United States Patent

[11] **3,630,486**

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[21] Appl. No. **828,646**
[22] Filed **May 28, 1969**
[45] Patented **Dec. 28, 1971**

[54] **BROKEN STAPLE REMOVER**
6 Claims, 8 Drawing Figs.

[52] **U.S. Cl.** **254/28**
[51] **Int. Cl.** **B25c 11/00**
[50] **Field of Search** 81/9.5, 341; 254/28

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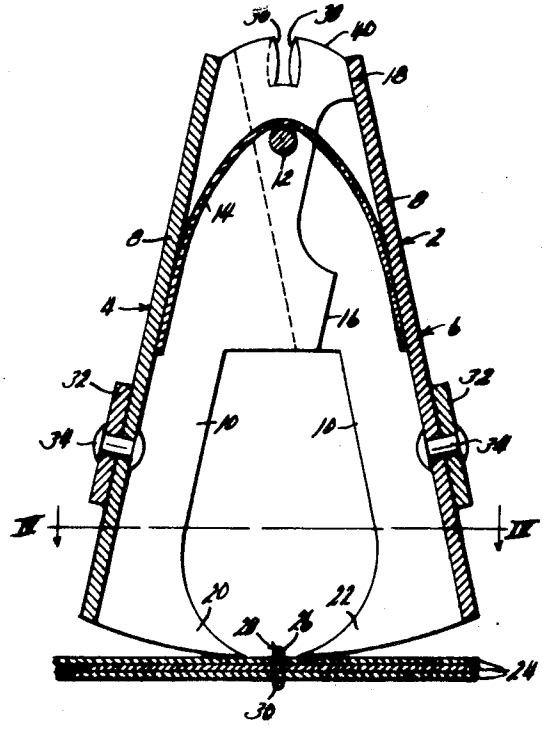
ABSTRACT: A device for removing broken portions of wire staples of the type used to secure together sheets of paper or the like, said device comprising a pair of overlying planar arms pivoted together on an axis normal thereto, said arms having cooperating notches formed in matching edges thereof generally radially of said pivot, whereby relative pivotal movement of said arms moves said notches from a position of registry, at which they may be engaged over the projecting portion of a broken staple, to an out-of-registry position to grip said wire between the edges thereof, whereupon said arms may be used as a pulling tool to withdraw the broken staple portion from the sheets in which it is engaged.



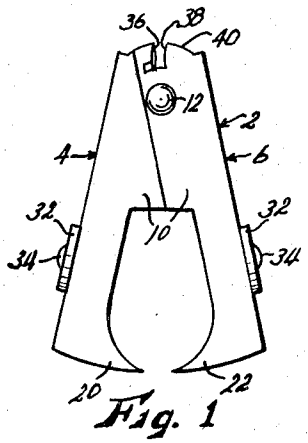


Fig. 1

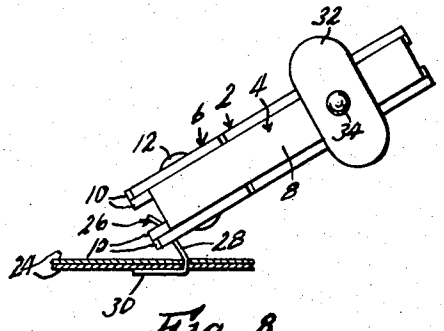


Fig. 8

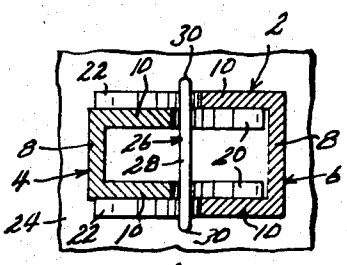


Fig. 4

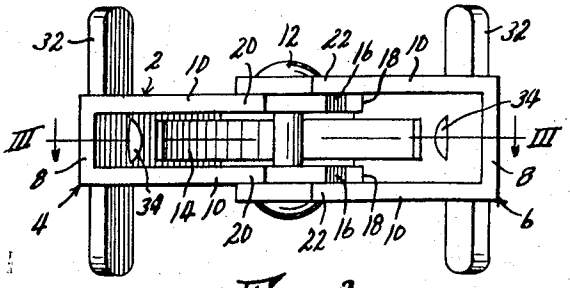


Fig. 2

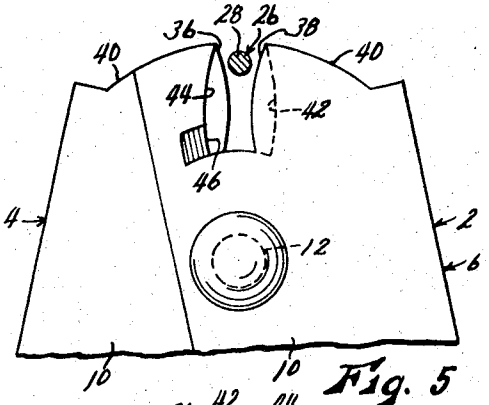


Fig. 5

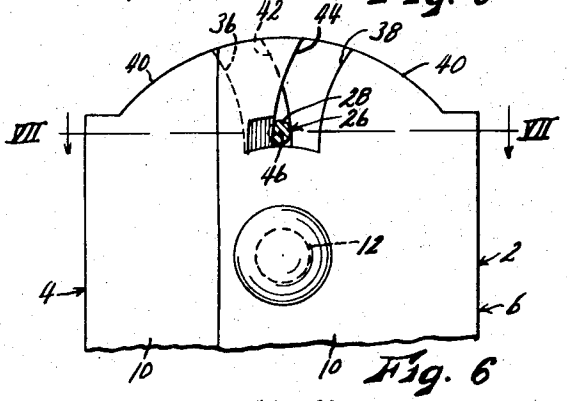


Fig. 6

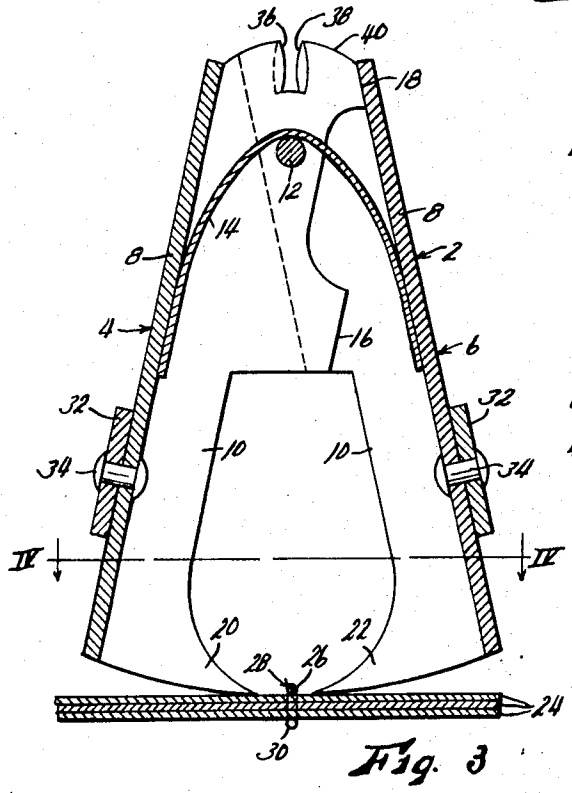


Fig. 3

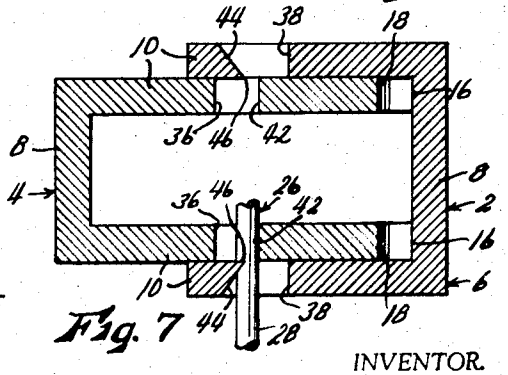


Fig. 7

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BROKEN STAPLE REMOVER

This invention relates to new and useful improvements in tools for removing wire staples of the type commonly used for securing together sheets of paper or other sheet material, said staple consisting of a U-shaped length of wire having parallel legs adapted to pierce said sheets and be pushed therethrough until its connecting or crown portion rests against the sheets, whereupon the legs are bent over at the opposite side of the sheets, and has particular reference to a tool for removing portions of such staples which have become broken, as often occurs.

Generally satisfactory tools for removing whole, unbroken staples are already in wide usage. Most commonly, such tools consist of pairs of opposed, confronting wedge-shaped cams, movably associated as by being mounted respectively on a pair of pivotably related arms, adapted to be inserted from opposite sides between the crown of the staple and the top sheet of the stapled material, then driven therebetween into interdigitating relation by relative movement of said arms, whereby the staple is withdrawn by the wedging action of the cams. However, this type of remover requires for its efficient operation that both ends of the staple crown be secured to the paper layers by its associated leg, and that the legs pull free of said layers substantially simultaneously. If the staple wire should break, or be cut between the wedge cams by faulty manipulation of the remover, or if one leg of the staple should pull free before the other, the result is a staple wire still secured at one end in the paper layers, with a raw end projecting outwardly therefrom, and the ordinary staple remover is completely ineffective to remove such wire fragments. Manual removal of these wire fragments is always difficult, pierced fingers and broken fingernails often resulting, and is virtually impossible where the staples are formed of heavier gauge wire and are hence stiffer.

Accordingly, the principal object of the present invention is the provision of a tool for effectively gripping the projecting raw end portions of broken or incompletely removed staples to permit removal thereof by tensile pulling thereon. Generally, this is accomplished by means of a pair of wire-gripping jaws carried by a pair of relatively pivoted arms.

Another object is the provision of a broken staple remover of the character described in which the jaws are designed to prevent escape of a wire therefrom transversely of itself, being configurated to draw the wire more deeply therebetween as they are closed, and to completely encircle said wire.

A further object is the provision of a broken staple remover of the character described in which the jaws are designed to prevent escape of a wire therefrom longitudinally of itself, being configurated to cut through said wire partially but not completely to insure a nonslip grip on said wire.

A still further object is the provision of a broken staple remover of the character described which can easily and conveniently be incorporated in and form a portion of preexisting removers for whole or unbroken staples, involving the addition of no new parts thereto and only slight modification of existing parts.

Other objects are extreme simplicity and economy of construction, and efficiency and dependability of operation.

With these objects in view, as well as other objects which will appear in the course of the specification, reference will be had to the accompanying drawing, wherein:

FIG. 1 is a front elevational view of an ordinary wedge-cam type of remover for whole or unbroken staples, modified in accordance with the present invention to serve as a remover for broken staples,

FIG. 2 is an enlarged, inverted plan view of the remover as shown in FIG. 1,

FIG. 3 is a sectional view taken on line III—III of FIG. 2, with the remover shown in an initial stage of its application to an unbroken staple for the removal thereof,

FIG. 4 is a sectional view taken on line IV—IV of FIG. 3, with the teeth closed to remove the unbroken staple,

FIG. 5 is an enlarged fragmentary view of the upper portion of the remover as shown in FIG. 1, showing the jaws thereof

especially adapted for gripping and removing broken staples, with a staple wire entering said jaws,

FIG. 6 is a view similar to FIG. 5 but showing the jaws closed,

FIG. 7 is a sectional view taken on line VII—VII of FIG. 6, and

FIG. 8 is a side view of the remover to the scale shown in FIG. 1, shown in operative engagement with a broken staple wire.

Like reference numerals apply to similar parts throughout the several views, and the numeral 2 applies generally to an ordinary staple remover for unbroken staples, said remover being of the wedge-cam type, including a pair of elongated arms indicated generally at 4 and 6. Each of said arms is formed of sheet metal and is of U-shaped cross-sectional contour, having a web 8 and parallel sidewalls 10. Sidewalls 10 of arm 4 are engaged slidably between the sidewalls of arm 6, and the arms are pivotally engaged adjacent their upper ends by a pivot pin 12 extending through all of sidewalls 10 normally thereto. A leaf spring 14 biases the lower ends of the arms yieldably apart to an open position as shown in FIG. 3, and they may be manually pushed toward each other against the force of said spring to a closed position in which their webs 8 are parallel, as shown in FIGS. 6 and 7. The free edges of sidewalls 10 of arm 4 are configurated to form stops 16 which engage the inner surface of web 8 of arm 6 to limit the closing movement of said arms, and stops 18 which engage said web to limit the opening movement of said arms.

At the ends of the arms remote from pivot pin 12, booth sidewalls 10 of both arms are formed to present teeth, teeth 20 of arm 4 projecting toward arm 6, and teeth 22 of arm 6 projecting toward arm 4. Said teeth are sharply pointed at their ends, and constitute wedge-shaped cams. In the open position of the arms, the teeth of the two arms are spaced apart in the plane of pivotal movement of the arms, as shown in FIG. 3. Also indicated in FIG. 3 are a plurality of sheets 24 of paper or the like secured together by an ordinary wire staple 26 including a crown portion 28 lying against the top sheet and leg portions 30 at each end of said crown piercing said sheets and being bent over beneath said sheets. With the tool positioned as in FIG. 3, with teeth 20 and 22 at respectively opposite sides of staple crown 28, the arms are pressed together to insert said teeth between said crown and top sheet 24 from opposite sides. Further closing movement of the arms moves teeth 20 into interdigitating relation between teeth 22, forcing staple crown 28 to ride upwardly on the upper edges of said teeth, whereby the staple is removed by pulling it from sheets 24 and straightening legs 30 thereof. A finger plate 32 affixed to the web 8 of each arm by means of a rivet 34 facilitates this manipulation of the tool.

The structure thus far described is common and well known in the art, but is also subject to certain common and well-known malfunctions. For example, due to faulty manipulation, only one pair of cooperating teeth 20–22 may enter between staple crown 28 and top sheet 24, with the result that only one leg 30 of the staple is pulled, leaving the other tightly engaged in sheets 24. Also, if the tool is placed improperly with respect to the staple, so that a tooth 22 is placed outwardly from the adjacent staple leg 30 and its cooperating tooth 20 is disposed inwardly of said staple leg, the staple wire may be cut and severed completely between the edges of said cooperating teeth. In addition, due to faults in the staple wires themselves, the staple crown may break before the legs thereof are fully freed from sheets 24. In any of these instances, the result is one or two wire fragments each still secured at one end in sheets 24 and with its opposite end extending outwardly from the sheets. The standard tool thus far described is in no way operable or adapted to grip or remove these fragments, and their manual removal is a tedious and annoying job, often resulting in pierced fingers and broken fingernails as previously mentioned. The provision of a tool for removing these wire fragments is the subject matter of the present invention, either in combination with the standard staple remover thus far described, or independent thereof.

According to the present invention, the standard staple remover thus far described may be modified by the formation of a notch **36** in the end of each sidewall **10** of arm **4** remote from teeth **20**, and a cooperating notch **38** in the end of each sidewall **10** of arm **6**. The notches **36** and **38** of each pair of sidewalls **10—10** resting in sliding engagement with each other form a cooperating pair. Said notches extend generally radially to pivot pin **12**, opening through coinciding edges **40** of sidewalls **10** which are generally concentric with said pivot pin. When arms **4** and **6** move from the open position of FIG. **5**, edge **42** of notch **36** moves toward edge **44** of notch **38**. These edges **42** and **44** constitute the working jaws of a broken staple remover. Each of said jaws is concavely curved, lying entirely at one side of a radius line drawn from the axis of pivot pin **12** to the outer end of said jaw, the inner end of said jaw being the point thereof at the greatest distance from said radius line. This spacing from the radius line should be at least as great as the approximate diameter of the wire of which staple **26** is formed. The contour of the edges of notches **36** and **38** opposite from jaw edges **42** and **44** is not particularly pertinent. Jaw edges **42** and **44** are square and unsharpened, except that the inner end portion of at least one of them (jaw **44** as shown) is sharpened to form a cutting edge **46** lying at the face of the sidewall **10** of which it forms a part which lies in sliding contact with the cooperating sidewall **10**.

In operation, it will be seen that when arms **4** and **6** are in their open position as shown in FIGS. **3** and **5**, the open ends of notches **36** and **38** are in registered relation. If a staple **26** has been broken, cut or incompletely removed as previously described, leaving one or both ends thereof still anchored in sheets **24**, the removing tool is simply reversed to the position shown in FIG. **8**, and the notches **36** and **38** applied over a projecting portion of crown **28** of the staple, as indicated. This step of the operation is also indicated in FIG. **5**. The arms **4** and **6** are then moved toward their closed position, against spring **14**, by pressing finger plates **32** toward each other. Jaws **42** and **44** are thus moved toward each other to grip the staple crown therebetween, whereupon the entire assembly **2** may be used as a "handle" for forcibly pulling the staple fragment from sheets **24**.

If the staple wire is initially positioned in the outer portions of notches **36** and **38**, as shown in FIG. **5**, the initial closing movement of jaws **42** and **44** will engage the staple wire between square, unsharpened portions of the jaws, these jaw portions being divergent toward the inner or base ends of the jaws due to the concave contour of the jaws. Thus during further closing movement of the jaws after initial contact with the wire, the cam said wire slidably toward the inner ends of the jaws. Eventually, before the wire reaches the inner ends of the jaws, the outer end portions of said jaws move into overlapping relation, as shown in FIG. **6**, and if the wire remained between these portions of the jaws, it would simply be cut, and this would of course defeat the purpose of the tool, which is to obtain a firm pulling grip on the wire. Therefore, the concave curvature of the jaws serves to prevent rejection of a wire from between the jaws once it has entered therebetween, to cam the wire to the inner ends of the jaws, and to prevent any possible escape of the wire from between the jaws transversely of itself. Once the jaws have moved into overlapping relation above the wire, the wire cannot possibly slip from between the jaws in that direction.

The inner end portions of jaws **42** and **44** never close completely. At the fully closed position of arms **4** and **6**, which occurs when stops **16** of arm **4** engage web **8** of arm **6**, the inner end portions of said jaws are still spaced apart, as shown in FIG. **6**, but the spacing therebetween is somewhat less than the diameter of the staple. Thus when the wire has been cammed to the inner ends of the jaws as previously described, the final closing movement of the jaws causes said jaws to cut into said wire partially, as indicated in FIGS. **6** and **7**, cutting edge **46** of jaw **44** facilitating this operation. The cut is only partial, since as previously discussed a complete severance of the wire would defeat the purpose of the tool, but it provides a grip on the wire which prevents any possible escape of the wire from the jaws longitudinally of itself. Even square jaw edges, without the special provision of cutting edges **46**, could in some cases provide the cutting effect described but the use of specially formed cutting edges **46** is preferable in view of the difficulty of producing accurately square edges by the usual die-stamping methods of producing the sheet metal blanks from which arms **4** and **6** are formed.

While the broken staple remover forming the subject matter of the present invention has been shown and described as an adjunct to or modification of an ordinary wedge-cam type of staple remover, and while this combination has certain advantages of convenience, ready availability at the time it is needed, and economy, since it involves the addition of no extra parts to the wedge-cam remover, nevertheless it will be readily apparent that it could be produced as a separate individual tool, since notches **36** and **38** have no necessary functional relationship to the presence of teeth **20** and **22** at the opposite ends of the arms **4** and **6**. Any pair of planar, overlapping arms pivoted together in the manner of either pair of cooperating sidewalls **10** could form jaws **42** and **44** and perform the desired function of removing broken staples. It is considered that these and many other minor changes of structure and operation could be made without departing from the spirit of the invention.

What I claim as new and desire to protect by Letters Patent is:

1. A broken staple remover comprising:

a. a pair of planar, elongated arms disposed in intersecting, overlapping relation,

b. means pivotally interconnecting said arms intermediate their ends for relative pivotal movement about an axis normal to their planes, one corresponding pair of ends of said arms constituting a pair of angularly confronting jaws operable to be moved toward each other into partially overlapping relation by relative pivotal movement of said arms, and

c. stop means carried by said arms to limit the closing movement of said jaws to a position at which at least a portion of the radial lengths of said jaws are spaced angularly apart by a distance less than the diameter of the wire of which a broken staple to be removed is formed, the confronting faces of said jaws being arcuately concave, all points of each of said jaws lying at one side of a radius line drawn from the pivotal axis of said arms to the outer end of said jaw, the inner end of each of said jaws being the point thereof having the greatest spacing from said radius line, whereby a wire engaged between said jaws is cammed by said jaws toward the inner ends thereof, said stop means preserving a minimum spacing between the inner ends of said jaws less than the diameter of the wire of which a broken staple is formed.

2. A device as recited in claim **1** wherein the spacing of the inner end of each jaw from a radius line drawn from the pivotal axis of said arms to the outer end of said jaw is at least as great as the diameter of the wire of which a broken staple is formed, whereby said jaws move into overlapping relation outwardly from said wire after said wire has been cammed to the inner ends of said jaws.

3. A device as recited in claim **1** wherein the outer end portions of said jaws are smooth and blunt, whereby to facilitate the camming action thereof in moving a wire engaged therebetween toward the inner ends of said jaws.

4. A device as recited in claim **2** wherein the outer end portions of said jaws are smooth and blunt, whereby to defeat the cutting of a wire therebetween as these portions of said jaws move into overlapping relation, and to facilitate the camming action thereof in moving said wire toward the inner ends of said jaws.

5. A device as recited in claim **3** wherein the inner end portion of at least one of said jaws is sharpened to provide a cutting edge lying in the plane thereof engaging the other of said jaws, whereby a staple wire disposed between the inner ends of said jaws is partially severed when said jaws are closed to the limit permitted by said stop means.

6. A device as recited in claim 4 wherein the inner end portion of at least one of said jaws is sharpened to provide a cutting edge lying in the plane thereof engaging the other of said jaws, whereby a staple wire disposed between the inner ends of said jaws is partially severed when said jaws are closed to the limit permitted by said stop means.

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