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CONTINUOUSLY ADVANCING TRACK TAMPING MACHINE COMPRISING A PLOUGH ARRANGEMENT

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(56) Prior Art Documents
AU 511709 29501/77 E01B 27/17
AU 510123 14461/76 E01B 27/17
AU 506910 12102/76 E01B 27/17

(57) Claim

1. A continuously advancing (non-stop) on-track machine for tamping the sleepers of a railway track comprising a machine frame supported by undercarriages spaced apart from one another,

a tool carrier - connected to the machine frame by a drive for displacement parallel to the longitudinal axis of the track and arranged between two undercarriages - for a vertically displaceable lifting and lining unit,

at least one vertically displaceable tamping unit comprising tamping tools designed for movement towards one another in pairs and for vibration under the power of squeezing and vibration drives and for penetration into the ballast bed and

a second machine frame - connected to the machine frame - of a vehicle on which a plough arrangement designed for activation and vertical displacement by drives is mounted, the plough arrangement being arranged between two undercarriages,

characterized in that the machine for tamping sleepers is designed to be pivotally connected or coupled at its front machine frame end (having regard to a working direction of the machine) to the second machine frame of the vehicle supported by at least one undercarriage.

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Complete Specification for the invention entitled:

CONTINUOUSLY ADVANCING TRACK TAMPING MACHINE COMPRISING A PLOUGH ARRANGEMENT

Our Ref : 172504
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The following statement is a full description of this invention, including the best method of performing it known to applicant's):

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This invention relates to a continuously advancing (non-stop) on-track machine for tamping the sleepers of a railway track comprising a machine frame supported by undercarriages spaced apart from one another, a tool carrier - connected to the machine frame by a drive for displacement parallel to the longitudinal axis of the track and arranged between two undercarriages - for vertically displaceable lifting and lining unit, at least one vertically displaceable tamping unit comprising tamping tools designed for movement towards one another in pairs and for vibration under the power of squeezing and vibration drives and for penetration into the ballast bed and a second machine frame - connected to the machine frame - of a vehicle on which a plough arrangement designed for activation and vertical displacement by drives is mounted, the plough arrangement being arranged between two undercarriages.

According to applicants' or patentees DE-OS 38,19,717, a continuously advancing (non-stop) on-track tamping, levelling and lining machine of this type is connected to two following machine frames arranged one behind the other and supported by undercarriages. The central machine frame immediately following the tamping machine is equipped with a vertically displaceable centre and shoulder plough arranged between two undercarriages while the third machine frame is equipped with track stabilizers arranged between two undercarriages and with a sweeping unit. In addition, one vertically displaceable and laterally pivotal small plough plate per rail is arranged at the front over-hanging end of the tamping machine. With a continuously advancing machine formation of this type comprising a driver's cabin at either end and an operator's cabin in the region of the tamping units, the sleepers of a track can be cyclically tamped with step-by-step advance of the tamping

unit; with the same machine formation, the ballast bed can also be profiled and subsequently consolidated by the track stabilizers. In a variant of the machine formation according to this literature reference, the continuously advancing track tamping, levelling and lining machine is followed in the working direction solely by the plough arrangement plus sweeping unit provided on the second machine frame and designed for vertical displacement under the power of a drive. If considerable and uneven accumulations of ballast or too little ballast is present in the vicinity of the tamping zones, this machine formation has to make a preliminary run with the plough arrangement to profile the ballast or to bring ballast into the tamping zones before carrying out the actual tamping operation. In this machine arrangement, driver's cabins are again provided at either end of the two coupled machine frames, the machine superstructure extending through to the height of the driver's cabins.

Applicants' or patentees' AU-PS 511 709 describes a track tamping, levelling and lining machine arrangement which advances in steps from sleeper to sleeper and in which the tamping machine is coupled both at its front end and at its rear end to a trailer having only one undercarriage. The front trailer is connected to the tamping machine for telescopic longitudinal displacement by a coupling assembly and, between the undercarriages, comprises a centre and shoulder plough designed for vertical displacement under the power of drives. A driver's cabin and - at the same height- the machine superstructure are provided above these ploughs. The rear trailer merely carries a vertically displaceable sweeping unit and feelers for the reference system. A machine arrangement such as this with a tamping machine advancing in steps from sleeper to sleeper and a ballast plough arrangement advancing continuously relative to the tamping machine has not yet been

constructed.

A similar track tamping, levelling and lining machine arrangement is known from applicants' or patentees AU-PS 514 464 In this known machine arrangement, however, a centre plough preceding the tamping machine is arranged on a separate continuously advancing vehicle having its own cabin and machine superstructure with indicating instruments and control systems.

Now, the problem addressed by the present invention is to provide a continuously advancing (non-stop) on-track sleeper tamping machine of the type described at the beginning with which railway track can be tamped, and the ballast bed treated, more effectively and more economically and improved potential applications can be obtained.

The invention is characterized in that, in a continuously advancing (non-stop) on-track machine of the type described at the beginning, the ~~tamping~~ for tamping sleepers machine is designed to be pivotally connected or ~~rather~~ coupled at its front having regard to a working direction of the machine machine frame end (~~in the working direction~~) to the second machine frame of the vehicle supported by at least one undercarriage.

This machine combination according to the invention provides for the first time for continuous treatment or rather profiling of the ballast bed in conjunction with continuous tamping of the uniformly ballasted track immediately afterwards in the course of a single, common continuous (non-stop) machine run. Accordingly, this machine enables a more uniform track durably tamped in a single pass - by virtue of the uniform ballasting - to be prepared particularly economically with little labour and relatively little use of the machine. In addition, the fact that the vehicle connected to the plough arrangement is directly coupled to the tamping machine affords the considerable advantage that the plough arrangement can easily be directly operated and power can be directly transmitted from the

driven axles of the tamping machine to the preceding plough vehicle for sufficiently powerful thrust forces for the continuous and trouble-free distribution of ballast. This combination or rather power transmission possibility also enables the preceding plough vehicle coupled to the tamping machine to be made particularly flat or rather low. This affords the further particular advantage of an unobstructed view of the traffic from the driver's cabin at the front end of the tamping machine onto the preceding track and also provides a view for clear observation and operation of the plough arrangement for use of the centre plough and/or the shoulder ploughs in accordance with the different ballast conditions. In addition, the advantage of the transmission of powerful tractive and thrust forces between the tamping machine and the preceding plough vehicle also provides for problem-free integration into a train formation for rapid in-transit journeys.

A preferred embodiment of the invention is characterized in that, at its rear machine frame end (~~in~~ having regard to the working direction of the machine), the track tamping machine connected to the preceding second machine frame with the vertically displaceable plough arrangement comprising a centre plough and shoulder ploughs operable by drives is designed to be pivotally connected or ~~rather~~ coupled to a third machine frame - supported by at least one undercarriage - of another vehicle on which is arranged a sweeping unit designed for vertical displacement by a drive and ~~preferably~~ connected to a transverse conveyor belt operable by a drive. This arrangement with a preceding and following vehicle each connected to ballast profiling and sweeping units provides for the rapid transport of ballast both immediately before and immediately after tamping for uniform ballasting of the track, particularly in the tamping zones, which ensures tamping of uniform quality and a durable track position. There is thus no need for the hitherto typical use of a

ballast plough after the tamping machine.

In another advantageous embodiment of the invention, the two machine frames equipped with the plough arrangement and with the sweeping unit are in the form of trailer vehicles equipped with only one undercarriage. Despite their particularly simple construction, these trailer vehicles respectively carrying the plough arrangement and the sweeping unit provide for the advantageous transmission of power, particularly to the leading and trailing vehicle, for the transmission of sufficiently powerful thrust and tractive forces for the continuous, problem-free distribution and sweeping of ballast. In addition, the fact that they are coupled to either end of the tamping machine enables continuous tamping machines already in use to be re-rigged without difficulty.

~~In another advantageous embodiment of the invention,~~ the leading and optionally trailing machine frame comprises a preferably central, overhanging girder which is connected to the tamping machine in the region of the end undercarriages thereof by a preferably universal joint. This coupling of the leading and optionally trailing machine frame is simple and yet robust and, in addition to advantageous tracking, provides for the adequate and safe transmission of power from the tamping machine to the preceding plough arrangement for the continuous, problem-free distribution and profiling of ballast.

Another advantageous embodiment of the invention is characterized in that the two vehicles with the front, second machine frame connected to the plough arrangement and the rear, third machine frame connected to the sweeping unit are designed to be pivotally connected or rather coupled to the middle, first machine frame in the immediate vicinity of a driver's or operator's cabin arranged at the front and rear end of the tamping machine, the two vehicles ~~with the second and third machine frame being constructed~~

In another advantageous embodiment of the invention, the second and the third machine frames each comprise a central girder which is overhanging from the plough arrangement and sweeping unit, respectively, and is connected to the tamping machine in the region of a respective end undercarriage thereof by a universal joint. This coupling of the second and third machine frames is simple and yet robust and, in addition to advantageous tracking, provides for the adequate and safe transmission of power from the tamping machine tothe preceding plough arrangement for the continuous, problem-free distribution and profiling of ballast.

Another advantageous embodiment of the invention is characterized in that the two vehicles with the front, second machine frame connected to the plough arrangement and the rear, third machine frame connected to the sweeping unit are designed to be pivotally connected or rather to the middle, first machine frame in the immediate vicinity of a driver's or operator's cabin arranged at the front and rear end of the tamping machine, the two vehicles with the second and third machine frame being constructed

without cabins and without tall superstructures or, essentially, only to the plane of the machine frame slightly above the associated undercarriage. This very simple construction of the leading and trailing vehicles, more particularly in conjunction with the immediately adjoining driver's or operator's cabins of the central tamping machine, provides for a full and open view of traffic on the adjacent track and also for a largely unobstructed view of the preceding plough arrangement and the following sweeping unit so that they can be clearly observed and are easy to operate.

Finally, another particularly advantageous embodiment of the invention is distinguished by the fact that the continuously advancing (non-stop) tamping machine which is equipped with its own axle drive and with the machine frame carrying the drive, brake, power supply and control systems and which comprises tamping units arranged between two undercarriages spaced apart from one another and a lifting and lining unit immediately preceding the tamping units in the working direction of the machine, is constructed as a track tamping, levelling and lining machine and as a standard vehicle with buffer couplings provided at either end of the machine frame and by the fact that at least one of the two vehicles is also equipped with buffer couplings at either end of its machine frame so that they may either be rapidly coupled to one another or to one end or the other end of the machine frame of the track tamping machine. A track tamping, levelling and lining machine such as this constructed as a standard vehicle is particularly suitable for coupling at its ends to vehicles carrying other functional units without any adverse effects on the functional units arranged between the undercarriages. The provision of buffer couplings both at the end of the tamping machine and on the additional machine frames provides for rapid coupling and uncoupling as required. Despite the leading and trailing

vehicles, the tamping machine can readily be integrated into a train formation for rapid and safe in-transit journeys.

Several examples of embodiment of the invention are described in detail in the following with reference to the accompanying drawings, wherein:

Figure 1 is a side elevation of a continuously advancing (non-stop) on-track tamping, levelling and lining machine according to the invention with one vehicle coupled to the front end of the machine and comprising a vertically displaceable plough arrangement and another vehicle connected to the rear end of the machine and comprising a vertically displaceable sweeping unit.

Figure 2 is a plan view of the machine according to the invention shown in Figure 1 with the plough arrangement consisting of a centre plough and shoulder ploughs provided on the front vehicle connected to the front end of the machine and the rear vehicle with the sweeping unit and a transverse ballast conveyor belt.

Figures 3 to 5 are three diagrammatic illustrations in the form of side elevations of a continuously advancing track tamping, levelling and lining machine similar in construction to that shown in Figure 1 with buffer couplings at either end and with the two other vehicles coupled to the machine in various in-use positions or combinations, the particular machine arrangement always being designed for an unobstructed view of traffic in both directions and for monitoring of the functional units; Figure 3 shows the same in-use position as Figure 1 while Figure 4 shows an in-use position of the tamping machine with an optional potential application - shown in dash-dot lines - of the vehicle connected to the plough arrangement behind the tamping machine in the working direction and Figure 5 shows an in-use position of the tamping machine with an additional fourth vehicle equipped with track stabilizers.

Figure 6 shows another embodiment of a standard, continuously advancing tamping, levelling and lining machine with a single vehicle preceding it in the working direction and connected to a vertically displaceable plough arrangement.

The track tamping, levelling and lining machine 1 shown in Figures 1 and 2 is designed to travel on undercarriages 2 along a ballasted track 6 consisting of sleepers 4 and rails 5 under the power of an axle drive 3. Between two driver's and operator's cabins 7,8 arranged at either end, an operator's cabin 9 and a central control console 10 are connected to the machine frame 11 immediately in front of the rear undercarriage 2 in the working direction. A track levelling and lining reference system 12 is used to determine the position of the track and any errors therein. The various, preferably hydraulic, drives are supplied from a central power supply plant 13. Arranged between the two undercarriages 2 spaced far apart from one another is a tool carrier 14 which, at its rear end (in the working direction indicated by an arrow 15), is directly supported on the track by a supporting and guiding undercarriage 16. The front end of the tool carrier 14 is mounted for longitudinal displacement on the machine frame 11 by means of a guide 17. The tool carrier 14 is connected to a drive 18 for relative displacement to the continuous (non-stop) advance of the machine frame 11.

A vertically displaceable tamping unit 19 comprising tamping tools 20 designed for movement towards one another in pairs and for vibration under the power of squeezing and vibration drives is connected to the tool carrier 14 per rail. In addition, a lifting and lining unit 23, which is designed for vertical and lateral displacement under the power of lifting and lining drives 21,22 and which is designed to be lowered onto and to travel along the track 6 via two pairs of flanged wheels in the form of lining

tools arranged at an interval behind one another, is fixed to the displaceable machine frame 14. The lifting and lining unit 23 further comprises lifting rollers 24 and hooks 25 designed for application to the rails. In addition to the drive 18, an axle drive 26 acting on the supporting and guiding undercarriage 16 is provided for the longitudinal displacement of the tool carrier 14 together with the tamping unit 19 and the lifting and lining unit 23.

The tamping machine 1 is coupled at its front machine frame end 27 (in the working direction) to a second machine frame 29 - supported by an undercarriage 28 - of a vehicle 30. Mounted on this vehicle is a plough arrangement 32 which is designed for vertical displacement by preferably hydraulic drives and which comprises a centre plough 34 operable by a preferably hydraulic drive 31 and shoulder ploughs 35 operable by drives 33. At its rear machine frame end 36, the tamping machine 1 is coupled to a third machine frame 38 - supported by an undercarriage 37 - of another vehicle 39. Arranged on the vehicle 39 is a sweeping unit 43 which is designed for vertical displacement under the power of a drive 40 and which is connected to a transverse conveyor belt 42 operable by a drive 41. The two machine frames 29,38 respectively equipped with the plough arrangement 32 and with the sweeping unit 43 are in the form of trailer vehicles 30,39 equipped with only one undercarriage 28,37 for the observation and operation of the plough arrangement 32 and the sweeping unit 43 from a control console 44 in the driver's or operator's cabin 7 or 8. The machine frames 29,38 comprise a central, overhanging girder 45,46 connected to the tamping machine 1 by a universal joint 47,48. Each of the two trailer vehicles 30,39 comprises buffer couplings 49,50 at its ends opposite the joints 47,48.

By virtue of the highly advantageous, low construction

of the two trailer vehicles 30,39 with no machine superstructure, the operator in the driver's or operator's cabin 7,8 has a clear, unobstructed view over the particular trailer vehicle 30 or 39 for unimpeded observation of the track and signals from the control console 44 (see chain line sight paths). In use, the tamping machine 1 advances continuously with the connected trailer vehicles 30,39 in the working direction indicated by the arrow 15 while the tool carrier 14 together with the tamping units 19 and the lifting and lining unit 23 advances in steps from sleeper to sleeper. By virtue of this advantageous arrangement or rather construction of the trailer vehicles, the plough arrangement 32 and the shoulder ploughs 35 can also be safely and easily operated via their drives from the control console 44 in the driver's or operator's cabin 7, the ballast conditions along the ballast bed being clearly visible. This is particularly important in regard to the rapid and continuous advance of the machine because the ballast conditions often change suddenly and necessitate rapid change-over of the ballast guide plates of the plough arrangement 32 or the shoulder ploughs 35 in order ultimately to obtain a uniformly ballasted track in the following region of the tamping units 19 and to supply sufficient ballast to the tamping zones in the region of the tamping units 19, more particularly in the same working run of the machine. Similarly, the sweeping unit 43 arranged on the following trailer vehicle 39 can readily be operated and monitored from the control console 44 in the driver's or operator's cabin 8 for the concluding uniform sweeping and profiling of the ballast bed.

Figure 3 shows a continuously advancing (non-stop) track tamping, levelling and lining machine 51 which is similar in its construction and equipment to the machine shown in Figures 1 and 2 and which is designed to travel on undercarriages 52 arranged at either end along a track

53 consisting of rails and sleepers and lying on ballast. A vertically displaceable tamping unit 56 comprising squeezable and vibratable tamping tools and a track lifting and lining unit 57 are arranged - per rail - on a tool carrier 55 designed for displacement relative to the machine frame in steps corresponding to a sleeper interval. In this embodiment, the tamping machine 51 in the form of a standard vehicle is equipped with buffer couplings 58,59 provided at both ends of the machine frame. With its front buffer coupling 58 (in the working direction indicated by the arrow 60), the tamping machine 51 is connected to a second vehicle 63, preferably in the form of a trailer, comprising a machine frame 61 and an undercarriage 62. The machine frame 61 is again connected to a plough arrangement 64 consisting of a centre plough and shoulder ploughs 65 and designed for vertical displacement under the power of drives. The rare buffer coupling 59 (in the working direction) of the tamping machine 51 is coupled to another vehicle 70 preferably in the form of a trailer comprising a machine frame 66, an undercarriage 67 and a sweeping unit 68 with a transverse conveyor belt 69. Buffer couplings 71 and 72 are provided at both ends of these two machine frames 61,66. The basic in-use position of the track tamping machine 51 with the vehicles 63 and 70 is the same as in the embodiment of the machine arrangement shown by way of example in Figures 1 and 2.

By contrast, Figure 4 diagrammatically illustrates a possible in-use position in which the vehicle 63 with the plough arrangement 64 connected to the front end of the tamping machine can also be connected as required to the rear buffer coupling 59 of the tamping, levelling and lining machine 51 (see dash-dot lines) in the interests of simple universal use. In this case, the second vehicle 70 connected to the sweeping unit 68 is readily connected to the rear end of the vehicle 63. This solution also pro-

vides for a clear unobstructed view of traffic and also for unimpeded observation and remote operation of the plough arrangement 64 and the sweeping unit 68. This in-use position of the machine will preferably be selected whenever insufficient ballast is present, for example, in the tamping zones for the tamping units and, more particularly, whenever exact profiling of the ballast bed with final sweeping is necessary.

In the combination example - shown in Figure 5 - of an in-use position to be established as and when required, the rear buffer coupling 59 of the track tamping, levelling and lining machine 51 is designed to be connected to a track stabilizer 73. The track stabilizer 73 comprises a machine frame which is connected to end undercarriages 74 and to which are fixed two stabilizing units 75 designed to be vibrated substantially horizontally and to receive strong vertical forces under the power of drives. A levelling arrangement 76 is provided for the controlled lowering of the track by means of the lifting rollers of the stabilizing units 75. The track stabilizer 73 is connected by a rear buffer coupling 77 to the vehicle 70 comprising the sweeping unit 68. As shown in dash-dot lines and by an arrow, the vehicle 63 connected to the plough arrangement 64 may also be connected to the rear end of the machine in the interests of universal use in accordance with the particular track conditions, for example in the presence of large accumulations of ballast and sections of track to be lowered relatively deeply by the track stabilizer.

Figure 6 diagrammatically illustrates another simple embodiment of a track tamping, levelling and lining machine 78 with a machine frame 79 which is designed to travel continuously (non-stop) on undercarriages 80 arranged at either end along a track 81 consisting of rails and sleepers in the working direction indicated by an arrow 82. A tamping unit 83, which is mounted on the machine frame 79

for longitudinal displacement under the power of drives and which comprises squeezable and vibratable tamping tools, and a track lifting and lining unit 84 are arranged - per rail - between the undercarriages 80 spaced far apart from one another. Buffer couplings 85,86 are provided at both ends of the tamping machine 78. The front end 87 of the machine frame or rather the buffer coupling 86 is connected to a vehicle 90 also provided with buffer couplings 88,89. The vehicle 90 comprises a vertically displaceable plough arrangement 92 between two undercarriages 91. A vertically displaceable sweeping unit 94 comprising a rotary brush is fixed to the front end of the machine frame 93. The vehicle 90 with the relatively low machine superstructure at its front end also provides for a clear unobstructed view of traffic and for simple operation of the plough arrangement 92 and sweeping unit 94 from a driver's or operator's cabin 95 of the track tamping machine 78. With this continuously advancing (non-stop) tamping, levelling and lining machine 78 in the most simple combination or basic in-use position, it is possible to profile the ballast bed with a sufficient supply of ballast to the tamping zones for the tamping units 83 and, at the same time, to tamp the track 81 in the course of a single working run of the machine, which provides for very economic operation.

The claims defining the invention are as follows:

1. A continuously advancing (non-stop) on-track machine for tamping the sleepers of a railway track comprising a machine frame supported by undercarriages spaced apart from one another,

a tool carrier - connected to the machine frame by a drive for displacement parallel to the longitudinal axis of the track and arranged between two undercarriages - for a vertically displaceable lifting and lining unit,

at least one vertically displaceable tamping unit comprising tamping tools designed for movement towards one another in pairs and for vibration under the power of squeezing and vibration drives and for penetration into the ballast bed and

a second machine frame - connected to the machine frame - of a vehicle on which a plough arrangement designed for activation and vertical displacement by drives is mounted, the plough arrangement being arranged between two undercarriages,

characterized in that the machine for tamping sleepers is designed to be pivotally connected or coupled at its front machine frame end (having regard to a working direction of the machine) to the second machine frame of the vehicle supported by at least one undercarriage.

2. A machine as claimed in claim 1, characterized in that, at its rear machine frame end (having regard to the working direction of the machine), the track tamping machine connected to the preceding second machine frame with the vertically displaceable plough arrangement comprising a centre plough and shoulder ploughs operable by drives is designed to be pivotally connected or coupled to a third machine frame - supported by at least one undercarriage - of another vehicle on which is arranged a sweeping unit designed for vertical displacement by a drive and connected to a transverse conveyor belt operable by a drive.

3. A machine as claimed in claim 2, characterized in that the two machine frames equipped with the plough arrangement and with the sweeping unit are in the form of trailer vehicles equipped with only one undercarriage.

4. A machine as claimed in claim 2 or 3, characterized in that the second and the third machine frames each comprise a

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central girder which is overhanging from the plough arrangement and sweeping unit, respectively, and is connected to the tamping machine in the region of a respective end undercarriage thereof by a universal coupling.

5. A machine as claimed in any one of claims 2 to 4, characterized in that the two vehicles with the front, second machine frame connected to the plough arrangement and the rear, third machine frame connected to the sweeping unit are designed to be pivotally connected or coupled to the middle, first machine frame in the immediate vicinity of a driver's or operator's cabin arranged at the front and rear end of the tamping machine, the two vehicles with the second and third machine frame being constructed without cabins and without tall superstructures or, essentially, only to the plane of the machine frame slightly above the associated undercarriage.

6. A machine as claimed in any of claims 1 to 4, characterized in that the continuously advancing (non-stop) tamping machine which is equipped with its own axle drive and with the machine frame carrying the drive, brake, power supply and control systems and which comprises tamping units arranged between two undercarriages spaced apart from one another and a lifting and lining unit immediately preceding the tamping units in the working direction of the machine is constructed as a track tamping, levelling and lining machine and as a standard vehicle with buffer couplings provided at either end of the machine frame and in that at least one of the two vehicles is also equipped with buffer couplings at either end of its machine frame so that they may either be rapidly coupled to one antoher or to one end or the other end of the machine frame of the track tamping machine.

7. A continuously advancing (non-stop) on-track machine for tamping the sleepers of a railway track, substantially as hereinbefore described with reference to what is shown in the accompanying drawings.

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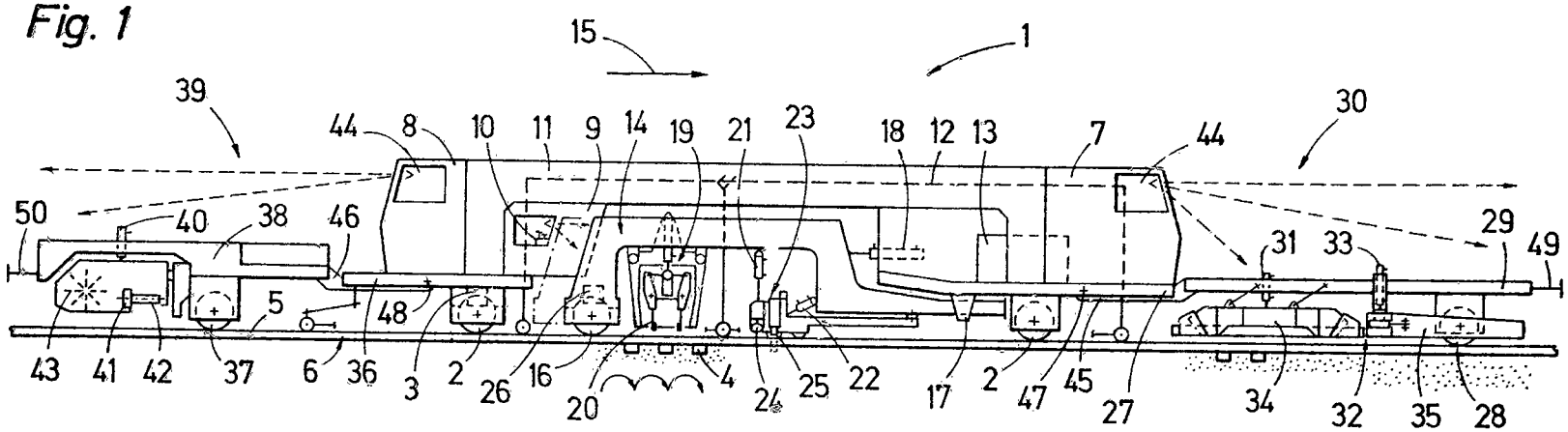
Fig. 1



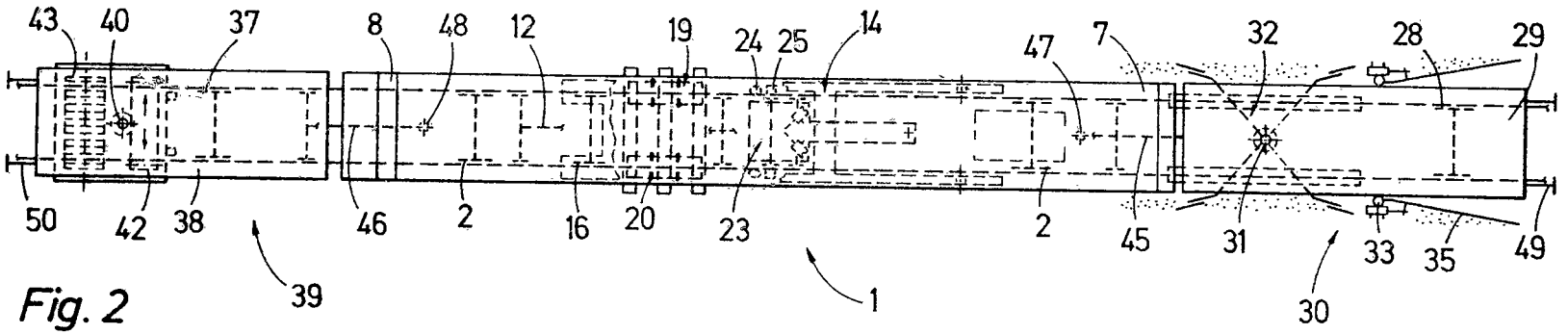


Fig. 2

Fig. 3

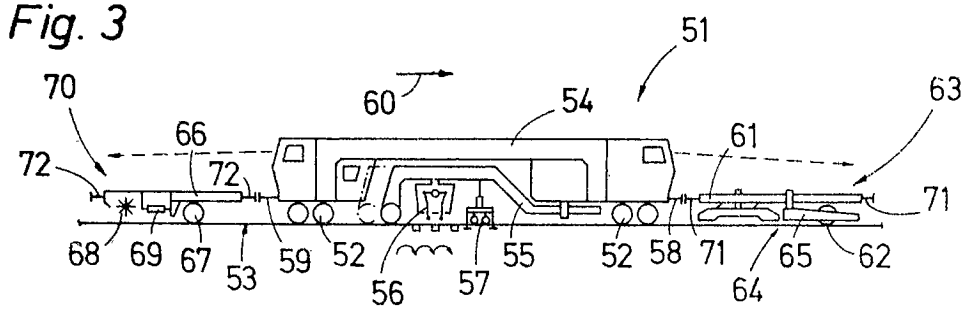


Fig. 4

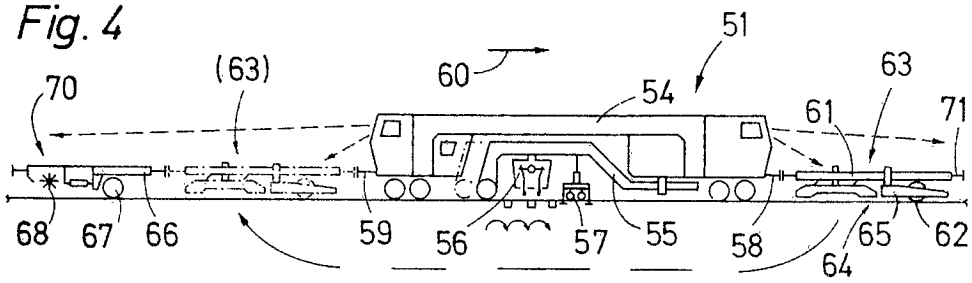


Fig. 5

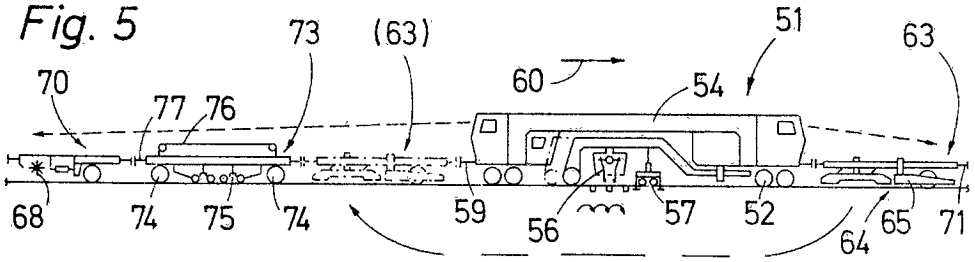


Fig. 6