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ACTUATING MECHANISM FOR PIVOTAL AND VIBRATORY BALLAST TAMPING TOOLS

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FIG. 2

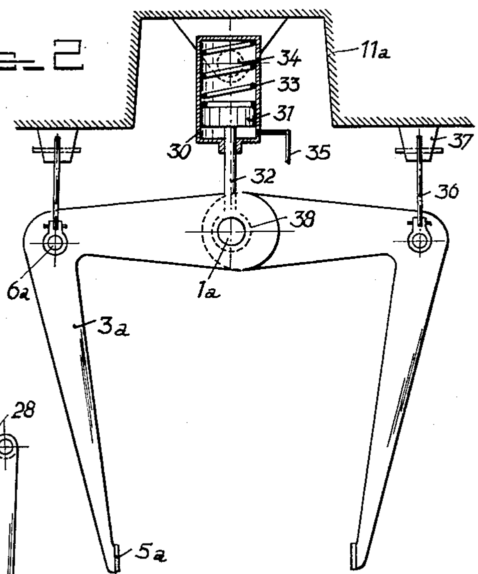
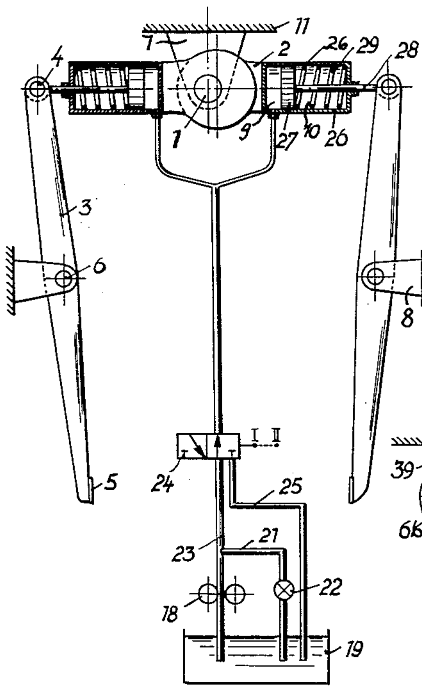


FIG. 1



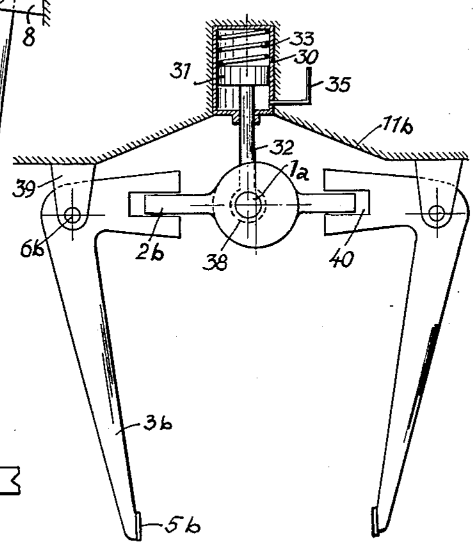


FIG. 3

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ACTUATING MECHANISM FOR PIVOTAL AND VIBRATORY BALLAST TAMPING TOOLS

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6 Claims. (Cl. 104—12)

The present invention relates to ballast tamping machines carrying one or several ballast tamping tools, preferably pairs of cooperating tamping tools which are simultaneously vibrated and pivoted together to compact ballast between their jaws. More particularly, this invention relates to the actuating mechanism for such tamping tools.

In modern machines of this type, the tamping tools are preferably mechanically vibrated by the rotation of an eccentric shaft engaging mounting arms for the tools while the distance between the tamping tool jaws of cooperating tools is varied by pressure fluid, preferably hydraulically, operated means. While modern tampers of this general type have recently made tremendous strides in improving the quality and cutting the cost of railroad bed maintenance, certain problems have been encountered in the construction of such machines. For instance, it has been found difficult to secure the center of vibration of the tamping tools against vibratory motion so as to make this point truly a dead center of the tools during vibration. In this connection, it has been proposed to apply the pressure fluid operated pivoting means of the tamping tools to the center of vibration and to use the power of this means also for holding the dead center against vibration.

If the tamping tools are pivoted by mechanical means, i. e. with a threaded spindle holding a nut linked to each tamping tool, the nut constitutes a relatively satisfactory dead center for the tool but the mechanical distance adjustment of the tamping tools is generally not satisfactory for modern, fast-operating tampers. If hydraulic means is used to move the vibration centers of the tamping tools and thereby to vary their distance, it has been found difficult, if not impossible, to eliminate vibrations which are then transferred by the hydraulic means to the tamping tool carrier and thence to the mobile track tamping carriage and the rails themselves. This is highly undesirable and, in an attempt to overcome this difficulty, very high pressures were used in the hydraulic pivoting means to hold the dead center of the tamping tools against vibration. This has involved complicated safety valve and vibration damper arrangements in the pivoting means, causing increased construction and operating costs as well as more rapid deterioration of the machine. Despite this, full elimination of vibrations from the hydraulic pivoting means was found to be impossible and, considering the great advantages of this means in other respects, this disadvantage has been accepted.

The present invention is based on the concept that no harm is done to a pressure fluid operated pivoting mechanism if it is subjected to vibrations and that such vibrations will not interfere with its operation and will not be transmitted to its fixed support. On the other hand, it is relatively simple to retain the vibration center of each tamping tool against vibration when the pivoting mechanism is structurally separated from the vibration center retaining means.

With this object in mind, the vibratory and pivoting motion is applied to each tamping tool at the same point. An eccentric shaft operatively engages the mounting arm of each tool and the pressure fluid operated tamping tool pivoting means is applied to the tool at the same point at which the mounting arm supports the tool.

The above and other objects, features and advantages of the present invention will be more fully explained in the following detailed description of certain preferred embodiments thereof, taken in conjuction with the accompanying drawing which illustrates certain structural details without limiting the invention thereto. In the drawing,

FIG. 1 is a schematic side view, partly in section, of an actuating mechanism for a pair of cooperating tamping tools according to one embodiment of the invention;

FIG. 2 is a view similar to that of FIG. 1 of another embodiment of the actuating mechanism; and

FIG. 3 illustrates a modification of the embodiment of FIG. 2.

Since the present invention constitutes an improvement of an otherwise well known type of track tamping machine exemplified but in no way limited to the type disclosed in our U. S. Patent No. 2,876,709, the description is confined to the specific improvement and to such parts as necessarily cooperate with it or as may be necessary to a complete understanding of it. For this reason the only conventional part of the mobile track tamping machine per se, which is indicated in the drawing, is the vertically adjustable tamping tool carrier.

Referring now to FIG. 1, there is shown an eccentric shaft **1** journaled in the bearings **7** of vertically adjustable tamping tool carrier **11**. The eccentric shaft vibrates the tamping tools **3** by reciprocating or oscillating tool mounting arms **2** when the shaft is rotated. The upper ends of the tamping tools **3** are pivoted to mounting arms **2** at **4** whereby the oscillating motion of the mounting arms is transferred to the tamping tools to vibrate the same.

As shown, the mounting arms for the tamping tools are constituted for a fixed element and an element which is relatively glidable by pressure fluid means whereby the arm length may be adjusted. The illustrated mechanism is a hydraulic cylinder-and-piston device used for varying the relative distance of the cooperating tamping tools **3** in a manner known per se. At the dead point or vibration center **6** of the tamping tools, which is at or near their midpoint, the tools are held in fixed bearings **8** which are mounted on tamping tool carrier **11**. The closing and opening movement of the lower ends or jaws **5** of the tamping tools, which are immersed in the ballast during the tamping operation, is effected by the hydraulic cylinder-and-piston device which will now be described.

The cylinders **26** are divided by piston **27** into two chambers. Chambers **9** receive pressure fluid from conduits **23** while a compression spring **29** is mounted in each chamber **10**. Piston rod **28**, which is the glidable element, is fixedly connected to piston **27** and has the upper end of a respective tamping tool linked to its outer end at **4**. Normally, spring **29** biases the piston and its piston rod inwardly, thus swinging the associated tamping tool outwardly about its pivot **6**, in which position the jaws **5** are at their farthest distance from each other, i.e., the cooperating tamping tools are "open." When pressure fluid is supplied to chambers **9** to counteract the bias of springs **29**, the pivots **4** are pushed out, swinging the tamping tools about pivots **6** in the opposite direction to effect mutual approachment of the jaws **5** to bring the cooperating tamping tools into the "closed" or tamping position wherein ballast between the jaws **5** is compacted under the pressure of the closing vibratory tamping tools. This type of tamping operation is well known per se and need, therefore, not be further described.

In the illustrated embodiment, the pressure fluid is a hydraulic liquid which may be supplied to cylinder chambers 9 from a hydraulic liquid supply constituted by tank 19. A control valve 24, with alternate positions I and II, is mounted in pressure fluid supply line 23 and pump 18 will supply hydraulic liquid to the cylinder chambers 9 when the control valve is in one position while the liquid will be returned to the storage tank by return conduit 25 when the valve 24 is in the other or closed position. A pressure safety line 21 with its pressure relief valve 22 regulates the maximum pressure in conduit 23 at all times.

FIG. 2 illustrates an embodiment in which each tamping tool forms a unitary element with its mounting arm, thus constituting a bell crank lever. As shown, the horizontal or mounting arm of each tamping tool *3a* is engaged by eccentric shaft **1***a* whereby rotation of the shaft transmits an oscillatory or vibratory motion to the tamping tools and their tamping jaws *5a*. Each bell crank is pivoted at its apex *6a* to tamping tool carrier **11***a*. It may be advantageous to mount the pivots of the tamping tools yieldingly at least in one plane. In the illustrated embodiment, the pivots are yieldingly mounted in a horizontal plane on leaf springs **36** which are securely clamped to the tamping tool carrier at brackets **37**.

In this case, the pincer movement of tamping jaws *5a* is effected by vertically moving the eccentric shaft *1a* in its bearing **38**. In this manner, the eccentric shaft serves not only to vibrate the tamping tools by its rotation but also as a fulcrum for the pivoting motion of the two mounting arms which form a unit with the tamping tools. When the eccentric shaft is moved up, the jaws close and when it moves down, the jaws open.

The vertical adjustment of the eccentric shaft is effected in the illustrated embodiment by a cylinder-and-piston mechanism including a cylinder **30** glidably holding a piston **31** with its piston rod **32** which operatively engages the eccentric shaft so that the shaft is vertically reciprocated by reciprocation of piston rod **32**. Pressure fluids, such as hydraulic liquid, is supplied to one chamber of the cylinder **30** through supply conduit **35** and a compression spring **33** is mounted in the other cylinder chamber. The hydraulic system may be the same or similar to that illustrated in FIG. 1 to supply pressure fluid to the cylinder when it is desired to close the jaws. Upon discontinuance of the pressure fluid supply, the compression spring **33** will automatically move the eccentric shaft down again into the illustrated or open position, for which purpose no great force is required.

As shown, the cylinder **30** is pivotally mounted in bracket **34** of carrier **11***a*. The horizontal vibrations generated by the rotation of the eccentric shaft are absorbed by leaf springs **36**.

A modification of the embodiment of FIG. 2 is shown in FIG. 3 wherein the horizontal vibrations are absorbed in a different manner. As shown, the apex *6b* of bell crank tamping tool *3b* is pivoted to a fixed bracket **39** of tamping tool carrier **11***b* while the mounting arms include elements **2***b* telescoped in the mounting arm elements of the bell cranks so that the two mounting arm elements may glidably move in relation to each other in guide slots **40** of the horizontal arms of the bell cranks. As in the other embodiments, rotation of eccentric shaft *1a* will oscillate or vibrate the tamping tools but the horizontal component of this vibratory motion will not be transmitted to the tools because the mounting arms **2***b* freely glide in slots **40** and thus absorb this motion.

As in the embodiment of FIG. 2, eccentric shaft **1a** also serves as fulcrum for a pivoting motion of the two mounting arms which engage the tamping tools and pivot them simultaneously. Closing and opening of the tamping jaws **5***b* is effected by the same mechanism as described in connection with FIG. 2, identical reference numerals being applied to these parts. It should be noted, however, that the cylinder **30** is fixedly mounted in the tamping tool carrier **11***b* of this embodiment, rather than being pivoted thereto, as in FIG. 2. In all other respects, the embodiments of FIGS. 2 and 3 are structurally and functionally identical. In each case, only vertical oscillation is transmitted to the horizontal arms of the bell crank tamping tools, which is automatically converted into horizontal oscillation or vibration at the jaws on the other ends of the tamping tools, which aids in the compacting of the ballast between the jaws during the tamping operation when the jaws are closed.

While certain preferred embodiments of the new and improved actuating mechanism for vibratory tamping tools have been described and illustrated in detail, it will be obvious that the only essential feature of the invention resides in the application of mechanical vibration and pressure-fluid operated pivoting of the tamping tool at the same point removed from the vibration center of the tool. Many modifications and variations of the structure embodying this principle may occur to the skilled in the art, particularly after benefiting from our teaching, without departing from the spirit and scope of the invention as defined in the appended claims.

What we claim is:

1. A tamping mechanism comprising a pivotal and vibratory ballast tamping tool, a tamping tool carrier, a fixed pivot mounting said tamping tool on said carrier, the tool being pivotal about said pivot, a mounting arm connected to the tamping tool, an eccentric shaft mounted on said carrier and operatively engaging the mounting arm whereby the mounting arm and the associated tamping tool are vibrated upon rotation of the eccentric shaft, and a pressure fluid operated means operatively connected with said tamping tool for pivoting the tamping tool about said fixed pivot, the vibratory and pivoting motion being applied at the same point of the tamping tool, which point is removed from the vibration or dead center of the tool.

2. A tamping mechanism comprising a pair of pivotal and vibratory, cooperating ballast tamping tools, a tamping tool carrier, a substantially horizontal mounting arm connected to each of the cooperating tamping tools, a substantially horizontal eccentric shaft mounted on said carrier and extending perpendicularly to and between the mounting arms, the eccentric shaft operatively engaging the mounting arms whereby the mounting arms and the associated tamping tools are vibrated upon rotation of the eccentric shaft, a fixed pivot mounting each of the cooperating tamping tools on said carrier intermediate the ends of the tamping tools, and a hydraulic pressure means operatively connected with and pivoting each of said tamping tools about a respective one of said pivots for varying the distance between the lower ends of the tamping tools, the vibratory and pivoting motion being applied at the same point of the tamping tools, which points are removed from the respective fixed pivots of said tools.

3. A tamping mechanism comprising a pair of pivotal and vibratory, cooperating ballast tamping tools, a tamping tool carrier, a substantially horizontal mounting arm for each of the cooperating tamping tools, each mounting arm being constituted by a fixed element and an element glidable in relation to the fixed element whereby the length of the arm may be adjusted, pressure fluid means for moving the two elements relative to one another, the upper end of each tamping tool being linked to a respective one of said glidable elements of the mounting arms, a substantially horizontal eccentric shaft mounted on said carrier and extending perpendicularly to and between the mounting arms, the eccentric shaft operatively engaging the fixed elements of the mounting arms whereby the mounting arms and the associated tamping tools are vibrated upon rotation of the eccen-

tric shaft, and a fixed pivot mounting the tamping tools on said carrier approximately mid-point at the dead center of each tamping tool.

4. A tamping mechanism comprising a pair of pivotal and vibratory, cooperating ballast tamping tools, each tool being constituted by a bell crank consisting of a tamping arm and a substantially horizontal mounting arm, the two arms of the bell crank meeting at an apex, a tamping tool carrier, a substantially horizontal eccentric shaft mounted on said carrier and extending perpendicularly to and between the mounting arms, the eccentric shaft operatively engaging the mounting arms whereby the mounting arms and the associated tamping tools are vibrated upon rotation of the eccentric shaft, a fixed pivot mounting each of the cooperating tamping tools at the apex of each bell crank on the carrier, and a hydraulic pressure means operatively connected with and vertically moving the eccentric shaft, the eccentric shaft forming a fulcrum for said mounting arms whereby the bell cranks are pivoted about their respective pivots upon vertical movement of the fulcrum.

5. A tamping mechanism comprising a pair of pivotal and vibratory, cooperating ballast tamping tools, each tool being constituted by a bell crank consisting of a tamping arm and a substantially horizontal mounting arm, the two arms of the bell crank meeting at an apex, a tamping tool carrier, a substantially horizontal eccentric shaft mounted on said carrier and extending perpendicularly to and between the mounting arms, the eccentric shaft operatively engaging the mounting arms whereby the mounting arms and the associated tamping tools are vibrated upon rotation of the eccentric shaft, a fixed pivot mounting each of the cooperating tamping tools at the apex of each bell crank on the carrier, means for yieldingly supporting each pivot in a horizontal plane defined by the mounting arms and the eccentric shaft, and a hydraulic pressure means operatively connected with and vertically moving the eccentric shaft, the eccentric shaft forming a fulcrum for said mounting arms whereby the bell cranks are pivoted about their respective pivots upon vertical movement of the fulcrum.

6. A tamping mechanism comprising a pair of pivotal and vibratory, cooperating ballast tamping tools, each tool being constituted by a bell crank consisting of a tamping arm and a substantially horizontal mounting arm, the two arms of the bell crank meeting at an apex and each mounting arm consisting of two elements telescoped into each other for relative gliding motion, a tamping tool carrier, a substantially horizontal eccentric shaft extending perpendicularly to and between the mounting arms, the eccentric shaft mounted on said carrier and operatively engaging one of said mounting arm elements of each tamping tool whereby the mounting arms and the associated tamping tools are vibrated upon rotation of the eccentric shaft, a fixed pivot mounting each of the cooperating tamping tools at the apex of each bell crank on the carrier and a hydraulic pressure means operatively connected with and vertically moving the eccentric shaft, the eccentric shaft forming a fulcrum for said mounting arms whereby the bell cranks are pivoted about their respective pivots upon vertical movement of the fulcrum.

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