Jan. 1, 1946. D. R. LA PLACE 2,392,159

METHOD OF STAPLING

Filed June 12, 1942

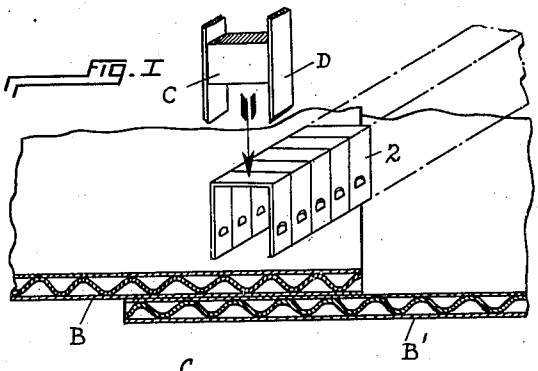


FIG. I.

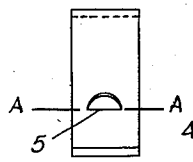


FIG. II.

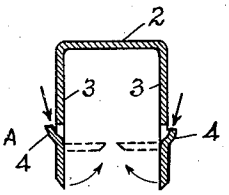


FIG. III.

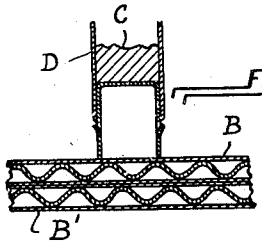


FIG. IV.

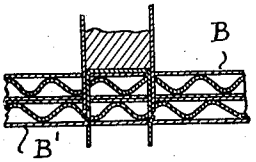


FIG. V.



FIG. VII.

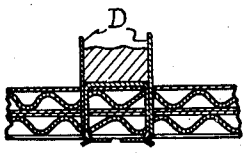


FIG. VI.

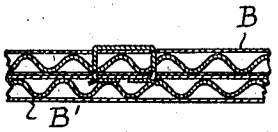


FIG. VIII.

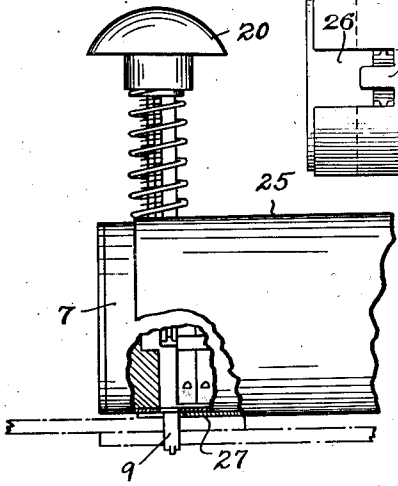


FIG. XII.

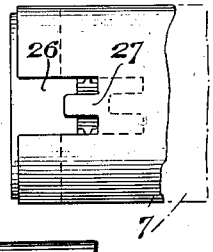


FIG XIII

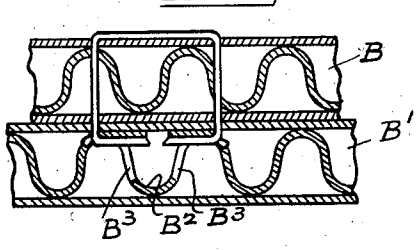


FIG IX

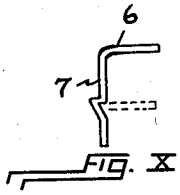


FIG. X.

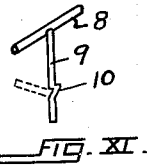


FIG. XI.

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UNITED STATES PATENT OFFICE

2,392,159

METHOD OF STAPLING

Desmond R. La Place, Pittsburgh, Pa., assignor to Bocjl Corporation, Pittsburgh, Pa., a corporation of Delaware

Application June 12, 1942, Serial No. 446,697

5 Claims. (Cl. 1—49)

This invention relates to the art of stapling and is for an improved method of stapling. The application is a continuation-in-part of my co-pending application Serial No. 343,703, filed July 3, 1940, now issued as Patent No. 2,302,559, dated November 17, 1942, and a continuation-in-part of Serial No. 346,959, filed July 23, 1940, now issued as Patent No. 2,308,611, dated January 19, 1943. In the former application there is shown and claimed a special form of staple for use with my method and in the latter one there is disclosed a machine or apparatus for carrying out my method as herein described.

At the present time, staples are very extensively used as fastening means in various industries. Such staples are of the conventional inverted U-shaped form. Among the important uses of staples at the present time is the securing together of the flaps of various kinds of fibre and cardboard containers and cartons. The sealing of cartons presents an especially peculiar problem because of the difficulty of turning or clinching the points of the staple to make them hold after the staple has been driven. At the present time stapling can be used for the sealing of cartons only where the carton is so constructed that some kind of an anvil can be inserted under the folds of the carton against which the points of the staple are driven and which turn or clinch the points of the staple. Obviously such a carton cannot be used to contain loose contents of a character which can sift through the opening necessary to permit the insertion and removal of the thin strip constituting the anvil. Another serious limitation to the use of staples at the present time is the fact that the points of the staple have to be driven completely through the overlapping layers of cardboard in which event they are apt to enter, mar or damage the contents of the box.

According to the present invention, there is provided a novel method of stapling wherein the points of the staple are automatically clinched or folded in toward each other after the staple has been driven a predetermined distance. This clinching may take place either after the points are completely through the layers which are to be stapled, or they may be clinched after they have entered a predetermined distance but before the points have completely penetrated the full thickness of the material. For example, according to the present invention, there is provided a staple or like driven fastener which can be used for the sealing together of overlapping layers of a carton where the legs of the staple will pass completely through the top layer and enter the underlying layers and be bent together within the thickness of such underlying layer so that they do not penetrate the full thickness of the underlying layer and therefore cannot damage or injure the contents of the box or carton. The invention further provides a method of stapling in which the clinching of the staple is effected entirely without the use of any anvil under the inner lift and is controlled entirely from the driver.

In my co-pending application, Serial No. 346,959, filed July 23, 1940, there is disclosed a driver for driving the staples as herein disclosed in accordance with the method herein described. According to the present invention, the leg of the staple itself is provided with an outwardly protruding burr or projection thereon intermediate the length thereof. This burr or projection is preferably formed in a manner such as to weaken the resistance of the leg to bending at the point where the burr is formed. The staple is driven in the usual manner and then a follower moving down the outside of each leg of the staple, striking the burr, creates a bending moment tending to bend the points of the staples. The extent to which the legs are bent inwardly is determined by the travel of the follower.

My invention may be more fully understood by reference to the accompanying drawing which illustrates certain embodiments of my invention and in which:

Figure I is a perspective view showing a row of staples constructed in accordance with the present invention positioned above overlying layers of corrugated fibre board with the driving element positioned over the staple which is to be next driven;

Figure II is a side elevation of one of the staples embodying my invention;

Figure III is a transverse vertical section through the staple shown in Figure II;

Figure IV is a more or less schematic view illustrating the first step in the method of driving the staple;

Figure V is a similar view showing a staple partly driven;

Figure VI is a view similar to Figure V showing the ends of the staple clamped or bent together;

Figure VII shows the staple in place with the driver removed. In Figures IV to VII inclusive, the views are transverse vertical sections through the overlapping layers of material through the staple and through the driver, where the driver is illustrated;

Figure VIII is a view similar to Figure VII showing a modification wherein the ends of the

staple are turned without having penetrated the full thickness of the underlying layer of the corrugated fibre board;

Figure IX is a view similar to Figure VIII but on a larger scale;

Figure X is a modification showing a slightly different form of fastener;

Figure XI is a perspective view showing still another modification;

Figure XII is an elevation, partly in section, of one form of driver which may be used in carrying out my invention; and

Figure XIII is a bottom plan view of the portion of the driver shown in Figure XII.

Referring first to Figures II and III, the staple is illustrated as being of conventional form formed of narrow flat strip material having a cross bridge 2 and parallel legs 3. The ends of these legs may be square or they may be suitably sharpened or chiseled to facilitate the entering of the staple into the material into which it is to be driven. Each leg is provided intermediate its ends with a protruding burr or lug 4 thereon. The lug is preferably formed by punching the metal from which the staple is formed in such manner that the lugs 4 comprise outwardly and upwardly extending tongues that are severed along the top sides thereof from the metal, being attached to the metal along their bottom edge along the line marked 5 in Figure II. This punching of the metal not only serves to form the lug 4 but also serves to weaken the leg transversely in the general plane of the line A—A in Figure II.

In the operation of stapling, the staples are usually delivered in succession to a driver. In Figure I there is shown such a succession of staples 2. B designates one of two overlying thicknesses of corrugated cardboard or fibre board, and B' designates the other layer. B and B' may, for example, be two overlying flaps at the end of a carton. In the conventional practice of stapling, the staples are at the present time usually driven diagonally to both edges of the carton, and in Figure I they have been illustrated in a position diagonal to the free edges of the sheets B and B'. In Figures IV to IX, however, no attempt has been made to indicate such positioning of the staple, and it will be understood that the position or direction of the staple with reference to the material in which it is to be driven is unimportant and forms no part of the present invention, and is mentioned here only to indicate that the staple may be used in the conventional ways that ordinary staples are now employed.

According to the present invention, the staple as shown in Figures II and III is driven into the material to its full limit and then the points are turned inwardly. In Figures I and IV to VIII inclusive, the method of stapling is clearly illustrated. The driver which forces the staple into the material and which may be of any suitable construction and may be either manually or mechanically operated is designated C, and D indicates a follower which preferably is associated with the driver but which may be separate therefrom. When the staple has been brought to the proper position on the top layer B of the carton or other surface into which the staple is to be driven, pressure is applied to the top of the staple by means of the driver C. This forces the staple into the material to the full depth permitted by the cross bridge 2. When the staple has been driven to the full depth to which it is or can be moved by the driver C, the legs D of the follower which are spaced a width equal to the outside width of the staple are forced downwardly. These legs D of the follower are preferably of the width of the staple, and while being quite thin, are formed of a rigid material. They may be sharpened very slightly as illustrated to facilitate their entering the material. Preferably, the legs D of the follower move down into the material along the outside of the staple as the staple is being driven as illustrated in Figure V. When the further downward movement of the staple and the driver C is stopped, the legs of the follower continue to move on down. They strike and push down on the burrs or projections 4. Since the staple itself cannot be moved down further, this pressure being applied to a point at one side of the plane of the leg of the staple creates a bending moment causing the free ends of the staple to be turned inwardly. This bending moment is made more effective by the weakening of the staple transversely in the general plane of the line A—A of Figure II, while in Figure VI the follower is shown at the full downward limit of its travel, and the free ends of the staple are bent in horizontally. The extent of bending of the free ends of the legs of the staples is determined by the movement of the follower. It is not necessary to effectively hold the staple that the ends be bent at right angles to their original plane. Even if they are bent in to only a slight angle they will, in most cases, satisfactorily hold the material. On the other hand, the staples can be bent past a 90° turn if the movement of the follower is continued beyond the point shown in Figure VI. This, however, is usually not necessary or desirable.

In Figures IV to VII inclusive, the length of the staple is such that when the staple is driven into its full depth as illustrated in Figure V, the ends protrude well below the under-surface of the bottom layer B' of fibre board, and the burrs happen to coincide with the plane of the under-surface of the layer B'.

Where it is desired to turn the ends of the staple inwardly without them projecting at all or only slightly through the bottom layer of material before they are turned, the method illustrated in Figures VIII and IX may be employed. In this case the staple is made of a length insufficient to completely pass through the lower layer of material or may be of a length such as to barely pass through the lower layer of material, and the location of the burr is determined to assure bending of the staple within the thickness of the material. The former condition is illustrated in Figures VIII and IX. In this case, when the staple is driven to its full depth, the legs D of the follower operate to turn the legs inwardly within the thickness of the lower layer of material B'. The points of the staple, in moving toward each other within the fibre board itself, tear their way through the fibre board. This is especially illustrated in Figure IX where the corrugated layer B^2 is illustrated as being torn away at B^3, and the portion of the corrugation so torn away is caught under the inwardly turned legs and pressed against the layer of fibre constituting the top surface of the sheet B'.

From the foregoing description it will be seen that the invention in its preferred embodiment contemplates the use of a staple of a readily bendable material having a bridge or head portion and having legs. Each leg is in effect divided into a primary upper portion and a secondary lower portion, and the burr or nib is located at the point of juncture of these two portions, and the leg is also preferably weakened in some man-

ner so that when pressure is applied in an axial direction toward the free end of the leg, the lower or secondary portion of the leg will tend to rotate about an axis transverse to the longitudinal axis of the leg. The burr or nib is made wide enough, with reference to the total width of the leg, or strong enough that it will transmit a bending moment to the leg instead of merely bending over without turning the leg.

Instead of the staple being formed from flat sheet metal, it may be formed of either square or round wire, and the burr or nib **4** may be formed in some other way to produce the desired result. Figure X illustrates a modification wherein the fastener is illustrated as having a crossbar or head portion **6** and a leg portion **7**. Intermediate its ends the leg portion is crimped or bent outwardly in such manner as to form a projection to be engaged by the follower D, and the shape of the bend is such that downward pressure on the top of the offset portion causes the lower portion of the leg to swing inwardly. A complete fastener in the form of a letter **C** is provided on the completion of the driving operation. It will be understood that the structure shown in Figure X may be made out of flat sheet metal or that the modification shown in Figure X may be incorporated in a two-leg fastener instead of a single-leg fastener.

In the modification shown in Figure XI, there is illustrated another form of fastener having a single leg with a cross-bar or head **8** and a leg portion **9** which is bent at **10** in the manner shown in Figure X, the fastener being of a generally T-shaped form. With this arrangement, however, it is contemplated that the leg will be bent in a plane perpendicular to the body or crossbar **8** rather than parallel with it as illustrated in the preceding modifications.

Under some circumstances, especially with soft cardboard or with the less rigid boxes, as for example a cake box, the pressure exerted for clinching the staple may tend to push the staple through the paper or push the paper away from the driving implement. In such case a driver, such as shown in Figure XII and more fully shown in my co-pending application 346,959 (Figures 8 to 10) may be used in which there is a sleeve **25** about the cylindrical barrel **7** of the driving tool, this barrel having a notch **26** therein through which the staple is driven and in this notch there is a little tongue **27** or support that extends under the bridge of the staple to limit the depth to which the staple is driven. After the driving of the staple, the sleeve is moved back to withdraw the support or tongue from under the staple. In this view **20** is the driver and **21** designates the follower that does the clinching. Since this tongue limits the extent to which the staple is ejected and also holds the staple in fixed position with reference to the driver, it is possible to satisfactorily drive and clinch the staple in light material or flimsy boxes. This driver using a support may be employed with staples that pass entirely through the lower lift or with those that are clinched within the lower lift.

My invention as described, provides for the use of a fastener of the staple type having one or more legs with a bending nib or burr intermediate the end of each leg by means of which the free end portion of each leg may be caused to turn at an angle to the original axis of the leg by the application of pressure to the top of the nib or burr. The nib or burr is so designed that it does not obstruct or increase the difficulty of driving the staple. The invention is in the method wherein the turning of the point of the staple is controlled entirely from the driver without the use of any anvil to engage the points of the fasteners.

While I have illustrated and described certain preferred embodiments of my invention, it will be understood that the invention is not confined to the particular construction and arrangement of the parts illustrated but that various modifications may be made in both the staple and in the ways of using it within the contemplation of my invention and under the scope of the following claims.

I claim:

1. The method of stapling which comprises positioning a rigid supporting element over the material into which the staple is to be driven, driving a staple having projections in the legs thereof into the material until the bridge of the staple is restrained against further movement by engagement with the supporting element, applying a driving force in a direction normal to the bridge of the staple against the projections on the legs of the staples to create a bending moment in the end portions of the legs of the staple to clinch the end portions of the legs of the staples, and then withdrawing the rigid supporting element.

2. In the method of stapling with a staple having a projection on the legs thereof intermediate the end of the legs, which comprises interposing a rigid element in the path of movement of the staple to engage the under side of the bridge of the staple after the staple has been driven a predetermined distance, and holding the staple against said element while applying a force in a direction normal to the bridge of the staple against the projections on the legs of the staple to bend the legs of the staples intermediate their ends to clinch the terminal portions of the legs.

3. The method of fastening utilizing a fastener with a head portion and a leg portion with the leg having a lateral projection between its ends, driving the fastener into the material into which it is to be driven and then applying pressure to said projection from the direction of the head of the fastener toward the point to bend the leg of the fastener intermediate its ends.

4. The method of fastening overlapping layers of material with a driven fastener having a head portion and a leg portion, the leg having a projection thereon intermediate its ends, which method comprises the driving of the fastener through the upper thickness of material into the lower thickness of material and then applying pressure to the projection on the leg of the fastener from the direction of the head of the fastener toward the end of the leg to bend the leg portion of the fastener between its ends.

5. The method of fastening through the use of a driven fastener having a head portion and a leg portion which comprises driving the leg portion of the fastener a predetermined depth into the material, but not through it, the leg portion of the fastener being provided with a projection intermediate its ends, and thereafter applying a force parallel to the direction of the leg of the staple against said projection to generate a bending force in the leg of the staple to turn it in the body of the material.

DESMOND R. LA PLACE.