

May 30, 1967

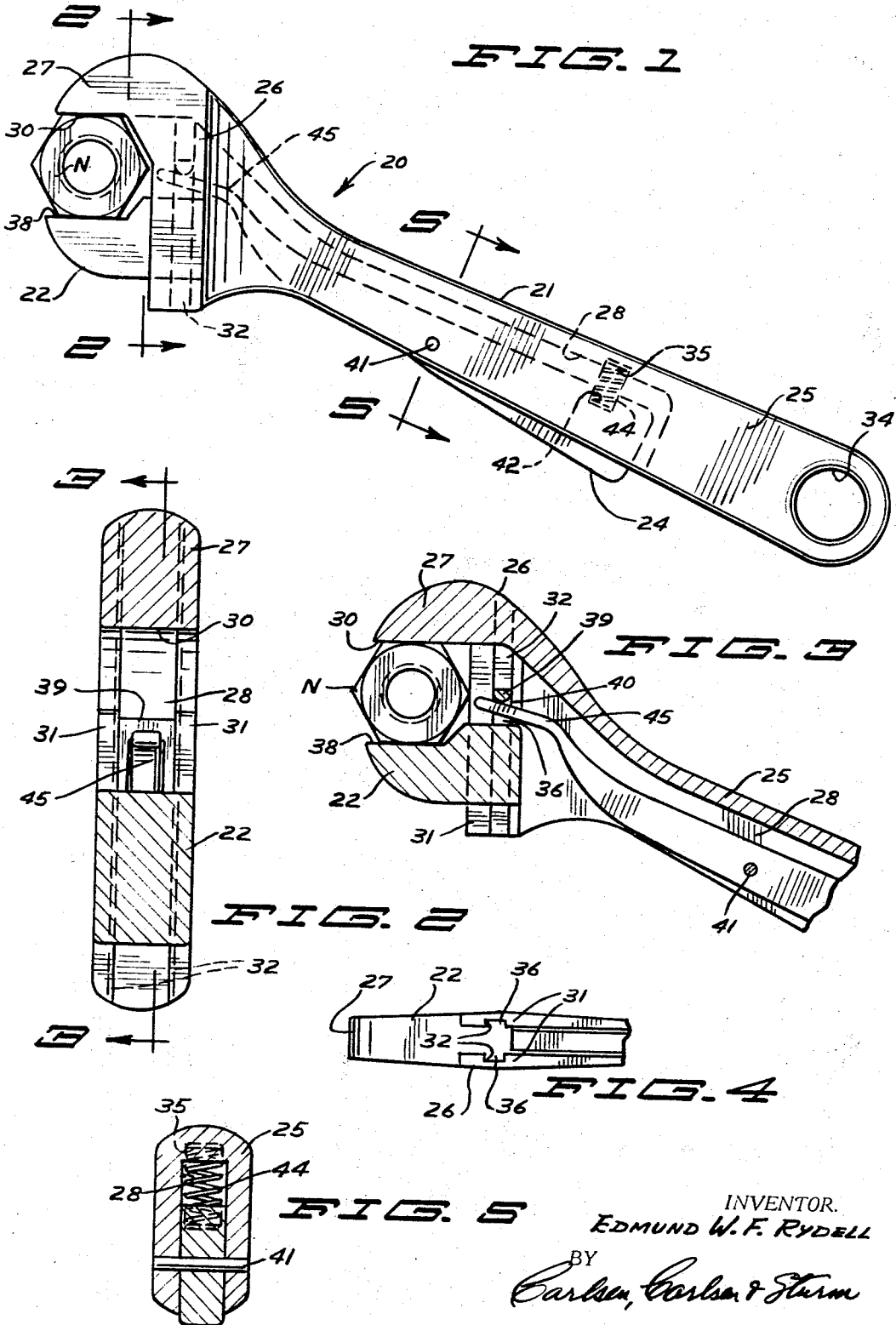
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3,322,009

SELF-ADJUSTING WRENCH

Filed Oct. 15, 1965

4 Sheets-Sheet 1



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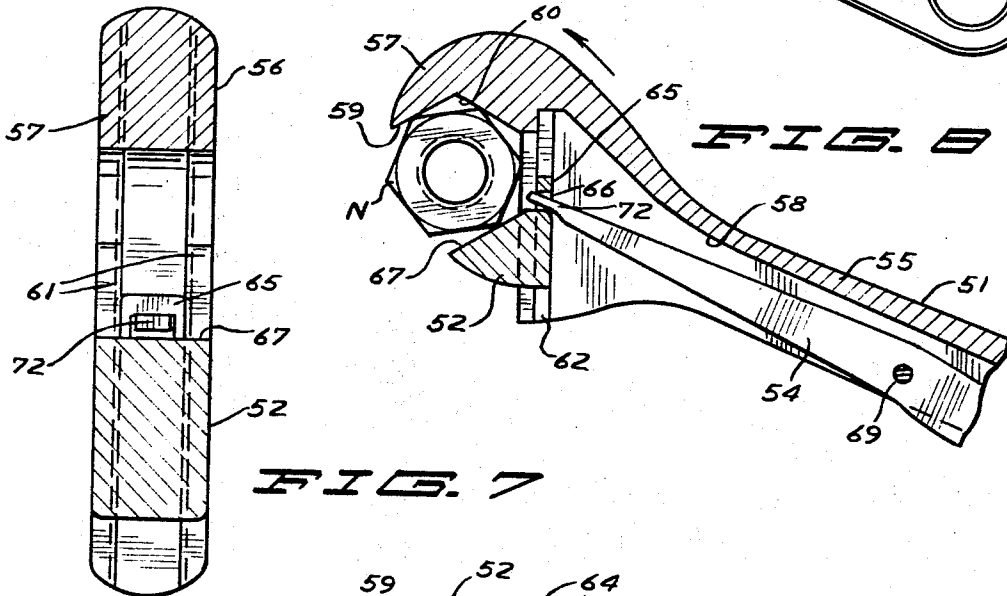
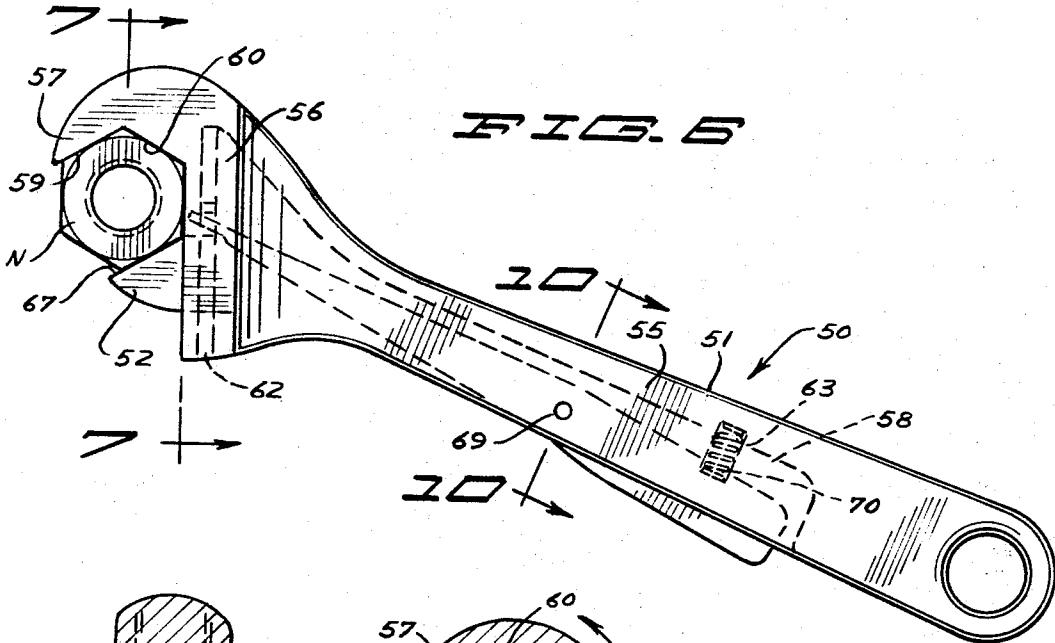


FIG. 7

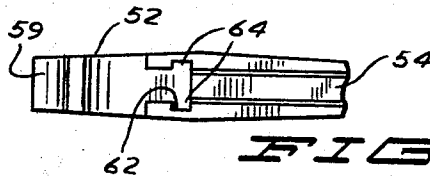


FIG. 8

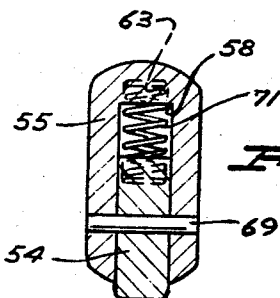


FIG. 9

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FIG. 11

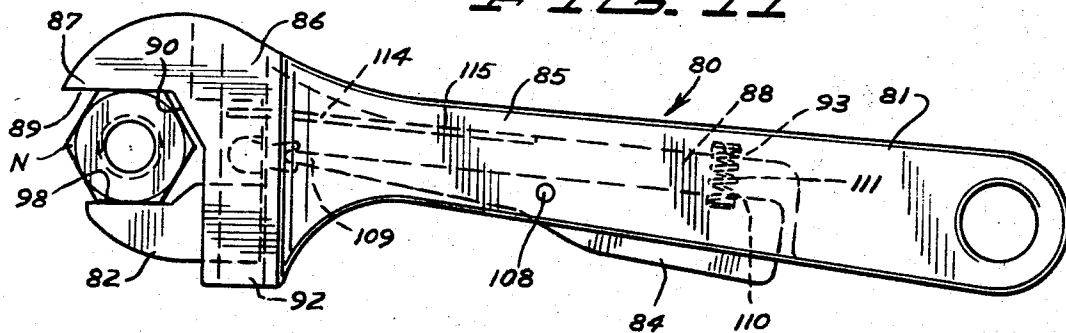


FIG. 12

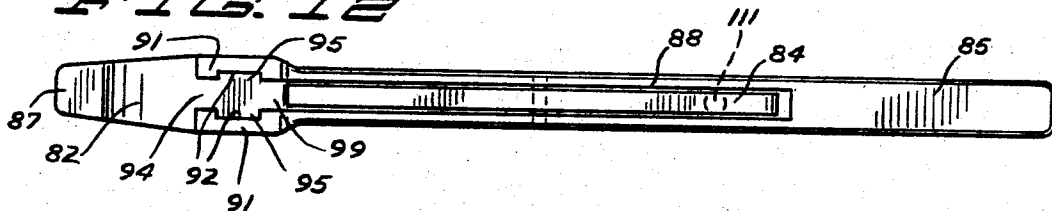


FIG. 13

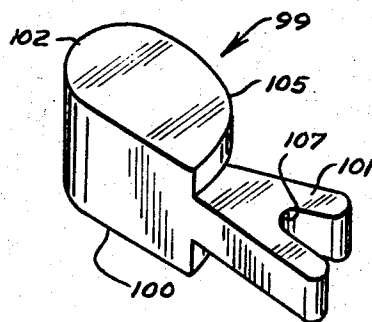
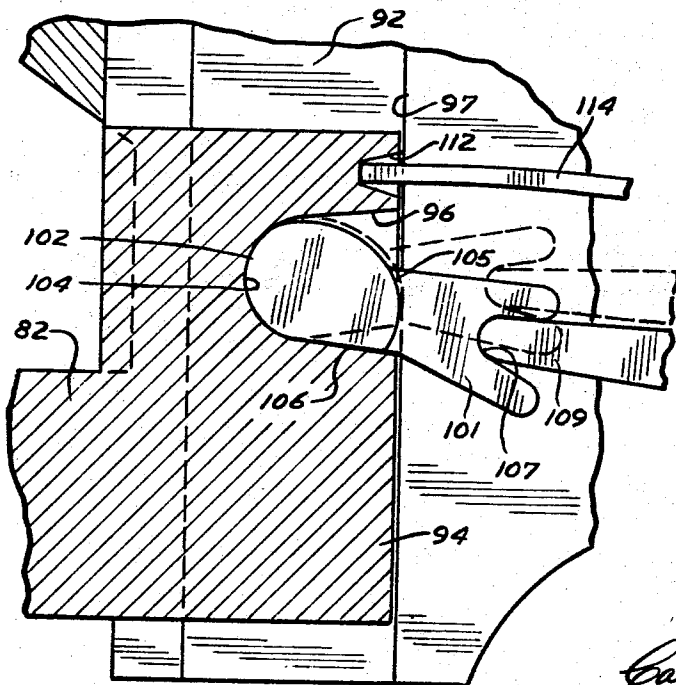


FIG. 14

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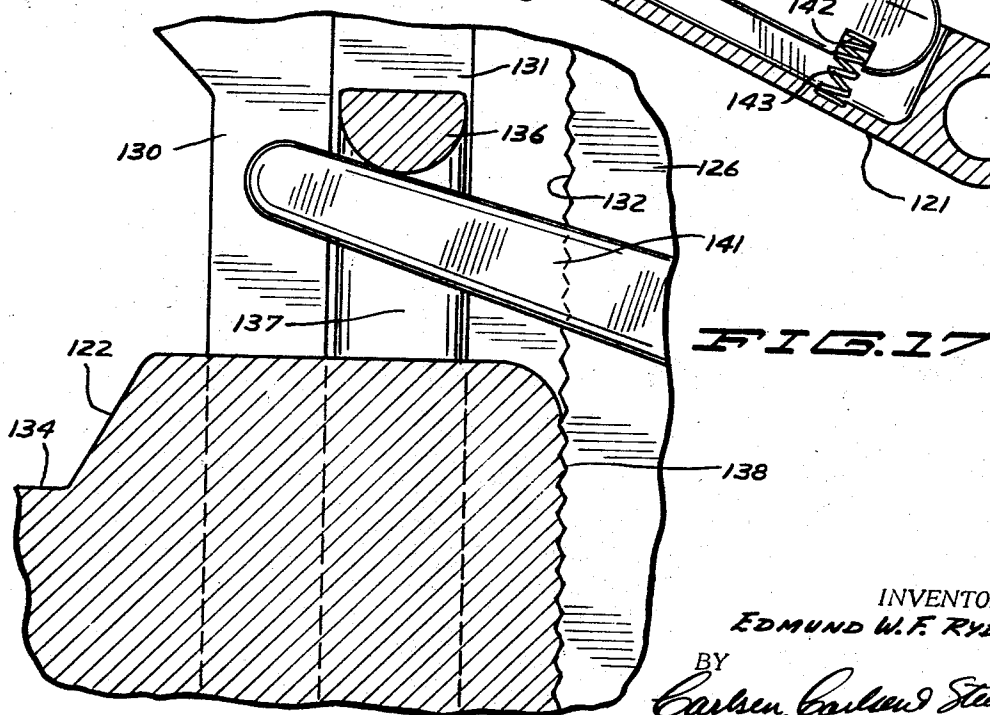
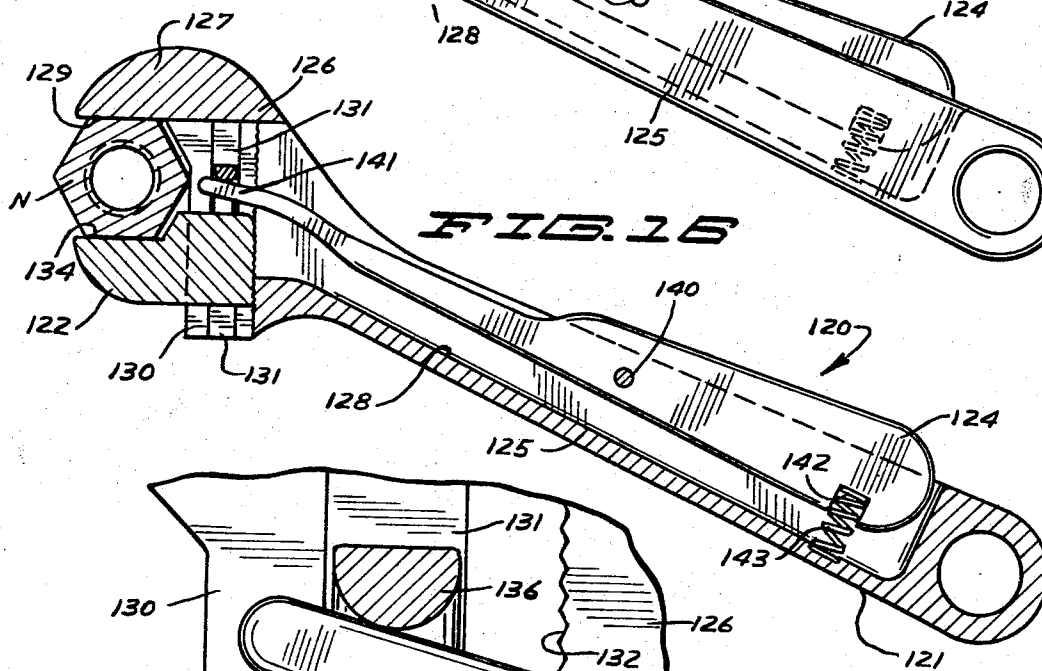
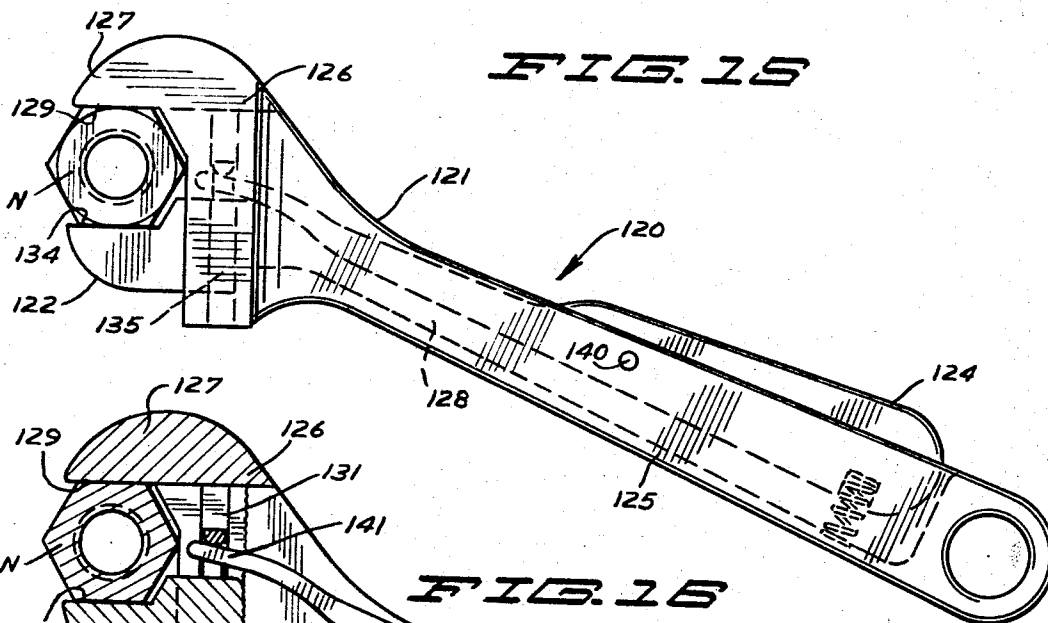
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3,322,009

SELF-ADJUSTING WRENCH

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4 Claims. (Cl. 81-359)

This invention relates generally to manually operable wrenches for turning multi-sided workpieces such as bolt heads or nuts and more particularly concerns such wrenches wherein the opposing jaws thereof are readily spreadable between a locked position on the workpiece for turning it in one direction and a release position disengaging the piece for return movement of the wrench in the opposite direction.

A primary object of the invention is to provide a hand wrench adapted to be brought into clamping engagement with a workpiece for automatic adjustment to different sizes and wherein the jaws will lock in relative adjusted position against spreading through pressures exerted between the jaws and workpiece as the wrench is used to turn the workpiece.

Another object of the invention is to provide a hand wrench adapted to automatically conform to different size workpieces through spring tensioned opening and closing movement of one of the wrench jaws in a slide and wherein said jaw is arranged to bind in the slide against opening movement during operation of the wrench.

Another object of the invention is to provide an open end ratchet wrench having jaws adapted to automatically conform to a workpiece and lock thereon for turning movement of the workpiece in one direction but spreadable to release the nut during turning movement of the wrench in the opposite direction.

Still another object of the invention is to provide a hand wrench for turning a workpiece wherein the wrench jaws can be relatively spread by manual squeezing of the wrench handle against spring tension but wherein the jaws will automatically lock on the workpiece for turning thereof when said manual squeezing is not applied.

Still another object of the invention is to provide a self adjustable wrench which is simple to operate, durable, and yet which can be manufactured at an extremely low cost.

With these and other objects in view, the invention broadly comprises a wrench body having an elongated handle with an integral jaw at one end, a movable jaw mounted in a slide on the body member for sliding movement toward and away from the integral jaw, an elongated lever extending along the handle and pivoted thereto for movement of the lever on a plane parallel to the plane of the jaw sliding movement, said lever having one end flexibly connected to the movable jaw for movement of the jaw along the slide by operation of the lever, spring means acting upon the lever to bias the movable jaw in one direction, and said mounting of the movable jaw in the slide being so arranged as to frictionally lock therein relative to the integral jaw when certain turning pressures are applied to the jaws. The invention may take various forms as hereinafter disclosed.

The above mentioned and additional objects of the invention will be brought to light during the course of the following specification, reference being made to the accompanying drawings, in which—

FIG. 1 is a plan view of one embodiment of the wrench in gripping engagement with a nut, and showing certain structural features of the wrench in broken lines to facilitate understanding the construction thereof.

FIG. 2 is an enlarged section through the head of the wrench taken on line 2—2 of FIG. 1.

FIG. 3 is a longitudinal section through the head por-

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tion of the wrench in the same condition as in FIG. 1, and taken on line 3—3 of FIG. 2.

FIG. 4 is a bottom view of the head portion of the wrench shown in FIG. 1.

FIG. 5 is a section through the wrench handle taken on line 5—5 of FIG. 1.

FIG. 6 is a plan view of a second embodiment of the wrench also showing certain features thereof in broken lines.

FIG. 7 is an enlarged section through this form of the wrench taken on line 7—7 of FIG. 6.

FIG. 8 is a longitudinal section through the head portion of the wrench shown in FIG. 6.

FIG. 9 is a bottom view of the head portion of the wrench shown in FIG. 6.

FIG. 10 is a section through the wrench handle taken on line 10—10 of FIG. 6.

FIG. 11 is a plan view of a third embodiment of the wrench in gripping engagement with a nut and showing certain features thereof in broken lines.

FIG. 12 is a bottom view of the wrench shown in FIG. 11.

FIG. 13 is an enlarged fragmentary view of the jaw locking mechanism for the wrench shown in FIG. 11.

FIG. 14 is a perspective view of the locking pawl used in the wrench shown in FIG. 11.

FIG. 15 is a plan view of a fourth embodiment of the wrench in gripping engagement with a nut.

FIG. 16 is a longitudinal section through the wrench shown in FIG. 15.

FIG. 17 is an enlarged fragmentary view of a head portion of the wrench shown in FIG. 16.

Description and operation of wrench shown in FIGS. 1 to 5

Referring now more particularly to the drawings, reference characters will be used to denote like parts or structural features in the different views. The form of the invention shown in FIGS. 1 to 5 will first be described. The wrench denoted generally at 20 has three main components, a body member 21, a movable jaw member 22, and a lever member 24. Body member 21 comprises an elongated handle 25 with a head 26 at one end which includes a fixed jaw 27. The body member 21 has an elongated recess 28 which extends along the handle 25, opening through one side thereof, and endwise through the head 26 and opening under jaw 27. The flat gripping face 30 of jaw 27 is disposed at an obtuse angle of approximately one hundred fifty degrees to the handle 21 in the same manner as a conventional crescent wrench. The wrench head 26 has spaced side walls 31 (FIG. 2) between which the recess 28 opens and these walls are provided with facing parallel slide grooves 32 which extend at right angles to the jaw face 30. The body member has a hang-up aperture 34 at the opposite end from jaw 27 and a spring seat 35 is provided in the handle 25 adjacent the same end and opening into the recess 28.

The movable jaw member 22 is shaped as best shown in FIGS. 3 and 4 with its inner portion slightly reduced in width and provided with laterally projecting elongated slide lugs 36 at each side adapted for a sliding fit in the grooves 32 for movement of the jaw member 22 along a set path toward and away from the fixed jaw 27. The outer portion of member 22 is provided with a flat nut engaging surface 38 which opposes and is parallel to the surface 30 when the member is mounted in the grooves 32. Lugs 36 extend perpendicular to the plane of surface 38 and project upwardly above the member and then interconnect by a cross portion 39 leaving an aperture 40 in the upper inner portion of the member 22. Aperture 40 opens in a direction longitudinally of the wrench toward recess 28 and the space between the jaws.

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The lever member 24 is of flat elongated tapering construction and extends longitudinally along and within recess 28 being pivoted to the handle 25 by a pivot pin 41. One end portion of the lever is provided with a seat 42 in opposing relation to the socket 35 and these two seats jointly hold therebetween a spiral spring 44 under compression. The forward tapered end of lever 24 angles into an actuator finger 45 which projects loosely through the aperture 40 in the movable jaw member 22.

It will accordingly be understood that spring 44 acting upon the lever 24 will bias the movable jaw member 22 in a closing direction relative to the jaw 27. When the lever 24 and handle 25 are squeezed together in the area of spring 44, the jaw 22 actuated by finger 45 will be moved in an opening direction with lugs 36 sliding in the grooves 32. Thus in use the jaws are opened and placed around the nut N as shown in FIGS. 1 and 3 and the jaws will be held in firm engagement with the nut by the compressive force of spring 44. When the wrench is then moved in a tightening or clockwise direction, as viewed in FIG. 1, upon the nut, the pressure upon the outer portion of jaw surface 38 will cause the lugs 36 to bind in the grooves 32 preventing any slippage or opening movement of the jaw member 22. This will also be true in this form of the invention when the wrench is moved in the opposite or counterclockwise direction.

When the operator wishes to release the nut he merely squeezes the lever and handle together sliding the jaw 22 outwardly away from the fixed jaw. Accordingly in turning the nut the wrench is alternately swung and squeezed to regrip the nut.

*Description and operation of wrench shown in
FIGS. 6 to 10*

The form of the invention shown in FIGS. 6 to 10 will now be described. As in the first embodiment this wrench, designated generally at 50, also has three basic components here identified as the body member 51, the movable jaw member 52, and the lever member 54. Body member 51 comprises an elongated handle 55 with a head 56 at one end which includes a fixed jaw 57. The body member 51 has an elongated recess 58 which extends along the handle 55 opening through one side thereof and endwise through the head 56. Jaw 57 is provided with hexagonally arranged nut gripping surfaces 59 and 60. The wrench head 56 has spaced side walls 61 between which recess 58 opens and these walls are provided with facing parallel grooves 62. The body member has a spring seat 63 opening into recess 58 in the end portion opposite head 56.

The movable jaw member 52 has the reduced inner portion thereof provided with elongated slide lugs 64 at each side thereof adapted for a sliding fit in grooves 62. The lugs extend upwardly and are interconnected by a cross portion 65 leaving an aperture 66 in the jaw which opens longitudinally of the wrench. The member 52 has a gripping surface 67 which opposes and is parallel to the surface 58 on the fixed jaw 57. In the first embodiment the gripping surface of the movable jaw is perpendicular to the lugs and the path of sliding movement. Here, however, the surface 67 is disposed at approximately a sixty degree angle to the lugs and their path of movement, as shown in FIGS. 6 and 8. The significance of this feature will be subsequently explained.

The lever member 54 is of flat elongated tapering construction and extends longitudinally within the recess 58 being pivoted to the handle by a pivot pin 69. One end portion of the lever is provided with a seat 70 in opposing relation to seat 63 and these two seats jointly hold therebetween a compressed spiral spring 71. The forward tapered end of the lever 54 terminates in a finger 72 which extends loosely through the aperture 66 in the movable jaw member 52.

This form of wrench functions in the same manner as the first form in that by squeezing the lever and handle together in the area of spring 71, the jaw 52 will be moved

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in an opening direction allowing the jaws to be placed over nut N. As the squeezing pressure is released the surfaces 59, 60 and 67 will close against the nut under the compressive force of spring 71.

As the wrench is turned in a clockwise direction, the pressure on the outer portion of surface 67 will cause lugs 64 to bind in slots 62 prohibiting relative opening movement of the jaws. This form of wrench is capable of an automatic ratchet action, however, as distinguished from the first wrench described. After the wrench has been moved clockwise the distance permitted within space limitations, it is then returned in a counterclockwise direction for a new grip on the nut. As this occurs the pressure of the nut on jaw 52 will be upon the inner portion of surface 67 (FIG. 8) close to the lugs 65 and parallel thereto so that the jaw 52 will slide outwardly in an opening direction against the force of spring 71 until the surface 67 again comes opposite a flat of the nut at which time the jaw 52 will again close against the nut. There is accordingly an automatic ratcheting action upon counterclockwise movement of the wrench 50. This is made possible by the relative angle between surface 67 and lugs 64 and the proximity of the nut engaging inner portion of surface 67 to the lugs.

*Description and operation of wrench shown in
FIGS. 11 to 14*

The form of the invention shown in FIGS. 11 to 14 will now be described, with the wrench being designated generally by the numeral 80. It includes a body member 81, a movable jaw member 82, and a lever member 84. The body member 81 comprises an elongated handle 85 with a head 86 at one end which includes a fixed jaw 87. The body member 81 has an elongated recess 88 which extends along the handle 85 opening through one side thereof and endwise through the head 86. Jaw 87 is provided with a pair of hexagonally arranged nut gripping surfaces 89 and 90 with surface 89 extending generally parallel to the handle 85. The wrench head 86 has spaced side walls 91 between which recess 88 opens and these walls are provided with facing parallel grooves 92. Body member 81 has a spring seat 93 opening into recess 88 in the end portion opposite head 86.

The movable jaw member 82 has its inner portion reduced in width as at 94 with the reduced portion provided with elongated slide lugs 95 at each side thereof adapted for a loose sliding fit in grooves 92. Portion 94 in the area of lugs 95 is provided with a rearwardly opening pawl pocket or recess 96 extending across the member. The side areas of the pocket open toward the rear walls 97 of the grooves 92. Member 82 has a nut gripping surface 98 opposing and parallel to the surface 89. Surfaces 89 and 98 lie substantially perpendicular to the extension of grooves 92.

A friction locking pawl 99 (FIG. 14) is positioned in the pocket 96. This pawl has a body portion 100 and an integral actuator fork 101. The pawl body has a semi-cylindrically curved front 102 adapted to seat in a mating surface 104 of the pocket 96 for limited oscillating movement about a transverse axis between a release position shown in full lines in FIG. 13 and a locking position shown in broken lines. From its front curved surface 102 the top surface 105 of the body 100 curves rearwardly on a gradually increasing radius to meet a flat bottom surface 106. The spacing is such that the pawl will clear wall 97 when in the lowered position but will frictionally engage the wall and bind thereagainst as it is raised to the dotted line position. The fork 101 is transversely centered on the pawl and projects rearwardly between the handle side portions and into recess 88. The fork has a rearwardly opening transverse notch 107.

The lever member 84 is of elongated flat forwardly tapering construction as in the other wrenches and is pivoted for scissors movement with the handle in the recess 88 as by pin 108. The forward tapered end of the

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lever forms a finger 109 which seats in the notch 107 of pawl 99. The lever is provided with a spring seat 110 opposing seat 93 and a spiral spring 111 is held under compression between the seats so as to urge the lever finger 109 upwardly, as viewed in FIG. 11. Jaw member 82 is provided with a rearwardly opening V-shaped notch 112 just above the pocket 96 and this notch receives and seats the forward end of a leaf spring 114, the rear portion of which is suitably anchored at 115 to the handle 85 within recess 88. Spring 114 is tensioned to bias the jaw 82 upwardly, as viewed in FIG. 11, or in a closing direction.

The operation of wrench 80 will now be described. The spring 114 is of sufficient strength to normally hold the jaw 82 in closed condition with surface 98 relatively close to surface 89. When it is desired to grip a nut N, the lever 84 and handle 85 are squeezed together in the area of spring 93. This initially causes finger 109 to move the pawl 99 downwardly to the position shown in full lines in FIG. 13 with the surface 105 clear of the groove wall 97. With continued lever movement the jaw 82 will be moved in an opening direction with lugs 95 sliding in grooves 92 against the bias of spring 114. When the jaws have been spread a sufficient distance to engage opposite sides of the nut N, the lever 84 is released and spring 93 will cause finger 109 to pivot the pawl 99 in its pocket to the position shown in broken lines. With this movement the pawl surface 105 is moved into engagement with wall 97 and wedges thereagainst prohibiting any downward or separating movement of the jaw 82 with respect to jaw 87. Accordingly, as the nut is turned by swinging the wrench in a clockwise direction (FIG. 11), the lower or movable jaw member will be locked in firm nut engaging position.

When the wrench has been moved within the available space limits, the manual squeezing grip is reapplied to the lever and handle to again move the pawl 99 to its unlocked or release position. This allows the nut to slip between the jaws as the wrench is moved counterclockwise, the jaw 82 being freely slidable in the grooves 92. When the desired position has been reached the grip is released and pawl 99 will again lock the jaw in fixed position for further turning of the nut.

Description and operation of wrench shown in FIGS. 15 to 17

The form of the invention shown in FIGS. 15 to 17 will now be described with the wrench being designated generally by the numeral 120. It includes a body member 121, a movable jaw member 122 and a lever member 124. The body member 121 comprises an elongated handle 125 with a head 126 at one end which includes a fixed jaw 127. The body member has an elongated recess 128 which extends along the handle 125 opening through the upper side thereof as viewed in FIG. 15. This is the opposite side of the longitudinal axis of the wrench from the movable jaw 122 as contrasted with the same side of the axis in the forms of wrenches hereinbefore described. Recess 128 also opens forwardly into the area between the jaws 122 and 127. Jaw 127 is provided with a gripping surface 129 which is disposed at an oblique angle to the handle axis as in wrench 20. The wrench head 126 has transversely spaced side walls 130 between which recess 128 opens and these walls are provided with facing parallel grooves 131. At each side of recess 128 and to the rear of side walls 130, the body member is provided with forwardly facing shoulders 132 which are disposed parallel to grooves 131. These shoulders are serrated as best shown in FIG. 17.

The movable jaw member 122 is constructed similar to jaw 22 in the wrench 20. It has a gripping or clamping face 134 disposed in opposing and parallel relation to the surface 129 on the jaw 127. Also the inner portion of jaw member 122 has the same configuration as jaw 22 with side lugs 135 extending perpendicular to the surface 134 and slidably disposed in the grooves 131.

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The lugs extend upwardly above the jaw being interconnected by cross portion 136 and leaving a fore and aft directed aperture 137. The rear face of member 122 differs from that of member 22 in that it is transversely serrated as at 138 for interlocking engagement with the shoulders 132. Grooves 131 are sufficiently wider than lugs 135 to allow the serrated surface 138 to separate sufficiently from shoulder 132 to slide thereover.

The lever member 124 is of elongated flat forwardly tapering design and pivoted centrally to the handle 125 by pin 140 for relative scissor movement therewith. The narrow forward end portion of the lever forms a slightly curved finger 141 which extends loosely through the aperture 137 in the jaw member 122. At its opposite end the lever member is provided with a seat 142 to seat one end of a compression spring 143 the other end of which abuts against the handle 125.

The operation of this form of the invention is in some respects the reverse of the others. Here spring 143 acts upon the lever 124 in such direction as to yieldably retain the jaws 122 and 127 in fully spread or open condition. When it is desired to grip nut N, the jaws are moved over opposite sides thereof and the lever 124 and handle 125 are squeezed together in the area of the spring 143. As this occurs the lever will cause jaw 122 to slide in grooves 131 toward jaw 127 to firmly grip the nut between the jaws. The operator's tight hold on the wrench is maintained during clockwise movement of the wrench and this is rather natural as the turning pressure in this direction must be exerted against the lever 124. Jaw member 122 then is actually held in place at the point of contact between finger 141 and the jaw portion 136. Accordingly, the pressure between the nut and jaw 122 will hold the jaw surface 138 securely against the shoulders 132 and the interlocking engagement of these serrated surfaces will prevent any outward slippage of the jaw.

Upon return or counterclockwise movement of the wrench for regripping of the nut, the operator's holding or squeezing grip is relaxed and the lever under the force of spring 143 will move jaw 122 to an open position for rotation of the jaws around the nut until it is to be regripped.

It will, of course, be understood that the interlocking serrated surfaces 138 and 132 may also be used on the wrenches 20, 50 and 80 with equal effectiveness.

While each form of the invention herein disclosed is slightly different in construction, the broad concept of a loosely sliding jaw operated by a control lever and adapted to frictionally bind in its slide in nut gripping position is common to all. Each form of the invention is readily adjustable to conform to various size nuts, provides a secure grip on the workpiece and yet is readily releasable for ratcheting operation.

It is understood that suitable modifications may be made in the structures as disclosed, provided that such modifications come within the spirit and scope of the appended claims. Having now therefore fully illustrated and described my invention, what I claim to be new and desire to protect by Letters Patent is:

1. In a wrench, a wrench body having a head at one end of an elongated handle, an integral jaw on the head, the head having walls spaced transversely of the handle, said walls having parallel grooves therein opening toward each other to form a slide, a movable jaw longitudinally aligned with one side of the handle and arranged in opposing relation to the integral jaw and having a pair of laterally extending elongated parallel lugs disposed one in each groove for sliding movement of the movable jaw along the slide toward and away from the integral jaw, the body having an elongated recess extending along the handle and opening endwise between said walls and side-wise through said one side of the handle, an elongated lever disposed in and extending along said recess and being pivoted at a medial point to said handle on an axis perpendicular to the slide, the lever having a finger

formed at one end, means providing a flexible connection between the movable jaw and said finger, spring means held under compression between the other end of the lever and the handle to bias the finger and movable jaw in a direction toward the integral jaw and the said other end of the lever to protrude through said sidewise opening for manual engagement, and said lugs fitting in such grooves so as to bind therein against sliding movement as pressure is applied to said movable jaw at a point thereof remote from the jaw lugs in a direction away from the integral jaw.

2. The subject matter of claim 1 wherein said movable jaw has a gripping face facing the integral jaw and disposed substantially perpendicular to said slide whereby pressure against said face at any point will bind the movable jaw lug portion in the slide to lock it against movement in an opening direction.

3. The subject matter of claim 1 wherein the movable jaw has a pocket opening into the slide and toward one wall thereof, said flexible connection including a locking device pivoted in the pocket for movement between a position in frictional engagement with said one wall and a position away from said wall, and said finger connected

to the device for movement thereof between said positions.

4. The subject matter of claim 3 wherein said locking device comprises a pawl having a fork extending through said recess opening into the recess, and the finger extending into the fork for moving the pawl between said positions.

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