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STRAP TENSIONING TOOL

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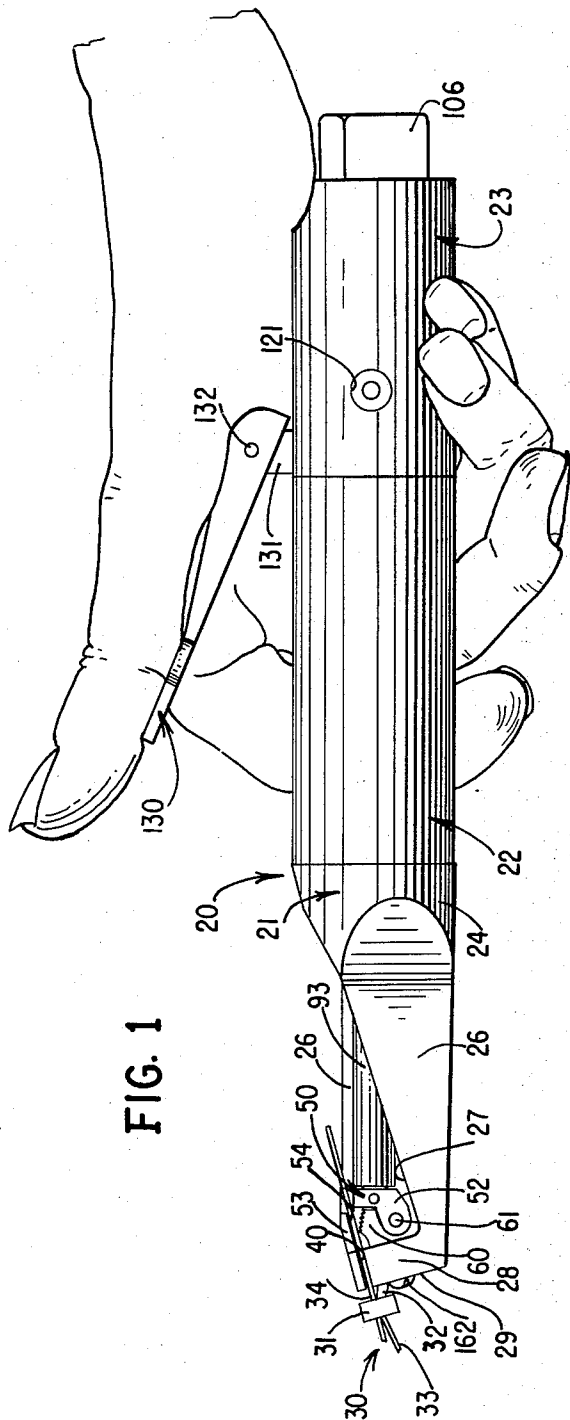


FIG. 1

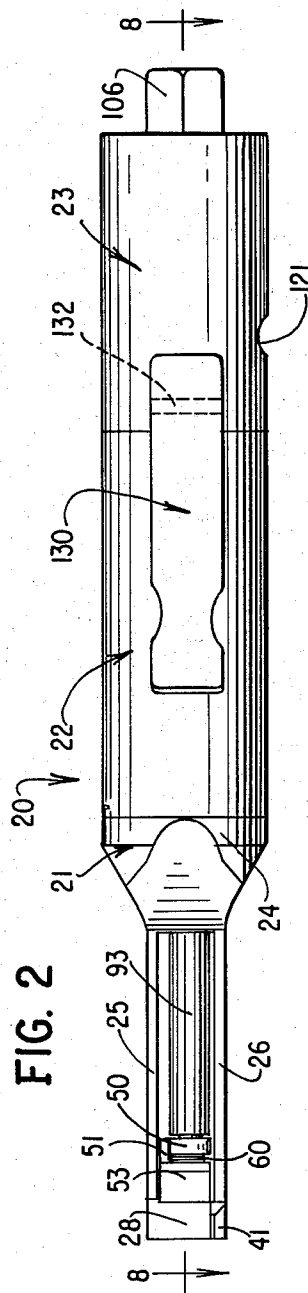


FIG. 2

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STRAP TENSIONING TOOL

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The present invention relates to tools for applying flexible binder straps around bundles of wires and the like, and particularly to power operated tools for tightening binder straps and cutting the free strap ends after tightening of the binder straps.

In many constructions and machines large numbers of wires are utilized to interconnect spaced points, such as for example, in electrical control panels, automobiles, aircraft and the like, and it is desirable when a plurality of wires are disposed adjacent to one another to bind the wires into groups or cables. To this end binder straps are utilized which comprise a longitudinally extending strap and a clamping collar or connector, one end of the strap being attached to the connector and the other or free end of the strap being adapted to slide through the connector in a tightening movement; there is customarily provided latching structure disposed between the connector and the length of the strap to hold the strap in the tightened position once it is placed in that position. For the sake of neatness, it is desirable to cut the free strap end extending beyond the connector after tightening of the binder strap.

Such binder straps have been applied heretofore manually or by the use of manually operated tools, and in the application thereof it is desirable automatically to wrap the binder strap about the associated bundle or object and to pull it tight to a predetermined tension, and after tightening to sever the free strap end adjacent to the connector as has been explained above. It has been difficult using prior methods and prior tools to apply the binder straps rapidly and with any degree of precision as to the tension with which the binder strap is tightened around the associated bundle or object.

Accordingly, it is an important object of the present invention to provide an improved tool for applying binder straps of the type set forth, and more particularly to provide a power operated tool for applying binder straps.

In connection with the foregoing object, it is another object of the present invention to provide a motor operated binder strap tensioning and cutting tool, the motor being hydraulically actuated, and more specifically air actuated.

Yet another object of the invention is to provide an improved binder strap applying tool of the type set forth which quickly tensions the binder strap to a predetermined tension and thereafter automatically cuts the free strap end therefrom adjacent to the connector.

Still another object of the invention is to provide a binder strap tensioning and cutting tool of the type set forth which is provided with biasing mechanism that is selectively operable to exert different predetermined biases so that the operator of the tool can select the tension to which the binder strap is to be tightened.

Yet another object of the invention is to provide in a binder strap tensioning and cutting tool of the type set forth improved binder strap gripping structure which is automatically moved to the open or non-gripping position when placed in position to receive a new binder strap therein.

Still another object of the invention is to provide in a binder strap tensioning and cutting tool of the type set forth an improved strap gripping structure which automatically opens to release the cut free strap end at the conclusion of a strap tensioning and cutting operation.

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In conjunction with the foregoing, it is another object of the invention to provide in an improved binder strap tensioning and cutting tool of the type set forth mechanism for automatically ejecting the released cut free strap end at the conclusion of the strap cutting operation.

Yet another object of the invention is to provide in a binder strap tensioning and cutting tool of the type set forth an improved cutting mechanism for cutting the free strap end adjacent to the connector at the conclusion of the strap tightening operation, the cutting mechanism including a movable blade and a guard therefor, the guard being in covering relationship with respect to the blade when no strap is present in the tool.

In connection with the foregoing object, it is another object of the invention to provide an improved binder strap tensioning and cutting tool of the type set forth, wherein the guard is constructed and arranged so that it is shifted out of position to admit a binder strap simply by urging the binder strap thereagainst and toward the operative position therefor.

Yet another object of the invention is to provide an improved binder strap tensioning and cutting tool of the type set forth wherein the angular relationship between the binder strap tensioning head and the actuating handle for the drive motor can be adjusted to any convenient position so as to permit the use of the tool of the present invention in places and positions which have been considered awkward or impossible heretofore for the use of strap tensioning and cutting tools.

A further important object of the invention is to provide in a binder strap tensioning and cutting tool, of the type set forth, an improved fluid actuated drive motor useful in accomplishing the above objects, the drive motor preferably being of a double-piston arrangement producing an accurately controlled and predetermined tension in a binder strap by actuating a strap cut-off or severing mechanism in response to the reaching or attainment of the predetermined tension. Said predetermined tension produced in the strap is governed and sensed by a biasing mechanism independently of the pressure of the fluid fed to the tool, so that the predetermined tension is accurately reached in the strap even though variations may occur in said fluid pressure, and the cut-off of the strap is triggered by the overcoming of the biasing restraint or, in other words, by the attainment of the predetermined tension in the strap.

Further features of the invention pertain to the particular arrangement of the parts of the improved strap tensioning and cutting tool whereby the above-outlined and additional operating features thereof are attained.

The invention, both as to its organization and method of operation, together with further objects and advantages thereof will best be understood by reference to the following specifications taken in connection with the accompanying drawings, in which:

FIGURE 1 is a side elevational view of a binder strap tensioning and cutting tool made in accordance with and embodying therein the principles of the present invention, the hand of the user being diagrammatically illustrated in operative position about the housing of the tool with the thumb on the control actuator and with a binder strap and connector in position to be tightened thereby;

FIG. 2 is a top elevational view of the tool of FIG. 1; FIG. 3 is a side elevational view similar to FIG. 1 but showing the other side of the tool;

FIG. 4 is a bottom elevational view of the tool of FIG. 1;

FIG. 5 is an end elevational view of the front end of the tool of FIG. 1, the binder strap and connector having been removed for clarity of illustration;

FIG. 6 is an end elevational view of the rear end of the tool of FIG. 1;

FIG. 7 is an enlarged top elevational view of the forward end of the tool of FIG. 1 and illustrating particularly the connector abutment structure and the strap gripping structure of the tool;

FIG. 8 is a view in longitudinal section through the tool of FIG. 2 along the line 8—8 thereof, the parts being illustrated in the position assumed at the beginning of a binder strap tensioning and cutting operation;

FIG. 9 is a cross sectional view similar to FIG. 8 but showing the parts in the position assumed during a strap tensioning operation and immediately prior to a strap cutting operation;

FIG. 10 is a cross sectional view similar to FIGS. 8 and 9 but showing the parts in the position assumed at the conclusion of a strap cutting operation;

FIG. 11 is a fragmentary enlarged view in longitudinal section through the forward end of the tool and showing the positions of the strap gripping member, the cutting blade and the blade guard at the beginning of a strapping operation and before the insertion of a free strap end in the tool;

FIG. 12 is a fragmentary view in cross section similar to FIG. 11 and showing the position of the parts after the insertion of a free strap end thereinto and subsequent to a short movement of the strap gripping member in the tightening direction;

FIG. 13 is a fragmentary view in cross section similar to FIGS. 11 and 12 and showing the parts at the conclusion of a strap cutting operation; and

FIGS. 14 through 17 are diagrammatic representations of the tool of FIGS. 1 to 13 showing the positions of the various parts thereof at various stages in the operation thereof;

FIG. 18 is a fragmentary longitudinal cross-sectional view showing a modified form of the biasing structure of the tool; and

FIG. 19 is a similar view showing still another modified form of biasing structure for the tool.

Referring to FIG. 1 of the drawings, there is shown a binder strap tensioning and cutting tool made in accordance with and embodying the principles of the present invention, the tool being generally designated by the numeral 20. There is shown associated with the tool 20 at the forward or lefthand end thereof as viewed in FIG. 1 a binder strap generally designated by the numeral 30 of the type particularly adapted to be tightened thereby, the binder strap 30 including a connector or locking collar 31 which is provided with structure for receiving and holding a connector strap end 32, the strap end 32 being in turn connected to a strap portion 33 adapted to encircle a bundle of wires or other object to be bound and terminating in a free strap end 34 which is also received through the connector 31, the connector 31 including structure automatically to grip the strap end 34 after the strap has been tightened about the associated bundle or object. More specifically, the binder strap 30 can be of the construction and arrangement disclosed in the co-pending application for United States Letters Patent of Jack E. Caveney and Roy A. Moody for Binder Strap, Serial No. 178,331, filed March 8, 1962, now Patent No. 3,197,829. Such a binder strap 30 is ordinarily supplied to the operator with the connector 31 having the connector end 32 therein and affixed thereto; the operator places the strap portion 33 about the bundle of wires or other object to be bound and passes the free strap 34 through the connector 31. The strap portion 33 is tightened by pulling the strap portion 34 to the right as viewed in FIG. 1 with respect to the connector 31 until a predetermined tension is created therein, after which the free strap end 34 to the right of the connector 31 is cut, the connector 31 automatically grabbing and holding both strap ends disposed therein against retrograde or loosening movement thereof. The tool 20 is constructed and arranged to provide the necessary tightening or tensioning movement of the free strap end 34 with respect to

the connector 31 and thereafter automatically to cut the free strap end 34 adjacent to and to the right of the connector 31 as viewed in FIG. 1.

As may be best seen in FIGS. 1 to 6 of the drawings, the tool 20 is generally in the shape of an elongated cylinder and includes a housing formed in three sections, namely, a first or forward housing section 21, a second or central housing section 22 and a third or rear housing section 23. The housing sections 22 and 23 are both essentially cylindrical in form and have the same external diameter and are disposed in end to end relationship and in use are relatively fixed with respect to each other. The forward housing section 21 has a generally cylindrical portion 24 at the righthand end thereof as viewed in FIGS. 1 to 4 but quickly converges to a pair of forwardly extending and generally parallel spaced-apart walls 25 and 26 which extend to the outer or front end of the tool 20. The cylindrical portion 24 of the forward housing section 21 has substantially the same diameter as the adjacent housing section 22 but is connected thereto and arranged so that there can be relative rotating movement between the housing sections 21 and 22 about the longitudinal axis of the tool 20 for a purpose which will be explained more fully hereinafter.

The structure for receiving and holding the binder strap assembly 30 and the strap per se 34 is disposed on the outer end of the housing section 21 and particularly on the outer end of the walls 25 and 26 thereof, the wall 26 being relieved along the line 27 and the outer ends of the walls 25 and 26 being joined by a lateral wall 28 which inclines upwardly and to the left as viewed in FIG. 1. The outer surface 29 of the wall 28 also is inclined upwardly and to the left as viewed in FIG. 1 and is adapted to receive thereagainst the connector 31 and/or the connector strap end 32 during operation of the tool 20, the wall 29 serving as an abutment member for restraining the movement of the connector 31 and the connector strap end 32 in a direction to the right in FIG. 1 while the free strap end 34 is pulled through the connector 31 and to the right as viewed in FIG. 1. In order to accommodate the movement of the free strap end 34 to the right while the connector 31 and the connector strap end 32 are restrained by the abutment member 29, a narrow slot 40 is provided in the front wall 28 and extends from the abutment member 29 on the wall 28 and upwardly and to the right as viewed in FIG. 1, the portion of the wall 28 beneath the slot 40 and adjacent thereto being beveled as at 41 to assist in movement of the free strap end 34 thereacross and into the slot 40.

A strap gripping structure is provided between the walls 25 and 26 for gripping the free strap end 34 to pull the strap end 34 through the slot 40 and through the connector 31 so as to tighten the strap portion 33 about the associated bundles of wires or any other object to be bound. More particularly, the gripping structure includes a head 50 having a pair of forwardly extending walls 51 and 52, the wall 51 having an arm 53 extending therefrom and toward and overlying the wall 52 and providing on the underside thereof a gripping surface 54. As may be best seen in FIGS. 1 and 11, the gripping surface 54 extends upwardly and to the right at the same angle as the slot 40 and provides a continuation thereof when the parts are positioned as illustrated therein. Pivotaly mounted between the walls 51 and 52 is a gripping member 60 pivoted about a pin 61 received in the walls 51 and 52, the gripping member 60 having a notched or serrated surface 62 disposed toward the gripping surface 54. The surface 62 is further disposed eccentrically with respect to the center of the pin 61 so that the serrated surface 62 is moved away from the gripping surface 54 when the gripping member 60 is rotated in a clockwise direction and so that the serrated surface 62 moves toward the gripping surface 54 when the gripping member 60 is rotated in a counterclockwise direction. There is provided between the head 50 and the gripping member 60

a spring 63 which is arranged continuously to urge the gripping member 60 in a counterclockwise direction or into the gripping position thereof so that the gripping structure automatically grips a binder strap end disposed between the gripping surface 54 and the serrated surface 62. The gripping member 60 is further provided with a first abutment surface 64 adapted when the parts are in the position illustrated in FIGS. 1 and 11 to engage an adjacent surface of the lateral wall 28, the shape of the surface 64 and the adjacent surface of the wall 28 being such as to pivot the gripping member 60 in a clockwise direction against the action of the spring 63 so as to move the gripping member 60 to the non-gripping position thereof. A second abutment surface 65 is provided on a dependent arm 66 integral with the gripping member 60, the second abutment surface 65 likewise being arranged to pivot the gripping member 60 in a clockwise direction and into the non-gripping position thereof upon being brought into contact with an engaging stop as will be more fully explained hereinafter. There further is provided a third abutment surface 67 which is adapted to engage a cooperating surface 57, on the head 50 to prevent overtravel of the gripping member 60 in the counterclockwise or gripping direction when there is no binder strap in the gripping head 50.

The gripping head 50 and associated parts including the gripping member 60 are all mounted upon the forward or lefthand end as viewed in FIG. 1 of a piston rod forming a part of the fluid actuated motor and specifically an air motor for the tool 20, the motor being fundamentally disposed within the intermediate housing section 22 and generally designated by the numeral 70, see particularly FIGS. 8 to 10. The forward or lefthand end of the housing section 22 has formed about the inner periphery thereof a slot 71 extending therearound, the slot 71 being rectangular in cross section and being in alignment with a like slot 72 about the outer periphery of the inner end of the housing section 21, there being a shoulder 73 on the housing section 21 against which the outer end of the housing section 22 abuts. Disposed within the aligned slots 71 and 72 is a retainer ring 74 which prevents longitudinal separation of the housing sections 21 and 22 but permits rotation therebetween about the longitudinal axis of the housing section 22 so that any desired angular relationship can be had between the housing sections 21 and 22. There further is provided between the housing sections 21 and 22 and disposed inwardly or to the right of the ring 74 an airtight seal in the form of an O-ring 75 disposed in suitable annular slots therein and providing an airtight seal therebetween.

The rear or righthand end of the housing section 22 is internally threaded and threadedly engages the adjacent end of the rear housing section 23 as at 76, an O-ring 77 being provided to form an airtight seal between the housing sections 22 and 23. This construction of the annular housing 22 and its airtight connection to the adjacent housing connections 21 and 23 serves to form a first or outer cylinder which is generally designated by the numeral 78 and forms a part of the fluid actuated motor 70. Disposed within the outer cylinder 78 is a first piston generally designated by the numeral 80 and including an elongated substantially cylindrical sleeve 81. The forward end of the sleeve 81 is internally threaded as at 82 and threadedly receives a first piston head 83 which is externally threaded so as to engage the threads 82 on the sleeve 81, the threaded joint between the sleeve 81 and the piston head 83 being made airtight by means of an O-ring seal 84. The rear end on the sleeve 81 is also internally threaded as at 85 and receives a second piston head 86 which is externally threaded and engages the threads 85, the joint between the sleeve 81 and the cylinder head 86 being formed airtight by means of a seal 87. It will be noted the inner surface of the housing 22 and the outer surface of the sleeve 81 are spaced-apart to provide a fluid chamber 88 therebetween.

The sleeve 81 also serves as a second cylinder and receives therein a second piston generally designated by the numeral 90, the piston 90 including a piston head 91 which is mounted for sliding movement within the sleeve 81 and has an annular recess extending therearound for receiving an O-ring 92 to provide an airtight seal between the inner wall of the sleeve 81 and the piston head 91. Attached to and extending forwardly from the piston 90 is a piston rod 93 upon which is mounted the strap gripping head 50, the outer end of the piston rod 93 being internally threaded as of 94 and receiving therein a threaded extension 58 on the head 50. The rear end of the piston rod 93 passes through a complementarily shaped opening in the piston head 83, an O-ring 95 being provided between the piston head 83 and the piston rod 93 to provide an airtight seal therebetween. A cross pin 96 disposed in aligned openings in the piston head 91 and the rear end of the piston rod 93 serves fixedly to interconnect these parts. As will be explained more fully hereinafter the piston 80 moves longitudinally within the cylinder 78 and more particularly is supported at the front end thereof upon a surface 97 on the interior of the housing section 21, an O-ring 98 being provided between the piston head 83 and the surface 97 to provide an airtight seal therebetween.

Disposed within the rear housing section 23 is a biasing structure generally designated by the numeral 100 by which the operator of the tool 20 determines the tension to be placed in the binder strap being applied, the biasing structure actually applying a bias restraining the movement of the piston 80 to the left as viewed in FIGS. 8 to 10. More specifically, the piston head 86 of the piston 80 has an opening centrally thereof which receives there-through a tension rod 101 extending rearwardly therefrom and securely affixed thereto, the rod 101 having an outwardly extending shoulder 102 engaging the outer surface of the piston head 86 and having a washer 103 with a retaining ring 104 engaging the inner surface of the piston head 86. The other end of the rod 101 has a portion 105 of reduced cross section which carries thereon a control knob 106 secured thereto by a screw 107, the control knob 106 being essentially rectangular in plan view as seen in FIG. 6 of the drawings and extending outwardly beyond the rear of the housing section 23. The housing section 23 further has a large annular recess 108 therein which carries a pair of coiled springs 110 and 111 under compression therein, the coil spring 110 being larger in diameter than the coil spring 111 and being substantially heavier, i.e., exhibiting a greater resistance to compression. The forward ends of both the springs 110 and 111 rest upon the bottom wall 112 of the recess 108, the wall 112 being disposed toward the front end of the tool 20. The other end of the spring 110 bears against an index plate 114 which is annular in shape and is restrained from movement to the right as viewed in FIGS. 8 and 9 by a retainer ring 115 mounted in the outer end of the housing 23, the plate 114 being restrained from movement outwardly to the right from the position illustrated in FIGS. 8 and 9 but being free to move inwardly to the left as viewed in FIG. 10. The plate 114 further has a pair of protuberances or detents 116 disposed on opposite portions thereof which cooperate with recesses in the control knob 106 so as to position the control knob 106 with respect to the index plate 114. The outer or righthand end of the inner spring 111 bears against a washer 117 which fits upon an outwardly extending shoulder 118 on the rod 101 and is held in position by the knob 106.

In the operation of the tool 20, the biasing structure 100 tends to resist movement of the piston 80 to the left as viewed in FIGS. 8 to 10, the actual amount of resistance to movement being determined by the positioning of the control knob 106 with respect to the index plate 114. When the parts are in the position illustrated in FIGS. 6 and 8 to 10, the piston 80 is connected by the rod 101 via the knob 106 and the plate 114 and the washer 117 so that the combined resistance of both springs 110 and

111 must be overcome in order to move the piston 80 to the left. By turning the knob 106 90° from the position illustrated in FIGS. 6 and 8 to 10, the control knob 106 slips through a complementarily shaped rectangular slot 119 in the index plate 114 so that it is out of engagement with the plate 114 and is only in engagement with the washer 117. Accordingly, only the resistance of the smaller inner spring 111 is encountered upon attempting to move the piston 80 to the left as viewed in FIGS. 8 to 10. It will be seen therefore that the bias or tension exhibited by the biasing structure 100 can be varied and adjusted by turning the selector knob 106 with respect to the index plate 114.

The control valve for controlling the operation of the motor 70 is also disposed within the housing section 23, the control valve being generally designated by the numeral 120. There is provided in the wall of the housing 23 a port or inlet opening 121 adapted to be connected to a source of fluid under pressure, preferably air, for the operation of the motor 70. The valve 120 includes a spool or shiftable valve member 122 disposed in a cylindrical bore 123 in the housing section 23, the spool 122 being shiftable from the position illustrated in FIG. 8 to that illustrated in FIG. 9 under the urging of a manually operable actuating handle 130. The handle 130 is pivotally mounted upon a support 131 fixedly attached to the housing section 23, a pin 132 interconnecting the support 131 and the handle 130 whereby the handle 130 drives an actuating arm 133 that is in contact with the end of the spool 122 disposed forwardly or to the left in FIGS. 8 to 10. The other end of the spool 122 is in engagement with a spring 134 urging the spool 122 forwardly or to the left and against the actuating arm 133. There is provided adjacent to each end of the spool 122 an annular slot therearound receiving an O-ring 124 therein to provide for airtight sliding connection with the walls of the bore 123. Disposed centrally of the spool 122 there is an elongated recess 125 thereabout which is designed and arranged with respect to the port 121 so that it is always in communication therewith.

When the spool 122 is in the normal or non-actuated position thereof illustrated in FIG. 8, the opening formed by the recess 125 is in communication with a passage 126 in the housing section 23, the passage 126 in turn communicating with the opening in the housing 23 which receives the rod 101 therethrough; the rod 101 has an annular recess 127 therein at this point adapted to communicate with the passage 126 regardless of the angular orientation of the rod 101 with respect to the housing section 23. The recess 127 in turn communicates with a passage 128 formed in the rod 101 and extending to the left-hand end thereof so that it is in communication with the inner cylinder formed by the sleeve 81. It will be noted that the admission of air under pressure through the port 121 via the spool 122 and the passages 126, 127 and 128 will place air under pressure within the sleeve 81 and urge the piston 90 forwardly or to the left as viewed in FIG. 8 so as to push the piston rod 93 and the attached binder strap gripping head 50 forwardly or to the left.

If the handle 130 is now moved from the position illustrated in FIG. 8 to that illustrated in FIG. 9, the spool 122 is shifted within the housing section 23 to the right and removes the annular space 125 from communication with the air passage 126 and further places the passage 126 in communication with the atmosphere through the bore 123; accordingly, there is no further air pressure applied to the cylinder within the sleeve 81 through the air passage 128. Furthermore, the passage 126 is now exposed to the atmosphere through the bore 123 and around the left-hand end of the spool 122 so as to vent the space within the sleeve 81 disposed between the piston heads 86 and 91. The annular recess 125 in the spool 122, however, is now in registration with another air passage 129 which extends downwardly and to the left as illus-

trated by the dashed lines in FIG. 8 and communicates with the chamber 88 between the inner surface of the housing section 22 and the outer surface of the sleeve 81. There is provided in the sleeve 81 an air passage 140 which communicates with the space between the piston head 83 and the piston head 91 to introduce air under pressure thereinto, the introduction of air under pressure into this space moving the piston 90 to the right as viewed in FIG. 8 and thus moving the binder strap gripping head 50 to the right and away from the abutment member 29 to effect a tightening of the binder strap. It will be seen therefore that the compressed air from the port 121 first moves the piston 90 to the position illustrated in FIG. 8 with the operating handle 130 in the raised position; upon the movement of the operating handle 130 from the position illustrated in FIG. 8 to that illustrated in FIG. 9, compressed air under pressure is admitted through the port 21 and via the passages 125, 129 and 140 into the space between the piston head 83 and the piston 90 to move the piston 90 and the attached parts from the position illustrated in FIG. 8 toward that illustrated in FIG. 9.

In accordance with the present invention, a cutting mechanism is provided to cut the free strap end at a point adjacent to the connector when the tension in the binder strap reaches a predetermined value. The cutting mechanism is generally designated by the numeral 150 and is fundamentally mounted upon the forward housing section 21, see particularly FIGS. 8 to 13 of the drawings. The cutting mechanism 150 includes a knife or cutter blade 151 which is mounted for sliding movement within a slot or guideway 152 formed in the face of the forward wall 28, the blade 151 having a cutting edge on the upper end thereof and moving upwardly and slightly to the left and downwardly and slightly to the right during the cutting and retracting movements thereof, respectively, as viewed in FIGS. 11 to 13, and being illustrated in the retracted or non-cutting position in FIG. 11 and in an intermediate position in FIG. 12 and in the projected or cutting position in FIG. 13. Movement of the cutting blade 151 from the retracted position illustrated in FIG. 11 to the cutting position illustrated in FIG. 13 is accomplished by means of a lever arm 153 having a pair of aligned and outwardly extending stub shafts 154 which are received in recesses 155 in the walls 25 and 26, respectively. The forward or left-hand end of the lever arm 153 carries a forwardly extending projection 156 which is received within a slot in the lower end of the blade 151 so that pivoting of the lever arm 153 about the shafts 154 in a direction to move the projection upwardly from the position illustrated in FIG. 11 to that illustrated in FIG. 13 moves the cutter blade 151 from its retracted position to the cutting position thereof. A coiled spring 157 under compression is disposed between a point fixed with respect to the wall 28 and the outer end of the lever 153 so as continuously to urge the lever 153 in the counterclockwise direction as viewed in FIGS. 8 to 13. Clockwise rotation or rotation of the lever arm 153 in the cutting direction about the shafts 154 is achieved by contact between a roller 158 mounted upon the rear or right-hand end of the lever arm 153 and a cam surface 159 formed on the forward end of the piston head 83, the shape of the cam surface 159 being such that movement of the piston 80 from the position illustrated in FIG. 8 to that illustrated in FIG. 10 pivots the lever arm 153 about the pivot shafts 154 and moves the outer end of the lever arm 153 from the position illustrated in FIG. 11 to that illustrated in FIG. 13 so as to impart a cutting movement to the cutter blade 151.

In order to insure a full movement of the piston 80 in the strap cutting direction, namely, to the left as viewed in FIGS. 8 to 10, structure is provided for applying hydraulic fluid to the right-hand face of the piston head 86 after a short movement of the piston 80 to the left or in the cutting direction of movement thereof. More specifical-

ly, an annular shoulder 170 is provided on the lefthand end of the housing section 23 which has an internal diameter of the size to receive the piston head 86 therein and the piston head 86 in turn carries an annular groove 171 therearound in which is disposed an O-ring 172 which provides an airtight seal between the shoulder 170 and the piston head 86 so long as the parts are in the position of FIGS. 8 and 9. However, after a short movement of the piston 80 to the left so that the rear or right-hand surface of the piston head 86 clears the left-hand edge of the shoulder 170, the hydraulic fluid pressure within the space between the housing section 22 and the sleeve 81 is applied directly to the rear or right-hand face of the piston head 86 and serves rapidly to move the piston 80 to its most forward or full cutting position illustrated in FIG. 10 of the drawings, this movement being rapid under the urging of the full air pressure available from the port 129 which is more than adequate to overcome the resistance of the springs 110 and 111 in the biasing structure 100. Accordingly, full cutting movement of the piston 80 is assured at all times and regardless of the setting of the biasing structure 100.

In order that straps 34 of different sizes and thicknesses may be received in the slot 40 with their connector collars 31 properly abutted during the tensioning of the straps, a collar-abutting sliding blade guard 160 is provided overlying the outer surface of the cutter blade 151. The guard 160 is preferably formed of sheet metal and is disposed within the slot 152 in the forward wall 28 and is mounted for sliding movement along the outer surface of the cutter blade 151 from a covering of protecting position illustrated in FIG. 11 and a retracted and operative position illustrated in FIG. 12. To accommodate this movement of the guard 160, an elongated slot 161 is provided in an outer end thereof, the longer axis of the slot 161 being in the direction of movement of the cutter blade 151 and the blade guard 160, the slot 161 receiving therethrough a retainer screw 162 which is threadedly received in the forward wall 28. There further is provided a spring 163 having one end disposed in a recess 164 within the wall 28 and the other end disposed in an opening 165 adjacent to the outer end of the blade guard 160 for continuously urging the guard 160 upwardly into the covering position illustrated in FIG. 11 of the drawings. When the guard 160 is so positioned, it will be noted that the passage in which the free strap end 34 is to be placed is at least partially blocked and in order to facilitate the insertion of the strap end 34 into the slot 40 therefor, the upper edge of the guard 160 and particularly the corner thereof disposed toward the beveled surface 41 (see FIG. 5) is also beveled as at 166 so as to facilitate the insertion of the strap end 34 into the slot 40.

When the gripping structure 50 is moved to the furthest righthand position thereof as illustrated in FIG. 10 wherein the piston 90 is seated against the piston head 86, it is desired to release the strap end 34 held thereby and further to eject the strap end therefrom. To this end the piston head 83 on the piston 80 carries a forwardly projecting and U-shaped stop 180 which is positioned to engage the abutment surface 65 on the arm 66 of the gripping member 60 when the piston 90 is fully seated against the piston head 86, i.e., when the parts are in the position illustrated in FIG. 10. The contact between the abutment surface 65 and the stop 180 will rotate the gripping member 60 in a clockwise direction so as to release the cut free strap end 34 that has been heretofore held thereby. At this time there also is established a connection between the fluid pressure within the piston 80 and a strap ejection port 181 provided in the head 50. More specifically, an inlet port 182 in the piston rod 93 is brought into communication with the interior of the piston 80, the port 182 communicating with a passage 183 within the rod 93, the passage 183 in turn communicating with the passage 184 within the head

50, the passage 184 terminating in the port 181. The port 181 is positioned directly beneath the arm 53 and the gripping surface 54 thereon and slightly above the upper surface of the gripping member 60 so as to direct a blast of air directly against the adjacent edge of the strap end 34 so as to blow the cut strap end 34 out of the gripping structure. This blow-out of the cut strap end 34 and the communication of the port 181 with the interior of the piston 80 between the piston heads 83 and 90 does not evacuate the space between the piston heads 83 and 90 inasmuch as sufficient clearance is provided between the outer surface of the sleeve 81 and the interior of the head 21 in the area of the port 140, when the parts are in the condition seen in FIG. 10, to permit continuous replenishment of the air under pressure between the two piston heads 83 and 90, through the port 140.

After the cutting of the strap end 34, the handle 130 may be released, whereupon the spring 134 causes the spool 122 and the handle to return to their positions shown in FIG. 8. The shifting of the spool 122 to its original position (FIG. 8) uncovers the upper end of the passage 129 and exposes the same to the atmosphere, thereby venting the chamber 88 and the space between the piston heads 83 and 90. This permits the tension in the springs 110 and 111 of the biasing structure 100 to return the entire piston 80 and the associated parts to the right-hand position seen in FIG. 8. During this returning movement of the parts, any tendency for air to be entrapped under the piston head 86 is avoided by the fact that any such air may move along the clearance space around the rod 101, to the atmospheric vent 186. The return of the spool 122, of course, also causes the passage 128 to be placed in communication with the fluid pressure source, thereby introducing fluid or air under pressure within the sleeve 81 between the piston heads 86 and 91 to insure return of the piston 91 to its initial position (FIG. 8).

The operation of the tool 20 will now be described in detail, reference also being made to FIGS. 14 to 18 of the drawing wherein schematic representation of the parts of the tool are depicted at various stages during the operation thereof. At the beginning of a cycle of operation of the tool 20, a suitable fluid connection, and preferably an air connection, is made to the opening 121, the air supply to the opening 121 being under pressure. The operator selects the tension to which the binder straps are to be tightened, this being done by manipulation of the knob 106 whereby to place either the spring 111 or both the springs 110 and 111 in operative connection with the rod 101. Assuming that the knob 106 is placed in the position illustrated in FIG. 8, the combined force of the springs 110 and 111 is applied to the rod 101 and serves to position the piston 80 to the right as viewed in FIGS. 8 and 14 with the right-hand end of the piston 80 disposed against the adjacent wall of the housing section 23. With the actuating handle 130 in the upper or non-actuating position as illustrated in FIGS. 1, 8 and 14, the parts will assume the positions illustrated more particularly in FIGS. 8 and 14. Specifically, air under pressure from the opening 121 will pass around the spool 122 through the recess 125 and then through the passage 126 into the annular passage 127 about the rod 101, and thence via the passage 128 into the piston 80 and more particularly into the space between the piston heads 86 and 91, whereby to push the piston 90 to the left and to the position illustrated in FIGS. 8 and 14. Positioning of the piston 90 as illustrated in FIG. 8 places the abutment surface 64 on the gripping member 60 against the inner surface of the wall 28 so as to pivot the gripping member 60 against the action of the spring 63 to the non-engaging position illustrated particularly in FIG. 11. The roller 158 is out of contact with the cam surface 159 and therefore the spring 157 will urge the lever arm 153 in a counterclockwise direction and thus retract the cutter blade 151 to the

position illustrated in FIG. 11. Similarly, the spring 163 urges the blade guard 160 upwardly to a position in front of and covering the upper or cutting edge of the blade 151.

The operator first manually arranges the binder strap 30 as illustrated in FIGS. 1 and 14 and more specifically wraps the strap 33 about the object to be bound, such as the wires 35 in FIG. 14, and inserts the free strap end 34 through the connector 31. Next the free strap end 34 is moved edgewise into the slot 40 and over the beveled surface 41 on the front wall 28. Before the strap end 34 is fully seated, it engages the beveled surface 166 on the guard 160 and moves the guard 160 downwardly against the action in the spring 163 as the free strap end 34 is finally seated in the slot 40, the seating of the free strap end 34 being further facilitated by the fact that the gripping member 60 is in the non-gripping position thereof illustrated particularly in FIG. 11.

Having positioned the free strap end 34 within the slot 40 and having placed the connector 31 in front of the abutment surface 29, the operator now depresses or moves the actuating handle 130 from the position illustrated in FIGS. 8 and 14 to that illustrated in FIGS. 9 and 15. Such movement of the handle 130 pivots the arm 133 in a counterclockwise direction to move the spool 122 to the right, and more particularly, to the position illustrated in FIGS. 9 and 10. Such movement of the spool 122 first vents the portion of the piston 80 between the piston heads 86 and 91 to the atmosphere through the passage 128 and the annular passage 127 in the rod 101 and then through the passage 126 in the housing section 23 through the opening in the housing section 23 receiving the arm 133. Substantially simultaneously, the inlet connection 121 which is still in communication with the annular passage 125 is connected via the passage 129 with the chamber 88 disposed between the housing section 22 and the sleeve 81, the chamber 88 in turn being connected via the passage 140 into the space between the piston heads 83 and 91, i.e., to the lefthand face of the piston head 91. Air admitted into the space between the piston heads 83 and 91 will move the piston 90 to the right from the position illustrated in FIGS. 8 and 14 to that illustrated in FIGS. 9 and 15.

The initial movement of the piston 90 to the right serves to move the gripping member 60 and particularly the abutment surface 64 thereof out of contact with the front wall 28 so that the gripping member 60 is pivoted under the urging of the spring 63 in a counterclockwise direction to the position illustrated in FIG. 12 so as firmly to grip the free strap end 34 between the gripping surface 54 and the serrated surface 62 as illustrated in FIG. 12. Continued movement of the piston 90 to the right serves to pull the free strap end 34 through the connector 31 which is disposed against the abutment member 29 and to tighten the strap 33 about the wires 35.

When the tension in the portion of the free strap end 34 disposed between the gripping member 60 and the abutment member 29 initially reaches the value selected by the adjustment of the knob 106, the parts will be in the position, for example, illustrated in FIGS. 9 and 15. Continued admission of air under pressure into the space between the piston heads 83 and 91 now tends to move the piston head 83 to the left and therefore tends to move the entire piston 80 to the left against the bias of the springs 110 and 111. The moment the pressure within the piston 80 overcomes the tension exerted by the springs 110 and 111 and starts to move to the left, the piston head 86 becomes unseated from its normal position against the forward face of the tool section 23, thereby instantly subjecting the rear face of the piston head 86 to the full pressure of the air in the chamber 88 and causing the entire piston 80 to be driven quickly and forcefully to the left and to the position illustrated in FIG. 16, such movement of the piston 80 bringing the cam surface 159 into the contact with the roller 158 to move it from the

position illustrated in FIG. 15 to that illustrated in FIG. 16. Such movement of the roller 158 in turn will pivot the lever arm 153 and move the cutter blade 151 from the position illustrated in FIGS. 12 and 15 to that illustrated in FIGS. 13 and 16, this movement of the cutter blade 151 cutting or severing the free strap end 34 adjacent to the abutment member 29. It will be understood that the connector collar 31 has automatically grabbed the portion of the free strap end 34 passing therethrough and holds the strap end 34 with respect thereto and against retrograde movement therethrough, the cutting of the free strap end 34 by the cutter blade 151 completing the application of the binder strap 30 about the wires 35. Although the tensioned strap end 34 is not cut off flush with the face of the connector collar 31 because of the presence of the relatively thin collar abutting blade guard 160 between the collar 31 and the cutting blade 151, the tension in the strap and the resilience of the strap normally pulls the free end of the severed strap into the collar or to a position substantially flush with the face of the collar. This slight retraction of the severed end of the strap end 34 pulls the same free of the upper edge of the member 160 and from the slot 40 so as to permit the spring 163 to return the member 160 from the position illustrated in FIG. 13 to that illustrated in FIG. 11. If the severed end of the strap 34 is not automatically retracted from the slot 40 in this manner, the operator may simply remove the severed strap end laterally from the slot, thus freeing the tool from the now tensioned strap assembly.

In the initial portion of the movement of the piston 80 from the position illustrated in FIGS. 9 and 15 to that illustrated in FIGS. 10 and 16, the only force tending to produce such movement is that within the piston 80 and more particularly between the piston heads 83 and 91. However, as soon as the rear end of the piston head 86 clears the shoulder 170, the full air pressure within the chamber 88 is applied to the rear or right-hand surface of the piston head 86 and serves to assist in the final movement of the piston 80 to the left and to the position illustrated in FIGS. 10 and 16 so as to insure a positive operation of the cutting mechanism 150. It further will be noted that as the piston 80 moves toward the left from the position of FIG. 15 to that of FIG. 16, the piston 90 disposed therein remains in substantially its original position and therefore moves with respect to the piston 80 until the cutter blade 151 severs the free strap end 34.

Upon the cutting of the free strap end 34, the piston rod 93 moves from the position illustrated in FIG. 16 to that illustrated in FIG. 17 due to the air pressure within the piston 80 between the piston head 83 and the piston 90, the parts eventually coming to rest in the position illustrated in FIG. 17 with the piston 90 disposed against the piston head 86.

Upon the arrival of the piston rod 93 in the position of FIG. 17, the abutment surface 65 on the gripping member 60 contacts the stop 180 (see FIG. 10) to rotate the gripping member 60 in a clockwise direction from the gripping position thereof to the non-gripping position thereof, thus to release the cut free strap end 34 carried thereby. Arrival of the piston rod 93 in the position illustrated in FIGS. 10 and 17 also places the port 182 carried thereby in communication with the interior of the piston 80 so as to admit air under pressure through the port 181 and the passages 183 and 184 and therefrom outwardly through the strap ejection port 181 in the head 50, the blast of air from the port 181 blowing the cut free strap end 34 which has now been released out of the head 50 and more particularly from between the strap gripping surface 54 and the strap gripping member 60.

The operator of the tool 20 next releases the actuating handle 130 whereupon the spring 134 (see FIGS. 9 and 10) will return the spool 122, the lever arm 133 and the actuating handle 130 to the position illustrated in FIGS. 8 and 14, this movement of the spool 122 placing the

inlet opening 121 with the under pressure therein in communication with the annular passage 124, the passage 126, the annular passage 127 and the passage 128 so as to admit air under pressure into the piston 80 between the piston head 86 and the piston 90. Admission of air under pressure in this manner will move the piston 90 outwardly or to the left from the position illustrated in FIG. 18 to that illustrated in FIGS. 8 and 14. After only a short movement of the piston 90, the abutment surface 65 on the gripping member 60 will be moved out of contact with the stop 180 and the abutment surface 67 will come into contact with the abutment surface 57 to prevent overtravel of the gripping member 60 in a counterclockwise direction under the urging of the spring 63. Upon arriving at the outermost position thereof, the abutment surface 64 on the gripping member 60 engages the lateral wall 28 again to rotate the gripping member 60 in a counterclockwise direction from the gripping position thereof to the non-gripping position thereof. As previously indicated herein, the returning movement of the spool 122 to the position thereof shown in FIG. 8 also vents the chamber 88 and the space between the piston heads 83 and 91 to permit all of the parts to restore to the positions thereof illustrated in FIG. 8. The parts are now in the position illustrated in FIGS. 8, 11 and 14 and are ready for the reception of the next binder strap to be applied.

It will be understood that the operation of the tool 20 is substantially identical to that described above when the selector knob 106 is positioned to place only the lighter spring 111 in operative connection with the piston 80, the only difference in the operation of the tool 20 being that the piston 80 will be shifted from the position illustrated in FIGS. 9 and 15 to that illustrated in FIGS. 10 and 16 when the tension in the portion of the free strap end 34 between the abutment member 29 and the gripping member 60 reaches a lower predetermined value.

It will be observed that the tool accomplishes all of the objects referred to initially hereinabove and, in addition to its other features, it is to be particularly noted that the biasing mechanism 100, with its springs 110 and 111, is, in effect, a sensing means which senses the achievement of the proper tension in the strap and permits severing of the strap only when that tension has been accomplished. Furthermore, the biasing mechanism 100 and the piston 80 coact to insure that the finished strap is neither over-tensioned or under-tensioned when it is being applied as described above, despite variations that may occur in the fluid pressure source made available for use with the tool. Indeed, if the available fluid pressure is too low, the operator will immediately know this, for the tool will not act to cut off the strap and will simply restore to its original condition, with the strap end 34 still intact, if the pressure is too low to overcome the bias of the springs 110 and/or 111 and unseat the piston head 86 to cause severing. On the other hand, the fact that the fluid pressure may be higher than necessary will not cause the strap to be over-tensioned. This is true because, regardless of how high the pressure may be, the bias of the springs 110 and/or 111 will be overcome when the proper predetermined tension has been achieved in the strap, thereby unseating the piston head 86 and causing immediate forceful movement of the entire piston 80 instantly to sever the strap.

Many variations may be made in tools embodying the present invention, and in FIGS. 18 and 19 two variations are shown in the biasing structure, both providing for high and low tension settings and for adjustment of each of these settings, all of which is useful when the operator is applying straps of different thicknesses and widths and desires the tensions to be different between different straps. In FIGS. 18 and 19 the right-hand end of the rod 101 is shorter than that shown in FIGS. 8-10 and is tapped out to provide internal threads 200 which threadably receive

a stem 201. Adjacent its inner end the stem 201 has a portion 202 of reduced diameter, the shoulders of which are adapted to engage a transverse stop pin 203 mounted in the threaded wall of the rod 101, it being understood that the stem 201 may be rotated relative to the rod 101 and thus threaded inwardly and outwardly between the stop positions at which the pin 203 will engage the opposite end walls of the reduced portion 202 of the stem. The outermost end of the stem 201 is threaded and receives thereon a short transverse hinge pin 204 upon which there is eccentrically and pivotally mounted a selector knob 205, the knob 205 bifurcated to provide a pair of spaced legs 206 (only one of which is shown) which straddle the outermost end of the stem 201 and are pivoted on the hinge pin 204. The lowermost edges of the legs 206 are provided with rounded cam surfaces 207 which, it will be noted, are eccentric with respect to the axis of the hinge pin 204.

The adjustment knob 205 has opposite side edges 208 and 209, it being observed that because of the eccentricity of the mounting of the knob 205 upon the transverse hinge pin 204, the edges 208 of the knob lie closer to the axis of the pin 204 than do the edges 209. In FIG. 18, the selector knob 205 is illustrated in a position wherein its edges 208 abut the outer face of the end wall 210 of a cap member 211 which is slidably received on the stem 201 and is internally recessed at 212. Two coiled compression springs 213 and 214 are disposed about the rod 101 and stem 201 and have outer ends which bear against the inner surface of the end wall 210 of the cap 211, their inner ends bearing against the wall 112 of the recess 108 of the rear section 23 of the tool.

The selector knob 205 is illustrated in FIG. 18 as being in a "low tension" position, in that the edges 208 of the knob 205 bear against the outer wall 210 of the cap 211. It will be appreciated, however, that the knob 205 may be rotated in a clockwise direction, from its position shown in FIG. 18, through 180° to a position wherein the edges 209 of the knob 205 will bear against the end wall 210 of the cap 211. In this latter position, the knob 205 will be in its "high tension" position, wherein the cap 211 will be moved inwardly on the stem 201 and thus compress the springs 213 and 214 to a greater extent than the state of compression represented by the springs as presently illustrated in FIG. 18. Thus, the two positions of the knob 205, i.e., the "high tension" and the "low tension" positions, create two distinctly different states of compression in the springs 213 and 214 and thus represent two selective tensioning conditions for the strap 34, inasmuch as the strap 34 will not be severed until the air pressure built up within the tool between the piston heads 83 and 91 is sufficient to move the entire piston 80 to overcome the bias of the springs 213 and 214 and thus unseat the piston head 86 and cause severance of the strap end 34. The tension adjustment provided by the biasing structure shown in FIG. 18 may be considered a "linear tension" adjustment, inasmuch as the tension values produced in the strap, in accordance with the adjustments made with the biasing structure illustrated, will lie on a common line in a graph wherein the tension produced in the strap is plotted against the deflection of the springs 213 and 214. Furthermore, it will be observed from the structure illustrated in FIG. 18 that, when the selector knob 205 is in either its "high tension" position or its "low tension" position, the knob 205 may be rotated to cause linear threaded adjustment of the stem 201 within the pin 101. This rotation of the selector knob 205 will, of course, vary the compression in the springs 213 and 214 and thus vary the state of tension which must be achieved in the strap 34 before the strap is severed.

In FIG. 19 the knob 205 is shown in its "high tension" position with its edges 209 bearing upon the end wall 215 of a hollow cap 216. An inner coiled compression spring 217 has one end which bears upon the inner surface of the wall 215 and its other end bearing upon

the wall 112 of the recess 108. The outer periphery of the wall 215 has an outwardly extending peripheral shoulder formed thereon and, as illustrated, a ring 218 rests against the inner or under surface of that shoulder. An outer heavier coil spring 219 has one end which bears against the ring 218, and its other end bears against the wall 112. Inasmuch as the knob 205 in FIG. 19 is illustrated in its "high tension" position depressing the cap 116 well into the recess 108, the inner or lighter spring 217 is compressed and the ring 218, which bears against the peripheral shoulder of the wall 215, likewise compresses the heavier outer spring 219. Thus, the biasing mechanism illustrated in FIG. 19 is shown in its "high tension" condition wherein the strap 34 will be caused to be relatively highly tensioned before it is severed. In the mechanism illustrated in FIG. 19, however, the knob 205 may be rotated through 180° to its "low tension" position to bring its edges 208 into contact with the wall 215 of the cap 216, in which condition the cap 216 will be moved outwardly, or to the right, relieving the compression of the springs 217 and 219. Indeed, when the knob 205 of FIG. 19 is rotated to its "low tension" position just described, the ring 218 will come to bear against a ring 220 fixed in the recess 108 adjacent the outermost end of the tool, thereby permitting the ring 218 to be disengaged from the peripheral shoulders of the wall 215 and thus relieve from the cap 216 all of the compressive forces of the spring 219. In this latter selective condition of the biasing mechanism illustrated in FIG. 19, only the inner or smaller spring 217 is active to bias the rod 101 and thus control the tension at which the strap 34 will be severed. In both of the above-described conditions of the mechanism of FIG. 19, the stem 201 may be threadedly rotated within the rod 101 to produce inward or outward adjustment of the stem 201 and thus selectively vary the tensions at which the straps 34 will be severed.

The biasing mechanism illustrated in FIG. 19 may be considered to provide a non-linear bias adjustment, inasmuch as the selective tensions produced by the mechanism in its "high tension" condition and in its "low tension" condition will lie along different lines in a graph when tension of the strap is plotted against deflection of the springs.

There has been described an improved tool for applying flexible binder straps around bundles of wires and the like and particularly an improved power operated tool for tightening such binder straps and cutting of free strap end after tightening of the binder strap which fulfills all of the objects and advantages set forth above. While there has been described what at present is considered to be the preferred embodiment of the invention, it will be understood that various modifications may be made therein, and it is intended to cover in the appended claims all such modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. A power operated tool for tensioning and cutting a strap or the like, comprising a movable strap gripping means, strap cutting means, motor means for driving said strap gripping means and said strap severing means, and spring biasing means for restraining the driving of said strap severing means until a predetermined tension has been produced in the strap.

2. A power operated hand tool for tensioning and cutting a strap or the like, comprising frame means adapted to be held in the hand, movable strap gripping means on said frame, first motor means on said frame for driving said strap gripping means to tension the strap, strap cutting means on said frame, second motor means actuable to drive said strap cutting means to sever the strap, and strap tension sensing means for restraining the actuation of said second motor means until a predetermined tension has been produced in said strap.

3. A power operated hand tool for tensioning and cutting a strap or the like, comprising frame means adapted

to be held in the hand, movable strap gripping means on said frame, first motor means on said frame for driving said strap gripping means to tension the strap, strap cutting means on said frame, second motor means actuable to drive said strap cutting means to sever the strap, and spring biasing means for restraining the actuation of said second motor means until a predetermined tension has been produced in said strap.

4. A power operated tool for tensioning and cutting a strap or the like, comprising a first cylinder a movable first piston in said cylinder, said first piston being hollow and closed at its opposite ends to provide therein a second cylinder, a movable second piston within said second cylinder, strap gripping means operatively connected to said second piston and adapted to grip and tension the strap upon movement of said second piston, strap severing means adapted to be actuated by movement of said first piston, means for admitting fluid under pressure to move said pistons, and biasing means for restraining movement of said first piston and actuation of said strap severing means until said second piston has been moved by said fluid to tension the strap.

5. A binder strap tensioning tool for tightening a binder strap loop about an object by pulling a free strap end with respect to a connector strap end and for cutting the free strap end extending outwardly from the connector strap end, said tool comprising a housing having an abutment member thereon for engaging an associated connector strap end during the tightening of the loop about the object, strap gripping structure mounted upon said housing for movement toward and away from said abutment member, said gripping structure including a gripping surface and a gripping member movably mounted with respect thereto and movable between a gripping position and a non-gripping position, a spring urging said gripping member toward said abutment surface, said gripping member having an abutment surface thereon for moving said gripping member from said gripping position to said non-gripping position, a fluid actuated motor mounted upon said housing and connected to said gripping structure for moving said gripping structure between a position adjacent to said abutment member and a retracted position spaced therefrom to pull the free strap end with respect to the connector strap end to tighten the loop around the object and for placing under tension the portion of the free strap end between said abutment member and said gripping member, cutting mechanism mounted upon said housing for cutting the portion of the free strap end between said abutment member and said gripping member, an actuator for said cutting mechanism responsive to the placement of that portion of the free strap end between said abutment member and said gripping member under a predetermined tension for actuating said cutting mechanism to cut the free strap end, a stop mounted on said housing at a point to engage said actuating arm at the completion of the strap cutting operation to move said gripping member to the non-gripping position thereof to release the cut free strap end held thereby, and fluid actuated mechanism for ejecting the cut free strap end from between said gripping surface and said gripping member when said gripping member is in the non-gripping position thereof at the end of a strap cutting operation.

6. A binder strap tensioning tool for tightening a binder strap loop about an object by pulling a free strap end with respect to a connector strap end and for cutting the free strap end extending outwardly from the connector strap end, said tool comprising a housing having an abutment member thereon for engaging an associated connector strap end during the tightening of the loop about the object, strap gripping structure mounted upon said housing for movement toward and away from said abutment member, said gripping structure including a gripping surface and a gripping member movably mounted with respect thereto for gripping a strap there-

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between and movable between a gripping position and a non-gripping position, a spring urging said gripping member toward said gripping surface, said gripping member having a first abutment surface thereon and a second abutment surface thereon for moving said gripping member from said gripping position to said non-gripping position, a first stop mounted adjacent to said abutment member and engaging said first abutment surface when said gripping structure is adjacent to said abutment member for moving said gripping member to the non-gripping position thereof, a fluid actuated motor mounted upon said housing and connected to said gripping structure for moving said gripping structure between a position adjacent to said abutment member and a retracted position spaced therefrom to pull the free strap end with respect to the connector strap end to tighten the loop around the object and for placing under tension the portion of the free strap end between said abutment member and said gripping member, cutting mechanism mounted upon said housing for cutting the portion of the free strap end between said abutment member and said gripping member, an actuator for said cutting mechanism responsive to the placement of that portion of the free strap end between said abutment member and said gripping member under a predetermined tension for actuating said cutting mechanism to cut the free strap end, a second stop mounted on said housing at a point to engage said second actuating surface on said gripping member at the end of the cutting operation to move said gripping member to the non-gripping position thereof to release the cut free strap end held thereby, and fluid actuated mechanism for ejecting the cut free strap end from between said gripping surface and said gripping member when said gripping member is in the non-gripping position thereof at the end of a strap cutting operation.

7. A binder strap tensioning tool for tightening a binder strap loop about an object by pulling a free strap end with respect to a connector strap end and for cutting the free strap end extending outwardly from the connector strap end, said tool comprising a housing having an abutment member thereon for engaging an associated connector strap end during the tightening of the loop about the object, strap gripping structure mounted upon said housing for movement toward and away from said abutment member, said gripping structure including a gripping surface and a gripping member movably mounted with respect thereto and movable between a gripping position and a non-gripping position, a spring urging said gripping member toward said abutment surface, said gripping member having an abutment surface thereon for moving said gripping member from said gripping position to said non-gripping position, a stop mounted adjacent to said abutment member and engaging said abutment surface when said gripping member is adjacent to said abutment member for moving said gripping member to the non-gripping position thereof, a fluid actuated motor mounted upon said housing and connected to said gripping structure for moving said gripping structure between a position adjacent to said abutment member and a retracted position spaced therefrom to pull the free strap end with respect to the connector strap end to tighten the loop around the object and for placing under tension the portion of the free strap end between said abutment member and said gripping member, a strap cutting blade shiftably mounted on said housing adjacent to said abutment member, drive mechanism for said blade responsive to the placement of that portion of the free strap end between said abutment member and said gripping member under a predetermined tension for moving said blade to cut the free strap end, and a guard mounted on said housing adjacent to said blade for covering said blade.

8. The binder strap tensioning tool set forth in claim

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7, wherein said housing has a slot therein adjacent to said abutment member and said blade for receiving the free end of the strap therethrough, said guard is shiftably mounted and resiliently urged to a position closing said slot to cover said blade, the upper edge of said guard having a cam surface thereon so that placement of a strap thereagainst and movement of the strap into said slot will shift said guard downwardly and out of registration with said slot.

9. A binder strap tensioning tool for tightening a binder strap loop about an object by pulling a free strap end with respect to a connector strap end and for cutting the free strap end extending outwardly from the connector strap end, said tool comprising an elongated housing including a first housing section at one end thereof and a second housing section at the other end thereof, joining structure interconnecting said housing sections and permitting rotating movement between said housing sections, an abutment member on said first housing section for engaging an associated connector strap end during the tightening of the loop about the object, a strap gripping member for gripping an associated free strap end during the tightening of the loop around the object, said gripping member being mounted upon said first housing section for movement toward and away from said abutment member, a fluid actuated motor mounted upon said second housing section and connected to said gripping member for moving said gripping member between an engaging position adjacent to said abutment member and a retracted position spaced therefrom to pull the free strap end with respect to the connector strap end to tighten the loop around the object and for placing under tension the portion of the free strap end between said abutment member and said gripping member, control structure mounted on said second housing section and including an actuating handle extending outwardly therefrom for controlling the operation of said motor, cutting mechanism mounted upon said first housing section for cutting the portion of the free strap end between said abutment member and said gripping member, and an actuator for said cutting mechanism responsive to the placement of that portion of the free strap end between said abutment member and said gripping member under a predetermined tension for actuating said cutting mechanism to cut the free strap end.

10. A binder strap tensioning tool for tightening a binder strap loop about an object by pulling a free strap end with respect to a connector strap end and for cutting the free strap end extending outwardly from the connector strap end, said tool comprising an elongated housing including a first housing section at one end thereof and a second housing section at the other end thereof, joining structure interconnecting said housing sections and permitting rotating movement between said housing sections, an abutment member on said first housing section for engaging an associated connector strap end during the tightening of the loop about the object, a strap gripping member for gripping an associated free strap end during the tightening of the loop around the object, said gripping member being mounted upon said first housing section for movement toward and away from said abutment member, a fluid actuated motor mounted upon said second housing section and connected to said gripping member for moving said gripping member between an engaging position adjacent to said abutment member and a retracted position spaced therefrom to pull the free strap end with respect to the connector strap end to tighten the loop around the object and for placing under tension the portion of the free strap end between said abutment member and said gripping member, control structure mounted on said second housing section and including an actuating handle extending outwardly therefrom for controlling the operation of said motor, biasing mechanism mounted on said second housing section and including two biasing members selectively operable to exert differ-

ent predetermined biases, a selector knob mounted externally of said second housing for selecting said biasing members, cutting mechanism mounted upon said first housing section for cutting the portion of the free strap end between said abutment member and said gripping member, and actuator for said cutting mechanism responsive to the placement of that portion of the free strap end between said abutment member and said gripping member under a tension determined by the selected bias exerted by said biasing mechanism for actuating said cutting mechanism to cut the free strap end.

11. A tool for tensioning and cutting a strap or the like, said tool comprising an elongated housing, a first hydraulic cylinder in said housing and having a first hydraulic piston therein and movable therealong, said first piston having a first piston head thereon at the end thereof disposed toward one end of said housing, a second hydraulic cylinder in said first piston and having a second piston therein and movable toward and away from said one housing end, said second piston having a second piston head thereon at the end thereof opposite said one housing end, a gripping member mounted upon and carried by said second piston for gripping a strap or the like during the tightening thereof around an object, biasing structure mounted in said housing and connected to said first piston and urging said first piston away from said one housing end under a predetermined bias, a control valve in said housing and operable in a first position thereof to admit fluid under pressure between said first piston head and said second piston head to move said gripping member toward said one housing end for receiving a strap therein and operable in a second position thereof to admit fluid under pressure into the space between said second piston head and the end of said second cylinder disposed toward said one housing end to move said gripping member away from said one housing end, cutting mechanism mounted upon said housing for cutting the strap gripped by said gripping member, and an actuator for said cutting mechanism responsive to the movement of said first piston toward said one housing end upon the placement of the strap gripped by said gripping member under a predetermined tension determined by the bias exerted by said biasing structure for actuating said cutting mechanism to cut the strap.

12. A tool for tensioning and cutting a strap or the like, said tool comprising an elongated housing, a first hydraulic cylinder in said housing and having a first hydraulic piston therein and movable therealong, said first piston having a first piston head thereon at the end thereof disposed toward one end of said housing, a second hydraulic cylinder in said first piston and having a second piston therein and movable toward and away from said one housing end, said second piston having a second piston head thereon at the end thereof opposite said one housing end, a gripping member mounted upon and carried by said second piston for gripping a strap or the like during the tightening thereof around an object, biasing structure mounted in said housing and connected to said first piston and urging said first piston away from said one housing end under a predetermined bias, a control valve in said housing and operable in a first position thereof to admit fluid under pressure between said first piston head and said second piston head to move said gripping member toward said one housing end for receiving a strap therein and operable in a second position thereof to admit fluid under pressure into the space between said second piston head and the end of said second cylinder disposed toward said one housing end to move said gripping member away from said one housing end, a strap cutting blade shiftably mounted upon said housing adjacent to said one end thereof, an actuating member mounted on said housing and engaging said blade for moving said blade to the cutting position thereof, and a cam surface on said first piston disposed toward said one housing end and engagable with said actuating mem-

ber to actuate said blade in the cutting direction responsive to the movement of said first piston toward said one housing end upon the placement of the strap gripped by said gripping member under a predetermined tension determined by the bias exerted by said biasing structure.

13. A tool for tensioning and cutting a strap or the like, said tool comprising an elongated housing, a first hydraulic cylinder in said housing and having a first hydraulic piston therein and movable therealong, said first piston having a first piston head thereon at the end thereof disposed toward one end of said housing, a second hydraulic cylinder in said first piston and having a second piston therein and movable toward and away from said one housing end, said second piston having a second piston head thereon at the end thereof opposite said one housing end, a gripping member mounted upon and carried by said second piston for gripping a strap or the like during the tightening thereof around an object, biasing mechanism mounted in said housing and including two biasing members selectively connectable to said first piston for urging said first piston away from said one housing end under selected predetermined biases, a control valve in said housing and operable in a first position thereof to admit fluid under pressure between said first piston head and said second piston head to move said gripping member toward said one housing end for receiving a strap therein and operable in a second position thereof to admit fluid under pressure into the space between said second piston head and the end of said second cylinder disposed toward said one housing end to move said gripping member away from said one housing end, cutting mechanism mounted upon said housing for cutting the strap gripped by said gripping member, and an actuator for said cutting mechanism responsive to the movement of said first piston toward said one housing end upon the placement of the strap gripped by said gripping member under a predetermined selected tension determined by said selected bias exerted by said biasing mechanism for actuating said cutting mechanism to cut the strap.

14. A binder strap tensioning tool for tightening a binder strap loop about an object by pulling a free strap end with respect to a connector strap end and for cutting the free strap end extending outwardly from the connector strap end, said tool comprising an elongated housing having an abutment member thereon at one end thereof for engaging an associated connector strap end during the tightening of the loop about the object, a first hydraulic cylinder in said housing and having a first hydraulic piston mounted therein and movable toward and away from said abutment member, said first piston having a first piston head thereon, at the end thereof opposite said abutment member, a second hydraulic cylinder in said first piston and having a second piston mounted therein and movable toward and away from said abutment member, said second piston having a second piston head thereon at the end thereof opposite said abutment member, a strap gripping member mounted upon and carried by said second piston for gripping an associated free strap end during the tightening of the loop around the object, biasing structure mounted in said housing and connected to said first piston and urging said first piston away from said abutment member under a predetermined bias, a control valve operable in a first position thereof to admit fluid under pressure between said first piston head and said second piston head to move said gripping member toward said abutment member for receiving a free strap end therein and operable in a second position thereof to admit fluid under pressure into the space between said second piston head and the end of said second cylinder disposed toward said abutment member to move said gripping member away from said abutment member, movement of said gripping member away from said abutment member pulling the free strap end with respect to the connector strap end to tighten the loop around the

object and placing under tension the portion of the free strap end between said abutment member and said gripping member, cutting mechanism mounted upon said housing for cutting the portion of the free strap end between said abutment member and said gripping member, and an actuator for said cutting mechanism responsive to the movement of said first piston toward said abutment member upon the placement of that portion of the free strap end between said abutment member and said gripping member under a predetermined tension determined by the bias exerted by said biasing structure for actuating said cutting mechanism to cut the free strap end.

15. A binder strap tensioning tool for tightening a binder strap loop about an object by pulling a free strap end with respect to a connector strap end and for cutting the free strap end extending outwardly from the connector strap end, said tool comprising an elongated housing having an abutment member thereon at one end thereof for engaging an associated connector strap end during the tightening of the loop about the object, a first hydraulic cylinder in said housing and having a first hydraulic piston mounted therein and movable toward and away from said abutment member, said first piston having a first piston head thereon, at the end thereof opposite said abutment member, a second hydraulic cylinder in said first piston and having a second piston mounted therein and movable toward and away from said abutment member, said second piston having a second piston head thereon at the end thereof opposite said abutment member, a strap gripping member mounted upon and carried by said second piston for gripping an associated free strap end during the tightening of the loop around the object, biasing structure mounted in said housing and connected to said first piston and urging said first piston away from said abutment member under a predetermined bias, a control valve operable in a first position thereof to admit fluid under pressure between said first piston head and said second piston head to move said gripping member toward said abutment member for receiving a free strap end therein and operable in a second position thereof to admit fluid under pressure into the space between said second piston head and the end of said second cylinder disposed toward said abutment member to move said gripping member away from said abutment member, movement of said gripping member away from said abutment member pulling the free strap end with respect to the connector strap end to tighten the loop around the object and placing under tension the portion of the free strap end between said abutment member and said gripping member, a strap cutting blade shiftably mounted upon said housing adjacent to said abutment member for cutting the portion of the free strap end between said strap end between said abutment member and said gripping member, an actuating lever mounted on said housing and engaging said blade for moving said blade to the cutting position thereof, and a cam operating surface on said first piston disposed toward said abutment member and engagable with said lever to actuate said blade in the cutting direction responsive to the movement of said first piston toward said abutment member upon the placement of that portion of the free strap end between said abutment member and said gripping member under a predetermined tension determined by the bias exerted by said biasing structure.

16. A binder strap tensioning tool for tightening a binder strap loop about an object by pulling a free strap end with respect to a connector strap end and for cutting the free strap end extending outwardly from the connector strap end, said tool comprising an elongated housing having an abutment member thereon at one end thereof for engaging an associated connector strap end during the tightening of the loop about the object, a first hydraulic cylinder in said housing and having a first hydraulic piston mounted therein and movable toward and away from said abutment member, said first piston

having a first piston head thereon, at the end thereof opposite said abutment member, a second hydraulic cylinder in said first piston and having a second piston mounted therein and movable toward and away from said abutment member, said second piston having a second piston head thereon at the end thereof opposite said abutment member, a strap gripping member mounted upon and carried by said second piston for gripping an associated free strap end during the tightening of the loop around the object, biasing structure mounted in said housing and connected to said first piston and urging said first piston away from said abutment member under a predetermined bias, a control valve operable in a first position thereof to admit fluid under pressure between said first piston head and said second piston head to move said gripping member toward said abutment member for receiving a free strap end therein and operable in a second position thereof to admit fluid under pressure into the space between said second piston head and the end of said second cylinder disposed toward said abutment member to move said gripping member away from said abutment member, movement of said gripping member away from said abutment member pulling the free strap end with respect to the connector strap end to tighten the loop around the object and placing under tension the portion of the free strap end between said abutment member and said gripping member, a strap cutting blade shiftably mounted upon said housing adjacent to said abutment member for cutting the portion of the free strap end between said abutment member and said gripping member, an actuating lever mounted on said housing and engaging said blade for moving said blade to the cutting position thereof, a cam operating surface on said first piston disposed toward said abutment member and engagable with said lever to actuate said blade in the cutting direction responsive to the movement of said first piston toward said abutment member upon the placement of that portion of the free strap end between said abutment member and said gripping member under a predetermined tension determined by the bias exerted by said biasing structure, and means for admitting fluid under pressure against the face of said first piston disposed away from said abutment member upon initial movement of said first piston toward said abutment member to insure rapid and full operation of said blade.

17. A binder strap tensioning tool for tightening a binder strap loop about an object by pulling a free strap end with respect to a connector strap end and for cutting the free strap end extending outwardly from the connector strap end, said tool comprising an elongated housing having an abutment member thereon at one end thereof for engaging an associated connector strap end during the tightening of the loop about the object, a first hydraulic cylinder in said housing and having a first hydraulic piston mounted therein and movable toward and away from said abutment member, said first piston having a first piston head thereon, at the end thereof opposite said abutment member, a second hydraulic cylinder in said first piston and having a second piston mounted therein and movable toward and away from said abutment member, said second piston having a second piston head thereon at the end thereof opposite said abutment member, a strap gripping member mounted upon and carried by said second piston for gripping an associated free strap end during the tightening of the loop around the object, biasing mechanism mounted in said housing and including two biasing members selectively connectable to said first piston for urging said first piston away from said abutment member under selected predetermined biases, a control valve operable in a first position thereof to admit fluid under pressure between said first piston head and said second piston head to move said gripping member toward said abutment member for receiving a free strap end therein and operable in a second position thereof to admit fluid under pressure into the space between said

second piston head and the end of said second cylinder disposed toward said abutment member to move said gripping member away from said abutment member, movement, of said gripping member away from said abutment member pulling the free strap end with respect to the connector strap end to tighten the loop around the object and placing under tension the portion of the free strap end between said abutment member and said gripping member, cutting mechanism mounted upon said housing for cutting the portion of the free strap end between said abutment member and said gripping member, and an actuator for said cutting mechanism responsive to the movement of said first piston toward said abutment member upon the placement of that portion of free strap end between said abutment member and said gripping member under a predetermined selected tension determined by the selected bias exerted by said biasing mechanism for actuating said cutting mechanism to cut the free strap end.

18. The binder strap tensioning tool set forth in claim 17, wherein said biasing mechanism includes two springs having different biasing strengths, and structure for selectively connecting said springs to said first piston.

19. A binder strap tensioning tool for tightening a binder strap loop about an object by pulling a free strap end with respect to a connector strap end and for cutting the free strap end extending outwardly from the connector strap end, said tool comprising an elongated housing having an abutment member thereon at one end thereof for engaging an associated connector strap end during the tightening of the loop about the object, a first hydraulic cylinder in said housing and having a first hydraulic piston mounted therein and movable toward and away from said abutment member, said first piston having a first piston head thereon, at the end thereof opposite said abutment member, a second hydraulic cylinder in said first piston and having a second piston mounted therein and movable toward and away from said abutment member, said second piston having a second piston head thereon at the end thereof opposite said abutment member, a piston rod mounted upon and carried by said second piston and extending outwardly therefrom toward said abutment member, a strap gripping member mounted upon and carried by said piston rod for gripping an associated free strap end during the tightening of the loop around the object, biasing structure mounted in said housing and connected to said first piston and urging said first piston away from said abutment member under a predetermined bias, a control valve operable in a first position thereof to admit fluid under pressure between said first piston head and said second piston head to move said gripping member toward said abutment member for receiving a free strap end therein and operable in a second position thereof to admit fluid under pressure into the space between said second piston head and the end of said second cylinder disposed toward said abutment member to move said gripping member away from said abutment member, movement of said gripping member away from said abutment member pulling the free strap end with respect to the connector strap end to tighten the loop around the object and placing under tension the portion of the free strap end between said abutment member and said gripping member, cutting mechanism mounted upon said housing for cutting the portion of the free strap end between said abutment member and said gripping member, an actuator for said cutting mechanism responsive to the movement of said first piston toward said abutment member and the placement of that portion of the free strap end between said abutment member and said gripping member under a predetermined tension determined by the bias exerted by said biasing structure for actuating said cutting mechanism to cut the free strap end, and a fluid passage in said rod having an outlet adjacent to said gripping member and an inlet communicating with the space between said first cylinder and

said first piston at the end of the strap cutting operation for ejecting the cut free strap end from the gripping member.

20. A binder strap tensioning tool for tightening a binder strap loop about an object by pulling a free strap end with respect to a connector strap end and for cutting the free strap end extending outwardly from the connector strap end, said tool comprising an elongated housing having an abutment member thereon at one end thereof for engaging an associated connector strap end during the tightening of the loop about the object, a first hydraulic cylinder in said housing and having a first hydraulic piston mounted therein and movable toward and away from said abutment member, said first piston having a first piston head thereon, at the end thereof opposite said abutment member, a second hydraulic cylinder in said first piston and having a second piston mounted therein and movable toward and away from said abutment member, said second piston having a second piston head thereon at the end thereof opposite said abutment member, a piston rod mounted upon and carried by said second piston and extending outwardly therefrom toward said abutment member, strap gripping structure mounted upon said piston rod for movement toward and away from said abutment member, said gripping structure including a gripping surface and a gripping member movably mounted with respect thereto for gripping a strap therebetween and movable between a gripping position and a non-gripping position, a spring urging said gripping member toward said gripping surface, said gripping member having a first abutment surface thereon and a second abutment surface thereon for moving said gripping member from said gripping position to said non-gripping position, a first stop mounted adjacent to said abutment member and engaging said first abutment surface when said gripping structure is adjacent to said abutment member for moving said gripping member to the non-gripping position thereof, biasing structure mounted in said housing and connected to said first piston and urging said first piston away from said abutment member under a predetermined bias, a control valve operable in a first position thereof to admit fluid under pressure between said first piston head and said second piston head to move said gripping member toward said abutment member for receiving a free strap end therein and operable in a second position thereof to admit fluid under pressure into the space between said second piston head and the end of said second cylinder disposed toward said abutment member to move said gripping member away from said abutment member, movement of said gripping member away from said abutment member pulling the free strap end with respect to the connector strap end to tighten the loop around the object and placing under tension the portion of the free strap end between said abutment member and said gripping member, cutting mechanism mounted upon said housing for cutting the portion of the free strap end between said abutment member and said gripping member, an actuator for said cutting mechanism responsive to the movement of said first piston toward said abutment member upon the placement of that portion of the free strap end between said abutment member and said gripping member under a predetermined tension determined by the bias exerted by said biasing structure for actuating said cutting mechanism to cut the free strap end, a second stop mounted on said housing at a point to engage said second actuating surface on said gripping member at the end of the cutting operation to move said gripping member with a non-gripping position thereof to release the cut free strap end held thereby, and a fluid passage in said rod having an outlet adjacent to said gripping member and an inlet communicating with the space between said first cylinder and said first piston when said gripping member is in the non-gripping position thereof at the end of a strap cutting operation.

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21. A binder strap tensioning tool for tightening a binder strap loop about an object by pulling a free strap end with respect to a connector strap end and for cutting the free strap end extending outwardly from the connector strap end, said tool comprising an elongated housing including a first housing section at one end thereof and a second housing section at the other end thereof, joining structure interconnecting said housing sections and permitting rotating movement between said housing sections, an abutment member on said first housing section for engaging an associated connector strap end during the tightening of the loop about the object, a first hydraulic cylinder in said second housing section and having a first hydraulic piston mounted therein and movable toward and away from said abutment member, said first piston having a first piston head thereon, at the end thereof opposite said abutment member, a second hydraulic cylinder in said first piston and having a second piston mounted therein and movable toward and away from said abutment member, said second piston having a second piston head thereon at the end thereof opposite said abutment member, a strap gripping member mounted upon and carried by said second piston for gripping an associated free strap end during the tightening of the loop around the object, biasing structure mounted in said second housing section and connected to said first piston and urging said first piston away from said abutment member under a predetermined bias, a control valve in said second housing section and including an actuating handle extending outwardly from said second housing section for moving said valve between a first position and a second position, said valve in the first position thereof being operable to admit fluid under pressure between

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said first piston head and said second piston head to move said gripping member toward said abutment member for receiving a free strap end therein and in the second position thereof being operable to admit fluid under pressure into the space between said second piston head and the end of said second cylinder disposed toward said abutment member to move said gripping member away from said abutment member, movement of said gripping member away from said abutment member pulling the free strap end with respect to the connector strap end to tighten the loop around the object and placing under tension the portion of the free strap end between said abutment member and said gripping member, cutting mechanism mounted upon said first housing section for cutting the portion of the free strap end between said abutment member and said gripping member, and an actuator for said cutting mechanism responsive to the movement of said first piston toward said abutment member upon the placement of that portion of the free strap end between said abutment member and said gripping member under a predetermined tension determined by the bias exerted by said biasing structure for actuating said cutting mechanism to cut the free strap end.

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