

A hand-operated stapler capable of holding a plurality of
staple bars in alignment with one another

5 The invention relates to a hand-operated stapler capable of
holding a plurality of bars of interconnected staples in
alignment with one another, comprising a staple magazine
pivoted on a base for holding the staple bars in a row,
pusher means for pushing the staple bars from one toward
10 the other end of the staple magazine, and a handle also
pivoted on the base for ejecting the successive staples
from within the staple magazine against an anvil on the
base.

15 Hand-operated staplers have been known which lend them-
selves to use with bars of U-shaped wire staples intercon-
nected, as by means of an adhesive, in a readily separable
manner. Typically, each bar consists of 50 staples. Two
or more such staple bars may be loaded in a row in a staple
magazine, in the shape of an elongate, open-top box, which
20 is proximally pivoted on a base and which has a transverse
slot at the distal end of its bottom. A spring-loaded
pusher is slidably mounted in the staple magazine for push-
ing the row of staple bars toward its distal end. Also
pivoted on the base in overlying relation to the staple
25 magazine, a handle has an ejector for driving the succes-
sive staples out of the slot in the staple magazine against
an anvil on the base.

30 Being in end-to-end abutment with one another within the
staple magazine, the staple bars may come out of alignment
when pushed endwise by the spring-loaded pusher. Some
staple bars may then lap over the others, or they may even
jump out of the staple magazine through its open top.

35 Suggestions have been made to overcome this weakness of
hand staplers by providing a magazine cover between the

staple magazine and the handle for openably closing the open top of the staple magazine, as disclosed for example in Japanese Utility Model Publication No. 48-19653. The magazine cover of this particular prior art device can be forced into positive engagement with the staple magazine in order to firmly retain the series of staple bars in neat alignment therein.

The noted conventional solution is objectionable because the magazine cover, being a discrete unit, makes the stapler construction unnecessarily complex. Moreover, during assemblage, the magazine cover demands additional steps of mounting and adjustment.

The present invention provides a much simpler, truly satisfactory solution to the problem of how to retain a series of staple bars in position within the staple magazine. It makes the familiar magazine cover unnecessary; instead, the staple magazine is itself substantially integrally provided with retainer means generally extending in its longitudinal direction for holding the staple bars in exact alignment therein. Typically, the retainer means take the form of series of inward bosses or other protuberances formed, as by embossing, on the staple magazine so as to overhang the row of staple bars loaded therein. As the loaded staples are successively ejected from within the staple magazine, the staple bars will travel forwardly in sliding engagement with the retainer protuberances.

Among the advantages gained by the invention is the much simpler construction of the inventive stapler than that of the conventional staplers having the magazine cover. Since the retainer means of the invention are substantially integral with the staple magazine, the manufacture and assemblage of the stapler is far easier than if the separate magazine cover is employed. Further the retainer means

need no adjustment whatever following the assemblage of the stapler. Additional advantages include a decrease in the cost of manufacture and in the percentage of defective products.

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The invention will now be described more specifically in terms of several embodiments thereof with reference to the attached drawings in which:

10 Figure 1 is a longitudinal, vertical section through the hand-operated stapler constructed in accordance with the novel concepts of the invention;

15 Figure 2 is a view in perspective of the staple magazine of the stapler;

Figure 3 is a view in perspective of the base of the stapler;

20 Figure 4 is an enlarged section through the staple magazine, taken along the line IV-IV in Figure 2;

Figure 5 is an enlarged section through the staple magazine, taken along the line V-V in Figure 2;

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Figure 6 is an enlarged view in perspective of the staple bar pusher of the stapler;

30 Figure 7 is a longitudinal, vertical section through another preferred form of the stapler in accordance with the invention;

Figure 8 is a view in perspective of the staple magazine of the Figure 7 stapler;

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Figure 9 is a longitudinal, vertical section through still

another preferred form of the stapler in accordance with the invention;

Figure 10 is a view in perspective of the staple magazine of the Figure 9 stapler;

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Figure 11 is a similar view of an alternative staple magazine for use in the Figure 9 stapler; and

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Figure 12 is a similar view of another alternative staple magazine for use in the Figure 9 stapler.

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Figures 1-6 show the hand stapler constituting a first specific embodiment of the invention. Generally designated 1 in Figure 1, the stapler 1 comprises an elongate base 2 shown extending horizontally in Figure 1, a staple magazine 3 overlying the base and pivotally mounted thereon, and a handle 4 overlying the staple magazine and also coupled to the base 2 for pivotal motion about the same axis as the staple magazine 3. In this particular embodiment the staple magazine 3 accommodates four bars of inverted-U-shaped staples S in a row, with each bar consisting of 50 staples pasted together or otherwise interconnected in a readily separable way.

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As will be understood from both Figures 1 and 3, the base 2 is generally in the shape of an elongate box, being hollow and rectangular in shape, and is molded of a rigid plastic. A metal-made anvil or matrix 5 is rigidly mounted on the front end, shown directed to the left in Figures 1 and 3, of the base 2. Each staple S on being ejected from the staple magazine 3 is to be forced against the anvil 5 in order to be clinched.

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Figure 3 clearly illustrates a pair of upstanding bearing walls 6 erected on both sides of the base 2 adjacent its rear end. A pair of trunnions 7 are rigidly mounted to the

5 respective bearing walls 6 in horizontal alignment with
each other in the transverse direction of the base 2. Each
trunnion 7 extends from the associated bearing wall 6 both
laterally inwardly and outwardly of the base 2. The in-
wardly extending portions of the trunnions 7 are engaged
10 respectively in a pair of aligned holes 8, Figure 2, formed
in the rear end of the staple magazine 3, whereas the
outwardly extending portions of the trunnions are engaged
respectively in a similar pair of holes, not shown, formed
15 in the rear end of the handle 4. Thus the staple magazine
3 and the handle 4 are independently pivotable toward and
away from the base 2 about a common axis. Figure 1 shows a
base-magazine spacer spring 9 mounted between base 2 and
staple magazine 3 for normally providing a sufficient space
20 between their free front ends for the insertion of sheets
of paper or the like to be stapled.

As best shown in Figure 2, the staple magazine 3 is made
from sheet metal into the shape of an elongate box, opening
20 both upwardly and rearwardly. The bottom of the staple
magazine 3 has an eject slot 10 cut transversely in its
front end in register with the foremost one of the staple S
within the staple magazine. The staples S are to be suc-
cessively ejected from the staple magazine 3 through the
25 eject slot 10 against the anvil 5 on the base 2 in a manner
to be set forth presently.

In order to retain the bars of staples S in position within
the staple magazine 3, a pair of retainer lugs or flaps 11
30 are formed in the pair of opposed side walls 12 of the
staple magazine adjacent its front end, as shown in both
Figures 1 and 2 and in more detail in Figure 4. The pair
of retainer lugs 11 protrude from the side walls 12 of the
staple magazine 3 toward each other into overhanging rela-
35 tion to the staple bars loaded therein. These retainer
lugs are formed by cutting U-shaped incisions in the staper

magazine side walls 12 and by bending the thus-created flaps inwardly.

Further, for the same purpose, a plurality of, six in this embodiment, spaced-apart retainer bosses 13 are formed on the inside surface of each staple magazine side wall 12, as shown also in Figures 1 and 2 and in more detail in Figure 5. The retainer bosses 13 on each side wall 12 are arranged in a row extending rearwardly from the associated retainer lug 11 and terminating some distance away from the rear end of the staple magazine 3. Hemispherical in shape, the retainer bosses 13 can be readily formed by embossing. The spacing between any two adjoining ones of the retainer bosses 13, and the spacing between each retainer lug 11 and the neighboring retainer boss 13, should each be less than the length of each bar of staples.

Figure 1 shows at 14 a staple pusher slidably mounted in the staple magazine 3 for pushing the bars of staples S forwardly. As illustrated on an enlarged scale in Figure 6, the staple pusher 14 is in the shape of an inverted U as seen cross-sectionally of the staple magazine 3, having a pair of vertical front edges 15 for abutting engagement with the rearmost one of the staple bars within the staple magazine. Projecting laterally from the staple pusher 14, a pair of slide pins 16 are slidably engaged respectively in a pair of guide grooves 17, Figures 2 and 5, formed in the inside surfaces of the side walls 12 of the staple magazine 3. It will also be noted from Figures 2 and 5 that the guide grooves 17 extend under the rows of retainer bosses 13 on the staple magazine side walls 12.

Formed on the rear end of the staple pusher 14 is a hook 18 for engagement with one end of a pusher spring 19 shown in Figure 1 as a helical tension spring. The pusher spring 19 extends forwardly from the hook 18, is folded back over a

pin 20 rigidly mounted within the handle 4 adjacent its front end, and has its other end engaged with a depending hook 21 within the handle. Thus, when the handle 4 is in a closed position with respect to the staple magazine 3, as depicted in Figure 1, the pusher spring 19 biases the staple pusher 14 forwardly of the staple magazine thereby causing the pusher to push the staples S toward the eject slot 10 in the front end of the staple magazine.

Typically molded from a rigid plastic, the handle 4 is generally in the shape of an elongate box, opening both downwardly (i.e. toward the staple magazine 3) and rearwardly, but is sized slightly more than the staple magazine 3 to somewhat loosely fit thereover when the handle is depressed for staple ejection. The handle 4 has mounted therein a staple ejector 22 and a magazine-handle spacer spring 23 shown as a cantilever spring. The staple ejector 22 and handle-magazine spacer spring 23 can be a single piece of sheet metal pressfitted or otherwise mounted to the handle 4. Depending from the free end of the handle 4, the staple ejector 22 functions to expel the successive foremost ones of staples S from the staple magazine 3 through its eject slot 10 upon depression of the handle 4. The handle-magazine spacer spring 23 serves to normally provide a spacing between the free ends of the staple magazine 3 and the handle 4 as shown in Figure 1.

As seen in both Figures 1 and 5, the staple magazine 3 is formed to include a pair of laterally outward protuberances 24 at a midpoint of its longitudinal dimension. These protuberances 24 are capable of releasable engagement with appropriate means, not shown, on the inside surfaces of the pair of opposite sides of the handle 4. When the staple magazine 3 and the handle 4 are so engaged with each other, the noted magazine-handle spacer spring 23 functions to bias their free ends away from each other to the relative

positions shown in Figure 1.

In operation, for loading the bars of staples S in the staple magazine 3, the handle 4 may first be opened, that is, pivoted in a clockwise direction, as viewed in Figure 1, away from the staple magazine until the handle becomes approximately in line with the staple magazine. The pusher spring 19 will pull the staple pusher 14 to the retracted position, indicated by the dashed lines in Figure 1, within the staple magazine 3 when the handle 4 is pivoted as above to the open position. Figure 1 also indicates by the phantom outline the pusher spring 19 pulling the staple pusher 14 rearwardly upon clockwise turn of the handle 4 to the open position.

Now, between the rearmost ones of the staple retainer bosses 13 on the staple magazine 3 and the front edges 15 of the staple pusher 14, a space has been created which has a longitudinal dimension slightly more than that of each bar of staples S. The staple bars may be loaded one after another in the staple magazine 3 through the thus-created space.

The handle 4 may be turned back to the closed position following the loading of the four staple bars, until the unshown engagement means on the handle become engaged with the pair of protuberances 24 on the staple magazine 3. Then the pusher spring 19 will act to force the staple pusher 14 forwardly of the staple magazine 3, with the slide pins 16 of the staple pusher sliding along the guide grooves 17 in the staple magazine, thereby causing the staple pusher to push the staple bars into close end-to-end engagement with one another. The foremost one of the loaded staples S will then be positioned in register with the eject slot 10 at the front end of the staple magazine 3. Figure 1 represents this state. It will be appreciated

from this figure, as well as from Figures 4 and 5, that the staple bars are slidably caught under the pair of retainer lugs or flaps 11 and the rows of retainer bosses 13 thereby to be retained in alignment within the staple magazine 3.

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Sheets of paper or like penetrable material to be stapled may now be placed over the anvil 5 on the base 2. Upon depression of the handle 4 the staple magazine 3 will pivot downwardly with the handle against the force of the base-magazine spacer spring 9 into contact with the sheets. 10 With the continued depression of the handle 4 the staple ejector 22 will move into the staple magazine 3 thereby driving the foremost staple S down through the eject slot 10. The ejected staple will penetrate the sheets and, on 15 striking the anvil 5, will be thereby clinched for firmly binding the sheets together.

As the handle 4 is subsequently released, the staple magazine 3 will move with the handle away from the base 2 under 20 the bias of the base-magazine stapler spring 9, and the handle itself will travel away from the magazine under the influence of the magazine-handle spacer spring 23, with the consequent withdrawal of the staple ejector 22 from within the staple magazine 3. Being caught under the retainer 25 lugs 11 and retainer bosses 13, the staple bars will stay within the staple magazine 3 and will be fed forwardly by the spring-loaded staple pusher 14. The next staple will now be ready for ejection.

30 The hand-operated stapler 1a shown in Figures 7 and 8 by way of another embodiment of the invention is smaller in size than the stapler 1 of Figures 1-6, incorporating a staple magazine 3a capable of housing three bars of staples S in a row. The stapler 1a features a pair of retainer 35 lugs 11a employed in lieu of the pair of retainer lugs 11 of the Figures 1-6 stapler 1. The retainer lugs 11a are

formed by bending the front end portions of the side walls 12 of the staple magazine 3a toward each other so as to overhang the staple bars loaded therein. The stapler 1a can be akin in the other details of construction and operation to the stapler 1.

In Figures 9 and 10 is shown another hand-operated stapler 1b in accordance with the invention. This device can be of the same size as the known stapler designed to accommodate only one bar of staples but can be located with two staple bars. The staple retainer means of this particular embodiment consist of only four retainer bosses 13b formed in a row on the inside surface of each side wall 12 of a staple magazine 3b. The spacings between the retainer bosses 13b are less than the length of each bar of staples S.

The stapler 1b further differs from the foregoing embodiments in the way in which the loaded staple bars are sprung forwardly of the staple magazine 3b. Molded of a plastic, a staple pusher 14b has a pair of slide pins, not shown, for sliding engagement in the pair of guide grooves 17 in the side walls 12 of the staple magazine 3b. The front end 15b of the staple pusher 14b normally butts on the staple bars. A hook 18b formed on the underside of the staple pusher 14b engages one end of a pusher spring 19b. Extending rearwardly from the hook 18b, the pusher spring 19b is folded over the rear end 20b of the staple pusher 14b and extends forwardly therefrom for engagement with a hook 21b formed by bending part of the staple ejector 22. The other details of construction can be essentially similar to those set forth in conjunction with the Figures 1-6 stapler 1.

Thus, when the handle 4 is closed over the staple magazine 3b as depicted in Figure 3, the staple pusher 14b will push the staple bars forwardly of the staple magazine 3b under the force of the pusher spring 19b. When the handle 4 is

pivoted away from the staple magazine 3b, on the other hand, the pusher spring 19b will pull the staple pusher 14b rearwardly of the staple magazine, as indicated by the dashed lines in Figure 9. The staple magazine 3b can then
5 be reloaded with staple bars in the manner set forth previously.

Figure 11 illustrates a staple magazine 3c for use in the stapler 1b of Figure 9 in substitution for the staple
10 magazine 3b shown in Figure 10. The alternative staple magazine 3c features a pair of retainer ribs 11c formed by embossing on the opposed surfaces of its side walls 12. The retainer ribs 11c are located adjacent the front end of the staple magazine 3c and extend in its longitudinal
15 direction. One retainer boss 13c is shown provided rearwardly of each retainer rib 11c. The staple magazine 3c is identical in the other details of construction with the Figure 10 magazine 3b except that the former has a pair of guide slots 17c in places of the pair of guide grooves 17
20 of the latter.

Another alternative staple magazine 3d shown in Figure 12, also for use in the Figure 9 stapler 1b in substitution for the magazine 3b, is closely akin in construction to the
25 Figure 11 magazine 3c. However, in this staple magazine 3d, a pair of eyelets 13d are engaged in holes cut in the magazine side walls 12 in places of the pair of retainer bosses 13c of the Figure 11 magazine 3c. The eyelets 13d serve as the retainer means of the invention in combination
30 with the pair of retainer ribs 11c. The other details of construction can be identical with those of the staple magazine 3c.

Notwithstanding the foregoing detailed disclosure it is not
35 desired that the invention be limited by the exact details of the illustrated embodiments. For the staple retainer

means suggested by the invention may take in practice a variety of forms other than those disclosed herein. For instance, the staple bars may be retained in position by protuberances or overhangs of columnar, rectangular or various other shapes may be formed on the opposed inside surfaces of the staple magazine. Further such protuberances or overhangs may either be integral parts of the staple magazine or may be separate units that have been attached to the staple magazine by rivetting, welding or any other known or suitable means.

It is also understood that the staple retainer means of the invention find use in various types of staplers in addition to those disclosed herein. For example, the staple pusher may be biased forwardly of the staple magazine by a compression spring, instead of by a tension spring as in the above disclosed embodiments. It is not a requirement, either, that the base, the staple magazine and the handle should pivot with respect to one another about a common axis; instead, the three members may be pivotally interconnected in various different ways known heretofore.

CLAIMS

1. A hand-operated stapler capable of holding a plurality of staple bars in alignment with one another, comprising an elongate base having an anvil adjacent a forward end thereof, an elongate staple magazine for holding therein a plurality of bar-shaped units of interconnected staples in a row, the staple magazine having a rear end pivoted on a rear end of the base and having an open side directed away from the base to permit the loading of the staple bars, a staple pusher disposed within the magazine slidably along an elongated guide means extending in the longitudinal direction of the magazine, spring means for urging the staple pusher and therefore the staple units from the rear end of the magazine toward a forward end thereof, and an elongate handle having a rear end pivoted on the rear end of the base and having a staple ejector on a forward end thereof for ejecting successive staples out of the forward end of the staple magazine against the anvil on the base, wherein the staple magazine and the handle are independently pivotable toward and away from the base:

characterised in that said elongated guide means are provided in a rearward longitudinal extent of the magazine excluding a forward longitudinal extent adjacent a forward end of the magazine, and first staple retainer means is provided in said forward longitudinal extent on each of the inner side surfaces of the magazine for preventing the units of the staples from floating within the staple magazine;

that second staple retainer means is provided in said rearward longitudinal extent on each of the inner side surfaces of the magazine for preventing the units of the staples from floating within the staple magazine, said second staple retainer means being a



spot protrusion formed adjacent said elongated guide means and being aligned with said first staple retainer means in relation to the longitudinal axis of the magazine; and

5 that a space of a longitudinal dimension more than that of each unit of the staples is provided between the or a rearmost spot protrusion of the second retainer means and a forward edge of the staple pusher in a most retracted position.

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2. A hand-operated stapler is claimed in claim 1, characterised in that said elongated guide means are guide grooves.

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3. A hand-operated stapler as claimed in claim 1, characterised in that said elongated guide means are guide slots.

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4. A hand-operated stapler as claimed in claim 1, characterised in that said first staple retainer means is a retainer lug formed by bending a part of the side wall of the staple magazine inwardly so as to overlies the units of the staples loaded therein.

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5. A hand-operated stapler as claimed in claim 1, characterised in that said first staple retainer means is a retainer rib projecting inwardly from the side wall of the staple magazine so as to overlies the units of the staples loaded therein in the magazine.

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6. A hand-operated stapler as claimed in claim 1, characterised in that said first staple retainer means is a row of retainer bosses projecting inwardly from the side wall of the staple magazine to overlies the units of the staples loaded in the magazine.

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7. A hand-operated stapler as claimed in claim 1, characterised in that said second staple retainer means is a row of retainer bosses projecting inwardly from the said wall of the staple magazine so as to overlie the units of the staples loaded in the magazine.

8. A hand-operated stapler as claimed in claim 1, characterised in that said second staple retainer means is a single retainer boss projecting inwardly from the side wall of the staple magazine so as to overlie a unit of the staples loaded in the magazine.

9. A hand-operated stapler as claimed in claim 1, characterised in that said second staple retainer means is a single retainer eyelet projecting inwardly from the side wall of the staple magazine so as to overlie a unit of the staples loaded in the magazine.

10. A hand-operated stapler substantially as described herein with reference to and as illustrated in Figures 1-6 of the accompanying drawings.

11. A hand-operated stapler substantially as described herein with reference to and as illustrated in Figures 7 and 8 of the accompanying drawings.

12. A hand-operated stapler substantially as described herein with reference to and as illustrated in Figures 9-12 of the accompanying drawings.
