United States Patent

[11] 3,612,480

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

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[73] Assignee **FMC Corporation**
Philadelphia, Pa.

[54] **FEED WHEEL FOR STRAP TENSIONING TOOL**
7 Claims, 8 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**
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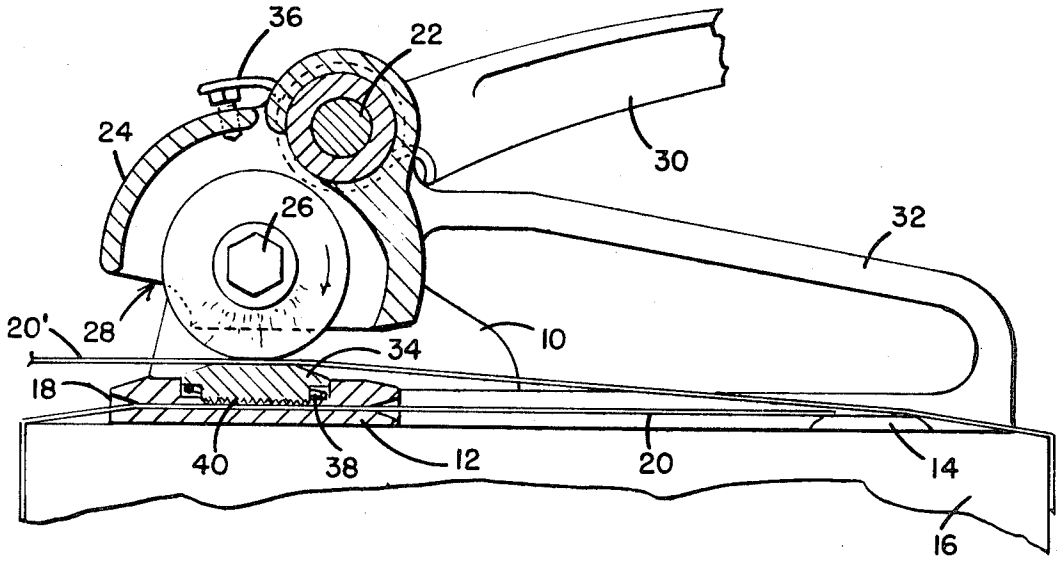
3,232,582	2/1966	Kneidl et al.	254/51
3,309,061	3/1967	Plattner	254/51

Primary Examiner—Othell M. Simpson
Attorneys— Thomas R. 0'Malley, George F. Mueller and Charles H. Johnson

ABSTRACT: A feed wheel-type package-strap tensioning apparatus particularly adapted for use with nonmetallic strapping involves an improved tensioning wheel having effectively a rough metal surface for engaging the strapping and deforming under pressure so as to provide greater than line-contact with the strapping.



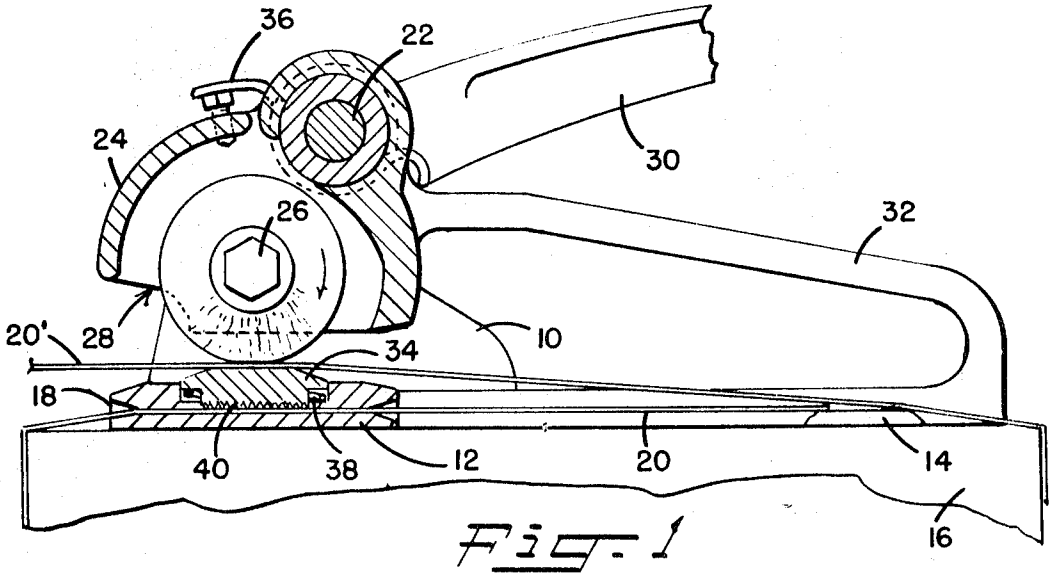


Fig. 1

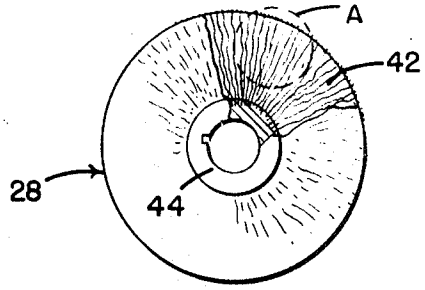


Fig. 2

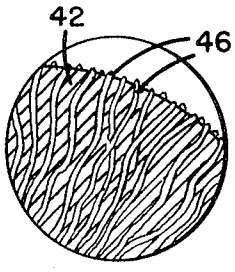


Fig. 3

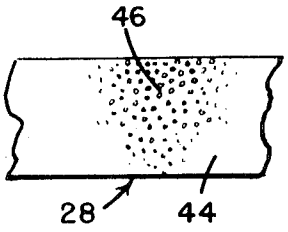


Fig. 4

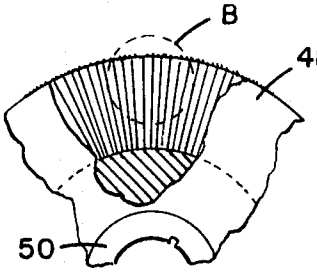


Fig. 5

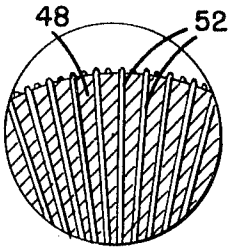


Fig. 6

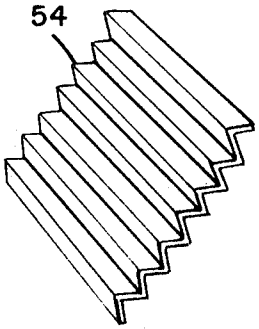


Fig. 7

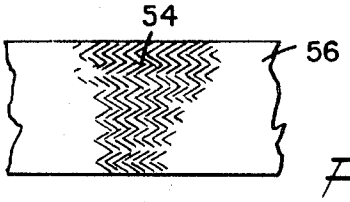


Fig. 8

FEED WHEEL FOR STRAP TENSIONING TOOL

The invention relates to feed wheel-type package-strap tensioning tools and more particularly to an improved tensioning wheel forming part of such an apparatus.

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 in a package-strap tensioning apparatus, an improved tensioning wheel which deforms under pressure against the strap so as to provide greater than line-contact with 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 side elevation and partially in section of one form of improved tensioning wheel according to this invention;

FIG. 3 is an enlarged view of the area indicated by dotted line A in FIG. 2;

FIG. 4 is a fragmentary plan view of the periphery of the wheel of FIG. 2;

FIG. 5 is a fragmentary view partially in side elevation and partially in section of another form of improved tensioning wheel;

FIG. 6 is an enlarged view of the area indicated by dotted line B in FIG. 5;

FIG. 7 is an isometric view of a metal element forming a part of still another form of the improved tensioning wheel; and

FIG. 8 is a fragmentary plan view of a wheel incorporating metal elements of the type shown in FIG. 7.

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 level 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 level 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.

One form of construction of the tensioning wheel 28 is shown in FIGS. 2, 3 and 4 as comprising a resilient body portion 42 having a cylindrical periphery and having secured therein a metal hub 44 by means of which the wheel is drivingly connected to shaft 26. The resilient material of which the body portion 42 is formed may be a rather firm rubber or may be some other elastomeric material which is capable of deforming to a limited extent when the wheel is pressed against the strap by the spring 36. In order to be able to transmit enough torque from shaft 26 to tension the strap to a fairly high degree, the body portion 42 of the wheel should be only resilient enough to permit the wheel to flatten against the strap sufficiently to achieve a bit more than line-contact with the strap, only slightly more than line-contact, of course, greatly increasing the area of contact and greatly reducing the unit pressure against the strap.

Embedded within the resilient body portion 42 of the wheel are a multiplicity of metal elements 46. In the wheel shown in FIGS. 2, 3 and 4, the metal elements are in the form of radially extending resilient steel wires having their inner ends secured in the metal hub 44 and having outer ends extending a short distance beyond the cylindrical periphery of the body portion 42 of the wheel. The wires may be straight but preferably are crimped or otherwise deformed from the straight line configuration to enable them to more readily shorten overall under pressure of the wheel against the strap in a radial direction. Wires 46 are located very close together and provide an all-metal contact with the strap as is the case with previously used tensioning wheels but the present arrangement differs from the normal rough surfaced metal tensioning wheel in that it provides, by flattening, a considerable area of contact with the strap. This relatively large area of contact considerably reduces the unit pressure necessary to obtain a driving grip of the wheel against the strap and results in less or no damage to the strap.

The modified form of tensioning wheel shown in FIGS. 5 and 6 comprises a resilient body portion 48 having a cylindrical periphery and having secured therein a metal hub 50. Embedded in and extending radially of the resilient body portion 48 are a multiplicity of metal elements in the form of straight, rigid, small diameter rods 52, the outer ends of which protrude a short distance beyond the periphery of the body portion and the inner ends of which stop short of the metal hub. This form of wheel differs from the one shown in FIGS. 2, 3 and 4 in that the metal elements do not flex or bend as the wheel is pressed against the strap but rather move bodily radially inward, this type movement being permitted by the fact that the inner ends of the rods are spaced from the metal hub. If desired, that portion of the resilient body 48 of the wheel located inwardly of the inner ends of rods 52 may be slightly more yielding than that portion in which the rods are actually embedded to more definitely assure that when the wheel is pressed against the strap, the rods will move inward with their inner ends sinking into the interior of the resilient body while their outer ends continue to protrude beyond the cylindrical periphery whereby a good grip with the strap is obtained. As with the wires 46, rods 52 are positioned very close together so as to provide in effect a metal strap engaging surface for the wheel.

Instead of the small diameter rods **52**, the metal elements may be in the form of corrugated members **54**, one of which is shown in FIG. **7**. Members **54** are embedded in a resilient body portion of the wheel in the same manner as rods **52**; that is, with their outer ends protruding beyond the periphery of the resilient body portion and their inner ends spaced away from the metal hub so that said member may move bodily inwardly when the wheel presses against the strap. As seen in FIG. **8**, members **54** are substantially as wide as the resilient body portion of wheel, the latter portion being indicated at **56**.

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

1. In a package-strap tensioning apparatus wherein a rotatable tensioning wheel presses against a portion of strap supported upon a substantially planar surface whereby line-contact is normally provided between the cylindrical periphery of the tensioning wheel and the strap and wherein rotation of the tensioning wheel is effective to slide the strap over the planar surface; an improved tensioning wheel comprising a resilient body portion having a cylindrical periphery, a multiplicity of metal elements embedded in said body portion, each of said elements having a longitudinal dimension extending radially through said body portion and having an end extending a short distance beyond the cylindrical periphery of the body portion, said wheel deforming under pressure contact with a strap whereby greater than line-contact with the strap is obtained.

2. The apparatus set forth in claim **1** wherein said metal elements are in the form of substantially straight rigid rods.

3. The apparatus set forth in claim **1** wherein said metal elements are in the form of resilient wires.

4. The apparatus set forth in claim **1** wherein said metal elements are in the form of corrugated members having outer ends which are substantially coextensive with the width of the cylindrical periphery of said wheel.

5. The apparatus set forth in claim **2** wherein said wheel comprises a metal hub and said rigid rods have inner ends spaced radially away from said hub whereby said rods may move radially inward to a certain extent without contacting said hub.

6. The apparatus set forth in clam **3** wherein said wheel comprises a metal hub and said resilient wires are secured at their inner ends to said metal hub.

7. The apparatus set forth in claim **4** wherein said wheel comprises a metal hub and said corrugated members have inner ends spaced radially away from said hub whereby said members may move radially inward to a certain extent without contacting said hub.