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ACCESSORY OR ADJUNCT FOR MANUAL IMPACT WRENCHES

Filed July 6, 1961

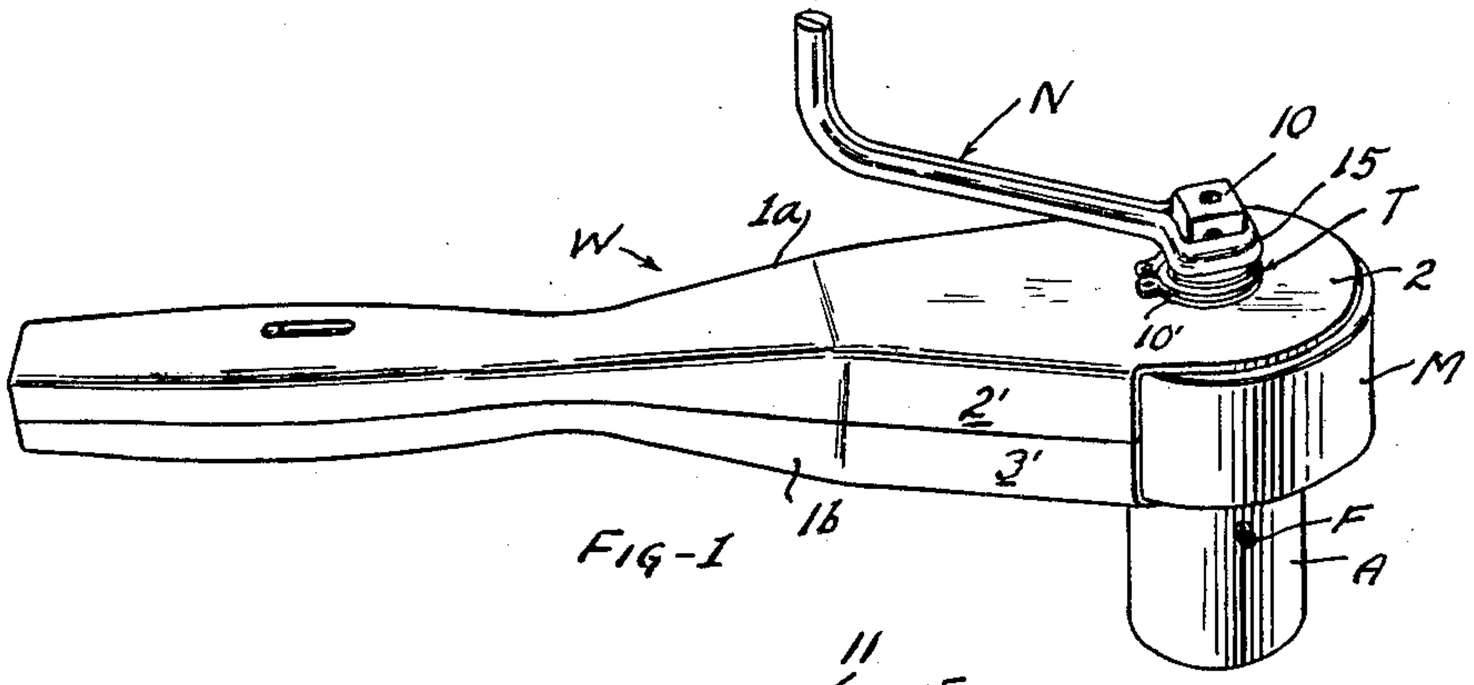


FIG-1

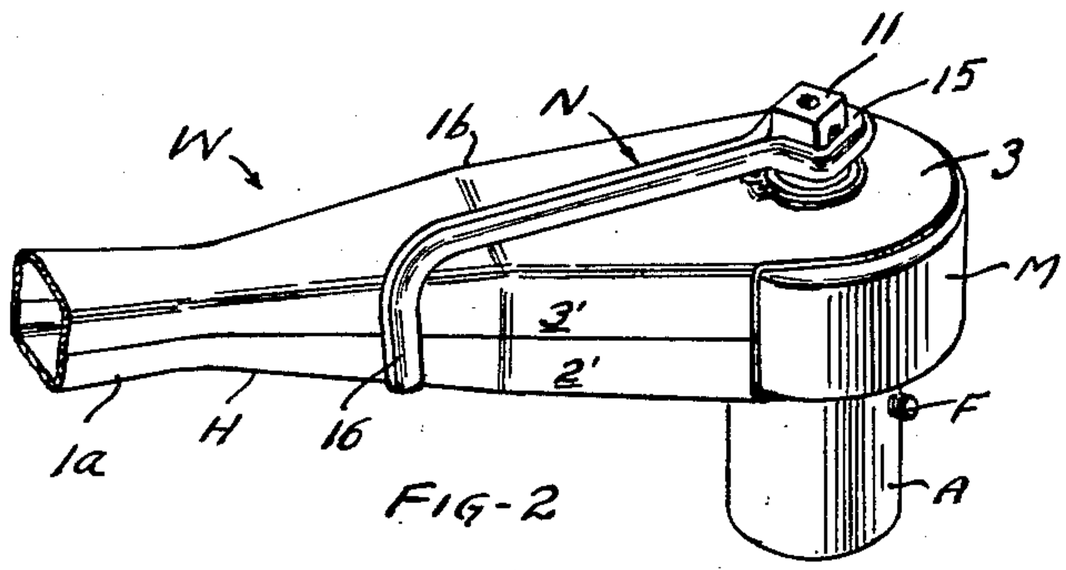


FIG-2

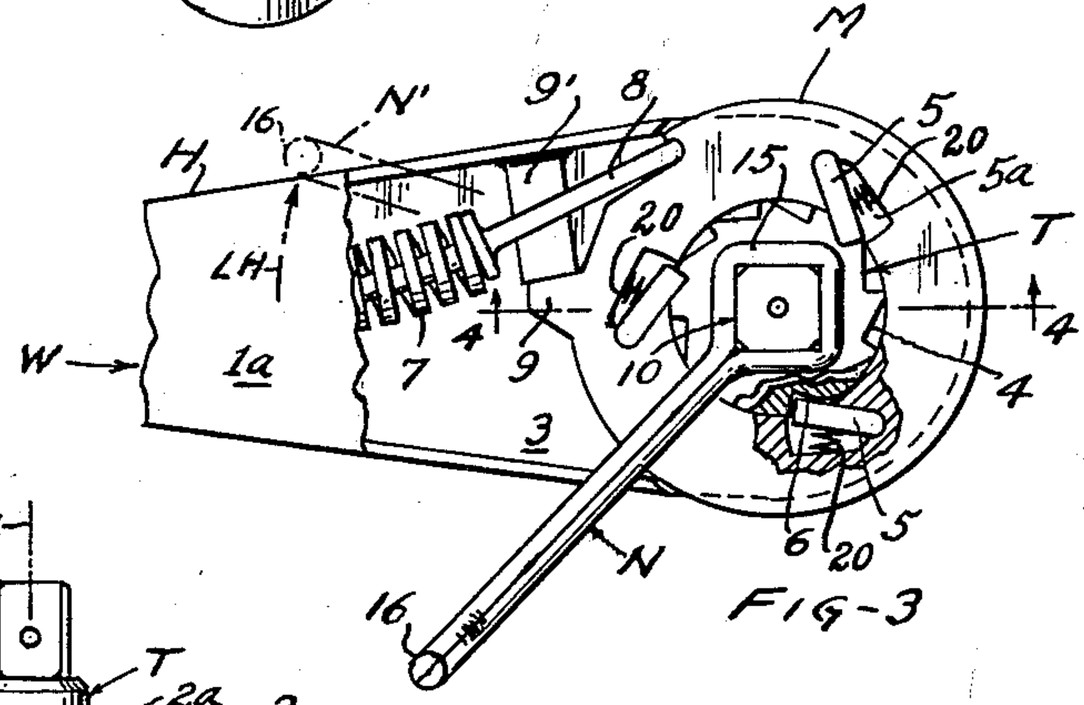


FIG-3

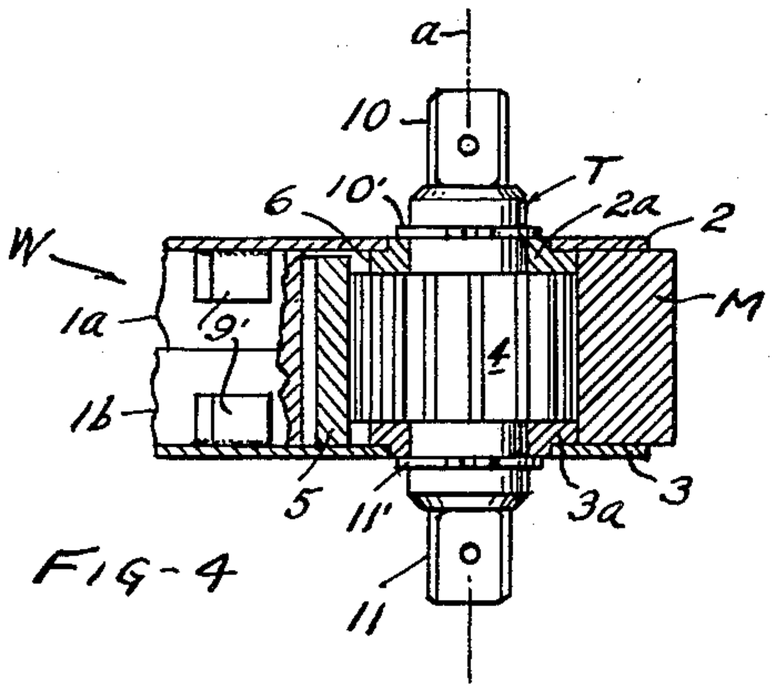


FIG-4

INVENTORS
ANDREW SCHMIDT
JOHN J. VARGA
MERRILL A YOUNG
By George M Sousa
ATTORNEY

United States Patent Office

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# 3,180,185
# ACCESSORY OR ADJUNCT FOR MANUAL IMPACT WRENCHES

Andrew Schmidt, Middleburg, John J. Varga, Lyndhurst, and Merrill A. Young, Gates Mills, Ohio, assignors to Curtiss-Wright Corporation, a corporation of Delaware

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1 Claim. (Cl. 81—52.3)

In a manually operated rotary impact-producing tool being manufactured and sold by the assignee hereof under the registered trade mark Swench, a power spring is mounted in a hollow operating handle and an annular inertia member or rotor which carries pawl elements operating on a ratchet-toothed portion of an output shaft or tool head produces, through force alternately stored in and released by the spring, successive sharp and powerful impacts, via the tool head, as on a screw threaded member (bolt or nut) to tighten or loosen it.

In the practical use of manually operated impact wrenches such as outlined above—for example during the tightening of a conventional nut on a bolt or stud—impact operation is unnecessary and undesirable until the nut meets with considerable resistance to further turning, as after it abuts a frame surface holding the bolt. Should the coacting threads bind for any reason while the nut is a considerable distance away from the abutment surface, e.g., to an extent such that the operator cannot turn the nut by hand without using a wrench—and assuming the situation will not permit full rotation of the impact wrench handle—then valuable time would ordinarily be consumed in freeing the nut by other means, if available. Similarly, after using the manual impact wrench to "break loose," e.g., a badly corroded threaded connection, then very often after the nut has been broken loose, neither the impact wrench nor direct manual operation can most expediously be used to complete the removal of the nut from the bolt or stud.

In cases such that there is adequate room to revolve the impact wrench handle about the tool head, then the handle can effectually be used for spinning-on or spinning-off purposes. However it is then desirable that the impact-performing mechanism shall temporarily be rendered inoperative in order to avoid slack or springiness in either desired operating direction due to incomplete operations tending to produce impacts.

The present invention provides a simple, light weight, inexpensive and adequately rugged adjunct or accessory device for a manual impact wrench unit having a rotary tool head provided with ratchet type means to produce impacts, whereby spinning-on or spinning-off of fasteners without having to rotate the wrench unit or handle is facilitated, and whereby, when desired, the impact producing operation of the wrench mechanism can be strongly prevented from taking place by appropriate easy application of the subject device in association with the tool head and housing or handle of the wrench unit.

Objects and novel features of the present invention not indicated above will become apparent from the following description of the preferred embodiment shown in the drawing. The essential characteristics are summarized in the claim.

In the drawing FIG. 1 is a perspective view showing an impact wrench W and the adjunct or accessory device N hereof in a position for spinning-on or spinning-off operations as outlined earlier.

FIG. 2 is a fragmentary perspective view showing the device N hereof in inverted position to block impact-producing operations of the wrench mechanism. Wrench W is also shown inverted.

FIG. 3 is a fragmentary view of the impact wrench W

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with a portion of one of its housing components broken away to expose portions of the impact-producing mechanism and showing the device N (full lines) in position for nut running or spinning operation as in FIG. 1.

FIG. 4 is a detail fragmentary longitudinal sectional view of the wrench mechanism taken as indicated by the line 4—4 on FIG. 3.

The impact wrench unit W, as shown herewith has an output shaft or tool head unit T having oppositely disposed coaxial generally polygonal (e.g. square) stubs **10** and **11** (commonly "drive squares") adapted for engagement with complementary recesses in adapters or standard wrench sockets so that threaded members of a predetermined duty magnitude can operatingly be engaged by the wrench for tightening or loosening threaded members. The illustrated drive squares **10** and **11** usually engage complementary recesses in suitable adapters or wrench sockets, one such being shown at A in FIGS. 1 and 2. Those can be detachably secured to the tool head as by spring fastener pins F. Drive square **10** or **11** would be so engaged with the adapter or socket according to whether the fastener is to be tightened or loosened.

The main body (handle H) of wrench W as shown comprises a hollow metal housing made of mutually complemental half shells **1***a* and **1***b* having integral parallel side plate portions **2** and **3** respectively, suitably connected together through the intermediary of the tool head as by snap rings **10'** and **11'** adjacent bearing bushing portions **2***a* and **3***a* of the shells integral with the side plate portions **2** and **3** thereof respectively. The shells **1***a* and **1***b* have respective continuous side wall portions **2'** and **3'** terminating adjacent peripheral circular external surface portions of the rotor M. Thus the interior of the housing H is approximately closed all around, and, at the woking end, by cooperation with the rotor. The shells **1***a* and **1***b* are detachably connected together remotely of the tool head T by suitable means not shown.

The tool head T of wrench unit W as shown by comparison of FIGS. 3 and 4 has a central ratchet toothed portion **4** between the bushings **2***a* and **3***a*. An annular inertia member or rotor M surrounds the ratchet toothed portion **4**; and the bearing bushings just mentioned guide the shaft, the handle and the inertia member for angular concurrent or relative movement about the working axis *a* (FIG. 4) of the tool head. Pawls **5** movably supported on the rotor M, as in associated recesses **5***a* therethrough, are biased by suitable springs for engagement with the ratchet teeth. Cams **6**, one for each pawl, formed on the bushings **2***a* and **3***a* or otherwise connected for movement by and with the housing or handle H, are operable against the pawls as a function of predetermined angular relative movement of the handle H and rotor M about said axis in a predetermined direction to enable successive escapements and impacts between the pawls and the ratchet teeth.

A coiled compression power spring **7** disposed within the handle H lengthwise thereof reacts on the outer end of the handle (inside it, reaction means not shown). The spring connects the handle to the rotor eccentrically thereof, as via a rigid pushrod **8** carried by the illustrated portion of the power spring, so that the earlier mentioned relative angular movement of the handle and rotor will, pursuant to said escapements, produce the impacts through energy alternately stored in and released by the power spring.

As will be evident from FIGS. 1 and 3 (assuming a semi-tightened fastener engaged by adapter A), clockwise movement of the handle H about the axis of tool head T will axially compress and thereby store energy in the spring **7** since the tool head T and rotor M will strongly resist angular movement. As the handle advances, the

cams **6** which move with the handle encounter the pawls **5** and move them outwardly against springs **20** until they clear the engaged teeth of ratchet **4**. With the pawls no longer restraining it, the motor M accelerates rapidly in a clockwise direction impelled by the energy which was stored in the spring **7**. The pawls forcibly engage the next set of teeth on the ratchet and thereupon suddenly release the rotational energy contained in the swiftly moving rotor. In other words the ratchet teeth and pawls serve as anvil and hammer means respectively. This impact gives a rotational impetus to the ratchet which is transmitted to the tool head T. As the rotor accelerates, the pawls **5** are moved into original positions relative to the cams and rotor M by the rotational movement of the rotor itself and by the restoring action of springs **20** whereby the tool is conditioned to repeat the described sequence of operations. With the illustrated three pawls, hence three cams and twelve ratchet teeth, escapement and impact occurs for each clockwise movement of the handle somewhat in excess of 30°. Operating movement of the handle H can be unidirectional or back and forth (indexing movement) in the manner of operating a ratchet wrench. Stops shown at **9** and **9'**, integral with the rotor M and housing H respectively, determine the initial or starting position of the rotor M between impacts.

Adjunct or accessory device N hereof, as shown, is produced from tough, half round metal stock (e.g., uniformly of D-shaped cross section but with rounded "edges") being of non-circular form (cf. FIG. 3) at the hollow hub portion **15** and with adequate all-around clearance to enable the hub portion to slip over and transmit torque to the drive squares **10** and **11** and have adequate bearing area thereon in face-to-face contact with the flat side surfaces of the drive squares.

The single piece of half round stock from which the device N is made is bent or formed around a die or mandrel having a nearly square cross section (i.e. nearly sharp corners), so that relieved or chamfered "corner" portions of the drive squares (note showing of drive square **10** in FIG. 3) provide considerable clearance inside each corner of the hub so that there can be no binding at the corners. The mutually abutting face-to-face portions of the stock which comprise or form the crank arm and the curved handle portion **16** at right angles to the principal plane of the hollow hub portion **15** or parallel to the tool head axis in either mounted position on the wrench W are preferably joined together while disposed along an approximately straight line or axis—not shown—as by spot welding in several places including the region which forms the handle **16**. The handle or hand-hold portion **16** is die formed afterward (bent out into general L-shape), preferably on a fairly large radius or as shown in FIGS. 1 or 2.

In use for spinning-in or nut running, it will be evident from comparing FIGS. 1 and 3, assuming the hub portion **15** of the adjunct or accessory device N has been slipped over the driving square **10** in such manner that the crank handle **16** extends away from the wrench unit, as upwardly, the device N can now be used to spin the tool head T, hence adapter A and fastener engaged thereby (not shown), in a clockwise direction by successively forcing the pawls **5** back into their recesses **5***a* as the teeth move past the pawls. The spinning operation is continued until the fastener is tight on or in or against its coacting member. The device N is then slipped off the drive square. Thereafter operation of the handle of wrench W either back and forth or steadily in a clockwise direction will produce impacts to seat or tighten the fastener via connection thereof with the adapter A as already described.



In FIG. 2, assuming device N has not yet been applied but that the wrench W has been inverted so that the adapter or wrench socket A is engaged by the depending drive square **10**, loosening impact operations (with right hand threaded fasteners) will take place as described if the handle H is turned counterclockwise from the point of view of an operator or generally above the wrench in its illustrated position. Thus if in FIG. 2 the adjunct device N hereof is applied over the drive square **11** so that the depending crank portion **16** will abut the side wall (e.g., 3') of the wrench handle assembly H it will then be impossible to stress the power spring as necessary to produce or tend to produce impact operations because the handle or housing H cannot move angularly the necessary distance with respect to the (assumed stationary) tool head T.

The same or an equivalent situation as just described above would apply in reference to FIG. 3 in case the device N is positioned as shown in broken lines N' and relatively underneath the wrench W or with its hollow hub portion **15** embracing (hidden) drive square **11**. In that case clockwise (loosening or tightening) movement of the impact wrench handle (per arrow LH FIG. 3) would normally produce impacts for delivery to a fastener via illustrated drive square **10** but would be prevented from doing so by juxtaposition or (upstanding) crank handle **16** and the side wall of the wrench housing. If the device N, FIG. 3, is placed on the other side of the handle (not illustrated) it blocks movement of the handle relative to the tool head such as would enable indexing or to and fro movement of the handle to produce unidirectional turning of the tool head.

By further reference to FIG. 3 (position N' of adjunct device N) it will be seen that the resistance offered by said device N to impact-performing operation of the wrench W is unlikely to damage (e.g., bend) the device N since the power spring **7** would have to be deflected before bending of the device N could take place.

We claim:

In combination with an impact wrench arranged to operate through successive escapement and impact cycles on part of a pawl carried by a rotary inertia member against ratchet teeth of a rotary tool head having axially opposite shaft stubs of uniform non-circular cross section for operative engagement with a threaded fastener, the wrench having an operating handle extending transversely of the tool head axis; a spinner device in the form of an L-shaped crank having a hollow hub portion suitably shaped to slip easily over either shaft stub to impart torque thereto in a desired direction and a hand-hold portion which in any position of the hub portion on a shaft stub is disposed approximately in parallel relation to the axis of the tool head, the hand-hold portion, in a tool-head-blocking position of the hub portion on one of the stubs, extending in the same direction as the other stub so that the hand-hold portion can be turned with the tool head into abutment with the handle of the wrench thereby to block further turning of the tool head.


**References Cited by the Examiner**

UNITED STATES PATENTS

| | | | |
|---|---|---|---|
| 1,359,325 | 11/20 | Butler | 81—58.1 |
| 2,729,998 | 1/56 | Deliso | 81—72 |
| 2,787,180 | 4/57 | Fish | 81—58.1 X |
| 2,954,714 | 10/60 | Swenson | 81—52.3 |
| 3,108,506 | 10/63 | Swenson | 81—52.3 |


WILLIAM FELDMAN, *Primary Examiner.*