July 4, 1961 A. F. GATTIKER, JR., ET AL 2,990,812

IMPACT TOOL

Filed April 12, 1960 2 Sheets-Sheet 1

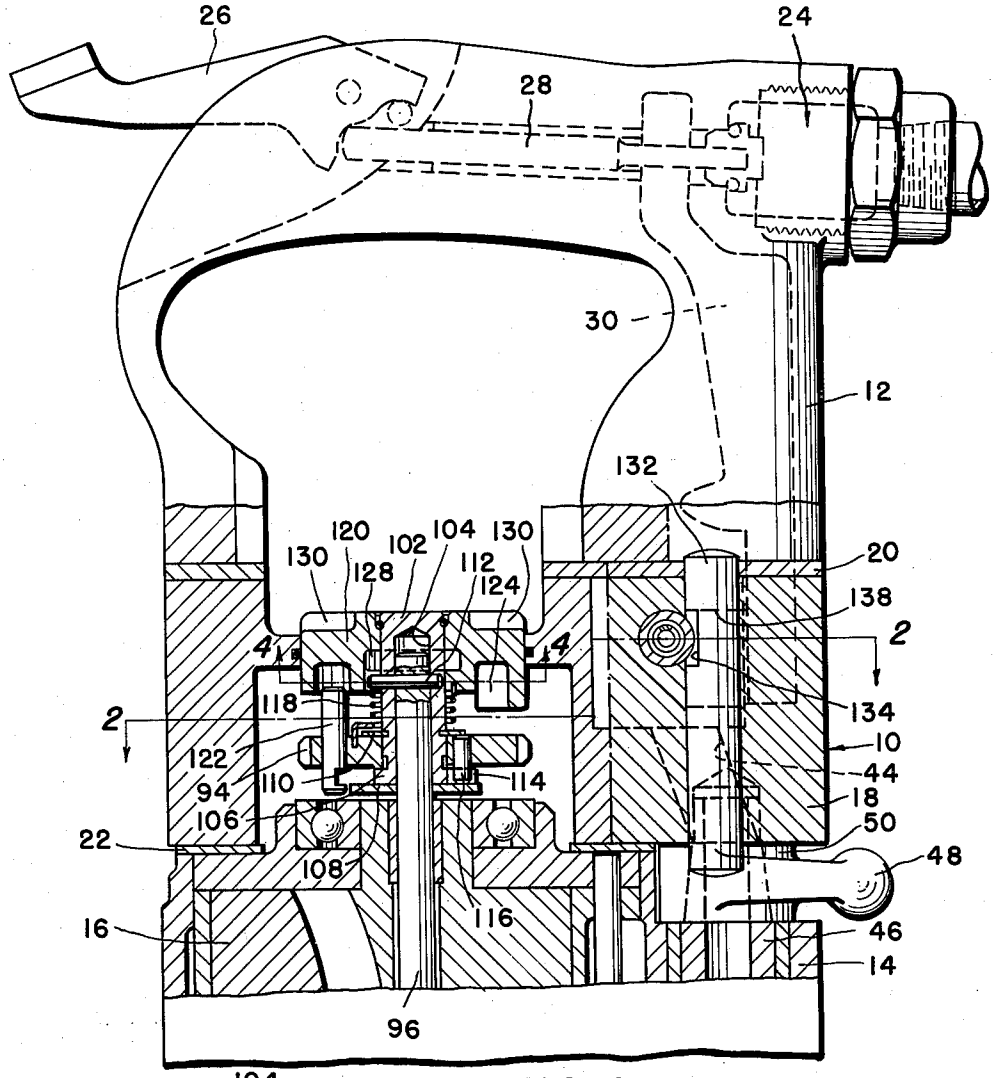



FIG. 1

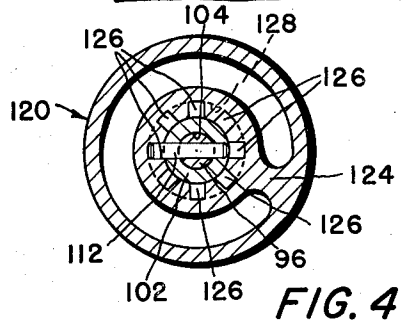



FIG. 4

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Filed April 12, 1960 2 Sheets-Sheet 2

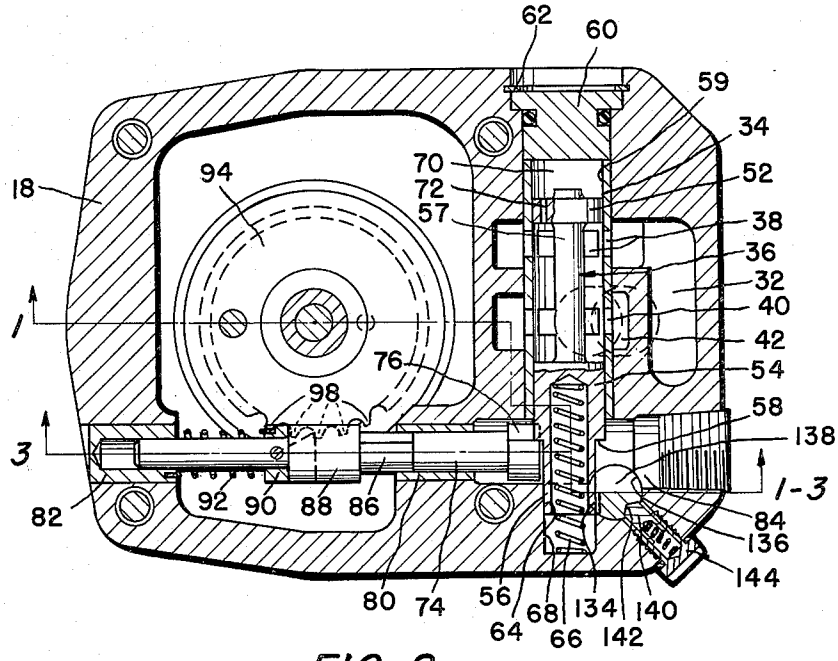



FIG. 2

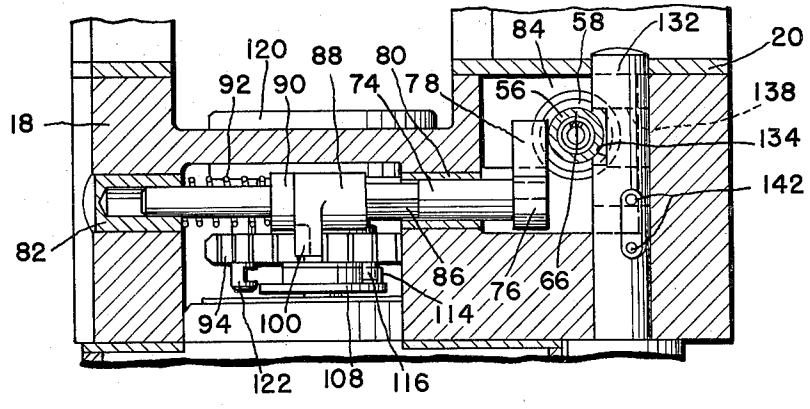



FIG. 3

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# IMPACT TOOL

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6 Claims. (Cl. 121—33)

This invention relates to an automatic shut-off device for pneumatic wrenches and the like having a motor and a spindle the rotation of which is to be the controlling factor in the operation of the motor.

The invention is particularly useful as a control device for that type of wrench generally referred to as an impact tool. It is especially designed to make possible the limited rotation of a wrench socket to a definite degree as, for instance, something less than a full revolution. This is an improvement of the John B. Vilmerding application for Impact Tool, Serial No. 27,374, filed May 6, 1960, wherein is described a tool particularly useful in an operation where it is desired to tighten up, for instance, a plurality of bolts in a plate up to a certain degree of tightness as for example merely seating the bolt on the plate and thereafter to tighten each nut or bolt a certain number of degrees less than a full revolution or 360°. The invention provides also a lock in such a device to prevent reverse rotation of the machine when the rotation control is set for operation.

It is an object of this invention to provide an improved shut-off mechanism to control the operation of apparatus above referred to.

Other objects and advantages of the invention will be in part obvious and in part pointed out hereinafter.

In the drawings showing a preferred embodiment of the invention

FIGURE 1 is a longitudinal section of part of a tool constructed in accordance with the practice of the invention only so much of the tool being shown as contains the improvement,

FIG. 2 is a cross section of the tool of FIG. 1 taken at the line 2—2 looking in the direction of the arrows, and the line 1—1 in this figure indicates the section at which FIG. 1 is taken, the arrows indicate the direction of view,

FIG. 3 is a cross section of the tool taken along the line 3—3 of FIG. 2 looking in the direction of the arrows, and

FIG. 4 is a section taken along the line 4—4 looking in the direction of the arrows and shows more particularly the construction of the stop member.

Referring to the drawings the shut-off mechanism is in this instance housed within the casing 10 of an impact wrench or the like, the housing being composed of a handle section 12 and a portion 14 within which is housed the motor 16, the intermediate casing portion 18 having an upper end plate 20 and a lower end plate 22 forming closures for cavities which will be explained later.

This machine being of the pneumatic variety is provided with the usual form of throttle valve 24 housed in the grip portion of the handle 12 the throttle being controlled by the usual trigger 26 actuating a plunger 28 by which the throttle valve is adapted to be controlled to admit motive air through a passage 30 in the handle to a cavity 32 formed in the intermediate portion 18 of the casing.

Within the cavity 32 is mounted a cylindrical bushing 34 having a control valve 36 slidable therein, actually to control inlet ports 38 leading to the interior of the bushing from cavity 32 and the supply ports 40 in the periphery of bushing 34 leading by way of a passage 42 and a port 44, a reversing valve 46 and thence by suitable supply ports (not shown) to the motor 16. Reversing valve 46 is of a rotary type and is provided with a handle 48 attached



to the body portion 50 of reversing valve 46 and is swingable in a space provided between the upper wall of casing portion 14 and the intermediate portion 18 of the casing.

Control valve 36 is of the spool type having a head 52 at one end for controlling the inlet ports 38 and a head 54 forming a closure for the bushing 34 and extending therethrough being provided with a tail portion 56 there being a shoulder 58 at the juncture of the tail portion 56 with head 54. Intermediate heads 52 and 54 is a stem 57 of much reduced diameter as compared with the heads 52 and 54 to provide ample space within bushing 34 for the flow of air from inlet ports 38 to supply ports 40.

Bushing 34 is mounted in a bore 59 extending transversely of casing portion 18 and is held therein by a plug 60 held in place by a keeper 62.

In tail portion 56 of control valve 36 is provided a bore 64 to accommodate a biasing spring 66 seating at the bottom of a hole 68 in the casing portion 18 in line with the tail part 56.

Opposing the force of spring 66 on the valve 36 is the pressure on the outer face of head 52 due to the presence of air under pressure in the space indicated at 70, head 52 being provided with a restrictive leak port 72.

Initially in the operation of this device, valve 36 is adapted to be held in its open position as shown in FIG. 2. This is accomplished by means of a latch member 74 in the form of a rod having at one end a head 76 from which projects an arm 78 adapted to engage shoulder 58 on valve 36. Latch 74 is both rotatable and movable axially in bearing bushings 80 and 82 disposed transversely with respect to bore 59 in casing member 18.

Head 76 and the end of valve head 54 are both disposed in a chamber 84 in casing part 18 which communicates with atmosphere.

For part of its length as at 86, latch 74 is hexagonal and carries a dog 88 slidably mounted on the hexagonal portion 86 so as to be non-rotatable with respect to latch 74. Axial movement of dog 88 with respect to latch 74 in one direction is limited by a collar 90 pinned to latch member 74, which also serves as an abutment for a compression and torsional spring 92 attached to collar 90 and bearing member 82.

When pressed in its rotative position by control valve 36 as shown in FIG. 2 dog 88 on latch 74 is adapted to engage a ratchet member 94 rotatably mounted on a spindle 96.

Ratchet member 94 is in the shape of a circular disc with teeth on its periphery as at 98 corresponding in form with the dog tooth 100 of dog 88.

For this purpose spindle 96 is provided with a bushing 102 having a central bore 104 to receive spindle 96. Bushing 102 is cylindrical on its outer face and terminates in a flange 106 adjacent a plate 108 mounted on spindle 96. Ratchet disc 94 is rotatable on bushing 102 and rests against flange 106 being kept in that position by a keeper 110. Bushing 102 is pinned to spindle 96 as at 112. Ratchet member 94 is adapted to have initial starting position with respect to spindle 96 at the time of engagement of dog tooth 100 with teeth 98.

For this purpose flange 106 is provided with a projection 114 to engage a pin 116 extending into its path from the lower surface of ratchet member 94.

For this purpose is provided a torsion spring 118 about bushing 102 attached at one end to ratchet member 94 and at the other end to a stop member 120 mounted to rotate with shaft 96. Stop member 120 is adapted to engage ratchet member 94 upon partial rotation of shaft 96 with respect to ratchet 94. For this purpose ratchet member 94 is fitted with an upwardly extending pin 122 engageable by a lug 124 extending from stop member 120 toward ratchet member 94. The degree of rotation of stop member 120 with regard to ratchet member 94 is adjustable.

To this end engagement of stop member **120** with respect to the bushing **102** is adjustable.

The lower face of member **120** is provided with notches spaced on its periphery as shown at **126** to fit the projecting end of pin **112**. Notches **126** terminate inwardly in a continous groove **128** so that when stop member **120** is depressed against the compression of spring **118**, it can rotate with respect to bushing **102** to any desired angular relation of stop lug **124** and pin **122**. Upon being released, spring **118** causes reengagement of pin **112** with a suitable notch **126** to facilitate turning of stop member **120**. Depressions **130** are formed in the upper face of member **120** to provide a purchase for the operator's fingers.

It will be understood that spindle **96** is the member, the rotation of which is to be the controlling factor in the operation of motor **16**.

In some way as will be understood its rotation will, as regards its continuation be the measure which is to control operation of motor **16**. Thus in operation and with throttle valve **24** closed there will be no air under pressure in the system and spring **66** will push valve **36** to a position where the valve head **52** uncovers inlet ports **38**. The shoulder **58** of the valve permits spring **92** to push latch **74** into engaging position of arm **78** with shoulder **58**. Under the influence of spring **66**, valve **36** is pushed well up into bushing **34** which permits rotation of dog **88** out of engagement with teeth **98** of dog tooth **100**. Being thus disengaged ratchet member **94** assumes a position with pin **116** engaging projection **114** of flange **106**.

In preparation for operating the tool, the operator adjusts stop member **120** by depressing it and rotating it to a suitable position which will be indicated by the upper face of stop member **120** with respect to the bushing **102**. Upon opening of throttle **24**, air will pass to motor **16** by way of cavity **32**, inlet port **38**, supply ports **40**, and thence through passages **42** and **44**. Simultaneously, motive fluid passes through leak port **72** into space **70** above upper head **52** of valve **36** depressing that valve, and by engagement of shoulder **58** with arm **78** of latch **74**, dog tooth **100** is rotated into engagement with teeth **98** of ratchet member **94**. Rotation of spindle **96** turns stop member **120** until lug **124** contacts pin **122**, causing ratchet member **94** to turn and push dog **88** against compression of spring **92**. Axial movement of latch member **74** withdraws arm **78** from shoulder **58**, releasing valve **36**. Pressure in chamber **70** against head **52** forces valve **36** axially, closing inlet port **38**, thereby shutting off supply of motive fluid to motor **16**.

Upon closing of throttle **24** pressure in the system soon drops to atmospheric pressure, valve **36** returns to its normal open position, and the remaining parts, accordingly, to the initial position above described.

Means is provided to prevent operation of control valve **36**, and to this end is provided a plunger **132** slidable transversely in casing member **18** with respect to valve **36**. Plunger **132** has a notch **134** at a position where tail portion **56** intersects bore **136** within which plunger **132** is adapted to move axially. Thus in the position shown in FIG. 1, plunger **132** provides no obstruction to the motion of valve **36**. However, a second notch **138** transverse to notch **134** and extending beyond the latter is arranged to abut the end of tail portion **56** upon motion of plunger **132** upwardly (FIG. 1).

Reciprocation of control valve **36** is thereby prevented in such latter position.

Rotation of plunger **132** is prevented and its axial movement also limited by a spring pressed detent **140** (FIG. 2) engaging a notch **142** extending longitudinally in plunger **132**. Detent **140** is mounted for removal, in a suitable plug **144** threaded into casing portion **18**. As will be observed from in FIG. 1 reversing throttle handle **48** cannot turn while plunger **132** is in position for normal operation of the shut-off.

Thus when the operator wishes to operate the tool either in a forward position as an ordinary tool without automatic shut-off, he merely pushes plunger **132** in the upper position (FIG. 1). With the plunger in that position he may also reverse the tool, or he has the option of operating it with the automatic shut-off device as above explained.

Thus by the above construction are accomplished, among others, the objects and advantages hereinbefore referred to. It will be obvious to those skilled in the art that changes may be made within the spirit of the invention which is intended to be limited merely by the scope of the appended claims.

We claim:

1. An automatic shut-off device for pneumatic wrenches and the like having a motor and a spindle the rotation of which is to be the controlling factor in the operation of the motor including a throttle valve, a control valve actuatable to open and close communication of motive fluid to such motor, a latch to hold said control valve in position to open such communication to said motor, means on said spindle to control the operation of said latch comprising a member engageable with said latch and rotatably mounted on said spindle, a stop means rotatable with said spindle and adapted to engage and rotate said member to disengage said latch, said stop means having a portion fixedly mounted on said spindle, a disc depressible with respect to said spindle to disengage said portion, and releasable to engage said portion in a variety of positions with respect to said member.

2. An automatic shut-off device as set forth in claim 1 in which is provided means to hold said latch inoperative.

3. An automatic shut-off device as set forth in claim 1 in which is provided a plunger to hold said control valve from operative relation with said latch.

4. An automatic shut-off device as set forth in claim 1 in which is provided a plunger to hold said control valve from operative relation with said latch and a third valve to control flow of air to said motor having a portion cooperative with the plunger to hold said third valve operative only in a position of said plunger in such valve holding position.

5. An automatic shut-off device as set forth in claim 1 in which said fixedly mounted portion on said spindle is a protrusion on the spindle and said disc has a plurality of spaced apertures each adapted to receive said protrusion.

6. An automatic shut-off device as set forth in claim 1 in which said fixedly mounted portion on said spindle is a transversely protruding pin and said disc has an internal groove to receive said pin and a plurality of spaced apertures opening into said groove to receive the protruding portion of said pin.

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