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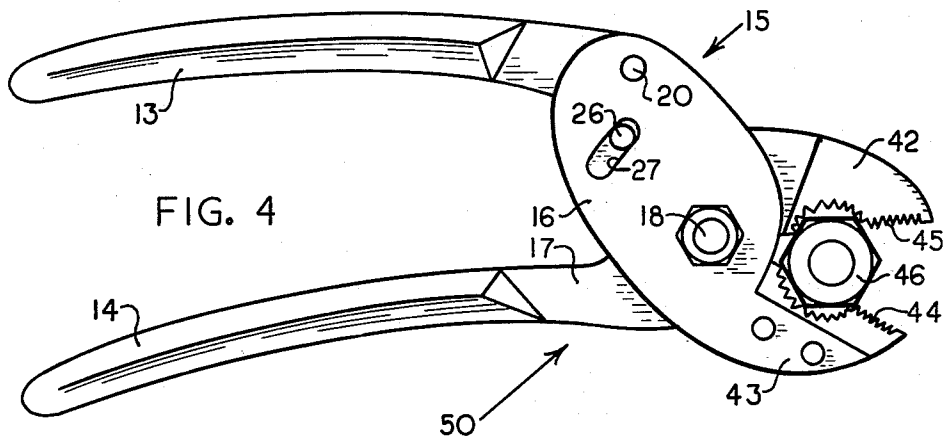
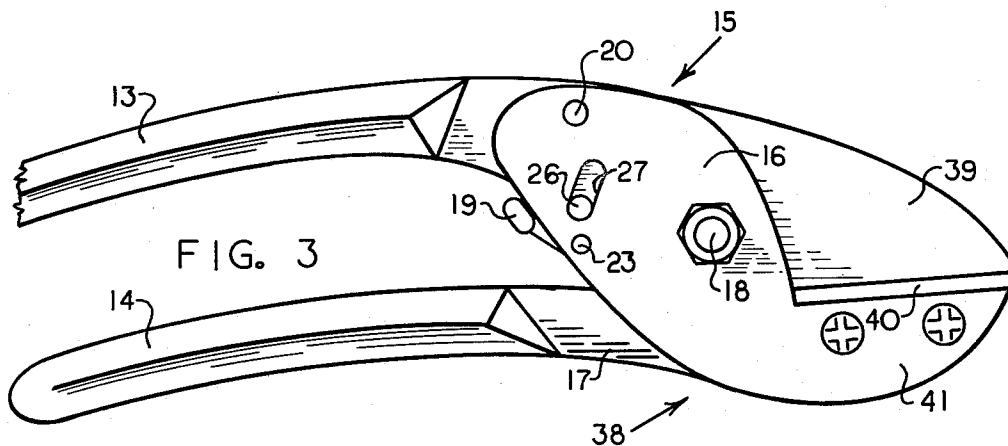
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POWER FINGERS

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2 Sheets-Sheet 2



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POWER PINCERS

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This invention relates generally to improvements in pincers type tools, and more particularly concerns the increasing of mechanical advantages in effect during jaw actuation by handle members.

One problem solved by the present invention concerns the difficulty of cutting or pruning thick branches with short handled pruning shears. Such shears have limited mechanical advantage due to their short handles, whereas they do have the desirable feature of one-hand operation or actuation leading to their preference by many users over the longer handled shears requiring actuation by two hands. Attempts to solve this problem have not, to my knowledge, embodied the novel and unusually desirable features and results of the pincers tool, the provision of which comprises a major object of the present invention.

In a broader sense it is an object of the invention to provide in a pincers type tool a novel combination of elements comprising a pair of jaws and means including a pair of handle members and a transmission for actuating the jaws with mechanical advantage in response to handle actuation, and for increasing said mechanical advantage during progressive closing of the jaws. Typically, said means also includes a transmission control having different positions between which the control is movable during progressive closing of the jaws, one handle remaining integral with one jaw in said different control positions. The other handle is integral with the other jaw in a first control position and is mounted for rotation with respect to said other jaw and toward the one handle when the control is in second position, to increase said mechanical advantage.

More specifically, the transmission includes a cam rotatable by the mentioned other handle in the control second position, and a follower mounted for both rotation and bodily movement in response to cam rotation thereby to transmit force acting to close the jaws with increased mechanical advantage.

Other objects of the invention include the provision of further novel transmission structure wherein a pair of transmission sections have pivoted interconnection, one section integral with one jaw carrying a series of ratchet shoulders selectively engageable by the follower to transmit jaw closing force as the handle members are repeatedly closed together and released during progressive closing of the jaws. Accordingly, the handles may be closed together and released several times during the course of cutting a thick branch, resulting in the incorporation of very high mechanical advantage in a short handled pincer type tool.

Finally, the principles of the invention are applicable to pincers type tools other than pruning shears, and such as pliers, tin snips, wire cutters, metal crimping devices or other grippers, giving them the ability to grip a nut with much greater mechanical advantage than conventional pliers of the same size, and resulting in nonslip action where conventional pliers would slip.

These and other objects and features of the invention, as well as the details of an illustrative embodiment, will be more fully understood from the following detailed description of the drawings.

FIGURE 1 is a side elevation showing the details of the invention as applied to pruning shears in the jaws closed condition and the handles locked in normal configuration;

FIGURE 2 is a view like FIG. 1 with the shears shown in jaws open condition and handles in a configuration

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wherein force is being transmitted with increased mechanical advantage to the jaws;

FIGURE 3 is an external side elevation of shears housing the novel transmission in a limited area in such a way as not to increase the size of the shears; and

FIGURE 4 is an external side elevation of pliers to which the principles of the invention have been applied.

Referring first to FIGURES 1 and 2, the pruning shears 10 includes a pair of jaws 11 and 12 and means including a pair of handle members 13 and 14 and a transmission, generally indicated at 15, for actuating the jaws with mechanical advantage in response to handle actuation. As will be brought out, the transmission functions to increase the mechanical advantage during progressive closing of the jaws.

The transmission 15 may be considered as including intermediate sections of the pincers levers, as indicated at 16 and 17, these sections having pivotal interconnection at 18. The section 17 is seen to integrally interconnect handle 14 with jaw 11, whereas the section 16 is integral with jaw 12 but mounts the other handle 13 for rotation relative thereto.

A transmission control, typically in the form of a lever, is provided at 19 to block and unblock rotation of the handle 13 about pivot 20. In the position shown in FIG. 1, the control shoulder 21 engages the shoulder 22 of handle 13, thereby to block such handle rotation relative to jaw 12, whereas in the released position shown in FIG. 2, the control unblocks said handle rotation. The control is typically pivoted as at 23 to section 16, in order to swing between its blocking and unblocking positions in response to finger manipulation during use of the shears.

The transmission 15 typically includes a cam 24 rotatable by handle 13 when the control 19 is in unblocking position, and a cam follower 25 mounted for rotation and bodily movement in response to cam rotation to transmit force acting to close the jaws 11 and 12 with increased mechanical advantage. As illustrated, the follower carries a pivot lug or pin 26 about which the follower body may rotate under imposed constraints, the lug being received in a guide slot 27 cut in transmission section 16. Lug 26 may also move bodily or translate along the guide slot 27 under imposed constraints, as will appear.

One of such constraints comprises a compression spring 28 carried by section 16 and received between follower shoulder 29 and a stop 30 integral with section 16. Another constraint comprises the cam 24 which engages follower shoulder 31. A third constraint comprises ratchet shoulders or teeth 32 carried by section 17 to be selectively engaged by the follower shoulder 33 to transmit jaw closing force as the handle members 13 and 14 are repeatedly closed together and released during progressive closing movement of the jaws. In this regard, as the handle members are released, they are typically spread apart by expansion of spring 28.

In operation, the shear jaws are opened to straddle a branch limb with handle members initially in the FIG. 1 configuration. If the limb is difficult to cut, the control 19 is released and the handles gripped together to shift into the multiple mechanical advantage configuration, as seen in FIG. 2. As handle member 13 closes toward member 14, the cam 24 actuates the follower 25 to pivot and translate, whereby its shoulder 33 engages the first of the series of teeth 32, transmitting jaw closing force with increased mechanical advantage.

When handle 13 has closed sufficiently toward handle 14 and the limb 36 remains only partially cut through, the handles are released to spread and then regripped, causing the follower shoulder 33 to ratchet into engagement with the next tooth of the series 32. This cycle is repeated until the thick limb is completely cut, an operation ac-

complished easily and quickly by short handled shears, through use of the present invention.

FIG. 3 shows the invention as applied to pruning shears 38 of slightly different jaw configuration, the cutting edge of jaw 39 being received against an anvil plate 40 of jaw 41. The reverse side of a transmission 15a is illustrated, it being the same as the transmission 15 of FIGS. 1 and 2 and therefore bears the same identifying numerals. Handle members 13 and 14 are also the same.

The same transmission and handle members are shown in FIG. 4 as applied to a pliers 50 having jaws 42 and 43. The latter are serrated at 44 and 45 for gripping a nut 46 with increased mechanical advantage.

I claim:

1. In a pincers type tool, a pair of jaws, and means including a pair of handle members and a transmission for actuating the jaws with mechanical advantage in response to handle actuation, said means also including a transmission control having different positions between which the control is movable during progressive closing of the jaws to increase said mechanical advantage, one handle remaining integral with one jaw in said different control positions, and the other handle being connected with the other jaw in a first control position and being mounted for rotation with respect to said other jaw and toward said one handle when the control is in a second position, the control in said first position blocking relative movement of the other handle and said other jaw and the control in said second position unblocking relative movement of the other handle and other jaw.

2. The invention as defined in claim 1 in which said transmission includes sections having pivoted interconnection, one section integrally interconnecting said one handle member with said one jaw, and another section being integral with the other jaw and mounting the other handle member for rotation relative thereto, the trans-

mission including a cam rotatable by said other handle in said control second position and a follower mounted for rotation and bodily movement relative to the other handle and said other section in response to cam rotation to transmit force acting to close said jaws with increased mechanical advantage.

3. The invention as defined in claim 2 in which said one section carries a series of ratchet shoulders selectively engageable by the follower to transmit jaw closing force as said handle members are repeatedly closed together and released during progressive closing of the jaws.

4. The invention as defined in claim 3 in which said other section has a guide shoulder for guiding said bodily movement of the follower to engage said ratchet shoulders as the follower rotates in response to cam rotation.

5. The invention as defined in claim 3 including yieldable means urging the follower into engagement with said rotating cam when the control is in said second position, and holding the follower out of engagement with said ratchet shoulders when the control is in said first position.

6. The invention as defined in claim 3 in which said jaws have cutting edges.

7. The invention as defined in claim 3 in which said jaws have work gripping edges.

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