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STRAP RESTRAINING MEANS FOR THE BASE OF A STRAP TENSIONING DEVICE

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FIG. 1

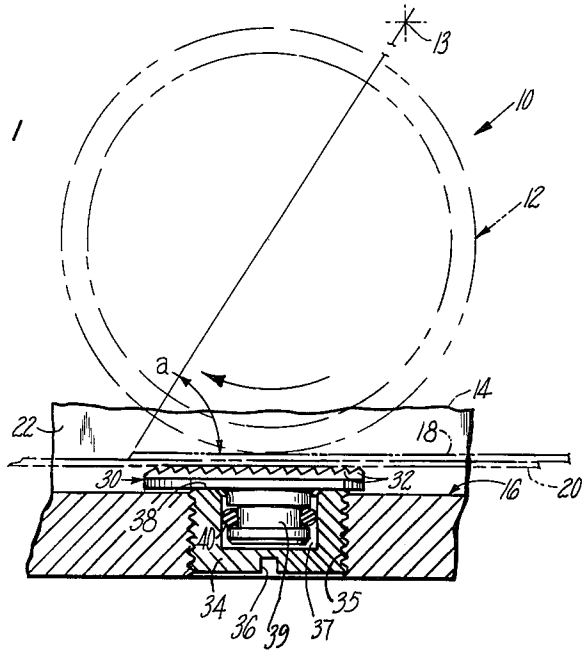
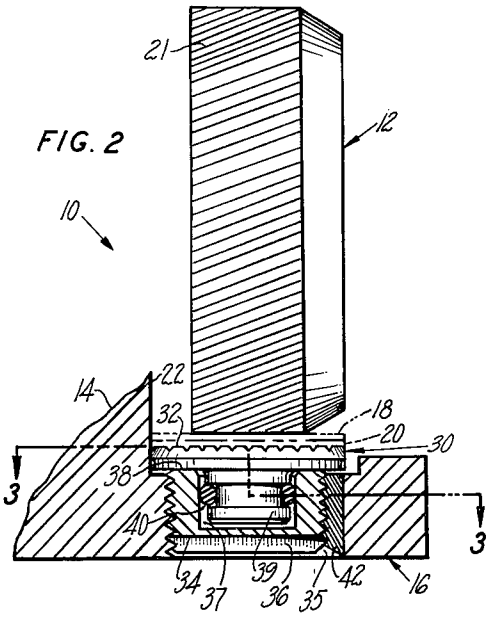


FIG. 2



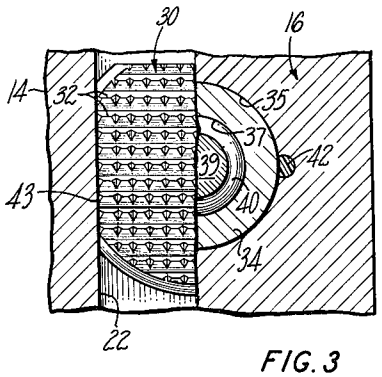


FIG. 3

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STRAP RESTRAINING MEANS FOR THE BASE OF A STRAP TENSIONING DEVICE

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The present invention relates to the feeding and tensioning of strapping material and more particularly to a tool adapted for receiving overlapping portions of a loop of strap and for feeding one of the overlapping portions while restraining the other overlapping portion and thereby tension the loop of strap about an enclosed article. An example of the type of strap tensioning tool to which the present invention is directed is disclosed in United States Patent 2,621,893, issued December 16, 1952, on an invention of William C. Childress entitled, Tensioning Tool.

It is a primary aim of the present invention to provide in a strap tensioning tool of the type described a new and improved device for gripping the restrained overlapping portion of strap which is useful with straps of different thicknesses with optimum functioning of the feeding and restraining of the overlapping portions of strap.

It is another aim of the present invention to provide a new and useful gripping device particularly useful in association with a strap tensioning tool of the type having a rotary tensioning or feeding wheel mounted for pivotal movement into engagement with the outer overlapping portion of strap.

It is a further aim of the present invention to provide an improved gripping device useful in conventional strap tensioning tools and which is economical and compact in construction and reliable in operation.

It is a still further aim of the present invention to provide an improved gripping device which is adjustable for use with straps of different thicknesses, which provides effective gripping in each adjusted position and which may be readily removed for replacement or repair.

Other objects will be in part obvious and in part pointed out more in detail hereinafter.

The invention accordingly consists in the features of construction, combination of elements and arrangement of parts which will be exemplified in the construction hereafter set forth, and the scope of the application of which will be indicated in the appended claims.

In the drawings:

FIG. 1 is a partial longitudinal section view, partly broken away and partly in phantom, of an installation of overlapping portions of a loop of strap in a strap tensioning tool incorporating the present invention;

FIG. 2 is a partial transverse section view, partly broken away and partly in phantom, of the installation of FIG. 1; and

FIGURE 3 is a partial section view, partly broken away, taken substantially along the line 3—3 of FIG. 2.

Referring particularly to FIG. 1 of the drawings, a strap tensioning tool 10 is partially shown with a feed or tensioning wheel 12, represented in phantom, and a tool frame 14 having a laterally extending base 16, whereby the outer and inner overlapping portions 18, 20, respectively, of a loop of strap, also represented in phantom, are receivable between the feed wheel and base. In a conventional manner the feed wheel engages the outer overlapping portion 18 of strap to feed it for tensioning the loop of strap about an enclosed article, for which purpose the feed wheel is provided with peripheral teeth 21 helically arranged as seen in FIG. 2 to maintain the loop of strap in engagement with an upstanding generally

planar side wall 22 of the frame which thereby functions as a strap guide.

As in the aforementioned United States patent, the feed wheel 12 is adapted to be rotatably driven, clockwise as seen in FIG. 1, and is pivotally mounted for movement outwardly of the base for appropriate receipt and removal of the overlapping portions of the loop of strap. Conventionally, the pivotal axis of the feed wheel lies outwardly of and is offset from its axis of rotation, as shown diagrammatically at 13 in FIG. 1, and the feed wheel is pivotally urged by a suitable torsion spring toward the base for engagement with the outer overlapping portion of strap. Upon reference to FIG. 1 it can be seen that the driving action between the tension wheel and outer overlapping portion of strap creates a reaction force pivotally urging the tension wheel to the right and thereby cam the overlapping portions of strap against the base 16, with the camming force being a function of the driving torque of the feed wheel and of the angle a between the direction of feed of the outer overlapping portion of strap and the radial of pivotal movement of the tensioning wheel. This camming force is useful for gripping the overlapping portions of strap during the tensioning of the strap and therefore the optimum camming force increases with the tension of the strap and is therefore a function of the driving torque of the feed wheel. Accordingly, with the use of straps of different thicknesses it is desirable to maintain the same angle a and therefore the same pivotal position of the feed wheel 12 whereby the optimum gripping action is maintained in accordance with the driving torque of the feed wheel. As a result, slippage of the strap or undue cutting or deformation of the strap due to the engagement of the peripheral teeth of the feed wheel with the outer overlapping portion of strap and the engagement of the restraining teeth on the base with the inner overlapping portion of strap is avoided.

In accordance with the present invention the pivotal angle of the feed wheel is adapted to be maintained substantially constant by appropriate adjustment of a base plate 30 in a direction perpendiculr to the axis of rotation of the feel wheel. The base plate 30 receives the inner overlapping portion of strap and is notched to form a plurality of individual rearwardly facing and outwardly projecting teeth 32 to assist in gripping and thereby restrain the inner overlapping portion of strap against forward movement as the loop of strap is tensioned about an enclosed article.

Adjustment of the base plate 30 is provided by an inner plug 34 threaded into an opening 35 through the base and having a transverse slot 36 useful for receiving the end of a screwdriver. The inner plug 34 is provided with a coaxial cylindrical chamber or pocket 37 having a chamfered outer opening and with an axially facing flat bearing surface 38 surrounding the opening. The adjustable base plate 30 forms an outer plug with a depending generally cylindrical extension 39 received in the cylindrical chamber 37 of the inner plug and dimensioned to have lateral freedom of movement therein. For axially retaining the outer plug on the inner plug the depending extension is provided with a peripheral groove or annulus with an O-ring 40 inserted therein, which O-ring resiliently engages the opposed cylindrical surfaces of the chamber and groove. For supporting the outer plug, the inner face of the base plate 30 is provided with a flat bearing surface engageable with the bearing surface 38 of the inner plug. Accordingly, the outer plug is axially supported on the inner plug, is resiliently maintained against lateral movement with respect to the inner plug and is frictionally retained within the pocket 37 of the inner plug and thereby susceptible to manual removal after

the feed wheel **12** is pivoted out of overlying relationship with the plug.

By adjustment of the inner plug **34** within the threaded opening **35** in the base, the height of the base plate **30** may be accurately and conveniently adjusted with respect to the feed wheel, as for maintaining the angle *a* constant for straps of different thicknesses or, where desired, to alter the angle *a* and thereby effect a change in the gripping action of the tensioning wheel **12** and base plate **30** with the overlapping portions **18**, **20** of strap. For maintaining a selected adjusted position of the base plate, the inner plug **34** is preferably frictionally retained by a resilient rod **42**, of nylon for example, which is received in a corresponding recess in the base **16** adjacent the threaded opening **35**.

To maintain the teeth **32** on the base plate **30** in appropriate relationship with the strap and thereby provide optimum restraint of the strap portion **20**, the base plate is held against angular movement through coaction with the side wall **22** of the tool frame **14**. In the illustrated embodiment, the base plate **30** is formed with an elongated planar edge **43** in engagement with the frame side wall, which engagement thereby prevents angular movement of the base plate without affecting its height adjustment or installation or replacement. Inasmuch as the base plate **30** has a lateral freedom of movement provided by the resilient O-ring **40**, the lateral force on the base plate resulting from the helically arranged teeth **21** on the tension wheel maintains the edge **43** of the base plate in firm engagement with the side wall **22** thereby assisting in preventing even slight angular displacement of the base plate. As a result, the teeth **32** on the base plate have maximum effectiveness at all times in restraining the inner overlapping portion **20** of strap.

Thus it can be seen that the gripping device of the present invention is readily adjustable for each strap thickness or for effecting a change in the gripping action on the overlapping portions of the loop of strap. Additionally, adjustment is accomplished without angular displacement of the toothed base plate and when desirable the base plate may be readily removed for cleaning, repair or replacement.

As will be apparent to persons skilled in the art, various modifications and adaptations of the structure above described will become readily apparent without departure from the spirit and scope of the invention, the scope of which is defined in the appended claims.

We claim:

1. In a strap tensioning tool operable for tensioning a loop of strap with overlapping inner and outer strap portions, having a tool frame with a base and a rotary feed wheel mounted for pivotal movement outwardly of the base for receiving the overlapping strap portions therebetween, and means on the base for restraining the inner strap portion, the improvement wherein the restraining means comprises a threaded opening through the base; an inner plug threadedly mounted in the base opening having an outwardly opening pocket with a cylindrical side wall and an outwardly facing bearing surface thereabout; an outer plug having an outwardly facing toothed surface adapted for receiving the inner strap portion, an inwardly extending projection loosely received within said pocket, and an inwardly facing bearing surface engageable with the bearing surface of the inner plug; said projection having a peripheral annulus, and an O-ring received within the annulus in engagement with the cylindrical side wall for frictionally retaining the outer plug on the inner plug, said frame having an outwardly extending side wall, and said outer plug having an edge engageable with said side wall to prevent angular displacement of the outer plug.

2. In a strap tensioning device operable for tensioning a loop of strap with overlapping inner and outer strap portions, having a base and strap tensioning means mounted outward of the base for receiving the overlapping strap portions therebetween, and means on the base for restraining the inner strap portion, the improvement wherein the restraining means comprises inner and outer generally coaxial and relatively rotatable plugs, means rotatably mounting the inner plug on the base and the outer plug on the inner plug, the outer plug having an outer toothed face adapted for receiving the inner strap portion, and means provided for axially adjusting the outer plug upon angular adjustment of the inner plug, said strap tensioning device having an outwardly extending side wall adjacent the outer plug and the outer plug having an edge engageable with the side wall for preventing angular displacement of the outer plug.

3. In a strap tensioning device operable for tensioning a loop of strap with overlapping inner and outer strap portions, having a base and strap tensioning means mounted outward of the base for receiving the overlapping strap portions therebetween, and means on the base for restraining the inner strap portion, the improvement wherein the restraining means comprises an inner plug threadedly mounted on the base for angular adjustment, an outer plug rotatably mounted and axially supported on the inner plug having an outer toothed face adapted for receiving the inner strap portion, the inner plug having an outwardly opening chamber with a cylindrical side wall, the outer plug having a depending generally cylindrical extension loosely received within the chamber, and a resilient ring encircling the extension and in engagement with said cylindrical side wall.

4. In a strap tensioning device operable for tensioning a loop of strap with overlapping inner and outer strap portions, having a base and strap tensioning means mounted outward of the base for receiving the overlapping strap portions therebetween, and means on the base for restraining the inner strap portion, the improvement wherein the restraining means comprises an inner plug threadedly mounted on the base for angular adjustment, the inner plug having an outwardly opening chamber with a cylindrical side wall and an outwardly facing annular bearing surface therearound; an outer plug having an outwardly facing tooth surface adapted for receiving the inner strap portion, an inwardly extending projection received within said chamber, and an inwardly facing annular bearing surface engageable with the annular bearing surface of the inner plug; and means for preventing angular displacement of the outer plug relative to the base.

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