United States Patent [19]

Hidassy

[11] **3,810,498**

[45] **May 14, 1974**

[54] **TOOL JAWS**

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[73] Assignee: **Thomas & Betts Corporation**, Elizabeth, N.J.

[22] Filed: **Mar. 21, 1973**

[21] Appl. No.: **343,415**

[52] **U.S. Cl.** ..... **140/93 A**, 140/123

[51] **Int. Cl.** **B21f 9/02**

[58] **Field of Search** ..... 140/93 A, 93.2, 123; 81/367

[56] **References Cited**

UNITED STATES PATENTS

3,621,889	11/1971	Hidassy	140/123
2,501,238	3/1950	Sarsgard	81/367

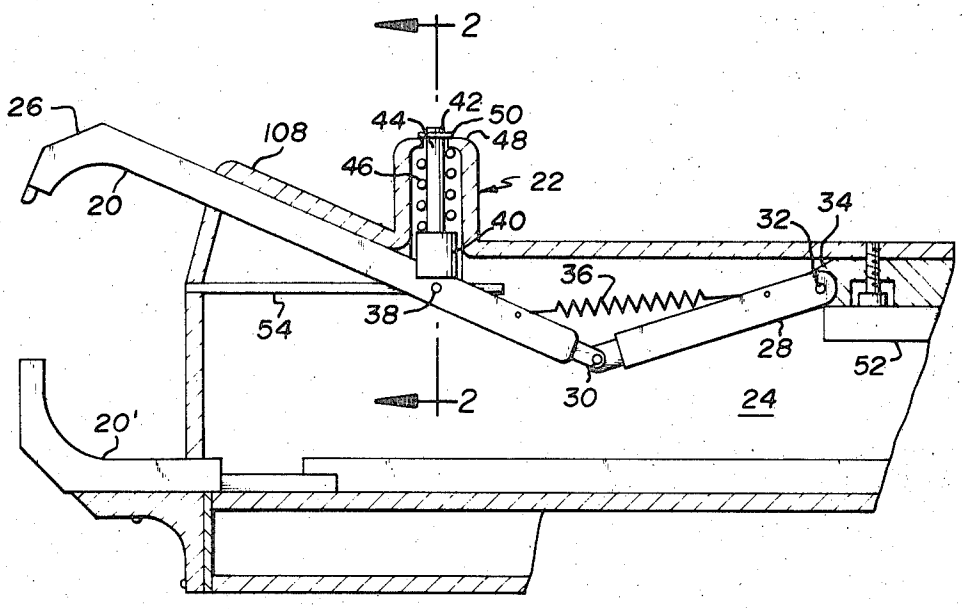
Primary Examiner—Lowell A. Larson

Attorney, Agent, or Firm—David Teschner; Jesse Woldman

[57] **ABSTRACT**

At least one of a pair of selectively operable tool jaws of a strap applying tool is cooperatively coupled to biasing means to permit selective displacement of the jaw or jaws in the event full closure of such jaws is restricted either by an obstruction or an oversized article situated between the jaws. In a preferred embodiment, the displaceable tool jaw is partially restrained by the bifurcated end of a plunger means having a shank portion engaged by a spring means resiliently coupling the plunger means to the tool housing. Adjusting means may be provided to selectively vary the pressure exerted by the biasing means.

13 Claims, 10 Drawing Figures



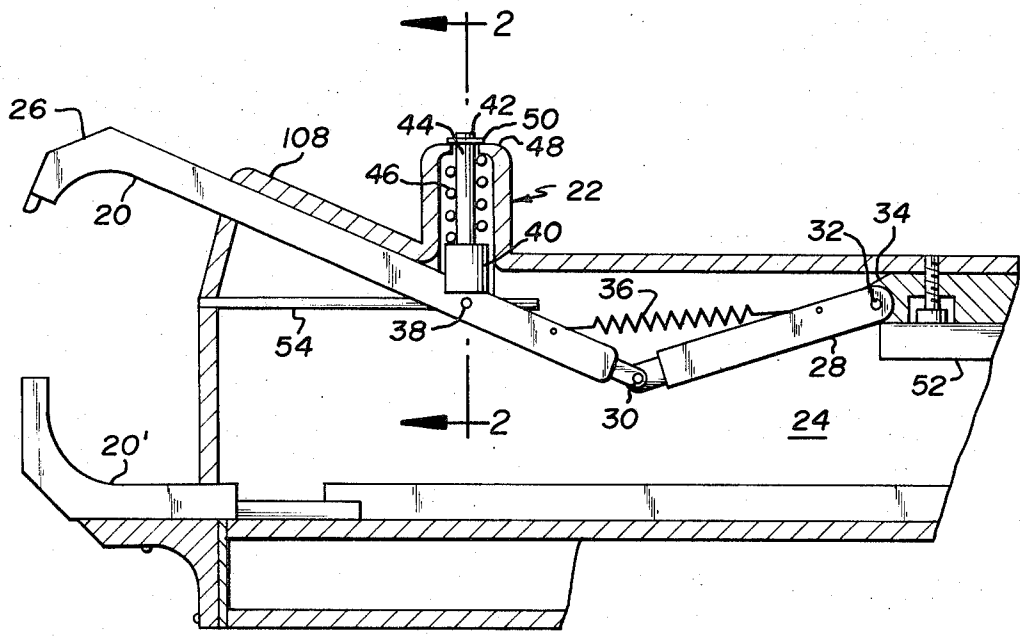
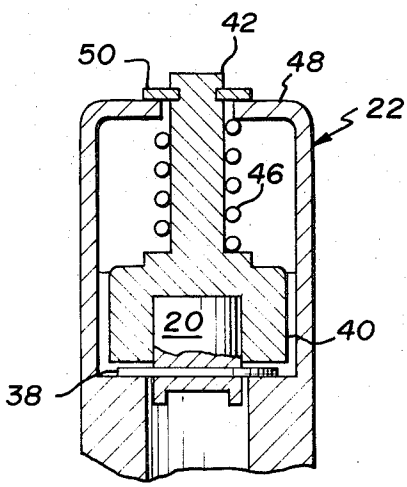


FIG. 1

FIG. 2



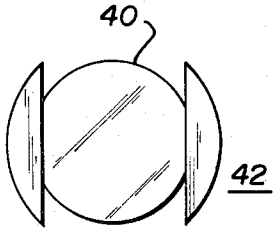


FIG. 3

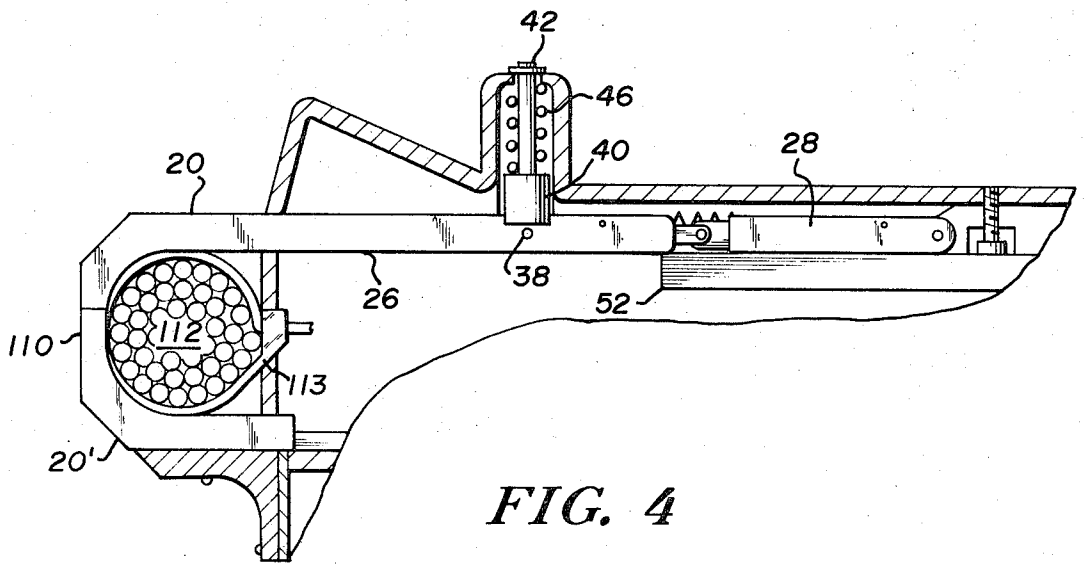


FIG. 4

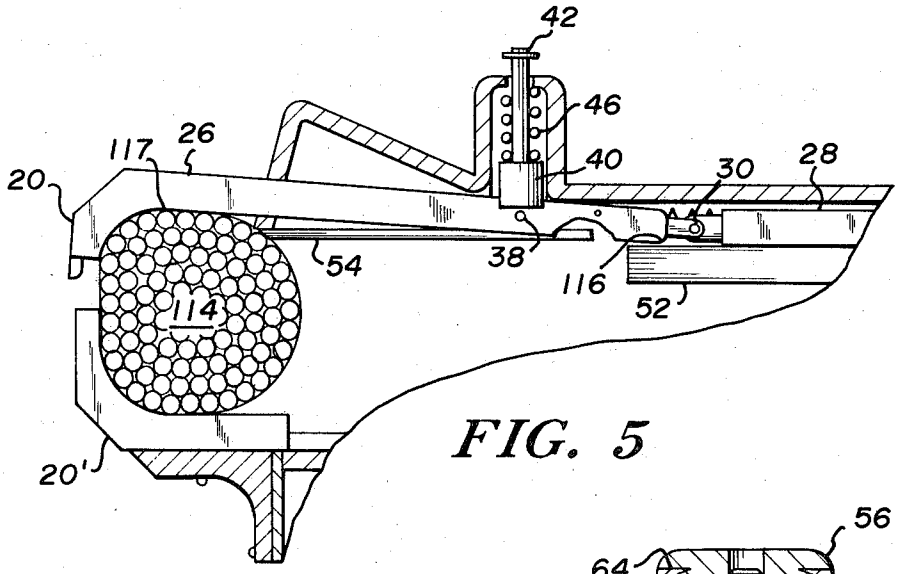


FIG. 5

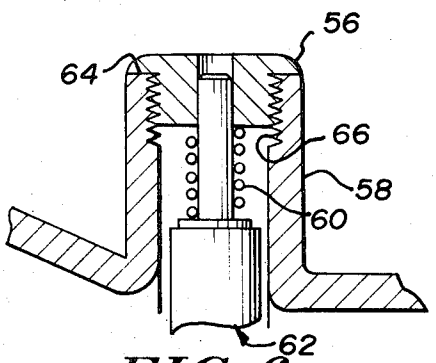


FIG. 6

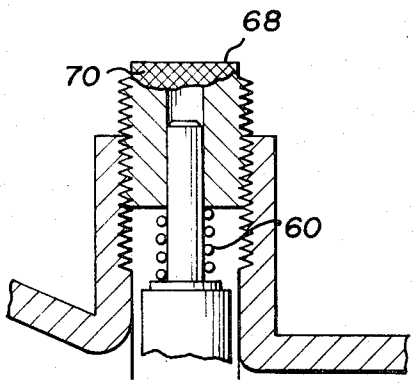


FIG. 7

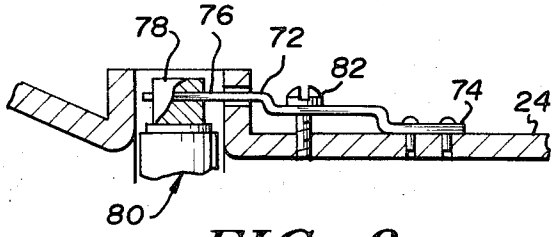


FIG. 8

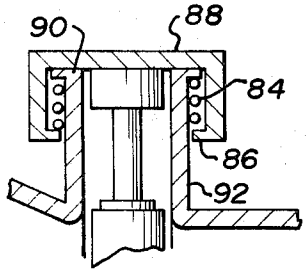


FIG. 9

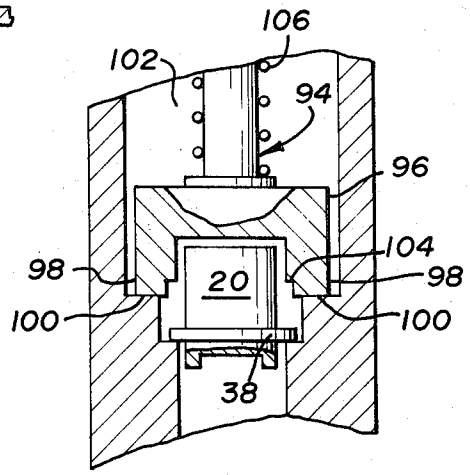


FIG. 10

TOOL JAWS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention is directed to the field of tools having movable jaw means operable between a closed and an open position, as exemplified, for example, in U.S. Pat. No. 3,515,178, issued June 2, 1970, and assigned to the assignee of the instant invention.

2. Description of the Prior Art

Prior art tool jaws useful for example in automatic strap applying tools, as exemplified, for example, in U.S. Pat. No. 3,621,889, issued Nov. 23, 1971, and assigned to the assignee of the instant invention, and U.S. Pat. No. 3,515,178, issued June 2, 1970 and assigned to the assignee of the instant invention, generally comprised a pair of selectively operable tool jaws adapted to encircle a wire harness bundle or the like to provide a restraining means and guide for a bundling strap fed into the tool jaws and around the bundle and thereafter tightened and severed to provide a looped tie thereat. The movable jaw is selectively operable from an open position to a closed position by means of a reciprocating plunger, as described in greater detail in U.S. Pat. No. 3,515,178, whereby the articulated assembly forming the movable jaw means is contacted by the plunger and urged into a straightened position to provide the necessary closure. A serious problem was often encountered with this arrangement in the event the jaws were physically restrained from closing fully due to the presence of an obstruction or oversized article therebetween, since the movable jaw was subjected to a relatively large stress generated by the advancing plunger which frequently caused damage to either the jaw member itself or the operating mechanism, or both, thereby seriously hampering the proper functioning of the tool and causing expensive delay and repair in attempting to correct this condition. Additionally, it is readily apparent that personal injury may commonly result from such arrangement where a portion of the body of a user is entrapped between the non-yielding jaws during closure.

SUMMARY OF THE INVENTION

The invention is directed to selectively operable tool jaws provided with yieldable biasing means for overcoming the problems and limitations noted above with respect to prior art devices. Cooperatively coupled to the movable one of a pair of tool jaws is a biasing means which, in a preferred embodiment, includes a plunger having a bifurcated end portion at least partially straddling a portion of the tool jaw and maintained in a first or normal position adjacent a pin or similar protrusion extending from the tool jaw and adapted to engage the end of the plunger. A resilient member which may be in the form of a compression spring cooperates with the shank of the plunger means to exert a force thereagainst to provide resilient coupling between the plunger means and the tool jaw support to which the resilient member is coupled. The biasing means may be disposed within a suitably orificed housing attached to or integral with the support means to provide longitudinal reciprocation of the plunger therewithin. In another embodiment, a leaf spring is employed to provide the biasing force and extends through the side of the housing containing the plunger means and engages a portion of the shank thereof. A cover or cap adjustably secured to the housing containing the plunger means may be employed to vary the spring pressure and thus vary the biasing force exerted on the movable tool jaw. The movable tool jaw assembly may include an articulated arrangement urged into colinear alignment for closure of the tool jaws in which case the biasing means cooperates with the forward portion of the tool jaw assembly to permit its displacement about the pivot joining the forward portion with the adjacent portion of the tool jaw assembly when the tool jaw subjected to a force sufficient to overcome the force of the biasing spring. The movable tool jaw to which the biasing means is coupled is thus caused to be yieldably displaced out of its normal operating position to a position generally parallel to the longitudinal axis of the tool jaw to relieve the stress thereon as the tool jaws are advanced towards the closed position about either an oversized object, or an obstruction preventing the full closure of the jaws, thereby advantageously minimizing damage either to the tool itself or to an object placed between the tool jaws. It is therefore an object of this invention to provide improved tool jaws.

It is a further object of this invention to provide means for enabling a movable tool jaw to be yieldably displaced out of its normal position upon engagement with an obstruction tending to deform or damage such jaw.

It is another object of this invention to provide means for limiting the closure force exerted between a pair of obstructed tool jaws.

It is still another object of this invention to provide biasing means arranged to resiliently couple a movable tool jaw to the tool body.

It is still a further object of this invention to provide a variable biasing means for an obstructed driven tool jaw.

It is yet another object of this invention to provide a yieldable tool jaw assembly in an automatic strap applying and tensioning tool.

Other objects and features of the invention will be pointed out in the following description and claims and illustrated in the accompanying drawings which disclose, by way of example, the principle of the invention and the best mode which has been contemplated for carrying it out.

BRIEF DESCRIPTION OF THE DRAWINGS

In the Drawings

FIG. 1 is a fragmentary side elevational view, partly in section, of yieldable tool jaw means constructed in accordance with the concepts of the invention.

FIG. 2 is an enlarged fragmentary elevational view, partly in section, of the biasing means employed in the structure of FIG. 1, taken along the line 2—2 therein.

FIG. 3 is a bottom view of the plunger means of the device of FIG. 2.

FIG. 4 is a fragmentary side elevational view, partly in section, showing the tool jaws of FIG. 1 in a normally closed position about a wire bundle.

FIG. 5 is a fragmentary side elevational view, partly in section, showing the tool jaws of FIG. 1 held in a partially open position about a wire bundle larger in diameter than that for which the jaws are adapted.

FIGS. 6, 7, 8, and 9 are fragmentary elevational views, partly in section, of further embodiments of

yieldable tool jaws biasing means constructed in accordance with the concepts of the invention.

FIG. 10 is a fragmentary elevational view, in section, showing a further embodiment of the biasing means of a yieldable tool jaw assembly constructed in accordance with the concepts of the invention.

Similar elements are given similar reference characters in each of the respective drawings.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Turning now to FIGS. 1, 2 and 3 there is shown a pair of tool jaws 20, 20 cooperatively coupled to a biasing means 22 attached to a support 24 and constructed in accordance with the concepts of the invention. The upper or first tool jaw 20 is movably connected to the support 24 while the lower or second jaw 20' is stationary with respect to support 24. Jaw 20 comprises an articulated assembly including a first portion 26 and a second portion 28 coupled together by a pin 30. Jaw portion 28 is further pivotally coupled at 32 to a further member 34 which is rigidly coupled to the tool jaw support means 24. An extension spring 36 is attached at each of its ends respectively, to portion 26 and portion 28 of jaw 20, to maintain the two portions in a cocked position, as shown, to establish the open position between jaws 20, 20'. A pin 38 located a predetermined distance from the juncture between portion 26 and portion 28 of jaw 20 protrudes outwardly from either side of jaw 20 just beneath the adjacent surface of the bifurcated end portion 40 of a plunger means 42 reciprocatingly disposed within the housing 22. Plunger means 42 further comprises a shank portion 44 about which is circumferentially disposed a compression spring 46 extending between the end portion 40 of plunger means 42 and a restrictively apertured portion 48 of housing 22. The shank portion 44 of plunger means 42 extends slightly beyond the housing 22 and is engaged by a restraining ring 50 supporting and restricting the downward movement of plunger means 42. Thus, in the arrangement illustrated in FIG. 1, plunger means 42 may be displaced upwardly towards the top of FIG. 1 but is restricted in its downward travel essentially as shown therein. The moveable jaw 20 is operated to the closed position by a plunger 52 which is reciprocatingly operable towards and away from the second portion 28 of jaw 20. As plunger 52 is advanced towards the left in FIG. 1, it contacts the second portion 28, of jaw 20, urging portion 28 clockwise into essentially horizontal parallel alignment with plunger 52 causing the first portion 26 of first jaw means 20 to rotate counterclockwise into engagement with jaw 20', as illustrated in FIG. 4, and causing a slight lateral movement of pin 38 towards the left of FIG. 1 beneath the end portion 40 of plunger means 42. Plunger means 42, however, is held in position above pin 38 to avoid contact therebetween during normal operation of the tool jaws, the lower part of pin 38 riding horizontally along a slot 54 in support means 24. To provide for the vertical motion of pin 38 upwardly towards plunger 42, in the event jaw 20 is displaced upwardly, as will be explained in greater detail below, the upper portion of slot 54 is relieved in the area generally adjacent plunger 42. The biasing means illustrated in FIGS. 1 through 5 is essentially nonadjustable, thereby establishing a fixed biasing force determined by the spring rate of the spring 46 employed therewith. Where necessary or desirable, the biasing means may be modified to provide for an adjustable biasing force in a manner shown, for example, in FIGS. 6 and 7. In FIG. 6, a threaded cap 56 is threadably coupled to a biasing means housing 58 adjacent the upper end thereof to selectively vary the spring length to and hence the biasing force generated by a spring 60 placed over the shank of a plunger 62 constructed similar to plunger 42 shown in FIG. 1. Cap 56 may be then selectively rotated in either direction to vary the spring pressure generated by spring 60. Cap 56 is further provided with a shoulder portion 64 arranged to abut the adjacent surface of housing 58, as cap 56 is rotated downwardly into further engagement with housing 58 to provide a stop means therefor. The extent of travel of cap 56 may, of course, be limited in any one of a number of alternate methods including, for example, limiting the length of the internally threaded portion 66 of housing 58.

In another embodiment, illustrated in FIG. 7, the adjusting means comprises an essentially uniformly dimensioned threaded cap 68 provided with a knurled outer surface 70 to permit convenient manual rotation of the cap 68.

A further embodiment of adjustable biasing means is shown in FIG. 8 wherein the biasing force is supplied by a cantilever spring 72, coupled at one end 74 to the tool jaw support 24 and at its other end 76 to a slotted portion 78 of the shank of a plunger means 80. The force generated by spring 72 may be readily regulated by the selective adjustment of an adjusting means shown in FIG. 8 as a threaded screw 82 passing through an orifice in spring 72 and engaging a complementarily threaded hole in support 24. Thus, by selectively rotating the threaded member 82 in either a clockwise or counterclockwise direction, the biasing force may be selectively increased or decreased. A further embodiment of a biasing means is illustrated in FIG. 9. A compression spring 84 is disposed about the outer periphery of a biasing means housing 92, being encaptured between an inturned lip 86 adjacent the mouth of an overlying cap member 88 and an external shoulder portion 90 adjacent the top opening of housing 92. In this arrangement, the biasing means plunger and spring are essentially protected from external exposure, and may be readily adapted to provide for a completely sealed assembly where necessary or desirable. It also has the further advantage of avoiding direct physical contact between the spring 84 and the shank of the biasing means plunger, where, for example, the assembly includes a metallic spring and a non-metallic or plastic plunger in which case contact between the two parts might lead to excessive wear and ultimate failure. In the embodiments illustrated in FIGS. 6, 7, 8 and 9, it will be noted that, due to the absence of a restraining member such as the ring 50 shown in FIG. 1, the biasing means plunger is free to move downwardly unrestrictively under the influence of the biasing spring and, accordingly, apply an initial downward thrust against the pin 38 (FIG. 1). To maintain the bifurcated end of the plunger out of initial contact with pin 38, an arrangement similar to that illustrated in FIG. 10 may be employed. A biasing means plunger 94 having a bifurcated end portion 96, similar to portion 40 illustrated in FIG. 1, is provided with raised portions 98 arranged to seat against the opposing inwardly extending surfaces 100 of the biasing means chamber 102, and to restrict the downward movement of the plunger 94 and prevent its

engagement with pin 38 when the jaw 20 is operated to the normally open or normally closed position. Upon the upward displacement of jaw 20, however, as will be described in more detail hereafter, pin 38 is urged upwardly between the raised portions 98 and against a recessed portion 104 of plunger 94 thereby advancing plunger 94 upwardly against the force of the biasing spring 106. The upward travel of the first portion 26 of movable jaw 20 is restricted by an overhanging portion 108 of support 24 providing a stop means therefore.

Referring now to FIG. 4, jaws 20, 20' are shown in their normally closed position, plunger 52 having been advanced towards the left to activate the articulated assembly comprising the first portion 26 and the second portion 28 of the movable jaw 20, and the bight of the loop formed by the tool jaws 20, 20', as at 110, being continuous and unobstructed. For purposes of illustration, and to better illustrate the principle of the invention, the jaws of the invention are shown in conjunction with a strap applying tool of the type exemplified in U.S. Pat. No. 3,515,178 cited heretofore. In this application, a bundling strap 113 has been inserted into the jaw members and advanced around the bight of the jaws to provide a complete loop about a bundle of wires 112, which is of a size adapted to be totally encompassed by the tool jaws 20, 20'. It will be further noted that upon closure of jaw 20, a small gap exists between pin 28 and plunger 42 and, accordingly the plunger 42 is undeflected during such cycle. However, where the jaws 20, 20' have been urged towards the closed position about an article larger than that for which the tool jaws are adapted, such as, for example, a bundle of wires 114 having a diameter larger than bundle 112, as shown in FIG. 5, pin 38 is forced upwardly against the end portion 40 of plunger 42 causing plunger 42 to be displaced upwardly against the force of spring 46 permitting the jaw 20 to be axially displaced in a direction generally parallel to its longitudinal axis and away from jaw 20'. As plunger 52 continues to advance towards the left of FIG. 5, jaw 20 is displaced upwardly as a result of its contact with plunger 52 at 116 and with the wire bundle 114 generally at 117. Upon the retraction of plunger 52 towards the right of FIG. 5, the first jaw portion 26 of jaw 20 will then be urged downwardly under the influence of spring 46 and plunger 42 to its normally open position as illustrated in FIG. 1. The cycle has thus been completed safely without damage either to the jaw 20 or to the other portions of the operating mechanism. The extent of displacement of jaw 20 will of course be determined by the gap available between the upper surface of the first portion 26 of jaw 20 and the overlying flanged portion of support 24. The relative position of pin 38 with respect to pin 30 joining the first portion 26 of the jaw 20 with the second portion 28 will determine the relationship between the displacement of pin 38 with respect to the displacement of the free end of the first portion 26 of jaw 20. For example, the closer pin 38 is to pin 30 the greater will be the size of the object which may be accommodated between the jaws 20, 20' for a fixed displacement of pin 38 and, conversely the further pin 38 is positioned from pin 30, the smaller the amount of displacement of the free end of the first portion 26 of jaw 20 with respect to a fixed displacement of pin 38. It will of course be readily apparent to those skilled in the art that pin 38 may be replaced by any protrusion either affixed to the jaw 20, or as an integral part thereof, to provide the necessary drive for plunger 42 without departing from the spirit of the invention and within the concepts herein disclosed. It will of course also be readily apparent that, although not illustrated, both of the tool jaws 20, 20' may be connected to support 24 and a biasing means such as described above employed therewith within the teachings herein disclosed.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows.

1. In an automatic installing tool for placing and fastening elongated bundling straps about a plurality of articles to be bundled, of the type having support means, a first jaw means coupled to said support means, a second jaw means coupled to said support means, at least one of said first and said second jaw means being movably coupled to said support means and operable towards and away from the other of said first and said second jaw means to a closed and an open position, respectively, and means for normally urging the movable one of said first and said second jaw means toward the other to a closed position, the improvement comprising: biasing means coupled to said support means and selectively coupled to the movable one of said first and said second jaw means so that the jaw means to which said biasing means is coupled is permitted to move against said biasing means and in a direction generally parallel to the longitudinal axis of said movable one of said first and said second jaw means and away from the other of said first and said second jaw means when said first and said second jaw means encounter an obstruction preventing the full closure thereof.

2. The improvement as defined in claim 1 wherein said biasing means is selectively coupled to said movable one of said first and said second jaw means generally intermediate the ends thereof.

3. The improvement as defined in claim 1 wherein said movable one of said first and said second jaw means comprises a first portion having a first end engageable with an opposing first end of the other of said first and said second jaw means.

4. The improvement as defined in claim 3 wherein said movable one of said first and said second jaw means comprises a second portion pivotally coupled to said first portion and to said support means to provide an articulated assembly.

5. The improvement as defined in claim 1 wherein said biasing means includes plunger means resiliently coupled to said support means.

6. The improvement as defined in claim 5 wherein said biasing means includes spring means resiliently coupling said plunger means to said support means.

7. The improvement as defined in claim 5 wherein said plunger means includes a bifurcated end portion at least partially straddling said movable jaw means.

8. The improvement as defined in claim 7 wherein said plunger means end portion includes a generally arcuate surface cooperating with said movable jaw means to provide at least a partial guide therefor.

9. The improvement as defined in claim 1 wherein said biasing means includes plunger means having a bifurcated end portion at least partially straddling said movable jaw means, and spring means resiliently coupling said plunger means to said support means.

10. The improvement as defined in claim 1 further comprising a housing attached to said support means, said biasing means including plunger means at least partially disposed within said housing and slidably movable therewithin.

11. The improvement as defined in claim 10 wherein said biasing means further includes spring means disposed in said housing and resiliently coupling said plunger means to said housing.

12. The improvement as defined in claim 1 further comprising means for adjusting the force exerted by said biasing means.

13. The improvement as defined in claim 12 wherein said biasing means includes plunger means having a bifurcated end portion at least partially straddling said movable jaw means, and spring means resiliently coupling said plunger means to said support means, said adjusting means including threaded means engaging said spring means to vary the force exerted thereby.

* * * * *

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,810,498 Dated May 14, 1974

Inventor(s) Laszlo Hidassy

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 3, line 13, "20, 20" should be -- 20, 20' --

Signed and sealed this 24th day of September 1974.

(SEAL)
Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

FORM PO-1050 (10-69)

USCOMM-DC 60376-P69
* U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334