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CA 2137012 C 2004/09/14

(11)(21) 2 137 012

(12) BREVET CANADIEN
CANADIAN PATENT

(13) C

(22) Date de dépôt/Filing Date: 1994/11/30

(41) Mise à la disp. pub./Open to Public Insp.: 1995/06/02

(45) Date de délivrance/Issue Date: 2004/09/14

(30) Priorité/Priority: 1993/12/01 (A 2438/93) AT

(51) Cl.Int.^{5}/Int.Cl.^{5} E01B 27/06

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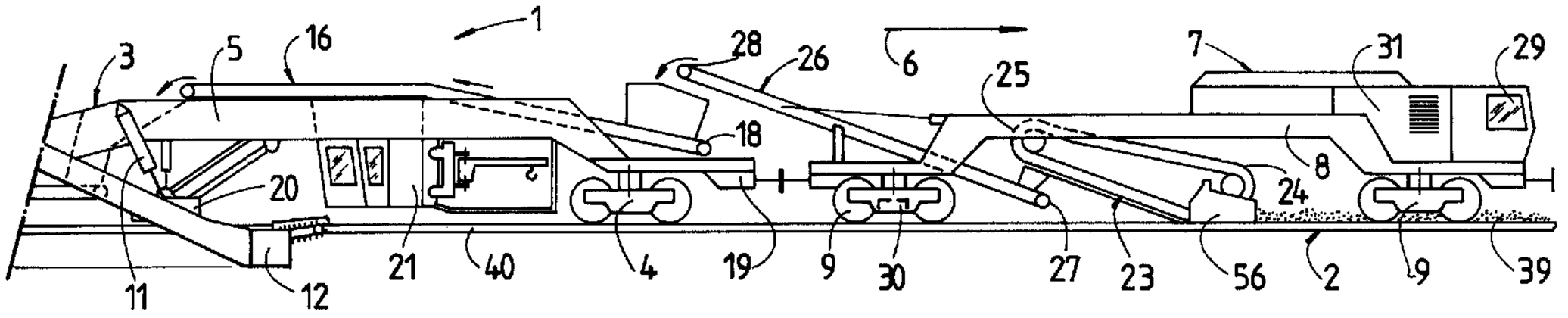
(54) Titre : MACHINE POUR LE CONDITIONNEMENT DE BALLAST DE VOIE FERREE
(54) Title: A MACHINE INSTALLATION FOR TREATING THE BALLAST BED OF A TRACK



(57) Abrégé/Abstract:
A machine installation (1) for treating the ballast bed of a track (2) has a first machine (3) comprising a machine frame (5) supported on on-track undercarriages (4). Associated with this machine frame are a vertically adjustable excavating device (12) for picking up ballast lying beneath the track and a first conveyor belt arrangement for removing the picked-up ballast and a second conveyor belt arrangement (16) for conveying bulk material, of which the intake end (18) is situated at the end of the machine for receiving bulk material from a second machine (7). Associated with the second machine (7) which is arranged so as to precede the first machine (3) in the working direction is a second excavating device (23) comprising an excavating chain (24) for picking up bulk material lying on the track (2) and a third conveyor belt arrangement (26) for the transfer of bulk material, an intake end (27) of the third conveyor belt arrangement (26) being arranged beneath a discharge end (25) of the second excavating device (23).

ABSTRACT

A machine installation (1) for treating the ballast bed of a track (2) has a first machine (3) comprising a machine frame (5) supported on on-track undercarriages (4). Associated with this machine frame are a vertically adjustable excavating device (12) for picking up ballast lying beneath the track and a first conveyor belt arrangement for removing the picked-up ballast and a second conveyor belt arrangement (16) for conveying bulk material, of which the intake end (18) is situated at the end of the machine for receiving bulk material from a second machine (7). Associated with the second machine (7) which is arranged so as to precede the first machine (3) in the working direction is a second excavating device (23) comprising an excavating chain (24) for picking up bulk material lying on the track (2) and a third conveyor belt arrangement (26) for the transfer of bulk material, an intake end (27) of the third conveyor belt arrangement (26) being arranged beneath a discharge end (25) of the second excavating device (23).

(Fig. 1)

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A MACHINE INSTALLATION FOR TREATING THE BALLAST BED OF A TRACK

The invention relates to a machine installation for treating the ballast bed of a track, consisting of a first machine comprising a machine frame supported on on-track undercarriages, with which there are associated a vertically adjustable excavating device for picking up ballast lying beneath the track and a first conveyor belt arrangement for removing the picked-up ballast and a second conveyor belt arrangement for conveying bulk material, of which the discharge end is situated following the excavating device in the working direction of the machine and the intake end is situated at the end of the machine for receiving bulk material from a second machine with which a third conveyor belt arrangement is associated for the transfer of bulk material.

A machine installation of this kind is already known through DE 43 12 585 A1. In this installation, there are associated with a first machine frame supported on on-track undercarriages an excavating device which is vertically adjustable by means of drives and a first conveyor belt arrangement for removing the ballast picked up by the excavating device. Arranged in the rear portion of the machine frame, with respect to the working direction, is a second conveyor belt arrangement which extends in the longitudinal direction of the machine and which is composed of an intake end located at the rear machine end and a discharge end located immediately following the excavating device. Located above the said intake end of the second conveyor belt arrangement is a third conveyor belt arrangement which is associated with a second machine designed as a hopper wagon. This is shown on Figure 1 of DE 43 12 585 A1.

With this known installation, during a continuous working advancing movement, fouled ballast is conveyed by the excavating device onto the first conveyor belt arrangement and is discharged by the said conveyor belt arrangement into a preceding screening unit for cleaning. The cleaned ballast is transported back by means of another conveyor belt unit and is discharged over the exposed formation. In parallel therewith, new ballast stored in the hopper wagon is discharged as required onto the formation by way of the second and third conveyor belt arrangement in order to replace the fairly large amounts of dirt removed in the screening unit by replenishing the ballast in this way. It would also be possible with this installation, however, to increase the height of the ballast bed, for example, the additional ballast being discharged into the renewal gap by way of the second and third conveyor belt arrangement in parallel with the returning of the cleaned ballast.

Further, a machine installation for picking up, cleaning and reintroducing the ballast bed of a track is already known through EP 0 408 839 A1. This installation has a first machine, arranged in front in the working direction, comprising two vertically adjustable excavating devices, each one arranged on a longitudinal side of the machine, for picking up the fouled ballast in the region of the ballast bed shoulders. The picked-up fouled ballast is cleaned in a screening unit situated on a second machine and is then discharged onto the track. In parallel therewith, the rest of the fouled ballast lying beneath the track is picked up by another, third excavating device located on a machine which follows in the working direction and is cleaned in another screening unit.

The cleaned ballast lying on the track is lifted from the sleepers for a short period by means of an appropriate device comprising an endless conveyor chain (as shown on Figures 7 and 8 of EP 0 408 839 A1), is conveyed by a cutter bar of the third excavating device and

discharged onto the exposed formation. At the same time the ballast picked up by the third excavating device and cleaned by the second screening unit is also discharged. With an installation of this kind, the cleaning performance can be increased by progressive treatment of the fouled ballast bed by means of three excavating devices situated at a distance from one another.

A sand excavating machine SRM 500 is also known through the journal "Eisenbahntechnische Rundschau" ("Railway Review"), 4/1980, pages 299 and 300. This machine, developed for removing sand drifts on tracks, has an excavating device which projects over the front end of the machine and is designed as an elevator, with which a conveyor belt arrangement is associated for laterally discharging the excavated sand.

Other machine installations are known through EP 0 408 837 B1 and AT 235 328 B.

The object of the present invention is to create a machine installation of the type previously defined which may be used for rehabilitating the ballast bed with reduced vehicular expenditure even where there is a fairly large bulk material requirement.

This object is achieved according to the invention with a machine installation of the type previously defined in that with the second machine, arranged so as to precede the first machine in the working direction, is associated a second excavating device comprising an excavating chain - rotating around axes of rotation extending at right angles to the longitudinal direction of the machine and horizontally - for picking up bulk material lying on the track, an intake end of the third conveyor belt arrangement being arranged beneath a discharge end of the second excavating device.

With this special combination of machines or features it is possible to pre-deposit or temporarily deposit on the track bulk material, e.g. new ballast, required for replenishing or improving the ballast bed, independently of the point of use of the machine installation. The logistics involved in obtaining and providing bulk material at the right time are thereby simplified, and in addition no specially designed hopper and conveyor wagons are required for the pre-depositing. Since the bulk material can easily be pre-deposited within the area of the whole length of the worksite track, the working performance of the installation according to the invention advantageously is completely independent of limits predetermined by the storage capacity of the hopper wagons.

It is ensured by the flanged rollers resting on the rails that the pre-deposited bulk material can be picked up as completely as possible, with the excavating chain remaining at a constant distance from the sleepers. The excavating chain is also automatically centred between the rails.

With the excavating chain of the second excavating device having a width smaller than the gauge of the on-track undercarriages, reliable positioning of the excavating chain between the rails, on the one hand, and also optimum utilization of the potential depositing space for the pre-deposited bulk material, on the other hand, is guaranteed.

Further developments of the invention ensure disruption-free, continuous picking-up of bulk material from the track onto the excavating chain.

With a further development, according to which a hopper wagon is provided between the first and the second machine, the bulk material pre-deposited on the track and picked up by the second excavating device can be stored for a short period

while a continuous conveyor belt arrangement is maintained, so that varying material requirements can easily be compensated for.

In a further aspect, the present invention resides in an installation for the rehabilitation of a ballast bed supporting a track including two rails, which comprises a first machine, a second machine, the machines being supported on the track by undercarriages for movement in an operating direction, and the second machine preceding the first machine in the operating direction, a vertically adjustable ballast excavating device mounted on the first machine for excavating ballast from underneath the track, a first conveyor arrangement arranged to remove the excavated ballast from the ballast excavating device, a second conveyor arrangement for conveying clean bulk material from the second to the first machine, the second conveyor arrangement having a discharge end rearwardly of the ballast excavating device in the operating direction, and a clearing device mounted on the second machine, the clearing device comprising a scraping chain arranged to take up clean bulk material lying on the track, the scraping chain revolving about a horizontal axis extending transversely to the track and having a discharge end, and an input end of the second conveyor arrangement being arranged under the discharge end of the scraping chain.

The invention is explained in more detail in the following with the aid of embodiments shown in the drawing, in which

Fig. 1 and 2 show a side view of the machine installation, in which the front portion in the working direction is evident in Fig. 1,

Fig. 3 shows the front portion of another embodiment of the machine installation, in side view,

Fig. 4 shows a side view of an additional variant of the machine installation,

Fig. 5 shows an enlarged detail side view of the second excavating device according to the invention, and

Fig. 6 shows a view of this second excavating device in the longitudinal direction of the machine, in the direction of arrow VI in Fig. 5.

The machine installation 1 shown in Fig. 1 and 2 for cleaning the ballast bed of a track 2 is composed of a first machine 3, comprising a machine frame 5 supported on on-track undercarriages 4, and another, second machine 7 preceding it in the working direction (arrow 6), comprising a machine frame 8 and on-track undercarriages 9. In order to clean the ballast, a screening wagon 10 is coupled to the first machine 3. Associated therewith, between the on-track undercarriages 4, is a first excavating device 12, vertically and laterally adjustable by means of drives 11 and comprising an endless excavating chain running around the track 2. Provided between a screening unit 13 and a discharge point 14 of the first excavating device 12 is a first conveyor belt arrangement 15, extending in the longitudinal direction of the machine, for

transporting the fouled ballast picked up by the first excavating device 12. Another, second conveyor belt arrangement 16 serves to transport new ballast, of which the discharge end 17 is situated following the first excavating device 12 in the working direction and the intake end 18 is situated at the front machine end 19. Other devices which should be mentioned are a lifting-lining unit 20 which is vertically and laterally adjustable by means of drives, an operator's cab 21 and a plough or wiping device 22.

Located between the on-track undercarriages 9 of the second machine 7 - in an upwardly recessed portion of the machine frame 8 - is a second excavating device 23 which is vertically adjustable by means of drives and the endless excavating chain 24 of which is designed to rotate in a vertical plane entending in the longitudinal direction of the machine. Situated between a discharge end 25 of the second excavating device 23 and the intake end 18 of the second conveyor belt arrangement 16 is a third conveyor belt arrangement 26 which is fixed to the machine frame 8. This is arranged so as to be inclined in such a way that a front intake end 27, in the working direction, is situated beneath the discharge end 25 of the excavating chain 24 and a rear, elevated discharge end 28 is situated above the intake end 18 of the second conveyor belt arrangement 16. Located at the front end of the machine installation 1 is a driver's cab 29 and a power unit 31 supplying power to the various drives and to a motive drive 30.

The screening wagon 10 situated at the rear end of the machine installation 1 has a conveyor belt unit 32, extending in the longitudinal direction of the machine, the discharge end 33 of which is located above the plough or wiping device 22 resting on the track 2. Another conveyor belt unit 34 is also provided for removing the spoil eliminated from the screening unit 13. A wagon frame 36 of the screening wagon 10 supported on on-track undercarriages 35 is connected to a

driver's cab 37 and a power unit 38.

The way in which the machine installation 1 according to the invention operates is described in more detail in the following.

Independently of the machine installation 1 and prior to its operational use, new ballast 39 is discharged in the required amount between rails 40 onto the track 2 by suitable hopper wagons which are not shown specifically. In operational use of the machine installation 1, during a continuous working advancing movement in the working direction shown by the arrow 6, the new ballast 39 pre-deposited or temporarily deposited on the track 2 is picked up by means of the second excavating device 23 and is conveyed by way of the third conveyor belt arrangement 26 onto the following second conveyor belt arrangement 16.

In parallel therewith, the fouled ballast of the ballast bed located beneath the track 2 is continuously picked up by the first excavating device 12 and is conveyed by means of the first conveyor belt arrangement 15 to the screening unit 13. The cleaned ballast is in turn discharged by way of the conveyor belt unit 32 onto a formation 41 exposed by the first excavating device 12. In parallel therewith, the cleaned ballast is replenished by appropriate discharging of the new ballast 39 in the region of the discharge end 17. Amounts of ballast which have been considerably reduced by the removal of fairly large amounts of spoil can be compensated for by being replenished in this way. However, more ballast can optionally also be supplied, for example, in order to obtain better ballasting of the track 2.

Optionally, however, complete renewal of the ballast bed (so-called total excavation) can also be carried out with the machine installation 1. During this the fouled ballast is discharged by means of the first conveyor belt arrangement 15

onto hopper wagons coupled to the installation 1. The new ballast bed is pre-deposited virtually in its entirety on the track 2 and is discharged by way of the second excavating device 23 and the third and second conveyor belt arrangement 26, 16 onto the exposed formation 41. It may be more advantageous in this case for the second excavating device 23 to be arranged so as to project over the front end of the machine frame 8 so that it can easily cope with even fairly large amounts of bulk material. In this case the ballast could possibly even be deposited over the entire width of the track.

A variant of the machine installation 1 shown in Fig. 3 has a hopper wagon 42 and a drive unit 43 between the first and the second machine 3 and 7 respectively. By arranging a base conveyor belt 44 and an inclined transfer conveyor belt 45 on the hopper wagon 42 and another conveyor belt 46 extending in the longitudinal direction of the machine on the drive unit 43, the third conveyor belt arrangement 26 is in practice extended to the intake end 18 of the second conveyor belt arrangement 16. By optionally varying the speed of rotation of the base conveyor belt 44, it is possible with this variant temporarily to store the new ballast 39 picked up by the second excavating device 23 or, in the case of a greater requirement, to discharge more ballast on the formation 41 than is picked up.

Fig. 4 shows another form of construction of the machine installation 1 which is provided for the introduction of a formation protection layer and which is composed of a first and second machine 3 and 7 respectively, a hopper wagon 42 arranged between them, and a screening wagon 10 following the first machine 3. Since the composition of this machine installation 1 is the same in principle as the machine installation 1 described in Fig. 1 to 3, except for the additions hereinafter described, the same reference numerals are used for the parts which have already been mentioned.

Unlike the previously described variants, in this machine installation 1 the discharge end 17 of the second conveyor belt arrangement 16, located following the first excavating device 12, is designed so as to be shortened or situated at a distance in the longitudinal direction of the machine from the plough or wiping device 22. A vertically adjustable and vibratable consolidating device 49 is arranged in the space thereby created and is connected to the machine frame 5 in an articulated manner.

Before this variant of the machine installation 1 is used, sand 48 or some other bulk material mixture provided for the creation of a formation protection layer 47 is pre-deposited on the track 2 between the rails 40. This sand 48 is now picked up by means of the second excavating device 23 and is conveyed via the third conveyor belt arrangement 26 to the hopper wagon 42 - serving as a buffer store. From this hopper wagon the sand then arrives on the second conveyor belt arrangement 16 and is discharged by way of the shortened discharge end 17 onto the formation 41 which has been exposed by the first excavating device 12. Immediately thereafter the sand 48 is graded and consolidated by means of the consolidating device 49 to produce the formation protection layer 47. The ballast picked up by the first excavating device 12 beneath the track 2 and conveyed by way of the first conveyor belt arrangement 15 into the screening wagon 10 for cleaning is then again discharged on top of the said formation protection layer using the conveyor belt unit 32 and the plough or wiping device 22.

As shown in detail in Fig. 5 and 6, the second excavating device 23 has a supporting frame 50 which is mounted in a universally mobile joint 51 on the machine frame 8 of the second machine 7 and is vertically and also laterally adjustable in relation thereto by means of two vertical adjustment drives 52. The supporting frame 50 is provided with two flanged rollers 53, spaced apart from one another in

the transverse direction of the machine, which serve to support the supporting frame 50 on the rails 40 of the track 2 or to guide them in track curves. The excavating chain 24 connected to the supporting frame 50 runs around axes of rotation 54 oriented at right angles to the longitudinal direction of the machine and horizontally and is arranged symmetrically relative to a vertical plane 55 extending in the longitudinal direction of the machine and centrally through the on-track undercarriages 9 (Fig. 6). The width of the excavating chain 24 is here designed so as to be smaller than the gauge of the on-track undercarriages 9.

The lower or front end of the supporting frame 50 is provided with two guide flaps 56, positioned in the transverse direction of the machine within the two rails 40 of the track 2 and each connected to the supporting frame 50 so as to be pivotable about a vertical axis 57. In operation, the front ends, in the working direction, of the guide flaps 56 are pivoted outwards towards the respective rail 40 in order thereby to divert the bulk material towards the centre of the track or towards the excavating chain 24. The latter has a portion 58 extending at an angle to the plane of the track 2 which immediately precedes, in the working direction, the lowest point 59 of the excavating chain 24. By means of this inclined portion 58 even fairly large accumulations of discharged, pre-deposited bulk material can easily be managed or can be conveyed via a baffle 60 to the intake end 27 of the third conveyor belt arrangement 26. In order to cover the rail fastenings, rail tunnels 62 connected to the supporting frame 50 are provided in a bulk material pick-up area 61 of the second excavating device 23.

Claims

1. A machine installation (1) for treating the ballast bed of a track, consisting of a first machine (3) comprising a machine frame (5) supported on on-track undercarriages (4), with which there are associated a vertically adjustable excavating device (12) for picking up ballast lying beneath the track (2) and a first conveyor belt arrangement (15) for removing the picked-up ballast and a second conveyor belt arrangement (16) for conveying bulk material, of which the discharge end (17) is situated following the excavating device (12) in the working direction of the machine and the intake end (18) is situated at the end of the machine for receiving the bulk material from a second machine (7) with which a third conveyor belt arrangement (26) is associated for the transfer of the bulk material, characterized in that with the second machine (7), arranged so as to precede the first machine (3) in the working direction, is associated a second excavating device (23) comprising an excavating chain (24) - rotating around axes of rotation (54) extending at right angles to the longitudinal direction of the machine and horizontally - for picking up the bulk material lying on the track (2), an intake end (27) of the third conveyor belt arrangement (26) being arranged beneath a discharge end (25) of the second excavating device (23).

2. An installation according to claim 1, characterized in that associated with a supporting frame (50), connected to a vertical adjustment drive (52), of the second excavating device (23) are two flanged rollers (53) which are spaced apart from one another in the transverse direction of the machine for resting on rails (40) of the track.

3. An installation according to claim 1 or 2, characterized in that the second excavating device (23) of the second machine (7) is arranged symmetrically in relation to a

vertical plane (55) extending in the longitudinal direction of the machine and centrally through the on-track undercarriages (9), the width of the excavating chain (24) of the second excavating device (23) being designed so as to be smaller than the gauge of the on-track undercarriages (9).

4. An installation according to claim 2, characterized in that in a bulk material pick-up area (61) of the second excavating device (23) rail tunnels (62) are provided which are connected to the supporting frame (50) supporting the excavating chain (24) and the flanged rollers (53), and which extend in the longitudinal direction of the machine, and which are spaced apart from one another in the transverse direction of the machine, for covering the rails (40) of the travelled track (2).

5. An installation according to claim 2 or claim 4, characterized in that guide flaps (56), situated in the transverse direction of the machine within the two rails (40) of the track (2) and each mounted on the supporting frame (50) of the second excavating device (23) so as to be pivotable about a vertical axis (57), are provided for deflecting the bulk material which is to be picked up.

6. An installation according to any one of claims 1 to 5, characterized in that the excavating chain (24) of the second excavating device (23) has a portion (58) extending at an angle to the plane of the track (2) which immediately precedes a lowest point (59) of the excavating chain (24) in the working direction.

7. An installation according to any one of claims 1 to 6, characterized in that between the first machine (3) and the second machine (7) preceding it in the working direction is provided a hopper wagon (42) with a base conveyor belt (44) extending in the longitudinal direction thereof and a transfer conveyor belt (45), following it in the working direction and

arranged so as to be inclined, for conveying the stored bulk material onto the second conveyor belt unit (16).

8. An installation for the rehabilitation of a ballast bed supporting a track including two rails, which comprises

(a) a first machine,

(b) a second machine,

(1) the machines being supported on the track by undercarriages for movement in an operating direction, and

(2) the second machine preceding the first machine in the operating direction,

(c) a vertically adjustable ballast excavating device mounted on the first machine for excavating ballast from underneath the track,

(d) a first conveyor arrangement arranged to remove the excavated ballast from the ballast excavating device,

(e) a second conveyor arrangement for conveying clean bulk material from the second to the first machine, the second conveyor arrangement having a discharge end rearwardly of the ballast excavating device in the operating direction, and

(f) a clearing device mounted on the second machine, the clearing device comprising

(1) a scraping chain arranged to take up clean bulk material lying on the track, the scraping chain revolving about a horizontal axis extending transversely to the track and having a discharge end, and

(2) an input end of the second conveyor arrangement being arranged under the discharge end of the scraping chain.

9. The installation of claim 8, wherein the second conveyor arrangement comprises a conveyor mounted on the second machine and another conveyor mounted on the first machine, further comprising a storage car for the bulk material arranged between the first and second machines, the storage car comprising a longitudinally extending bottom conveyor band arranged to receive the clean bulk material from the third conveyor, and a rising transfer conveyor band succeeding the bottom conveyor band in the operating direction and arranged to receive the clean bulk material from the bottom conveyor band and to transfer the clean bulk material to the other conveyor.

Fig.1

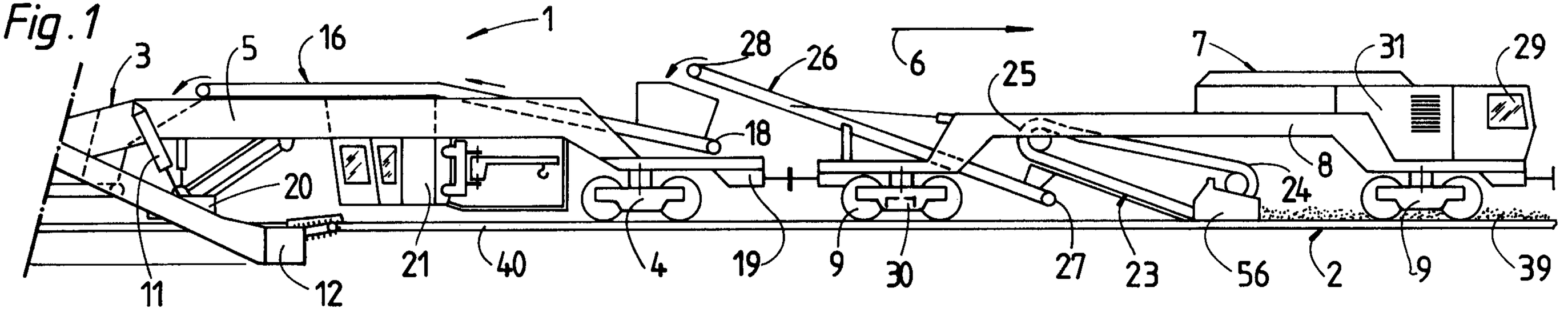


Fig.2

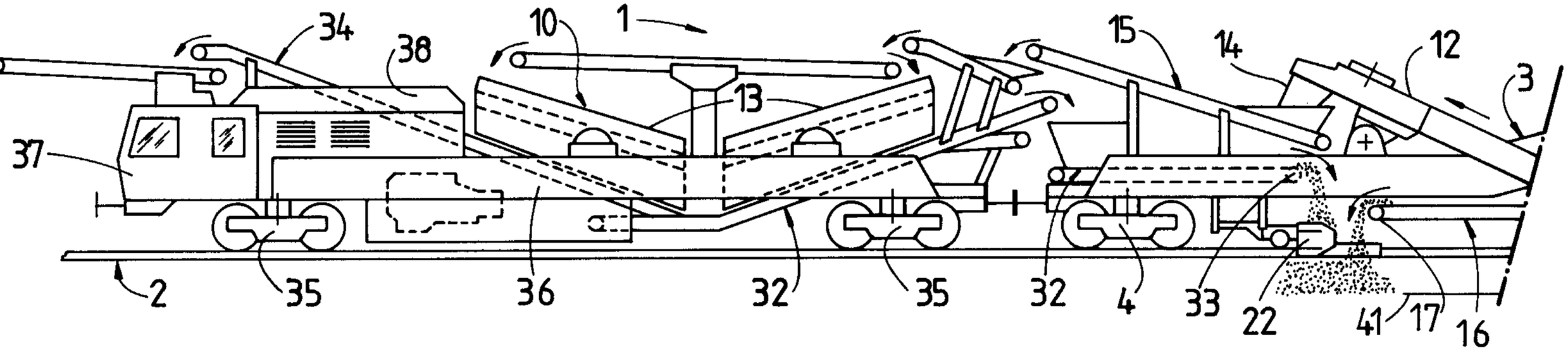
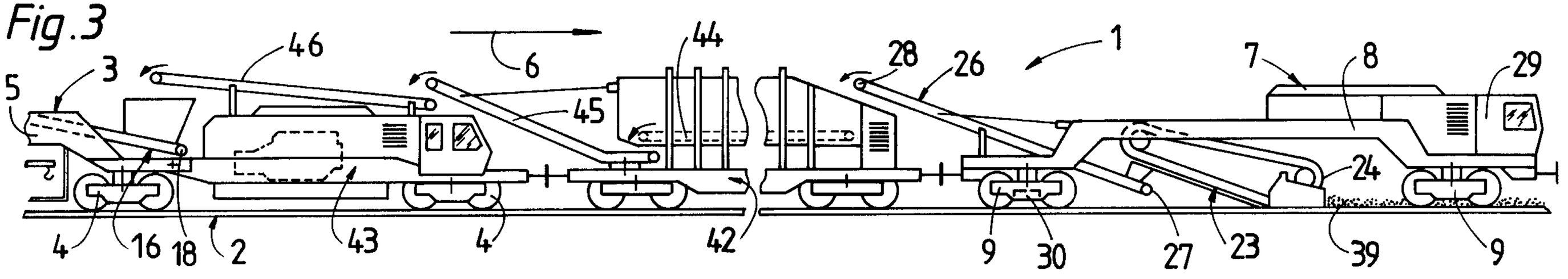


Fig.3



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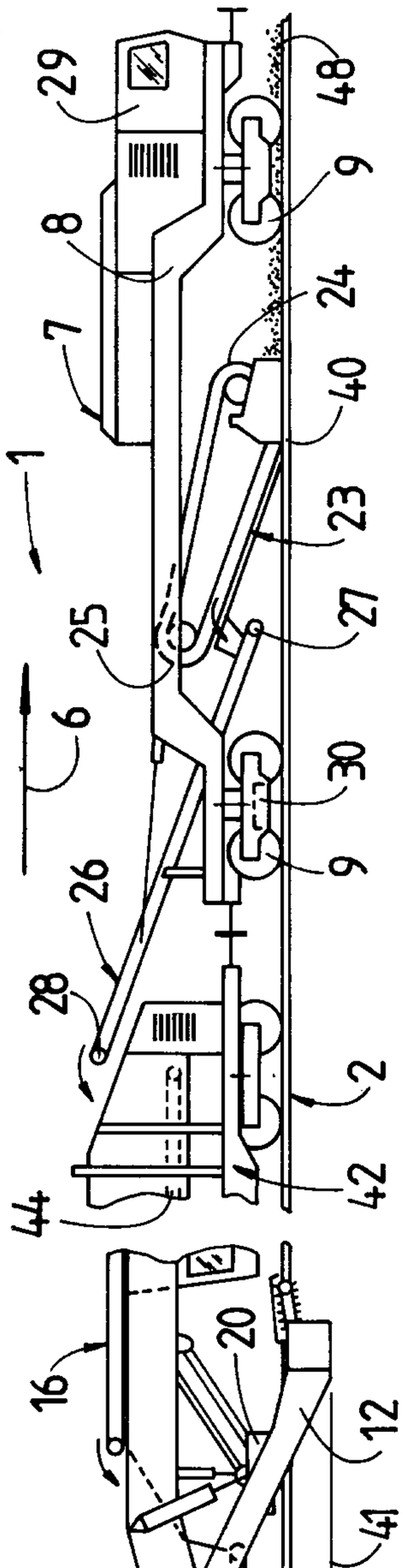


Fig.4

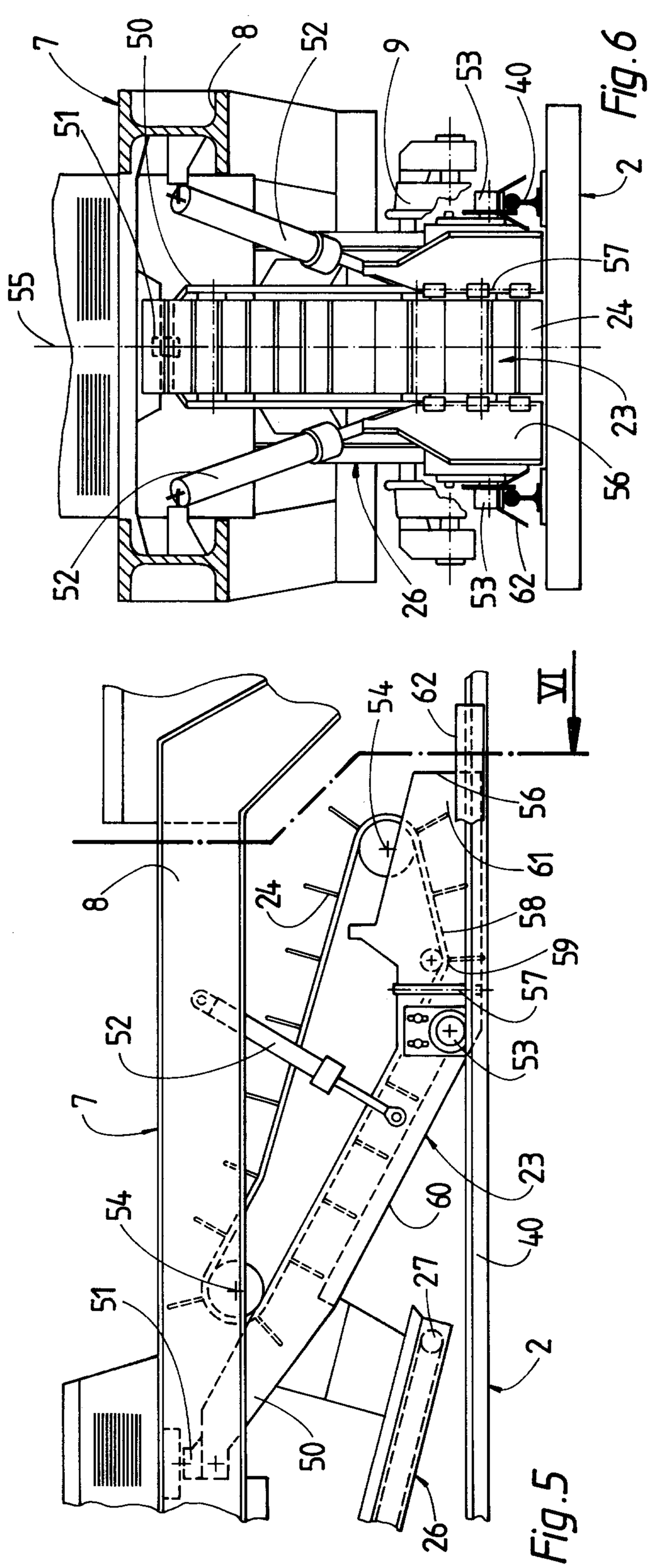
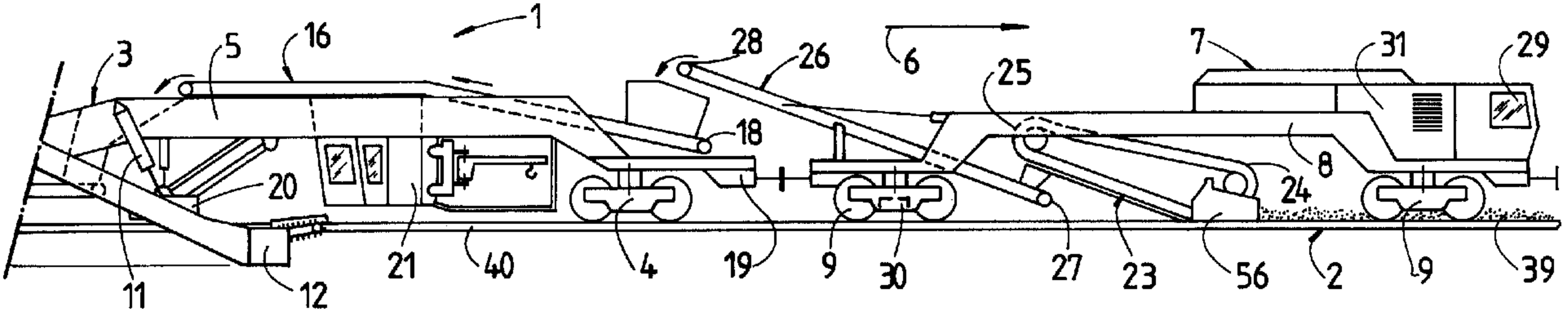


Fig.5

Fig.6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