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S. L. GOOKIN

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PUNCHING AND FASTENER INSERTING APPARATUS

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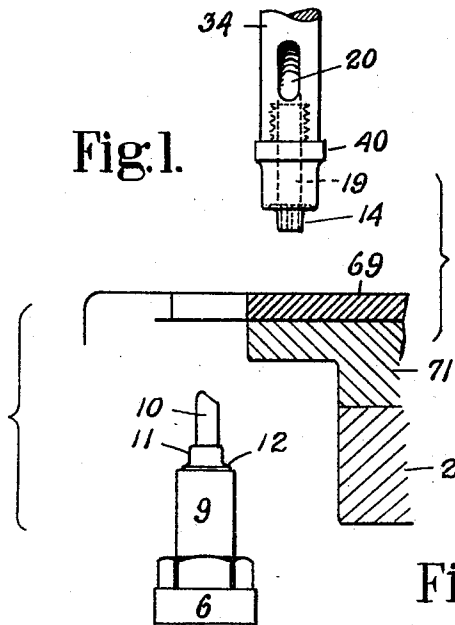


Fig. 1.

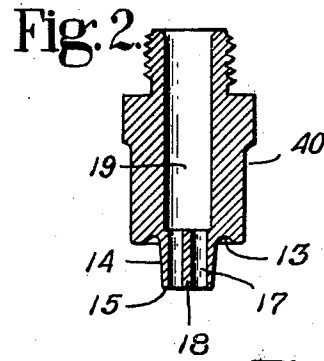


Fig. 2.

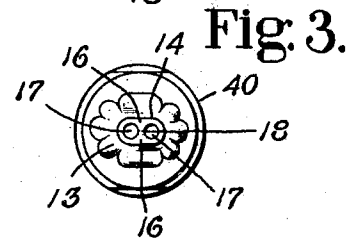


Fig. 3.

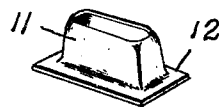


Fig. 4.

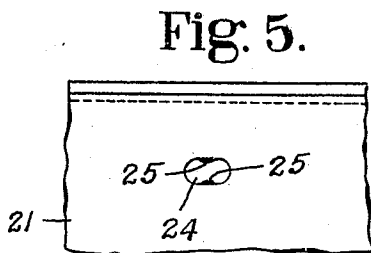


Fig. 5.

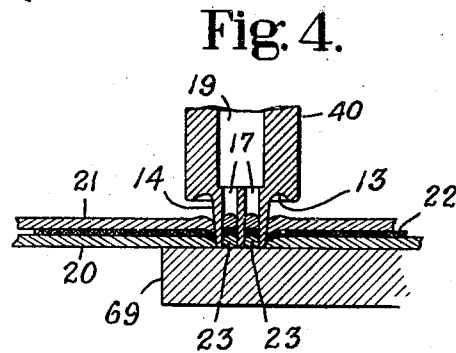


Fig. 6.

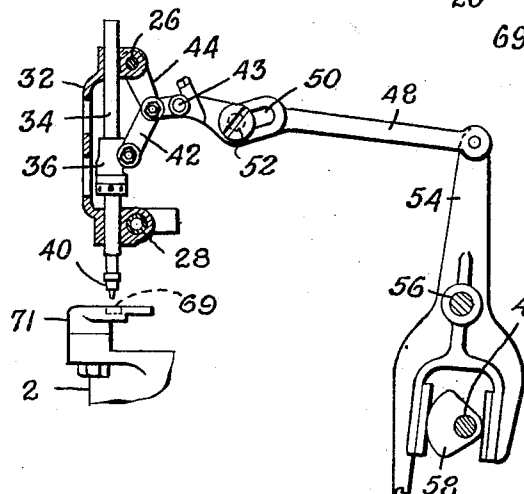


Fig. 7.

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PUNCHING AND FASTENER-INSERTING APPARATUS

Application filed August 3, 1928. Serial No. 297,197.

This invention relates to fastener-inserting machines, and more especially to punching tools used therein. The invention is herein illustrated as embodied in a fastener-inserting machine of the type commonly employed to punch holes in shoe uppers and insert eyelets therein.

It is common, in eyelet-inserting machines that punch holes in the work for the reception of the eyelets, to form a punch on one of the setting tools. Furthermore, when a punching and setting tool is used in a machine that feeds the work it is common to use that tool to impart the feeding movements to the work. In such cases, and for certain kinds of work, the most satisfactory results are obtained with a hollow or tubular blunt-edged punch and a solid, flat, hardened steel punch-bed or work-support, since the tubular form of the punch provides a duct for the chips or punchings of waste material, while the solid flat punch-bed solves certain problems that arise from shifting the punch laterally to feed the work. This type of punching means has proved to be satisfactory when the punch is circular in cross-section as required by circular eyelets, but experience has demonstrated that tubular punches of non-circular cross-section, as heretofore made to meet the requirements of non-circular eyelets, are not strong enough to withstand the punching pressure. Constant breaking of such non-circular punches has resulted in serious losses both in tools and in production of eyeleted work.

In efforts that have been made to overcome punch breakage solid punches have been tried but they too have broken. Their breaking is accounted for by the fact that a solid punch provides no duct for the escape of the waste material and requires a much heavier pressure against a solid punch-bed to punch the holes.

In view of the difficulties above set forth, an object of the present invention is to provide an improved tubular punch of non-circular cross-section adapted to cooperate with a solid flat punch-bed without breaking. Accordingly, the invention consists, broadly, in providing the walls of a tubular punch of

non-circular cross-section with longitudinal reinforcing portions extending to the punching or cutting end of the punch to sustain the punching stresses to which that end of the punch is subjected by cooperation with a solid punch-bed. Preferably, the walls of the punch are provided with internal reinforcing ribs extending longitudinally of the punch.

In the illustrated example a punching and clenching tool is provided with an oblong clenching surface and with a tubular punch of oblong cross-section projecting therefrom, the reinforcing ribs of the punch being formed on the two major walls, since these walls, because of their greater dimension, have greater need of reinforcement than the minor walls. Moreover, as illustrated, additional reinforcement is provided by a transverse web connecting a reinforcing rib on one major wall with a reinforcing rib on the other major wall. For economy of manufacture, the illustrated construction is preferably produced by boring a plurality of individual circular chip-ducts longitudinally through the punch, since such boring in a non-circular punch results not only in forming reinforcing ribs but also in providing a reinforcing web to connect them.

Referring to the drawings,

Fig. 1, partly in front elevation and partly in section, shows two cooperative fastener-inserting tools and a flat solid punch-bed of an eyelet-inserting machine;

Fig. 2 is a vertical section, on a larger scale, of the upper fastener-inserting tool shown in Fig. 1;

Fig. 3 is a bottom plan view of the tool shown in Fig. 2;

Fig. 4 is a vertical section showing the upper one of said tools as having punched a hole in a part of a shoe upper for the reception of an eyelet;

Fig. 5 is a plan view of a portion of a part of a shoe upper in which a hole has been punched by the upper tool;

Fig. 6 is a perspective view of an eyelet the barrel of which is oblong in cross-section; and

Fig. 7 is an elevation, partly in vertical sec-

tion, of the punching mechanism of the eyelet-inserting machine.

The construction shown in Fig. 7 is substantially like the corresponding mechanism of the machine more fully shown and described in United States Letters Patent No. 1,228,768, granted June 5, 1917, on application of P. R. Glass. The reference numerals used therein are also used in the present application to identify corresponding parts. So far as the construction shown in said Letters Patent is reproduced in the present application, it comprises the following elements: a stationary frame 2, a work support 71 fixed to said frame, a flat solid punch-bed 69 of hardened steel, mortised into and forming a part of the work support, a rotary operating shaft 4 journaled in bearings in the frame 2, a cam 58 carried by said shaft, a lever 54 operated by said cam, a fulcrum 56 about which said lever oscillates, a link 48 by which the motions of said lever are communicated to toggle members 42 and 44, pivotal means 43 connecting said link and said toggle members, a slot 50 formed in the link 48, and a guiding stud 52 extending through the slot 50 and into a portion of the frame 2 to brace the link against lateral displacement. The illustrated construction, like the machine disclosed in the Letters Patent referred to, also includes a horizontally movable feed-carriage 32, parallel rods 26 and 28 by which the movements of said carriage are guided, a vertically movable plunger 34 arranged to slide in bearings in the carriage 32, and a collar 36 forming an operating connection between the toggle members and the plunger. A vertically movable plunger 6 and an eyelet-inserting tool 9 (Fig. 1) are, to all intents and purposes identical with the corresponding plunger and eyelet-inserting tool shown in said Letters Patent except that the tool 9 shown in this application is designed to insert a non-circular eyelet such as that illustrated in Fig. 6, rather than a circular eyelet. As in the machine referred to, the tool 9 is provided with a spring-pressed spindle 10 adapted to pick an eyelet from a raceway (not shown) and to yield under conditions commonly encountered in machines of this type.

The problems with which the present invention is concerned have to do with tubular fasteners of non-circular cross-section, and although these problems are not limited to any one shape of cross-section, an oblong cross-section is suitable as an example for purposes of description. The invention will therefore be described with particular reference to the fastener shown in Figs. 1 and 6, which is an eyelet having a rectangular barrel 11 of oblong cross-section and having a flange 12. The spindle 10 of the inserting tool 9 has an oblong cross-section to prevent turning movement of the eyelet so that the

position of the eyelet relative to the article of work into which it is to be inserted will be positively controlled.

A hardened steel punching and clenching tool 40 is screwed into the lower end of the plunger 34. The tool 40 is provided with a non-circular fastener-clenching surface 13 formed with scallops or corrugations, as illustrated in Fig. 4, and with a tubular punch or projection 14 protruding from said surface. The punching or cutting end 15 of the punch cooperates with the punch-bed 69 to punch a fastener-receiving hole in an article of work such, for example, as a shoe upper, as illustrated in Fig. 4, the portion 20 of the upper being provided with an inner facing or lining 21 of leather and an interposed eyelet-stay 22 of woven fabric.

The perimeter of the punch 14 has an oblong shape as illustrated in Fig. 3, but it tapers slightly from the clenching surface 13 to its punching end 15 so that the latter may readily enter the barrel as the tool 9 rises to insert the eyelet into the article of work through which the punch has penetrated. The punch 14 is tubular to enable it to penetrate the work readily and to provide for conducting the chips or punchings away from the punching locality. To insure sufficient strength of the punch, particularly at its punching end which is commonly more susceptible to breakage than any other part of the punch, the latter is provided with longitudinal reinforcing ribs 16. These ribs, in a punch of the shape shown, are preferably formed on the flat walls that provide the major dimension of the oblong shape, and they extend to its punching end 15. The walls of the punch taper in thickness toward the end 15 but are blunt at that end to insure durability consistent with the conditions encountered in cooperating with a solid punch-bed of hardened steel.

When, as shown, the punch is oblong, a tubular form may best be obtained by boring a plurality of circular chip-ducts 17 there-through. As a result of this process of manufacture the reinforcing ribs 16 are formed on the interior of the major walls, so that the effective shape of the punch is not altered thereby. At the same time, additional reinforcement of the punch is provided as a result of spacing the chip-ducts 17 far enough apart to leave a web 18 between them. As shown in Fig. 3 the web 18 connects the two reinforcing ribs 16 so that the major walls of the punch brace each other. In operation, the web 18 divides the waste material into chips 23 some of which are forced through one duct 17 while the others are forced through the other duct. The material initially engaged by the end face of the punch flows laterally as penetration of the punch progresses, the pressure of the punch against the punch-bed being sufficient to force some of the com-

pressed material into the ducts 17 and the rest outwardly beyond the perimeter of the punch.

As shown in Fig. 3, the walls of minor dimension of the punch 14 are curved to give an elliptical shape to the perimeter of the punch. By reason of this shape and by reason of the generally elliptical shape of the clenching surface 13 of the tool 40 the latter is adapted to operate not only on rectangular eyelets like the one shown in Fig. 6 but also on eyelets provided with elliptical barrels. When the tool 40 cooperates with a solid flat punch-bed, as shown in Fig. 4, it punches a single oblong hole 24 in the work (see Fig. 5), and the punchings 23 of waste material are conducted by the relatively small ducts 17 to a relatively large duct 19 in the body of the tool by which they are led to a discharge opening 20 in the plunger 34.

The punch 14 derives great durability from the reinforcing ribs 15 and from the connecting web 18. The greater part of the material encountered by these portions is forced into the ducts 17 by the force of compression as the punch penetrates the work, and although the ribs 16 frequently leave fins 25 (Fig. 5) of unsevered material in the punched holes these fins are so thin and so nearly disintegrated by the punch and the punch-bed that they do not appreciably obstruct the insertion of the eyelets and do not produce any noticeable effect on the eyeleted work.

In operation, the tool 40 is initially raised and out of register with the tool 9 but in register with the punch-bed 69 as shown in Fig. 1. The plunger 34 descends to cause the punch 14 to cooperate with the punch-bed as shown in Fig. 4, and after the completion of the punching stroke the pressure of the punch against the punch-bed is relieved and the feed-carriage 32 is operated to shift the tool 40 from right to left until that tool is in register with the tool 9. In the meantime, as the tool 9 rises, the spindle 10 takes an eyelet from the raceway, the raceway is retracted, and the tool 9 inserts the eyelet and clenches the barrel thereof against the surface 13 of the tool 40. Thereupon, the plunger 34 rises and the plunger 6 descends, a return motion of the feed-carriage 32 occurring when the plunger 34 is at or near its uppermost position to place the punch 40 once more in register with the punch-bed 69.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. A punching and clenching tool for fastener-inserting machines, provided with a clenching surface and a tubular punching projection protruding from said surface, said projection being provided with reinforcing ribs extending longitudinally thereof.

2. A punching and clenching tool for fastener-inserting machines, provided with a clenching surface and a tubular punch projecting from said surface, said punch being provided with a reinforcing web connecting its walls to brace them.

3. A punching and clenching tool for fastener-inserting machines, provided with an oblong clenching surface and a tubular punch of oblong cross-section projecting from said surface, the major walls of said punch being flat and having internal reinforcing ribs extending longitudinally of the punch.

4. A punching and clenching tool for fastener-inserting machines, provided with an oblong clenching surface and a tubular punch of oblong cross-section projecting from said surface, said punch being provided with a web connecting and reinforcing the major walls thereof.

5. A punching and clenching tool for fastener-inserting machines, provided with a clenching surface and a tubular punch projecting from said surface, said punch being provided with internal reinforcing ribs and a reinforcing web connecting them.

6. A tubular punch having relatively thin portions and relatively thick portions formed by reinforcing ribs extending longitudinally to its punching end to reinforce that end against the punching stresses encountered in cooperating with a solid punch-bed.

7. A tubular punch of oblong cross-section the major walls of which are provided with reinforcing ribs extending longitudinally to its punching end whereby said major walls are reinforced at said end against the punching stresses encountered in cooperating with a solid punch-bed.

8. A tubular punch of oblong cross-section provided with a pair of individual chip-ducts side by side and with a reinforcing web connecting opposite walls of the punch between said chip-ducts.

9. A blunt tubular punch of oblong cross-section provided with a plurality of individual chip-ducts, reinforcing ribs extending longitudinally to sustain the punching stresses encountered in cooperating with a solid flat punch-bed, and a reinforcing web connecting opposite walls of the punch between contiguous chip-ducts.

10. A punching machine comprising, in combination, a solid flat punch-bed, a blunt tubular punch arranged to cooperate therewith, and mechanism arranged to effect relative punching movement of said punch and said punch-bed, said punch having a non-circular perimeter and one or more circular chip-ducts.

11. A punching and clenching tool for fastener-inserting machines, provided with a non-circular fastener-clenching surface, and a blunt tubular punch projecting there-

from, said punch having a non-circular perimeter and longitudinally extending reinforcing ribs to sustain the punching stress against a solid punch-bed.

12. A punching and clenching tool for fastener-inserting machines, provided with a non-circular fastener-clenching surface, and a blunt tubular punch projecting therefrom, said punch having a non-circular perimeter and a circular chip-duct whereby the punch is provided with one or more longitudinally extending reinforcing ribs.

13. A punching and clenching tool for fastener-inserting machines, provided with a non-circular fastener-clenching surface, and a blunt tubular punch projecting therefrom, said punch having a non-circular perimeter and a plurality of individual chip-ducts side by side.

14. A punching and clenching tool for fastener-inserting machines, provided with a non-circular fastener-clenching surface, and a non-circular punch projecting therefrom, said punch having a plurality of circular chip-ducts extending longitudinally there-through.

15. A punching and clenching tool for fastener-inserting machines, provided with a surface formed to upset and clench a tubular fastener of oblong cross-section, and a punch of oblong cross-section projecting from said surface, said punch having a plurality of individual ducts extending longitudinally therethrough to receive and conduct chips punched from the work.

16. A tool for use in fastener-inserting machines, provided with a body portion and a punch, said punch being non-circular in cross-section and having a plurality of relatively small ducts extending longitudinally therethrough to conduct chips punched from the work, and said body portion having one relatively large duct communicating with each of said small ducts to receive the chips from the latter.

17. A punching and clenching tool for fastener-inserting machines, provided with a hollow body portion having a surface formed to upset and clench a tubular fastener of non-circular cross-section and a punch of similar non-circular cross-section projecting from said surface, said punch having a plurality of individual chip-ducts arranged side by side and separated by a web connecting and reinforcing the outer walls of the punch, and said body portion having a relatively large duct arranged to receive the chips from the first said ducts.

18. A fastener-inserting machine comprising, in combination, a solid flat punch-bed, a blunt tubular punch arranged to cooperate therewith to make a fastener-receiving hole in an article of work, mechanism arranged to operate said punch, and mechanism arranged to insert a fastener in said

hole, said punch having reinforcing ribs extending longitudinally thereof to its punching end.

19. A fastener-inserting machine comprising, in combination, a solid punch-bed, a tubular punch arranged to cooperate therewith to make a fastener receiving hole in an article of work, said punch being provided with reinforcing ribs extending longitudinally thereof to its punching end to sustain the punching stresses, mechanism for operating said punch, and means arranged to insert a fastener in the hole made by said punch.

In testimony whereof I have signed my name to this specification.

SYLVESTER L. GOOKIN.