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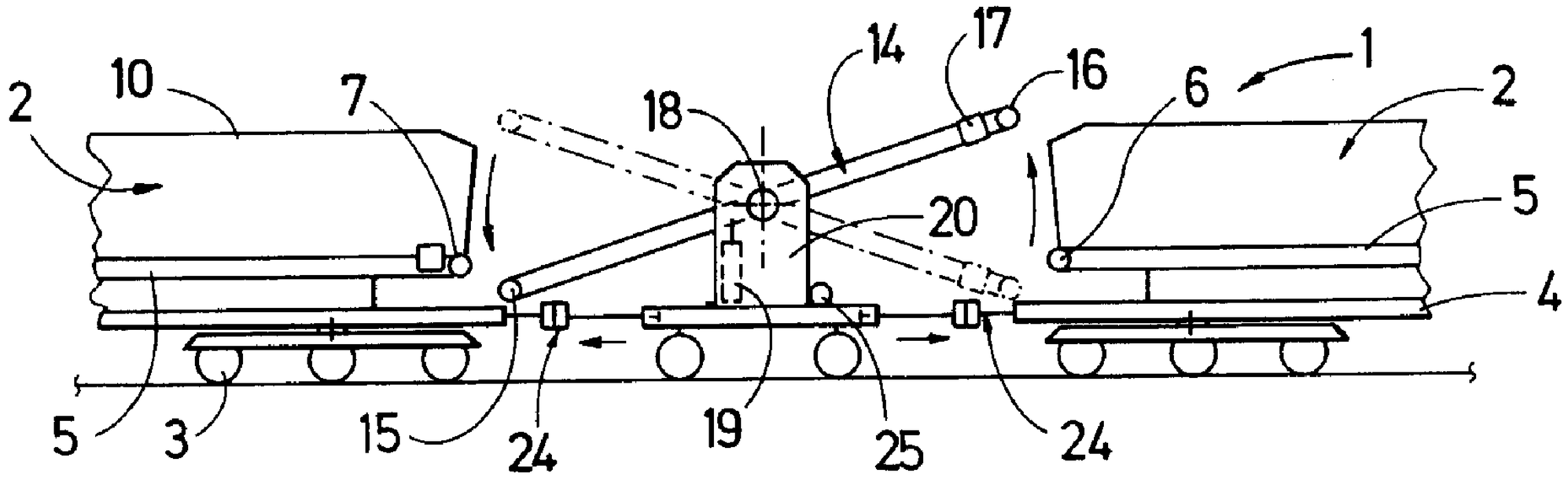
(54) Title: A BULK MATERIAL LOADING WAGON



(57) Abrégé/Abstract:
A bulk material loading wagon (2) for incorporation into a loading train (1) consisting of several such wagons is equipped with an open-topped storage box (10) attached to a chassis frame (4) for storage of the bulk material and with a bottom conveyor arrangement (5) associated therewith which extends in the lower region of the storage box (10) and in the longitudinal direction of the wagon. Provided for the transfer of bulk material between the individual storage boxes (10) is an endless transfer conveyor arrangement (14) having a conveyor drive (17). The subtending deflection end (15) of the transfer conveyor arrangement (14) is designed to be distanced by means of a drive (19) from the closer or overlapping deflection end (6, 7) of the bottom conveyor arrangement (5).

ABSTRACT

A bulk material loading wagon (2) for incorporation into a loading train (1) consisting of several such wagons is equipped with an open-topped storage box (10) attached to a chassis frame (4) for storage of the bulk material and with a bottom conveyor arrangement (5) associated therewith which extends in the lower region of the storage box (10) and in the longitudinal direction of the wagon. Provided for the transfer of bulk material between the individual storage boxes (10) is an endless transfer conveyor arrangement (14) having a conveyor drive (17). The subtending deflection end (15) of the transfer conveyor arrangement (14) is designed to be distanced by means of a drive (19) from the closer or overlapping deflection end (6,7) of the bottom conveyor arrangement (5).

A BULK MATERIAL LOADING WAGON

The invention relates to a bulk material loading wagon for incorporation into a loading train consisting of several such wagons, comprising an open-topped storage box attached to a chassis frame for storage of the bulk material and, associated therewith, a bottom conveyor arrangement which extends in the lower region of the storage box and in the longitudinal direction of the wagon and which, while forming two deflection ends spaced from one another in the longitudinal conveying direction, is of endless shape and has a conveyor drive, and also a transfer conveyor arrangement, adjustable by a drive, which is arranged at an angle with respect to the bottom conveyor arrangement and, while forming two deflection ends spaced from one another in the longitudinal conveying direction, is of endless shape and has a conveyor drive, wherein on coupling two such bulk material loading wagons, the lower deflection end of the transfer conveyor arrangement subtends the front end, in the conveying direction, of the bottom conveyor arrangement preceding in the conveying direction, while the higher deflection end of the transfer conveyor arrangement overlaps the rear deflection end of the succeeding bottom conveyor arrangement.

From US 4 576 538, a loading wagon of this kind is already known which, in a particularly advantageous manner, is connected with other like loading wagons to form a loading train. In doing so, each transfer conveyor arrangement, having the shape of a conveyor belt, projects over the storage box of the adjoining loading wagon, so that the latter can be filled with the aid of the projecting transfer conveyor arrangement. The conveyor drive of the bottom conveyor arrangement, likewise shaped as a conveyor belt, may be operated at variable speed, so that at low conveying speed the storage box is filled with slow forward movement of the heap of bulk material. On the other hand, when the conveying speed is higher, the bulk material can be

transported onward to the preceding loading wagon without storage.

By means of such a loading train which can be extended as needed by a suitable number of loading wagons, it is possible to transport the waste generated, for example, by a cleaning machine from the adjoining end of the loading train via the respective bottom and transfer conveyor arrangements all the way to the front-most loading wagon and to store it therein. The projecting transfer conveyor arrangement is pivotable about a vertical axis, making it possible to unload all the loading wagons simultaneously.

Additionally known from GB 2 277 725 B is a bulk material loading wagon of the kind described at the beginning, in which the transfer conveyor arrangement is designed to pivot in the region of the subtending conveyor end. The transfer conveyor arrangement is thus vertically adjustable by means of a drive from a normal, first position for transferring bulk material onto the succeeding loading wagon to a lowered second position for discharging the stored bulk material directly onto the track while reducing the height of the drop.

Finally, a further variant of the said bulk material loading wagon is known from US 5 151 002, each loading wagon having two bottom and transfer conveyor arrangements positioned side by side in the transverse direction of the wagon and extending parallel to one another. The deflection end of one of the bottom conveyor arrangements in each case is alternately subtended or overlapped by the deflection end of the transfer conveyor arrangement. The two bottom conveyor arrangements are separated from one another by a central separating wall extending in the longitudinal direction of the wagon, whereby a separate storage box is associated with each bottom conveyor arrangement. This double arrangement of the conveyor

arrangements affords the possibility to store and/or transport bulk material in parallel in two opposite conveying directions.

The object of the present invention is now to create a bulk material loading wagon of the specified kind which enables a change in the conveying direction of the bulk material to be carried out with the smallest possible additional structural expense and with a minimum of retrofitting operations.

This object is accomplished according to the invention in that, in a bulk material loading wagon of the kind described at the beginning, the subtending deflection end of the transfer conveyor arrangement is designed to be distanced by means of a drive from the closer or overlapping deflection end of the bottom conveyor arrangement.

Owing to such an adjustability it is possible with merely small retooling expense to convert the transfer conveyor arrangement so that in connection with the reversing of the conveying direction a problem-free transport of bulk material in the opposite direction is possible. This only requires an adjustment of the transfer conveyor arrangement by means of a drive in such a way that the previously overlapping deflection end is moved to a subtending position with regard to the adjoining bottom conveyor arrangement, while, parallel thereto, the previously subtending deflection end is moved to an overlapping position. It is of particular advantage hereby that the entire storage capacity of the loading wagon is available without restriction in both conveying directions.

For retrofitting quickly and easily, it is particularly advantageous if the couplings connecting the chassis frames to one another are extensible by virtue of an appropriate design. This makes it possible to temporarily create suitable free space for the change in position of the transfer conveyor arrangement in order to move the respective deflection end from a subtending to an overlapping position and vice versa without problem.

Additional advantages become apparent from the sub-claims and the drawings.

The invention is described in detail in the following with reference to embodiments represented in the drawing, in which

Figs. 1, 2 and 3 show a loading train formed by several bulk material loading wagons, with a transfer conveyor arrangement being illustrated in various working positions,

Fig. 4 shows an enlarged top view of an extensible coupling for temporarily increasing the distance between two loading wagons in order to convert the transfer conveyor arrangement, and

Figs. 5 to 11 show further variants of embodiment of the invention in a schematically simplified representation, with parts having the same function being denoted by the same reference numerals as in Figs. 1 to 3.

A loading train 1, shown schematically in Figs. 1 to 3, is composed of a number of similar bulk material loading wagons 2 arranged one following the other in the longitudinal direction of the wagons. Each bulk material loading wagon 2 is equipped with a plateau-shaped chassis frame 4, supported on on-track undercarriages 3, on which a bottom conveyor arrangement 5 extending in the longitudinal direction of the wagon is supported. The bottom conveyor arrangement 5 is in the shape of an endless conveyor belt having two deflection ends 6,7, which is movable by means of a conveyor drive 8 in the conveying or transporting direction indicated by an arrow 9 or, optionally, also in the opposite direction. The bottom conveyor arrangement 5 forms the lower boundary of a storage box 10 which is

constituted of two side walls 11, extending parallel to one another and in the longitudinal direction of the wagon, as well as two end walls 12 extending perpendicularly to the longitudinal direction of the wagon. The latter are spaced from the bottom conveyor arrangement 5 at their lower end region respectively to define a discharge opening 13.

A transfer conveyor arrangement 14, positioned in each case between two bottom conveyor arrangements 5 of two coupled bulk material loading wagons 2 and arranged at an angle to the horizontal or to the conveying plane of the bottom conveyor arrangement 5, is designed as an endless conveyor belt forming two deflection ends 15,16 and extending in the longitudinal direction of the wagon and is equipped with a conveyor drive 17.

The transfer conveyor arrangement 14 is positioned in such a way that, on coupling two similar bulk material loading wagons 2, the lower deflection end 16 subtends the front deflection end 6, in the conveying direction, of the bottom conveyor arrangement 5 preceding with respect to the conveying direction, while the other, higher deflection end 15 overlaps the deflection end 7 of the second bottom conveyor arrangement 5. The transfer conveyor arrangement 14 is mounted on a carrier frame 20 for pivoting about a pivot axis 18, extending horizontally and perpendicularly to the longitudinal direction of the wagon or the conveying direction, with the aid of a drive 19. This carrier frame 20, mobile on a track via on-track undercarriages 27, is mounted on a chassis frame 22 for displacement perpendicularly to the conveying direction by means of a drive 25, the chassis frame 22 being connected to the chassis frames 4 of the two adjoining bulk material loading wagons 2 by means of couplings 24 extensible in the longitudinal direction of the wagon with the aid of drives 23 (see Fig. 4). Alternately, the chassis frame 22 could also be designed in such a way that one longitudinal end is

articulatedly connected to the adjoining chassis frame 4 while the opposite longitudinal end is supported on the track by an on-track undercarriage 27. Each bulk material loading wagon 2 is equipped with a motor 26 by means of which the hydraulic conveyor drives 8 and 17 as well as the further drives 19,25 can be actuated.

In the position of the transfer conveyor arrangements 14 shown in Fig. 1, the bulk material can be transported in the conveying direction indicated by the arrow 9 by actuation of the two conveyor drives 8,17 and can optionally be stored in the various bulk material loading wagons 2 upon changing the conveying speed of the bottom conveyor arrangement 5. By transversely displacing the carrier frame 20 by a small amount together with the transfer conveyor arrangement 14 it is possible to perform an unimpeded transfer of bulk material also in track curve regions.

In order to reverse the conveying direction in the direction indicated by an arrow 21 in Fig. 3, the drives 23 (see Fig. 4) of the couplings 24 are actuated, causing a spacing apart of the chassis frames 4 and 22. Subsequently, the transfer conveyor arrangement 14 is pivoted about the pivot axis 18 by actuation of the drive 19 until the previously higher deflection end 15 comes to lie in a lower position with respect to the deflection end 7 of the adjoining bottom conveyor arrangement 5. Parallel thereto, the opposite deflection end 16 is automatically moved to a position overlapping the adjoining bottom conveyor arrangement 5. By actuation of the drives 23 in the opposite direction, the couplings 24 are retracted to their normal position again, whereby the lower deflection end 15 of the transfer conveyor arrangement 14 automatically assumes a position subtending the deflection end 7 of the bottom conveyor arrangement 5. The two conveyor drives 8,17 must be actuated in a reverse rotational direction for the following conveying operation. The described

pivoting of the transfer conveyor arrangement 14 for reversing the conveying direction would, of course, also be attainable without length-adjustable couplings 24 by spacing the bulk material loading wagons 2 apart from one another after uncoupling to create the required free space.

The extensible coupling 24 represented on an enlarged scale in Fig. 4 shows a coupling part 35 mounted for displacement in the longitudinal direction of the wagon in a guide 36 of the chassis frame 22. Displacement is accomplished by means of the drive 23. In the retracted position for normal working operation of the loading train 1, the displaceable coupling part 35 can be fixed in position relative to the chassis frame 22 by means of a blocking device 38. The blocking device 38 comprises a bolt 40 which may be hydraulically moved into a bore 39 of the coupling part 35.

In the variant schematically shown in Figs. 5 and 6, the carrier frame 20 is designed to be rotatable relative to the chassis frame 22 about a vertical axis 29 by means of a drive 28. In order to reverse the conveying direction, the drive 28 is actuated and the carrier frame 20 together with the transfer conveyor arrangement 14 is rotated about the vertical axis 29 (see arrow in Fig. 6) until, after a 180° turn, the lower deflection end 16 comes to lie underneath the deflection end 7 of the adjoining bottom conveyor arrangement 5.

In the variant shown in Fig. 7, the transfer conveyor arrangement 14 is fastened to a support frame 30, projecting over a longitudinal end of the chassis frame 4 of the bulk material loading wagon 2, for rotation about a horizontal pivot axis 31, extending perpendicularly to the conveying direction, as well as a vertical pivot axis 32. Drives 33,34 are provided for pivoting the transfer conveyor arrangement 14. In this variant, too, it is not absolutely necessary to adjust the distance between the two chassis frames 4 for moving the

transfer conveyor arrangement 14 from the position shown in full lines to the position shown in dash-dotted lines. Optionally, the support frame 30 can also be mounted for rotation relative to the chassis frame 4 about a vertical axis 52 by means of a drive 37.

In the variant of a bulk material loading wagon 2 shown in Figs. 8 to 11, a coupling 41 for detachably connecting the transfer conveyor arrangement 14 is provided at each longitudinal end between the bottom conveyor arrangement 5 and the chassis frame 4. As shown particularly in the enlarged top view in Fig. 11, said coupling 41 has the shape of a coupling carriage 43 displaceable in the longitudinal direction of the wagon by means of a drive 42. Longitudinal displacement is carried out by means of guide tracks 44 connected to the chassis frame 4. The coupling carriage 43 is rotatable about a vertical axis 46 with respect to a guide plate 45 and has two attachment cylinders 47 spaced from one another in the transverse direction of the wagon. Each of said attachment cylinders 47 is equipped with a hydraulically adjustable locking bolt 48 which may be moved into a bore of a flange 49, arranged in the region of the deflection end 15 or 16, of the transfer conveyor arrangement 14.

According to Fig. 8, the right deflection end 16 of the transfer conveyor arrangement 14 is attached to the coupling carriage 43. The transfer conveyor arrangement 14 is additionally supported by a cable connection 50 and a drive 51. When conveyor drives 8 and 17 are actuated, bulk material is transported in the direction indicated by the arrow 9 from one bulk material loading wagon 2 to the adjoining one.

When the conveying direction is to be reversed, the bulk material loading wagons 2 are uncoupled and moved apart sufficiently to allow an unimpeded lowering of the transfer

conveyor arrangement 14 into a horizontal position by actuation of drive 51 (Fig. 9). Subsequently, the coupling carriage 43 directly opposite the deflection end 15 is moved toward the transfer conveyor arrangement 14 by actuation of drive 42 and is attached to the flanges 49 by actuation of the attachment cylinders 47. Thereupon, the opposite coupling carriage 43 can be detached from the transfer conveyor arrangement 14. The cable connection 50 is connected to the transfer conveyor arrangement 14 in a section adjoining the deflection end 16 and also to the drive 51 which is hinged to that bulk material loading wagon 2 to which the transfer conveyor arrangement 14 is now articulatedly connected. After the deflection end 15 has been displaced by corresponding displacement of the coupling carriage 43 to a position subtending the deflection end 7 of the bottom conveyor arrangement 5 (see Fig. 10), the transfer conveyor arrangement 14 can be lifted by actuation of drive 51 in such a way that the deflection end 16 is placed in an overlapping position relative to the adjoining bulk material loading wagon 2 as needed for the transfer of bulk material. Thereupon, the adjoining bulk material loading wagons 2 are again coupled to one another to form a loading train 1.

Claims:

1. A bulk material loading wagon (2) for incorporation into a loading train (1) consisting of several such wagons, comprising:

an open-topped storage box (10) attached to a chassis frame (4) for storage of the bulk material and, associated therewith, a bottom conveyor arrangement (5) which extends in the lower region of the storage box (10) and in the longitudinal direction of the wagon and which, while forming two deflection ends (6,7) spaced from one another in the longitudinal conveying direction, is of endless shape and has a conveyor drive (8), and also a transfer conveyor arrangement (14), the distance of the transfer conveyor arrangement (14) from the ends of the bottom conveyor arrangement (5) is adjusted by an adjusting drive, which is arranged at an angle with respect to the bottom conveyor arrangement (5) and, while forming two deflection ends (15,16) spaced from one another in the longitudinal conveying direction, is of endless shape and has a conveyor drive (7), wherein on coupling two such bulk material loading wagons (2), the lower deflection end (16) of the transfer conveyor arrangement (14) subtends the front end, in the conveying direction, of the bottom conveyor arrangement (5) preceding in the conveying direction, while the higher deflection end (15) of the transfer conveyor arrangement (14) overlaps the rear deflection end (7) of the succeeding bottom conveyor arrangement (5), characterized in that the subtending deflection end (16 or 15) of the transfer conveyor arrangement (14)is distanced from the closer or overlapping deflection end (6,7) of the bottom conveyor arrangement (5) by means of the adjusting drive.

2. A wagon according to claim 1, characterized in that the transfer conveyor arrangement (14) is mounted on a separate

chassis frame (22) which is connected to the chassis frames (4) of the two adjoining bulk material loading wagons (2) by means of couplings (24) extensible in the longitudinal direction of the wagon with the aid of coupling drives (23).

3. A wagon according to claim 2, characterized in that the transfer conveyor arrangement (14) is mounted on a carrier frame (20) for pivoting about the pivot axis (18), extending horizontally and perpendicularly to the longitudinal conveying direction, with the aid of the adjusting drive.

4. A wagon according to claim 2 or 3, characterized in that the carrier frame (20) is rotatable relative to the chassis frame (22) about a vertical axis (29) by means of a rotatable drive (28).

5. A wagon according to one of claims 2, 3 or 4, characterized in that the carrier frame (20) is mounted on the chassis frame (22) for displacement perpendicularly to the conveying direction by means of a displacement drive (25).

6. A wagon according to claim 1, characterized in that the transfer conveyor arrangement (14) is fastened to a support frame (30), projecting over a longitudinal end of the chassis frame (4) of the bulk material loading wagon (2), for rotation about horizontal pivot axis (31), extending perpendicularly to the conveying direction, as well as a vertical pivot axis (32).

7. A wagon according to claim 6, characterized in that the support frame (30) is mounted for rotation relative to the chassis frame (4) about a vertical axis (52) by means of a rotation drive (37).

8. A wagon according to claim 1, characterized in that each deflection end (15,16) of the transfer conveyor arrangement (14) may be detachably connected to the chassis frame (4) by means of a coupling (41).

9. A wagon according to claim 8, characterized in that a coupling carriage (43) is mounted on the chassis frame (4) at each deflection end (6,7) of the bottom conveyor arrangement (5) for displacement in the longitudinal direction of the wagon, the coupling carriage (43) being detachably connectable to a deflection end (15,16) of the transfer conveyor arrangement (14) by means of an attachment cylinder (47).

10. A wagon according to claim 9, characterized in that the transfer conveyor arrangement (14) has at each deflection end (15,16) a flange (49) serving as a coupling device for detachable connection to the coupling carriage (43).

11. A wagon according to claim 9 or 10, characterized in that the coupling carriage (43) is mounted to the chassis frame (4) for rotation about a vertical axis (46).

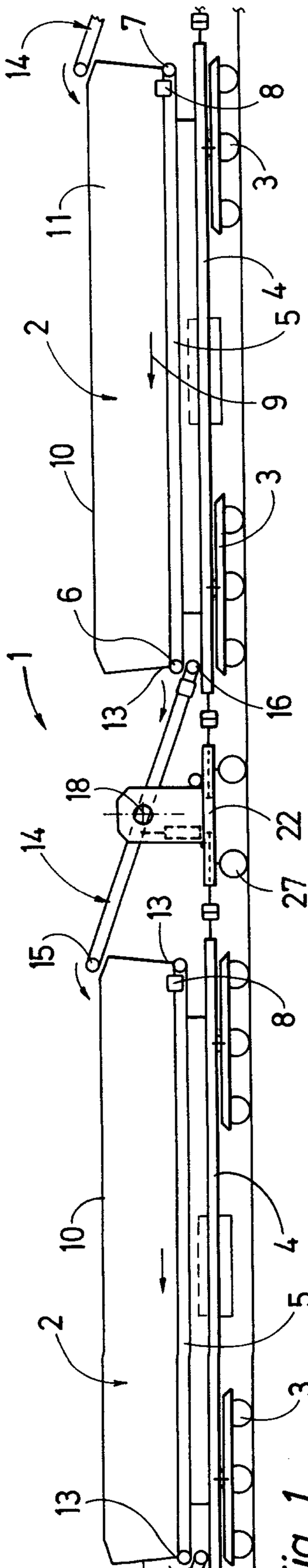


Fig. 1

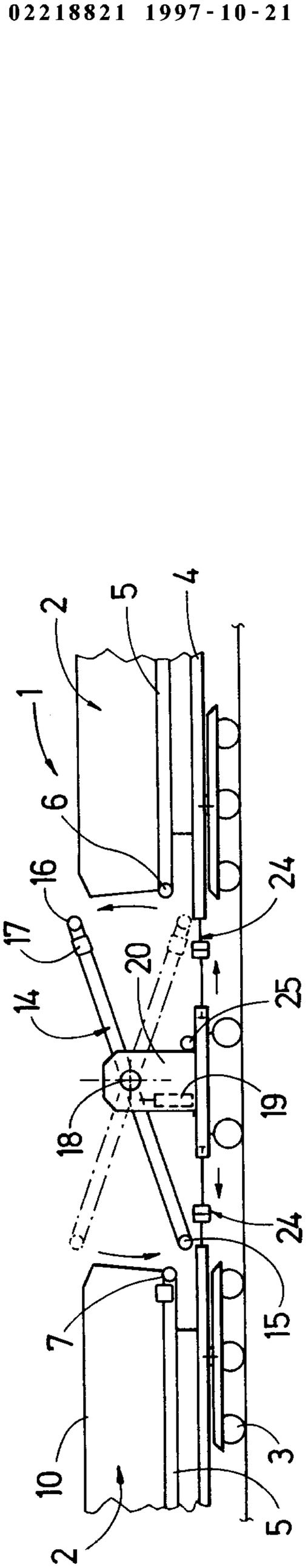


Fig. 2

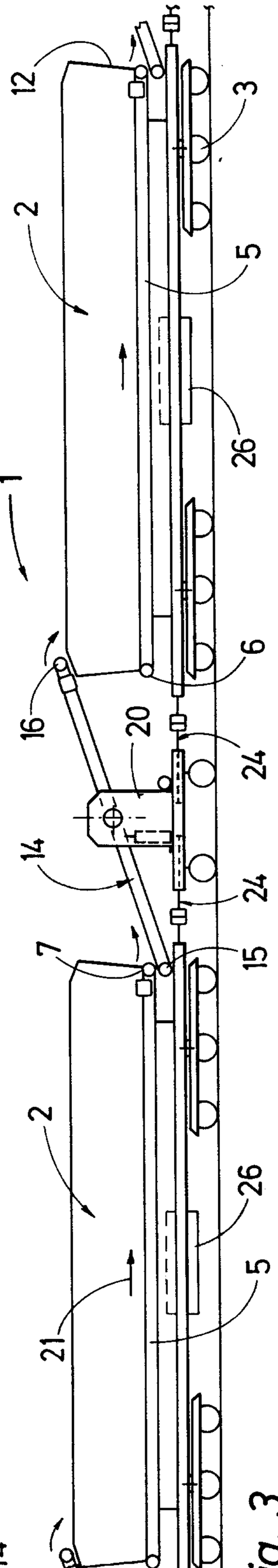
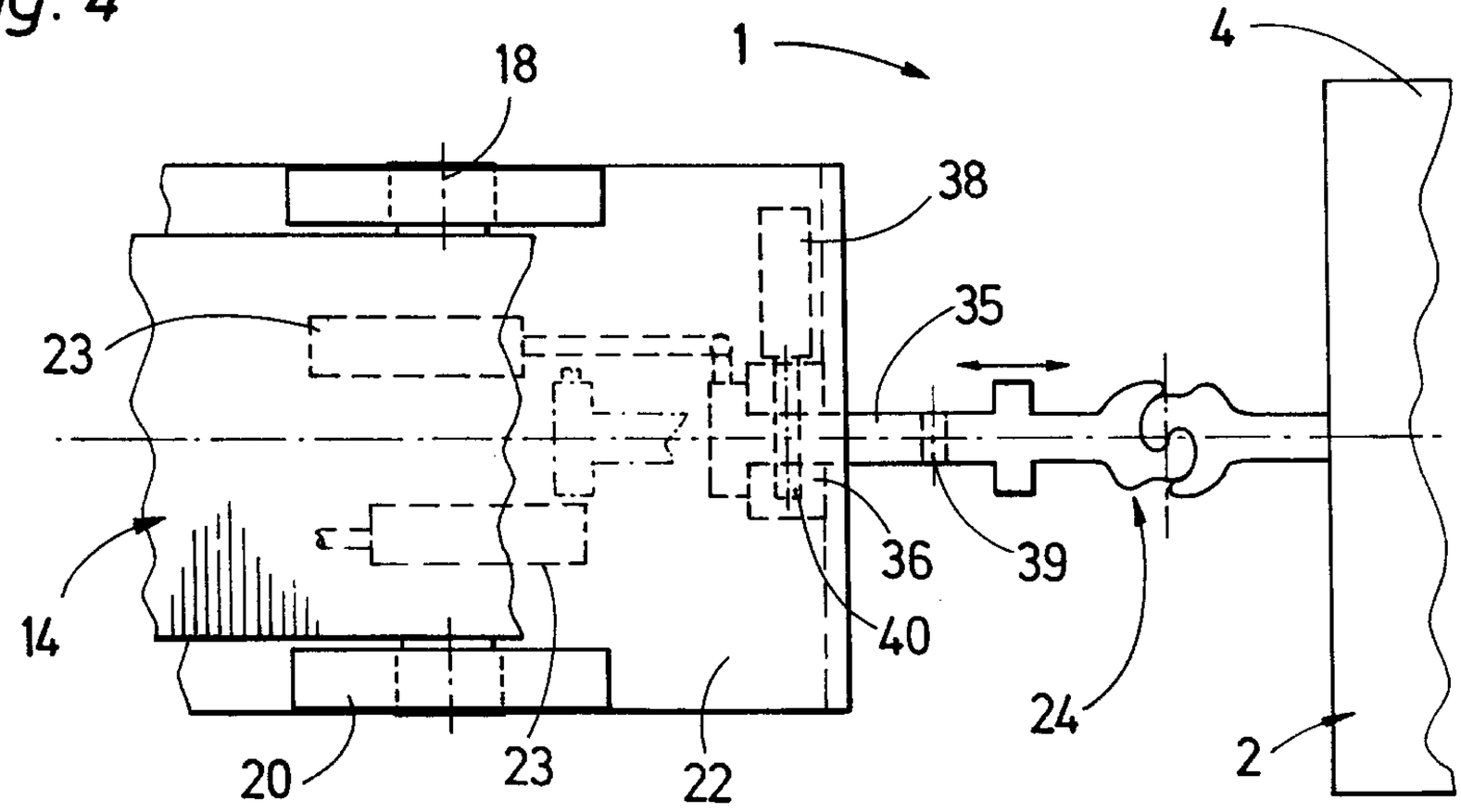


Fig. 3

Fig. 4



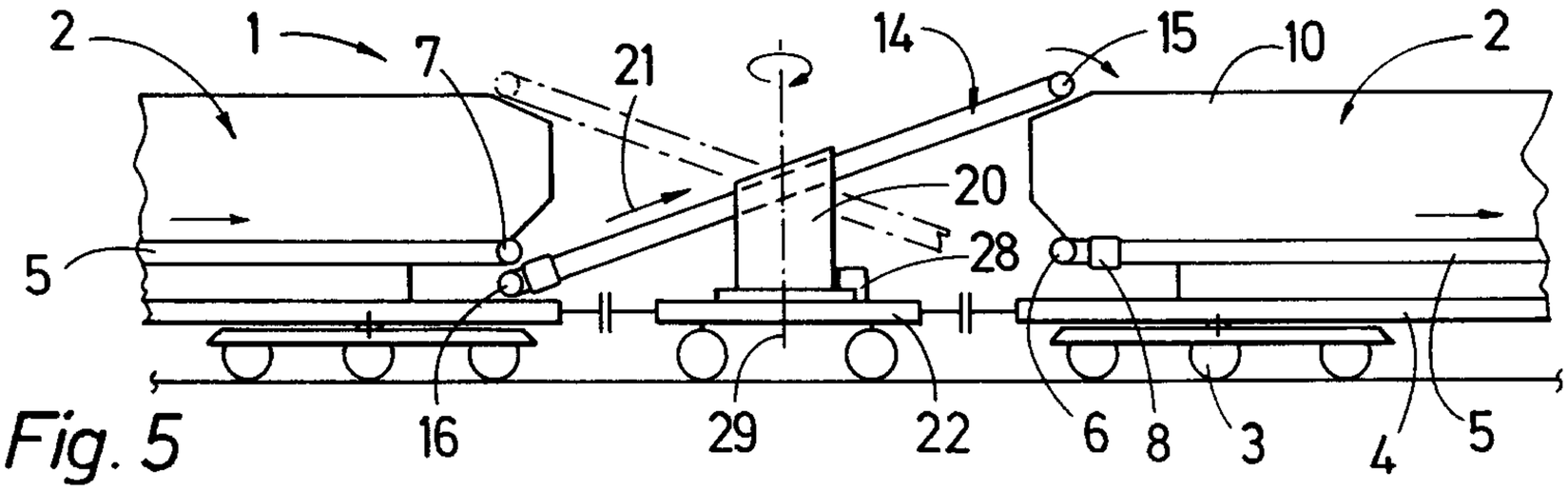


Fig. 5

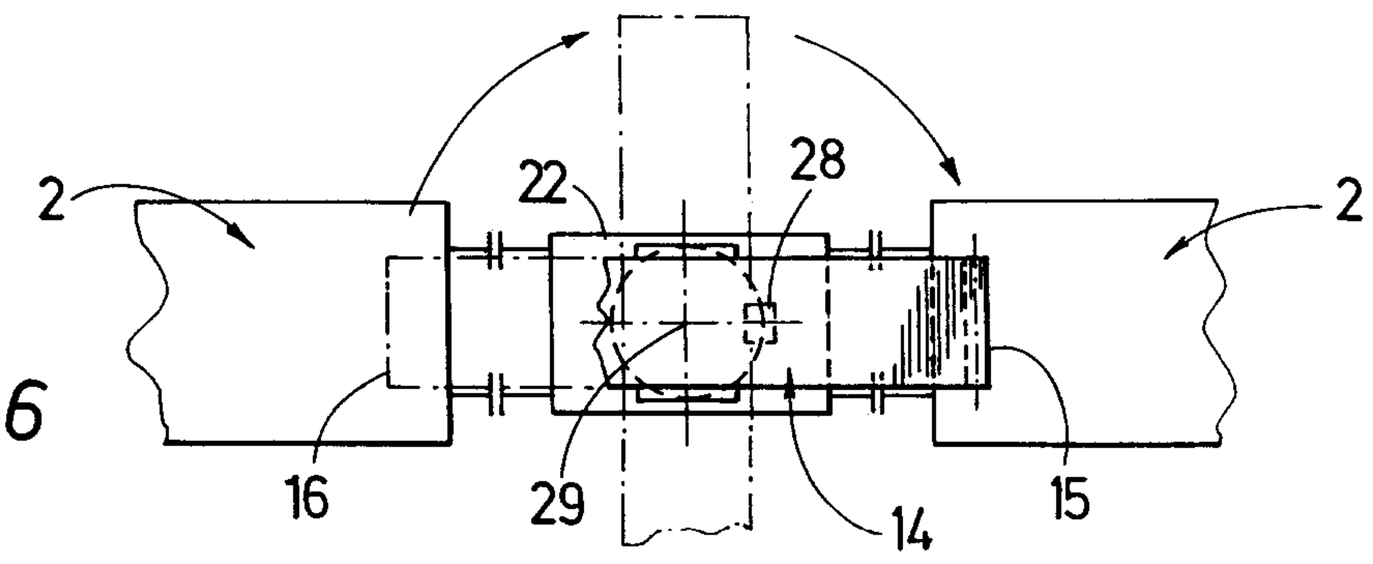


Fig. 6

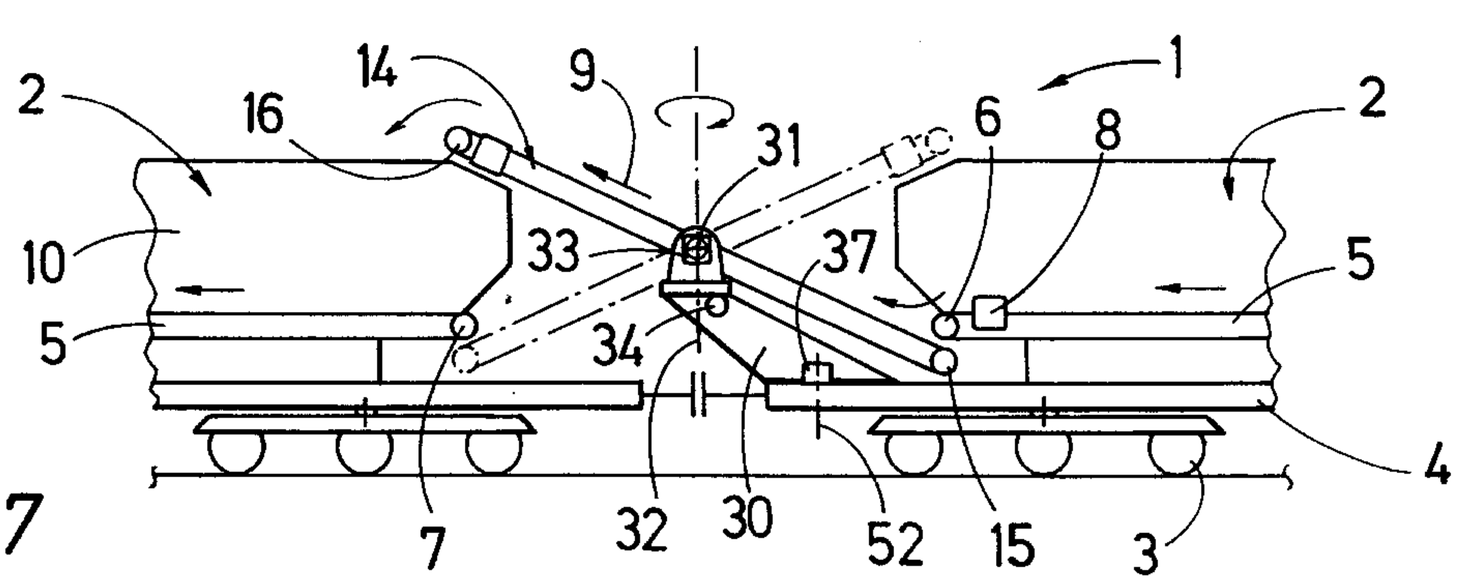


Fig. 7

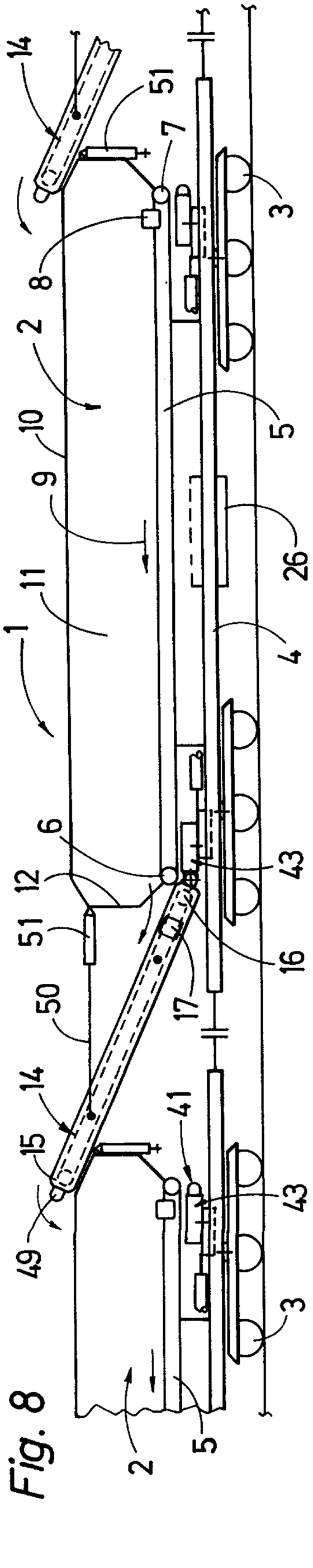


Fig. 8

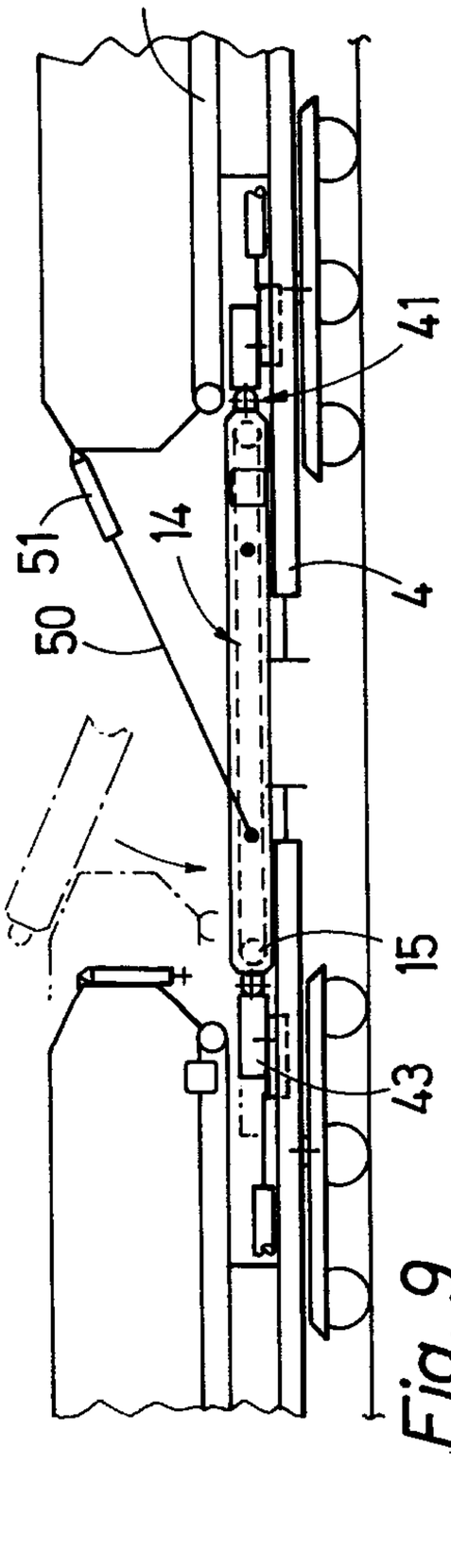


Fig. 9

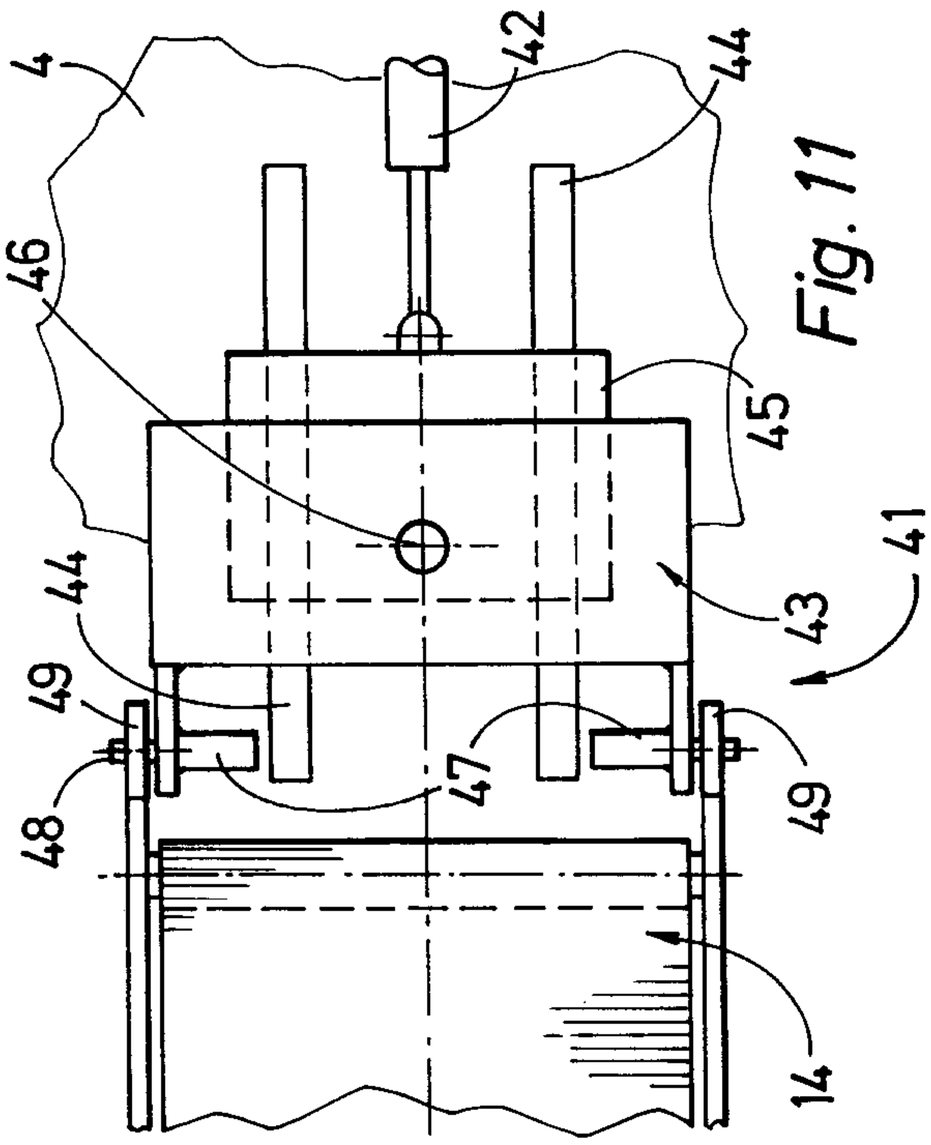


Fig. 11

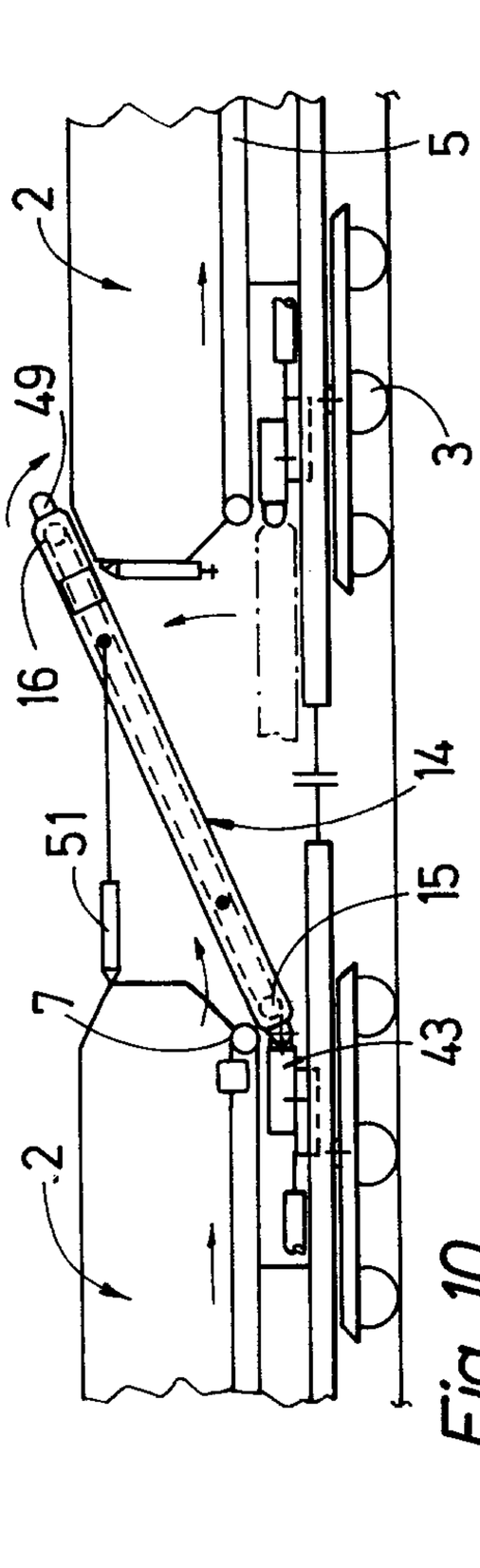
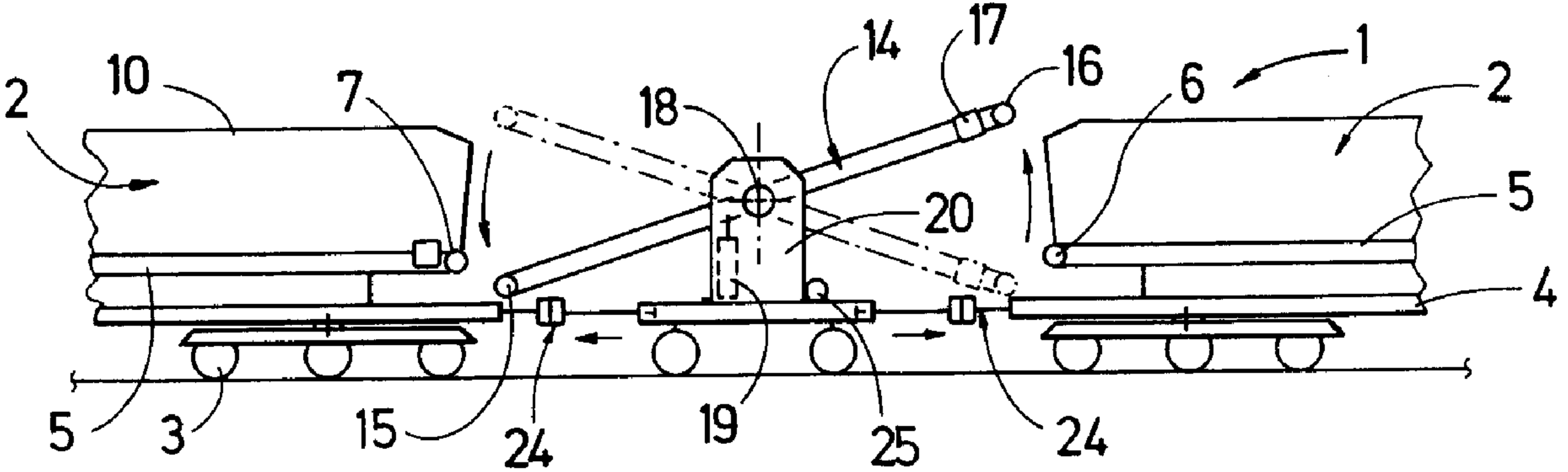


Fig. 10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