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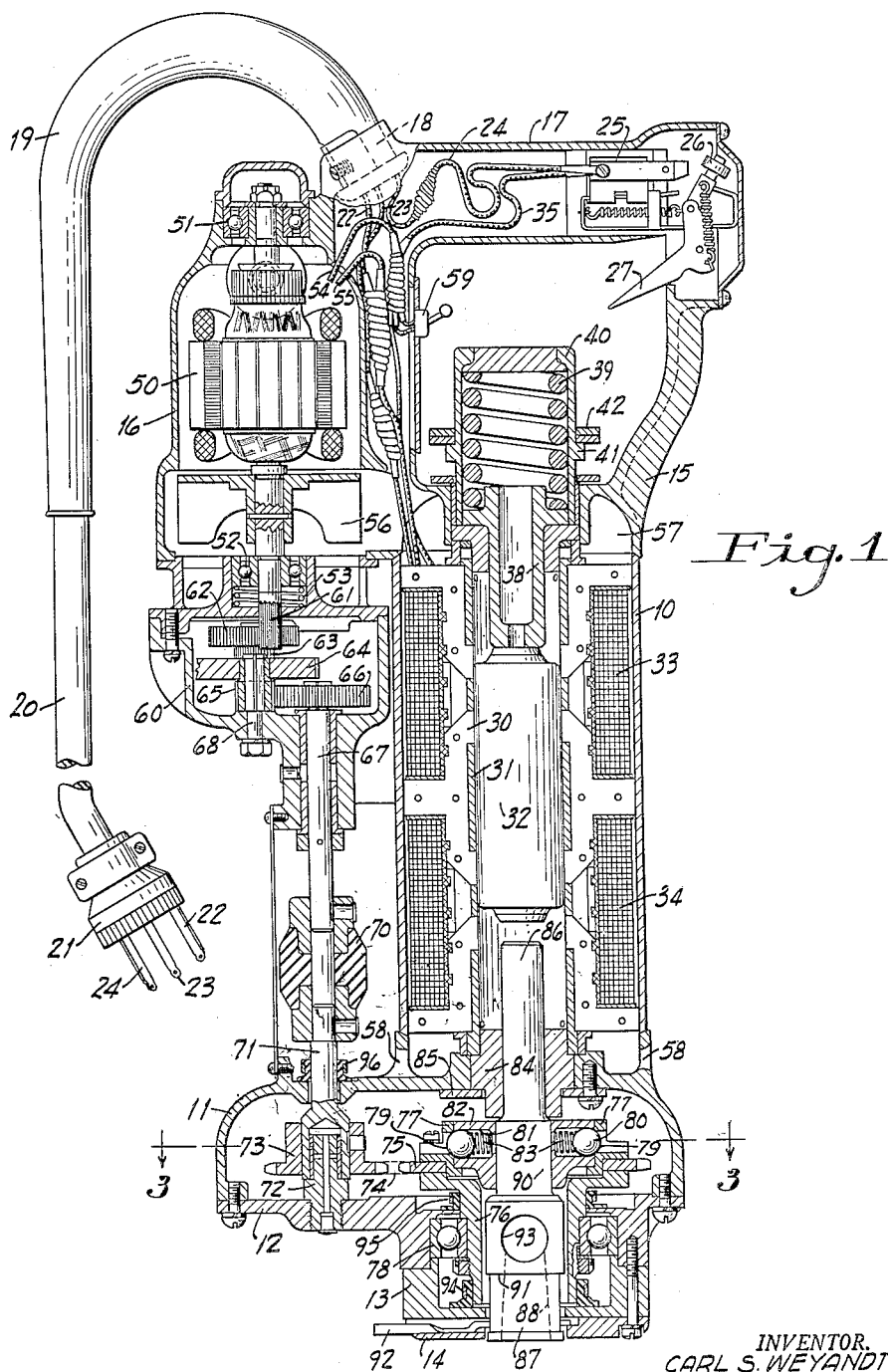
C. S. WEYANDT ET AL

2,536,971

ROTARY TOOL ON ELECTRIC HAMMER

Filed March 2, 1949

2 Sheets-Sheet 1



INVENTOR.  
CARL S. WEYANDT  
AND WILLIAM V. SPURLIN  
BY  
*William D. Carothers*  
THEIR ATTORNEY.

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Fig. 3

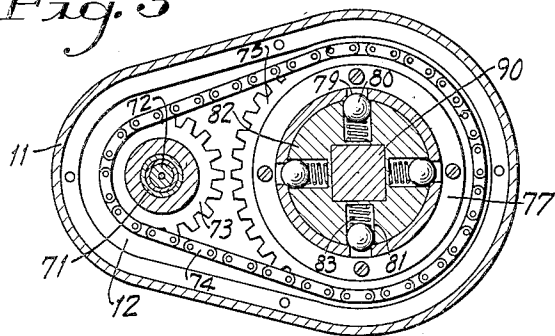


Fig. 2

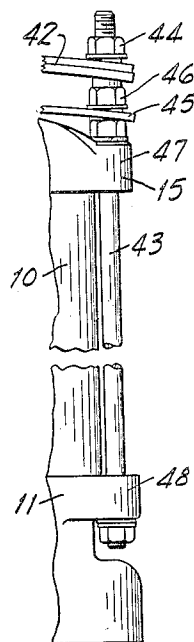


Fig. 4

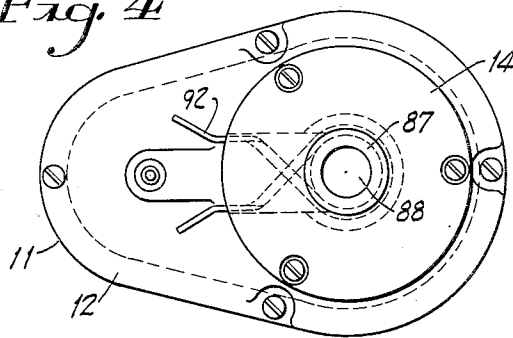
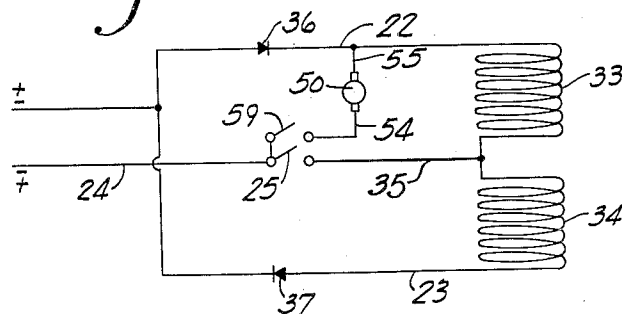


Fig. 5



INVENTOR,  
CARL S. WEYANDT  
AND WILLIAM V. SPURLIN  
BY  
*William A. Barrothe*  
THEIR ATTORNEY.

## UNITED STATES PATENT OFFICE

2,536,971

## ROTARY TOOL ON ELECTRIC HAMMER

Carl S. Weyandt, Homer City, and William V. Spurlin, Indiana, Pa., assignors to Syntron Company, Homer City, Pa., a corporation of Delaware

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4 Claims. (Cl. 255—43)

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This invention relates generally to electric hammers and more particularly to electric hammers having an electromagnetically operated free reciprocating piston which strikes a tool that is simultaneously rotated by a rotary electric motor carried by the hammer.

The principal object of this invention is the provision of an electromagnetic reciprocating hammer which also carries a rotary electric motor which cools the reciprocating motor and at the same time rotates the tool actuated by the reciprocating motor.

Another object is the provision of rotating the tool chuck of an electric reciprocating hammer through a pressure clutch which permits the motor to rotate and cool the reciprocating motor regardless of whether the tool is wedged in the work.

Another object is the provision of an electric reciprocating hammer having a rotary motor constructed to cool the reciprocating motor and rotate the tool regardless of whether the reciprocating motor is in operation or not.

Another object is the provision of an electric reciprocating hammer carrying a rotary motor connected through a clutch to rotate the reciprocating tool of the hammer, which clutch is arranged to temporarily disengage the rotary motor when the torque on the tool exceeds a predetermined amount.

Another object is the provision of an electric hammer motor for reciprocating a tool in axial alignment therewith and a rotary motor carried by the hammer to rotate the reciprocating tool through a flexible connection. Such a connection may be made through a flexible coupling or a resilient V-belt drive which eliminates the necessity of close tolerance in manufacturing and the effect of vibration producing short life.

Other objects and advantages appear hereinafter in the following description and claims.

The accompanying drawings show for the purpose of exemplification, without limiting the invention or claims thereto, certain practical embodiments of the invention wherein:

Fig. 1 is a view in vertical elevation of the electric reciprocating hammer comprising this invention;

Fig. 2 is a side elevation of the electric hammer comprising this invention with parts broken away;

Fig. 3 is a sectional view taken on the line 3—3 of Fig. 1;

Fig. 4 is a bottom plan view of the electric hammer as shown in Fig. 1; and

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Fig. 5 is a circuit diagram illustrating the electrical connections for the operation of the electric reciprocating hammer and the rotary cooling and tool driving motor.

Referring principally to Figs. 1 and 2, the electric hammer comprises the cylindrical housing 10, having fitted to the bottom thereof the nose casting 11, which in turn has its lower portion closed by the bearing retainer plate 12, the bearing cap plate 13 and the end cover 14. At the other end of the cylindrical housing 10 the electric hammer is enclosed by the handle casting 15 having the rotary motor case 16 integrally formed therewith. The hand grip 17 of the handle casting is hollow and is provided with an electric cable connecting clamp 18 for receiving the sheath 19 through which the electric cable 20 extends from the plug 21. The plug 21 and the cable carry three conductors 22, 23 and 24, the circuit diagram of which is illustrated in Fig. 5. The conductor 24 is connected with the electric switch 25 within the grip 17 of the handle casting, which switch is actuated by the roller 26 on the end of the trigger actuating mechanism 27.

The reciprocating hammer motor within the housing 10 consists of the laminated electromagnetic core member 30 that is constructed in a star arrangement on the nonmagnetic tubular barrel 31, the bore of which encases the free moving piston or reciprocating armature 32. The star shaped core 30 is provided with spaced recesses for receiving the electromagnetic coils 33 and 34 which are wound on the core with suitable insulation interlocked in grooves encircling the star arranged core member 30.

The conductor 35 connects one end of each of the coils 33 and 34 to the switch 25 wherein the circuit is completed to the conductor 24. The conductors 22 and 23, respectively, connect the other ends of the electromagnetic windings 33 and 34. When the switch 25 is closed the coils 33 and 34 become alternately energized by current pulsations due to the fact that each of the conductors 22 and 23 is connected to the source of alternating current supply through oppositely set rectifiers energized from an alternating current source as illustrated at 36 and 37 as shown in Fig. 5. Thus, if a sixty cycle alternating current supply is employed the electromagnetic coils 33 and 34 are alternately energized each cycle and the electromagnetic core or piston 32 will be reciprocated by the energization of the spaced electromagnetic coils.

On its upward or rearward stroke the free piston 32 engages the stop casting 38 to compress the

spring 39 contained in the cap 40 extending within the opening of the handle casting 15. The cap 40 is provided with an annular shoulder 41 engaged by the sides of the leaf spring members 42 which are provided with aligned openings for receiving the body of the cap 40 and rest on the shoulder 41 as shown in Fig. 1. The ends of the springs 42 are retained on the diametrically disposed tierods 43 by the nuts 44 as indicated in Fig. 2. A second spring 45 is likewise provided with a central opening to receive the cap 40, and is retained on the oppositely disposed tierods 43 by the nuts 46. The oppositely disposed tierods 43 extend through aligned openings in the ears 47 of the handle casting 15 and the ears 48 of the nose casting 11. The oppositely disposed tierods 43 hold the handle and nose castings in assembled relation on the cylindrical housing 10 of the reciprocating motor. It will be noted that each of these castings is provided with flared openings for receiving the ends of the housing 10.

The rotary motor 50 is preferably a series motor mounted within the shell 16 of the handle casting with the upper end of the armature being retained by the bearing 51 and the lower end retained by the bearing 52, the latter of which is supported axially by the spring 53 to prevent vibration from harming the motor. One side of the series motor is preferably connected to the conductor 22 through the wire 55 and the other side is connected to the conductor 24 through the switch 59 and the wire 54 as illustrated in Figs. 1 and 5.

The armature of the motor 50 is also provided with the fan member 56 arranged to draw air through openings in the casing around the bearing 52, which are not shown and blow air laterally to the bell end 57 of the handle casting 15 and thence downwardly through the reciprocating motor housing and the spaces between the star arranged magnetic core 30 to the lower end thereof wherein it is discharged laterally through the openings 58 for the purpose of cooling the reciprocating hammer.

The shaft of the motor 50 extends downwardly to within the gear housing 60 and its lower end is provided with a pinion face as illustrated at 61 which engages the gear 62 that is formed integral with the pinion 63, which in turn engages the second idler gear 64, having a pinion 65 integral therewith for engaging the gear 66 on the shaft 67. The idler gears of this train are supported on stub shafts, one of which is shown at 68 in Fig. 1.

The shaft 67 extends through the aligned flanged bearings pressed in the bore of the casting 60 and extends therebelow where it is attached to one end of the rubber coupling member 70. The other end of the rubber coupling member is connected to the shaft 71, mounted on the pinion sprocket stub shaft 72. The lower end of the shaft 71 is hollow to receive the stub shaft 72 and has attached thereto the pinion sprocket wheel 73 which is connected by means of the flexible chain 74 to the gear sprocket wheel 75, or V-belt wheels connected by a flexible V-belt member.

The gear sprocket 75 is secured to the tubular sprocket shaft 76 and to the external clutch ring 77. The tubular sprocket shaft 76 is supported by the bearings 78 in the bearing retainer 13 and is held against lateral and axial movement in the casting 12. As shown in Figs. 1 and 3 the ring 77 is provided with four seats 79 quadrangularly disposed about the bore of the ring and arranged

to receive a portion of the clutch ball members 80 which are contained within pockets 81 formed in the inner clutch ring member 82. As shown in Fig. 3 the inner ring 82 is provided with quadrangularly positioned pockets 81 which mate with the seats 79 and receive the ball members 80 and the coil springs 83 which maintain said ball members in their extended positions in said seats when properly aligned with the pockets. Thus, as the outer ring is rotated the ball members become engaged in their corresponding seats 79 and if the friction in rotating the tool exceeds a predetermined amount of pressure exerted on the clutch ball members 80 by the springs, the balls are forced and are retracted back in the pockets 81 thereby permitting the outer ring 77 to slip relative to the inner ring 82.

The upper end of the nose casting 11 has an opening therein for receiving the bushing 84 which abuts against the cylindrical barrel 31 and is held in place by the bushing retaining plate 85. The bore of the bushing 84 is cylindrical to receive a corresponding section 86 of the chuck 87. The chuck 87 is provided with an outwardly flaring socket 88 at the outer end thereof to receive a tool and its intermediate portion is squared, as shown at 89 in Figs. 1 and 3, for receiving the squared bore of the ring 82. Thus, as the piston 32 of the electric hammer reciprocates it strikes the anvil end 86 of the chuck 87 and causes the latter to bump downwardly as shown in Fig. 1 and move its tool into the material being cut. The weight of the hammer or the pressure exerted by the operator on the tool, together with the reactance of the material being worked on by the tool, provides for the retroaction of the tool. At the same time the rotary motor 50 rotates the chuck and the tool through the rotary electric motor drive on one side of the electric hammer.

The lower perimetral surface of the chuck 87 is provided with a recess as indicated at 91 having oppositely disposed shoulders arranged to engage the chuck retainer tongs 92 as shown in Fig. 4. By squeezing the ends of the retainer tongs 92 toward one another, the central circular portion of the tongs opens up to permit the chuck 82 to be removed from the hammer. The chuck is provided with a tool drift hold 93 for the purpose of receiving a drift pin for driving the tools out of the tapered chuck 88 after the chuck has been removed from the hammer.

The nose casting 11 is completely enclosed by the bearing retainer plate 12 and the block 13 and is sealed from dirt and grit by the rubber rings 94 and 95 mounted on the tubular shaft 76 on either side of the bearing 78. A similar seal 96 is likewise placed on the top of the nose casting surrounding the shaft 71. These seals are made of flexible rubber having an annular recess to receive the gripping ring that retains the seal member tightly on the object which its surrounds. The flaring lips of the flexible rubber seals engage the adjacent stationary member to thereby form a seal.

While, for clarity of explanation, certain preferred embodiments of this invention have been shown and described, it is to be understood that this invention is capable of many modifications, and changes in the construction and arrangement may be made therein and certain parts may be employed without conjoint use of other parts and without departing from the spirit and scope of this invention.

**We claim:**

1. An electric reciprocating tool comprising a plurality of spaced coaxially mounted electromagnetic coils adapted to be alternately energized by pulsating current, a stop coaxially mounted at one end of said coils, a tool receiving chuck coaxially mounted at the other end of said coils, a free piston to reciprocate within said coils following the magnetic impulses and strike said stop member and said tool receiving chuck, a rotary electric motor carried by the tool and connected for energization with the coils, a power take off on said rotary motor, a slip clutch rotatably supported coaxially of the coils on the end of the tool and having coaxially mounted ring members with a clutch action therebetween, a rotary driving connection between the power take off and the one ring member, and a non-round sliding connection between the other ring member and the tool chuck.

2. An electric reciprocating tool comprising a plurality of spaced coaxially mounted electromagnetic coils adapted to be alternately energized by pulsating current, a stop coaxially mounted at one end of said coils, a tool receiving chuck coaxially mounted at the other end of said coils, a free piston to reciprocate within said coils following the magnetic impulses and strike said stop member and said tool receiving chuck, a rotary electric motor carried by the tool and connected for energization with the coils, a power take off on said rotary motor, a slip clutch rotatably supported coaxially of the coils on the end of the tool and having coaxially mounted ring members with a clutch action therebetween, a rotary driving connection between the power take off and the one ring member, a flexible coupling interposed in said rotary driving connection, and a non-round sliding connection between the other ring member and the tool chuck.

3. An electric reciprocating tool comprising a plurality of spaced coaxially mounted electromagnetic coils adapted to be alternately energized by pulsating current, a stop coaxially mounted at one end of said coils, a tool receiving chuck coaxially mounted at the other end of said coils, a free piston to reciprocate within said coils following the magnetic impulses and strike said stop member and said tool receiving chuck, a rotary

electric motor carried by the tool and connected for energization with the coils, a power take off on said rotary motor, a slip clutch rotatably supported coaxially of the coils on the end of the tool and having coaxially mounted ring members with a clutch action therebetween, a rotary driving connection between the power take off and the one ring member, a flexible coupling in said rotary driving connection including a resilient connection and an endless flexible member having driving engagement with aligned wheel members one of which is connected to said one ring member, and a non-rotary sliding connection between the other ring member and the tool chuck.

4. An electric reciprocating tool comprising a plurality of spaced coaxially mounted electromagnetic coils adapted to be alternately energized by pulsating current, a stop coaxially mounted at one end of said coils, a tool receiving chuck coaxially mounted at the other end of said coils, a free piston to reciprocate within said coils following the magnetic impulses and strike said stop member and said tool receiving chuck, a rotary electric motor carried by the tool, independent electrical switch means controlling the electric current supply to said rotary motor and to said coils, a power take off on said rotary motor, a slip clutch rotatably supported coaxially of the coils on the end of the tool and having coaxially mounted ring members with a clutch action therebetween, a rotary driving connection between the power take off and the one ring member, and a non-round sliding connection between the other ring member and the tool chuck.

CARL S. WEYANDT.

WILLIAM V. SPURLIN.

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**Certificate of Correction**

**Patent No. 2,536,971**

**January 2, 1951**

**CARL S. WEYANDT ET AL.**

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows:

Column 6, line 13, for "non-rotary" read *non-round*;  
and that the said Letters Patent should be read as corrected above, so that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 20th day of February, A. D. 1951.

**[SEAL]**

**THOMAS F. MURPHY,**  
*Assistant Commissioner of Patents.*

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