This invention relates to improvements in an open end wrench provided with a slidable movable jaw face, whereby the wrench may be used similarly to a ratchet-type socket wrench in that the head of the wrench need not be removed from a bolt or nut each time a new face is engaged by the wrench following a preceding turning of the nut or bolt by the wrench.

Certain types of open end wrenches having ratchet means have been devised heretofore but various difficulties and deficiencies have been experienced both in regard to manufacturing such wrenches as well as in using the same. Certain wrenches of this type have had ratchet pawls or movable jaw faces which must be manufactured with close precision both in regard to the pawl or movable face per se as well as the means which supports the pawl or face in the head of the wrench and if such precision is not maintained, it is possible for the pawls or faces accidentally to become removed from the means which receive and support the same in the head of the wrench.

Another deficiency of such wrenches resides in the fact that the ratchet pawls or jaw faces have been of less thickness or width than the thickness of the jaw of the wrench head relative to which the pawl or face is movable and, due to the fact that the pawl or face usually is mounted midway between opposite faces of the head of the wrench, it is not possible to engage a nut or bolt head if only a very small amount of the height thereof projects beyond a surface for engagement by the wrench, such as where, for example, the bolt head or nut may be disposed within a socket in the object upon which the nut or bolt is mounted.

Still another deficiency in ratchet-type open end wrenches which have been made heretofore resides in the fact that the ratchet pawl or movable jaw face is relatively thin in the direction between the jaw faces, especially under conditions where it is slidable disposed directly against the face of one of the jaws of a wrench head, whereby the pawl or face is subject to breakage as well as becoming worn out much more rapidly than if it were thicker and more sturdy but, due to the particular mounting means normally employed heretofore, it is not readily possible to make the pawl or face more sturdy and still support the same by means currently used.

The principal object of the invention is to provide an open end wrench having a slidable jaw face which is provided with a jaw face head that extends entirely between the opposite faces of the head of the wrench, whereby the jaw face head may engage even only a slightly projecting portion of an object such as a bolt head or nut, as long as the same is projecting above the surface which will be engaged by one or the other faces of the wrench during operation thereof.

Another object of the invention is to provide a substantially rectangular notch in the face of one jaw of the wrench head within which the jaw face head slidable moves so as to furnish a bearing surface of substantial area, and the opposite ends of the notch afford ample stop means for limiting the movement of the jaw face head in opposite directions.

One other object of the present invention is to provide an open end wrench having a slidable jaw face which can be manufactured within a relatively wide range of tolerances without seriously impairing the operation of the jaw face.

Still another object of the invention is to provide an open end wrench with a slidable jaw face which is substantially more rugged and durable than a number of those made heretofore.

A further object of the invention is to provide an open end wrench with a slidable jaw face and supporting mechanism within the head of a wrench by which the jaw face may be initially assembled within the head of the wrench with convenience and, in addition, also provide guide means for the jaw face during normal operation thereof which is of a novel nature that insures more accurate guiding of the jaw face relative to one jaw of the wrench head than has been possible heretofore.

Details of the foregoing objects and of the invention, as well as other objects thereof, are set forth in the following specification illustrated in the accompanying drawing comprising a part thereof.

In the drawing:

FIG. 1 is a slightly perspective view of an open end wrench provided with a slidable jaw face embodying the principles of the present invention.

FIG. 2 is a fragmentary enlarged plan view of the head of the wrench shown in FIG. 1, the same being partly in section to illustrate certain details of the slidable jaw face and mounting means thereof.

FIG. 3 is a perspective exploded view showing the slidable jaw face per se and guide means thereon as well as complementary guide means connectable to the head of the wrench for guiding the jaw face during the reciprocating movement thereof during use.

FIG. 4 is a fragmentary plan view of the head of the wrench while being moved counter-clockwise for purposes of engaging a new face of the exemplary geometrical figure comprising an object being engaged by the wrench.

FIG. 5 is a view similar to FIG. 4 but showing the wrench after the same has been moved to engage another face of the object being turned by the wrench and illustrating the relationship of the wrench head to the object as when the wrench is being moved in the clockwise direction.

FIG. 6 is an enlarged fragmentary vertical sectional view taken on the line 6—6 of FIG. 1.

The open end wrench to which the present invention pertains, as shown in FIG. 1, comprises an elongated handle 10 which extends from one end of a wrench head 12. The head is also formed with a recess 14 which extends into the head 12 from the end thereof opposite that from which the handle 10 extends, the recess 14 defining a pair of substantially parallel jaws 16 and 18. The faces 20 and 22 of said jaws are substantially parallel to each other and said faces are connected by a transverse, slightly curved surface 24 which comprises the inner end of recess 14.

As is conventional in open end or so-called cut wrenches, the handle 10 extends somewhat to one side of the center of the head 12 as is clearly evident in FIGS. 1, 2, 4 and 5. Such arrangement renders the jaw 18 preferable to have the slidable jaw face 26 slidably associated therewith. In accordance with the principles of the invention, and as especially shown best in detail in FIG. 2, the jaw 18 is provided with a substantially rectangular notch 28, the opposite ends 30 and 32 of which comprise stop means for limiting the movement of the jaw face 26 in opposite directions.

As is evident from FIG. 4 particularly, the faces 20 and 22 of the jaws of the wrench head are spaced apart slightly greater than the widest dimension of the object 34 which is to be rotated by the wrench, the same having a geometrical cross-section such as the exemplary hexa-
gon shown in the various figures which are not to be regarded as restrictive relative to the shape of such object. It is to be understood that such object may be a nut, bolt head, bar, or any other object or item to be rotated by the wrench. As is obvious from FIGS. 1, 2 and 5 however, the thickness of the jaw face head 36 is substantially greater than the depth of the rectangular notch 28, whereby the outer face of the jaw face head 36 extends beyond the projects beyond the relative distance. Hence, especially as shown in FIGS. 1 and 4, when the wrench is rotated in the clockwise direction, the distance between the face 20 of jaw 18 and the outer surface or face of the jaw face head 36 is only slightly greater than the least dimension across the object 34, such as the distance between the two opposed parallel faces thereof. Such arrangement therefore permits the object 34 to be rotated by the wrench when the wrench is moved in the clockwise direction as indicated in FIGS. 1 and 5.

The jaw face head 36 is substantially as wide as the thickness of the jaw 18 as is clearly evident from FIG. 6. That is, the jaw face head 36 extends between the opposite faces of the jaw 18, whereby as clearly shown in FIG. 6, the wrench and particularly the jaw face head 36 thereof readily can engage even only a slightly projecting part of an object 34, such as a bolt head or similar which may be disposed within a socket or recess 38. In order to provide jaw 18 with adequate strength, particularly in the vicinity where it is connected to the main body of the wrench head 12, the jaw face head 36 is provided with preferably cylindrical guide means 40, the diameter of which is substantially less than the thickness of the jaw 18 or the width of jaw face head 36 as clearly seen in FIG. 6. The guide means 40 is also of restricted length and is coaxial as well integral with a guide extension 42 which is substantially longer than the cylindrical guide means 40 and is for purposes to be described.

From FIG. 2 is shown that the hole 44 which is formed in the head 12 is the hole 44 which is formed in the cylindrical guide means 40 and limited clearance is provided between the means 40 and 42 to permit the guide means 40 to slide freely but without undue play, within the guide bearing hole 44. Further, the means 40 and hole 44 are both circular in cross-section, relative rotation between the jaw face and the hole 44 is prevented by virtue of the fact that the surface 46 is planar and comprises a bearing surface which flatly and slidably engages the inner surface of the rectangular notch 28. The interior of the guide extension 42 is much less than that of the bearing hole 44, whereby the jaw face 26 may be positioned operatively with respect to the head 12 of the wrench by inserting the jaw face, with the guide extension 42 foremost, into the hole 44 from the recess 14. Before doing this, a small compression spring 48 first is disposed coaxially upon the extension 42 and, after the jaw face head 36 has been disposed within the notch 28, a threaded guide bushing 50, having a coaxial cylindrical circular bearing hole 52 therein, is threaded into the tapped and somewhat enlarged outer end 54 of hole 44. Preferably, the outer end of threaded bearing 50 is provided with an Allen-type wrench socket 56, which is engageable by an Allen-type wrench by which the bearing 50 is threaded home to the full extent shown in FIG. 2 and, when in this latter position, the spring 48 is compressed sufficiently so as normally to maintain the jaw face head 36 against the outermost end 54 of the notch 28, such as illustrated in FIGS. 1, 2 and 5. It will be understood that the clearance between the guide extension 42 and bearing hole 52 also is limited but sufficient to permit free sliding of the guide extension within said bearing.

From the foregoing, it will be seen that the jaw face 26 is provided with guide means at longitudinally spaced locations, the same being highly adequate to maintain the jaw face head 36 readily within the notch 28, even though only substantial ranges of tolerances are permitted during the manufacturing of both the jaw face 26 as well as the notch 28 and hole 44. Further, due to the fact that the main 44 is formed by drilling through the head 12 from the handle end thereof toward the recess 14, such drilling is continued until the end 32 of the notch 28 is reached and, preferably, the surface of the end 32 is substantially perpendicular to the axis of the hole 44. Accordingly, there is no tendency for the drill to deviate from the direction desired for the hole 44 and the axis of said hole preferably is parallel to the face 20 of jaw 18. The notch 28 is formed by any suitable such as broaching or milling although preferably, the same may be formed principally incident to the forging of the head 12, with final finishing operations being required.

The jaw face head 36 also preferably is formed with a notch 58 in the outer face of the head 36, between the notch 58 and the outer end of the head 36, and the outer face of said jaw face head preferably is smoothly contoured to include a curved surface, as readily is seen especially in FIGS. 2 and 3, to provide a working surface which is the ratchet means for engaging the object 34 to rotate the same as is clearly shown best in FIGS. 1 and 5 when the wrench is rotated clockwise as viewed in said figures.

Due to the distance between the faces 20 and 22 of the jaws being as described above relative to the shortest and widest dimensions of the object 34 which is engaged by the wrench, and also because the thickness of the jaw face head 36 is as shown and described, the object 34 readily is rotated clockwise when the wrench is moved clockwise as viewed in the figures of the drawing but, when the wrench is moved counter-clockwise, especially as indicated in FIG. 4 by an arrow, the object stays stationary and the jaw face 36 is moved inwardly relative to hole 44 and may move in said direction until the transverse, preferably planar, shoulder 60 on the jaw face head 36 abuts the inner end 36 of the notch 28 and thereby limits such inward movement. Such operation of the wrench effects a ratchet action, whereby repeated operative movements of the wrench in clockwise direction may be readily followed inadvertently by counter-clockwise movements, as in the exemplary illustration shown herein, without removing the head 12 from the object 34 being rotated thereby. It will be understood of course that by reversing the wrench from the positions shown in the figures, counterclockwise directional movement will take place in the counter-clockwise direction for rotating the object 34.

From FIGS. 1 through 5 particularly, it also will be seen that the thickness of the jaw face head 36 is substantial, rendering it rugged and long-wearing, and from FIG. 6, it will be seen that the width of the jaw face head 36 is equal to that of the thickness of the jaw 18 between the opposite parallel surfaces thereof. Particularly for purposes of limiting the outward movement of the jaw face 26, the notch 28 is provided in order that the opposite ends 30 and 32 thereof conveniently may be used as movement limiting stops, but the provision of notch 28 also makes it possible to employ a jaw face head 36 of substantial thickness as described above and shown particularly in FIG. 2, without unduly increasing the distance between the faces 20 and 22 of the jaws of the wrench so as to permit ratcheting movement of the wrench head relative to the wrench handle 12, followed smoothly by counter-clockwise movements as the invention herein described and illustrated.

While the invention has been described and illustrated in its preferred embodiment, it should be understood that the invention is not to be limited to the precise details herein illustrated and described since the same may be carried out in other ways falling within the scope of the invention as claimed.

We claim:

1. An open end wrench having a head provided with a recess extending thereinto from one end and defining sub-
stantially parallel jaws, one of said jaws having a substantially rectangular notch in one face extending between and through opposite surfaces of said head and substantially from the base of said recess but being shorter than said face of said jaw and defined by walls at opposite ends extending transversely to said face of said jaw and connected by a bearing wall substantially parallel to said face of said jaw, a jaw face slidably engaging the innermost wall of said notch parallel to said jaw face and being shorter than said notch to permit limited sliding ratchet movement of said jaw face between the end walls of said notch, said jaw face extending between the opposite surfaces of said head of said wrench to afford maximum gripping effect by said jaw face for the full thickness of said head, and means engaging said jaw face and operable yieldably to urge said jaw face toward the outer end wall of said notch.

2. An open end wrench having a head provided with a recess extending thereinto from one end and defining substantially parallel jaws, one of said jaws having a substantially rectangular notch in one face extending between and through opposite surfaces of said head and substantially from the base of said recess but being shorter than said jaw and said head also having a guide bearing hole extending therethrough, said notch being defined by walls in opposite ends extending transversely to said face of said jaw, a jaw face slidably engaging the innermost wall of said notch parallel to the face of said jaw and being shorter than said notch to permit limited sliding ratchet movement of said head of said jaw face between the end walls of said notch, said jaw face head extending between the opposite surfaces of said head of said wrench to afford maximum gripping effect by said jaw face for the full thickness of said head, and means engaging said jaw face and operable yieldably to urge said jaw face toward the outer end wall of said notch.

3. The open end wrench set forth in claim 2 further characterized by said guide bearing hole not extending appreciably beyond the base of said recess in said wrench head defining said jaws, and spring means surrounding said jaws extending appreciably beyond the base of said recess in said wrench head defining said jaws, and said guide bearing hole being substantially circular in cross-section and of a diameter less than the width of said jaw face, a guide stem on said jaw face head of smaller diameter than said guide means and projecting within said guide hole axially and oppositely from said jaw face head, thereby to facilitate assembly of said jaw face head in said notch, a guide bushing member mounted in said hole adjacent the end thereof opposite to the end adjacent said jaw face head, and means engaging said jaw face head and operable yieldably to urge the same toward the outer end wall of said notch.

4. An open end wrench having a head provided with a recess extending thereinto from one end and defining substantially parallel jaws, one of said jaws having a substantially rectangular notch in one face extending between and through opposite surfaces of said head and substantially from the base of said recess but being shorter than said face of said jaw, a jaw face having one surface slidably engaging the innermost wall of said notch parallel to said jaw face and being shorter than said notch to permit limited sliding ratchet movement, the opposite surface of said jaw face projecting laterally toward the opposite jaw an appreciable amount and being notched to provide a gripping surface effective to engage an object to be rotated by said wrench when the wrench is rotated in one direction, said jaw face extending between the opposite surfaces of said head of said wrench to afford maximum gripping effect by said jaw face for the full thickness of said head, and means engaging said jaw face and operable yieldably to urge said jaw face toward the outer end of said notch.

5. An open end wrench comprising in combination, a head having a handle extending outward from one end of said head and a recess extending into said head from substantially the opposite end thereof to define a pair of wrench jaws having parallel inner faces, said head being provided with a substantially rectangular notch extending into one jaw face for the full width of said face between the opposite surfaces of said head and having an innermost wall parallel to said jaw face and said notch terminating inward from the outer end of said jaw, said head also having a hole adjacent said notch and merging therewith, a jaw face head substantially as wide as the thickness of said jaw and shorter than said notch and movable therein with one surface slideable against the inner wall of said notch and the opposite operative surface of said jaw face head extending beyond said jaw face toward the opposite jaw, guide means on said jaw face head slidably within said hole of said head, and spring means engaging said jaw face head and operable to urge said head against the outer end wall of said notch.

6. The open end wrench set forth in claim 5 further characterized by said notch and hole being substantially longitudinally coextensive and said hole comprising a guide bearing, guide means on said jaw face head slideable in said guide bearing, additional guide means on said jaw face head of less cross-sectional dimension than said first mentioned guide means and extending axially therefrom, and additional guide bearing means within said hole complementary in cross-section to said additional guide means and receiving the same slideably, whereby said jaw face head has longitudinally spaced guide means to prevent appreciable movement of said head laterally from said notch.

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