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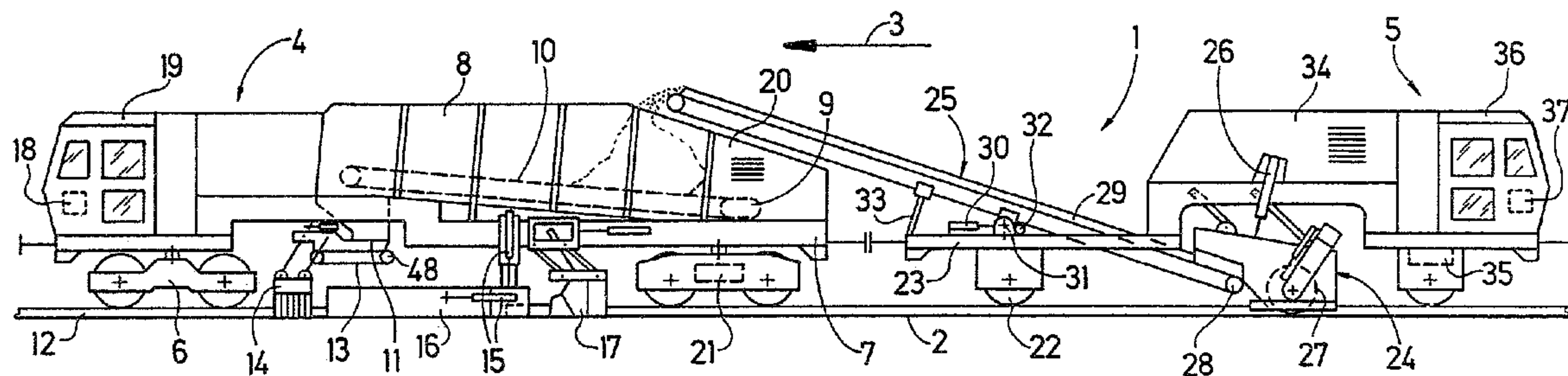
(72) Inventeurs/Inventors:  
THEURER, JOSEF, AT;  
WORGOTTER, HERBERT, AT

(73) Propriétaire/Owner:  
FRANZ PLASSER BAHNBAUMASCHINEN-  
INDUSTRIEGESELLSCHAFT M.B.H., AT

(74) Agent: RICHES, MCKENZIE & HERBERT LLP

(54) Titre : MACHINE SERVANT A RAMASSER, A STOCKER ET A REPARTIR LE BALLAST D'UNE VOIE

(54) Title: MACHINE ARRANGEMENT FOR PICKING UP, STORING AND DISTRIBUTING THE BALLAST OF A TRACK



(57) **Abrégé/Abstract:**

A machine arrangement (1) for picking-up, storing and distributing the ballast of a track (2) consists of a ballast pick-up device (24) composed of rotatable brushes, a ballast transporting device (25) coordinated therewith and projecting over one end of a machine frame (23), a ballast store (8) which has a conveyor belt (10) extending in the longitudinal direction of the machine or of the track, and a plough (16, 17) designed so as to be vertically adjustable. The ballast plough (4) and the ballast store (8) are disposed on a first machine frame (7), in the working direction of the machine arrangement (1), the ballast store (8) having outlet openings (11) located before the ballast plough (16, 17) and the conveyor belt (10) being located in the base region of the ballast store (8). The ballast pick-up device (24) is provided together with the ballast transporting device (25) disposed before it on a second machine frame (23) disposed thereafter. The machine arrangement (1) may be expanded by means of a bulk material loading vehicle (38) located between the ballast plough (4) and the ballast picking-up device (24).



ABSTRACT

A machine arrangement (1) for picking-up, storing and distributing the ballast of a track (2) consists of a ballast pick-up device (24) composed of rotatable brushes, a ballast transporting device (25) coordinated therewith and projecting over one end of a machine frame (23), a ballast store (8) which has a conveyor belt (10) extending in the longitudinal direction of the machine or of the track, and a plough (16, 17) designed so as to be vertically adjustable. The ballast plough (4) and the ballast store (8) are disposed on a first machine frame (7), in the working direction of the machine arrangement (1), the ballast store (8) having outlet openings (11) located before the ballast plough (16, 17) and the conveyor belt (10) being located in the base region of the ballast store (8). The ballast pick-up device (24) is provided together with the ballast transporting device (25) disposed before it on a second machine frame (23) disposed thereafter. The machine arrangement (1) may be expanded by means of a bulk material loading vehicle (38) located between the ballast plough (4) and the ballast picking-up device (24).

**Machine Arrangement for Picking Up, Storing and  
Distributing the Ballast of a Track**

The invention relates to a machine arrangement for picking  
5 up, storing and distributing the ballast of a track comprising a  
ballast pick-up device composed, for example, of rotatable  
brushes, a ballast transporting device coordinated therewith and  
projecting over one end of a machine frame, a ballast store  
connected thereto and having a conveyor belt extending in the  
10 longitudinal direction of the machine or of the track, and a plough  
designed so as to be vertically adjustable.

There is a machine arrangement known through European  
Patent Application No. 0 052 089, published on May 19, 1982,  
15 for picking up, storing and distributing the ballast of a track,  
comprising a ballast pick-up device which is composed of  
rotatable brushes. It is located on a first machine frame, in the  
working direction, between a vertically adjustable ballast plough  
projectingly connected thereto and a ballast transporting device  
20 disposed thereafter. The latter is composed of three conveyor  
belts which extend parallel to one another and upwardly ascend in  
the opposite direction to the working direction and which project  
over the rear end of the machine frame. Disposed after the first  
machine frame is a second machine frame, designed as a bulk  
25 material loading vehicle, which has in its upper end region a  
conveyor belt extending in the longitudinal direction of the vehicle  
with a ballast scraper designed so as to be displaceable in the  
longitudinal direction thereof.

30 In operational use, the ballast is levelled and distributed over  
the whole bed cross-section with the ballast plough provided in  
the front end region of the machine arrangement. By means of  
the following brushes, the surplus ballast present on the sleepers  
or between the sleepers is discharged on to the following



conveyor belts which in their turn convey the ballast onwards on to the conveyor belt of the ballast store. By means of the ballast scraper which is displaceable in the longitudinal direction of the machine, the ballast is discharged at various points of the conveyor belt so as to fill up the ballast store completely. However, with a known machine arrangement of this kind ballast cannot be discharged on to the track as required in track sections which have too little ballast.

10           There is also a ballast grading machine known through Swiss Patent No. 652 428, published on November 15, 1985, which is supported on undercarriages and has a vertically displaceable ballast plough between the said undercarriages. At the rear end of the machine, with respect to the working direction, there is provided a ballast pick-up device composed of a rotatable brush by which surplus ballast or ballast lying on the sleepers is either distributed immediately in front of the machine on the ballast bed or is loaded on to a transport vehicle for subsequent re-use.

20           A new kind of machine for picking up and distributing the bedding ballast is described in European Patent Application No. 0 426 004, published on May 8, 1991, in which a special ballast store is provided for receiving and storing the ballast which has been conveyed upwards from the track by a ballast pick-up device. This ballast store has a conveyor belt arranged at the base and extending in the longitudinal direction of the machine, outlet openings being provided in its discharge region for the discharge of ballast as required. Immediately behind these outlet openings, in the working direction, a vertically adjustable ballast plough is arranged below the machine frame, by means of which ballast discharged from the ballast store on to the track may be distributed. The machine is particularly suitable for treating track sections with variably ballasted track.

Finally, through U.S. Patent No. 4,576,538, issued on March 18, 1986, a special bulk material loading vehicle is also known which has in the base region of a storage container a conveyor belt extending in the longitudinal direction of the vehicle and  
5 extended at one end by an upwardly inclined transfer conveyor belt projecting over the vehicle end. With a bulk material loading vehicle of this kind, any number of vehicles can be coupled to form a combined train formation in order to increase the storage capacity.

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The object of the present invention lies in creating a machine arrangement of the type described in the introduction with which larger amounts of surplus ballast can also be stored and if required be introduced into the track again in sections  
15 which have too little ballast.

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This object is achieved according to the invention with a machine arrangement of the type specified in the introduction in that the plough and the ballast store are arranged on a first  
20 machine frame, in the working direction of the machine arrangement, the ballast store having outlet openings located before the plough and beneath the front end of the conveyor belt and the conveyor belt being located in the base region of the ballast store, and in that the ballast pick-up device together with  
25 the ballast transporting device disposed in front of it are provided on a second machine frame disposed thereafter. A machine arrangement designed in this way has the particular advantage that for the first time fairly long track sections with greatly varying ballasting can also be treated with this machine  
30 arrangement, efficient ballast distribution also being achievable in a single working operation in parallel with the prescribed ballasting by means of the plough, so as to obtain consistently uniform track ballasting. With this particularly efficient distribution of ballast, the procurement of new ballast, which is



expensive, and its transport to the site, which is organisationally and operationally complicated, can be dispensed with entirely in an economical manner.

5           Accordingly, one aspect of the present invention resides in a machine arrangement for picking up, storing and distributing the ballast of a track comprising a ballast pick-up device, a ballast transporting device coordinated therewith and projecting over one end of a first machine frame, a ballast store having a conveyor  
10 belt extending in the longitudinal direction of the machine or of the track, and a plough designed so as to be vertically adjustable, characterised in that the plough and the ballast store are arranged on the first machine frame, in the working direction of the machine arrangement, the ballast store having outlet openings  
15 located before the plough and below the front end of the conveyor belt and the conveyor belt being located in the base region of the ballast store, and in that the ballast pick-up device together with the ballast transporting device disposed in front of it are provided on a second machine frame disposed thereafter, both machine  
20 frames being supported by particular undercarriages of their own, respectively associated therewith, and the ballast transporting device being designed to overlap an end of the conveyor belt when the machine frames are coupled together.

25           In another aspect, the present invention resides in a mobile machine arrangement for receiving, storing and distributing track ballast, the machine arrangement being mounted on the track for mobility in an operating direction and comprising (a) a first machine frame, (b) a second machine frame succeeding the first  
30 machine frame in the operating direction and having a forward end in the operating direction, (c) a ballast storage device mounted on the first machine frame, the ballast storage device comprising (1) a ballast conveyor band arranged at a bottom of the ballast storage device and extending longitudinally in the direction of the

track, the ballast conveyor band having a forward end in the operating direction and (2) the ballast storage device having outlet means below the ballast conveyor band forward end, (d) a ballast plow arrangement vertically adjustably mounted on the first machine frame behind the ballast storage device outlet means in the operating direction, (e) a ballast receiving device mounted on the second machine frame and arranged to receive the track ballast, and (f) a ballast transport device projecting from the second machine frame end towards the first machine frame, the ballast transport device having (1) an input end preceding the ballast receiving device in the operating direction and arranged to receive the track ballast, and (2) an output end arranged to deliver the received track ballast to the ballast conveyor band.

The aforesaid increase in the storage capacity may be achieved by the fact that any number of special bulk material loading vehicles may be disposed between the two machine frames, these enabling the ballast to be temporarily stored while absolutely maintaining the transport path between the ballast pick-up device and the outlet openings coordinated with the ballast plough. On the other hand, however, because of the large storage capacity, it is also possible to ballast fairly long track sections which have insufficient ballasting with carried ballast and to plough them at the same time.

Another advantageous development of the invention is the machine arrangement as described above, characterised in that the conveyor belt disposed in the ballast store at the base is arranged so as to be inclined upwards from the rear end, in the conveying direction, towards the outlet openings located in the front end region enables a special discharging device to be incorporated below the outlet openings, on the one hand, and enables the storage capacity to be increased, on the other hand, while avoiding exceeding the clearance gauge.



## 5a

A further design variant of the machine arrangement as described above, characterised in that the ballast transporting device disposed in front of the ballast pick-up device is designed to be displaceable perpendicularly and horizontally to the transporting direction by means of a drive, enables the ballast to be freely transported onwards, even in tight track curves, by the inclined ballast transporting device into the ballast store disposed in front.

A device provided in a further variant for supporting and blocking the ballast transporting device according to the machine arrangement as described above, characterised in that the ballast transporting device mounted on the second machine frame so as to be capable of swivelling approximately centrally, with respect to its length, about an axis extending transversely to the longitudinal direction of the machine may be supported and blocked in its swivelling movement by means of a device disposed at the front end of the second machine frame, permits, in operational use, an unrestricted swiveling movement with permanent support, on the one hand, so that ballast can be freely transferred even in track curves. On the other hand, however, for transfer journeys there is also the facility for blocking the range of swivel of the ballast transporting device, reliably eliminating slew into a region located outside the clearance gauge.

Extending the machine arrangement by means of a bulk material loading vehicle according to the machine arrangement as described above, characterised in that between the first machine frame which is provided with the vertically adjustable plough and the second machine frame which is connected to the ballast pick-up device is disposed at least one bulk material loading vehicle which is provided with a bulk material loading vehicle conveyor belt extending in the longitudinal direction of the vehicle and a transfer conveyor belt which is disposed before it, is capable of



5b

swivelling about a vertical axis, projects over the front frame end and is inclined upwards, or characterised in that the bulk material loading vehicle conveyor belt is disposed at the base in a storage container which is open at the top, the advantage that with a very high storage capacity, the onward transport, entirely unhindered, of the stored ballast is ensured even in track curves. Moreover, the storage capacity may be increased very simply without any conversion work by means of an appropriate number of bulk material loading vehicles disposed one behind the other.

10

According to a further development of the invention, the free ends of the transfer conveyor belt and of the ballast transporting device are arranged approximately at the same height. This means that the machine arrangement can easily be extended by the inclusion of various bulk material loading vehicles or also be restricted to the vehicles connected to the ballast plough and the ballast pick-up device.

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Finally, a further variant of a possible bulk material loading vehicle is characterised in that the free ends of the transfer conveyor belt and the ballast transporting device are disposed at approximately the same height, which is suitable for inclusion in the machine arrangement according to the invention while also achieving the advantages mentioned in the introduction.

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The invention is described in detail below by means of three embodiments represented in the drawing.

Fig. 1 shows a side view of a machine arrangement designed according to the invention with a vehicle disposed in front which has a plough and a ballast store and with a further vehicle disposed after it and connected to a ballast pick-up device,

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Fig. 2 shows a machine arrangement extended by means of a bulk material loading vehicle, and

5 Fig. 3 shows a further embodiment of a machine arrangement extended by means of a bulk material loading vehicle.

10 A machine arrangement 1 represented in Fig. 1 for picking up, storing and distributing the ballast of a track 2 is composed of a front vehicle - relative to the working

direction represented by an arrow 3 - referred to as the ballast plough 4 and a vehicle disposed after it, referred to as the ballast pick-up device 5.

5           The ballast plough 4 has a machine frame 7 supported at each end on undercarriages 6 and connected to a ballast store 8. The latter is designed as a storage container which is open at the top and instead of a base has a conveyor belt 10  
10           extending in the longitudinal direction of the machine and connected to a drive 9. The said conveyor belt is arranged so as to be inclined such that the front end, located above outlet openings 11 of the ballast store 8, is higher than the rear end. Coordinated with the two outlet openings 11, in each case disposed above a rail 12, is a respective short  
15           distributing conveyor belt 13 which may be swivelled about a vertical axis. Coordinated in each case with the front end of this distributing conveyor belt 13 is a chute 14, vertically displaceable by means of a drive, for distributing the discharged ballast on to the two tamping zones. Immediately  
20           behind the outlet openings 11, on each longitudinal side of the machine, there are located a shoulder plough 16 which is vertically and laterally adjustable by means of drives 15 and two centre ploughs 17 which are disposed side by side in the transverse direction and are vertically and longitudinally  
25           adjustable by means of drives. The ballast plough 4 is further equipped with a driver's cabin 19 having central control equipment 18, a central power plant 20 and a motive drive 21.

30           The ballast pick-up device 5 disposed after the ballast plough 4 and connected thereto is essentially composed of a machine frame 23, supported at the ends on undercarriages 22, a vertically adjustable ballast pick-up device 24 and a ballast transporting device 25 disposed in front of the  
35           latter. The ballast pick-up device 24 which is vertically adjustable by means of a drive 26 is composed of a sweeping brush 27 which is rotatable by means of a drive about an axis



extending transversely to the longitudinal direction of the machine. The ballast transporting device 25 consists of a conveyor belt 29 which may be set in motion by means of a drive 28 and which is mounted on the machine frame 23 so as to be capable of swivelling by means of a drive 30 about an axis 31 extending transversely to the longitudinal direction of the machine. The conveyor belt 29 is additionally displaceable transversely to the longitudinal direction of the machine by means of a further drive 32. A device 33 is provided at the front end of the machine frame 23 for supporting and blocking the ballast transporting device 25. The ballast transporting device 25 projects over the front end of the machine frame 23 such that when coupled with the ballast plough 4 disposed in front, there is an overlap with the conveyor belt 10 at the base. The ballast pick-up device provided with a central power plant 34 and a motive drive 35 has in its rear end region a driver's cabin 36 with central control equipment 37.

The machine arrangement represented in Fig. 2 is extended by means of a bulk material loading vehicle 38 located between the ballast plough 4 and the ballast pick-up device 5 and with it forms a combined mobile train formation. In a storage container 39 which is open at the top, the bulk material loading vehicle has a conveyor belt 41 which extends in the longitudinal direction of the vehicle, is arranged in place of a base surface and is connected to a drive 40. Before this there is disposed a transfer conveyor belt 44 which is able to swivel about a vertical axis 42 and projects over the front end of a machine frame 43 and which may be set in motion by means of a drive 45. The transfer conveyor belt 44 may be supported on a supporting and blocking device 46. The power for the various drives on the bulk material loading vehicle 38 is supplied by a power plant 47.

If sections of track which do not have very much surplus ballast are being treated, the machine arrangement 1

represented in Fig. 1 can be employed. In this case the surplus ballast is continuously thrown by the lowered sweeping brush 27 on to the conveyor belt 29 and is thereby conveyed upwards for discharge into the ballast store 8 disposed in front. The ballast discharged on to the conveyor belt 10 is briefly set in motion by means of the drive 9 as soon as the cone of bulk material approximately reaches the height of the side walls of the ballast store 8, with the result that the ballast is transported towards the outlet openings 11. As soon as the second cone of bulk material which is now formed has reached the aforementioned height, it is again transported onwards slightly by the conveyor belt 10. If a section of track which has insufficient ballast is now reached, the ballast located on the conveyor belt 10 is quickly transported onwards until it falls via the outlet openings 11 on to the distributing conveyor belts 13 and from these via the chutes 14 on to the track 2. The distributing conveyor belts 13 are set in motion by means of drives 48. As soon as action upon this drive 48 is stopped, the distributing conveyor belt 13 acts as a closure for the outlet openings 11. The ballast discharged on to the track 2 in this way is distributed and graded as required by the immediately following shoulder and/or centre ploughs 16, 17. The following ballast pick-up device 24 may be lowered as before so as thereby to scrape ballast present on the sleepers into the sleeper cribs located in front or to discharge it on to the conveyor belt 29. On arrival at a new section which has surplus ballast, the distributing conveyor belts 13 are stopped and the conveyor belt 10 - as described above - is gradually moved forwards in order to store ballast.

In the situation in which fairly large surpluses of ballast are anticipated, an optional number of bulk material loading vehicles 38 corresponding to the required storage capacity is disposed between the ballast plough 4 and the ballast pick-up device 5 prior to operational use. In this case the ballast conveyed upwards by the ballast transporting



device 25 of the ballast pick-up device 5 falls on to the conveyor belt 41 at the base of the bulk material loading vehicle 38 and may be stored as required in the storage container 39. Storage is implemented - in the manner already described in the case of the ballast plough 4 - by the conveyor belt 41 at the base moving gradually forwards. The projecting transfer conveyor belt 44 enables the ballast stored in the bulk material loading vehicle 38 to be transported as required on to the bulk material loading vehicle located in front or into the ballast store 8 of the ballast plough 4. This extended machine arrangement 1, represented as an example in Fig. 2, thus enables the conveyor belt or transport system between the ballast pick-up device 24 located at the rear end and the outlet openings 11 of the ballast store 8 located at the front end to be extended as desired, increasing the storage capacity. If fairly long sections which have insufficient ballast are being treated, the stored ballast may be supplied to the outlet openings 11 as required from the accompanying bulk material loading vehicle 38 by way of the conveyor belt 10 of the ballast plough 4. The storage containers 39 thereby emptied may be filled up with surplus ballast again during the subsequent treatment of sections of the track. Increased storage capacity also enables longer sections which have greatly differing ballasting of the track 2 to be treated, appropriate storage capacity or stored amounts of ballast always being available.

Represented in Fig. 3 is a further example of an extended machine arrangement 1 with a different embodiment of a bulk material loading vehicle 49. This has a base conveyor belt 50 extending from the rear vehicle end to beyond the front vehicle end, inclining upwards in the working direction and having a drive 51. The front end of the base conveyor belt 50 is designed to project over a machine frame 52 far enough for there to be at least a slight overlap with the conveyor belt 10 of the ballast store 8 which is disposed in front. Also



with a bulk material loading vehicle 49 of this kind the ballast conveyed upwards by the ballast pick-up device 5 may be stored as required and/or transported through to the ballast plough 4 disposed in front.

## WHAT IS CLAIMED IS:

1. A machine arrangement for picking up, storing and distributing the ballast of a track comprising a ballast pick-up device, a ballast transporting device coordinated therewith and projecting over one end of a first machine frame, a ballast store having a conveyor belt extending in the longitudinal direction of the machine or of the track, and a plough designed so as to be vertically adjustable, characterised in that the plough (16, 17) and the ballast store (8) are arranged on the first machine frame (7), in the working direction of the machine arrangement (1), the ballast store (8) having outlet openings (11) located before the plough (16, 17) and below the front end of the conveyor belt (10) and the conveyor belt (10) being located in the base region of the ballast store (8), and in that the ballast pick-up device (24) together with the ballast transporting device (25) disposed in front of it are provided on a second machine frame (23) disposed thereafter, both machine frames (7, 23) being supported by particular undercarriages (6, 22) of their own, respectively associated therewith, and the ballast transporting device (25) being designed to overlap an end of the conveyor belt (10) when the machine frames (7, 23) are coupled together.
2. A machine arrangement according to claim 1, wherein said ballast pick-up device is composed of rotatable brushes.
3. A machine arrangement according to claim 1 or 2, characterised in that the conveyor belt (10) disposed in the ballast store (8) at the base is arranged so as to be inclined upwards from the rear end, in the conveying direction, towards the outlet openings (11) located in the front end region.
4. A machine arrangement according to claim 1, 2 or 3, characterised in that the ballast transporting device (25) disposed

in front of the ballast pick-up device (24) is designed to be displaceable perpendicularly and horizontally to the transporting direction by means of a drive (32).

5. A machine arrangement according to any one of claims 1 to 4, characterised in that the ballast transporting device (25) mounted on the second machine frame (23) so as to be capable of swivelling approximately centrally, with respect to its length, about an axis (31) extending transversely to the longitudinal direction of the machine may be supported and blocked in its swivelling movement by means of a device (33) disposed at the front end of the second machine frame (23).

6. A machine arrangement according to any one of claims 1 to 5, characterised in that between the first machine frame (7) which is provided with the vertically adjustable plough (16, 17) and the second machine frame (23) which is connected to the ballast pick-up device (24) is disposed at least one bulk material loading vehicle (38) which is provided with a bulk material loading conveyor belt (41) extending in the longitudinal direction of the vehicle and a transfer conveyor belt (44) which is disposed before it, is capable of swivelling about a vertical axis, projects over the front frame end and is inclined upwards.

7. A machine arrangement according to claim 6, characterised in that the bulk material loading conveyor belt (41) is disposed at the base in a storage container (39) which is open at the top.

8. A machine arrangement according to claim 6 or 7, characterised in that the free ends of the transfer conveyor belt (44) and the ballast transporting device (25) are disposed at approximately the same height.



9. A machine arrangement according to any one of claims 1 to 5, characterised in that between the first machine frame (7) which is provided with the vertically adjustable plough (16, 17) and the second machine frame (23) which is connected to the ballast pick-up device (24) is disposed at least one bulk material loading vehicle (49) which has an upwardly ascending base conveyor belt (50) extending from the rear vehicle end to over the front vehicle end and projecting thereover.

10. A mobile machine arrangement for receiving, storing and distributing track ballast, the machine arrangement being mounted on the track for mobility in an operating direction and comprising

- (a) a first machine frame,
- (b) a second machine frame succeeding the first machine frame in the operating direction and having a forward end in the operating direction,
- (c) a ballast storage device mounted on the first machine frame, the ballast storage device comprising
  - (1) a ballast conveyor band arranged at a bottom of the ballast storage device and extending longitudinally in the direction of the track, the ballast conveyor band having a forward end in the operating direction and
  - (2) the ballast storage device having outlet means below the ballast conveyor band forward end,
- (d) a ballast plow arrangement vertically adjustably mounted on the first machine frame behind the ballast storage device outlet means in the operating direction,
- (e) a ballast receiving device mounted on the second machine frame and arranged to receive the track ballast, and
- (f) a ballast transport device projecting from the second machine frame end towards the first machine frame, the ballast transport device having

- (1) an input end preceding the ballast receiving device in the operating direction and arranged to receive the track ballast, and
- (2) an output end arranged to deliver the received track ballast to the ballast conveyor band.

11. The machine arrangement of claim 10, wherein the ballast receiving device is a rotatable brush arranged to engage the track ballast.

12. The machine arrangement of claim 10, wherein the ballast conveyor band is upwardly inclined towards the outlet means.

13. The machine arrangement of claim 10, further comprising a drive means for displacing the ballast transport device perpendicularly and horizontally with respect to a transport direction of the device.

14. The machine arrangement of claim 10, further comprising a transversely extending axle pivotally supporting the ballast transport device substantially centrally between the input and output ends thereof, and a support device supporting and blocking the ballast transport device on the second machine frame forward end in a selected pivoted position.

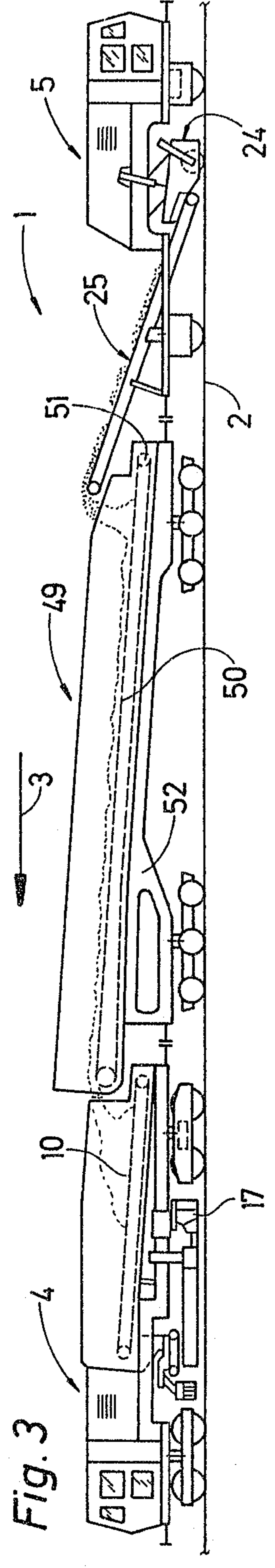
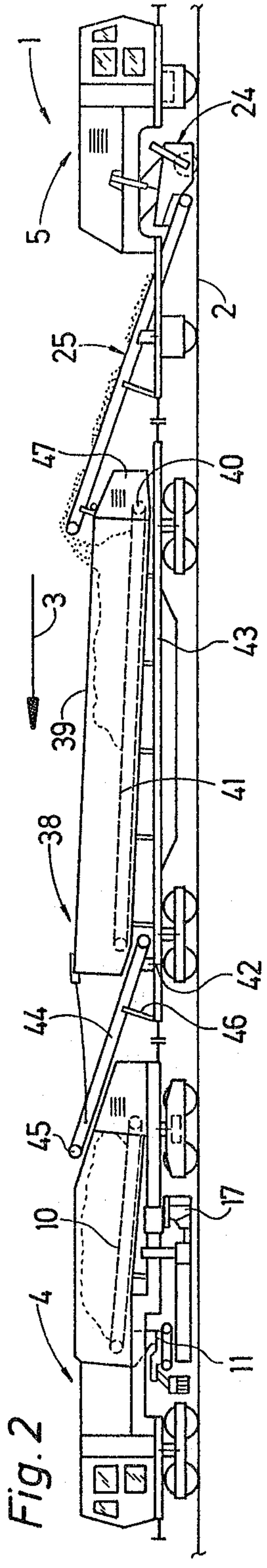
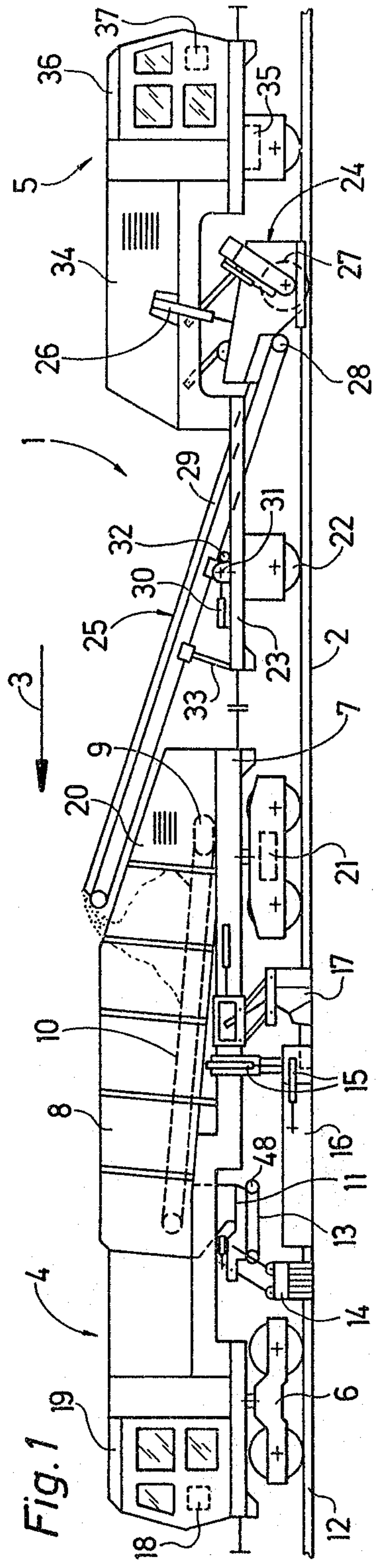
15. The machine arrangement of claim 10, further comprising a ballast transport car arranged between the first machine frame and the second machine frame forward end, the ballast transport car comprising a ballast conveyor band extending longitudinally in the direction of the car and an upwardly inclined ballast transfer band projecting from a forward end of the car in the operating direction and pivotal about a vertical axis.

16. The machine arrangement of claim 15, wherein the ballast transport car comprises a box having an open top and a bottom, the ballast conveyor band being arranged at the bottom of the box.

17. The machine arrangement of claim 15, wherein the output end of the ballast transport device and an output end of the ballast transfer band are arranged substantially at the same level above the track.

18. The machine arrangement of claim 10, further comprising a ballast transport car arranged between the first machine frame and the second machine frame forward end, the ballast transport car comprising a ballast conveyor band extending longitudinally in the direction of the car from a rear end to a forward end thereof in the operating direction and projecting therefrom, the ballast conveyor band being upwardly inclined in said direction.





*Richard Mc Kenzie & Herbert*

