LOCKING DEVICE FOR PIVOTALLY OPPOSED MEMBERS

Charles H. Ortman, Chardon, Ohio, assignor of one-third to Ira J. Warner, Cleveland, Ohio

Application April 30, 1953, Serial No. 352,115

5 Claims. (Cl. 81—49)

My invention relates to locking or clamping means for handles, levers and similar elements, and relates more particularly to means whereby levers or handles may be locked in any one of a plurality of predetermined positions. The invention is equally well applicable to handles, levers or clamping elements which may be opposed or crossed with respect to each other.

It is one of the objects of my invention to provide an effective clamping device for levers, handles or similar elements whereby the same may be releasably locked in any predetermined position without the use of springs or other resilient members.

A further object of the invention is to provide a device of this kind which is extremely simple in construction and which, being simple of construction, is inexpensive to manufacture.

A further object of the invention is to provide a simple locking means for pivoted members which includes a locking arm having a fulcrum at one end movable along an elongate slot on one of said levers or handles and having its other end capable of being adapted to a member fixed on an opposed member such as a handle or lever.

Other objects and advantages of this invention will become more apparent as the following description of two of the several aspects of the invention is presented.

Figure 3 is a sectional view showing an application of the invention to a pair of pliers.

Figure 4 is a sectional view of a pair of pliers having a slot in the jaws.

In carrying out my invention, I have used the term "locking arm", as applied to a clamping tool, such as a pair of pliers or the like for clamping the handles thereof in a predetermined relative position, although it is to be understood that the invention is not to be limited in this respect, since it is equally applicable to other types of levers, handles, cranks, clamps or the like.

Referring now more particularly to Figs. 1 to 4, inclusive, in which I have illustrated one form of the invention as applied to a handle or lever of a tool such as pliers for locking the same in a predetermined relative position for gripping a workpiece, the tool is illustrated as comprising a pair of crossed handles 1 and 2, respectively pivotally connected at 3 and terminating in work-gripping jaws 4 and 5, respectively. The jaw 5 may be provided with a projection 6 which is movable in the path of a fixed lug 7 on the jaw 4 to limit the spread of the jaws or handles. In the opposite direction, the jaws may move freely to a completely closed position wherein the opposed gripping faces of the jaws may be brought into intimate contact and alignment.

The extreme simplicity of the construction of my invention is very apparent from the drawings illustrating the application of the same. The handle 2 of the jaw 5 is provided with an integral offset portion 8 which extends rearwardly of the handle from a point on the fulcrum 3 and preferably extends outwardly of the handle and having at least a portion thereof in the plane of the handles 1 and 2. This outwardly extending portion may be termed a segment of an ellipse formed by an elongate slot 9 preferably in arcuate or curved form and whose radii preferably converge to a location between the handles 1 and 2 and rearwardly with respect to a guide member carried by the opposed handle or lever 1.

The handle 1 is provided at a point opposite the offset portion 8 with a fixed guide member 10 which, in the form illustrated in Figs. 1 through 4, is a U-shaped guide member rigidly fixed to the handle 1 or formed integral therewith to provide a flat elongate slot or opening through which a clamping member 11 is adapted to pass.

The clamping member 11 preferably comprises a flat rigid strip having a width less than the length of the flat opening through which the member passes in the guide 10 and is provided at one end with a stud 12 which is disposed at right angles to the arm 11 and through the slot 9 in which it is free to slide at the will of the operator either to adjust the clamping action or to release it therefrom. A washer 13 is provided on the shank of the stud and engages the upper surface of the offset portion 8 as viewed in Fig. 3. A nut 14 may be threaded onto the threaded portion of the stud to assemble the locking member 11 in operative relation to the offset portion 8 and the slot 9. It is understood that the stud and the locking member 11 under certain conditions have freedom of movement along the slot 9 to and from a locking position but by virtue of the construction of the device is adapted to lookingly engage a wall of the slot under loading gripping or locking conditions which will be explained more fully hereinafter.

It will be noted that if an imaginary straight line 19 is projected from any point of the stud 12 along a wall or edge of the elongate slot 9 in handle 2 to the fulcrum or center on which the handles and respective jaws are pivoted, and if an imaginary line 109 is projected from the bearing or binding points 102 and 106 of the inverted U-shaped guide member 10 toward the jaw end of the handle 1 and which points are engaged by the opposite longitudinal edges of the jaws or handles 4 and 5, these imaginary lines will intersect at a point remote from the fulcrum 3 of the handles and behind the jaws 4 and 5. This is clearly indicated in Figs. 1 and 2.

It will also be noted that, by virtue of the construction disclosed a positive locking action is available for any position of the jaws 4 and 5 in gripping an object, it being merely necessary to grip the workpiece as illustrated in Fig. 2 at W between the jaws by compressing the handles 1 and 2 toward each other and then shifting the locking arm 11 from a position such as shown in Fig. 1 to the position shown in Fig. 2. In so shifting this member, the stud 12 may be pushed along the elongate slot 9 by applying a slight thumb or finger pressure against the stud 12 and pushing the locking member 11 to the position shown in Fig. 2. During movement of the locking member 11 from one position to the other, its free end will freely slide through the flat elongate opening 109 provided by the inverted U-shaped fixed guide member 10 and the adjacent wall of the elongate slot 9 to which it is attached. When the locking arm 11 is in locking position as in Fig. 2 to clamp a workpiece in the pliers, a positive binding or gripping condition is established between the longitudinal edges of the locking arm 11 and the respective legs of the inverted U-shaped fixed member 10 on the handle 1, and also between the stud 12 and the walls of the curved slot 9.

If the thickness of the workpiece W is more or less than that indicated, the locking arm can be shifted along the slot 9 and within the elongate opening 109 to estab-
lish the same effective binding and locking effect to maintain the handles 1 and 2 and consequently the jaws 4 and 5 in clamping position upon the workpiece W. However, in the case of the present invention, an effective wide range of easily accomplished and easily disposed of adjusting devices are available without the use of springs or other tensioning means intended to exert a normal pressure on the clamping arms. It will be noted that while the imaginary line 9' passes through the axis of the fulcrum 3, it will always be intersected by the line 10' at a point behind the fulcrum 3, that is, on the handle side thereof. It will be further noted that the imaginary lines may be clamped between the jaws 4 and 5 within their pivotal limits. In each instance, however, the clamping relationship between the fixed guides 10, 11, and slot 9 and the respective portions of the locking member 11 engaged thereby will be substantially the same, that is, the imaginary lines 9' and 10' when projected forwardly toward the jaws may converge and intersect at a point behind the fulcrum 3 and the jaws 4 and 5.

Referring now to Figs. 5 and 6, I have illustrated a further simplified form of the invention. In this illustration, I have illustrated the same type of pair of pilers or similar tool but have eliminated the slotting portion of one of the jaws and have so modified the clamping member that, while it is as effective as the form of the invention illustrated and described above, it is of considerably simplified construction, easy to assemble and can be produced at low costs. In the form of the invention illustrated, the handle 2 itself is formed with a portion bowed outwardly in the plane of the pilers as at 20. This portion of the handle in cross section is flat and is adapted to receive thereon the formed enveloping end of the clamping member 21 in slidable relation thereto. One end of the clamping member 21 is slidable between guiding members or lugs 22 spaced apart on a flat portion of the handle 1 and in line with each other, to each of which the clamping member 21 is formed to envelop the arcurate portion 20 of the handle 2 to permit sufficient clearance for the clamping member to slide over this portion of the handle when desired and also to provide means whereby the handle 2 may be gripped by the clamping member under load-gripping conditions. A finger grip 23 is formed integral with the clamping member 21 and extends outwardly along the longitudinal axis of the member by means of which the operator may apply thumb or fingers pressure to the portions 21 and 23, as shown in Fig. 5, to engage the portion of the enveloping end of the clamping member 21 which overlies that portion of the handle 2 is indicated at 24 and terminates in a projection 25 which is bent inwardly toward the main body of the clamping member 21 and which engages the inner arcuate edge of the bowed or arcuate portion of the handle 2 to cooperate with the end wall 26 of the member 21 engaging the outer edge of the bowed portion 20 thereof to guide the clamping member in its movement along the bowed portion and to keep it in alignment with the opposed handle 1 as the opposite end thereof operates between the lugs 22.

From the above it will be noted that the relationship between the locking member 21, the operative portion of the bowed portion 20 of the handle 2 and the guiding members or lugs 22, is substantially the same as that existing between the clamping member 11, the arcuate guides 9 and the fixed guide member 10, respectively.

Here again, as in the embodiment shown in Figs. 1 through 4, the effective binding or gripping points being defined as between the respective longitudinal edges 27 of the arm 21 and the adjacent respective lugs 22, as well as between the enveloping end of the arm 21 and the curved edges of the portion 20 of the handle 2. It is pointed out that in this form of the invention it is equally unnecessary for the operator to exert any appreciable pressure against the clamping devices thereby contributing to the simplicity and low cost of the device. As is the case with the first embodiment described above, the center about which the curved portion 20 is formed is located at a point remote from the fulcrum 3. Furthermore, it will be clear that there is provided in both forms of the invention, as illustrated herein, a positive and ratchet engagement with the side member to a location behind the fulcrum 3 and the pivotal members 4 and 5.

Various changes may be made in the details of construction and arrangement of parts of the invention without departing from the spirit thereof or the scope of the appended claims.

1. In a device comprising pivotally opposed members, means for locking or holding said opposed members in a preselected position, said means comprising guide means on each of said members, and a locking member operatively connected with and movable along each of said guide means, one end of said locking member having pivotal and sliding support along one of said guide means, each of said members in said preselected position being in a position which would maintain the inclined U-shaped portion facing to a location behind the fulcrum 3 and the pivotal members 4 and 5.

2. In a device comprising pivotally opposed members, means locking or holding said opposed members in a selected position, said means comprising a locking means on each of said members, a locking arm bridging said members and frictionally engageable with said guiding means to lock the member in any selected position, the locking means on one of the members slidably receiving said locking arm having a portion at one of its ends for guiding movement therealong, and guide means on said other member comprising engaging members with said other member an opening for slidably receiving said locking arm having a portion at one of its ends for guiding movement therealong, and guide means on said other member comprising engaging members with said other member an opening for slidably receiving said locking arm.

3. In a device comprising pivotally opposed members, means for locking and holding said members in a selected position, said means comprising a link bridging said members, one of said members having a portion formed with an arcuate guide slot, means on one end of said link projecting transversely thereof and disposed in said slot to slidably engage said slot in a longitudinally extending direction, and an elongate guide formed on said other opposed member for slidably receiving the other end of said link, the end walls of said last named guide being engageable with opposed sides of said link and defining an intermediate portion, said arcuate slot and said elongate guide extending toward a common point behind the fulcrum of the pivotal members.

4. A device of the class comprising a pair of opposed relatively pivoted members and means for frictionally holding said members in a predetermined relative position, said means comprising a link connecting said members, one end of said link being formed to envelop a portion of one of said members and movable longitudinally of said member portion, and on the other member for receiving the other end of said link in slidable relation thereto for guiding said link transversely of said other member upon relative movement of said members, said guiding means having engagement with opposite sides of said link, the engagement of the guiding means on opposite sides of said link and the engagement of the enveloping end of said link with said one member portion defining a three point binding means located behind the fulcrum of the pivotal members.

5. A device of the class described, a pair of pivotally opposed relatively movable members, one of said members having an intermediate portion formed out of its general contour, a guide means on said other member and a link connecting said members, one end of said link being slidably longitudinally in said member portion, the other end of said link embracing and being slidable along the portion of said first member formed out of said first member's general contour, the respective end portions of the link having binding engagement with the side member to a location behind the fulcrum 3 and the pivotal member of one of said pivotally opposed members to lock said opposed pivot members in pre-selected relative positions, said intermediate portion
of said one member and said guide means extending toward a common point behind the fulcrum of the pivoted members.

References Cited in the file of this patent

UNITED STATES PATENTS

396,819    Hubbell                Jan. 29, 1889

447,776    Islin                Mar. 10, 1891

566,249    Tinsman et al.        Aug. 18, 1896

1,149,060   Ingram               Aug. 3, 1915

1,818,869   Reed                 Aug. 11, 1931

2,454,309   Davis                Nov. 23, 1948