United States Patent

[11] 3,612,481

[72] Inventor **Warren H. Guy**
Glen Mills, Pa.

[21] Appl. No. **885,913**
[22] Filed **Dec. 17, 1969**
[45] Patented **Oct. 12, 1971**
[73] Assignee **FMC Corporation**
Philadelphia, Pa.

[54] **STRAP TENSIONING MECHANISM**
6 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** **254/51,** 140/93.4
[51] **Int. Cl.** **B66f 1/00**
[50] **Field of Search** 254/51; 140/93.4

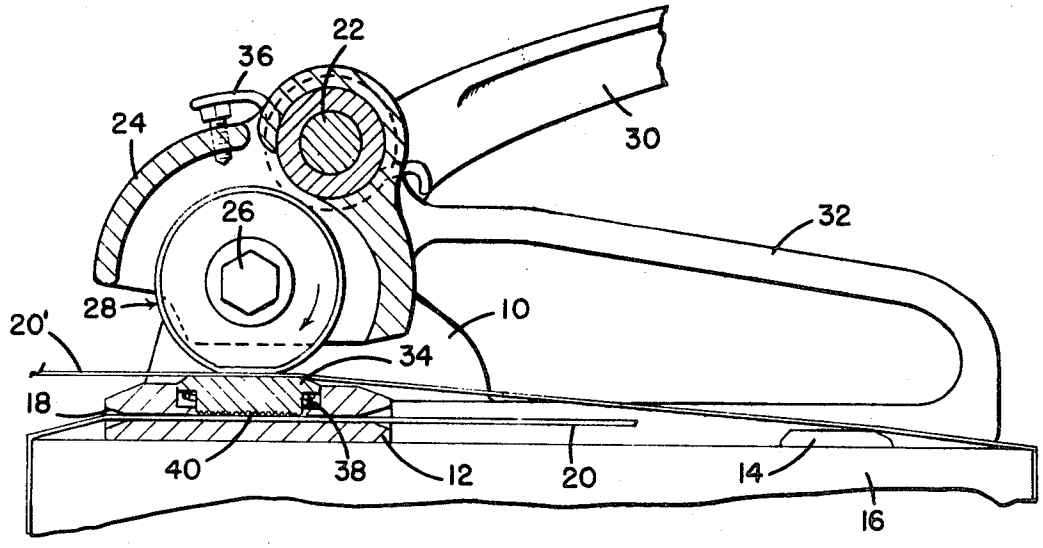
[56] **References Cited**

UNITED STATES PATENTS

3,232,582	2/1966	Kneidl et al.	254/51
3,309,061	3/1967	Plattner	254/51

Primary Examiner—Othell M. Simpson
Attorneys—Thomas R. O'Malley, George F. Mueller and Charles H. Johnson

ABSTRACT: Feed wheeltype strap tensioning mechanism designed for providing a high tension on nonmetallic strapping without damaging the strapping. Instead of the normal line contact between the feed wheel and the strapping, the mechanism is arranged to provide an appreciable area of contact whereby the pulling and gripping force of the wheel is spread over a sufficient area of the strapping as to avoid damaging the same.



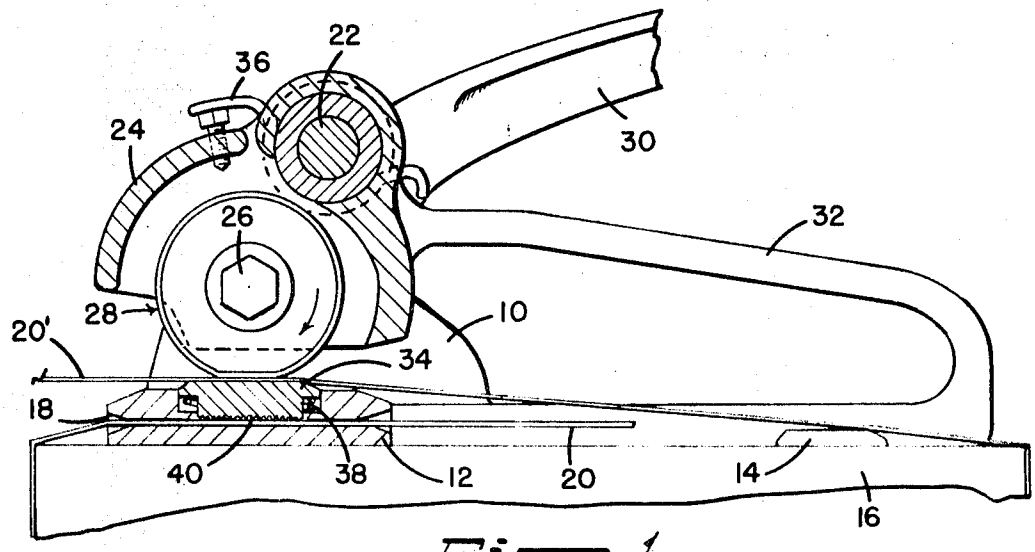


Fig. 1

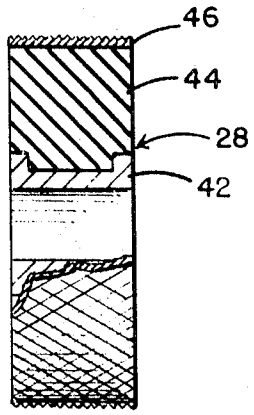


Fig. 2

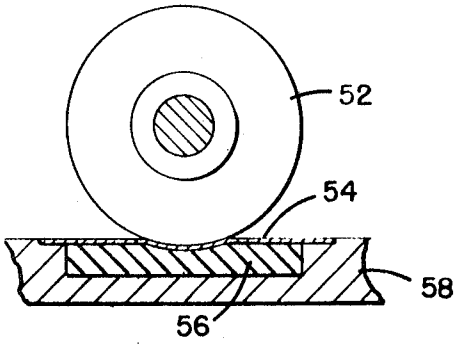


Fig. 3

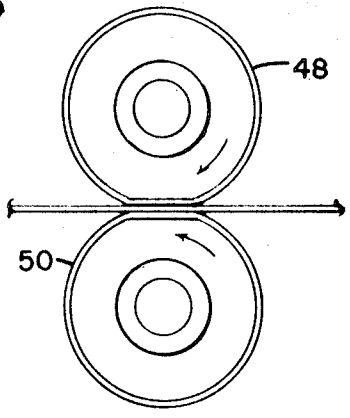


Fig. 4

STRAP TENSIONING MECHANISM

This invention relates to strapping tools and more particularly to a feed wheel-type strap tensioning tool especially adapted for tensioning nonmetallic strapping.

Packages are often secured and reinforced by having a strap tightly secured therearound. The strap is generally tensioned by some form of tool either manually operated or automatic. One form of tensioning mechanism involves engaging the strap with a rotatable knurled, serrated or otherwise roughened wheel which when rotated causes the portion of the strapping engaged thereby to slide in strap tightening direction either over an anchored portion of the strapping or over a foot or anvillike member against which the strapping is squeezed by the feed wheel. This form of tensioning mechanism normally calls for a line contact between the wheel and the strapping and, particularly in the case of nonmetallic strapping such as an extruded strip of polypropylene or nylon or the like, this line contact can result in severe damage to the strap. The line contact between the feed wheel and the strap is particularly harmful when the strap is to be highly tensioned because in order to avoid slippage of the wheel, a substantial pressure must be applied over the thin line of contact and the roughened surface of the wheel generally has to dig into the surface of the strap with the result that the strap is weakened where it is contacted by the feed wheel.

It is an object of the present invention to provide an improved feed wheel-type tensioner for nonmetallic strapping wherein a substantial area of contact is provided between the feed wheel and the face of the strap whereby unit pressure of the wheel against the strap is substantially less than in the case where there is line contact between the wheel and the strap.

Other and further objects, features and advantages of the invention will become apparent as the description of certain preferred embodiments thereof proceeds.

Referring now to the drawing:

FIG. 1 is a side elevation partially in section of a strapping tool incorporating the present invention;

FIG. 2 is a view partially in section of one form of feed wheel useful in carrying out the invention;

FIG. 3 is a partial view of a tool embodying a modified form of the invention; and

FIG. 4 is a side elevational view showing a further modification of the invention.

In FIG. 1, the invention is shown embodied in a tool which may be overall very similar to a tool described in detail in U.S. Pat. No. 2,621,893. This tool comprises a frame 10 having a pair of feet or rests 12 and 14 for contacting a package, a fragmentary portion of which is indicated at 16. Foot 12 is slotted at 18 to accommodate an end portion 20 of a strap which extends around the package and over the feet 12 and 14, a portion 20' extending from the upper face of foot 12 to a supply in the form of a roll or the like of strapping, not shown.

Swingably mounted on a shaft 22 carried by the framework 10 is a subassembly 24 carrying a shaft 26 to which is secured a tensioning wheel indicated generally at 28. Swingably mounted on shaft 26 is an operating lever 30 and as described in U.S. Pat. No. 2,621,893, when lever 30 is pressed downward toward a handle 32 of the main frame 10, subassembly 24 is swung clockwise about shaft 22 to raise the feed wheel 28 to a position removed from the vicinity of an anvil 34 carried by foot 12 so as to permit the portion 20' of the strap to be inserted between the feed wheel and the anvil. Upon release of pressure from lever 30, a spring 36 swings the subassembly 24 counterclockwise to force the feed wheel 28 into engagement with either anvil 34 or a face of the strapping, if the strapping has been positioned between the feed wheel and the anvil. Anvil 34 is resiliently articulated to foot 12 by means of a spring 38. Said anvil has a smooth upper face and a roughened or serrated lower surface 40. When feed wheel 28 is forced against the anvil 34 or strap portion 20', the pressure of the feed wheel presses the anvil down against the action of the light spring 38 so that the serrations 40 grip the lower portion 20 of the strap and hold it during the tensioning operation. Oscillation of lever 30 then is effective through a ratchet and pawl arrangement, not shown, to rotate wheel 28 in a clockwise direction so as to draw or feed the strap portion 20' toward the left whereby to tighten the strap about the package, the lower end of the strap being held stationary due to being squeezed between the bottom of anvil 40 and the bottom of slot 18.

The construction of feed wheel 28 is shown in FIG. 2 and comprises a central metal hub 42 to which is secured a somewhat resilient cylindrical member 44. The portion 44 of the wheel may be formed of various elastomeric materials having only a low resiliency. Secured around the member 44 is a relatively thin, deformable metal facing or tire 46, the outer surface of which is knurled, serrated or otherwise roughened. Wheel 28 normally has a cylindrical surface which would provide a line contact with the anvil 34 or the strap upon light engagement therewith. However, spring 36 is sufficiently strong and the resilient portions of the wheel are sufficiently resilient that when the wheel is operatively engaged with the strap, it flattens somewhat so as to provide an area of engagement substantially greater than a line contact. The flattening of the wheel 28 is shown greatly exaggerated in FIG. 1, but even a slight flattening is sufficient to very substantially increase the area of contact with the strap to thereby spread the pull of the wheel when it is rotated over a sufficient area of the strap to avoid damaging the same.

Instead of engaging the strap between the resilient wheel and a nonyielding anvil as shown in FIG. 1, the strap can be engaged between a pair of resilient wheels 48 and 50 as shown in FIG. 4. In the FIG. 4 arrangement, either or both of the wheels may be positively driven, but both of them should be somewhat resilient in order to provide the greater than line contact area of engagement with the strap.

It is not necessary that the yieldable member be the wheel but instead there can be an arrangement such as shown in FIG. 3 wherein a nonresilient wheel 52 with knurled gripping surface presses the strap against a deformable metal facing 54 underlying which is a resilient portion 56 of a stationary foot or anvil 58. This FIG. 3 arrangement would provide a line contact upon light engagement of the wheel with the facing 54, but under pressure member 54 and the underlying portion 56 yield so as to conform to a portion of the periphery of the wheel whereby a greater area than line contact is provided.

In certain arrangements for feeding strip material, the strap is frictionally engaged by a resilient wheel which flattens somewhat against the strip. In these arrangements the wheel can well be all rubber or even inflated in the manner of a vehicle tire but with this type of feed wheel, it would not be possible to tension package strapping to the extent normally desired. By providing a deformable metal facing around the periphery of the feed wheel, it is possible to provide the strap engaging periphery of the wheel with a roughened surface which can actually dig into the strap in order to provide a nonslipping grip. Thus, such a wheel obtains the advantages of the gripping ability of knurled or roughened metal and the greater area of contact of a rubber wheel.

Having thus described certain preferred embodiments of the invention, what is claimed is:

1. Strap tensioning mechanism comprising a pair of opposed elements between which a length of strap may be positioned, means for relatively moving said elements toward each other, one of said elements having a cylindrical surface and the other having a surface which provides a line contact between the two elements upon light engagement therebetween, one of said elements being deformable so as to conform to the shape of the surface of the other under application of pressure whereby each element has more than a line contact with a strap squeezed therebetween, and said last mentioned element comprising a relatively thin deformable metal facing secured to an underlying resilient portion.

2. The strap tensioning mechanism set forth in claim 1 comprising means for rotating the element having the cylindrical surface when the two elements are pressed toward one another with a strap portion located therebetween.

3. The strap tensioning mechanism set forth in claim 2 wherein the metal facing is on the element having the cylindrical surface.

4. The strap tensioning mechanism set forth in claim 2 wherein the metal facing is on the element other than the one defined as having a cylindrical surface.

5. The strap tensioning mechanism set forth in claim 1 wherein both said elements have a relatively thin deformable metal facing.

6. The strap tensioning mechanism set forth in claim 3 wherein said metal facing has a roughened strap engaging surface.