United States Patent [19]

Gray

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[54] **JACKHAMMER**

[76] Inventor: **Paul L. Gray,** 504 N. Central Dr., Moses Lake, Wash. 98837

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[52] **U.S. Cl.** **173/78,** 173/104, 173/119, 173/124, 173/126, 279/20

[51] **Int. Cl.** **E21c 7/00,** E21c 1/12

[58] **Field of Search** 173/104, 119, 122–124, 173/129, 130, 132, 57, 126, 128, 78, 90, 91; 279/20, 19, 19.6, 19.7

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Primary Examiner—Marvin A. Champion
Assistant Examiner—William F. Pate, III
Attorney—Greek Wells et al.

[57] **ABSTRACT**

A jackhammer has a frame which supports a trip wheel and a power device for rotating the wheel. A striker bar is held by the frame against the periphery of the wheel. The striker bar has a notch in it and the wheel has peripheral trip fingers to engage the notch alternately to raise and release the striker bar. Coiled springs in the frame are operatively connected to the striker bar to be compressed when the bar is lifted and drive the bar downward when it is released. A drill stem is guided in the frame for limited vertical movement with respect to the frame. A head on the striker bar has a sleeve that strikes a shoulder on the drill stem to deliver the impact caused by the springs when the striker bar is released. When desired, a pawl and ratchet mechanism is included to use the upward movement of the striker bar to turn the drill stem.

5 Claims, 8 Drawing Figures

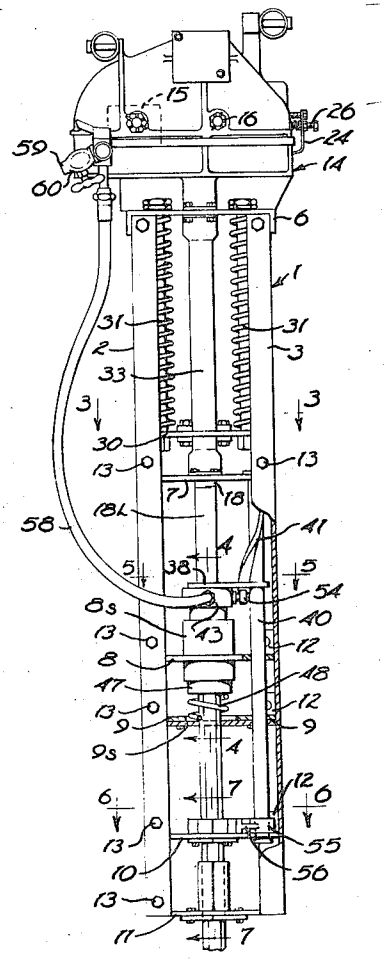


FIG 1

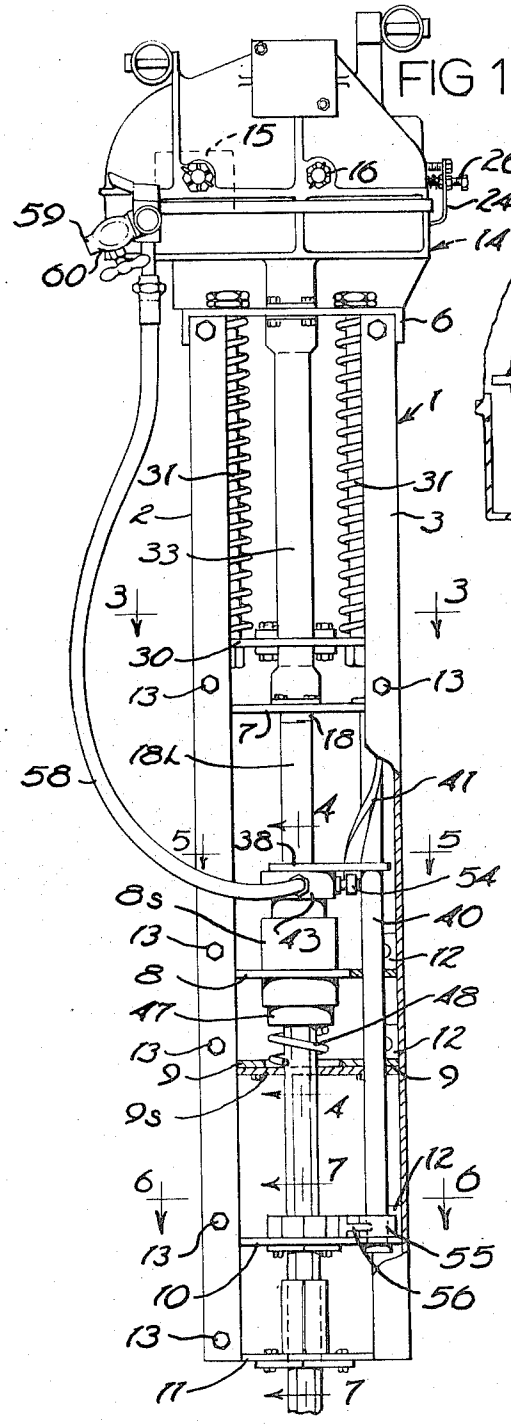
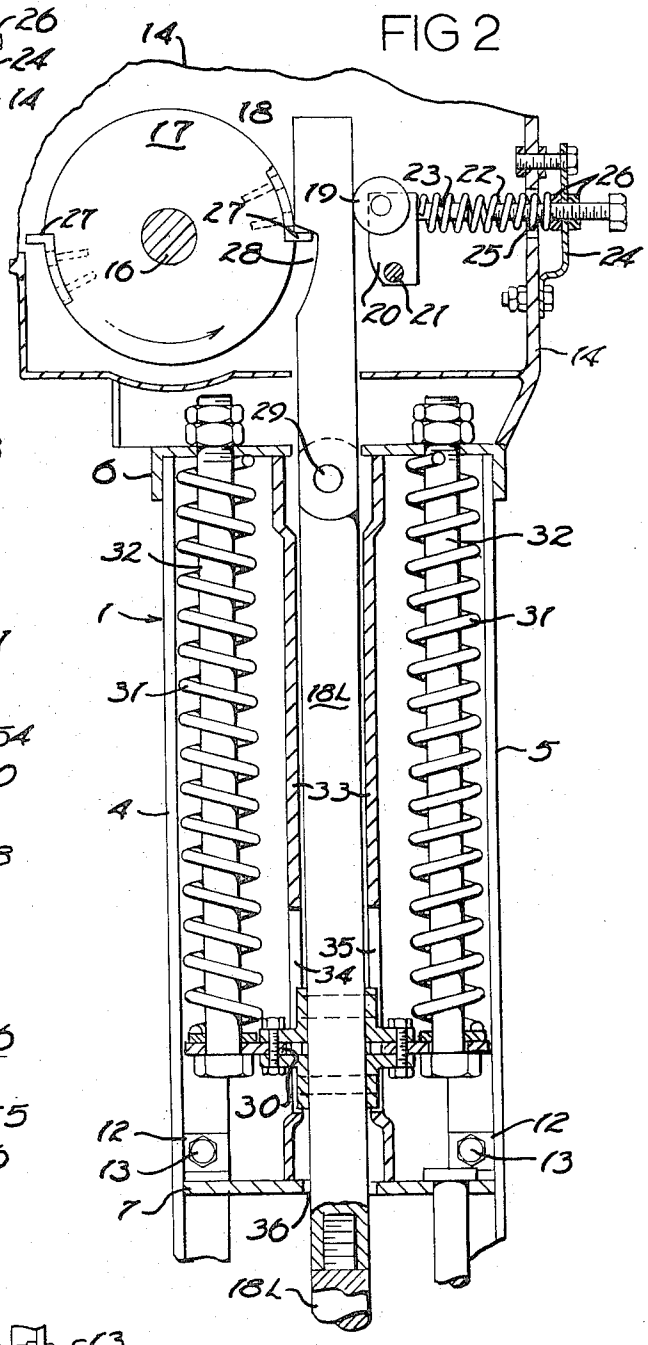


FIG 2



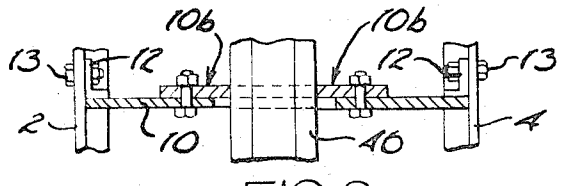


FIG 8

FIG 3

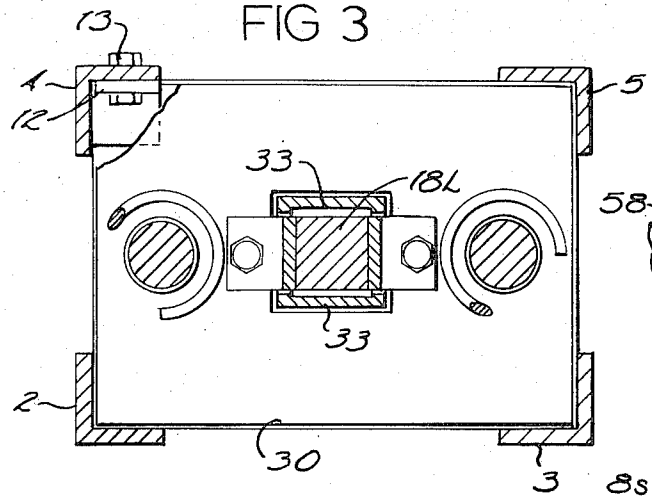


FIG 4

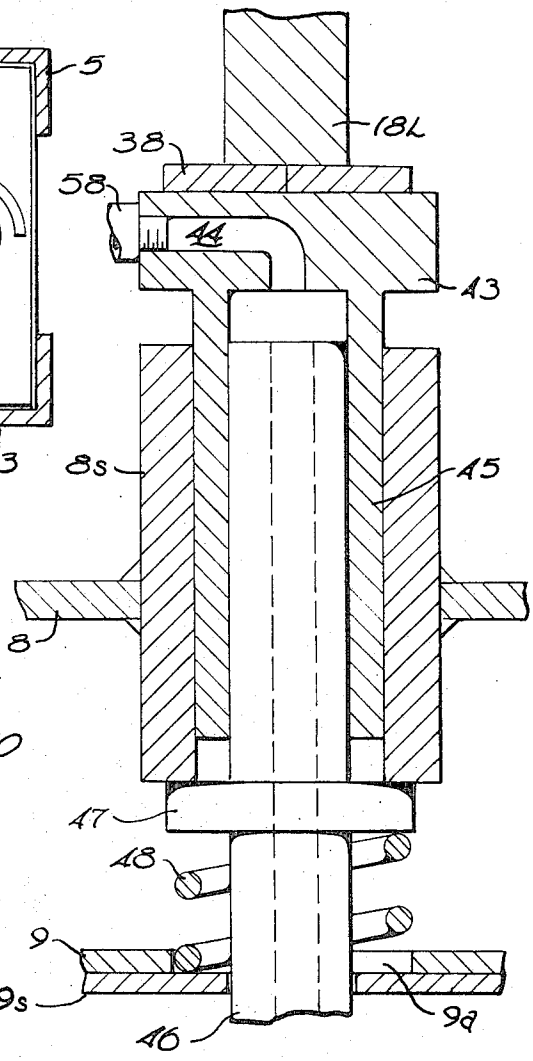


FIG 5

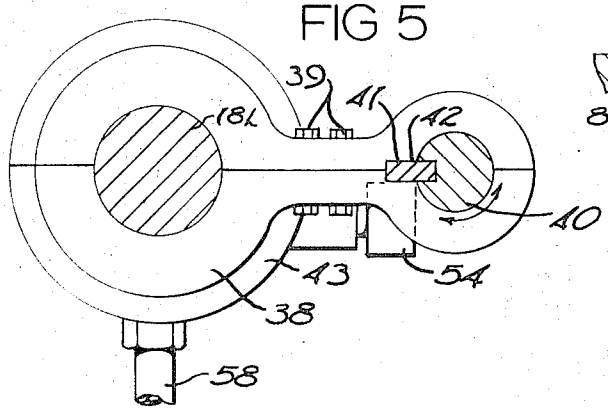


FIG 7

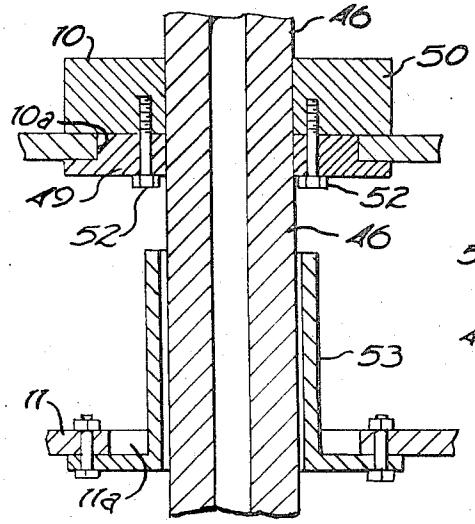
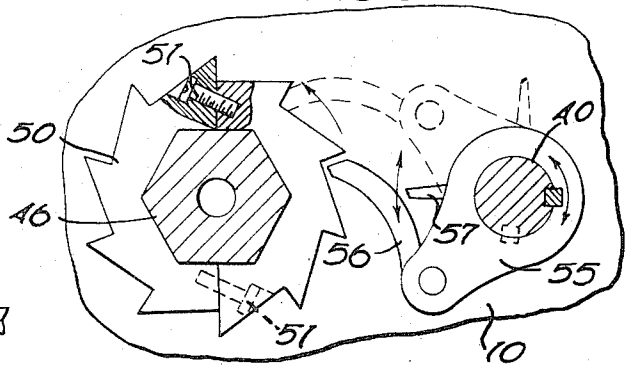


FIG 6



JACKHAMMER

BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is a side view of a jackhammer embodying the invention.

FIG. 2 is a vertical sectional view taken centrally through the machine.

FIG. 3 is an enlarged sectional view on the line 3—3 of FIG. 1.

FIG. 4 is an enlarged sectional view on the line 4—4 of FIG. 1.

FIG. 5 is an enlarged fragmentary sectional view taken on the line 5—5 of FIG. 1 with the framework left out.

FIG. 6 is an enlarged fragmentary sectional view on the line 6—6 of FIG. 1 with the framework left out.

FIG. 7 is a fragmentary sectional view on the line 7—7 of FIG. 1.

FIG. 8 is a sectional view similar to FIG. 7 showing a modification in which the drill stem does not turn.

GENERAL DESCRIPTION

Referring now in detail to the drawings, a framework 1 made up of four upright angle iron frame members 2, 3, 4 and 5, (FIGS. 1, 2 and 3), a cap unit 6 and a plurality of partition plates 7, 8, 9, 10 and 11 each of which is secured to the upright frame members by flanges 12 fixed to the plates and bolts 13. The flanges 12 are welded to the partition plates. All of the operating parts are mounted within or on top of the framework 1.

A housing 14 is secured on the cap unit 6. It encloses a conventional power unit 15 indicated in dotted lines in FIG. 1. Preferably this power unit is a hydraulic motor. The power unit operates a shaft 16 which has a trip wheel 17 fixed thereon. The shaft 16 is journalled in the housing 14. The trip wheel 17 rides against the side of a striker bar 18. A roller 19 engages the striker bar 18 on the side thereof opposite the trip wheel 17 and holds the bar against the wheel 17. The roller 19 is journalled in a block 20 pivoted on an axle 21 which is mounted in the housing 14. A spring 22 presses the pivoted block 20 toward the striker bar 18. The spring 22 is guided by a stem 23 that is secured to the block 20 and projects away from the striker bar 18 toward a keeper bracket 24 which is bolted to the housing 14. A second guide stem 25 is threaded through the bracket 24. A stop and lock nut combination 26 serves to adjust the stem 25 toward and away from the stem 23 so that the block 20 can hold the roller 19 against the striker bar 18 and allow the block 20 to spring as much as needed.

The trip wheel 17 has a plurality of alike trip fingers 27 on it to engage in a notch 28 of the striker bar 18. The notch 28 is shaped as shown so that, as the wheel 17 moves a finger 27 upward alongside the bar 18, the finger 27 will go into the notch 28 and lift the bar 18. As the finger 27 moves upward above the level of the center of the wheel 17, the finger 27 will move out of the notch 28 and finally clear the notch.

The striker bar is made up of an upper part 18 that has the notch 28 therein and a lower part 18L. The two sections are pivoted together at 29 so that the upper part 18 has the freedom to rock slightly as the tip of the finger 27 leaves the notch 28. The part 18L is affixed to a crosshead 30 that supports two coiled springs 31 which are alike. The two springs are under compression between the cap 6 and the crosshead 30. They are guided by two guide bolts 32 carried by the cap 6.

When the striker bar 18 is lifted by a finger 27 it lifts the crosshead 30 and compresses the springs 31. Upon release of the bar 18 by the finger 27, the striker bar is driven down to effect the hammer action of the striker bar 18-18L. There is a guide sleeve 33 around the striker bar. Sleeve 33 is slotted at 34 and 35 for the crosshead 30. This guide sleeve 33 extends to the partition plate 7. The striker bar part 18L passes through an aperture 36 in the plate 7. The bar part 18L is made in two pieces threaded together. The upper piece is square in cross section and the lower part is circular in cross section.

The lower end of the striker bar part 18L is provided with a turn plate 38 which is split in half as shown in FIG. 5 to fit around the part 18L. The two halves of the plate 38 are clamped together on the part 18L by bolts 39. The plate 38 fits around a drill turning shaft 40 which has a spiral key 41 therein fitting a key seat 42 in the plate 38. The functioning of the shaft 40 will be described more fully later.

Directly below the plate 38 the striker bar part 18L has an enlarged head 43 securely affixed to it and this head has a passage 44 in it to supply liquid to a hollow drill stem 46. The head 43 includes a sleeve 45 that surrounds the upper end of the stem 46 and slides in a sleeve 8s that is welded to the plate 8. The drill stem 46 has a shoulder 47 thereon which is engaged by the lower end of the sleeve 45 when the springs 31 drive the striker bar 18 down. The space between the head 43 and the upper end of the sleeve 8s determines the depth of the cutting stroke of the stem 46.

The plates 9, 10 and 11 have apertures 9a, 10a and 11a that are large enough to allow the shoulder 47 to pass through these plates. The plate 9 carries a removable split plate 9s bolted to it to support a light spring 48 that bears against the shoulder 47 to urge the stem 46 upward to its top limit against the lower end of the sleeve 8s after each blow by the sleeve 45. The plate 10 has a two piece ratchet wheel 50 and a two piece bearing block 49 rotatably mounted in its aperture 10*a* as shown in FIG. 7. Bolts 51 (FIG. 6) secure the two pieces of the ratchet wheel together and bolts 52 secure the bearing block pieces to the ratchet wheel 50. The plate 11 carries a guide sleeve 53 which is a split sleeve as indicated in FIG. 1.

The plate 38, the head 43 and the ratchet wheel 50 cooperate with the turn shaft 40 to run the drill stem 46 when turning of the drill is desired. If it is not desired to turn the stem 46 when it is operating the turn shaft 40 and the plate 38 are not needed. FIG. 8 shows a modified split plate 10*b* bolted to the plate 10 to hold the hexagonal drill stem against turning. The turn shaft 40 is rotatable in the plates 7, 8, 9, and 10. The head 43 carries a roller 54 bearing against the key 41 to turn the shaft 40 clockwise as the head 43 rises with the striker bar 18. The shaft 40 has a pawl support 55 keyed to it. This support 55 rests on the plate 10 and turns thereon as the turn shaft is rocked to and fro by the up and down movement of the plate 38 and the roller 54 along the key 41. The support 55 carries a pawl 56 that engages the ratchet wheel 50. It also has a stop 57 thereon to direct the pawl into engagement with the teeth of the ratchet wheel as it rocks back after each power stroke on the ratchet wheel. The force necessary to turn the drill is applied to the key 41 of the turn shaft 40 on the up stroke of the striker bar 18. This causes the roller 54 to roll up and crowd the key 41 in a clock-

wise direction as it is seen in FIG. 5. On the down stroke of the striker bar 18, the turn shaft 40 merely has to move the pawl from the dotted line position in FIG. 6 to its full line position. Thus very little force is needed for this movement of the turn shaft and a second roller 41 is not needed.

To conduct drill liquid to the passage 44 in the head 43, a flexible conduit 58 is shown as leading into the head 43 from a supply conduit 59 through a valve 60 which is manually controlled.

The operation of the jackhammer is believed to be obvious from the foregoing description. The power unit 15 turns the shaft 16 and the trip wheel 17 to repeatedly lift the striker bar 18 and store striking energy in the springs 31. Upon its release from a trip finger 27, the striker bar 18 is driven down carrying the head 43 with it to cause the sleeve 45 to deliver a blow to the shoulder 47 on the drill stem 46. Upon the next lifting of the bar 18, the turn shaft 40 is rotated by upward movement of the roller 54 against the key 41. The pawl 56 is forced to turn the ratchet wheel 50 and the drill stem 46. The stem 46 is free to move up and down through the ratchet wheel 50 but must turn with the ratchet wheel. In this way, repetitive blows are delivered to the drill stem 46.

The invention in which an exclusive right is claimed is defined in the following claims:

1. In a jackhammer, a frame having means therein to support and guide a drill stem;

a trip wheel on the frame having trip fingers thereon;

a power device on the frame for rotating the trip wheel;

a striker bar guided in the frame for endwise movement tangentially of the wheel and having a crosshead thereon;

a notch in the striker bar operable to receive the trip fingers for lifting the bar;

coiled springs carried by the frame and under compression between the top of the frame and the crosshead;

a head on the striker bar at its lower end;

a drill stem mounted for limited endwise movement in the frame and having a shoulder thereon positioned to receive an impact from the head when the springs force the striker bar down upon release of the bar by the trip fingers;

the head including a sleeve into which the drill stem extends; and

the frame having a sleeve fixed therein in which the sleeve of the head reciprocates.

2. The jackhammer defined in claim 1 with;

a turn shaft alongside the striker bar in the frame operably connected to the striker bar to turn as the striker bar moves up and down; and

means connecting the turn shaft to the drill stem operable to rotate the drill stem.

3. The jackhammer defined in claim 1 wherein the drill stem is tubular and open at the top into the sleeve of the head; and

a fluid supply conduit is connected to the head to supply fluid through the sleeve of the head into the drill stem.

4. The jackhammer defined in claim 1 wherein the frame has removable guide means spaced below the striker bar head and surrounding the drill stem.

5. The jackhammer defined in claim 1 embodying a spring pressed roller bearing on the side of the striker bar opposite the place of contact between the striker bar and the wheel.

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