

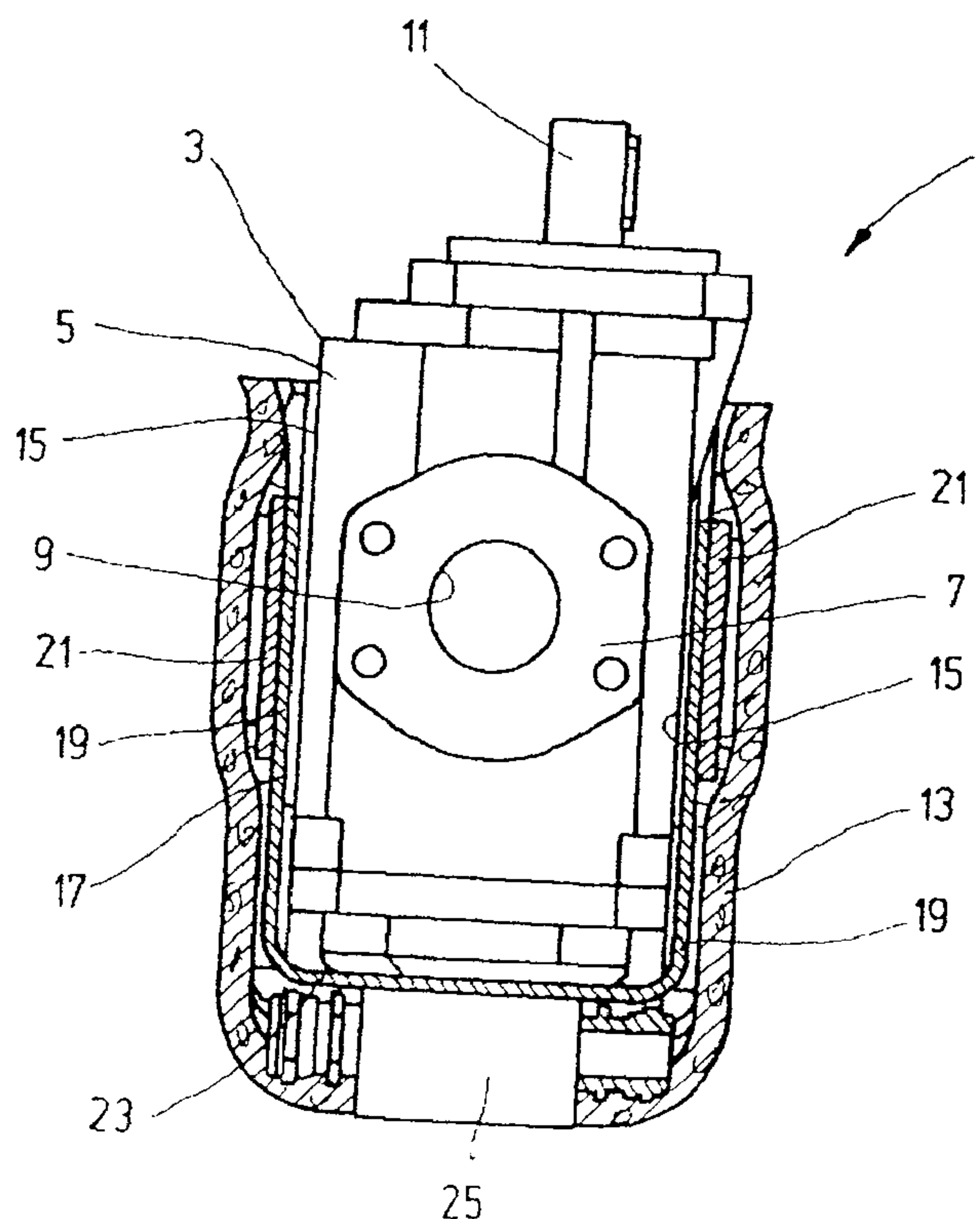


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(54) Titre : DISPOSITIF DE CIRCULATION DE FLUIDES A CAPACITE D'ECOULEMENT, EN PARTICULIER DES LUBRIFIANTS

(54) Title: MEANS FOR DELIVERY OF FLOWABLE MEDIA, ESPECIALLY LUBRICANTS



(57) Abrégé/Abstract:

A device for conveying flowable materials, in particular lubricants, with a motor-driven pump (1) forming a component of a piping system, is characterized in that at least one heating element (21) that can be activated by feeding power to it, is provided outside the housing (3) of the pump (1) in a position enabling heat transmission to the housing (3).



A b s t r a c t

A means for delivery of flowable media, especially of lubricants, with a pump (1) which can be driven by a motor and which forms a component of a line system is characterized in that at least one heating element (21) which can be activated by energy supply is located outside of the housing (3) of the pump (1) in a position which enables heat transfer to the housing (3).

Means for Delivery of Flowable Media, Especially Lubricants

The invention relates to a means for delivery of flowable media, especially of lubricants, with a pump which can be driven by a motor and which forms a component of a line system.

In known means of this type, under certain unfavorable operating conditions there is the danger that malfunctions, for example a drop of delivery output, pump overload, or even its failure will occur. These difficulties can occur especially when overly low oil temperatures occur as lubricating oils are being delivered in a lubricant circuit. These operating states prevail for example during cold running phases of certain systems or occur in wind power plants under winter conditions, and these states can last over longer time intervals. The corresponding strong increase of the viscosity of the lubricating oils to be delivered leads at least to a reduction of the delivery output, resulting in danger to the assigned machinery system, or in less favorable cases leads to overloading or even failure of the pump; this in turn entails corresponding subsequent damage to the pertinent system.

With respect to this prior art, an object of the invention is to make available a means for delivering flowable media, especially lubricants, with operating reliability which is ensured even when very low temperatures of the line system and the medium to be delivered prevail.

According to an aspect of the invention heat transfer to the pump housing is provided from the outside. In this way, on the one hand the result is that if necessary a direct temperature increase can take place in the critical, i.e. fault-susceptible area of the line system, specifically directly on the pump. On the other hand, the heating of the pump housing leads to a corresponding temperature increase of the delivered medium; this causes a corresponding temperature increase of the entire pertinent line system, including an increase of a possible overly low oil temperature in a lubricant circuit.

In especially advantageous exemplary embodiments there is at least one heating element in the form of a self-regulating electrical resistance element with a positive temperature coefficient (PTC), for example in the form of a so-called PTC heating element. Commercially available PTC heating elements consist of doped polycrystalline ceramic with barium titanate as the base material. These PTC elements ensure rapid heat-up, have good self-regulation behavior and thus a long service life, since there is no danger of overheating due to the self-regulating properties. The use of such PTC elements is therefore also especially advantageous because these elements can automatically maintain a desired temperature level, without control means or temperature sensors being necessary.

Preferably the housing of the pump has more than one flat outside wall section, to each of which one PTC element is assigned.

Preferably the arrangement here is made such that the PTC heating elements are assigned to those outside wall sections of the housing which are spatially adjacent to the inside displacement elements of the pump. This piston arrangement leads to especially effective and prompt heat-up in the desired region which is critical against insufficient temperatures.

In exemplary embodiments in which on the pump housing the fluid input and output which define the start and end of the inner pump flow path which has the displacement elements are placed flush with one another on one end wall or rear wall of the pump housing, preferably on the side walls which join the end wall and the rear wall to one another, there is one PTC heating element each in this outside wall section which is placed at the height of the fluid input and output. This yields especially specific heat-up in the area of the inner flow path of the pump.

In advantageous exemplary embodiments, the carrier for the PTC heating elements is an aluminum sheet which adjoins the pertinent outside wall sections for heat transfer, and adjoining the outer side of which are the PTC heating elements made in a flat construction. This support of the PTC heating elements ensures especially good heat transfer to the pump housing.

In this connection the carrier can be made U-shaped and with U-legs which run parallel to one another it can form one collar of the two opposing outside wall sections of the pump housing at a time, on the outside of each U leg there being one PTC heating element.

The PTC heating elements for their part can be held in contact with the U-legs by means of an enclosure which can be attached to the outside of the U-legs and which is made from highly heat-conductive metallic material.

The efficiency of the means is especially good when the pump housing is surrounded with heat-insulating jacketing, leaving its pump shaft and fluid input and output exposed, so that heat losses to the vicinity are for the most part prevented. This jacketing with which the housing is for example cast round, prevents not only heat exit to the outside, but also forms protective jacketing which prevents direct access to the PTC heating elements.

According to an aspect of the present invention there is provided a device for delivery of flowable media, the device comprising:

- a pump which can be driven by a motor and which forms a component of a line system, said pump having a pump housing; and

- at least one heating element, which can be activated by an energy supply,

- wherein the at least one heating element is located outside of the pump housing in a position which enables heat transfer to the pump housing.

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The invention is explained below in detail with reference to an exemplary embodiment shown in the drawings, in which

- FIG. 1 shows a perspective oblique view of a pump intended for one exemplary embodiment of the invention;
- FIG. 2 shows a front view, looking at the end wall of the pump housing, its components surrounding the side walls being shown cutaway;
- FIG. 3 shows a perspective oblique view of part of a carrier which forms the collar of the side walls of the pump housing with PTC heating elements located on its outside and their electrical connecting means;
- FIGS. 4 and 5 shows a side view and a front view of the support from FIG. 3;
- FIG. 6 shows a bottom view drawn roughly in actual size of a metallic enclosure of a PTC heating element of flat construction held in it and
- FIG. 7 shows a section according to line VII-VII from FIG. 6.

FIGS. 1 and 2 show a pump labelled 1 overall, with a pump housing 3 which has a fluid input 9 provided with a connecting flange 7 on the front end wall. Diametrically opposite on the rear wall which is not shown in the figures there is a corresponding fluid output which is flush with the fluid input 9. Within the flow path of the pump 1 between the fluid input 9 and fluid output there is a gear pair which forms the displacement elements, i.e. the pump 1 is an outside gear pump with a drive shaft 11 which is located on the top of the housing. As is best shown in FIG. 1, the pump housing 3 is surrounded with heat-insulating jacketing 13, leaving exposed the areas of the fluid input 9, of the housing top with the drive shaft 11, and of the area of the fluid output which is not shown. In this connection it can be a cast or foamed jacket.

FIG. 2 shows the part of the jacket 13 which includes the side walls 15 of the pump housing 3 which extend between the end wall 5 and the rear wall, in a vertically cut representation, its being apparent that between the side walls 15 and the jacketing 13 there is a U-shaped carrier.

FIGS. 3 to 5 show the carrier 17 in greater detail. The carrier 17 which has been shaped from aluminum sheet has two U-legs 19 which are intended to make contact with the side walls 15 of the pump housing 3 and which define planes which are parallel to one another. A PTC element unit 21 which is shown only schematically in FIGS. 3 to 5 is attached to the outside of each U-leg 19. FIGS. 6 and 7 show details of the PTC element units 21. Each of the element units 21 is provided with its own PTC element 29 in the form of a flat cuboid. The latter is located in an enclosure 31 which is made in the manner of a round disk of metal with good heat conductivity, provided with profiling. The enclosure 31 has central profiling 33 which on the bottom 35 of the enclosure 31 which is intended for contact with the pertinent U-leg 19 forms a receiving channel 37 in which the PTC element 29 is fixed by a heat-resistant adhesive film strip 39, in the exemplary embodiment a Kapton[®] strip. On either side of the receiving channel 37 there are profilings 41 of low height with a round mounting hole 43 and an oblong hole 45 for forming a screw connection between the enclosure 31 and the pertinent U leg 19.

Connecting wires 27 intended for power supply of the PTC element 29 are connected in the manner conventional for PTC elements 29 to the flat metal electrodes provided thereon. In the end area bordering the PTC element 29 the connecting wires 27 are surrounded by a silicone insulating tube 47. Moreover the transition area between the end of the connecting wires 27 provided with the insulating tube 47 can be sealed with rubber in the area bordering the PTC element 29.

The enclosure 31 attached to the pertinent U-leg 19 of the carrier 17 forms a heat conducting plate for transfer of the heat generated by the PTC element 29 to the aluminum sheet of the pertinent U-leg 19 which for its part adjoins the pertinent side wall 15 of the pump housing 3 as a heat transfer agent. This thermal coupling makes it possible using the self-regulating characteristic of the

PTC heating element 29 to maintain the desired temperature during changing operating states on the pump housing 3 without the need for control electronics for this purpose.

The invention is explained above using the example of an outside gear pump. It goes without saying that the invention can be used likewise in pumps of a different design, for example for inside gear pumps, screw pumps, vane cell pumps, radial piston pumps or in pumps with a different operating principle. In any case it is advantageous to attach the pertinent PTC heating elements to the respective pump housing in a position such that there is good thermal coupling to the pertinent inner displacement elements. While the invention is explained using one example in which two element units 21 with one contained PTC element 29 each are used, it goes without saying that there could be a different number of PTC elements 29 and that other designs different from the flat execution can be used, for example PTC elements with a round or rectangular cartridge shape.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A device for delivering flowable media, comprising:
 - a pump driven by a motor, forming a component of a line system and having a pump housing with opposite first and second end walls joined by first and second side walls;
 - a fluid input and a fluid output aligned on said first and second end walls, respectively, and defining a start position and an end position of an inner flow path of said pump;
 - displacement elements of said pump in said pump housing;
 - at least one heating element activated by an energy supply located outside of said pump housing in a position to transfer heat to said pump housing, said heating element unit including a first PTC heating element on a flat section of an outside surface of said first side wall at a height of said fluid input and said fluid output;
 - a second PTC heating element attached on a flat section of an outside surface of said second side wall of said pump housing, said flat sections being adjacent said displacement elements in said pump housing; and
 - a carrier formed of an aluminum sheet mounting said first and second PTC heating elements to said flat sections of said outside surfaces of said pump housing to transfer heat to said pump housing, said PTC heating elements having flat outer sides adjoining said carrier.
2. A device according to claim 1, wherein:
 - said carrier is U-shaped with parallel U-legs and forms a collar extending about said flat sections of said outside surfaces of said pump housing, each of said U-legs supporting one of said PTC heating elements.
3. A device according to claim 2, wherein:
 - said U-legs are connected by a crosspiece enclosing a bottom part of said pump housing; and
 - an electrical connector is on an outside surface of said crosspiece to supply electrical power to said PTC heating elements.

4. A device according to claim 3, wherein:
enclosures hold said PTC heating elements in contact with said U-legs, are attached to outside surfaces of said U-legs, and are formed of highly heat-conductive metallic material.
5. A device according to claim 4, wherein:
said PTC heating elements adjoin said U-legs over a large area thereof.
6. A device according to any one of claims 1 to 5, wherein:
said pump includes a pump shaft; and
a heat-insulating jacket surrounds said pump housing and said heating elements while leaving exposed said pump shaft, said fluid input and said fluid output.
7. A device for delivering flowable media, comprising:
a pump driven by a motor, forming a component of a line system and having a pump housing with opposite first and second end walls joined by first and second side walls, said side walls having outside surface sections;
a fluid input and a fluid output aligned on said first and second end walls, respectively, defining a start position and an end position of inner flow path of said pump;
displacement elements of said pump in said pump housing between said fluid input and fluid output, said outside surface sections being adjacent said displacement elements in said pump housing;
a carrier formed of an aluminum sheet and placed on said outside surface sections; and
first and second PTC heating elements having flat surfaces mounted on said carrier and activated by electrical energy supplied from outside said pump housing to transfer heat to said pump housing.
8. A device according to claim 7, wherein:

said carrier is U-shaped with parallel U-legs, and forms a collar extending about said outside surface sections of each of said U-legs supporting one of said PTC heating elements.

9. A device according to claim 8, wherein:

said U-legs are connected by a crosspiece enclosing a bottom part of said pump housing; and

an electrical connector is on an outside surface of said crosspiece to supply electrical power to said PTC heating elements.

10. A device according to claim 9, wherein:

enclosures hold said PTC heating elements in contact with said U-legs, are attached to outside surfaces of said U-legs, and are formed of highly heat-conductive metallic material.

11. A device according to claim 9, wherein:

said PTC heating elements adjoin said U-legs over a large area thereof.

12. A device according to any one of claims 7 to 11, wherein:

said pump includes a pump shaft; and

a heat-insulating jacket surrounds said pump housing and said PTC heating elements while leaving exposed said pump shaft, said fluid input and said fluid output.

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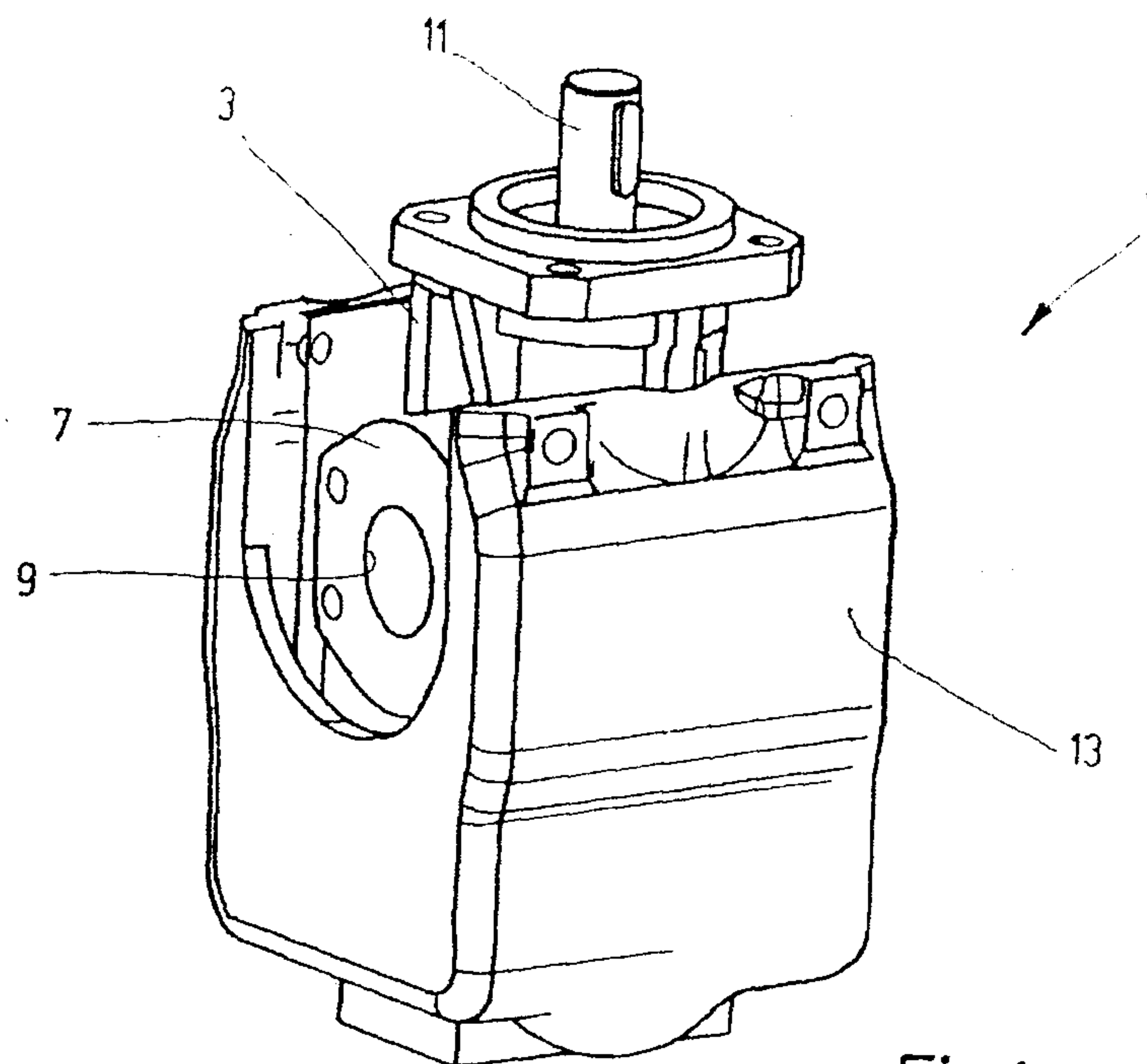


Fig.1

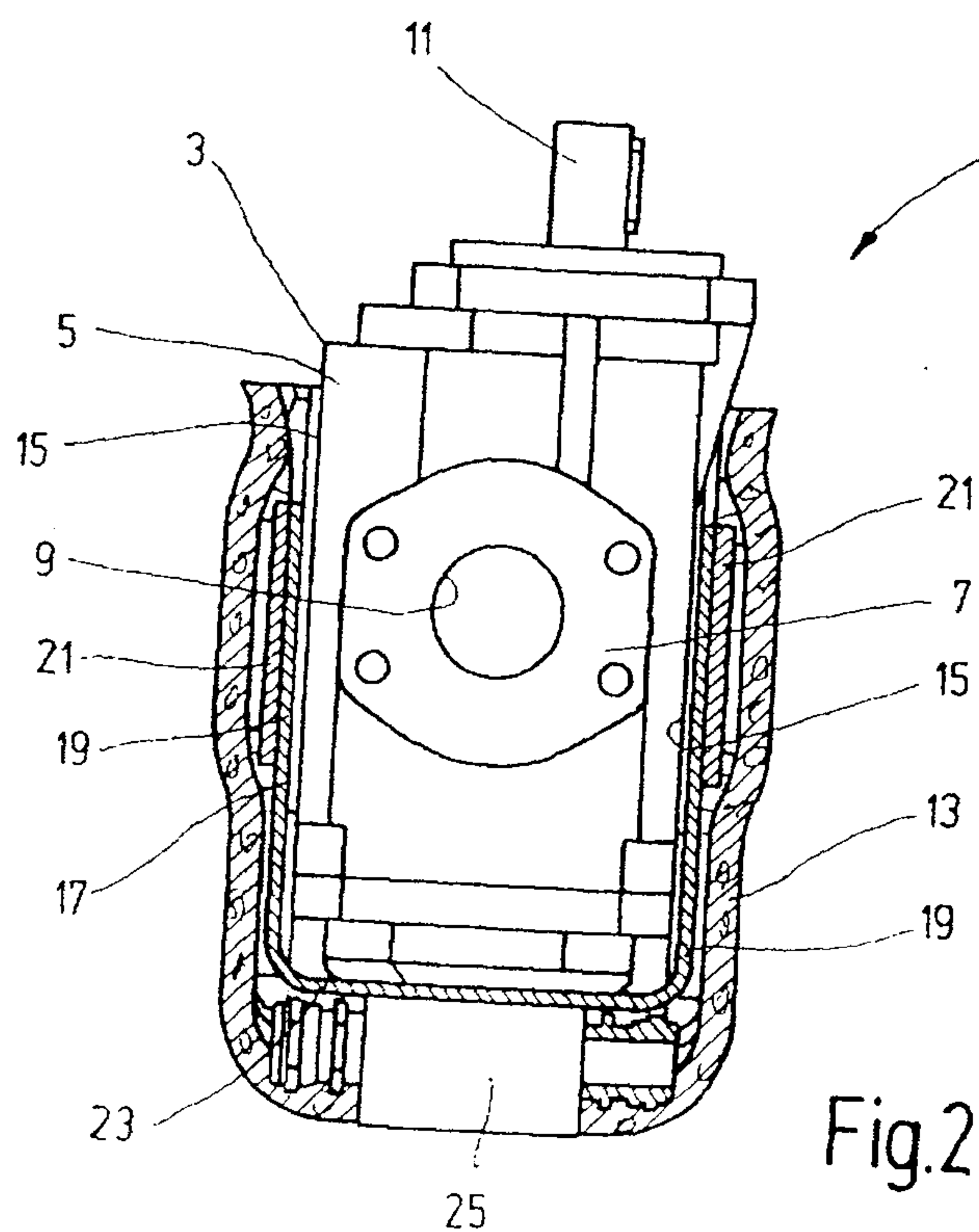


Fig.2

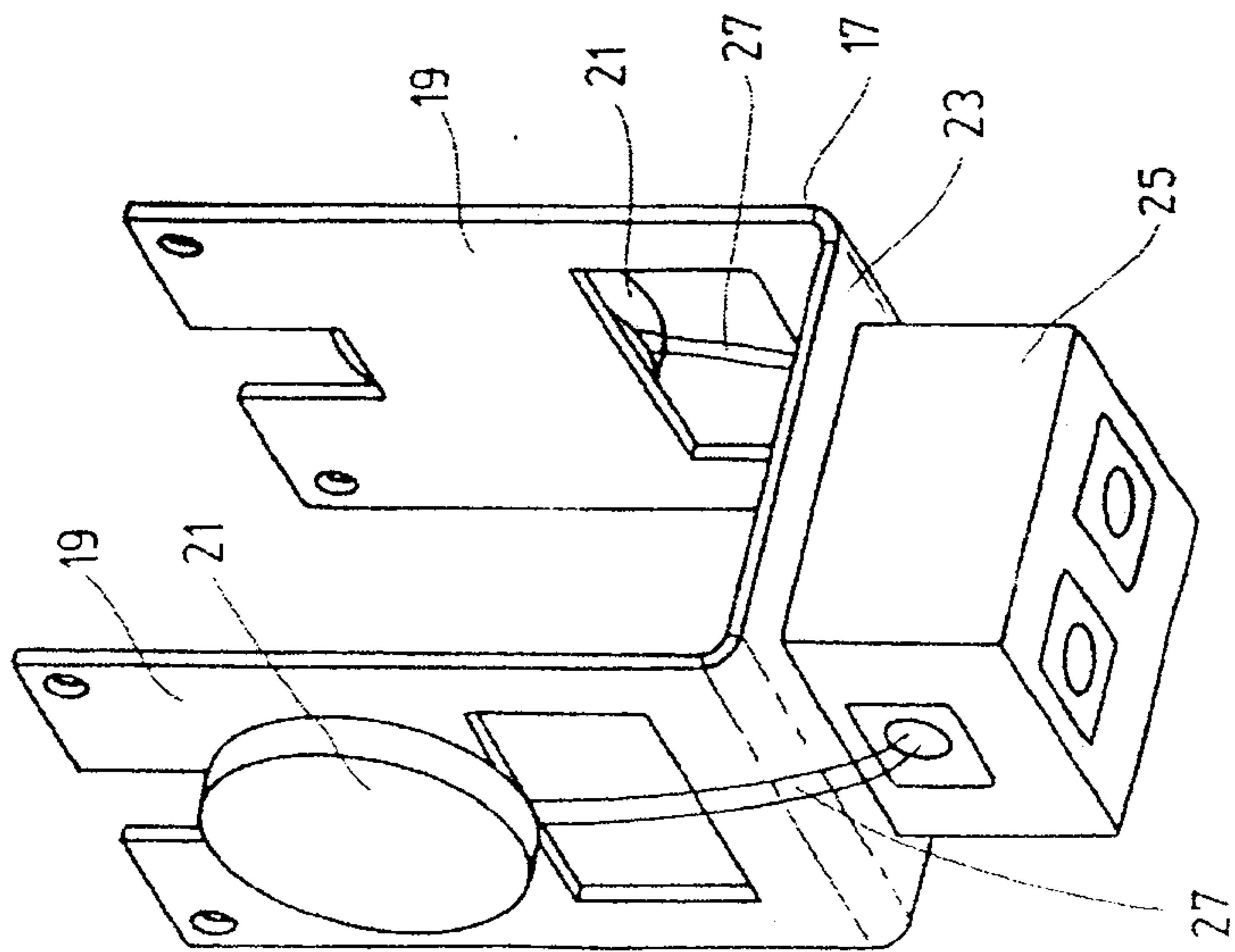


Fig.3

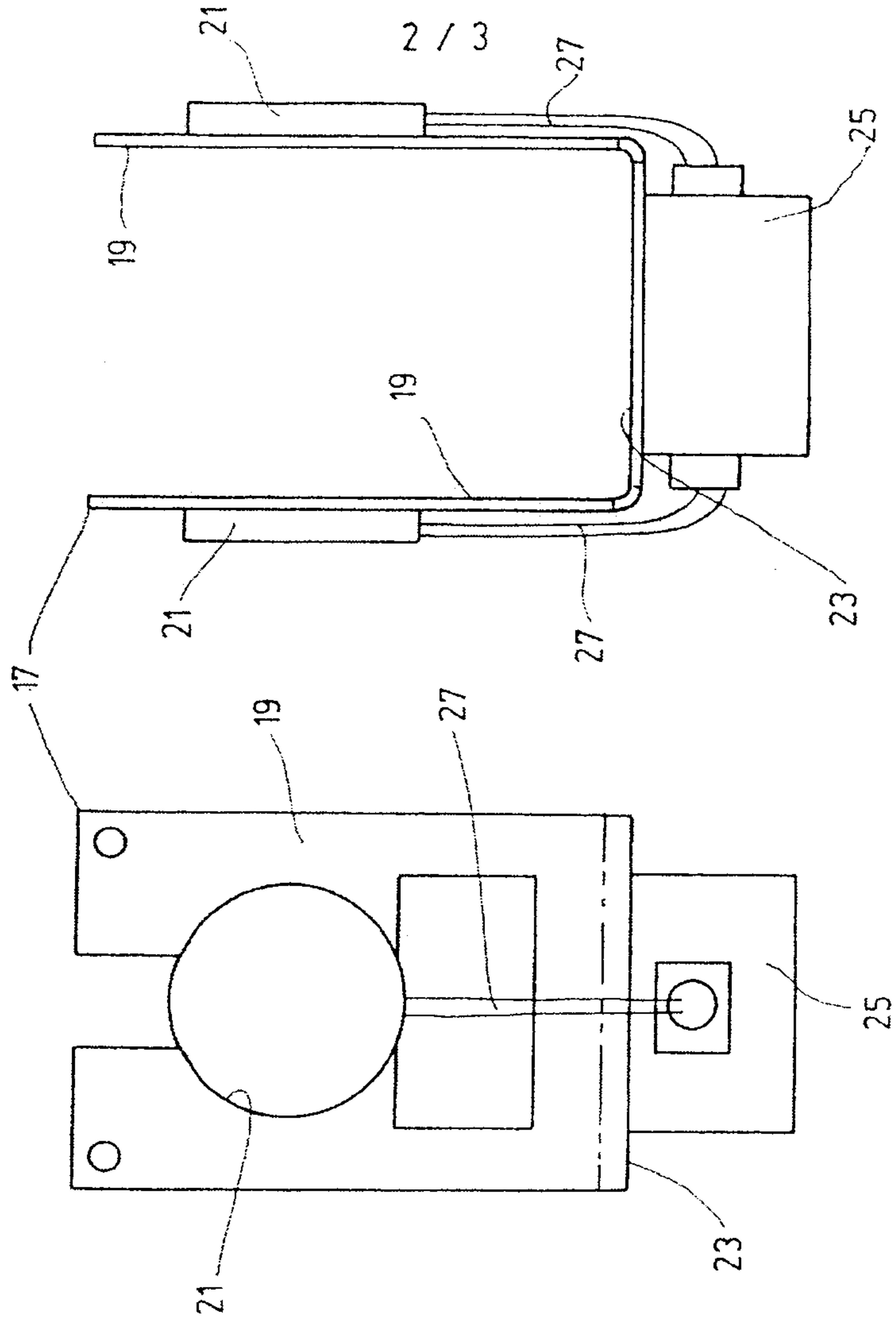


Fig.4

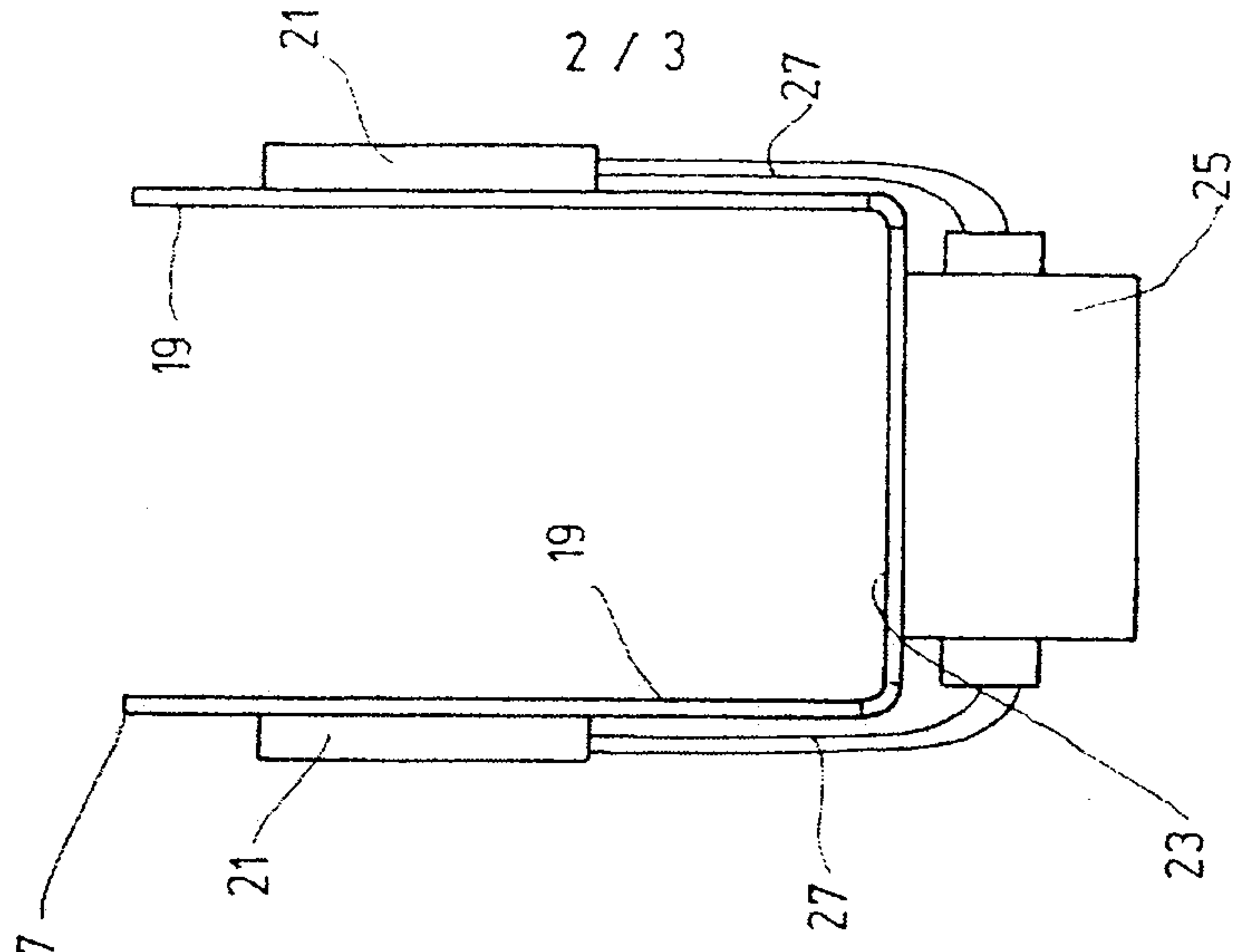


Fig.5

