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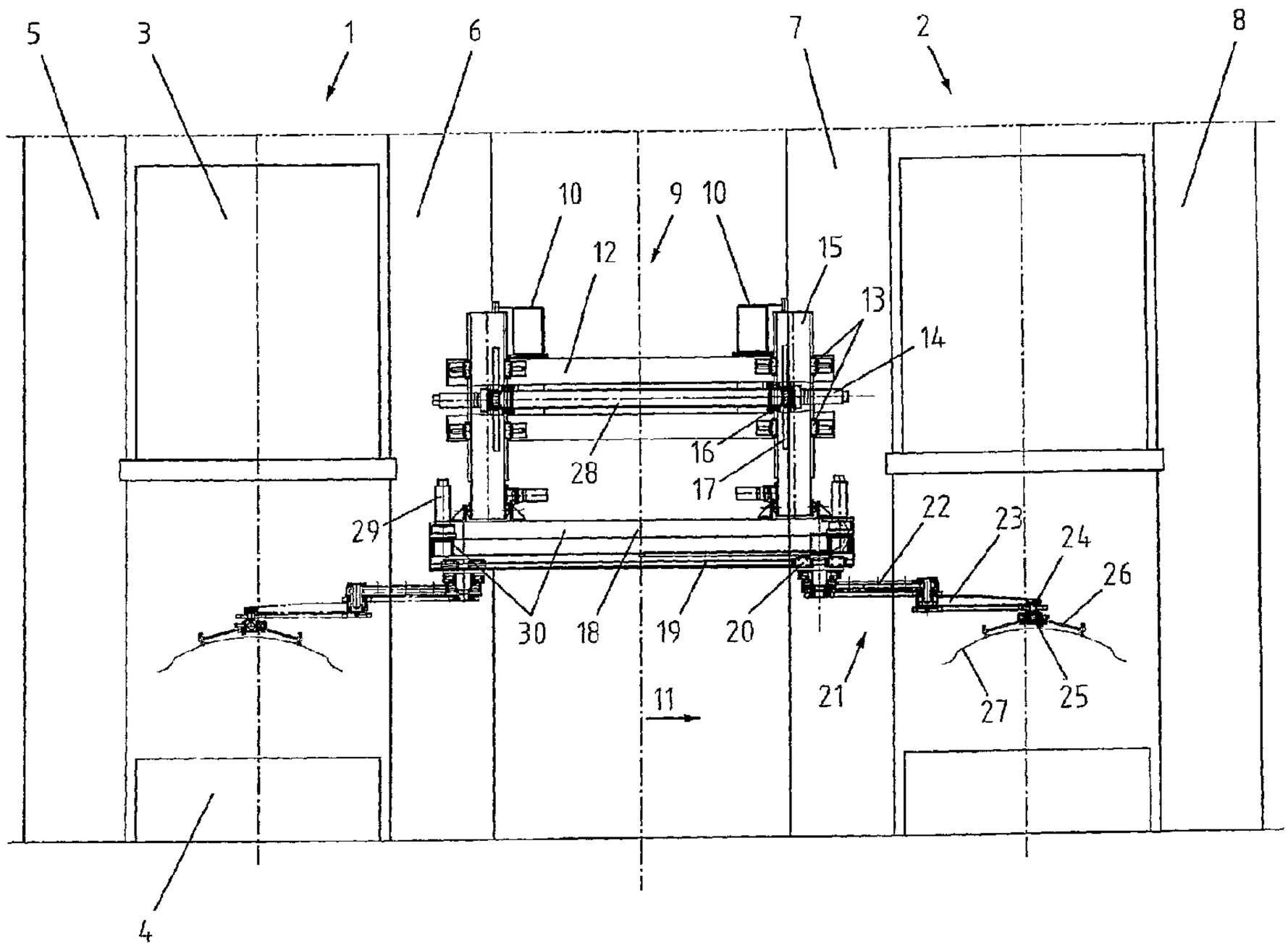
(54) Titre : DISPOSITIF DE TRANSPORT DE PIECES A TRAVAILLER DANS DES SYSTEMES DE PRESSAGE
(54) Title: DEVICE FOR CONVEYING WORKPIECES THROUGH PRESSING SYSTEMS



(57) Abrégé/Abstract:
The invention relates to a device for transporting work pieces through pressing systems, in particular a double hinged arm feeder for step presses or press working lines. Said transport device is configured in such a manner that the work pieces are transported at high speed with a large system rigidity. The hinged arm is pivotably mounted on a slit (20) which supports the pivot drive and which is guided on a rail (18) whereon at least one stationary drive (29) is located enabling the slits (20) to move in a horizontal manner in relation to the slits (20) and the whole unit can be moved in a vertical manner over at least one stationary lift drive (14). Due to said configuration, the hinged arm or the two hinged arm parts only have a small looped length.

ABSTRACT

The invention relates to a device for transporting work pieces through pressing systems, in particular a double hinged arm feeder for step presses or press working lines. Said transport device is configured in such a manner that the work pieces are transported at high speed with a large system rigidity. The hinged arm is pivotably mounted on a slit (20) which supports the pivot drive and which is guided on a rail (18) whereon at least one stationary drive (29) is located enabling the slits (20) to move in a horizontal manner in relation to the slits (20) and the whole unit can be moved in a vertical manner over at least one stationary lift drive (14). Due to said configuration, the hinged arm or the two hinged arm parts only have a small looped length.

Device for Conveying Workpieces through Pressing Systems

Description

The present invention relates to a device for conveying workpieces through the processing stations of a press or press line.

Prior art

If production of a workpiece requires a plurality of processing stages such a stamping and shaping stages then, in the interests of economical production, the individual operations that are required are carried out in a sequential press, or a press working line.

As a rule, such systems are provided with conveying devices that transport the workpieces automatically. Various conveying devices of this kind are disclosed in DE 195 21 976 A1. This document also discloses a so-called articulated arm feeder. In a particularly advantageous manner, the complete drive system is disposed above the workpiece transport plane. This structural form permits optimal accessibility to the press area.

The articulated arm feeder can be retrofitted to existing sequential presses for large parts or press working lines at no great cost. The articulated arm feeder can be used for mechanically and hydraulically powered presses without any restrictions.

In principle, the articulated arm feeder comprises two articulated parts that form the articulated arm. The articulated arm is powered in such a way that a pivoting movement in the horizontal plane can be made about a vertical axis. Additional degrees of freedom are provided for, such as horizontal mobility in and counter to the direction in which the workpieces are transported. A vertical lifting device is integrated into the movable part of the articulated arm feeder. The actual workpiece retaining means are secured on crossbeams, the so-called suction bars.

Also known from this document is the fact that the articulated arm feeder can be made with two articulated arms that are disposed in a mirror image arrangement relative to each other, i.e., as a so-called double articulated arm feeder.

Common to both versions is the fact that the freely projecting articulated parts of the articulated arm are prone to undesirable and powerful oscillations when subjected to heavy dynamic loads.

Objective and advantages of the present invention

It is the objective of the present invention to avoid the disadvantages discussed heretofore, and to so improve the rigidity of the articulated arm feeder that more reliable transport of the workpiece is ensured at a high dynamic level.

An aspect of the invention relates to conveying device for transporting workpieces through processing stations of shaping machines, with a conveying device that transports at least one workpiece in a multi-axis transport movement, which is installed above the plane of the workpiece transport between the processing stations, the conveying device removing the workpiece from a processing station and moving it through a lifting movement, a horizontal pivoting movement about a vertical axis, and a horizontal movement to the next processing station without any intermediate positioning, the conveying device being configured as at least one articulated arm with a first articulated part and a second articulated part, wherein the articulated arm is supported so as to be able to pivot on a slide on which is installed a pivot drive and which is guided on a traverse on which there is a drive, which is fixed relative to the slide, for a horizontal movement of the slide, and the complete unit is movable vertically through at least one fixed lift drive.

The underlying concept of the present invention is that the articulated arm or the two parts of the articulated arm require only a small projecting length. In addition, the mass that is moved has been significantly reduced and the dynamics of the articulated arm improved thereby.

This has been achieved in that a slide that bears the articulated arm is moved close up to the press or forming station. To this end, the slide itself is provided with only a horizontal drive. The slide is guided and supported on a traverse that is, in its turn, connected to a vertical movement axis. This division of the movement axes makes the desired low-mass configuration possible. The great horizontal transport path is thus traveled by the slide and articulated arm that are acted upon by a small mass, and this permits high rates of acceleration and speed. The significantly smaller vertical lift is then completed together with the traverse.

Increased rigidity and reduced oscillation are additionally achieved by the use of two articulated arms as a double articulated arm feeder. The crossbeam that is located at the front end of the articulated arm with the workpiece retaining means is supported significantly better by the double articulated arm feeder.

In particular, the vertical and horizontal turning and tilting moments that occur are supported or in part balanced out. The acceleration forces that result from the horizontal acceleration when the workpiece is being transported are absorbed in a favourable form by the closed articulation layout.

An additional advantage of double articulated arm feeders is that the installed height of the articulated arms is reduced, with the result that, in addition to the lower mass, accessibility to the upper tool is improved when the workpiece is being put in position or removed.

The articulated arm feeder can be provided with additional degrees of freedom without any problem, so that it can perform all the movements that are needed in order to change the position of the workpiece with the result that—as a rule—neither intermediate positioning nor an orientation station is needed. Double parts can also be transported without any problems.

The connection of the articulated arm to the crossbeam with the workpiece retaining means is so configured that the most varied systems can be coupled by means of adapters.

Energy is supplied to the workpiece retaining means by way of the two articulated arms in a low installed height with advantageous freedom of movement. At the point of rotation of the joint and on the crossbeam there are non-rotatable rollers for the energy guide chain, whereas the lever joints have rotatable rollers that are moved by the energy guide chain.

Further details and advantages of the present invention are set out in the description and the drawings of an exemplary embodiment that follow. These drawings show the following:

Figure 1: An illustration showing the principle of two presses of a press working line with a conveying device;

Figure 2: A plan view of Figure 1;

Figure 3: A view of a press with a conveying device transversely to the conveying device.

Description of the exemplary embodiment

Figure 1 shows two presses 1, 2 of a press working line. Also shown are the ram 3, the sliding table 4, and the stands 5 – 8. The conveying device 9 according to the present invention is held by two traverses 10 that are secured on the stands 6, 7 transversely to the direction of movement 11 of the workpiece. A mounting plate 12 is connected to the traverses 10 and supports the guide 13 and the lift drive 14 for the lift column15. The lifting movement is initiated by a gear wheel 16 that is secured on the shaft of the lift drive 14 and works in conjunction with a gear rack 17 that is disposed on the lift column 15. The lift drive 14 can be twinned and both can be synchronized through a connecting tube 28. A traverse 18 is secured to the lower end of the lift column 15 with the linear guide 19 for the slide 20 of the articulated arm 21. The articulated arm comprises a first articulated part 22 and a second articulated part 23 that are both of the same lever length. At the outer end of the second articulated part 23 there is a receptacle for the crossbeam 25 that supports the workpiece retaining means 26 for the workpiece 27.

The drives 29 are provided for horizontal transport movements and these operate in conjunction with a notched-belt drive 30 to which the slide 20 is secured. It is plain to see that with such a design arrangement the articulated arm 21 need only project a short distance. An optimal installed height and favourable accessibility to the upper tool is achieved thereby.

Figure 2 shows the embodiment as a double articulated arm. The articulated arms 21 are installed in a mirror image arrangement relative to each other and are driven in opposite directions. The particular drive motor of the pivot drives 31 acts on the first axis of pivot 32 through a transmission stage and on the second axis of pivot through a gear chain. The axis of pivot 33 is connected to the pivot and bearing shaft 34 through a notched-belt drive. The receptacle 24 for the crossbeam 25 is secured to the pivot and bearing shaft 34. The drives 35 for rotation of the crossbeam 25 about its own axis 41, and the drives 36 for the mobility of the workpiece retaining means 26 transversely to the direction of movement 11 of the workpiece 11 make other degrees of freedom possible. The design and movement sequence are described in detail in DE 195 21 976 A1.

Figure 3 shows pivoting transversely to the direction of movement 11 of the workpiece as an additional degree of freedom. A drive 37 drives a gear wheel 38 that functions in conjunction with a toothed quadrant 39 to pivot the workpiece 27 about the axis 40. The fixed lift drive 14 drives the gear wheel 16 thereby initiating the vertical movement of the lift column 15.

Structural details of the vertical mobility can also be seen in Figure 3. The fixed lift drive 14 drives the gear wheel 16 thereby initiating the vertical movement of the lift column 15.

The present invention is not restricted to the exemplary embodiment described and illustrated herein.

1 Press
2 Press
3 Ram
4 Sliding table
5 Stand
6 Stand
7 Stand
8 Stand
9 Conveying device
10 Traverse
11 Workpiece conveying device
12 Mounting plate
13 Guide
14 Lift drive
15 Lift column
16 Gear wheel
17 Gear rack
18 Traverse
19 Linear guide
20 Slide
21 Articulated arm
22 First articulated part
23 Second articulated part
24 Receptacle
25 Crossbeam
26 Workpiece retaining means
27 Workpiece
28 Connecting tube
29 Drive
30 Notched belt drive
31 Pivot drive
32 Axis of pivot
33 Axis of pivot
34 Pivot and support axis
35 Drive
36 Drive
37 Drive
38 Gear wheel
39 Toothed quadrant
40 Axis
41 Axis

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CLAIMS:

1. Conveying device for transporting workpieces through processing stations of shaping machines, with a conveying device that transports at least one workpiece in a multi-axis transport movement, which is installed above the plane of the workpiece transport between the processing stations, the conveying device removing the workpiece from a processing station and moving it through a lifting movement, a horizontal pivoting movement about a vertical axis, and a horizontal movement to the next processing station without any intermediate positioning, the conveying device being configured as at least one articulated arm with a first articulated part and a second articulated part, wherein the articulated arm is supported so as to be able to pivot on a slide on which is installed a pivot drive and which is guided on a traverse on which there is a drive, which is fixed relative to the slide, for a horizontal movement of the slide, and the complete unit is movable vertically through at least one fixed lift drive.

2. Conveying device as defined in Claim 1, wherein two articulated arms are disposed in a mirror image arrangement relative to each other and driven in opposite directions relative to each other by pivot drives and are configured as a double articulated arm feeder.

3. Conveying device as defined in Claim 1, wherein a crossbeam is pivotable about the axis by a drive, a gear wheel, and a toothed quadrant.

4. Conveying device as defined in Claim 1, wherein the crossbeam is pivotable about an axis by a drive.

5. Conveying device as defined in Claim 1, wherein the workpiece retaining means is movable transversely to the direction of movement of the workpiece by a drive.

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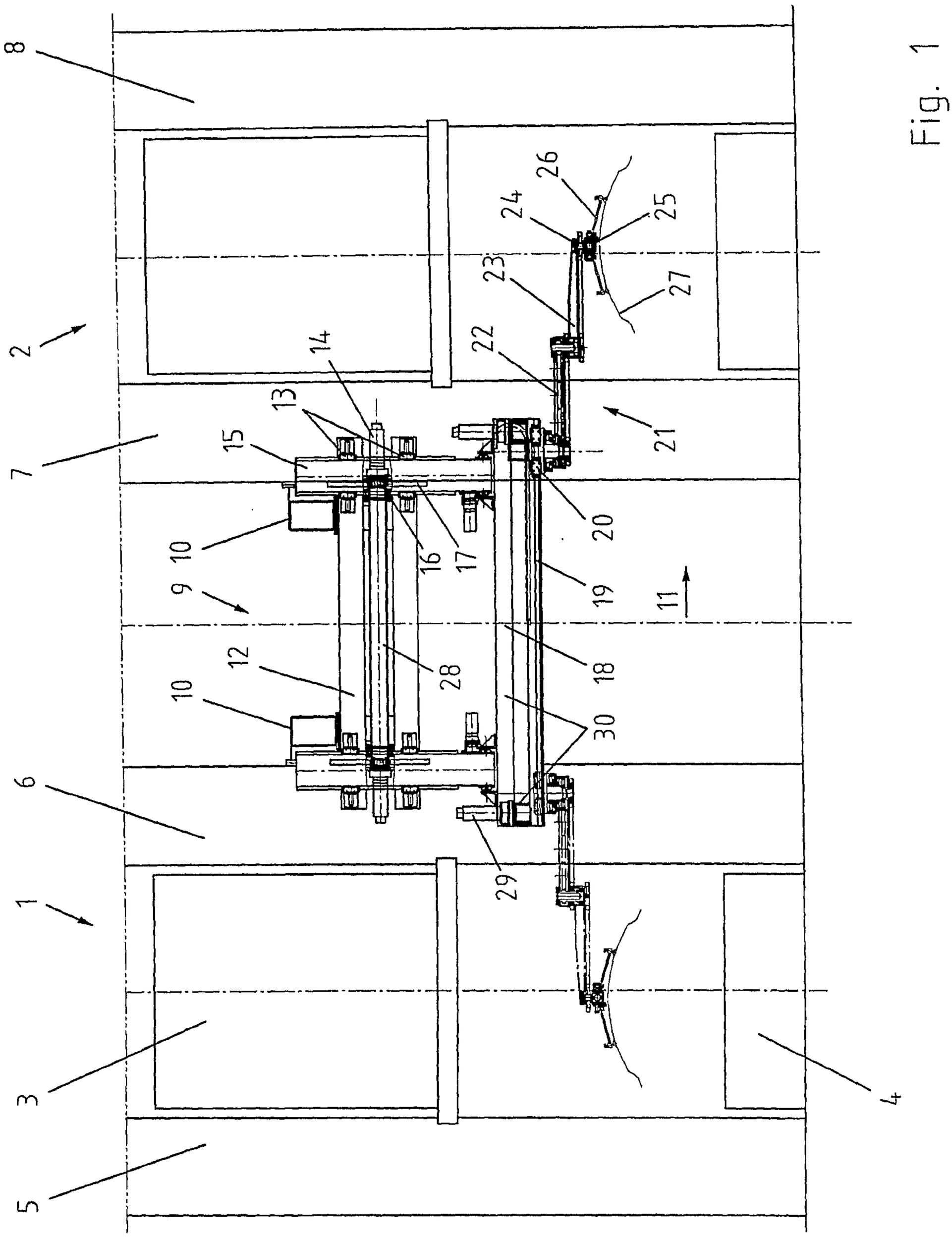
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Fig. 1

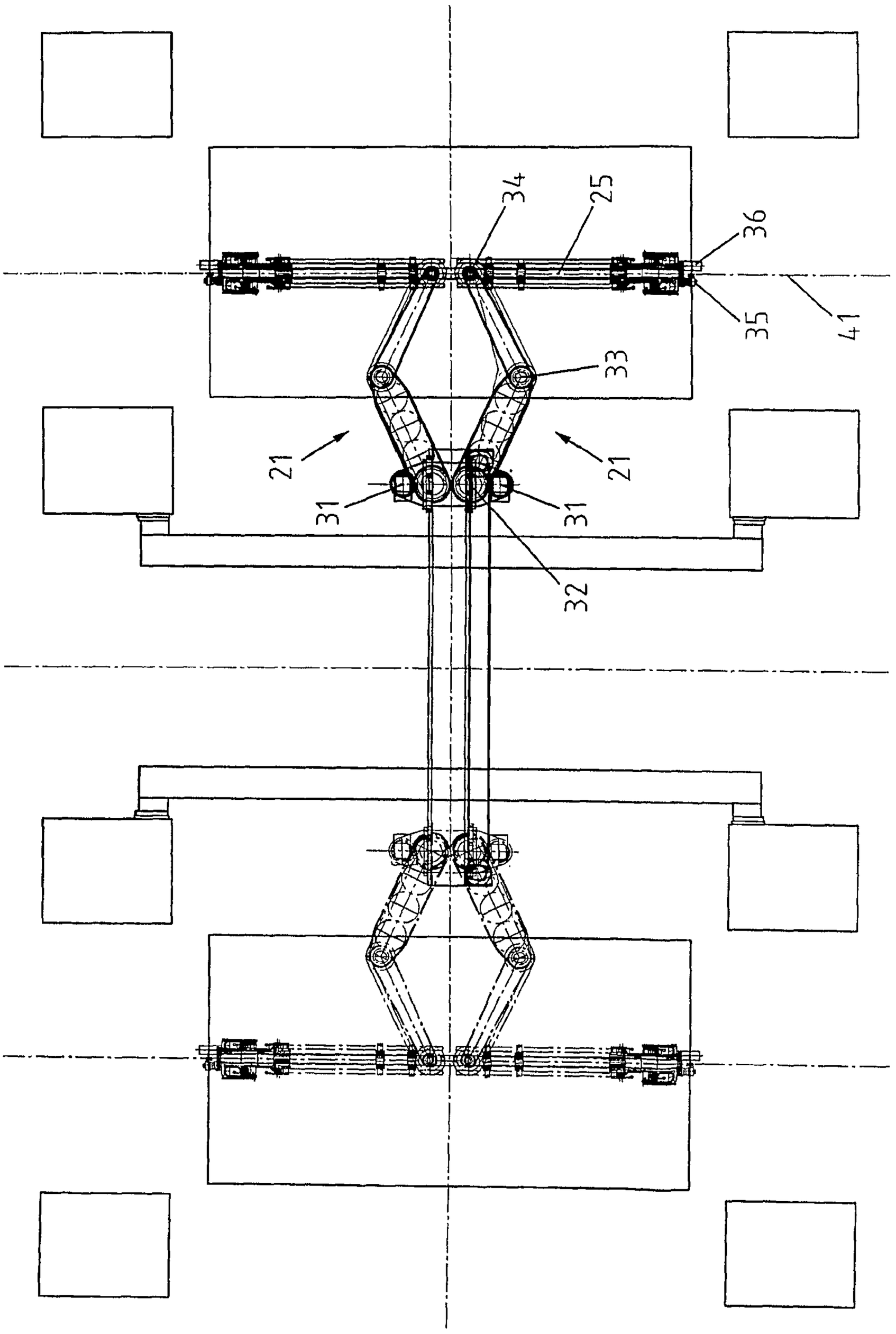


Fig. 2

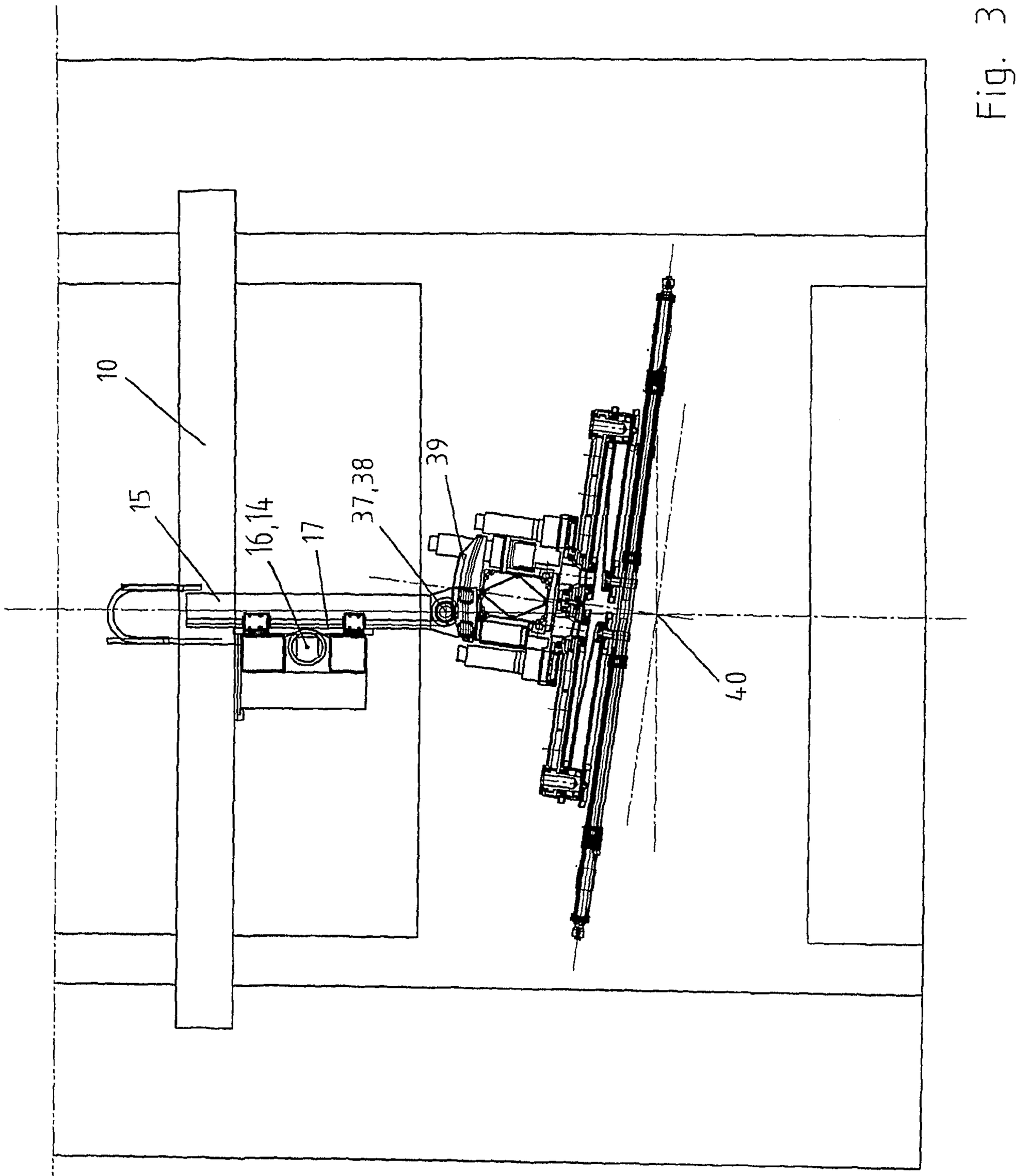
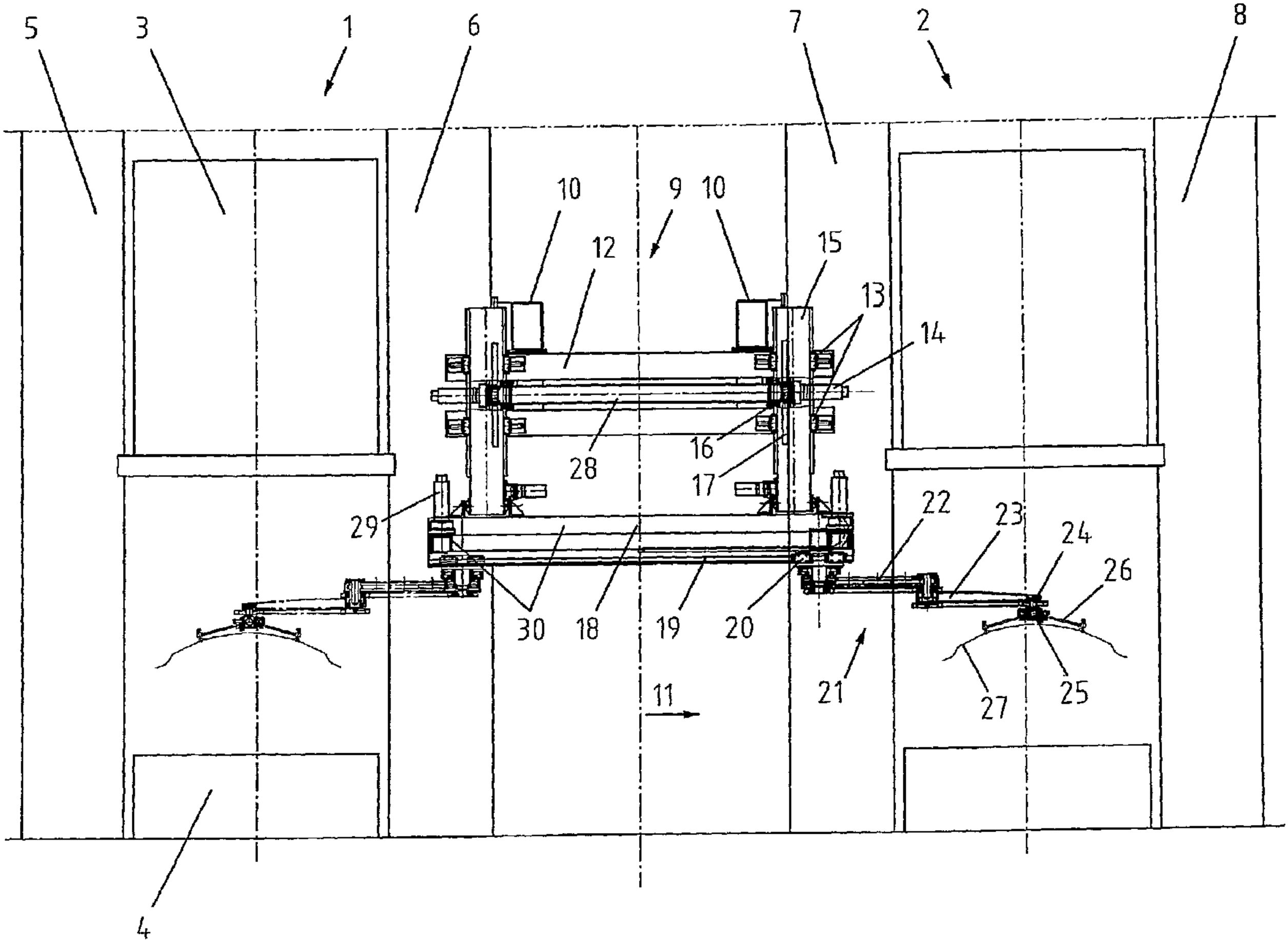


Fig. 3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