Aug. 22, 1950 F. H. KIND 2,519,477

POWER HAMMER

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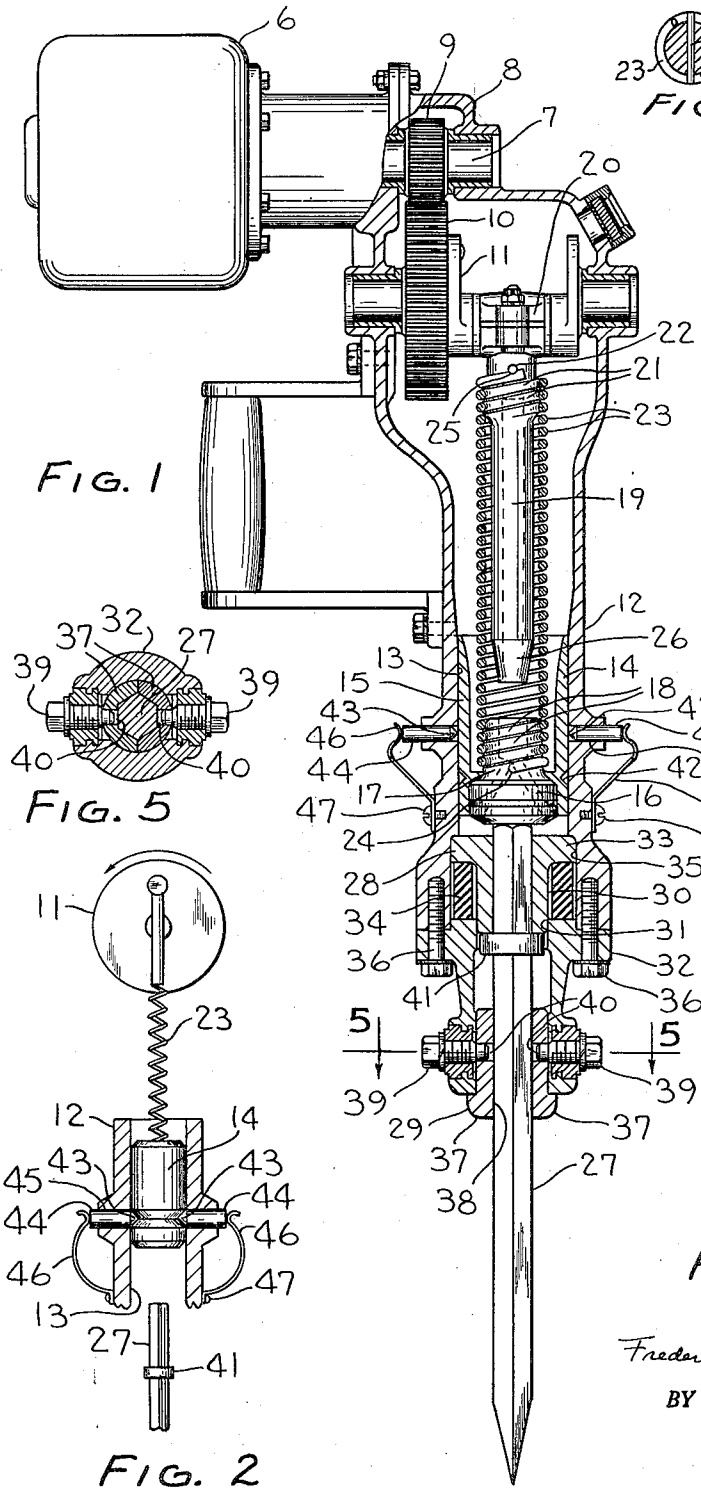

FIG. 1

FIG. 5

FIG. 2

FIG. 6.

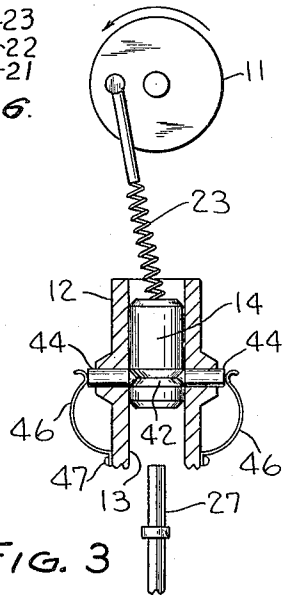

FIG. 3

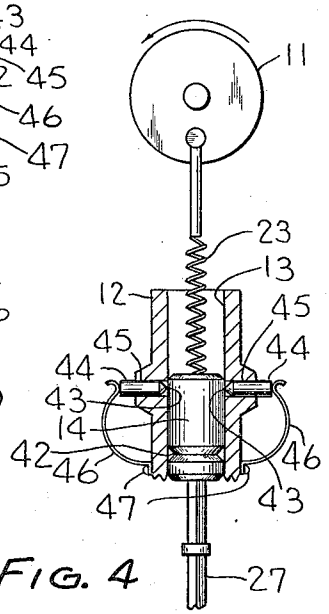

FIG. 4

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POWER HAMMER

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4 Claims. (Cl. 125—31)

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The invention relates to percussion tools, and more particularly to a reciprocatory or power hammer.

One object of the invention is to improve upon reciprocatory hammers of the spring driven type by providing a double spring connection between the rotary driven shaft and the hammer associated with means for limiting the whip of the springs and thus greatly prolonging the useful life of the tool. It has been found in practice that where a single freely whippable spring is provided as a drive connection for the hammer, that frequent breakage of the spring occurs and that such a tool is commercially impracticable.

A further object of the invention is to provide a reciprocatory hammer in which the hammer is operated by the stored up energy of a spring means which is released after a predetermined pressure or force has been built up in said spring means, the power for operating the spring preferably being a rotary motor driven drive shaft.

A further object of the invention is to provide a hammer including a reciprocatory piston, a rotary drive shaft, a connecting rod between said shaft and piston including a spring, and spring pressed detents engageable with said piston and releasable when their holding force is overcome by the greater pressure of the driving spring, thus causing a quick release of the energy stored up in the spring.

A further object of the invention is to provide a cushioning means for the tool carrying socket member.

A further object of the invention is to provide a simple and effective form of tool guide and tool retainer member.

The invention further consists in the several features hereinafter set forth and more particularly defined by claims at the conclusion hereof.

In the drawings:

Fig. 1 is a vertical sectional view through a hammer embodying the invention;

Figs. 2, 3, and 4 are diagrammatic sectional views with parts broken away showing the different positions of the parts, the drive means being shown in end elevation;

Fig. 5 is a detailed horizontal sectional view taken on the line 5—5 of Fig. 1.

Fig. 6 is a detailed sectional view taken on the line 6—6 of Fig. 1.

Referring to Fig. 1, the numeral 6 designates a motor or prime mover which may be either an electric motor, as shown, or a small portable internal combustion engine whose drive shaft 7 is journalled in a frame 8 and carries a gear 9 meshing with a gear 10 on a crank shaft 11, said frame being suitably split to permit the mounting of said shafts therein, the gears 9 and 10 forming a speed reduction drive between the main drive and the hammer drive shaft 11.

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A cylinder 12 is formed integral with or suitably connected to the frame 8 and has a bore 13 in which a reciprocatory piston or hammer member 14 is mounted. The piston 14 is preferably formed in two parts, a guide barrel or sleeve 15 and a hardened metal head 16 having a shank 17 of reduced diameter projecting up into said sleeve and provided with double or parallel thread or spring mounting grooves 18.

The crank shaft has a spring mounting and spring side whip restraining member 19 secured thereto by a split bearing or removable cap type of connection 20, the end of said member adjacent said crank shaft having double or parallel disposed spring receiving grooves 21 and a carrying diametrically disposed spring locking pin 22.

A double spring 23, that is two springs in which the coils of one spring are threaded or disposed between the coils of the other spring similar to a double screw thread have their ends respectively connected to the head 16 and the member 19 by being threaded or turned onto the grooves 18 and 21 of said members. At the head, the ends 24 of these springs abut the diametrically disposed ends of said grooves 18 and need no other means to hold them tight since the natural tendency of these springs is to wind toward said ends, but at their upper ends said spring ends are retained against movement relative to the member 19 by the pin 22 engaging a notch 25 in said spring, it being noted that the ends of said springs of this double spring structure are one hundred eighty degrees apart. It is also to be noted that the member 19 extends down in spaced relation or free of the springs 23 more than half and preferably about three-quarters of the free length of said springs between their anchorage points and is tapered at its lower end 26.

A tool 27, such as a railroad ballast tamping tool, is slidably mounted in a pair of guides 28 and 29 disposed at the lower end of the cylinder 12.

The guide 28 is in the form of a sleeve 30 slidably mounted in the bore 31 of a casing member 32 and having a flanged head 33 resting upon an annular rubber cushion 34 slidably mounted in the enlarged bore 35 in the lower end of the cylinder 12 and retained therein by the member 32 which is secured to the cylinder by bolts 36. The cushion 34 takes the shock of the blow de-

livered by the hammer or piston 14 when said hammer has forced the upper end of the tool 27 to a level with the upper end of the sleeve or guide 30 and also acts to return the tool toward the piston though it will be understood that since in tools of this kind the operator may put pressure on the tool by forcing it into the material being acted upon, this pressure together with the weight of the device will also serve to shift the tool 27 upwardly relative to the cylinder to receive another blow from the hammer.

The guide 29 is formed of two complementary half sleeve sections 37 having a polygonal, usually hexagonal, bore 38 to conform to the cross section of the shank of the tool which sections are detachably secured in operative position by set screws 39 whose reduced ends engage in holes 40 in the sections 37. In use the shoulder or flange 41 on the tool works between the guides 28 and 29 and prevents the tool from falling out of the device, but the tool can be readily removed by loosening the set screws from the sections 37, so that they can be removed from the lower end of the device to permit the tool to drop out.

With the above construction, the continuous rotary motion of the shaft 11 acts to reciprocate the spring 23 and to compress said spring between their anchored ends on the down stroke of said crank shaft and allow them to expand on its up stroke, thus imparting energy to the springs 23 which in turn imparts their energy to the hammer 14 causing its rapid reciprocation and that a certain amount of whipping action imparted to the springs because of their angular movement is desirable as it increases the overall energy delivered by the springs 23 to the hammer though too much whipping action is impractical and it results in frequent spring breakage, so that while the member 19 permits some side whip of the spring, it limits it to an extent which greatly reduces liability of spring breakage under this action.

The above construction provides a simple and efficient form of spring hammer in whch the rapid reciprocation of the spring and piston produces hammer blows on the tool, but in some instances it may be desirable to temporarily hold the hammer 14 as the energy is being stored up in the springs 23, and for this purpose the piston 14 is provided with an annular V-groove 42 to receive the pointed ends 43 of one or more diametrically disposed detents 44 slidably mounted in bores 45 in the cylinder 12 and yieldingly pressed inwardly by the free ends of flat springs 46 which are anchored at their other ends to the cylinder by screws 47. The tension of the springs 46 is such as to resist outward movement of the detents 44 until substantially the maximum energy has been built up in the springs 23 whereupon the detents 44 are released or moved outwardly by the wedging action of the groove 42 thereon, and the hammer descends with a quick movement from the position shown in Fig. 3 to the position shown in Fig. 4 hitting the top of the shank of the tool 27 a sharp blow, Fig. 2 showing the position of the parts when the hammer is in its upper position, Fig. 3 their position just before the release of the detents on counter-clockwise rotation of the shaft 11, and Fig. 4 the finish of the hammer stroke. For the sake of simplicity only a single spring has been shown in Figs. 2 to 4 as connecting the crank shaft 11 with the hammer, but it is to be understood that the double spring 23 and the member 19 would be used in practice.

I desire it to be understood that this invention is not to be limited to any particular form or arrangement of parts except in so far as such limitations are included in the claims.

What I claim as my invention is:

1. In a device of the character described, the combination of a rotary drive shaft, a reciprocatory hammer, a drive connection between said shaft and hammer including a compression spring, and releasable detents normally engageable with said hammer to arrest its movement until released by an increase of tension in said spring, said hammer adapted to have impact engagement with a tool.

2. In a device of the character described, the combination with a rotating drive shaft, a cylinder, a hammer working in said cylinder, a connecting rod having an eccentric drive connection with said shaft and including an energy transmitting spring operatively conecting said shaft with said piston, and spring pressed detents normally engageable with the hammer to arrest its movement until released by the increased tension of said energy transmitting spring, said hammer adapted to have impact engagement with a tool mounted in the lower end of said cylinder.

3. In a power tool, the combination of a rotary drive shaft having a crank, a reciprocatory hammer, a double spring anchored at one end to said hammer and in which the coils of the springs forming the double spring have threaded relation with each other, and a spring whip limiting member connecting the upper end of said double spring with said crank for oscillatory and reciprocatory movement thereby, and terminating short of the anchorage connection of said spring with said hammer to allow a limited amount of free whip of said double spring without danger of spring breakage.

4. In a power tool, the combination of a rotary crank shaft, a cylinder, a piston hammer working in said cylinder, a spring whip limiting member having one end journalled on the crank of said crank shaft and having its other end free to oscillate, and a double spring anchored at one end to said hammer and connected at its other end to the journalled end of said whip limiting member and in which the coils forming the double spring have threaded relation with each other, said whip limiting member extending into the convolutions of said double spring in spaced relation thereto and allowing a limited amount of free whip of said spring.

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