Feb. 6, 1968 W. A. MEIER ET AL 3,367,374

GRIPPER PLUG

Filed April 8, 1965

Fig. 1

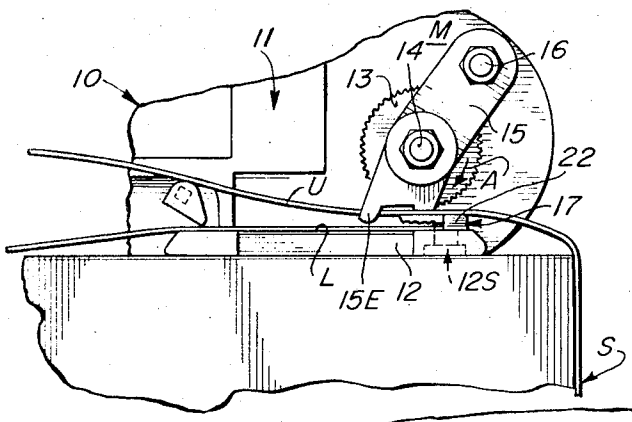


Fig. 5

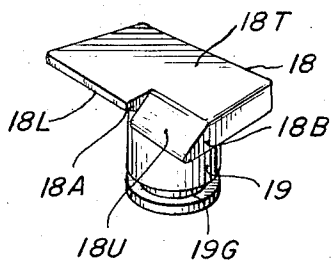


Fig. 2

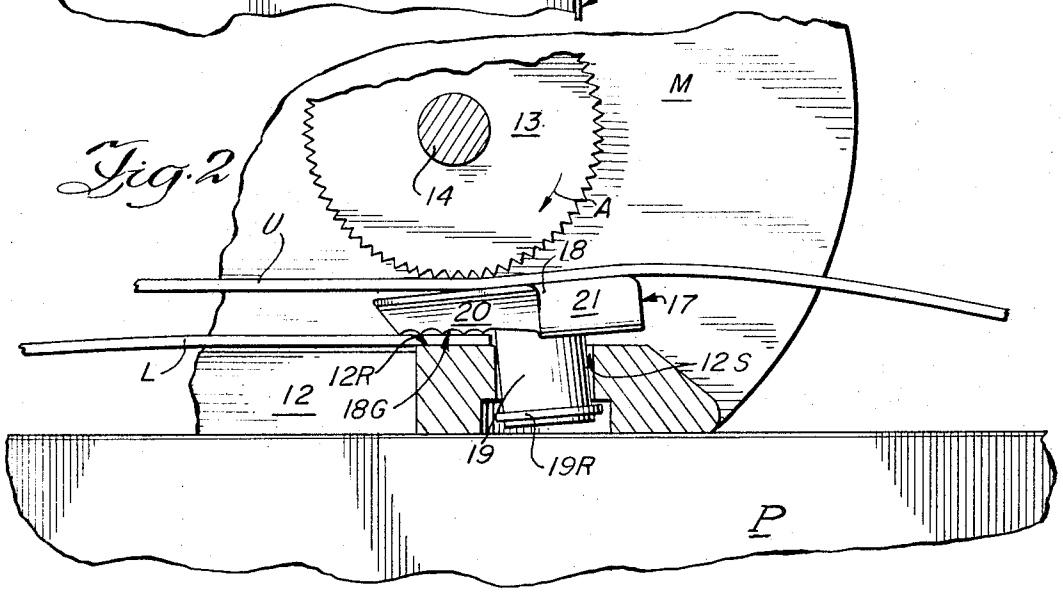
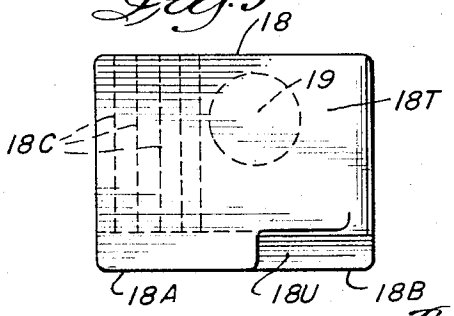


Fig. 3



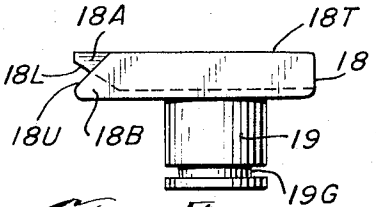


Fig. 4

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GRIPPER PLUG

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ABSTRACT OF THE DISCLOSURE

A gripper plug is provided in the base of a strap tensioning and sealing tool to facilitate strap insertion, strap tensioning and strap release, the plug comprising a head plate portion that serves as a separator between the overlapping strap ends and that overhangs a locator stem portion that fits loosely in the tool base to accommodate rocking of the plug between grip and release positions. The plug stem is aligned with the strap to serve as a locator for the strap end that is beneath the head plate portion which presents a rough lower gripper surface to the lower strap end and a smooth upper slide surface to the upper strap end.

This invention relates to strap tensioning and sealing tools and more particularly, is concerned with an accessory in the form of a gripper plug to be applied to a strapping tool for facilitating the actual tensioning of a strap loop about a package and for facilitating insertion and release of the strap ends in the tool. The gripper plug of this invention can be used with many conventional strapping tools and it is to be understood that no limitations with respect to the specific apparatus illustrated herein is intended or should be inferred.

In the strapping art, it is highly desirable that the strapping tool release easily from the completed strap loop in order to provide rapid and efficient operation. It is also desirable that the strap ends feed in a pre-determined relation within the tool to afford positive control over the amount of overlap at the strap ends and thereby reduce strap waste occasioned by careless overlapping of the strap ends. The problem of strap waste is particularly serious when heavy strap is involved.

An important feature of the present invention is the provision of a gripper plug applicable to conventional strapping tools for facilitating closure of a strap loop around a package.

Another feature of the invention is the provision of a gripper plug for use with a combination strap tensioning and sealing tool to function as a separator between the upper and lower overlapping strap ends and present a gripper surface holding the lower strap end stationary and a slide surface facilitating tensioning movement of the upper strap end.

More particularly, the invention provides a plug for a strapping tool having a head plate serving as a separator between the overlapping upper and lower ends of a strap loop and having a locator stem depending from the head plate for mounting in loose fit relation in the tool. The head plate of the plug has a beveled edge configuration facilitating lateral insertion of the strap ends above and beneath the plug. The loose fit mounting of the locator stem and the location of the head plate with vertical clearance accommodates free rocking movement of the head plate between a gripper position wherein the plate anchors the lower strap end and a final release position wherein the plate is free of the lower strap end and facilitates disengagement of the tool from the completed strap loop. In addition, the upper region of the stem is in the plane of the strap loop and serves as a locating stop that insures accurate positioning of the lower strap end.

Other features and advantages of the invention will be apparent from the following description and claims, and are illustrated in the accompanying drawings which show structure embodying preferred features of the present invention and the principles thereof, and what is now considered to be the best mode in which to apply these principles.

In the accompanying drawings forming a part of the specification, and in which like numerals are employed to designate like parts throughout the same,

FIGURE 1 is a fragmentary side elevational view of the relevant parts of a typical strap tensioning and sealing tool shown equipped with a gripper plug constructed in accordance with this invention;

FIGURE 2 is a related fragmentary side elevational view and is further enlarged to illustrate the construction and action of the gripper plug which is here shown in the position assumed during actual tensioning;

FIGURE 3 is a plan view of the gripper plug;

FIGURE 4 is an end elevational view of the gripper plug; and

FIGURE 5 is a perspective view of a gripper plug constructed in accordance with this invention.

Referring now to the drawings, in FIG. 1 the relevant elements of a typical strap tensioning and sealing tool **10** are shown. The particular tool shown herein for purposes of illustrative disclosure corresponds generally to the strapping machine shown in the United States Letters Patent 2,594,397 issued to W. C. Childress et al. and reference may be made to that patent for further details concerning the strapping tool **10**.

In the arrangement shown in FIGURES 1 and 2, a package P is illustrated with a strap loop S formed about it and with opposite overlapping upper and lower ends U and L, respectively, of the strap loop shown positioned in the tool in readiness for tension to be drawn on the strap loop. After tensioning, the strap loop is completed by applying a seal (not shown) at the regions of the strap ends which are beneath the sealer head mechanism **11** of the tool. The upper strap end U normally leads to a strap supply reel (not shown) and concurrently with crimping of a seal the upper strap end is sheared from the supply reel.

The illustrated strap tensioning and sealing tool **10** has a stationary main frame M which includes a base or contact foot **12** to engage the package P and a strap feed wheel **13** mounted from the main frame for bodily movement toward and away from an upwardly facing surface region **12R** of the main frame foot **12** respectively to load and to release the loop strap ends. The tool **10** includes drive means including a feed wheel shaft **14** movable bodily with the feed wheel and operatively connected to drive the feed wheel in a single rotary direction indicated by the arrow A in FIG. 2 to draw the upper strap U in a loop tightening direction, that is to the left as viewed in FIGURES 1 and 2.

In the particular tool arrangement illustrated herein the movement of the feed wheel between load and release positions is effected by a side plate **15** which is pivoted on a cross shaft **16** carried in the main frame M and which carries the feed wheel shaft **14** for arcuate swinging movement to approach the base **12** along a selected energizing angle which is inclined from the vertical. The side plate **15** terminates at its lower end in an integral extension **15E** serving as a retaining finger that restricts lateral movement of the upper strap end U.

In accordance with the present invention, the tool **10** is provided with a separating plug designated generally at **17** in FIGURES 1 and 2. The contact foot **12** is provided with an upwardly open vertical socket **12S** at a location adjacent the surface region **12R** and in align-

ment with it in the direction of the strap loop S. The socket 12S serves as a mount for the gripper plug 17 to locate the gripper plug at a position to serve as a separator between the overlapping strap ends and to serve as a locator stop for determining the end edge position of the lower strap end L.

The gripper plug 17 comprises a compression resistant head plate 18 carried on a locator stem 19 that depends from a portion only of the underface of the plate 18 to provide overhanging plate regions 20 and 21 (FIGURES 1 and 2) at locations aligned in the direction of the strap loop and extending oppositely from the axis of the locator stem 19. While the plug mounting arrangement could be such that the base socket 12S is offset laterally from the plane of the strap loop, there is advantage in locating the socket 12S in this plan. The stem is then located for abutment with the lower strap end L and serves as a positive stop which eliminates the possibility of careless extension of the lower end L beyond a useful region. Therefore, wastage of strap due to careless positioning of the lower end L is avoided.

The mounting socket 12S is of stepped diameter, undercut configuration and the stem 19 extends in loose fit relation through the upper region of the socket 12S to accommodate a rockable mounting of the plug and enable shifting of the plug from the truly vertical stem position illustrated in FIG. 1 to the vertically inclined stem position illustrated in FIG. 2. The lower end of the stem 19 terminates within the wider, lower region of the socket 12S and is provided with a peripheral groove 19G (FIG. 4) dimensioned to receive a split type retaining ring 19R which serves to trap the plug against accidental escape from the socket 12S.

The plate sections 20 and 21 have coplanar upper faces while the plate section 21 is thicker and extends to a lower region than the plate section 20. This presents a stepped lower edge configuration to the base 12 so that the plug normally tends to assume the position illustrated in FIG. 1 wherein the lower face of the plate section 21 contacts the base 12 and spaces the plate section 20 in clearance relation to the base 12 by an amount in excess of the thickness of the strap. This clearance facilitates insertion of the lower strap end L beneath the plate section 20. It will be noted that the head plate 18 has one lengthwise edge extending in the direction of the strap loop and characterized by adjacent merging tapered edge portions 18A and 18B. The edge portion 18A is actually a portion of the plate section 20 and terminates laterally in an upwardly inclined lower bevel face 18L to facilitate lateral reception of the lower strap end L beneath the plate section 20. The edge portion 18B is an integral part of plate section 21 and terminates laterally in a downwardly inclined upper bevel face 18U to facilitate lateral reception of the upper strap end U in overlying relation on the head plate 18.

The head plate 18 is provided with a smooth top surface 18T to facilitate easy sliding movement of the upper strap during tensioning of the strap loop. In the preferred embodiment, the gripper plug is an integral one piece casting and is provided with a chromium plated and polished top surface 18T for maximum smoothness and durability. It is desirable that the top coating 18T have a minimum surface depth of .010 inch.

It will be apparent from a consideration of FIGURES 2 and 3 that the plate section 20 also presents a rough lower strap grip surface 18G for secure gripping contact against the lower strap end L. The surface 18G preferably has a toothed configuration and in one specific example this consists of a set of 5 row teeth having crestlines 18C (FIG. 3) extending transversely of the strap travel direction and spaced about 1/16 inch apart, with groove depths between crests being about 1/40 of an inch.

While the gripper plug 17 assumes a vertical stem direction when the feed wheel 13 is at a release position as illustrated in FIG. 1, movement of the feed wheel to load position to engage the upper strap end U against the slide surface 18T rocks the plug 17 to the position of FIG. 2 to engage the lower grip surface 18G upon the lower strap end L. During the strap tensioning cycle, the lower strap end L is held secure in pinched engagement between the surfaces 12R and 18G while the upper straps end U slides freely upon the slide surface 18T.

When the strap loop S is brought to the desired tension and the strap ends U and L are sealed to complete the strap loop, the tensioning wheel 13 may be elevated to enable the action of the tensioned strap loop to return the plug to the FIG. 1 position wherein the lower strap end L is free of the plug and the tool can easily be disengaged from the strap loop.

Thus, while preferred constructional features of the invention are embodied in the structure illustrated herein, it is to be understood that changes and variations may be made by those skilled in the art without departing from the spirit and scope of the appended claims.

What is claimed is:

1. In a strap tensioning tool of the type having a main frame having a foot to contact a package being tied with a strap loop that has opposite strap ends overlapping and extending in opposite directions above the foot, a strap feed wheel mounted from the main frame for bodily movement toward and away from an upwardly facing portion of the main frame foot respectively to load and to release the loop strap ends, and means movably bodily with the feed wheel and operable to drive the same in one rotary direction to draw the upper strap end in a loop tightening direction, said tool having a plug mounted on the main frame foot at a location adjacent the said upwardly facing portion, said plug comprising a compression resistant head plate carried on a locating stem that depends from a portion only of the head plate and extends in loose fit relation into said foot to provide overhanging plate sections rockably disposed at locations aligned in the direction of the strap loop and oppositely extending from the axis of the stem, one of said plate sections presenting an upper strap slide surface and a lower strap grip surface generally in vertical registry, with each other and with the said foot portion and with the feed wheel when the feed wheel is in load position.

2. In a strap tensioning tool of the type having a main frame having a foot to contact a package being tied with a strap loop that has opposite strap ends overlapping and extending in opposite directions above the foot, a strap feed wheel mounted from the main frame for bodily movement toward and away from an upwardly facing portion of the main frame foot respectively to load and to release the loop strap ends, and means movably bodily with the feed wheel and operable to drive the same in one rotary direction to draw the upper strap end in a loop tightening direction, said tool having a plug mounted on the main frame foot at a location adjacent the said upwardly facing portion, said plug comprising a compression resistant head plate carried on a locating stem that depends from a portion only of the head plate and extends in loose fit relation into said foot to provide overhanging plate sections rockably disposed at locations aligned in the direction of the strap loop and oppositely extending from the axis of the stem, one of said plate sections presenting an upper strap slide surface and a lower strap grip surface generally in vertical registry, with each other and with the said foot portion and with the feed wheel when the feed wheel is in load position, said head plate at an edge that extends in the direction of the strap loop having one edge portion terminating laterally in a downwardly inclined upper bevel face to facilitate lateral reception of an upper strap end in overlying relation on the slide surface and having an adjacent edge portion terminating laterally in an upwardly inclined lower bevel face to facilitate lateral re-

ception of a lower strap end in underlying relation to the grip surface.

3. In a strap tensioning tool of the type having a main frame having a horizontal foot to contact a package being tied with a strap loop that has opposite strap ends overlapping and extending in opposite directions above the foot, a strap feed wheel mounted from the main frame for bodily movement toward and away from an upwardly facing portion of the main frame foot to approach along an energizing angle inclined to the vertical respectively to load and to release the loop strap ends, a ratchet wheel movable and rotatable with the feed wheel for rotating it, and drive means movable bodily with the feed wheel and operatively connected to drive the same in a single rotary direction to draw the upper strap end in a loop tightening direction, said tool having its foot provided with an upwardly open vertical socket at a location adjacent said portion and in alignment therewith in the direction of the strap loop, and a plug comprising a compression resistant head plate carried on a locating stem that depends from a central portion of the head plate and extends in loose fit relation through said socket to provide overhanging plate sections spaced above the foot at locations aligned in the direction of the strap loop and oppositely extending from the axis of the stem to accommodate rocking movement of the plug in the plane of the strap loop, with the stem having its upper portion projecting above the foot to serve as a locating end abutment for the lower strap end, one of said plate sections presenting an upper strap guide surface and a lower strap grip surface generally in vertical registry with each other and with the said foot portion and with the feed wheel when the feed wheel is in load position, to enable movement of the feed wheel to load position to engage the upper strap end against the upper slide surface and thereby rock the plug to engage the lower grip surface against the lower strap end and to enable return of the plug by the action of the tensioned strap loop to free the lower strap end when the feed wheel returns from the load position.

4. An arrangement in accordance with claim 3 and wherein said head plate at an edge thereof that extends in the direction of the strap loop having one edge portion terminating laterally in a downwardly inclined upper bevel face to facilitate lateral reception of an upper strap end in overlying relation on the slide surface and having an adjacent edge portion terminating laterally in an upwardly inclined lower bevel face to facilitate lateral reception of a lower strap end in underlying relation to the grip surface.

5. A separating plug applicable to a tensioning tool to serve as a separator between overlapping opposite ends of a strap loop during tensioning of the loop by the tool, said plug comprising a metallic head plate carried on a locator stem that depends from a portion only of the head plate to provide an overhanging plate section presenting a flat upper strap slide surface and a lower strap grip surface generally in vertical registry.

6. A separating plug applicable to a tensioning tool to serve as a separator between overlapping opposite ends of a strap loop during tensioning of the loop by the tool, said plug comprising a metallic head plate carried on a locator stem that depends from a portion only of the head plate to provide an overhanging plate section presenting a flat upper strap slide surface and a lower strap grip surface generally in vertical registry, said head plate at an edge that extends in the direction of the strap loop having one edge portion terminating laterally in a downwardly inclined upper bevel face to facilitate

lateral reception of an upper strap end in overlying relation on the slide surface and having an adjacent edge portion terminating laterally in an upwardly inclined lower bevel face to facilitate lateral reception of a lower strap end in underlying relation to the grip surface.

7. A separating plug applicable to a tensioning tool to serve as a separator between overlapping opposite ends of a strap loop during tensioning of the loop by the tool, said plug comprising a compression resistant head plate carried on a locator stem that depends from a portion only of the head plate to provide overhanging plate sections disposed at locations aligned in the direction of the strap loop and oppositely extending from the axis of the stem, one of said plate sections presenting a smooth upper strap slide surface and a rough lower strap grip surface generally in vertical registry.

8. A separating plug applicable to a tensioning tool to serve as a separator between overlapping opposite ends of a strap loop during tensioning of the loop by the tool, said plug comprising a compression resistant head plate carried on a locator stem that depends from a portion only of the head plate to provide overhanging plate sections disposed at locations aligned in the direction of the strap loop and oppositely extending from the axis of the stem one of said plate sections presenting a smooth upper strap slide surface and a rough lower strap grip surface generally in vertical registry, said head plate at an edge that extends in the direction of the strap loop having one edge portion terminating laterally in a downwardly inclined upper bevel face to facilitate lateral reception of an upper strap end in overlying relation on the slide surface and having an adjacent edge portion terminating laterally in an upwardly inclined lower bevel face to facilitate lateral reception of a lower strap end in underlying relation to the grip surface.

9. In a strap tensioning tool of the type having a main frame having a foot to contact a package being tied with a strap loop that has opposite strap ends overlapping and extending in opposite directions above the foot, a strap feed wheel mounted from the main frame for bodily movement toward and away from an upwardly facing portion of the main frame foot respectively to load and to release the loop strap ends, and means movably bodily with the feed wheel and operable to drive the same in one rotary direction to draw the upper strap end in a loop tightening direction, said tool having a plug mounted on the main frame foot at a location adjacent the said upwardly facing portion, said plug comprising a head plate carried on rockable mounting means that depends from the head plate and extends into said foot at a location in vertical alignment with the feed wheel, said head plate providing an overhanging plate section presenting an upper strap slide surface and a lower strap grip surface generally in vertical registry, with each other and with the said foot portion and with the feed wheel when the feed wheel is in load position.

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