My Invention has for its object to provide a ratchet wrench having means for preventing ro-

tative movement of elements beyond points where the element meets with a predetermined

resistance to further rotation.

The invention provides an adjustable wrench means for producing rotation of an element, un-
til the element resists rotation, at a pressure accurately determined by adjustment of the ad-

justable means.

The invention may be contained in structures of different forms and to illustrate a practical ap-

clication of the invention, I have selected a wrench embodying the invention as the example

of the different structures that contain the in-

vention and shall describe the selected wrench

hereinafter. The particular structure selected is

shown in the accompanying drawings.

Fig. 1 is a side view of the wrench. Fig. 2

is a view of a longitudinal section of a part of

the wrench taken on the plane of the line 2—2

indicated in Fig. 1. Fig. 3 is a view of a section

of a part of the wrench taken on the plane of

the line 3—3 indicated in Fig. 2. Fig. 4 illus-

trates a part of the wrench wherein certain of

the elements of the wrench are shown in one re-

lation to each other. The figures illustrate a

view similar to that shown in Fig. 4, but showing the said

elements in another relation to each other.

The wrench 1 is provided with a handle 2

located on one end of a bifurcated shank 4, which

may be formed of two strips of metal suitably

shaped and secured to a threaded block 5 by

means of the rivets 7. The handle is interiorly

tapped and may be adjustably located along the

block by rotation of the handle. The position

of the handle, with reference to the bifurcated

shank, may be indicated by the ends of a sheet

metal strip 8 bent U-shape, and slidably movable

along the shank as the handle is moved longitudi-

nally with respect to the shank. The strip 8 may be secured by means of a stud or set

screw 10 located in the end of the handle 2.

One end of the screw 10 is provided with a neck

and head 11. The neck extends through the

strip 8 and the head 11 connects the screw 10

to the strip and permits rotation of the screw

relative to the strip to adjust the strip relative

to the shank and permit rotation of the handle

and screw relative to the strip. The opposite

sides of the shank 4 are provided with indicators

12 comprising a plurality of spaced markings

formed on the outer sides of the shank 4 in the

vicinity of the ends of the strip. The location of

the ends of the strip will, thus, indicate the rela-
tive location of the handle on the shank.

The bifurcated end parts 14 of the shank 4

are enlarged and, preferably, are formed circular

in outline. The end parts are provided with large

circular openings 15. A toothed ratchet wheel

17 is located intermediate the end parts 14 and

is provided with hubs 18 which project into and

fit the openings 15, but with suitable clearance to

enable rotation of the ratchet wheel 17 relative

to the shank 4. Preferably, the center of rota-
tion of the ratchet wheel is located in a line dis-

posed parallel to and spaced from the longitudinal

axis of the shank.

A dog 20 is located intermediate the bi-

furcations of the shank 4 and is pivotally con-

nected thereto by means of a pin 21 located in

short slots 22 formed in the sides of the shank.

The pin 21 is, preferably, disposed between end

parts of the U-shaped strip 2 to retain the pin

within the slots 22. A suitable flanged collar

24 and a spring 25 are located on the shank.

The spring is disposed intermediate the collar

24 and one end of the handle 2. The dog is pro-

vided with shoulders 27 that protrude from the

side edges of the shank and are engaged by the

collar 24. The collar and the engaging surfaces

of the shoulders are located in a plane extending

transverse the shank and, preferably, through

the axis of the pivot pin 21. The shoulders 27

have rounded corners to produce a rocking

movement of the dog on the collar when the dog

is tilted relative to the shank. The spring 25

operates to press the collar against the shoulders

and press the pin 21 to the ends of the slots

22, remote from the handle with a pressure that is

dependent upon the relative location of the han-

dle on the shank. The indicator 21 thus indicates

the pressure of the spring 25. The markings 12

may be suitably positioned relative to each other,

by calibration, to indicate pounds pressure, or the

markings may be marked with suitable indicia to

indicate desired pressures to which the ele-

ments are to be subjected by the operation of the

wrench. The spring operates to normally main-

tain the dog 20 in position to engage the toothed

ratchet wheel 17. Deflection of the dog, by tilting,

from its normal engaging position, due to the

spring pressure, is held by the teeth of the rachet

wheel in the shank. The teeth are resiliently re-

sisted by the pressure of the spring 25 on the inside of the shoulders 27.

The end edge 30 of the dog is inclined to its

longitudinal axis which extends at right angles to the plane of the surfaces of the shoulders 27.

The side edge 29 of the dog 20 is parallel to its
longitudinal axis. A roller 32 is disposed on a bolt 38 and intermediate the bifurcations of the shank 4 and, normally, in contact with the side edge 29 to limit rotative movements of the dog in one direction. The upper ends of the slots 22 also limit the reciprocatory movements of the dog in one direction.

The teeth 28 of the ratchet are V-shaped and the corner formed between the end edge 30 and the side edge 29 of the dog, engages in the valley or the corner formed between the contiguous surfaces of two of the teeth. The center of the ratchet is located with reference to the side edge 29 such that the line of the side edge crosses a radius of the ratchet at right angles and near a central point of the said radius. Also, the relative inclination of the surfaces of the teeth to the radii through their points or centers, and the inclination of the end edge 30 to the side edge 29 of the dog, are such as to dispose the following surface of the leading of the said two teeth, with respect to the direction in which the ratchet is rotated by the wrench, coincident with the surface of the end edge 30. Thus, upon a ratchet-driving movement of the handle, the pressure of the spring is transmitted to the tooth engaged by the dog, and if movement of the ratchet is resisted, the point of the said tooth engages the end edge 30 of the dog to press the dog 20 counter to the pressure of the spring 25.

The toothed ratchet wheel 11 is provided with a suitable opening 31, such as a hex or a square, for receiving an element, such as a nut, bolt head, or a connector for connecting an element to the wrench, which is to be operated by the wrench. When the wrench is connected to an element, such as a nut or other threaded element, for rotating the element clockwise about the axis of the element, the tool is located in the position shown in Fig. 1, and the handle is moved clockwise, which causes the dog to engage the ratchet and rotate the element, and if there is some resistance to return rotation of the element, the end of the dog 20 will move over the teeth, as indicated in Fig. 5, when the wrench handle is moved counter-clockwise. Upon succeeding movements of the handle to the left, the dog 20 will engage the ratchet and rotate the element step by step.

When it is desired to rotate the element until it meets a definite predetermined resistance, the spring 25 is adjusted accordingly, as may be indicated by the position of the strip 8 relative to the indicator 12. When the predetermined resistance to the pressure of the element, produced by its rotation, is reached, the end edge 30 of the dog will tilt on the point of the tooth engaged by the dog, as shown in Fig. 4. As the handle is further moved in its rotation clockwise, the end edge 30 will slide along the point of the tooth dog pressing the dog counter to the pressure of the spring 25, and the pivot pin will move along the slots 22 by reason of the movement of the side edge 29 of the dog toward an alignment with radius extending through the point of the tooth.

The maximum pressure of the spring to produce rotation of the ratchet occurs during the initial angular movement of the end edge relative to the tooth engaged, since, at that point, the pressure of the spring is exerted at right angles to one of the radii and, as the handle moves, the line of the pressure of the spring extends through the point of the tooth and the line approaches the dead center of the ratchet togglewise, which increases the mechanical advantage of the spring.

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This produces a definite pressure point in the resistance of the element to rotation that releases the element from the wrench and prevents an increased operating pressure of the wrench. When the end edge 30 of the dog slips by the tooth, further rotation of the element will be prevented.

I claim:

1. In an automatic pressure-release wrench, a toothed ratchet wheel, means for connecting the ratchet to a rotatable element, a shank for rotatably supporting the ratchet, a dog for engaging the teeth of the ratchet, the shank having a slot, a pivot pin located in the slot for pivotally supporting the dog, a spring for yieldingly pressing the dog along the slot and to the slot and resisting pivotal movements of the dog about the said pin, and means located on the shank for preventing tilting movements and longitudinal movements each in one direction.

2. In an automatic pressure-release wrench, a toothed ratchet wheel, means for connecting the ratchet to a rotatable element, a dog for engaging the teeth of the ratchet, a pivot pin for pivotally supporting the dog, a spring exerting its maximum producible pressure in a direction endwise of the dog, the dog having a slot, a pivot pin located in the slot for pivotally supporting the dog, a spring for yieldingly pressing the dog along the slot and to the slot and resisting pivotal movements of the dog about the said pin, and means located on the shank for preventing tilting movements and longitudinal movements each in one direction.

3. In an automatic pressure-release wrench, a toothed ratchet wheel, means for connecting the ratchet to a rotatable element, a shank for rotatably supporting the ratchet, a dog for engaging the teeth of the ratchet, the dog having a side edge, the side edge of the dog being located substantially parallel to the longitudinal axis of the shank and an end edge inclined to the side edge, the shank having a slot, a pivot pin located in the slot for pivotally supporting the dog, a spring for pressing the dog in a direction of the longitudinal axis of the shank and the pivot pin against one end of the slot, the dog having a part engaged by the spring and located on one side of the pivot pin with reference to the longitudinal axis of the shank for yieldingly resisting tilting movements of the dog in one direction, means located on the shank for engaging the said side edge of the dog and for preventing tilting movements in a direction opposite to the said one direction, and the teeth of the ratchet operable to tilt the dog when the shank is rotated in one direction and for engaging the dog for resisting movement of the wrench by pressure exerted in the direction of the longitudinal axis of the shank.

4. In an automatic pressure-release wrench, a shank, a toothed ratchet wheel rotatably supported on the shank, means for connecting the ratchet to a rotatable element, a dog having a longitudinal axis substantially parallel to the longitudinal axis of the shank, a pivot pin for pivotally supporting the dog, the shank having a slot for receiving the pivot pin, a spring surrounding the shank for engagement of one end of the dog to press the pivot end of the dog along the slot, the dog having means for engaging the spring for yieldingly resisting pivotal movements of the dog in one direction, the shank having means for preventing pivotal movements of the dog in a direction opposite to the said one direction, and the
teeth of the ratchet operating to move the pivot pin along the slot against the pressure of the spring when the element is rotated by the wrench.

5. In an automatic pressure-release wrench, a shank, a toothed ratchet wheel rotatably supported on the shank, means for connecting the ratchet to a rotatable element, a dog having a longitudinal axis substantially parallel to the longitudinal axis of the shank, a pivot pin for pivotally supporting the dog, the shank having a slot for receiving the pivot pin, a spring surrounding the shank for engagement of one end of the dog to press the pivoted end of the dog along the slot, the dog having means for engaging the spring to yieldingly resist pivotal movements of the dog in one direction, the shank having means for preventing pivotal movements of the dog in a direction opposite to the said one direction, the dog having an end edge and a side edge, and the center of the ratchet being disposed with reference to the shank to normally locate the following side surfaces of succeeding teeth in the plane of the end edge surface of the dog to produce tilting movements of the surface of the end edge of the dog relative to the point of the tooth engaged by the dog counter to the pressure of the spring upon rotation of the shank relative to the ratchet in one direction.

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