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(54) **Railway wagon equipped to replace sleepers along tracks**

(57) The present invention relates to a railway wagon equipped to replace sleepers along tracks, which is provided at the front (4) with an articulated arm (5) fixed at one of its ends to the railway wagon (1) and provided at its free end with a gripper device (6) for gripping individually the sleepers (3) and extracting them from underneath a railway track (2) or for inserting them under

it. A store (9) for a plurality of sleepers (3) is positioned in the central part (7) and rear part (8) of the wagon. Also provided are handling means (13, 15, 17) designed to transfer the individual sleepers (3) from the store (9) to a pick-up position (12), from where the articulated arm (5) is able to pick up each individual sleeper (3) and insert it underneath the railway track (2).

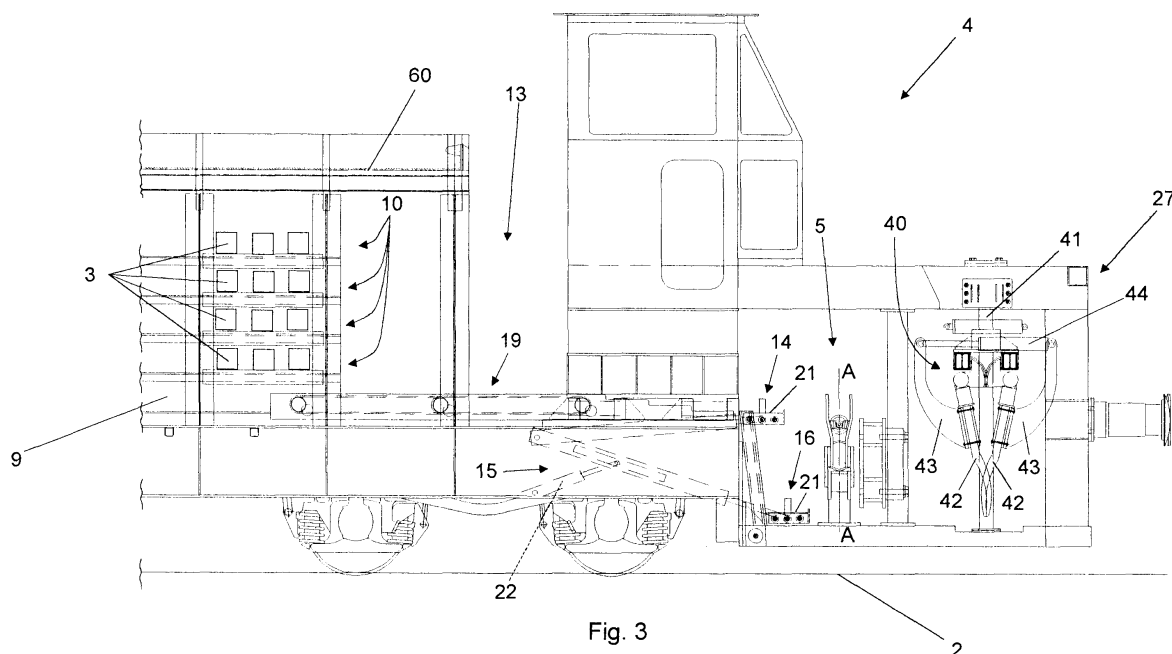


Fig. 3

Description

[0001] The present invention relates to a railway wagon equipped to replace both wooden and reinforced-concrete sleepers along tracks.

[0002] The wagon in question is intended to be used to replace sleepers which are no longer suitable, with other new sleepers, without modifying the arrangement of the track. At present, in accordance with the known art, there are basically two systems for performing the replacement of sleepers: a first system of the semi-manual type and a second system which uses a railway wagon provided with an apparatus for handling the sleepers.

[0003] The first system of the semi-manual type envisages, as is known, that displacement of the sleepers outside of the track and removal of part of the ballast are performed with grab-bucket mechanical means, while extraction and reinsertion of the sleepers as well as preparation of the support surface for the new sleepers are performed manually by the operators who use, for this purpose, forks, shovels and rakes.

[0004] The operations performed by means of this first semi-manual system of the known type requires a considerable amount of time which in some cases, where there is a large number of sleepers to be replaced, results in the decision to close off the track completely, with demolition and subsequent reconstruction thereof. This obviously causes major disruption of the rail traffic. The second system of the known type is described in Italian patent of industrial invention No. 01253254. In accordance with this second system, the apparatus mentioned above basically comprises an articulated arm mounted on the railway wagon and provided at its free end with a gripper for respectively extracting the sleepers from underneath and inserting them under the tracks. A pair of movable hook-irons are also provided for displacing the ballast from the railway bed and forming the seats for the sleepers to be inserted underneath the tracks.

[0005] This second system, although allowing operational improvements compared to the first system, has in practice a major drawback.

[0006] In fact, according to this system, the new sleepers which are to replace those sleepers along the track which are no longer suitable, must be positioned beforehand along the railway line itself in a position suitable for allowing gripping thereof by the articulated arm. This operation requires a considerable amount of time which negatively influences the time needed for replacement of the sleepers.

[0007] The main object of the present invention is therefore that of overcoming the drawbacks associated with the systems of the known type, by providing a railway wagon equipped to replace sleepers along tracks, allowing automatic replacement of the sleepers which are no longer suitable, with other new ones.

[0008] A further object of the present invention is that of providing a railway wagon equipped to replace sleep-

ers, which is constructionally simple and operational entirely reliable.

[0009] These and other objects are all achieved by the railway wagon in question which essentially comprises an articulated arm fixed at one of its ends to the railway wagon and provided at its free end with a gripper device for gripping individually the sleepers and extracting them from underneath a railway track or inserting them under it. In particular the railway wagon in question is characterized by the fact that it comprises a store for a plurality of sleepers, which is arranged on top of the railway wagon, and handling means designed to transfer the individual sleepers from the store to a pick-up position, from where the articulated arm can be operated so as to pick up each individual sleeper and insert it underneath the railway track.

[0010] The technical features of the invention, in accordance with the abovementioned objects, may be clearly determined from the contents of the claims indicated below and the advantages thereof will emerge more clearly in the detailed description which follow, with reference to the accompanying drawings which show a purely exemplary and non-limiting embodiment thereof and in which:

- Figure 1 shows schematically a side view of the railway wagon according to the present invention with some parts removed so that others may be more clearly seen;
- Figure 2 shows schematically a plan view of the railway wagon according to Fig. 1 with some parts removed so that others may be more clearly seen;
- Figure 3 shows schematically a view, on a larger scale, of the front part of the railway wagon according to Fig. 1;
- Figure 4 shows schematically a view, on a larger scale, of the front part of the railway wagon according to Fig. 2;
- Figure 5 shows schematically a front view of a constructional detail of the railway wagon in question, relating to a bridge crane and a store;
- Figure 6 shows schematically a side view of a constructional detail of the railway wagon in question, relating to an articulated arm;
- Figure 7 shows schematically a view, on a larger scale, of a detail according to Fig. 4.

[0011] In accordance with the Figures of the accompanying drawings, 1 denotes in its entirety the railway wagon equipped to replace sleepers along tracks according to the present invention.

[0012] Said wagon travels along the same track 2 where the sleepers 3 are to be replaced and for this purpose is motorised so that it is able to perform in a completely autonomous manner the necessary movements along the railway line.

[0013] Advantageously, it may be envisaged that the equipment provided for replacement of the sleepers 3

is fixed at the front of the railway wagon 1 (see Figs. 1 and 2). In more detail, the railway wagon in question has, in its front part 4, an articulated arm 5 which is fixed at one of its ends to the railway wagon 1 and provided at its free end with a gripper device 6 (see Fig. 6) which is designed to grip individually the sleepers 3 and extract them from underneath the railway track 2 or insert them under it.

[0014] The central part 7 and rear part 8 of the wagon 1 are provided internally with a store 9 which houses a plurality of sleepers 3 arranged on several parallel shelves 10.

[0015] Handling means 13, 15, 17 are also provided on top of the railway wagon 1, for transferring the individual sleepers 3 from the store 9 to a pick-up position 12.

[0016] The articulated arm 5 is able to rotate about a vertical axis A and pick up, by means of operation of a plurality of mechanical actuators (indicated by 50, 51, 52, 53 and 54 in Fig. 6)), the individual sleepers 3 from the pick-up position 12 and insert them underneath the track 2. As can be noted from Fig. 4, the pick-up position 12 of the sleeper 3 is offset perpendicularly with respect to the track 2 towards one side of the railway wagon 1. This is so as to allow easy gripping of the sleepers 3 by the gripper device 6 mounted on the articulated arm 5.

[0017] In accordance with the example shown in the accompanying figures, the handling means comprise transportation means 13 for picking up the sleepers from the store 9 and conveying them as far as a first transit position 14, elevator means 15 for transferring the sleepers 3 from the first transit position 14 to a second transit position 16, and positioning means 17 which are able to displace the sleepers perpendicularly with respect to the track and thus convey them from the second transit position 16 to the abovementioned pick-up position 12 (see Fig. 3).

[0018] The transportation means 13 in turn consist of a bridge crane 18 (see Fig. 5) mounted above the store 9 and feeding means 19 which receive the sleepers 3 from the bridge crane 18 (preferably in groups formed by several sleepers 3) and move them forwards in successive steps as far as the first transit position 14.

[0019] In more detail the bridge crane 18 is motorised and is able to move along the whole of the main extension of the store 9 owing to a rack 60 with which it meshes by means of a pair of gear wheels 61 (see Fig. 1).

[0020] As can be seen in Figs. 1 and 5, removal of the sleepers 3 by means of the bridge crane 18 is performed with the aid of a harness 62 connected to a first linear actuator 63 designed to allow the vertical displacements thereof. The elevator means 15 mentioned above consist (see Figs. 3 and 4) of a structure 20 provided with a receiving seat 21 and actuated by a second linear actuator 22 so as to move via special guides 23 between an upper position, where it receives, in the seat 21, a sleeper 3 supplied by the feeding means, and a lowered position, where it allows the positioning means 17 to

bring the sleeper 3 arranged in the seat 21 into the pick-up position 12. The feeding means 19 mentioned above comprise (see Fig. 4) a fixed frame 24 and a movable frame 25 which receives the movement from a pair of motorised cams 26 which impart to it a to-and-fro movement. With each rotation of the shaft on which the cams 26 are mounted, the movable frame 25 picks up the sleepers 3 from the fixed frame 24 and then deposits them again in a more advanced position of the fixed frame 24 in the direction of feeding of the means 19 (or towards the pick-up position 12).

[0021] The positioning means 17 comprise a pair of linear actuators (not shown in the accompanying figures) which are contained inside the box-shaped support structure of the receiving seat 21 and each of which is able to move, by means of the guides 70, a movable element 71 (see Figs. 4 and 7). The latter, when actuated by means of the corresponding linear actuator, is in turn able to push the sleeper 3 into the pick-up position 12 by means of a pawl 72.

[0022] The front part 4 of the railway wagon 1 is provided, in the vicinity of the articulated arm 5, with means 27 for displacing the ballast of the railway bed (not shown in the accompanying figures) and consequently providing a seat for the sleeper 3 to be inserted underneath the tracks 2. These means 27 for displacing the ballast comprise, as shown in Fig. 3, a vertically movable structure 40 which is operated by a pair of hydraulic jacks 41 which are arranged vertically and a series of iron-hook pairs integral with the movable structure 40 and designed to penetrate into the ballast of the bed and displace it laterally. Each of the iron hooks 42 is formed by an arm with a slightly curved bottom part which can be actuated by means of an operating lever 43 via a hydraulic jack 44.

[0023] Advantageously, the shelves 10 of sleepers 3 located inside the store 9 are arranged at a distance from one another by separation bars 28 (see Fig. 5). The latter are connected to a surrounding frame 29 of the store 9 by means of a plurality of arms 30 which are movable (in the direction of the arrows indicated in Fig. 5) and designed to displace the separation bars 28 between a first position, where they support the sleepers 3 and are arranged between two successive shelves 10 of sleepers 3, and a second position, where they are arranged outside the sleepers 3 in the vicinity of the surrounding frame 29.

[0024] Obviously, the movement of the separation bars 28 between the abovementioned two positions may also be obtained in an entirely automatic manner by means of special actuation means which are not shown in the accompanying figures.

[0025] Therefore, when the bridge crane 18 has finished dealing with one shelf 10 of sleepers 3, the separation bars 28 are displaced by means of the movable arms 30 into the second position behind the surrounding frame so as to allow the bridge crane 18 to remove a further lower shelf 10 of sleepers 3.

[0026] Operationally speaking, the railway wagon 1 according to the present invention, which was described above from a mainly structural point of view, is able to operate as described hereinbelow.

[0027] Initially the sleepers 3 are loaded onto the wagon 1 at the rear 8 thereof and are then arranged by means of the bridge crane 18 on different shelves 10 inside the store 9.

[0028] At this point, the railway wagon 1 is ready to perform replacement of the sleepers which are not suitable, with other new sleepers. For this purpose, the bridge crane 18 transports in groups the sleepers 3 from the store 9 to the feeding means 19 which transport them as far as the first transit position 14, by means of the to-and-fro movement of the movable frame 25 with respect to the fixed frame 24. When each individual sleeper 3 reaches the first transit position 14, its position is recorded by detection means (such as, for example, a photocell) which cause, on the one hand, temporary stoppage of the feeding means 19 and, on the other hand, transportation of the sleeper 3 by the elevator means 19 into the second transit position 16. At this point the sleeper 3 is pushed perpendicularly with respect to the direction of the track 2 until it reaches the pick-up position 12 so as to allow subsequent easy gripping thereof by the gripper device 6 mounted on the articulated arm 5. At this point the means 27 for displacing the ballast of the railway bed and forming the seat designed to allow insertion of the sleeper 3 underneath the track 2 by the articulated arm 5 start to operate.

Claims

1. Railway wagon equipped to replace sleepers along tracks, comprising an articulated arm (5) fixed at one of its ends to the railway wagon (1) and provided at its free end with a gripper device (6) designed to grip individually the sleepers (3) and extract them from underneath a railway track (2) or insert them under it, characterized in that it comprises a store (9) for sleepers (3) and handling means (13, 15, 17) designed to transfer the individual sleepers (3) from said store (9) to a pick-up position (12), from where said articulated arm (5) can be operated so as to pick up each individual sleeper (3) and insert it underneath said railway track (2).
2. Railway wagon according to Claim 1, characterized in that said handling means (13, 15, 17) comprise: transportation means (13) able to pick up the sleepers (3) from said store (9) and convey them as far as a first transit position (14); elevator means (15) able to transfer the sleepers (3) from said first transit position (14) to a second transit position (16) arranged at a different height with respect to the height of said first transit position (14); positioning means (17) able to displace the sleepers (3) per-

pendicularly with respect to the track (2) and thus transfer them from said second transit position (16) to said pick-up position (12).

3. Railway wagon according to Claim 2, characterized in that said transportation means (13) comprise at least one bridge crane (18) mounted on said railway wagon (1) above said store (9).
4. Railway wagon according to Claim 3, characterized in that said transportation means (13) comprise feeding means (19) which receive the sleepers (3) from said bridge crane (18) and move them forwards in successive steps as far as said first transit position (14).
5. Railway wagon according to Claim 2, characterized in that said elevator means (15) comprise a structure (20) provided with a receiving seat (21) and actuated by at least one second actuator (22) so as to move in a guided manner between an upper position, where it receives, in the seat (21), a sleeper (3) supplied by said feeding means (19), and a lowered position, where it allows said positioning means (17) to bring said sleeper (3) into said pick-up position (12).
6. Railway wagon according to Claim 1, characterized in that it comprises means (27) for displacing the ballast of the railway bed and forming a seat for the sleeper (3) to be inserted underneath the track (2).
7. Railway wagon according to Claim 6, characterized in that said means (27) for displacing the ballast of the railway bed are located in the vicinity of said articulated arm (5) in the front part (4) of said railway wagon (1).
8. Railway wagon according to Claim 1, characterized in that the sleepers (3) housed inside said store (9) are located on a plurality of shelves (10) which are arranged at a distance from each other by separation bars (28).
9. Railway wagon according to Claim 8, characterized in that said separation bars (28) are connected to a surrounding frame (29) of said store (9) by means of a plurality movable arms (30) which are designed to guide said separation bars (28) between a first position, where said separation bars (28) support the sleepers (3) and are located between two successive shelves (10) of sleepers (3), and a second position, where said separation bars (28) are arranged outside the sleepers (3) in the vicinity of said surrounding frame (29).
10. Railway wagon according to Claim 1, characterized in that said feeding means comprise a fixed frame

(24) and a movable frame (25) which receives the movement from at least one motorised cam (26) and thus performs a to-and-fro movement, thus picking up, with each rotation of said cam (26), the sleepers (3) arranged on said fixed frame (24) and then depositing them again on said fixed frame (24) in a more forwards position towards said pick-up position (12).

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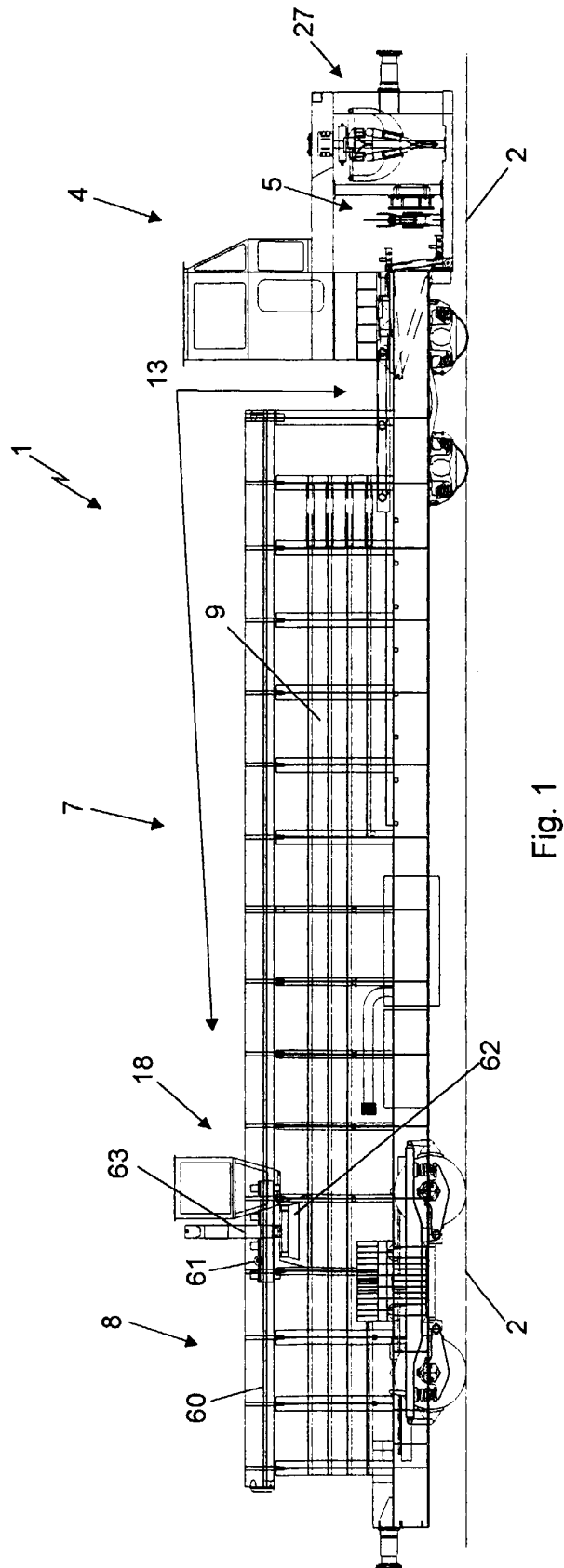


Fig. 1

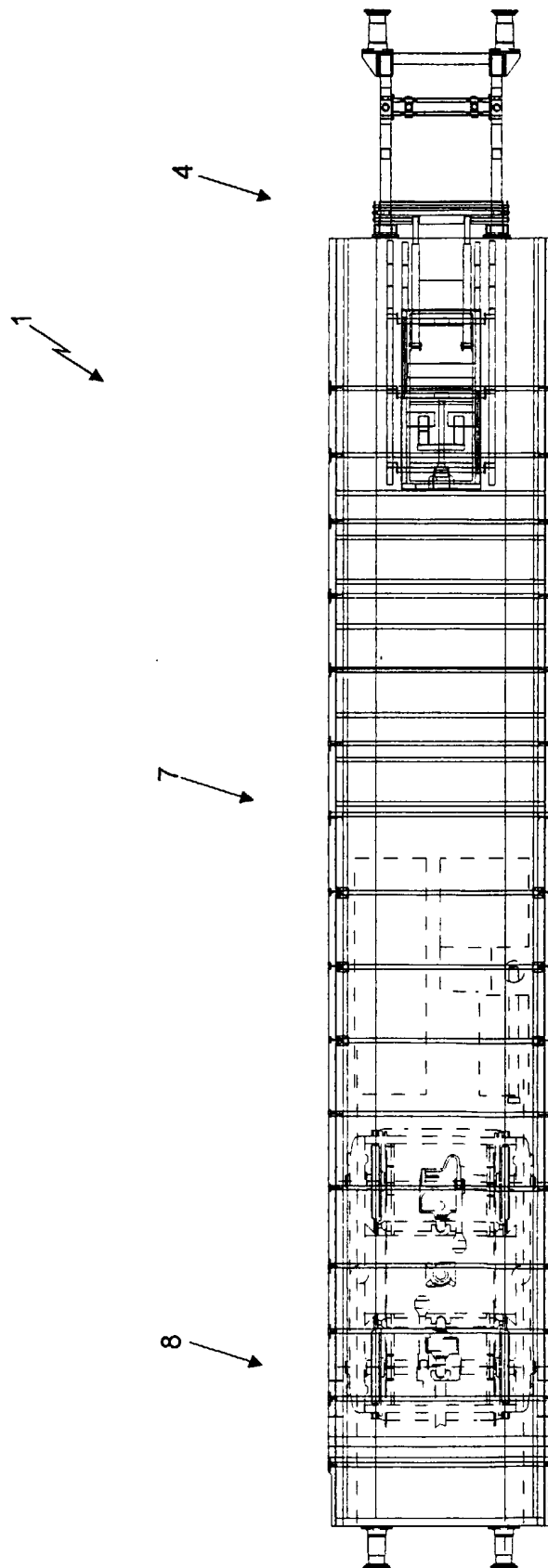
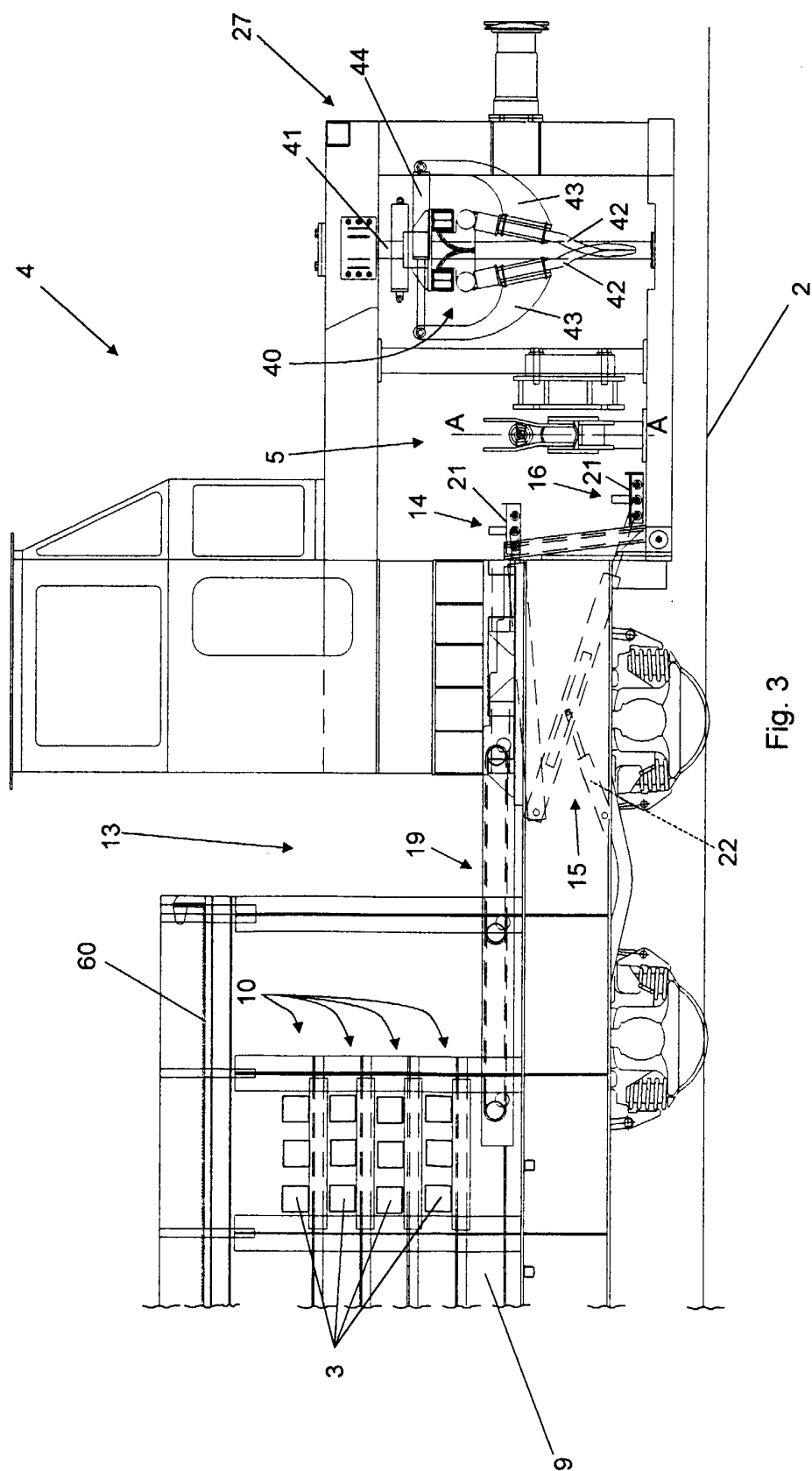


Fig. 2



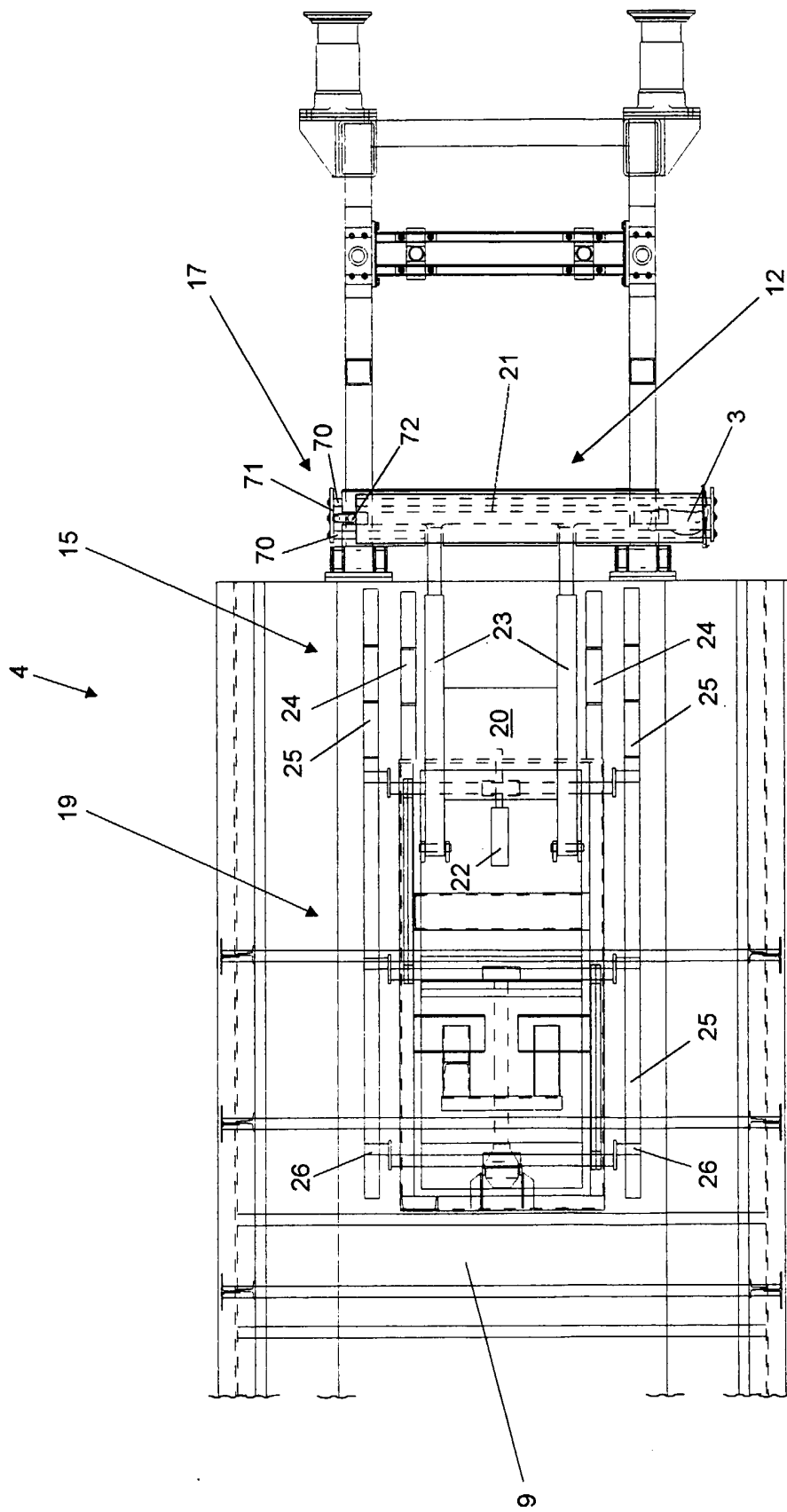


Fig. 4

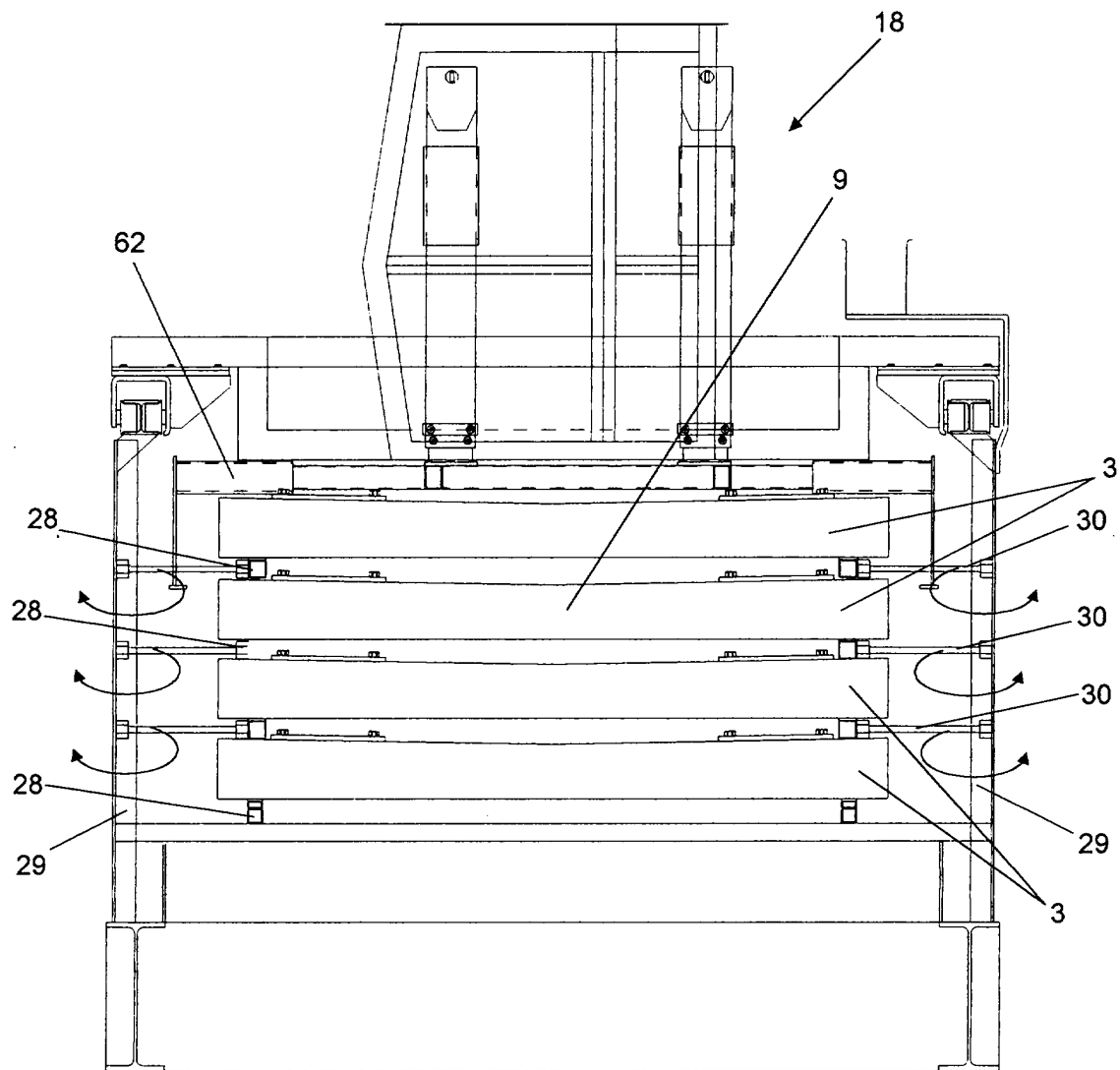


Fig. 5

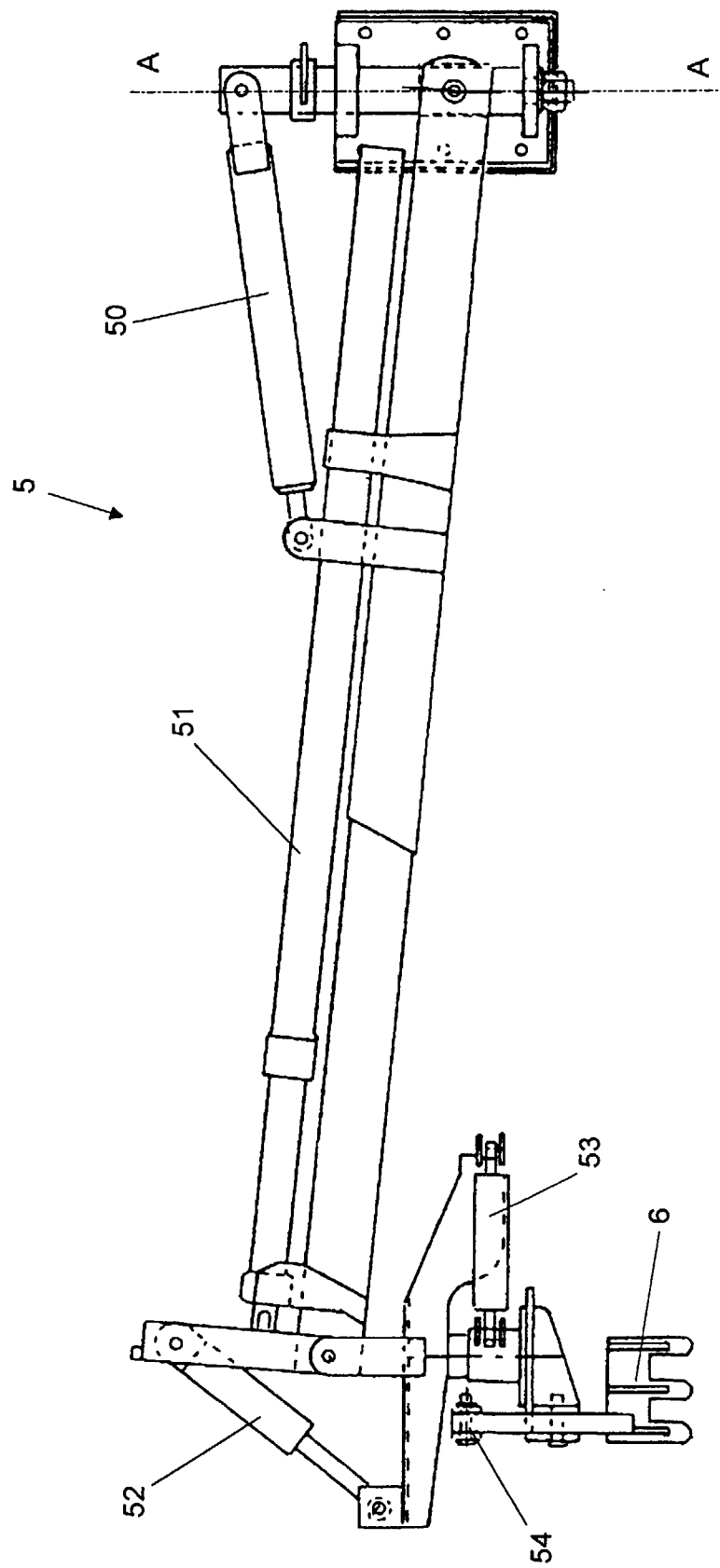


Fig. 6

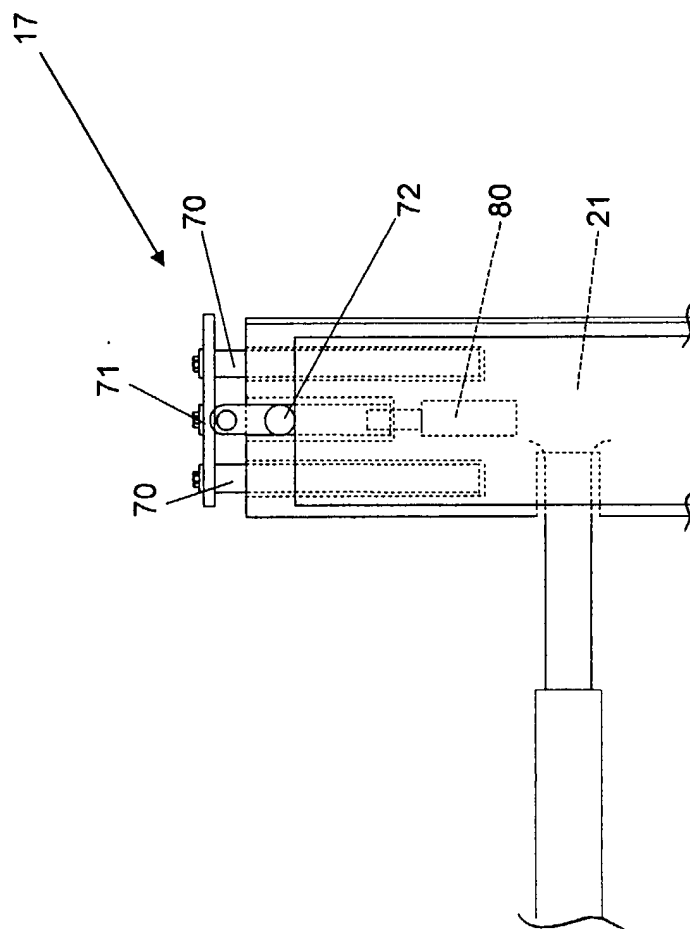


Fig. 7



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Application Number
EP 99 83 0399

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The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 7 October 1999	Examiner Blommaert, S
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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