PORTABLE DRILL JACK

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This invention relates to a portable drill jack.

The principal objects of the invention are to provide a mechanism that is simple, inexpensive, convenient and adapted for use with ordinary portable drills such as electric or pneumatic.

In general, the purpose of any drill jack is to provide the necessary means for holding the drill to the work and to feed the drill against such resistance.

A feature of the invention is that it is easily and quickly attachable to an ordinary drill without making any structural changes in such a drill. Another feature is that after attaching the jack to the drill, the combination is ready to be applied to the work without any tedious preparation.

According to the aforesaid objects a housing is provided in which a ratchet-toothed plunger is disposed to move back and forth. A threaded boss extends from the housing on one side thereof, and a driving handle from the other side. The threaded boss is inserted into the drill structure in the place of a usual handle after which the mechanism is ready for use.

The ratchet-toothed plunger is propelled in the working direction by means of a combination of pawls that is actuated by a lever which closes against the handle in a scissors-like fashion.

The necessary resistance to the operation of the drill is made possible by a flexible connector, such as a chain that is attached to the plunger and extends to a fixed part of the work to be drilled. A convenient way of attaching to the work is to wrap a turn of the chain around the work and to bring the loose end of the chain back to a fastening on the housing. Now, working the lever against the plunger, the drill into the work, it being understood that a compression spring operates between the lever and the handle in opposition to the muscular action.

In the accompanying drawing which illustrates one embodiment of the invention,

Fig. 1 represents an assembly side elevation of the drill jack and a driving mechanism thereof; Fig. 2, a side elevation of the drill jack alone drawn to an enlarged scale, portions being broken away for convenience; Fig. 3, a side elevation similar to Fig. 2, certain working parts however, being shown in alternative positions; Fig. 4, a cross section taken on line 4—4 in Fig. 3; Fig. 5, a section on line 5—5 in Fig. 3; Fig. 6, a section on line 6—6 in Fig. 3; and Fig. 7, a section on line 7—7 in Fig. 2.

In the side elevation of the invention built into the drilling mechanism as an integral part thereof, the illustration in this instance showing the combination structure stripped of the movable parts.

Referring to the drawing, the numeral 10 denotes the assembled mechanism of the invention. This includes as important parts, a housing 11 and a plunger 12, the latter having a ratchet face 13.

The plunger slides axially in a guide 11a which in this instance is an integral part of the housing 11. Facing the inside of the housing is a slotted portion 11b through which the ratchet 13 is integrally engageable by a forwarding or feeding pawl 14 and a restraining or holding pawl 15. Advantageously, the guide 11a serves as the back wall of the housing while an oppositely spaced wall 11c constitutes the front of the housing.

A side wall 11d connects the back wall 11a and the front wall 11c together, thereby defining the interior space 11e within which certain of the moving parts of the mechanism are located.

Projecting outwardly from the back wall is a threaded boss 16 that screws into the threaded socket 17, Fig. 1, which usually accommodates one handle (not shown) of an existing drilling mechanism to which the jack happens to be applied. Such an existing drilling mechanism is shown at 18 by way of illustration only, and not of limitation. Projecting outwardly from the front wall of the housing, advantageously as an integral part thereof, is a handle 19, and a pivot 20 in proximity to the base of this handle is a lever 21 which is adapted to be manually operated in pump-handle fashion. Normally the lever 21 is held retracted by a compression spring 22. At 24, as a part of the lever 21, is a lug that extends into the housing 11e and has suspended from it, the forwarding pawl 14. Here, the suspension means consists of a pair of links 25 pivotally secured to the lug 24 and to the pawl 14 by the respective pins 26 and 27.

The compactness and efficiency of the present device is brought about largely because of the unique construction and operation of the ratchet and pawl assembly. This is illustrated clearly in Figs. 2 and 3 where the space 11e constitutes a gangway or well alongside the slotted guideway 11a.

The pawl 14 in this instance spans substantially the space between the front and back walls of the housing so that the tail portion 14a of the pawl is substantially below the inside surface of the front wall 11c while the nose at 14d, Fig. 2, engages the ratchet 13.

At 28 is a stationary post on which is pivoted the holding pawl 15 which, under the urge of a compression spring 29, engages the ratchet and holds it during the feeding intervals of pawl 14. The spring 29 exerts its tension between the body of pawl 15 and the tail portion 14c of pawl 14 to urge both pawls in common to simultaneously enter engagement with ratchet 13. The present pawl assembly is unique in that the releasing urge that causes one pawl to hold the ratchet, at the same time provides the yielding pressure upon the other pawl to allow the latter to swing free from engagement with the ratchet during the intervals of recession.

The floating suspension of pawl 14 by means of links 25 provides its aforementioned swinging freedom. Furthermore, such suspension allows the spring 29 to constantly push the tail 14a into sliding contact with the inside surface of wall 11c and thereby to bring into play by reaction a horizontal force component that normally keeps the nose of pawl 14 in engagement with the ratchet tooth. This can be clearly visualized from what is shown in Fig. 2, in connection with a downstroke of lever 21, the short arm of which overhangs the well 11e. In Fig. 2 are pictured the normal operating positions of the different parts.

A slide 30 is important in certain phases of the functioning of the pawl assembly. The said slide is an opening 32 with a lower edge 23 adapted to lift pawl 15, while the upper edge of the slide lifts pawl 14. In the normal working position of the pawls, Fig. 2, the slide hangs loosely on pawl 15. Suppose it is desired to reset the ratchet plunger; the lever 21 is allowed to remain in the retracted position (handle 21 up) while the slide 30 is pushed clear up manually to release both pawls from the ratchet and to cause them to be mutually interlocked by the slide. In the interlocked position the lips of both pawls bear against the surface of the slide, and when the lock is caused to hold because the tension of spring 29 is exerted through pawl 15 to keep the slide frictionally stationary against the inner face of wall 11c, thereby holding both pawls free of engagement with the ratchet 13 and interlocked with respect to each other. This permits the plunger 12 to be easily withdrawn from its guide.

After the ratchet plunger is replaced into its guide, re-engagement of both pawls with the ratchet is effected by first pushing down on lever 21. This raises the pawl 14 so its lip will have passed over the upper edge 33 of the slide as in Fig. 3. In the meanwhile the pawl 15 is left in contact with slide 30. Then, by sharply releasing lever 21, the slide receives an impact from pawl 14 which pushes the slide down slightly past the lip of pawl 15. The latter then assumes its normal position freeing the pawl 14 from engaging the ratchet. Thus, the normal working relation of the pawls is restored.
In the normal operating phase, pumping of the handle 21 finally brings the ratchet plunger into a position where it merely idles so as to prevent any undue stresses upon the working parts. Such functioning is explained more fully hereinafter.

The portability of the drill jack has hereinbefore been emphasized since it can be applied to existing drills, but it is to be clearly understood that the design of the structure is readily adaptable to constitute original built-in equipment with any standard electric, pneumatic or other drill. When that is the case, the boss 16, which is shown in the drawing in the nature of an adapter, is actually eliminated by making the portion 16 of Fig. 1 an integral part of the socket 17. Since the socket 17 is an integral part of the body 39 of a usual drill, it is obvious that the housing 11 would also be an integral part of the body 39.

An alternative integral structure 40 is illustrated in Fig. 8 where the housing 41 corresponds to the housing 11 of Fig. 1, but is integrally connected to the body 42 by the portion 43. The ratchet guide 44 corresponds to the guide 11c in Fig. 7, and the handle 45 to the handle 19 in other figures.

Obviously, it is a primary purpose to supply mechanically the force necessary to push a starting drill bit against the work, rather than to exert such force through sheer manual effort.

In preparation for drilling, an attachment member such as a swiveled hanger link 34 depends from the plunger 12 and serves to hold two portions of a flexible connector, presently shown as a link chain 35, fast to the plunger. Preferably one end of the chain is permanently attached at the eyelet 36, leaving the other end of the chain, or an intermediate portion thereof, free to hang on one or the other of two horns 37.

In operation, assuming a usual drilling mechanism 18 to be equipped with the device of the invention, the combination is set up after the manner suggested in Fig. 1. This means that the drill bit 31 is in contact with a piece of work 38, the chain 35 having meanwhile been looped around the work and a free portion of the chain suspended from a horn 37. By working the lever 21 back and forth, any slight slack in the chain is first taken up by the plunger. Afterwards, continued working of the lever causes the chain to be stressed and the bit to be fed to the work as desired. It is to be observed that a downstroke of the lever 21 obviously lifts the pawl 14 together with the plunger 12 and feeds the bit 31 a corresponding distance. Then, on the upstroke of the lever, the restraining pawl 15 is caused to hold the plunger until the next downstroke comes into action. The upward travel of the hanger 34 finally brings it into contact with the slide 50 and automatically causes the same to act as a "kick-out," just before reaching the aforementioned interlocking position.

The slide 39, Fig. 5, is advantageously provided with an arm 46 which is effective to prevent undue sideways rocking of the slide.

Serving as a closure for the housing 11 is a removable cover 47 held in place by suitable means, for illustration, screws 48.

Whereas this invention is here illustrated and described with respect to certain preferred embodiments thereof, it should be understood that various changes may be made therein and various other constructions may be adopted on the basis of the teachings hereof, by those skilled in the art, without departing from the protective scope of the following claims.

Having fully described my invention what I claim is:

1. A holding and feeding mechanism, comprising a ratchet; a guideway for the ratchet; a guideway adjacent the guideway and having a surface opposite the guideway; a pawl having a nose engaging the ratchet and a tail slidably on said surface; another pawl engaging the ratchet apart from the first pawl; spring means reacting between the second pawl and said tail; linkage pivoted on said pawl between said spring means and said nose; and means disposed to reciprocate the linkage.

2. A holding and feeding mechanism according to claim 1, wherein the reciprocating means for the linkage consists of a handle having a fulcrum adjacent the guideway surface and a connection to said linkage.

3. A holding and feeding mechanism according to claim 2, wherein said handle has two depending lugs straddling said guideway surface so as to engage the fulcrum; and wherein a depending suspension lug is spaced between the straddling lugs so as to constitute said connection to the linkage.

4. A holding and feeding mechanism according to claim 1, wherein a plate slidably disposed between the ratchet and the pawl assembly, said plate having edge portions disposed to lift both pawls simultaneously from engagement with the ratchet; and wherein is further included a projection from the ratchet effective to actuate said plate at a given point of ratchet travel.

5. A holding and feeding mechanism comprising a feed ratchet; a wall spaced apart from and facing the ratchet; a feed pawl having a nose in engagement with the ratchet and a tail in contact with the wall; a holding pawl having a body spaced apart from the feed pawl and a nose in engagement with said ratchet; spring means disposed to exert force between tail of the feed pawl and body of holding pawl; and handle means disposed to propel the feed pawl so that the tail thereof slides along said wall, and simultaneously, the nose thereof imparts feeding motion to said ratchet.

6. A holding and feeding mechanism according to claim 1, wherein is included a slide between the two said pawls and the ratchet, said slide being effective to selectively withdraw both pawls from engagement with the ratchet.

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