

FIG. 1B

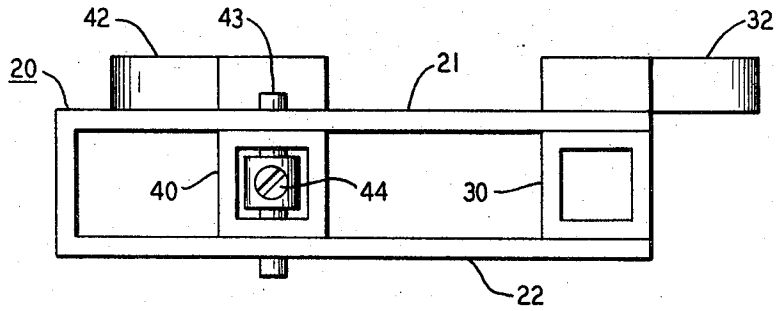


FIG. 3

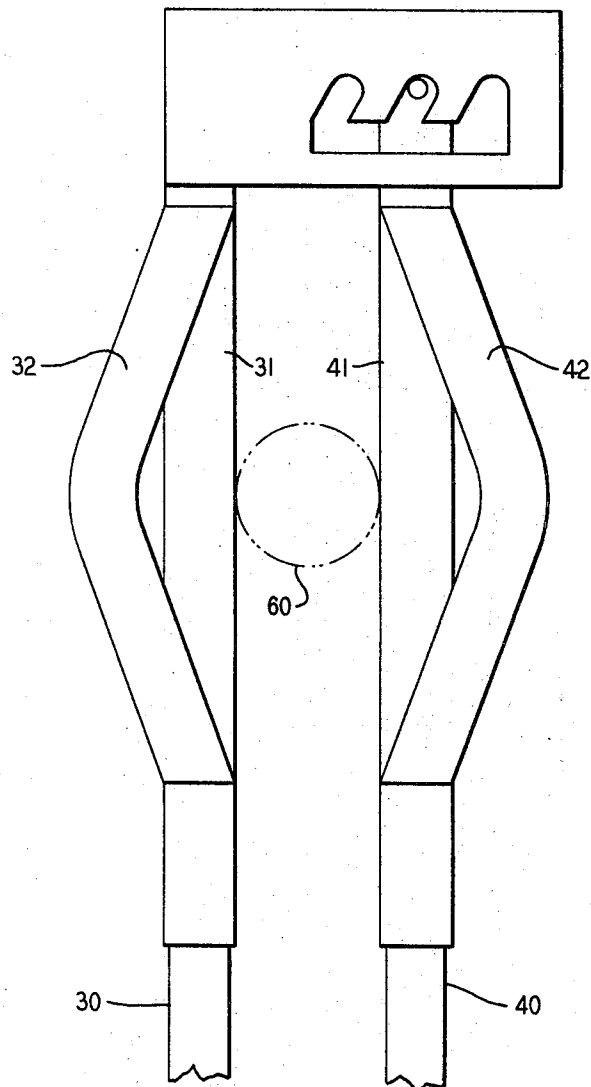


FIG. 2A

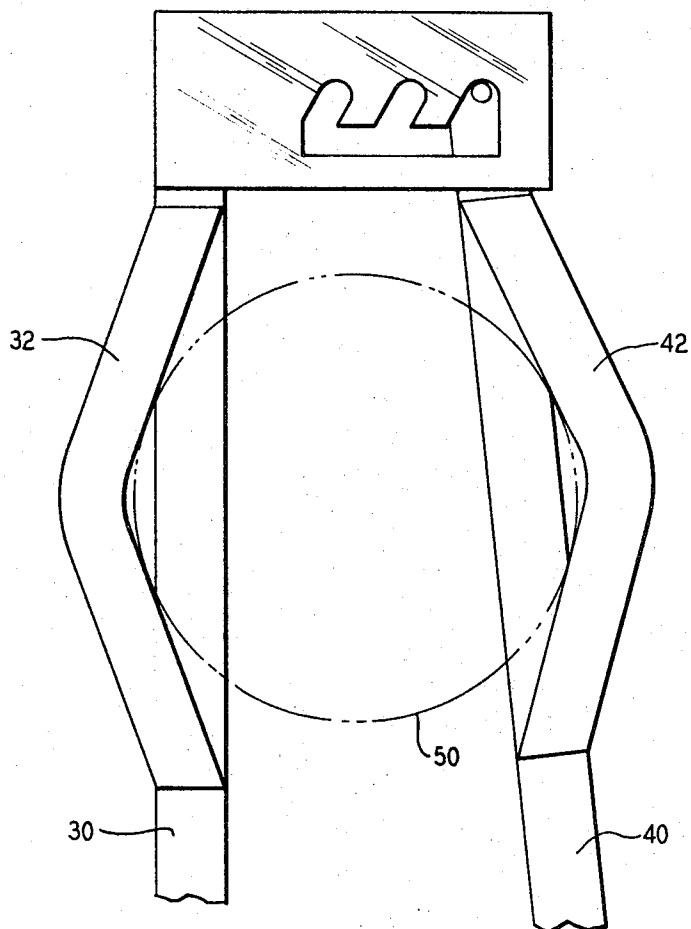


FIG. 2B

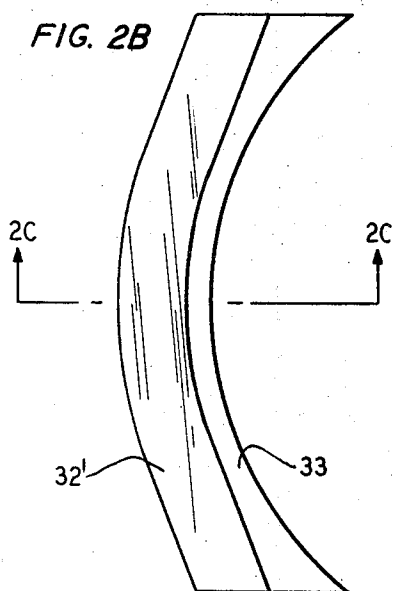
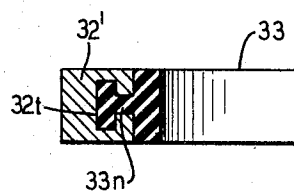


FIG. 2C



GRIPPER TOOL

BACKGROUND OF THE INVENTION

This invention relates to gripper tools and, more particularly, to tools for opening and closing tightly sealed containers that have closures of various sizes.

Gripper tools are commonly used in opening and closing lids of jars and caps of bottles that resist manual manipulation. Such tools have gripper arms that are pivoted relative to each other. Since bottles and jars have variously sized lids and caps, it is important to be able to adjust the tool accordingly.

However, when the tool is made adjustable, there tends to be a corresponding reduction in the durability of its pivot portion. If the tool is used with tightly fastened closures, or in making tight seals, the stresses at the pivot position may be so great that they produce structural failure. In addition, the gripper arms of an adjustable tool tend to exhibit lateral play relative to each other. This interferes with the proper seating and use of the tool.

Another difficulty is that an adjustable tool cannot be optimum for all sizes. A gripper tool typically is designed for use with an intermediate size closure in the hope that it will be usable for other sizes as well. Such a tool cannot be efficient for both large and small sized closures. Further, even for the design size, there tends to be slippage which becomes aggravated for the other sizes.

Accordingly, it is an object of the invention to provide a durable gripper tool which is adjustable for a wide variety of different sizes of closures. Another object is to provide a gripper tool that is suitable for use over a wide range of large and small closures. Still another object is to enhance the grip of the tool over a wide range of closure sizes.

Not only are typical gripper tools insufficiently durable, they are often of complex mechanical configuration and hard to adjust. In addition, they are often difficult to position on containers with large closures.

Accordingly, it is a further object of the invention to achieve a gripper tool which can be accurately positioned for the removal or fastening of relatively large closures. Another object is to provide a gripper tool that is readily adjusted and is easily manufactured. Still another object is to achieve a durable gripper tool which has a simple mechanical configuration and is light in weight.

SUMMARY OF THE INVENTION

In accomplishing the foregoing and the related objects, the invention provides a tool for gripping objects using gripper arms that are positioned in a head with separate portions that are spaced from each other and contain opposed guide channels for an end of one of the arms. The other arm is stationary. This provides a durable, yet adjustable gripper tool.

In accordance with one aspect of the invention, the channels in the opposed portions of the head are aligned with each other. Each has an elongated transverse region connecting a set of diagonally disposed branch regions for fixing the adjustment point of the movable arm. As a result, the movable arm is easily adjusted with respect to the stationary arm and is secure against accidental dislocation during operation of the tool.

In accordance with another aspect of the invention, the arms of the tool are of rectangular, preferable square, cross section. This permits the stationary arm to be securely fastened to the opposed portions of the head, and simultaneously permits the other arm to be easily moved between the two portions to an appropriate gripper setting.

In accordance with a further aspect of the invention, the arms carry clamps, with the portions of the arms in the vicinity of the clamps serving to position the clamps with respect to the container whose closure is to be removed or fastened.

In accordance with a yet further aspect of the invention, each clamp is designed to provide, for each object in excess of a prescribed design size, at least two regions of contact to provide increased contact with the object being gripped.

In accordance with still another aspect of the invention, the clamps advantageously contain an insert of elastomeric material, such as rubber, in order to increase the degree of contact between each clamp and the closure to which it is applied. According to a related aspect of the invention, the arms of the tool are at least partially covered with an elastomeric material to permit the arms to be used with relatively small objects with enhanced gripping contact.

In accordance with yet another aspect of the invention, the head of the tool is formed from a single piece of material that is folded to form a closed side and an open side, with stationary arm being affixed at the open side.

In accordance with still another aspect of the invention, the arms of the gripper tool are hollow members of rectangular cross section. This permits the realization of a relatively light-weight tool of added strength.

BRIEF DESCRIPTION OF THE DRAWINGS

Other aspects of the invention will become apparent after consideration of several illustrative embodiments taken in conjunction with the drawings in which;

FIG. 1 is a perspective view of a gripper tool in accordance with the invention;

FIG. 1A is a cross-sectional view of the head of the gripper tool in FIG. 1;

FIG. 1B is an end view of the head of the gripper tool in FIG. 1;

FIG. 2A is a view of the gripper tool of FIG. 1 being used to open a jar with a large lid;

FIG. 2B is a view of an alternative clamp for the gripper tool of FIG. 2A;

FIG. 2C is a cross-sectional view of the alternative clamp of FIG. 2B; and

FIG. 3 is a view of the gripper tool of FIG. 1 being used to close a bottle with a small cap.

DETAILED DESCRIPTION

Turning to the drawings, FIG. 1 shows a gripper tool 10 in accordance with the invention formed by a two-part head 20, a stationary arm 30 and an adjustable arm 40.

The head 20 is constituted of two portions 21 and 22 which are spaced apart from each other to permit one of the arms 40 to be adjusted relative to the other arm 30 in a way that provides an adjustable, yet durable gripper tool.

The stationary arm 30 is attached at one side of the head 20 between the portion or parts 21 and 22. The

adjustable arm 40 is movable between the parts 21 and 22 with respect to channels 23-1 and 23-2.

Each of the channels 23-1 and 23-2 has a transverse branch 23*t* and diagonal branches 23*d*. The movable arm 40 has a pin 42 that extends into the channels 23-1 and 23-2. This permits the arm 40 to be shifted transversely with respect to the stationary arm 30 to an appropriate position where the pin 43 of the arm 40 is moved into the nearest diagonal branch. The angle of each diagonal branch with respect to its transverse branch of the channel 23-1 or 23-2 facilitates movement of the arm 40 to the desired setting and also militates against having the arm slip from its set position when the tool 10 is being used with objects that provide considerable resistance to torque.

The arms 30 and 40 are adapted for securely gripping objects. For that purpose the gripping surfaces of the arms 30 and 40 are desirably formed by respective coatings or sleeves 31 and 41 of an elastomeric material.

In addition, the arms 30 and 40 have respective gripper clamps 32 and 42. The latter have knurled edges 32*k* and 42*k*, and are proportioned to grip objects with four points of contact, instead of two points as in the case of a clamp formed by an arc member with a single radius of curvature. To achieve the additional points of contact, the clamps 32 and 42 have central regions of curvature 32*a* and 42*a* and outer regions 32*b* and 42*b*. The radii of curvature for the outer regions 32*b* and 42*b* are greater than for the inner regions 32*a* and 42*a*. For the particular embodiment of FIG. 1, the outer regions 32*b* and 42*b* are straight line segments, and thus have infinite radii of curvature. This facilitates construction of the clamps 32 and 42, for example, by allowing each of them to be fabricated by bending a straight piece of stock.

Details of the relationship between the stationary and adjustable arms 30 and 40, and the head 20 are shown in the cross-sectional view of FIG. 1A.

The head 20 is illustratively formed from a single sheet-metal stamping which is folded at right angles about its central side part 24 to form a U-shaped head with support parts 21 and 22. The open side of the head is filled by the permanently attached, stationary arm 30. Alternatively, the head 20 and the stationary arm 30 could be cast as a unitary structure.

As shown by FIG. 1A, both the stationary arm 30 and the adjustable arm 40 are hollow and of rectangular cross section. The use of hollow arms 30 and 40 desirably lightens the weight of the tool, regardless of the material, for example, light-weight metal such as magnesium or aluminum or heavier metal such as stainless steel. The square configuration of the cross section gives added rigidity in the head 20. It will be understood that the portions of the arms 30 and 40 beyond the head 20 may have any other suitable configuration, being for example, of circular cross section.

Also shown in FIG. 1A is the relationship between the pin 43 of the adjustable arm 40 and the diagonal branches 23*d* of the channels 23-1 and 23-2 (FIG. 1) of the head 20. The pin 43 extends through the adjustable 40 and bears against side walls of the diagonal branches 23*d*. For the particular setting shown in FIGS. 1 and 1A, the pin 43 rests against the shoulder of the middle diagonal branch of the upper part 21, and against a corresponding shoulder of the middle diagonal branch of the lower part 22. The pin 43 can be se-

cured to the adjustable arm 40 by being press-fit into it.

An end view of the gripper tool 10 of FIG. 1 is shown in FIG. 1B. In order to permit the adjustable arm 40 to be removable from the head 20, the pin 43 is undersized with respect to the pin apertures of the arm 40 and is held in position by a set-screw arrangement 44. When the adjustable arm 40 is to be replaced, either because a different configuration is desired, or because the old arm is no longer serviceable, the set-screw 44 is unfastened, permitting the pin 41 to be removed from the head 20 and freeing the arm 40. In assembling the tool 10 with a removable arm 40, the arm is inserted between the parts 21 and 22 until the pin apertures are aligned with portions of the channels 23-1 and 23-2. The set-screw attachment 43 is then placed within the arm 40 in alignment with the pin holes and the pin 41 is inserted.

The use of the tool 10 of FIG. 1 to open a jar with a large lid is illustrated in FIG. 2A. The adjustable arm 40 is set for an opening that is appropriate to accommodate the diameter of a relatively large lid 50. The outer surface of the lid 50 rests against flat surfaces of the arms 30 and 40, while the clamps 32 and 42 are in edge contact. As noted earlier, there are four regions of contact because the outer radii of curvature for the clamps 32 and 42 exceed the central radii. This increases the effectiveness of the clamps. Further, the particular disposition of the clamps with respect to the arms 30 and 40 permit the latter to act as platforms to facilitate the positioning of the tool 10 with respect to the lid 50. It will be appreciated that the clamps 32 and 42 may be of different material than the arms 30 and 40. Thus, the clamps 32 and 42 may be of plastic, while the arms 30 and 40 are of metal.

In order to increase the area of contact between each of the clamps 32 and 42 and the object being gripped, it is advantageous to use an insert 33 of the kind illustrated in FIG. 2B for an alternative clamp 32'. The insert 33 is of elastomeric material, such as rubber, and is wider at the ends of the clamp than in the center. This results in substantially continuous contact between the clamps and the object being gripped since, when gripping force is applied, the insert 33 becomes deformed and tends to fill any void between the object being gripped and the clamp 32'.

To retain the insert 33 in the clamp 32', the latter contains a T-shaped slot 31*t* shown in FIG. 2C. The slot 32*t* holds a neck 33*n* of the insert 33.

The clamps 32 and 42 of the tool 10 are advantageous for gripping relatively large objects. For relatively small objects, it is desirable to be able to use the arms 30 and 40 directly. Such a use is shown in FIG. 3 where the arms 30 and 40 grip a small bottle cap 60. The grip is promoted by virtue of the elastomeric sleeves 31 and 41. Alternatively, elastomeric inserts of the type shown for the alternative clamp 32' may be employed.

While various aspects of the invention have been set forth by the drawings and the specification, it is to be understood that the foregoing detailed description is for illustration only and that various changes in parts, as well as the substitution of equivalent constituents for those shown and described, may be made without departing from the spirit and scope of the invention as set forth in the appended claims.

What is claimed is:

5

1. A tool for gripping objects comprising an elongated head having a first portion spaced from a second portion, each portion having a longitudinal main channel and a plurality of subchannels communicating with said main channel, the channels of the respective portions being aligned with one another,

a first arm affixed to said head and extending outwardly therefrom and a second, outwardly extending arm that is movable between the first and second portions of said head,

each of said subchannels extending diagonally away from said fixed arm and having a rounded terminal region opposite its region of connection with its main channel,

said movable arm including means for engaging the terminal regions of selected oppositely positioned subchannels in the rounded regions thereof, and the arms have clamping surfaces for gripping ob-

6

jects of a first size and auxiliary clamping members for gripping objects of a second size, different from the first, when said arms are separated by a prescribed distance.

2. A gripper tool as defined in claim 1 wherein said head is formed from a single piece of folded material that is open at one side thereof and closed at the other side.

3. A gripper tool as defined in claim 2 wherein said first arm is affixed at the open side of said head.

4. A gripper tool as defined in claim 1 wherein the first and second arms are hollow members of rectangular cross section.

5. A gripper tool as defined in claim 4 wherein said arms have gripper regions coated with an elastomeric material.

* * * * *

20

25

30

35

40

45

50

55

60

65