Aug. 13, 1963 H. HORNSCHUCH 3,100,558

IMPACT TOOL

Filed June 22, 1961

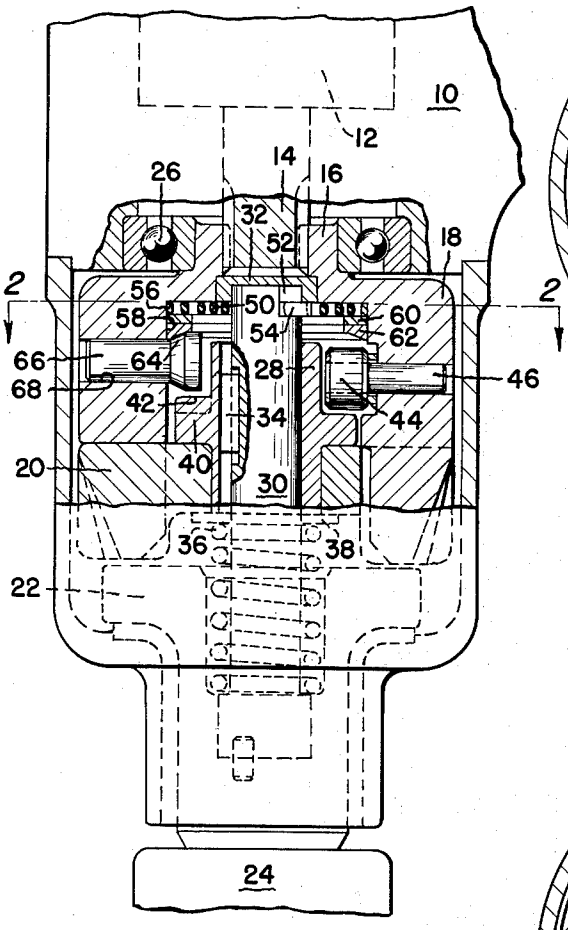

FIG. 1

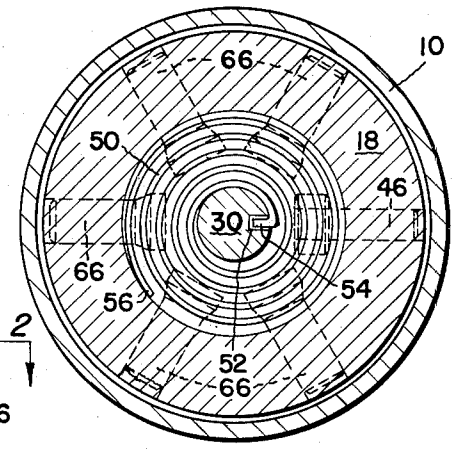

FIG. 2

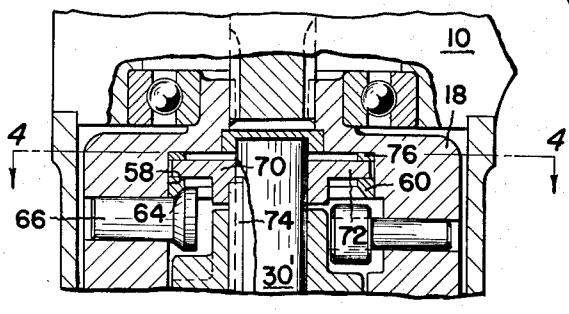

FIG. 3

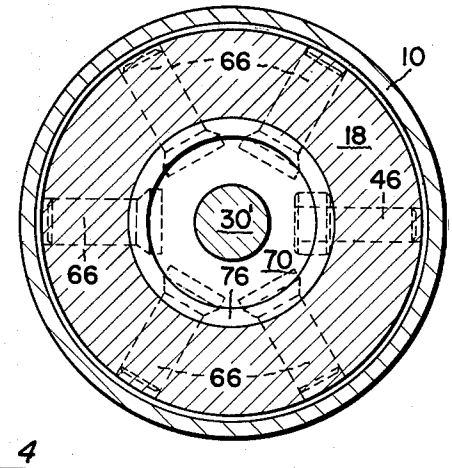

FIG. 4

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IMPACT TOOL

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This invention relates to impact tools and more particularly to impact tools of the type adapted to strike successive rotational hammer blows on a work element such as a socket wrench, screwdriver and the like.

This type of tool characteristically has periods between blows at which the torque is light or non-existent resulting in looseness or slack in the train of elements leading to the work. For this reason those parts which are out of contact have to be accelerated by the hammering element and part of the force is thereby reduced and not delivered to the work. "Snubbing" or taking up the slack in the parts greatly enhances the effectiveness of the tool.

It is an object of this invention to provide an effective snubbing arrangement for a tool of this character.

The invention is attained, briefly, by inter-connecting the hammer and anvil of an impact wrench by a snubbing means which is operative, in response to an increase in rotary speed of said hammer just before it strikes an impact to the anvil, to apply a frictional drag on the anvil, tending to bias the anvil in the same rotary direction as the hammer is moving, the snubbing means being also operative, in response to the stopping of the hammer, when it delivers an impact to the anvil, to release the frictional drag on the anvil while the hammer begins to again attain its rotary speed prior to delivering its next impact. In other words, the snubbing means of this invention is intermittently operating, instead of continuously applying a frictional drag on the anvil; it is only effective just before the striking of each hammer blow and is ineffective during the early portion of each acceleration period of the hammer to avoid the waste of power and energy.

The invention will be more completely understood by reference to the following description taken in conjunction with the accompanying drawings which includes

FIGURE 1, a view of the front end of an impact tool showing in part broken away, the snubbing arrangement being in section longitudinal of the tool,

FIG. 2 is a transverse section of the tool taken along the line 2—2 of FIG. 1 looking in the direction of the arrows,

FIG. 3 is an alternative embodiment of the invention and shows in longitudinal section the snubbing arrangement as mounted in a tool of the general character of FIG. 1, and

FIG. 4 is a transverse section along the line 4—4 of FIG. 3 looking in the direction of the arrows.

Referring to the drawing the impact tool here illustrated is of the general character of that shown in Jack S. Vaughn, patent application Serial No. 749,476, filed July 18, 1958, and so far as the general operation of the tool as a hammer is concerned and the cooperation thereof with the anvil and working implement these constructions may be considered to be identical.

Referring to the drawing the impact tool comprises a casing **10** housing a motor indicated in dash lines at **12** and provided with a shaft **14** fluted to engage the internally fluted end **16** of a hammer **18**. At its forward end hammer **18** is provided with dogs **20** which are adapted to reciprocate periodically for engagement with an anvil **22** mounted in the forward end of casing **10** and adapted to carry a working implement **24** externally of

casing **10** for engagement with suitable work. Hammer **18** is adapted to be rotated by motor **12** and is provided with anti-friction bearings **26** at its rearward end.

Periodic engagement of dogs **20** with anvil **22** is accomplished by a cam element **28** mounted on a longitudinally disposed spindle **30** keyed to anvil **22** and extending through hammer **18** having an end bearing in a cup-shaped bearing member **32**. As described in the Vaughn application the cam member **28** is slidable longitudinally on stem or spindle **30** being provided with a keyway connection **34** on that stem. Normally, cam **28** is pressed rearwardly by a spring **36** encircling stem **30** and bearing against a ring plate **38** contacting the forward end of cam **28** and dogs **20**. Thus spring **36** provides a means for disengaging dogs **20** from anvil **22**. Motion of the dogs **20** in a forward direction for engagement with anvil **22** is effected through a radial extending flange **40** which bears the camming surface **42** adapted to be acted upon by roller **44** carried by a transverse pin **46** mounted in the wall of hammer **18**. The construction thus far described is identical in its operation with that of the Vaughn application above mentioned.

As thus constructed there is bound to be a certain amount of looseness in the connection between anvil **22** and socket **24** connection, between anvil **22** and stem **30**, as well as at the keyway connection **34** between cam **28** and stem **30**. As above stated it is desirable to eliminate the effect, as far as possible and especially at the time of impacting of the dogs **20** with anvil **22**, of all looseness in the system. The difficulty with snubbers provided for this purpose in the past has been that they provide a steady frictional connection between the driving part and the driven part which not only produces excessive wear but cuts down on the available power. By this invention there is provided a snubber which acts only intermittently and which releases upon delivery of the hammer blow operating only intermittently. This snubbing force may be applied by a frictional element or through a spring member which transmits the snubbing pull to the anvil. In this instance the pull is applied through the stem **30** and in the embodiment of FIGS. 1 and 2 the resilient connection is utilized.

To this end a spring **50** is attached at one end to stem **30** at a notch **52**. Spring **50**, being of the coil variety similar to a watch spring but of considerable strength, has an inner end **54** fitting in notch **52**. The other end **56** is attached to a ring **60** lying within a bore **58** at the end of hammer **18**. In contact with ring **60** is provided a second frictional ring **62** having a tapered face adapted to be engaged by the tapered heads **64** of a plurality of plungers **66** preferably cylindrical and slidable radially in cylindrical bores **68** arranged radially with respect to hammer **18**. Thus as plungers **66** are moved radially outward the heads **64** will engage ring **62** to press against ring **60** whereby the end **56** of spring **50** is constrained to move with hammer **18**. Such radial motion of plungers **66** is effected only by centrifugal force developed as a result of rotation of hammer **18**. It is understood that upon stopping of hammer **18** and a cessation of the centrifugal force ring **60** is released and any wind up in spring **50** is relieved. So, in the operation of the hammer tool upon delivering a blow hammer **18** comes to a standstill and any frictional engagement of plungers **66** with spring **50** is released. Then as hammer **18** accelerates to accumulate rotational energy for the subsequent blow on an anvil **22** plungers **66** are impelled radial outward to push ring **62** into engagement with ring **60** thereby resiliently urging stem **30** to take up any slack in its connection with anvil **22** and furthermore to take up the slack in the connection between anvil **22** and the working implement **24**. It is understood that spring

50 will be of sufficient strength or stiffness to transmit such a snubbing force. Upon delivery of the blow by hammer 18 to anvil 22 hammer 18 stops and the resilient connection described ceases.

The arrangement in FIG. 3 and FIG. 4 provides a frictional engagement but eliminates spring 50. As before, hammer 18 is provided with plungers 66 with tapered heads 64 to engage the ring 60. In this instance however the connection between ring 60 and stem 30' is effected through a collar 70 slidable on stem 30' but having a key connection 74 therewith. The outwardly extending flange 72 on collar 70 is adapted to be engaged by ring 60 and to be gripped thereby, there being a backing ring 76 to engage the flange 72 on the side opposite ring 60. The backing ring 76 may be a frictional facing secured to the bottom of bore 58. The operation of this arrangement is like that of FIG. 1 and FIG. 2 except that member 72 is not resilient.

Thus, by the above construction are accomplished, among others, the objects hereinbefore referred to.

I claim:

1. An impact wrench comprising a rotatable hammer, dogs carried by said hammer, an anvil adapted to receive a working tool, a stem carried by said anvil, a member periodically engaged by said hammer and keyed to said stem to actuate said dogs to impact said anvil, and centrifugal means cooperative with said stem and said hammer to inter-engage said hammer and stem frictionally immediately prior to each impact of said dogs with said anvil and to release said stem and hammer from frictional engagement immediately after each of said impacts.

2. An impact wrench as set forth in claim 1 in which said centrifugal means comprises weighted members radially disposed on said hammer, and a frictional element carried by said stem to be engaged by said radial members upon rotation of said hammer.

3. An impact wrench as set forth in claim 2 in which said members are plungers mounted for radial movement in said hammer.

4. An impact wrench as set forth in claim 3 in which said plungers have heads engageable with said frictional element for compression thereagainst.

5. An impact wrench as set forth in claim 2 in which said frictional element is resiliently carried by said stem.

6. An impact wrench as set forth in claim 5 in which is provided a coil spring attaching said frictional element to said stem.

7. An impact wrench as set forth in claim 3 in which said plungers are cylindrical and rotatably mounted in said hammer.

8. An impact wrench comprising: a rotatable hammer adapted to be driven by a motor; an anvil adapted to be connected to a work piece for delivering periodic rotary impacts to the work piece; impact delivering means for intermittently interengaging said hammer and anvil and transmitting periodic impacts from the hammer to the anvil; snubbing means operative to apply a frictional drag on said anvil, tending to bias the anvil in the same direction that the hammer is rotating in, immediately prior to the delivery of each impact by said hammer to said anvil, said snubbing means being operative, immediately after each impact, to release said anvil from said frictional drag for a short time while said hammer gains rotational speed again.

9. An impact wrench comprising: a rotatable hammer adapted to be driven by a motor; an anvil adapted to be connected to a work piece for delivering periodic rotary impacts to the work piece; impact delivering means for intermittently interengaging said hammer and anvil and transmitting periodic impacts from the hammer to the anvil; and snubbing means operative, in response to an increase in rotary speed of said hammer, to apply a frictional drag on said anvil biasing it in the same rotary direction as said hammer is moving, said snubbing means being operative, in response to the stopping of said hammer when it delivers an impact to said anvil, to release said frictional drag on said anvil.

10. The impact wrench of claim 9 wherein said snubbing means includes: a weighted member mounted on said hammer to be moved radially outward by centrifugal force as said hammer increases rotary speed; a frictional clutch interconnecting said hammer and anvil; and mechanism operative, in response to the radially outward movement of said weighted member, to engage said clutch and cause said rotating hammer to apply a frictional drag on said anvil.

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