

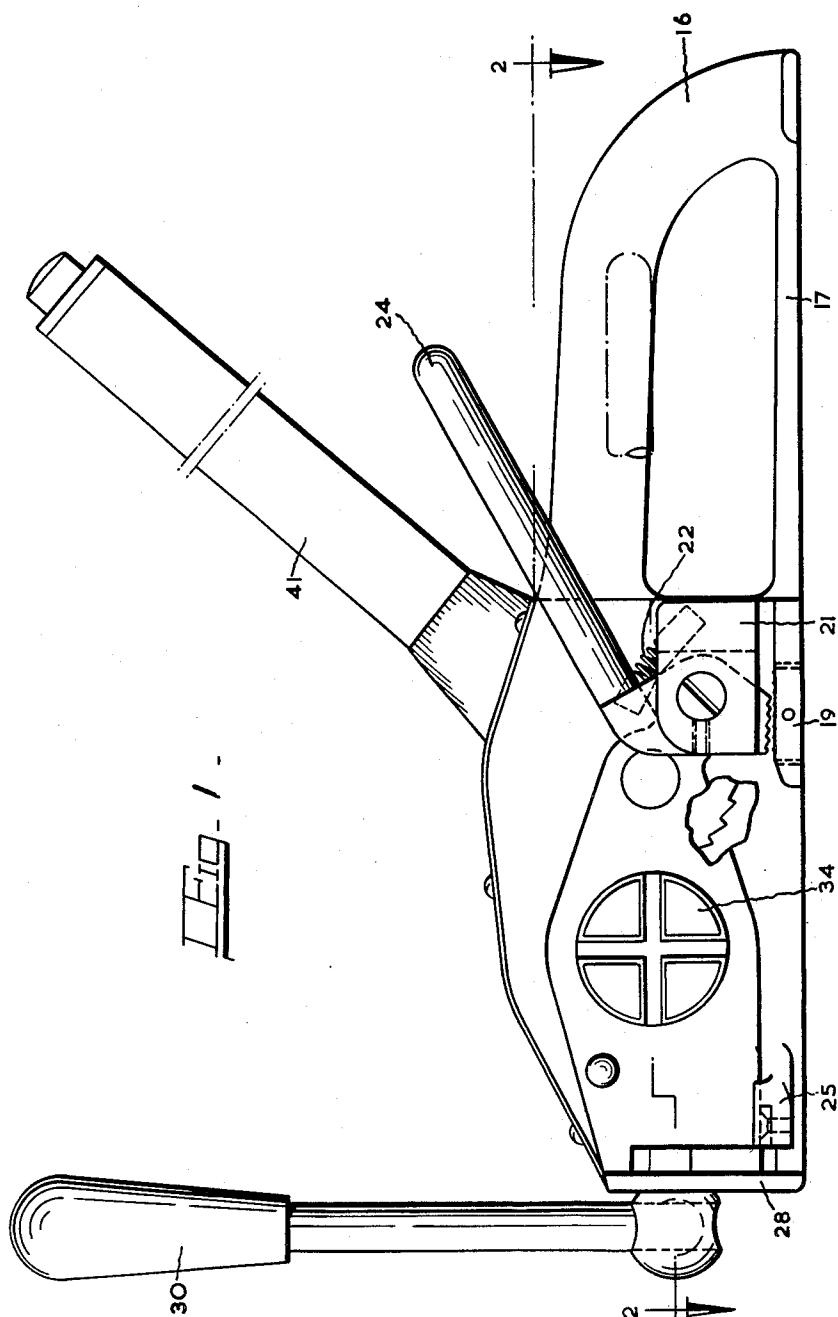
Dec. 19, 1961

M. H. JONES
TENSIONING TOOLS

3,013,589

Filed Dec. 21, 1959

5 Sheets-Sheet 1



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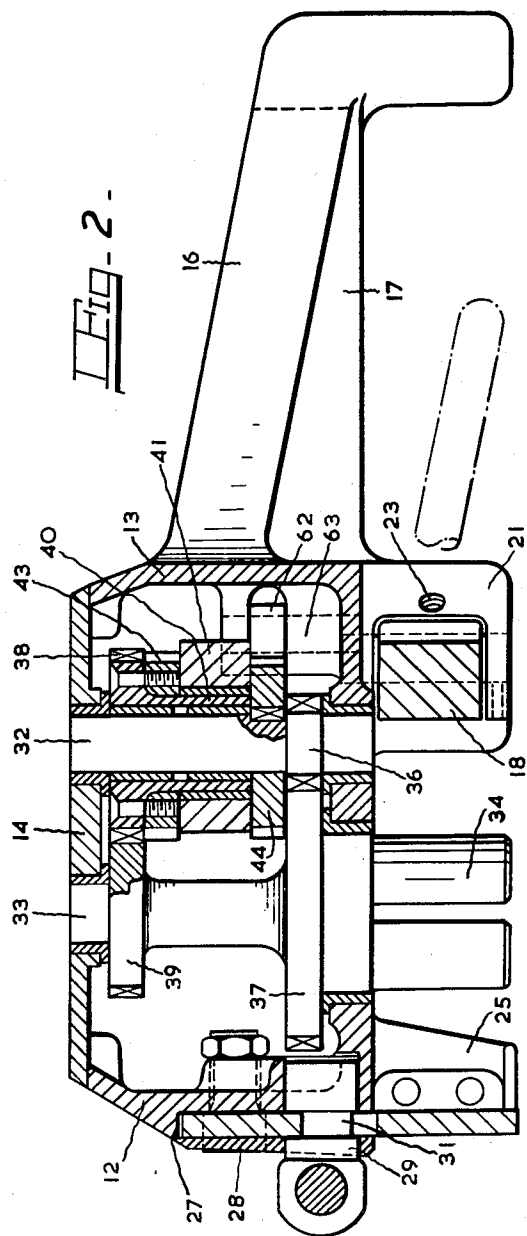
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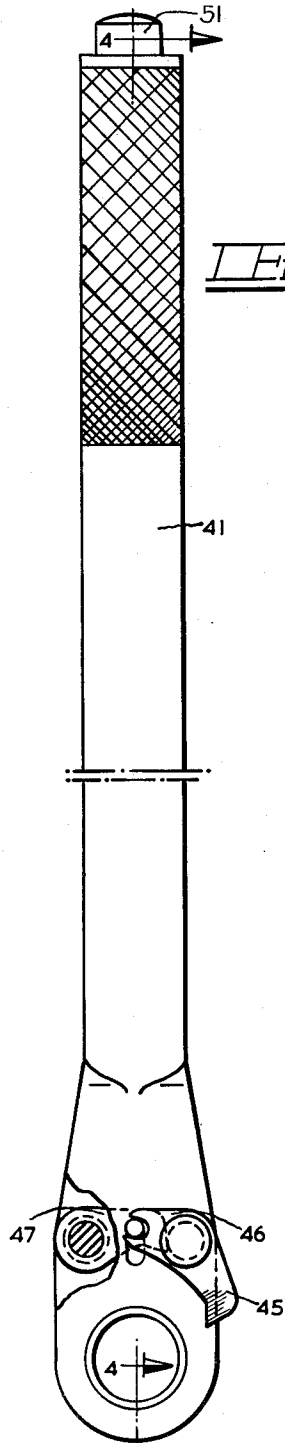


Fig. 3

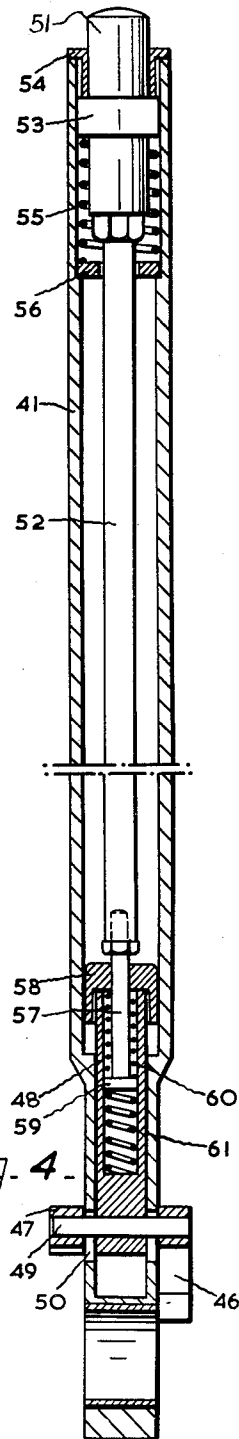


Fig. 4

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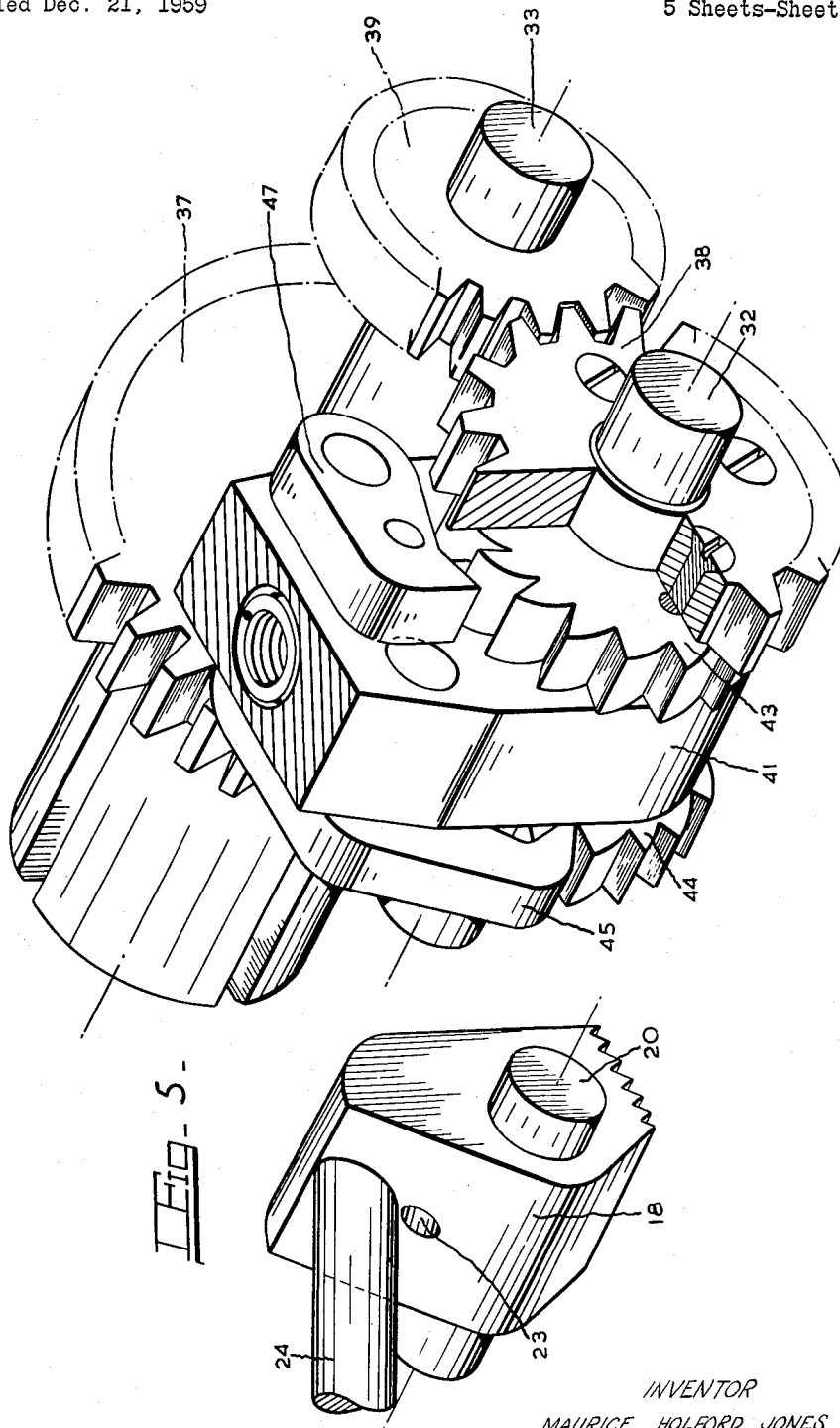
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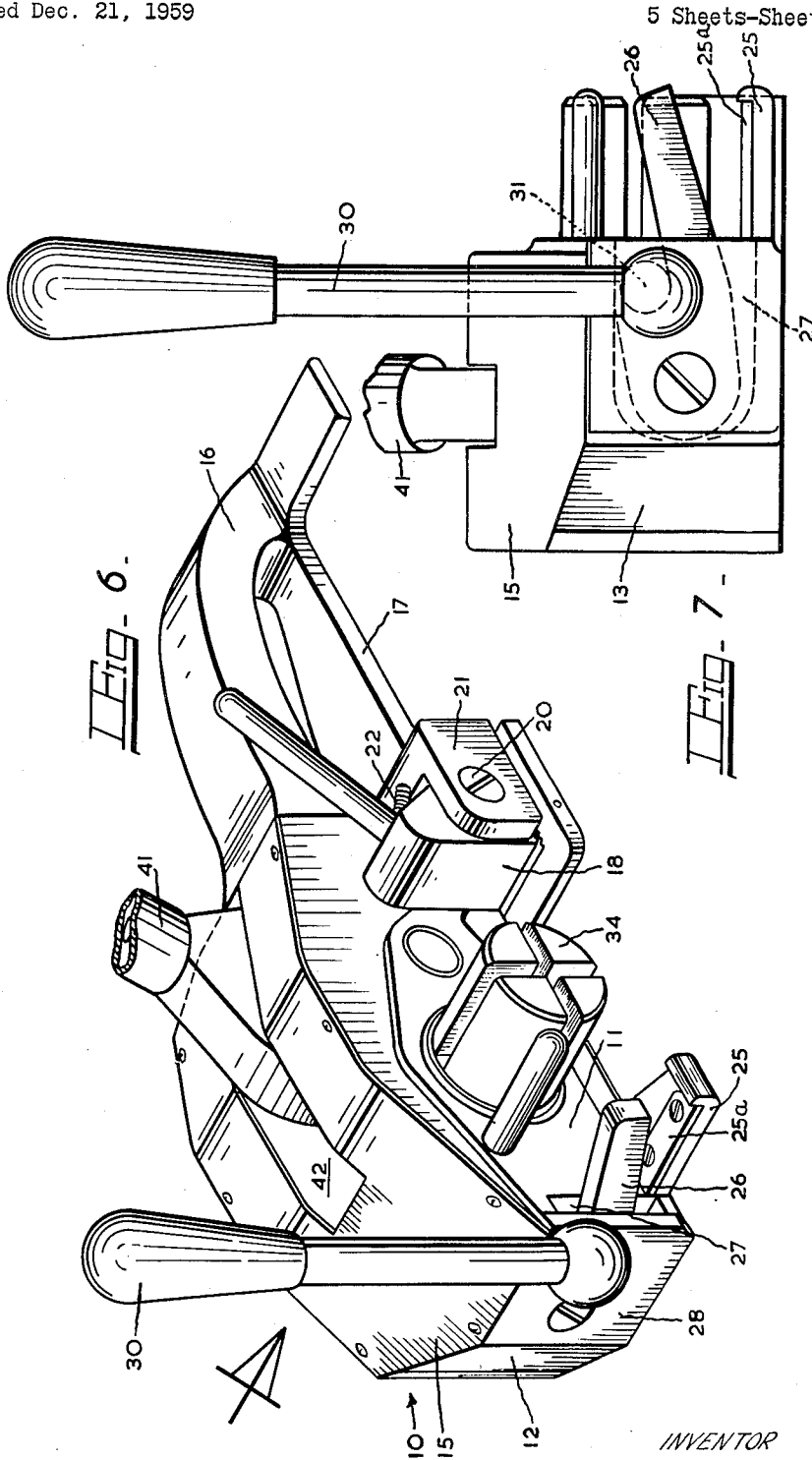
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TENSIONING TOOLS

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14 Claims. (Cl. 140—123.6)

This invention relates to tensioning tools used for tightening a loop of binding metal around a package prior to securing together overlapping ends of the loop.

The present invention consists in a tensioning tool for tightening a loop of binding metal around a package, comprising tensioning means including a rotary tensioner, for tightening the loop about the package and an oscillatory driving lever, the drive being transmitted from the lever to the tensioner through a two-speed transmission.

The provision between the driving lever and the tensioner of a transmission having drives of different velocity ratio makes the tool particularly suitable for operation by hand. The driving lever preferably incorporates a manually operable speed selector mounted in a convenient position so that it is readily accessible to the hand of the operative working the lever.

The rotary tensioner may be a capstan member around which one end of the loop of binding metal is wound. In operation the low velocity ratio is used to wind-in the surplus binding metal which on a large packet or crate may be considerable and bring the loop closely into contact with its surface. As soon as appreciable resistance is felt a change is made to the higher velocity ratio to obtain a greater mechanical advantage so that final tension can be applied.

With a tool according to the present invention ordinary wire, flattened wire or metal strip may be used as the binding metal.

An embodiment of the invention will now be described by way of example with reference to the accompanying drawings in which:

FIGURE 1 is a front elevation of a tensioning tool;

FIGURE 2 is a section on the line 2—2 in FIGURE 1;

FIGURE 3 is a part sectional front elevation of the driving lever or handle;

FIGURE 4 is a section on the line 4—4 in FIGURE 3;

FIGURE 5 is a rear perspective view of the drive transmitting mechanism of the tool;

FIGURE 6 is a front perspective view of the tool;

FIGURE 7 is a side elevation of the tool.

There is shown in the drawings a hand-operated tensioning tool the moving parts of which are mounted on or in a metal casing 10 which comprises a unitary member forming the front wall 11 and side walls 12 and 13 of the casing, a back plate 14 and a roof 15. A downwardly curving arm 16 projects from the top of the side wall 13 and, at its outer extremity, meets the corner of a flat, L-shaped bar 17 projecting laterally from the bottom of the said side wall.

The tool is equipped with a gripper having a jaw 18 mounted by a pivot 20 on an L-shaped bracket 21 that is rigidly connected to the front wall of the casing. The jaw is formed with a serrated face and is urged by a spring 22 into a position in which that face lies closely adjacent to the serrated face of a pad or insert 19 of hardened metal which is fastened rigidly to the front of the casing beneath the bracket 21. The spring 22 is housed in opposed pockets 23 which are formed in the bracket and the gripper and a handle 24 is provided on the gripper jaw to enable it to be opened against the action of the spring.

The tool also possesses a guillotine comprising an anvil and a pivoted blade. The anvil 25 is formed with an

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upturned flange at its free end and is fixed to the front of the casing just above the lower edge thereof. The blade 26 is mounted by a pivot in a recess 27 in the side wall 12 of the casing. The outer face of this recess is closed by a cover 28 and the forward end of the blade protrudes from a slot-like aperture in the front of the casing. Above the blade there is mounted a rotary spindle 29 carrying a handle 30. Between the walls of the recess 27 the spindle has a portion 31 of reduced diameter which is disposed eccentrically with respect to the axis of rotation of the spindle and this eccentric portion is engaged and partially embraced by a curved edge of complementary shape on the blade 26 (see FIGURE 7). The anvil carries a hard metal shear plate 25a with which the blade co-operates when it is depressed by the eccentric portion of the spindle. The curved edge on the blade embracing the eccentric portion enables the blade to be lifted by the eccentric portion into its inoperative position after performance of a cutting operation.

Inside the casing there are two parallel shafts, a driving shaft 32 and a driven shaft 33, which are journaled in bushed bearings in the front wall 11 and the back-plate 14. The driven shaft 33 extends through the front wall 11 and its forward end constitutes a rotary capstan 34 which is situated outside the casing between the gripper and the guillotine. The capstan is quartered by two diametral slots which are adapted to receive the free end of a loop of binding metal.

There are two gear trains connecting the driving shaft and the driven shaft, a high speed gear train and a low speed gear train. The low speed gear train includes a small pinion 36 on the driving shaft and a large gear wheel 37 on the driven shaft, both pinion and gear wheel being rigid with their shafts. The high speed gear train includes a gear wheel 38 rotationally mounted on the driving shaft and a companion gear wheel 39 of similar size which is rigid with the driven shaft. The driving gear 38 has a long tubular boss 40 which surrounds the driving shaft, bearing bushes being provided between the shaft and the boss so that the gear 38 and its shaft can revolve independently of each other.

The tensioning tool includes an oscillatory driving lever or handle 41 and which supplies the drive for the capstan 34 and there is a speed selector mechanism which can be operated to couple the handle to the capstan through one or other of the gear trains.

The handle is loosely mounted on the tubular boss 40 of the driving gear 38 and it protrudes to the exterior through a slot 42 in the roof of the casing. The lower end of the handle is flanked by a pair of ratchet wheels one of which, the ratchet wheel 43, is mounted on the boss 40 and rigidly connected to the driving gear 38 while the other, the ratchet wheel 44, is keyed to the driving shaft next to the pinion 36. There is a pawl associated with each ratchet wheel and the two pawls are mounted by separate pivots one on each side of the handle. The pawl 45 is engageable with the ratchet wheel 44 and possesses a notched tail 46. The pawl 47 is engageable with the other ratchet wheel. There is a stop pawl 62 mounted in the lower part of the casing by a pivot 63, said pawl being spring-urged into engagement with the ratchet wheel 44. It will be seen that owing to the presence of this stop pawl the rotary capstan is movable in one direction only.

The handle is hollow and the lower end of its stepped bore contains a tubular plunger 48 which is slidable in the bore. The plunger has a solid part carrying a pin 49 that extends on each side through slots 50 in the wall of the handle. At one end the pin engages the notch in the tail of the pawl 45 and at the other it engages pawl 47 at a point between the tooth and pivot of that pawl. The two pawls are thus turned in opposite directions

when the plunger is reciprocated in the bore of the handle.

There is a speed selector member or push button 51 projecting from the top of the handle and a push rod 52 extending between the push button and the tubular plunger. Midway between its ends the push button is formed with a collar 53 which is a sliding fit in the bore of the handle and the upper end of the button works in a guide bush 54 fitted into the open end of the handle. The push rod is rigidly connected to the lower end of the button. A helical spring 55 seats on a washer 56 in the bore of the handle, the upper end of the spring bearing against the underside of the collar 53 so that the push button is normally protruded from the handle.

The lower end of the push rod carries a pin 57 which passes through a cap 58 closing the open end of the plunger and terminates in a head 59 fitting slidably in the bore of the plunger between two compression springs 60, 61. These springs provide a resilient connection between the push rod and the plunger.

It can be seen that in the normal position of the push button the plunger occupies its uppermost position in the bore of the handle and the pawl 45 is held in resilient engagement with the associated ratchet wheel 44 by the upper spring 60 while the other pawl 47 is held clear of ratchet wheel 43. With the push button depressed the plunger occupies its lowermost position and pawl 45 is now held clear of its ratchet wheel while the other pawl 47 is held resiliently in engagement with ratchet wheel 43 by the lower spring 61.

In use the tensioning tool is placed on top of a package to be bound with metal. One end of a length of metal strip trained by hand around the package is fed from the right (as viewed in FIGURE 1) between the jaw 18 and pad 19 of the gripper and is passed below the anvil 25 so as to project beyond the tool on the left hand side. The other end of the strip is passed over the anvil from the left and threaded into the slots of the capstan 34. A channel-shaped metal seal is then placed around the overlapping portions of the strip to the left of the anvil. The tool is steadied by grasping the arm 16 and push button 51 is depressed to engage pawl 47 with its ratchet wheel, thereby drivably connecting the handle to the capstan through the high speed gear train. The slack in the loop of metal is then rapidly taken up by oscillating the handle. During each driving stroke the handle, ratchet wheel 43 and driving gear 38 turn freely in a counterclockwise direction on the shaft 32 (as seen in FIGURE 5). The motion of the gear 38 is transmitted to the driven shaft and surplus metal is wound up on the capstan thus drawing the loop into contact with the sides of the package. While the high speed gear train is active the motion of the driven shaft 33 is communicated through gear 37 and pinion 36 to the driving shaft which turns idly in its bearings. During each recovery stroke the handle moves by itself in a clockwise direction the pawl 47 overriding the teeth of its ratchet. At the same time stop pawl 62 checks any tendency of the capstan to recoil owing to accumulated tension in the loop of metal. As soon as appreciable resistance to movement of the handle is felt the push button is released to transfer the drive from the high speed to the low speed gear train so that final tension can be applied to the loop of binding metal. The plunger 48 is urged to its uppermost position in the bore of the handle by the spring 55 thereby causing the pawls to exchange duties. The drive is transmitted to the capstan through pinion 36 and gear wheel 37 and the driving gear 38 is now revolved idly on its shaft by its companion gear 39.

As soon as final tension has been applied the channel shaped seal is closed tightly upon the overlapping portion of the loop and notched or crimped to fasten them securely together. The guillotine handle is pulled down to sever the free end of metal attached to the capstan

from the loop. It will be noticed that the blade 26 cannot descend below the anvil to cut the loop itself because it is stopped by the floor of the recess in which it is housed (see FIGURE 7). The upturned flange at the end of the anvil prevents the free end of metal from being pushed off the anvil during the cutting operation.

It will be apparent to those skilled in the art that the above described embodiment of the invention is susceptible of many modifications. For example, the drive could be transmitted from the handle to the capstan by chain and sprocket instead of gears and some form of one-way clutch other than a ratchet could be used. Furthermore the capstan could take the form of a friction wheel or roller mounted, as by an eccentric bearing, to press against the binding metal and move it longitudinally on rotation of the wheel or roller, and the oscillatory driving lever or handle could be arranged to drive the capstan or other rotary tensioner during both of its oppositely directed strokes.

The essential features of the invention are pointed out in the appended claims and it is intended to cover all changes and modifications of the embodiment described by way of example which do not constitute departures from the spirit and scope of the invention.

I claim:

1. A tensioning tool, for tightening a loop of binding material around a package, comprising tensioning means, including a rotary tensioner, for tightening the loop, an oscillatory driving lever, a two speed mechanical transmission between the driving lever and the tensioner including drives of different velocity ratio and speed selection means selectively operable to couple the lever through said drives to the tensioner.

2. A tensioning tool, for tightening a loop of binding material around a package, comprising tensioning means, including a rotary tensioner, for tightening the loop, an oscillatory handle for driving said tensioner, two speed drive transmission means between the handle and the tensioner and speed selection means, including a manually operable selector member on the handle for selectively connecting said handle to said drive for operating said tensioner at one or the other of its speeds.

3. A tensioning tool for tightening a loop of binding material around a package, comprising tensioning means including a rotary tensioner, for tightening the loop, an oscillatory handle for driving said rotary tensioner, two speed drive transmission means including one way clutch means between the handle and the tensioner, and speed selection means, said clutch means being operable by the speed selection means to couple the lever to the tensioner selectively through drives of different velocity ratio.

4. A tensioning tool for tightening a loop of binding material around a package comprising a rotary tensioner for applying tension to one end of the loop, a gripper for anchoring the other end of the loop, an oscillatory lever for driving said tensioner, separate drive transmission means of different velocity ratio each including a one-way clutch having input and output members, the output members of each clutch being permanently coupled in driving relation to the tensioner and the corresponding input members being permanently coupled to the lever, means to prevent recoil of said rotary tensioner due to tension in the loop and a selector member associated with the lever and operable to engage the input and output members of one or other of the clutches.

5. A tensioning tool, for tightening a loop of binding material around a package, comprising a rotary tensioner for applying tension to one end of the loop, a gripper for anchoring the loop near the other end, an oscillatory lever for driving said tensioner, two drive transmitting mechanisms of different velocity ratio each including a ratchet member, two pawls pivotally connected to the lever each pawl being associated with a different one of the ratchet members, means to prevent recoil of said

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rotary tensioner due to tension in the loop, a selector member mounted on the lever and a linkage between the selector member and the pawls, so that the selector member is operable to engage one or other of the pawls with its associated ratchet member to place the lever in driving connection with the rotary tensioner.

6. A tensioning tool for tightening a loop of binding material around a package, comprising a rotary tensioner for applying tension to one end of the loop, a gripper for anchoring the loop near the other end, an oscillatory lever for driving said tensioner, two drive transmitting mechanisms of different velocity ratio coupled to said tensioner and each including a ratchet member, two pawls pivotally connected to the lever each pawl being associated with a different one of the ratchet members, a reciprocatory link joining the two pawls for simultaneously moving them in opposite senses between ratchet engaging and ratchet disengaging positions, means to prevent recoil of said rotary tensioner due to tension in the loop, a selector member on the lever, and a connection between the selector member and said link, said selector member being operable to shift the link so as to disengage the lever from one drive transmitting mechanism and engage it with the other.

7. A tensioning tool, for tightening a loop of binding material around a package, comprising a rotary tensioner for applying tension to one end of the loop, a gripper for anchoring the loop near the other end, a hollow, driving lever mounted for oscillatory movement, two drive transmitting mechanisms of different velocity ratio each including a ratchet wheel, the drive for the tensioner being derived from said lever alternatively through the two mechanisms, means to prevent recoil of said rotary tensioner due to tension in the loop, two pivoted pawls mounted on opposite sides of the lever each pawl being associated with a different one of the ratchet members, a reciprocatory link joining the two pawls for simultaneously moving them in opposite senses between ratchet engaging and ratchet disengaging positions, a slot in the lever housing said link, a push rod movably mounted within the lever for shifting said link, a push button connected to the push rod and projecting from the free end of the lever and a spring opposing inward movement of the push button.

8. A tensioning tool as claimed in claim 7 wherein the link is a pin extending transversely through the slot and projecting therefrom at each end and further comprising a connection between the pin and one of the pawls at a point between the pivot and the tip of that pawl, a tail on the other pawl, a connection between the tail and the pin, a tubular coupling member slidably mounted within the lever and carrying the pin, a telescopic connection between the coupling member and the push rod and a spring housed within said telescopic connection.

9. A tensioning tool for tightening a loop of binding material around a package, comprising tensioning means, including a rotary tensioner, for tightening the loop, an oscillatory lever for driving the tensioner, two gear trains of different velocity ratio, two ratchet clutches which are alternatively engageable to couple the lever drivably to the tensioner through either of the gear trains, means preventing movement of said rotary tensioner in one direction and selector means for operably connecting said lever with one or other of said clutches.

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10. A tensioning tool for tightening a loop of binding material around a package, comprising a rotary tensioner for applying tension to one end of the loop, a gripper for anchoring the loop near the other end, an oscillatory driving handle, means to prevent movement of said rotary tensioner in one direction, two gear trains of different velocity ratio, two ratchet clutches which are alternatively engageable to couple the handle drivably to the tensioner through a different one of the gear trains, and a selector member on the handle for operably connecting the latter with one or other of said clutches.

11. A tensioning tool, for tightening a loop of binding material around a package, comprising a rotary tensioner for applying tension to one end of the loop, a gripper for anchoring the loop near the other end, a guillotine adapted, after formation of a join in the loop, to sever from the join that end of the loop which is engaged by the tensioner, an oscillatory driving handle, two gear trains of different velocity ratio, two ratchet clutches which are alternatively engageable to couple the handle drivably to the tensioner through a different one of the gear trains, means preventing movement of said tensioner in one direction and a selector member on the handle for operably connecting said handle with one or other of the clutches.

12. A tensioning tool, as claimed in claim 11 wherein the rotary tensioner comprises a slotted capstan, the slots in the capstan being adapted to receive and frictionally to anchor one end of the loop, and the guillotine comprises a fixed shear plate adapted to space apart overlapping portions of the loop, a pivoted blade, an eccentric member which is turnable to move said blade into co-operation with said shear plate and stop means for preventing movement of the blade beyond the shear plate.

13. A tensioning tool, for tightening a loop of binding material around a package, comprising a driven shaft with two gear wheels, a capstan on said shaft, for applying tension to one end of the loop, a gripper for anchoring the other end of the loop, a driving shaft, a gear wheel loosely mounted on the driving shaft with a ratchet wheel drivably connected to it, a gear wheel rigid with the driving shaft with a ratchet wheel drivably connected to it, the gear wheels of the two shafts meshing to provide drives of different velocity ratio, a stop pawl associated with the last mentioned ratchet wheel, an oscillatory handle loosely mounted on the driving shaft between its gear wheels, two pawls pivotally connected to the handle, each pawl being associated with a different ratchet wheel, a push button on the handle and a linkage connecting the push button to the pawls, so that the push button is operable to engage one or other of the pawls with its ratchet wheel.

14. A tensioning tool, for tightening a loop of binding metal around a package, comprising gripping means for anchoring one end of the loop, unidirectional rotary tensioning means for winding in the other end of the loop, an oscillatory driving handle, two-speed mechanical transmission means drivably connecting said handle to said rotary tensioning means, and speed selection means associated with said handle for selectively connecting the handle with said transmission means so as to operate said tensioning means at one speed or the other.

No references cited.