United States Patent [19]

Elder et al.

[11] **3,823,596**

[45] **July 16, 1974**

[54] **METHOD OF PRODUCING LOCK KEY BLANKS**

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[73] Assignee: **Schlage Lock Company**, San Francisco, Calif.

[22] Filed: **Jan. 26, 1973**

[21] Appl. No.: **326,827**

[52] **U.S. Cl.** ..... **72/324**, 76/110, 113/116 BB, 113/116 V

[51] **Int. Cl.** **G01f 23/02**

[58] **Field of Search** ..... 76/110; 29/557, 180 A, 29/193.5, DIG. 20, DIG. 37; 113/116 V, 116 BB; 72/414, 404, 324, 326, 329, 332, 336, 337, 329; 90/13.05

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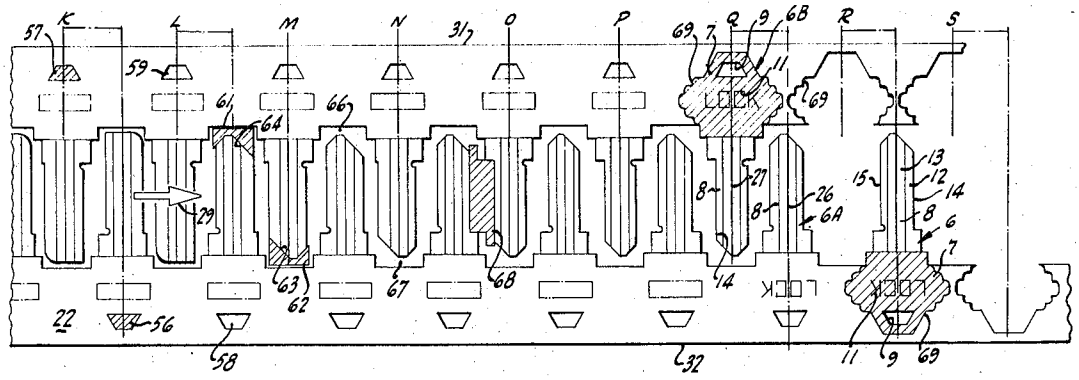
[57] **ABSTRACT**

Lock key blanks are produced from an elongated strip of key material having a width at least as great as the length of a transversely extending key pair arranged with their shanks overlapping longitudinally of the strip and arranged with their bows alternately disposed adjacent opposite edges of the strip. Production is accomplished by performing simultaneously in time and successively in the length of the strip certain forming and cutting operations shaping and removing from the strip different areas defining fractional parts of the boundaries of the key pair, also performing operations coining and grooving the potential key pair, and finally performing cutting operations severing the boundaries of portions remaining integral with the strip to free fully formed, separate key pair blanks from the strip.

4 Claims, 4 Drawing Figures



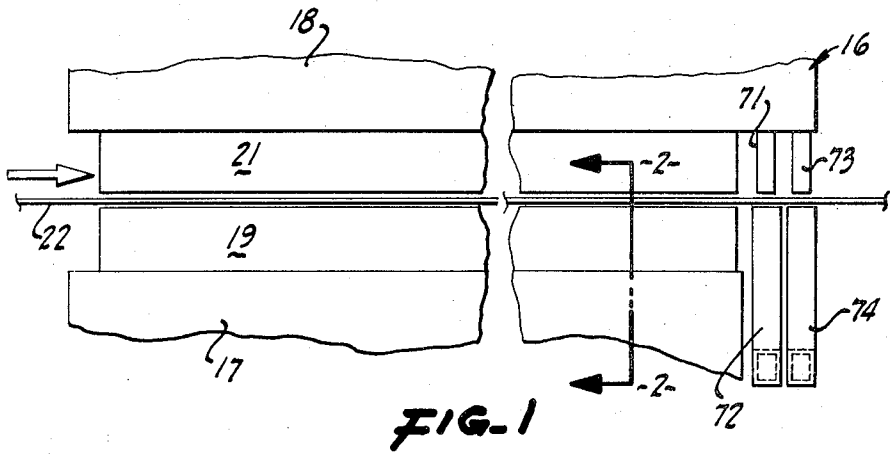


FIG. 1

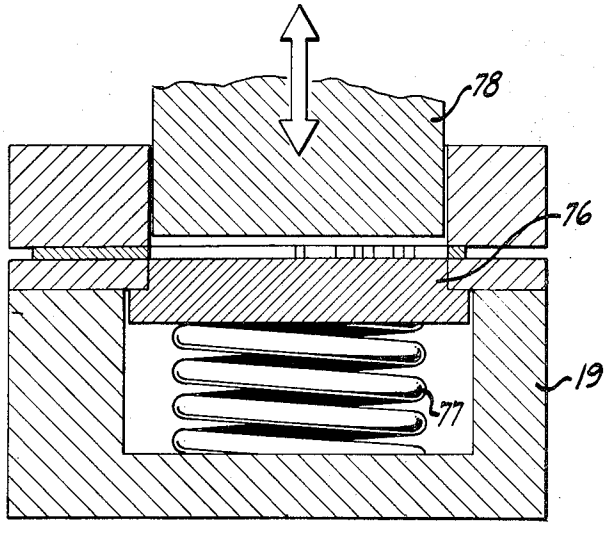


FIG. 2

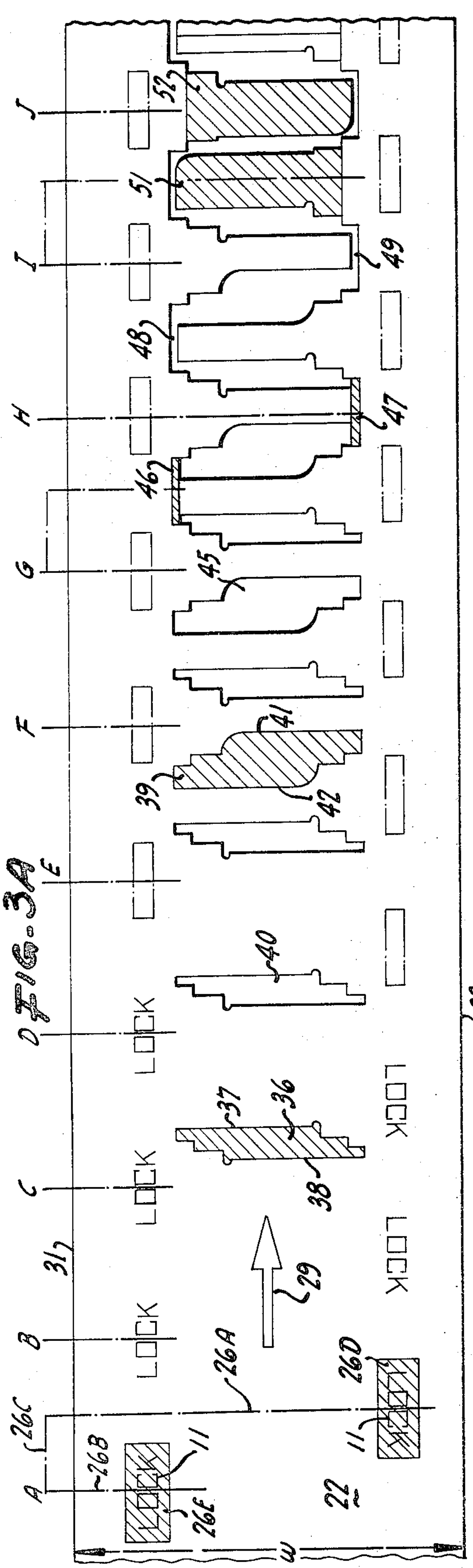


FIG. 3A

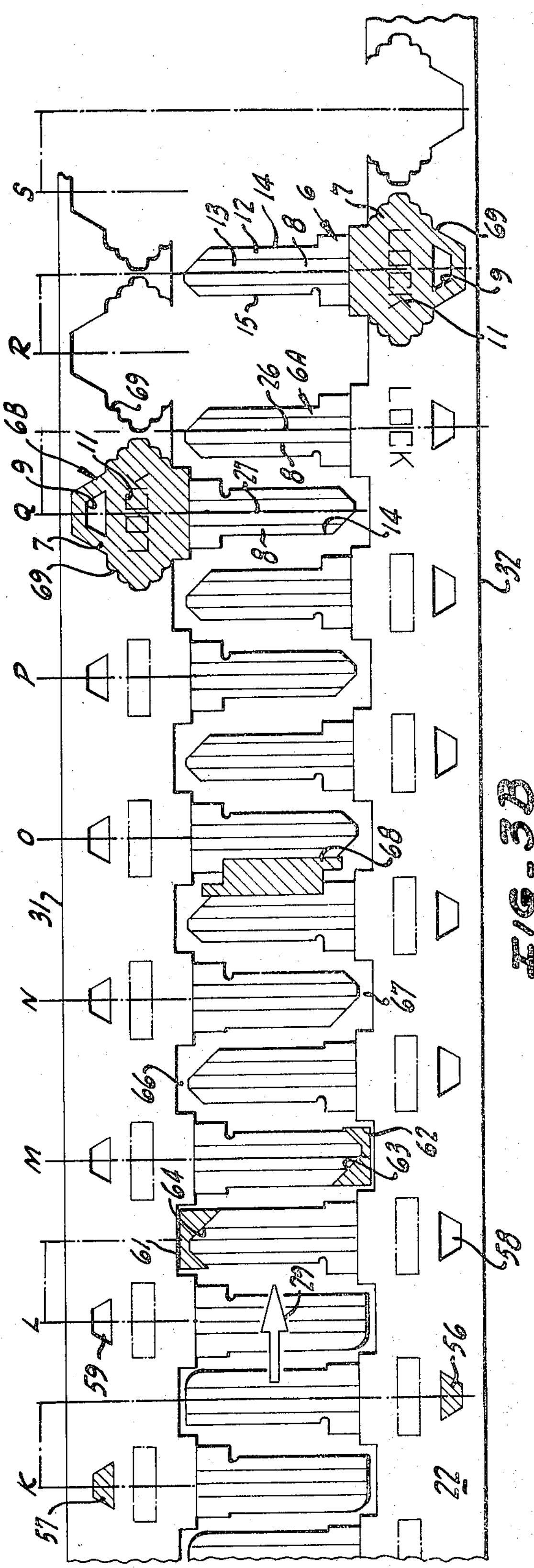


FIG. 3B

METHOD OF PRODUCING LOCK KEY BLANKS

In the quantity production of locks such as building locks, operable by means of keys, usually metallic keys, it is necessary to provide a large number of lock keys all having the same or generally similar bow and shank outline configuration and having a selected cross-section in the shank portions thereof. The shanks are serrated, bitted along an edge to engage and actuate related locks. It is usually desirable to perform the bitting step separately, but it is helpful to make the key blanks (the keys without bitting) in large quantities. It is customary to provide the shank cross-section, usually a family of grooves and ridges running longitudinally of the key, by some sort of metal chip cutting, such as milling or the like. It is advantageous to provide the desired cross-sectional shank contour without the necessity of removing substantial material therefrom and particularly without chip cutting.

It is therefore an object of the invention to provide a method of producing lock key blanks in which the key bow portions are all substantially identical and the key shank portions are uniformly furnished with a predetermined cross-sectional configuration readily available for bitting.

Another object of the invention is to provide a method of producing lock key blanks which is economical of the lock key material and which is effective to produce keys without substantial loss of material, particularly loss due to chip cutting operations.

A further object of the invention is to provide a method of producing lock key blanks in which the material of the key blanks may be worked during the forming or producing operation.

Another object of the invention is to provide a method of producing lock key blanks in large quantities in a short space of time.

A further object of the invention is to provide a method of producing lock key blanks in which separate handling of the potential key blanks between operations is eliminated.

A further object of the invention is in general to provide an improved method of producing lock key blanks.

Other objects of the invention, together with the foregoing, are attained in the embodiment of the invention described in the accompanying description and illustrated in the accompanying drawings, in which:

FIG. 1 is a diagrammatic view showing a portion of a machine effective to operate dies pursuant to the requirements of the method in order to produce the desired key blanks from strip stock;

FIG. 2 is a cross-section, the plane of which is indicated by the line 2—2 of FIG. 1;

FIG. 3A is a plan of a portion of a key blank strip as it receives successive steps of treatment during the process; and

FIG. 3B is a continuation of FIG. 3A, the left end of FIG. 3B being contiguous to the right end of FIG. 3A and shows further steps in the performance of the process.

The process of the invention can be practiced in a number of different ways and on a number of objects comparable to key blanks, but for illustration, it is described herein in connection with the production of finished key blanks such as are disclosed toward the right hand end of FIG. 3B. A typical finished key blank 6 has

a bow 7 (shaded) and a shank 8. The key blank has an opening 9 for hanging the key or putting it on a key ring and usually carries on each side a legend 11 such as the name of the maker. The shank 8 customarily has certain longitudinal ridges 12 and grooves 13 on both sides defining an irregular and special shank cross-section to fit a special group of locks. The blank has no notches or bits but does have a longitudinal edge 14 provided as a site for notches subsequently cut after the key blank has been finished. The shank also has a longitudinal bearing edge 25 and a point. The thickness of the key blank is substantially uniform throughout except for whatever depressions and raised portions might be provided at the legend 11 or in the surrounding areas of the bow 7 or except for the ridges 12 and grooves 13 in the shank 8.

Pursuant to the method and in order to provide a key blank of the noted sort, it is preferred to conduct the entire operation on a press 16 (FIG. 1) or a comparable machine having a stationary base 17 and a ram 18 reciprocable vertically toward and away from the base 17. The base 17 supports a special die 19 whereas the ram 18 supports a complementary punch 21. When the ram 18 is driven by any appropriate means (not shown) the punch is reciprocated repeatedly in a vertical path. The punch 21 and die 19 cooperate to form and cut material disposed between them.

For this purpose there is fed into the machine, from the left of FIG. 1, a strip 22 of material. The feed mechanism is well known and is not shown, but in synchronism with the press operation the material is fed intermittently in equal steps.

The material fed is appropriate for the manufacture of lock key blanks and is customarily metal of the brass family or of the nickel-silver family having a thickness approximately that of the key blank to be furnished. The length of the strip is suitable for a production run. The strip width W, particularly as shown in FIG. 3A, is at least as great as, and preferably is slightly more than, the width of a pair of adjacent key blanks such as 6A and 6B (FIG. 3B) when those blanks are arranged in a set position with their center lines 26 and 27 parallel to each other transversely of the strip 22 and at right angles to the direction of advance of the strip as indicated by the arrow 29. The key blanks 6A and 6B in set position are disposed so that their shanks 8 are overlapped when considered in the direction of advance of the strip and are reversed, or upright and inverted, as to their side faces. The bows 7 are staggered and reversed each with respect to the other and come quite close to the opposite longitudinal edges 31 and 32 of the strip 22.

In this way successive key blanks 6A and 6B can be considered as grouped in repetitive pairs. This pairing puts the blanks quite close to each other with only a relatively small amount of intervening and surrounding strip material.

A strip 22 of the desired width, length and thickness is introduced and fed between the punch 21 and the die 19. As shown at the left end of FIG. 3A, the strip is initially formed at a first station A that is duplex and is illustrated by center lines 26A and 26B joined by a ligament 26C to indicate that duplex operations along the center lines 26A and 26B are performed by the punch and die at the first station A.

In this instance, the operation at station A provides a pair of mutually staggered, individually centered, op-

positely directed, identical legends or indicia **11.** This operation is a coining operation since it displaces the material of the strip without removing any and embosses as to portions raised from their surroundings and debosses as to portions depressed below adjacent areas. Usually the maker+s name or trademark is coined. The cross-hatched areas, such as **26D** and **26E**, at the stations illustrate the approximate area of the strip worked upon at those stations. They also illustrate duplex or paired operations longitudinally staggered from each other but equally spaced from the longitudinal center line of the strip.

Upon the opening of the die set after the operation at the first station A, the strip **22** is advanced to a second station B. This is a standard increment or feed or longitudinal distance from station A but is one in which no forming operation occurs. Next, the strip **22** advances the unit amount to station C whereat the punch **21** encounters the strip **22** so as to sever the margins or outline of an area **36** having sides **37** and **38** each defining a similar portion of the ultimate boundaries of the potential blanks **6A** and **6B**. A single area is referred to as a first area and is removed at station C.

When the die is again opened the strip advances to the next station D, a unit distance away. The first cut portion **36** having been knocked out of the strip, there is left a corresponding opening **40** therethrough, as is shown at station D, which is void. At the next increment or step, the station E, the punch descends and cuts the boundaries of another area **39,** similar to the area **36,** and having boundaries **41** and **42.** The boundary **41** defines an equivalent or corresponding portion of a key blank **6B** at the next station while the boundary **42** defines a portion of the key blank **6A** at the station E. These portions are in addition to the sides **37** and **38** previously defined by cutting. The area **39** is punched out at station E and the strip then advances the unit amount to station F. With the key **6B** in this position the descending punch forms the edge **42** of the key and a void **45** remains in the strip.

At the next strip advance, station G, a punch cuts and forces out an area **46,** referred to as a second area, extending longitudinally of the strip and disposed across the end of the shank of the key blank **6A.**

An advance is made to the next station H, the strip progressing the unit amount. At station H the punch descends and cuts from the strip a similar, spaced area **47,** a second area, also extending longitudinally of the strip and disposed across the end of the shank of the key blank **6B.** In fact, the areas **46** and **47** interconnect the voids **40** and **45,** thus detaching each key shank on three sides but leaving it still attached to the strip on the fourth side. The areas **46** and **47** are symmetrical about the longitudinal center line of the strip, as before, but are staggered in a longitudinal direction.

The strip again advances the unit amount to the next station I, the previously removed areas **46** and **47** leaving connecting end voids **48** and **49.** At the station I when the punch descends, the key shank **6A** is subjected to coining pressure over the area **51.** This operation provides the longitudinal ridges **12** and grooves **13** extending more or less the full length of the shank. The ridging and grooving operation does not remove any material but displaces the material of the strip not only in a vertical direction (normal to the planar surfaces of the strip) but also in a longitudinal and perhaps transverse direction. The resulting laterally extended area of the key shank (as shaded at station I) may be in excess of the desired final dimensions. At the next station, J, the punch performs a similar coining operation on the blank **6B** as shown by the shaded area **52** at that station, the operation being identical to that performed at station I on the blank **6A.**

The strip then advances the unit amount from station J to station K (FIG. 3B) and a duplex operation is performed. In this instance, another pair of second areas **56** and **57** are cut and removed from the strip to define appropriate boundaries for both of the openings **9** indicated by the voids **58** and **59** for the individual blanks.

When the strip has advanced to station L the descending punch cuts the boundary of an area **61** which is removed. At the next station, M, the boundaries of a similar second area **62** are cut and the resulting slug is removed. The areas **61** and **62** are staggered longitudinally and are symmetrical with respect to the longitudinal center line of the strip. They provide boundaries **63** and **64** for the ends of the key pair and afford the finished end shape.

The next advancement of the strip to station N shows voids **66** and **67** due to previous removal of the areas **61** and **62.**

Descent of the punch at station N is effective to cut and dislodge a first or single area **68** as a reenlargement and final shaping of the void **45,** reduced at stations I and J, to provide final dimensions for the edge **14** of the adjacent blank **6A** and of the corresponding edge of the blank **6B** at the next station.

At the next station, O, the operation is repeated to provide the similar edge **14** for the trailing key blank **6B.** Station P, the next in order, is blank.

In the advancement to the next station Q the strip is positioned for the punch to make a cut **69** corresponding to the remaining outline of the bow of but one of the blanks **6B,** the blank **6A** not being operated upon at station Q. Actually, the blank **6B** is cut at the bow and is displaced from the strip but is returned to the plane of the strip and is frictionally retained therein for transport to adjacent station R. Thereat a particular punch **71** (FIG. 1) in descending knocks out the completely severed key blank **6B** which falls into a chute **72** for subsequent separate handling. Also at station R, the main punch cuts the bow outline **69** of the blank **6A** which is displaced from and returned to the strip. At station S the blank **6A** is knocked out by a special punch **73** into a chute **74** for separate handling.

In the foregoing description the cutting and displacing events at the individual stations are described as they occur successively when considered relative to the longitudinal dimension or length of the progressing strip **22.** However, it is preferred that all of the individual punches be situated on the main punch **21** to meet with corresponding cavities in the lower die **19** at the same time so that all of the operations disclosed in FIGS. **3A** and **3B** occur simultaneously during one cycle of the machine **16.** This is readily accomplished, despite variations in the nature of the steps performed at the different, individual stations.

In some of the stations the die **19** may be provided with a yieldable support **76** held normally in its uppermost position by a relatively strong die spring **77.** When the local punch on the ram **18** descends against the local portion of the strip **22** to displace it, the yielding portion **76** descends in order to insure that the sever-

able portion is actually displaced. Then the displaced part is restored by the spring 77 to the plane or body of the strip for advancement.

In this fashion, material for key blanks is fed into one end of the machine, and in each operation of the machine a number of partially completed blanks are severed, formed, trimmed and marked and a pair of completed key blanks is discharged. No further mechanical operation is needed on any one of the blanks and all handling of the blank pairs is by normal advancement of the strip 22 intermittently through the machine.

Customarily, the discharged key blanks are subsequently bitted in accordance with an appropriate scheme or program in entirely different machinery. If, however, a large number of key blanks are to have similar bittings, then it is feasible to have a station provided with an appropriate punch shaped to cut away bit areas of each key blank along the edge 42 thereof so that the finally discharged key pairs are immediately ready for use in corresponding locks and do not require separate notching or bitting.

What is claimed is:

1. A method of forming key blanks having integral bow and shank portions from a strip of deformable material wherein said strip is advanced in intermittent cycles to position sequential portions thereof in successive operating stations and wherein a plurality of forming operations are simultaneously performed on said portions of said strip at a plurality of said stations at each of said cycles, and including the steps of:

performing said forming operations on each sequential strip portion in the sequence of first removing material from said strip to leave shank portions of alternate ones of said blanks integral with the remainder of said strip and extending transversely across said strip from alternate sides thereof; then forming the material of said shank portions to final configuration by spreading the material thereof, by forming grooves and ridges extending therealong and by trimming; and thereafter severing a bow portion, integral with each shank portion, from said strip to release successive key blanks.

2. The method of claim 1 wherein said material is removed from said strip entirely within the side edges thereof.

3. The method of claim 1 wherein said material is removed in at least two successive steps, first removing material from along the sides of said shanks and then from the end portions of said shanks.

4. The method of claim 1 wherein said step of forming grooves and ridges on said shank portions is performed by a die stamping step.

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