July 21, 1936. W. C. CHILDRESS 2,048,374

STRAP STRETCHING DEVICE

Filed Feb. 13, 1935 3 Sheets-Sheet 1

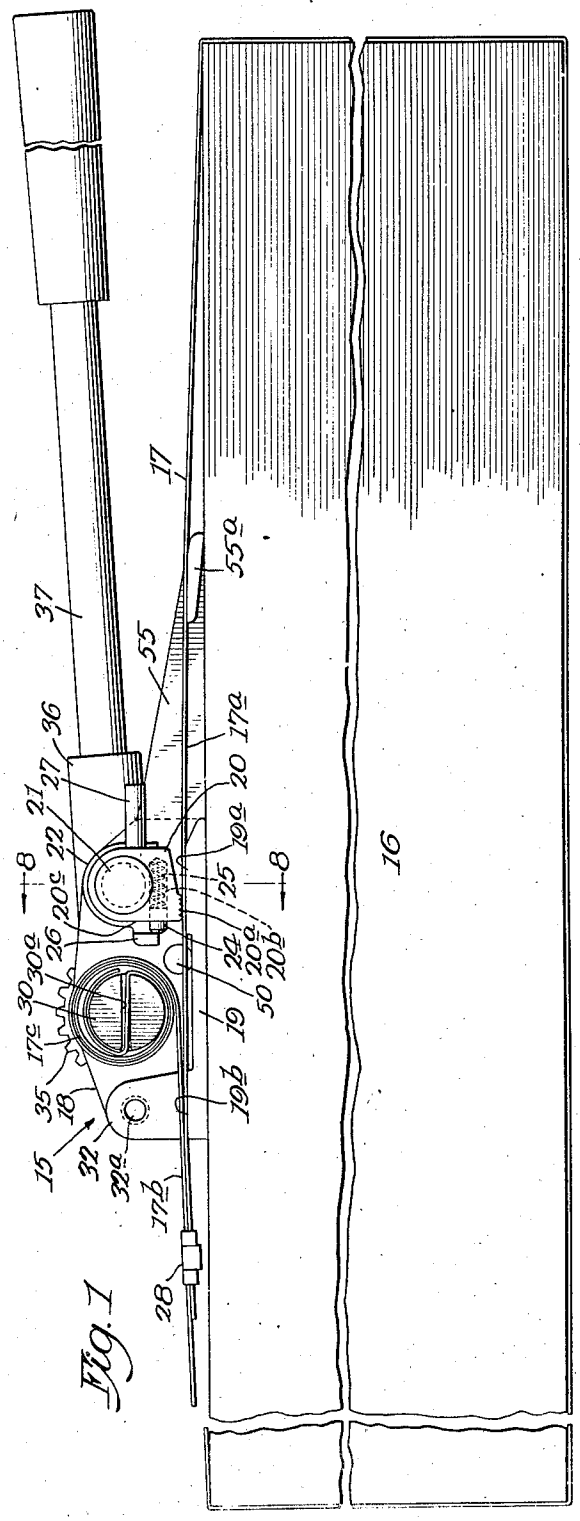


Fig. 1

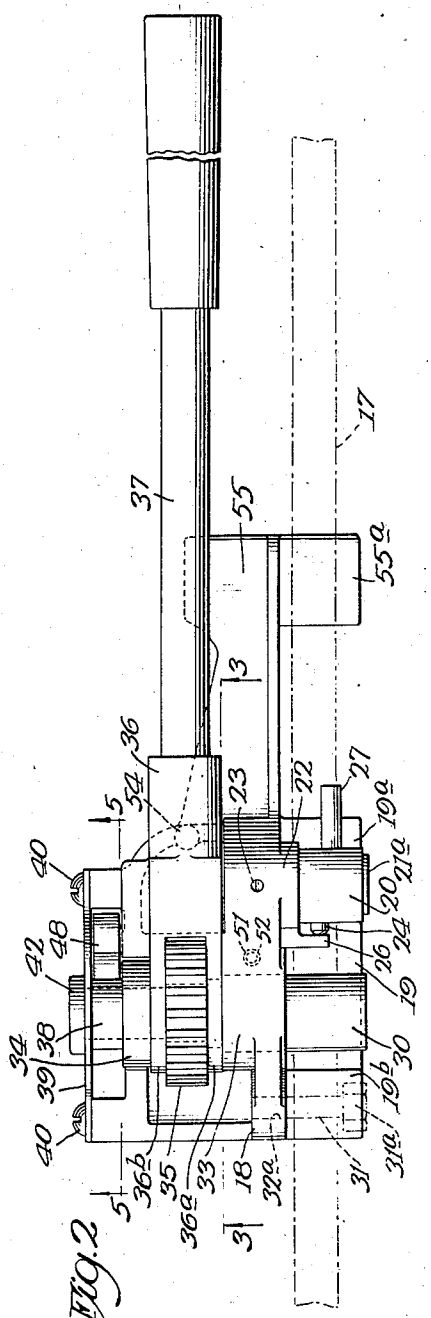


Fig. 2

Inventor:
William C. Childress
By Rector, Hibbey, Davis
& Macauley Attys.

July 21, 1936. W. C. CHILDRESS 2,048,374

STRAP STRETCHING DEVICE

Filed Feb. 13, 1935 3 Sheets-Sheet 2

Fig.3

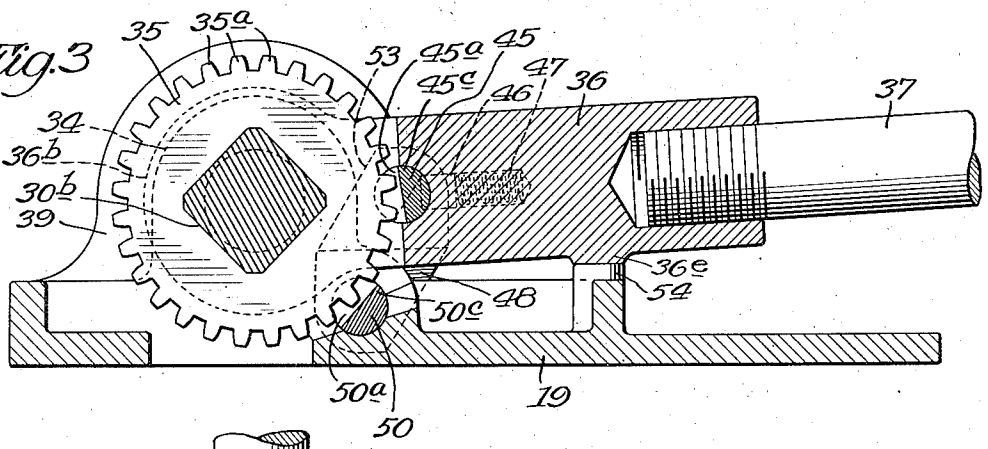


Fig.4

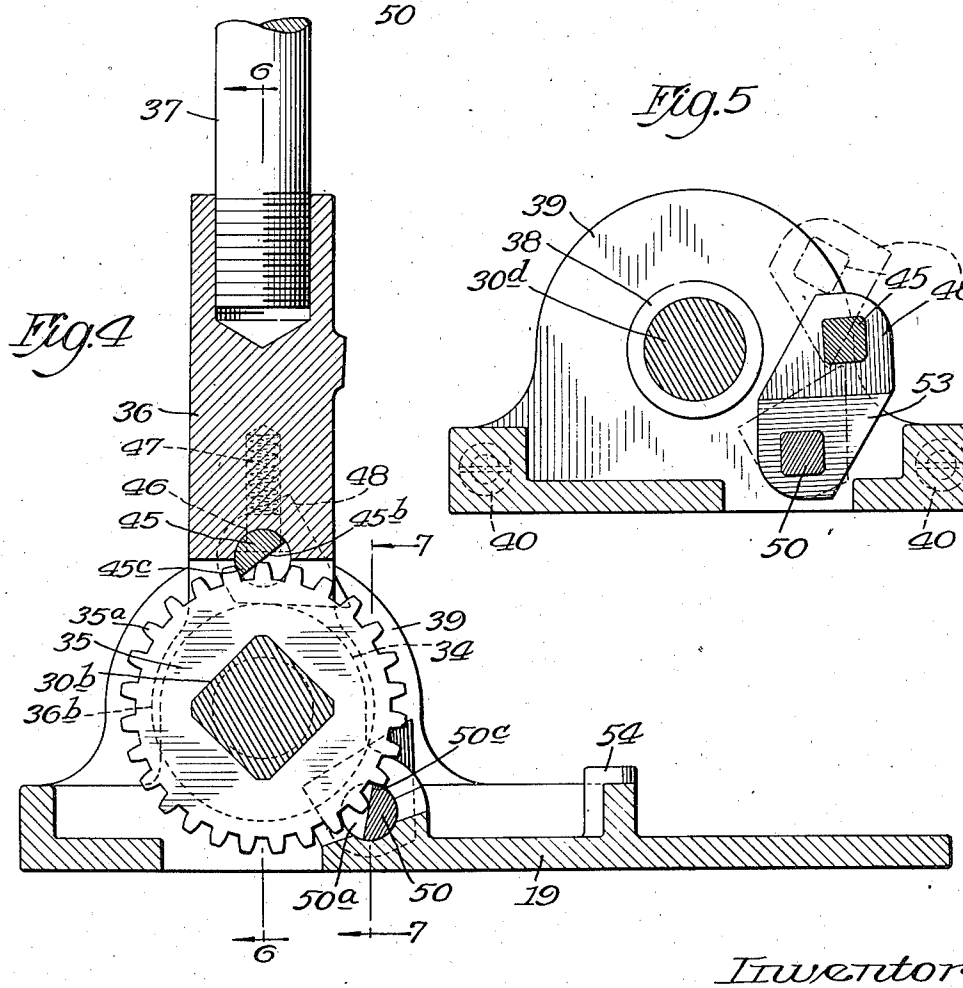


Fig.5

Inventor:
William C. Childress
By Rector, Hibben, Davis & Macauley, Attys.

July 21, 1936. W. C. CHILDRESS 2,048,374

STRAP STRETCHING DEVICE

Filed Feb. 13, 1935 3 Sheets-Sheet 3

Fig.7

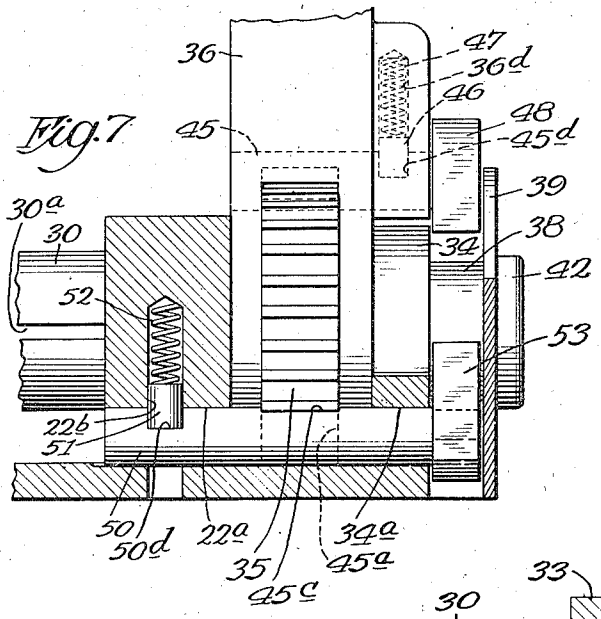


Fig.6

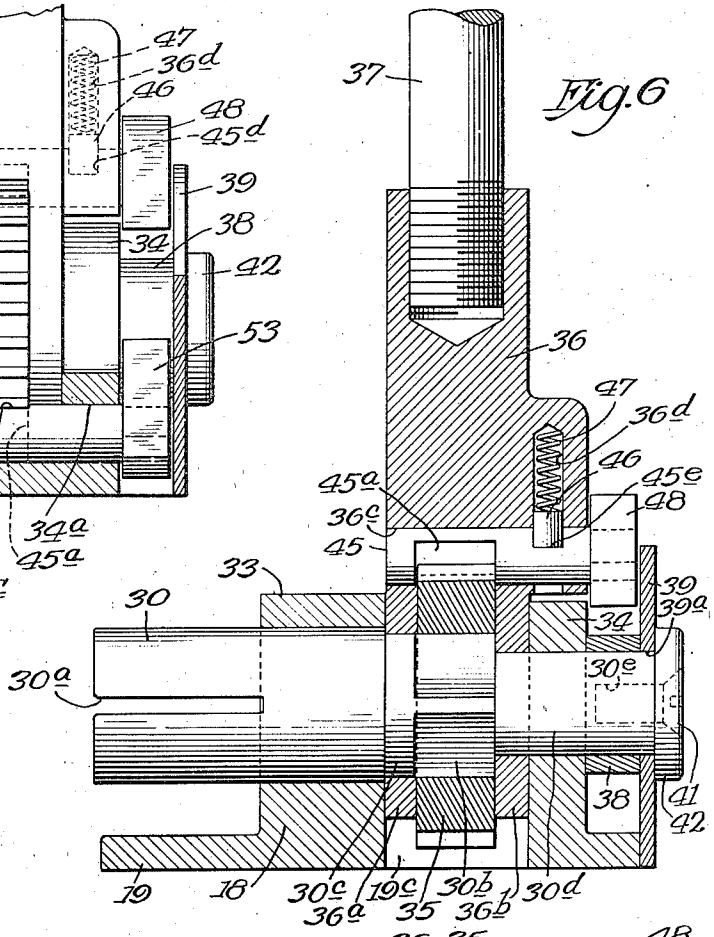


Fig.9

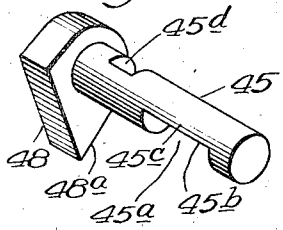


Fig.8

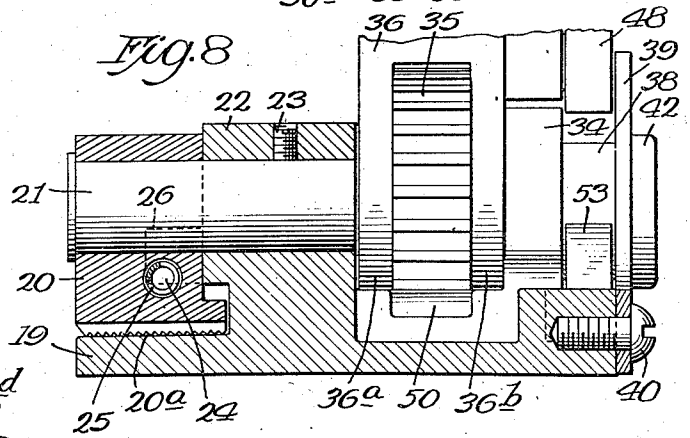
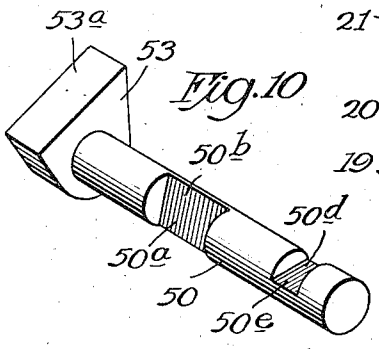


Fig.10



Inventor:
William C. Childress
By Rector, Hibben, Davis & Macauley, Attys.

Patented July 21, 1936 2,048,374

UNITED STATES PATENT OFFICE

2,048,374

STRAP STRETCHING DEVICE

William C. Childress, Oak Park, Ill., assignor to Acme Steel Company, Chicago, Ill., a corporation of Illinois

Application February 13, 1935, Serial No. 6,310

13 Claims. (Cl. 254—164)

This invention relates to improvements in strap stretching devices and, in particular, to an improved strap stretching device adapted particularly for drawing taut around a package or a group of packages a relatively heavy steel strap, preliminarily to securing the ends of the strap together by means of a seal or the like. The present invention is an improvement upon the form of strap stretching device described and claimed in United States Patent No. 1,833,168, granted November 24, 1931 on an application of Chester M. MacChesney and John Ekern Ott.

In the practice of the so-called unit-load method of loading freight cars and other carriers, described and claimed in the United States patent of Chester M. MacChesney and John Ekern Ott, No. 1,703,495, dated February 26, 1929, wherein a number of boxes, packages, or other load elements are bound together by surrounding steel straps or other flexible binders to form relatively large load units, and in other situations where relatively heavy seal strapping is employed for reenforcing or binding objects for shipment, it is desirable to employ a strong and durable stretching tool for drawing the strap taut before securing the overlapping ends of the strap together and it has been found that the required power for drawing the strap taut may be most effectively applied by means of a stretching tool in which the strap is wound about a rotatable drum during the stretching operation, as disclosed in said Patent No. 1,833,168. It has developed, however, that in the operation of stretching tools of this type, there is difficulty in removing the drum of the tool from the surrounding coil of strap after the strap has been drawn taut and a joint formed between the overlapping strap ends because a portion of the strap remains tightly coiled about the drum and cannot readily be cut off until after this coiled portion has been removed from the drum.

It is the principal object of the present invention to overcome the above mentioned difficulty by providing a strap stretching tool of the drum type in which means are provided for automatically releasing the drum after the strap has been drawn taut and the joint formed, in order to permit the drum to rotate in the reverse direction under the influence of the tension in the coiled strap, thereby permitting the drum to be readily withdrawn endwise from the coil of strap as the tool is moved bodily from engagement with the taut strap.

A further object of the invention is to provide a strap stretching device of the rotatable drum type comprising means for rotating the drum and for normally holding the drum against reverse rotation in combination with means actuated when the operating member of the tool reaches a predetermined position for automatically releasing the drum and permitting such reverse rotation. A further object of the invention is to provide a strap stretching device comprising a base plate having mounted thereon a rotatable drum adapted to be engaged by the strap to be drawn taut and having mounted thereon a ratchet wheel adapted to be actuated by a lever provided with a pawl for rotating the ratchet wheel and having mounted adjacent thereto a detent for holding the ratchet wheel against reverse rotation during the reciprocation of the operating member, said pawl and detent being so arranged that when the operating member reaches a predetermined position the detent is automatically disengaged from the ratchet wheel. Still another object of the invention is to provide a strap stretching device comprising means for drawing a strap taut and improved means for supporting the tool on the box or package or other object about which the strap is being drawn during the actuation of the strap stretching means. 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 strap stretching tool of the present invention mounted upon a box or package about which a strap has been drawn taut by the use of the tool;

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

Fig. 3 shows an enlarged longitudinal section taken on the line 3—3 of Fig. 2, the operating lever being in its lower position wherein the pawl and detent are both disengaged from the ratchet wheel;

Fig. 4 is a sectional view similar to that of Fig. 3, illustrating the operating handle in an upright position wherein the teeth of the ratchet wheel or gear are engaged by both the pawl and the detent;

Fig. 5 shows an enlarged longitudinal section taken on the line 5—5 of Fig. 2;

Fig. 6 shows a vertical section taken on the line 6—6 of Fig. 4;

Fig. 7 shows a vertical section taken on the line 7—7 of Fig. 4;

Fig. 8 shows an enlarged vertical section taken on the line 8—8 of Fig. 1;

Fig. 9 is a perspective view of the pawl carried by the operating lever; and

Fig. 10 is a perspective view of the detent by which the drum is normally held against reverse rotation.

As shown in the accompanying drawings, the improved strap stretching tool 15 is shown seated upon the upper surface of a box or package 16 about which a flat metal strap 17 has been drawn taut by the operation of the tool. The strap stretching device 15 comprises a frame 18 having a base plate 19 which is adapted to rest upon the surface of the box or package 16. This base plate 19 has a surface 19a on which one end portion 17a of the strap 17 is adapted to be seated with the free end of the strap extending beyond the other end of the frame 18. The end portion 17a of the strap is adapted to be held on the surface 19a of the base plate by means of a gripping dog 20 which is pivotally mounted upon a pin 21 secured in the hub portion 22 of the frame 18. This pin 21 has an enlarged flat head 21a which retains the gripping dog 20 in place and it is held within the hub portion 22 by means of a set screw 23. The gripping dog 20 is provided on its under side with a serrated gripping surface 20a which is adapted to engage the upper side of the end portion 17a of the strap. This gripping portion 20a of the gripping dog is offset toward the left, as viewed in Fig. 1, from a vertical plane containing the axis of the pin 21 on which the gripping dog is pivotally mounted, so that a pull on the strap toward the right tends to increase the grip of the dog upon the strap. The gripping dog is normally moved toward strap engaging position by means of a pin 24 which is slidably mounted in a bore 20b formed in the gripping dog. A coil spring 25 is mounted in this bore 20b and forces the pin 24 into engagement with a flange 26 which projects laterally from the frame 18 at a short distance above the base plate 19. The spring 25 maintains the serrated gripping surface 20a normally in engagement with the upper surface of the strap, but it may be released by turning the gripping dog in a clockwise direction, as viewed in Fig. 1, about its pivot pin 22 and for this purpose the gripping dog is provided with a projecting handle 27 which may be pushed downwardly for the purpose of tilting the gripping dog against the compression of the spring 25. This tilting movement of the gripping dog is limited by the engagement of its face 20c with the lower edge of the flange 26.

After seating the strap stretching device 15 against the surface of the box or package 16 and placing the end portion 17a of the strap 17 beneath the gripping dog 20, the strap, which is preferably in the form of a flat flexible steel strap, is carried around the box or package 16 and the opposite end portion 17b thereof is placed over the projecting end portion 17a above the surface 19b of the base plate upon which the portion 17a is seated. The portion 17a of the strap projects beyond the end of the base plate and these two overlapping portions of the strap are adapted to be connected together, after the strap has been drawn taut about the package, by means of a seal or other fastening device 28 which may be a seal of the form described and claimed in the United States Patent No. 1,260,016, granted March 19, 1918, on an application of Ralph H. Norton. Before applying the seal 28, the extremity 17b of the strap is passed through a slot 30a formed in the rotatable drum 30 which is mounted in the frame 18 and by which the strap 17 is drawn taut around the package. In some instances, and particularly when the tool 15 is applied to the vertical side of a box or package, it may be desirable to mount a stud 31, shown by dotted lines in Fig. 2, in a threaded aperture 32a which is formed in a flange 32 carried by the frame 18. This stud has an enlarged head 31a which assists in maintaining the end portion 17b of the strap in proper alignment with the underlying portion 17a during the preliminary steps of drawing the strap taut.

The drum 30 is rotatably mounted in a hub portion 33 formed integrally with the hub portion 22 and with the base plate 19, and also in another hub portion 34 which is formed integrally with the base plate 19. The two hub portions 33 and 34 are spaced apart, as shown particularly in Fig. 6 and the base plate 19 is apertured between them as shown at 19c. Between these portions, the drum 30 is provided with a portion 30b of square or other non-circular cross section which fits an aperture of corresponding shape formed in a ratchet wheel 35 which, in this instance, is in the form of a gear wheel having the usual gear teeth. At one side of the portion 30b, the drum 30 has a portion 30c of lesser diameter than the body portion of the drum which is journaled in the hub portion 33, and at the other side of the portion 30b, the drum is reduced in diameter as shown at 30d and this part is journaled in the hub portion 34. The reduced portions 30c and 30d of the drum are rotatably engaged, on opposite sides of the ratchet or gear wheel 35, by flanges 36a and 36b, respectively, which form integral parts of an operating lever 36. This operating lever has an extension in the form of a tubular handle 37 which engages a threaded aperture in the outer end thereof and this handle is adapted to be manipulated by the operator for reciprocating the operating lever and thereby rotating the wheel 35 as hereinafter described. The reduced portion 30d of the drum which projects beyond the hub portion 34 is engaged by a sleeve 38 and the extremity of this reduced portion of the drum fits loosely within an aperture 39a formed in a plate 39 which is secured to the edge of the base plate 19 by means of cap screws 40, as shown in Figs. 6 and 8. This reduced end of the drum is provided with an axial threaded hole 30e and a screw 41 engaging this threaded hole has its head countersunk in a cap member 42 which overlaps the plate 39 and thus secures the drum 30 against endwise movement. By removing the screw 41, the cap member 42 may be detached and the drum 30 may then be removed by drawing it endwise toward the left as viewed in Fig. 6.

The operating lever 36 is provided adjacent the periphery of the gear 35 with a transversely extending aperture 36c of circular cross section in which there is mounted the pawl 45 which is in the form of a cylindrical pin. This cylindrical member is milled out on one side to form a notch 45a which is located in registry with the gear wheel 35. This notch is bounded on its inner side by a flat face 45b which is located substantially at the axis of the pin and there are formed at the edges of the notch 45a sharp projections 45c, one of which is adapted to enter a space be-

tween two of the teeth 35a of the gear wheel, as shown in Fig. 4, so that when the operating lever is moved from the position shown in Fig. 3 to the position shown in Fig. 4, the wheel 35 is moved by the engagement with one of its teeth of the projection 45c on the pawl. For the purpose of holding the pawl 45 normally in the position shown in Fig. 4, another notch 45d is milled in the side of the pawl to register with a pin 46 which is slidably mounted in a bore 36d formed in the operating lever 36, as shown in Fig. 6. A coil spring 47 mounted in this bore engages the inner end of the pin 46 and normally moves it into engagement with the flat face 45e which forms the inner boundary of the notch 45d.

The engagement of the flat end of the pin 46 with the flat face 45e of the notch 45d under the pressure of the coil spring 47 serves normally to maintain the pawl 45 in a position wherein a projection 45c at the edge of the notch 45a engages one of the teeth of the gear wheel 35, but, when sufficient pressure is applied to the pawl 45, it may be rotated in its bearing and caused to assume the position shown in Fig. 3 and the pin 46 then moves into the bore 36d of the operating lever with a resulting further compression of the spring 47. This turning of the pawl 45 is adapted to be effected by an actuating arm or cam 48 which is substantially triangular in form, as shown particularly in Fig. 9. This member 48 is mounted in fixed position on the projecting end of the pawl 45, as shown in Fig. 6 and lies partially within the upwardly extending plate 39 which thereby serves to retain the pawl and its actuating member in position with respect to the operating lever 36. The actuating member or cam 48 is provided with converging flat faces 48a, one of which is adapted to be engaged by a corresponding face of a similar actuating member mounted on the detent, as hereinafter described, for automatically turning the pawl and the detent when the operating lever is moved to the position shown in Fig. 3.

The lower part of the frame 18 is provided with aligning apertures 22a and 34a, of circular cross section, which extend through the bearing portions 22 and 34, respectively, as shown in Fig. 7, and these aligning apertures have rotatably mounted therein a detent 50 which is in the form of a cylindrical pin. As shown particularly in Fig. 10, this detent has one side thereof milled off to form a semi-cylindrical notch or recess 50a bounded on its inner side by a flat surface 50b which coincides substantially with the axis of the detent. There are thus formed at opposite edges of the surface 50b angular projections 50c one of which is adapted to engage the space between two of the teeth 35a of the gear wheel 35 when the detent is in the proper angular position as shown in Fig. 4. The detent is normally held in this angular position by means of a pin or plunger 51 which is mounted within a cylindrical bore 22b formed in the bearing portion 22, as shown in Fig. 7. A coil spring 52, mounted in this bore, engages the upper end of the pin or plunger 51 and forces it downwardly into engagement with another similar cylindrical notch or recess 50d which is formed in the side of the detent 50. This notch or recess 50d is bounded on its inner side by a flat surface 50e which is normally engaged by the flat end of the pin or plunger 51, thus holding the detent in the angular position illustrated in Fig. 4 under the compression of the coil spring 52. The detent 50 may return from this angular position by an actuating member or cam 53 which is substantially triangular in cross section and which is provided with converging flat faces 53a, one of which is adapted to be engaged by the actuating member or cam 48 mounted upon the pawl 45.

As the operating lever approaches its lower position shown in Fig. 3, the tip of the cam 48 engages a side face of the cam 53 and, as the downward motion of the operating lever continues, the coacting cam serves to turn both the pawl and the detent until two of the flat faces 48a and 53a are in contact with each other as shown in Fig. 3. In this position of the cams 48 and 53, both the pawl and the detent are turned so that the teeth of the gear wheel 35 are permitted to pass through the notches 45a and 50a of the pawl and detent, respectively. This permits the gear wheel 35 to be turned in a direction which is the reverse to its direction of movement during the operation of turning the drum 30 to wind up the strap 17 and draw it taut around the box or package. The tension in the tightly wound coil of strap 17b about the drum 30 will be sufficient to cause this reverse movement of the drum and ratchet wheel as soon as the pawl and detent are disengaged therefrom and this will result in unwinding the coil 17c sufficiently so that the drum 30 may be moved out of engagement therewith by an endwise sliding movement transversely to the strap. When this disengagement has been effected, the projecting upper end of the strap which includes the coil 17c may then be cut off adjacent to the seal 28 which will have been applied after the strap has been drawn taut and before releasing the gear wheel 35 from the detent 50. When the operating lever 36 is in its lowermost position, shown in Fig. 3, a boss 36e formed on the operating lever will rest upon a ledge or shoulder 54 which is formed upon the base plate 19. It will be understood that during the ordinary operation of drawing the strap taut, the operating lever 36 may be reciprocated about its pivot on the reduced portions of the drum 30 and that the flat face 45e of the pawl 45 will slide over the teeth 35a of the gear wheel and that the pawl will turn angularly against the compression of the spring 47 to permit the pawl to be moved into engagement with a new tooth of the wheel, so that the gear wheel may be rotated continuously in the same direction by successive increments of movement each brought about by the engagement of the pawl with a separate tooth of the wheel. To prevent the tilting of the frame 18 of the strap stretching device on the surface of the box or package during the operation of drawing the strap taut, the frame 18 is preferably provided with an arm or tail-piece 55, preferably of angular cross section, which extends parallel to the direction of the strap 17 and which is provided at its extremity with a laterally extending flange 55a adapted to underlie the strap 17 and to rest upon the surface of the box or package. By this arrangement, the tool is given a bearing of considerable length upon the package.

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

I claim:

1. The combination in a strap stretching device, of a frame, a drum rotatably mounted in said frame and having means for receiving a strap to be wound thereon, an operating lever

pivotally mounted on said drum, a pawl pivotally mounted on said operating lever and actuated normally to engage said ratchet wheel, a detent pivotally mounted in said frame and actuated normally to engage said ratchet wheel, and cams mounted on said pawl and said detent and adapted to engage each other upon a predetermined movement of said operating lever for disengaging both said pawl and said detent from said ratchet wheel.

2. The combination in a strap stretching device, of a frame, a drum rotatably mounted in said frame and having means for receiving a strap to be wound thereon, an operating lever pivotally mounted on said drum, a pawl pivotally mounted on said operating lever and actuated normally to engage said ratchet wheel, a detent pivotally mounted in said frame and actuated normally to engage said ratchet wheel, and V-shaped cams secured on said pawl and said detent and adapted to engage each other upon a predetermined movement of said operating lever for moving both said pawl and said detent out of engagement with said ratchet wheel.

3. The combination in a strap stretching device, of a frame, a drum rotatably mounted in said frame and having means for receiving a strap to be wound thereon, a ratchet wheel mounted on said drum, an operating lever pivotally mounted on said drum, a pawl pivotally mounted on said operating lever and actuated normally to engage said ratchet wheel to permit rotation of said drum in one direction by the reciprocation of said operating lever, a detent pivotally mounted in said frame and actuated normally to engage said ratchet wheel to prevent reverse rotation of said drum, and means actuated by a predetermined movement of said operating lever for disengaging said detent from said ratchet wheel.

4. The combination in a strap stretching device, of a frame, a drum rotatably mounted in said frame and having means for receiving a strap to be wound thereon, a ratchet wheel mounted on said drum, an operating lever pivotally mounted on said drum, a pawl pivotally mounted on said operating lever and actuated normally to engage said ratchet wheel to permit rotation of said drum in one direction by the reciprocation of said operating lever, a detent pivotally mounted in said frame and actuated normally to engage said ratchet wheel to prevent reverse rotation of said drum, a cam mounted on said detent, and means carried by said operating lever for engaging said cam upon a predetermined movement of said operating lever for disengaging said detent from said ratchet wheel.

5. The combination in a strap stretching device, of a frame, a drum rotatably mounted in said frame having means for receiving a strap to be wound thereon, said frame having spaced bearing post portions in which said drum is journaled, means carried by said frame for rotating said drum, a plate carried by said frame and having an aperture to receive one end of said drum, and a cap member detachably secured on the end of said drum and overlapping said plate to prevent endwise movement of said drum in one direction.

6. The combination in a strap stretching device, of a frame having spaced bearing portions, a drum having a part to receive a strap adapted to be wound thereon and having parts of different diameter journaled in said bearing portions, a ratchet wheel mounted on said drum between said bearing portions, an operating lever having parts pivotally mounted on said drum on opposite sides of said ratchet wheel, means carried by said operating lever for rotating said ratchet wheel and said drum, a plate carried by said frame and having an aperture to receive the end of said drum opposite the portion on which said strap is wound, a sleeve mounted on said drum between said plate and said operating lever, and a cap member detachably mounted on the end of said drum on the outer side of said plate.

7. The combination in a strap stretching device, of a frame, a drum rotatably mounted in said frame and having a part to receive a strap adapted to be wound thereon, a ratchet wheel secured on said drum, a pivotally mounted operating lever, and a cylindrical pawl pivotally mounted in said operating lever and having a notch cut therein whereby a part at the edge of said notch forms a tooth adapted to engage said ratchet wheel.

8. The combination in a strap stretching device, of a frame, a drum rotatably mounted in said frame and having a part to receive a strap adapted to be wound thereon, a ratchet wheel secured on said drum, a pivotally mounted operating lever, and a cylindrical pawl pivotally mounted in said operating lever and having a notch cut therein whereby a part at the edge of said notch forms a tooth adapted to engage said ratchet wheel, said pawl having another notch therein, and means engaging said last-named notch for normally turning said pawl to a position wherein said tooth is adapted to engage said ratchet wheel.

9. The combination in a strap stretching device, of a frame, a drum rotatably mounted in said frame and having a part to receive a strap adapted to be wound thereon, a ratchet wheel secured on said drum, a pivotally mounted operating lever, and a cylindrical pawl pivotally mounted in said operating lever and having a notch cut therein whereby a part at the edge of said notch forms a tooth adapted to engage said ratchet wheel, said pawl having another notch therein, said last-named notch having a flat inner face, and a spring pressed plunger mounted in said operating lever and adapted to engage said flat face for normally maintaining said pawl in a position wherein said tooth is adapted to engage said ratchet wheel.

10. The combination in a strap stretching device, of a frame, a drum rotatably mounted in said frame and having a part adapted to engage a strap to be wound thereon, a ratchet wheel mounted on said drum, means engaging said ratchet wheel for rotating said drum, a cylindrical detent rotatably mounted in said frame adjacent said ratchet wheel, said detent being notched on one side to form at the edge of said notch a tooth adapted to engage said ratchet wheel, and means engaging said detent for normally turning it to a position wherein said tooth engages said ratchet wheel.

11. The combination in a strap stretching device, of a frame, a drum rotatably mounted in said frame and having a part adapted to engage a strap to be wound thereon, a ratchet wheel mounted on said drum, means engaging said ratchet wheel for rotating said drum, a cylindrical detent rotatably mounted in said frame adjacent said ratchet wheel, said detent being notched on one side to form at the edge of said notch a tooth adapted to engage said ratchet wheel, said detent having another notch therein provided with a flat inner face, a plunger slidably mounted in said frame and adapted to engage said face, and re-

silient means for pressing said plunger into engagement with said face.

12. The combination in a strap stretching device, of a frame, a drum rotatably mounted in said frame and having a part to receive a strap adapted to be wound thereon, a ratchet wheel secured on said drum, a pivotally mounted operating lever, a pawl pivotally mounted in said operating lever and having a tooth adapted to engage said ratchet wheel, said pawl comprising a cylindrical part having a flat bottom notch cut therein, and a spring engaging the bottom of said notch for normally turning said pawl to a position wherein said tooth is adapted to engage said ratchet wheel.

13. The combination in a strap stretching device, of a frame, mechanism carried by said frame for drawing a strap taut, a ratchet wheel for operating said mechanism, a pivotally mounted operating lever, and a cylindrical pawl pivotally mounted in said operating lever and having a notch cut therein whereby a part at the edge of said notch forms a tooth adapted to engage said ratchet wheel.

WILLIAM C. CHILDRESS.