DEVICE FOR INSTALLATION OF BUNDLING STRAPS

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The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

The present invention relates to a device for tensioning and subsequently cutting locking tie straps or the like, and more particularly to an improved hand tool for tensioning a flexible plastic strap when looped around a plurality of bunched articles and for subsequently cutting the free end portion of the strap.

In particular, the present invention is an improvement over the structure disclosed in U.S. Patent No. 3,168,119 to Daniel P. Schwester et al. for "Device for Tensioning Bundling Straps" issued Feb. 2, 1965. This latter hand tool is of the parallel action pliers type and is particularly adapted for tensioning, locking, and severing individual flexible plastic bundling straps of the character disclosed in U.S. Patent 3,002,557, whereby the application of said straps on a plurality of bunched, insulated electrical conductors, for example, may be effected at spaced points thereafter with greater convenience and dispatch and, with all tied straps under equal tension.

Heretofore, in tieing such bundling straps with the hand tool shown in the above Patent No. 3,168,119, a detent lever is actuated after the desired tension is obtained. This permits further movement of the handle members which, in turn, advances the cutting edge of the tool to the cut-off position for removing the free end or tail of the bundling strap. It should be observed that until the actual cutting of the tail takes place, this "further movement" causes the pawl to grip the strap and to apply additional tension thereto which may result in damage to the bundled wires or elongation or distortion of the strap material, making it susceptible to breakage. It is also readily observed that a large compressive force is required to be exerted on the tool handles to sever the strap since the movement of the handles is opposed by both the cutting resistance of the strap and the resistance of the strap to the tension applied by the pawl.

The present invention obviates the deleterious conditions that exist above by providing a means for overriding the specific function of the pawl and thereby releasing the tension on the strap when the selected bundling tension is reached and when it is desired to cut the free end of the bundling strap. Additionally, the provision of a cutting edge in the guide plate is provided to aid in the cutting off of the excess strap in a smooth manner without the exertion of unreasonable pressure on the handles.

It is an object of the present invention to provide an improved hand tool which obviates the above-noted disadvantages and permits more efficient and faster application of straps than heretofore obtained.

A further object of the present invention is to provide a hand tool of the character described which allows the operator to obtain precise tensioning and to prevent overtension and cable damage.

Another object of the present invention is to provide an improved hand tool of the character described which prevents strap elongation and distortion due to overtension and which additionally allows easier cut-off of the excess strap material.

Still another object of the present invention is to provide a hand tool of the character described which provides a means of tensioning and severing individual flexible, plastic bundling straps with a greater efficiency and relative ease and at more equal tension selected by the operator than heretofore obtained.

A still further object of the present invention is to provide an improved hand tool of the character described which facilitates the removal of the excess strap material close to the locking device thereby eliminating the tail which is a potential safety hazard and which prevents the pawl gripping teeth on the hand tool from dulling due to interaction with the tool frame.

Various other objects and advantages will appear from the following description of an embodiment of the invention and the novel features will be particularly pointed out hereinafter in connection with the appended claims.

In the drawing:

FIG. 1 is a side elevation view of an improved hand tool showing the jaw members thereof after they have been moved toward each other but prior to engaging and cutoff position, and with a free end portion of a bundling strap therebetween.

FIG. 2 is a fragmentary side elevation view of the improved hand tool showing the other side of FIG. 1 with the camming position of the pawl and camming arm illustrated in dotted lines.

FIG. 3 is a bottom fragmentary view of the tool of FIG. 2.

FIG. 4 is a cross sectional view taken along the line 4—4 of FIG. 1.

FIG. 5 is a fragmentary sectional view taken on the line 5—5 of FIG. 3.

Referring to the drawing, the figures illustrated therein show the various elements of the tool in the position at which the desired tension has been reached. In particular, there is illustrated a hand tool of the pliers-type generally indicated at 10 comprising a pair of crossed handle members 12 of forged steel or the like, pivotally connected at 14. The handle members 12 include a pair of jaws 16a—16b of rectangular cross section formed integrally therewith and adapted to swing in an arc in scissors-like fashion when moved toward each other upon angular manipulation of the handle members 12. The jaws, comprising upper jaw member 16a and lower jaw member 16b, and pivoted handle members 12 are yieldably maintained in an open or spaced-apart position by a coiled compression spring 18 disposed between the opposed interfaces of the handle members 12 adjacent the pivotal connection 14 and cooperating with the handle members 12 in a manner known and used in the art. The hand grip portion of the handle members 12 are provided with a plastic covering or sleeve 20 to insulate a portion of the tool 10 and at the same time provide a non-slip surface thereon.

As viewed in FIGS. 1, 2 and 3, a major portion of each of the jaws 16a and 16b which extend beyond the fulcrum or pivotal connection 14 is offset by an offsetting portion 16c in the manner and for the purpose described in the above-mentioned Patent No. 3,168,119. Further, as illustrated in each of the figures, the lower jaw 16b terminates at its nose end in an integral, or angularly extending lip or tooth 25 in opposed relation to the nose end of the upper jaw 16a. As viewed most clearly in FIG. 4, the tooth 25 per se terminates at the free end thereof in a diagonally disposed transverse knife edge 25a to facilitate cutting of a strap S when brought into engagement therewith.

The upper jaw 16a is provided at the nose end thereof with an angle plate 34 having one leg 34a thereof secured on the outer face of the upper jaw 16a by means of suitable screws 36 or the like. The opposite free leg 34b of the angle plate 34 extends across the nose end
of the upper jaw 16a at right angles to the opposing faces of the jaw 16a and 16b. As seen in FIGS. 4 and 5, the extended free leg 34b of the angle plate 34 is provided with a slot 40 extending inwardly from one side margin thereof and includes a depending ear 42 for insuring snug reception within slot 40 of the body portion of the bundling strap S. The width of the slot thereby formed being slightly less than the width of the body portion of the strap S for maintaining the latter against lateral as well as reverse movement when extended through the slot 40. The leg 34b of the angle plate 34 is additionally formed on the inwardly facing surface thereof with a channel 43 having a width slightly greater than the width of the lower jaw 16b, the interior channel surface having a sliding contact relation with the tooth 25 when the jaws 16a and 16b of tool 10 are in the position shown by FIGS. 1 through 5.

As viewed most clearly in FIG. 5 the upper marginal edge of slot 40 is formed with a knife edge 43a to facilitate the cutting of strap S when the same is brought into engagement therewith. It is, therefore, readily apparent that the cooperation between the two cutting knife edges 25a and 43a greatly facilitate the cutting of the strap S when such is desired.

In accordance with the invention as illustrated in FIGS. 1 and 2, the means for drawing the strap S taut about a plurality of bunched elements, not shown, in small successive increments of adjustment comprises an arcuate pawl 44 provided with a pair of spaced parallel ears 46 depending from one end thereof and suitably adapted to serve as hinge members, the pawl being thereby pivotally mounted across the inner face of the lower jaw 16b adjacent the nose end thereof by means of a transverse hinge pin 48 extending through the ears 46 and lower jaw 16b. The pawl 44 is yieldably biased into an upright position by means of a spring 50 mounted on the hinge pin 48 with one end thereof bearing on the underside of the pawl 44 and the opposite end thereof bearing on the bottom of a rectangular clearance recess or cavity, not shown, formed in the inner face of the lower jaw 16b whereby the pawl 44 is adapted for limited angular movement between the opposing faces of the jaws 16a and 16b towards the fulcrum 14 of the tool 10 from a normal upright position to a substantially horizontal position.

As illustrated in FIGS. 1 and 2, the convex side of the free end portion of the pawl 44 is suitably abraded, knurled, serrated or the like as at 54 whereby the pawl 44 is adapted to bite or grip the linearly grooved face of the body portion of the strap S in response to repeated movement of the jaws 16a and 16b toward each other as when drawing the bundling strap S taut.

As viewed in FIG. 1, the pawl 44 includes a groove 44a formed in the upper surface thereof and terminates in an arcuate camming surface 44b for the purpose to be described below.

In order to cam the pawl 44 out of engagement with the bundling strap S at the time that it is desired to sever the free end of the strap S, this camming action allowing the jaws to be brought into cutting engagement without further tensioning of the strap and facilitating the cutting operation, a camming arm generally noted at 70 is provided. The camming arm 70 is freely pivotally mounted on the forward offset portion of the upper jaw 16a by means of a suitable pivot pin 76a or the like, the camming arm 70 comprising a flat, arcuately shaped camming disk 71 having an arcuate camming surface 71b adapted to overlie and engage the camming surface 44b on the pawl 44 and an integral finger piece control member 72. Limited rotation of the camming arm 70 about the pivot pin 76a is obtained by means of a detent 75 which engages the offsetting portion 16c of the upper jaw 16a and the engagement of the member 72 and the handle member 12 over which the former extends.

It should be observed that the width of the detent 75 is such that the knurled surface 54 of the pawl 44 is precluded from engaging the upper jaw 16a when the jaws 16a and 16b are brought together. This arrangement prevents deterioration of the gripping surfaces 54.

The operation of the device will now be described with reference to the figures. The tail end of a bundling strap S is inserted by the operator into the slot 40 formed in the plate 34b. Squeezing the handles 12 causes the jaws 16a–16b to come together and the pawl 44 to grip the strap S in response thereto to draw the bundling strap S taut. When the desired tension has been applied by the operator, the control member 72 of the camming arm 70 is urged downwardly from the solid line position shown in FIG. 2 to the dotted line position thereof. This movement causes the camming disk 71 to cam the pawl 44 out of engagement with the strap S. Further movement of the jaws 16a–16b toward each other will then cause the knife edges 25a and 43a to engage and sever the bundling strap S. It is observed that this cutting action adds no further tension to the strap S.

It will be understood that various changes in the details, materials, steps and arrangement of parts, which have herein described and illustrated in order to explain the nature of the invention, may be made by those skilled in the art within the principle and scope of the invention as expressed in the appended claims.

What is claimed is:

1. In a hand tool for tensioning and subsequently cutting a plastic strap when looped about a plurality of bunched articles wherein a pair of jaw members are connected for movement toward and away from each other in response to movement of a pair of integral handle members, and including a plate mounted across the end of one of the jaw members and having a slot adapted to guide an end portion of a plastic strap between the jaw members and further including a pawl pivotally mounted on the other of the jaw members across the inner face and adjacent the end thereof operable between the jaw members upon movement thereof toward each other to impart small increments of relative movement to the strap through jaw members, and further including a cutting member having a transverse knife edge integral with the end of the other of the jaw members and movable across the slot in response to movement of the jaw members toward each other to sever the strap, the improvement comprising: means attached to one of the jaw members for urging the pawl out of engagement with the strap when it is desired to sever the same.

2. A hand tool as defined in claim 1 wherein said means is pivotally attached to the jaw opposite the jaw to which the pawl is pivotally connected.

3. The device as defined in claim 2 wherein said means includes an arcuate plate freely pivotally connected to the jaw opposite the jaw to which the pawl is pivotally connected.

4. The device as defined in claim 3 wherein said means further includes a lever member integral with said plate extending adjacent the handle of the hand tool and operable to pivot said plate to thereby cam the pawl out of engagement with the strap.

5. The device as defined in claim 4 wherein the pawl includes an arcuate camming surface engageable by said plate.

References Cited

UNITED STATES PATENTS

3,047,945 8/1962 Logan 140—123.6
3,168,119 2/1965 Schwester et al. 140—123.6

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