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D-4800 Bielefeld 1(DE)(54) **A support boom in a transport vehicle.**

(57) An arrangement in transport vehicles in order to lock to each other for the duration of transport a fixed loadbearing frame (5) and an also loadbearing structural component (3) which is pivotable to the side for the duration of loading and unloading, and to support during the loading and unloading this structural component pivotable to the side. The arrangement comprises a support boom (8) which is articu-

lated to the frame of the transport vehicle and can be placed under the said structural component pivotable to the side. When turned into a position parallel to the transport vehicle, the support boom (8) serves as a latch which locks the joint (6) between the loadbearing side wall (4) of the structural component (3) pivotable to the side and the frame of the freight wagon.

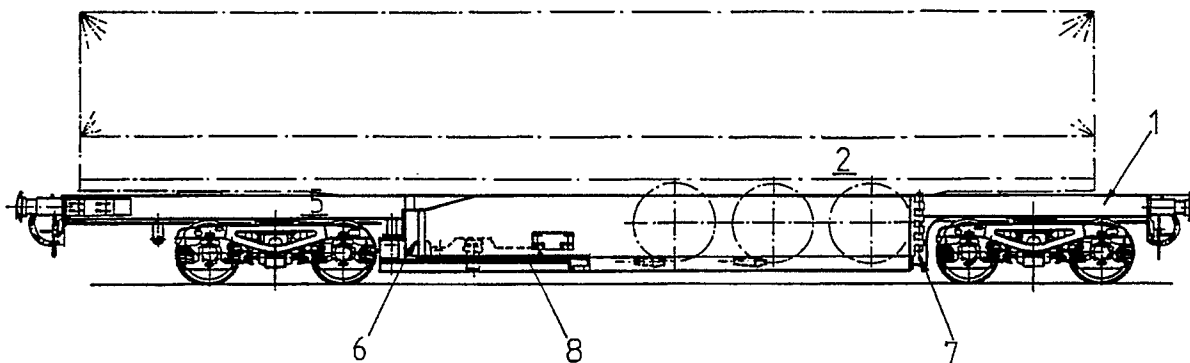
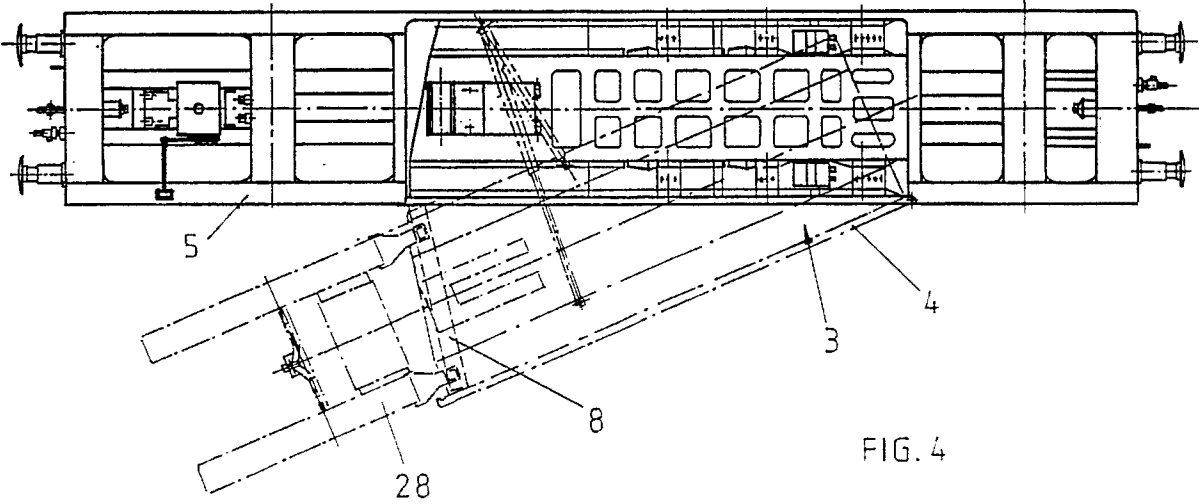


FIG. 3

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A support boom in a transport vehicle

The present invention relates to an arrangement in transport vehicles in order to lock to each other for the duration of transport a fixed load-bearing frame and an also loadbearing structural component, pivotable to the side for the duration of loading and unloading, and to support during loading and unloading this structural component pivotable to the side, which arrangement comprises a support boom articulated to the frame of the transport vehicle and locatable under the said structural component which can be pivoted to the side.

Especially in railway transport, efforts have been made to develop transport methods and systems so that the 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 as well as containers 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 case, 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 this case a trailer, a semi-trailer or a container, are close to the permitted outer dimensions of a freight wagon, it is not possible to construct the structures of a freight wagon such that they could be fixed during the loading and unloading. For example, the dimensions of trailers allow only a very thin floor and thin sides 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.

When a structural component pivotable to the side and a driving ramp are used for loading a trailer, certain problems are encountered which require additional equipment. Figures 1 and 2 depict one known system according to the state of the art. The figures show a freight wagon 31 and a semi-trailer 32 driven onto its pivotable structural component 33. The structural component pivots to the side about a hinge 37, which is part of the frame 35 of the freight wagon. When the structural component is in the center of the wagon, it is locked to the frame 35 by using a locking mechanism 36. When the component 33 is in the position pivoted to the side, as in Figure 1, it must be propped with

a support boom 38. Thereupon it is possible to drive onto the structural component 33 along driving bridges 41. In this structure it is necessary, before the structural component 33 is pivoted to the side, first to pivot the support boom 38 about its hinge 39 into the correct position out from the frame 35, thereafter the boom has to be lowered to the level of the lower surface of the structural component 33 pivotable to the side, to bear on the ground, whereafter it is possible to open the locking devices 36 and to pivot the structural component 33 to the side. When closing, the above steps must be carried out in the reverse order.

The prior-art arrangement has the disadvantage of a complicated structure both because the boom has to be transferred in the vertical direction and because the boom requires its own locking device for the duration of transport, as does the structural component pivotable to the side. The complicated nature of the structure of course not only increases the price but makes the structure vulnerable to damage. In particular the hinge 39 of the boom is easily damaged, if the soil fails under the footing 40 at the other end of the boom. Also the large number of work steps has the consequence that loading and unloading take a considerable amount of time.

The object of the invention is to provide a boom structure which can be moved from the transport position to the support position by using a series of movements as simple as possible. It is also an object of the invention to provide a boom structure the use of which enables the preparation of a railway wagon for loading, and respectively for transport, to be carried out with as few work steps as possible and by using as few mechanisms as possible. It is a further object of the invention to provide a boom structure which is reliable in operation and is not damaged even if the bearing capacity of the soil on the loading and unloading site is not very high.

By using the arrangement according to the invention the problems described above can be solved and the objects defined above can be achieved. In order to accomplish this, the arrangement according to the invention is characterized in what is disclosed in the characterizing clause of Claim 1.

It can be deemed to be the most important advantage of the invention that in it several previously separate devices are combined into one actuating device, while the structure is simple and reliable in operation. In this case the handling of the transport vehicle in loading and unloading situations is rapid and easy. It is a further advantage

that the structure can also withstand overloading without being damaged.

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

Figures 1 and 2 depict a plan view and respectively a side elevation of a prior-art support-boom structure.

Figure 3 depicts a side elevation of a railway wagon in which the pivotable side wall is in place and which includes a support boom according to the invention.

Figure 4 depicts a plan view of the railway wagon of Figure 3.

Figure 5 depicts a side elevation of a support boom according to the invention, in the closed position, as seen from the side of the railway wagon.

Figure 6 depicts a plan view, partly as a cutaway, of the support boom of Figure 5.

Figure 7 depicts a plan view of the support boom, pulled open, below the opened freight space.

Figure 8 depicts a sectional side elevation of the foot of the support boom.

Figure 3 depicts generally a freight wagon 1 commonly used on the railways, with a semi-trailer 2 loaded on it. Figure 4 depicts the same structure, in which the box 3 and the loadbearing side wall 4 fixedly adjoining it are indicated with dot-dashed lines in their position pivoted to the side, in which case a trailer can be driven onto the box along a driving bridge 28. In Figure 4 the box 3 and the side wall 4 have been drawn with a continuous line in their closed position, which thus corresponds to Figure 3. The rest of the frame of the freight wagon, to which the wheels and the box with their side walls are secured, is in general indicated by reference numeral 5. In these Figures 3 and 4, the opening joint of the side wall, by which joint the box 3 is locked to the frame 5 for the duration of transport, is in general indicated by reference numeral 6, and the hinge device between the side wall 4 and the frame 5, about which hinge device the box 3 is pivoted to the side for loading and to inside the wagon 1 for transport, is indicated by reference numeral 7. The support boom according to the invention, which is shown in Figure 3 in the transport position, turned under the side wall 4, and is depicted with dot-dashed lines in Figure 4 in the support position turned under the box 3, is indicated in general by reference numeral 8.

Figure 5 depicts the structure of the support boom 8 and its articulation 9 to the frame 5 of the freight wagon. When turned under the side wall 4, the support boom, which is made up, for example, of an arm 29 having a box-like cross section and of an articulation casing 30 protruding from one of its ends, is locked so as to be immobile by means of

latch devices 10, which are not depicted in greater detail. In Figure 5 the articulation 9 is depicted in cross section. It comprises a vertical shaft secured to the freight-wagon frame 5, an articulation piece 12 being mounted on it inside the articulation casing 30 and being locked so as to be immobile by means of a fastening nut 13. To the support boom there is also, between the articulation casing 30 and the articulation piece 12, secured a spring support 14, which comprises a ram 16 loaded by plate springs 15, for example, and a control nut 17. At the free end of the arm 29 of the support boom 8 there are fastening means 21 for the support foot 22 adjustable in the vertical direction.

Figure 6 shows how the articulation piece 12 is secured using horizontal pins 18 pivotably to the support boom 8 so that a pin-and-bushing structure is formed. The spring support 14 rests on the articulation piece 12 and is adjusted, for example by using a nut 17, to such a length D that the support boom 8 is in an approximately horizontal position when it is being pivoted about the articulation 9, i.e. about the vertical center line 42 of the shaft 11. The spring support 14 thus allows, when yielding, whereby its length D decreases, the transfer of the support boom under load from its horizontal position, without any damage to the articulation 9.

Figure 6 also shows how the support boom 8, with a latch tappet 19 located on the outer wall of the articulation casing 30, locks the wedge joint 20 according to patent application FI-882563 for example, between the side wall 4 and the freight-wagon frame 5. The latch devices 10 are at least approximately at the distance of the length L2 of the boom arm 29 from the articulation 9 and from the center line 42 of its pivot shaft. The latch tappet 19 for its part is at a small distance L1 from this center line 42.

In Figure 7 the arm 29 of the support boom 8 is turned outward, in which case it is under the box 3 pivoted to the side from the freight-wagon frame 5. The limiter 23 consists of a bar 43 articulated to the boom arm, one end of the bar being capable of sliding relative to the frame 5 as far as the stop 44. At the outer end of the support-boom arm 29 there is a support foot 22. Figure 8 depicts one structure for the adjustable support foot 22. It consists of a frame part 24, a leg fixedly installed in it, and a shoe 27 linked to the leg by a screw thread and adjustable by turning.

The operation of the articulation 9 in the pivoting to the box support position, in the possible yielding of the boom 8 during the support position, and in the locking of the box 3 to the frame 5 of the wagon is as follows:

When the box 3 is to be moved to its position pivoted to the side, i.e. to the loading position, the

boom arm 29 is pivoted about the vertical center line 42 of the shaft 11, since the articulation piece 12 is fixedly mounted on the shaft 11. When the arm 29 of the boom 8 is in the desired support position, the box 3 can be pivoted out onto the boom arm 29, as shown in Figure 4. In this case, no vertical transfer of the boom 8 is necessary, since the upper surface 45 of the arm 29 is continuously in the correct position at the level of the corresponding support surface 46 of the lower side of the box 3, as can be seen in Figure 5. Before the box 3 is pivoted onto the boom 8 which has been pulled out, there is pushed into the fastening means 21 of the arm 29 the support foot 22, which is adjusted by means of a screw thread 26 to a suitable height so that the shoe 27 is pressed tightly against the ground, whereupon the support foot will support the outer end of the boom arm 29. Thereafter the box 3 can be pivoted normally to the loading/unloading position, in which the lower support surface 46 of the box bears on the upper surface 45 of the boom in order to support the box and the load.

The horizontality of the boom arm 29 is adjusted by using the spring support 14, which at the same time enables the articulation 9 to yield in case the soil yields under the support foot 22. The articulation casing 30 of the boom is according to the invention mounted by means of pins 18 in the articulation piece 12 so that the pivot axis 47 is at least approximately horizontal and at least approximately perpendicular to the length L2 of the boom arm 29 and at distance H from the upper surface 45 of the boom arm 29. In the embodiment shown in the figures, the spring support 14 is at distance S, which is greater than H, from the upper end 45 of the boom arm 29 and on the opposite side of the plane defined by the axes 42 and 47 than the boom arm 29, and between the articulation piece 12 and the articulation casing 30. By this location the pressing of the boom arm, for example, from the end with the fastening means 21, causes the upper edge of the articulation casing 30, in which the spring support 14 is, to approach the articulation piece 12, the spring support 14 yielding but nevertheless resisting the movement with its spring force. Thus the articulation yields without being damaged and without losing its functioning capacity. As a reverse operation, by changing the length D of the spring support, the boom can be pivoted about the axis 47, whereupon the arm 29 portion with the fastening means 21 will ascend or descend according to the adjustment.

The pivoting of the boom outward about the axis 42 is limited by a limiter 23 when the sliding means, e.g. a roller 48, of that bar 43 end which faces away from the boom arm 29 impinges against a stop 44, thus preventing greater projec-

tion of the boom. When the boom is being pivoted outward or inward, the roller 48 runs in slide bars 49 in the frame.

The locking of the box 3 to the wagon frame is advantageously also by means of the boom 8. When the boom is turned under the box 3 and the side wall 4 in their place in the frame 5, the boom serves as an effective lever the fulcrum of which is on the axis 42, and the working lever arm is the distance L1 of the latch tappet 19 from the axis 42, and the lever arm of the force is approximately the entire length L2 of the boom. Thereby, for example, the force closing the wedge joint 20 will be very high, since its magnitude will be $L2/L1 \times F$, where force F is the pushing force effective at the end of the boom. This structure is especially suitable for closing a wedge joint according to previous patent application FI-882563, since it replaces the closing lever used in it. However, since in practice any joint arrangement requires a considerable closing force and thus a lever, the boom 8 according to the invention can serve as the closing lever of any closing mechanism. The embodiment described has a single-arm lever, but a double-arm lever can also be construed, when necessary.

When the lever 8 has been pushed into its transport position, it is located outside the exterior lines of the wagon and in the plane of the wagon floor and will not take any space needed for other things. The boom 8 is locked in place by latch means 10, which may per se be of any known type.

The invention is not limited to the embodiment described above; numerous variants of the structure can be made. Thus, for example the spring support 14 can be placed on the same side of the plane of center lines 42 and 47 as the arm 29 when it is below the upper surface 45 of the arm. By using a spring of another type the spring support can also be placed on the boom arm side from the said plane, above the plane 45, or alternatively on that side of the said plane which faces away from the boom arm 29, below the plane 45. Likewise, the positioning of the axis 42 and parts corresponding to it may considerably differ from that depicted in the lateral direction of the wagon. Also, the positioning of the horizontal axis 47 and the parts associated with it can in the vertical direction differ considerably from that depicted, in which case it may be either above or below the planes 45, 46, depending on the rest of the wagon structure or on the space requirement. Also, the axis 47 need not necessarily be perpendicular to the real center line of the boom arm 29, although this is usually preferable. In the embodiment described, the shaft 11 and the articulation piece 12, together with the bearings between them, are located inside the pivoting articulation casing, but a reverse structure is

also conceivable in which the structural parts corresponding to the articulation casing and pivot pins 18 are placed inside the shaft 11, in which case the bearings are in a way formed between the outer surface of the articulation casing and the inside hole of the shaft 11.

It is also conceivable that the spring support 14 is located so that its operating line is not horizontal as in the embodiment example but vertical, in which case it could, for example, be located on an extension parallel to the arm 29 on that side of the plane formed by the axes 42 and 47 which faces away from the arm 29. What is essential is that the arm 29 and the spring support form effective points for the forces of a lever the fulcrum of which is located on the axis 47.

Claims

1. An arrangement in a transport vehicle in order to lock to each other for the duration of transport a fixed loadbearing frame (5) and an also loadbearing structural component (3) which is pivotable to the side for the duration of loading and unloading, and to support during loading and unloading this structural component (3) pivotable to the side, which arrangement comprises a support boom (8) which is articulated to the frame of the transport vehicle and can be located under the said structural component which can be pivoted into the side, **characterized** in that the support boom (8), when pivoted to a position parallel to the transport vehicle, serves as a latch which locks the joint (6) between the loadbearing side wall (4) of the structural component (3) pivotable to the side and the frame of the freight wagon.

2. An arrangement according to Claim 1, **characterized** in that, in order to achieve the support and locking functions, the support boom (8) is secured to the frame (5) of the freight wagon by means of a pin-and-bushing structure (9), which allows the boom (8) to be pivoted about an at least approximately vertical axis (42) and about an at least approximately horizontal axis (47) which is transverse to the longitudinal direction of the boom arm (29).

3. An arrangement according to Claim 1 or 2, **characterized** in that the articulation structure (9) securing the support boom is located in the transport-vehicle frame (5) in the vicinity of that end of the structural component (3) pivotable to the side which moves to the side, and that the boom arm (29) is located in the vicinity of the lower surface of this structural component (3), in which case the pivoting of the boom about its vertical axis (42) transfers the boom from the support position to the locking position, and vice versa.

4. An arrangement according to any of the above claims, **characterized** in that in its locking position the support boom (8) reaches from the articulation structure (9) across the joint (6) between the structural component pivotable to the side and the frame to the area of this structural component, and that the boom (8) constitutes a lever which closes the joint (6), the fulcrum of the lever being the articulation (9) of the boom and the force lever arm (L2) being in the main the length of the boom from this articulation, and the working lever arm (L1) of the lever being made substantially shorter in order to increase the closing force.

5. An arrangement according to Claim 4, **characterized** in that the joint (6) between the structural component (3) pivotable to the side and the frame (5) is tightened and held tight by a latch tappet (19) in the boom arm, the latch tappet being at the distance of the working lever arm (L1) from the articulation (9) of the boom, and that the boom is locked for the duration of transport into its locking position by a latch device (10) close to that end which faces away from the boom articulation (9).

6. An arrangement according to any of the above claims, **characterized** in that the support-boom arm (29), when pivoted to a position parallel to the transport vehicle, is located towards the center line of the transport vehicle from the plane of the outer surface of the side wall of the structural component pivotable to the side, below the lower support surface (46) of this structural component (3), with which support surface (46) the structural component (3) in the support position bears on the upper surface (45) of the boom.

7. An arrangement according to any of the above claims, **characterized** in that the boom (8) is provided with a spring support (14), which is located, at a distance from the horizontal axis (47), between the boom arm (29) or its continuation (30) and the shaft (11) which is fixed in relation to the frame of the transport vehicle, or an articulation piece (12) mounted on this shaft.

8. An arrangement according to any of the above claims, **characterized** in that the approximately horizontal axis (47) of the pin-and-bushing coupling (9) is located at a perpendicular distance (H) from the upper surface (45) of the boom and that the spring support (14) constitutes a lever arm (H-S) and a corresponding spring force in relation to the axis (47), and the boom length and weight distribution constitute a second lever arm and force with the axis (47) as the fulcrum, the position of the boom arm being adjustable within the length (D) of this spring support (14), and the boom being capable of yielding from this spring support (14) under excess depression caused by the load.

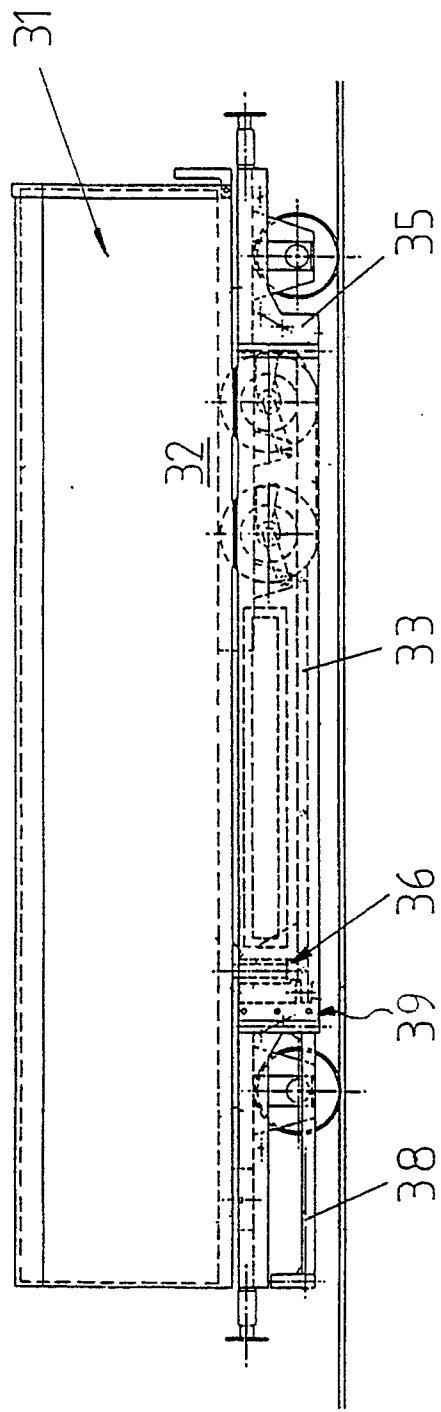


FIG. 2

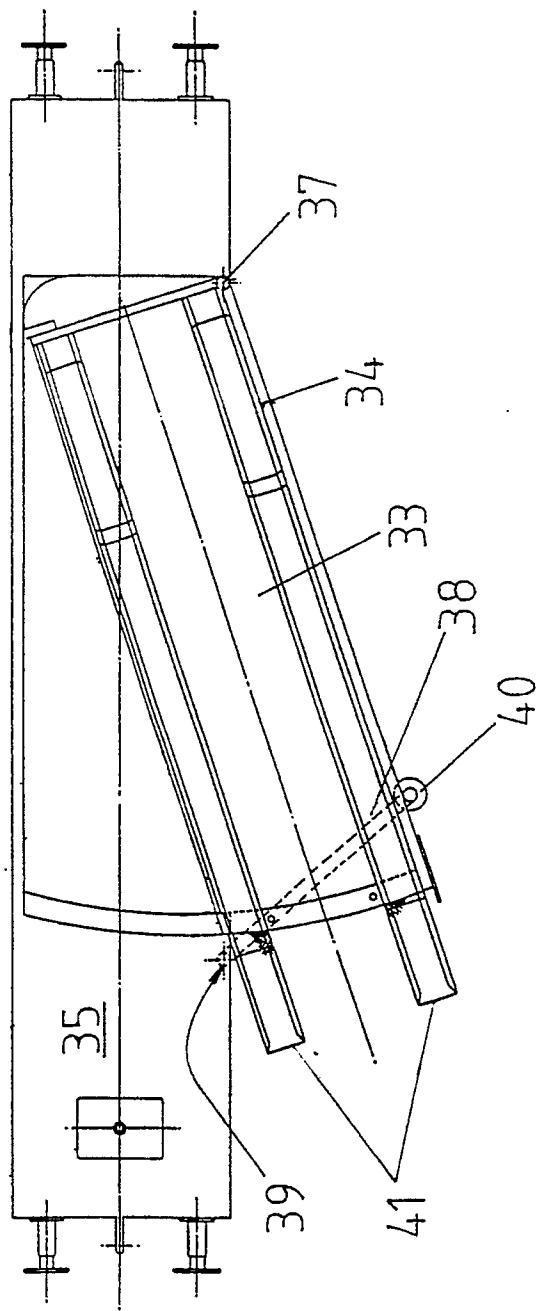


FIG. 1

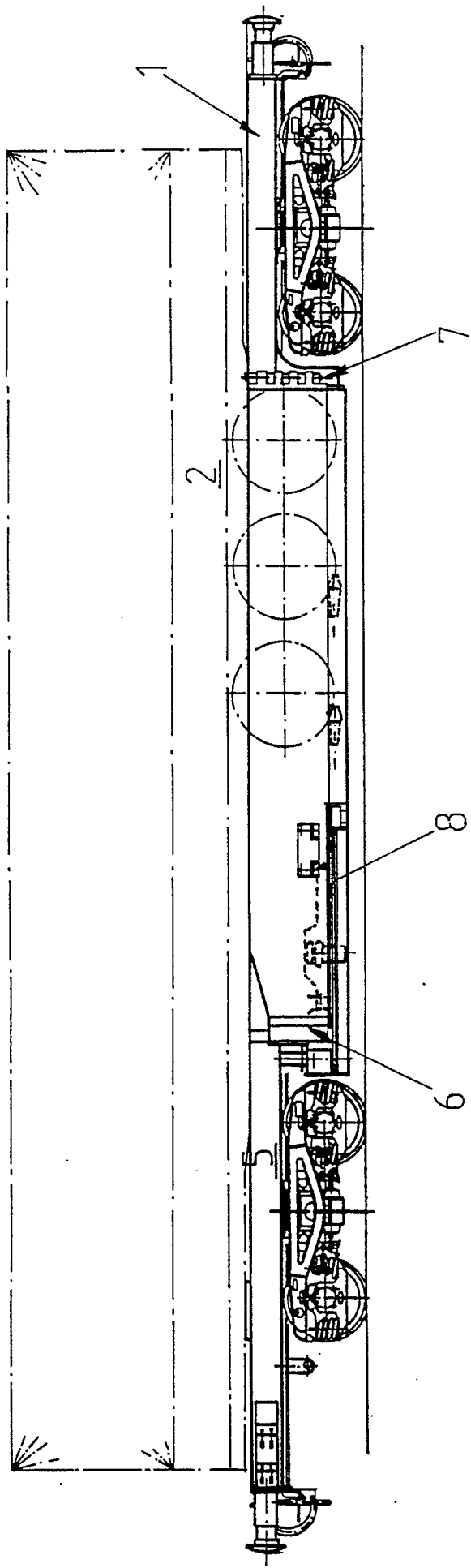


FIG. 3

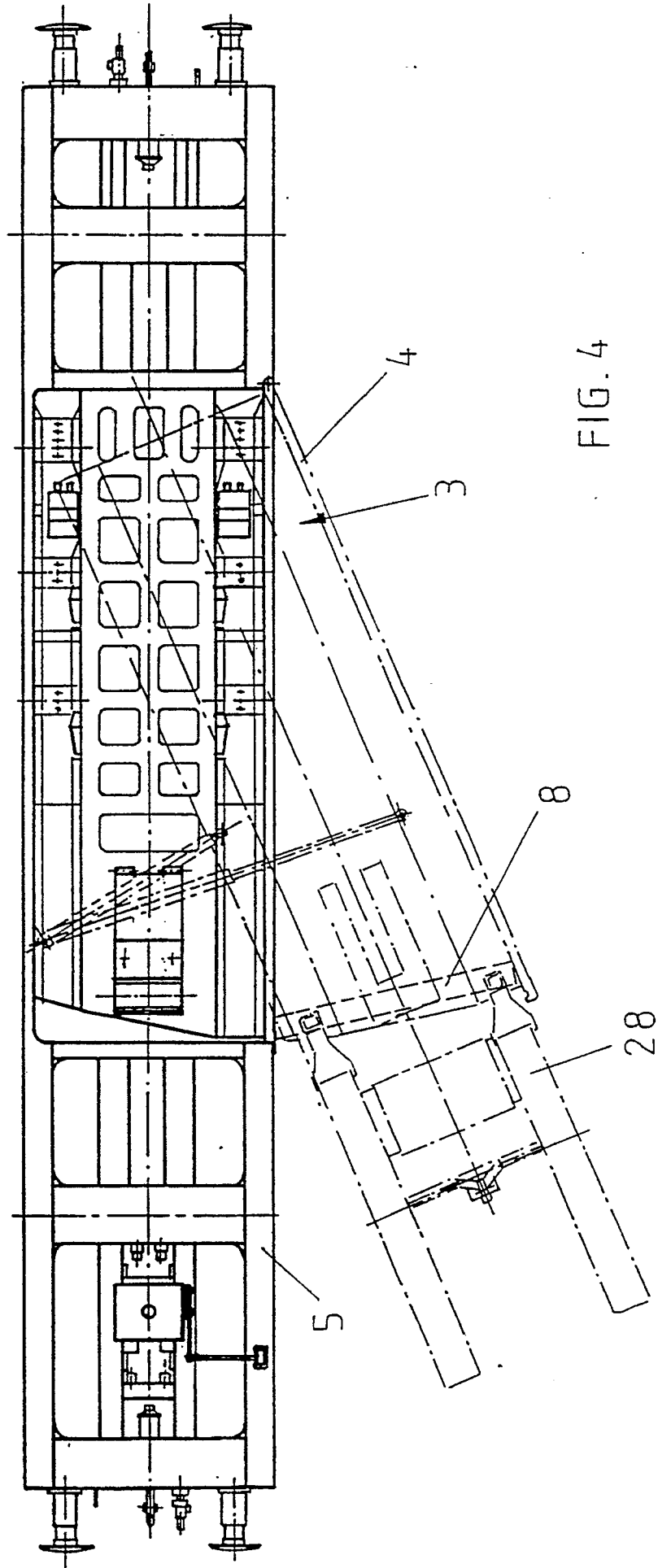
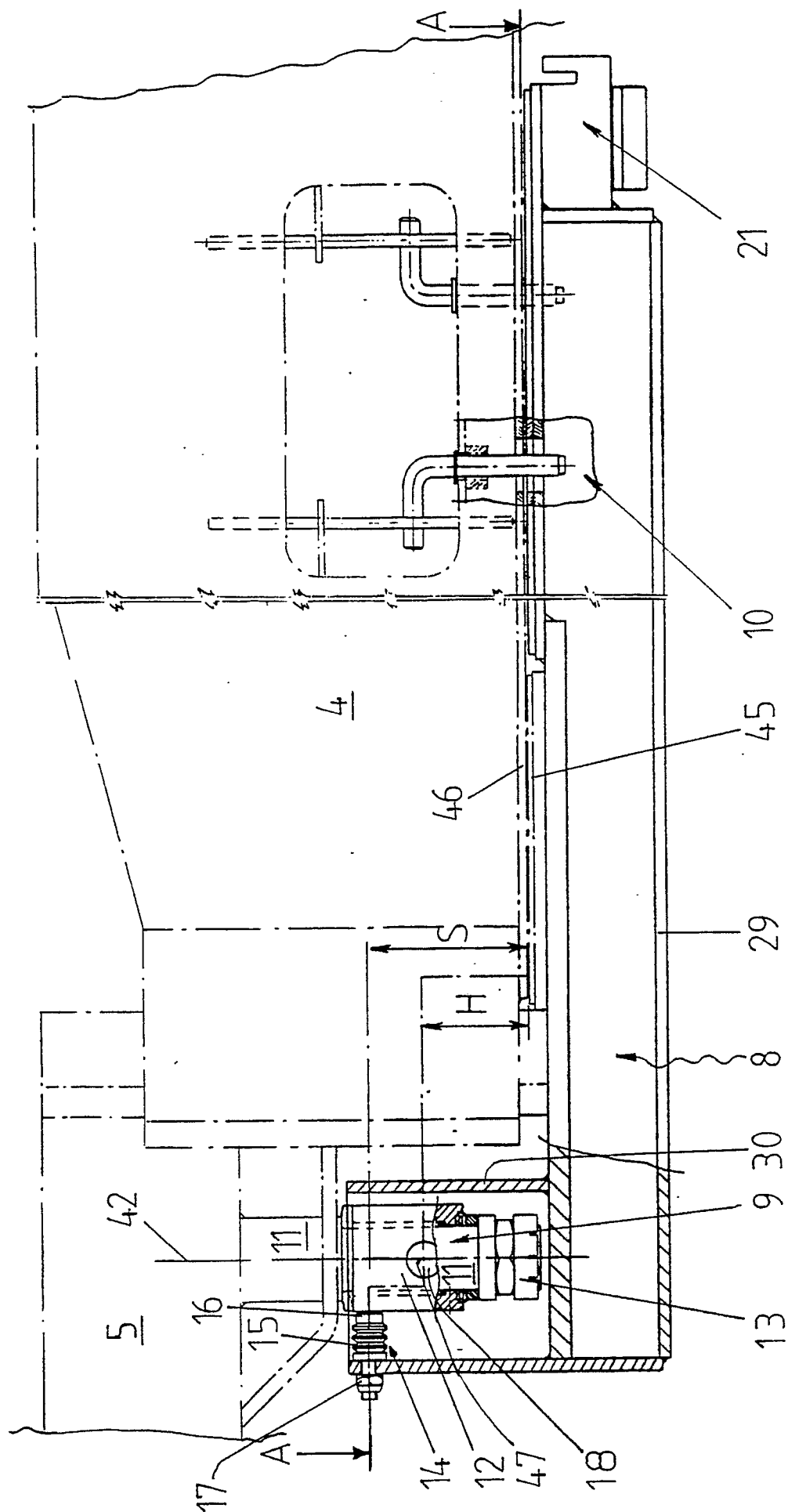
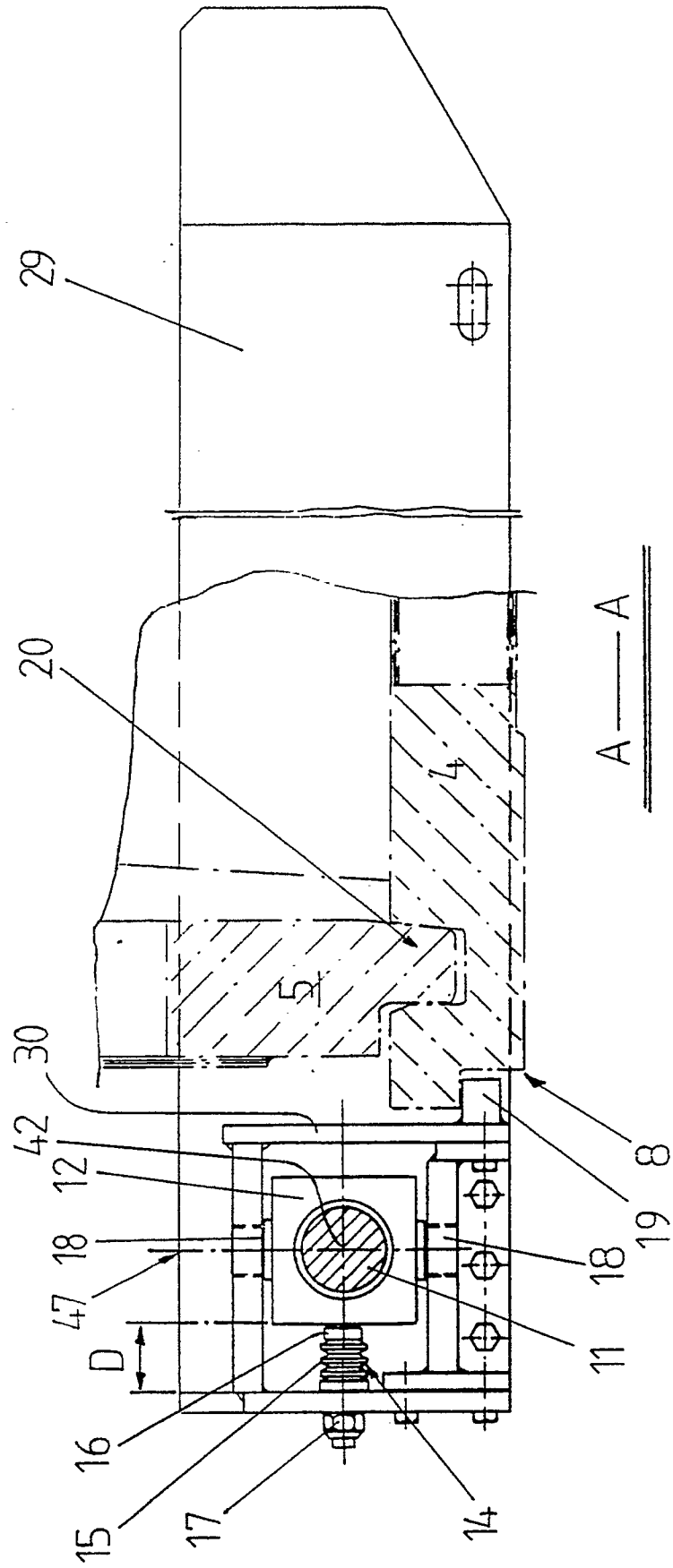
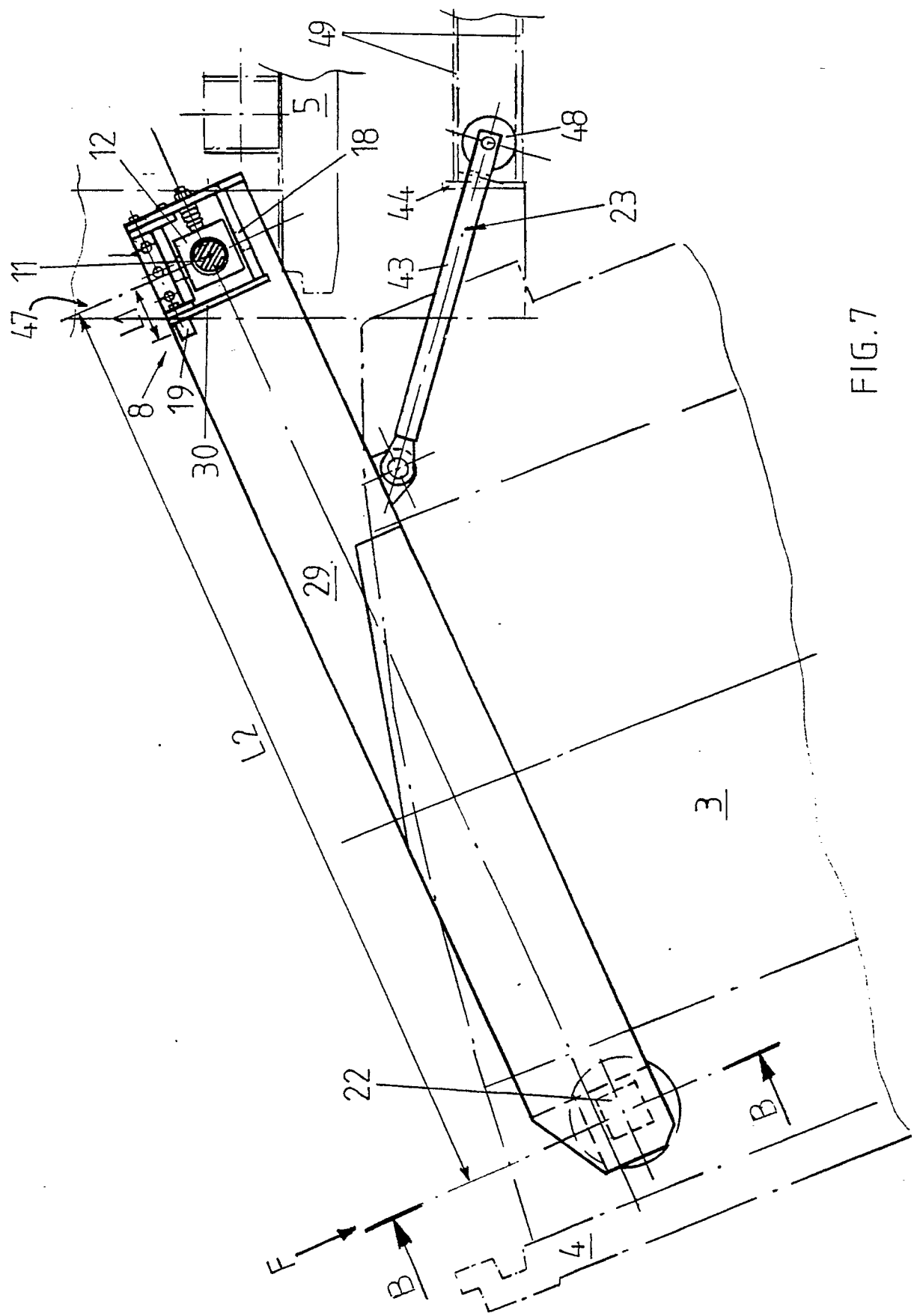


FIG. 4







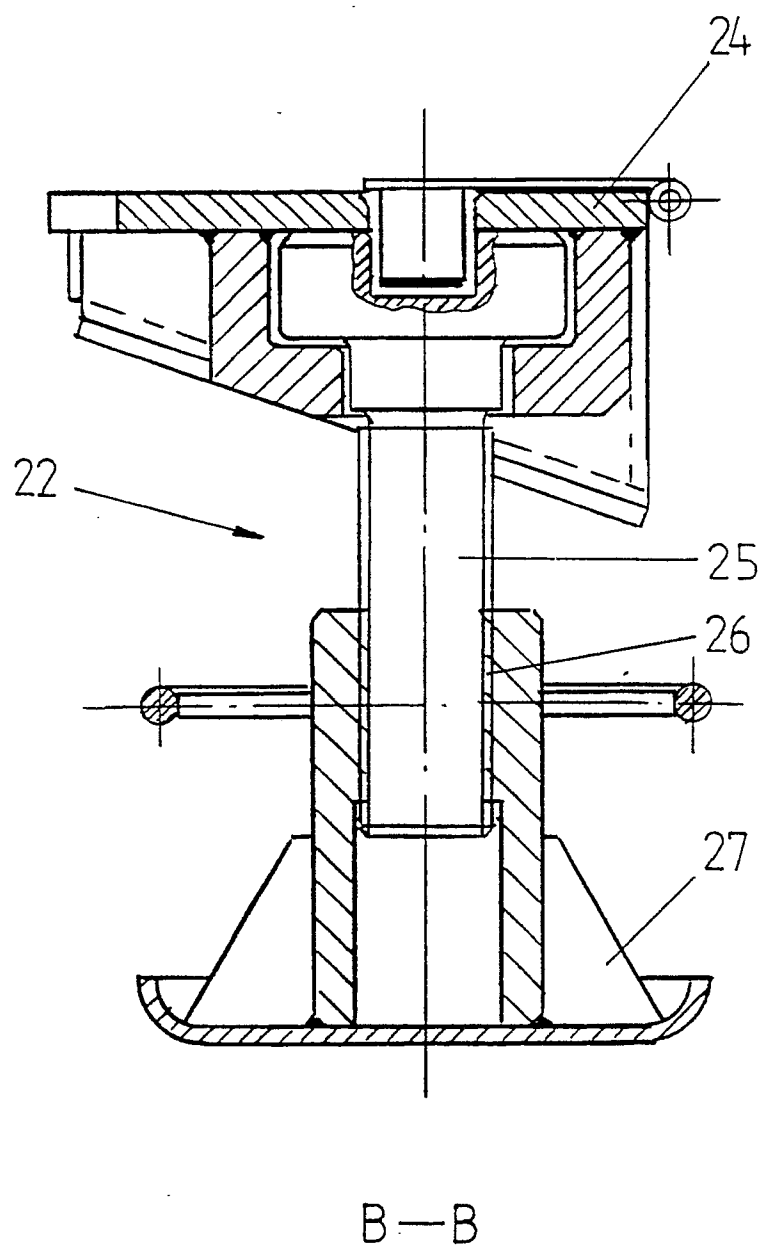


FIG. 8