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R. MARTINES

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TOOL

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Fig. 1.

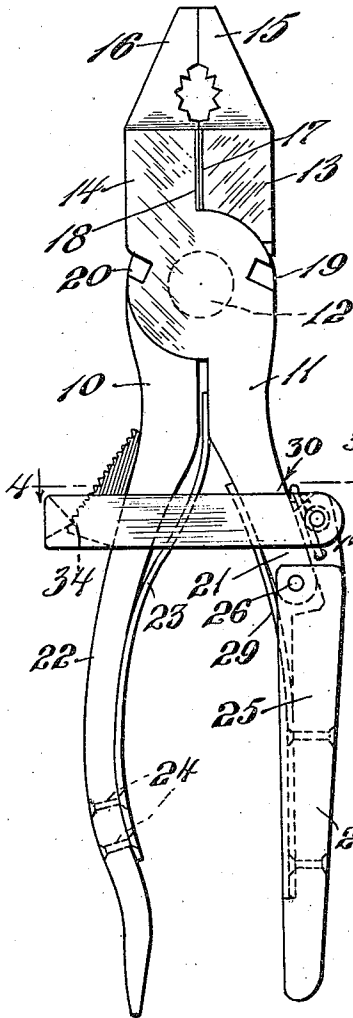


Fig. 2.

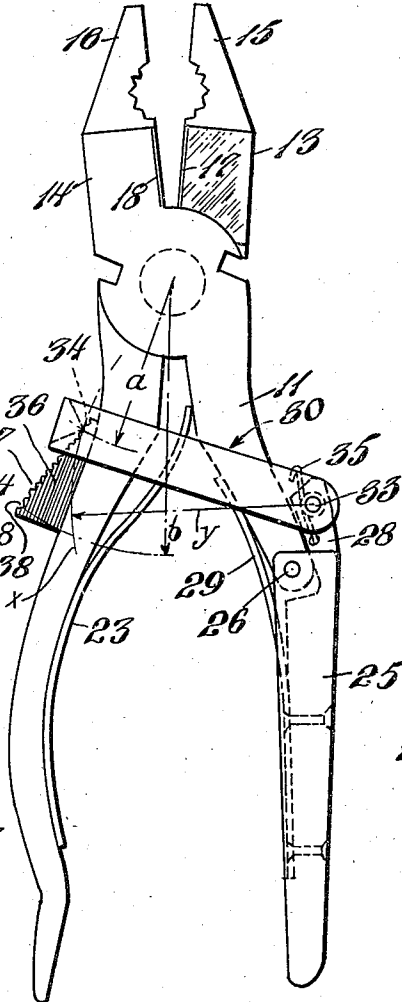


Fig. 3.

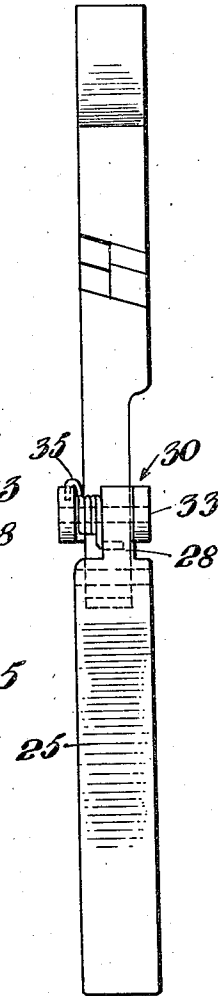
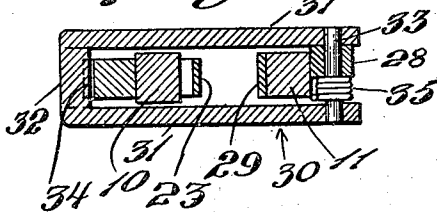


Fig. 4.



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TOOL

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7 Claims. (Cl. 81-46)

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This invention relates to a manually operable tool of the type in which manually actuated members are movable toward and from each other to cause the movement of jaws or other operable parts.

One adaptation of this invention is to cutting pliers or the like in which two actuating members are provided for movement toward each other by pressure of the hand. It is well known that when the hand is fully expanded and the thumb and fingers are just grasping two such actuating or handle members that the strongest pressure of which the hand is capable cannot be applied in this position. Further when the hand is fully collapsed or doubled up such greatest pressure cannot be applied. A point between this fully expanded and fully closed position of the hand affords a position for most strongly applying pressure upon handle or actuating members toward each other.

Accordingly, one of the objects of this invention is to so arrange the actuating members that they will be within the grasp of the hand at a position at which the hand may exercise maximum pressure.

Tools of the above character where considerable leverage is desired are usually provided with long handles in order that the leverage may be increased. These long handles however must move through a considerable distance and are not adaptable to be used by a single hand. Further, in devices of this type the relative position of the actuating members where grasped vary throughout the stroke of the operating jaws as no adjustment is provided.

One of the objects of this invention is to provide actuating members which may be movable toward or from each other in a normal way but when resistance is encountered a multiplication of the leverage will be permitted.

Another object of the invention is to provide relatively movable actuating members one of which has a movable part carried by it permitting adjustment so that the spacing between the members may be occasioned to be substantially the same through operation on the work.

Another object of the invention is to provide a ratchet type arrangement for moving a pair of actuating members together so that each time the ratchet moves relative to the ratch an increased leverage will be provided.

Another object of the invention is to provide a compound multiplication of force applied on the two relatively movable manual members by reason of shifting of the point of engagement

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along one of the members by a ratchet type mechanism so that the leverage may be continually increased as a new grip is provided.

Another object of this invention is to provide 5 relatively movable parts with resilient means which moves these parts toward their desired position without special attention from the operator.

With these and other objects in view, the invention consists of certain novel features of construction, as will be more fully described and particularly pointed out in the appended claims.

In the accompanying drawing:

Fig. 1 is a top plan view of this invention applied to a pair of pliers;

Fig. 2 is a view similar to Fig. 1 showing the pliers in open position;

Fig. 3 is an edge view of the pliers;

Fig. 4 is a section on line 4-4 of Fig. 1.

20 With reference to the drawing which illustrates the invention as applied to pliers in which the movable members are pivoted, 10 designates one member and 11 the other member pivoted thereon as at 12 so that the jaw 13 of the member 10 25 will move therewith while the jaw 14 of the member 11 will move with this member as the actuating members 10 and 11 are relatively swung about the pivot. Gripping noses 15 and 16 are provided on these jaws while cutting edges 30 17 and 18 are also formed on the jaws. Other cutters are provided as at 19 and 20 which have a known formation and function.

The actuating members 10 and 11 on the opposite side of the pivot consists of handles. 35 Handle 22 is of the same piece of material as jaw 13 or a piece integrally united with the jaw 13 and carries a resilient leaf spring 23 riveted to the handle or actuating member as at 24 which bears on the opposite member 11 and tends to 40 open the actuating members to move them away from each other, which movement also serves to open the jaws 13 and 14 which are actuated by these members.

The other handle includes a lever 25 pivoted 45 as at 26 to the portion 21 of member 11 to rock relative to the actuating member 11. The portion 27 serves as a handle or gripping portion opposite the handle 22 while the portion 28 on the opposite side of the pivot 26 is of shorter extent providing a shorter leverage arm and serves to 50 multiply any force applied to the handle portion 27 of the lever as it swings about the pivot 26. A leaf spring 29 tends to swing the lever 25 about the pivot 26 while the short leverage arm 28 serves to engage the portion 21 limiting the move-

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ment of the lever about the pivot in this direction.

A yoke designated 30 consists of bridging portion 32 (see Fig. 4) and arms 31 which are pivoted by the pin 33 to the short arm 28 of the lever 25 so that the arms 31 extend either side of the actuating members 10 and 11 while the bridge portion 32 is provided with a ratchet 34 conveniently formed by bringing the stock of the bridge portion 32 to a chisel edge as shown in dotted lines in Fig. 1. A spring 35 which encircles the pin 32 engages the yoke 30 and also the lever arm 28 and tends to swing the yoke about the pivot 33 in a counterclockwise direction as shown in Figs. 1 and 2 through the arc x at radius y .

A ratch is conveniently formed for the ratchet tooth 34 by a block 36 being secured to the actuating member 10 and formed with a plurality of notches or teeth 37 formed along its edge to serve as a ratch. It will be apparent that when the ratchet 34 is in the position shown in Fig. 2 pressure will be applied on the actuating member 10 through a moment arm a while if the tooth or ratchet 34 engages the ratch at a point 38 the moment arm on the actuating member 10 would be the distance represented by b from the pivot. Thus, as the yoke 30 moves along the actuating member 10 the leverage arm through which force is applied on this member 10 is increased and thus any force upon the jaws such as 13 and 14 is multiplied in this manner.

In operation, assuming the tool to be in the position shown in Fig. 2, work may be placed between the jaws 13 and 14 such for instance as to be engaged in the cutting edges 17 and 18. The handles 22 and 27 may be grasped in the hand and the hand closed to move these handles toward each other. Spring 29 will be of sufficient strength so that at first the lever 25 and portion 21 will move as one. However, as resistance is encountered upon the edges 17 and 18 coming in contact with the work, spring 29 will then commence to yield and the handle or arm portion 27 of lever 25 will move relative to the portion 21 by the lever 25 swinging about the pivot 26, thus moving the pivot 33 on the arm portion 28 of the lever to apply pressure through the yoke 30 at the point where the ratchet 34 engages the ratch, such for instance as at distance a in Fig. 2. The force applied at the edges 17 and 18 will thus be multiplied by the ratio of the distance from the point of application of pressure on the handle or arm 27 to the pivot 26 and from the pivot to the point 33 on arm 28 and further multiplied by the ratio of the moment arm a to the distance from the pivot 12 to the point of resistance on jaws 17, 18. Assuming that the cutting jaws move into the work a new grip may then be desired. Pressure will be released and a spring 29 will tend to swing the lever 25 counterclockwise which will release the yoke and immediately the spring 35 will swing the yoke downwardly along the ratch so as to provide another grip which will be at a greater distance from the pivot 12. The pressure

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may then be again applied to the handle 27 and a force with increased leverage due to the new position of the ratchet 34 upon the ratch will increase the leverage arm a and a further cut may be made in the work. Release may then occur on the handle portion 27 when the yoke will be moved further down the ratch where its leverage will be again increased and so forth until the jaws have worked their way through the work to be cut.

It will be apparent from the above that this arrangement may be applied to any actuating members which are intended to be moved toward each other and transmit such movement to do work. It is particularly adapted for an arrangement where the work acted upon will permit increasingly additional movement of the members toward each other in the completion of the operation to be performed, but may be variously applied as will be readily apparent to any skilled mechanic.

I claim:

1. In a device of the class described, a pair of members having work engaging jaws at one end thereof, means connecting said members together for movement toward and from each other, one of said members being shorter than the other member, a lever, a pivot mounting said lever intermediate its ends on the shorter member and extending from the shorter member into opposed relation with the longer member to form a hand grip on one side of the pivot and a power arm on the other side of the pivot, resilient means engaging the lever and shorter member and holding said lever so as to move as one with the shorter member until a predetermined resistance is met whereupon the lever will then swing on its pivot, means for transmitting movement of said lever about its pivot to said longer member including a link extending between said power arm and longer member and pivoted to one of them and including means having steps fixed to the other of them and so arranged that said link will engage one of said steps for transmitting movement from said arm to said longer member.

2. A device as set forth in claim 1 wherein said steps are fixed to said longer member and said pivot is on said power arm.

3. A device as set forth in claim 1 wherein said steps are successively engaged by said link as said members are closed against a resistance sufficient to swing said lever relative to said shorter member.

4. A device as set forth in claim 1 wherein the members are pivotally related.

5. A device as set forth in claim 1 wherein the link member is a yoke embracing both members.

6. A device as set forth in claim 1 wherein a spring is on the link acting at the pivot between it and the lever.

7. A device as set forth in claim 1 wherein said step means comprise steps on the long member and a pawl on the link.

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