Dec. 20, 1932. E. J. KETCHAM 1,891,767

STRAPPING JACK AND PUNCH

Filed March 28, 1929 2 Sheets-Sheet 1

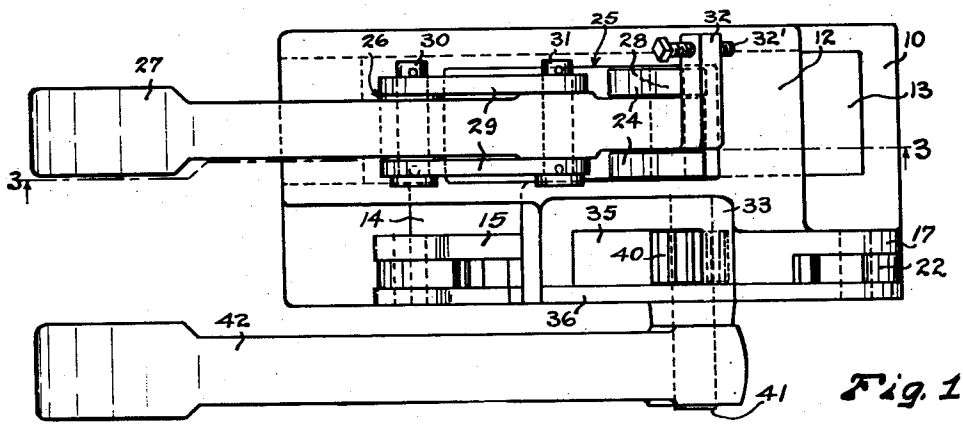


Fig. 1

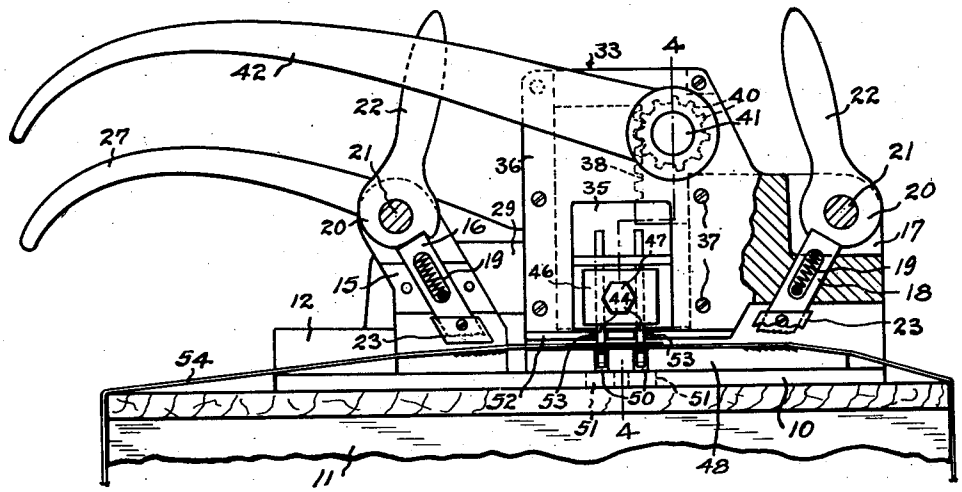


Fig. 2

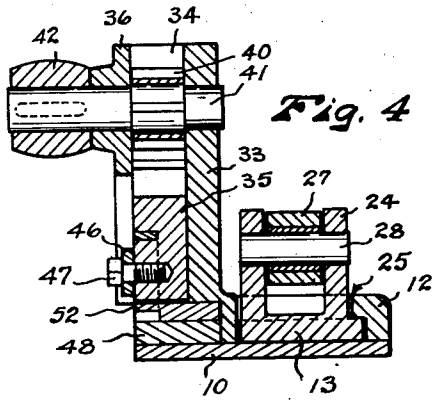


Fig. 4

INVENTOR
Ernest J. Ketcham
BY
Fred C. Matheny
ATTORNEY

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STRAPPING JACK AND PUNCH

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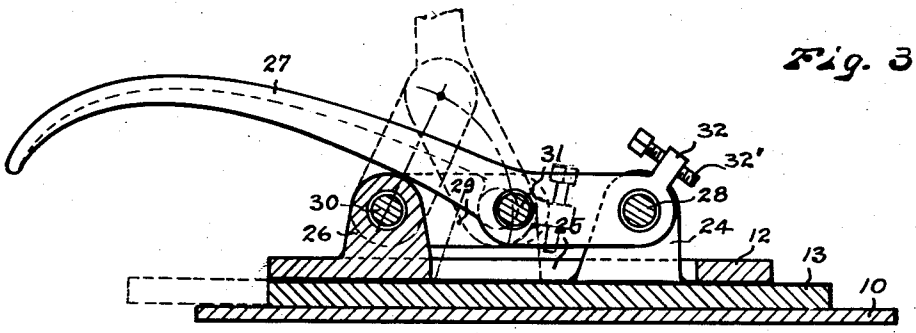


Fig. 3

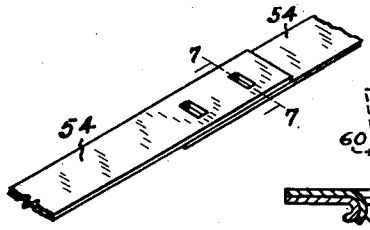


Fig. 6

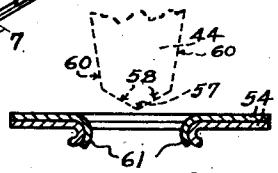


Fig. 7

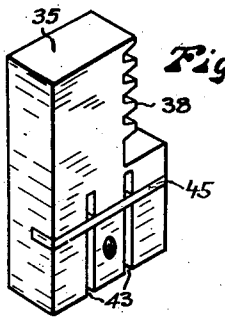


Fig. 5

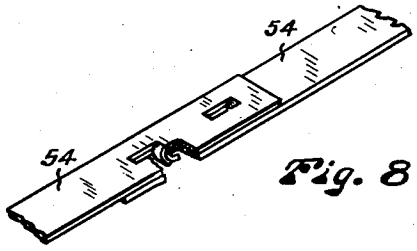


Fig. 8

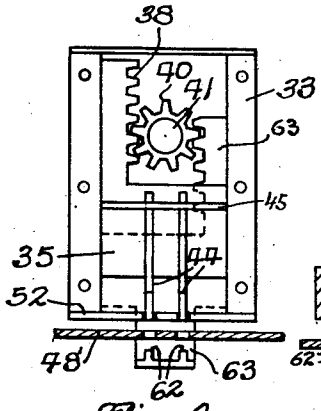


Fig. 9

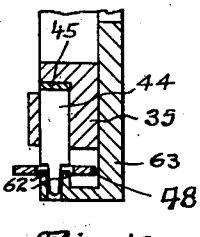


Fig. 10

INVENTOR
Ernest J. Ketcham
BY
Fred C. Matheny
ATTORNEY

Patented Dec. 20, 1932 1,891,767

UNITED STATES PATENT OFFICE

ERNEST J. KETCHAM, OF SEATTLE, WASHINGTON, ASSIGNOR TO ACME STEEL COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS

STRAPPING JACK AND PUNCH

Application filed March 28, 1929. Serial No. 350,486.

My invention relates to improvements in strapping machines and to improvements in the method of fastening together two overlapping portions of a metal strap and the object of my invention is to devise a simple and efficient method of, and machine for, fastening together two overlapping portions of a sheet metal strap without the use of clips or clamps or rivets or any fastening devices of this nature.

Another object is to provide a machine of simple and efficient construction which may be used for putting tension on a metal strap to draw the same tightly around a box or package, and for securing together the two overlapping ends of said strap while it is held under tension, said machine embodying means for gripping the two ends of the strap, jack means for exerting a pull on said strap to tension the same around a package or box and punch means for clinching integral portions of the overlapping ends of the straps through each other to secure said ends together.

Other and more specific objects of the invention will be apparent from the following description taken in connection with the accompanying drawings.

In the drawings, Figure 1 is a plan view of a machine constructed in accordance with my invention.

Fig. 2 is a side elevation of the same showing a fragment of a box and a metal strap which is being applied to said box.

Fig. 3 is a sectional view substantially on broken line 3—3 of Fig. 1 showing the operation of the jack mechanism, parts being shown in elevation.

Fig. 4 is a sectional view substantially on broken line 4—4 of Fig. 2.

Fig. 5 is a detached perspective view of a movable die block.

Fig. 6 is a detached fragmentary perspective view on an enlarged scale showing the overlapped ends of a metal strap which are secured together in accordance with my invention.

Fig. 7 is a cross section on a still larger scale of said two overlapped ends taken substantially on broken line 7—7 of Fig. 6, and showing by broken lines the outline of one of the punches.

Fig. 8 is a perspective view, with parts in section showing a slightly modified method of clinching the two overlapped ends together.

Fig. 9 is a detached front elevation with parts removed showing an alternative means for punching the straps and clinching the punched portions at the same operation, the die block being shown in a raised position and the anvil or clinching member being shown in a lowered position.

Fig. 10 is a fragmentary sectional view on a larger scale of said alternative means, the die block being shown in the lowered position and the anvil member being shown in the raised position.

In preparing boxed apples and other fruit for export it is required that the boxes be strapped to prevent them from being broken open in handling. This strapping is done with flat straps of sheet metal which are drawn tightly around the boxes and have their two overlapping ends fastened together. These straps must be flat and of substantial width to avoid cutting the boxes and injuring the fruit, it being impractical to use wire for this purpose. The present method of strapping fruit boxes is to draw the strap around the box and then clamp a clip onto the two overlapping ends to secure them together. This method necessitates the provision of clips separate from the strap, which clips must be handled separately and which require a separate tool for clamping the same onto the two overlapped ends of the strap. The separate clips involve considerable expense when large numbers of the same are used and the use of two different tools in the strapping operation consumes a considerable amount of time, thus increasing the labor cost.

In accordance with my invention, the clips are entirely dispensed with and a single tool is made to perform both the tensioning and the fastening operation.

Referring to the drawings, throughout which like reference numerals designate like parts, I show a tool embodying a base 10,

preferably in the nature of a flat plate arranged to rest upon a box 11 or other package which is to be strapped.

Fixedly mounted on the top of the base plate 10 is a frame casting designated generally by the numeral 12. The frame casting 12 affords a longitudinal guideway for slidably receiving the longer arm 13 of an L shaped tensioning member. This tensioning member is provided at its rear end with a shorter arm 14 which extends sidewise and upon which is a fixedly mounted bracket 15 within which a clamping pawl 16 is slidably movable. Another bracket 17 is rigidly secured to the base 10 toward the forward end of the machine and is provided with a similar, slidably movable, clamping pawl 18. Springs 19 urge the pawls 16 and 18 upwardly into released position, and cams 20, mounted on pivots 21 and rigid with levers 22 engage with the top ends of the pawls 16 and 18 for moving said pawls downwardly into gripping position. Positioning plates 23, rigidly connected with the outer sides of the pawls 16 and 18 overhang the outer edges of said pawls and project below the ends of said pawls and serve to compel the ends of the strap to be pushed inwardly and properly positioned so they will overlap correctly before the pawls are forced down into gripping engagement with the strap ends. The lower ends of the pawls 16 and 18 are knurled to cause them to grip more securely, and the base portions of the brackets 15 and 17 with which the pawls cooperate may also be knurled.

The longer arm 13 of the tensioning member has spaced apart, fixed lugs 24 provided thereon toward its forward end which extend upwardly through a longitudinal slot 25 in the frame 12, the slot 25 being long enough to allow the required movement of the tensioning member. Another relatively fixed lug 26 is provided on the frame 12 toward the rear end of the machine. A tensioning lever 27 has its forward end pivotally mounted between the lugs 24 by means of a pivot bolt 28. The rear end of said lever is curved upwardly, as shown, to clear the lug 26 and to afford a convenient shape for hand operation. Two links 29 disposed on opposite sides of the lug 26 and the lever 27 and connected with the lug 26 by a pivot bolt 30 and with the lever 27 by a pivot bolt 31, complete the tensioning mechanism. The links 29 and that portion of the lever 27 which lies between the pivot 31 and the pivot 28 constitute a toggle mechanism for moving the tensioning member 13. When the tensioning lever 27 is raised, the lugs 24 will be moved toward the lug 26 and the tensioning member will be moved rearwardly. In Fig. 3 the curved dot and dash line shows the path in which the center of the pivot 31 will move when the lever 27 is raised and the straight dot and dash line shows the position which the center of the link 29 may occupy when fully raised. When the tensioning lever 27 is lowered the parts forming the toggle links will be straightened out and the tensioning member 13 will be moved back into the position shown in Figs. 1, 2 and 3. This toggle link movement gives greater speed and a lower ratio of power in the early stages of the tensioning stroke and less speed and greater power toward the end of the stroke thus functioning in a manner best suited to the operation of the device. If the tensioning lever is completely lowered the center of the pivot 31 will pass below the common plane of the pivots 28 and 30 thus making the device automatically self locking.

To limit the forward movement of the lever 27 I provide a lug 32 on the forward end of said lever, said lug having a set screw 32′ adjustable therein for engaging the top of the frame 12 thus forming an adjustable stop.

The mechanism for securing the two overlapping ends of a strap together by a punching and clinching process includes an upright guide frame 33 formed on one side of the frame member 12. This guide frame 33 is so shaped as to form an upright rectangular opening 34 for the reception of a die block 35. A plate 36 is secured onto the front side of the frame part 33, as by screws 37, to prevent displacement of the die block. Rack teeth 38 are provided on one side of the die block 35 near its upper end for engagement with a pinion 40 on a short shaft 41 to which is secured a clinching lever 42. The shaft 41 is journaled in the frame part 33 and plate 36. Manifestly, oscillation of the lever 42 will raise and lower the die block 35.

The die block 35 is provided with vertical grooves 43 for the reception of punch members 44. A stop for the upper ends of the punch members is formed by cutting a horizontal groove across the die block 35 intersecting the grooves 43 and inserting a metal plate 45 in said horizontal groove. The outer edges of the punch members 44 are slightly more than flush with the side of the die block and said punch members are secured in place by a plate 46 held by a tap screw 47. This makes the punch members quickly and easily removable for the purpose of replacement if they become worn or broken or for the purpose of substitution of punch members of different size. A die plate 48 is mounted on the base 10 of the machine directly below the die block 35 and is cut away or slotted as at 50 to afford clearance for the punch members 44. Holes 51 are provided in the base 10 directly below the slots 50. A stripper plate 52 is provided on the bottom of the guide frame 33 and spaced above the die plate 48, and holes 53 are provided in this stripper plate for the punch members to project

through. The stripper plate 52 is preferably shaped as shown in Fig. 4 and forms a backing against which the edges of a strap 54 which is being fastened may rest, to correctly position the overlapping ends of said strap.

In Figs. 6 and 7, I have shown the two overlapping ends of a metal strap 54 which are secured together in accordance with my invention. Fig. 7 also shows the shape of one of the punch members 44 with which the punching and fastening is done. The punch members 44 are symmetrical and are provided with a cutting edge 57, two surfaces 58 of sharper incline on each side of the edge 57 and two surfaces 60 of lesser incline beyond and above the surfaces 58. The punches are preferably positioned with the cutting edge 57 extending lengthwise of the strap. When the punches are brought down onto the metal straps 54 which rest on the die plate 48 the metal is first parted or sheared by the edges 57 and further movement of the punches causes the metal of both strap ends to be cut and rolled back, the metal 61 of the upper strap being pushed down through the holes in the lower strap and being curled outwardly by the inclined surfaces 58 and 60 of the punches so that it automatically clinches and prevents the two strap ends from being separated. The strain to which these straps are subjected is almost entirely tension and the portions 61 of the upper strap end which are punched down through the lower strap end are disposed edgewise relative to the direction of the pull exerted on the strap making it necessary to shear off these clinching portions before the two ends of the strap can be pulled apart.

In Fig. 8 I have shown two overlapping strap ends which are secured together by punching portions of the metal of one through the other in a manner similar to that hereinbefore described except that the punches are turned quarter way round so that the metal which is punched through will be rolled lengthwise of the strap instead of crosswise as was shown in the previous figures.

In Figs. 9 and 10 I have shown a fragment of a machine in which anvil members 62 are provided below the punches and are adapted to be raised by the lever 42 against the downwardly clinched metal 61 of the straps to flatten said clinched portions tightly against the bottom strap. This makes a neater fastening but is not necessary in most classes of work. In this form of the invention the anvil or clinching members 62 are perforated to receive the punches and are rigid with the anvil plate 63 which lies alongside the die block 35. Gear rack pinion 40 meshes with a gear rack on plate 63 and also with the rack on die block 35 whereby it may be rotated to simultaneously move the die block downwardly and the anvil members 62 upwardly thus first punching through the straps which rest on the die plate 48′ and then clinching the punched portions. In this construction the die plate may be of less thickness and the holes in the same will be large enough for the anvil members 62 to enter therein.

In the operation of my invention on boxes, as apple boxes, the machine is placed on the box 11 at the location where the strap is to be applied; one end of the strap is secured in one of the gripping dogs and the strap is drawn snugly around the box and the other end secured in the other gripping dog while the tensioning lever 27 is raised and the tensioning member 13—14 extended rearwardly. A downward pull is then exerted on the tensioning lever 27 retracting the tensioning member into the machine, drawing the strap tightly around the box and causing the two ends of the strap to overlap each other directly under the punch members. While the strap is held under tension the clinching lever 42 is depressed thus forcing the punch members through the overlapped strap ends and securing said overlapping ends together. The grip members are then released and the strap which is secured around the box slips out of the side of the machine as the machine is moved away.

The machine is simple and cheap in construction rapid and efficient in operation, obviates the use of clips or other separate securing devices, and forms a strong neat and compact clinch between the two strap ends.

The foregoing description and accompanying drawings clearly disclose a preferred embodiment of my invention but it will be understood that this disclosure is merely illustrative and that such changes in the device may be made as are fairly within the scope and spirit of the following claims.

I claim:

1. In a strap tightening and clinching machine, a frame including a base, means on said frame for gripping a metal strap which extends around a package and drawing the two ends of said strap together in overlapping relation, a die plate whereon said two overlapping ends may rest, said die plate having openings therein, a stripper plate above the overlapping ends of said strap, said stripper plate having holes therein, a die block guided for movement above said stripper plate, punch members in said die block in alignment with the holes in said stripper plate and said die plate, means for moving said die block to force said punch members through said overlapped strap ends and carry integral clinching portions of one strap end through openings in the other strap end, anvil members for clinching said clinch-

ing portions and means for moving said anvil members.

2. A machine for tightening and fastening a metal strap around a package embodying a base, a tensioning member slidable lengthwise on said base, a rigid arm on said tensioning member and extending sidewise therefrom, a strap gripping device mounted on said arm, an upper frame secured to said base and recessed to fit over said tensioning member and cooperating with said base to form a guide for said tensioning member, lugs on said tensioning member, said upper frame being slotted to afford clearance for said lugs, lug means on said upper frame, a lever pivoted at one end to the lugs on said tensioning member, links pivoted at one end to said lug means and at the other end to said lever and cooperating with the forward end of said lever to form toggle devices for moving said tensioning member, die block guide means formed in said upper frame at the side of said tensioning member, said die block guide affording a passageway near its base through which the ends of a metal strap may lie in overlapped relation, a die member in said guide, another lever for moving said die member to punch portions of said strap member through each other and secure said strap ends together solely by said punched portions, and another strap gripping device rigid with said upper frame and said base.

3. A machine for tightening and fastening a metal strap around a package comprising a frame, a strap gripping device carried by said frame, a tensioning member slidably mounted on said frame, another strap gripping device carried by said tensioning member, a pair of links pivotally connected to said frame and said tensioning member and having a pivotal connection with each other, a lever arm having a rigid connection with one of said links whereby movement of said lever operates said links to effect relative movement of said tensioning member and said frame to draw taut a strap held by said gripping devices, and a punch carried by said frame for perforating overlapping portions of said strap and forming a connection therebetween.

4. A machine for tightening and fastening a metal strap around a package, embodying a frame, a strap gripping device rigidly connected with said frame, a tensioning member slidable lengthwise within said frame, another strap gripping device mounted on said tensioning member, a lever pivoted at one end to said tensioning member, link means having one end pivotally connected with said lever and the other end pivotally connected with said frame, said link means and the forward end of said lever cooperating to form toggle devices whereby said tensioning member is moved, a die block guided for vertical movement at the side of said tensioning member, a die plate below said die block whereon the overlapped ends of a tensioned strap may rest, a stripper member between said die block and said die plate, said stripper member having openings therein, and means for moving said die block vertically.

5. A machine for tightening and fastening a metal strap around a package, embodying a base, a tensioning member slidable lengthwise of said base, a strap gripping device mounted on said tensioning member, an upper frame secured to said base and recessed to fit over said tensioning member and cooperating with said base to guide said tensioning member, another strap gripping device mounted on said upper frame, lugs on said tensioning member, said upper frame being slotted to afford clearance for said lugs, relatively fixed lug means on said upper frame, a lever pivoted at one end to the lugs on said tensioning member, links pivoted at one end to said fixed lug means and at the other end to said lever and cooperating with the forward end of said lever to form toggle devices for moving said tensioning member, a die block guided for vertical movement at the side of said tensioning member, a die plate below said die block, a stripper plate between said die block and said die plate, and means for moving said die block vertically.

6. A machine for tightening and fastening a metal strap around a package comprising a frame, a member movably mounted on said frame, gripping devices carried by said frame and said member for holding opposite ends of a strap looped around a package with the ends of said strap overlapping, means for effecting relative movement of said member and said frame for drawing said strap taut, a punch movably mounted in said frame transversely to said strap, means for operating said punch to perforate said overlapping strap ends and form a joint therebetween by projecting parts of one strap end through the perforation in the other strap end, and an anvil movably mounted on said frame for engaging and clinching the projecting parts of said strap ends.

7. A machine for tightening and fastening a metal strap around a package comprising a frame, a member movably mounted on said frame, gripping devices carried by said frame and said member for holding opposite ends of a strap looped around a package with the end of said strap overlapping, means for effecting relative movement of said member and said frame for drawing said strap taut, a punch movably mounted in said frame transversely to said strap, means for operating said punch to perforate said overlapping strap ends and form a joint therebetween by projecting parts of one strap end through the perforation in the other strap end, an anvil movably mounted on said frame for engaging

and clinching the projecting parts of said strap ends, and a stripper member having an opening therein to receive said punch and located on the opposite side of said strap from said anvil.

The foregoing specification signed at Seattle, Wash., this 13th day of March, 1929.

ERNEST J. KETCHAM.