Sept. 22, 1959 R. M. TURNER 2,905,034

RECIPROCATORY IMPACT HAND TOOL

Filed April 18, 1958

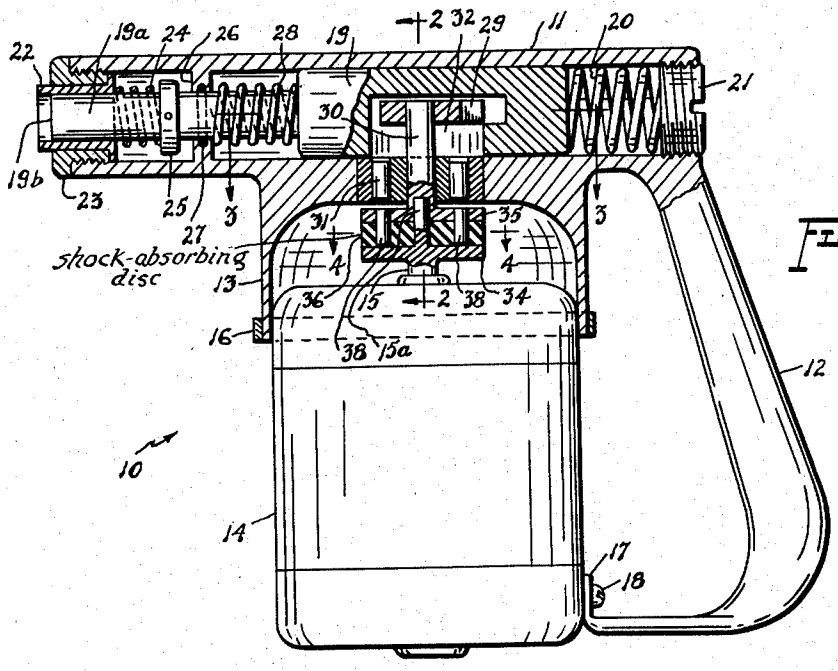


Fig. 1.

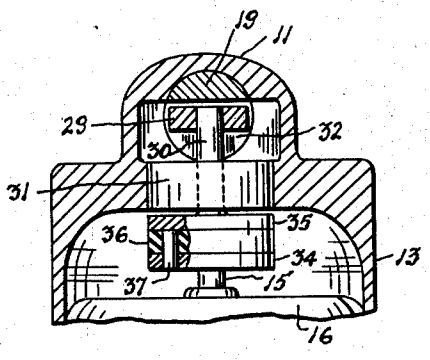


Fig. 2.

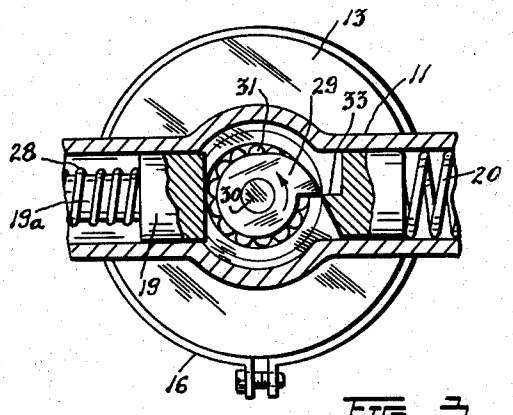


Fig. 3.

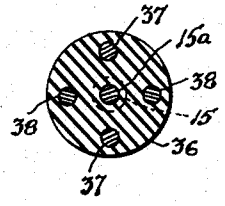


Fig. 4.

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RECIPROCATORY IMPACT HAND TOOL

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4 Claims. (Cl. 81—52.35)

The invention relates to new and useful improvements in reciprocatory impact hand tools for driving nails and numerous other similar operations, and in particular the invention relates to tools of the general type disclosed in my patents No. 2,749,548, issued June 12, 1956, and No. 2,850,739, issued September 9, 1958.

In said patents there are disclosed tools of this type which are adapted for attachment to a conventional electric hand drill for coverting the rotary motion thereof into a reciprocating movement with a definite impact during each stroke. The present invention, however, concerns itself with a tool which embodies an electric motor as a component thereof, so that the tool is a self-contained unit rather than an attachment.

The principal object of the present invention is to substantially improve the arrangement of my earlier inventions, this being attained by the provision of a self-contained tool which is very simple in construction, durable and efficient in operation, and which utilizes a minimum number of working parts.

With the foregoing more important object and features in view and such other objects and features as may become apparent as this specification proceeds, the present invention will be understood from the following description taken in conjunction with the accompanying drawing, wherein like characters of reference are used to designate like parts, and wherein:

Figure 1 is a side elevational view of the device, shown partly in section to reveal its construction;

Figure 2 is a fragmentary vertical sectional view, taken substantially in the plane of the line 2—2 in Figure 1;

Figure 3 is a fragmentary horizontal sectional view, taken substantially in the plane of the line 3—3 in Figure 1; and

Figure 4 is a sectional detail, taken substantially in the plane of the line 4—4 in Figure 1.

Referring now to the accompanying drawing in detail, the improved tool is designated generally by the reference numeral 10 and embodies in its construction an elongated, substantially tubular housing 11 which is provided at one end thereof with a downturned handle 12 and is also provided at the underside thereof with an inverted cup-shaped housing member 13 which is adapted to receive therein the upper end portion of a suitable electric motor 14. The motor 14 has the armature 15 thereof vertically disposed and is retained in the housing member 13 by a suitable clamp 16. The lower edge portion of the housing member 13 is preferably provided with one or more open slots (not shown) to facilitate proper clamping action of the motor therein by the clamp 16. The lower end of the handle 12 is provided with an upturned, apertured ear 17 for securing the same to the lower portion of the motor 16 by a suitable bolt or screw 18, as will be readily apparent.

A plunger 19 is reciprocable in the housing 11 against the action of a compression spring 20 which is also disposed in the housing in abutment with a screw-threaded

plug 21 provided in the end of the housing adjacent the handle 12. The plunger 19 is provided with a diametrically reduced extension 19*a* which is reciprocable in a retractable work guide 22, slidably mounted in a screw-threaded bushing 23 at the other end of the housing 11. The work engaging end of the plunger extension 19*a* is illustrated at 19*b* and the arrangement of the work guide 22 is the same as in my prior patent and co-pending application, both already identified. The work guide 22 is urged outwardly by a compression spring 24 which is interposed between the work guide and a collar 25 secured to the plunger extension 19*a*.

The housing 11 is provided intermediate its ends with a partition 26 having an aperture therein to provide a bearing for the plunger extension 19*a*, an oil seal 27 being provided in the opening of the partition to retain lubricant in the portion of the housing which contains the reciprocable plunger 19. A shock absorber spring 28, weaker than the spring 20, is interposed between the partition 26 and the plunger 19, in accordance with the teachings of my prior patent and co-pending application.

The plunger 19 is reciprocated by a cam 29 secured to the upper end of a shaft 30 which is coaxial with the armature 15 of the motor 14 and is journalled in a suitable anti-friction bearing 31 disposed in the housing member 13. The cam 29 is located in a recess 32 formed in the plunger 19 and a portion of the plunger within this recess is stepped as shown in Figure 3 to provide a follower 33 which is engageable by the lobe of the cam. It will be apparent from the foregoing that when the cam 29 is rotated by the motor 14, the plunger 19 will be alternately retracted against the spring 20 and projected by the spring 20 upon disengagement of the cam from the follower 33, thus causing the end 19*b* of the plunger extension 19*a* to deliver a positive impact against the work during each revolution of the cam.

In order to safeguard the motor 14 from harmful effects incident to the impacts delivered by the tool, the shaft 30 is not connected directly to the armature of the motor, but shock absorbing means are provided for such a connection. These means comprise a pair of discs 34, 35, one of which is provided on the armature 15 while the other is secured to the lower end of the shaft 30. A shock absorbing disc 36 of rubber, or the like, is interposed between the discs 34, 35 and is operatively connected to the disc 34 by a set of driving pins 37. Similarly, the disc 35 is operatively connected to the disc 36 by a set of driving pins 38. Thus, the drive from the armature 15 to the shaft 30 is taken through the medium of the shock absorber disc 36 and transmission of impacts from the plunger 19 to the motor 14 is eliminated.

The armature 15 is provided with a diametrically reduced extension 15*a* which passes through the discs 36, 35 and is slidably and rotatably journalled in a suitable bore formed in the lower end portion of the shaft 30, thus assisting to retain the shaft 30 in alignment with the armature. This extension (15*a*), however, does not transmit any shock from the shaft 30 to the motor, since the shock is torsional rather than longitudinal and the extension 15*a* is rotatable in the bore of the shaft 30 so that no torsional shock can be transmitted thereby.

It is to be particularly noted that the cam 29 is disposed in the plane of the axis of reciprocation of the plunger 19 and actuates the plunger in a direct line, without any lateral distortion or stresses being present, such as are involved when the cam is disposed at one side of the plunger.

While in the foregoing there has been described and shown the preferred embodiment of the invention, var-

ious modifications may become apparent to those skilled in the art to which the invention relates. Accordingly, it is not desired to limit the invention to this disclosure, and various modifications may be resorted to, such as may lie within the spirit and scope of the appended claims.

What is claimed as new is:

1. In a reciprocatory impact tool, the combination of an elongated housing, a plunger reciprocable therein between projected and retracted positions, resilient means in said housing for urging the plunger to its projected position, a motor carried by said housing and having an armature disposed at right angles to said plunger, a cam operatively connected to said armature and disposed in the plane of the axis of reciprocation of the plunger, follower means provided on the plunger and operatively engageable by said cam, whereby the plunger may be retracted against the action of said resilient means, and shock absorber means operatively connecting said cam to said armature.

2. The device as defined in claim 1 together with a handle provided on said housing and supportably connected to said motor.

3. In a reciprocatory impact tool, the combination of a substantially tubular housing, a downturned handle provided at one end thereof, an inverted cup-shaped housing member provided at the underside of the housing, an electric motor having its upper end portion secured in said housing member, the lower end portion of said motor being secured to said handle, said motor including an upwardly extending armature disposed perpendicularly to said housing, a recessed plunger reciprocable in the housing between projected and retracted positions, resilient

means provided in the housing for urging said plunger to its projected position, a shaft rotably journalled in said housing member and aligned axially with said armature, shock absorber means operatively connecting said shaft to said armature, a cam provided on said shaft within the recess of said plunger and in the plane of the axis of reciprocation of the plunger, and follower means provided on the plunger within the recess thereof and operatively engageable by said cam, whereby the plunger may be retracted against the action of said resilient means.

4. The device defined in claim 3 wherein said shock absorber means comprise a pair of discs secured to said armature and to said shaft, a disc of shock absorbing material interposed between said pair of discs, and pins projecting from the respective discs in the pair into said disc of shock absorbing material, whereby to operatively connect the same together.

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