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A CONTINUOUSLY ADVANCING (NON-STOP) TRACK TAMPING, LEVELLING AND LINING MACHINE

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(57) Claim

1. A continuously advancing (non-stop) track tamping, levelling and lining machine supported by on-track undercarriages and comprising a main frame, which supports the operator's cabin for the working tools and the drive, brake, power supply and control systems and which comprises at least one on-track undercarriage equipped with an axle drive and a brake arrangement, and a tool frame which is connected for longitudinal displacement to the main frame and comprises at least one on-track undercarriage and on which are arranged the tamping, lifting and lining units and their associated drives provided between two undercarriages spaced far apart from one another in the immediate view of the operator's cabin connected to and advancing continuously with the main frame; and further comprising a unit for the common step-by-step advance of these units and a levelling and lining reference system associated with the unit tools, characterized in that the main frame, which is connected to and advances continuously with the operator's cabin projects longitudinally of the machine through its undercarriage adjacent an on-track undercarriage of the tool frame and, with this projecting frame section, is mounted or supported for longitudinal displacement on the tool frame advancing in steps,

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continuously advancing main frame comprising only a single undercarriage which is equipped with an axle drive and a brake arrangement.

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Complete Specification for the invention entitled:

A CONTINUOUSLY ADVANCING (NON-STOP) TRACK TAMPING, LEVELLING AND LINING MACHINE

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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):

This invention relates to a continuously advancing (non-stop) track tamping, levelling and lining machine supported by on-track undercarriages and comprising a main frame, which supports the operator's cabin for the working tools and the drive, brake, power supply and control systems and which comprises at least one on-track undercarriage equipped with an axle drive and a brake arrangement, and a tool frame which is connected for longitudinal displacement to the main frame and comprises at least one on-track undercarriage and on which are arranged the tamping, lifting and lining units and their associated drives provided between two undercarriages spaced far apart from one another in the immediate view of the operator's cabin connected to and advancing continuously with the main frame; and further comprising a unit for the common step-by-step advance of these units and a levelling and lining reference system associated with the unit tools.

Applicants' or Patentees' AU-PS 560 265 describes the first continuously advancing (non-stop) track tamping, levelling and lining machine which was developed and built by Applicants themselves and which has already been successfully used in practice. As shown in Figures 3 to 5 for example, this continuously advancing tamping, levelling and lining machine comprises a main frame, which is supported by two on-track undercarriages spaced far apart from one another, one being connected to the axle drive, and which supports the main drive, brake, power supply and control systems, and a tool frame situated between the two undercarriages. At one end, the tool frame is supported on the track by an undercarriage in the form of a pair of support and guide wheels and, at its other end, is fixed to the main frame for universal pivoting and is connected to track tamping units together with vertical adjustment and vibration drives and also squeezing drives and to a track

lifting and lining unit together with the associated drives. The working units and the tool frame thus form a single longitudinally displaceable working unit. This tamping machine is equipped with a unit in the form of a hydraulic cylinder-and-piston drive for the common, step-by-step advance of this working unit and hence the tool frame. A levelling and lining reference system is associated with the tools for accurate positional correction of the track. Since the tool frame equipped with the tamping, lifting and lining units is supported on the track by a pair of support and guide wheels at its rear end adjacent the tamping unit, a considerable proportion of the weight and working forces of the tamping, lifting and lining units is transmitted to the track through the pair of support and guide wheels during the advance of the tool frame. Accordingly, the main frame of the tamping machine which advances continuously during the step-by-step advance of the tool frame is subjected to much less static and dynamic stressing. Since, in addition, the juddering and vibration are kept away from, above all, the operator's cabin of the tamping machine which is connected to the continuously advancing main frame, considerably improved working conditions are obtained for the operator. This machine concept was the first practical embodiment of this new tamping technology of continuous (non-stop) advance and cyclic tamping of the track.

A continuously advancing (non-stop) track tamping, levelling and lining machine supported by on-track undercarriages of the type described at the beginning is known from AU-PS 563 473, which is a further development of the same Applicants or Patentees. The main difference between this machine and the machine according to AU-PS 56o 265 described at the beginning is that the tool frame advancing step-by-step, for example as shown in Figure 1, comprises a pair of support and guide wheels which, like one of the

undercarriages of the main frame, comprises its own axle drive and its own brake arrangement serving as a unit for the common step-by-step advance of the working units. In addition, according to another embodiment shown in Figure 3 or 4, the tool frame advancing in steps, which carries the working units, is mounted on two undercarriages spaced relatively far apart from one another to form a daughter vehicle. The tamping, lifting and lining units are again arranged on the tool frame in front of (in the working direction) and within immediate view of an operator's cabin connected to and advancing continuously with the main frame. In addition, for step-by-step advance, the tool frame is pivotally connected to the main frame by a hydraulic cylinder-and-piston assembly which also acts as a locking unit. This further development has also been successfully used in practice. In particular, an even better and uninterrupted relative displacement between the main frame and the tool frame is obtained through the axle drive and the brake arrangement of the tool frame undercarriage.

In addition, Applicants' or Patentees' AU-PS 557 992 describes another continuously advancing (non-stop) machine for tamping the sleepers of a railway track. As shown in Figures 8 and 9 for example, this machine comprises a continuously advancing main frame supported by two undercarriages which is pivotally connected to a tool frame supported by two undercarriages for the vertically displaceable tamping and lifting/lining unit. The longitudinal displacement of the tool frame relative to the main frame is obtained by a hydraulic cylinder and an axle drive connected to an undercarriage so that the tool frame with the tamping unit can advance in steps from sleeper to sleeper while the machine or rather the main frame advances continuously (non-stop). A vertically displaceable track stabilizing unit with stabilizing tools operable by vib-

ration drives and designed to pivot laterally under the power of drives and a separate levelling reference system are provided on the main frame between the two undercarriages thereof so that the initial settlement of the track after tamping (during the continuous advance of the machine) under the weight of rail traffic can be anticipated and the resistance of the sleepers to transverse shifting on the ballast bed increased.

Another tamping machine designed to advance in steps with tamping, lifting and lining units between two on-track undercarriages arranged at either end of a machine frame is known from CH-PS 648 621. Of two driver's cabins arranged at either end of the machine, the front cabin (in the working direction) which is connected to an operator's cabin is mounted on the machine frame for displacement longitudinally of the machine and is connected to a hydraulic cylinder. In operation with the machine as a whole advancing in steps from sleeper to sleeper, the working/driver's cabin is intended to advance continuously during a tamping operation carried out with the machine at a standstill. When the machine advances to the next sleeper, the working/driver's cabin is intended to make a relative movement against the advance of the machine, the displacement path being measured by a vertically adjustable odometer. The object of all this design effort is to enable the operator to carry out a uniform continuous advance. However, a major disadvantage in this regard is that the entire machine - without the relatively light cabin - still has to be moved in steps from sleeper to sleeper with considerable energy and braking force, starting and stopping at each sleeper, so that tamping performance alone is not improved by a machine of this design in relation to a machine advancing in steps together with the operator's cabin. The proposal to design the control and monitoring cabin, which is displaceable relative to the machine, in such a way that

it can also be moved freely relative to the machine frame in the transverse direction and driven along the rails by means of flanged wheels, of which one is driven by a motor, also does not provide this arrangement with any advantages because all the drives are still provided in their own drive compartment which advances step-by-step. Accordingly, this machine has not hitherto been built for practical use.

Finally, Applicants' or Patentees' AU-PS 511 7o9 describes a tamping machine designed to advance in steps with vertically displaceable tool units situated between two undercarriages arranged at either end of a main frame. The main frame is preceded in the working direction by an additional frame which is connected to the main frame for longitudinal displacement by a hydraulic drive and which is supported on the track by an undercarriage arranged at the front end. A vertically displaceable ballast plough is connected to the additional frame between the undercarriage and the hydraulic longitudinal displacement drive. In operation, while the main frame, in the form of a tamping machine, advances in steps to tamp the track, the additional frame makes a corresponding relative displacement under the power of the hydraulic cylinder so that it is continuously advanced for uniform use of the ballast plough. Although the track can be uniformly ballasted for improved tamping by a track tamping machine of this type, tamping performance cannot be increased by comparison with machines advancing in steps which only line, level and tamp the track.

Now, the object of the present invention is to provide a continuously advancing (non-stop) track tamping, levelling and lining machine of the type described at the beginning which is simpler in construction, but shows improved tamping performance compared with tamping, levelling and lining machines advancing in steps.

According to the invention, this object is achieved in

that, in a machine of the type described at the beginning, the main frame, which is connected to and advances continuously with the operator's cabin, projects longitudinally of the machine through its undercarriage adjacent an on-track undercarriage of the tool frame and, with this projecting frame section, is mounted or supported for longitudinal displacement on the tool frame advancing in steps, the continuously advancing main frame comprising only a single undercarriage which is equipped with an axle drive and a brake arrangement. This particular arrangement or construction of the two frames longitudinally displaceable relative to one another and only a single undercarriage provides overall for a much simpler basic construction of a continuously advancing track tamping machine. This simplification of the tamping machine, apart from saving a second undercarriage for the main frame, also provides for a relatively thinner construction of the main frame through its single-ended support. In addition, because the main frame is supported at one end on the tool frame, the tool frame can be pressed with greater force onto the track, thus avoiding possible lifting of the tool frame when the tamping tools are penetrating in particular into hard, encrusted ballast. By virtue of its longitudinally displaceable mounting, the main frame can advantageously be continuously advanced with at least a large part of the weight or mass of the machine and, in particular, with the operator's cabin, so that power consumption and braking effort are also reduced in a machine according to the invention as compared with conventional tamping machines designed to advance in steps and the operator is not exposed to constantly changing acceleration and deceleration forces. Accordingly, with the tool frame longitudinally displaceable relative to the main frame, only a relatively small percentage of the machine's weight has to be accelerated in steps from sleeper to sleeper and stopped again.

In addition, a main frame having only one undercarriage is particularly easy to construct, the separate axle drive and separate brake arrangement providing for safe, continuous advance.

In another advantageous embodiment of the invention, both frames, namely the continuously advancing main frame and the tool frame advancing in steps, are designed to project longitudinally of the machine and, with their respective projecting frame sections, are mounted or supported for longitudinal displacement on the other frame through longitudinal roller mountings or guides provided on the main frame and on the tool frame. A construction such as this, through two relatively simple frames, not only provides for a simpler overall construction, it also enables the two undercarriages to be spaced relatively far apart from one another with the tamping, lifting and lining unit arranged in between, so that, even with the projecting frame sections pushed far into one another for the continuous lifting of the track, a sufficiently long rail curvature for safe positional correction of the track can be obtained, even during the lateral lining operation.

In one particularly simple and advantageous further development of the invention, both the continuously advancing main frame and the tool frame which is connected for longitudinal displacement thereto through its projecting frame section supporting the tamping, lifting and lining units comprise only a single undercarriage equipped with an axle drive and a brake arrangement, the axle drive of the single tool frame undercarriage preferably being in the form of a unit for the common step-by-step advance of the units. Even this very simple construction ensures that, through the separate axle drive and separate brake arrangement of the single undercarriage connected to the tool frame, the main frame can be advanced by its own axle drive in a uniform, continuous movement free from even

relatively slight jolting.

In another advantageous embodiment of the invention, the projecting part of the tool frame extends to beneath the operator's cabin arranged on the main frame in front of (in the working direction) and within immediate view of the units or into the region in front of or behind (in the working direction) the single undercarriage of the main frame, the projecting part of the main frame supported by its single undercarriage, preferably in the form of a bogie, preferably extending at least up to the single undercarriage, again preferably a bogie, supporting the tool frame and equipped with its own axle drive and brake arrangement and being supported for longitudinal displacement on the tool frame in this region by rollers and roller bearings or guides. By virtue of the fact that the main frame is supported above the single undercarriage associated with the tool frame, it is exposed to less flexural stressing, in addition to which the track which has already been tamped is capable of withstanding relatively heavy loads at this point immediately after the tamping unit, as is often desirable. In addition, this relatively simple but robust arrangement or design of the main frame spanning the entire tool frame affords the possibility of incorporating a two-sleeper tamping unit for the simultaneous tamping of two adjacent sleepers.

In another advantageous embodiment of the invention, the projecting section of the tool frame supported by a single undercarriage equipped with an axle drive and brake arrangement is mounted or guided for longitudinal displacement on the main frame above the single undercarriage connected thereto while the projecting section of the main frame, at its end connected to the operator's cabin, is mounted or guided for longitudinal displacement on the projecting section of the tool frame between the two single undercarrriages. In this embodiment, too, the fact that

the tool frame is supported at its end on the main frame above the single undercarriage associated with the main frame provides for a very robust construction which is also capable of withstanding relatively heavy loads and facilitates the arrangement of relatively powerful and heavy tamping units or even a two-sleeper tamping unit for the simultaneous tamping of two adjacent sleepers.

One particularly advantageous embodiment of the invention is characterized in that the single undercarriage provided with the axle drive and the brake arrangement is arranged in front (in the working direction) of the working units arranged on the tool frame to support the continuously advancing main frame. In addition to the advantageous possibility of controlling and observing the working units from a point situated in front of these units in the working direction, the preceding arrangement of the single undercarriage - connected to the main frame - with its axle drive and brake arrangement also has the advantage that the laterally acting reaction forces required in particular for lining of the track can be transmitted from the displaceable mounting of the tool frame to the main frame and can also be safely taken up by its undercarriage mounting.

According to another advantageous aspect of the invention, the projecting section of the continuously advancing main frame is mounted for longitudinal displacement on a tool frame advancing in steps supported by two undercarriages spaced apart from one another of which the trailing undercarriage (in the working direction) is equipped with an axle drive and a brake arrangement for the common step-by-step advance of the tamping, lifting and lining units, that end of the projecting section of the main frame which is connected to the operator's cabin preferably being guided or mounted for longitudinal displacement in front (in the working direction) of this trailing undercarriage or on the front end of the tool frame. This frame combin-

ation provides for a particularly short and simple but robust construction of the main frame which can be supported for longitudinal displacement very easily through the two-ended support of the tool frame on its own undercarriages without any flexural stressing of the tool frame. The operator's cabin arranged in the projecting section of the main frame, while retaining an unobstructed view of the tamping units, provides for comfortable and continuous carriage of the machine operator and for very simple and convenient arrangement of all the drive, brake, power supply and control systems on the main frame.

In one very practical embodiment of the invention, the operator's cabin arranged on the main frame advancing continuously on the single undercarriage is provided immediately in front of or behind (in the working direction) the tamping, lifting and lining units within immediate view of and above the working tools and between two driver's cabins provided at either end of the machine, particularly for in-transit journeys. Accordingly, the invention makes it possible for the first time for the operator's cabins to be arranged substantially centrally either in front of or behind the units; where they are arranged in front of the working units in the working direction, the operator is able to observe and control the tools of these units with his back to the direction of travel.

In another advantageous embodiment of the invention, the tamping unit and the lifting/lining unit arranged on the tool frame between two undercarriages spaced far apart from one another - to provide for a sufficiently long lifting and lining path - are arranged in this order immediately in front (in the working direction) of the undercarriage of the tool frame provided with its own axle drive and brake arrangement. Apart from being technologically the correct order, this sequence of the working units and the undercarriage - connected to the tool

frame - with its own axle drive provides the operator in the operator's cabin with an unobstructed and particularly clear view of the working units.

Another practical embodiment of the invention is characterized in that a plough arrangement provided with all drives is arranged on the main frame between the single undercarriage thereof and the following (in the working direction) undercarriage(s) of the tool frame provided with an axle drive and brake arrangement. Utilizing the continuous advance of the main frame with its own axle drive, this advantageous and very simple combination or construction provides for continuous and uniform ballasting of the track to enable the track to be uniformly tamped by the immediately following tamping units arranged on the tool frame.

In another advantageous embodiment of the invention, the single undercarriage supporting the continuously advancing main frame is arranged after the tamping, lifting and lining units (in the working direction) of the tool frame advancing in steps and supported by two undercarriages spaced far apart from one another, that end of the projecting section of the main frame which is connected to the operator's cabin being mounted or guided for longitudinal displacement on the tool frame above the rear undercarriage thereof. A construction such as this with a "trailing" arrangement of the main frame relative to the tool frame provides the operator with a direct view of the working units on the tool frame in the working direction in the hitherto known advantageous manner, the preceding section of track also being easier to survey at regular intervals. Through the arrangement of two undercarriages spaced far apart from one another on the tool frame, the main frame is relieved entirely of the weight of the tool frame connected to the working units.

In another advantageous embodiment of the invention,

at least one track stabilizer vertically adjustable by a drive and equipped with all drives and with a reference system is arranged on the main frame between the single undercarriage and the rear undercarriage of the tool frame provided with the axle drive and the brake arrangement. Through this particular construction of a combination of the two different tool units, the operations of track stabilization and tamping, which are totally different (continuous and cyclic) because of the necessary advance, can be combined in and carried out with advantage - utilizing the above-mentioned advantages of the continuously advancing tamping machine according to the invention - by a single machine structurally simplified in this way. This combination of a continuously advancing track tamping machine with a stabilizer of extremely simple basic design, in conjunction with the projecting section of the main frame, represents a particularly economical constructional solution.

In another particularly advantageous embodiment of the invention, the main frame equipped with the single undercarriage is connected at either end to an operator's cabin and driver's cabin and, on its projecting section with the longitudinal roller mountings or guides, is provided with a flanged wheel support designed to be raised and lowered trailer-fashion by a drive. This construction enables the main frame to be uncoupled quickly and simply from the tool frame on the track. In addition, the tool frame may also be used on its own, for example for small-scale tamping work, after uncoupling. It is also possible to combine the main frame with another tool frame for other special work.

In another advantageous embodiment of the invention, a locking unit operated by hand or by remote control is provided between the main frame designed to advance continuously under the power of the axle drive of its single undercarriage and the tool frame designed to advance in

steps under the power of the axle drive of its undercarriage, enabling the main frame and tool frame to travel together along the track, particularly on in-transit journeys. This locking unit enables the two frames to be rapidly interlocked so that the tamping machine formed by the two frames displaceable relative to one another can be prepared quickly and simply for in-transit journeys and may even be incorporated in a train formation.

Another advantageous embodiment of the invention is characterized in that a hydraulic piston-and-cylinder assembly pivotally connected to the tool frame and to the main frame and acting as a locking unit is provided in addition to the unit formed by the separate axle drive and separate brake arrangement on the undercarriage of the tool frame for the step-by-step advance of the tool units and is preferably designed for automatic control together with that unit, above all periodically, from the control console provided on the main frame. By means of a hydraulic piston-and-cylinder assembly which also acts as a locking drive, the tool frame together with its axle drive and brake arrangement can be accelerated or stopped even more quickly for increased tamping performance. The two frames displaceable relative to one another may advantageously be locked in any position.

Finally, in another advantageous embodiment of the invention, the brake arrangement and axle drive of the undercarriage of the tool frame may be or are automatically controlled by from the control console in dependence upon the work cycle, particularly the lifting and lowering, of the tamping unit through switching sensors or limit switches arranged thereon and preferably cooperating with delay elements or in dependence upon the step-by-step advance movement through an odometer arranged on the tool frame and/or on the main frame. This construction is of particular advantage for continuously advancing tamping

machines of the type in question because, if these movements are carried out quickly and accurately, it is possible to maximize the time required for the actual working movements, for example the squeezing movements or the lifting and lowering of the tamping tools. In addition, this automated step-by-step advance of the tool frame with the working units eliminates errors produced by operator fatique and always enables a uniform high tamping performance to be obtained, even after prolonged periods of operation. In addition, an odometer provides for the exact and automatic advance of the tool frame from sleeper to sleeper, particularly on new track with uniform sleeper intervals, so that tamping performance is always consistently high, even if the machine has been in use for prolonged periods.

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 track tamping, leevelling and lining machine according to the invention in which the projecting section of the main frame is mounted for longitudinal displacement above a single undercarriage of a tool frame advancing in steps which supports the tamping and track lifting and lining units.

Figure 2 is a diagrammatic plan view of the tamping machine shown in Figure 1.

Figure 3 is another example of embodiment of a continuously advancing tracking tamping machine according to the invention in which the tool frame is supported on two undercarriages.

Figure 4 shows another advantageous embodiment of the track tamping machine according to the invention in which the projecting section of a tool frame provided with the single undercarriage is mounted for longitudinal displace-

ment substantially above the single undercarriage of the main frame.

Figure 5 shows an embodiment of a continuously advancing track tamping machine according to the invention with a track stabilizer arranged on the main frame.

Figure 6 shows an embodiment of a track tamping machine according to the invention in which the continuously advancing main frame supported for longitudinal displacement on the tool frame is connected to a vertically displaceable plough arrangement.

A track tamping, levelling and lining machine 1 shown in Figure 1 consists of an elongate, upwardly recessed main frame 2 and a tool frame 3 arranged within the recessed section. The main frame 2 comprises a driver's or working cabin 4 at either end and, in the region of the tool frame, an operator's cabin 5 and also a power supply system 6 and is connected to only a single undercarriage 7. The single undercarriage 7 comprises an axle drive 9 and a brake arrangement 10 for the continuous advance of the main frame 2 in the working direction indicated by an arrow 8. The tool frame 3 is designed to travel on a track consisting of rails and sleepers through a single undercarriage 13 connected to an axle drive 11 and a brake arrangement 12 and is mounted for longitudinal displacement and for pivoting on two roller guides 14 connected to the main frame 2. The continuously advancing main frame 2 projects beyond its undercarriage 7 adjacent the undercarriage 13 of the tool frame 3 and is mounted at its front end (in the working direction) for longitudinal displacement on and supported by the tool frame 3 designed to advance in steps. This longitudinal displacement takes place through a roller guide 15 connected to the main frame 2, of which the rollers 16 with axes of rotation extending transversely of the longitudinal axis of the machine are guided or supported in a longitudinal guide 17 connected to the tool

frame 3 for supporting the projecting frame section 18 of the main frame 2.

A tamping unit 19 designed for vertical displacement under the power of drives comprising squeezable and vibratable tamping tools and a lifting and lining unit 20 designed for vertical and lateral displacement under the power of drives are arranged in a projecting frame section 18a of the tool frame 3. A locking unit 21 is provided between the main frame 2 advancing continuously under the power of the axle drive 9 of its single undercarriage 7 and the tool frame 3 advancing in steps under the power of the axle drive 11 of its single undercarriage 13, enabling the two frames 2 and 3 to travel together on in-transit journeys. The locking unit 21 consists of a holder 22 which is connected to the main frame 2 and in which a knockout bolt 23 is mounted for vertical displacement. The tool frame 3 comprises a bore in the region of the roller guide 14 to receive the bolt 23. All the drives of the track tamping machine 1, which is designed to travel on a track 24 consisting of sleepers and rails, are designed to be controlled from a central control console 25 in the operator's cabin 5. A levelling and lining reference system arrangement 26 is provided for the detection of errors in the position of the track. A hydraulic cylinder-and-piston assembly 27 privotally connected to the tool frame 3 and to the main frame 2 is provided in addition to the unit formed by the separate axle drive 11 and the separate brake arrangement 12 on the undercarriage 13 of the tool frame 3 for the step-by-step advance of the working units 19, 20. The step-by-step advance of the tool frame 3 together with the tamping and track lifting and lining unit 19, 20 from sleeper to sleeper is indicated by small arrows.

As shown in Figure 2 in particular, two rollers 16 spaced transversely apart from one another are mounted in

the roller guide 15 connected to the main frame 2. The rollers 16 are guided longitudinally of the machine by their own longitudinal guide 17. In the region of the frame section 18a projecting beyond the single undercarriage 13, the tool frame 3 is formed by two girders 28 which extend parallel to one another longitudinally of the machine and each of which comprises a bore to receive the bolt 23 in the region of the locking unit 21. The operator's cabin 5 is arranged substantially above and between the two girders 28 on the main frame 2 for the direct observation and control of the working tools or rather the units 19 and 20, providing for unimpeded displacement of the tool frame 3 relative to the main frame 2.

In the operation of the track tamping machine 1 in the working direction indicated by the arrow 8, the main frame 2 together with the driver's/working and operator's cabins 4, 5 connected thereto and the power supply 6 advances continuously (non-stop) along the track 24 by activation of the axle drive 9 of the single undercarriage 7 from the control console 25. During this continuous advance of the main frame 2, the tool frame 3 is moved in steps from sleeper to sleeper in the direction of the arrow. To this end, the axle drive 11 associated with the single undercarriage 13 of the tool frame 3 is activated from the central control console 25 on completion of the tamping operation and raising of the tamping unit 19. As a result, the tool frame 3 advances rapidly into its frontmost working position shown in dash-dot lines while the main frame 2 continues advancing without interruption. In this position, the tamping unit 19 is situated over the next sleeper in the working direction which is tamped immediately afterwards by lowering of the tamping unit 19. During the accelerated advance of the tool frame 3 and the subsequent braking by the brake arrangement 12, the rollers 16 travel longitudinally along the two longitudinal guides 17. Since

the two rollers 16 run along the recessed longitudinal guide 17, their longitudinal displacement is also accompanied by exact lateral guiding. On completion of the working run, the bolt 23 of the locking unit 21 is inserted into the bore of the tool frame 3 so that the two frames 2, 3 are fixed immovably to one another for the in-transit journey. The roller guide 14 may be mounted on the main frame 2 for transverse displacement under the power of remote-controlled drives so that, in operation on curved track, the working units 19, 20 can be better centred over the track 24.

A track tamping machine 29 shown in Figure 3 consists of a relatively short main frame 33 connected to operator's and driver's cabins 30, 31 and to a central power supply 32 and of an elongate tool frame 36 connected to tamping units 34 and a track lifting and lining unit 35. The front end of the main frame 33 in the working direction indicated by an arrow 37 is supported by a single undercarriage 38 on a track 41 consisting of sleepers 39 and rails 40. This single undercarriage 38 is connected to an axle drive 42 and a brake arrangement 43. A projecting section 44 of the continuously advancing main frame 33 supported only by a single undercarriage 38 is mounted for longitudinal displacement on the tool frame 36 advancing in steps and supported by two undercarriages 45, 46 spaced apart from one another. Of these two undercarriages 45, 46 of the tool frame 36, the rear undercarriage 46 is equipped with an axle drive 47 and a brake arrangement 48 for the common step-by-step advance of the tamping and lifting/lining units 34, 35. The section 44 of the main frame 33 which projects beyond the undercarriage 38 is supported on the front part of the tool frame 36 advancing in steps through a roller guide 49 connected to the main frame 33 and a roller 50. A longitudinal guide 51 is provided on the tool frame 36 for the longitudinal displacement of the rollers

50. The tamping unit 34 connected to the tool frame 36 and comprising squeezable and vibratable tamping tools 52 is designed for vertical displacement under the power of a drive 53. The lifting and lining unit 35 designed for application to the rail 40 and comprising lifting tools is connected to the tool frame 36 through lifting and lining drives 54. In addition, a driver's cabin 55 and a cover 56 are connected to the tool frame 36 at the rear end thereof, the cover 56 being mounted for longitudinal displacement on the operator's cabin 30. The track tamping machine 29 is equipped with a levelling and lining reference system arrangement 57 for correcting errors in the position of the track. All the drives on the two frames 33, 36 are controlled from a central control console 58 in the operator's cabin 30. The two frames 33, 36 are designed to be locked together for in-transit journeys by a locking unit similar to the locking unit 21 shown in Figure 1.

In operation, the operator sits in the operator's cabin 30 and, from the control console 58, activates the axle drive 42 for the continuous (non-stop) advance of the main frame 33 together with the cabins 30, 31 and the power supply 32. At the same time, the axle drive 47 of the undercarriage 46 connected to the tool frame 36 is only operated until the tool frame 36 has moved from the rear end position shown in dash-dot lines into the front end position shown in solid lines (see arrows 59). After the tamping tools 52 have been centred over the sleepers 39 to be tamped, the two-sleeper tamping unit 34 is lowered for tamping by activation of the drive 53. By corresponding activation of the lifting and lining drives 54 of the lifting and lining unit 35, the track 41 undergoes a corresponding vertical and trasverse displacement in accordance with the deviation from the set position of the track determined by the levelling and lining reference system arrangement 57. During the tamping operation which

takes place with the tool frame 36 locally stationary, the rollers 50 connected to the roller guide 49 are longitudinally displaced into the front end region of the longitudinal guide 51 as a result of the continuous advance of the main frame 33. The distance between the two undercarriages 38 and 45 is also increased until, on completion of the tamping operation and raising of the tamping unit 34, the axle drive 47 is activated so that the tool frame 36 is again accelerated forwards into the front end position shown in solid lines.

A continuously advancing (non-stop) track tamping, levelling and lining machine 60 shown in Figure 4 consists of a main frame 61 with a single undercarriage 62 in the form of a bogie and a tool frame 64 connected to a single undercarriage 63. The main frame 61 comprises a frame section 65 which projects beyond the undercarriage 62 and which is connected to a power supply 66, an operator's cabin 67 and a driver's/working cabin 68. The main frame 61 is U-shaped to accommodate the front end of the tool frame 64, the lower of the two parallel sides or frame sections comprising a longitudinal guide 69 for a roller mounting 71 comprising rollers 70 and connected to the tool frame 64. The projecting section 65 of the main frame 61 is also connected to a roller mounting 73 comprising rollers 72. The rollers 72 are mounted for longitudinal displacement in a longitudinal guide 74 connected to the tool frame 64. The single undercarriage 62 in the form of a bogie connected to the main frame 61 comprises an axle drive 75 and a brake arrangement 76. A control console 77 in the operator's cabin 67 is provided for the control of all drives on the tamping machine 60.

A hydraulic cylinder-and-piston assembly 82 pivotally connected to the tool frame 64 and to the main frame 61 and acting as a locking unit 81 is provided in addition to the unit 80 formed by a separate axle drive 78 and a separate

brake arrangement 79 on the undercarriage 63 of the tool frame 64 for the step-by-step advance thereof. Immediately in front of the single undercarriage 63 in the working direction of the tamping machine 60 indicated by an arrow 83, a tamping and lifting/lining unit 84, 85 is connected for vertical displacement to the tool frame 64. The tampirg unit 84, which comprises squeezable and vibratable tamping tools 86, is designed for vertical displacement under the power of a drive 87. Lifting and lateral lining drives 88, 89 are provided on the tool frame 64 for the vertical and lateral adjustment of the lifting/lining unit 85 designed to be applied to the rails by lifting rollers. The brake arrangement 79 and the axle drive 78 of the undercarriage 63 connected to the tool frame 64 are designed to be automatically controlled from the control console 77 through limit switches 90 connected to the tool frame 64 and delay elements cooperating therewith in dependence upon the work cycle and, in particular, the lifting and lowering of the tamping unit 84. A levelling and lining reference system arrangement 94 consisting of stretched wires and feeler rollers is provided for detecting errors in the vertical and lateral position of a track 93 consisting of sleepers 91 and rails 92, the feeler rollers 95 being mounted for vertical displacement on the tool frame 64. The two limit switches 90 and the longitudinal guide 74 are arranged on a projecting section 96 of the tool frame 64.

In operation, the axle drive 75 is activated from the central control console 77 for the continuous advance of the main frame 61 together with the cabins 67, 68 and the power supply 66. At the same time, the tool frame 64 connected to the working units 84 and 85 advances in steps from sleeper to sleeper in the direction of the small arrows 97 through alternate activation of the axle drive 78 and the brake arrangement 79. During lowering of the tamping unit 84 through activation of the drive 87 for tamping

the underlying sleepers 91, a relative displacement takes place in relation to the continuously advancing main frame 61 through the stoppage of the tool frame 64. At the same time, the rollers 70 and 72 run along the two longitudinal guides 69 and 74. The two limit switches 90 ensure that the longitudinal displacement of the rollers 70, 72 only takes place within the longitudinal guides 69 and 74. The hydraulic cylinder-and-piston assembly 82 is used to support the step-by-step advance of the tool frame 64 by the axle drive 78 and the brake arrangement 79. Under the power of the hydraulic cylinder-and-piston assembly 82, the two frames 61 and 64 are moved rapidly towards one another for the rapid advance of the tool frame 64 on completion of tamping. After the tool frame 64 has reached its front end position (dash-dot lines), it can also be rapidly braked by blocking the supply of pressure medium to support the brake arrangement 79. In all these operations, the operator's cabin 67 connected to the main frame 61 continues to advance steadily and uniformly without stopping.

A continuously advancing (non-stop) track tamping machine 98 shown in Figure 5 consists of a preceding tool frame 100 designed to advance in steps and a following main frame 101 supported for longitudinal displacement thereon in the working direction indicated by an arrow 99. The tool frame 100, which is connected to a vertically adjustable double tamping unit 102 and to a lifting and lining unit 103 designed for vertical and lateral displacement under the power of drives, is supported by two undercarriages 104, 105 arranged at either end on a track consisting of sleepers 106 and rails 107. Of these two undercarriages 104, 105, the rear undercarriage in the working direction is equipped with an axle drive 108 and a brake arrangement 109. For simultaneously tamping two adjacent sleepers 106, the tamping unit 102 designed for vertical displacement under the power of a drive 110 comprises four

tamping tools 111 aqueezable and vibratable by drives and arranged one behind the other longitudinally of the machine for each longitudinal side of a rail. A driver's cabin 112 for in-transit journeys is indicated by chain lines at the front end of the tool frame 100. A hydraulic cylinder-and-piston assembly 115 pivotally connected to the tool frame 100 and to the main frame 101 and acting as a locking unit 114 is provided in addition to the unit 113 formed by the separate axle drive 108 and the separate brake arrangement 109 on the undercarriage 104 of the tool frame 100 for the step-by-step advance of the working units 102, 103. The hydraulic cylinder-and-piston assembly, together with the unit 113, is preferably designed for automatic control from the central control console 117 in an operator's cabin 116.

The main frame 101 which is connected to a driver's/working cabin 118 and to a power supply 119 is supported on the track at its rear end by a single undercarriage 122 equipped with a axle 120 and a brake arrangement 121. Through a frame section 123 projecting beyond the undercarriage 122 in the working direction, the continuously advancing main frame 101 is supported for longitudinal displacement on the tool frame 100 designed to advance in steps. The main frame 101 is supported in this manner by way of a roller mounting 124 which is connected to the main frame 101 and which is designed to travel in a longitudinal guide 126 with guide rollers 125 connected to the tool frame 100 for rotation about a vertical axis. A track stabilizer 128 designed for vertical displacement and for application to the track under the power of drives 127 is arranged with a vibration drive 129 on the main frame 101 between the single undercarriage 122 thereof of the main frame 101 provided with the axle drive 120 and the brake arrangement 121 and the undercarriage 104 of the tool frame 100 provided with the axle drive 108 and the brake arrangement 109. The section 123 of the main frame 101

which is connected to the roller guide 124 and projects beyond the undercarriage 122 is connected to a flanged wheel support 131 designed to be raised and lowered trailer-fashion under the power of a drive 130. A levelling and lining reference system arrangement 132 is provided for detecting errors in the vertical and lateral position of the track and for the controlled lowering of the tamped track by the track stabilizer 128. The brake arrangement 109 and the axle drive 108 of the undercarriage 104 of the tool frame 100 are automatically controllable through an odometer 133 in dependence upon the step-by-step advance. An inductive transducer 134 cooperating with the rail fastenings or screws is provided in the region of the tamping unit 102 and is connected to the control console 117 by a corresponding control line.

In operation, the preceding tool frame 100 is advanced in steps in the direction of the arrows 135 by brief activation of the axle drive 108 and/or the hydraulic cylinder-and-piston assembly 115, the tamping tools 102 for simultaneously tamping two adjacent sleepers being lowered after the stoppage of the tool frame 100 by the brake arrangement 109 and the blocking of the hydraulic cylinder-and-piston assembly 115. At the same time, the main frame 101 together with the operator's cabin 116 is continuously advanced by the axle drive 120, the tamped track being lowered under control by means of the track stabilizer 128. Under the effect of the continuous advance of the main frame 101 on the one hand and the step-by-step advance of the tool frame 100 on the other hand, there is a constant, but minor relative displacement in the region of the longitudinal guide 126 which varies in relation to the working direction. Accordingly, the mounting of the longitudinal guide 126 on the tool frame 100 for rotation about a vertical axis ensures that even narrow curves in the track can be handled without difficulty by the tamping

machine 98. Since the tool frame 100 is able to advance by two sleepers at a time by virtue of the double tamping unit 102, the main frame 101 together with the track stabilizer 128 can be continuously advanced at increased speed. The step-by-step advance of the tool frame 100 may be controlled automatically by the operator in the operator's cabin 116 or by the odometer 133. The odometer 133 releases a control pulse to the control console 117 per unit distance travelled by the tool frame 100, the control unit controlling the supply of pressure medium to the hydraulic cylinder-and-piston assembly 115 accordingly so that the tool frame 100 with the tamping units 102 remains centred over the sleeper to be tamped until tamping is complete. When the tamping units 102 are raised, the control console 117 reverses the hydraulic cylinder-and-piston assembly 115 and/or the axle drive 108 accordingly, so that the tool frame 100 is accelerated until the tamping units 102 are centred over the next sleepers to be tamped. When the tamping units 102 are lowered, the odometer 133 is automatically set to zero, after which a new work cycle begins. The tamping unit 102 can be centred exactly over the two sleepers to be tamped by the inductive transducer 134 on the tool frame 100. For in-transit journeys, the two frames 100, 101 are immovably locked together by the hydraulic cylinder-and-piston assembly 115 and, optionally, by another mechanical locking unit. After the piston rod of the hydraulic cylinder-and-piston assembly 115 has been uncoupled from the main frame 101, the two frames 100, 101 can be separated through the pivoting of the flanged wheel support 131 onto the rails (dash-dot lines), so that the tool frame 100 may be used on its own, for example for relatively small-scale tamping work, or may be combined with a differently equipped main frame 139.

A continuously advancing (non-stop) track tamping machine 136 shown in Figure 6 consists of a leading main

frame (in the working direction indicated by an arrow 137) supported by a single undercarriage 138 and a trailing tool frame 142 arranged for longitudinal displacement in relation to the main frame 139 and supported by two undercarriages 140, 141 spaced apart from one another. The rear undercarriage 141 of the tool frame 142 is equipped with an axle drive 143 and a brake arrangement 144. A driver's/working cabin 145 arranged at the rear end is provided for in-transit journeys. A vertically displaceable tamping unit 146 comprising squeezable and vibratable tamping tools and a lifting and lining unit 147 connected to lifting and lining drives is connected to the tool frame 142 immediately in front of the undercarriage 141. A hydraulic cylinder-and-piston assembly 150 pivotally connected to the tool frame 142 and to the main frame 139 and acting as a locking unit 149 is provided in addition to the unit 148 formed by the separate axle drive 143 and the separate brake arrangement 144 on the undercarriage 141 of the tool frame 142 for the step-by-step advance of the working units. The piston-and-cylinder assembly 150 together with the unit 148 for the step-by-step advance of the working units is designed to be automatically controlled from the control console 152 provided in an operator's cabin 151 on the main frame 139. In addition to the operator's cabin 151, the main frame 139 is connected to a power supply 153 and a driver's cabin 154. A vertically displaceable plough arrangement 158 provided with drives 157 is arranged on the main frame 139 between its undercarriage 138 provided with an axle drive 155 and a brake arrangement 156 and the undercarriage 140 of the tool frame 142. A flanged wheel support 160 designed to be raised and lowered trailer-fashion under the power of a drive 159 is arranged immediately behind the plough arrangement 158. The rear end or projecting section of the main frame 139 is connected to a bogie-like roller mounting 162 mounted for

rotation about a vertical axis 161 with flanged rollers 163 spaced apart from one another longitudinally of the machine. The rollers 163, which are designed to rotate about a horizontal axis extending transversely of the longitudinal axis of the machine, are designed to travel in longitudinal guides 164 connected to the tool frame 142. Side guide rollers 165 rotatable about a vertical axis are connected to the tool frame 142 for the positive guiding of the rollers 163 in the longitudinal guide 164. Provided at either longitudinal end of the longitudinal guides 164 are limit switches 166 which are connected to the control console 152 and which limit the maximum step-by-step displacement of the tool frame relative to the main frame 139. An odometer 167 and an inductive transducer 168 are also connected to the central control console 152. The track tamping machine 136 - with the tool frame 142 and the main frame 139 and its projecting frame section 171 - which is designed to travel on a track consisting of sleepers 169 and rails 170 is equipped with a levelling and lining reference system arrangement 172 for detecting errors in the vertical position of the track.

In the operation of the track tamping machine 136, the main frame 139 together with the operator seated in the operator's cabin 151 is continuously advanced in the direction of the arrow 137 after activation of the axle drive 155. The plough arrangement 158 may be lowed onto the track as required in order uniformly to ballast the track. During the continuous advance of the main frame 139, the tool frame 142 is advanced in steps from sleeper to sleeper (see small arrows) by brief activation of the axle drive 143 and the hydraulic cylinder-and-piston assembly 149. By blocking the supply of pressure medium to the hydraulic cylinder-and-piston assembly 148 and by operation of the brake arrangement 144, the tool frame 142 is brought rapidly to a stop to carry out the tamping work, the

tamping tools of the tamping unit 146 being lowered into the sleeper cribs. Due to the stationary tool frame 142 and the continuously advancing main frame 139, the tool frame 142 undergoes a relative displacement from the front end position shown in dash-dot lines into the rear end position shown in solid lines. To this end, the rollers 163 in the form of flanged wheels run along the longitudinal guides 164, pivotal adaptation of the frames 139, 142 to curved track being possible by virtue of the axis 161. On completion of tamping, the tamping unit 146 is raised and the tool frame 142 together with the working units 146 and 147 is accelerated into the front end position (dash-dot lines) by activation of the axle drive 143 and the hydraulic cylinder-and-piston assembly 150, the distance travelled being measured by the odometer 167 which has been reset to zero. After the distance corresponding to an average sleeper interval and fed into the control console 152 for the step-by-step advance of the tool frame 142 has been reached, the supply of pressure medium to the hydraulic cylinder-and-piston assembly 150 and the axle drive 143 is automatically stopped and the brake arrangement 144 activated. However, this step-by-step advance of the tool frame 142 may also be manually controlled by the operator from the control console 152. If, as a result of overlong stoppage of the tool frame 142 or over-rapid advance of the continuously advancing main frame 139, the relative displacement is too long so that the front limit switch 166 is reached, the speed of the continuous advance is reduced and/or immediate acceleration of the tool frame 142 is initiated. If the rear limit switch 166 is operated by the rear end of the main frame 139, the speed of the continuously advancing main frame 139 is automatically increased. The front feeler roller of the levelling and lining reference system arrangement 172, which runs along the rails 170, is connected for vertical displacement to

the tool frame 142 and is guided through a slot-like opening in the main frame 139, so that the entire arrangement 172 is able to advance in steps with the tool frame 142 free from any interference. By pivoting of the flanged wheel support 160 into the position shown in dash-dot lines, the two frames 139, 142 may readily be separated from one another, after which the main frame 139 for example may be connected in the same way to a tool frame comprising a two-sleeper tamping unit to obtain increased tamping performance while the self-propelled tool frame 142 advancing in steps with its tamping, lifting and lining unit 146, 147 may be used on another track.

The claims defining the invention are as follows:

1. A continuously advancing (non-stop) track tamping, levelling and lining machine supported by on-track undercarriages and comprising a main frame, which supports the operator's cabin for the working tools and the drive, brake, power supply and control systems and which comprises at least one on-track undercarriage equipped with an axle drive and a brake arrangement, and a tool frame which is connected for longitudinal displacement to the main frame and comprises at least one on-track undercarriage and on which are arranged the tamping, lifting and lining units and their associated drives provided between two undercarriages spaced far apart from one another in the immediate view of the operator's cabin connected to and advancing continuously with the main frame; and further comprising a unit for the common step-by-step advance of these units and a levelling and lining reference system associated with the unit tools, characterized in that the main frame, which is connected to and advances continuously with the operator's cabin projects longitudinally of the machine through its undercarriage adjacent an on-track undercarriage of the tool frame and, with this projecting frame section, is mounted or supported for longitudinal displacement on the tool frame advancing in steps, continuously advancing main frame comprising only a single undercarriage which is equipped with an axle drive and a brake arrangement.

2. A machine as claimed in claim 1, characterized in that both frames, namely the continuously advancing main frame and the tool frame advancing in steps, are designed to project longitudinally of the machine and, with their respective projecting frame sections, are mounted or supported for longitudinal displacement on the other frame through longitudinal roller mountings or guides provided on the main frame and on the tool frame.

3. A machine as claimed in claim 1 or 2, characterized in that both the continuously advancing main frame and the tool frame which is connected for longitudinal displacement thereto through its projecting frame section supporting the tamping, lifting and lining units comprise only a single undercarriage

equipped with an axle drive and a brake arrangement, the axle drive of the single tool frame undercarriage preferably being in the form of a unit for the common step-by-step advance of the units.

4. A machine as claimed in claim 2 or claim 3, when appended to claim 2, characterized in that the projecting frame section of the tool frame extends to beneath the operator's cabin arranged on the main frame in front of (in the working direction) and within immediate view of the units or into the region in front of or behind (in the working direction) the single undercarriage of the main frame, the projecting frame section of the main frame supported by its single undercarriage, preferably in the form of a bogie, preferably extending at least up to the single undercarriage, again preferably a bogie, supporting the tool frame and equipped with its own axle drive and brake arrangement and being supported for longitudinal displacement on the tool frame in this region by rollers and roller bearings or guides.

5. A machine as claimed in any one of claims 1 to 4, characterized in that the projecting section of the tool frame supported by a single undercarriage equipped with an axle drive and brake arrangement is mounted or guided for longitudinal displacement on the main frame above the single undercarriage connected thereto while the projecting section of the main frame, at its end connected to the operator's cabin, is mounted or guided for longitudinal displacement on the projecting section of the tool frame between the two single undercarriages.

6. A machine as claimed in any one of claims 1 to 5, characterized in that the single undercarriage provied with the axle drive and the brake arrangement is arranged in front (in the working direction) of the working units arranged on the tool frame to support the continuously advancing main frame.

7. A machine as claimed in any one of claims 1 to 6, characterized in that the projecting section of the continuously advancing main frame is mounted for longitudinal displacement on a tool frame advancing in steps supported by two undercarriages spaced apart from one another of which the

trailing undercarriage (in the working direction) is equipped with an axle drive and a brake arrangement for the common step-by-step advance of the tamping, lifting and lining units, that end of the projecting section of the main frame which is connected to the operator's cabin preferably being guided or mounted for longitudinal displacement in front (in the working direction) of this trailing undercarriage or on the front end of the tool frame.

8. A machine as claimed in any one of claims 1 to 7, characterized in that the operator's cabin arranged on the main frame advancing continuously on the single undercarriage is provided immediately in front of or behind (in the working direction) the tamping, lifting and lining units within immediate view of and above the working tools and between two driver's cabins provided at either end of the machine, particularly for in-transit journeys.

9. A machine as claimed in any one of claims 1 to 8, characterized in that the tamping unit and the lifting/lining unit arranged on the tool frame between two undercarriages spaced far apart from one another - to provide for a sufficiently long lifting and lining path - are arranged in this order immediately in front (in the working direction) of the undercarriage of the tool frame provided with its own axle drive and brake arrangement.

10. A machine as claimed in any one of claims 1 to 9, characterized in that a plough arrangement provided with all drives is arranged on the main frame between the single undercarriage thereof and the following (in the working direction) undercarriage(s) of the tool frame provided with an axle drive and brake arrangement.

11. A machine as claimed in any one of claims 1 to 9, characterized in that the single undercarriage supporting the continuously advancing main frame is arranged after the tamping, lifting and lining units (in the working direction) of the tool frame advancing in steps and supported by two undercarriages spaced far apart from one another, that end of the projecting section of the main frame which is connected to the operator's cabin being mounted or guided for longitudinal displacement on the tool frame above the rear undercarriage

thereof.

12. A machine as claimed in claim 11, characterized in that at least one track stabilizer vertically adjustable by a drive and equipped with all drives and with a reference system is arranged on the main frame between the single undercarriage and the rear undercarriage of the tool frame provided with the axle drive and the brake arrangement.

13. A machine as claimed in any one of claims 1 to 12, characterized in that the main frame equipped with the single undercarriage is connected at either end to an operator's cabin and driver's cabin and, on its projecting section with the longitudinal roller mountings or guides, is provided with a flanged wheel support designed to be raised and lowered trailer-fashion by a drive.

14. A machine as claimed in any one of claims 1 to 13, characterized in that a locking unit operated by hand or by remote control is provided between the main frame designed to advance continuously under the power of the axle drive of its single undercarriage and the tool frame designed to advance in steps under the power of the axle drive of its undercarriage, enabling the main frame and tool frame to travel together along the track, particularly on in-transit journeys.

15. A machine as claimed in any one of claims 1 to 14, characterized in that a hydraulic piston-and-cylinder assembly pivotally connected to the tool frame and to the main frame and acting as a locking unit is provided in addition to the unit formed by the separate axle drive and separate brake arrangement on the undercarriage of the tool frame for the step-by-step advance of the tool units and is preferably designed for automatic control together with that unit, above all periodically, from the control console provided on the main frame.

16. A machine as claimed in any one of claims 1 to 15, characterized in that the brake arrangement and axle drive of the undercarriage of the tool frame may be or are automatically controlled from the control console in dependence upon the work cycle, particularly the lifting and lowering, of the tamping unit through switching sensors or limit switches arranged thereon and preferably cooperating

with delay elements or in dependence upon the step-by-step advance movement through an odometer arranged on the tool frame and/or on the main frame.

17. A continuously advancing (non-stop) track tamping, levelling and lining machine, substantially as hereinbefore described with reference to any one of the embodiments illustrated in the accompanying drawings.

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Fig.1

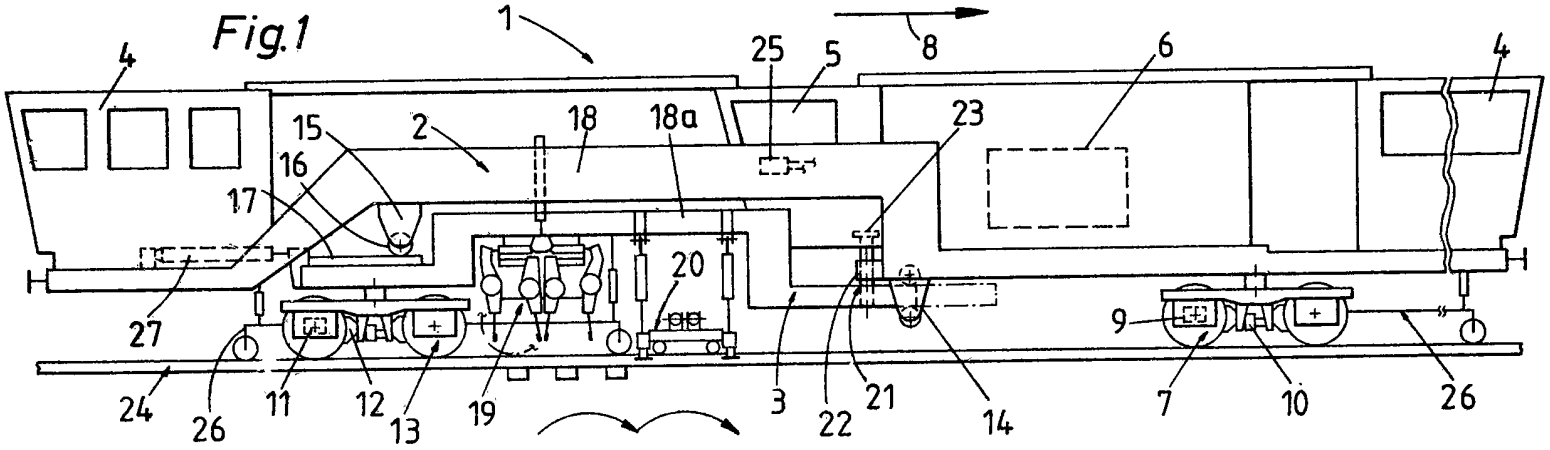

Fig. 2

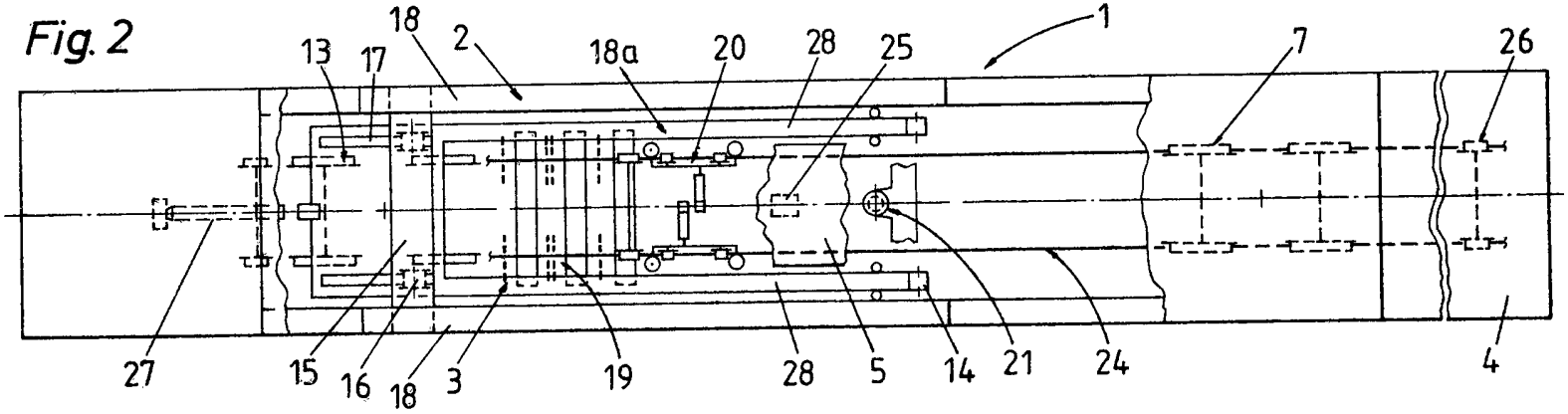

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Fig.3

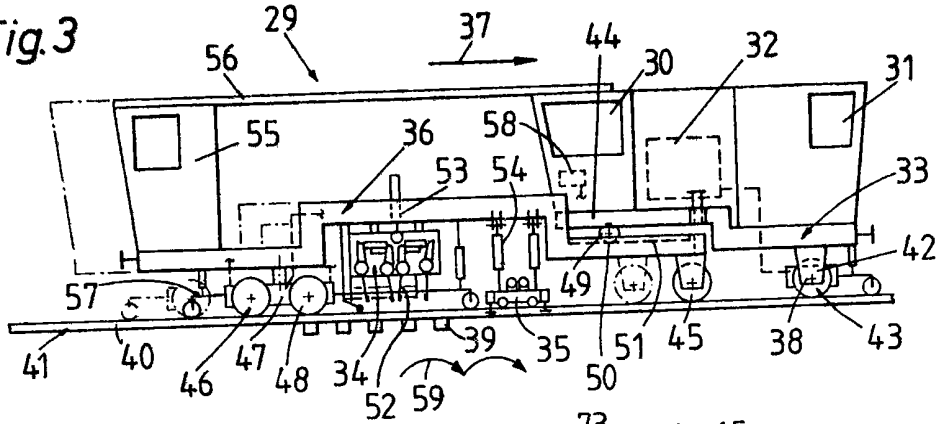

Fig.4

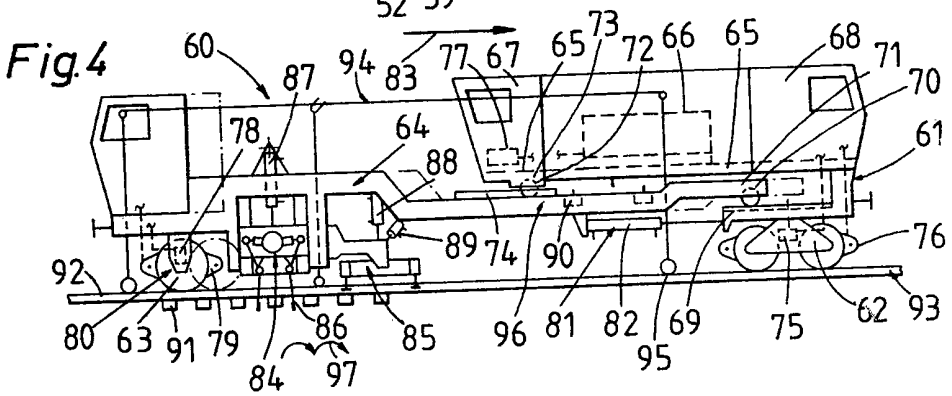

Fig.5

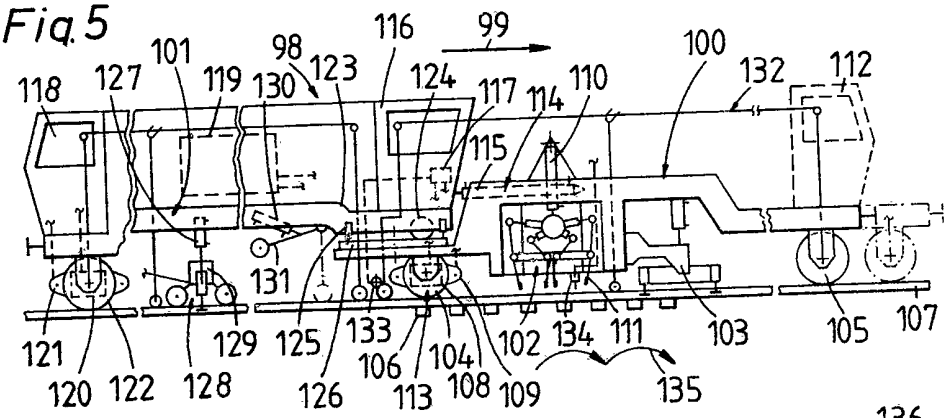

Fig.6