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(58) Field of search
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(54) Unit for tamping three adjacent railway sleepers

(57) A tamping unit (40) for track tamping machines for tamping three immediately adjacent sleepers (58) of a track comprises three pairs of tamping tools mounted in tandem longitudinally of the machine on a vertically displaceable tool carrier (43) or six tamping tools (45, 46) comprising tamping tines (56), the tamping tools being connected to an eccentric shaft (48, 49) by squeezing drives (50). Two eccentric shafts (48, 49) distanced from one another longitudinally of the machine are provided, each eccentric shaft (48, 49) being connected by the squeezing drive (50) to an outer tamping tool (46) situated in an end position relative to the longitudinal axis of the machine and to two adjoining inner tamping tools (45).

Fig.5

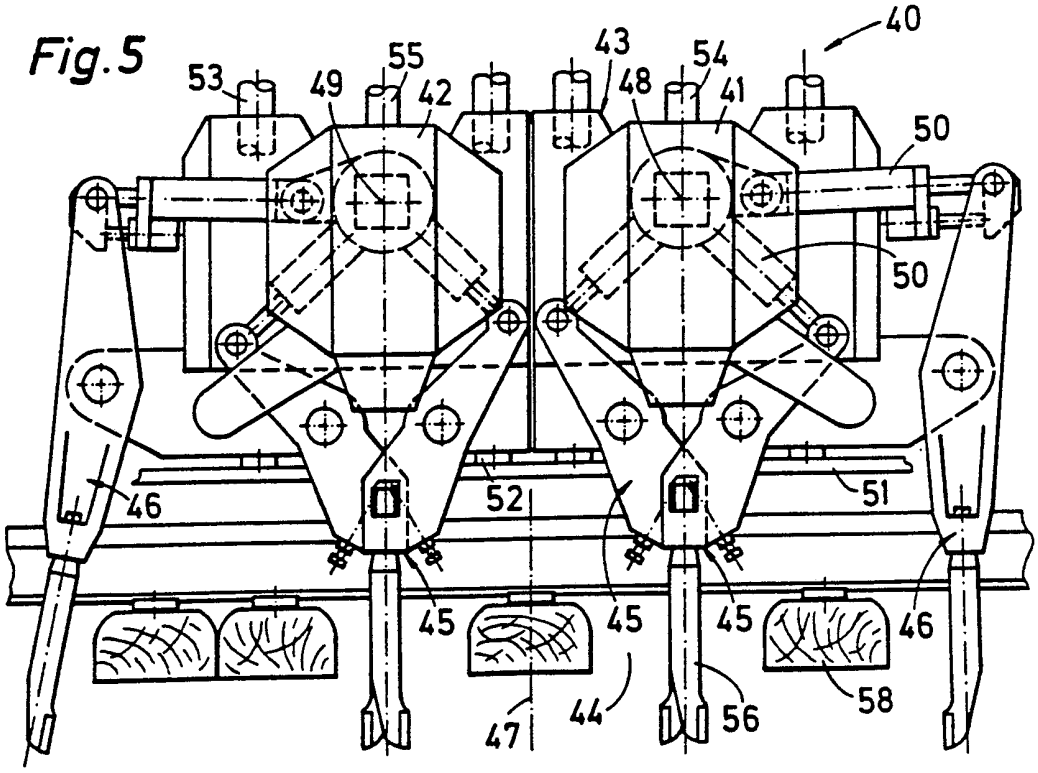

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Fig.1

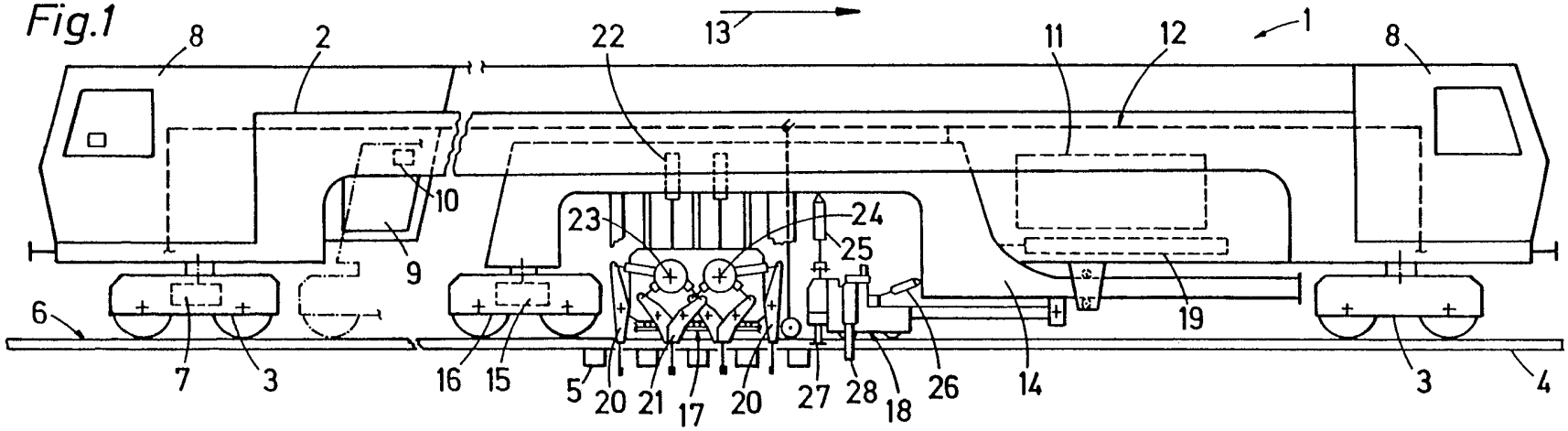


Fig.2

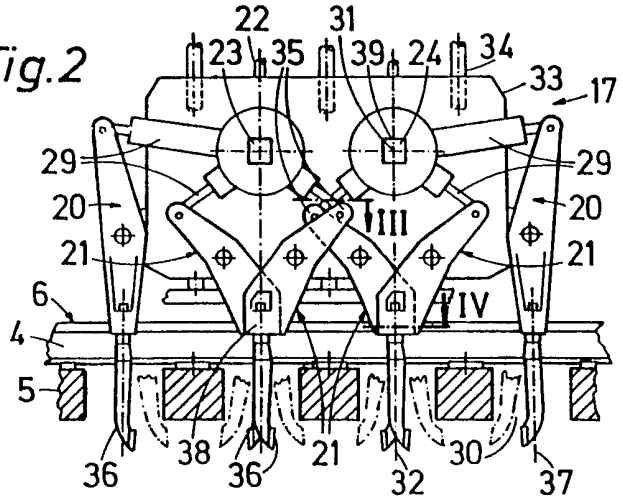
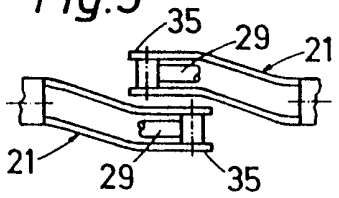


Fig.3



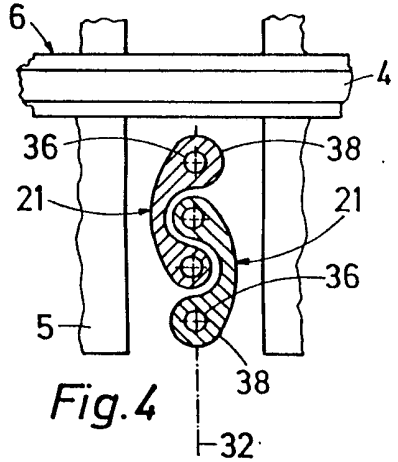


Fig.4

Fig.5

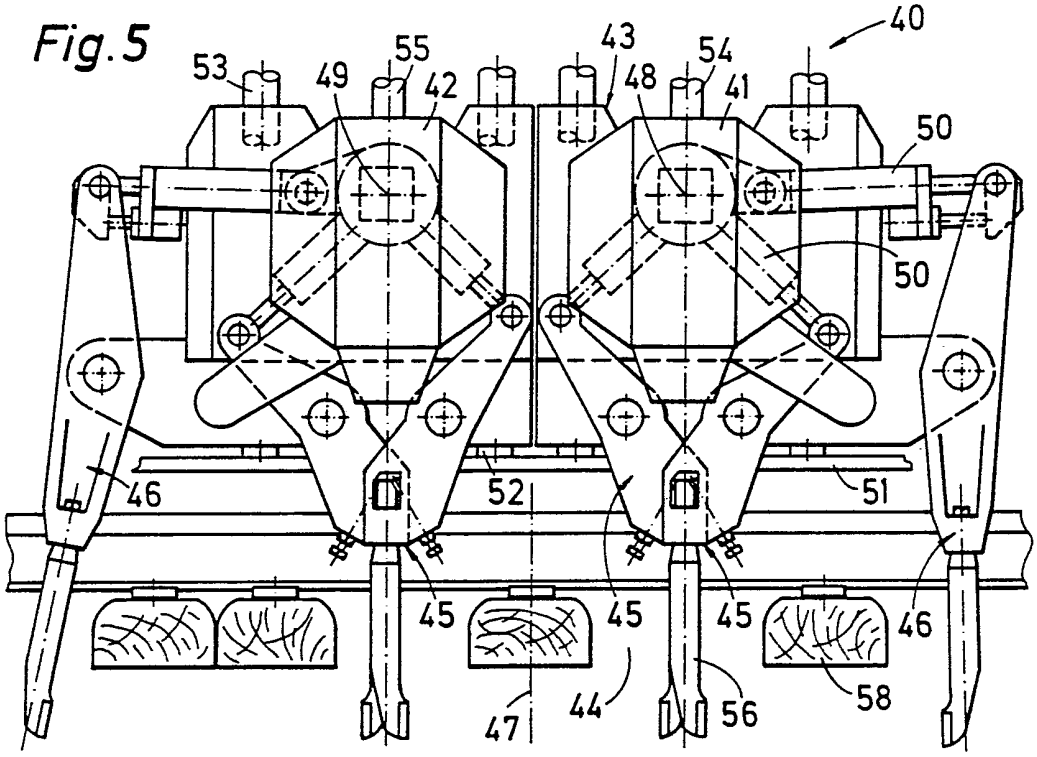

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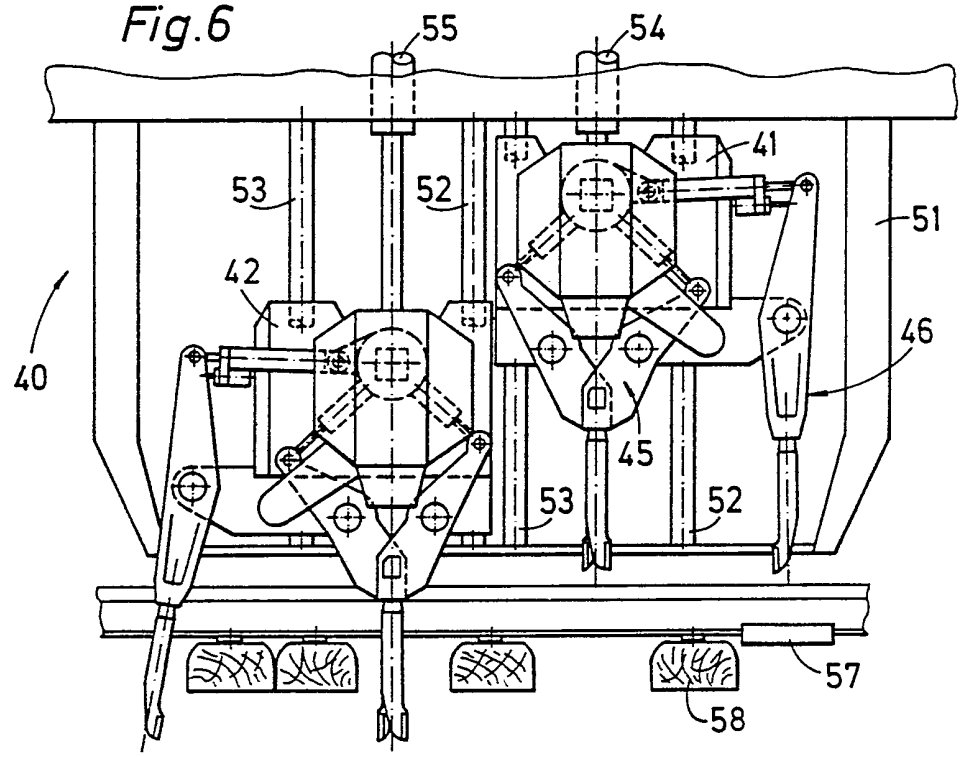
Fig.6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A TAMPING UNIT FOR TRACK TAMPING MACHINES FOR TAMPING THREE SLEEPERS

This invention relates to a tamping unit for track tamping machines for tamping three immediately adjacent sleepers of a track comprising at least three pairs of tamping tools mounted in tandem longitudinally of the machine on a vertically displaceable tool carrier or six tamping tools each comprising at least one tamping tine, the tamping tools being connected to an eccentric shaft by squeezing drives.

One such tamping unit for simultaneously tamping three immediately adjacent sleepers is described in AT-PS 385 797. The tamping tools mounted in tandem longitudinally of the machine on a vertically displaceable tool carrier, as shown in Fig. 9, are connected by squeezing drives and eccentric arms to an eccentric shaft mounted centrally on the tool carrier. Each of the two eccentric arms is formed by an angled lever which, in addition to the bearing ring used for pivotal connection to the eccentric shaft, comprises a second pivotal connection for the pair of tamping tools arranged adjacent one another longitudinally of the track. Another third pivotal connection is connected by a coupling to a journal fixed to the tool carrier. The disadvantage of this known tamping unit is that a very complicated and hence susceptible lever arrangement is required for transmitting the vibrations from the eccentric shaft to the squeezing drives.

AT-PS 337 753 also describes a tamping unit for tamping three immediately adjacent sleepers comprising a centrally arranged eccentric shaft. To carry out the squeezing movement or rather to consolidate the ballast, all the tamping tools are mounted for horizontal displacement longitudinally of the machine in the region of their mounting on the tool carrier and are connected to squeezing drives. The upper ends of the tamping tools are connected to the central eccentric shaft by eccentric arms. On account of the relatively large distance between the two

outer tamping tools and the eccentric shaft, the two eccentric arms are made correspondingly long and weighty.

Finally, a tamping machine for tamping four immediately adjacent sleepers is known from AT-PS 290 603. However, the machine is question is a combination of two pivotally interconnected machines each comprising a two-sleeper tamping unit.

Now, the object of the present invention was to provide a tamping unit for tamping three immediately adjacent sleepers of the type mentioned at the beginning which would provide for simplified transmission of the vibrations from the eccentric shaft to the tamping tools.

According to the invention, the solution to this problem is characterized in that two eccentric shafts distanced from one another longitudinally of the machine are provided, each eccentric shaft being connected by the squeezing drive to an outer tamping tool situated in an end position relative to the longitudinal axis of the machine and to two adjoining inner tamping tools. The arrangement of two eccentric shafts in conjunction with the special association of the individual tamping tools provides for greatly simplified transmission of the vibrations by comparison with hitherto known three-sleeper tamping units. Accordingly, particularly rough working conditions created by the vibrations and the repeated impact-like penetration of the tamping tools into the ballast can readily be accommodated. This is attributable in particular to the fact that the squeezing drives are directly mounted very easily on the eccentric shaft with no transmission elements or the like in between. The mechanical stressing of the two eccentric shafts is also substantially halved so that weaker dimensioning thereof is possible and the increased design effort involved in a double arrangement can largely be compensated in this way.

In one advantageous embodiment of the invention, the

squeezing drives of the two inner tamping tools designed to penetrate into the same sleeper crib are arranged symmetrically in relation to a vertical plane of symmetry passing through the axis of rotation of the eccentric shafts. By virtue of this arrangement, the upper lever arms - connected to the squeezing drives - of the inner tamping tools can be symmetrically designed so that the squeezing forces can be more uniformly transmitted.

Another embodiment of the invention is characterized in that the tool carrier is formed by two component tool carriers arranged in tandem longitudinally of the machine of which each is connected to its own vertical displacement drive and on which two inner tamping tools and one outer tamping tool per longitudinal rail side and an eccentric shaft are mounted. Even in the presence of track obstacles in the vicinity of one or two tamping tools of one half of the tamping unit, this division of the tool carrier enables the tamping tools mounted on the other component tool carrier to be lowered for unhindered tamping of the track. In other words, this advantageous solution enables the tamping unit to be used both as an integral unit for simultaneously tamping three immediately adjacent sleepers and as a component unit for tamping a single sleeper without any need for rerigging work.

In another embodiment of the invention, the two component tool carriers, the two eccentric shafts and the tamping tools are arranged symmetrically in relation to a vertical plane of symmetry extending transversely of the longitudinal axis of the machine. In this way, the tamping unit can be divided very easily and without difficulty to accommodate a tamping obstacle in the vicinity of one of the two halves of the tamping unit, avoiding the need for time-consuming rerigging work or further centring operations.

According to another aspect of the invention, the

upper ends - each connected to a squeezing drive - of the two inner tamping tools directly adjoining the middle of the unit are each arranged in the opposite half of the unit and are distanced from one another or offset in a transverse direction of the tamping unit passing through the axis of rotation of the eccentric shafts. Despite the partly interengaging arrangement, this offset construction provides for an undisturbed squeezing movement of the two central inner tamping tools, the resulting relatively long length of the levers also enabling the squeezing forces to be better transmitted.

In another embodiment of the invention, the tool carrier mounted for vertical displacement on at least three vertical guide columns is connected to two vertical displacement drives. In this way, the vertical displacements of the tool carrier which have to be completed very quickly before and after each tamping cycle can be carried out without difficulty despite the considerable weight of the tamping unit.

A further embodiment of the invention is characterized in that, in their penetration position, the tamping tines of the inner tamping tools which are designed to penetrate into the same sleeper crib and to be squeezed towards one another are situated with their longitudinal axes, including their shaft holder, in a common transverse plane which extends transversely of the longitudinal axis of the unit and parallel to the axis of the guide columns. Accordingly, the four tamping tines of the two inner tamping tools which are designed for penetration into the same sleeper crib can also be arranged in such a way that the width of the tine arrangement as a whole longitudinally of the machine occupies only a minimum of space. As a result, the tamping tools can penetrate readily even into relatively narrow sleeper cribs.

According to another aspect of the invention, the two

inner tamping tools which are designed to penetrate into the same sleeper crib and which are each connected to two tamping tines comprise a curved shaft holder, as seen in a cross-section taken perpendicularly of the longitudinal axis, the two shaft holders being offset in relation to one another transversely of the tamping unit to obtain an interengaging arrangement. The interengaging arrangement of the two shaft holders provides on the one hand for their unimpeded relative displacement and, on the other hand, for completely stable fixing of the tamping tines.

Another embodiment of the invention is characterized in that the axis of rotation of each eccentric shaft is arranged in the transverse plane common to the tamping tines of the inner tamping tools and parallel to the axis of the guide columns. This provides for symmetrical construction of the two inner tamping tools designed to penetrate into the same sleeper crib and hence for uniform transmission of the squeezing forces.

In another embodiment of the invention, the two eccentric shafts are mechanically coupled. This ensures that the tamping tools or tamping tines facing one another in the region of each longitudinal side of a sleeper to be tamped always vibrate in counter-phase to one another.

A further embodiment of the invention is characterized in that the tamping unit is arranged on a unit frame which is designed for displacement longitudinally of and relative to the machine frame of a track tamping machine and which is supported at its front end - in the working direction of the machine - on the machine frame and at its rear end on the track via a bogie-type undercarriage. By virtue of this arrangement of the very heavy three-sleeper tamping unit, its weight is concentrated on the unit frame so that the machine frame is largely relieved of the corresponding load, the unit frame merely having to be advanced in steps from one tamping position to the next while the greater

weight of the machine situated on the machine frame can advantageously be continuously advanced independently of the tamping cycles.

Two embodiments 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 tamping machine comprising a tamping unit for simultaneously tamping three immediately adjacent sleepers.

Figure 2 is an enlarged side elevation of the three-sleeper tamping unit.

Figure 3 is an enlarged cross-section through two tamping tools of the tamping unit on the line III in Fig. 2.

Figure 4 is an enlarged cross-section through the two middle tamping tools in the region of the shaft holders on the line IV in Fig. 2.

Figure 5 is a side elevation of another embodiment of a tamping unit according to the invention.

Figure 6 is a side elevation of the tamping unit shown in Fig. 5, only one half of the tamping unit being lowered to tamp the track.

The track tamping machine 1 shown in Fig. 1 comprises an elongate machine frame 2 which, through bogie-type undercarriages 3 at its ends, is designed to travel along a track 6 of rails 4 and sleepers 5 under the power of an axle drive 7. Two driver's cabins 8 and one operator's cabin 9 with a central control console 10 are arranged on the machine frame 2. The various drives are served by a central power plant 11. A levelling and lining reference system 12 is used to monitor the position of the track. The working direction of the track tamping machine 1 is indicated by an arrow 13.

Arranged between the two bogie-type undercarriages 3 is a unit frame 14 which, at its rear end, is supported on

the track 6 by a bogie-type undercarriage 16 comprising an axle drive 15 and, at its front end, is supported for longitudinal displacement on the machine frame 2. A longitudinal displacement drive 19 is provided for the longitudinal displacement of the unit frame 14 connected to a tamping and track lifting and lining unit 17,18. On each longitudinal rail side, the tamping unit 17 designed for the simultaneous tamping of three immediately adjacent sleepers 5 comprises two outer tamping tools 20 situated in an outer or end position relative to the longitudinal axis of the machine and four inner tamping tools 21 situated in between and is designed for vertical displacement under the power of drives 22. Two eccentric shafts 23,24 distanced from one another longitudinally of the machine are provided for vibrating the tamping tools 20,21. The track lifting and lining unit 18, which is designed to travel along the track 6 on flanged rollers and is connected to the unit frame 14 by lifting and lining drives 25,26, is equipped with lifting rollers 27 designed for lateral application to the outside of the rails and with a lifting hook 28.

The unit frame 14 together with the tamping and track lifting and lining unit 17,18 is designed for longitudinal displacement relative to the machine frame 2 from the front end position shown in solid lines into a rear end position shown in dash-dot lines. During tamping, the unit frame 14 remains stationary while that part of the machine which is connected to the machine frame 2 is continuously advanced. After tamping, the unit frame 14 together with the tamping, lifting and lining unit 17,18 is advanced at high speed from the rear to the front end position under the power of the axle drive 15 and the longitudinal displacement drive 19.

As shown in Fig. 2 in particular, each eccentric shaft 23,24 is connected by a squeezing drive 29 to an outer tamping tool 20 situated in an end or outer position longi-

tudinally of the machine and to two adjoining inner tamping tools 21. The relatively short squeezing drives 29 of the inner tamping tools 21 designed for penetration into the same sleeper crib 30 are arranged symmetrically in relation to a plane of symmetry or transverse plane 32 passing through the axis of rotation 31 of the eccentric shafts 23,24 and parallel to the guide columns 34. The tamping tools 20,21 and also the two eccentric shafts 23,24 are mounted on a tool carrier 33 which is designed for vertical displacement along three vertical guide columns 34 connected to the unit frame 14.

The upper ends 35 - each connected to a squeezing drive 29 - of the two inner tamping tools 21 immediately adjoining the middle of the unit are each arranged in the opposite half of the unit and are distanced from one another or rather offset in a transverse direction of the tamping unit 17 extending in the axis of rotation of the eccentric shafts 23,24. Tamping tines 36 fixed to the inner tamping tools 21 designed to penetrate into the same sleeper crib 30 and to be squeezed together are arranged with their longitudinal axis 37, including their shaft holder 38, in the common transverse plane 32 extending transversely of the longitudinal axis of the unit and parallel to the axis of the guide columns 34. The axis of rotation 31 of each eccentric shaft 23,24 is arranged in the transverse plane 32. Each eccentric shaft 23,24 is connected to a hydraulic drive 39. To ensure that the tamping tines 36 pivotal towards one another through the squeezing movement vibrate in counterphase for tamping a sleeper 5, the two eccentric shafts 23,24 are mechanically coupled together. In another embodiment, however, the tamping unit may also be directly arranged on the machine frame of a tamping machine advancing in steps.

The above-mentioned offset arrangement of the upper ends 35 of the inner tamping tools 21 arranged in the

middle of the unit is clearly visible in Fig. 3. In this arrangement, the upper ends 35 projecting beyond the middle of the unit are freely pivotal towards one another for the squeezing movement.

Figure 4 clearly shows that the two inner tamping tools 21, which are designed for penetration into the same sleeper crib 30 and are each connected to two tamping tines 36, have a curved shaft holder 38. The two shaft holders 38 are offset relative to one another transversely of the unit 17 and longitudinally of the sleepers to obtain an inter-engaging arrangement. The four tamping tines 36 designed to penetrate into the same sleeper crib 30 can thus be arranged in a common transverse plane 32 with no restriction on the squeezing movement.

The tamping unit 40 shown in Figs. 5 and 6 comprises a tool carrier 43 formed by two component tool carriers 41,42 arranged in tandem longitudinally of the machine and each comprising four inner tamping tools 45 and two outer tamping tools 46 per longitudinal rail side. The inner tamping tools 45 are arranged in pairs to penetrate into the same sleeper crib 44. Each of the two component tool carriers 41,42 arranged symmetrically in relation to a vertical plane of symmetry 47 extending transversely of the longitudinal axis of the machine comprises an eccentric shaft 48,49 which is connected to a drive and, via squeezing drives 50, to the tamping tools 45 and 46. Each of the two component tool carriers 41,42 is mounted for vertical displacement on its own guide columns 52,53 connected to a common unit frame 51 and is connected to its own vertical displacement drive 54,55. The entire tamping unit 40 is symmetrical in relation to the central plane of symmetry 47. As already described with reference to Figs. 1 to 4, tamping tines 56 connected to the inner tamping tools 45 are arranged with their longitudinal axis in a common plane extending transversely of the longitudinal axis of the

machine.

As shown in Fig. 6, the lowering of only the left-hand component tool carrier 42 to tamp a sleeper 58 is possible in the presence of a tamping obstacle 57, for example in the form of a switch box or the like. To this end, only the vertical displacement drive 55 is actuated. For the next tamping cycle, both vertical displacement drives 54,55 are actuated again for simultaneously tamping three immediately adjacent sleepers 58.

CLAIMS

1. A tamping unit for track tamping machines for tamping three immediately adjacent sleepers of a track comprising at least three pairs of tamping tools mounted in tandem longitudinally of the machine on a vertically displaceable tool carrier or six tamping tools each comprising at least one tamping tine, the tamping tools being connected to an eccentric shaft by squeezing drives, characterized in that two eccentric shafts distanced from one another longitudinally of the machine are provided, each eccentric shaft being connected by the squeezing drive to an outer tamping tool situated in an end position relative to the longitudinal axis of the machine and to two adjoining inner tamping tools .

2. A tamping unit as claimed in claim 1 , characterized in that the squeezing drives of the two inner tamping tools designed to penetrate into the same sleeper crib are arranged symmetrically in relation to a vertical plane of symmetry passing through the axis of rotation of the eccentric shafts .

3. A tamping unit as claimed in claim 1 or 2, characterized in that the tool carrier is formed by two component tool carriers arranged in tandem longitudinally of the machine of which each is connected to its own vertical displacement drive and on which two inner tamping tools and one outer tamping tool per longitudinal rail side and an eccentric shaft are mounted.

4. A tamping unit as claimed in claim 3, characterized in that the two component tool carriers , the two eccentric shafts and the tamping tools are arranged symmetrically in relation to a vertical plane of symmetry extending transversely of the longitudinal axis of the machine.

5. A tamping unit as claimed in claim 1 or 2, charac-

terized in that the upper ends - connected to a squeezing drive - of the two inner tamping tools directly adjoining the middle of the unit are each arranged in the opposite half of the unit and are distanced from one another or offset in a transverse direction of the tamping unit passing through the axis of rotation of the eccentric shafts .

6. A tamping unit as claimed in claim 1 or 2, characterized in that the tool carrier mounted for vertical displacement on at least three vertical guide columns is connected to two vertical displacement drives .

7. A tamping unit as claimed in any of claims 1 to 6, characterized in that, in their penetration position, the tamping tines of the inner tamping tools which are designed to penetrate into the same sleeper crib (30) and to be squeezed towards one another are situated with their longitudinal axes , including their shaft holder , in a common transverse plane which extends transversely of the longitudinal axis of the unit and parallel to the axis of the guide columns .

8. A tamping unit as claimed in any of claims 1, 2 and 5 to 7, characterized in that the two inner tamping tools which are designed to penetrate into the same sleeper crib and which are each connected to two tamping tines comprise a curved shaft holder , as seen in a cross-section taken perpendicularly of the longitudinal axis , the two shaft holders being offset in relation to one another transversely of the tamping unit to obtain an interengaging arrangement.

9. A tamping unit as claimed in claim 7 or 8, characterized in that the axis of rotation of each eccentric shaft is arranged in the transverse plane common to the tamping tines of the inner tamping tools and parallel to the axis of the guide columns .

10. A tamping unit as claimed in any of claims 1 to 9,

characterized in that the two eccentric shafts are mechanically coupled.

11. A tamping unit as claimed in any of claims 1 to 10, characterized in that the tamping unit is arranged on a unit frame which is designed for displacement longitudinally of and relative to the machine frame of a track tamping machine and which is supported at its front end - in the working direction of the machine - on the machine frame . and at its rear end on the track via a bogie-type undercarriage .

12. A tamping unit for a railway ballast tamping machine, substantially as herein described with reference to figures 1 to 4 or figures 5 and 6 of the accompanying drawings.

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