March 23, 1971 S. M. JURAS 3,572,192

SQUEEZE TYPE TOOLS

Filed May 10, 1968 2 Sheets-Sheet 1

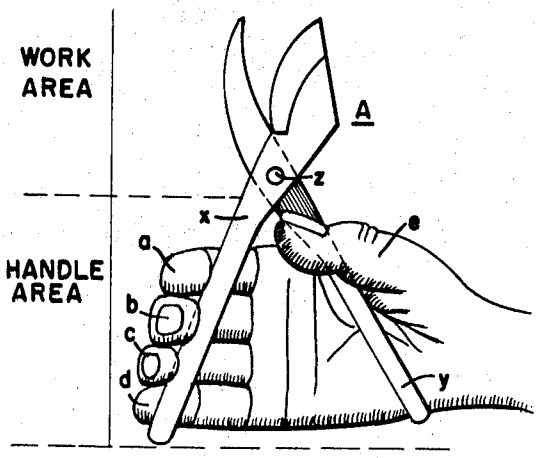

FIG. 1.

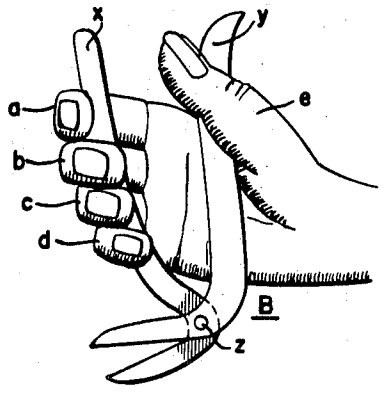

FIG. 2.

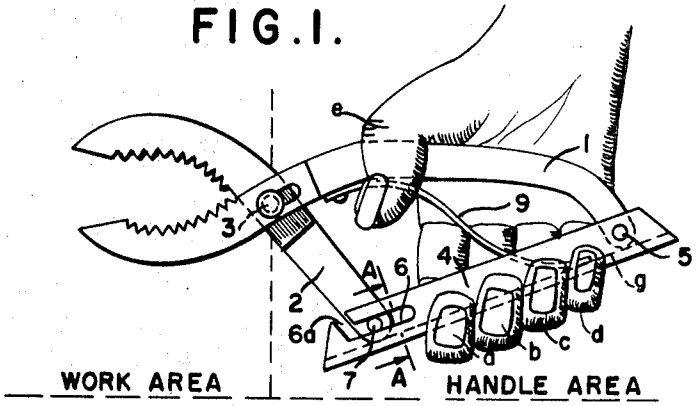

FIG. 3.

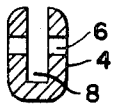

FIG. 3a.

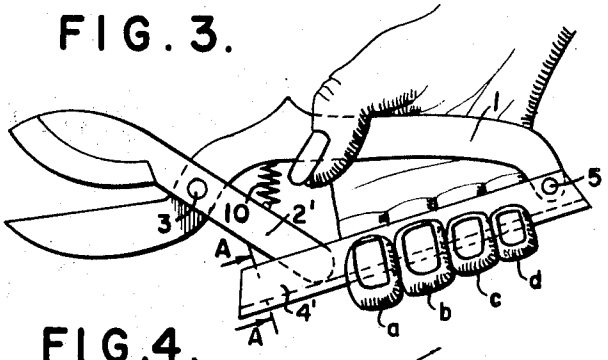

FIG. 4.

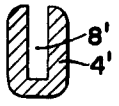

FIG. 4a

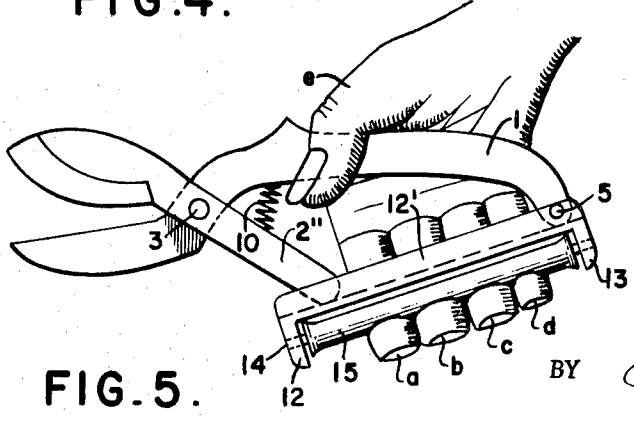

FIG. 5.

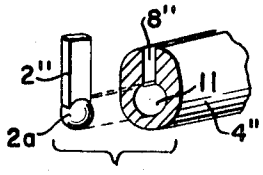

FIG. 5a.

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SQUEEZE TYPE TOOLS

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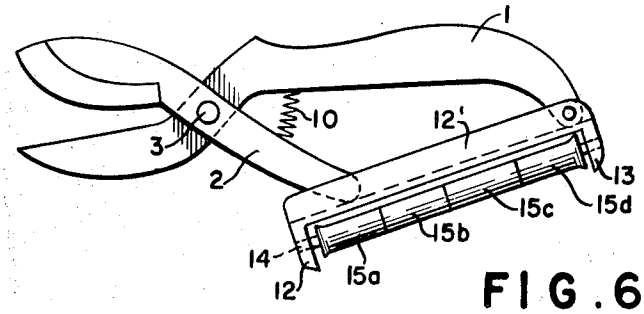

FIG. 6.

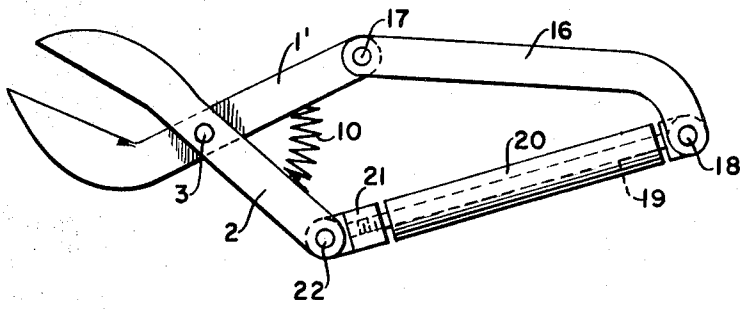

FIG. 7.

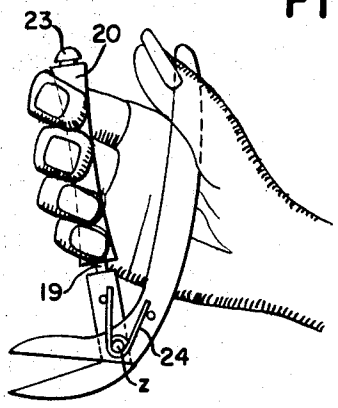

FIG. 8.

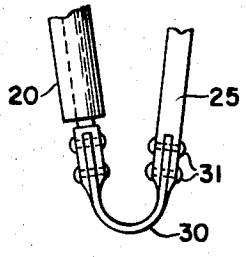

FIG. 10.

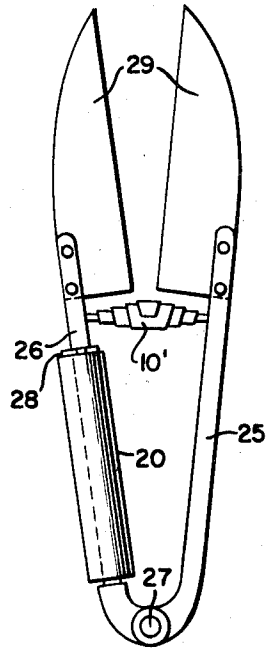

FIG. 9.

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3,572,192

SQUEEZE TYPE TOOLS

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Int. Cl. B25b 7/12
U.S. Cl. 81—383.5 10 Claims

ABSTRACT OF THE DISCLOSURE

A squeeze type tool having a pair of arms pivoted at a point intermediate their ends, so that a work area lies on one side of the pivot and a handle area lies on the other. One of the arms is relatively long when compared to the other and both arms cooperate with a third arm having one end pivotally connected to the extreme end of the long arm and having its other end slidably engaged with the short arm. This linkage permits the work area to be in full view of the operator when the tool is grasped in a natural manner with the thumb uppermost on the long arm and the fingers curling in efficient sequence on the third arm.

This invention relates to hand tools, and more particularly to tools of the lever-action squeeze type, operated by one hand, such as pruning shears, sheet metal shears ("tin snips"), pliers, punches, rivet setters, wire or strap cutters or pullers, etc.

The invention is concerned not with mechanical constructions designed to increase or multiply the force applied to the work area of such tools, but rather with the efficient transfer of energy from the hand to the tool.

Currently-used tools of the type referred to require the human hand to conform to the shapes and movements of the tools, which shapes and movements are unnatural, thus resulting in discomfort, inefficiency and tiring of the hand.

One of the objects of the invention is to provide a handle arrangement for such tools which allows a maximum amount of power to be derived from a hand squeezing action, and to do so with a minimum of discomfort and strain on the hand.

I accomplish this by providing interfaces, such as handles, between the tools and the human hand which conform most closely to the patterns of natural human behavior. In this way, energy transfer between humans and tools becomes most efficient. Moreover, I provide such an arrangement of handles which is both statically and dynamically satisfactory.

One reason for the inefficient arrangement of handles in present tools is the desirablility of so locating the work area relative to the handles in such position that it is in full sight, so that the operator can see what he is doing. It would be possible to reverse the position of the conventional handles relative to the hand so as to provide a much greater efficiency in the transfer of energy from the hand to the tool, but this would result in the work area being hidden from the operator, so that he would have to work blindly. However, in cases where it is not necessary for the operator to see the work, this reversal of position can be advantageously employed.

Otherwise, another object of the invention is to devise an arrangement of handle lever linkages so designed as to produce a highly efficient transfer of energy while at the same time maintaining the work area in full view of the operator at all times.

In conventional tools requiring a relatively large amount of power, especially where such tools are used more or less continuously, it is a common experience not only for the hand to become tired, but also for the fingers to become worn, blistered or calloused, due to

their rubbing against the handle linkage, this giving rise to serious discomfort. Still another object of the invention is to provide suitable anti-friction means to protect the fingers from such discomfort and damage.

In order that the invention may be clearly understood, reference is had to the accompanying drawings, forming part of this specification, and in which:

FIG. 1 is a side elevation of a conventional pair of pruning shears, illustrating the manner in which such a tool is ordinarily held in the hand;

FIG. 2 is a similar view of a slightly different type of tool, not pruning shears, but showing the position of the hand reversed as compared with FIG. 1;

FIG. 3 is a side elevation of a plier type tool embodying one form of my novel handle or linkage arrangement;

FIG. 3A is a cross-section substantially on the line A—A of FIG. 3, looking in the direction of the arrows;

FIG. 4 is a view similar to FIG. 3, but showing a slightly modified construction of handle or linkage;

FIG. 4A is a cross-section substantially on the line A—A of FIG. 4, looking in the direction of the arrows;

FIG. 5 is a view similar to FIG. 4, but illustrating one form of anti-friction means which I employ for protecting the fingers from injury;

FIG. 5A is a fragmentary perspective view, partly in section, showing still another form of linkage connection which I may employ in place of those shown in FIGS. 3 and 4;

FIG. 6 is a view similar to FIG. 5, but showing a modified construction of anti-friction means, the representation of the hand being omitted;

FIG. 7 is a side elevation of a plier type tool having a four-arm linkage instead of three, as shown in FIGS. 3, 4 and 5, and illustrating a still further modified arrangement of anti-friction means;

FIG. 8 is a view generally similar to FIG. 2, illustrating a tool used for removing surgical casts, and showing how my novel anti-friction means can be applied to a tool of this type;

FIG. 9 is a side elevation of a form of sheep shears or grass shears fitted with anti-friction means similar to that of FIG. 8; and

FIG. 10 is a fragmentary view of a modified construction of such shears in which the arms are movably connected for relative angular movement by means of a bow-spring instead of a pivot.

A study made by me of the natural behavior of the human hand shows that, during a closing or squeezing operation, the little finger tends to begin to curl first, followed by the third or ring finger, the middle finger, and then the first or index finger, in sequence, and any attempt to operate a hand-squeeze-type tool with a different sequence of finger action gives rise to inefficiency and an unnatural strain on the hand and fingers.

Referring to the drawings in detail, FIG. 1 illustrates the usual method of grasping a squeeze type tool, such as conventional pruning shears A. This tool comprises two members x and y connected at a point intermediate their ends by a pivot z. Spring means (not shown) are provided for normally holding the tool in open position, with the members at a maximum angle to each other. I will refer to the area on one side of the pivot as the "work area," and to the area on the opposite side of the pivot as the "handle area." In most cases it is necessary for the work area to be in full view of the operator. Hence, the usual method of grasping shown in FIG. 1. Note that the little finger d is usually not long enough to get a grip on the handle x because it is located at a point where the handles are farthest apart. Hence, it cannot have any effective initial curling action.

Altogether, the method of FIG. 1 is an extremely inefficient and unnatural arrangement, resulting in tiring of the hand, especially if used at frequent intervals.

In FIG. 2, I have illustrated the tool which is of a slightly different kind, reversed with respect to the hand. In this view it will be seen that the little finger *d* engages the handle *x* at a point near the pivot *z* and hence is able to curl around the handle in a natural manner, while the other fingers *a*, *b*, and *c* engage the handle at greater distances from the pivot, and at such distances which conform closely with the natural geometry of the hand fingers. Therefore, the method of grasping the tool as shown in this FIG. 2 is a much more natural and efficient one. The only trouble is that the work area is completely obscured from view by the operator's hand. In most cases this is unsatisfactory. The particular tool illustrated in FIG. 2 is of the type designed to remove surgical plaster casts, and for this purpose the arrangement shown in FIG. 2 may be acceptable.

In FIG. 3 is illustrated the basically novel linkage which I have devised. This linkage permits the work area to be in full view of the operator when the tool is grasped in a natural manner with the thumb uppermost, while at the same time allowing the fingers to curl in their natural, efficient sequence.

I achieve this by utilizing an additional arm or lever, so that my improved tool employs three arms, as distinguished from the two-arm type discussed above.

The tool shown in FIG. 3 comprises a pair of arms **1** and **2**, pivoted together at **3**, at a point intermediate their ends, so that the work area lies on one side of this pivot, and the handle area on the other side, as before. However, in my improved design, one of the arms **2** is relatively long, and when the tool is grasped in a natural manner, the handle portion of this long arm **1** becomes the "thumb arm," i.e., it fits under the thumb **3** adjacent the palm of the hand, as shown in the drawings.

My improved linkage, illustrated in FIG. 3 also includes a third or "finger arm" **4**, one end of which is pivoted at **5** to the extreme end of the long arm **1**. The other end of this "finger arm" is constructed to have a sliding connection with the extreme end of the short arm or lever **2**.

One way of doing this is to form a groove or channel **8** extending lengthwise the arm **4** and to provide a cross slot **6** extending transversely through this channel, and having an open end **6***a*. A cross pin **7**, carried by the arm **2** extends through and slides freely in this slot **6**. Means are provided for urging the arms to the open position illustrated, such means being shown as comprising a leaf spring **9** having one end rigidly secured to the inside of the arm **1** while the other end runs freely in the channel **8**.

In FIG. 4, I have illustrated a similar three piece linkage, the main difference being that it shows a slightly different method for providing the sliding connection. In this modification the end of the short arm **2'** has no cross pin but is rounded, and runs freely in the groove or channel **8'** in the arm **4'**. Also, a compression spring **10** is mounted between the arms **1** and **2'**, to urge them apart.

In FIG. 5A I have shown a still further slight modification in which the arm **4''** is formed with a groove **8''**, having at its inner side a cylindrical channel **11** in which slides a ball **2***a* carried by the short lever arm **2''**.

I have found that when a squeeze type tool of the kind referred to is used continuously or at frequent intervals, especially where the work load is heavy, the fingers often become painfully worn or blistered. This is due to the friction of the fingers sliding around the finger arm as the squeezing action takes place.

In my improved design, this is avoided by providing anti-friction means on the finger arm. One form of such anti-friction means is shown in FIG. 5. In this figure the finger arm is designated **12'** and has at its ends a pair of laterally projecting lugs **12** and **13**, between which extends a shaft **14**. This shaft is spaced from but parallel with the

axis of the finger arm **12'**, and mounted on such shaft is a roller **15**, adapted to be engaged by the fingers. It will be noted that this roller is of sufficient length to accommodate all four fingers. As the squeezing action takes place, the roller rotates under the fingers as they progressively change their position relative to the finger arm, thus protecting them from rubbing or dragging on the finger arm in the absence of the anti-friction roller.

FIG. 6 shows an arrangement similar to FIG. 5, except that, in place of a single roller **15**, there is provided a roller made up of a series of independently rotatable aligned sections, **15***a*, **15***b*, **15***c* and **15***d*, one for each finger. These sections may be made substantially cylindrical, as shown, or each may have a concave surface, as desired.

In FIG. 7 I have illustrated the application of the roller feature to a somewhat different type tool, namely a tool having a linkage made up of four arms, **1'**, **2**, **16** and **20**, the arms **1'** and **16** being joined by a pivot **17** and the arm **20** being pivoted at one end at **18** to the arm **16**, and at the other end, at **22**, to the arm **2**. This four-arm tool is of the same general style as shown, for example, in Pat. No. 2,749,615, to Griffon, but in FIG. 7, as also in Griffon, there is no sliding connection between any of the arms, this sliding connection being one of the characteristics of the novel three-arm linkage of my improved design shown in FIGS. 3 to 6.

Referring to the details of construction of FIG. 7, a shaft **19** is secured at one end to the pivot **18**, and at the other end to a socket piece **21**. In assembly the shaft **19** is first connected with the pivot **18**, then the roller **20** is slipped over the shaft, then the socket piece screwed on to the end of the shaft, and finally the socket piece is secured to the arm **2** by means of the pivot **22**.

It will be particularly noted that in FIG. 7 (and in other figures hereinafter referred to) the roller is mounted to rotate about an axis coincident with that of the finger arm, instead of about an axis spaced from that of the arm. Both arrangements lie within the scope of the invention.

In FIG. 8 I have shown the roller feature applied to a conventional two-arm lever tool such as the plaster cast remover illustrated in FIG. 2. Here, the finger arm comprises a shaft **19**, as before on which is rotatably mounted the roller **20**. The roller may be secured to the shaft by means of a screw **23**. Spring means **24**, for urging the arms to open position, may be associated with the pivot *z*.

In FIG. 9 I have illustrated still another form of tool to which the roller feature may be applied. This is the sheep shear or grass shear type of tool. It comprises a thumb arm **25** and a finger arm **26**, united at their ends by a pivot **27**. At their free ends the arms have relatively wide and long blades **29** secured thereto, as by riveting, and they are urged to open position by a conventional type of spring **10'**. The roller **20** is mounted to rotate on the finger arm **26**. One method of assembly is to slip the roller over the arm shaft before the blade **29** is attached, and then secure it in position by means of a snap ring **28** fitting into a circumferential groove in the shaft.

Finally, I may make the type of shear shown in FIG. 9 by substituting for the pivot **27** a bow spring **30**, as illustrated in FIG. 10, secured to the arms as by rivets **31**. The roller **20** may be applied to the finger arm in the same manner as just described.

This bow spring arrangement affords connecting means so that the arms are capable of relative angular movement when squeezed.

It will be noted that in all modifications the arms of the tool are normally disposed at an angle to each other and have spring means urging them to open position, and that the anti-friction means are provided on that one of the angularly disposed arms which is engaged by the fingers, as distinguished from the thumb, when the tool is grasped in a natural manner.

What I claim is:

1. A squeeze type tool comprising two lever arms pivoted together at a point intermediate their ends, one arm being relatively long and the other relatively short, a third arm pivoted at one end to the end of said long arm remote from said first mentioned pivot, a sliding connection between the end of said relatively short arm and said third arm, and spring means tending to urge said arms apart.

2. A squeeze type tool in accordance with claim 1 in which the area at one side of the first mentioned pivot constitutes the work area, while the area at the opposite side of said pivot constitutes the handle area, the handle portion of the relatively long lever arm constituting the "thumb" arm, which is normally uppermost when the tool is grasped in a natural manner, while the third arm constitutes the "finger" arm, which is normally below the "thumb" arm, whereby the work area is normally in full sight of the operator.

3. A squeeze type tool in accordance with claim 1, in which the relatively long arm has a handle portion constructed to be received under the base of the thumb when the tool is grasped in a natural manner, while the third arm constitutes the finger arm, the arrangement being such that when so grasped in a natural manner the little finger engages said arm at a point which is closer to the pivot connecting the third and long arms than are the other fingers.

4. A squeeze type tool in accordance with claim 1 in which the sliding connection comprises a channel formed in and extending longitudinally of said third arm, in which channel the end of said short arm travels as the arms are moved on their pivots.

5. A squeeze type tool having a thumb arm and a finger arm normally disposed at an angle to each other and connected so as to be capable of relative angular movement when the arms are squeezed, and an anti-friction roller mounted on the finger arm to rotate about an axis parallel with said finger arm and positioned to be engaged by at least one finger.

6. A squeeze type tool in accordance with claim 5 in which a plurality of anti-friction rollers, arranged in end-to-end alignment are mounted on the finger arm to rotate about an axis parallel therewith, and positioned to be engaged by the fingers.

7. A squeeze type tool in accordance with claim 5, in which the arms are pivotally connected, spring means tending to urge said arm apart, and an anti-friction roller mounted on said finger arm to rotate about an axis parallel therewith, and positioned to be engaged by at least one finger.

8. A squeeze type tool in accordance with claim 5 in which the anti-friction roller is mounted to rotate about an axis parallel with but spaced from that of said finger arm.

9. A squeeze type tool in accordance with claim 6 in which said roller is made up of four separate, independently rotatable aligned sections, one for each finger.

10. A squeeze type tool in accordance with claim 1 in which an anti-friction roller is mounted on said third arm to rotate about an axis parallel with but spaced from that of said third arm.

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U.S. Cl. X.R.

30—189, 193, 251, 252; 81—415