

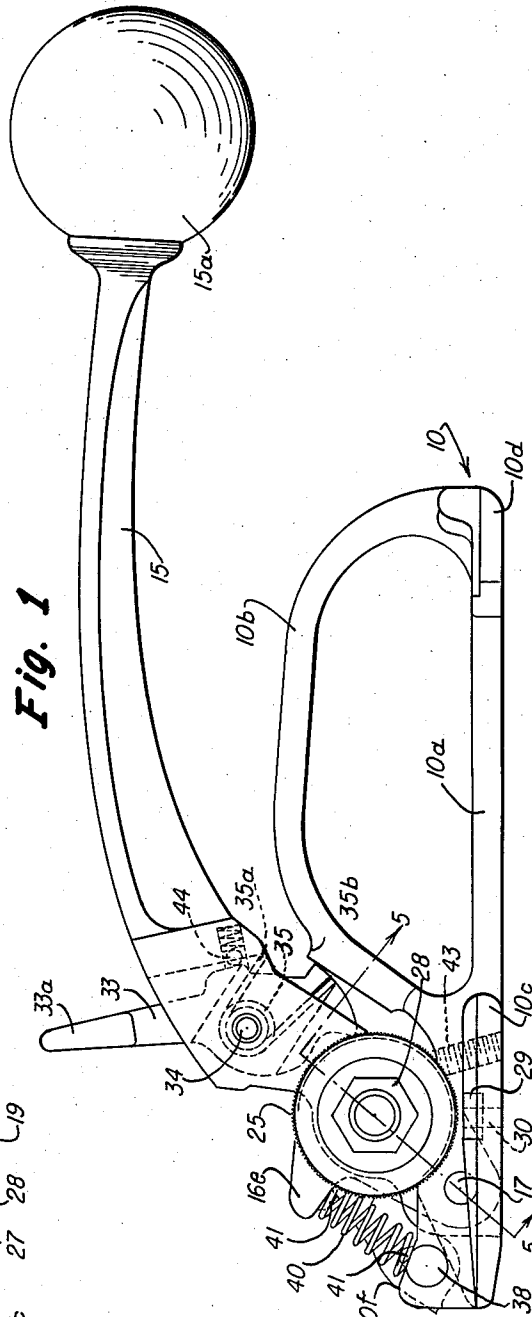
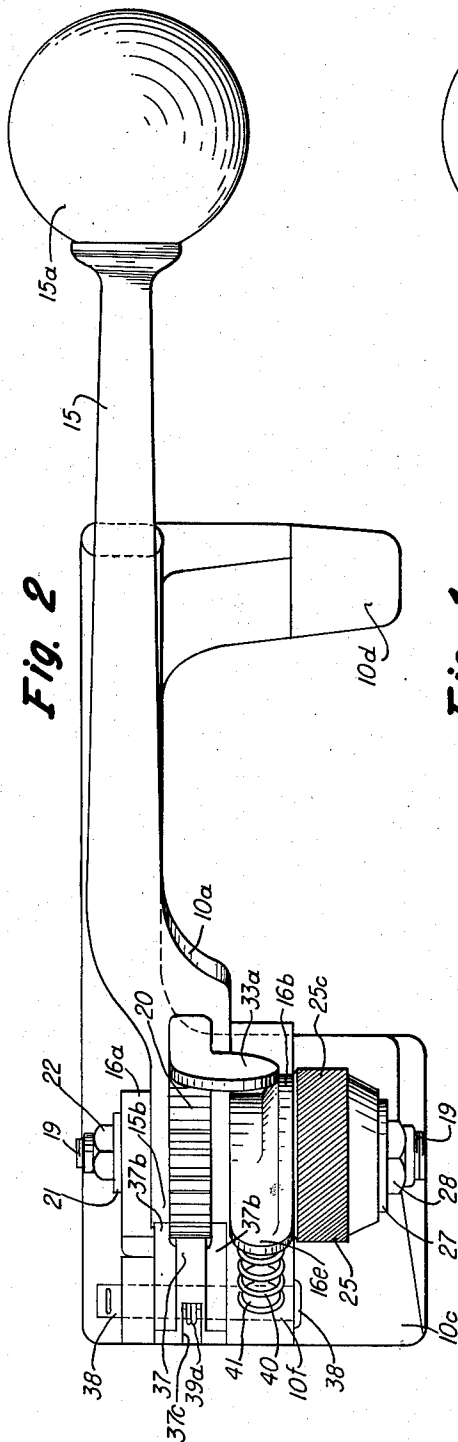
Dec. 13, 1960

M. B. HALL ET AL
STRAP STRETCHING DEVICE

2,964,295

Filed March 29, 1956

3 Sheets-Sheet 1



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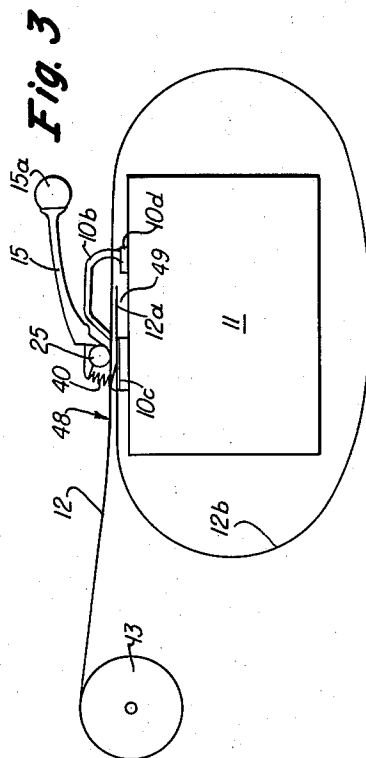
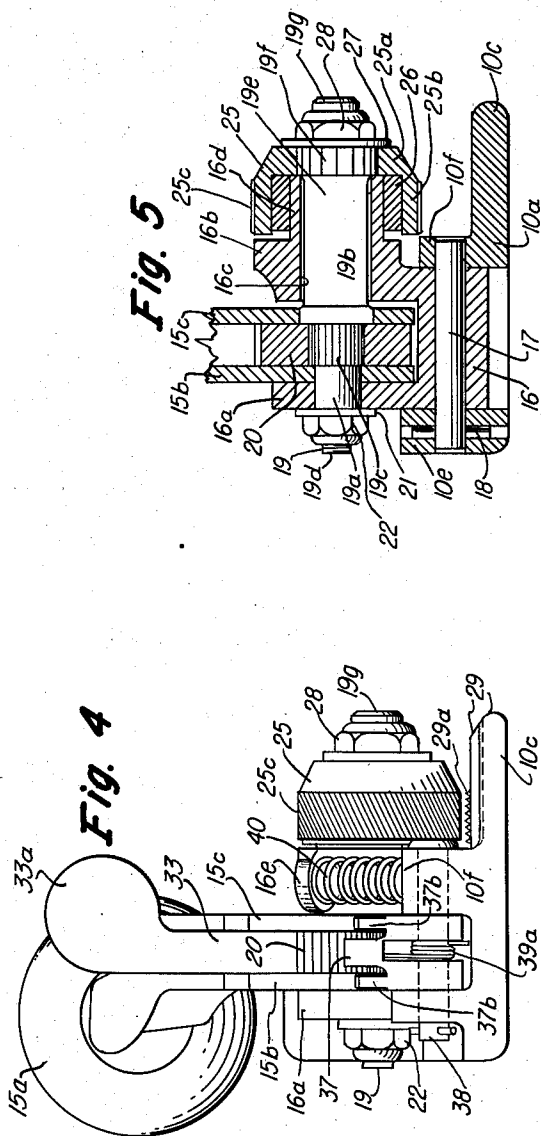
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Fig. 6

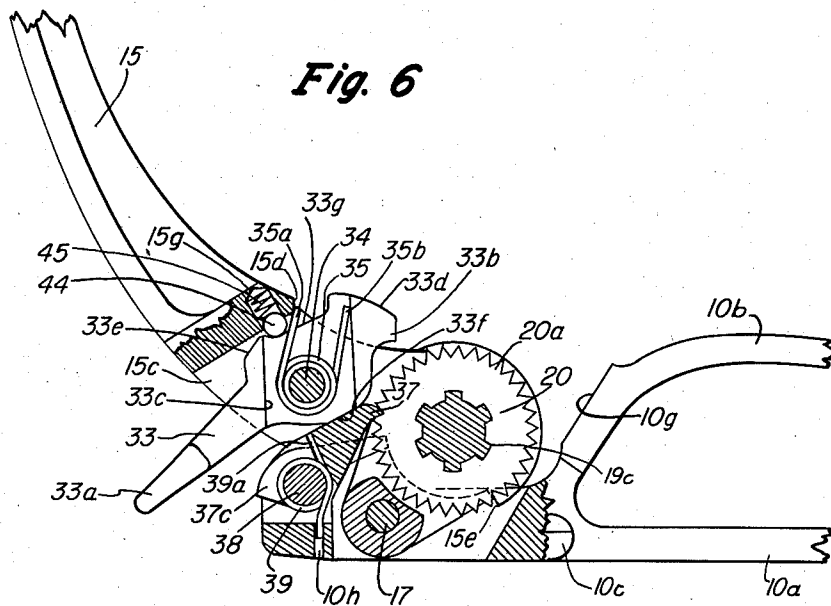
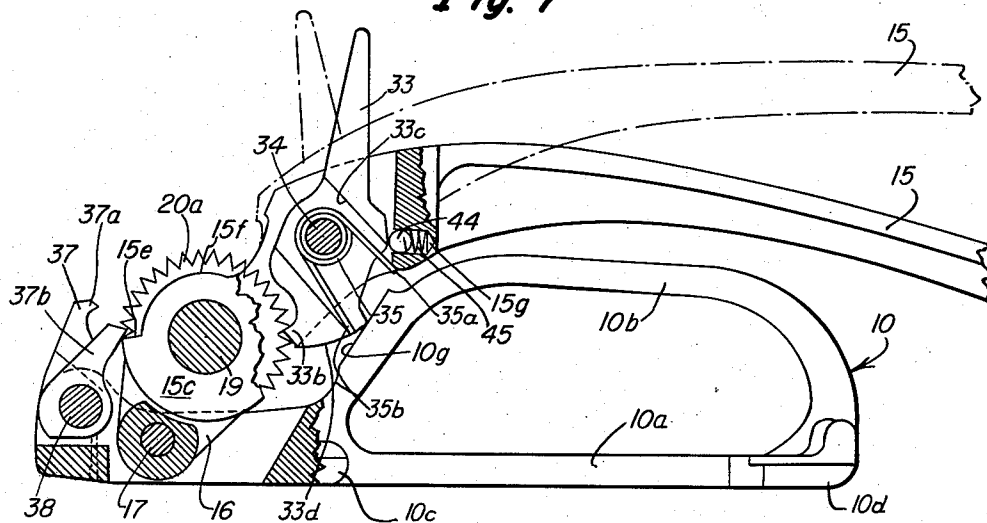


Fig. 7



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2,964,295

STRAP STRETCHING DEVICE

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Filed Mar. 29, 1956, Ser. No. 574,879

6 Claims. (Cl. 254—51)

This invention relates to improvements in strap stretching tools by which a flat metal strap may be drawn taut about a box or package or other object preliminary to uniting the overlapping ends of the strap by means of an interlocking joint or the like.

Strap stretching tools of this general type have heretofore been provided with means for tensioning the strap by mechanism which is operated by the manual reciprocation of a hand lever. This operating mechanism usually includes a pawl and ratchet device and, in order to release the pawl to permit the hand lever to be located in a more convenient or effective position for the operator, it has been necessary for the operator either to release one hand from its operating position on the lever to release the pawl or to release the pawl with his other hand which ordinarily is needed to hold the tool itself. Previous efforts to solve this problem have not been entirely successful.

The principal object of the present invention is to provide a strap stretching tool having operating mechanism actuated by a hand lever wherein the lever may be released from the actuating mechanism by its own movement while the tool is being held by the other hand of the operator, so that the lever may be conveniently moved to a new operating position with respect to the actuating mechanism with one hand while the operator retains his grip on the tool with his other hand. A further object of the invention is to provide a strap stretching tool having improved means for supporting a strap gripping device in a manner to relieve the load in the shaft which drives that device and to minimize the angular deflection of the gripping device with respect to the strap seat. Still another object of the invention is to provide novel means for moving the strap gripping device toward and from its operating position. Another object is to provide means for adjusting the normal gripping position of the strap gripping device. Other objects relate to various features of construction and arrangement which will appear more fully hereinafter.

The nature of the invention will be understood from the following specification taken with the accompanying drawings in which one embodiment is illustrated. In the drawings,

Figure 1 shows a side elevation of the improved stretching machine embodying the present invention with the operating lever in a normal operating position;

Fig. 2 shows a top plan view of the strap stretching tool illustrated in Fig. 1;

Fig. 3 is a somewhat diagrammatic illustration of the use of the tool shown in Figs. 1 and 2 during the binding of a box or package;

Fig. 4 shows an end elevation of the strap stretching tool shown in Figs. 1 and 2;

Fig. 5 shows a sectional view taken on the line 5—5 of Fig. 1;

Fig. 6 shows a partial side elevation and a partial longitudinal vertical section through the tool illustrated in Fig. 2 when the operating lever has been moved to a

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position wherein the pawl is automatically released from the ratchet wheel; and

Fig. 7 is a partial side elevation and a partial vertical section similar to that of Fig. 6 illustrating by the dotted lines the position of the operating lever when it is in its normal lower operating position and illustrating by the full lines the position of the operating lever when it is in an extreme position for the purpose of elevating the gripping dog from its normal gripping position.

As illustrated in the drawings, the invention is embodied in a strap stretching tool comprising a frame 10 having a base plate 10a adapted to rest upon a box or package or other objects to be bound. This frame is provided with an integrally formed handle 10b which is adapted to be engaged by one hand of the operator for the purpose of holding the tool in its proper operating position on a box or package to be bound, such as the box 11 shown in Fig. 3. The base plate 10a is provided with two lateral projections or flanges 10c and 10d which are adapted to underlie the metal binding strap 12 while this strap is being drawn taut around the box or package. The strap 12 may be withdrawn from a coil 13 and it is first extended around the box or package 11 with the free end 12a thereof extending over the flange 10c and somewhat beyond that flange toward the right as viewed in Fig. 3. The supply portion of the strap, after being extended around the box or package 11, is carried over the flange 10d and above the strap extremity 12a above the flange 10c. The loop 12b around the box or package may then be contracted manually to a considerable extent preliminary to the operation of the tool for drawing the strap taut around the box or package.

The mechanism by which the strap is drawn taut is actuated by a lever 15 which is provided at one end with a ball 15a adapted to be engaged by one hand of the operator and which is adapted to be reciprocated in a vertical plane to actuate the strap tightening mechanism.

This actuating mechanism comprises a yoke 16 which is pivotally mounted upon a pin 17 extending through apertures in two lugs 10e and 10f which are formed integrally with the base plate 10a. This pin 17 is secured in position by a small vertical pin 18 which is mounted in an aperture formed in the lug 10e so that it extends through a transverse hole formed in the pin 17. The yoke 16 has two parallel arms 16a and 16b which extend transversely to the pivot pin 17, as shown particularly in Fig. 5. The arm 16a has journaled therein the reduced portion 19a of a shaft 19 which extends loosely through an aperture 16c formed in the arm 16b. The operating lever 15 is provided at its lower end with two spaced side plates 15b and 15c which extend between the arms 16a and 16b of the yoke and which are apertured for engagement by portions of the shaft 19. The side plate 15b is rotatably mounted upon the reduced portion 19a and the side plate 15c is rotatably mounted upon an enlarged ring portion 19b of the shaft. Between the parts 19a and 19b, the shaft 19 is provided with a fluted portion 19c which has a splined engagement with a ratchet wheel 20 adapted to be operated by the reciprocation of the lever 15 for the purpose of effecting the rotation of the shaft. The reduced portion 19a of the shaft terminates in a threaded part 19d which is engaged by a washer 21 and a nut 22 for holding the shaft in position in its bearing.

The enlarged portion 19e of the shaft which extends loosely through the aperture 16c of the arm 16b, is connected to a fluted portion 19f which has a splined engagement with the disk 25a of a cup-shaped gripping wheel 25. The arm 16b of the yoke is provided with a cylindrical projection 16d upon which a cylindrical bearing member 26 is secured with a press fit and the

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cylindrical gripping portion 25b of the gripping member is journaled upon the bearing member 26, so that the member 25 is supported independently of the shaft 19 and the load on the shaft is relieved and deflection of the member 25 is minimized. The shaft 19 terminates beyond the gripping member 25 in a threaded portion 19g upon which a washer 27 and a nut 28 are secured to hold the gripping member in driving engagement with the shaft. The cylindrical portion 25b of the gripping member is provided with an annular series of diagonal teeth 25c which are adapted to engage the upper side of the strap 12 above the flange 10c of the frame. This flange 10c is provided with a recess in which there is mounted a gripping plate 29 held in place by a set screw 30. This gripping plate has upwardly projecting teeth which are adapted to coact with the underside of the strap to hold it against endwise movement above the flange 10c of the frame during the rotation of the gripping device 25 for the purpose of drawing the strap taut. During that operation, the extremity 12a of the strap remains in stationary position above the gripping plate 29a while the supply portion of the strap is moved over this strap extremity, toward the left as viewed in Fig. 3, by the rotation of the gripping wheel 25.

The rotation of the gripping wheel 25 is effected through the shaft 19 by the ratchet wheel 20, which, in turn, is actuated by the reciprocating lever 15 through a pawl 33 which has an arm 33a adapted to be engaged by the fingers of the operator and a tooth 33b adapted to engage the teeth 20a of the ratchet wheel 20. The pawl 33 is pivotally mounted on a pin 34 which extends between the side plates 15b and 15c of the lever 15. A coil spring 35 is mounted on the pin 34 within a slot 33c which extends transversely through the pawl 33. This spring has one arm 35a which engages a shoulder 15d on the lever and it has another arm 35b which engages one wall of the slot 33c so that the spring acts normally to move the pawl 33 into a position where the tooth 33b engages a tooth 20a of the ratchet wheel as shown in Fig. 1. In the normal operation of the tool, the lever 15 is reciprocated toward and from the handle 10b with the result that the tooth 33b of the pawl engages the ratchet wheel teeth to effect the rotation of the ratchet wheel upon the movement of the lever 15 toward the handle 10b, but upon reverse movement of the lever, the tooth 33b then slides over the teeth of the ratchet wheel as permitted by the compression of the spring 35.

Between successive tensioning strokes of the hand lever 15, the ratchet wheel 20 and the feed wheel 25 are both held in the positions to which they have been advanced by means of a detent 37, best shown in Figs. 2, 6 and 7, which is pivoted on a pin 38 extending between the up-standing lugs 10e and 10f in which the pin 17 is mounted. The detent 37 has a tooth 37a which is adapted to engage the teeth 20a of the ratchet wheel to hold the ratchet wheel and the feed wheel against reverse rotation, as shown in Fig. 6. During a forward stroke of the hand lever 15 toward the right as viewed in Fig. 1, the detent 37 slides over the teeth of the ratchet wheel with which it is normally maintained in contact by a coil spring 39 mounted on the pin 38 in a slot 37c which is formed in the detent. One arm 39a of the spring engages the wall of this slot and the other arm engages the aperture 10h formed in the base plate 10a so that during a reverse stroke of the lever 15, the detent tooth 37a engages a tooth of the ratchet wheel 20 to hold the ratchet wheel and the feed wheel 25 in the positions to which they have been moved, while the hand lever 15 is being returned for another working stroke.

The feed wheel 25 is normally maintained in contact with the strap 12 being operated upon by means of a coil spring 40 which extends between the lug 10f of the base 10a and an arm 16e which is formed on the yoke 16 to extend radially from the axis of the shaft 19, as shown in Fig. 1. The lug 10f and the arm 16e are

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provided with projections 41 which hold the spring 40 in position. This spring acts normally to pivot the yoke 16 about the pin 17, toward the right as viewed in Figs. 1, 6 and 7, so that the yoke is normally moved to the position where the peripheral surface 25b of the feed wheel will engage the upper surface of the uppermost strap seated on the flange 10c of the frame. This normal feeding position of the feed wheel 25 is adapted to be regulated by an adjusting screw 43 which extends through a threaded aperture of the frame 10 to engage the lower edge of the yoke 16 at a point removed from the pivot pin 17, as shown particularly in Fig. 1. Thus, the normal gripping position of the feed wheel 25 may be regulated to cause this member to perform properly upon metal straps of various thicknesses.

For the purpose of elevating the gripping wheel 25 away from the strap and from the flange 10c, which is desirable when the stretching tool is about to be removed from a box or package which has just been strapped, means are provided for swinging the yoke 16 upwardly about the pivot pin 17 until it occupies the elevated position shown in Fig. 7. For this purpose, the pawl 33 is provided adjacent to the tooth 33b with a cam surface 33d. The normal retracted position of the hand lever 15 is shown by the dotted lines in Fig. 7, but when the lever is swung beyond this position to that shown by the full lines in Fig. 7 the cam surface 33d engages a flat cam surface 10g which is formed on the handle 10b, so that the tooth 33b of the pawl then coacts with a tooth of the ratchet wheel 20 to raise the yoke 16 upwardly to the position shown in Fig. 7 with the heel of the cam 33d resting on the flat cam surface 10g.

When the lever 15 reaches this extreme position shown by the full lines in Fig. 7, the detent 37 is moved out of engagement with the ratchet teeth by the action of two arms 37b which are formed on the sides of the detent and which are angularly disposed with respect to the arm of the detent so that their extremities engage shoulders 15e which are formed on the side plates 15b and 15c of the hand lever at the ends of the arcuate surfaces 15f. In the normal operation of the lever 15, the arms 37b ride over the arcuate surface 15f without effecting the operation of the tooth 37a of the detent in engaging the teeth 20a of the ratchet wheel, but when the lever 15 has been moved to the extreme position shown by the full lines in Fig. 7, so that the yoke 16 is elevated, the shoulders 15e operate to elevate the arms 37b and thereby raise the detent 37 away from the ratchet teeth.

In order to move the tooth 33b of the pawl out of engagement with the ratchet teeth, merely by the movement of the hand lever 15, without manually operating the pawl 33, means is provided for automatically disengaging the pawl from the ratchet teeth when the lever 15 is swinging in a counter-clockwise direction to the extreme position shown in Fig. 6. For this purpose, the hand lever 15 is provided with a socket 15g in which there is mounted a spherical ball 44 actuated by a coil spring 45. In the normal reciprocating movements of the lever 15, the ball 44 rides upon a cam surface 33e which is formed on the pawl 33 and the tooth 33b moves into and out of engagement with the ratchet teeth as the tensioning of the strap proceeds. However, when the lever 15 is moved to the extreme position as shown in Fig. 6, a surface 33f on the pawl engages the upper surface of the detent 37 and the pawl is turned about its pivot pin 34 until the ball 44 passes out of engagement with the cam surface 33e and into engagement with a recess 33g which is formed in the pawl between the cam surfaces 33d and 33e. The ball 44 then interlocks with the shoulder at the end of the recess 33g so that the pawl is held with its tooth 33b out of engagement with the teeth of the ratchet wheel. This is accomplished while the operator maintains his grasp on the lever 15 and this lever may then be re-

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turned toward the position as shown by the dotted lines in Fig. 7 or the full lines in Fig. 1, with the tooth 33b of the pawl out of engagement with the ratchet wheel. As the lever 15 approaches the end of its clockwise movement, the cam surface 33d engages the flat face 10g of the handle with the result that the pawl is turned so that the ball 44 again engages the cam surface 33e, whereupon the pawl is again moved by its spring 35 into engagement with its ratchet teeth with the lever in a new position. Thus, the operator is enabled to vary the position of engagement of the tooth of the pawl with the ratchet wheel by a one-hand operation of the lever 15 without any manual manipulation of the pawl 33.

From the foregoing description it will be apparent that there has been provided a strap stretching tool operated by a hand lever which is reciprocated to effect a gradual tightening of a strap around an object being bound and that the tensioning mechanism is automatically held during the reverse strokes of the hand lever with the advantage that the point at which the pawl of the operating lever engages the ratchet wheel may be varied by the manipulation of the hand lever itself while the operator maintains his hold on the handle 10b to retain the stretching tool in the desired position on an object being bound. Also, the lever may be operated by one hand of the operator to elevate the tensioning wheel out of the gripping position and to disengage the detent by a movement of the hand lever, while still maintaining a grip on the handle 10b, thereby permitting the strap to be released from the gripping device and allowing the flanges 10c and 10d of the base plate to be moved outwardly from their positions beneath the strap. After the strap has been drawn taut, a joint between the overlapping end portions of the strap may be formed either in the region 48, at the left of the tool as shown in Fig. 3, or in the region 49 between the flanges 10c and 10d. The location of the joint in the latter position may be preferable because it involves some saving in the strap which may be cut off from the supply at the left of the flange 10c, as viewed in Fig. 3.

Although one form of the invention is shown and described by way of illustration, it will be understood that it may be constructed in various other embodiments which come within the scope of the appended claims.

We claim:

1. The combination in a strap stretching device for drawing a strap taut around an object to be bound, of a frame adapted to rest on the object, said frame having a part on which the strap is adapted to rest, a rotary gripping device adapted to engage the strap above said part, a shaft carried by said frame and connected to said gripping device for effecting the rotation thereof, a bearing for said shaft, a separate bearing for supporting said gripping device to bear the bending force imparted to said gripping device normal to the axis of said shaft by contact with the strap to relieve said shaft of that bending force, and means for rotating said shaft.

2. The combination in a strap stretching device for drawing a strap taut around an object to be bound, of a frame adapted to rest on the object, said frame having a part on which the strap is adapted to rest, a rotary gripping device adapted to engage the strap above said part, a shaft carried by said frame and connected to said gripping device for effecting the rotation thereof, a bearing for said shaft, said gripping member being secured on said shaft and having an annular flange for engaging the strap, a bearing member mounted on said frame and having said annular flange journaled thereon, and means for rotating said shaft.

3. The combination in a strap stretching device for drawing a strap taut around an object to be bound, of a frame adapted to rest on the object to be bound, said frame having a part on which the strap is adapted to rest, a supporting member pivoted on said frame, a shaft journaled in said supporting member, a rotary

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gripping device mounted on said shaft for engaging a strap resting on said part, a lever mounted for pivotal movement about said shaft, a ratchet wheel mounted on said shaft, a pawl carried by said lever for engaging and rotating said ratchet wheel, a detent carried by said frame for engaging said ratchet wheel and preventing reverse rotation thereof after it has been rotated by said pawl, means actuated by the movement of said lever to a first position for releasing said pawl from said ratchet wheel while said detent is in engagement with said ratchet wheel, means for holding said pawl retracted from said ratchet wheel while said lever is moved to a second position, and means including said pawl for moving said support member and said gripping device away from the strap and said rest part in response to movement of said lever into said second position.

4. The combination in a strap stretching device for drawing a strap taut around an object to be bound, of a frame adapted to rest on the object to be bound, said frame having a part on which the strap is adapted to rest, a supporting member pivoted on said frame, a shaft journaled in said supporting member, a rotary gripping device mounted on said shaft for engaging a strap resting on said part, a lever mounted for pivotal movement about said shaft, a ratchet wheel mounted on said shaft, a pawl carried by said lever for engaging and rotating said ratchet wheel, a detent carried by said frame for engaging said ratchet wheel and preventing reverse rotation thereof after it has been rotated by said pawl, said pawl being engaged by said detent upon extreme movement of said lever to one position for moving said pawl out of engagement with said ratchet wheel while said detent is in engagement with said ratchet wheel, means carried by said lever for holding said pawl retracted from said ratchet wheel while said lever is moved to a second position, and means including said pawl for moving said support member and said gripping device away from the strap and said rest part in response to movement of said lever into said second position.

5. The combination in a strap stretching device for drawing a strap taut around an object to be bound, of a frame adapted to rest on the object to be bound, said frame having a part on which the strap is adapted to rest, a supporting member pivoted on said frame, a shaft journaled in said supporting member, a rotary gripping device mounted on said shaft for engaging a strap resting on said part, a lever mounted for pivotal movement about said shaft, a ratchet wheel mounted on said shaft, a pawl carried by said lever for engaging and rotating said ratchet wheel, a detent carried by said frame for engaging said ratchet wheel and preventing reverse rotation thereof after it has been rotated by said pawl, said pawl being engaged by said detent upon extreme movement of said lever to a first position for moving said pawl out of engagement with said ratchet wheel while said detent is in engagement with said ratchet wheel, means carried by said lever for holding said pawl retracted from said ratchet wheel while said lever is moved to a second position, and means carried by said frame adjacent to said second position and engaged by said pawl when said lever is in said second position for restoring said pawl to engagement with said ratchet wheel and for moving said supporting member and said gripping device away from the strap and said rest part.

6. The combination set forth in claim 5, including means actuated by movement of said lever into said second position for disengaging said detent from said ratchet wheel.

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