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GB 2126635 A

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UK CL (Edition L) E1G GGC GGD
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(54) Continuously movable railway track tamping machine

(57) A tamping machine 1 has a frame 4 consisting of three parts 5, 6, 7 articulately coupled together in series. Provided beneath the central frame part 6, which is designed as an auxiliary tie-beam 10, is an operating frame 13 supported by two on-track undercarriages 14 and carrying tamping and track lifting units 15, 16. The operating frame 13 is designed for intermittent motion with respect to the continuously movable frame 4. The coupling point 9 can selectively allow or prevent longitudinal movement between the auxiliary tie beam 10 and the front frame part 5. The tamping machine is also provided with a rotary brush 30, a ballast plough 41 and a conveyor belt arrangement for removing and discharging ballast. The tamping machine 1 is suitable for tamping points sleepers.

Fig. 1

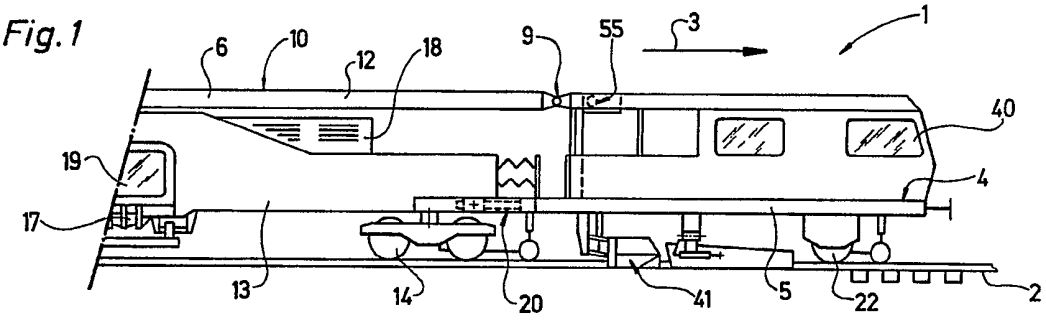

Fig. 2

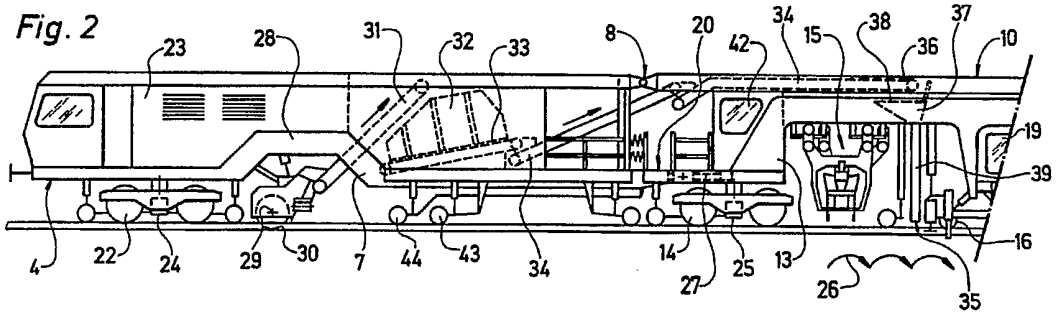

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Fig. 1

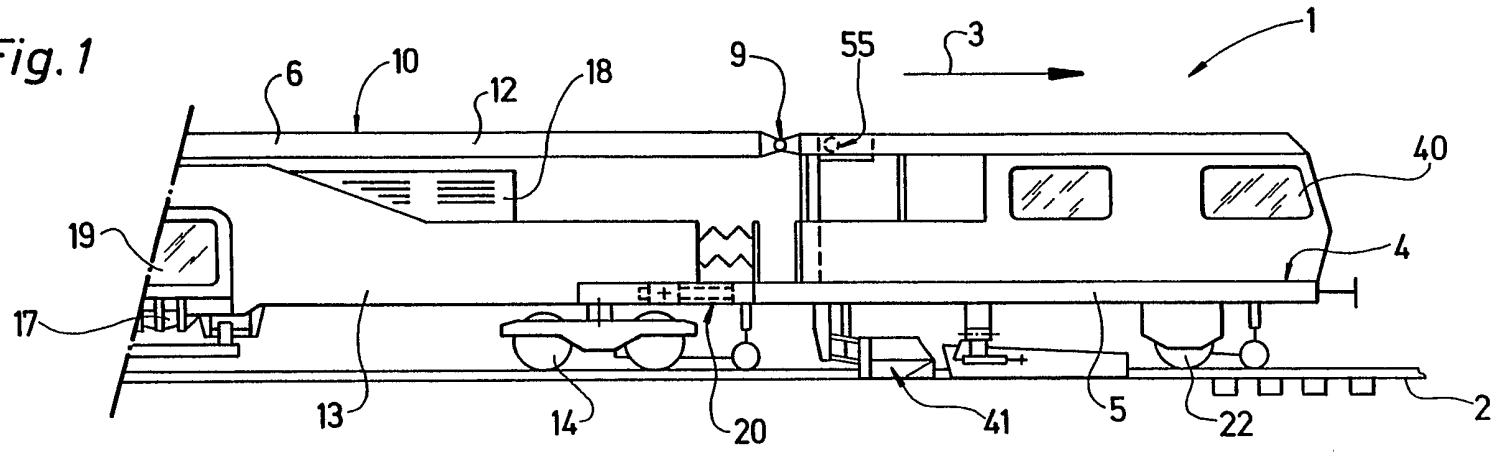
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Fig. 2

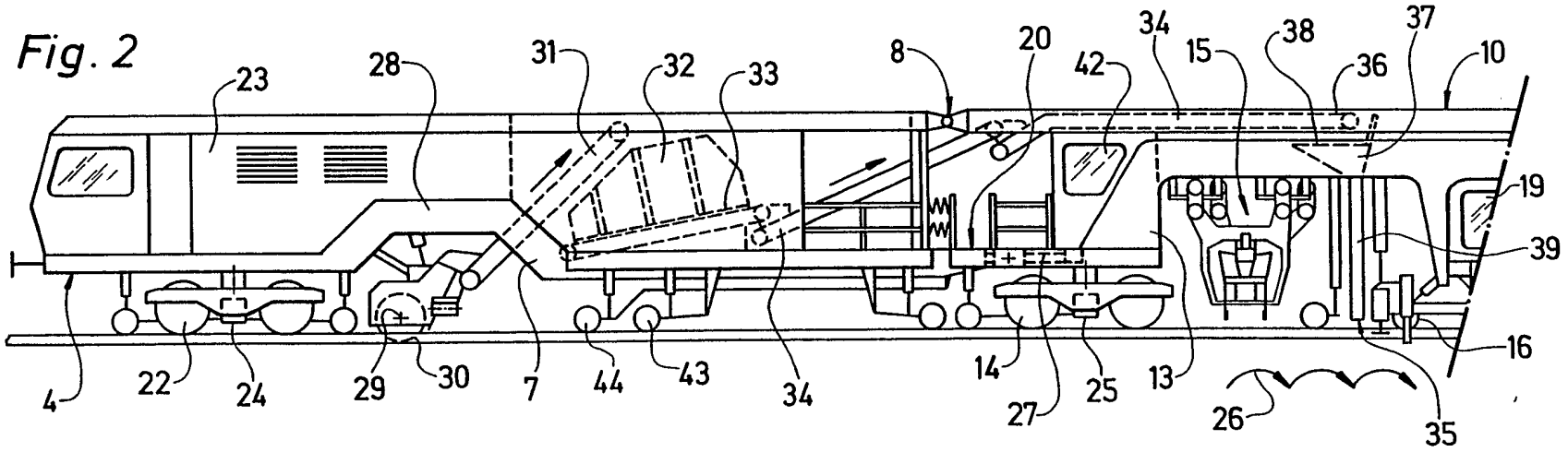
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Fig. 3

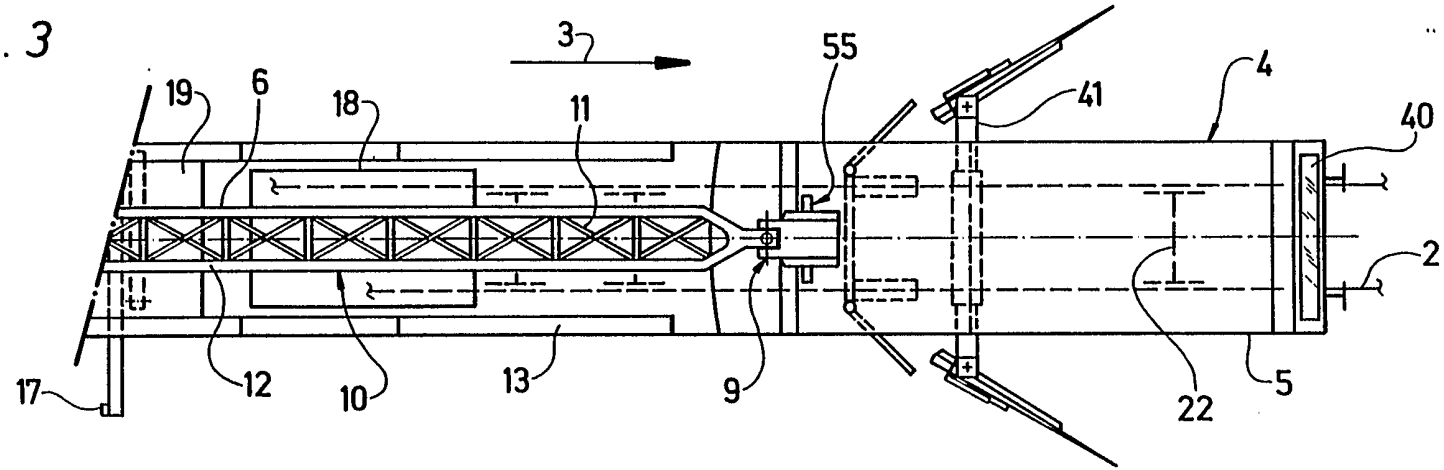
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Fig. 4

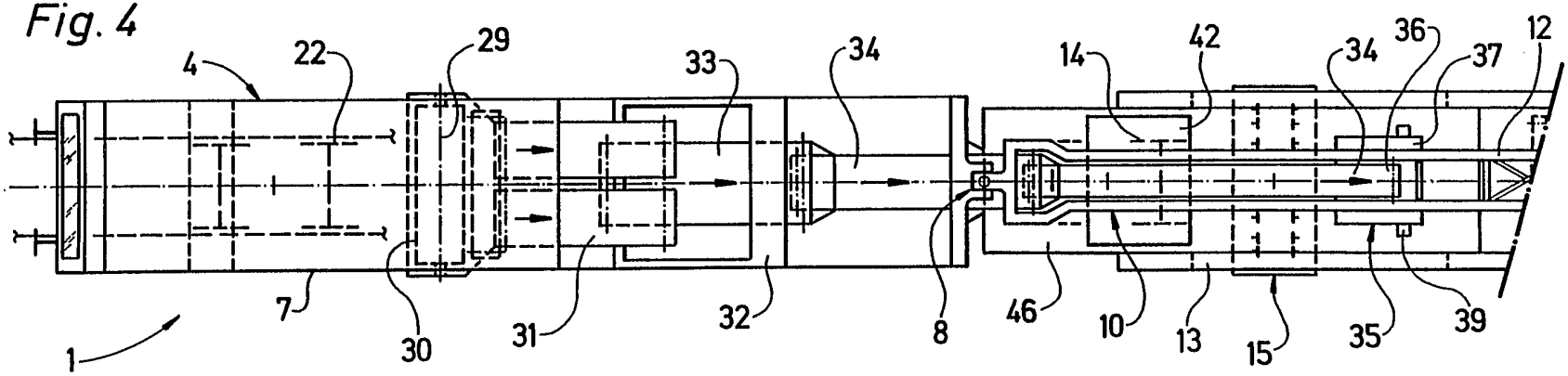
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Fig. 5

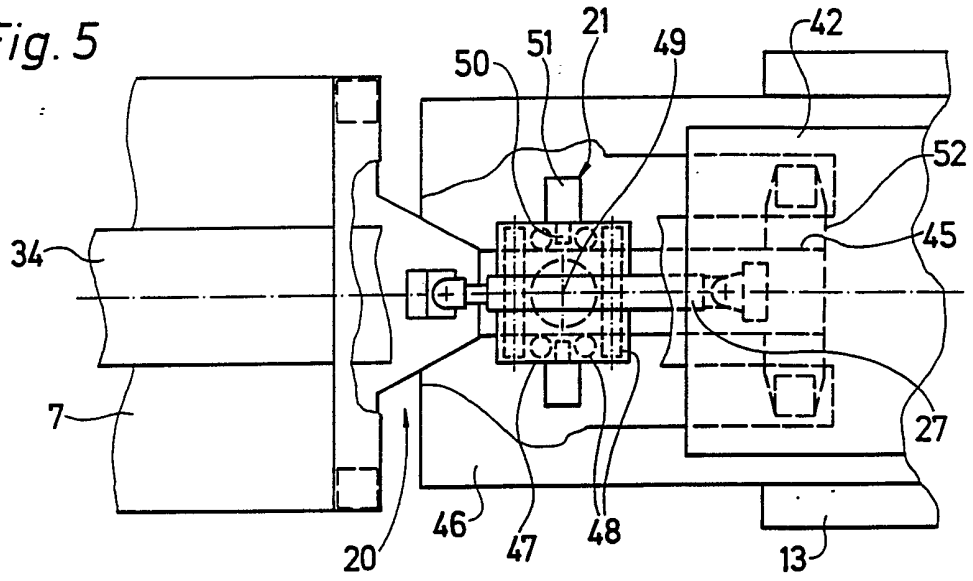


Fig. 6

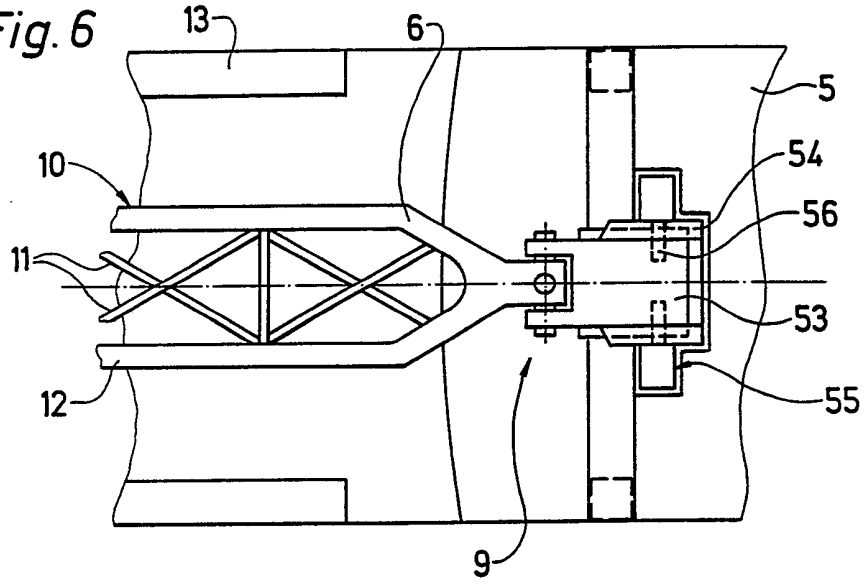
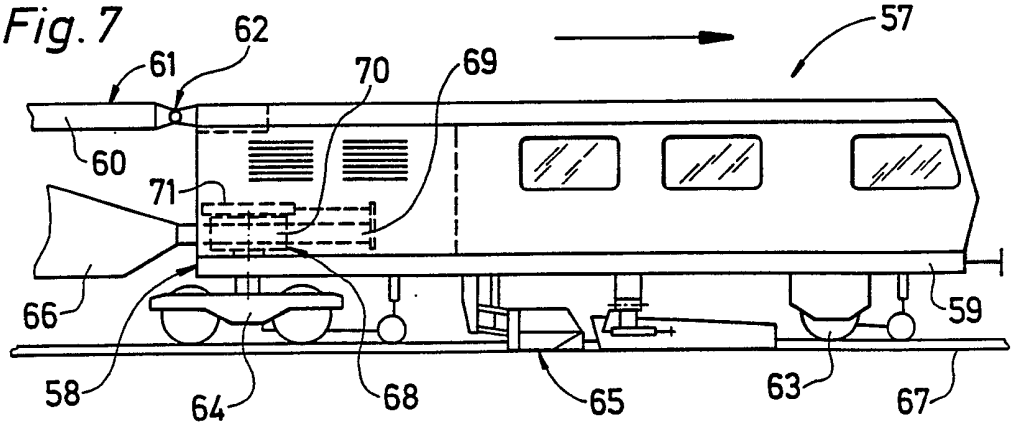


Fig. 7



CONTINUOUSLY MOVABLE RAILWAY TRACK

TAMPING MACHINE

The invention relates to a continuously movable track tamping machine comprising a machine frame consisting of at least of three frame parts arranged in series in the longitudinal direction of the machine and coupled together in an articulated manner, and an operating frame, supportable on the track by at least one on-track undercarriage and supporting tamping and track lifting units, the said operating frame being provided in the region of or beneath one frame part, and being designed for intermittent motion in operation with respect to the continuously movable frame parts.

A machine of this kind is described in an article in the journal "Der Eisenbahningenieur" ["The Railway Engineer"], January 1991, pages 24 and 25 (Figure 5). This continuously movable track tamping machine, known by the reference AC-109 FRP, has a machine frame which is composed of three frame parts, arranged in series in the longitudinal direction of the machine and coupled together in an articulated manner. The central one of these three frame parts is mounted on two bogie undercarriages, located at a distance from one another, and at each of its longitudinal ends is connected to one of the other trailer-like frame parts respectively, each of which is supported on an individual undercarriage. The frame part which leads in the operating direction is equipped with centre and shoulder plough arrangements and monitoring equipment. The third rearward frame part is located at a distance from the leading frame part and is provided with a

ballast sweeping means. Situated between the undercarriages of the bridge-shaped central frame part or beneath is an operating frame. The operating frame is supported by and capable of rolling on the track by means of an undercarriage and has arranged on it a vertically adjustable two-sleeper track tamping unit and a track lifting unit. This operating frame is linked by its front end to the central frame part and is displaceable in relation thereto in the longitudinal direction of the machine by means of a drive. As a result the operating frame - forming a so-called tamping satellite - is moved intermittently in two sleeper intervals during a sleeper tamping operation. The remaining frame parts may be moved forwards independently thereof at a continuous speed in an energy-saving manner. However, this track tamping machine is not suitable for treating points.

A continuously movable track tamping machine is also known according to US Patent 4,630,541 - the elongated and bridge- shaped machine frame of which is mounted at each end on the track by way of bogie undercarriages. Positioned between these undercarriages is an operating frame, designed as a satellite vehicle and also capable of rolling on the track by means of two undercarriages of its own. A longitudinally adjustable coupling device, designed as a hydraulic drive, joins the machine- and operating frame together. Only the operating units in the form of tamping and lifting units are arranged on the latter, whilst the driver's and operator's cabs, the power and drive equipment etc. are provided on the machine frame in order that the operating frame, which is moved intermittently in operation with respect to the continuously advancing machine frame, is relieved of load.

Finally, a track tamping machine is described in EP 0 436 757 A1, which has a two-part machine frame of

articulated design supported on the track by means of three undercarriages. Forward of the central undercarriage, in the operating direction, are a tamping unit and a lifting and aligning unit, positioned within visible range of an operator's cab. The rear region of the machine is provided with a ballast plough arrangement and a sweeping means with a rotatable sweeping broom. This is associated with a conveyor belt arrangement extending in the longitudinal direction of the machine. By means of the belt arrangement surplus ballast swept up from the track, is transported to a ballast hopper. The hopper is connected to a discharge means with ballast discharge openings which are arranged on the tamping unit in the area of the tamping tools and which serve for additionally ballasting the sleeper cribs in areas of track with insufficient ballast. The discharge openings are provided for this purpose with remotely controllable flaps which are operated from the operator's cab.

An object of the invention hereinafter described is to provide a continuously movable track tamping machine of the type described in the introduction, which, while retaining a previously proven combination of operating units can be moved continuously or discontinuously in operation and makes a constructionally very simple solution possible.

To this end according to the invention there is provided a track tamping machine of the type specified in the introduction in which the frame part bridging the operating frame is designed merely as an auxiliary tie-beam for the expedient connection during operation of the two other frame parts which are respectively adjoined the operating frame.

Because of this special frame construction, it is advantageously possible, to adapt the operating frame appropriately, particularly for accommodating tamping and lifting units for points. It is also possible to ensure continuous onward movement at a uniform speed during operation for the two frame parts adjoining the operating frame. In terms of the control technology, this is very simple and reliable. This is achieved by means of the auxiliary tie-beam which ensures the transmission of the continuously acting driving force on the frame parts situated a distance apart at either end of the tie-beam. Entirely independently thereof, the operating frame is movable intermittently from one tamping point to the next. By restricting the form of the frame part bridging the operating frame to an auxiliary tie-beam, the cross-section of which can be substantially smaller than a carriage frame and which merely serves to transmit tractive or thrust forces, the operating frame can be made correspondingly higher. The specific mounting of the tamping units can be arranged to obtain an extended transverse displacement distance with an increased installation height, for example. In addition, any reciprocal interference between the operating frame and the auxiliary tie-beam and also exceeding of the clearance gauge can thereby be reliably eliminated.

The features set forth in claim 2 enable the coupling point to be released with respect to the frame part, in order to join the various frame parts together in the prescribed manner in the lower frame region when non operational transit of the machine is required and for unhindered incorporation of the machine in a train formation.

With the further features according to claim 3, the operating frame, while being supported on the adjoining,

continuously movable frame part, may be rapidly moved forwards intermittently from one tamping point to the next.

The specific features of the auxiliary tie-beam according to claim 4 have, in combination with a relatively small cross-section, the particular advantage of enabling the operating frame to have a fairly large overall height. This facilitates the problem-free installation of tamping and lifting units for treating points.

The further features of claims 5 and 6, with the construction of a very sturdy operating frame, enables the tamping machine to be incorporated without difficulty in a train formation.

The modification according to claim 7 enables the operating frame to be of a simplified construction with merely a single on-track undercarriage.

The further modifications of the machine according to claims 8, 9 and 10, without adversely affecting the tamping operation, enable surplus ballast to be picked up from the track and to be temporarily stored for optional discharge in the tamping area. This enables the machine to ballast the tamping area adequately in the event of a deficiency of ballast so as to achieve durable tamping.

Finally, the arrangement of the operating cab according to the features of claim 11 has the particular advantage that the operator positioned in the operator's cab, in plain track operation of the machine, is moved from one tamping point to the next in a continuously advancing, manner together with the two frame parts adjoining the operating frame. This avoids jolting movements which are particularly tiring.

In order that the invention may be more readily understood reference will now be made by way of example only to the embodiments illustrated in the accompanying drawings, in which;

Fig 1 and 2 show a side view - depicted in two parts for the sake of greater clarity - of a track tamping machine according to the invention,

Fig 3 and 4 show plan views of the front and rear part respectively of the machine shown in Fig 1 and 2,

Fig 5 shows an enlarged detailed plan view of a coupling at the rear end of the operating frame,

Fig 6 shows a detailed plan view of a coupling point at the front end of the auxiliary tie-beam, and

Fig 7 shows a partial side view of a further form embodiment of the invention.

Shown in Fig 1 to 4 is a track tamping machine 1 which is movable on a track 2 in an operating direction indicated by an arrow 3 and which has a machine frame 4. The said machine frame is of a three-part construction and is composed, with respect to the operating direction, of a front, central and rear frame part 5, 6 and 7 respectively, arranged in series in the longitudinal direction of the machine and joined together in a universally articulated manner at two coupling points 8, 9. The central frame part 6 - constituting a relatively small cross-section with small height - is entirely arranged in the upper area of the machine 1 and is designed as an auxiliary tie-beam 10 which consists of two carriers 12, extending in the longitudinal direction of the machine and parallel to one

another, and joined together by means of supporting rods 11 in the manner of a lattice. The coupling point 9 of the auxiliary tie-beam 10 or central frame part 6 to the preceding, adjoining frame part 5 is designed so as to enable longitudinal displacement of the two frame parts 5, 6 in relation to one another to take place optionally; this will be described in more detail later with the aid of Fig 6.

Provided in the region beneath the central frame part 6 or auxiliary tie-beam 10 is a further frame, referred to as the operating frame 13, formed in the shape of a bridge and supported at each end on the track 2 by means of two on-track undercarriages 14 designed as bogies. The operating frame 13 is provided with a tamping unit 15 suitable for tamping points and a track lifting unit 16, both of which are designed for vertical and lateral adjustment by means of drives. An auxiliary lifting device 17 connected to the operating frame 13 serves for synchronously lifting the branching length of track at points during the lifting and tamping of the (main) track 2. Also, the operating frame 13 carries a power supply means 18 and an operator's cab 19, the latter being situated such that an operator positioned inside is able to have a good view of the operating area of the tamping and lifting units 15, 16 and of the auxiliary lifting device 17. The operating frame 13 is connected at each end in a universally articulated manner to the respectively adjoining frame part 5, 7 by means of a coupling 20, which is mounted for displacement in the longitudinal direction of the machine on the operating frame 13 or the frame part 5, 7 and which has respective blocking means 21 for locking the coupling against longitudinal displacement (see Fig 5).

The frame parts 5, 7 adjoining the operating frame 13 are each provided in the manner of a trailer with a

single undercarriage 22, located at a distance from the coupling 20, of which the rear undercarriage in the operating direction, associated with the frame part 7, is connected to a motive drive 24 supplied by a power source 23. The machine frame 4 or the frame parts 5 to 7 are thus continuously movable in operation, while the operating frame 13 provided with its own motive drive 25 can be moved intermittently independently thereof with respect to the frame parts 5 to 7, to enable tamping of the sleepers of the track 2 to be performed (see small arrows 26). During this operation, the auxiliary tie-beam 10 bridging the operating frame 13 serves to join the two frame parts 5 and 7, adjoining the operating frame at each end, expediently to one another at a fixed distance apart. A longitudinal displacement drive 27 is provided between the rear longitudinal end of the operating frame 13 and the adjoining frame part 7 or is connected to both, so as to assist the relative movement of the operating frame 13 for the intermittent operational forward advance thereof with respect to the machine frame 4 (see also Fig 5). The two aforementioned couplings 20 are freely longitudinally displaceable on the operating frame 13.

The frame part 7 following the operating frame 13 also has an offset region 28 in the area in front of its undercarriage 22. Housed therein is a sweeping broom 30 which is vertically adjustable and rotatable about an axis 29 extending in the transverse direction of the machine. The discharge end of a conveyor belt 31 adjoining the said sweeping broom is arranged directly above a ballast hopper 32, mounted on the frame part 7. A discharge opening 33 provided in the base region thereof is associated with a conveyor belt arrangement 34 which is secured to the frame part 7 and to the auxiliary tie-beam 10 and transports the ballast swept up from the track 2 or deposited in the ballast hopper 32 forwards in the operating direction to

the area of the tamping unit 15. Located on the operating frame 13 is a discharge means 35, adjacent to the tamping unit, which is essentially composed of a charging hopper 37, located directly beneath a discharge end 36 of the conveyor belt arrangement 34, with a V-shaped opening 38 and two conduit tubes 39 to be supplied by the hopper and each associated with one rail of the track 2. The size of the V- shaped opening 38 arranged in the upper region of the discharge means 35 is such that its greatest dimension, extending in the longitudinal direction of the machine, corresponds at least to the displacement distance of the couplings 20, so as to ensure the continued discharge of ballast into the charging hopper 37 while the operating frame 13 moves intermittently with respect to the conveyor belt arrangement 34 secured to the machine frame 4.

The front frame part 5 is provided with a large driver's or operator's cab 40 and has a centre and shoulder plough arrangement 41. A further operator's cab 42 is arranged in the region of the rear on-track undercarriage 14 of the operating frame 13 and is connected to the rear frame part 7. Both the operating frame 13 and the machine frame 4 are provided with track measuring means 43, 44 so as to be able to monitor the position of the track 2 both during and after tamping and aligning.

Fig 5 shows in detail the region of the rear coupling point 20 at which point the frame part 7 is connected to the operating frame 13 for displacement in the longitudinal direction of the machine. The front end of the frame part 7, in the operating direction, is designed as a central guide beam 45 which projects in the longitudinal direction of the machine underneath an access platform 46 of the operating frame 13 and is supported or slidably guided in a bearing block 47. The bearing block 47 is provided for this purpose with a number of guide

rollers 48 which are rotatable partly about horizontal axes extending in the transverse direction of the machine and partly about vertical axes and are arranged such that the guide beam 45 is mounted with a certain amount of play to permit slight movements of the frames relative to one another - at track bends or where there are irregularities in the track. For this reason the bearing block 47 is also secured to the operating frame 13 for rotation about a vertical axis 49. The front coupling 20 is similarly designed, a central guide beam of the front frame part 5 being mounted in a bearing block secured to the front end of the operating frame 13. The longitudinal displacement drive 27 is linked both to the operating frame 13 and to the frame part 7 and is provided to assist the intermittent operational advance in conjunction with the motive drive 25 of the operating frame 13.

So as to join the frame part 7 fixedly to the operating frame 13 in order to transmit the tractive and thrust forces during non operational transit of the machine, the blocking means 21 is mounted on the bearing block 47. This has two bolts 50, capable of engaging into recesses in the guide beam 45, which can be moved by remote control by means of a drive 51. Provided at the front end of the guide beam 45 is a support 52 by which the operator's cab 42 is mounted on the frame part 7. The connection of the operating frame 13 to the front frame part 5 is identical in principle to the coupling shown in Fig 5.

Shown in Fig 6 is the connection of the front end, in the operating direction, of the auxiliary tie-beam 10 or frame part 6 bridging the operating frame 13 to the front frame part 5 at the coupling point 9. This connection must be securable, so that in operation the frame parts 5, 6 and 7 can be coupled together to form a continuously movable

unit. In the case of non operational transit of the machine, however, this connection must be 'floating', i.e. freely movable in the longitudinal direction of the machine, as in this case the frame parts 5 and 7 are of course fixedly coupled with the operating frame 13 by means of the blocking means 21. For this purpose there is secured to the front end of the auxiliary tie-beam 10, which tapers to a point, for universal articulation a sliding block 53 which is arranged in a sliding bearing 54 for displacement in the longitudinal direction of the machine. This sliding bearing 54 is mounted on the front frame part 5 in the upper region thereof and is provided with a blocking means 55 which - like the blocking means 21 - is provided with two remotely controllable bolts 56, engageable in the sliding block 53.

The track tamping machine 1 may be used both for standard plain track tamping and for tamping points sleepers. In the first case, after arrival at the worksite, the blocking means 21 of the couplings 20 are released, these having fixedly connected the operating frame 13 to the front and rear frame part 5, 7 during the transfer journey. At the same time the auxiliary tie-beam 10 is securely connected to the frame part 5 at the coupling point 9 by means of the blocking means 55. The operating frame 13 may now be moved intermittently from one sleeper to the next, independently of the continuously advancing machine frame 4 or the frame parts 5 to 7. The operator is in this case positioned in the operator's cab 42, also moved along continuously, so that he is not subjected to the stress of frequently repeated acceleration and deceleration. When it is used for tamping points, on the other hand, continuous advancing of the machine is not appropriate, since the adjustment of the operating units and -tools to the constantly changing track and sleeper spacings is more time-intensive. The operator is positioned

in the operator's cab 19, from which the operating area and also the auxiliary lifting device 17 can be better observed.

In the further form of construction of the invention, represented in Fig 7, a track tamping machine 57 has a machine frame 58 composed of several frame parts. Only the front frame part 59, in the operating direction, and the frame part 60 adjoining it are shown in the drawing, these being connected together for longitudinal displacement by way of a coupling point 62, this being provided with a blocking means. The frame part 60 is designed as an auxiliary tie-beam 61 and at its other, rear end is connected in an articulated manner to a further frame part which is not shown. The frame part 59 is mounted on two undercarriages 63, 64, situated at a distance apart, between which a centre and shoulder plough arrangement 65 is arranged for vertical adjustment.

Located beneath the auxiliary tie-beam 61 is an operating frame 66 which has a tamping and lifting unit at its rear end and which is capable of rolling on the track 67 by way of an undercarriage (not visible). The front end of the operating frame 66 is mounted on the frame part 59 in a coupling 68 so as to enable displacement of the operating frame 66 in relation to the frame part 59 to take place in the longitudinal direction of the machine. A beam 69, forming the front end of the operating frame 66, projects in the longitudinal direction of the machine over the rear end of the frame part 59 and is supported thereon in a sliding bearing 70 which is arranged on the frame part 59 for rotation about a vertical axis. A longitudinal displacement drive 71 connects the sliding bearing 70 (or frame part 59) and the operating frame 66 and serves for the longitudinal displacement of the operating frame with respect to the machine frame 58 when used for tamping the track 67.

CLAIMS

1. A continuously movable track tamping machine comprising a machine frame consisting of at least of three frame parts arranged in series in the longitudinal direction of the machine and coupled together in an articulated manner, and an operating frame supportable on the track by at least one on-track undercarriage 14 and supporting tamping and track lifting units the operating frame being provided in the region of or beneath one frame part and being designed for intermittent motion in operation with respect to the continuously movable frame parts wherein said one frame part bridging the operating frame is designed merely as an auxiliary tie-beam for the expedient connection during operation of the two other frame parts which are respectively adjoined to the operating frame.

2. A machine according to claim 1, wherein a coupling point of the auxiliary tie-beam with the adjoining frame part is designed for displacement in the longitudinal direction of the machine.

3. A machine according to claim 1 or 2, wherein the operating frame is connected at least at one longitudinal end to an adjoining frame part by a longitudinal displacement drive.

4. A machine according to claim 1, 2 or 3, wherein the auxiliary tie-beam is formed by two carriers arranged above the operating frame, extending parallel to one another in the longitudinal direction of the machine and joined together by supporting rods in the manner of a lattice.

5. A machine according to any one of the preceding claims, wherein the operating frame, has tamping and lifting units and an operator's cab and is supportable at each end on the track on an undercarriage, and may be connected at each end in an articulated manner to a respectively adjoining frame part by means of a coupling.

6. A machine according to claim 5, wherein the frame parts adjoining the operating frame are trailer-like and each have only one undercarriage located a distance away from the coupling, the coupling being mounted on the operating frame or frame part and allowing displacement in the longitudinal direction of the machine and being connected to a blocking means for locking against longitudinal displacement.

7. A machine according to claim 1, wherein the operating frame, is supported at one end on an undercarriage, is connected by its front end by means of a coupling for displacement in the longitudinal direction of the machine to the front frame part, in the operating direction, the front frame part has two undercarriages situated a distance apart, and a longitudinal displacement drive is provided between the operating frame and the front frame part.

8. A machine according to any one of the preceding claims, wherein the rear frame part, adjoining the operating frame, has an offset region in which a rotatable and vertically adjustable sweeping broom with a conveyor belt is arranged.

9. A machine according to any one of the preceding claims, wherein there is provided on one of the frame parts a ballast hopper, having a discharge opening with which a

conveyor belt arrangement is associated for transporting ballast to a discharge means located in the region of the tamping unit on the operating frame.

10. A machine according to claim 9, wherein the discharge means has at its upper end region a V-shaped opening, the greatest dimension of which extending in the longitudinal direction of the machine is designed to correspond at least to the maximum displacement distance of the couplings between each end of the operating frame and one of the other frame parts.

11. A machine according to any one of the preceding claims, wherein an operator's cab, located in the region of a rear most on-track undercarriage of the operating frame, is connected to the auxiliary tie-beam or to the rear frame part adjoining the operating frame.

12. A machine substantially as herein described with reference to the accompanying figures.

Examiner's report to the Comptroller under Section 17 (The Search report)	GB 9317438.1
Relevant Technical Fields (i) UK Cl (Ed.L) E1G (GGD, GGC) (ii) Int Cl (Ed.5) E01B 27/17	Search Examiner PHIL THORPE Date of completion of Search 12 NOVEMBER 1993
Databases (see below) (i) UK Patent Office collections of GB, EP, WO and US patent specifications. (ii)	Documents considered relevant following a search in respect of Claims :- 1-12

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P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

&: Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages	Relevant to claim(s)
A	GB 2126635 A (PLASSER)	

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