The present invention relates to a tool for tensioning a tape wrapped around an object and cutting off the surplus when a pre-set tension has been reached in the tape, said tool comprising a displaceable handlever having a given range of travel, means for gripping and tensioning the tape, cutting means operatively associated with the handlever for being operated when the tape tension exceeds a predetermined value to cut the tape, coupling means between said handlever and the gripping and tensioning means and having an engaged state to cause tensioning of the tape as the handlever is displaced, and having a disengaged state at a predetermined tension in the tape, and stop means to limit displacement of the handlever to a restricted portion of the range of travel of the handlever with the coupling means in engaged state, said handlever being operatively positioned to actuate the cutting means only when the handlever is beyond the restricted portion of the range of travel after the coupling means is in disengaged state. According to the invention the coupling means includes a pull rod provided with a recess in one longitudinal edge and, a slide moveable in the longitudinal direction of the pull rod and carrying a runner which is guided to be moveable with respect to the slide transversely of the longitudinal direction of the pull rod and immovable with respect to the slide in the longitudinal direction of the pull rod and which is resiliently urged against that edge of the pull rod provided with the recess.

4 Claims, 3 Drawing Figures
TAPE TENSIONING TOOLS

BACKGROUND OF THE INVENTION

This invention relates to a tool for tensioning a tape wrapped around an object, for connecting the tape ends and cutting off surplus tape after a pre-set tension has been reached.

In my earlier Canadian Patent Specification No. 899,767 issued May 9, 1972, there is described and claimed a tool for tensioning a tape wrapped around an object, for connecting the ends of the tape by means of a lock member, and for cutting off surplus tape when a pre-set tension has been reached in the tape, said tool comprising a mounting for the lock member, a displaceable handlever having a given range of travel, means for gripping and tensioning the tape, means operable by the handlever to actuate the lock member and to cut the tape, coupling means between the handlever and the gripping and tensioning means which coupling means have an engaged state wherein the tape is tensioned as the handlever is displaced and disengaged state that is automatically assumed by the coupling means at a predetermined tension in the tape, and stop means operative when the coupling means are in the engaged state to limit displacement of the handlever to a restricted portion of the range of travel thereof, the handlever being positioned to actuate the lock member and thereafter the cutting means only when the handlever is beyond the said restricted portion of the range of travel thereof.

The present invention seeks to develop the subject matter of my earlier invention in accordance with a lighter construction having smaller dimensions and also to adapt the proven principle of the earlier device for such instances of use in which an automatically locking lock member is provided and, consequently, in which the lock locking member of my previous device is not required. Moreover, the present invention seeks to provide that the working stroke or travel of the hand lever is divided into a first portion, for the strap tightening movement, and into a second portion for the cutting movement, such that for gripping and tightening the strap there is a long stroke of the lever and for the final cutting-off of the strap, after release of the coupling, there is a short stroke of the lever. In addition the invention seeks to provide a uniform tension limit, or release force, for the coupling, independent of the particular position of the hand lever.

SUMMARY OF THE INVENTION

According to the present invention there is provided a tool for tensioning a tape wrapped around an object and cutting off the surplus when a pre-set tension has been reached in the tape, said tool comprising a displaceable handlever having a given range of travel, means for gripping and tensioning the tape, cutting means operatively associated with the handlever for being operated when the tape exceeds a predetermined value to cut the tape, coupling means between said handlever and the gripping and tensioning means and having an engaged state to cause tensioning of the tape as the handlever is displaced, and having a disengaged state at a predetermined tension in the tape, and stop means to limit displacement of the handlever to a restricted portion of the range of travel of the handlever with the coupling means in engaged state, said handlever being operatively positioned to actuate the cutting means only when the handlever is beyond the restricted portion of the range of travel after the coupling means is in disengaged state, said coupling means including a pull rod provided with a recess in one longitudinal edge and, a slide moveable in the longitudinal direction of the pull rod and carrying a runner which is guided to be moveable with respect to the slide transversely of the longitudinal direction of the pull rod and immovable with respect to the slide in the longitudinal direction of the pull rod and which is resiliently urged against that edge of the pull rod provided with the recess.

In a preferred embodiment of the invention the runner is mounted on a tensioning elbow pivotally connected to the handle, the pull rod being situated between the slide and the runner and the part of the tensioning elbow carrying the runner being pressed toward the slide by a spring which is adjustable in its force action.

Furthermore, it is advantageous if the axial centre of a roller forming the runner lies on the same level with the slightly bevelled rim of the recess when engaged therein, the recess having a rectangular profile.

The advantages obtained with the invention lie essentially in that the tool can be made lighter and considerably smaller in size and therefore more manageable than my earlier device. Consequently it is easier to reach places to which it is difficult to gain access and, in addition, the present tool is better suited for operation by women. In particular, however, a uniform release force at the coupling is ensured irrespective of the particular lever position, whereby all straps applied, say, to a length of cable, have the same tension.

BRIEF DESCRIPTION OF THE DRAWINGS

One embodiment of the invention is explained by way of example in the following in detail with reference to the drawings, in which:

FIG. 1 shows an elevation of the tool with the coupling engaged, one half of the housing having been removed;
FIG. 2 shows a section taken along the sectional line A—A in FIG. 1; and
FIG. 3 shows an elevation of the tool according to FIG. 1 but with the coupling disengaged.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The tool body 1 is rigidly connected to a handle 2 which may be gripped together with the hand lever 4 mounted on a pivot 3 in the tool body. At the front of the tool there is situated a plate 5 with a slit 6 for the passage of a strap which may, in one application of the device be looped round a cable harness and guided through an automatically locking lock member. The strap can be gripped by the tightening device of the tool and drawn rearwards, which device comprises a draw bar 8 and gripper 7 of known type fixed thereto. The draw bar 8 is moveably guided in its longitudinal direction in the tool body 1 and at its rear end is pivotally connected to a pull rod 9. This latter comprises on its upper side a rectangular recess 10 in which there rests a runner in the form of a roller 11 which in FIG. 1 is shown hatched in section. On its underside the pull rod 9 is supported by two rollers 12, 13 which are mounted in a slide 14. This latter is pivotally connected at its front end at 15 to a tensioning elbow member 16, in
of whose arms there is mounted the runner or roller 11. The pivot 15 is located, in relation to the longitudinal axis of the pull rod 9, substantially on the same level as the centre of the roller 11, or slightly farther removed from the pull rod. There acts on the other arm of the tensioning elbow one end of a compression spring 17 whose other end bears indirectly against a tongue 20 in a manner to be described later, which tongue is securely attached to the slide 14. In this way the roller 11 is forced against the top of the pull rod 9 and into its recess. The spring surrounds a threaded rod 18, one end of which is mounted rotatably and axially moveable in a plate 19 attached to the tensioning elbow member 16 and the other end of which is mounted free to rotate but immovable axially in the tongue 20. Between these two mounting points there is arranged on the thread of the threaded rod a nut 21 which is prevented from rotation by a pin 22 which is guided in a longitudinal groove 23 in the slide 14. The threaded rod 18 is extended beyond the mounting point in the tongue 20 and through an aperture on the underside of the tool body and it has at its end a knob 40 provided with knurling. By turning this knob it is possible to vary the axial setting of the nut 21 on the threaded rod 18, whereby the spring 17 is compressed to a greater or lesser extent. In this way it is possible to regulate the force with which the roller 11 is forced into the recess 10. The roller 11 has a radius which is about as large as the depth of the rectangular recess 10 or is only slightly larger (for example 5-10 percent). Thus the rear rim of the recess, which is intended to be rather sharp and is therefore only slightly bevelled or rounded off, is situated at about the level of the roller centre or slightly lower. The slide 14 is connected by means of a hinge pin 24 to a shift lever 25 which is pivotally mounted in the handle 2 about a pin 41 securely attached to the housing. The hinge pin 24 is arranged at about the same level as the roller 11 in relation to the pull rod. There is also pivotally connected to the shift lever 25 at 42 a pin 26 which at its lower end is mounted axially slidable in a guide 43 securely attached to the tool body 1, and which is surrounded by a return spring 27 which at one end presses against the shift lever 25 and at the other end bears against the guide 43.

When, in operation, the hand lever 4 is rotated in an anti-clockwise direction about the pivot 3, the movement is transmitted via a roller 28, mounted in the hand lever 4, to the shift lever 25 which is then rotated in a clockwise direction about the pivot 41. The shift lever 25 then moves, via the hinge pin 24, the slide 14, and via the pivot pin 15, the tensioning elbow 16, to the right in the drawing. The roller 11 mounted on the tensioning elbow and retained in the recess 10 thus entrains the pull rod 9, the draw bar 8 and, consequently, also the strap end to the tightening elbow 29 of the tensioning elbow against a stop member 30 rigid with the housing. The hand lever 4, is released by the operator and the lever 4 and the other parts which have been moved, are then returned into the initial position by the return spring 27 acting on the shift lever 25. Thereafter similar further tightening operations may be carried out until the force limit, previously determined by means of the setting of the nut 21 on the threaded rod 18, is reached. In the event of movement above this force limit the roller 11 comes out of the recess 10 in the pull rod 9, since the force, applied by the strap to the pull rod 9 and acting to dislodge roller 11, then exceeds the force exerted by spring 17 on the tensioning elbow trying to keep roller 11 in place in its recess 10. Consequently any tightening force being exerted on the pull rod 9 ceases and this latter remains in its position. The other moveable elements are moved further rearwards, being guided by the rollers 11, 12 and 13 along the pull rod 9. Due to the roller 11 jumping out of the pull rod recess 10 the tensioning elbow 16 is lifted. The stop member 30 rigid with the housing is so arranged that the end 29 of the tensioning elbow can now pass thereover (see FIG. 3) and is no longer obstructed.

The hand lever 4 has a projecting part 31 which carries a pin 44 engaging in a slot 45 in a control element 32 which is pivotally connected at 46 to one end of a cutter rocker arm 33 which is pivotally mounted at pin 34 rigid with the housing. At the other end arm 33 co-operates with a knife 35 which is slidably mounted on the front plate of the tool. The cutter rocker arm 33 is urged into the rest position shown in FIG. 1 by a spring (not shown). The slot is of such a length that the pin 44 can move freely therein during the tightening movement of the hand lever, while movement is restricted by the stop member 30, without moving the cutter rocker arm 33 from the rest position. However, if the roller 11 has jumped out of the recess 10 and the movement of the hand lever is no longer restricted because the end 29 of the tensioning elbow 29 passes over the stop member 30, the pin 44 arrives at the end of the slot 45 and in the event of continued movement of the hand lever pulls on the control element 32 in such a way that the cutter rocker arm 33 is pivoted, the knife 35 raised and the previously tightened strap, guided through the slit 6 in the front plate, is cut-off.

What I claim as my invention is:

1. A tool for tensioning a tape wrapped around an object and cutting off the surplus when a pre-set tension has been reached in the tape, said tool comprising a displaceable handlever having a given range of travel, means for gripping and tensioning the tape, cutting means operatively associated with the handlever for being operated when the tape tension exceeds a predetermined value to cut the tape, coupling means between said handlever and the gripping and tensioning means and having an engaged state to cause tensioning of the tape as the handlever is displaced, and having a disengaged state at a predetermined tension in the tape, and stop means to limit displacement of the handlever to a restricted portion of the range of travel of the handlever with the coupling means in engaged state, said handlever being operatively positioned to actuate the cutting means only when the handlever is beyond the restricted portion of the range of travel after the coupling means is in disengaged state, said coupling means including a pull rod provided with a recess in one longitudinal edge and, a slide moveable in the longitudinal direction of the pull rod and carrying a runner which is guided to be moveable with respect to the slide transversely of the longitudinal direction of the pull rod and immovable with respect to the slide in the longitudinal direction of the pull rod and which is resiliently urged against that edge of the pull rod provided with the recess.

2. A tool as claimed in claim 1 wherein the runner is mounted on a tensioning elbow pivotally connected to
the slide, the pull rod being situated between the slide and the runner and the part of the tensioning elbow carrying the runner being pressed toward the slide by a spring which is adjustable in its force action.

3. A tool as claimed in claim 1 wherein the axial centre of a roller forming the runner lies on the same level with the slightly bevelled rim of the recess when engaged therein, the recess having a rectangular profile.

4. A tool as claimed in claim 2 wherein the axial centre of a roller forming the runner lies on the same level with the slightly bevelled rim of the recess when engaged therein, the recess having a rectangular profile.

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