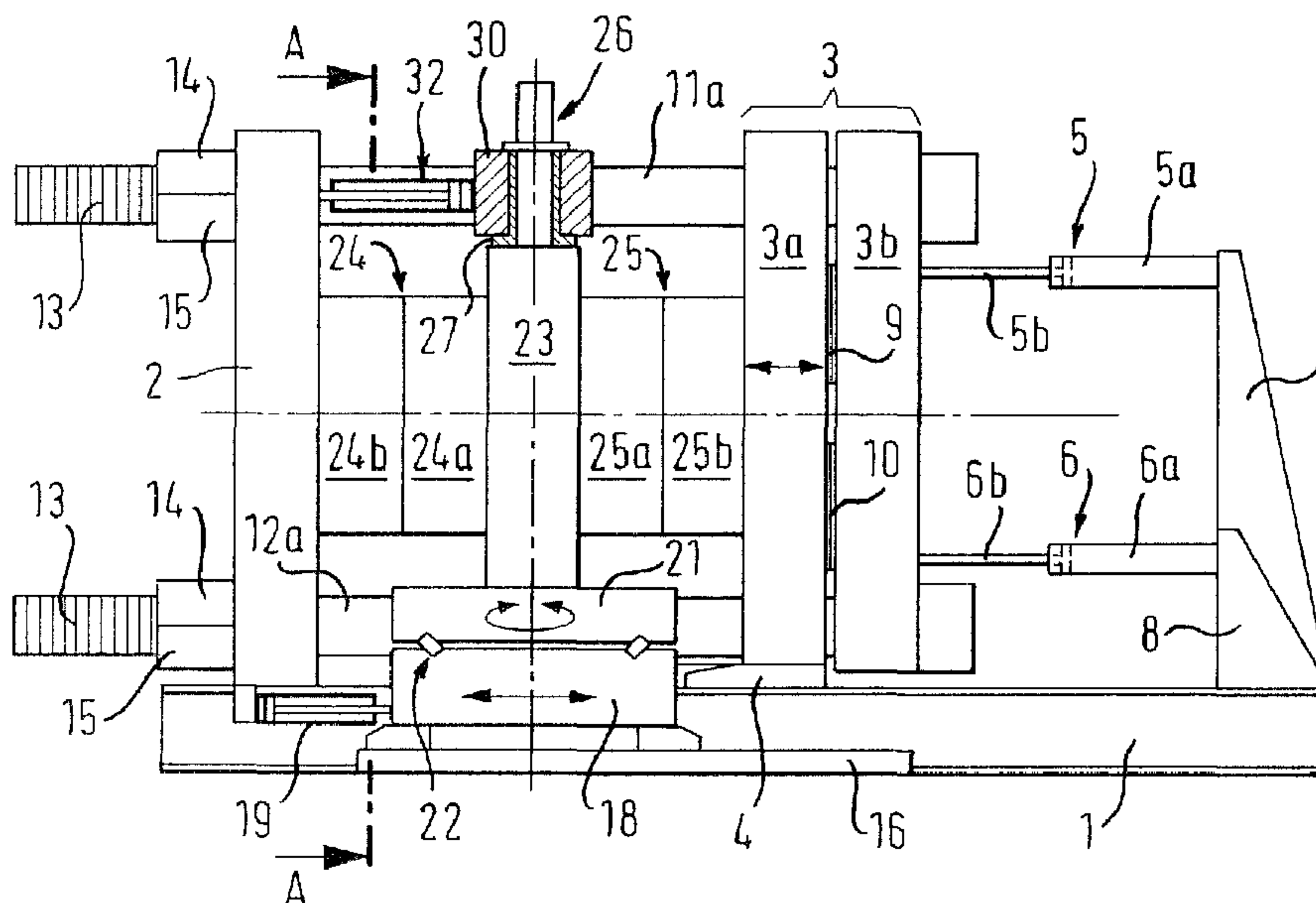




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(54) Titre : MACHINE DE MOULAGE PAR INJECTION HORIZONTALE COMPORTANT UN DISPOSITIF ROTATIF MOBILE POUR DES MOULES D'OUTILS DE MOULAGE PAR INJECTION
 (54) Title: HORIZONTAL INJECTION MOULDING MACHINE COMPRISING A DISPLACEABLE ROTARY DEVICE FOR MOULDS OF INJECTION MOULDING TOOLS



(57) **Abrégé/Abstract:**

The invention relates to a horizontal injection moulding machine, in particular a double-plate injection moulding machine, comprising a fixed (2) and a displaceable (3) mould clamping plate with columns (11a, 12a, 11b, 12b) that run between the two mould clamping plates and a base plate (18), which is situated between the mould clamping plates (2, 3) and which can be displaced parallel to the longitudinal axis of the machine by means of first drive elements (19, 20). A rotary table (21) is rotatably mounted on said base plate to rotate about a vertical axis and mould-half carriers (23) for the mould halves (24a, 25a) of injection moulding tools are fixed to said rotary table (21). The invention is characterised in that the machine is equipped with a yoke (30), which extends between the upper columns (11a, 11b), can be displaced in relation to the latter and comprises a recess, that a pivot pin (26) is provided on the upper face of the central mould-half carrier, said pin being rotatably mounted in the recess of the yoke (30) and that additional drive elements (32, 33) are provided on both sides of the pivot pin (26) between the yoke (30) and one of the two mould clamping plates (2, 3) for displacing the yoke (30) in relation to the latter (2, 3). The yoke (30) is preferably supported on the central mould-half carrier (23).

Abstract

The invention relates to a horizontal injection molding machine, in particular a two-platen injection molding machine, comprising a fixed (2) and a moving (3) platen with columns (11a, 12a, 11b, 12b) that extend between the two platens and a base plate (18), which is situated between the platens (2, 3) and which can be displaced parallel to the longitudinal axis of the machine by means of first drive elements (19, 20). A turntable (21) is rotatably mounted on the base plate to rotate about a vertical axis and mold half carriers (23) for the mold halves (24a, 25a) of injection molding tools are fixed to the turntable (21). The invention is characterized in that the machine is equipped with a yoke (30), which extends between the upper columns (11a, 11b), can be displaced in relation to the latter and has a recess, that a pivot pin (26) is provided on the topside of the center mold half carrier and rotatably mounted in the recess of the yoke (30) and that additional drive means (32, 33) are provided on both sides of the pivot pin (26) between the yoke (30) and one of the two platens (2, 3) for displacing the yoke (30) in relation to the latter (2, 3). The yoke (30) is preferably supported on the center mold half carrier (23).

HORIZONTAL INJECTION MOLDING MACHINE WITH A MOVING ROTARY DEVICE FOR MOLDS OF INJECTION MOLDING TOOLS

Description

The invention is directed to a horizontal injection molding machine with a moving rotary device for mold halves of injection molding tools according to the preamble of claim 1.

WO 01/010624 discloses a two-platen horizontal injection molding machine with a fixed platen and a moving platen, the latter moving along columns, as well as a rotary device which is provided for injection molding tools and arranged between the two platens, and which is displaceable parallel to the longitudinal machine axis and rotatable about a vertical axis. The rotary device includes a base plate which can be moved by first drive means in the longitudinal machine direction, a turntable which is arranged on the base plate and which can be rotated by second drive means about the vertical axis. For displacing the base plate, hydraulic actuators are typically provided which are attached, on one hand, on the base plate and, on the other hand, in the machine bed and/or on the fixed platen. This type of horizontal injection molding machine has the advantage that the rotary device can be completely separated from the columns extending between the platens, so that the columns are loaded neither with weight torque nor with torsion torque. This is of particular importance with two-platen horizontal injection molding machines, because the columns in these machines move, and small changes in the mutual spacing between the columns can have an adverse effect on the rotary device for the molding tools guided and supported on these columns. The installed injection molding tool is also accessible from both sides as well as from above. There are no limitations in the rotary motion with respect to the size of the installed injection molding tools, except by the maximum unobstructed width of the clamping unit of the injection molding machine. Disadvantageously, however, with

large horizontal injection molding machines of this type with a correspondingly sized rotary device and large, heavy mold halves is the presence of tilting moments during acceleration and deceleration of the base plate due to their mass inertia which have to be compensated. The base plate is thus guided on linear guides having a suitable cross-section, for example a dovetail cross-section. With increasing size of the horizontal injection molding machine, the tilting moments to be absorbed also increase; however, the required linear guides with a dovetail cross-section are relatively expensive and not available for very large horizontal injection molding machines.

The document JP 62060618A discloses another two-platen horizontal injection molding machine with a rotary device which is provided for injection molding tools and arranged between the two platens and which is displaceable parallel to the longitudinal machine axis and rotatable about a vertical axis. In this horizontal injection molding machine, the rotary device has upper and lower support blocks which are supported and guided on the columns. A mold half carrier with an upper and a lower pivot pin arranged on an axis is received for rotation between the support blocks. For moving the mold half carrier along the longitudinal machine axis, hydraulic actuators are provided between the fixed platen, on one hand, and, the upper and lower support blocks, on the other hand. This horizontal injection molding machine has the disadvantage that the columns are subjected to weight torque and torsion torque, in particular when using heavy mold half carriers. Because the moving platen is displaced via the columns, loading of the columns with weight and torsion torques has also an adverse affect on the movement mechanism and the travel for the moving platen.

DE 19733667 A1 discloses a three-platen horizontal injection molding machine with a moving platen which extends between a fixed platen and a support platen and which is longitudinally displaceable in the fixed upper and lower columns. A rotary device provided for mold halves of injection molding tools and displaceable

parallel to the longitudinal machine axis, is provided between the platens. In this horizontal injection molding machine, the rotary device has upper and lower support blocks which are supported and guided on the columns. A mold half carrier is rotatably received between the support blocks by an upper and lower pivot pin arranged on an axis and in suitable bearings. For moving the mold half carrier along the longitudinal machine axis, hydraulic actuators are provided between the moving platen and the upper and lower support blocks. Although the afore-mentioned tilting moments are not encountered in this type of horizontal injection molding machine, there is the drawback, however, that the lower columns of this three-platen horizontal injection molding machine are under stress because they have to support the not insubstantial weight of the mold half carriers. For particularly heavy mold half carriers, it is thus recommended to additionally prop up the lower support block with rollers and/or skids on the machine bed.

WO 99/28108 discloses another three-platen injection molding machine of the afore-described type, in which the two pivot pins are further provided with several channels or passageways for conducting media, such as gases, liquids or electric current, to the mold half carriers and onward to the mold halves. Advantageously, fluids such as gas and/or liquids are supplied via the lower pivot pin, whereas electric current is supplied via the upper pivot pin, so as to prevent accidental electric contact and contamination in the event of leaks.

Starting from the afore-described state of the art, the invention is based on the object to provide a horizontal injection molding machine which retains the advantages of the generic horizontal injection molding machine and which eliminates the need for complex linear guides even when large machines are involved.

The object is attained by a horizontal injection molding machine according to claim 1. Advantageous embodiments and modifications are recited in the dependent claims.

By providing a moving yoke between the upper columns, which is moving along the columns and engageable by a pivot pin of the center mold carrier, the center mold carrier can be moved by the drive means engaging the base plate from below as well as by additional drive means operating on the yoke, so that the presence of tilting moments during acceleration and deceleration of the rotary device can be eliminated. The entire weight of the rotary device is thereby kept away from the columns. The lower columns are neither subject to weight moments nor torque. The upper columns need, at the most, to support the weight of the yoke only; the weight can also be kept away from the upper columns by supporting the weight of the yoke on the mold carrier element by suitable sliding or roller bearings. Any torques resulting from the friction between the pivot pin and the yoke can be neglected, in particular when using appropriate bearings. Altogether, all four columns can therefore be kept free of torques caused by weight and torsion, as is also the case in the afore-mentioned prior art.

An exemplary embodiment of the invention will now be described with reference to Figs. 1 to 3.

The invention will now be described with reference to a two-platen horizontal injection molding machine. A fixed platen 2 is secured on a machine bed 1, and a moving platen 3 is movably supported on massive slide shoes 4 and suitable linear guides. The moving platen 3 can be moved by hydraulic actuators 5 and 6 which are arranged diagonally with respect to one another. These are secured, on one hand, (for example, with the cylinders 5a, 6a) on support struts 7 and 8, which are connected to the machine bed, and, on the other hand, on the moving platen 3 (for example with their piston rods 5b, 6b). The hydraulic actuators 5 and 6 can

also be provided between the fixed and the moving platen. The platen 3 is composed of the actual platen 3a and a pressure plate 3b, between which four pressure cushions are arranged for producing the clamping pressure, with only the rear pressure cushions 9 and 10 being visible in the figure. Secured to the moving platen 3 at the top and the bottom are two columns 11ab and 12ab, respectively, in parallel relationship and in a plane, of which the rear columns 11a and 12a only are visible in the figure. The columns extend through the fixed platen 2 and have grooves 13 on their protruding end for engagement of locking jaws 14 and 15. A base plate 18 can be moved on linear guides 16 and 17 by means of hydraulic actuators 19 and 20 in parallel relationship to the longitudinal machine axis. A turntable 21 is supported on the base plate 18 by a cross roller bearing 22 for rotation about a vertical axis. The rotary drive may involve conventional rotary drives which are not illustrated and described in detail. For example, a gear ring can be provided on the outer circumference of the turntable, in which a gear wheel driven by an electric motor or a hydraulic motor engages.

A yoke 30 is positioned above the reversing plate 23 and supported by a first slide bushing 27 upon the topside of the reversing plate 23 for rotation with respect thereto. The columns 11a and 11b are guided through the yoke 30 via additional slide bushings 28 and 29 in mating bores. The first slide bushing 27 extends through a mating opening in the center of the yoke 30 and is used for passage of a rotary distributor or a rotary feedthrough 26 for supply of media, such as water, oil, air, electric current and the like, to the reversing plate 23 and the mold halves 24a, 25a. The provision of a trailing cable installation 34 secured to the yoke 30 enables unillustrated supply lines, which conduct the media and lead to the connections 31 in the rotary distributor, to flexibly follow the travel of the rotary device.

Two hydraulic actuators 32 and 33 are provided between the yoke 30 and the fixed platen 2 at a distance to the rotary distributor 26. In cooperation with the

actuators 19 and 20 which operate below the reversing plate 23 on the base plate 18, the entire rotary device can travel along the longitudinal machine axis during acceleration and deceleration without the risk of tilting. Therefore, there is no need to configure the linear guides 16 and 17 with a special cross section. for example a dovetail cross-section. for absorbing the tilting moment. Instead, simple linear guides suffice so long as they provide lateral guiding, such as a U-shaped rail, in which a mating guide section can engage on the bottom side of the base plate, or a rail with an inverted T-profile (see Fig. 2), which engages with a mating groove on the bottom side of the base plate.

List of reference symbols

1	Machine bed
2	Fixed platen
3	Moving platen
3a	Mounting plate of the moving platen
3b	Pressure plate of the moving platen
4	Slide shoe
5,6	Hydraulic actuators for moving platen
5a, 6a	Hydraulic cylinder
5b, 6b	Piston rods
7, 8	Support struts
9, 10	Pressure cushion
11a, 11b	Upper columns
12a, 12b	Lower columns
13	Grooves
14, 15	Locking jaws
16, 17	Linear guides for base plate
18	Base plate
19, 20	Hydraulic actuators for base plate
21	Turntable
22	Cross roller bearing
23	Mold half carrier or reversing plate
24	First injection molding tool
24a, 24b	Mold halves of the first injection molding tool
25	Second injection molding tool
25a, 25b	Mold halves of the second injection molding tool
26	Rotary distributor or rotary feedthrough
27	First slide bushing
28, 29	Slide bushings on columns

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- 30 Yoke
- 31 connections for media supply
- 32, 33 Hydraulic actuators
- 34 Trailing cable installation
- 35 Linear guides for moving platen

Claims

1. Horizontal injection molding machine with a fixed and a moving platen, with columns extending between the two platens, with a base plate disposed between the platens and displaceable parallel to the longitudinal machine axis by first drive means, with a turntable supported on the base plate for rotation about a vertical axis, and with mold half carriers for mold halves of injection molding tools attached to the turntable,
characterized in that
a yoke is provided which extends between the upper columns and moves relative to the upper columns and which has an opening, that a pivot pin is provided on the topside of the center mold carrier and rotatably supported in the opening of the yoke, and that additional drive means for moving the yoke relative to the platen are provided on both sides of the pivot pin between the yoke and one of the two platens.
2. Horizontal injection molding machine according to claim 1,
characterized in that
the horizontal injection molding machine is a two-platen horizontal injection molding machine and that two hydraulic actuators are arranged between the fixed platen and the yoke to the left and to the right of the pivot pin.
3. Horizontal injection molding machine according to claim 2,
characterized in that
the yoke is supported on the mold half carrier, for example with a slide bearing or a roller bearing.
4. Horizontal injection molding machine according to one of the preceding claims,
characterized in that

the pivot pin is configured as a rotary distributor for supplying media to the mold carrier and/or mold halves, which pivot pin comprises a co-rotating inner part connected with the mold carrier, and a non-rotating outer part connected with the yoke for supplying media.

5. Horizontal injection molding machine according to one of the preceding claims,

characterized in that

first linear guides for the moving platen are provided on the machine bed, and that second linear guides for the base plate are provided on or in the machine bed.

6. Horizontal injection molding machine according to one of the preceding claims,

characterized in that

on one hand, first hydraulic actuators are provided between the yoke and the fixed platen to the left and to the right of the pivot pin, and second hydraulic actuators are provided between the base plate and the fixed platen or a retention member on the machine bed.

7. Horizontal injection molding machine according to one of the preceding claims,

characterized in that

a trailing cable installation is secured on the yoke for flexibly carrying supply lines.

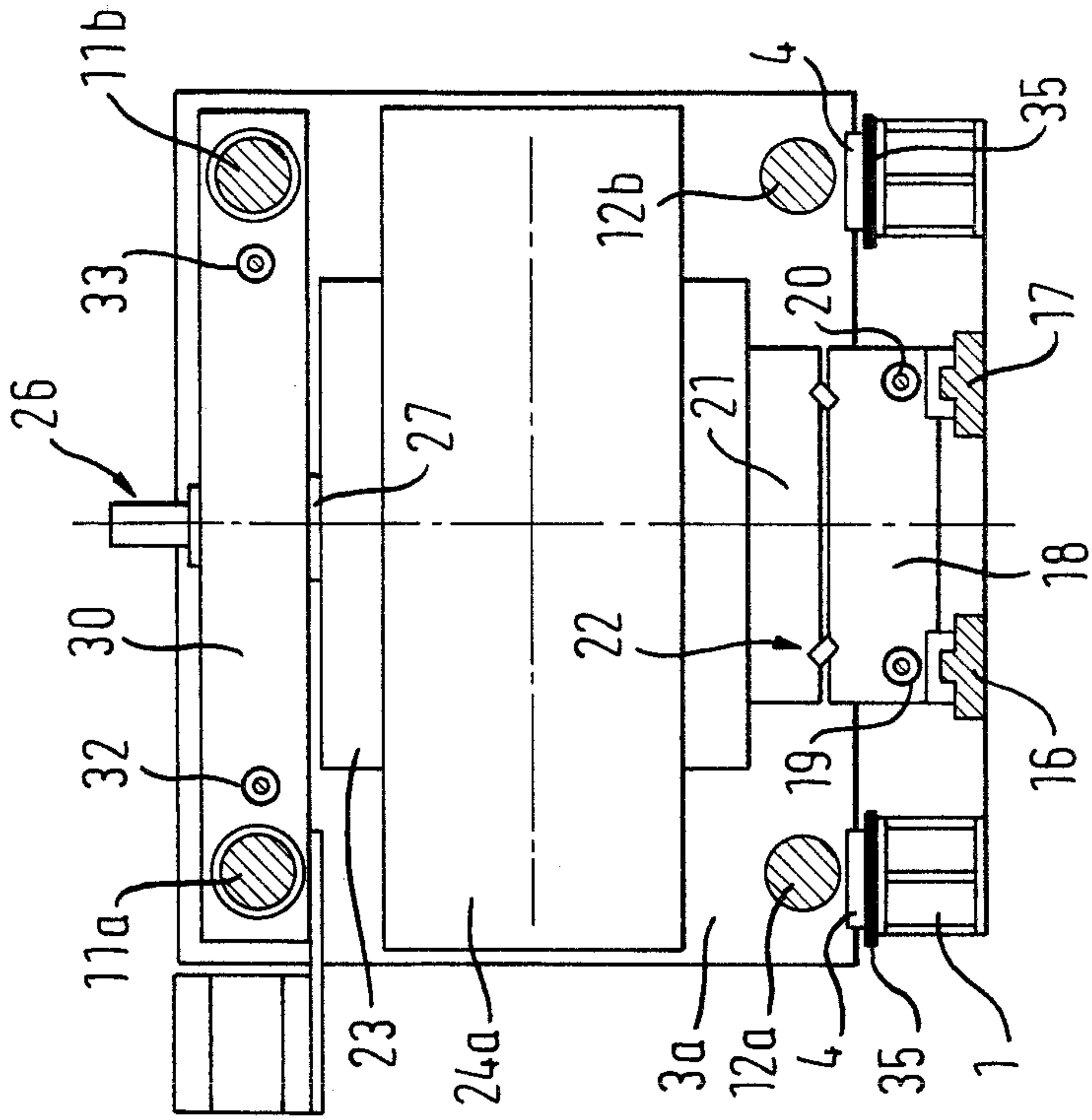


Fig. 2 (A-A)

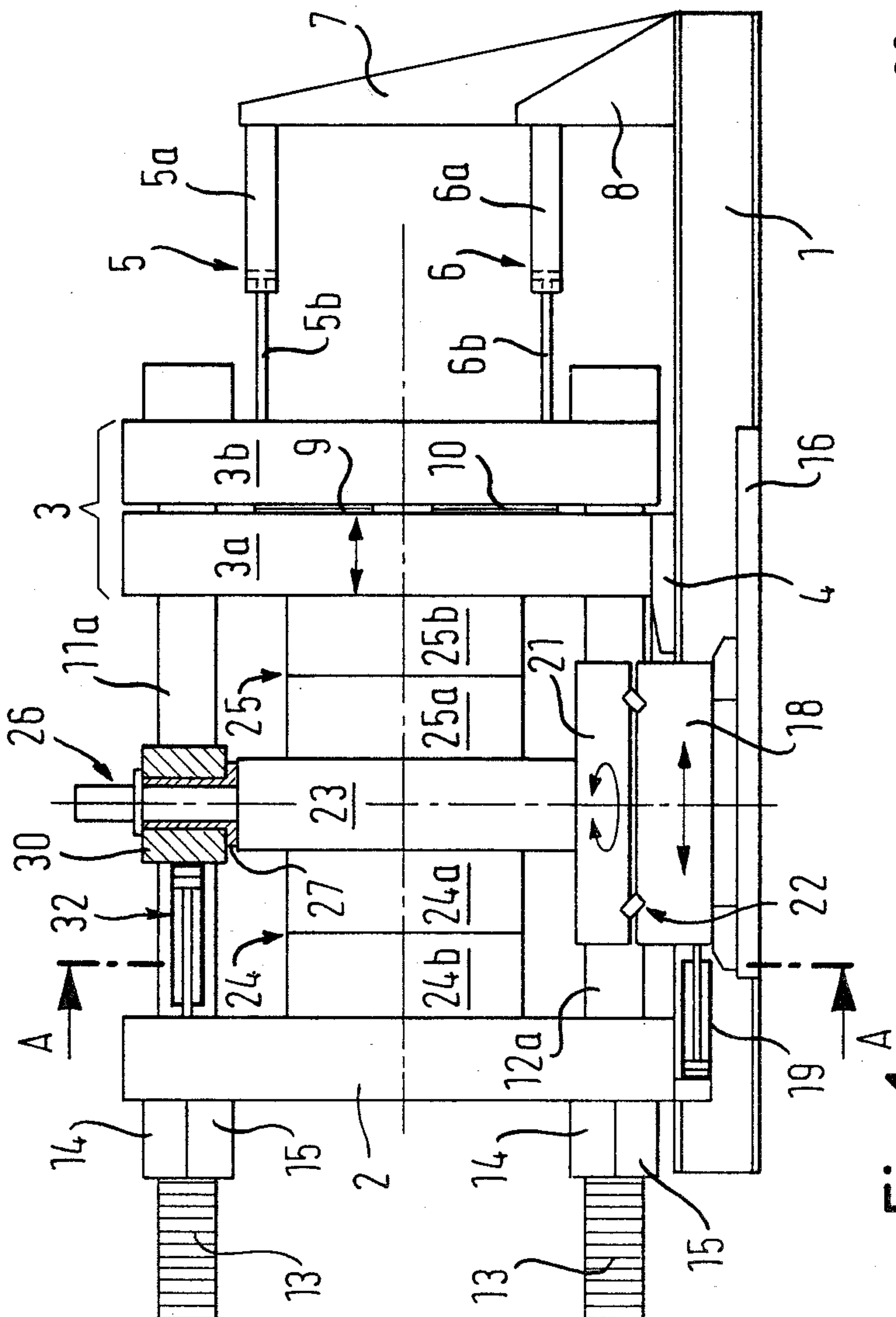


Fig. 1

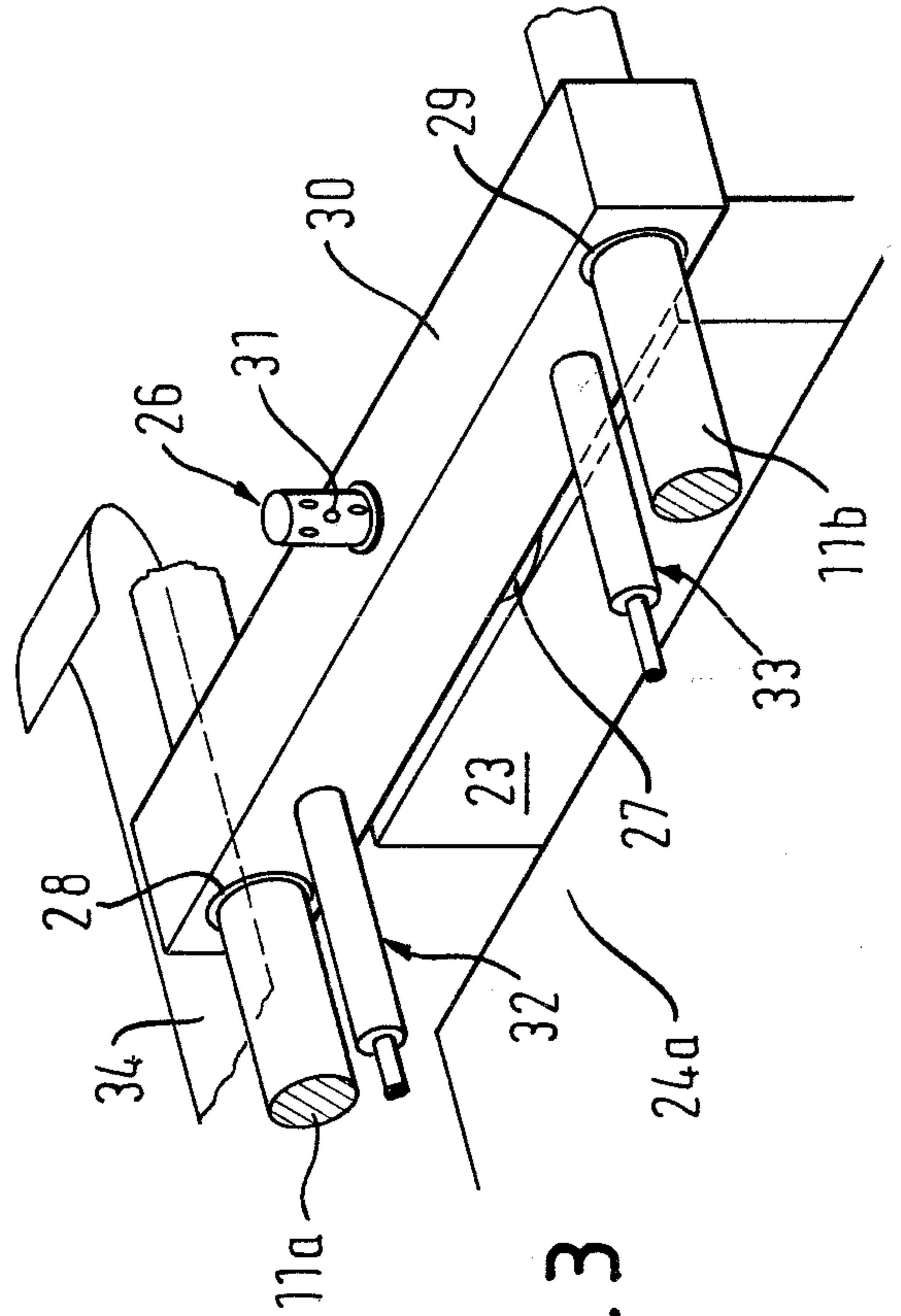


Fig. 3

