

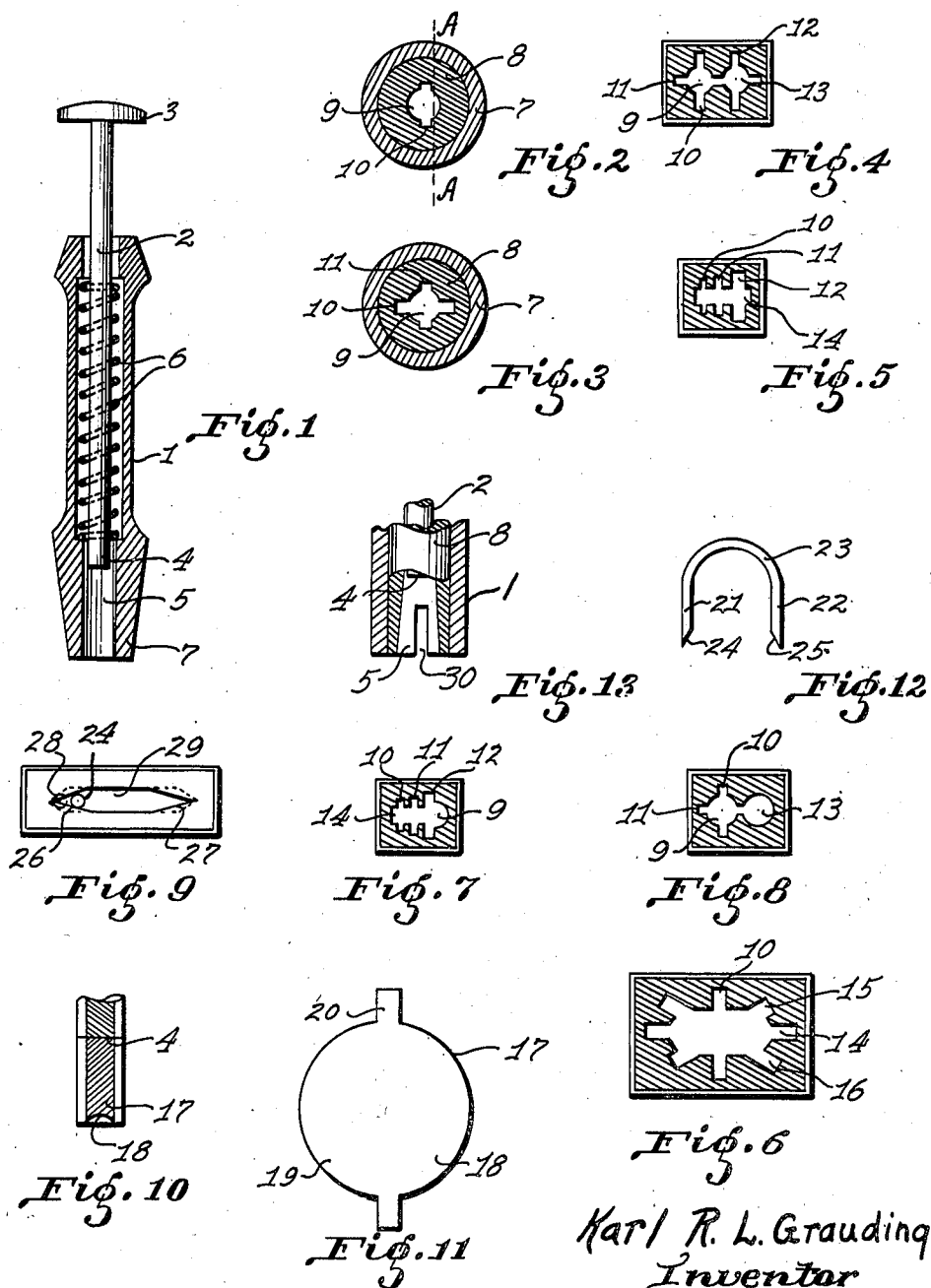
Sept. 28, 1943.

K. R. L. GRAUDING

2,330,575

TOOL

Filed May 3, 1941



Karl R. L. Grauding
Inventor

by *Albion*
Attorney

UNITED STATES PATENT OFFICE

2,330,575

TOOL

Karl Richard Leopold Grauding, Stuttgart, Germany; vested in the Alien Property Custodian

Application May 3, 1941, Serial No. 391,781
In Germany April 10, 1940

5 Claims. (Cl. 1—50)

The present invention relates to machines and tools for driving staples, nails or similar fastening means into bases of various kinds, such as walls and other surfaces, or for securing together various kinds of materials.

Tools of this general type have been known and used, for example, for stapling together sheets of paper or cardboard, especially in the art of book binding or in the production of folding boxes, cartons and the like. Essentially, these known tools consist of a housing, a punching element movable in longitudinal direction within the housing for driving a staple or other fastening element into a base, and channel-like means for enclosing and guiding the staple substantially along all sides during the punching process.

Since for accurate operation, the cross-sectional size and shape of such guiding surfaces must correspond rather exactly to the cross-sectional size and shape of the fastening means, a tool of this known type can only be used with the same particular type and size of fastening means for which the tool has been built. However, in many lines of trade and industry different kinds of fastening means are required and it has then always been necessary to provide a separate tool for each kind and each size of fastening means.

It is the object of the present invention to provide a tool of the general type described above which is adapted to accommodate and work upon fastening means of various kinds and sizes.

According to the invention, it has been found not to be absolutely necessary to guide the fastening means along all sides, but to be sufficient to guide, for example, staples or cramps along their parallel shanks and to prevent the punching element from sliding off the central portion connecting the two shanks.

For attaining this object, the present invention provides a punching tool with a plurality of channels having parallel axes and at least partially extending through one another for accommodating and guiding fastening elements of different kinds and sizes.

Another feature of the invention is a punching element the cross-sectional area of which corresponds to the total cross-sectional area of the guiding channels and which has in its driving end recesses corresponding to the cross-section of the individual channels and cooperating with said channels for guiding the respective fastening elements. Preferably, as will be later described in detail, the depth of these recesses in the driving

face of the punching element increases towards their centre.

The new tool is especially adapted for staples or cramps, the central portion of which is of round or oval shape instead of being bent sharply at a right angle to the shanks.

In driving a wire cramp into a piece of material, the punching member produces a certain spreading effect upon the shanks pressing the same tightly against the walls of the guiding channel, thereby causing considerable friction along said walls and thus requiring a great deal of force for driving a cramp or staple even into a soft material.

In order to avoid this disadvantage, according to the invention the width of the guiding channels increases slightly but gradually towards their ejecting end. In longitudinal section these channels are therefore of a trapezoidal shape deviating only slightly from a rectangle.

A further improvement of the guiding effect and a greater adaptability of the tool to cramps or staples of slightly different size and shape in one and the same guiding channel may be obtained according to the invention by tapering the cross-section of the guiding channel slightly and gradually toward the ejecting end thereof. Thus, if cramps made of a wire of slightly less thickness than that for which the guiding channel was originally intended are used, the above-mentioned spreading action exerted upon them while they are driven into a base presses them tightly against the walls of the channel so that they are safely guided thereby.

It has been found of great advantage to apply both of the above-mentioned improvements at the same time. In such a case it is, however, not necessary to increase the total cross-section in its longitudinal direction, but it is sufficient to flare or widen the taper toward the ejecting end. The effective cross-section of the channel for a given thickness of the shanks of the fastening element is thus widened.

Still another object of the invention resides in making the driving end of the punching member of magnetic material or in magnetizing said end portion so that the fastening element will cling to the punching member and not fall off when in manipulating the tool the latter is placed in various positions.

These as well as further objects, features, and advantages of the present invention will appear from the following detailed description and the accompanying drawing showing various embodiments of the invention, in which

Fig. 1 shows a vertical section through a nailing or stapling tool of a construction substantially as known in the art;

Figs. 2 to 9 are cross-sections through the lower end of the housing shown in Fig. 1 and further showing various modifications of the invention;

Fig. 10 is a vertical section through the lower end of a punching member according to the invention;

Fig. 11 is an enlarged view of the punching member according to Fig. 10 seen from below;

Fig. 12 shows one preferred form of a cramp or staple according to the invention;

Fig. 13 is a cross section of the lower or operating end of the punch, the flare of the channel therein being exaggerated.

As shown in Fig. 1, the nailing or stapling apparatus according to the invention consists of a housing 1 accommodating a punching member 2, so as to be slidable therein. The upper end of the punching member 2 carries a head 3 upon which a force may be exerted in downward direction either by hand or a hammer or similar tool. At its lower end 4 the punching member 2 penetrates into a channel 5 which is suitably designed so as to hold and guide for example a nail or pin. An aperture within the housing 1 accommodates a spring 6 acting in a known manner at the lower end upon the housing 1 and at the upper end upon a collar on the punching member 2 to force the latter normally into an upward position. The lower portion of the housing in which the channel 5 is provided is identified in the drawing by the reference numeral 7.

Figs. 2 to 8 show various combinations of two or more guiding channels according to the invention. According to Figs. 2 and 3, the lower portion 7 of the housing 1 is provided with a special insert 8 forming the surrounding walls of the guiding channels. If desirable, this insert 8 as well as the lower end 4 of the punching member 2 may be exchangeable. The different channels partly penetrating one another are indicated in Figs. 2 to 8 by the numerals 9 to 16, the channels 9 and 13 being of circular cross-section for accommodating pins, nails or the like, and the channels 10 to 12 and 14 to 16 being of substantially rectangular shape for guiding staples, cramps, hooks or the like.

Fig. 2 shows the combination of a channel 9 of circular cross-section with a coaxial channel 10 of rectangular cross-section.

Fig. 3 shows two coaxial channels 10 and 11 crossing each other at right angles, the point of intersection being enlarged to form a circular channel 9.

Fig. 4 shows two rectangular channels 10 and 12 lying parallel to one another and being crossed by a third rectangular channel 11. In this embodiment the points of intersection are likewise enlarged to form circular channels 9 and 13.

Fig. 5 only discloses rectangular channels 10, 11, 12 and 14, for guiding cramps, staples, hooks and the like, the three channels 10, 11 and 12 being parallel to one another and crossed at a right angle by the fourth channel 14.

Although in the previously described embodiments of the invention, the rectangular channels always cross each other at right angles, it is also possible as shown in Fig. 6 to arrange the channels at any other angles relative to each other. In such a manner, the space provided may be better utilized and also the cross-sectional area of the punching element corresponding in

shape to that of the sum of the channels 10, 14, 15 and 16 as shown in Fig. 6 will be more compact and the punching element itself will be considerably stronger.

Figs. 7 and 8 show two other possibilities of combining the various channels. In these two cases, the circular channel 9 of Fig. 7 and the oval channel 13 of Fig. 8 are located eccentrically relative to the points of intersection of two or more rectangular channels.

Fig. 9 illustrates a modification of the invention for guiding cramps, staples, hooks and the like, and for this purpose only shows a single channel, although obviously a plurality of such channels may be provided or one or more channels of this type may be combined with other types of channels as shown in Figs. 2 to 8. In this embodiment according to Fig. 9, the lateral ends of the channel 29 are tapered off to form points 26 and 27; the tapering may either be gradual or in steps. At or near its upper end, the channel 29 may have the shape shown in Fig. 9 in full lines, and at its lower end that shown in dotted lines.

Although the longitudinal axis of the cross-section of the channel 29 remained of the same length, the widening of the tapered ends 26 and 27 results in an increase in width of the effective cross-section of the channel. Thus, the shank 21 of a cramp or staple could at the lower end of the channel 29 assume the position 28 shown in dotted lines.

If the cross-sectional shape of the punching member 2 or the driving end portion thereof corresponds exactly to the cross-sectional shape of the channel at its upper end, the cramp or the like will be guided sufficiently also at the lower end of the channel so that the punching member cannot slide off the cramp and shear off the shanks. The total length of the cross-section of the channel may even be somewhat reduced toward the ejecting end and an increase of the effective cross-section may still be obtained by the widening. In such a case, the respective fastening element may be guided with great accuracy.

Fig. 10 shows a vertical section through the lower end of a punching member for a tool according to Fig. 2 in which the line A-A indicates the position along which the section has been taken. The lower end 4 of the punching member is provided with a special portion 17 secured thereto in any suitable manner and consisting of magnetic material, such as steel or a highly magnetic alloy. The lower end of the portion 17 may be provided with a recess 18 which also acts as a guiding means of the upper end of the cramp or the like. As shown in Fig. 10, this recess 18 may be of curved shape for accommodating the semicircular or oval head of a cramp or staple.

Fig. 11 shows an enlarged bottom view of the end portion 17 of Fig. 10. It will be seen that the recess 18 consists of a circular portion 19 and a rectangular portion 20 corresponding respectively to the channels 9 and 10 of Fig. 2.

Fig. 12 shows on an enlarged scale a cramp or staple as preferably used in a tool according to the invention. The two shanks 21 and 22 are connected by a bow-shaped central portion 23, whereas the ends of the shanks are sharpened to form tapered surfaces 24 and 25. The position of these tapered surfaces relative to each other controls the direction in which the shanks will be driven into a base. In the embodiment shown,

in Fig. 12, the ends of the shanks will be forced outwardly and rolled or bent to form an arc or spiral. In this manner, the cramps will be secured very strongly within the respective base.

For facilitating the operation of the tool, viewing slots 30 may be provided in the ejecting end of the channel 5, as indicated in Fig. 13. While the tool may have its housing 1 integrally carrying various arrangements of guide portions, guide carrying inserts may be provided as shown in Figs. 2 and 3 thereby enhancing the value of the tool. The staple ejecting end may be circular or polygonal, especially wherein certain openings in a piece of work might be encountered, making a particular tool peripheral pattern more desirable.

Although I have described and shown various embodiments of the invention, it is obvious that the same is susceptible of many other modifications and improvements, and, therefore, I do not want to be limited as to the scope of this invention except as defined by the appended claims.

I claim:

1. A tool for driving various types of fastening elements into a base, comprising means forming a channel for guiding the fastening elements, and a punching element adapted to drive said fastening elements through and out of said channel and into a base, said channel means consisting of a

plurality of interconnected channels having parallel axes and adapted to accommodate fastening elements of different type or size, the driving end of said punching member having a cross-section corresponding to the total cross-sectional area of said channels, and there being at least one channel which flares slightly and gradually toward its ejecting end.

2. A tool according to claim 1, in which the cross-section of at least one of the channels is tapering toward the lateral ends thereof.

3. A tool according to claim 1, in which the longitudinal section of at least one of the channels for guiding the fastening elements increases in width slightly and gradually toward the ejecting end, and in which the cross-section of at least one of the channels is tapering toward the lateral ends thereof.

4. A tool according to claim 1, in which the punching member has in its driving end at least one recess corresponding to the cross-section of the head of a fastening element and cooperating with at least one of said channels for guiding said fastening elements.

5. A tool according to claim 1, in which viewing slots are provided in the ejecting end of the channel.

KARL RICHARD LEOPOLD GRAUDING.