June 15, 1943. L. OBSTFELD 2,321,847

STAPLE FOR STAPLING MACHINES

Filed Jan. 2, 1941

Fig. 1

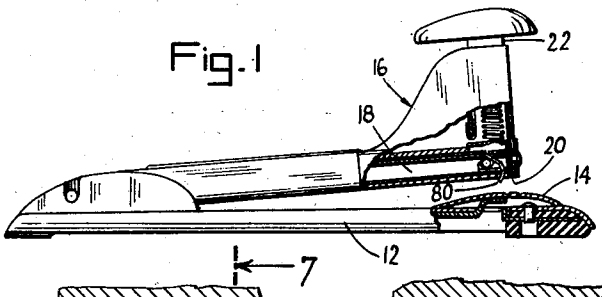


Fig. 2

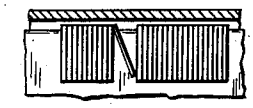


Fig. 3

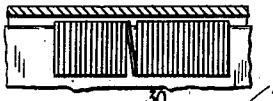


Fig. 4

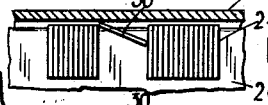
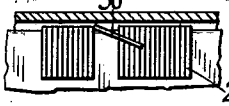


Fig. 5



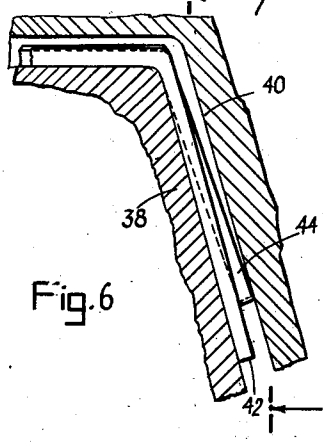


Fig. 6

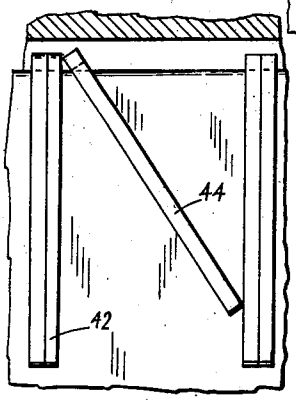


Fig. 7

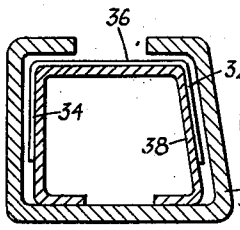


Fig. 8

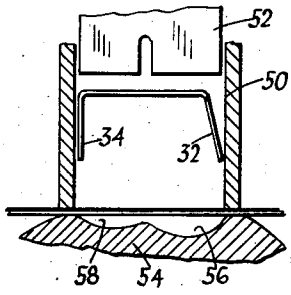


Fig. 9

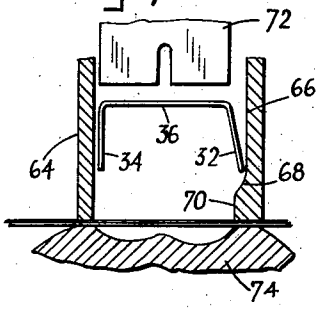


Fig. 12

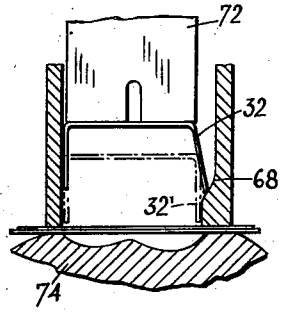


Fig. 13

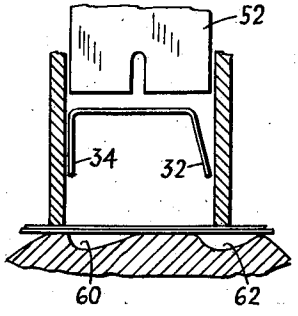


Fig. 10

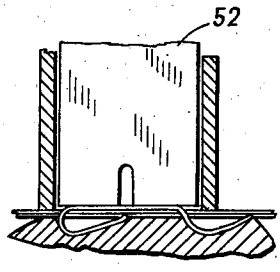


Fig. 11

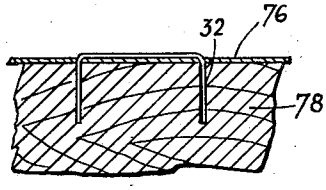


Fig. 14.

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STAPLE FOR STAPLING MACHINES

Lou Obstfeld, Brooklyn, N. Y., assignor of one-half to Abraham Obstfeld, New York, N. Y.

Application January 2, 1941, Serial No. 372,699

4 Claims. (Cl. 85—49)

This invention relates to the art of stapling, and more particularly to an improved staple for use with an improved stapling machine.

The primary object of my invention is to generally improve the art of stapling, and more especially stapling machines and thin wire staples such as are usually cemented together to form a stick.

A more specific object is to avoid jamming of staples in the staple magazine. Such a jam prevents further feed of staples by the staple feed spring, thus rendering the machine inoperative. In most machines the magazine is inaccessible except at one end for loading, and it is therefore a very difficult matter to free a jammed magazine. After considerable study of this problem, I have come to the conclusion that these staple jams are caused by rotation of a free staple about its top or bridge until the legs point toward the legs of next adjacent staples, alongside of which they then become wedged. The troublesome staple may become free in the first instance due to loading of a staple stick against an unfinished staple stick, or due to breakage of a staple stick during loading or during violent rapid operation of the stapling machine. In most cases a loose staple is fed along with the others without difficulty, but in rare instances such a staple may swing upwardly about its bridge to a nearly horizontal position, and thus lead to a staple jam. One primary object of the present invention is to overcome this difficulty and to prevent jams of this character.

The difficulty might be overcome by using a very small tolerance or close fit of the staple magazine about the staples, but this would greatly increase the manufacturing expense. Moreover, the trend in design is to make these stapling machines out of heavy gauge sheet metal, but then it is practically impossible to provide a magazine passage having very small tolerance, as there is always a certain amount of spring or opening up of the material after it leaves the forming dies. There are also irregularities in the thickness of the metal.

Accordingly, an important object of the present invention is to eliminate staple jams, without, however, in any way reducing the tolerance or clearance between the staples and the staple magazine, and while making the magazine out of bent heavy gauge sheet metal parts.

To the accomplishment of the foregoing and such other objects as will hereinafter appear, my invention consists in the staple and machine elements and their relation one to the other, as hereinafter are more particularly described in the specification and sought to be defined in the claims. The specification is accompanied by drawing, in which:

Fig. 1 is a partially sectioned side elevation of a stapling machine embodying features of my invention;

Fig. 2 is a partially sectioned side elevation of a fragment of the magazine, and is explanatory of the invention;

Fig. 3 is a similar view showing a loose staple being returned to proper position;

Fig. 4 is a similar view of a prior art machine showing a loose staple turned to nearly horizontal position;

Fig. 5 is a similar view showing how such a staple may lead to a staple jam;

Fig. 6 is an enlarged fragmentary transverse section explanatory of my invention;

Fig. 7 is a fragmentary section taken in the plane of the line 7—7 of Fig. 6;

Fig. 8 is a transverse section through a staple magazine loaded with my improved staples;

Fig. 9 is a transverse section through a stapling machine and clinching anvil at the staple driving blade;

Fig. 10 is a similar section, but with the anvil moved for temporary fastening;

Fig. 11 is a view similar to Fig. 10, but showing the temporarily fastened staple;

Fig. 12 is a section through a machine having a modified drive channel;

Fig. 13 is a similar view illustrating the operation of the modified drive channel; and

Fig. 14 is a section explanatory of an advantage of the modified machine and of my improved staple when used as a tacker.

Referring to the drawing, and more particularly to Fig. 1, I there show a desk stapling machine of a known type, said machine comprising a base 12 carrying a clinching anvil 14. A stapling arm generally designated 16 is pivotally mounted on base 12. It comprises a staple magazine 18 through which staples are fed forwardly by means of a feed spring (not shown) toward a staple driving blade 20, the latter being operated by a suitable plunger 22.

Referring now to Fig. 4 of the drawing, staples 24 are carried on a staple core 26 and are confined thereon by a surrounding staple magazine wall 28. For any of a number of reasons, the magazine may occasionally contain separated staple sticks with a loose staple 30 therebetween. The difficulty arises principally during faulty or careless loading of the machine. The operator may drop

the staple stick and so break it into a number of pieces, and then, rather than waste the staples, attempt to force these pieces one after another into the machine. In prevalent practice, the machines are of the front-loading type with a safety pawl, such as is indicated at **80** in Fig. 1, and the staples are forced into the front end of the machine against the action of the staple pusher and staple feed spring. Thus the legs may become turned and overlapped in condition for a jam, or may even be jammed during the loading of the staples into the machine. Or the jam may not be noticed during loading, but may manifest itself when the feed spring attempts to push the staples in the opposite direction, with the turned staple moving point first.

However, the difficulty is not caused solely by loading, but may arise during violent operation of the machine, as in factories using the machine for rapid production purposes. When the staples in the machine have been nearly used up, the resulting extension of the feed spring greatly reduces the feed spring pressure, and at this time the vibration or pounding on the machine may afford sufficient separation to permit a staple to rotate.

On some occasions a loose staple may swing upwardly over a large angle, as indicated in Fig. 4. In such case, the ends of the loose staple **30** may move alongside of the staples **24** and so become wedged between the staples and the magazine walls. This produces a jam which will prevent further feed of staples, and may prove extremely difficult to relieve.

The critical angle, theoretically, is 45°. A staple at a less angle will be restored to normal position. A staple at a greater angle may be jammed.

An ordinary staple comprises legs disposed perpendicularly to a connecting top or bridge. In accordance with the present invention, this staple construction is modified by sloping a leg of the staple. This is indicated at **32** in Fig. 8. The other leg **34** may also be sloped outwardly, but I find it better to leave this leg perpendicular to the bridge **36**. The staple magazine of my improved machine is made to fit the sloped leg staple, that is, the wall **38** of the staple core and outside wall **40** of the magazine are sloped to mate with the slope of staple leg **32**.

The inner wall of the magazine is thinner and may be fitted to the staples fairly accurately. The outer wall is of heavy gauge metal, making an accurate fit very difficult to obtain. The manufacturer usually aims for a passage fifty per cent larger than the staple thickness, but it often varies to double the thickness. Even with less than double thickness, a staple jam may occur in prior magazines because of the rounded section of the staple wire, and irregularities at the staple ends.

As a result of my angular staple and magazine construction, the amount which the staple may swing about the bridge **36** is severely limited. Thus, referring to Figs. 6 and 7, the perpendicular or normal position of the staple is indicated at **42**, while an upwardly swung staple is indicated at **44**. Now it will be seen in Fig. 6 that the position **44** represents the maximum swing of the staple, for the tip end of the staple leg has already reached and engaged the magazine wall **40**. Moreover, in Fig. 7 it will be seen that this rotation of the staple is well below 45°, and despite the use of a very liberal tolerance in the staple magazine. When the staple swings only the limited shown in Fig. 7 it is still under control, that is, it will tend to be moved back to vertical position under pressure of the feed spring, as is illustrated by the successive positions in Figs. 2 and 3 of the drawing, instead of tending to jam, as is illustrated in Figs. 4 and 5. Even if the staple legs were to slightly override one another, the continued action of the machine will correct the condition, because the staple legs will be disposed collaterally for most of their length and the feed pressure will tend to right the staple rather than to jam it.

It will thus be seen that by simply sloping the staple leg and by matingly sloping the staple magazine, jamming of staples in the magazine may be effectively prevented despite the use of liberal tolerances in the machine, and despite the use of bent heavy gauge sheet metal parts for the magazine.

The permitted angle of rotation of the staple leg is determined by the length of the leg relative to the clearance in the magazine, as well as the angle of the slope of the staple leg. The slope angle used for the leg may, of course, vary greatly. A slight angle has some advantages, but decreases the permissible tolerance in the fit between the magazine passage and the staples. A large angle increases the tolerance and decreases the permissible swing of the staple, but may introduce the disadvantage of reducing the strength of the staple leg against buckling when penetrating thick or hard material. I recommend an angle between five and thirty degrees, with an angle of ten to fifteen degrees as probably preferable for a satisfactory compromise between the advantages and disadvantages of more extreme angles.

Referring now to Fig. 9, I there show a stapling machine having a conventional straight-sided staple drive channel **50** with a driving blade **52** mating with the same. The permanent clinching anvil **54** is generally conventional, except that the clinching slot **56** is preferably made deeper and curved to more gradually turn the staple leg **32**, than is the case with clinching slot **58** and the perpendicular leg **34**. In other words, clinching slot **58** may be conventional, but clinching slot **56** is modified to compensate for the fact that the leg **32** slopes outwardly.

When it comes to temporary clinching, the outward slope of the leg **32** constitutes an advantage. Thus, referring to Figs. 10 and 11, I show an anvil having an inwardly directed clinching slot **60** and an outwardly directed clinching slot **62**. It is evident that the initial outward slope of the staple leg **32** facilitates the outward clinching of the same in slot **62**. In fact, the slot **62** may, if desired, be made shallower than the slot **60**. This leads to a temporary fastening of the type illustrated in Fig. 11. Some manufacturers prefer a temporary fastening in which the staple legs are both turned outwardly. Such an anvil may, of course, be used in lieu of that shown in Figs. 10 and 11, and in such case the perpendicular leg **34** will be turned outwardly in normal manner, while the sloping leg **32** will be turned outwardly even more readily.

Both permanent and temporary clinching slots may be provided on a single anvil, said anvil being movable in conventional manner to bring either type of slot beneath the staple driving blade. One arrangement is shown in Fig. 1, in which the anvil **14** is slidable longitudinally of the base in order to bring either of its sets of

clinching slots beneath the staple driving blade.

In Figs. 12 and 13 I illustrate a stapling machine having a modified staple drive channel. In this channel the wall 64 adjacent the perpendicular staple leg 34 is a straight wall, while the wall 66 adjacent the sloping leg 32 is turned inwardly at 68, thus narrowing the drive channel at 70 to an amount commensurate with the length of the top or bridge 36 of the staple. The staple driving blade 72 is dimensioned to fit between the walls 64 and 70, that is, it is no wider than the bridge 36 of the staple. The action of this machine will be clear from inspection of the drawing. The staple remains in normal condition until the leg 32 reaches the inwardly sloped wall 68, whereupon the leg 32 is bent or cammed inwardly until it assumes the perpendicular relation shown in broken lines 32'. The action of the clinching anvil 74 will then be normal.

This arrangement is of advantage not only when the staples are to be clinched, but also, or perhaps even more importantly, when the staples are to be used for tacking purposes. In common commercial parlance, a stapling machine which clinches the staples is called a "fastener," while a machine which merely drives the staple legs into a solid substance such as wood, is termed a "tacker." Some machines are made with a base which can be turned out of the way, so that the same machine may be used as either a fastener or a tacker. The machine shown in Fig. 1 is of this character, and when the base is swung out of the way, the staple may be driven without any clinching action in order to secure a piece of paper, cardboard, fabric or the like 76, to a piece of wood 78. Now when a sloping leg staple is used, the leg is preferably initially straightened to perpendicular relation, as shown at 32' in Fig. 13, before driving the same into the wood 78. After the staple has been driven, the leg 32 tends to swing outwardly, because of its own resilience, and this helps bind the staple against accidental removal.

While I have illustrated permanent clinching slots in Figs. 12 and 13, it will be understood that the special driving channel there shown may also be used with temporary clinching slots, although the special drive channel is obviously of greater advantage for permanent clinching and for tacking, rather than for temporary clinching. However, in all of these cases there is some advantage in bringing the legs to parallel condition at the instant of driving the same, when the material to be stapled is of great thickness or unusual hardness or difficult to penetrate.

Both staple legs may be sloped, but inasmuch as the object of preventing jamming of the staple will be fulfilled while sloping a single leg, it is preferred to slope only one leg. The sloping staple leg may be sloped inwardly instead of outwardly to fulfill the desired object of preventing rotation of the staple about the bridge. Of course, if the sloping leg is to be cammed to perpendicular position at the instant of driving the same, the outwardly sloping leg is preferable to the inwardly sloping leg, because the means for camming the leg to perpendicular position is very simple, as was described in connection with Figs. 12 and 13. With an inwardly sloping leg the camming means would have to be automatically retracted as the staple driver descends.

It is believed that the construction and operation of my improved staple and stapling machine for use with the same, as well as the important advantages thereof, will be apparent from the foregoing detailed description thereof. It will also be apparent that while I have shown and described my invention in several preferred forms, other changes and modifications may be made in the structures disclosed, without departing from the spirit of the invention as sought to be defined in the following claims.

I claim:

1. A staple for use in a magazine type stapling machine of ordinary character except that the staple guide passage of the magazine slopes to receive a matingly sloping staple leg, said staple being formed of a slender, uniform, readily deformable wire, and having a bridge with two legs depending therefrom, one of said legs being perpendicular to the bridge, and the other sloping at an angle of from five to thirty degrees from perpendicular.

2. A staple for use in a magazine type stapling machine of ordinary character except that the staple guide passage of the magazine slopes to receive a matingly sloping staple leg, said staple being formed of a uniform wire, and having a bridge with two legs depending therefrom, one of said legs being perpendicular to the bridge, and the other sloping outwardly.

3. A staple for use in a magazine type stapling machine of ordinary character except that the staple guide passage of the magazine slopes to receive a matingly sloping staple leg, said staple being formed of a slender, uniform, readily deformable wire, and having a bridge with two legs depending therefrom, one of said legs being perpendicular to the bridge, and the other sloping outwardly at an angle of from five to thirty degrees from perpendicular.

4. A staple for use in a magazine type stapling machine of ordinary character except that the staple guide passage of the magazine slopes to receive a matingly sloping staple leg, said staple being formed of a slender, uniform, readily deformable wire, and having a straight bridge with two straight legs depending therefrom, one only of said legs sloping outwardly at an angle of from five to thirty degrees from a plane perpendicular to the bridge.

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