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APPLICATION FOR A (h) STANDARD/PATENT

We (c) Franz Plasser Bahnbaumaschinen-
Industriegesellschaft m.b.H.

of (d) A-1010 Wien,
Johannesgasse 3,
AUSTRIA.

hereby apply for the grant of a (e) Standard/PATENT for an invention entitled

(f) "TAMPING MACHING WITH LIFTING-, TAMPING-
AND OPTIONAL DIRECTIONAL AGGREGATE"

which is described in the accompanying (g) complete specification.

(Note: The following applies only to Convention applications)

Details of basic application(s)

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<th>Application No.</th>
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<td>A 358/86</td>
<td>Austria</td>
<td>12 February, 1986</td>
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Address for Service: PHILLIPS ORMONDE AND FITZPATRICK
Patent and Trade Mark Attorneys
367 Collins Street
Melbourne, Australia 3000

Dated (i) 9 October, 1986.

PHILLIPS ORMONDE AND FITZPATRICK
Attorneys for:
FRANZ PASSER BAHNBAUMASCHINE-
INDUSTRIEGESSELLSCHAFT M.B.H.

PHILLIPS ORMONDE AND FITZPATRICK
Patent and Trade Mark Attorneys
367 Collins Street
Melbourne, Australia
DECLARATION FOR A PATENT APPLICATION

In support of the (0) CONVENTION application made by

FRANZ Plasser Bahnbaumaschinen-Industriegesellschaft M.B.H.

(hereinafter called "applicant(s) for a patent (c) for an
invention entitled (d)

TAMPING MACHINE WITH LIFTING-, TAMPPING- AND OPTIONAL
DIRECTIONAL AGGREGATE"

(i)

Joseph Theurer, technical supervision
A-1010 Wien, Johannesgasse 3, Austria

do solemnly and sincerely declare as follows:

1. I am/we are the applicant(s).
   (or, in the case of an application by body corporate)

2. I am/we are the actual inventor(s) of the invention.
   (or, where the applicant(s) is/are not the actual inventor(s))

3. Applicant is the assignee of the invention from
   the actual inventor.

(Note: Paragraphs 3 and 4 apply only to Convention applications)

3. The basic application(s) for patent or similar protection on which the application is based
   is/are identified by country, filing date, and basic applicant(s) as follows:

   Austria
   12 February, 1986
   Franz Plasser Bahnbaumaschinen-Industriegesellschaft m.b.H.

4. The basic application(s) referred to in paragraph 3 hereof was/were the first application(s)
   made in a Convention country in respect of the invention the subject of the application.

Declared at (k) Vienna.

Dated (l) FRANZ PLASSER

(m) Signature, declarant.

M. 7, 1986

To: The Commissioner of Patents

(Josef Theurer)

P18/10/83

PHILLIPS ORMONDE & FITZPATRICK
Patent and Trade Mark Attorneys
367 Collins Street
Melbourne, Australia
1. A track tamping machine comprising at least one tamping and lifting unit connected to the machine frame and arranged between two undercarriages spaced sufficiently far apart from one another for the lifting operation, said unit comprising tamping tools designed to penetrate into the ballast, to be squeezed towards one another and to be vibrated by a drive and said machine - in the form of a standard vehicle equipped with its own axle drive - comprising on the machine frame a ballast receiving and storage unit with variable outlet openings preceding the tamping and lifting unit in the working direction for distributing ballast over the sleeper cribs, characterized in that the machine is designed for universal application as a tamping, levelling and optionally lining machine comprising tamping tools designed to penetrate into the ballast, to be squeezed towards one another and to be vibrated by a drive and a reference system, more especially for incorporation in a track relaying train or behind a ballast cleaning machine or in conjunction with a ballast transporting and loading train or even

.../2
solely for use as a dedicated track tamping machine, the ballast receiving and storage unit being preceded by at least one conveyor train arranged on the machine frame for the delivery of ballast from the front end of the machine.
Complete Specification for the invention entitled:

"TAMPING MACHINE WITH LIFTING-, TAMPING AND OPTIONAL DIRECTIONAL AGGREGATE"

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 track tamping machine comprising at least one tamping and lifting unit connected to the machine frame and arranged between two undercarriages spaced sufficiently far apart from one another for the lifting operation, said unit comprising tamping tools designed to penetrate into the ballast, to be squeezed towards one another and to be vibrated by a drive and said machine - in the form of a standard vehicle equipped with its own axle drive - comprising on the machine frame a ballast receiving and storage unit with variable outlet openings preceding the tamping and lifting unit in the working direction for distributing ballast over the sleeper cribs.

Applicants' AU-PS 542 980 relates to a track tamping machine advancing in steps from sleeper to sleeper and comprising a lifting, tamping and lining unit with a reference system connected to the machine frame and arranged between two undercarriages spaced sufficiently far apart from one another for the lifting and lining operation. Track tamping machines of this kind equipped with squeezable and vibratable tamping tools designed to penetrate into the ballast may be used together with other track construction machines, such as for example a ballast cleaning machine preceding the tamping machine and a stabilization machine following the tamping machine, to form a so-called multiple-function train (MFT). These individual machines are all self-propelled. In this way, the ballast taken up by the conveyor chain of the ballast cleaning machine, cleaned and returned to the subgrade is consolidated in the region of the sleeper bearing surfaces in virtually one operation by the immediately following track tamping machine, so that
an accurate and stable track position is obtained after the MFT has finished its work. However, the sleeper bearing surfaces tamped by the tamping tools are not always uniform on account of the irregular distribution of the cleaned ballast by the distributing elements of the cleaning machine. In addition, Applicants' GB-PS 2 135 369 B describes continuously advancing (non-stop) track tamping machines comprising a main frame mounted on undercarriages and - pivotally connected thereto - a tool carrying frame which carries the squeezable and vibratable tamping tools designed to penetrate into the ballast bed and which is supported on the track between two undercarriages spaced apart from one another. Arranged on this tool carrying frame comprising a supporting and guiding undercarriage and pivotally supported on the main frame at a longitudinal distance therefrom - immediately in front of the supporting and guiding undercarriage - is the tamping unit which is preceded by the track lifting and lining unit together with the associated lifting and lining drives. At the point where it is mounted on the main frame, the tool carrying frame which is designed to advance in steps from sleeper to sleeper is arranged for displacement by a hydraulic piston-and-cylinder drive. It was this construction which, for the first time, led to the now successful continuous (non-stop) track tamping machine which not only has a higher performance, but also offers hitherto unachieved working comfort, saves energy and, in particular, eases the load on the axle drive and brakes of the main frame because no sudden acceleration or breaking and no vibration are transmitted to the operator's cabin on the main frame so that the operator's cabin is no longer exposed to such sudden stressing.

In addition, Applicants' GB-OS 2 127 468 A describes a continuous (non-stop) ballast cleaning machine comprising
a conveyor chain guided around the track and an additional laterally arranged conveyor chain and also a vibrating sieve which is preceded in the working direction by a track lifting and tamping unit. The frame of this lifting and tamping unit, which is designed for step-by-step advance under the power of a longitudinal displacement drive, is pivotally connected to the frame of the ballast cleaning machine. With this preceding track lifting and tamping unit comprising squeezable tamping tools designed to penetrate into the ballast bed, the track can be raised by tamping so that, in the following cleaning operation, the track is not subjected to excessive bending by the transverse part of the conveyor chain guided transversely beneath the track.

In addition, Applicants' GB-PS 2 112 840 B describes a continuous (non-stop) machine for continuous formation rehabilitation in conjunction with a track tamping and lifting unit. This machine consists essentially of a working vehicle with a clearing chain and conveyor belt arrangements for the separate delivery of sand and ballast and track transporting vehicles following this working vehicle with a crane runway extending over their entire length. The sand ballast required for rehabilitation is carried in containers which are emptied by means of a gantry crane into a sand storage bin arranged on the working vehicle and into a following ballast storage bin arranged on the transporting vehicle. Between its two undercarriages arranged at either end and following the ballast storage bin, the track transporting vehicle immediately following the working vehicle comprises on the one hand a tamping unit designed for longitudinal displacement along a runway of the machine frame under the power of a hydraulic piston-and-cylinder drive and comprising squeezable and vibratable tamping tools designed to penetrate into the ballast bed and a track.
lifting unit and, on the other hand, a reference system associated with these units. The rear end of the conveyor belt arrangement for transporting ballast to the ejection point behind the clearing chain is arranged beneath the ballast storage bin. However, a formation rehabilitation machine such as this requires particularly efficient transport for the sand and ballast because the entire ballast bed is renewed in a single operation by laying of a layer of sand and a ballast bed. In conjunction with machines for the continuous replacement of tracks consisting of rails and sleepers, for example according to Applicants' AU-PS 510 521, a machine for the rapid fixing or loosening of rail and sleeper fastenings is known from Applicants' GB-PS 1 293 912 which comprises on an undercarriage-mounted frame a number of underfloor cabins and longitudinal conveyors for delivering the fastenings to the individual underfloor cabins. With an arrangement such as this, however, fastening of the sleepers to the laid rails would not be completely uninterrupted because, during the distribution of ballast over the sleeper cribs, any manipulation of the fastening tools would give rise to difficulties. In addition, so-called ballast ploughs are known for uniformly distributing and profiling the bedding ballast of railway tracks (cf. for example AU-PS No. 463 196 and AT-PS No. 353 820). In addition to a ballast plough, machines of this type comprise at least one brush arranged at their rear end in the working direction for transporting surplus ballast to a ballast storage unit via an immediately preceding elevator belt.

In addition, an advertisement in the journal "Railway Gazette International", February 1985, pages 120/121, shows a formation rehabilitation machine used in conjunction with a tamping, lifting and lining unit manufactured by Applicants for continuously removing the old bedding
ballast and introducing a new layer of sand and ballast. This machine consists of a central, main machine comprising a conveyor chain and conveyor belt arrangements for delivery of the sand and new ballast, a following so-called satellite and a number of transporting vehicles. Between its two undercarriages arranged at either end, the satellite comprises a tamping and lifting-and-lining unit (with squeezable and vibratable tamping tools designed to penetrate into the ballast and lifting-and-lining tools) which is designed to advance in steps from sleeper to sleeper while the formation rehabilitation machine is designed for continuous advance. While the soiled ballast taken up by the conveyor chain is ejected by conveyor belts onto preceding silo wagons, containers filled with sand and new ballast are brought in by a gantry crane and are emptied into sand and ballast storage bins. From these storage bins, the sand and ballast is transported forwards on the associated conveyor belt arrangement to the ejection point situated behind the conveyor chain on the main machine. In addition to this main ejection point for the ballast, another ejection point is provided in front of the tamping unit. This ballast tamping machine or satellite vehicle is integrated within the machine formation as a whole by the crane runway for the gantry crane and by the conveyor belt arrangement for transporting ballast from the ballast silo to the main machine. Although this machine has been successfully used in practice, it does require particularly efficient transport systems for the sand and ballast.

Finally, Applicants' GB-PS 2 004 933 B describes a travelling machine for cleaning and consolidating the ballast bed of railway tracks by means of a cleaning machine and a following ballast consolidating machine coupled thereto. The ballast consolidating unit and
the lifting and lining unit preceding it in the work direction are arranged between the undercarriages, so-called high-thrust consolidating tools being provided for greater consolidation of the sleeper cribs. Consolidating tools of this type are characterized by a relatively high ballast demand. By transporting the cleaned ballast accumulating from the cleaning machine on an endless conveyor belt projecting beyond the rear end of the cleaning machine to a ballast silo arranged at the front end of the tamping machine, sufficient ballast can be delivered to that machine. This ballast may be uniformly distributed over the track through drive-operated outlet chutes provided on the ballast silo, so that sufficient ballast is always present for the high-thrust consolidating tools. However, this method of consolidation cannot replace sleeper tamping by squeezable and vibratable tamping tools designed for penetration into the ballast which achieve a high degree of consolidation of the sleeper bearing surface. The following is stated on page 3 of this literature reference: "in addition, the correcting work which has to be carried out afterwards - using tamping machines with squeezable tamping tools to build up sleeper bearing surfaces - and the degree of settlement of the track under the weight of subsequent rail traffic are also kept smaller" in other words tamping with standard track tamping machines is still necessary.

In addition, EU-PS 0 057 128 describes a machine comprising units for changing sleepers in conjunction with a tamping unit connected to the machine frame and arranged between two undercarriages spaced far apart from one another. The tamping unit is equipped with tamping tools designed to penetrate into the ballast bed. In addition, the machine is built as a standard vehicle with its own axle drive and comprises a ballast storage
unit with variable outlet openings arranged immediately in front of the tamping unit (in the working direction) on the machine frame for distributing ballast in a sleeper crib. This ballast storage unit is designed to be filled by a conveyor belt which extends from the rear end of the machine to the ballast storage unit. The ballast storage unit is immediately preceded — again between the two undercarriages of the machine — by a sleeper transporting and gripping arrangement. With a sleeper changing machine such as this, individual sleepers which are no longer serviceable, for example split wooden sleepers or the like, are replaced by new sleepers. Since the new sleepers are loosely introduced, the ballast storage unit distributes ballast over the corresponding sleeper zones via outlet chutes, the ballast thus distributed subsequently being tamped under the new sleeper by the tamping unit. Accordingly, this machine can only be used for removing individual sleepers or at most two adjacent sleepers and replacing them with new sleepers which are subsequently tamped in the same operation. A section of track comprising several such individual sleepers which are no longer serviceable will of course deteriorate in regard to its position and become more unreliable under the weight of rail traffic so that, with this machine which essentially functions as an auxiliary vehicle, susceptible sleepers such as these (either one or even two immediately adjacent sleepers) may be replaced and tamped by the same machine. This machine is neither designed nor suitable for the continuous, step-by-step tamping of sleepers. Neither can the tamped sleeper be corrected, for example vertically, in its position because, if only a single sleeper were to be corrected in its position, the position of the other sleepers would be destroyed again.

Starting out from EU-PS 0 057 128, the object of
the present invention is to provide a track tamping machine of the type described at the beginning which provides for better adaptation to the track conditions, more especially to the ballast conditions, to achieve more uniform and improved tamping of all sleepers over relatively long sections of track.

The object of the invention is achieved by the track tamping machine described at the beginning in that the machine is designed for universal application as a tamping, levelling and lining machine comprising a reference system, more especially for incorporation in a track relaying train or behind a ballast cleaning machine or in conjunction with a ballast transporting and loading train or even solely for use as a dedicated track tamping machine, the ballast receiving and storage unit being preceded by at least one conveyor train arranged on the machine frame for the delivery of ballast from the front end of the machine.

A machine constructed in this way now provides for more uniform and improved tamping of all sleepers largely irrespective of the existing ballast conditions in the vicinity of the individual sleepers over long sections of track and also irrespective of the additional common use of other machines, because sufficient ballast or rather the required amount of ballast is now present or can be delivered at any time in the same operation.

With the track tamping machine constructed in accordance with the invention, considerably more uniform and improved tamping of all sleepers and, at the same time, precision fixing of the track position can be achieved irrespective of any other machine, providing the ballast storage unit is filled with ballast. The ballast storage unit of this machine may advantageously be filled with ballast from the various working machines or from ballast yards or the like in the vicinity of stations. This arrangement of
the on-board ballast receiving and storage unit with its variable outlet openings preceding the tamping unit advantageously enables the operator responsible for the tamping unit to fill each of the sleeper cribs individually, for example even in the case of double sleepers, where more ballast has to be supplied in adjacent sleeper cribs, because the tamping of double sleepers requires a larger amount of ballast. Accordingly, it is possible with the track tamping machine constructed in accordance with the invention - with particularly rational use of only one machine for uniform and improved ballasting of the track panel - to carry out the track tamping work directly related to this ballasting to create improved and uniform sleeper bearing surfaces and, at the same time, to fix the position of the track in the same operation and preferably in a single operation.

One particular advantage of the track tamping machine according to the invention is that it may be universally used for a variety of track construction vehicles which involve the transport of ballast, for example the ballast accumulating or the new ballast to be transported in a track relaying train or the cleaned ballast accumulating in a cleaning machine or even for example the ballast loaded in a ballast loading train. The track tamping machine according to the invention may thus surprisingly be used with particular advantage as a universal machine both for step-by-step advance or even for continuous (non-stop) advance - with additional provision of a longitudinal displacement drive for the track tamping, lifting and lining units for integration in or coupling to a continuous (non-stop) train formation, in either case in conjunction with the advantage of a concluding, improved and more uniform tamping of the sleepers of the track accompanied by fixing of the track position. In addition, by virtue of the arrangement of the conveyor
train on the track tamping machine itself, ballast may with advantage always be continuously delivered to the ballast receiving and storage unit, particularly in cases where relatively large amounts of ballast are required, as is often necessary for very long sections of track, thus avoiding uneconomic interruptions in the progress of work.

Another advantageous embodiment of the invention is characterized in that, in addition to the operator's and driver's cabin associated with the track tamping, lifting and, in particular, lining unit, another driver's cabin is provided at the other end of the machine frame for observation and operation of the ballast receiving and storage unit with its variable outlet openings which are preferably connected to hydraulic flaps for regulating the outflow of ballast. The provision of a separate operator's cabin for observation of the section of track immediately preceding the variable outlet openings provides for rapid adaptation or variation of the quantities of ballast to be ejected in dependence upon the demand as determined from the operator's cabin.

In another advantageous embodiment of the invention, the variable outlet openings of the ballast storage unit preceding the track tamping unit may be formed by four outlet chutes which are arranged adjacent one another longitudinally of the sleepers and which are designed for arrangement over a sleeper crib corresponding to the tamping zones. These four outlet chutes arranged transversely of the longitudinal axis of the machine, corresponding to the four rows of tamping tines of the tamping unit (looking longitudinally of the rails), provide for the controlled supply of ballast to the four sleeper bearing surfaces of two adjacent sleepers of a track. The independent operation of the control flaps associated with each outlet chute enables any uneven accumulation
of ballast extending across the track to be taken fully into consideration.

In another variant of the invention, the variable outlet openings of the ballast storage unit preceding the tamping unit are formed by four outlet chutes which are each arranged above a rail/sleeper intersection of two immediately adjacent sleepers to be tamped in the same operation by the tamping unit, another outlet opening variable by an outlet chute and following the outlet chutes in the working direction preferably being provided for the distribution of ballast in the middle of the track. A variant such as this with a total of eight variable outlet openings is particularly suitable for applications involving a relatively high ballast demand, such as for example the ballasting of a track panel exposed by the relaying work on the graded track bed. This ensures that, despite the totally exposed track panel and the resulting heavy demand for ballast, the sleeper cribs can be filled sufficiently to create advantageous tamping conditions in a single operation and preferably in the same operation.

In another preferred embodiment of the invention, a ballast metering unit preferably operable by a limit switch or by a sleeper contact switch via a hydraulic drive for regulating the outflow of ballast is associated with the ballast storage unit preceding the tamping unit or with each of the variable outlet openings preceding the tamping tools or with each outlet chute. The association of a metering unit with the outlet chutes provides for cyclic and, in particular, uniform filling of the sleeper cribs either during the stop cycle, i.e. the tamping cycle, of a step-by-step track tamping machine or, for example, even during the continuous advance of a track relaying train.

In one particularly advantageous embodiment of the
invention, the conveyor train for the delivery of ballast to the ballast storage unit from the rear or front end of the machine consists of a conveyor belt arrangement mounted on - preferably above - the machine frame and consists of one or more endless conveyor belts preferably drivable in both directions. This embodiment of the invention has the particular advantage of a universal machine because ballast may be delivered as required to the ballast storage unit both from the front end and from the rear end of the machine. In addition, the possible arrangement of the conveyor train above the machine frame avoids troublesome influencing of the ballast storage unit and the tamping and lifting-and-lining unit.

In another particularly advantageous embodiment of the invention, the conveyor train consists of a vertically displaceable sweeping unit arranged at the front end of the machine with an endless elevator belt, the ejection end of the elevator belt being associated with the ballast storage unit and the track tamping machine provided with the ballast storage unit preferably comprising - for continuous (non-stop) advance - a separate tool frame which in particular is provided with a supporting undercarriage, carries the track tamping, lifting and lining units and is connected to its drive for longitudinal displacement relative to the machine frame. This embodiment is of particular advantage, for example, when the machine is used behind a cleaning machine or on a track on which the ballast has not yet been correctly distributed over the areas to be tamped. This ballast distributing work is normally carried out by a ballast plough or ballast grading machine. Since, in addition, this machine is also capable of continuous (non-stop) advance, not only the performance but also the overall operational economy of such a machine are significantly
Another advantageous embodiment of the invention is characterized in that the conveyor train consists of a single endless conveyor belt (Figure 6), preferably drivable in both directions, which is arranged above the machine frame and extends from the rear end of the machine to at least the ballast storage unit, a guide member preferably being arranged above the ballast storage unit for guiding the ballast into the storage unit and/or for further transport of the ballast. This embodiment is relatively simple in structural terms and has the advantage that it may even be added to existing track tamping machines. In addition, it is possible with this machine not only to ballast the area preceding the track tamping unit in the same operation, this surplus ballast may even be further transported as required to a ballast loading train in cases where there is an excessive accumulation of ballast through transport via the track tamping machine itself.

Another preferred embodiment of the invention is characterized in that, for use in a track relaying train, a rear frame section - looking in the working direction of the machine - of a machine frame of the track tamping machine consisting of two frame sections connected together by a joint comprises the tamping and lifting-and-lining units mounted for longitudinal displacement relative to the frame section by a drive between its two undercarriages spaced far apart from one another, a number of underfloor cabins and conveyor belts for the sleeper/rail fastenings being associated with the front frame section and the conveyor train associated with the ballast storage unit extending from the end of the rear frame to the front frame section. A "two-part" construction such as this of the track tamping machine is particularly suitable for coupling to a working vehicle designed for
track relaying work, the rail fastenings advantageously being able to be fixed without interference before the distribution of ballast through the outlet openings of the ballast storage unit. By virtue of its one-piece, jointed construction, the track tamping machine may readily be connected together with the associated conveyor train to an existing track relaying train or to the track relaying vehicles without any need for rerigging.

According to another aspect of the invention, the conveyor train for transporting the ballast to the ballast storage unit consists of several conveyor belts arranged one behind the other above both frame sections as an extension of a conveyor belt arrangement provided on the track relaying train with units for taking up and laying the old and new sleepers and for turning the sleepers through 90° for transport through a two-part main frame and with a clearing chain for levelling and taking up the ballast, the guide member for guiding the ballast transportable by the conveyor train into the storage unit and/or onto the following conveyor belts being arranged above the ballast storage unit. With this conveyor train designed as an extension of the clearing chain by which the ballast is taken up, the ballast taken up in the relaying gap of a relaying train can be continuously transported to the ballast storage unit on board the track tamping machine without any effect on the underlying working units. By means of the guide member, surplus ballast can always be transported to the rear end of the track tamping machine and taken up there, for example by a coupled silo wagon, without any effect on the continuous flow of ballast.

In another preferred embodiment of the invention, the machine frame connected to a tamping, lifting and lining unit by a longitudinal displacement drive is
coupled to the front end of a continuously advancing (non-stop) ballast transporting and loading train for transporting ballast, preferably via the storage unit, during the continuous (non-stop) advance of tamping or work, the conveyor train being an extension of a conveyor line of the loading train. A continuously advancing track tamping machine constructed in this way is particularly suitable in conjunction with the continuous supply of ballast in relatively large quantities for the complete ballasting of, for example, a newly laid track after a track relaying train. The new ballast may be continuously discharged from the conveyor line of the coupled loading wagons onto the conveyor train associated with the ballast storage unit. In this case, the tamping unit may be moved in steps from sleeper to sleeper by the longitudinal displacement drive without interrupting the continuous flow of ballast overhead on the conveyor train.

Another advantageous embodiment of the invention is characterized in that the ballast storage unit preceding the tamping unit comprises eight variable outlet chutes which are arranged in two groups of four respectively adjacent one another and above a sleeper bearing surface in two transverse rows arranged one behind the other longitudinally of the machine, preferably at a distance corresponding to the sleeper interval. These eight variable outlet chutes enable the outflow of ballast to be exactly adapted to the existing distribution of ballast on the track, so that the same tamping conditions always prevail for the following tamping units.

Another advantageous embodiment of the invention is distinguished by the fact that, for separate use behind a continuously advancing (non-stop) ballast cleaning machine, the conveyor for delivering ballast to the ballast storage unit is in the form of a vertically displaceable elevating ballast conveyor belt which is
arranged overhanging the machine frame – advancing in steps with its undercarriages and a preferably two-sleeper tamping unit under the power of a drive – and with which a center plough designed to take up ballast with laterally arranged ballast guide plates is associated. After the use of, for example, a ballast cleaning machine and the resulting irregular distribution of ballast, a track tamping machine constructed in this way provides for uniform ballasting of the track panel and, in particular, for permanent fixing of the lateral track position, the track being tamped as required and, at the same time, vertically and/or laterally corrected in the same working run, for which purpose the track may be tamped as required and, at the same time, vertically and/or laterally corrected in the same working run. The ballast storage unit is filled with surplus ballast which has been brought up by the ballast elevator and which may then be ejected as required into areas of track where there is too little ballast. Accordingly, there is no longer any need to use separate, self-propelled ballast ploughs.

For separate use behind a working machine, for example a ballast cleaning machine, the conveyor train for delivering the ballast to the ballast storage unit is designed at the front end of the machine as a sweeping unit with an endless elevator belt, optionally with a side plough, the tamping and lifting-and-lining unit being arranged on the separate tool frame provided with the supporting undercarriage and connected to a drive for longitudinal displacement with the machine frame. This combination combines the advantages afforded by a continuously advancing track tamping machine comprising a separate tamping tool frame with a supporting undercarriage with the advantages afforded by the preceding arrangement of a ballast storage unit on the same machine. The
continuous advance of the machine provides for simultaneous distribution of the ballast and for taking up of any surplus ballast by the preceding sweeping unit, this surplus ballast being stored in the ballast storage unit and returned to the track as and when required. This universal embodiment also eliminates the need to use a separate self-propelled ballast plough.

According to another aspect of the invention, the variable outlet openings of the ballast storage unit and the outlet chutes associated therewith are distributed at least over the length of a sleeper corresponding to the tamping zones and are mounted for displacement in a longitudinal guide of the ballast storage unit, being connected to a longitudinal displacement drive and preferably to the longitudinal displacement drive coupled to the tool frame of the track tamping unit, the longitudinal displacement path corresponding to at least one sleeper interval. This longitudinally displaceable mounting of the outlet chutes provides for step-by-step movement from one sleeper crib to the next in coordination with the tamping units, the variable outlet openings preferably being closed during the return of the outlet chutes to their starting position. This ensures that the ballast dispensed from the outlet chutes only comes to rest between the sleepers.

Another advantageous embodiment of the machine according to the invention is characterized in that, where it is designed for use as a continuous (non-stop) tamping machine with continuous advance of its machine frame and step-by-step advance of the working units from one tamping zone to the next, the distance between the ballast storage unit and the front end of the track lifting-and-lining unit connected to the tamping unit in its rearmost position (in the working direction) corresponds to at least twice the sleeper interval. An interval such
as this between the ballast storage unit and the track tamping unit ensures that, during the continuous (non-stop) advance of the machine with continuous outflow of ballast, sufficient time is left for the stationary tamping cycle in which the machine frame is moved relative to the tamping and lifting-and-lining unit.

Finally, another advantageous embodiment of the invention is characterized in that a vertically displaceable sweeping unit provided with a brush rotatable about a shaft extending transversely of the longitudinal axis of the machine is arranged on the machine frame behind the tamping unit and preferably behind the undercarriage in the working direction. This sweeping unit moves the ballast present on the sleepers through its continuous ejection from the outlet openings of the ballast storage unit into the sleeper cribs, the reduction in the ballast level caused by the tamping operation being compensated and any surplus ballast being carried by the transverse conveyor belt to the shoulder of the ballast belt and deposited there.
Several examples of embodiment of the invention and various possibilities for the layout of the machine in question are described in detail in the following with reference to the accompanying drawings, wherein:

Figure 1 is a highly diagrammatic side elevation of a track tamping machine with a preceding ballast receiving and storage unit according to the invention in conjunction with a track relaying train.

Figure 2 is a side elevation on a larger scale of the track tamping machine shown in Figure 1.

Figure 3 is a plan view of the track tamping machine shown in Figure 2.

Figure 4 is a side elevation of another embodiment of the track tamping machine according to the invention in the form of a self-propelled standard vehicle in conjunction with the following ballast transporting and loading train.

Figure 5 is a side elevation of a track tamping machine comprising a two-sleeper tamping unit constructed in accordance with the invention in conjunction with a preceding, self-propelled ballast cleaning machine.

Figure 6 is a side elevation of a track tamping machine according to the invention comprising a pole-like tool frame supported on the track by a supporting undercarriage and connected to the tamping unit for continuous advance of work in conjunction with a working vehicle comprising a conveyor belt for supplying ballast.

Figure 7 is a diagrammatic partial plan view of the outlet chutes of the ballast storage unit of the track tamping machine shown in Figure 6.

A track tamping machine 1 as shown in Figures 1 to 3 comprising a machine frame 3 supported on undercarriages 2 is designed to travel along a track 6 consisting of rails 4 and concrete sleepers 5. The machine frame 3 which, for use in a train formation, is connected to a
continuously advancing track relaying train 7 designed
to change the rails 4 and the sleepers 5 consists of two
frame sections 9, 10 arranged one behind the other longi-
tudinally of the track and interconnected by a joint 8.
A tamping unit 12 comprising vibratable and squeezable
tamping tools and also a track lifting and lining unit 13
are arranged on the rear frame section 10 in the working
direction of the machine as indicated by the arrow 11.
The vertically displaceable tamping unit 12 is preceded
in the working direction by a ballast receiving and storage
unit 14 comprising adjustable outlet openings 15 for
introducing ballast into a sleeper crib 16. The outlet
openings 15 are connected to hydraulically operable flaps
17 designed to pivot about a spindle extending trans-
versely of the longitudinal axis of the machine. A con-
veyor train 18 mounted on the machine frame 3 is designed
to bring in ballast. This conveyor train 18 consists
of several conveyor belts 19 arranged one behind the
other above the two frame sections 9, 10 and is an
extension of a conveyor belt arrangement 20 provided on
the track relaying train 7. Above the ballast storage
unit 14, a guide member 21 is pivotally arranged on a
spindle extending transversely of the longitudinal axis
of the machine to enable the ballast transportable by
the conveyor train 18 to be guided either into the ballast
storage unit 14 and/or onto the following conveyor
belts 22.

The vertically displaceable tamping and lifting-and-
lining unit 12, 13 is mounted on guides extending longi-
tudinally of the machine and is displaceable from one
sleeper crib 16 to the next in the direction of the
arrows 24 by means of a longitudinal displacement drive 23.
Arranged between the two drive units 12, 13 is a feeler
roller 26 which is associated with a reference system 25
and which bifurcately surrounds a reference cord stretched
between feeler rollers. The two units 12, 13 are immediately followed by an operator's cabin 27 with a central control unit 28 and a driver's cabin 29. To ease the load on the track relaying train 7, a separate axle drive 30 is provided. Beneath the driver's cabin 29, a vertically displaceable sweeping unit 32 provided with a brush 31 rotatable about a shaft extending transversely of the longitudinal axis of the machine is arranged on the machine frame 3. This sweeping unit 32 is preceded by a transverse conveyor belt 33.

The front section 9 of the machine frame 3 is preceded by a number of underfloor cabins 34 and vibrating conveyor belts 35 for sleeper/rail fastenings. The track relaying train 7 coupled to the track tamping machine 1 consists essentially of a two-part main frame 37 designed to be spread by a drive 36 with a vertically displaceable clearing chain 38 following the conveyor belt arrangement 20 for taking up and levelling the ballast 39 and of an old-sleeper take-up unit 40 and a new-sleeper laying unit 41. A gantry crane 42 designed to travel over the entire length of the train on its own runway is provided for transporting the old and new sleepers.

As can be seen from Figure 3 in particular, the outlet openings 15 of the ballast storage unit 14 are formed by four outlet chutes arranged adjacent one another longitudinally of the sleepers and designed for arrangement over a sleeper crib. The outlet chutes 43 are followed in the working direction by another outlet chute 44 for distributing ballast in the middle of the track.

A track tamping machine 45 shown in Figure 4 is designed for universal use as a standard vehicle with its own axle drive 46 and driver's cabins 47 at either end and with an operator's cabin 48 comprising a control unit. The tamping machine 45 comprising a frame 49
is designed to travel on bogies 50 along a track 53 consisting of rails 51 and sleepers 5. Between the two bogies 50, a vertically displaceable tamping and track lifting-and-lining unit 54, 55 is designed to advance cyclically from sleeper to sleeper longitudinally of the machine under the power of a longitudinal displacement drive 56 while the tamping machine 45 continues to advance. A reference system 57 guided on the track 53 by feeler rollers is associated with each of the two units 54, 55. 

Arranged between the front undercarriage 50 and the track lifting-and-lining unit 55 is a ballast storage unit 58 with outlet openings 60 in the form of outlet chutes 59 adjustable by hydraulic flaps. The ballast storage unit preceding the track tamping unit 54 comprises eight adjustable outlet chutes 59 which are arranged in two groups of four adjacent one another in the tamping-tine penetration zones and above a sleeper bearing surface in two transverse rows 61 arranged one behind the other longitudinally of the machine and preferably separated by a distance equivalent to the sleeper interval. Arranged above the machine frame 49 is a conveyor train 62 consisting of two conveyor belts forming an extension of a conveyor line 64 formed by a ballast transporting and loading train 63. Each loading wagon of the loading train 63, which is connected to its own axle drive, comprises a ballast wall 65 displaceable longitudinally of the track. A vertically displaceable sweeping unit 67 consisting of a rotatable brush is provided at the rear end of the tamping machine 45 in its working direction indicated by the arrow 66. Associated with the front outlet chutes 59 of the ballast storage unit 58 is a sleeper feeler 68 which is designed to control the flaps varying the width of outlet opening.

A track tamping machine 69 with a frame 70 as shown in Figure 5 is designed to travel on undercarriages 71.
along a track 74 consisting of rails 72 and sleepers 73 in the direction indicated by an arrow 75. Arranged at either end of the machine is a driver's cabin 76, the rear driver's cabin 76 being immediately preceded by an operator's cabin 77 with a control unit. The machine 69 travels under the power of its own axle drive 78. The operator's cabin 77 is preceded for visual observation by a vertically displaceable two-sleeper tamping unit 79 comprising vibratable and squeezable tamping tools for simultaneously tamping the ballast beneath two adjacent sleepers 73 and by a track lifting-and-lining unit 80. A reference system 81 supported on the track 74 by feeler rollers is associated with each of the two units 79, 80. A ballast storage unit 82 with outlet openings 84 variable by flaps 83 is arranged on the machine frame 70 immediately behind the front undercarriage 71. A conveyor train 85 extending towards the front, lower end of the machine is provided for transporting the ballast to the ballast storage unit 82. The conveyor train 85 comprises a vertically displaceable elevator in the form of a ballast conveyor belt 87 overhanging the machine frame 70 which is designed to advance in steps in the direction of the arrows 86. The elevator comprises a centerplough 88 for levelling the sleeper cribs extending beyond the sleeper level and laterally arranged ballast guide plates 87. A vertically displaceable sweeping unit 90 provided with a rotatable brush is arranged at the rear end of the machine. The tamping machine 69 is preceded by a self-propelled ballast cleaning machine 91 comprising an endless clearing chain 92 guided around the track, a vibrating sieve and an ejection conveyor belt 94 for introducing the cleaned ballast. The ballast storage unit 82 is followed by further endless conveyor belts 93 for bringing in ballast transported as in Figure 4 on following silo wagons.
A track tamping machine 95 as shown in Figure 6 comprises a frame 96 with an axle drive 97 and is designed to travel on undercarriages 98 along a track 101 consisting of rails 99 and concrete sleepers 100. At either end of the machine frame 96 is a driver's cabin 102, the rear driver's cabin 102 being immediately preceded by an operator's cabin 103 with a central control unit 104. A vertically displaceable tamping unit 105 comprising vibratable and squeezable tamping tools and a preceding track lifting-and-lining unit 106 are arranged on their own tool frame 109 which is provided with a supporting undercarriage 107 and which is connected to a drive 108 for longitudinal displacement relative to the machine frame 96. The tamping unit 105 comprises a vertically displaceable tamping tool shown in chain lines in its lower position, so that the tamping unit 105 which, basically, is designed to tamp the ballast beneath two adjacent sleepers 100 may also be used for tamping the ballast under only one sleeper. The tool frame 109 is preceded by a ballast storage unit 110 comprising variable outlet openings 111 and associated outlet chutes 112 which are distributed over at least the length of a sleeper at intervals corresponding to the tamping locations. The outlet chutes 112 are mounted for displacement in a longitudinal guide 113 of the ballast storage unit 110 and are connected to the tool frame 109 by a connecting rod 114 shown in Figure 7. Provided at the front end of the ballast storage unit 110 is a ballast dispenser 115 in the form of a slide 117 connected to a hydraulic drive 116. The hydraulic drive 116 is actuated by a limit switch 118.

For independent use, particularly behind a working vehicle 119, for example in the form of a ballast cleaning machine, which is shown only in dash-dot lines and which comprises a retractable and extendable conveyor
1 belt for the particular supply of ballast required, a conveyor train 120 for transporting the ballast to the ballast storage unit 110 is provided at the front end of the machine with a vertically displaceable sweeping unit 121. An endless elevator belt 122 is provided as conveyor between the sweeping unit 121 and the ballast storage unit 110. The conveyor train 120 may advantageously comprise another endless conveyor belt shown in chain lines above the machine frame in Figure 6 which, in particular, can be driven in both directions and which comprises a guide member. At its rear end in the working direction indicated by an arrow 123, the track tamping machine 95 is provided with another sweeping unit 124 comprising a rotatable brush and an immediately preceding transverse conveyor belt 125. A reference system 126 guided on the track 101 by feeler rollers is associated with each of the two units 105, 106 arranged on the tool frame 109. Another conveyor belt (shown in chain lines) with a guide member may be arranged above the tamping unit 105, extending from the ballast storage unit 110 to the rear end of the machine.

The mode of operation of the track tamping machine according to the invention in the arrangement shown by way of example in Figures 1 to 7 is described in detail in the following to explain the various universal applications.

The track relaying train 7 advancing continuously (non-stop) in the working direction indicated by an arrow 11, as shown in Figure 1, continuously removes the old track consisting of rails fixed to wooden sleepers, as shown on the left-hand side of Figure 1, after which the ballast in the track-free zone thus created is levelled and surplus ballast taken up by the clearing chain 38. The ballast taken up is delivered by the connected conveyor belt arrangement 20 via the new-sleeper laying
unit 41 onto the conveyor belt train 18 of the track tamping machine 1 connected to the track relaying train 7 which is also designed for continuous (non-stop) advance. From the conveyor belt arrangement 20, the ballast is completely ejected into the underlying ballast storage unit 14 because of the position of the guide member 21 shown in Figure 2. The operator in the operator's cabin 27 controls the penetration of the tamping tools of the tamping unit 12 into the ballast bed and the subsequent cyclic forward movement of the two tamping, lifting and lining units 12 and 13 provided for each rail while the entire track relaying train 7 with the track tamping machine 1 coupled thereto continues its continuous (non-stop) advance. However, the operator - carefully observing the quantities of ballast present ahead of the ballast storage unit 14 - also controls the size of the outlet openings 15 of the ballast storage unit 14 at the tamping locations by opening the hydraulic flaps 17 arranged in pairs in the event of light ballast demand and closing them in the event of heavy ballast demand. Accordingly, the ballast stored in the ballast storage unit 14 passes through the outlet chutes 43 arranged on either side of each rail 4 in the region of the sleeper bearing surface and through the central outlet chute 44 (Figure 3) between the exposed, newly laid sleepers 5 and fills the sleeper crib to the desired level. This introduction of ballast ensures that enough ballast is present for tamping immediately afterwards by the step-by-step or cyclic tamping unit 12 of the continuously advancing tamping machine 1. Accordingly, the preceding ballast storage unit 14 provides for uniform track ballasting and for the provision of uniform, homogeneous and durable sleeper bearing surfaces in a single operation, irrespective of the existing state of the ballast bed. Any surplus ballast on the concrete sleepers 5 is swept onto
the transverse conveyor belt 33 by the sweeping unit 32 at the rear end of the machine 1 and is deposited by the transverse conveyor belt 33 along the shoulders of the ballast bed. The entire transport of ballast from the clearing chain 38 to the ballast storage unit 14 of the tamping machine 1 takes place without any interference with the working systems and units situated beneath the transport path. In this way, the men in the underfloor cabins 34 are also able to secure the fastenings by which the newly laid rail 4 is fixed to the sleepers 5 without any interruption. When the ballast storage unit 14 is completely full because of light ballast demand, the guide member 21 is turned to the front in the working direction so that all the ballast brought up by the clearing chain 38 is transported by the other conveyor belts 22 above the tamping machine 1 and ejected at the end of the machine, for example onto a coupled silo wagon. However, by bringing the guide element 21 into a corresponding central position, ballast can be ejected both into the ballast storage unit 14 and also onto the following conveyor belts 22.

The machine combination shown in Figure 4 provides for another universal application of the tamping machine 45 according to the invention. In this embodiment, a track newly laid on a new line is spread with ballast, the relatively heavy wagons of the ballast transport and loading train 63 already travelling on the previously ballasted, positionally corrected and permanently tamped track. With this machine arrangement, in which large quantities of ballast are permanently available for an economic length of track, there is no need for possession of the adjacent track, for example for supplying ballast. The tamping machine 45 in the form of a self-propelled standard vehicle is placed at the head of a ballast transport and loading train 63 consisting of a number of
individual wagons. The conveyor train 62 of the tamping machine 45 forms the front end of the conveyor line 64 formed by the loading train 63. Through this conveyor line 64, the ballast passes onto the conveyor train 62 and the adjoining ballast storage unit 58 from which it is ejected as required in the region of the sleeper bearing surfaces through the variable outlet openings 60. The sleeper feeler 68 which feels the sleepers blocks the outlet opening 60 when it is situated exactly over a sleeper. When the outlet opening 60 is positioned over a sleeper crib, the ballast is ejected as required. Since the two tamping and lifting-and-lining units 54 and 55 are mounted for displacement relative to the machine frame 49, they are moved step by step or cyclically from sleeper to sleeper during the continuous (non-stop) advance of the tamping machine 1 together with the ballast transporting and loading train 63.

With the machine arrangement shown in Figure 5, the tamping machine 69 according to the invention designed to advance in steps may advantageously be used immediately after a continuously advancing ballast cleaning machine 91 without any need for a separate ballast plough. In this arrangement, the tamping machine 69 solves the problem of levelling out the different amounts of cleaned ballast ejected attributable to different levels of waste spoil by ballast being taken up by the preceding ballast conveyor belt 87 from areas where too much ballast has been ejected and stored in the ballast storage unit 82 of the tamping machine 69. In areas where too little ballast has been ejected from the cleaning machine, the ballast stored in the ballast storage unit of the tamping machine 69 is discharged onto the track as required through the outlet chutes 84. In this way, the following tamping unit 79 encounters an already uniformly ballasted track for the formation of durable sleeper bearing surfaces.
The uniform distribution of ballast is of particular advantage insofar as, through the total removal of the bedding ballast by the clearing chain 92, the new ballast bed is completely unconsolidated so that tamping requires a correspondingly large amount of ballast in the sleeper cribs. Because of this, it is also of advantage in this connection to use a two-sleeper tamping unit 79 for greater performance. If there is too little ballast in the ballast storage unit 82, fresh ballast may be off-loaded into the ballast storage unit 82 from ballast silo wagons following the machine via the conveyor belts 93.

The track tamping machine 95 shown in Figure 6 is designed for continuous (non-stop) application behind a working vehicle 119, for example in the form of a ballast cleaning machine. The ballast situated above the sleeper level is swept onto the elevator belt 122 by the sweeping unit 121 arranged at the front end and is carried upwards by the elevator belt 122 into the ballast storage unit 110. Because it is connected to the tool frame 109 in the same way as the two tamping and lifting-and-lining units 105, 106, the outlet chute 112 provided on the underneath of the ballast storage unit 110 is moved cyclically from tamping zone to tamping zone. In the frontmost position of the outlet chute 112 shown in dash-dot lines, the hydraulic drive 116 is actuated by contact with the limit switch 118, moving the slide 117 into the position shown in dash-dot lines (Figure 7) and thus releasing the outlet opening 111 of the ballast storage unit 110. As a result, ballast falls from the ballast storage unit 110 into the underlying outlet chute 112, the ballast falling into two adjacent sleeper cribs through the relatively small outlet openings of the outlet chute 112. To prevent ballast from dropping onto the sleeper 100, a V-shaped deflector 127 is provided. When the outlet chute 112 has been filled with the required amount of
ballast, the hydraulic drive 116 is actuated in the opposite direction so that the slide 117 is pushed over the outlet opening 111 and closes it.

The spacing of the outlet chute 112 from the tamping unit 105 by a distance corresponding to several times a sleeper division ensures that, while the tamping unit 105 used to tamp the ballast beneath the sleeper 100 is at a standstill, the preceding outlet chute 112 lies with its openings exactly over two sleeper cribs. During the continuous (non-stop) advance of the tamping machine 95, the outlet chutes 112 are displaced along the longitudinal guide 113 so that the ejection points always remain over the sleeper crib. In practice, the outlet chute 112 is emptied before reaching its lowermost position (Figure 6). When, on completion of tamping, the tool frame 109 is moved together with the outlet chute 112 into the front starting position in the direction of the arrows 128, the described filling and tamping cycle begins again. Since, as shown in Figure 7, there are in all four outlet chutes 112 each with two outlet openings arranged on either side of the rail 99 in the region of the sleeper bearing surface, the ballast may be ejected at a correspondingly high rate. Any excess ballast is again swept onto the transverse conveyor belt 125 by the sweeping unit 124 arranged at the rear end of the tamping machine 95 and is deposited by the transverse conveyor belt 125 along the shoulders of the ballast bed. In this application, too, the provision of the ballast storage unit 110 on the track tamping machine 95 for the controlled distribution of ballast makes it unnecessary for the ballast bed to be treated by a separate machine provided with ballast and shoulder ploughs.

In cases where, for example in the embodiment shown in Figure 6, the preceding working vehicle 119, i.e. the
ballast cleaning machine, provides too much cleaned ballast, for example where the ballast bed is only lightly soiled, so that the ballast storage unit 110 is already full, this ballast may be directly ejected - with displacement of the conveyor belt of the cleaning machine to the ballast storage unit 110 - onto the conveyor belt shown in chain lines following the ballast storage unit 110. This surplus ballast may be ejected from this conveyor belt, for example onto following silo wagons. When less ballast accumulates from the ballast cleaning machine, it may be directly ejected as required back into the ballast storage unit 110. However, if too little ballast accumulates from the cleaning machine, new ballast may be directly transported from the following, optionally coupled silo wagons into the ballast storage unit 110 by the conveyor belt shown in chain lines. According to the invention, the track tamping machine 95 constructed in accordance with the invention may also be used as a standard machine advancing in steps from sleeper to sleeper.
The claims defining the invention are as follows:

1. A track tamping machine comprising at least one tamping and lifting unit connected to the machine frame and arranged between two undercarriages spaced sufficiently far apart from one another for the lifting operation, said unit comprising tamping tools designed to penetrate into the ballast, to be squeezed towards one another and to be vibrated by a drive and said machine - in the form of a standard vehicle equipped with its own axle drive - comprising on the machine frame a ballast receiving and storage unit with variable outlet openings preceding the tamping and lifting unit in the working direction for distributing ballast over the sleeper cribs, characterized in that the machine is designed for universal application as a tamping, levelling and optionally lining machine comprising tamping tools designed to penetrate into the ballast, be squeezed towards one another and to be vibrated by a drive and a reference system, more especially for incorporation in a track relaying train or behind a ballast cleaning machine or in conjunction with a ballast transporting and loading train or even solely for use as a dedicated track tamping machine, the ballast receiving and storage unit being preceded by at least one conveyor train arranged on the machine frame for the delivery of ballast from the front end of the machine.

2. A machine as claimed in Claim 1, characterized in that, in addition to the operator's and driver's cabin associated with the track tamping, lifting and, in particular, lining unit, another driver's cabin is provided at the other end of the machine frame for observation and operation of the ballast receiving and storage unit with its variable outlet openings which are preferably connected to hydraulic flaps for regulating the outflow of ballast.

3. A machine as claimed in Claim 1 or 2, characterized in that the variable outlet openings of the ballast storage unit preceding the tamping unit are formed by four outlet chutes which are arranged adjacent on another longitudinally of the sleepers and which are designed for
arrangement over a sleeper crib corresponding to the tamping zones.

4. A machine as claimed in Claim 1 or 2, characterized in that the variable outlet openings of the ballast storage unit preceding the tamping unit are formed by four outlet chutes which are arranged above a rail/sleeper intersection of two immediately adjacent sleepers to be tamped in the same operation by the tamping unit, another outlet opening variable by an outlet chute and following the outlet chutes in the working direction preferably being provided for the distribution of ballast in the middle of the track.

5. A machine as claimed in any of Claims 1 to 4, characterized in that a ballast metering unit preferably operable by a limit switch or by a sleeper contact switch via a hydraulic drive for regulating the outflow of ballast is associated with the ballast storage unit preceding the tamping unit or with each of the variable outlet openings preceding the tamping tools or with each outlet chute.

6. A machine as claimed in any of Claims 1 to 5, characterized in that the conveyor train for the delivery of ballast to the ballast storage unit from the rear or front end of the machine consists of a conveyor belt arrangement mounted on - preferably above - the machine frame and consisting of one or more endless conveyor belts preferably drivably in both directions.

7. A machine as claimed in any of Claims 1 to 5, characterized in that the conveyor train consists of a vertically displaceable sweeping unit arranged at the front end of the machine with an endless elevator belt, the ejection end of the elevator belt being associated with the ballast storage unit and the track tamping machine provided with the ballast storage unit preferably comprising - for continuous (non-stop) advance - a separate tool frame which in particular is provided with a supporting undercarriage, carries the track tamping, lifting and
lining units and is connected to its own drive for longitudinal displacement relative to the machine frame.

8. A machine as claimed in any of Claims 1 to 5, characterized in that the conveyor train consists of a single endless conveyor belt (Figure preferably drivable in both directions, which is arranged above the machine frame and extends from the rear end of the machine to at least the ballast storage unit, a guide member preferably being arranged above the ballast storage unit for guiding the ballast into the storage unit and/or for further transport of the ballast.

9. A machine as claimed in any of Claims 1 to 8, characterized in that, for use in a track relaying train, a rear frame section - looking in the working direction of the machine - of a machine frame of the track tamping machine consisting of two frame sections connected together by a joint comprises the tamping and lifting-and-lining units mounted for longitudinal displacement relative to the frame section by a drive between its two undercarriages spaced far apart from one another, a number of underfloor cabins and conveyor belts for the sleeper/rail fastenings being associated with the front frame section and the conveyor train associated with the ballast storage unit extending from the end of the rear frame section to the front frame section (Figures 1 to 3).

10. A machine as claimed in Claim 9, characterized in that the conveyor train for transporting the ballast to the ballast storage unit consists of several conveyor belts arranged one behind the other above both frame sections as an extension of a conveyor belt arrangement provided on the track relaying train with units for taking up and laying the old and new sleepers and for turning the sleepers through 90° for transport through a two-part main frame and with a clearing chain for levelling and taking up the ballast, the guide member for
guiding the ballast transportable by the conveyor train into the storage unit and/or onto the following conveyor belts being arranged above the ballast storage unit (Figures 1 to 3).

11. A machine as claimed in any of Claims 1 to 9, characterized in that the machine frame connected to a tamping, lifting and lining unit by a longitudinal displacement drive is coupled to the front end of a continuously advancing (non-stop) ballast transporting and loading train for transporting ballast, preferably via the storage unit, during the continuous (non-stop) advance of tamping or work, the conveyor train being an extension of a conveyor line of the loading train.

12. A machine as claimed in any of Claims 1 to 11, characterized in that the ballast storage unit preceding the tamping unit comprises eight variable outlet chutes, which are arranged in two groups of four respectively adjacent one another and above a sleeper bearing surface in two transverse rows arranged one behind the other longitudinally of the machine, preferably at a distance corresponding to the sleeper interval (Figure 4).

13. A machine as claimed in any of Claims 1 to 12, characterized in that, for separate use behind a continuously advancing (non-stop) ballast cleaning machine, the conveyor for delivering ballast to the ballast storage unit is in the form of a vertically displaceably elevating ballast conveyor belt which is arranged overhanging the machine frame - advancing in steps with its undercarriages and preferably two-sleeper tamping unit under the power of a drive - and with which a center plough designed to take up ballast with laterally arranged ballast guide plates is associated (Figure 5).

14. A machine as claimed in any of Claims 1 to 13, characterized in that - for separate use behind a working machine, for example a ballast cleaning machine - the conveyor train for delivering the ballast to the
ballast storage unit is designed at the front end of the machine as a sweeping unit with an endless elevator belt, optionally with a side plough, the tamping and lifting-and-lining unit being arranged on the separate tool frame provided with the supporting undercarriage and connected to a drive for longitudinal displacement with the machine frame (Figure 6).

15. A machine as claimed in any of Claims 1 to 14, characterized in that the variable outlet openings of the ballast storage unit and the outlet chutes associated therewith are distributed at least over the length of a sleeper corresponding to the tamping zones and are mounted for displacement in a longitudinal guide of the ballast storage unit, being connected to a longitudinal displacement drive and preferably to the longitudinal displacement drive coupled to the tool frame of the track tamping unit, the longitudinal displacement path corresponding to at least one sleeper interval.

16. A machine as claimed in any of Claims 1 to 15, characterized in that, where it is designed for use as a continuous (non-stop) tamping machine with continuous advance of its machine frame for step-by-step advance of the working units from one tamping zone to the next, the distance between the ballast storage unit and the front end of the track lifting-and-lining unit connected to the tamping unit in its rearmost position (in the working direction) corresponds to at least twice the sleeper interval.

17. A machine as claimed in any of Claims 1 to 16, characterized in that a vertically displaceable sweeping unit provided with a brush rotatable about a shaft extending transversely of the longitudinal axis of the machine is arranged on the machine frame behind the tamping unit and preferably behind the undercarriage in the working direction.

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BHILLIPS ORMONE AND FITZ
Attorneys for:
FRANZ PLASSER BAHNBAUMASCHINEN-INDUSTRIEGESSELLSCHAFT M.B.H.