MECHANICAL FINGER GRIPPING DEVICE

Inventor
Milton S. Dunkelberger

By Attorney

Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5
This invention relates to a mechanical finger gripping device and more particularly to the structure thereof and the manufacture of same.

An object of this invention is to provide mechanical fingers that are easily assembled from few well designed parts, resulting in a device that is economical, efficient and dependable.

Another object of this invention is to provide a pair of mechanical fingers adapted to grip or grab an article in a manner quite similar to the use of a man's fingers, so constructed that these mechanical fingers will pick up articles out of reach by hand.

Another object of this invention is to form a blank from a flat piece of material into a mechanical finger in one operation.

Another object of this invention is to provide a flexible mechanical finger gripping device that may be adjusted at will into various positions in readiness for use.

Other objects and advantages reside in the construction of parts, the combination thereof and the mode of operation, as will become more apparent from the following description.

In the drawings, Figure 1 is a side elevational view of the preferred embodiment of a mechanical finger gripping device.

Figure 2 is a longitudinal cross sectional view of the device shown in Figure 1.

Figure 3 is an end view of the device looking in the direction of the arrow 3 shown in Figure 2.

Figure 4 is a blank stamping used in forming a finger grip jaw.

Figure 5 is a perspective view of a finger grip jaw after it has been formed from the blank disclosed in Figure 4.

Figure 6 is a side elevational view of a modification wherein a mechanical finger gripping device having a flexible tubular portion has been shown.

Figure 7 shows another side elevational view of the modification shown in Figure 6, wherein the flexible portion has been curved to show the operation of the mechanical finger gripping device.

Figure 8 is an enlarged side elevational view of the modification shown in Figure 6, with parts shown in section.

The mechanical finger gripping device disclosed herein has a pair of pivotally mounted gripper jaws positioned in a flared tubular member, which gripper jaws have the outer extremities positioned in a substantially common plane so as to simulate a pair of fingernails in position for grasping a small article upon a smooth surface. The device is assembled on a machine that automatically holds the tubular sleeve, the plunger rod and the spring in position in readiness for final assembly. This machine is provided with suitable automatic means for controlling the proper timing of the operation.

Referring to the drawings, the reference character 10 indicates the main tubular body member having one end flared at 12 and the opposite end provided with a reduced diameter receiving a curved or dish-shaped, washer-like grip 14, held in position by the spun or upset marginal portion 16 of the tubular main body member 10.

A shaft or rod 20 projects into the tubular main body member 10. One end of the shaft 20 is provided with a flattened shank portion 22. A pair of gripper jaws 28 is pivotally attached by a pin 26 to the flattened shank portion 22 provided with a suitable aperture 24. These gripper jaws are made from a flat blank shown in Figure 4. This flat blank is provided with a pair of lobular portions 32 that are bent to form 120° angles along the line 34.

The ends of the gripper jaws 28 that are attached to the shank portion 22 are flat. These flat portions merge into diverging arcuate portions 30. The lobular portions 32 are formed so as to extend in a common plane, extending at right angles to the longitudinal axis of the shaft or rod 20 when the gripper jaws are in the closed position, as will appear more fully later. By this arrangement, the inwardly directed lobular portions have a function simulating a man's fingernails in picking up objects lying on a flat surface. In addition to the function of picking up articles, the lobular portions formed at an angle reinforce the adjacent arcuate portion, so as to give it rigidity. The inner points of the lobular portions 32 have been severed so that the lobular portions cooperate to form a substantially square opening between the jaws when closed. Furthermore, the arcuate portions adjacent the line 34 have been flattened, so that the arcuate portions merge into substantially straight side edges 36.

By forming the blank so that the lobular portions 32 are folded along the lines 34, which lines intersect to form angles of substantially 120°, the gripper jaws 28 lend themselves to the use as a wrench for engaging diametrically disposed corners of hexagon nuts. By this arrangement, the device disclosed herein is adapted to be used as a wrench for loosening or tightening hexagon nuts or bolts. Areas 38 adjacent the fold line 34 and merging into the arcuate portion 30 are
flattened, so as to have flat areas in the immediate vicinity of the lobular portions. By pivotally attaching the gripper jaws to the shank portion 32 of the rod 20, the gripper jaws align themselves so as to meet each other properly.

This pivot connection expedites manufacture of the assembly, in that accurate alignment is not necessary between the gripper jaws 28 and the rod 20. No attention is paid to alignment in the manufacture of the assembly, in that the gripper jaws when inserted into the flared end of the main body portion automatically align themselves with the rod 20 and engage each other properly. This feature reduces the cost of production and at the same time insures accuracy in registration of the lobular portions with each other.

When positioning nuts and bolts, the corners of the nuts or the edges of the heads of the bolts fit into the straightened portions of the gripper jaws above the lobular portions 32, so that the gripper jaws 28 may function as a wrench or as a screw driver in screwing and unscrewing parts.

The end of the shaft or rod 20 opposite the shank portion 32 threadedly receives a hand grip member 40. This hand grip member cooperates with the washer-like grip member 14 to form seats for a helical spring 42 having the ends 44 and 46 flared outwardly. By flaring the ends of the spring 42, binding action on the part of the spring when compressed is reduced or eliminated. This spring 42 draws the gripper jaws 28 into engagement with the flared ends 12 of the tubular body member 10 to close the jaws. Whenever it is desirable to open the jaws, it is merely necessary to depress the hand grip member 40 so as to compress the spring 42.

Due to the resiliency of the gripper jaws 28, the gripper jaws spread in readiness to grasp the article to be handled. The gripper jaws being shaped as they are, are well adapted to pick up round pieces, hexagon nuts and small cotter pins. Furthermore, the gripper jaws will pick up screws, nuts, washers, bolts, rivets, pins, small tools, rags, parts of a machine, waste and almost anything that may be dropped in a place where it cannot readily be picked up by hand. From this it can be seen that the device is ideal for starting hexagon and square nuts, machine screws, fitting on washers, placing cotter pins and inserting miscellaneous parts of a machine or apparatus upon which work is being done. Only one hand is required to release the gripper jaws. This leaves the other hand free to guide and support the device as desired.

In the modification disclosed in Figures 6 to 8, a mechanical finger gripping device has been disclosed that has a flexible portion, whereby the fingers may be diverted to any side whereby to pick up or manipulate articles that may be inaccessible with a straight finger gripping device, as disclosed in the preferred embodiment. In the modification a Bowden wire arrangement has been shown, wherein the remote end of the finger gripping device may be turned aside to any selected angular position with the structural limitations of the device and remain in this position until some external force is applied to the end of the finger grip device, so as to move it into some other position.

Attempts have been made to utilize a spring as a support for the mechanical finger gripping device, wherein the end of the spring may be held in a depressed position; but as soon as the force deflecting the spring is released, it imme-

diately straightens. Such a device may be used for a few limited uses; but it is not adaptable for all purposes, in that it may be desirable to pick up or position articles in a position inaccessible by hand and in a position 20 where it is not feasible to attempt to hold the ends of a spring in a fixed position.

Referring to Figures 6 to 8, instead of a tubular main body portion 10, a composite main body has been used. This composite main body includes a tubular member 60, supporting a U-shaped washer-like gripping member 14 on one end and a cup-shaped member 62 on the opposite end. One end of a flexible metallic tube 64 is fixedly seated in the cup-shaped member 62. The opposite end is fixedly attached to a cup-shaped member 66 attaching tubular member 60 having the remote end 70 flared.

A pair of gripper jaws 28, identical to those described above, project outwardly from the flared end 70 of the tubular member 60. The jaws 28 are pivotally attached to an actuating member 72 provided with an axial hole having embedded therein one end of a flexible wire 74. This end of the wire 74 may be soldered, fused or swaged into position. The flexible wire 74 extends through the flexible metallic tube 64 and part way into the tubular member 60 where member 70 terminates, as viewed in Figure 8, is seated in a suitable recess in an actuating rod 76. The actuating rod 76 projects outwardly from the tubular member 60 and is provided with a hand grip member 40, which cooperates with the hand grip member 14 to form seats for a helical spring 42.

The mechanical finger gripping device is controlled in the same manner as described in connection with the preferred embodiment, with the exception that the lower end, as shown in Figure 7, may be deflected or moved sidewardly, so as to manipulate articles that are best engaged in the direction at some angle to the longitudinal axis of the actuating rod 76. For example, the article may be best handled in a direction normal to the longitudinal axis of the tubular member 60 and the rod 76. The wire 14 is deflected with a tubular member 64 and functions as a Bowden wire be necessary to provide a support for the deflected end of the mechanical finger gripping device, as it is self-supporting and will remain in the deflected position until acted upon by some external force.

Although the preferred modification of the device has been described, it will be understood that within the purview of this invention various changes may be made in the form, details, proportion and arrangement of parts, the combination thereof and mode of operation, which generally stated consist in a device capable of carrying out the objects set forth, as disclosed and defined in the appended claims.

Having thus described my invention, I claim:
1. A mechanical finger gripping device including a tubular supporting member, a rod mounted for reciprocatory movement in the tubular supporting member, a pair of gripper jaws pivotally attached to the rod, said gripper jaws projecting beyond the tubular supporting member, each of said gripper jaws being characterized by an arcuate portion merging into a pair of flattened areas terminating in a pair of lobular portions, the lobular portions being disposed in a plane substantially normal to the longitudinal axis of the tubular supporting member, when the gripper jaws are in closed position, said flattened areas
forming angled seats adapted to hold nuts and the like.
2. A mechanical finger gripping device including composite tubular supporting means, said composite tubular supporting means including a pair of rigid tubular portions one at either end of the composite tubular supporting means, and a flexible intermediary tubular member fixedly attached to the rigid tubular portions, said flexible member having sufficient rigidity to support the flexible member and the rigid tubular members in flexed position, reciprocatory means mounted for reciprocatory movement in the composite tubular supporting means, said reciprocatory means including a rod projecting into one portion of the composite tubular supporting means, a flexible wire fixedly attached to the end of the rod and extending through the flexible intermediary tubular member, a pair of gripper jaws projecting into the other rigid tubular portion, means for interconnecting the gripper jaws and the flexible wire, said flexible wire cooperating with the flexible intermediary tubular member to function as a "Bowden" wire so that as the flexible member is bent the wire bends with it, said gripper jaws projecting beyond the adjacent tubular supporting portion and including an arcuate portion merging into a pair of flattened areas terminating in a pair of lobular portions, the lobular portions being disposed in a plane substantially normal to the longitudinal axis of the adjacent tubular supporting portion when the gripper jaws are in closed position, said flattened areas forming angled seats adapted for holding nuts and the like.
3. A mechanical finger gripping device including a tubular supporting body, reciprocatory means mounted in the tubular supporting body, said reciprocatory means terminating in a flattened portion, and a pair of gripper jaws pivotally attached to the flattened portion, said pivotal attachment permitting adjustment of the gripper jaws with respect to said reciprocatory means so as to properly align the gripper jaws to cause registry thereof, each of said gripper jaws including an arcuate portion merging into a pair of flattened areas terminating in a pair of lobular portions, said lobular portions being disposed in a plane substantially normal to the longitudinal axis of the tubular supporting body when the gripper jaws are in closed position, said flattened areas forming 120° dihedral angles so as to be adapted to snugly fit opposite corners of hexagon nuts and the like.
4. A mechanical finger gripping device including a tubular supporting member, said tubular supporting member including a flexible portion, an actuating member mounted for reciprocatory movement in the tubular supporting member, a pair of gripper jaws pivotally attached to the actuating member, each of said gripper jaws projecting beyond the tubular supporting member, said gripper jaws being characterized by an arcuate portion merging into a pair of flattened areas terminating in a pair of lobular portions, the lobular portions being disposed in a plane substantially normal to the longitudinal axis of the tubular supporting member when the gripper jaws are in closed position, said flattened areas forming angled seats adapted to hold nuts and the like.
5. A mechanical finger gripping device including a tubular supporting body including a flexible portion, reciprocatory means mounted in the tubular supporting body, said reciprocatory means having a flexible portion extending through the flexible portion of the supporting body, said reciprocatory means terminating in a flattened portion, and a pair of gripper jaws pivotally attached to the flattened portion, said pivotal attachment permitting adjustment of the gripper jaws with respect to said reciprocatory means so as to properly align the gripper jaws to cause registry thereof, each of said gripper jaws including an arcuate portion merging into a pair of flattened areas terminating in a pair of lobular portions, said lobular portions being disposed in a plane substantially normal to the longitudinal axis of the tubular supporting body when the gripper jaws are in closed position, said flattened areas forming 120° dihedral angles so as to be adapted to snugly fit opposite corners of hexagon nuts and the like.

MILTON S. DUNKELBERGER.