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Schneider

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[54] **RESILIENT PLASTIC STAPLE**

[76] Inventor: **Robert J. Schneider,** 479 Geneva Rd., Glen Ellyn, Ill. 60137

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[52] **U.S. Cl.** **85/49,** 85/21, 85/31

[51] **Int. Cl.** **F16b 15/08**

[58] **Field of Search** 85/49, 13, 31, 23, 85/26

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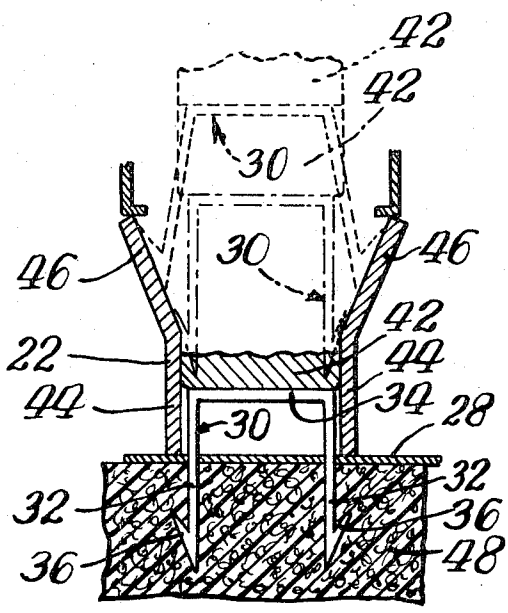
Primary Examiner—Marion Parsons, Jr.
Attorney—Hibben, Noyes & Bicknell

[57] **ABSTRACT**

A fastener or staple is formed of a resilient plastic material which has an elastic memory. The staple has legs, a crown integrally joining the legs, and retaining means such as barbs on the legs. The staple is formed so that normally the legs of the staple are non-parallel. The staple legs are displaced while being driven into the material to be stapled so that the legs are parallel, and after being driven into the material the legs return or tend to return to their normal non-parallel position due to the elastic memory of the plastic from which the staple is made. Thus the barbs or other retaining means are biased by the legs, which tend to return to their non-parallel position, into engagement with the material being stapled to retain the staple.

8 Claims, 11 Drawing Figures



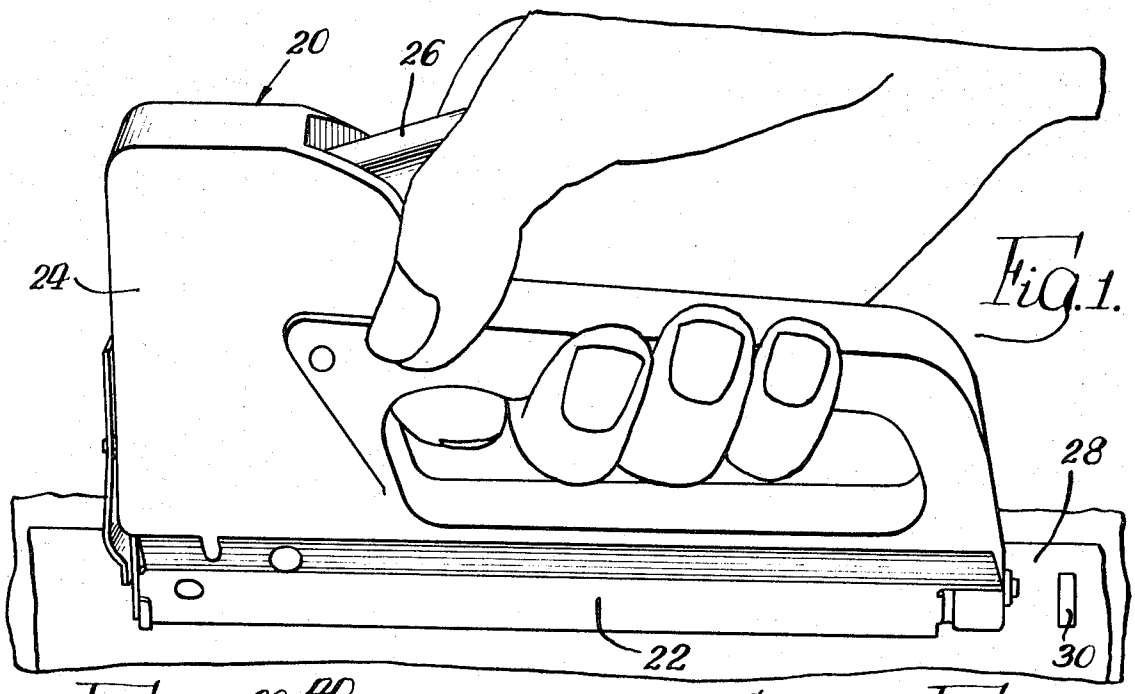


Fig. 1.

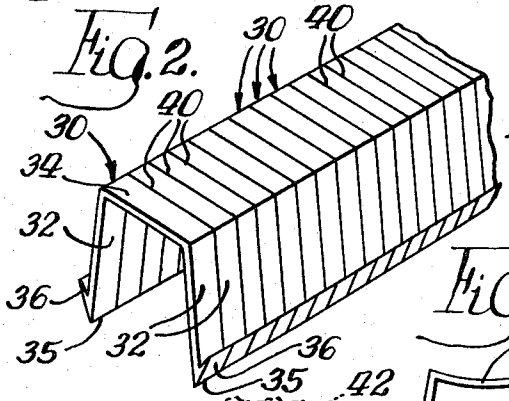


Fig. 2.

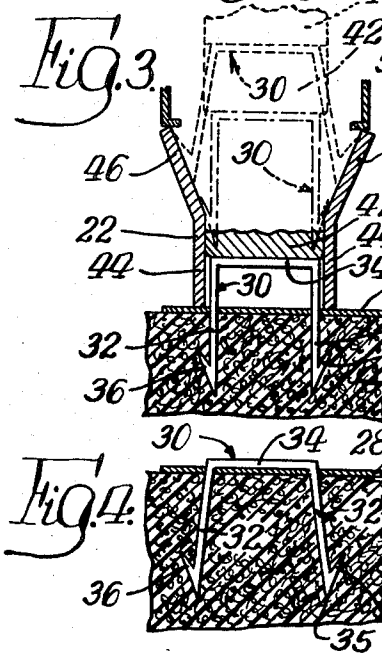


Fig. 3.

Fig. 4.

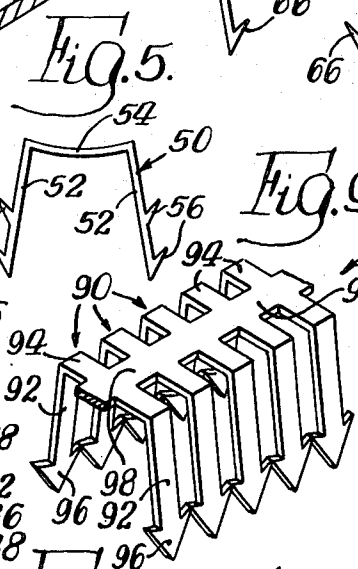


Fig. 5.

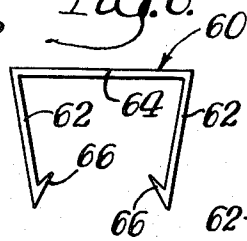


Fig. 6.

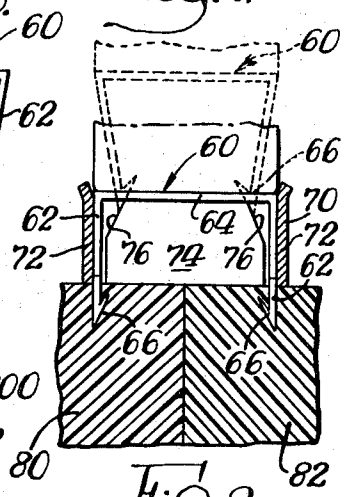


Fig. 7.

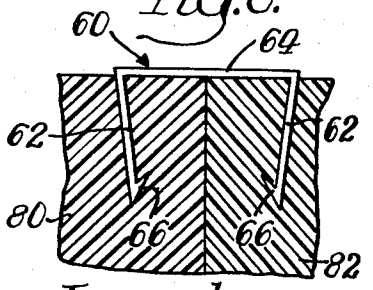


Fig. 8.

Fig. 9.

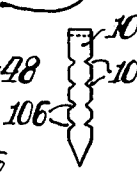


Fig. 10.

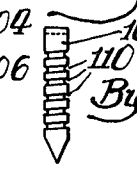


Fig. 11.

Inventor:-
Robert J. Schneider,
By Hibben, Noyes & Bicknell
Attys.

RESILIENT PLASTIC STAPLE

This invention relates to fasteners and more particularly, to plastic staples.

Heretofore, fasteners or staples have been formed from metal wire or strip in the form of a U and are driven into the material to be stapled. The staple is usually clinched or secured in place by driving the ends of the staple against an anvil which forces the ends of the staple either apart or toward each other. In some locations, especially in the packaging industry, it is not always possible to use an anvil to clinch the staple. To meet these needs, metal staples have been suggested which have resilient ends or barbs which will deflect from a normal position while being driven and, after being driven in, will tend to return to their normal position to retain the staple and material together. The holding power provided by such staples is limited because the barbs can be displaced only a limited amount. Also, the barbs remain essentially in the same holes formed in the material when the staple legs are driven into the material. Moreover, for certain applications it would be advantageous to use non-metallic staples, such as staples formed from plastic. Yet, the staples must be secured simply by driving them in from one side without the use of an anvil.

In accordance with the present invention, the staples are formed from a resilient plastic material which tends to return to its normal position after being displaced therefrom and is said to have an "elastic memory." The staple comprises leg portions joined by a crown portion in such manner that the legs in their normal position are non-parallel. The legs have retaining means or barbs. The legs are held parallel during the driving or installation of the staple, but after the staple has been driven in, the legs of the staple tend to return to their normal or non-parallel position so that the barbs dig into the material into which the staple is driven, thus holding the staple in place. Since the entire leg is displaced, instead of just the barb thereof, the holding power of the staple is greatly increased.

Accordingly, it is a primary object of the present invention to provide a novel and improved fastener formed of a resilient, plastic material having an "elastic memory."

Another object of the invention is to provide a staple which can be driven into engaged or retained position from one side without the use of an anvil.

Still anther object of the invention is to provide an inexpensive non-metallic fastener with good holding strength.

These and other objects of the present invention will become more apparent from the following description and accompanying figures of the drawing in which:

FIG. 1 is a perspective view of a staple gun with which the staples of the present invention may be used;

FIG. 2 is a fragmentary perspective view of a row of staples comprising one embodiment of the present invention;

FIG. 3 is a fragmentary cross-sectional view showing the driving of the staple of FIG. 2;

FIG. 4 is a fragmentary cross-sectional view showing the completed installation of the staple of FIG. 2;

FIG. 5 is a front elevational view of a staple comprising a second embodiment of the present invention;

FIG. 6 is a front elevational view of a staple comprising a third embodiment of the present invention;

FIG. 7 is a fragmentary cross-sectional view showing the driving of the staple of FIG. 6;

FIG. 8 is a fragmentary cross-sectional view showing the completed installation of the staple of FIG. 6;

FIG. 9 is a perspective view of a row of staples comprising a fourth embodiment of the present invention;

FIG. 10 is a side elevational view of a staple comprising a fifth embodiment of the present invention; and

FIG. 11 is a side elevational view of a staple comprising a sixth embodiment of the present invention.

FIG. 1 illustrates a hand fastener or stapling gun **20** with which fasteners or staples of the present invention may be used, it being understood that other types of fastening tools may also be used. The stapling gun **20** has a magazine **22** which may be loaded with fasteners or staples and a driving head **24** which is activated by squeezing a trigger or lever **26** to drive the staple into the material, such as a corrugated cardboard or foam plastic container **28**, to be secured or fastened with staples indicated at **30**.

As is shown in FIG. **2**, one embodiment of the staple **30** comprises a pair of elongated leg portions **32** integrally joined at their ends by a crown portion **34**. In this embodiment, the legs **32** angle outwardly so that the legs **32** are divergent or non-parallel when the staple **30** is in its normal position. Each leg **32** has retaining means which in this instance comprises a reversely extending pointed barb **36** defining a sharp point **35** at the free end of the leg **32**. Each barb **36** extends outwardly at an angle from its leg **32**, and the barbs lie generally in the plane of the staple formed by the legs **32** and the crown **34**. While only one portion of the staple, such as the legs or the crown, need be formed of resilient material, preferably the entire staple **30** is formed of a resilient plastic material which has an elastic memory.

A row or stick **38** of staples **30** may be formed by conventional plastic injection molding techniques to the desired length and shape. The row **38** and staples **30** may be made of such synthetic plastic materials as nylon or polypropylene which have an elastic memory. Since the staples **30** are formed by injection molding, there is no need for adhesive to hold the individual staples **30** together. Instead, weakened or thin sections are formed between adjacent staples **30**, as at **40** in FIG. **2**. The staples **30** then break off one at a time when struck by the driver blade **42** (FIG. **3**) of the staple gun **20**.

As is best seen in FIGS. **3** and **4**, a row **38** of staples **30** is loaded in the magazine **22** having parallel side guide walls **44**, the upper portions **46** thereof preferably being tapered outwardly to acommodate the divergent legs **32** of the staples **30**. As is shown in dashed lines in FIG. **3**, the driver blade **42** of the staple gun **20** strikes the end staple **30** of the row **38** moving it through the guide walls **44** to the position shown in the dashed-dot lines, with the legs **32** having been cammed generally parallel to each other by the wall portions **46**. The staple **30** then is driven completely through the guide walls **44** into the material to be fastened, such as the cardboard **28** and the underlying plastic foam or cellular material **48**. While in the lower portion of the guide walls **44**, the staple **30** is in a position with its legs **32** parallel, in this instance vertical, and after being completely driven from the guide walls **44** into the materials **28** and **48**, the legs **32** again move outwardly because of the elastic memory of the staple to substantially their normal or non-parallel position. The tendency for the legs **32** to return to their non-parallel po-

sition causes the barbs **36** of the legs **32** to firmly grip the material **48**, and the barbs are embedded in the material to prevent removal of the staple **30** as in FIG. **4**. As the legs **32** penetrate the material **48**, the relatively rigid barbs **36** form holes or clearances between the legs **32** and the surrounding material **48**, and these clearances facilitate the return of the legs **32** toward their non-parallel position. As will be evident, the staples of the present invention are particularly suited for use on soft materials, such as corrugated cardboard, cellular or foam plastic packaging materials, fibrous or pulp building, insulating and construction materials, and rubber or gum-like materials. In harder materials such as soft wood, the legs **32** of the staple **30** may not fully return to their normal position but will spread sufficiently for the barbs **36** to grip the material and retain the staple.

The angle at which each leg of the staple diverges from a parallel position may vary and depends upon the intended application of the staple. Staples which are driven completely through thin material should have a greater angle of divergence than staples which are embedded in thicker material, such as is shown in FIG. **4**. A suitable range for the angle of divergence of the legs from parallel position will vary from as little as about 1° to as much as about 25°, dependent upon the plastic material selected and the length of the legs.

In FIG. **5** a modified fastener or staple **50** is shown comprising a pair of legs **52** and a crown **54** joining the legs. Here the crown **54** is formed with a curve or bow therein so as to cause the legs **52** to angle outwardly into a non-parallel normal position. Each of the legs has a plurality of barbs, in this instance two barbs **56**, for increased gripping or holding power. During driving of the staple **50**, the curved crown **54** tends to be flexed toward a straight position, thereby enhancing the resilient force tending to spread the legs **52** upon completion of the driving. The use of a plurality of barbs or retaining means on each leg is advantageous in stapling thin materials since, should the staple be driven through, at least some of the barbs will grip the material.

In FIGS. **6–8** another embodiment is illustrated comprising a staple **60** having a pair of legs **62** and a crown **64** joining the legs at their upper ends. In this case the legs **62** are angled inwardly in their normal or non-parallel position and have barbs **66** at their lower or free ends which extend inwardly from the legs. The magazine **70** (FIG. **7**) of the gun for the staple **60** has parallel outer guide walls **72** which guide the staple **60**. An inner bar guide **74**, which is attached to the magazine **70**, has outwardly tapered surfaces **76** which cause the barbed ends **66** of the staple **60** to separate or spread apart to a parallel position during installation. Thus, upon being driven into the material (in this instance, two pieces of foam plastic **80** and **82** which are to be joined) the legs **62** and barbs **66** enter generally perpendicular to the surface of the plastic pieces **80** and **82**, and the legs **62** are parallel to each other as shown in FIG. **7**. After being completely driven in the legs **62** tend to move towards their non-parallel or normal inwardly angled position, thus causing the barbs **66** to tightly engage and hold the pieces **80** and **82** together and preventing removal of the staple **60**, as is shown in FIG. **8**.

A further embodiment of the invention is illustrated in FIG. **9** and comprises a staple **90** having a pair of legs **92** joined by a crown **94**. In this instance the legs **92** are again angled outwardly but now have barbs **96** which extend from opposite edges of each leg **92** and lie in the same plane as the leg. To accommodate the opposed arrangement of the barbs **96** on adjacent staples, small integral tab portions **98** join the adjacent crowns **94** in spaced relation to form a row or stick **100**. The integral tab portions **98** on adjoining staples **90** will shear apart when the end staple is driven from the magazine of a staple gun.

As is shown in FIGS. **10** and **11**, retaining means other than barbs may be provided on the staples of the present invention. For example, the legs **104** of the staple may be provided with notches **106** at the various sides thereof as in FIG. **10**, or the legs **108** may have a plurality of threads or grooves **110** thereon.

Although the invention has been described with particular reference to certain specific structural embodiments thereof it should be understood that other modifications and equivalent structures may be resorted to without departing from the scope of the invention as defined in the appended claims.

I claim:

1. A staple formed from a resilient plastic material having an elastic memory and adapted to be driven by a stapling gun or the like for use in fastening relatively soft work material such as cellular or foam plastic, corrugated cardboard, and the like, said staple comprising:

a pair of preformed, substantially straight, and normally non-parallel leg portions; and

a preformed crown portion integrally connecting said leg portions so that said leg portions are each normally inclined from parallel position at an angle of up to about 25°;

each of said leg portions having a preformed reversely extending barb projecting angularly in substantially rigid relation from the free end of the leg portion and defining a sharp point at said free end for penetrating the work material during driving of the staple, said barb being adapted to form a clearance between the leg portion and the surrounding work material as the leg portion penetrates the work material;

each of said barbs being integrally joined with its leg portion solely at the outermost surface of the leg portion; and

said leg portions being deflectable momentarily to substantially parallel relation before and during penetration of the staple into the work material and thereafter returning toward their normal non-parallel position, by reason of said elastic memory, and thereby embedding said barbs in the work material, the return of said leg portions toward their non-parallel position being facilitated by the clearances formed by said barbs during penetration of the leg portions into the work material.

2. The staple of claim **1** further characterized in that said crown portion is normally curved or bowed and is adapted to be flexed toward a straight position during driving of the staple, thereby enhancing the resilient force urging said leg portions to their normal non-parallel position.

3. The staple of claim **1** further characterized in that said barbs lie generally in the plane of the staple formed by said leg portions and said crown portion.

4. The staple of claim **1** further characterized in that each of said leg portions has a pair of oppositely pro-

jecting barbs lying generally in the plane of the respective leg portion.

5. The staple of claim 1 further characterized in that said leg portions in their normal non-parallel position are inclined outwardly away from each other.

6. The staple of claim 1 further characterized in that said leg portions in their normal non-parallel position are inclined inwardly toward each other.

7. The staple of claim 1 further characterized in that a plurality of said staples are provided in the form of a strip or stick adapted to be inserted in a staple-driving tool.

8. The staple of claim 1 further characterized in that each of said leg portions has at least one additional preformed barb projecting angularly in substantially rigid relation from the leg portion and spaced from the first-mentioned barb, said additional barb also being integrally joined with the leg portion solely at the outermost surface of the leg portion without diminishing the effective cross-sectional area of the leg portion.

* * * * *