

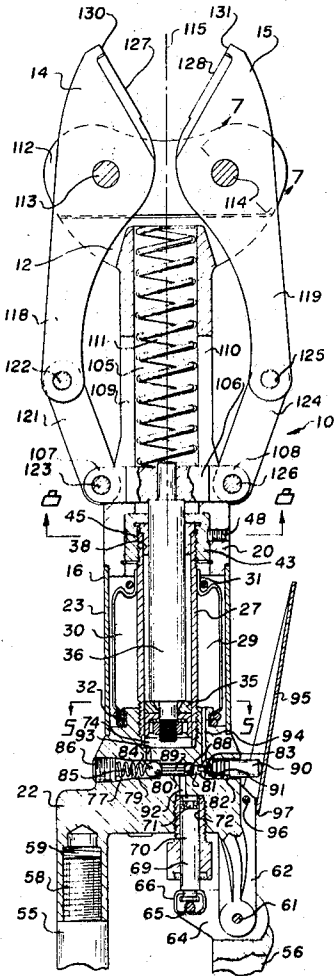
[54] **MANUAL HYDRAULICALLY-OPERATED TOOLS**
[72] Inventor: **Gerard Van Schaik**, Delta, British Columbia, Canada
[73] Assignee: **Dynamic Tools Ltd.**, Vancouver, British Columbia, Canada
[22] Filed: **Dec. 28, 1970**
[21] Appl. No.: **101,830**
[52] U.S. Cl. **81/301, 30/180**
[51] Int. Cl. **B25b 7/22**
[58] Field of Search **30/180, 228; 81/301; 29/252; 60/52 HA**

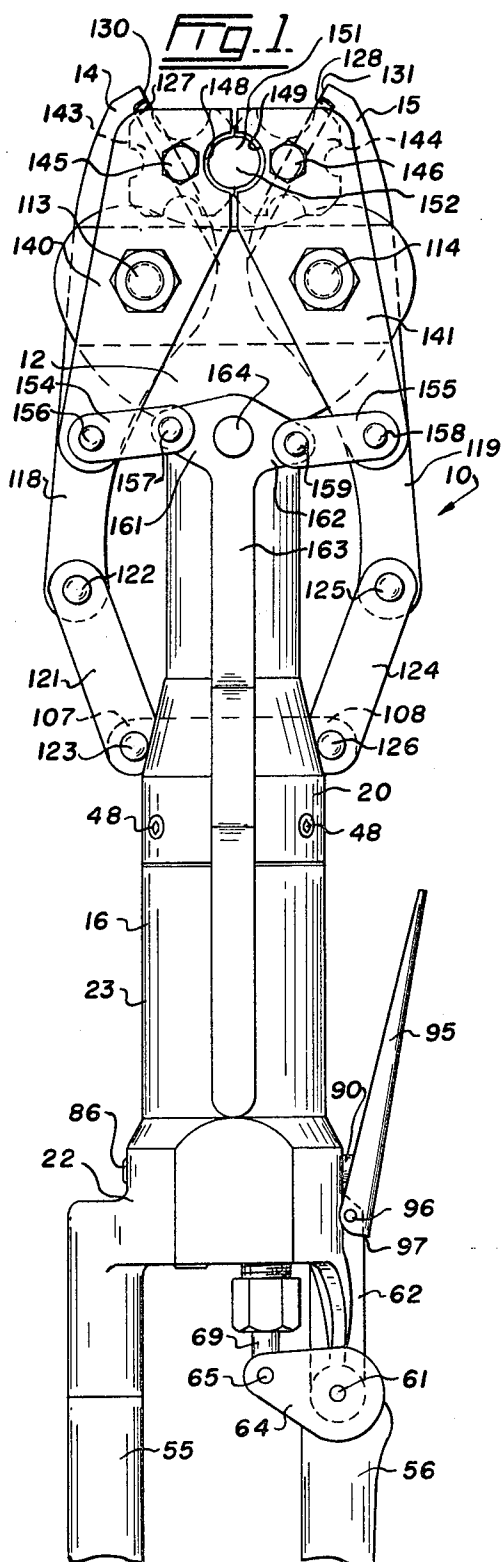
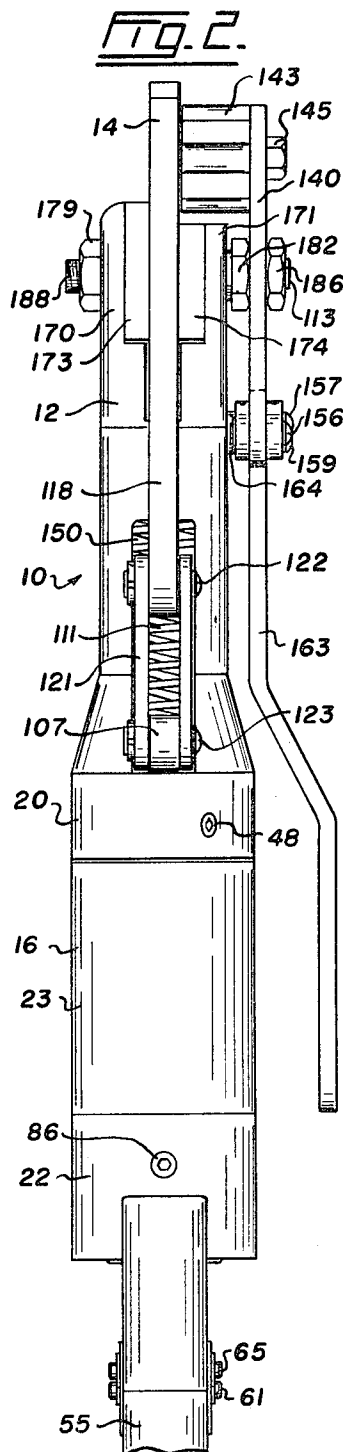
[56] **References Cited**
UNITED STATES PATENTS
2,729,063 1/1956 Hoadley **81/301 X**
2,791,028 5/1957 Bidin **30/180**
2,869,407 1/1959 Swanson **81/301 X**

3,030,838 4/1962 Klingler **81/301 X**
3,269,223 8/1966 Pawloski **81/301 X**
Primary Examiner—Granville Y. Custer, Jr.
Assistant Examiner—J. C. Peters
Attorney—Fetherstonhaugh & Co.

[57] **ABSTRACT**
Hydraulically-operated tools for different purposes, and particularly for cutting bars, multi-strand cables, and the like, and including a pair of operating jaws which are operated through a linkage by a hydraulic system and cylinder unit. Handles for the tool are used to operate the piston and cylinder unit as a pump. The tool when made for cutting includes gripping means for firmly holding the article to be cut in correct relationship to the operating jaws. Said jaws are provided with cutting edges, and means is provided for keeping the cutting edges in correct alignment and for preventing the edges from coming together during a cutting action.

13 Claims, 12 Drawing Figures





INVENTOR
GERARD VAN SCHAIK
BY
Jedherstonhaugh & Co.
ATTORNEYS

Fig. 4.

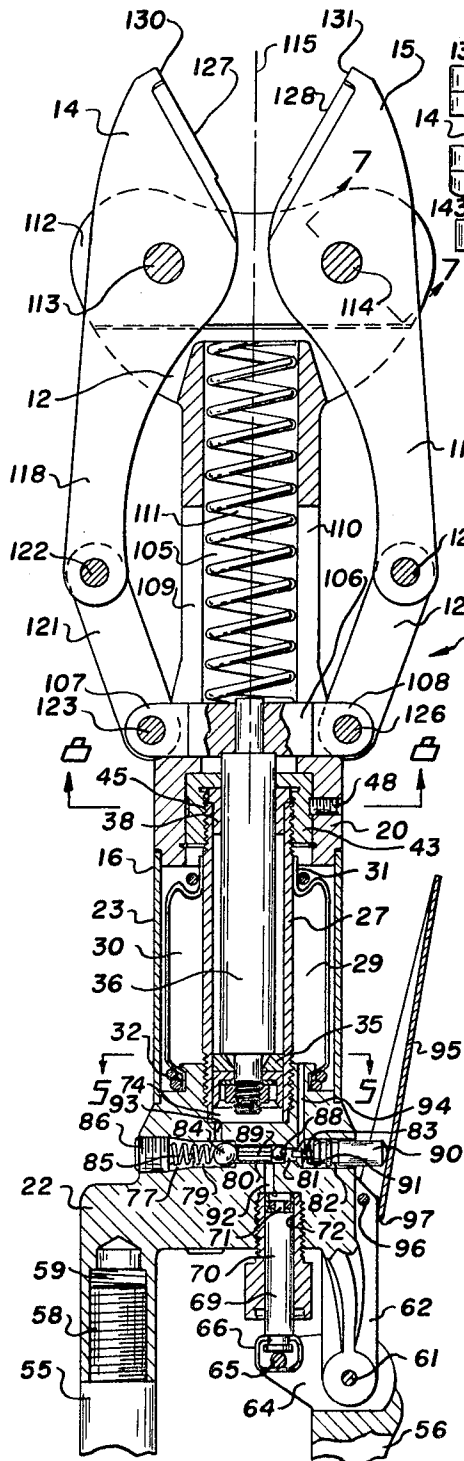


Fig. 3.

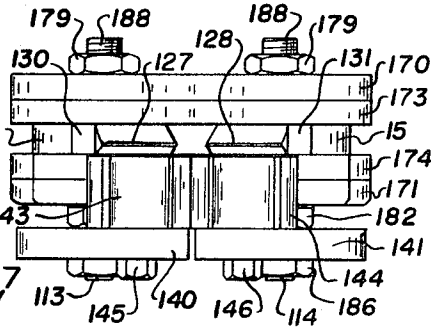


Fig. 5.

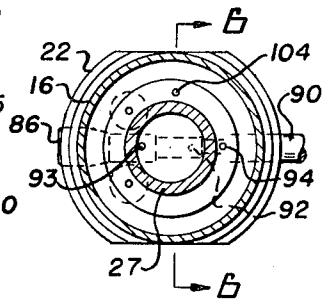
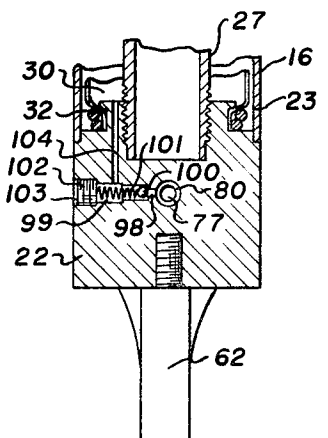


Fig. 6.

INVENTOR
GERARD VAN SCHAIK
BY
Fetherstonhaugh & Co.
ATTORNEYS

Fig. 7.

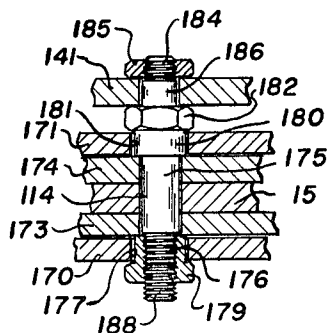


Fig. 8.

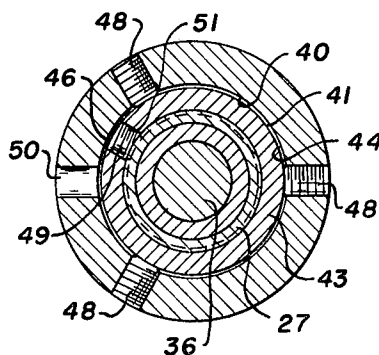


Fig. 9.

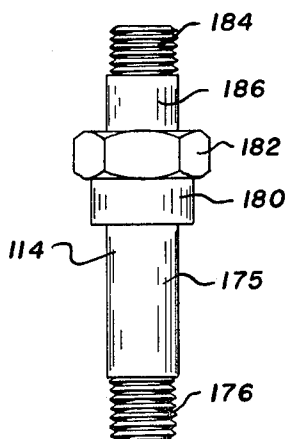


Fig. 10.

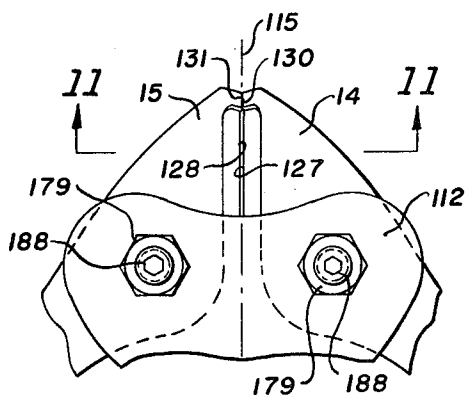


Fig. 11.

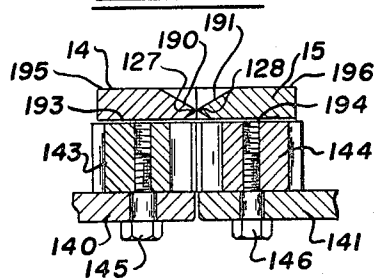
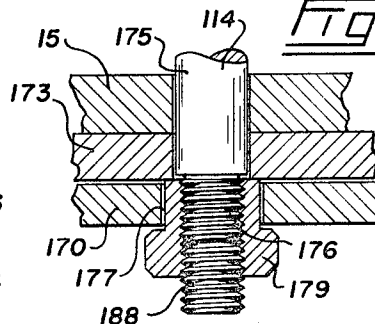


Fig. 12.



INVENTOR

GERARD VAN SCHAIK

BY

Fetherstonhaugh & Co.
ATTORNEYS

MANUAL HYDRAULICALLY-OPERATED TOOLS

This invention relates to manual hydraulically-operated tools which may be designed for different purposes, and mainly for cutting multi-strand cables, bars, and the like. It is particularly concerned with tools of the same general kind as those disclosed in U.S. Pat. 2,791,028 issued May 7, 1957 to Peter Bidin, and in U.S. application Ser. No. 57,515 filed July 23, 1970 now Pat. No. 3,685,151 in the name of Rolph Grante and Byron Andre.

While the tool has special application for cutting cable and bar, it is to be appreciated that it is useful in many instances where it is required that a pair of pivoted jaws are to be brought together under considerable force to effect an operation, such as, for example, in crimping electrical connector elements to conductors. In the latter case, the tool will be supplied with suitable crimping elements in place of the cutting parts of the jaws of the tool described herein.

Tools of the kind with which this invention is concerned have a head upon which a pair of jaws are pivoted, a body connected to the head and supporting a ram which is connected through a linkage to operate the jaws. A pair of handles are secured to the body, and one is pivotable to operate a pump housed within the body and connected to operate the ram. A flexible resilient reservoir supplies fluid to the pump regardless of the attitude of the tool.

With the tools of the prior art there has been experienced considerable difficulty in assembling the units quickly and economically, keeping the tool head and body in alignment, and to get the jaws to close on the line of action of the ram, which is important especially in cutting spiral wound multistrand cables.

The aforementioned application shows a tool in which the inventors have resorted to a relatively complex collar and spring circlip arrangement to secure the jaw carrying head to the body of the unit. Although this is effective in most cases, it is relatively complex and the factory adjustment of the units can later be changed so that the cutting action is less efficient, usually resulting in the operator blaming the tool.

Another drawback of the unit described in the above-mentioned application is that there is an insert fitted into the body of the tool, and this insert includes several conduits or passages for the flow of the hydraulic fluid and the necessary check valves. This necessitates the careful aligning of the insert with an opening through the body through which a valve operating element extends.

The tool of the present invention has a main body construction which may be easily and quickly assembled. There is a simple connection between the head and body which ensures these elements being in proper alignment, and yet it is difficult to tamper with the tool after it has been factory assembled and adjusted. A novel mounting is provided for the cutting jaws so that the cutting edges are maintained in proper alignment, and suitable means is provided for keeping the cutting edges apart even when the jaws are in the fully-closed position.

A tool in accordance with the present invention comprises a body having a base at an inner end thereof, a cylinder in and extending longitudinally of the body and secured at an inner end to said base, a head having

an inner bell end with a socket therein into which the outer end of the cylinder extends, a connecting ring secured to the cylinder outer end and fitting snugly within said socket, means securing the connecting ring in the socket to said bell end, a ram operatively mounted in the cylinder and projecting from the outer end thereof, a pair of operating jaws mounted on said head, linkage operatively connecting the ram to said jaws, and hydraulic pumping means at the body base operable to close and open said jaws through the ram and linkage.

The invention also contemplates a tool comprising a body having a base at an inner end thereof, a cylinder secured in and extending longitudinally of the body, a head secured to an outer end of the body, a ram operatively mounted in the cylinder and projecting from the outer end thereof, a pair of operating jaws mounted on said head, linkage operatively connecting the ram to said jaws, cutting edges on said jaws positioned on opposite sides of the longitudinal center line of said ram, and hydraulic pumping means at the body base operable to close and open said jaws through the ram and linkage, said cutting edges moving towards said center line during cutting action when said hydraulic pumping means is being operated.

A preferred embodiment of the present invention is illustrated in the accompanying drawings, in which

FIG. 1 is a front view of this tool particularly designed for cutting multi-strand cable,

FIG. 2 is an elevation of the tool taken substantially at right angles to FIG. 1,

FIG. 3 is an end elevation of the cutting end of the tool,

FIG. 4 is a view similar to FIG. 1 but with most of the elements of the tool shown in section,

FIG. 5 is an enlarged section taken on the line 5—5 of FIG. 4,

FIG. 6 is a cross-section taken on the line 6—6 of FIG. 5,

FIG. 7 is an enlarged section taken on the line 7—7 of FIG. 4,

FIG. 8 is an enlarged cross-section taken on the line 8—8 of FIG. 4,

FIG. 9 illustrates a mounting pin for an operating jaw,

FIG. 10 is a fragmentary view showing the cutting jaws in the closed position,

FIG. 11 is a section taken on the line 11—11 of FIG. 10, and

FIG. 12 is an enlarged fragmentary view of one end of the blot shown in FIG. 7.

Referring to the drawings, 10 is a manual tool in accordance with this invention and particularly designed to operate as a cutter. This tool is made up generally of a supporting head 12 carrying a pair of operating jaws 14 and 15 which in this case are cutting jaws, and a main body 16.

Supporting head 12 is formed with a bell 20 at its inner end which is connected to and closes the adjacent outer end of body 16. This body includes a base 22 at its outer end and a cylindrical casing 23 extending between this base and bell end 20 of the supporting head. A cylinder 27 extends centrally through body 16 and is connected at its opposite inner and outer ends to base 22 and bell end 20. The space between casing 23

and cylinder 27 forms a reservoir area 29, and it is preferable to provide a cylindrical flexible bag 30 within this reservoir area, said bag being connected at its opposite ends 31 and 32 to cylinder 27 near bell end 20 and base 22, respectively. The flexible bag is filled with a hydraulic fluid.

A piston 35 operates in cylinder 27 and has a ram 36 connected thereto and slidably extending through a flange bearing 38 fitting into and closing the outer end of the cylinder.

As it is absolutely necessary that the elements supported by head 12 be maintained in correct relationship with body 16, and particularly with ram 36, a special connecting arrangement is used for this purpose. The connecting arrangement herein is such that the elements can be quickly and easily put together, and easily taken apart for repair and servicing, and yet will not be disturbed by a person unfamiliar with the construction of the tool.

To this end, bell end 20 is formed with a smooth cylindrical inner surface 40 which forms a wall of a socket 41 in said end which opens towards body 16. A connecting ring 43 is shaped to fit snugly in socket 41, said ring having a smooth peripheral surface 44, and is rotatable around the common axis of the socket and of ram 36. Socket surface 40 and ring surface 44 are accurately machined so as to properly position the various elements associated therewith. Ring 43 is internally threaded and is adapted to receive the adjacent threaded end of cylinder 27, as indicated at 45. Ring 43 has an annular groove 46 formed in its outer surface 44, and is maintained in socket 41 by one or more set screws 48 which are threaded in the wall of the surrounding bell end, and extend into annular groove 46.

When assembling tool 10, the cylindrical casing 23 is positioned between base 22 and bell end 20 of head 12, ring 43 being retained in position by set screws 48. Then head 12 is rotated to screw ring 43 on to the adjacent end of cylinder 27 until casing 23 is firmly held in position. Screws 48 are loosened so that the supporting head can be rotated on ring 43 to enable a set screw 49 to be inserted through a radial hole 50 in end 20 and screwed into a threaded hole 51 in ring 43, see FIG. 8. Screw 49 is turned until it presses against cylinder 27 firmly to secure the ring and the cylinder together. After this screw is tightened, head 12 is rotated to position it properly relative to base 22, and after set screws 48 are tightened, the head is firmly fixed in place. Although not shown, it is preferable to fill hole 50 with a suitable plastic substance which can be removed if it is desired to take the tool apart. With this arrangement, connecting ring 43 is firmly secured to cylinder 27 by screw 51, and said ring is firmly secured to the bell of the supporting head by screws 48.

Although the hydraulic system for actuating piston 35 and ram 36 in cylinder 27 is important, it does not form part of the present invention and, therefore, does not require description in great detail.

Tool 10 is provided with a pair of handles 55 and 56 which are substantially parallel and extend axially away from the base of body 16. Handle 55 is formed with a reduced and threaded inner end 58 which is threaded into a socket 59 formed on and projecting outwardly from base 22 adjacent one side thereof. Handle 56 is swingably mounted on a pin 61 carried by an arm 62

extending outwardly from base 22 on the opposite side thereof to socket 59 and substantially parallel to the latter. Handle 56 is in the form of a bell crank the short arm 64 of which and the region of the pivot pin 61 are bifurcated. A pin 65 extends through the outer end of arm 64 and a clip 66 extends around this pin and has its ends removably connected to the outer end of a piston rod 69 of a hydraulic pump 70 see FIG. 4. Rod 69 has a piston 71 connected to its inner end within cylinder 72 of pump 70.

Base 22 is formed with an internally threaded socket 74 into which the adjacent end of cylinder 27 is threaded. When the hydraulic pump is operated by handle 56, hydraulic fluid is pumped into cylinder 27, forcing piston 35 to move along said cylinder.

A main passageway 77 extends diametrically through and across base 22 between pump 70 and cylinder 27. This passage is formed with aligned sections 79, 80, 81 and 82. A ball 84 is seated at the inner end of section 79 and is retained in this position by a spring 85 extending between the ball and a plug 86 in one end of passage 77. Another ball 88 is seated in the opposite end of passage section 80 from ball 84, and a fluted spacer piece 89 extends between these balls. A plunger 90 slidably fits in passage section 82 and has a stem 83 extending inwardly therefrom towards ball 88. Plunger 91 is biased outwardly relative to its passage by a spring 91.

A bore 92 extends between the inner end of pump 70 and passage section 80, a second bore 93 extends between passage section 79 and the adjacent end of cylinder 27, and a third bore 94 extends between passage section 81 and the interior of bag 30.

When pump 70 is operated by swinging handle 56 back and forth on pin 61, fluid is drawn from reservoir bag 30 through bore 94, passage section 81 and bore 92 into the pump, ball 88 being unseated at this time. The pump forces this fluid back through bore 92, passage section 80 and bore 93 into cylinder 27 to move piston 35 and ram 36 along the cylinder, ball 84 being unseated at this time. When plunger 90 is moved inwardly against the pressure of spring 91, stem 83 unseats ball 88 which moves spacer piece 89 to unseat ball 84. This allows the hydraulic fluid to flow back into the reservoir bag under the action of spring means which moves ram 36 back along cylinder 27.

Plunger 90 may be depressed in any desired manner in order to release the fluid from the cylinder. The plunger projects laterally from base 22 and may be pressed inwardly of the base by hand. However, it is preferable to provide a lever 95 for this purpose. The lever is mounted on a pin 96 carried by arm 62, and extends over plunger 90 and substantially parallel with the body 16. The lever and pin 96 are so located relative to each other that the inner end 97 of the lever bears against arm 62 to act as a stop to limit the outward swinging movement of lever 95 under the action of the spring of plunger 90, as clearly shown in FIG. 4. The plunger is depressed by swinging the outer end of the lever towards body 16.

FIGS. 5 and 6 illustrate pressure relief means for the hydraulic system of the tool. Section 80 of passage 77 is connected by a lateral bore 98 to an enlarged bore 99 which opens out from the side of base 22. A ball 100 is normally seated in the inner end of bore 99 to close

bore 98, said ball being resiliently retained on its seat by a spring 101 held in position by a plug 102 threaded in bore 99. This plug has an axial groove 103 in its outer surface. Another bore 104 extends from bore 99 and opens out through the inner end of base 22 within the flexible reservoir bag 30.

If the pressure in the hydraulic system rises beyond a predetermined point, as when someone continues to pump after the cutting jaws are closed, ball 100 is unseated and the pumped fluid travels back to the reservoir through bores 98, 99 and 104. The setting of plug 102 determines the pressure at which ball 100 is unseated.

Supporting head 12 is formed with a central bore 105 extending longitudinally thereof in which a crosshead 106 slidably fits. This crosshead has ears 107 and 108 projecting laterally therefrom through slots 109 and 110 formed in the supporting head and extending longitudinally thereof away from body 16. A spring 111 in bore 105 biases crosshead 106 towards the inner end of head 12 and body 16. Head 12 is formed with an enlargement 112 on its outer end carrying pins 113 and 114 equally spaced outwardly on opposite sides of the common longitudinal axis 115 of cylinder 27, piston 35, ram 36, crosshead 106 and bore 105 of the supporting head.

Operating jaws 14 and 15 are swingably mounted on and carried by pins 113 and 114 so that said jaws are supported by the enlargement 112 of head 12.

Jaws 14 and 15 have tails 118 and 119 extending past pins 113 and 114 generally towards body 16. A pair of links 121 are connected by pins 122 and 123 to jaw tail 118 and ear 107, while another pair of links 124 are connected to jaw tail 119 and to ear 108 by pins 125 and 126.

When jaws 14 and 15 are designed for cutting purposes, as in the illustrated tool, they are formed respectively with cutting edges 127 and 128 which, when the jaws are open, as shown in FIGS. 1 and 4, extend in a V away from each other on opposite sides of the axis or center line 115. When the jaws are closed, these cutting edges almost meet on the center line, as shown in FIG. 10. Actually, cutting edges 127 and 128 are located inwardly of their respective jaws, while stops 130 and 131 formed on the outer ends of the jaws come together on the center line. These stops engage each other when the jaws are fully closed and prevent the cutting edges 127 and 128 from coming together so that they cannot damage each other regardless of whether the operator of the tool continues to pump after the jaws have come together. The pressure relief of the hydraulic system prevents the tool from being damaged when the pumping continues after stops 130 and 131 come together.

If the tool is to be used for purposes other than cutting, jaws 14 and 15 would have to have the appropriate elements secured thereto in place of the cutting edges to be brought together when the operating jaws close, such as the opposing elements of a crimping tool.

If tool 10 is to be used for cutting multi-strand cable, it is desirable to provide holding means for securing the cable and holding it in position during the cutting action. For this purpose, a pair of clamping plates 140 and 141 are swingably mounted on pins 113 and 114 and spaced laterally outwardly from the adjacent jaws

14 and 15. A pair of clamping elements or blocks 143 and 144 are located between plates 140 and 141 and their respective jaws 14 and 15 near the cutting edges of the latter. The blocks 143 and 144 are carried by pins 145 and 146 which project laterally therefrom and are carried by plates 140 and 141.

Clamping elements or blocks 143 and 144 are generally square in section, and have grooves 148 and 149 in their peripheral edges and extending substantially at right angles to the blade cutting edges 127 and 128. Grooves 148 and 149 are preferably substantially semi-circular in cross-section, and the grooves of each block are in different sizes. The blocks usually have four grooves therein which progress from a small groove up to a large one.

When clamping plates 140 and 141 are in cable-gripping position, the adjacent surfaces of blocks 143 and 144 bear against each other, and the grooves in these surfaces form a substantially circular channel 151 which is adapted to fit around a cable of a size to match these grooves. It will be noted that plates 140 and 141 have matching grooves therein which, when blocks 143 and 144 are in gripping position, form an opening 152 which is larger than the largest channel 151 that can be formed by the block grooves 148 and 149.

Plates 140 and 141 are moved into and out of clamping or gripping position and are held in the gripping position in a very simple manner. In this example, the inner ends of plates 140 and 141 are connected by pairs of links 154 and 155 by pins 156, 157 and 158, 159, respectively, to laterally projecting arms 161 and 162 of a handle 163 which is swingably mounted on a pin 164 projecting laterally from head 12. Pins 156, 157, 164, 158 and 159 are in alignment when handle 163 extends at right angles to aligned links 154 and 155. When this handle is swung to the right, with reference to FIG. 1, the lower ends of plates 140 and 141 are drawn towards each other to swing gripping blocks 143 and 144 away from each other. When it is desired to grip a cable, handle 163 is swung in the opposite direction, and the adjacent surfaces of blocks 143 and 144 come together as the pins 156, 157 and 158, 159 of links 154 and 155 and handle pin 159 are in alignment. When the handle is swung to the left a little further, it acts as a toggle and shifts pins 157 and 158 on opposite sides of a toggle line passing through pin 159 and the aligned position of the link pins so that the clamping blocks are held in the cable-gripping position. At this time, handle 56 is swung back and forth to operate pump 70 and this causes jaws 14 and 15 to close so as to cut the cable held in the combined channel 151 of the clamping blocks. When blade stops 130 and 131 come together, the cutting action is completed and yet the cutting edges 127 and 128 have not touched each other.

There is a special arrangement for locating pins 113 and 114 in the enlargement 112 of head 12, and the mounting of jaws 14 and 15 and clamping plates 140 and 141 on these pins, the arrangement of one of these pins, namely pin 114, will now be described with reference to FIG. 7, said pin 114 being illustrated in FIG. 9.

The enlargement 112 of head 12 is bifurcated so that it has spaced apart sides 170 and 171, as shown in FIGS. 3 and 7. The head sides 170 and 171 are inter-

nally notched to receive spacer plates 173 and 174 which are retained in position by pins 113 and 114. By referring to FIG. 7, it will be seen that pin 114 extends through registering holes in spacer plates 173 and 174 and jaw 15 located therebetween. The main portion 175 of the pin is not long enough to extend to the outer faces of spacer plates 173 and 174, and a reduced threaded end 176 extends through a relatively large hole 177 in the side wall 170 of the supporting head. A sleeve nut 179 is threaded on to the pin end 176 and extends through the wall 170 to bear against the outer surface of spacer plate 173. An enlargement 180 formed on pin 114 extends through a hole in 181 in side wall 171 and bears against the outer surface of plate 174. A nut-like enlargement 182 is formed on pin 114 and acts as a spacer between wall 173 and clamping plate 141. An enlargement 184 on pin 114 extends through said plate 141, and a nut 185 threaded on the pin end 186 holds the assembly together. It will be noted that the head of nut sleeve 179 and pin enlargement 184 do not touch the outer surfaces of head walls 170 and 171. A set screw 188 is threaded into the outer end of sleeve nut 179 and is turned in until it engages the outer end of pin end 176 to jamb the sleeve nut in position. Nut 179 is only finger-tightened so that jaws 14 and 15 can turn freely on their respective pins 113 and 114, set screw 188 locking said nut in place.

By referring to FIG. 11, it will be seen that clamping blocks 143 and 144 are retained very close to the cutting jaws 14 and 15 by clamping plates 140 and 141. In addition, the adjacent edges of jaws 14 and 15 are ground so as to locate cutting edges 127 and 128 very close to these gripping blocks. The surfaces 190 and 191 of jaws 14 and 15 are ground deeply into the blades so that the cutting edges are closer to the inner surfaces 193 and 194 of the blades than to the outer surfaces 195 and 196 thereof. This arrangement improves the cutting action of the tool, particularly when it is used to cut multi-strand cable. The cutting or shearing action takes place very close to the portion of the cable gripped by blocks 143 and 144 so that there is no chance of the cable twisting or bending during the cutting action. If the cable is permitted to bend even a little, the result is a very poor cut.

As stated above, connecting ring 43 makes it easy to connect head 12 to body 16 while maintaining all of the elements associated with these parts in proper position in relation to each other. The body itself is of simple construction since it is made up of casing 23 and cylinder 27 with bag 30 connected thereto, and base 22. All of the passages, bore and recesses of the latter can be drilled therein. The special arrangement of pins 113 and 114 retain the cutting blades and the clamping plates in position while allowing these to operate in the proper manner. The stops 130 and 131 on the cutting blades prevent the cutting edges thereof from being damaged by engaging each other at the end of a cut.

I claim:

1. A hydraulically-operated tool comprising a body having a base at an end thereof, a cylinder in and extending longitudinally of the body and secured at a first end to said base, a head having a bell end with a socket therein into which a second end of the cylinder extends, a connecting ring threaded on the cylinder second end and fitting snugly within said socket, said

socket and the connecting ring being circular in cross-section, a screw threaded in the ring and tightened against the connecting ring, a ram operatively mounted in the cylinder and projecting from the outer end thereof, a pair of operating jaws mounted on said head, linkage operatively connecting the ram to said jaws, and hydraulic pumping means at the body base operable to close and open said jaws through the ram and linkage.

2. A tool as claimed in claim 1 in which said socket has an inner wall and said ring has an outer wall accurately made so as to position the head and the jaws thereon accurately relative to the longitudinal center line of said ram.

3. A tool as claimed in claim 2 in which the inner end of the cylinder is threaded into the base, and said body comprises a cylindrical casing surrounding and spaced from the cylinder and extending between the base and the bell end of the head.

4. A tool as claimed in claim 3 including a flexible reservoir bag between the cylinder and said casing secured adjacent the first and second ends of the cylinder, said bag being adapted to hold fluid for said hydraulic pumping means.

5. A hydraulically-operated tool comprising a cylinder, a base secured to a first end of the cylinder, a head at a second end of the cylinder and having a bell end with a socket therein surrounding and enclosing said second end, a casing surrounding the cylinder and removably fitting between the base and the head and spaced from the cylinder to form a reservoir, a ram operatively mounted in the cylinder and slidably extending through a bearing closing said second end of the cylinder, a connecting ring secured to the cylinder second end and fitting snugly within said socket, means removably securing the connecting ring in the socket to the bell end, said socket having a cylindrical wall and said ring having a peripheral surface accurately machined so as to properly position the bell end and head relative to the axis of the ram, a pair of operating jaws mounted on said head, linkage operatively connecting the ram to the jaws, and a hydraulic pumping means at said base operable to move the ram in the cylinder to close and open the jaws through said linkage.

6. A tool as claimed in claim 5 in which a pair of handles are connected to said base and extend outwardly therefrom away from said body, one of said handles being pivotally mounted, and including means operatively connecting said pivotally mounted handle to said pumping means.

7. A tool as claimed in claim 5 including a closed flexible bag in said reservoir in communication with said pumping means and adapted to supply hydraulic fluid to and to receive the fluid from said pumping means.

8. A tool as claimed in claim 5 in which said linkage comprises a crosshead mounted on the head to slide towards and away from the cylinder second end, means connecting the crosshead to the ram outside the cylinder, a spring mounted on the head biasing the crosshead towards the cylinder, and a link for each jaw pivotally connected at one end to said each jaw and at an opposite end to the crosshead.

9

10

9. A tool as claimed in claim 5 in which said connecting ring is threadedly mounted on the second end of the cylinder, and said base is threadedly secured to the first end of said cylinder.

10. A tool as claimed in claim 5 in which said means securing the connecting ring to the bell end comprises at least one set screw threaded in the bell end and tightened against the connecting ring.

11. A tool as claimed in claim 5 in which said connecting ring is threadedly mounted on the second end

of the cylinder, and including a set screw threaded in the connecting ring and tightened against said second end of the cylinder.

12. A tool as claimed in claim 10 in which said bell end has a hole therein through which said set screw can be reached.

13. A tool as claimed in claim 11 in which said bell end has a hole therein through which said set screw can be reached.

* * * * *

15

20

25

30

35

40

45

50

55

60

65