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**54** An arrangement for the positioning of a load in a railway wagon.

**57** A positioning arrangement for use in loading a trailer or the like (2) onto a transport vehicle (1) the freight space (3) of which is at least in part movable to the side, in which case the trailer on its wheels is pushed into the freight space moved to the side, and when the freight space has been returned into connection with the frame (5) of the transport vehicle, the front part of the trailer is locked so as to be immobile in the lateral direction, on the center line

(A-A) of the transport vehicle, by means of a support table (6). The freight space (3) movable to the side has a lifting table (7) raisable against the chassis (29) of the trailer (2), the lifting table having lateral-transfer devices (23) for transferring the front part of the trailer in the lateral direction. The freight space also has guides (8) for the wheels of the trailer in order to center the rear part of the trailer in the lateral direction.

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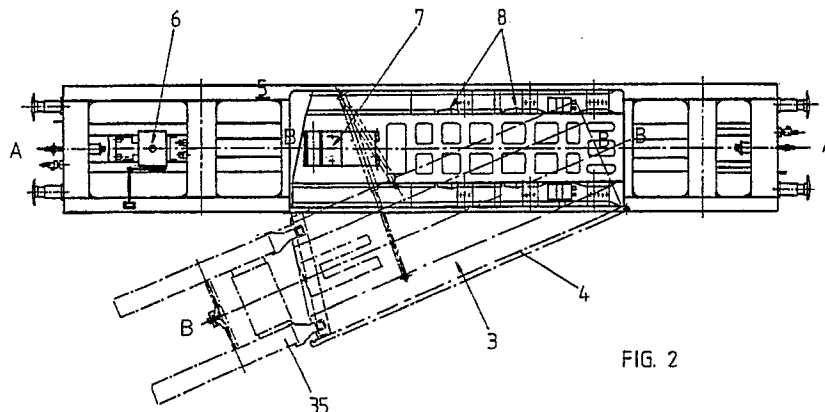


FIG. 2

### An arrangement for the positioning of a load in a railway wagon

The present invention relates to an arrangement and devices for loading and positioning a semi-trailer in another transport vehicle, precisely on its center line so that the permissible projection of the load is not exceeded on either side of the transport vehicle when a load of maximum width is being transported. The invention relates in particular to a positioning arrangement for use in loading a trailer or the like into another transport vehicle, the freight space of which is movable at least in part to the side from the transport vehicle itself and the trailer or the like on its wheels is pushed into the freight space moved to the side and is supported in it, and when the freight space has been returned into connection with the frame of the transport vehicle the front part of the trailer or the like is locked by means of a support table or the like so as to be immobile in the lateral direction on the center line of the transport vehicle.

Especially in railway transport, efforts have been made to develop transport methods and systems so that loading and unloading would become rapid to carry out without massive hoist equipment. In this, special attention has been paid to the loading of trailers, semi-trailers and the like. For the loading of these *per se* there have been developed a number of different techniques, of which this application will discuss only those in which the load is introduced into a railway wagon from the side. In this connection, various problems have arisen from the fact that, since the outer dimensions of a freight wagon are precisely limited all over the world, whereas the outer dimensions of the load, in the present case a trailer or a semi-trailer or the like, are close to the permitted outer dimensions of a freight wagon, the load must be brought precisely to the correct position in the freight wagon. Even in this case the dimensions of trailers allow only a very thin floor and thin side walls in a freight wagon, in which case the sides must be relatively high in order to obtain sufficient strength. In this case the trailer can be placed between the sides only by pivoting the side or sides out of the way. In structures such as this, the loading and unloading are carried out by driving the trailer or the like onto a railway wagon along a ramp, as described in publication GB-2 179 311, or by pushing it in from the side of the wagon.

Application FI-882564 describes one way of centering a semitrailer when loading it onto a freight wagon opening from the side. In this, the front part of the semi-trailer is centered by means of a specially structured support table on the center line of the freight wagon and its rear part remains in the position in which it was parked. It

has proven that the support table according to application FI-882564 is heavy to use and requires great manual strength from the loading personnel. In addition, it is difficult, merely by reversing, to bring the rear part of the trailer sufficiently precisely onto the center line of the freight wagon. Imprecise centering may in an extreme case lead to damage to the transport vehicle or the trailer under the effect of forces appearing during the loading and transport, or under the effect of some other structure in a wrong position.

Efforts have been made in the state of the art to align the rear part of a trailer by using, in the box pivotable to the side, wheel tracks having bevelled wedge-like longitudinal sides. The purpose is that the wheels of the vehicle should slide along these wedge-like surfaces if the vehicle does not originally align with the center, and they thus center the rear end of the trailer. Such a centering method is not very effective, since the wheels do not easily slide along a surface even if it is in practice greased in order to promote sliding. If the wedge of the surface is nearly vertical, sliding does occur, but the achieved lateral transfer is very slight, and if the wedge surface is gently sloping, the necessary sliding does not occur.

The object of the invention is to provide a positioning arrangement by means of which the front part of the trailer can be centered precisely and easily so that fastening by the towbar precisely on the center line of the transport vehicle is possible. Another object of the invention is a positioning arrangement by means of which the rear part of the trailer can simultaneously be centered with sufficient precision on the center line of the transport vehicle. It is a further object of the invention to provide a positioning arrangement which is simple in structure and reliable in operation.

By using the arrangement according to the invention a crucial improvement is achieved with respect to the disadvantages described above and the objects defined above are reached. In order to accomplish this, the arrangement according to the invention is characterized in what is stated in the characterizing clause of Claim 1.

The most important advantages of the invention can be deemed to be that by using the support table, lifting table with its centering devices, and trailer wheel guides, according to the invention, both ends of a trailer or the like can be centered rapidly and reliably. Thereby the loading time becomes short, which is economically advantageous, and the trailer or the like can be guided and secured to the transport vehicle so that no part is damaged during loading and transportation. It is a

further advantage that the loading does not require any steps physically dangerous for the personnel.

The invention is described below in greater detail with reference to the accompanying drawings:

Figure 1 depicts a side elevation of a railway wagon having the positioning equipment according to the invention.

Figure 2 depicts a plan view of the railway wagon of Figure 1.

Figure 3 depicts a plan view of a support table according to the invention.

Figure 4 depicts a cross-sectional side elevation of a support table according to the invention.

Figure 5 depicts a side elevation of the lifting table according to the invention, in its lower position.

Figure 6 depicts a side elevation of the lifting table of Figure 5, in its upper position.

Figure 7 depicts a plan view of the lifting table of Figure 5.

Figures 7a and 7b depict the operation of the load-centering devices of the lifting table of Figure 7.

Figure 8 depicts a perspective representation of the mutually aligned structures of the lifting table and the trailer.

Figure 9 depicts the operation of the devices of Figure 8 in conjunction with each other during the centering of the trailer.

Figure 10 depicts a plan view of the trailer wheel guides in a railway wagon.

Figure 11 depicts a side elevation of the wheel guides of Figure 10.

Figure 12 depicts the wheel guides of Figure 10, as seen from the driving direction.

Figure 1 depicts a side elevation of a freight wagon 1 for the transport of a semi-trailer 2. Figure 2 depicts the same freight wagon, in which the dot-dashed lines depict the box 3 of the wagon, with its side wall 4, pivoted out from the freight wagon 1, in which case the semi-trailer or the like can be driven along a ramp or a separate driving bridge 35 onto and off the box 3 of the wagon. The frame of the freight wagon is indicated in general by numeral 5, and at one end of the frame there is secured a support table 6 according to the invention. A lifting table 7 according to the invention and wheel guides 8 according to the invention are secured to the box 3.

Figure 3 depicts a support table 6, which can move on slide bars 9 in the longitudinal direction of the wagon. In Figure 4 the support table 6 is depicted as seen from the side, sectioned through the center line A-A. In the longitudinal direction of the wagon the movement of the support table 6 is limited in the wagon frame by the rubber cushions 11 of buffer beams 10 and by rams 12. The sup-

port table 6 can be moved on slide bars 9 by a hand crank 13 with the help of a gear 15 driven by chain transmission 14 and of a gear rack 16 in the support table 6. The support table 6 has a conventional system for locking the tow-bar of the of the trailer into an aperture 17 by means of a fork 19 operated by a hand lever 18.

Figures 5 and 6 depict side elevations of the lifting table 7 in the box 3 pivotable to the side, in its extreme vertical positions, and Figures 7, 7a, 7b depict plan views of the same in the center and in both lateral-transfer positions of the centering devices 23. The lifting table comprises a bridge 21, parallel to the longitudinal direction of the box and secured by an articulation 20 to the box 3; the other end of the bridge can be raised by hydraulic cylinders 22. In addition, the bridge 21 has trailer-centering devices, indicated in general by reference numeral 23, at that bridge end which is raisable by the hydraulic cylinders 22.

Figures 7a and 7b depict the structure and operation of the centering devices 23. For example, two single-acting hydraulic cylinders 24a and 24b acting in opposite directions are coupled by their frames to the bridge 21, and the piston arms 32a, b of the cylinders are interconnected by a spring-loaded equalizing bracket 25 so that mutually similar springs 26a and 26b will induce the return movement of the cylinders 24a, 24b when the hydraulic pressure in the cylinder decreases. A flange 31 located between the springs 26a and 26b and movable in relation to the bracket 25 is secured on the center line of the bridge 21, in which case, when pressure is removed from the cylinders, it will pull in under the effect of the springs and center, in relation to the bridge, both pistons and the rams 27a and 27b in their arms 32a, 32b. Thus, in the structure the bracket 25, the piston arms 32a, 32b, and the rams 27a, 27b are fixedly secured to each other, and the bracket 25 by way of the flange 31 to the bridge 21.

Figures 8 and 9 show perspective representations of the lifting table 7 with its parts and support legs 28 which are in the trailer and can be partly turned up. The frame of the trailer has a lifting boom 29, which is made up of vertical bars 33 and a transverse pipe 34. Close to the ends of the transverse pipe 34 of the lifting boom there are stops 30a, b, the distance S between them being greater than the bridge width D, but smaller than the sum (D+L) of the bridge width and the travel distance L of the rams 27a, b.

Figures 10, 11 and 12 depict the lateral guides 8 for the trailer wheels, located in the box 3, which guides are conical rollers 37 mounted on the sides of the wheel tracks 36a, 36b and at distance H from the bottoms 41 of the wheel tracks, in parallel to the center line B-B of the track, i.e. the box. The

conical rollers 37 are typically located on either the inner sides and/or the outer sides of the wheel tracks, always symmetrically in pairs. The rotation axes of the rollers are thus parallel to the longitudinal center line B-B of the track, i.e. the box. The axes of successive rollers may be congruent or at different widths in the transverse direction. The distance P between the outer surfaces of the rollers, if they are on the inner sides of the tracks as in the figures, is approximately equal to, or only slightly smaller than, the inner distance R between the vehicle wheels 39, in which case the rollers will force the trailer to the center of the box reliably, with small force, and without damaging the wheels or axle structures of the vehicle. This is due precisely to the shape and rotation of the rollers 37, the wheels 39 being transferred, by the transfer indicated by arrow 40, from a point on the side to the correct point when the rollers 37 rotate under the edge of the wheel 39. For the purpose of driving out it is advantageous to make the rollers 37 as double-cone rollers, in which case the cone portion 38a in the driving-out direction U may be shorter than the cone portion 38b working in the loading-drive direction K. The bases of the cones are against each other and their apices, or apparent apices, are away from each other, i.e. the rollers are thicker in the middle than at the ends.

When the freight wagon 1 is being loaded, the positioning of the trailer 2 takes place as follows: The box 3 of the freight wagon is in the opened position, indicated by dotted lines in Figure 2. The trailer 2 is driven or pushed along the driving bridge 35 onto wheel tracks 36 on the box 3. The lateral guides 8 force the rubber wheels 39, even when driven somewhat aside, with sufficient precision onto the wheel tracks 36 and the trailer to the center of the box 3. The tow-bar of the trailer is released from the locking in the traction table of the tractor unit, the lifting table 7 is raised to its upper position by means of the hydraulic cylinder 22 and the tractor unit is driven off. Thereupon the front part of the trailer rests, by the transverse pipe 34 of its lifting boom 29, on the end of the box 21 of the lifting table 7, approximately in alignment with the centering devices 23 in the manner depicted in Figure 9. At this time the stops 30a, 30b are aligned with the rams 27, on both sides of them. The driving bridge 35 is removed and the box 3 is moved to inside the wagon frame 5 and is locked at the side wall 4. The support table 6 is transferred along the slide bars 9 in the longitudinal direction of the freight wagon by using the hand crank 13, into alignment with the tow-bar of the trailer. By using the hydraulic cylinders 24a, 24b the stops 30a, b of the lifting boom 29 of the trailer are pushed, when necessary, alternately from each side by means of the rams 27a, b of the centering

device 23, until the front part of the trailer is centered so that the tow-bar will be in alignment with the aperture 17 in the support table 6, also in the lateral direction of the freight wagon. The lifting table 7 is lowered by its hydraulic cylinders, whereupon the tow-bar of the trailer passes into the aperture 17 in the support table and is locked into it by the fork 19. Meanwhile, the centering device 23 has become centered as the pressure has been removed, and so it is not in the way. The rubber wheels of the trailer are supported so as to be immobile by means of wheel stops, and the freight wagon is ready for transport. When the load is being unloaded, the procedure is similar, but in the reverse order.

The invention is not limited to the embodiment disclosed above; the structural details may deviate considerably from that described above. What is essential is that the arrangement includes means for centering both ends of the trailer or the like and for locking one end so as to be immobile in the lateral direction. Thus the hydraulic and spring-actuated mechanisms can be implemented also by using other structural parts.

## Claims

1. A positioning arrangement for use in loading a trailer or the like (2) into another transport vehicle (1), the freight space (3) of which is at least in part movable to the side from the transport vehicle itself, and the trailer or the like on its wheels is pushed into the freight space, which has been moved to the side, and is supported in it, and after the freight space (3) has been returned into connection with the frame (5) of the transport vehicle (1), the front part of the trailer or the like is locked by means of a support table (6) or the like so as to be laterally immobile on the center line (A-A) of the transport vehicle, **characterized** in that the freight space (3) movable to the side has a lifting table (7) which can be raised against the chassis (29) of the trailer (2) and has lateral transfer devices (23) for transferring the front part of the trailer or the like in the lateral direction of the transport vehicle (1) as well as trailer wheel guides (8) for centering the rear part of the trailer or the like in the lateral direction of the transport vehicle.

2. A positioning arrangement according to Claim 1, **characterized** in that the wheel guides (8) consist of conical rollers (37) mounted in parallel to the track on the inner sides and/or the outer sides of the wheel tracks (36a, 36b).

3. A positioning arrangement according to Claim 1 or 2, **characterized** in that the lateral-transfer devices (23) consist of at least two rams (27a, 27b) which are moved by drive means (24) in

relation to the lifting table (7), in the lateral direction of the transport vehicle, the first ram (27a or 27b) extending, when necessary, away from the lifting table against stop means (30a or 30b) in the trailer chassis in order thereby to push the end of the trailer in a first lateral direction or, respectively, the second ram (27a or 27b) away from the lifting table in the opposite lateral direction against the other stop means (30b or 30a) in order to push, when necessary, the end of the trailer in this other direction in order to align the fastening means laterally with the support table (6).

4. A positioning arrangement according to Claim 3, **characterized** in that the drive means (24) are hydraulic cylinders (24a, 24b) or the like acting in opposite directions, and that the cylinder piston arms (32a, 32b) are interconnected by an equalizing bracket (25) which is affected by springs (26a, 26b) bearing on the lifting table (7), in order to center the lateral-transfer device (23) in relation to the lifting table when the device is not being used.

5. A positioning arrangement according to any of the above claims, **characterized** in that the lifting table (7) comprises a bridge (21) which is articulated (20) to the freight space (3), and that the lateral-transfer devices (23) are secured to that end of the bridge which is away from the articulation and which raises the trailer by a pipe, bar or the like (34) transverse to its chassis (29).

6. A positioning arrangement according to any of the above claims, **characterized** in that the support table (6) for locking the front part of a trailer or the like so as to be immobile in the lateral direction can be transferred by transfer devices (13, 14, 15, 16) in the direction of the center line (A-A) of the transport vehicle during loading, and that these transfer devices (13, 14, 15, 16) can be detached from the support table (6) for the duration of transport.

7. A positioning arrangement according to any of the above claims, **characterized** in that there are conical rollers (37) on the sides of the wheel tracks (36a, 36b), always in pairs on two sides symmetrically, so that the axis of rotation of the rollers is at a distance (H) from the bottom (41) of the wheel tracks (36a, 36b), and that the rollers are shaped as double-cone rollers, in which case the conical portion (38a) in the driving-out direction is shorter than the conical portion (38a) working in the loading-drive direction (K), the bases of the cone portions being against each other.

8. A positioning arrangement according to any of the above claims, **characterized** in that the pivot axis of the articulation (20) of the bridge (21) is approximately transverse to the center line (A-A) of the transport vehicle, and that the raising and lowering of the bridge are effected by one or

several hydraulic cylinders (22).

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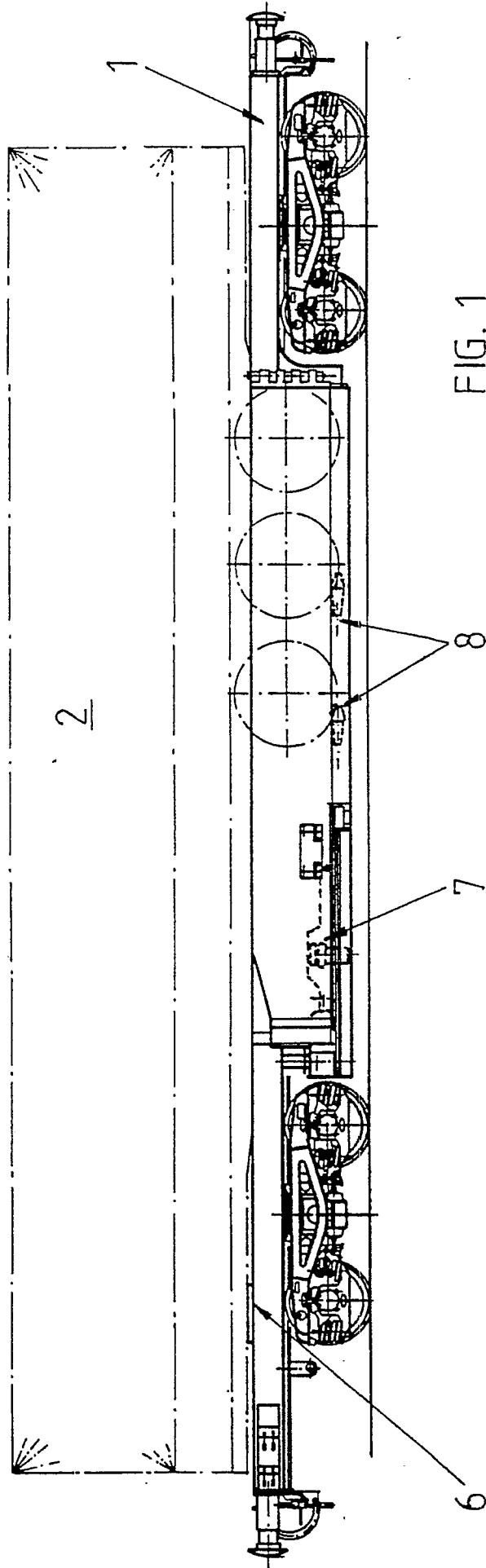


FIG. 1

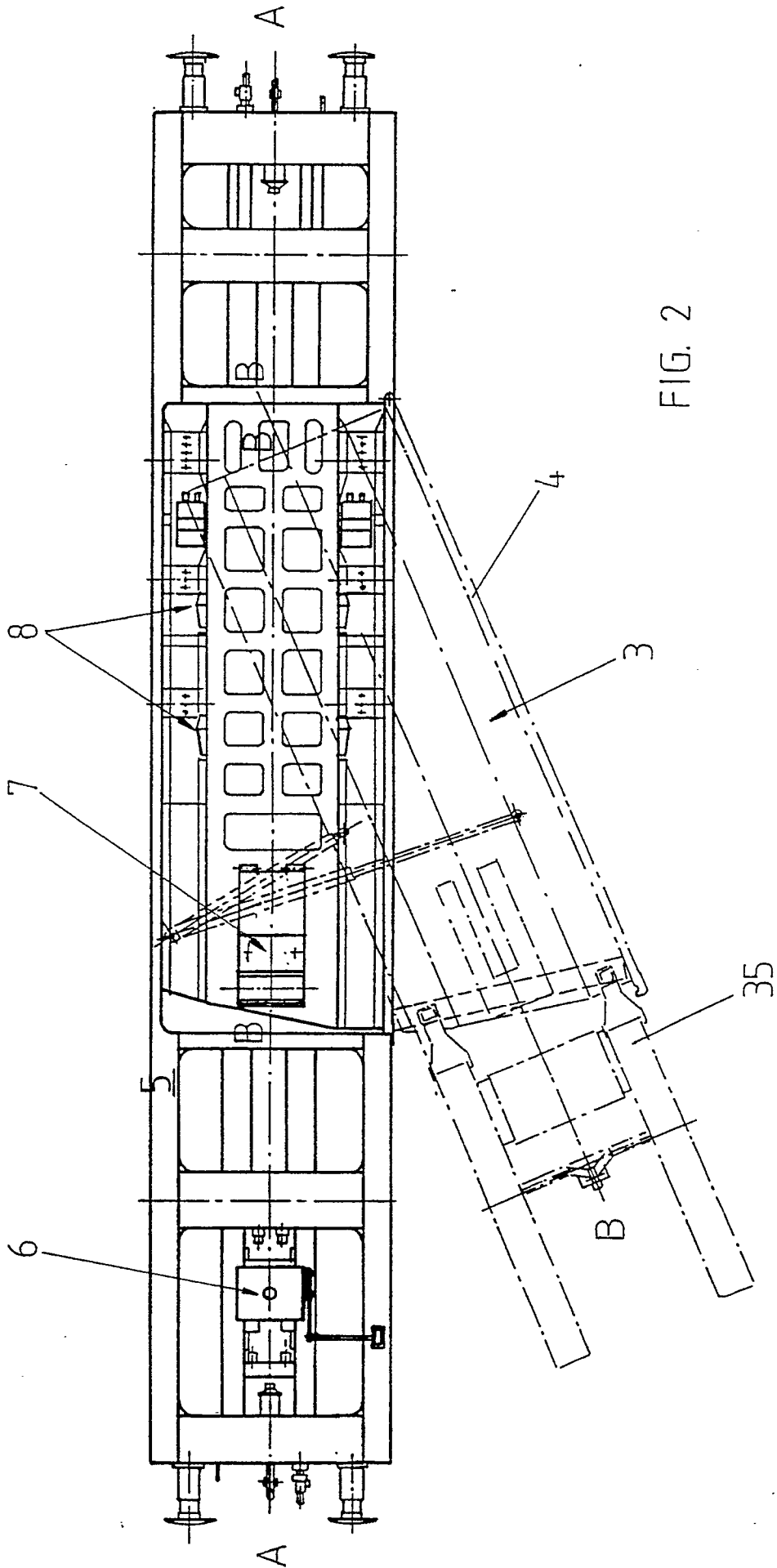


FIG. 2

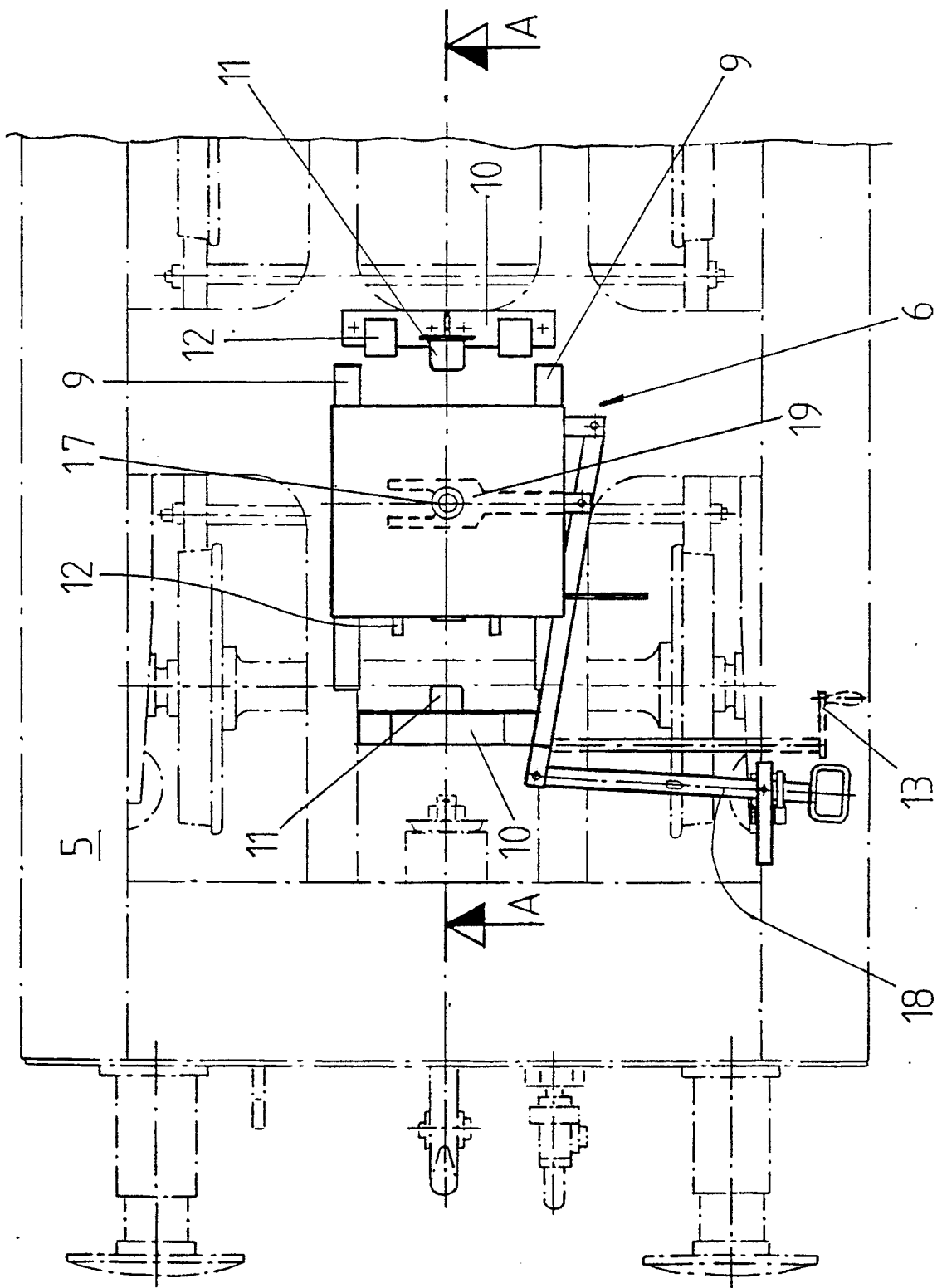
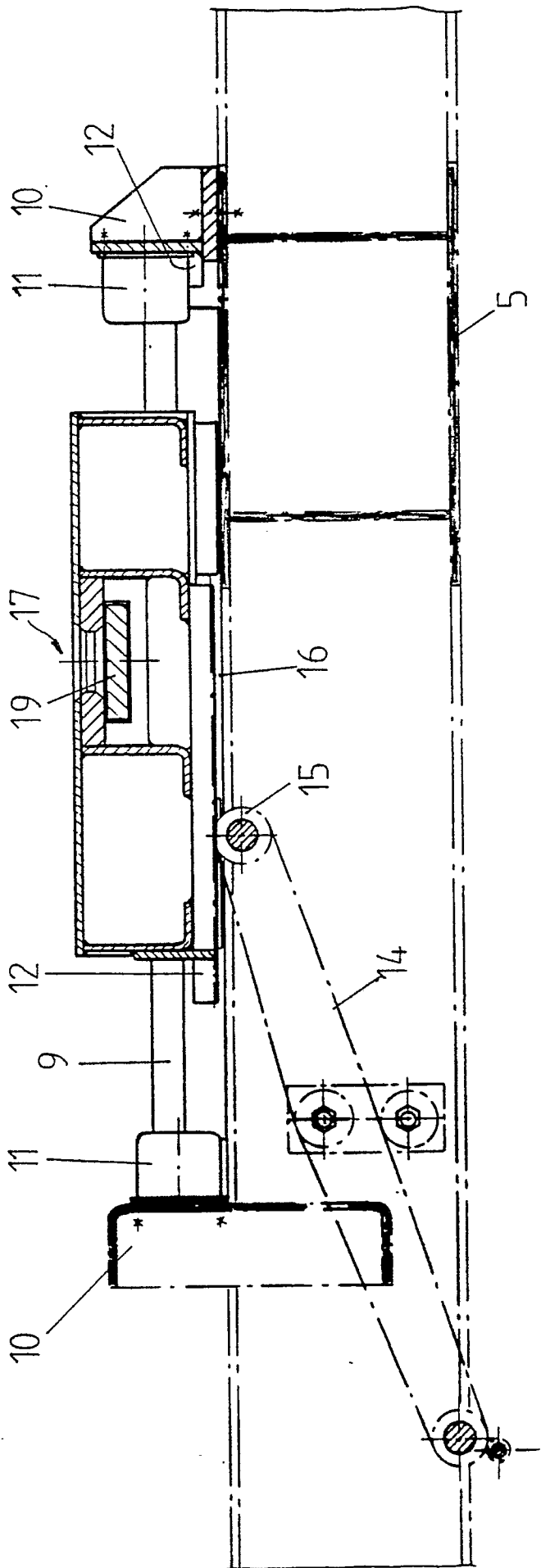


FIG. 3



A—A

FIG. 4

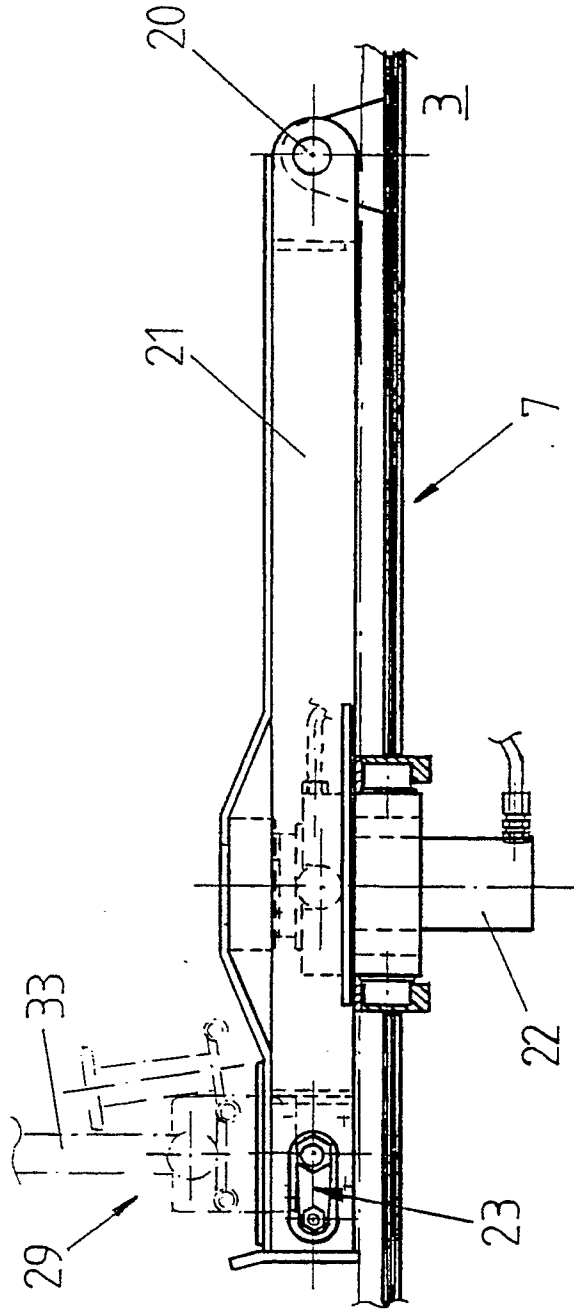


FIG. 5

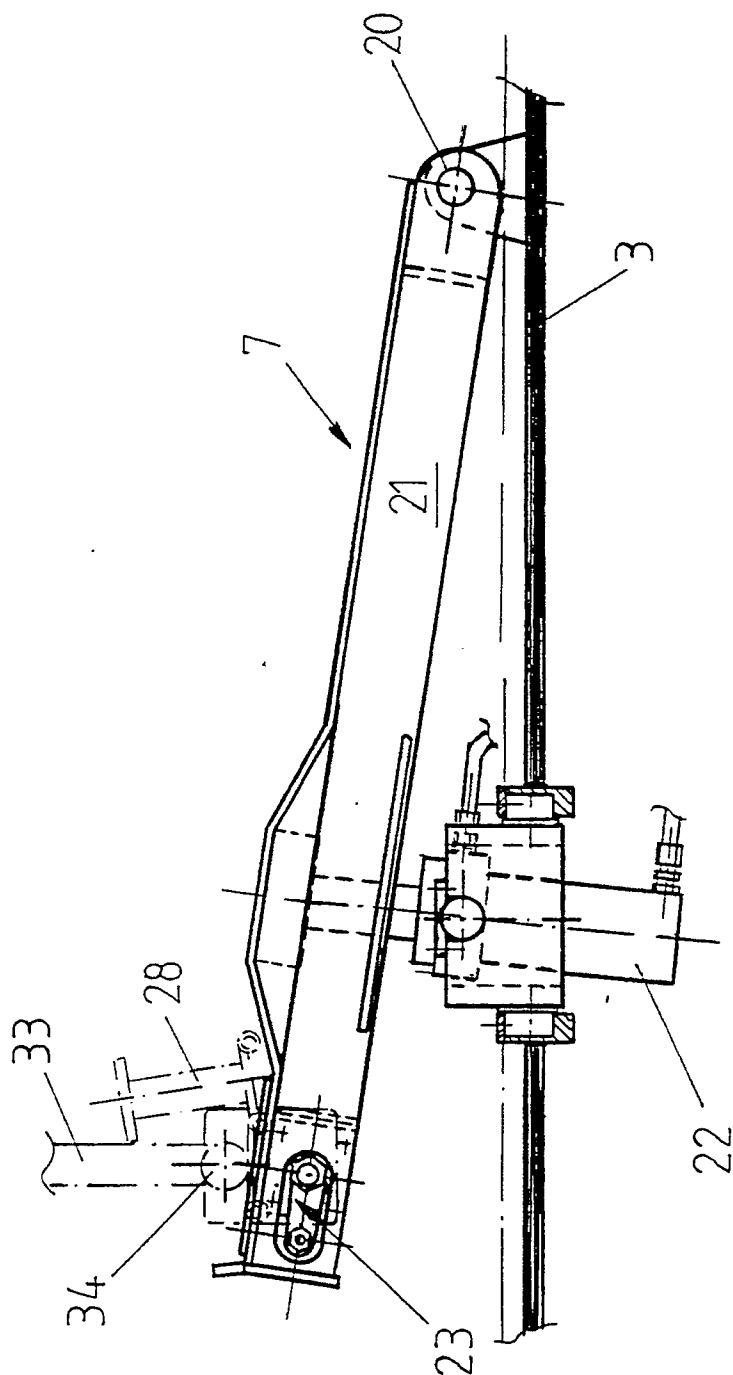


FIG. 6

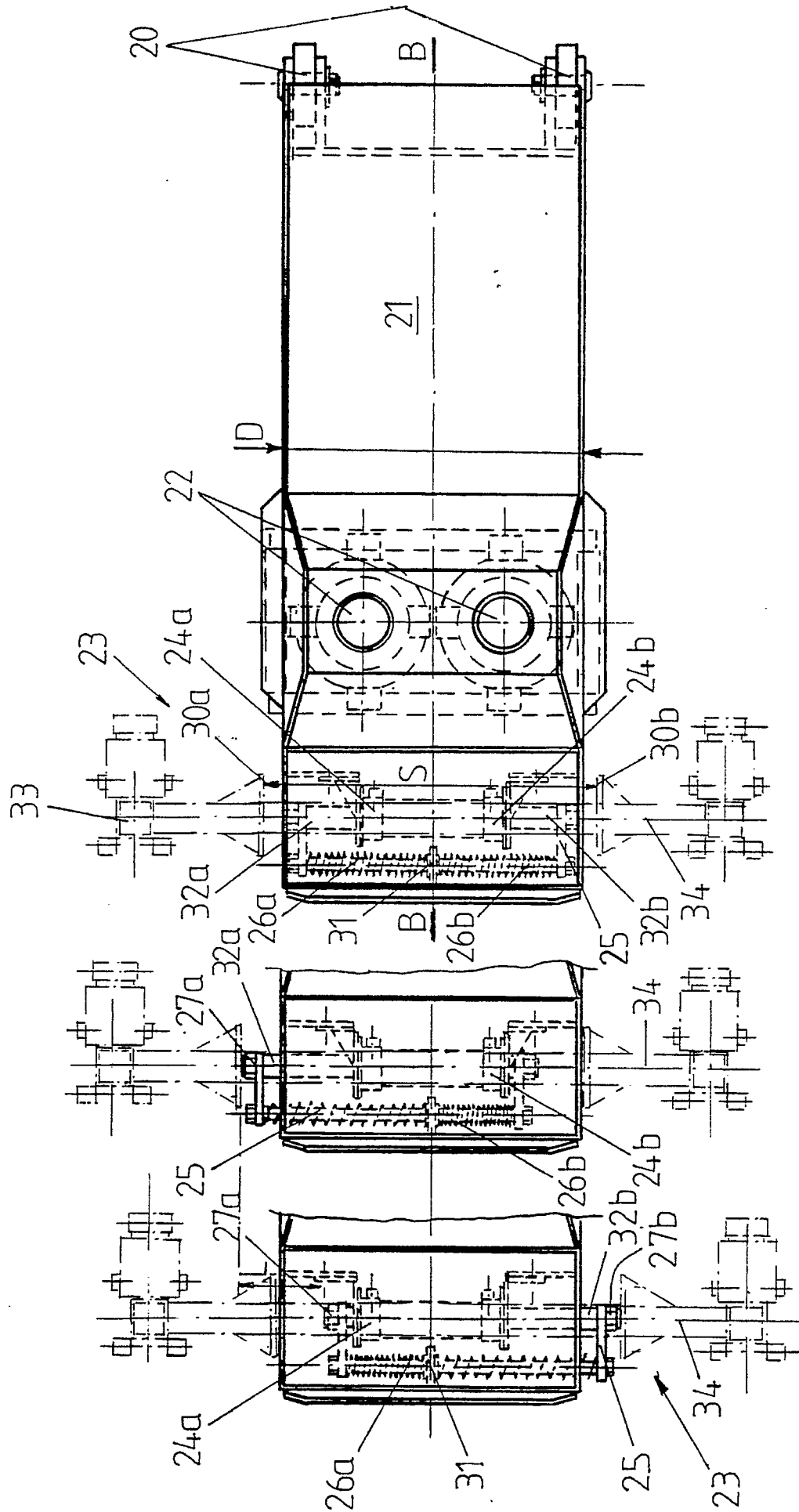


FIG. 7

FIG. 7a

FIG. 7b

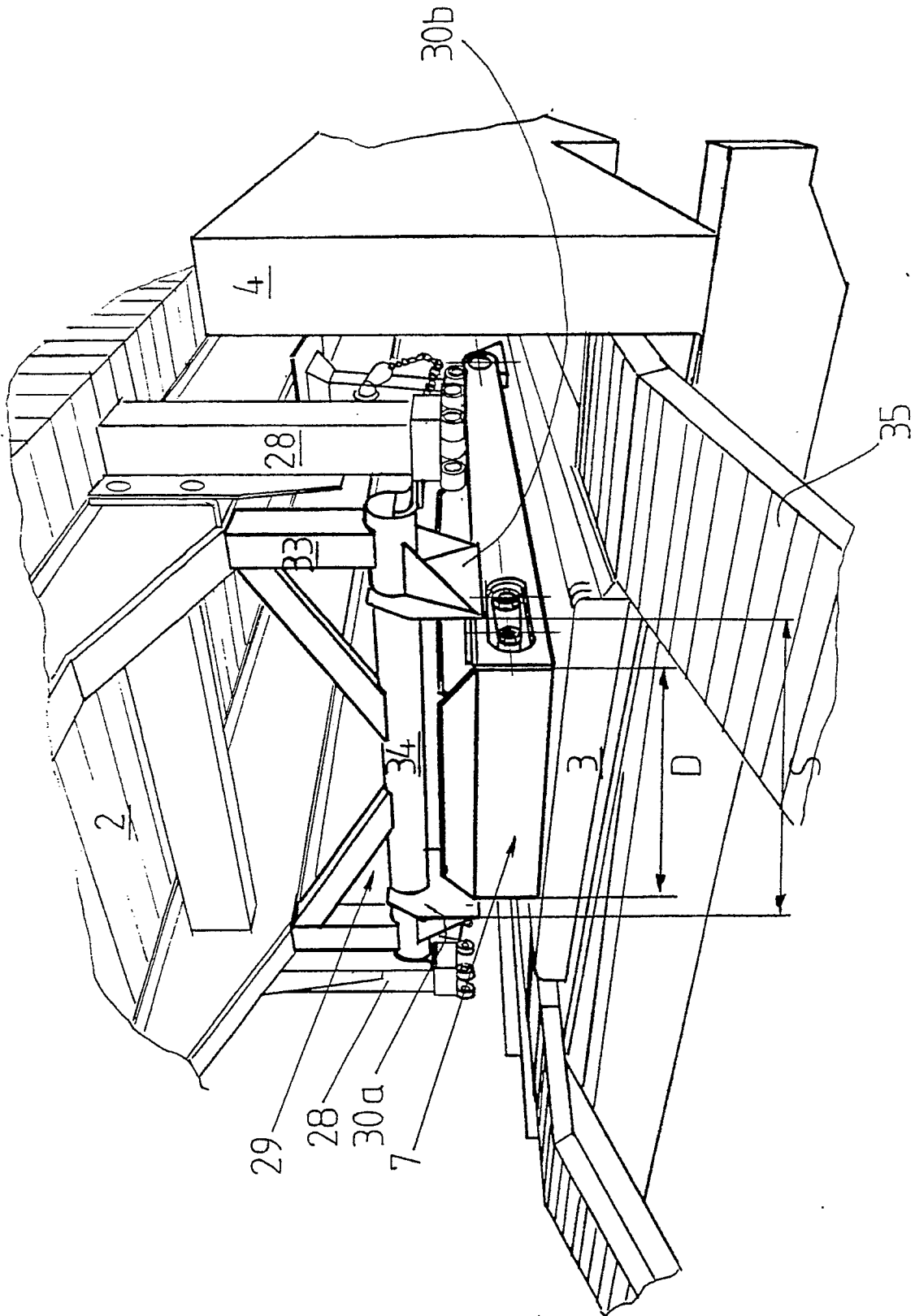


FIG. 8

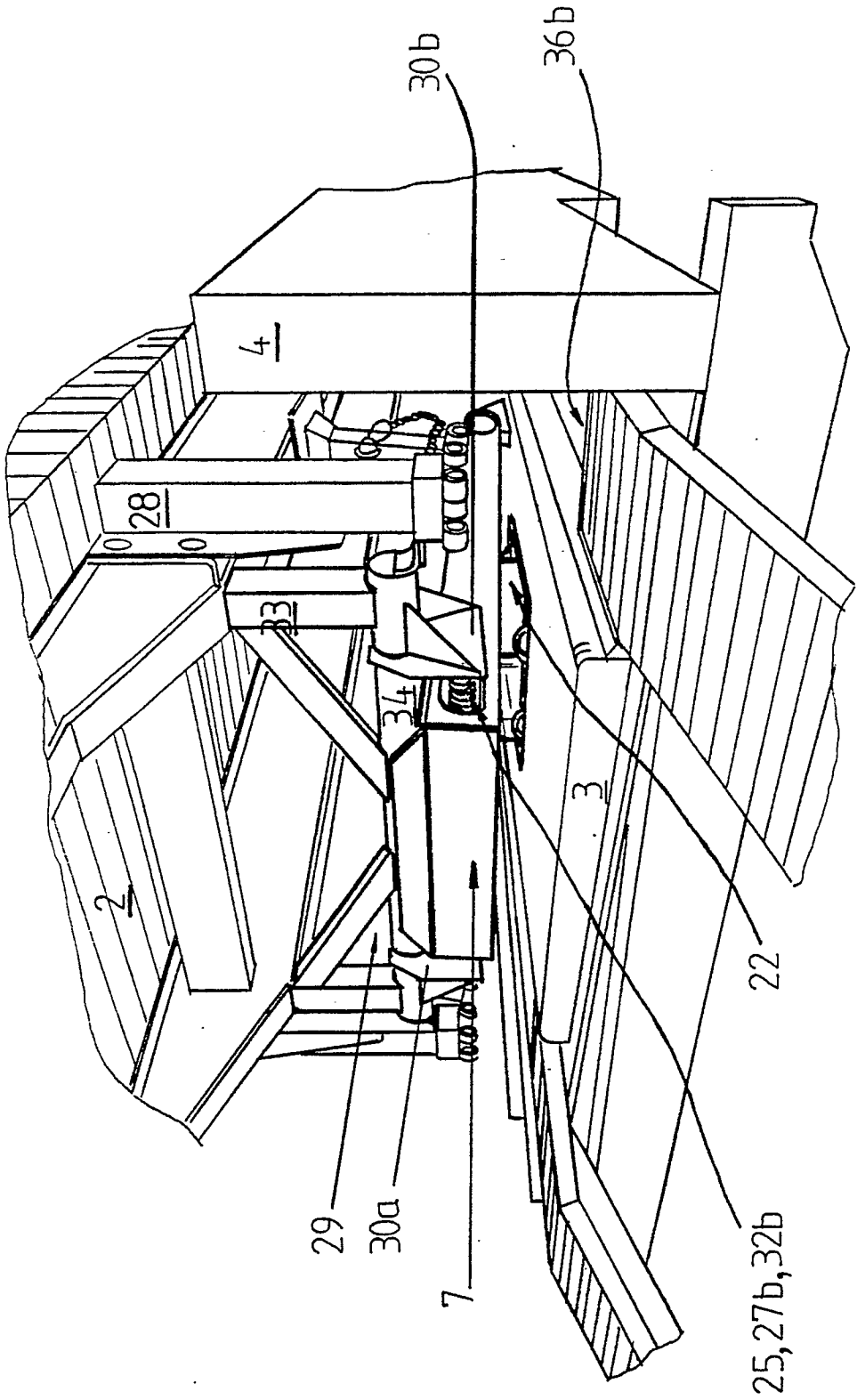


FIG. 9

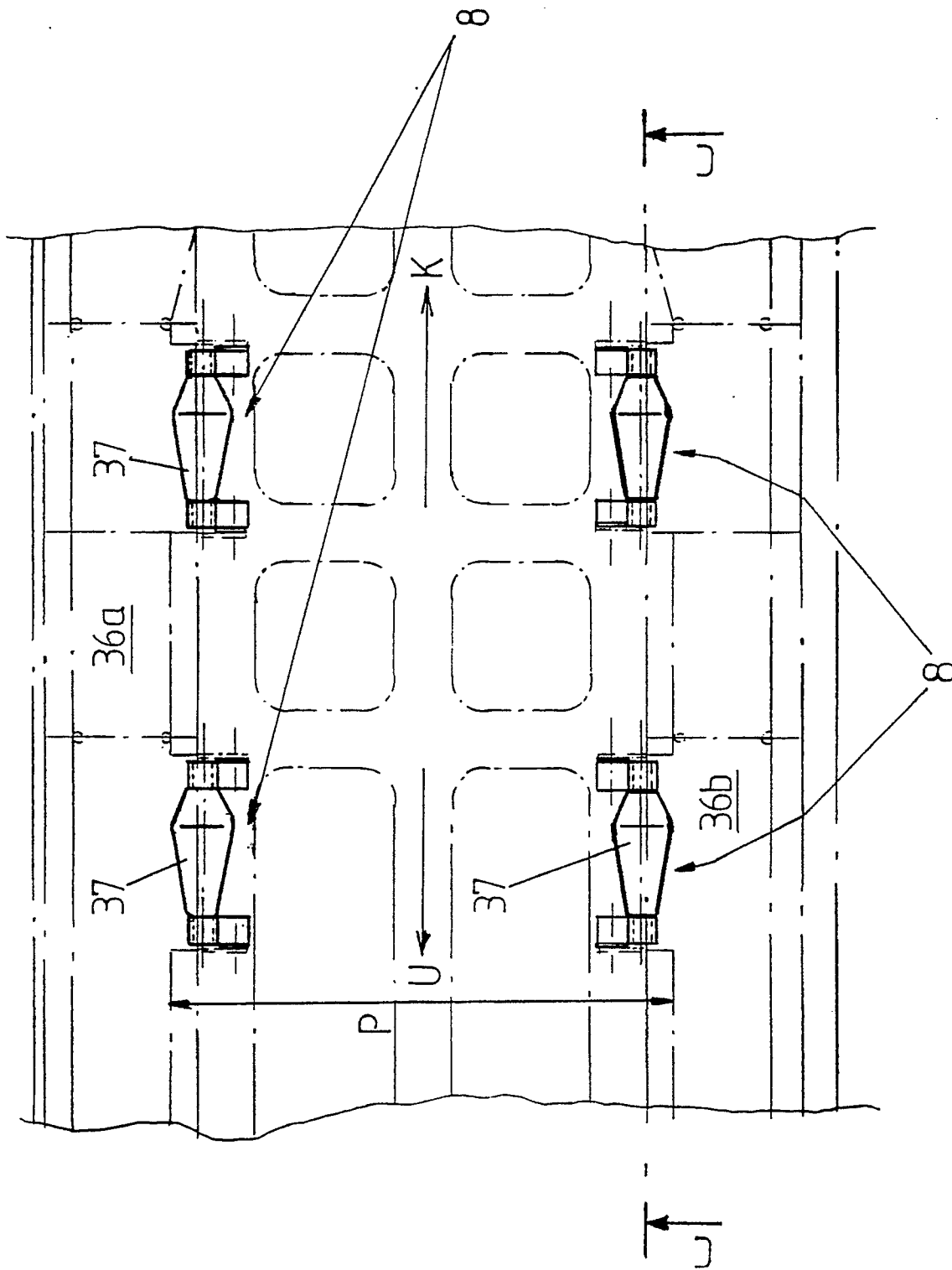


FIG. 10

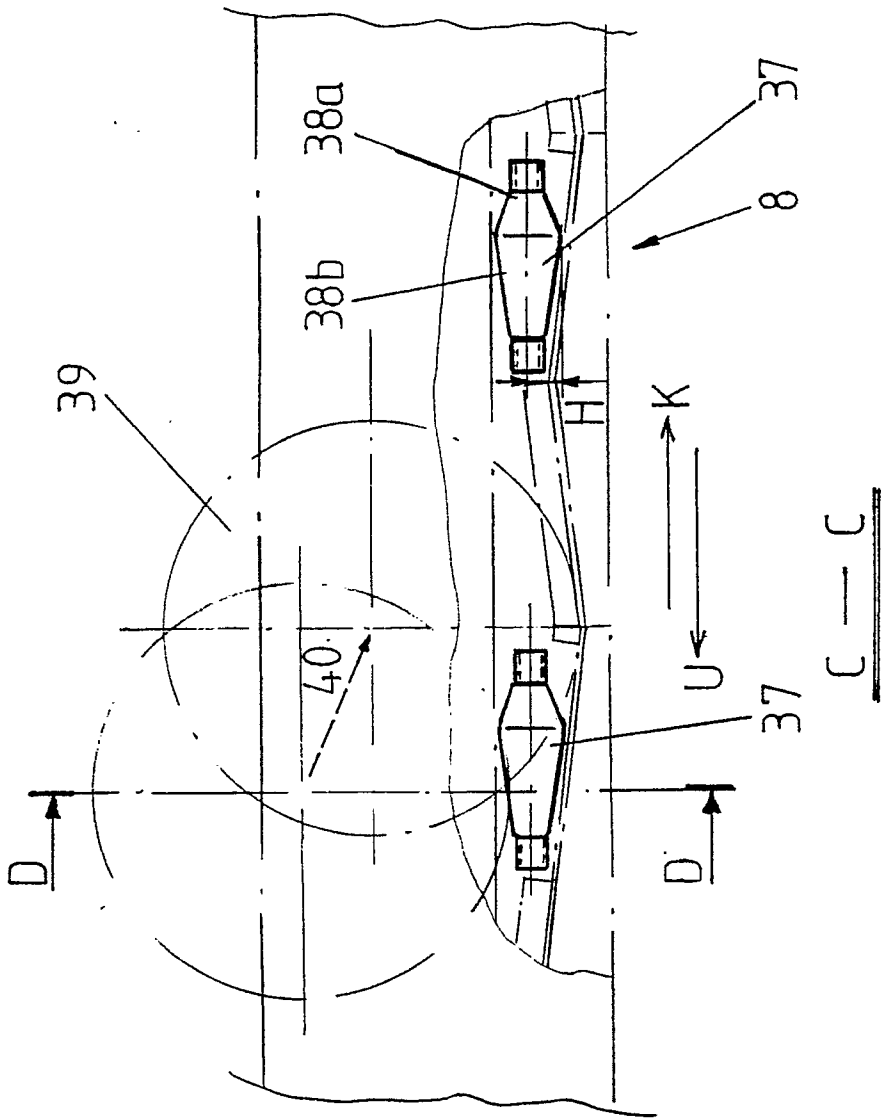


FIG. 11

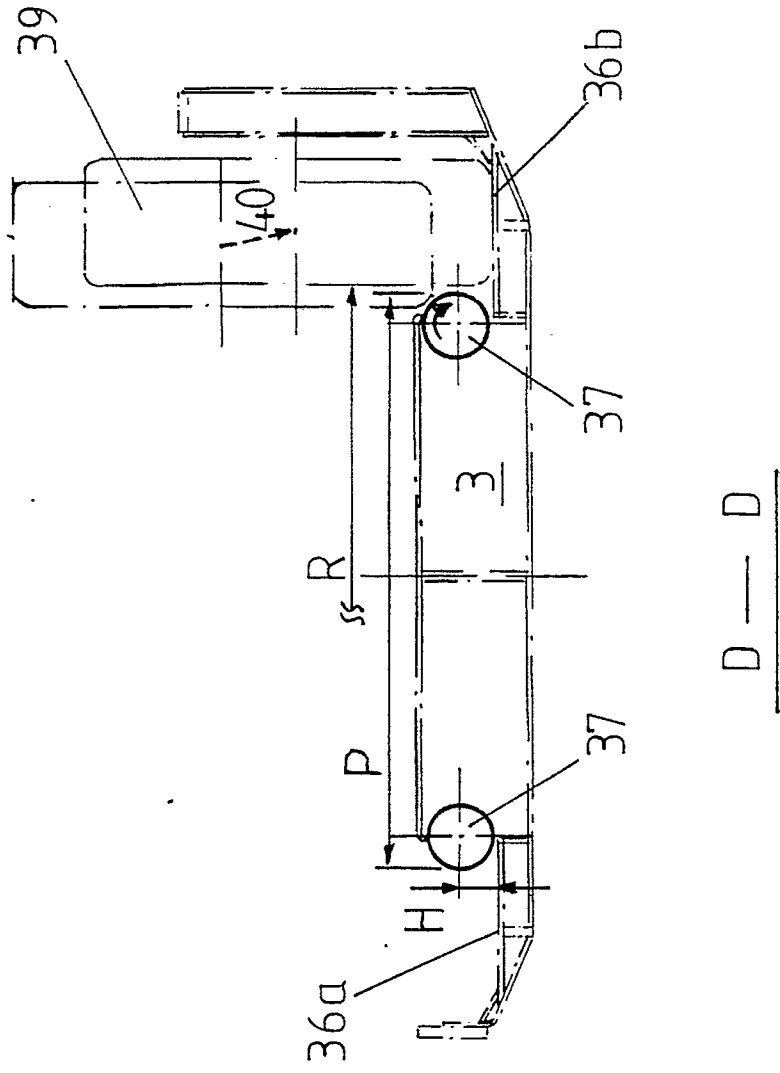


FIG. 12