall which divides the flat nozzle slot in the longitudinal direction into at least two slot portions. The at least one partition wall connects the two parallel boundary walls of the flat nozzle slot and keeps them at the structurally predetermined distance from one another. The at least one partition wall prevents the flat nozzle slot from widening in the sense of an increase in the outlet height of the slot due to the pressure of the compressed air flowing out.

In principle, the number of partition walls can be freely selected, the partition walls preferably being arranged distributed uniformly over the length of the flat nozzle. A design with a single partition wall is preferred which, as a middle partition wall, divides the flat nozzle into two longitudinal sections of equal length.

The at least one partition wall is preferably arranged directly at the nozzle outlet and can have a small extension in the direction of the air flow.

At its end facing away from the nozzle slot, the at least one partition wall preferably has a leading edge or surface which is curved, in particular concavely curved. This not only leads to a reduction in the development of noise, but also results in that the air flow emerging separately from the longitudinal sections of the nozzle slot is combined into a homogeneous continuous air flow instead of acting as separate air flows. This ensures effective drying of the surface to be dried even in the narrow area of the partition wall.

Another preferred development of the flat nozzle provides that it has a flexible element, in particular a flexible lip, on its outlet-side edge, which serves to protect the surface to be dried from damage in the event of the flat nozzle touching or colliding with the surface. A flexible lip is preferably arranged in each case on the two parallel longitudinal edges of the flat nozzle at the nozzle outlet and preferably extends essentially over the entire length of the longitudinal edges. In particular, the flexible lip extends over the entire circumference of the flat nozzle slot.

The flexible element can consist of a flexible plastic material, such as silicone or the like.

An exemplary embodiment of a solution according to the invention is explained in more detail below with reference to the accompanying schematic drawings. Therein,

- Fig. 1 shows a side view of an embodiment of a handheld blower device according to the invention,
- Fig. 2 shows a front view of the handheld blower device according to FIG. 1 with its housing,
- Fig. 3 shows the front view according to FIG. 2 in an enlarged representation with the housing open,
- Fig. 4 shows a side view of an embodiment of a flat nozzle device for the handheld blower device according to FIGS. 1 to 3,

Fig. 5 shows a front view of the flat nozzle slot,

Fig. 6 shows a sectional view along the line VI-VI of FIG. 5,

Fig. 7 shows a modified design of a handheld blower device and

Fig. 8 shows an exploded view of the handheld blower device according to FIG. 7.

In Fig. 1 to 3, a handheld blower device 10 is shown for the pneumatic drying of surfaces such as motor vehicles or building glazing. The handheld blower device 10 has a stationary part 12 shown on the left in FIG. 1 and a movable part 14 shown on the right in FIG. 1.

The stationary part 12 comprises a stationary, cubic housing 16 and a stationary holding device 18 arranged next to it. This is formed with two vertical support posts 19 and arm carrier 20 protruding horizontally therefrom.

The movable part 14 comprises a flexible hose 21 which is connected with one of its two ends to the housing 16. At the other end of the hose 21 there is a manually movable flat nozzle device 22.

The housing 16 and its contents are shown in more detail in FIG. 3. At the top of the housing 16 there is an air inlet 24 which is provided with a frustoconical filter 26. The filter 26 protrudes upwards from the top of the housing 16. The air inlet 24 leads through the housing 16 into the interior thereof. There is an inlet pipe 28 which leads vertically downward to a high-pressure blower 30. The high-pressure blower 30 is designed as a side channel compressor or side channel blower and, during operation, generates a delivery pressure of greater than 100, in particular greater than 250 mbar. It is driven by an electric motor 31 which has a current consumption of 400 V and a power consumption between 3 and 10 kW, in particular between 5 and 10 kW. The motor 31 is arranged in the center of the housing 16 with a vertically oriented axis of rotation. A substantially torus-shaped conveyor channel 32 of the high-pressure blower 30 with the (inner) side channel contained therein is aligned in a horizontal plane, that is to say parallel to an installation surface 33. The high-pressure blower 30 is attached or fastened directly to the installation surface 33 and the housing 16 has no housing base all around. In this way, the arrangement is statically particularly stable and acoustically particularly damped. Furthermore, the arrangement is particularly advantageous to clean.

In the interior of the housing 16 there is also a control device 36 for the motor 31, which is operatively coupled to it by means of an electrical line 38 to the motor 31 and which is furthermore coupled to an external power source (not shown) by means of an electrical supply line 39. On the outside, where the control device 36 is arranged on the inside, there is a control panel 40 on the housing 16. On the control panel 40, the control device 36 can be operated by a user of the handheld blower device 10 by means of a coin payment device 42 and an emergency stop switch 44.

An outlet pipe 34, which leads vertically upward to an air outlet 35, is also connected to the conveyor channel 32 of the high-pressure blower 30. The air outlet 35 penetrates the housing 16 on its upper side. On the outside, the flexible hose 21 is then connected with one of its two ends to the air outlet 35. The hose 21 has a hose diameter of between 30 and 100 mm, in particular between 50 and 100 mm, in particular between 50 and 70 mm or between 70 and 90 mm. The hose length is between 5 and 10 m, in particular between 7 and 9 m. With the high-pressure blower 30, a flow rate of compressed air of 5 to 100 m/s, in particular of 20 to 100 m/s, in particular of 40 to 80 m/s or 50 to 90 m/s, is generated in the hose 21.

The flat nozzle device 22 located at the other end of the hose 21 comprises a tube 46 approximately 50 cm long, the diameter of which corresponds to that of the hose 21. Two handles 48 or, alternatively, only one handle are attached to the tube 46 protruding radially. By means of the handles 48, an operator of the handheld blower device 10 can grip the flat nozzle device 22 and guide it manually.

At the end of the tube 46 facing away from the hose 21 there is a flat nozzle 50 which is designed as a flat nozzle. The flat nozzle has a straight flat nozzle slot 52 with an outlet width of 100 to 250 mm, in this case 180 mm, and an outlet height of 0.5 to 20 mm, in particular from 1 to 10 mm, in this case 5 mm.

In FIG. 4, an exemplary embodiment of the flat nozzle device 22 is shown, which is also designed with a tube 46 and a flat nozzle 50 attached to its end. The flat nozzle 50 has a flat nozzle slot 52 which is inclined or aligned obliquely with respect to a longitudinal axis 54 of the tube 46. The flat nozzle slot 52 assumes an angle 56 of 60° to the longitudinal axis 54. The flat nozzle slot 52 is not located symmetrically to the tube 46, but is arranged eccentrically with respect to its projection surface 58. A first end region or a first end 60 of the flat nozzle slot 52 extends completely within the projection surface 58, while a second end region or a second end 62 projects beyond the projection surface 58. In this way, the flat nozzle 50 is designed overall as a nozzle fan 64 which, viewed from the side, as shown in FIG. 4, essentially has the shape of an equilateral triangle.

A flat nozzle tube 66 extends from this nozzle fan 64 towards the tube 46, the diameter of which is slightly larger than that of the tube 46 and which is fit onto the tube 46 in this way. On this flat nozzle tube 66 there is a handle shell 68 on the side facing downward in relation to FIG. 4, the so-called underside of the flat nozzle device 22. The handle shell 68 engages around the air-conducting tube 46 itself and rests flat against its outer surface approximately over half the circumference. At the same time, on this underside of the flat nozzle device 22 at the other end of the tube 46, there is a handle tube 70 which is also fitted onto the tube 46. The handle 48 protrudes downward on this handle tube 70, specifically also at an angle 56 of 60° with respect to the longitudinal axis 54 of the tube 46.

With the handle 48 and the handle shell 68, there are two handling areas on the flat nozzle device 22 for the user, by means of which the flat nozzle device 22 can be guided in a particularly advantageous and safe manner over a surface to be dried or cleaned.

The front view of the outlet opening of the flat nozzle 50 according to FIG. 5 shows a preferred embodiment of the flat nozzle 50 in which a middle partition wall 72 connects the upper and lower walls delimiting the flat nozzle slot 52. The middle partition wall 72 divides the flat nozzle slot 52 into a slot section 74 and a slot section 76. The middle partition wall 72 holds the upper and lower walls at a predetermined distance from one another.

As shown in the sectional view according to FIG. 6, the middle partition wall 72 can have a concavely curved leading edge 78 in order to avoid acoustic excitation. This can counteract the occurrence of unpleasant whistling noises.

FIG. 7 shows a modified design of a handheld blower device 80 which is adapted for use by commercial providers. In contrast to the design according to FIGS. 1-3, the handheld blower device 80 is not connected directly to a flexible hose, but to a rigid tube 81 extending in the vertical direction. A further pipe 83 is connected to the rigid pipe 81 via a rotating flange 82 and comprises a 90° angle, so that the tube 83 provides a horizontal projection. At the end of the tube 83 facing away from the handheld blower device 80, the latter has a further 90° angle, to which a flexible hose 84 is connected, to the end of which a flat nozzle device (not shown) can be connected. The rotating flange 82 enables the tube 83 to rotate relative to the tube 81 about a vertical axis of rotation extending in the direction of the tube axis of the tube 81, so that the flexible hose 84 including the flat nozzle device can be displaced over a large area and a vehicle arranged next to the handheld blower device 80 and below the horizontal tube 83 can be dried from all sides without any effort.

In the exploded view according to FIG. 8, the handheld blower device 80 is shown disassembled into its individual parts. The following components can be seen:

- 80 handheld blower device
- 81 tube
- 82 rotating flange
- 83 tube
- 84 hose
- 85 high-pressure blower
- 86 noise protection net
- 87 glass wool
- 88 lateral sound insulation

89	front sound insulation
90	front housing part
91	upper housing part
92	inlet pipe
93	lower left housing part
94	outlet pipe
95	base plate
96	connector support
97	rotating flange
98	control box
99	hinge
100	pipe support
101	front panel
102	closure elements
103	air filter
104	LED panel
105	backlight actuation

By means of the high-pressure blower, a volume flow of 50 to 500 m<sup>3</sup>/h or 200 to 1000 m<sup>3</sup>/h, in particular 350 to 500 m<sup>3</sup>/h or 300 to 850 m<sup>3</sup>/h, is conveyed through the flat nozzle device during operation of the handheld blower device. A flow rate of 50 to 300 m/s, in particular 100 to 200 m/s, is generated by means of the high-pressure blower through the flat nozzle device.

The handheld blower device according to the invention is not only suitable for drying surfaces, but also for cleaning or purging surfaces by means of blowing off. In particular, the handheld blower device is advantageously suitable for removing dust and sand deposits from surfaces. This function is particularly advantageous in countries around the world where surfaces quickly become dusty due to environmental influences, such as countries in the desert and steppe zones.

In addition, the handheld blower device according to the invention is advantageously provided with a heater for the compressed air that is expelled. This heater advantageously heats the air to be expelled in the direction of flow behind the high-pressure blower. It is preferably arranged in the area of the outlet pipe and designed as an electrical heater. The waste heat from the engine can also advantageously be used to warm up the air to be expelled. Using the waste heat, the expelled air can be heated to a temperature of between 30 and 50°C.

Finally, it should be noted that all the features that are mentioned in the application documents and in particular in the dependent claims, despite the formal reference made to one or more specific claims, should also be given independent protection individually or in any combination.

**List of reference numerals:**

10	handheld blower device
12	stationary part
14	moving part
16	housing
18	holding device
19	support post
20	arm carrier
21	hose
22	flat nozzle device
24	air inlet
26	filter
28	inlet pipe
30	high-pressure blower
31	engine
32	conveyor channel
33	installation surface
34	outlet pipe
35	air outlet
36	control device
38	line
39	supply line
40	control panel
42	coin payment device
44	emergency switch
46	tube
48	handle
50	flat nozzle
52	flat nozzle slot
54	longitudinal axis of the tube
56	angle
58	projection surface
60	first end of the flat nozzle slot
62	second end of the flat nozzle slot

64	nozzle fans
66	flat nozzle tube
68	handle shell
70	handle tube
72	middle partition wall
74	flat nozzle section
76	flat nozzle section
78	leading edge
80	handheld blower device
81	tube
82	rotating flange
83	tube
84	hose
85	high-pressure blower
86	noise protection net
87	glass wool
88	lateral sound insulation
89	front sound insulation
90	front housing part
91	upper housing part
92	inlet pipe
93	lower left housing part
94	outlet pipe
95	base plate
96	connector support
97	rotating flange
98	control box
99	hinge
100	pipe support
101	front panel
102	closure elements
103	air filter
104	LED panel
105	backlight actuation

## Patentkrav

1. Håndholdt blæseapparat (10) til manuel pneumatisk tørring af overflader foretaget af en bruger af det håndholdte blæseapparat (10), med en fladdyseindretning (22) til udstødning af komprimeret luft fra det håndholdte blæseapparat (10) på den overflade, der skal tørres, et gribeområde, især et greb (48) til manuelt at gribe og føre fladdyseindretningen (22) hen over den overflade, der skal tørres, og en transportindretning til transport af den komprimerede luft til fladdyseindretningen (22), hvor fladdyseindretningen (22) er udformet med en fladdyse (50), og transportindretningen er udformet med en stationært anbragt, især fast anbragt højtryksblæser (30), **kendetegnet ved, at** der med højtryksblæseren (30) gennem fladdyseindretningen (22) er tilvejebragt en volumenstrøm på 200 til 1000 m<sup>3</sup>/h og en strømningshastighed på 50 til 300 m/s.
2. Håndholdt blæseapparat ifølge krav 1, **kendetegnet ved, at** transportindretningen omfatter en fleksibel slange (21), som forbinder højtryksblæseren (30) med fladdyseindretningen (22).
3. Håndholdt blæseapparat ifølge krav 1 eller 2, **kendetegnet ved, at** der med højtryksblæseren (30) gennem fladdyseindretningen (22) er tilvejebragt en volumenstrøm på 300 til 850 m<sup>3</sup>/h, fortrinsvis på 350 til 500 m<sup>3</sup>/h, fortrinsvis 350 til 450 m<sup>3</sup>/h, især 400 til 420 m<sup>3</sup>/h.
4. Håndholdt blæseapparat ifølge et af kravene 1 til 3, **kendetegnet ved, at** der med højtryksblæseren (30) gennem fladdyseindretningen (22) er tilvejebragt en strømningshastighed på 100 til 200 m/s, fortrinsvis på 100 til 150 m/s, især 120 til 130 m/s.
5. Håndholdt blæseapparat ifølge et af kravene 1 til 4, **kendetegnet ved, at** der med højtryksblæseren (30) gennem fladdyseindretningen (22) er tilvejebragt en strømningshastighed, der måles i en afstand på 7 cm fra dyseudgangen i strømningsretningen, på 40 til 100 m/s, fortrinsvis på 50 til 90 m/s, fortrinsvis på 60 til 80 m/s, især 70 til 80 m/s.

6. Håndholdt blæseapparat ifølge et af kravene 2 til 5, **kendetegnet ved, at** der med højtryksblæseren (30) i slangen (21) er tilvejebragt en strømningshastighed på 20 til 100 m/s, fortrinsvis på 30 til 90 m/s, især på 60 til 80 m/s.
- 5 7. Håndholdt blæseapparat ifølge et af kravene 1 til 6, **kendetegnet ved, at** fladdysen (50) er udformet med en fladdyseslids (52), som har en udgangsflade på 500 til 1.500 mm<sup>2</sup>, fortrinsvis på 700 til 1.200 mm<sup>2</sup>, især på 850 til 950 mm<sup>2</sup>, og som fortrinsvis er udformet med en udgangsbredde på 100 til 300 mm, fortrinsvis på 150 til 250 mm, fortrinsvis på 150 til 200 mm, især på 175
- 10 til 185 mm, og som fortrinsvis er udformet med en udgangshøjde på 0,5 til 20 mm, fortrinsvis på 1 til 10 mm, fortrinsvis på 2 til 8 mm, især på 4 til 6 mm, især ca. 5 mm.
8. Håndholdt blæseapparat ifølge et af kravene 1 til 7, **kendetegnet ved, at**
- 15 fladdysen (50) er udformet med en i det væsentlige rektangulær fladdyseslids (52), hvis forhold mellem udgangsbredde og udgangshøjde ligger i området fra 25 til 60, fortrinsvis fra 30 til 40, især fra 33 til 38.
9. Håndholdt blæseapparat ifølge et af kravene 1 til 8, **kendetegnet ved, at**
- 20 fladdyseindretningen (22) er udformet med et rør (46) til at føre den komprimerede luft hen til fladdysen (50), og fladdysen (50) er udformet med en fladdyseslids (52), som i forhold til rørets (46) langsgående akse er orienteret skråt i en vinkel (56) på mindre end 90°, foretrukket i en vinkel (56) på mellem 45° og 75°, især i en vinkel (56) på 60°.
- 25
10. Håndholdt blæseapparat ifølge krav 9, **kendetegnet ved, at** fladdyseslidsen (52) ender inden i rørets (46) projektiionsflade (58) med en af sine to ender.
11. Håndholdt blæseapparat ifølge et af kravene 7 til 10, **kendetegnet ved, at**
- 30 fladdyseslidsen (52) er udformet på en fladdysevifte (64), som er udformet i form af en ligesidet trekant.
12. Håndholdt blæseapparat ifølge et af kravene 1 til 11, **kendetegnet ved, at**
- 35 fladdyseindretningen (22) er udformet med et rør (46) til at føre den komprimerede luft hen til fladdysen (50), og grebet (48) er orienteret skråt i forhold til

rørets (46) langsgående akse i en vinkel på mindre end 90°, foretrukket i en vinkel på mellem 45° og 75°, særligt foretrukket i en vinkel på 60°.

5 **13.** Håndholdt blæseapparat ifølge et af kravene 1 til 12, **kendetegnet ved, at** der på fladdysen (50) er udformet en gribeskal (68), som brugeren kan holde fladdyseindretningen (22) med.

10 **14.** Håndholdt blæseapparat ifølge et af kravene 1 til 13, **kendetegnet ved, at** fladdysen (50) har mindst en ribbe (72), som opdeler fladdyseslidsen (52) i den langsgående retning i mindst to slidsafsnit (74,76).

**15.** Anvendelse af et håndholdt blæseapparat ifølge et af kravene 1 til 14 til manuel pneumatisk tørring af overflader, især karosseriet af et køretøj.

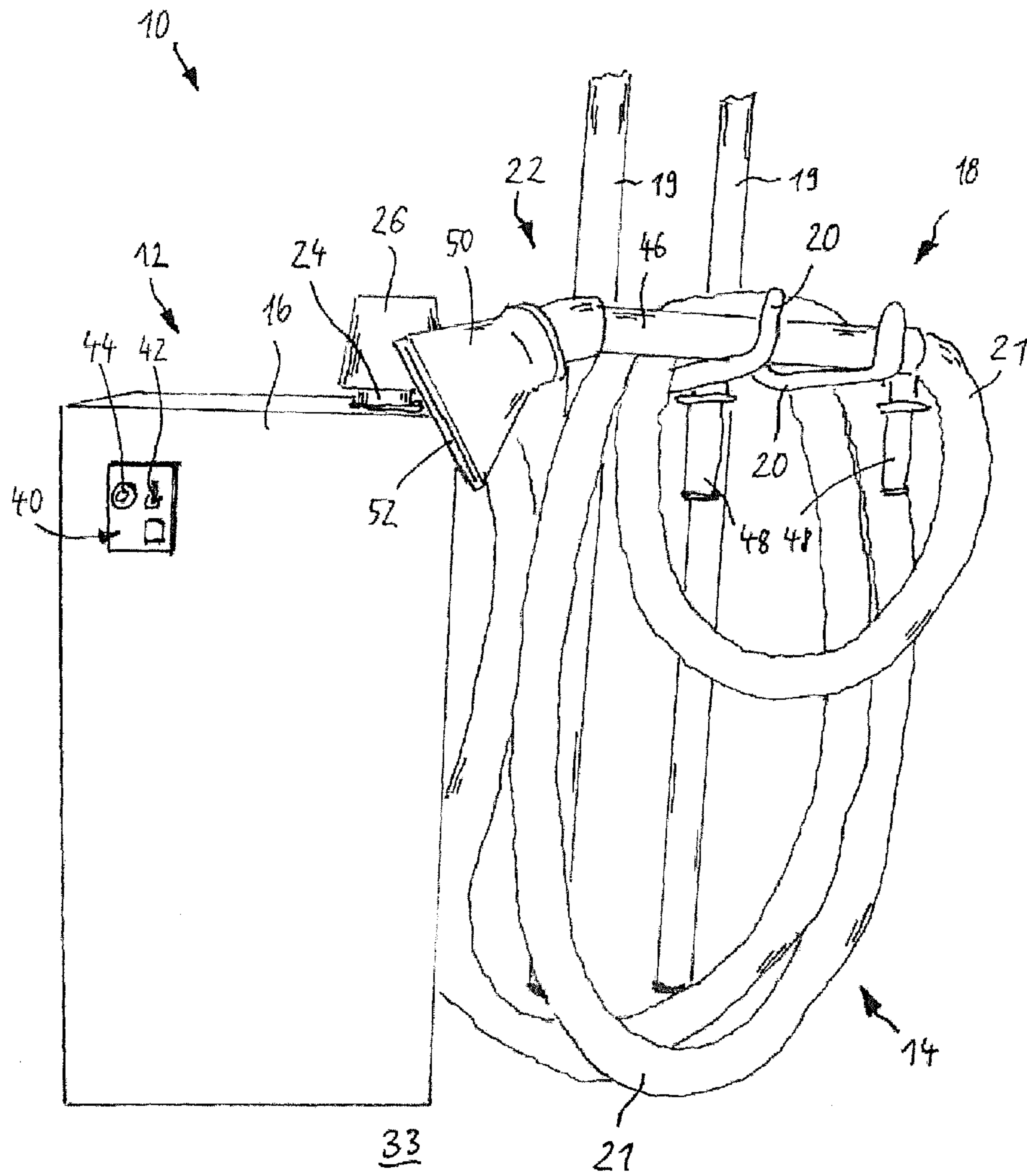


Fig. 1

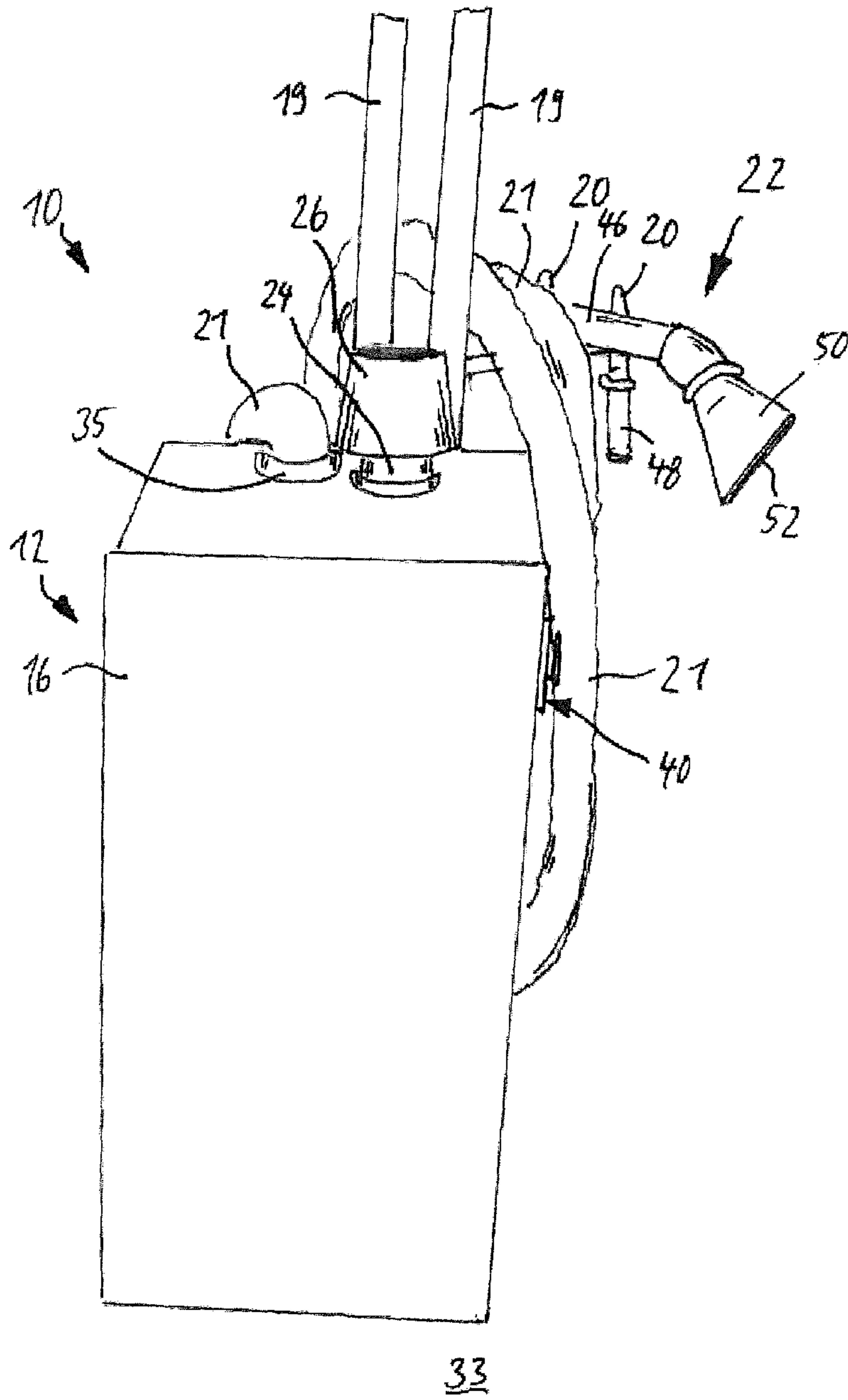


Fig. 2

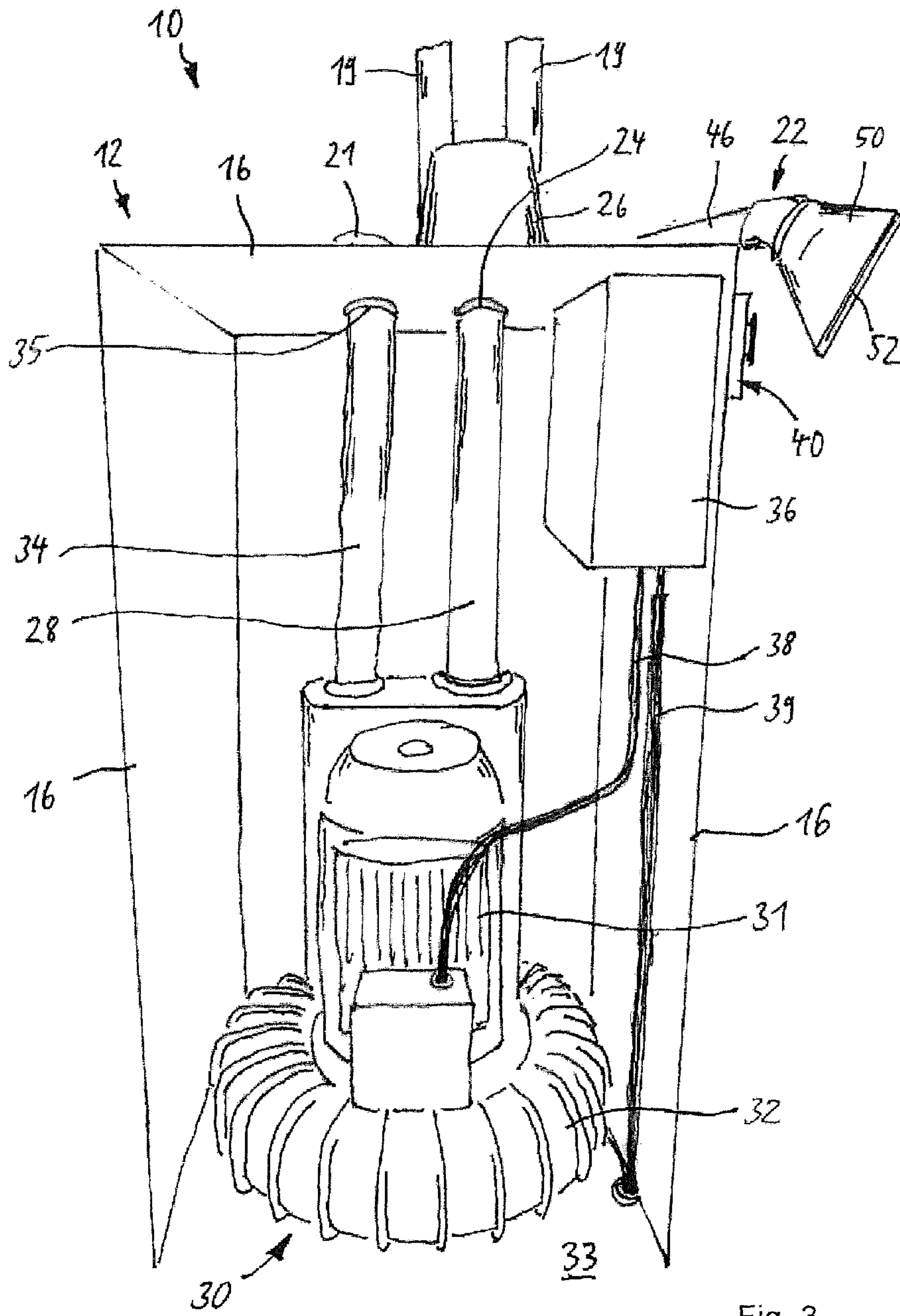


Fig. 3

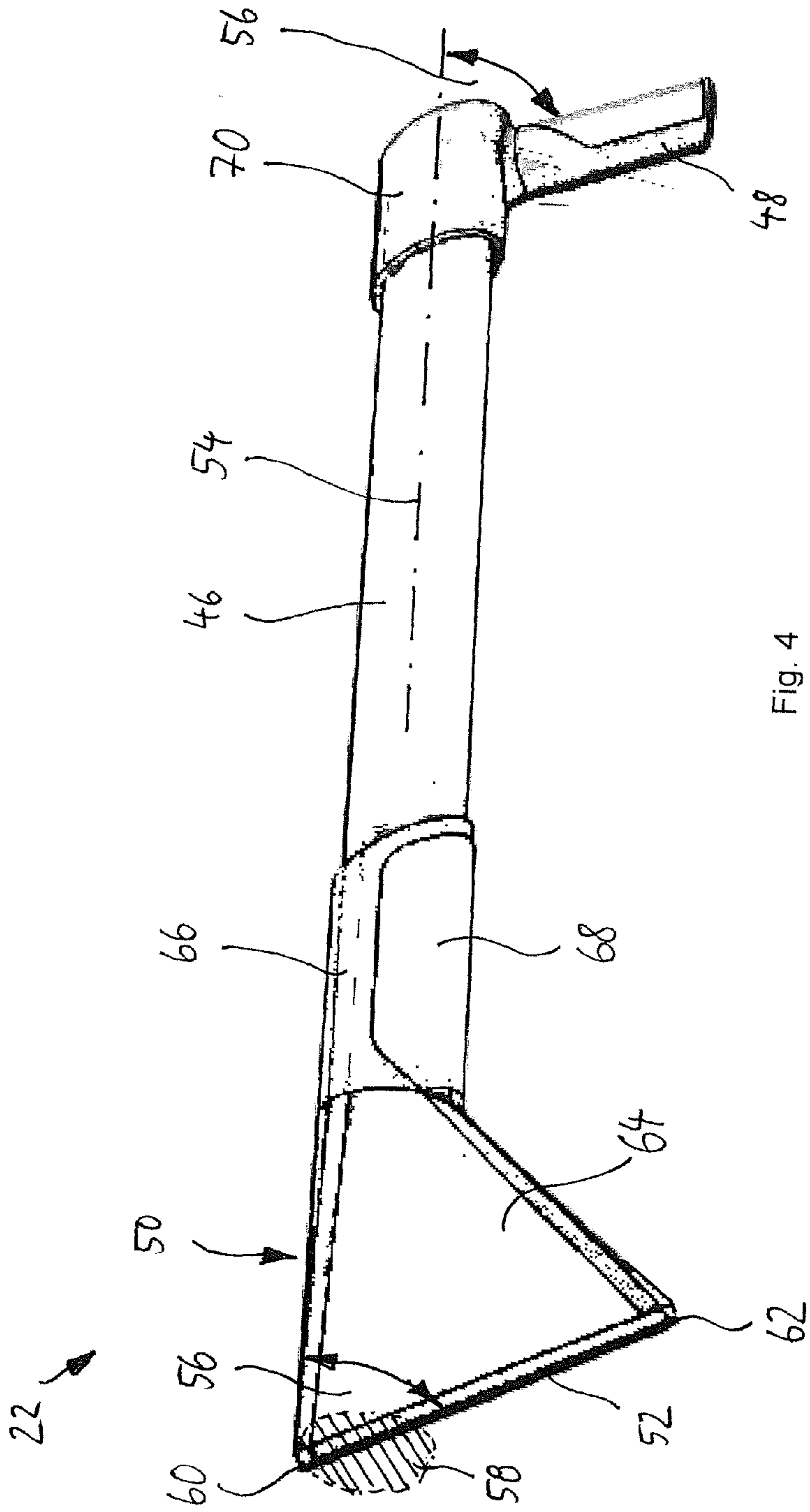


Fig. 4

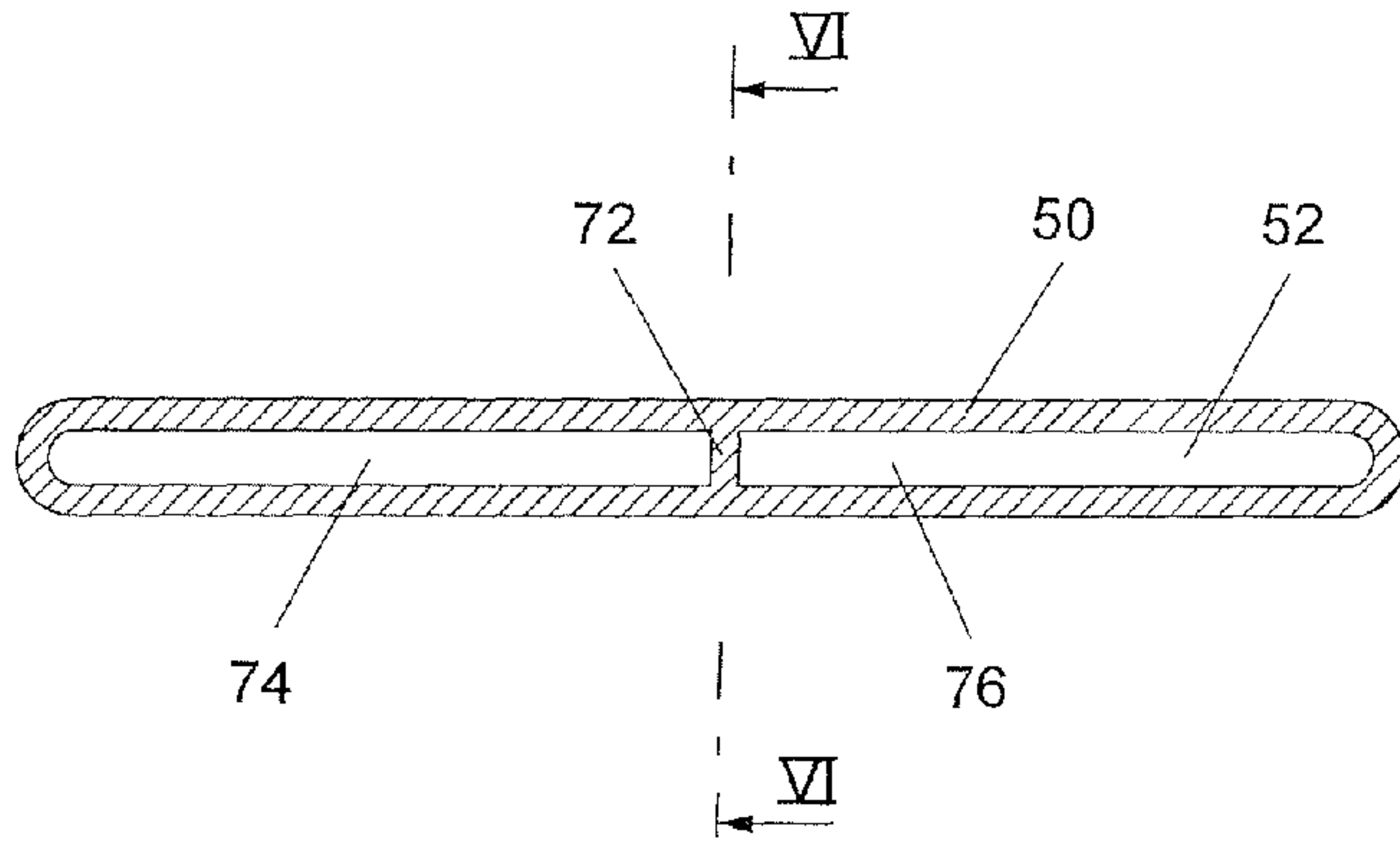


Fig. 5

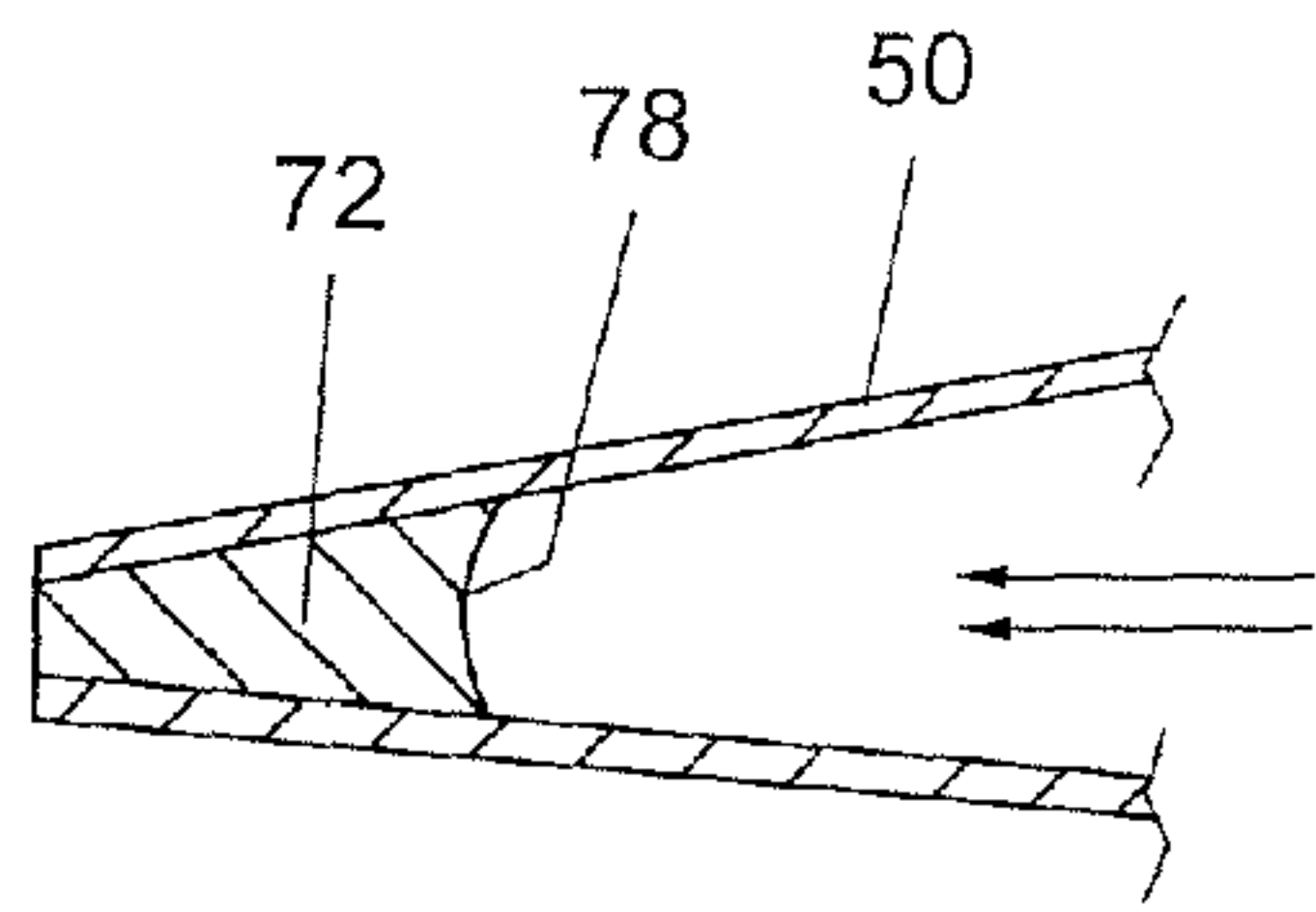


Fig. 6

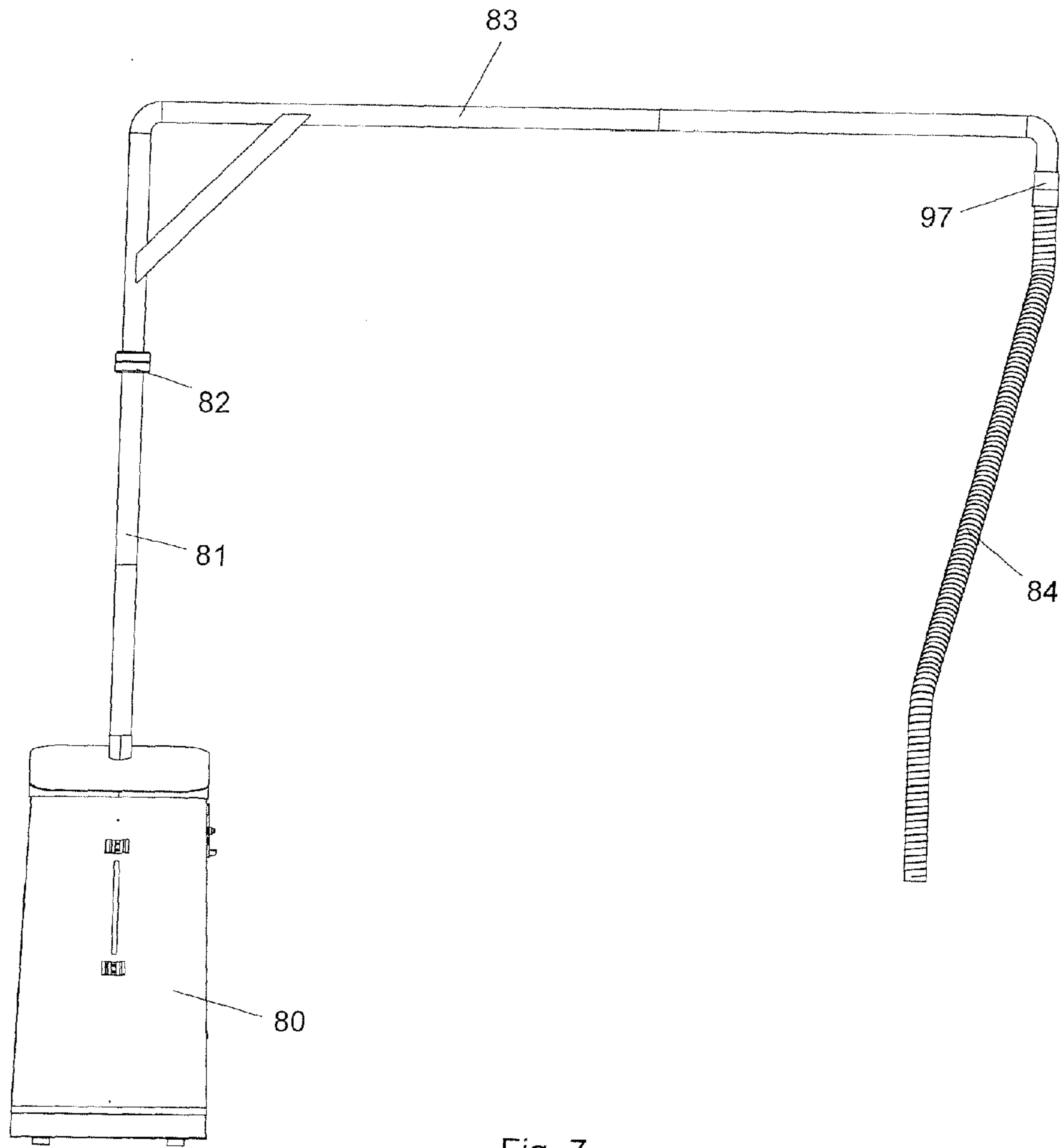


Fig. 7

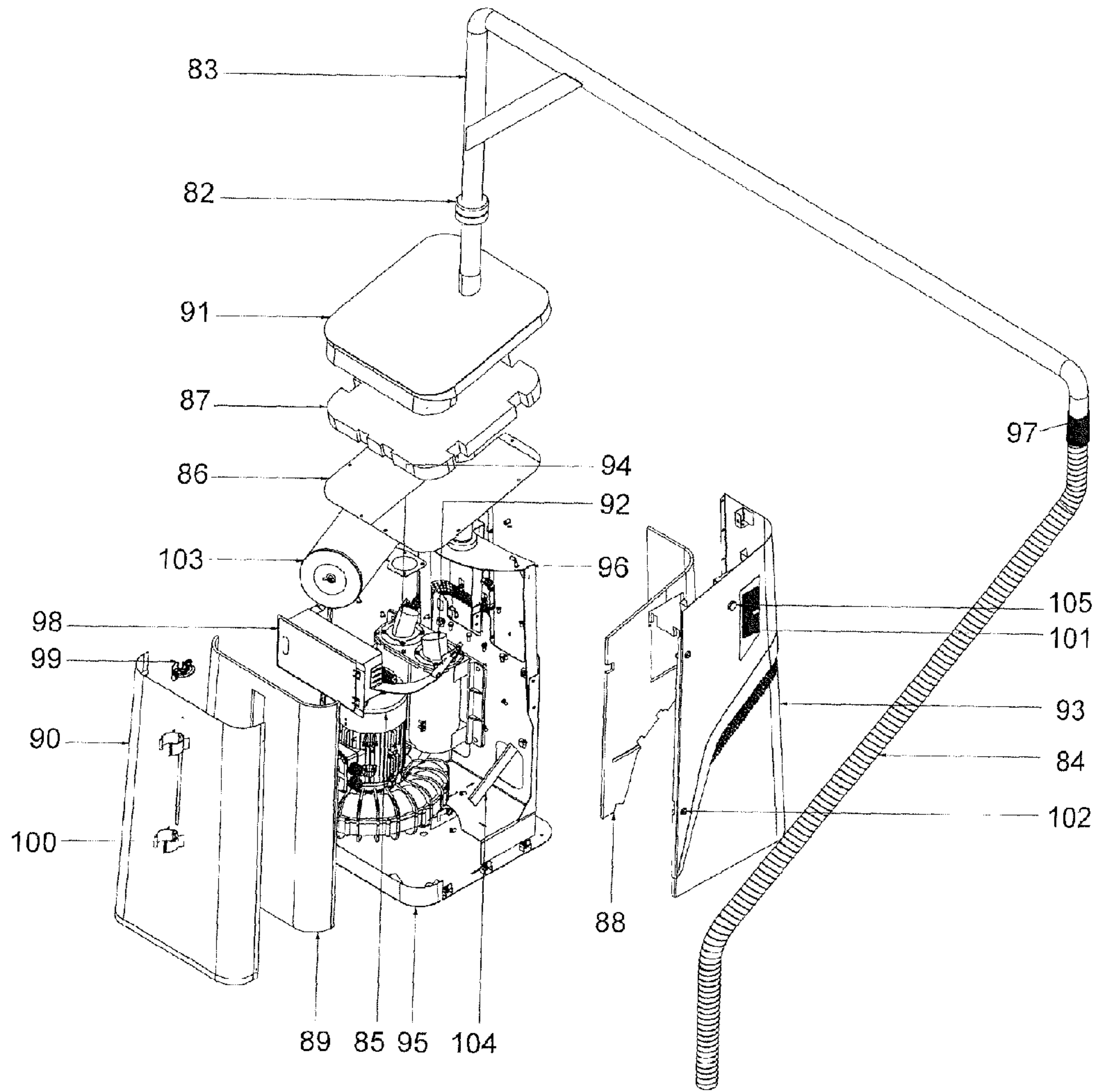


Fig. 8