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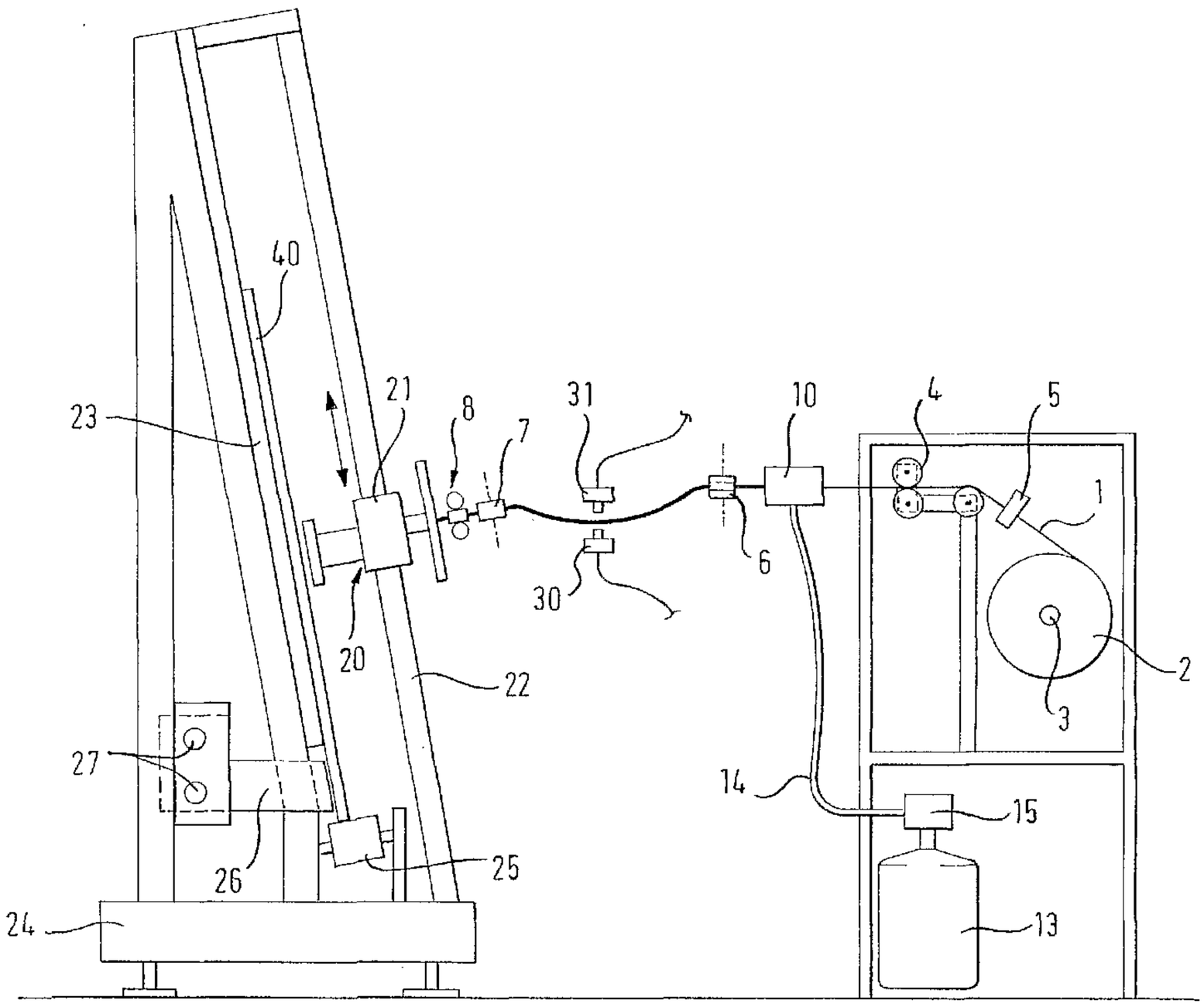
(54) Titre : PROCEDE ET DISPOSITIF DE FABRICATION D'UNE PLAQUE DE VERRE ISOLANT
(54) Title: PROCESS AND DEVICE FOR PRODUCING AN INSULATING GLASS PANE



(57) Abrégé/Abstract:
A process and device are disclosed for applying an elastoplastic band (1) as a spacer when producing insulating glass panes. The device comprises a take-off reel (2) for the band, a plurality of driven band-guiding rollers (4, 6, 7, 8) and a band compression head (20) movable relative to a first glass pane (40). Unlike in the prior art, an elastoplastic band is used whose lateral surfaces are not coated with an adhesive. The adhesive is rather applied to the band shortly before the band is applied. For this purpose, opposite nozzles (11, 12) are arranged between the take-off reel (2) and the compression head (20) and coat the band lateral surfaces with adhesive.

Abstract of the disclosure

A process and device are disclosed for applying an elastoplastic band (1) as a spacer when producing insulating glass panes. The device comprises a take-off reel (2) for the band, a plurality of driven band-guiding rollers (4, 6, 7, 8) and a band compression head (20) movable relative to a first glass pane (40). Unlike in the prior art, an elastoplastic band is used whose lateral surfaces are not coated with an adhesive. The adhesive is rather applied to the band shortly before the band is applied. For this purpose, opposite nozzles (11, 12) are arranged between the take-off reel (2) and the compression head (20) and coat the band lateral surfaces with adhesive.

Process and Device For Producing An Insulating Glass Pane

The invention relates to a method and an apparatus for producing insulating glass panes made of at least two glass panes between which there is arranged an elastoplastic strip as a spacer.

Spacers between an insulating glass unit comprising two or more glass panes usually consist of hollow aluminum or steel profiles.

From DE-A-30 02 904 a spacer in the form of a strip with a rectangular cross section is known which is frequently designated as a "swiggle-strip". This spacer, which is provided with protective films, comes from a storage drum or winder and is applied onto the glass pane by means of an apparatus provided with a turning head. This strip-like spacer on the basis of butyl caoutchouc is viscoplastic, strongly adhesive (which is desirable for achieving a gas-tight connection at first with the first and later with a second glass pane of the insulating glass unit) and has a strongly temperature-dependent viscosity.

In recent times, substantially less temperature-sensitive elastoplastic spacer strips have been developed on the basis of polyurethane or the like which also have a rectangular cross section, are substantially more resilient with respect to shape and dimension than the so-called "swiggle-strip", comprise on the later outer side a lamination made of aluminum film and are provided only on the two narrow sides designated for gluing with the glass panes with the thin coating made of an adhesive glue, which coating is covered with a protective film until the application. DE-A-102 12 359 discloses a method and apparatus for

applying such a strip onto at least the first glass pane of an insulating glass pane consisting of at least two such glass panes.

However, the adhesive glue applied to the two narrow sides of the strip shows no tightness against the diffusion of water vapor. That is why after the assembly of the insulating glass pane the remaining boundary joint needs to be filled with a jointing compound which ensures the mandatory tightness against the diffusion of water vapor. Otherwise, water vapor would penetrate the enclosed inner space of the insulating glass pane over time and would unavoidably lead to the formation of condensation water and thus the uselessness of the glass pane. Suitable jointing compounds are expensive and are required in large quantities due to the considerable cross section of the boundary joint.

The invention is based on the object of providing a cost-effective method for producing insulating glass panes and to provide an apparatus which is especially suitable for performing the method.

This object is achieved in accordance with the method by the steps stated in claim 1.

Other than in the state-of-the-art, and elastoplastic strip is used whose side surfaces are not yet coated with an adhesive. The same is only applied shortly before the application of the strip onto the two side surfaces. This leads to the advantage of allowing the use of the adhesive which is best suitable for this purpose and which ensures that the respective side surface of the strip adheres to the respective glass pane in a manner so as to be tight against the diffusion of water vapor. That is why the jointing compound with which the remaining boundary joint is filled no longer needs to ensure this function or no longer needs to ensure this function alone, so that cheaper jointing compounds can be used than the previous ones. A further advantage is that with the factory-made coating with adhesive of the side surfaces

of the strip it is possible to omit the respective cover or protective films. In addition to the reduction of the production cost for the strip, it is especially important that the previous devices for withdrawing the protective films and winding them up for the purpose of proper disposal are superfluous in the apparatus for applying the strip onto the first glass pane.

A butyl adhesive is preferably used as an adhesive (claim 2), as has already proven its worth in the coating of the side surfaces of spacer frames made of hollow metal profiles.

In the method according to the invention, the strip is preferably placed on to the first glass pane by means of an automatically working application station and is pressed onto the same (claim 3).

The quantity of glue applied to the strip is appropriately regulated depending on the strip transport speed (claim 4), which occurs in such a way that the most constant thickness of the adhesive layer is obtained. This can be achieved in such a way that the quantity of adhesive consumed per unit of time for the application is kept proportional to their strip transport speed, which means that it goes towards zero especially upon standstill of the strip.

Ideally, the thickness of the adhesive coating is kept approximately constant irrespective of the transport speed (claim 5).

The latter can be achieved especially in such a way that the actual value of the thickness of the coating is measured and the deviation from a predetermined setpoint value is used as an error signal for keeping constant the coating thickness (claim 6). Suitable methods for measuring the coating thickness are known.

The object of the invention is further achieved with an apparatus which comprises a supply winder for the strip, several driven strip guide rolls and a pressing head for the strip which is movable relative to a first glass pane in such a way that mutually opposing nozzles for coating the side surfaces of the strip with an adhesive offering tightness against the diffusion of water vapor are arranged between the supply winder and the pressing head (claim 7).

The coating nozzles can be associated especially with means for controlling the adhesive throughput depending on the strip transport speed (claim 8).

At least one first pair of rollers for the lateral guidance of the strip can be arranged before the coating nozzles relating to the direction of transport of the strip (claim 9).

A height guidance means for the strip can additionally be arranged before the coating nozzles relating to the direction of transport of the strip (claim 10), which height guidance means may optionally only consist of a simple horizontal supporting web, a supporting roll on which the strip rests or a pair of rollers between which the strip passes through.

Pairs of rollers can additionally also be arranged after the coating nozzles for lateral guidance of the strip relating to the direction of transport of the strip. Their rollers will then appropriately only touch the strip at the edges of the side surfaces of the strip (claim 11) in order to prevent any soiling of the rollers by the freshly applied layer of adhesive and conversely to avoid damaging the same.

In the case of precise dosing, a string of adhesive can be applied to each of the side surfaces of the strip whose cross section is dimensioned in such a way that upon pressing the strip against the first glass pane or upon pressing the second glass

pane against the other side surface of the strip an even layer of adhesive is formed without the adhesive pouring over the edges of the side surfaces of the strip. It is usually simpler to form the coating nozzles as slotted nozzles (claim 12).

In this case, the width of the slot of the coating nozzles can be smaller than the width of the side surfaces of the strip (claim 13), so that under the precondition of a non-excessive application of adhesive the respective coating reaches not quite up to the edge of the side surfaces of the strip. It is thus achieved that further lateral guide means such as the previously mentioned pairs of rollers will not come into contact with the adhesive coating in the case of suitable (e.g. V-shaped) profiling and will therefore not be soiled.

A device for measuring the thickness of the coating can finally be arranged after the coating nozzles relating to the direction of transport of the strip, which device regulates the adhesive throughput through the coating nozzles (claim 14).

The method in accordance with the invention is explained below by way of examples by reference to the drawings which are merely schematic, wherein:

Fig. 1 shows a strongly simplified side view of an apparatus for applying a spacer strip;

Fig. 2 shows the spacer strip in the cross section between the coating nozzles on a highly enlarged scale, and

Fig. 3 shows a downstream pair of rollers for the lateral guidance of the strip, also on an enlarged scale.

In accordance with Fig. 1, an elastoplastic strip 1 with a rectangular cross section (see Fig. 2) is withdrawn from a supply winder 2 which is situated on a driven shaft 3 via indicated

guide rollers 4 and a distance measuring device 5. The strip 1 runs into a coating station 10 which is connected via a conduit 14 with a pump 15 on a container 13 containing butyl adhesive. The coating station 10, in which the butyl adhesive layer is applied to the side surfaces of the strip, is followed by a pair of rollers 6 for the lateral guidance of the now coated strip. This is followed by a section in which the strip 1 is allowed to sag without support. The sagging is kept between an (upper) minimum value and a (lower) maximum value by a lower sensor 30 and an upper sensor 31 which are connected via the indicated signal leads with the machine control unit (not shown), which control occurs in such a way that the machine control unit acts upon the respective winder and roller drives depending on the signals of sensors 30 and 31. This ensures that the strip will run into the indicated application head 20 without any longitudinal tensions (i.e. neither squashed nor pulled apart) over further pairs of rollers such as 7 and 8, which application head is movable via a carriage 21 in the direction of the double arrow on a pillar 22. The pillar 22 is slightly inclined towards the vertical and parallel to a conventional supporting wall 23, e.g. air cushion supporting wall which rests on a machine frame 24. A glass pane 40 rests on the supporting wall 23, with the lower edge of the pane resting on the indicated roller conveyor 25. The glass pane 40 is reversibly transportable by means of this conveyor or a vacuum conveyor 26 of a conventional type which is displaceable on horizontal posts 27. The pressing head 20 can be twisted on its part about an axis rectangular to the pillar 22. The strip 1 is pressed against the glass pane 40 so as to extend around the same close to the edge by a respectively controlled relative displacement of the pressing head 20, as is generally known.

Fig. 2 schematically shows the nozzles 11 and 12 arranged in the coating station 10 for applying the butyl adhesive onto the side surfaces of strip 1. The throughput of the butyl adhesive through each of the nozzles 11 and 12 can be controlled or regulated by

means of slides 11.1 and 12.1 driven by means of servomotors that the side surfaces of the strip 1 are each coated with an adhesive layer 1.1 and 1.2 with a substantially constant thickness which is independent from the momentary speed of strip 1. For this purpose, the drive motors of slides 11.1 and 12.1 and optionally downstream thickness measuring devices are connected with the machine control unit (not shown). The nozzles are displaceable according to the double arrows for adjusting the distance of their orifices to strips of different width.

In accordance with Fig. 3, at least the pairs of rollers such as 6 and 7 downstream of the coating station 10 are provided with a wedge-like profiled running surface for the lateral guidance of the strip 1, so that the illustrated rollers 6.1 and 6.2 only touch the strip at the edges of the side surfaces of the strip. The rollers, such as the rollers 6.1 and 6.2, can be provided with a free-running configuration or be situated on the shafts of drive motors (not shown) which keep the circumferential speed of the rollers synchronous and in agreement with the momentary or momentarily required strip running speed.

CLAIMS:

1. A method for producing an insulating glass pane made of at least two glass panes, comprising the following steps:
- withdrawal of an elastoplastic strip from a supply winder;
- pressing the strip with one of its side surfaces against the first glass pane as a spacer extending around the pane close to the edge;
- applying and pressing the second glass pane;
characterized in that
- the side surfaces of the strip, after the withdrawal from the winder, are coated with an adhesive which is tight against the diffusion of water vapor.

2. A method according to claim 1, characterized in that a butyl adhesive is used as an adhesive.

3. A method according to claim 1 or 2, characterized in that the strip is placed onto the first glass pane by means of an automatically working application station and is pressed against the same.

4. A method according to one of the claims 1 to 3, characterized in that the quantity of adhesive applied to the strip is regulated depending on the transport speed of the strip.

5. A method according to one of the claims 1 to 4, characterized in that the thickness of the adhesive coating is kept approximately constant irrespective of the transport speed of the strip.

6. A method according to claim 5, characterized in that the actual value of the thickness of the coating is measured and the deviation from a predetermined setpoint value is

used as an error signal for keeping the coating thickness constant.

7. An apparatus for applying an elastoplastic strip (1) as a spacer in the production of insulating glass pane, comprising a supply winder (2) for the strip, several driven strip guide rollers (4, 6, 7, 8), and a pressing head (20) for the strip which is movable relative to a first glass pane (40), especially for performing the method according to one of the claims 1 to 6, characterized in that mutually opposing nozzles (11, 12) for coating the side surfaces of the strip (1) with an adhesive are arranged between the supply winder (2) and the pressing head (20).

8. An apparatus according to claim 7, characterized in that the coating nozzles (11, 12) can be associated with means (11.1, 12.1) for controlling the adhesive throughput depending on the transport speed of the strip.

9. An apparatus according to claim 7 or 8, characterized in that at least one first pair of rollers for the lateral guidance of the strip is arranged before the coating nozzles (11, 12) relating to the direction of transport of the strip.

10. An apparatus according to one of the claims 7 to 9, characterized in that a height guidance means (4) for the strip (1) is arranged before the coating nozzles relating to the direction of transport of the strip.

11. An apparatus according to one of the claims 7 to 10, characterized in that pairs of rollers (6, 7) are arranged after the coating nozzles (11, 12) relating to the direction of transport of the strip for lateral guidance of the strip, with the rollers (6.1, 6.2) touching the strip

(1) only at the edges of the side surfaces of the strip.

12. An apparatus according to one of the claims 7 to 11, characterized in that the coating nozzles (11, 12) are slotted nozzles.

13. An apparatus according to claim 12, characterized in that the width of the slot of the coating nozzles (11, 12) is smaller than the width of the side surfaces of the strip.

14. An apparatus according to one of the claims 7 to 12, characterized in that a device for measuring the thickness of the coating is arranged after the coating nozzles relating to the direction of transport of the strip, which device regulates the adhesive throughput through the coating nozzles.

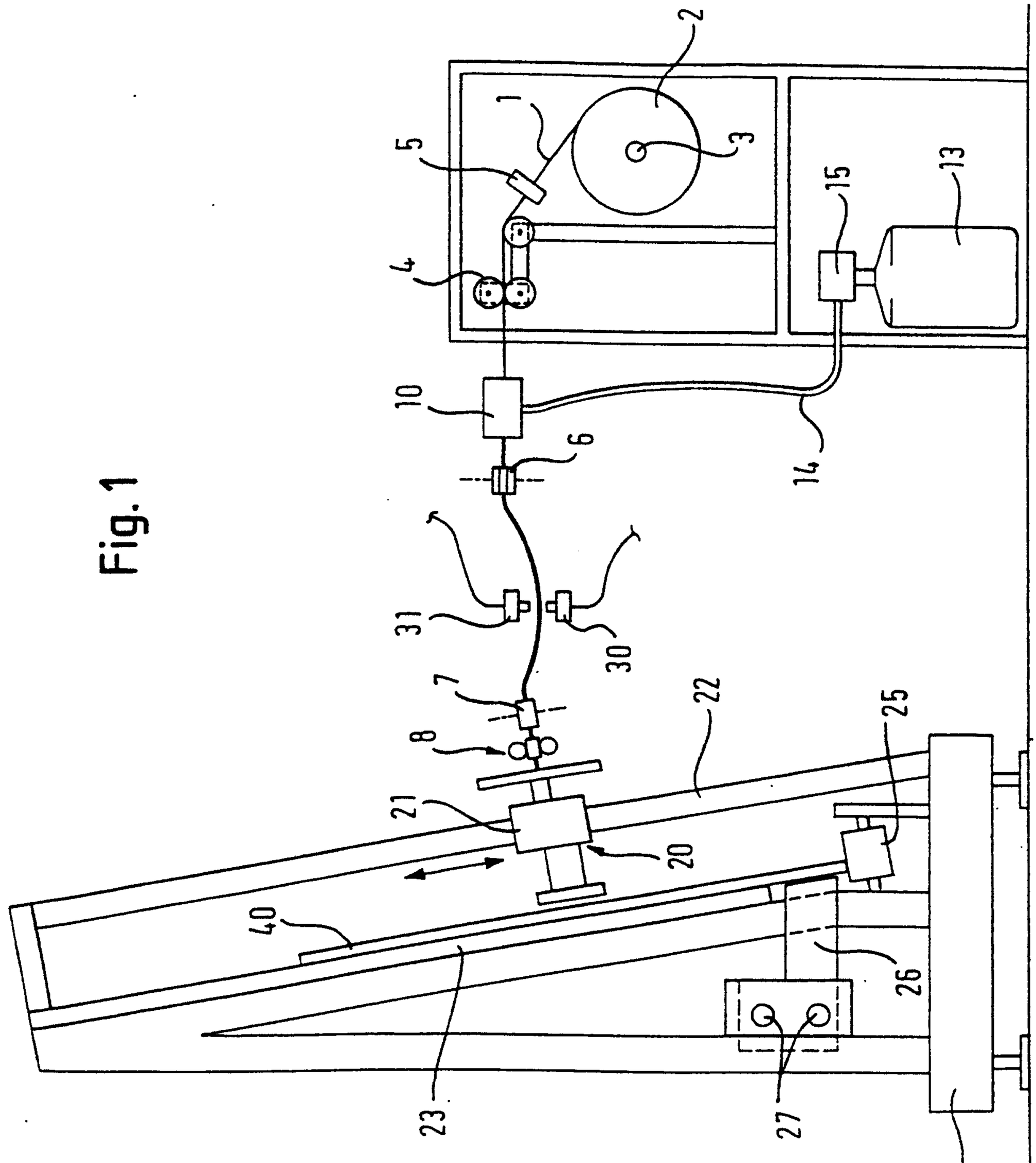


Fig. 1

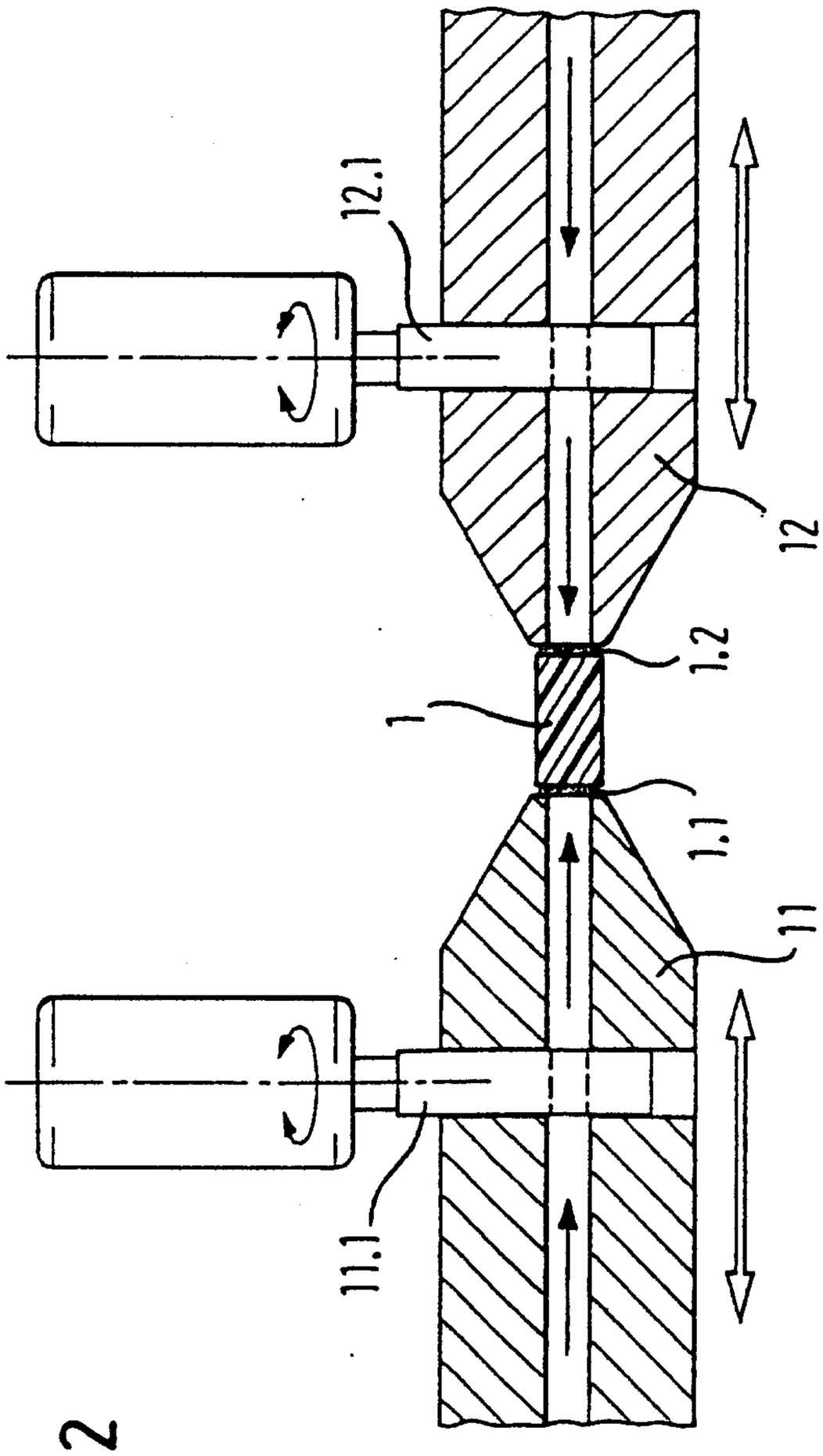


Fig. 2

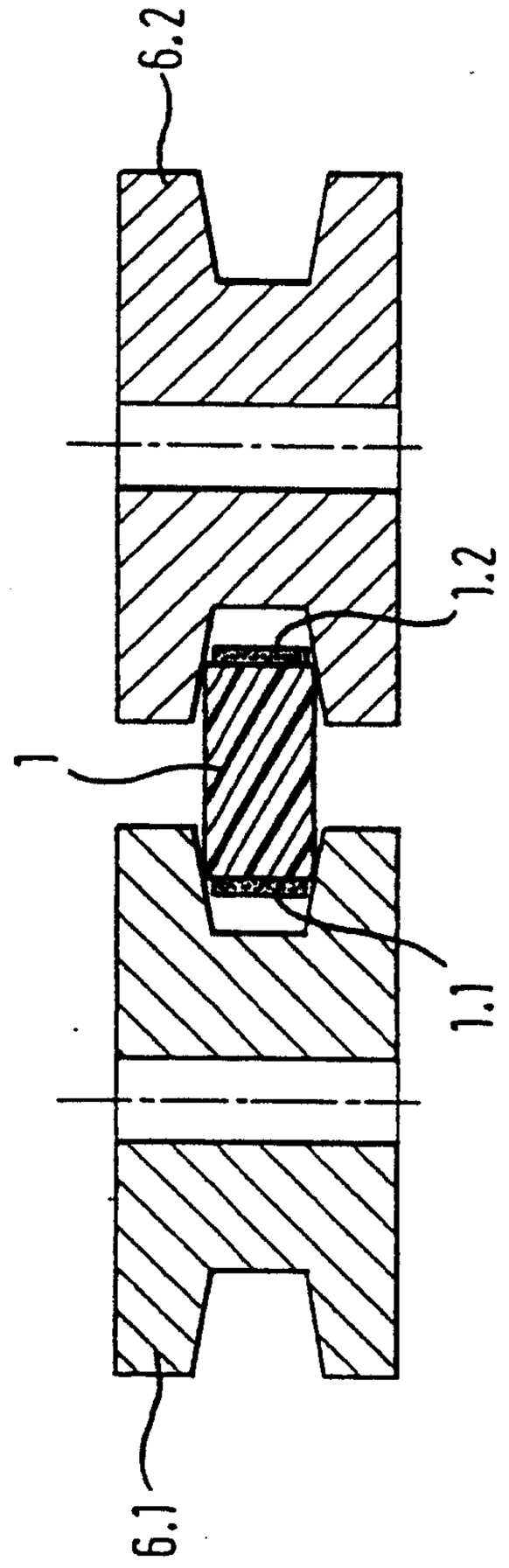
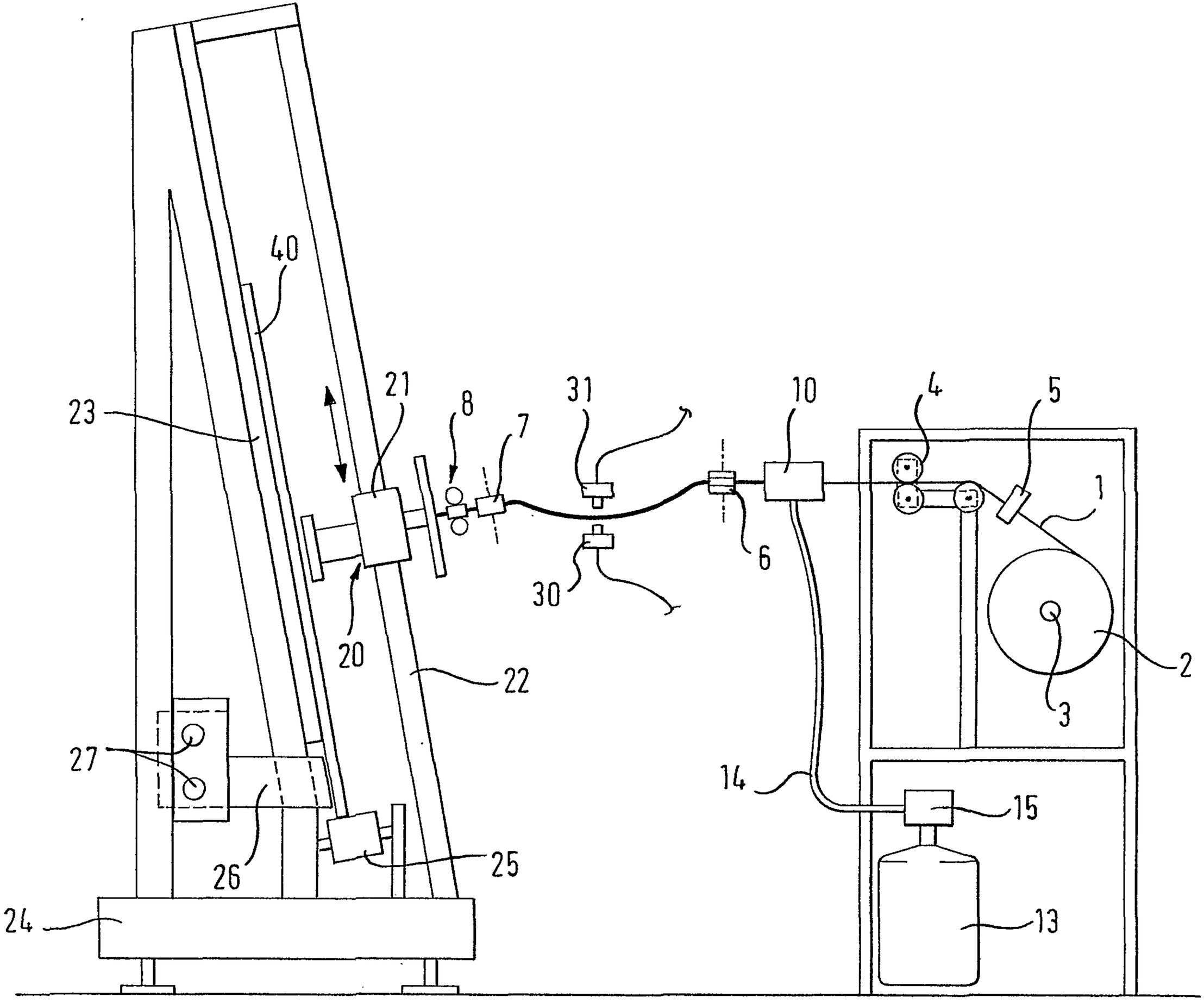


Fig. 3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