Sept. 9, 1958 J. CONWAY 2,850,931

CAM-CLOSED, SLIDABLE JAW WRENCH

Filed Jan. 3, 1957

Fig. 1

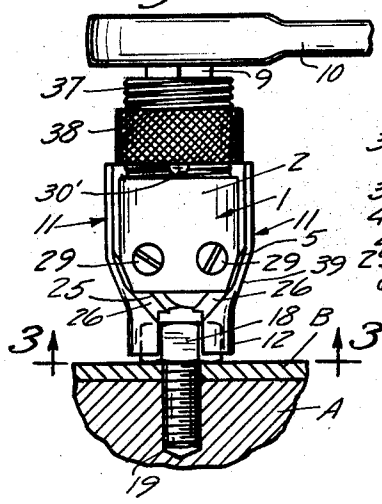


Fig. 2

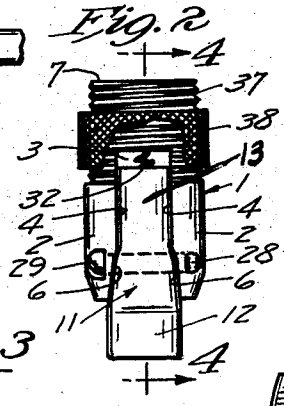


Fig. 3

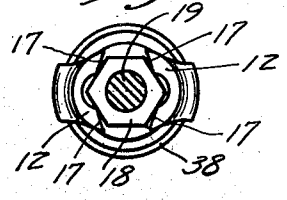


Fig. 5

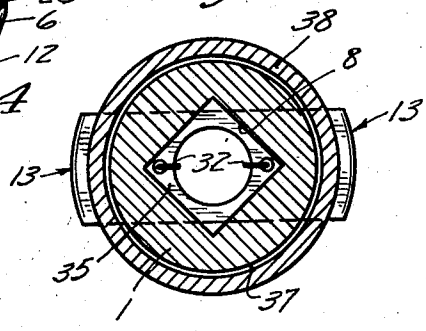


Fig. 4

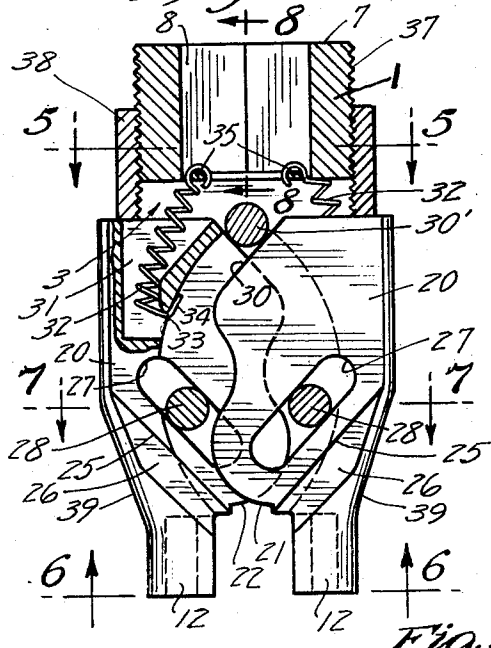


Fig. 6

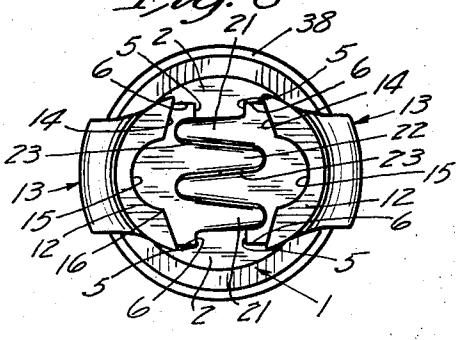


Fig. 7

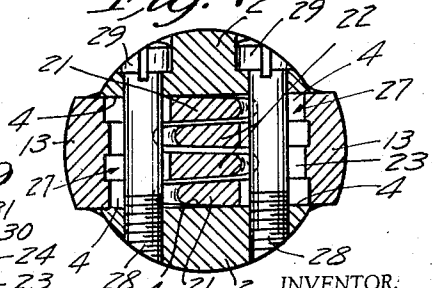


Fig. 8

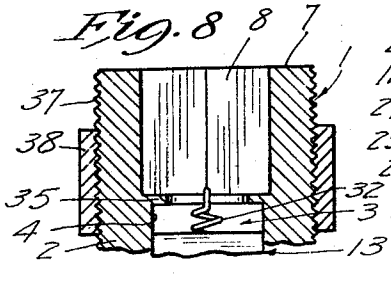
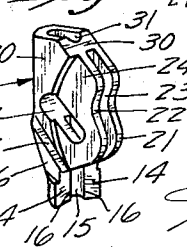


Fig. 9



INVENTOR:
James Conway
BY
Merchant & Merchant
ATTORNEYS

United States Patent Office

2,850,931

Patented Sept. 9, 1958

2,850,931

CAM-CLOSED, SLIDABLE JAW WRENCH

James Conway, St. Paul, Minn.

Application January 3, 1957, Serial No. 632,373

9 Claims. (Cl. 81—128)

My invention relates generally to adjustable gripping tools and more particularly to improvements in adjustable wrenches for gripping and turning articles such as bolts, nuts, and the like.

An important object of my invention is the provision of a wrench which can be quickly and easily adjusted to accommodate nuts, bolts, and the like of various sizes within a given range, and which includes gripping jaws that remain in parallel relationship throughout their range of adjustment.

Another important object of my invention is the provision of an adjustable wrench of the socket type which includes gripping jaws that occupy a minimum of space about the article engaged thereby, throughout the range of adjustment thereof, the overall diameter of the wrench varying according to the size of the articles gripped thereby, whereby to permit insertion or removal of such articles into or out of relatively small recesses and like confined areas.

Still another object of my invention is the provision of an adjustable socket wrench having opposed gripping jaws movable relatively toward and away from each other, and in which said jaws include portions which grip an article in such a manner that substantially all of the turning force of the wrench is applied as torque to the article, and in which the usual cam action of a nut or bolt head against the wrench jaws, tending to spread the jaws, is substantially eliminated.

Another object of my invention is the provision of a socket wrench which retains its adjustment size when removed from and replaced successively on several similar articles, whereby to render periodic tightening or loosening of the jaws unnecessary.

Another object of my invention is the provision of an adjustable socket wrench comprising a head defining a guideway, and a pair of opposed gripping jaws mounted for movements toward and away from each other in said guideway, said jaws having intermeshing portions to allow each jaw greater depth and width and hence, more strength while occupying a minimum space.

A still further object of my invention is the provision of an adjustable socket wrench which is capable of a wide range of adjustability and which is of relatively small size.

Another object of my invention is the provision of a wrench as set forth which is capable of efficient operation, and is not materially affected by the presence of dust, grit, or the like.

Another object of my invention is the provision of a wrench as set forth, which is relatively simple and inexpensive to manufacture, which has few moving parts, and which is rugged in construction and durable in use.

The above, and still further highly important objects and advantages of my invention will become apparent from the following detailed specification, appended claims, and attached drawings.

Referring to the drawings, which illustrate the invention, and in which like characters indicate like parts throughout the several views:

Fig. 1 is a fragmentary view partly in side elevation and partly in section, showing my novel socket wrench in use;

Fig. 2 is a view in side elevation of the wrench of Fig. 1, some parts being broken away and some parts being removed;

Fig. 3 is a view in horizontal section, taken on the line 3—3 of Fig. 1;

Fig. 4 is an enlarged view partly in side elevation and partly in vertical section taken substantially on the line 4—4 of Fig. 2;

Fig. 5 is a horizontal section taken on the line 5—5 of Fig. 4;

Fig. 6 is a view in bottom plan as seen from the line 6—6 of Fig. 4;

Fig. 7 is a horizontal section taken on the irregular line 7—7 of Fig. 4;

Fig. 8 is a fragmentary section taken on the line 8—8 of Fig. 4; and

Fig. 9 is a view in perspective of one of the gripping jaws of my wrench.

In the preferred embodiment of the invention illustrated, the numeral 1 indicates a generally cylindrical head that is bifurcated for the greater part of its length to provide a pair of opposed legs 2 which define therebetween an axial passageway 3, said legs 2 having axially extended diametrically opposed flat retaining surfaces 4. At their free end portion, the legs 2 are formed to provide guide surfaces 5 which converge toward the free ends of the legs. Intermediate the guide surfaces 5 and the free ends of the legs 2 are other opposed parallel guide surfaces 6 that are spaced apart a greater distance than the retaining surfaces 4, and which cooperate with said retaining surfaces 4 in a manner which will hereinafter become apparent. The opposite end of the head is shown as being provided with an axial recess 8 which extends to the guideway 3 and which is shown as being polygonal, preferably square, in cross section, to receive the cross sectionally square shaft 9 of a conventional turning handle or the like 10 fragmentarily shown in Fig. 1.

Mounted in the guideway 3 for movements in opposite directions angularly, axially and radially with respect to the head 1 are a pair of identical gripping jaws 11, each comprising an outer article gripping end portion 12 disposed axially outwardly of the adjacent free end of the legs 2, and a shank portion 13 contained for the most part in the guideway 3. The outer work-engaging ends 12 of the gripping jaws 11 are each provided with a pair of angularly disposed flat faces 14 that are generally parallel to the axis of the head 1, said axis being the axis of rotation of the wrench. The planes of the faces 14 define an angle preferably greater than 120°, and each of said jaws is formed to provide an inwardly opening channel 15 at the point of intersection of said planes. The channels 15 extend longitudinally of the head 1 and have a length substantially equal to that of their respective faces 14, and the opposite side portions of the channels

15 intersect their respective faces 14 to define axially extending sharp edges 16 which are adapted to make line contact with angularly disposed side surfaces of a cross sectionally polygonal object to be gripped by the wrench. In Figs. 1 and 3, the wrench is shown as gripping side surfaces 17 of the cross sectionally hexagonal head 18 of a conventional machine screw or bolt 19.

Although the wrench of the instant invention is designed primarily for gripping and turning bolts and nuts of polygonal cross sections, I have found this device to be quite effective in gripping and turning articles of other various cross sectional shapes as well as round stock. In Fig. 1, the wrench of the instant invention is shown as being applied to the bolt 19 which is screw threaded into a work piece A to hold a second piece B secured thereto. The shank portions 13 of the gripping jaws 11 have flat parallel opposite side surfaces 20 that slidably engage adjacent retaining surfaces 4 of the legs 2 when the shank portions are received in the guideway 3, one of the side surfaces 20 of each shank portion 13 being the side of one of a pair of laterally inwardly projecting spaced parallel flanges 21 and 22 integrally formed with their respective shank portions 13. The flanges 21 and 22 of each shank portion 13 define therebetween axially extended channel 23 closely slidably receiving the flange 22 of the opposite shank portion 13. Each flange 22 is laterally inwardly spaced from the adjacent side surface 20 of its respective shank portion 13, and cooperates with the retaining surface 4 of the adjacent leg 2 to define a channel 24 which restingly receives the flange 21 of the opposite shank portion 13, see particularly Fig. 6. With this arrangement, the gripping jaws 11 have maximum cross section areas which render the same highly resistant to twisting from one end to the other thereof and against bending. Adjacent the outer ends 12 of the gripping jaws 11, the shank portions 13 are formed to provide angular flat shoulders or surfaces 25 which project laterally outwardly from adjacent side surfaces 20 and which slidably engage the guide surfaces 5 of the legs 2, whereby the gripping jaws 11 are guided and supported for movements toward and away from each other in angular directions axially and radially with respect to the head 1. The laterally outer edges of the shoulders 25 are defined by side surfaces 26 in laterally outwardly spaced parallel relation to their adjacent side surfaces 13, said secondary surfaces 26 slidably engaging the guide surfaces 6 of the legs 2 to mainly support the gripping jaws 11 against twisting or angular movement relative to each other and to the head 1 under extreme load.

The flanges 21 and 22 of each gripping jaw 11 are provided with aligned transverse slots 27 that are elongated in a direction parallel to the angular surfaces or shoulders 25 and through which extend retainer elements in the nature of studs or machine screws 28 which extend transversely through the guideway 3 in laterally spaced parallel relationship to each other, and which have their heads 29 imbedded in one of the legs 2, the other ends of said screws 28 being screw threaded into the opposite leg 2, see Fig. 7. Laterally inner edge portions of the flanges 21 and 22 adjacent the inner ends of the shank portions 13 define angular secondary guide surfaces 30 parallel to their respective slots 27 and shoulders 25, that are slidably engaged by a guide element in the nature of a stud or bolt 30' extending transversely across the guideway 3 in spaced parallel relationship to the retainer elements 28 and intermediate said retainer elements 28 and the inner end of the guideway 3. Like the retainer elements or screws 28, the guide element 30' is anchored at its opposite end portions in the opposite legs 2 of the head 1. The guide element 30' engages the guide surfaces 30 to maintain the gripping jaws in parallel relationship when the bolt head 18 is gripped by the outer ends 12 thereof and when torque load is applied to the wrench.

Each of the shank portions 13 is provided with a bore 31 which extends generally longitudinally from the inner end thereof for the reception of one of a pair of coil tension springs 32. As shown in Fig. 4, each bore 31 communicates with the channel 23 in its respective shank portion and forms therewith an edge portion 33 for anchoring a hooked end 34 of the spring 32 in the respective bore 31. The springs 32, at their other ends are looped about laterally spaced portions of a perforate anchoring wall 35 integrally formed with the head 1 and defining the bottom of the recess 8 and the inner end of the guideway 3. It will be noted that the springs 32 converge toward the recessed end 7 of the head 1 for the purpose of yieldingly urging the gripping jaws 11 axially toward the end 7 of the head 1. The yielding bias of the springs 32 causes the gripping jaws 11 to move angularly toward their limit of spaced apart relationship, and the converging relationship of the springs 32 causes the secondary guide surfaces 30 of the shank 13 to be held in engagement with the guide element 30'.

The outer surface of the head 1 is formed to provide a screw thread 37 which extends from the end 7 of the head 1 for substantially one-half of the length of the head. A generally cylindrical internally threaded adjustment nut or collar 38 is screw threaded on the threaded portion 37 of the head 1 and engages the inner ends of the shank portions 13 to adjustably move the gripping jaws 11 axially against the bias of the springs 32, wherein the jaws 11 will move angularly toward one another and toward the axis of the head 1. Obviously the adjustment collar 38 positively limits movement of the gripping jaws 11 in a spaced apart direction. Preferably, the adjustment collar 38 is knurled so that the same may be easily gripped for turning.

It will be noted that the radially outer surfaces of the gripping jaws 11 are arcuate in shape, whereby to follow the generally cylindrical contour of the head 1. Further, the radially outer surfaces taper inwardly between the shank portions 13 and the axially extended article gripping portions 12 as indicated at 39. The edge of line contact between the edges 16 of the article engaging ends 12 and the side faces 17 of the bolt head 18, and reception of the edges of the bolt head in the recesses between the edges 16 enables a bolt or nut to be gripped by the gripping jaws as above described so that most of the turning effort applied to the head 1 and the gripping jaws 11 is transferred to the bolt or nut and the tendency of the jaws to be spread apart during the turning effort is reduced to a minimum. With this arrangement, the article engaging ends 12 may be of relatively thin cross section, thereby enabling the wrench to be applied to bolt heads, nuts and the like which are situated in relatively confined areas such as in recesses and the like.

It will be appreciated that, although the instant device is intended primarily for use as an adjustable socket wrench, the same will lend itself to a multiplicity of uses, in the automotive and other mechanical fields, and is particularly adapted for use in surgery, for the purpose of holding bones, applying internal splints and other like appliances as well as for extracting fragments of broken bones or foreign matter. It will be further appreciated that the head 1 may, if desired, be attached to or provided with any suitable means for supporting and turning the device.

While I have shown and described a commercial embodiment of my device, it will be understood that the same is capable of modification, and that modification may be made without departure from the spirit and scope of the invention as defined in the claims.

What I claim is:

1. In an adjustable wrench, a head, a pair of jaws having gripping portions adjacent their outer ends and mounted in said head for relative movement toward and away from each other to respectively grip and release an object between the gripping portions thereof, the gripping

portions of each of said jaws having angularly disposed faces directed toward an object to be held and an inwardly opening channel between said faces and extending in a direction parallel to the axis of rotation of said wrench, said channels cooperating with their respective faces to define axially extending edges adapted to make line contact with spaced portions of an object to be gripped by said wrench, and means on said head for imparting said relative movement to said jaws toward each other and positively limiting said movement of the jaws away from each other, said jaws including shank portions movable within said head, one of said shank portions having a laterally inwardly projecting flange, the shank portion of the other one of said gripping jaws defining an inwardly opening recess for reception of said flange, whereby to provide said jaws with a cross sectional area having maximum strength within a minimum of space.

2. The structure defined in claim 1 in further combination with yielding means urging said jaws toward spaced apart relationship, said means for imparting movements to said jaws toward each other comprising a screw device engaging said shank portions to move said jaws against bias of said yielding means.

3. In an adjustable wrench, a generally cylindrical head defining a guideway at one end portion thereof, a pair of opposed gripping jaws having shank portions mounted in said guideway for movement toward and away from each other, said jaws extending axially outwardly of the adjacent end of said head and having arcuate outer surfaces the axes of which are parallel to the axis of said head, each of said jaws having a pair of angularly disposed flat inner faces generally parallel to the axis of said head and facing toward said axes the faces of each jaw cooperating to define an angle greater than 120°, each of said jaws having a channel at the point of intersection of the planes of the faces thereof and extending longitudinally of the axis of said head said channel having a length substantially equal to that of their respective faces, the side portions of said channels and their respective faces intersecting to define axially extending edges adapted to make line contact with adjacent angularly disposed side surfaces of a cross sectionally polygonal object to be gripped by said wrench, and means on said head for imparting said movements of the jaws toward each other and positively limiting said movements of the jaws away from each other.

4. In an adjustable wrench, a generally cylindrical head defining a guideway at one end portion thereof, said guideway having guide surfaces converging in the direction of the adjacent end of said head and diametrically opposed parallel retaining surfaces, a pair of opposed gripping jaws having shank portions mounted in said guideway and opposed gripping portions axially outwardly of said adjacent end of the head, each of said jaws having a pair of angularly disposed flat faces generally parallel to the axis of said head and facing toward said axis, the faces of each jaw cooperating to define an angle greater than 120°, each of said jaws having a channel at the point of intersection of the planes of the faces thereof and extending longitudinally of the axis of said head, said channels having a length substantially equal to that of their respective faces, the side portions of said channels and their respective faces intersecting to define axially extending edges adapted to make line contact with adjacent angularly disposed side surfaces of a cross sectionally polygonal object to be gripped thereby, said shank portions having angularly disposed surfaces slidably engaging said guide surfaces and opposed parallel sides slidably engaging said retaining surfaces, whereby said jaws are movable toward and away from each other in directions angularly radially and axially of said head and held against twisting movement relative to the head when a torque load is applied to the wrench, and means on said head for imparting simultaneous movements to said jaws toward each other and positively limiting movement of said jaws away from each other.

5. The structure defined in claim 4 in further combination with spring means yieldingly biasing the shank portions of said gripping jaws angularly radially and axially inwardly of said head, said means on the head for imparting movements to said jaws comprising an adjustment nut screw threaded on said head adjacent the opposite end thereof and engaging the adjacent ends of said shank portions of the jaws.

6. The structure defined in claim 4 in which said shank portions each include a plurality of laterally spaced parallel axially extending flanges defining laterally inwardly opening grooves, the flanges of one of said shanks being laterally offset from those of the other thereof and received in the grooves of the other of said shanks, whereby to provide said jaws with a cross sectional area having maximum strength while occupying a minimum of space within said head.

7. In an adjustable wrench, a generally cylindrical head bifurcated for the greater portion of its length to provide a guideway having guide surfaces adjacent the open end of said head and diametrically opposed parallel retaining surfaces extending the full length of said guideway, said guide surfaces converging in the direction of the open end of said head, a pair of opposed gripping jaws having shank portions mounted in said guideway and opposed gripping portions axially outwardly of the open end of the head, each of said jaws having a pair of angularly disposed flat faces generally parallel to the axis of said head and facing toward said axis, the faces of each jaw cooperating to define an angle greater than 120°, each of said jaws having a channel at the point of intersection of the planes of the faces thereof and extending longitudinally of the axis of said head, said channels having a length substantially equal to that of their respective faces, the side portions of said channels and their respective faces intersecting to define axially extending edges adapted to make line contact with adjacent angularly disposed side surfaces of a cross sectionally polygonal object to be gripped thereby, said shank portions having angularly disposed surfaces slidably engaging said guide surfaces and opposed parallel sides slidably engaging said retaining surfaces, whereby said jaws are movable toward and away from each other in directions angularly readially and axially of said head and held against twisting movement relative to the head when a torque load is applied to the wrench, said shank portions each including a plurality of laterally spaced parallel axially extending flanges defining laterally inwardly opening grooves, the flanges of one of said shanks being laterally offset from those of the other thereof and received in the grooves in the other of said shanks, whereby said jaws each have a maximum overall size and strength while sharing a minimum space further restrained against twisting movement relative to each other, an adjustment collar encompassing the opposite end portions of said head and screw threaded thereon for movements longitudinally thereof, the adjacent ends of said shank portions projecting radially outwardly of the head and engaged by said collar to be moved thereby, said shanks having transverse slots through their respective flanges and elongated in directions parallel to their respective guide surfaces, and retainer elements extending transversely of said guideway and through said slots to retain the guide surfaces of said jaws in engagement with the cooperating guide surfaces of said guideway.

8. The structure defined in claim 7 in which the inner edges of said flanges define secondary guide surfaces parallel to said angularly disposed surfaces on their respective shanks, and in further combination with a guide element extending transversely of said guideway in spaced parallel relation to said retainer elements, said secondary guide surfaces of each shank engaging an opposite side portion of said guide element whereby to maintain said

jaws in parallel relationship and yielding means urging said shank portions into engagement with said guide element.

9. In an adjustable wrench, a head, a pair of jaws having gripping portions adjacent their outer ends and mounted in said head for relative movement toward and away from each other to respectively grip and release an object between the gripping portions thereof, the gripping portions of each of said jaws having angularly disposed faces directed toward an object to be held and an inwardly opening channel between said faces and extending in a direction parallel to the axis of rotation of said wrench, said channels cooperating with their respective faces to define axially extending edges adapted to make line contact with spaced portions of an object to be gripped by said wrench, and means on said head for imparting said relative movement to said jaws toward each other and positively limiting said movement of the jaws away from each other.

References Cited in the file of this patent

UNITED STATES PATENTS

1,395,585	Kizer	Nov. 1, 1921
1,482,075	Fisher	Jan. 29, 1924
1,554,963	Fisher	Sept. 22, 1925
2,745,305	Reiffin	May 15, 1956

FOREIGN PATENTS

183,281	Great Britain	July 27, 1922
372,816	France	Mar. 1, 1907