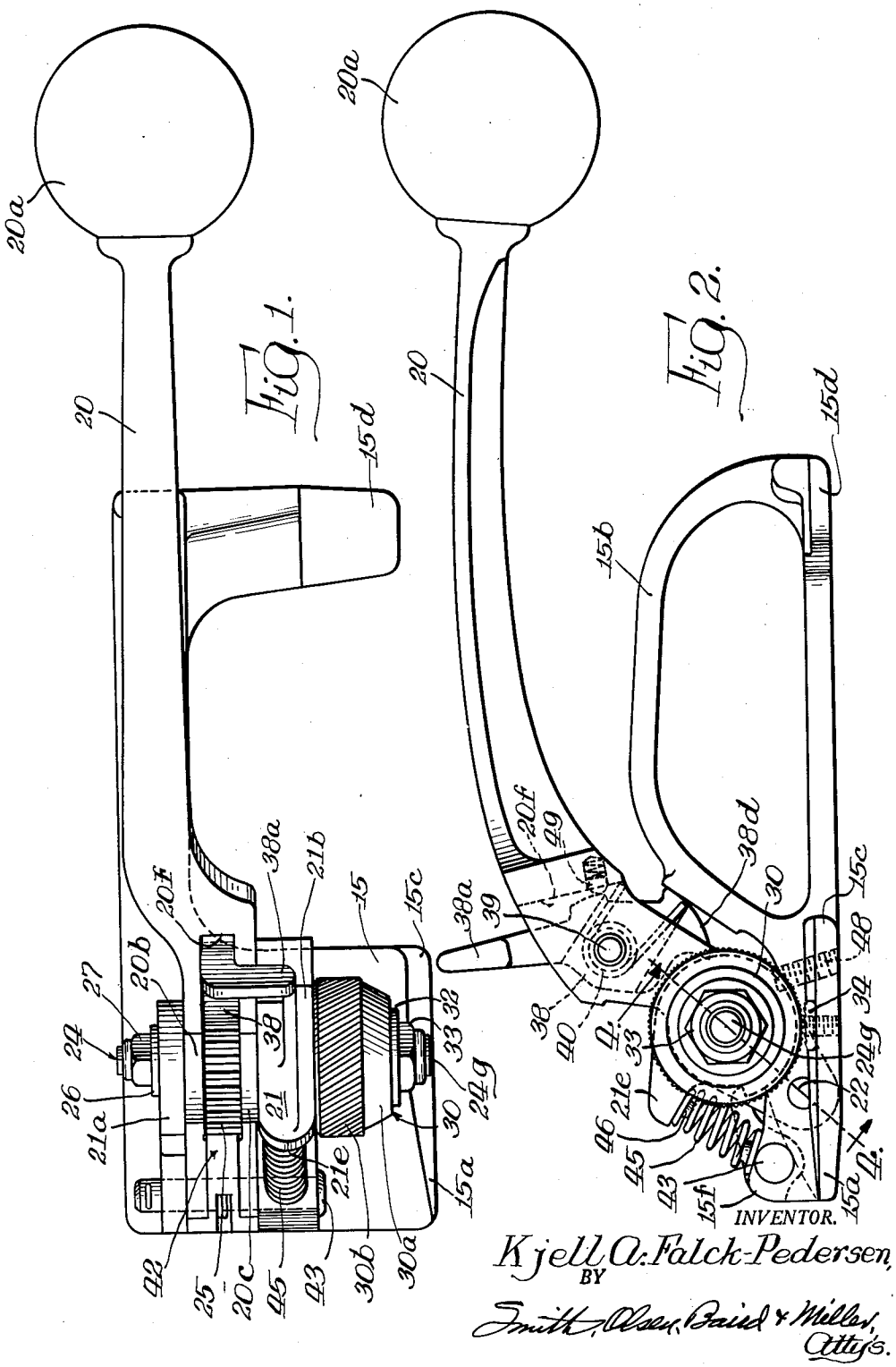
May 30, 1961 K. A. FALCK-PEDERSEN 2,986,376

STRAP TENSIONING TOOL

Filed Sept. 24, 1956 4 Sheets-Sheet 1



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STRAP TENSIONING TOOL

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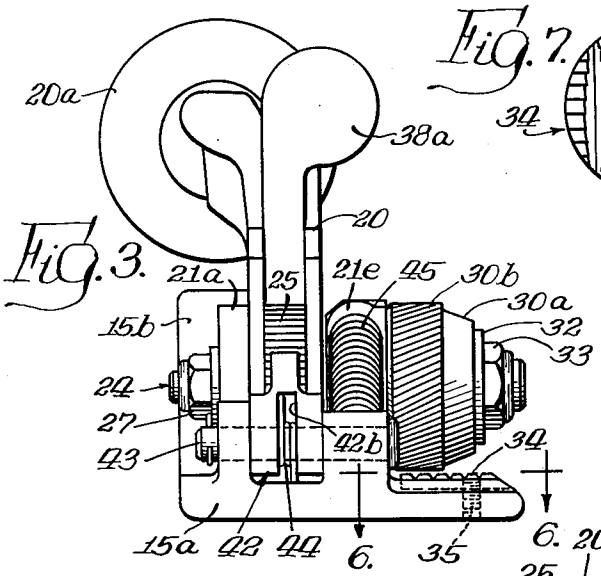

Fig. 3.

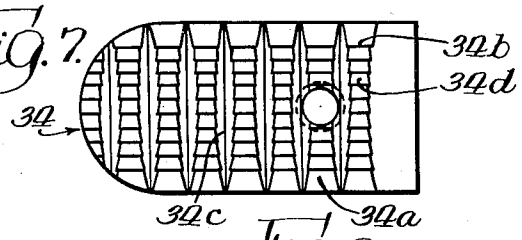

Fig. 7.

Fig. 8.

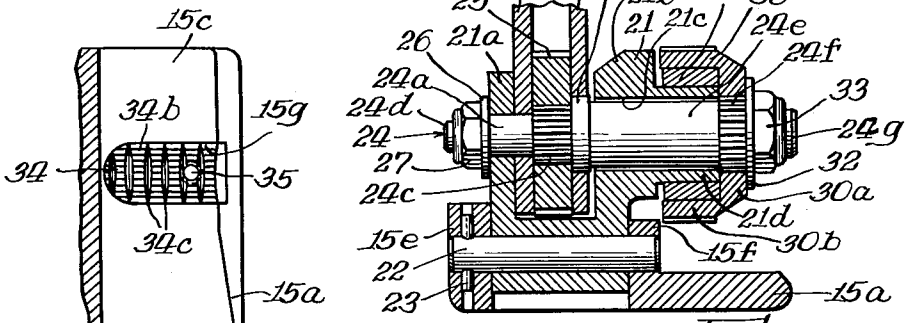

Fig. 4.

Fig. 6.

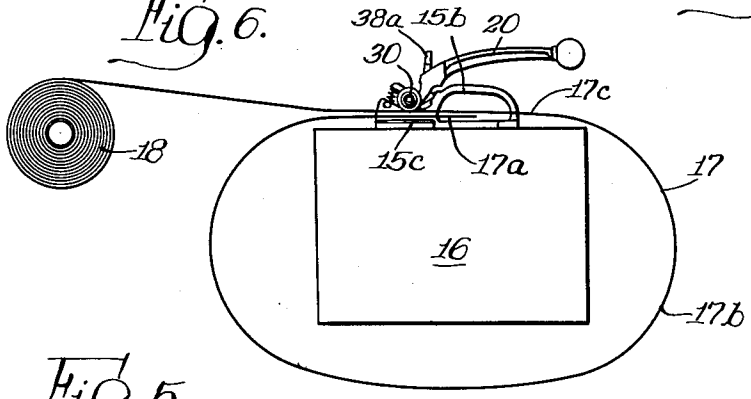

Fig. 5.

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Fig. 9.

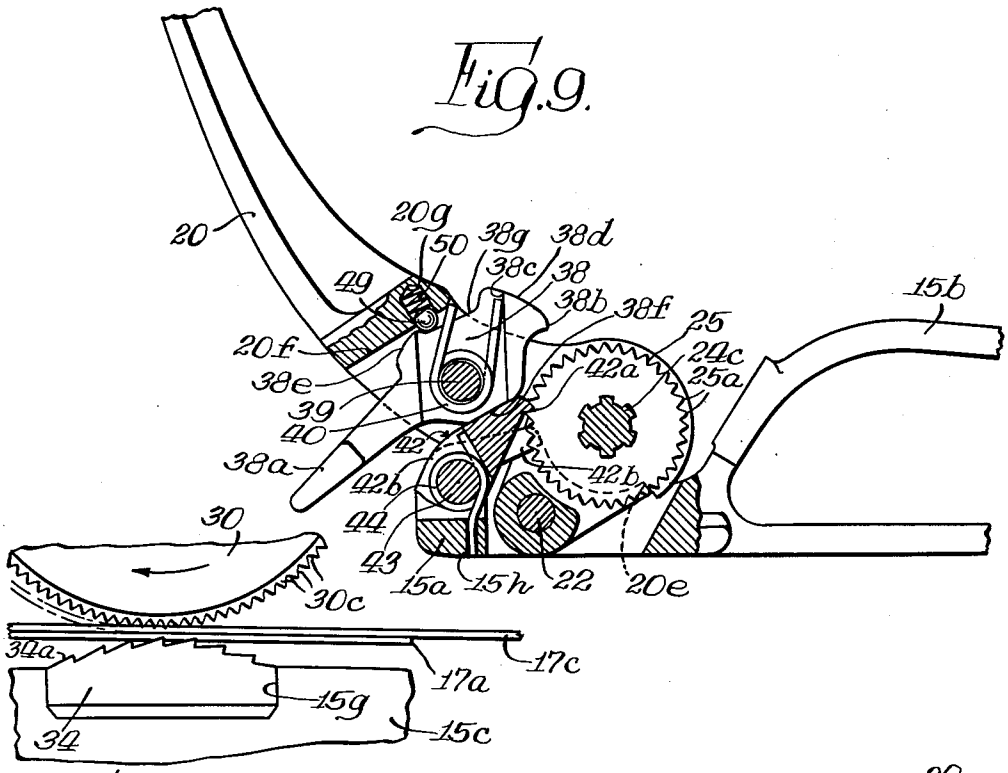

Fig. 10.

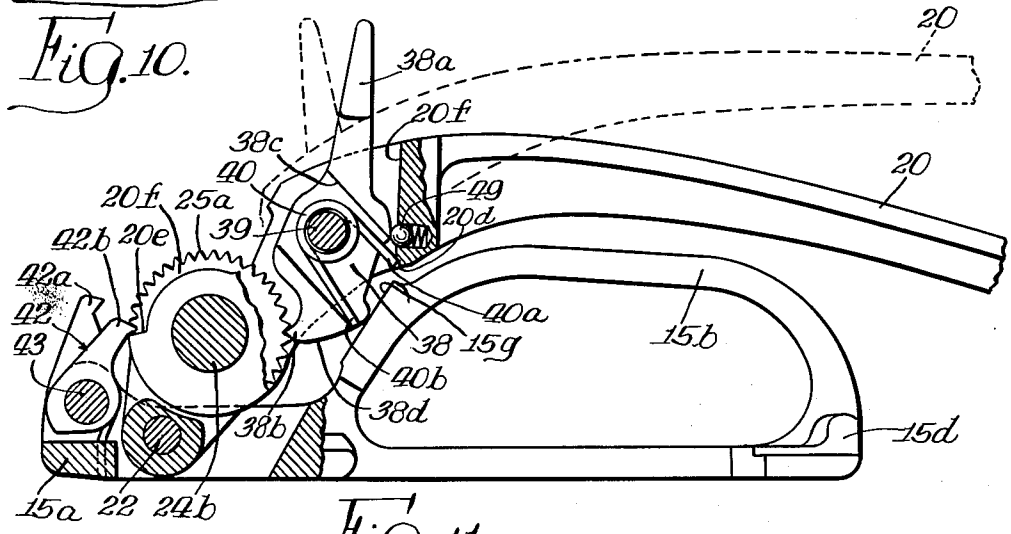

Fig. 11.

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Fig. 12.

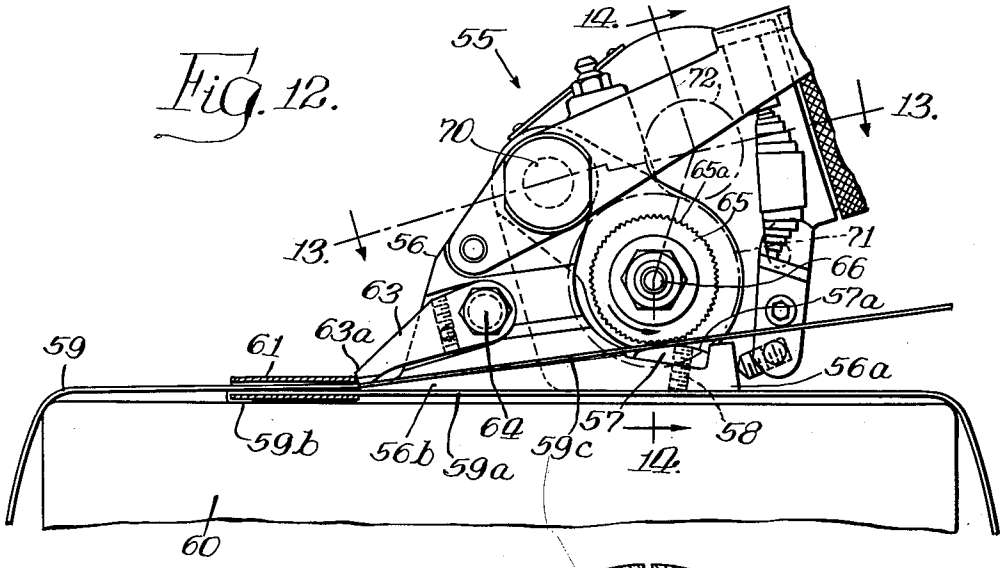


Fig. 13.

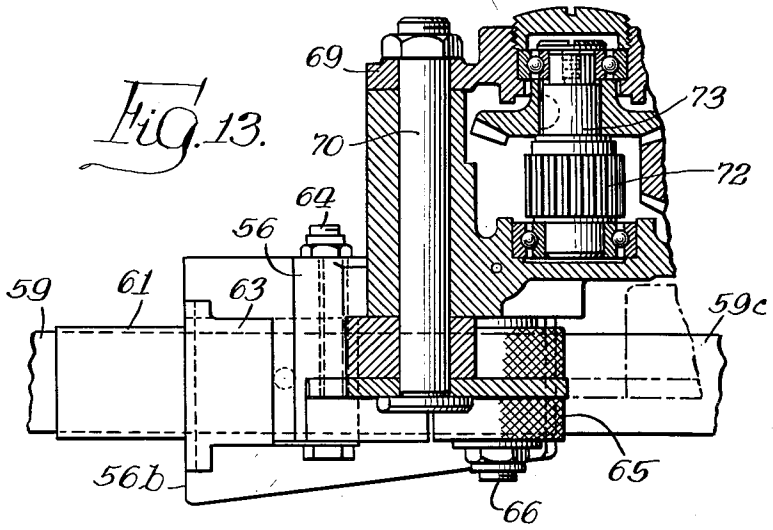
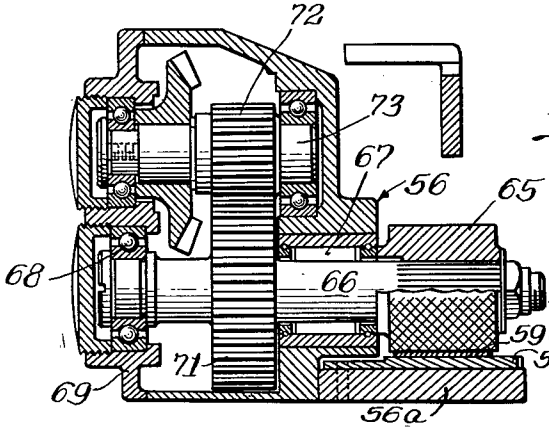


Fig. 14.



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STRAP TENSIONING TOOL

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Filed Sept. 24, 1956, Ser. No. 611,524

9 Claims. (Cl. 254—79)

This invention relates to improvements in strap tensioning tools and its purpose is to provide an improved device or drawing a metal strap taut around a box or package preliminary to uniting the overlapping ends of the strap by forming an interlocking joint in any well known manner as, for example, by deforming a metal seal and portions of the strap ends surrounded by the seal.

In the binding of packages, it has heretofore been the usual practice to use hand tools which enabled the operator to draw the strap taut with a relatively low tension, perhaps from 400 to 500 pounds per square inch, which has been satisfactory for most purposes. However, it has become desirable to set up higher degrees of tension in the binding straps in some operations and tensioning tools of the manually operated type and also of the power operated type have been provided for accomplishing that result.

When using strap stretching devices for developing a high tension in the strap wherein a rotary gripping wheel engages the strap to draw it taut, it has been found that the rotation of this wheel causes the strap to curl longitudinally in a direction tending to conform to the curvature of the wheel. This curvature of the strap tends to increase as the tension in the strap increases. This condition has the disadvantage that when the supply portion of the strap is cut off after a joint has been formed, the supply end of the strap is left with a longitudinal curl which makes it difficult to thread this end of the strap into a tool for another strapping operation.

The present invention involves the discovery that the above mentioned difficulty may be overcome by providing opposite to the strap tensioning wheel a strap seat having a curvature which is opposite to that of the tensioning wheel whereby the curling of the strap is prevented and the supply portion thereof is longitudinally straight when it is cut off.

This improvement may be applied to strap tensioning tools of two different types. In the first type of tool the ends of the strap overlap after being passed around the package and the rotary tensioning wheel causes one end portion of the strap to slide over the other end during the tensioning operation. In the second type of tool, known as the pusher type, the free end of the strap is passed through the tubular seal which is to form a part of the joint and is reversely bent while the supply portion of the strap also passes through the seal after being looped around the package. In this second type of tool the free end of the strap is held by a part of the tool abutting against the end of the seal and the supply portion of the strap is then moved endwise by the rotary tensioning wheel in order to draw the strap taut. In the first type of tool where the two strap portions overlap, it is necessary to provide a strap seat having a high coefficient of friction for engagement with the lower strap in order that this portion of the strap will be held against movement while the upper portion slides over it during the tensioning process. In the second type of tool, however, it is desirable to provide a strap seat having a smooth surface

and a low coefficient of friction so that the strap may slide freely over the strap seat upon rotation of the tensioning wheel. In either form of tool, the present invention contemplates the use of a strap seat which is longitudinally curved in a direction opposite to the curvature of the periphery of the tensioning wheel. With either type of tool, it has been found that the use of a strap seat having a longitudinal curvature opposite to that of the tensioning wheel greatly reduces or substantially eliminates the longitudinal curvature which has heretofore been found to be present in the supply end portion of the strap.

In practice, it is usually desirable to provide a strap seat having a curvature which is greater than that of the tensioning wheel to facilitate the manufacture thereof and to reduce the necessary thickness of the strap seat. It has been found that a satisfactory tool embodying the improvement of the present invention may be formed with a rough or serrated strap seat having a curvature which is twice that of the periphery of the tensioning wheel. Such a tool has worked satisfactorily with metal strapping having a thickness of .035", where the improvement was embodied in a tool of the first type in which a double thickness of the strap is positoned on the strap seat. With a tool of the pusher type a strap seat having a smooth surface of a 6 inch radius has been found to serve satisfactorily with a tensioning wheel having a radius of ⅞ inch. These dimensions are given merely by way of example and other degrees of curvature may be successfully employed.

When the strap seat has a smooth strap engaging surface it may have a greater radius of curvature than the curvature of a strap seat which is toothed or serrated for the reason that the serrated teeth penetrate the contacting strap and tend to increase any tendency of the strap to conform to the curvature of the tensioning wheel, whereas, when the strap seat is smooth there appears to be a greater resistance to the tendency of the strap to coform to the curvature of the wheel. There is a greater tendency for the longitudinal curling of the strap when the strap is relatively thin and it is, therefore, desirable to provide a strap seat having a greater degree of curvature when the thin strapping is employed. Other features and advantages of the invention will appear more fully hereinafter.

The nature of the invention will be understood from the following specification taken with the accompanying drawings in which two embodiments are illustrated.

In the drawings,

Figure 1 shows a top plan view of a strap tensioning tool of the type wherein two thicknesses of the strap extend beneath the tensioning wheel and one portion of the strap slides over the other during the tensioning operation;

Fig. 2 shows a side elevation of the tensioning tool illustrated in Fig. 1;

Fig. 3 shows an end elevation of the tensioning tool illustrated in Figs. 1 and 2;

Fig. 4 shows a sectional view taken on the line 4—4 of Fig. 2;

Fig. 5 is a somewhat diagrammatic illustration of the use of the tools shown in Figs. 1 and 2 during the binding of a box or package;

Fig. 6 shows a sectional view taken on the line 6—6 of Fig. 3, illustrating a top plan view of the strap seat;

Fig. 7 shows an enlarged top plan view of the strap seat illustrated in Figs. 3 and 6;

Fig. 8 shows an end elevation of the strap seat illustrated in Fig. 7, illustrating the curvature of the top surface of the seat;

Fig. 9 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 position wherein the pawl is automatically released from the ratchet wheel;

Fig. 10 shows an enlarged side elevation of the lower portion of the tool illustrated in Fig. 1, showing the engagement of the overlapping strap portions by the rotary tensioning wheel and the strap seat;

Fig. 11 is a partial side elevation and partial longitudinal vertical section, similar to that of Fig. 9, illustrating by dotted lines the position of the operating lever when it is in its lower operating position and illustrating by full lines the position of the lever when it is in an extreme position for the purpose of elevating the gripping dog from its normal gripping position;

Fig. 12 shows an enlarged side elevation of the strap stretching head portion of a tensioning tool of the pusher type wherein a single thickness of strap extends between the tensioning wheel and the strap seat;

Fig. 13 shows a sectional view taken on the line 13—13 of Fig. 12; and

Fig. 14 shows a vertical section taken on the line 14—14 of Fig. 12.

As illustrated in Figs. 1 to 11, inclusive, of the drawings the invention is embodied in a strap stretching tool comprising a frame **15** having a base portion **15***a* adapted to rest upon a box or package or other object to be bound. This frame is provided with an integrally formed handle **15***b* which is adapted to be engaged by one hand of the operator for the purpose of holding the tool in its proper position on a box or package such as the box **16** shown in Fig. 5. The base **15***a* is provided with two lateral projections or flanges **15***c* and **15***d* which are adapted to underlie the metal binding strap **17** while this strap is being drawn taut around the box or package. The strap **17** may be withdrawn from a coil **18** and it is first extended around the box **16** with the free end **17***a* thereof extending over the flange **15***c* and somewhat beyond that flange toward the right hand end of the tool as seen in Fig. 5. The supply portion **17***c* of the strap, after being extended around the box **11**, is carried over the flange **15***d* and above the strap extremity **17***a* over the flange **15***c*. The loop **17***b* around the box **16** may then be contracted manually to a considerable extent preliminary to the operation of the tool for drawing the strap taut around the box.

The mechanism by which the strap is drawn taut is actuated by a lever **20** which is provided at one end with a ball **20***a* adapted to be engaged by one hand of the operator and to be reciprocated in a vertical plane to actuate the strap tightening mechanism. This mechanism comprises a yoke **21** which is pivotally mounted upon a pin **22** extending through apertures in two lugs **15***e* and **15***f* formed integrally with the base plate **15***a*. The pin **22** is secured in position by a small vertical pin **23** which is mounted in an aperture formed in the lug **15***e* so that it extends through a transverse hole formed in the pin **22**. The yoke **21** has two parallel arms **21***a* and **21***b* which extend transversely to the pivot pin **22**, as shown particularly in Fig. 4. The arm **21***a* has journaled therein the reduced portion **24***a* of a shaft **24** which extends loosely through an aperture **21***c* formed in the arm **21***b*. The operating lever **20** is provided at its lower end with two spaced side plates **20***b* and **20***c* which extend between the arms **21***a* and **21***b* of the yoke and which are apertured for engagement by portions of the shaft **24**. The side plate **21***b* is rotatably mounted upon the reduced portion **24***a* and the side plate **20***c* is rotatably mounted upon an enlarged portion **24***b* of the shaft. Between the parts **24***a* and **24***b*, the shaft **24** is provided with a fluted portion **24***c* which has a splined engagement with a ratchet wheel **25** adapted to be operated by the reciprocation of the lever **20** for the purpose of effecting the rotation of the shaft. The reduced portion **24***a* of the shaft terminates in a threaded part **24***d* which is engaged by a washer **26** and a nut **27** for holding the shaft in position in its bearing.

The enlarged portion **24***e* of the shaft which extends loosely through the aperture **21***c* of the arm **21***b* is connected to a fluted portion **24***f* which has a splined engagement with the disk **30***a* of a cup-shaped gripping wheel **30**. The arm **21***b* of the yoke **21** is provided with a cylindrical portion **21***d* upon which a cylindrical bearing member **31** is secured with a press fit and the cylindrical gripping portion **30***b* of the gripping member is journaled upon the bearing member **31**. The shaft **24** terminates beyond the gripping member **30** in a threaded portion **24***g* upon which a washer **32** and a nut **33** are secured to hold the gripping member in driving engagement with the shaft. The cylindrical portion **30***b* of the gripping wheel is provided with an annular series of diagonal teeth **30***c* which are adapted to engage the upper side of the strap **17** above the flange **15***c* of the frame.

This flange **15***c* is provided with a recess **15***g*, shown particularly in Fig. 10, in which there is mounted a hard metal gripping plate **34** which forms the strap seat for the end portion of the strap **17** which has been passed around the box or package **16**. This gripping plate is held in place in the recess **15***g* by a set screw **35** extending upwardly through the flange **15***c* and it is provided on its upper side with a transverse curvature surface **34***a* which is convex upwardly, as shown particularly in Fig. 8, so that its curvature is opposite to that of the curvature of the serrated surface **30***c* of the gripping wheel **30**. The surface **34***a* is serrated along lines parallel to the axis of rotation of the gripping wheel as shown in **34***b* and it is also provided with a series of parallel grooves **34***c* which extend parallel to the longitudinal axis of the strap seated thereon, thereby providing a plurality of series of teeth **34***d* which rows extend parallel to each other and parallel to the longitudinal axis of the strap. The teeth which are thus formed are inclined toward the right as viewed in Figs. 2, 5 and 10, so that they tend to dig into the underlying end portion **17***a* of the strap and to resist the movement of this end portion of the strap toward the left, as viewed in Fig. 5, during the tightening of the strap around the box. This tightening operation is effected by the rotation of the gripping wheel **30** in contact with the supply portion **17***c* of the strap which is then moved endwise over the portion **17***a* toward the left as viewed in Fig. 5.

The rotation of the gripping wheel **30** is effected through the shaft **24** by the ratchet wheel **25** which, in turn, is actuated by the reciprocating lever **20** through a pawl **38** having an arm **38***a* adapted to be engaged by the fingers of the operator, and having a tooth **38***b* adapted to engage the teeth **25***a* of the ratchet wheel **25**. The pawl **38** is pivotally mounted upon a pin **39** which extends between the side plates **20***b* and **20***c* of the lever **20**. A coil spring **40** is mounted on the pin **39** within a slot **38***c* which extends transversely through the pawl **38**. This spring has one arm **40***a* which engages a shoulder **20***d* on the lever **20** and it has another arm **40***b* which engages one wall of the slot **38***c* so that the spring acts normally to move the pawl **38** into a position where the tooth **38***b* engages a tooth **25***a* of the ratchet wheel as shown in Figs. 2 and 12. In the normal operation of the tool, the lever **20** is reciprocated toward and from the handle **15***b* with the result that the tooth **38***b* of the pawl engages the ratchet wheel teeth to effect the rotation of the ratchet wheel upon movement of the lever **20** toward the handle **10***b* but, upon the reverse movement of the lever **20**, the tooth **38***b* slides over the teeth of the ratchet wheel as permitted by the compression of the spring **40**.

Between successive tensioning strokes of the hand lever **20**, the ratchet wheel **25** and the tensioning wheel **30** are both held in the positions to which they have been advanced by means of a detent **42**, best shown in Figs. 9 and 11, which is pivoted on a pin **43** extending between the upstanding lugs **15***e* and **15***f* in which the pin **22** is mounted. The detent **42** has a tooth **42***a* which is adapted to engage

the teeth 25*a* of the ratchet wheel to hold the ratchet wheel and the tensioning wheel against reverse rotation, as shown in Fig. 9. During the forward stroke of the hand lever 20 toward the right, as viewed in Fig. 2, the detent 42 slides over the teeth of the ratchet wheel with which it is normally maintained in contact by means of a coil spring 44 mounted on the pin 43 in a slot 42*b* which is formed in the detent. One arm 44*a* of the spring 44 engages the wall of this slot and the other arm engages an aperture 15*h* formed in the base plate 15*a* so that, during a reverse stroke of the lever 20, the detent tooth 42*a* engages a tooth of the ratchet wheel 25 to hold the ratchet wheel and the tensioning wheel 30 in the positions to which they have been moved during the time that the hand lever 20 is being returned for another working stroke.

The feed wheel 30 is normally maintained in contact with the strap 17 being operated upon by means of a coil spring 45 which extends between the lug 15*f* of the base 15*a* and an arm 21*e* which is formed on the yoke 21 to extend radially from the axis of the shaft 24, as shown in Fig. 2. The lug 15*f* and the arm 21*e* are provided with projections 46 which hold the spring 45 in position. This spring acts normally to pivot the yoke 21 about the pin 22 toward the right, as viewed in Figs. 2 and 11, so that the yoke is normally moved to the position where the peripheral surface 30*b* of the tensioning wheel will engage the upper surface of the supply portion 17*c* of the strap, as shown particularly in Fig. 10. This normal feeding position of the tensioning wheel 30 is adapted to be regulated by an adjusting screw 48 to perform properly upon metal straps of various thicknesses.

For the purpose of elevating the tensioning wheel 30 away from the strap and from the strap seat 34, which is desirable when the tensioning tool is adapted to be removed from a box or package which has just been strapped, means are provided for swinging the yoke 21 upwardly about the pivot pin 22 until it occupies the elevated position shown in Fig. 11. For this purpose, the pawl 38 is provided adjacent to the tooth 38*b* with a cam surface 38*d*. The normal retracted position of the hand lever 20 is shown by dotted lines in Fig. 11 but, when the lever is swung beyond this position to that shown by full lines in Fig. 11, the cam surface 38*d* engages a flat cam face 15*g* which is formed on the handle 15*b*, so that the tooth 38*b* of the pawl then coacts with a tooth of the ratchet wheel 25 to raise the yoke 21 upwardly to the position shown in Fig. 11 with the heel of the cam 38*d* resting on the flat cam surface 15*g*.

When the lever 20 reaches the extreme position shown by full lines in Fig. 11, the detent 42 is moved out of engagement with the ratchet wheel by the action of two arms 42*b* which are formed on the sides of the detent 42 and which are angularly disposed with respect to the arm of the detent, so that their extremities engage shoulders 20*e* which are formed on the side plates 20*b* and 20*c* of the hand lever 20 at the ends of the arcuate surface 20*f*. In the normal operation of the lever 20, the arms 42*b* ride over the arcuate surface 20*f* without effecting the operation of the tooth 42*a* of the detent in engaging the teeth 25*a* of the ratchet wheel but, when the lever 20 has been moved to the extreme position shown by full lines in Fig. 11, so that the yoke 21 is elevated, the shoulders 20*e* operate to elevate the arms 42*b* and thereby raise the detent 42 away from the ratchet teeth.

In order to move the tooth 38*b* of the pawl out of engagement with the ratchet teeth, merely by the movement of the hand lever 20, without manually operating the pawl 38, means are provided for automatically disengaging the pawl from the ratchet wheel when the lever 20 is swinging in a counterclockwise direction toward the extreme position shown in Fig. 9. For this purpose, the hand lever 20 is provided adjacent to the slot 20*f* with a socket 20*g* in which there is mounted a spherical ball 49 actuated by a coil spring 50. In the normal reciprocating movements of the lever 20, the ball 49 rides upon a cam surface 38*e* which is formed on the pawl 38 and the tooth 38*b* moves into and out of engagement with the ratchet teeth as the tensioning of the strap proceeds. However, when the lever 20 is moved to the extreme position shown in Fig. 9, a surface 38*f* on the pawl engages the upper surface of the detent 42 and the pawl is turned about its pivot 39 until the ball 49 passes out of engagement with the cam surface 38*e* and into engagement with a recess 38*g* which is formed in the pawl between the cam surfaces 38*d* and 38*e*. The ball 49 then interlocks with the shoulder at the end of the recess 38*g* so that the pawl is held with its tooth 38*b* out of engagement with the teeth of the ratchet wheel. This is accomplished while the operator maintains his grasp on the lever 20 and this lever may then be returned toward the position shown by dotted lines in Fig. 11 or by full lines in Fig. 2, with the tooth 38*b* of the pawl out of engagement with the ratchet wheel. As the lever 20 approaches the end of this clockwise movement the cam surface 38*e* engages the flat face 15*g* of the handle 15*b* with the result that the pawl is turned so that the ball 49 again engages the cam surface 38*e*, whereupon the pawl is again moved by its spring 40 into engagement with the ratchet teeth with the lever 20 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 20 without any manual manipulation of the pawl 38.

In Figs. 12, 13 and 14 of the drawings there is shown a second form of the invention in which the gripping plate or strap seat is embodied in a strap tensioning tool of the pusher type wherein a single thickness of strap lies between the strap seat and the tensioning wheel during the tensioning operation. In the embodiment illustrated in the drawings, the tensioning wheel is intended to be power operated but the improvement of the present invention may be employed in a tensioning tool of the pusher type which is manually actuated. As shown in Figs. 12, 13 and 14, the invention is embodied in a tool having a stretching head illustrated generally at 55 and comprising a frame 56 having a forwardly projecting flange 56*a* on which there is mounted a strap seat or gripping plate 57 which is secured in a recess in the flange 56*a* by means of a setscrew 58. A metal strap 59 extended around a box or package 60 to be bound has its free end 59*a* extended through a tubular metal seal 61 and reversely bent as shown at 59*b*. The strap 59 extends freely around the box or package 60 and the supply portion 59*c* thereof extends from the seal 61 over the flange 56*a* and thence over the gripping plate or strap seat 57, as shown particularly in Fig. 12.

The flange 56*a* has a tapered extremity 56*b* which is of substantial width and which is adapted to engage the lateral walls of the tubular seal 61 between the free end portion 59*a* of the strap and the supply portion 59*c* thereof. Also, a detent 63 is pivoted at 64 on the frame 56 and its extremity 63*a* thereof is adapted to engage the top wall of the seal above the supply portion 59*c* of the strap in the same vertical plane as the extremity of the flange 56*a* of the frame. Thus, when a pull is exerted on the strap 59 by tension exerted on the supply portion 59*c* thereof, the strap is drawn taut around the box or package 60 and the free end 59*a* of the strap is held in position by the engagement of the seal 61 with the flange 56*a* and the detent 63.

The strap 59 is drawn taut around the box or package 60 in the manner just referred to by means of a rotary tensioning wheel 65 which is fixed on a shaft 66 and which is provided with a serrated gripping surface 65*a* adapted to engage the upper side of the supply portion 59*c* of the strap at a point opposite to the gripping plate or strap seat 57. This strap seat has a smooth upper surface 57*a* which is curved longitudinally of the supply portion 59*c* of the strap in a direction opposite to the curvature of the peripheral surface of the tensioning wheel 65

so that there is obtained the advantage described above, whereby the strap is drawn taut and is moved over the smooth surface of the gripping plate 57 without setting up any substantial longitudinal curvature in the supply portion of the strap as the tensioning operation proceeds.

The shaft 66 which carries the tensioning wheel 65 is journaled in a bearing 67 and its opposite extremity is mounted in a ball bearing unit 68, these bearings being carried by an auxiliary frame 69 which is pivoted at 70 on the main frame 56 so that the tensioning wheel 65 and the parts for actuating it may be swung upwardly to permit the disengagement of the tensioning wheel with the supply portion 59c of the strap. The shaft 66 has formed integrally therewith a gear 71 arranged to mesh with a driving pinion 72 mounted upon a shaft 73 adapted to be driven by a suitable power operated mechanism, not shown, which is not a part of the present invention.

In the embodiments of the invention which have been described above, means have been shown for effecting the tensioning of a metal strap by means of a tensioning tool in which the strap is gripped between a rotary tensioning wheel and a stationary gripping plate or strap seat which has its strap engaging surface curved in a plane containing the longitudinal axis of the strap and extending at right angles to the axis of rotation of the tensioning wheel, so that the strap may be drawn taut by the rotation of the tensioning wheel without causing any substantial longitudinal curvature to be imparted to the strap as it passes between the tensioning wheel and the gripping plate. The gripping plate should have no transverse curvature on the strap-engaging surface thereof since that would tend to bring about a longitudinal stretching of the center portion of the strap with a resultant longitudinal curving and channel shaping of the strap which would interfere with the proper manipulation thereof in subsequent operations in the formation of a strap joint. In each form of apparatus described above the curved surface of the gripping plate or strap seat may be a segment of a cylindrical surface with its axis in the same plane as the axis of the tensioning wheel. Substantially the same relative arrangement of the opposed curved surfaces is preferable where the surface of the gripping plate is not a segment of a cylinder.

Although two embodiments of the invention have been shown and described by way of illustration, it will be understood that it may be constructed in various other embodiments without departing from the scope of the appended claims.

I claim:

1. The combination in a strap tensioning tool for drawing a strap taut about an object to be bound, of a frame adapted to rest on said object, a strap seat carried by said frame for supporting said strap and having a strap engaging surface which is substantially straight laterally of the strap and is curved longitudinally of the strap, and means including a rotary tensioning wheel for engaging said strap opposite said seat and effecting the longitudinal movement thereof.

2. The combination in a strap tensioning tool for drawing a strap taut about an object to be bound, of a frame adapted to rest on said object, a strap seat carried by said frame for supporting said strap and having a strap engaging surface which is substantially straight laterally of the strap and is curved longitudinally of the strap, and means including a rotary tensioning wheel for engaging said strap opposite said seat and effecting the longitudinal movement thereof, the curvature of the periphery of said wheel being opposite to the curvature of said strap seat.

3. The combination in a strap tensioning tool for drawing a strap taut about an object to be bound, of a frame adapted to rest on said object, a strap seat carried by said frame for supporting said strap and having a strap engaging surface which is substantially straight laterally of the strap and is curved longitudinally of the strap, and means including a rotary tensioning wheel for engaging said strap opposite said seat and effecting the longitudinal movement thereof, the curvature of the periphery of said wheel being opposite to the curvature of said strap seat, said longitudinally curved surface of said strap seat being serrated transversely.

4. The combination in a strap tensioning tool for drawing a strap taut about an object to be bound, of a frame adapted to rest on said object, a strap seat carried by said frame for supporting said strap and having a strap engaging surface which is substantially straight laterally of the strap and is curved longitudinally of the strap, and means including a rotary tensioning wheel for engaging said strap opposite said seat and effecting the longitudinal movement thereof, the curvature of the periphery of said wheel being opposite to the curvature of said strap seat, said longitudinally curved surface of said strap seat being transversely serrated and being provided with spaced longitudinal grooves.

5. The combination in a strap tensioning tool for drawing a strap taut about an object to be bound, of a frame adapted to rest on said object, a strap seat carried by said frame for supporting said strap and having a strap engaging surface which is substantially straight laterally of the strap and is curved longitudinally of the strap, and means including a rotary tensioning wheel for engaging said strap opposite said seat and effecting the longitudinal movement thereof, the curvature of the periphery of said wheel being opposite to the curvature of said strap seat, the centers of curvature of said strap seat and of said tensioning wheel being in the same plane.

6. The combination in a strap tensioning tool for drawing a strap taut about an object to be bound, of a frame adapted to rest on said object, a strap seat carried by said frame for supporting said strap and having a strap engaging surface which is substantially straight laterally of the strap and is curved longitudinally of the strap, and means including a rotary tensioning wheel for engaging said strap opposite said seat and effecting the longitudinal movement thereof, the curvature of said strap seat being opposite to and greater in radius than the curvature of the peripheral surface of said wheel.

7. The combination in a strap tensioning tool for drawing a strap taut about an object to be bound, of a frame adapted to rest on said object, a strap seat carried by said frame for supporting the supply portion of a strap looped around said object, means carried by said frame for abutting against a tubular strap seal to which the free end of said strap is attached and through which said supply portion is threaded, and means including a rotary tensioning wheel engaging said supply portion for moving said supply portion over said strap seat and thereby drawing said strap taut about said object, said seat having a smooth strap engaging surface which is substantially straight laterally of the strap and is curved longitudinally of and away from said strap from the place of contact with said strap.

8. The combination in a strap tensioning tool for drawing a strap taut about an object to be bound, of a frame adapted to rest on said object, a strap seat carried by said frame for supporting the supply portion of a strap looped around said object, means carried by said frame for abutting against a tubular strap seal to which the free end of said strap is attached and through which said supply portion is threaded, and means including a rotary tensioning wheel engaging said supply portion for moving said supply portion over said strap seat and thereby drawing said strap taut about said object, said seat having a smooth strap engaging surface which is substantially straight laterally of the strap and is curved longitudinally of and away from said strap from the place of contact with said strap, the centers of curvature of said smooth strap engaging surface and of the periphery of said wheel being in the same plane.

9. The combination in a strap tensioning tool for draw-

ing a strap taut about an object to be bound, of a frame adapted to rest on said object, a strap seat carried by said frame for supporting the supply portion of a strap looped around said object, means carried by said frame for abutting against a tubular strap seal to which the free end of said strap is attached and through which said supply portion is threaded, and means including a rotary tensioning wheel engaging said supply portion for moving said supply portion over said strap seat and thereby drawing said strap taut about said object, said seat having a smooth strap engaging surface which is substantially straight laterally of the strap and is curved longitudinally of and

away from said strap from the place of contact with said strap, the radius of curvature of said smooth surface being greater than the radius of curvature of the periphery of said wheel.

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