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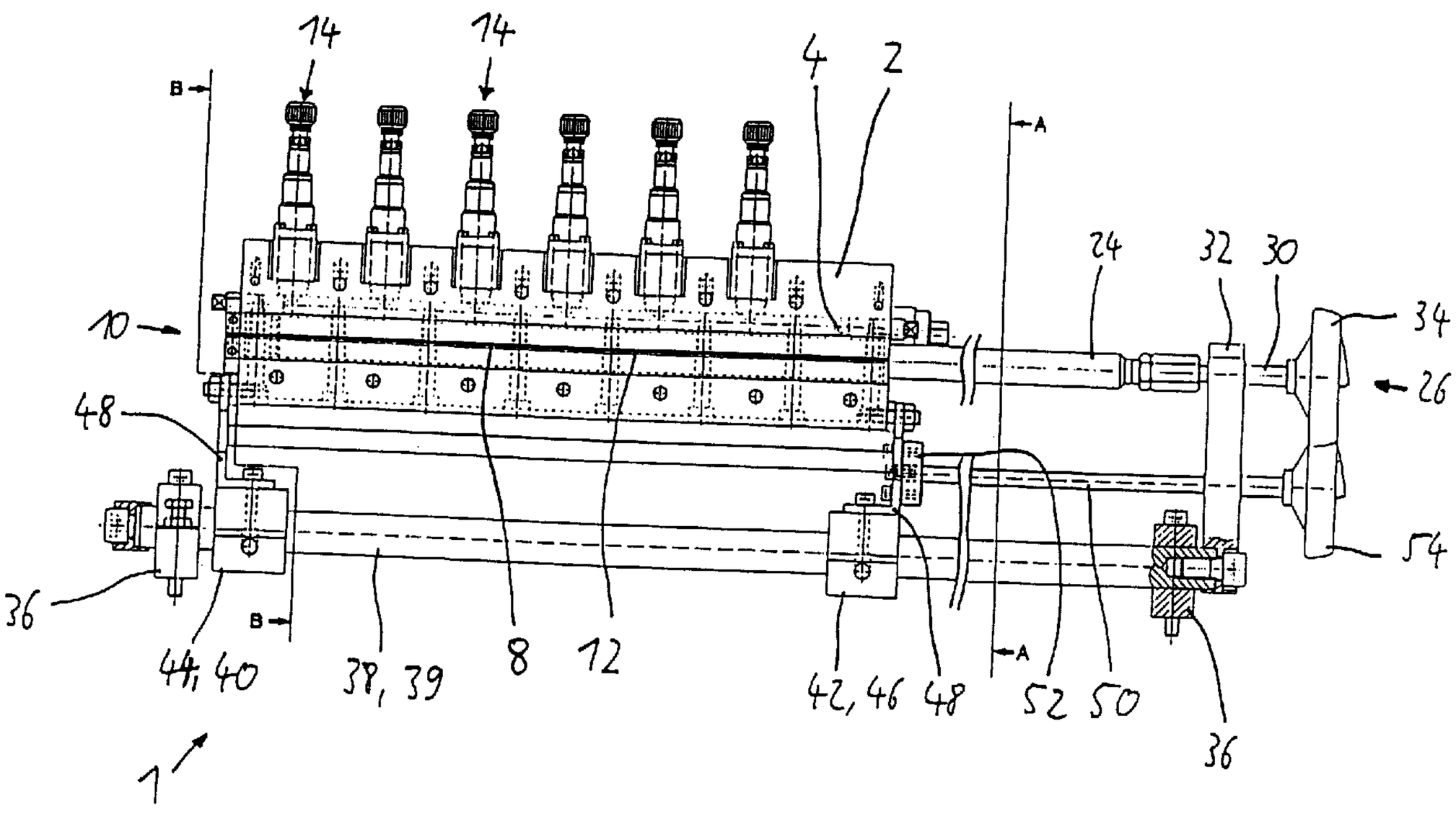
(54) Titre : DISPOSITIF POUR L'APPLICATION DE FLUIDE
(54) Title: DEVICE FOR DISCHARGING A LIQUID



(57) Abrégé/Abstract:
The invention relates to a device for discharging a liquid onto a substrate, especially an adhesive onto films, which can move in relation to said device. The inventive device comprises a liquid feed channel (4) which is formed in a base body(2) and can be connected to a fluid source, at least one discharge valve (14) for selective interruption or release of a flow of liquid and a slotted nozzle arrangement comprising a longitudinal slot and a discharge opening and which can communicate with the fluid feed channel, whereby the length of said slot can vary due to the action of a moveable sealing body (18) inside said slot which can seal it laterally. According to the invention, the base body is displaceably and lockably mounted in the direction of the longitudinal axis of the slot by means of a guide and displacement device.

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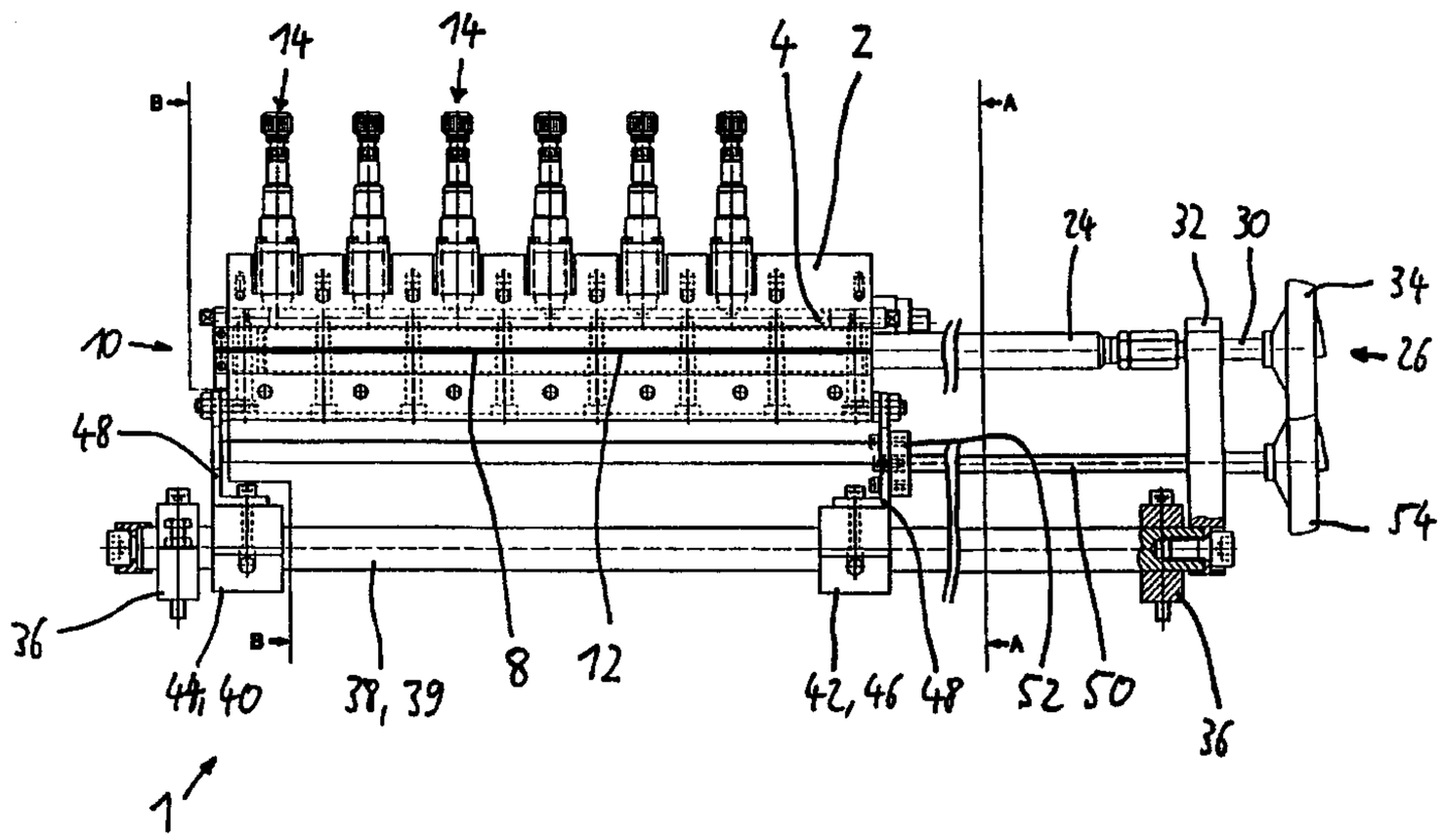
[Fortsetzung auf der nächsten Seite]

(54) Title: DEVICE FOR DISCHARGING A LIQUID

(54) Bezeichnung: VORRICHTUNG ZUM AUFTRAGEN VON FLUID



(57) Abstract: The invention relates to a device for discharging a liquid onto a substrate, especially an adhesive onto films, which can move in relation to said device. The inventive device comprises a liquid feed channel (4) which is formed in a base body(2) and can be connected to a fluid source, at least one discharge valve (14) for selective interruption or release of a flow of liquid and a slotted nozzle arrangement comprising a longitudinal slot and a discharge opening and which can communicate with the fluid feed channel, whereby the length of said slot can vary due to the action of a moveable sealing body (18) inside said slot which can seal it laterally. According to the invention, the base body is displaceably and lockably mounted in the direction of the longitudinal axis of the slot by means of a guide and displacement device.

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DEVICE FOR DISCHARGING A FLUID

BACKGROUND OF THE INVENTION

The present invention pertains to a device for applying fluid to a substrate which can be moved relative to the device, especially for applying adhesive to sheet materials, which device has a fluid feed channel formed in a base body, the channel being connected to a source of fluid; at least one applicator valve for interrupting or releasing the flow of fluid as desired; and a slit nozzle assembly communicating with the fluid feed channel, which assembly has an elongated slit with a discharge opening, where the length of the slit can be varied by means of a stopper, which can move in the slit and seal off the slit at one end.

Devices of this type are often called applicator heads and are used in various areas of industry to apply adhesives or other liquids in two-dimensional patterns to sheet materials, packaging materials, or other substrates. The applicator head is usually mounted on a frame, and the substrate is conducted past the applicator head by a transport device. During operation, the liquid emerges from the elongated discharge opening of the slit of the slit nozzle assembly and thus arrives on the surface of the substrate traveling past the discharge opening.

JP 05-200,346 (Patent Abstracts of Japan) describes a slit nozzle coating device with a slit for dispensing coating material. The width of the slit can be adjusted on both sides by the introduction of so-called stoppers.

To vary the length of the slit of the slit nozzle assembly and thus to vary the width of the fluid applied, it has been proposed that stoppers be provided inside the slot, one at each end of the slit. These stoppers can slide within the slit and be fixed in various positions to define the lateral dimensions of the slit. In this way, the application width can be decreased from its maximum value by reducing the length of the slit from both ends.

SUMMARY OF THE INVENTION

The task of the present invention is to provide an application device of simple design which makes it possible to vary the application width and to adapt the application to different types of substrates.

The invention accomplishes this task with a device of the general type indicated above in that the base body is supported by a guiding and adjusting device in such a way that it can slide in the

direction of the longitudinal axis of the slit and then be held in the desired position.

The invention provides a simple design which makes it possible not only to vary the length of the slit of the slit nozzle assembly and thus to vary the application width but also to shift the entire applicator head if needed in order to align the applicator head precisely with respect to the various substrates being conducted past it. The device according to the invention offers several adjustment possibilities: By shifting the entire base body in the direction of the longitudinal axis of the slit and simultaneously shifting the stopper in the same shifting direction, the application width remains the same, but the slit nozzle assembly is shifted together with the applicator head relative to the substrate without any change in the length of the slit, so that, although the application width is unchanged, the slit nozzle assembly can be oriented precisely with respect to the substrate. Alternatively, the base body can be shifted by means of the guiding and adjusting device, whereas the stopper, which is installed movably in the slit and which seals off the slit at one end, is kept in its original position relative to the stationary frame of the production system. Only its position relative to the slit nozzle assembly of the applicator head changes, with the result that the length of the slit is reduced, and a lateral edge of the slit changes position relative to the substrate. Yet another alternative according to a preferred embodiment of the invention is to use an adjusting device, explained in more detail below, to shift the movable stopper inside the slit, while the base body remains fixed relative to the stationary frame. As a result, the length of the slit is changed, e.g., reduced, and the position of one end of the slit is also changed, whereas the other end of the slit remains in its original position. The device according to the invention thus makes it possible to adjust the width of the slit and the position of the slit relative to a substrate in a much more flexible manner than that allowed by the state of the art. The positions of the two ends of the slit can be varied, and the entire slit nozzle assembly can be shifted as a whole.

A preferred embodiment of the invention is characterized in that the guiding and adjusting device has several linear guides with rolling elements, so that it is possible to shift a rigid applicator head assembly easily with little force from its fixed position.

It is especially preferred for the guiding and adjusting device to have a rotatably supported threaded spindle and a threaded body, which is mounted on the base body and is in engagement with the threaded spindle. This represents a simple design which nevertheless provides reliable shifting. Alternatively, a ball screw spindle could be provided. It is advisable for the threaded spindle to be

connected to a handwheel for manual adjustment of the base body, the handwheel providing for simple and precise shifting of position.

According to a preferred, alternative embodiment, it is provided that the stopper, which can move inside the slit, be connected rigidly to a piston, which is sealed with freedom of movement in a distribution channel communicating with the slit. It is advisable to provide a slit-adjusting device to move the stopper and the piston in common. With the help of the piston installed movably in thedistribution channel and the stopper, the end of the distribution channel can also be varied together with the length of the slit. In addition, the fluid is forced completely out of the distribution channel and the slit, so that no fluid residues can accumulate, which is especially important when adhesives are being processed. When operations must be interrupted for an extended period of time, the piston and the stopper can also be used to clean the device and to press adhesive out of the slit and the distribution channel, so that the adhesive cannot harden in the device.

According to an elaboration of the invention, it is provided that the shifting device has a rotatably supported, threaded spindle and a threaded sleeve, which is rigidly connected to the piston and in engagement with the threaded spindle. The threaded spindle of the adjusting device is preferably connected to a handwheel for manual adjustment.

The applicator head according to the invention can be managed very easily if the handwheel of the guiding and adjusting device and the handwheel of the slit-adjusting device are arranged next to each other on one side of the base body and if the threaded spindles are arranged parallel to each other, because then the guiding and adjusting device for the base body and the slit-adjusting device can be actuated from one side even while the device is in operation and the application process is underway.

According to an elaboration, a substrate guide device is provided, which has a frame, which can be pivoted on the base body by means of a pneumatic cylinder, and two elongated guide elements, which are parallel to the slit and supported on the frame, the guide elements being supported so that they can be pivoted in common and fixed in place relative to the frame.

Because the frame can be pivoted relative to the base body and also because the two guide elements in contact with the substrate to be guided can be pivoted and then fixed in place relative to the frame, the substrate is positioned and guided past the outlet of the slit of the slit nozzle assembly in an optimum manner during operation, with the result that the fluid can be applied in an

optimum manner. In an extremely simple design, the guide elements are designed as guide bars with polished surfaces. Alternatively, the guide elements could also be designed as rotating shafts to reduce friction.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is described below on the basis of exemplary embodiments with reference to the attached drawings:

Figure 1 shows a side view of a device according to the invention for applying adhesive;

Figure 2 shows a plan view of the device according to Figure 1 in partial cross section;

Figure 3 shows a side view of the device according to Figure 1;

Figure 4 shows another view of the device according to Figure 1 from the opposite side;

Figure 5 shows a side view of part of the device according to the invention;

Figure 6 shows a plan view of a substrate guide device;

Figure 7 shows a side view of the substrate guide device according to Figure 6; and

Figure 8 shows another side view of the substrate guide device.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The device shown in the figures (referred to below as the applicator head) for applying fluid to a substrate which can be moved relative to the device serves to apply liquid adhesive to sheet materials conducted past the device. Of course, other types of substrates such as packaging material, etc., could also be coated with layers of adhesive.

The applicator head *1* has a metal base body *2* and a fluid feed channel *4*, which can be connected to a source of adhesive (not shown). The feed channel is designed as a cylindrical bore in the base body *2*, to which a flexible adhesive line is attached. The base body has an upper part *3* and a lower part *5*, which are screwed together. A cylindrical distribution channel *6* is provided within the base body *2*, which channel extends, like the fluid feed channel *4*, over the entire length of the applicator head *1*. The distribution channel *6* is made in two halves, one half consisting of a semi-cylindrical recess in the upper part *3*, the other half consisting of a semi-cylindrical recess in the lower half *5*, so that the distribution channel *6* can be easily cleaned. The distribution channel *6* communicates with a horizontal slit *8* of a slit nozzle assembly *10*. The slit *8* opens out into an elongated discharge opening *12*, from which the adhesive emerges during operation and then arrives on the substrate.

Above the fluid feed channel *4*, six applicator valves *14* for interrupting or releasing the flow of adhesive as desired from the fluid feed channel *4* into the distribution channel *6* and thus also through the slit *8* are attached to the base body *2*. In the exemplary embodiment, each applicator valve *14* is designed as a pneumatically actuated valve, and each has a needle *16*, which is connected to a pressurized gas piston, which moves in a cylinder. When pressure difference act on the piston, the needle moves up and down. The lower section of the needle *16* cooperates with a valve seat on the base body *2*. Directly adjacent to the valve seat, a vertical connecting bore is provided between the fluid feed channel *4* and the distribution channel *6*, which connecting bore is closed by the tip of the needle *16* when the applicator valve is in the closed position and is open when the needle *16* is in its open position. Each applicator valve *14* has a connecting bore. The applicator valves *14* are connected to pressurized gas lines (not shown).

As Figure 2 illustrates, a stopper *18* is inserted movably in the slit *8* of the slit nozzle assembly *10* and thus seals off one end of the slit. The stopper *18* is rigidly connected to a cylindrical piston *20*, which is installed with freedom of axial movement inside the distribution channel *6*. The stopper *18* extends from the piston *20* to the discharge opening *12* of the slit nozzle assembly *10*. The piston *20* has an outer jacket *22*, which is attached to a threaded sleeve *24*.

The threaded sleeve *24* is part of an adjusting device *26* for varying the length of the slit *8* by shifting the stopper *18* in the slit *8* together with the piston *20* in the distribution channel *6*. The adjusting device *26* also has a threaded spindle *30*, rotatably supported by two ball bearings *28*, the outside thread of this spindle engaging with the inside thread of the threaded sleeve *24*. The ball bearings *28* are recessed into a plate *32*. A handwheel *34* for manually turning and adjusting the adjusting device *26* is attached to the end of the threaded spindle *30*. By turning the handwheel *34*, the threaded spindle *30* is rotated, as a result of which the threaded sleeve *24*, the piston *20*, and the stopper *18* are shifted axially in the direction of the longitudinal axis of the slit *8* and of the distribution channel *6*, so that, depending on the direction in which the handwheel *34* is turned, the length of the slit, looking in the longitudinal direction of the applicator head *12*, is either made smaller or larger and can thus be varied as desired.

The base body *2* and thus the entire applicator head *1* are supported by a guiding and adjusting device, explained below, in such a way that it is able to slide back and forth in the direction of the longitudinal axis of the slit *8* and be fixed in position at different points relative to a stationary

frame. The guiding and adjusting device has two carriers *36*, which can be attached to a frame (not shown) of a production system; two cylindrical guide bars *38, 39*, which are parallel to each other and attached to the carriers; and linear guides *40, 42, 44, 46*, which surround the guide bars *38, 39*. The linear guides are provided with several rolling elements, which roll along the guide bars *38, 39*. The lower part of the base body *2* is also screwed to the linear guides *40, 42, 44, 46*. Thus the base body *2* can be shifted in a linear manner along the longitudinal axes of the guide bars *38, 39*. The ends of the guide bars *38, 39*, as can be seen in Figure 1, are attached by screws to the carriers *36*. The linear guides are screwed by way of several angle pieces to the base body *2*.

The guiding and adjusting device also has a threaded spindle *50* with an outside thread, which is supported rotatably by ball bearings in the plate *32*, and a threaded body *52* with an inside thread, which is screwed to an angle piece *48* (see Figure 1) and is in engagement with the outside thread of the threaded spindle *50*. By rotation of a handwheel *54* connected to the threaded spindle *50*, the base body *2* and thus the entire applicator head *1* can be moved forward or back in a straight line depending on the direction in which the handwheel *54* is turned. The maximum travel depends on the length of the guide bars *38, 39*. Because of the friction between the outside thread of the threaded spindle *50* and the inside thread of the threaded body *52*, the base body *2* is held in place in any desired position. The handwheels *34, 54* and the threaded spindles *30, 50* are located on one side of the base body *2*, so that it is easy to operate the system from one side, that is, easy to vary the length of the slit *8* or the position of the base body *2* and thus of the applicator head *1*.

Figures 3-8 illustrate a substrate guide device for conducting sheet material or the like past the discharge opening *12* of the slit nozzle assembly *10* along a defined path. The substrate guide device has a frame *58*, which is supported on the base body *2* and which can be pivoted by two pneumatic cylinders *56*; the device also has two guide elements *60, 62* in the form of guide bars with polished surfaces, which are mounted on the frame *58*. These bars are a certain distance apart, are parallel to each other, and can be pivoted in common to different angular positions and then held in place there.

The ends of the two guide bars *60, 62* are mounted in two plates *64, 66*, which can pivot around an axis *68* (see Figure 7) relative to the frame *58*. It can be seen from Figures 3 and 5 that the frame *58*, the plates *64, 66*, and the guide elements *60, 62* can be pivoted by means of the pneumatic cylinders *56* from a first position, in which they are out of the way, into a second,

operating position. Thus, by adjusting the angular position of the plates *64, 66* and by fixing them in position there with the help of screws, the substrate, as it is being guided past the discharge opening *12,* can be held in the optimum position for the selected type of application. Alternatively, a feed roll instead of the guide elements *60, 62* can be set up opposite the discharge opening *12*.

5

List of Reference Numbers

1 applicator head

2 base body

3 upper part

4 fluid feed channel

5 lower part

6 distribution channel

8 slit

10 slit nozzle assembly

12 discharge opening

14 applicator valves

16 needle

18 stopper

20 piston

22 jacket

24 threaded sleeve

26 adjusting device

28 ball bearing

30 threaded spindle

32 plate

34 handwheel

36 carrier

38 guide bar

39 guide bar

40 linear guide

42 linear guide

44 linear guide

46 linear guide

48 angle piece

50 threaded spindle

52 threaded body

54 handwheel

56 pneumatic cylinder

58 frame

60, 62 guide bars

64, 66 pivot axis

CLAIMS

1. Device for applying fluid to a substrate which can move relative to the device, especially for applying adhesive to sheet materials,

with a fluid feed channel (*4*);

with at least one applicator valve (*14*) for interrupting or releasing the flow of fluid as desired; and

with a slit nozzle assembly (*10*), which communicates with the fluid feed channel (*4*) and has an elongated slit (*8*) with a discharge opening (*12*),

where the length of the slit (*8*) can be varied by means of a stopper (*18*), which can move in the slit (*8*) and seal it off at one end,

characterized in that the base body (*2*) is supported in such a way that it can be shifted in the direction of the longitudinal axis of the slit (*8*) and held in place by a guiding and adjusting device.

2. Device according to Claim 1, characterized in that the guiding and adjusting device has several linear guides (*40, 42, 44, 46*), which are preferably provided with rolling elements.

3. Device according to Claim 1 or Claim 2, characterized in that the guiding and adjusting device has a rotatably supported threaded spindle (*50*) and a threaded body (*52*), which is mounted on the base body (*2*) and is in engagement with the threaded spindle (*50*).

4. Device according to Claim 3, characterized in that the threaded spindle is connected to a handwheel (*54*) for the manual adjustment of the base body (*2*).

5. Device according to at least one of the preceding claims, characterized in that the stopper (*18*), which can move in the slit (*8*), is rigidly connected to a piston (*20*), which is sealed, with freedom of movement, in a distribution channel (*6*), which communicates with the slit (*8*).

6. Device according to Claim 5, characterized in that the stopper (*18*) and the piston (*20*) can be moved by a common slit-adjusting device (*26*).

7. Device according to Claim 6, characterized in that the adjusting device (*26*) has a rotatably supported, threaded spindle (*30*) and a threaded sleeve, which is rigidly connected to the piston (*20*) and in engagement with the threaded spindle (*30*).

8. Device according to Claim 7, characterized in that the threaded spindle (*30*) of the adjusting device (*26*) is connected by a handwheel (*34*) for manual adjustment.

9. Device according to Claims 4 and 8, characterized in that the handwheel (*54*) of the guiding and adjusting device and the handwheel (*34*) of the slit-adjusting device (*26*) are mounted next to each other on one side of the base body (*2*), and in that the threaded spindles (*30, 50*) are arranged parallel to each other.

10. Device according to any one of claims 1 to 9, characterized by a substrate guide device for conducting the substrate past the discharge opening (*12*) of the slit (*8*) along a defined path, where the guide device has a frame (*58*), which can be pivoted by means of a pneumatic cylinders (*56*) on the base body (*2*), and two elongated guide elements *(60, 62)*, which are supported on the frame (*58*) and arranged parallel to the slit, and where the guide elements (*60, 62*) are mounted in such a way that they can pivot in common and be held in place relative to the frame (*58*).

11. Device according to Claim 10, characterized in that the guide elements (*60, 62*) are designed as guide bars with polished surfaces.

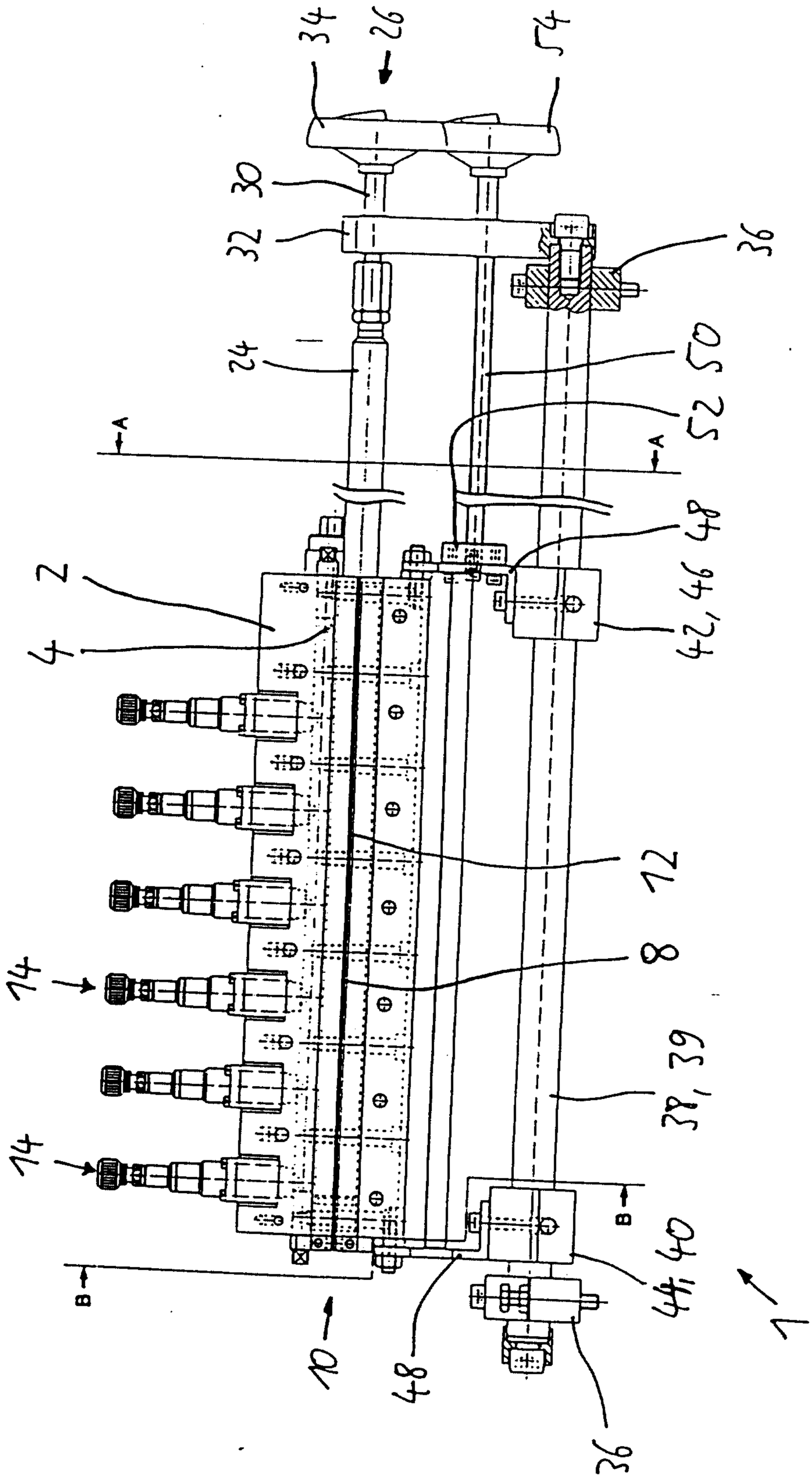
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Fig. 1

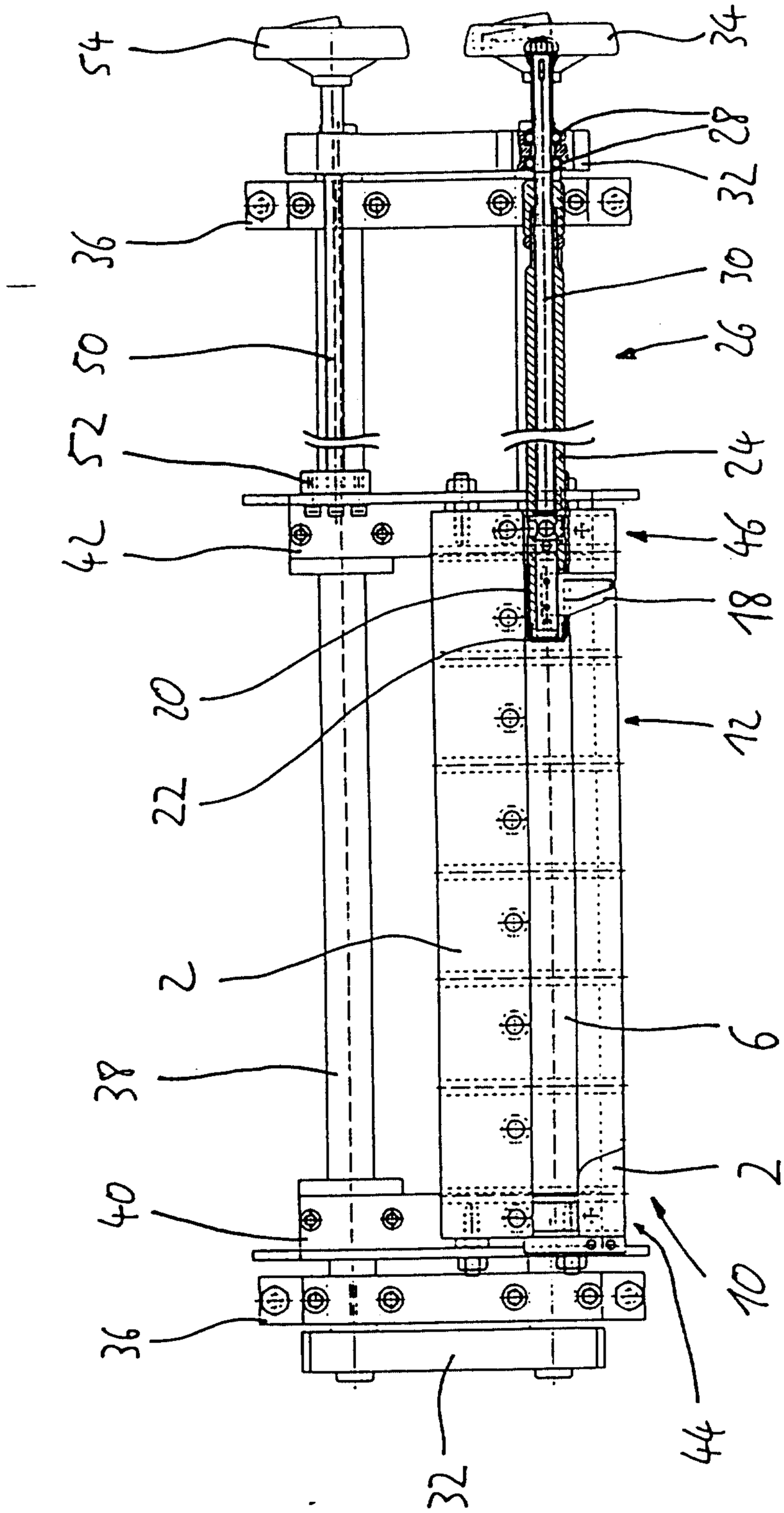

Fig. 2

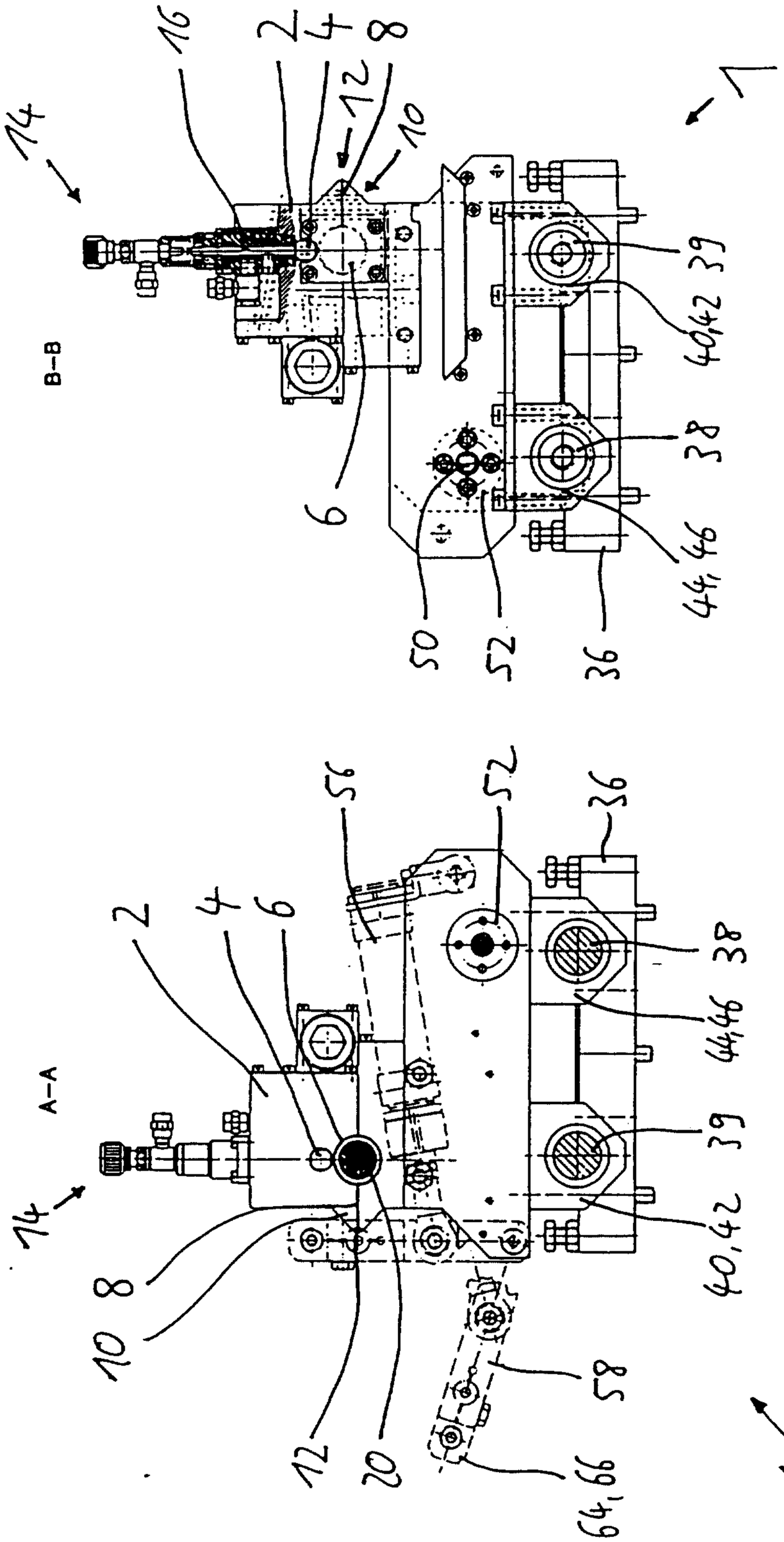
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Fig. 4

Fig. 3

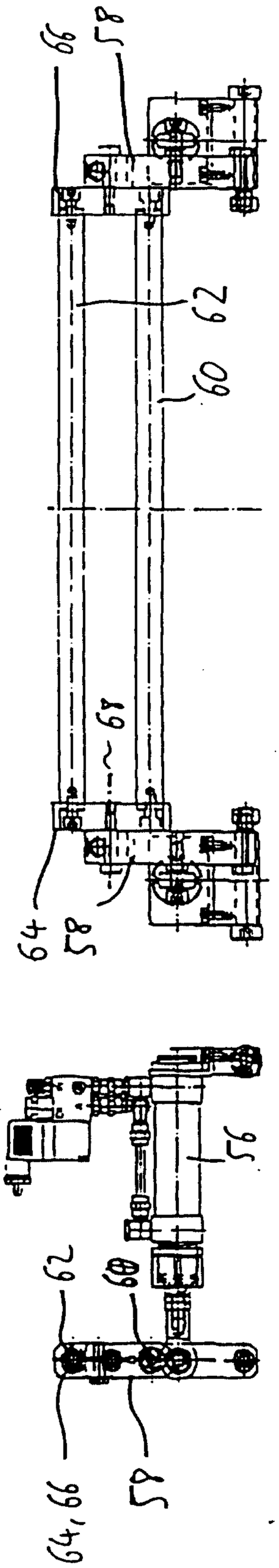


Fig. 7

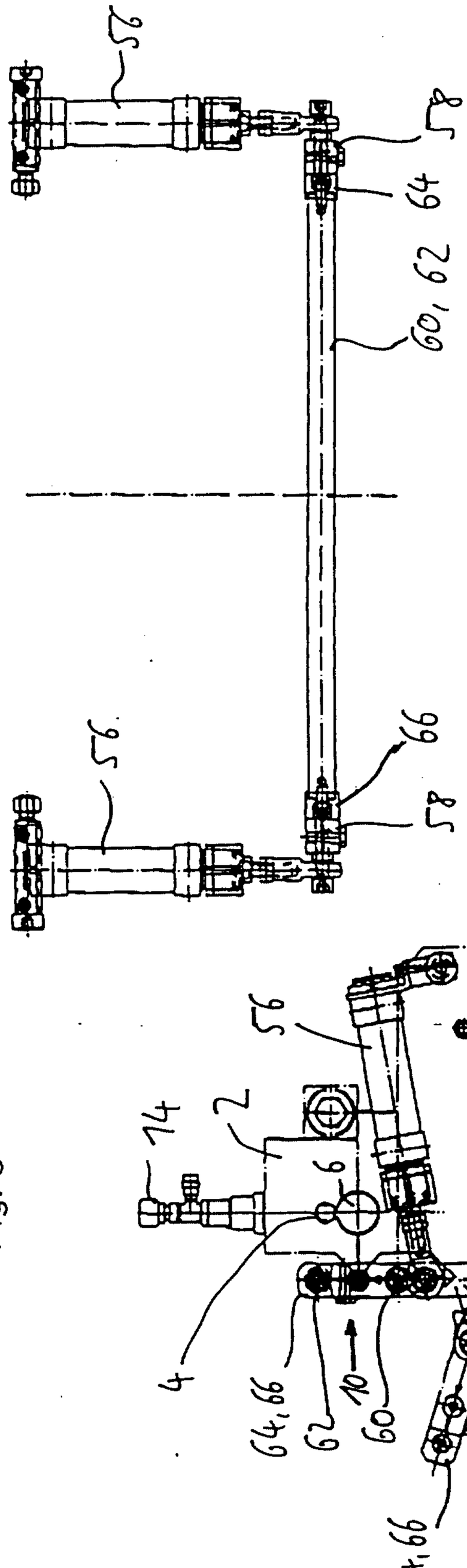
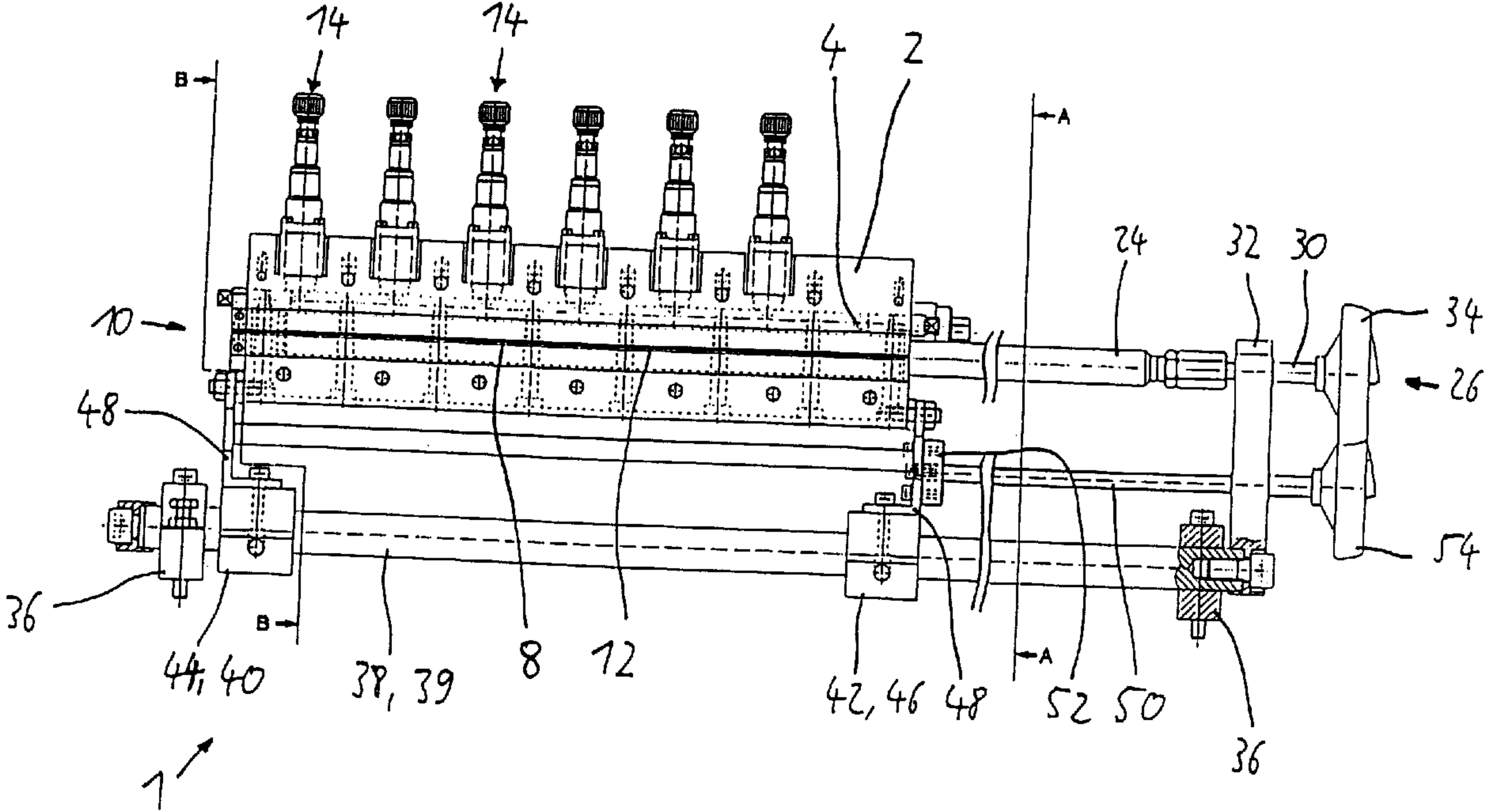


Fig. 6

Fig. 8

Fig. 5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