June 18, 1963 R. C. SPAIN 3,094,039

KEY BITTING MACHINE

Filed March 18, 1960 3 Sheets-Sheet 1

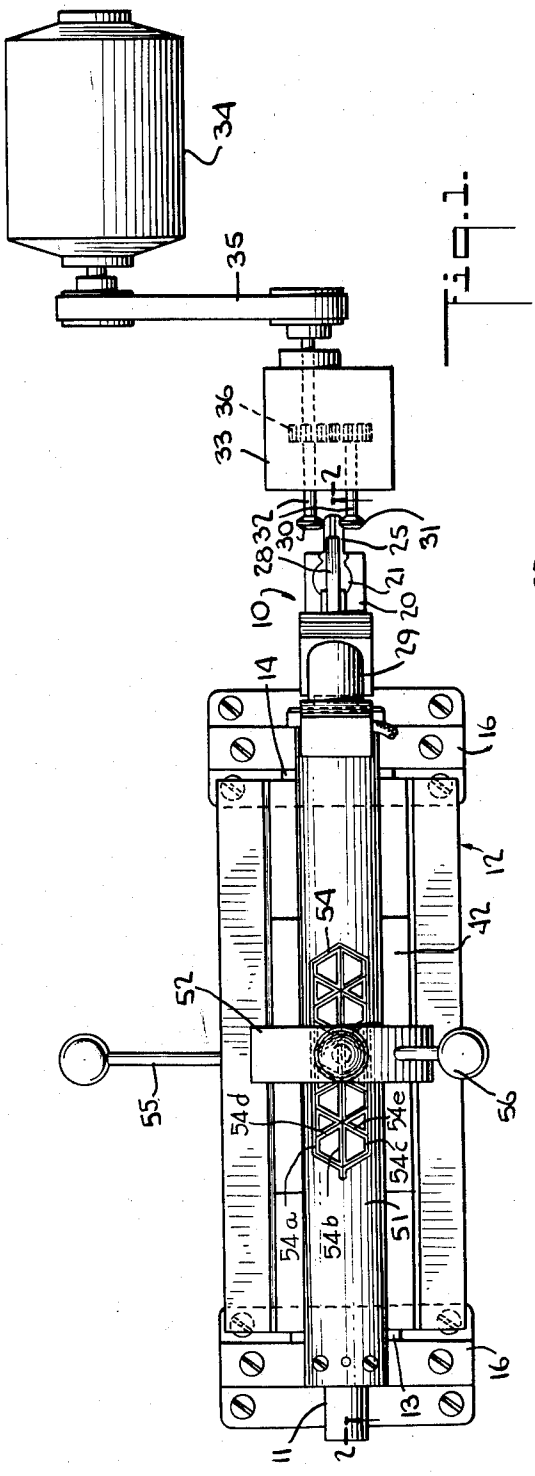
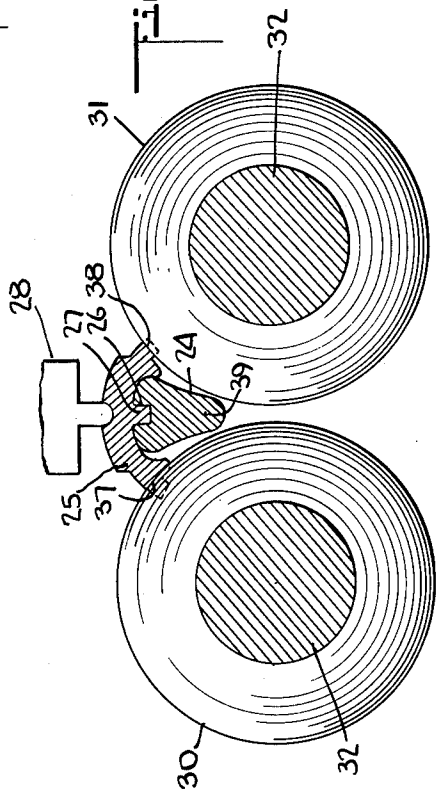


Fig. 1.

Fig. 1A



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June 18, 1963 R. C. SPAIN 3,094,039

KEY BITTING MACHINE

Filed March 18, 1960 3 Sheets-Sheet 2

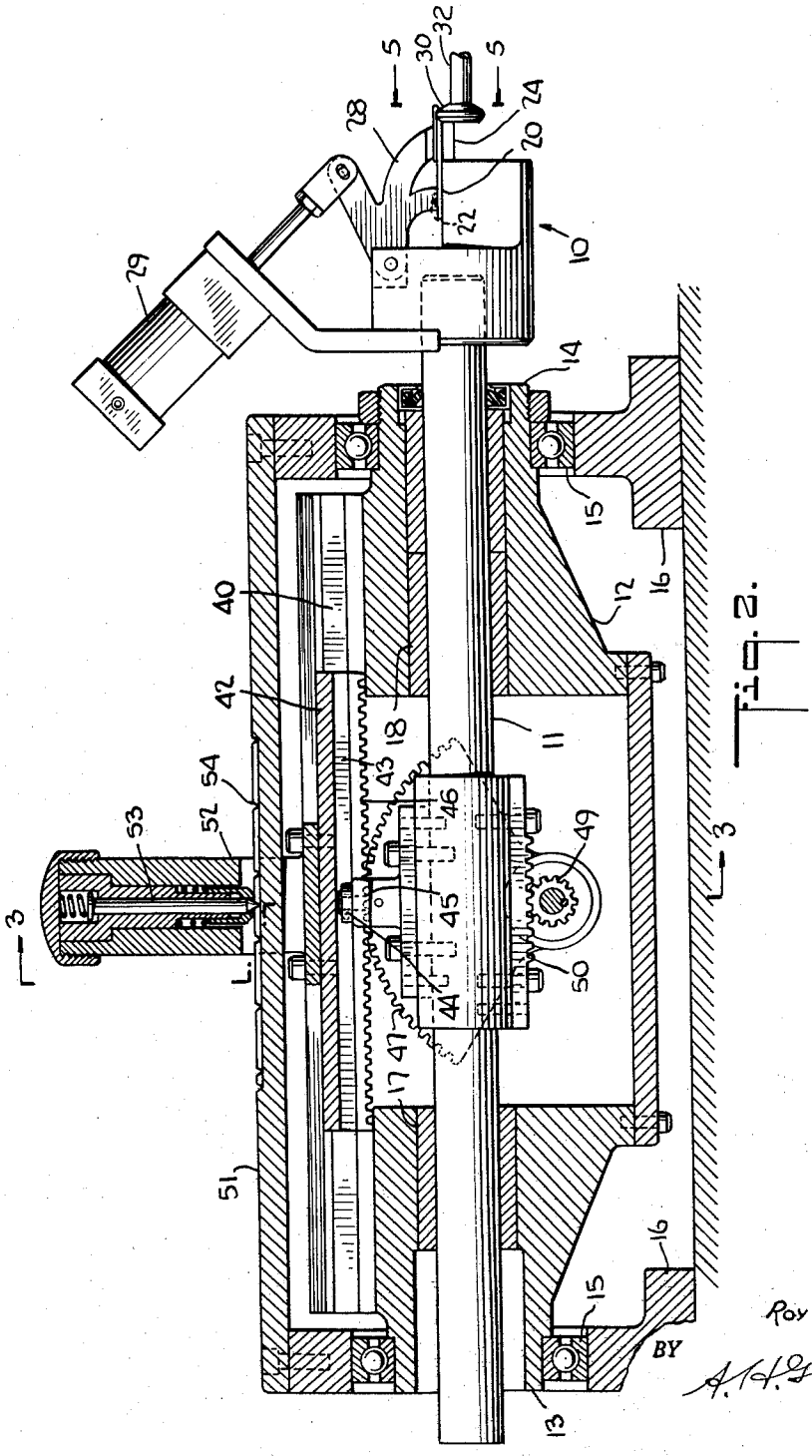

Fig. 2.

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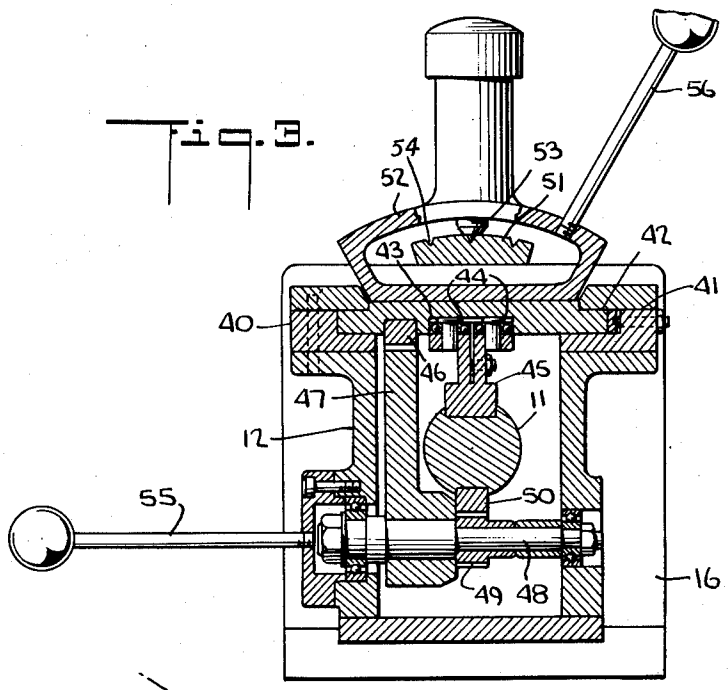
June 18, 1963 R. C. SPAIN 3,094,039

KEY BITTING MACHINE

Filed March 18, 1960 3 Sheets-Sheet 3

Fig. 3.



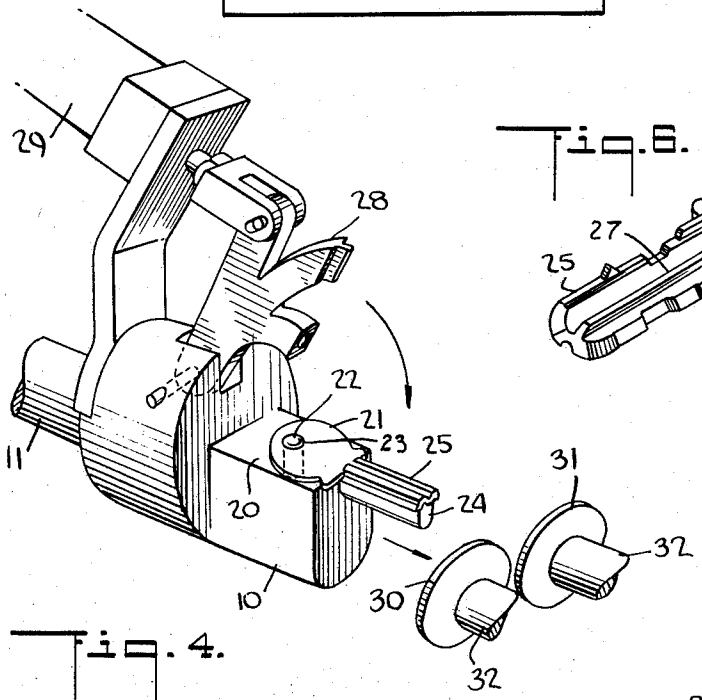
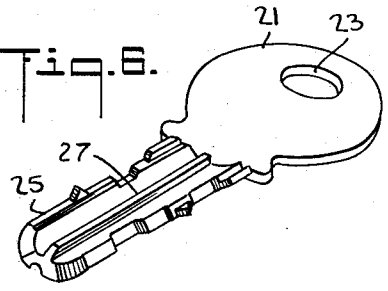


Fig. 4.

Fig. 6.



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3,094,039

KEY BITTING MACHINE

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11 Claims. (Cl. 90—13.05)

This invention relates to a machine for bitting keys that are utilized in a rotary tumbler lock.

In locks of the particular class, the tumblers are rotated by a bitted edge of the key acting against surfaces on the tumblers. Since the tumbler surfaces rotate, the surface of each bitting on the key should be formed in predetermined relation to the tumbler axis, in order to prevent rapid wear and to enable the key to set the tumblers in an accurate position. That, together with the fact that each bitting must be cut to a particular depth in the key, requires that extreme care be utilized in forming the bittings. Through the novel concept of my invention, I now contribute a machine that will very easily and accurately bit the keys of rotary tumbler locks, My machine will, in fact, operate effectively to form bittings that have a complementary arrangement on the opposed edges of the key, as in my earlier Patent No. 2,690,070.

In my novel bitting machine, I effect the bitting of a key by moving the key and a bitting cutter relatively to one another on a short radius. Thus, as a feature of my invention, my machine utilizes a rotating movement such that the cutter will form the bitting surfaces in different angular positions on the key, when cutting those surfaces to different depths. In the form of my invention that I prefer, I utilize a key support that rotates about an axis which actually is equivalent to the axis of the lock tumblers that are to be actuated by the key. My machine then will form bitting surfaces to lie each in a particuluar relation to the key coacting surfaces of the rotary lock tumblers, enabling me very easily to bit keys for a lock of the particular class.

As a further feature of my invention, I equip my machine with a pair of the bitting cutters, arranged one at either side of a key on the support. As the key support rotates, the cutters will form bittings that are complementary on the opposed edges of the key. While complementary, the surfaces of the bittings also will extend in particular lines relatively to the axis of the rotary lock tumblers.

As another feature, my machine has guide means that will facilitate the cutting of a series of bittings to a desired shape on the key. The guide means include a template, and a follower that is connected to the key support through parts that will effect proportional movements between the follower and key support, as the key support rotates and also moves longitudinally. Those proportional movements enable me to utilize a template that is relatively large so as to be very effective in controlling the cutting of the angularly related key bittings.

I have thus outlined rather broadly the more important features of my invention in order that the detailed description thereof that follows may be better understood, and in order that my contribution to the art may be better appreciated. There are, of course, additional features of my invention that will be described hereinafter and which will form the subject of the claims appended hereto. Those skilled in the art will appreciate that the conception on which my disclosure is based may readily be utilized as a basis for the designing of other structures for carrying out the several purposes of my invention. It is important, therefore, that the claims be regarded as including such equivalent constructions as do not depart from the spirit and scope of my invention, in order to prevent

the appropriation of my invention by those skilled in the art.

Referring now to the drawings,

FIG. 1 shows a plan view of my novel key bitting machine;

FIG. 2 is a longitudinal section substantially on the line 2—2 in FIG. 1;

FIG. 3 is a cross section on the line 3—3 in FIG. 2;

FIG. 4 shows in detail the construction of the key support;

FIG. 5 shows a section on the line 5—5 in FIG. 2;

FIG. 6 shows a key that is cut on my novel machine.

In the particular construction that I have chosen to illustrate, my novel key bitting machine has a key support, indicated generally by the numeral **10**, that is mounted on one end of a shaft **11**. I utilize to support the shaft **11** a frame **12**, best seen in FIG. 2, having opposed end portions **13**, **14** that are mounted to rotate in bearings **15** on two support members **16**. The shaft **11** is arranged in axial relation to the bearings **15**, and is adapted to slide in bearing sleeves **17**, **18** on the frame **12**. Thus, it will be understood that the key support **10** and shaft **11** are mounted for longitudinal movement and also for rotating movement in a particular axis. In FIGS. 1, 2 and 4 I show the key support **10** formed to hold the key that is shown in detail in FIG. 6, that key being like the one shown in my Patent No. 2,690,070, to which I have already referred.

The key support **10** has a portion **20** that is adapted to accept the bow **21** of the key, with a lug **22** adapted to engage in the opening **23** in the bow. Also, the key support **10** has an arm portion **24** that will accept the blade **25** of the key, with a groove **26**, best seen in FIG. 5, for a longitudinal rib **27** on the blade. For reasons that will appear in due course, the arm portion **24** of the key support has a relatively narrow tapered cross section. I equip the key support **10** with a clamp **28** that I prefer to mount on a pivot, and a fluid pressure actuated cylinder **29** that is adapted to move the clamp **28** into position holding the key against the portions **20** and **24** of the support **10**. It is important to observe that the key support portions **20** and **24** in my novel machine are so formed as to support the key in a longitudinal position that is a relatively short distance from the axis in which the support rotates, that being the axis of shaft **11**.

I equip my machine with a pair of cutting wheels **30**, **31**, such as grinding wheels or disc saws, having each a shaft **32** that is mounted to rotate on a casing **33** as shown in FIG. 1. Suitable means are utilized to rotate the cutting wheels **30**, **31**, and for purposes of disclosure I show a motor **34** that will drive the shafts **32** through a belt **35**, and gears **36** in the casing **33**. The shafts **32** support the wheels **30**, **31** in particular positions with their cutting surfaces opposed to the two edges of the key on the key support **10**. If we refer particularly to FIG. 5, we see that the positions of the wheels **30**, **31** are such that the cutting contact between each wheel and the key, as indicated by the numeral **37** or **38**, will lie substantially in a line that extends to the axis in which the key support rotates, indicated by the numeral **39**.

The importance of that arrangement will be better appreciated when it is realized that the wheels **30**, **31** then will form the bitting surfaces of the key in angular relation to one another, as is indicated by the cutting contacts **37** and **38** in FIG. 5, and substantially radial to the axis **39**. Moreover, the bitting surfaces always will be radial regardless of the depth to which they are cut, due to the rotation of the key about axis **39**.

The construction that I have described represents a very considerable contribution to the art, because it will enable me very easily to bit the edges of a key that is used in a rotary tumbler lock, and also to form the bittings in com-

plementary fashion on a key that is to be used in a lock like that shown in my patent. However, my machine does have further features that are of importance and that contribute very considerably to the effective operation of my machine.

If we refer now to FIGS. 2 and 3 of the drawings, we will see that the frame **12** has on its upper portion a pair of guideways **40**, **41** on which a slide **42** moves longitudinally, or in other words in a direction parallel to the shaft **11**. The slide **42** itself is formed with a guideway **43** on its lower surface. I mount a pair of rollers **44** on the shaft **11**, as through a bracket **45** bolted to the shaft, those rollers being engaged in the guideway **43** so that the shaft **11** always will rotate bodily with the frame **12**.

I also equip my machine with gear means extending between the slide **42** and shaft **11**, those gear means including a rack **46** mounted on the lower side of slide **42**, and a gear **47** that is meshed with the rack. The gear **47** is mounted on a shaft **48** that rotates in bearings on the side walls of frame **12** and that has a relatively small gear **49** mounted to rotate integrally with gear **47**. To the bottom of shaft **11** I bolt a rack **50** that meshes with the small gear **49**. The arrangement is such that the slide **42** will move a predetermined distance longitudinally relatively to frame **12** while shaft **11** has a relatively short sliding movement.

On the top of the support members **16** I mount a template **51**, FIGS. 1, 2 and 3, that extends longitudinally in a position above the slide **42**. In the form that I prefer and that I show in FIG. 1, the template **51** has grooves **54** that are shaped to correspond to the configurations of the different bittings that may be cut in a key. Thus, I prefer to form the grooves **54** in three longitudinal lines **54***a*, **54***b*, **54***c*, that correspond to different depths of bittings that may be cut, with inclined connecting lines at positions that may correspond to the edges of bittings that can be formed in different longitudinal positions on the key. The operator of the machine will select merely one of the longitudinal lines of grooves **54***a*, **54***b*, **54***c* as a guide for forming a particular bitting, depending upon the depth to which he wishes to cut the bitting. If he wishes, he may select a different groove **54***a*, **54***b* or **54***c* for the next bitting, using as a guide for the transition an appropriate inclined groove such as **54***d* or **54***e*. While corresponding to the possible bittings, the grooves **54** nevertheless are formed on a scale much larger than that of the actual bittings.

Wtih the template grooves **54** I utilize a follower **53** in the form of a spring pressed pin that is mounted on a yoke **52** fixed to the slide **42**. The follower **53** will move through a greater longitudinal distance than does the key support **10**, due to the action of the gears **47**, **49**. In addition, the follower **53** will have more movement in a transverse direction because of its relatively greater distance from the axis about which a key on the key support **10** rotates. Actually, the relative movements between the follower **53** and key will be proportional during both the longitudinal and rotating movements of the key support **10**. Since the template grooves **54** are formed on a large scale, the operator of the machine then can utilize the template as a guide for the follower **53** so as to achieve very easily the accurate bitting of the key.

I prefer to equip the rotating frame **12** with a handle **55** shown in FIG. 3, through which the operator can rotate the key support **10**. In addition, I equip the yoke **52** with a handle **56** that the operator can use for moving the slide **42** to effect longitudinal movements of the key support **10**. It will be appreciated, of course, that the particular actuating means are not important to an understanding of my invention, and it is merely necessary to know that the movements of the frame **12** and slide **42** in my novel machine will enable the very effective bitting of a key for a rotary tumbler lock.

I believe that the construction and operation of my novel key bitting machine will now be understood, and that the very considerable value of my invention will be fully appreciated by those skilled in the art.

I now claim:

1. In a machine of the class described for bitting keys for a rotary tumbler lock, said keys being bitted by forming bitting surfaces at different depths in longitudinal edges of the keys with the surfaces extending across said edges, a bitting cutter, a support for holding a key so that a longitudinal edge of the key is against said cutter whereby to form a bitting surface on the key, and means mounting said key support to rotate on a relatively short radius so that the cutter when cutting the bitting surface to different depths in the key will form the surface in different angular positions relatively to the key.

2. In a machine of the class described for bitting keys for a rotary tumbler lock, said keys being bitted by forming bitting surfaces at different depths in longitudinal edges of the keys with the surfaces extending across said edges, a bitting cutter, a support for holding a key relatively to said cutter, means mounting said key support for rotation about a predetermined longitudinal axis to move a longitudinal edge of the key against the cutter, said support by so rotating enabling the cutter to form a bitting surface at different depths in the key, and means mounting said cutter in position so that the cutting contact between the cutter and key will lie substantially on a line extending to the predetermined axis about which the key support rotates, whereby to form the bitting surface in radial relation to a particular point regardless of the depth to which it is cut.

3. In a machine of the class described for bitting keys for a rotary tumbler lock, said keys being bitted by forming bitting surfaces at different depths in longitudinal edges of the keys with the surfaces extending across said edges, a bitting cutter, a support for holding a key relatively to said cutter, means mounting said key support for rotation about a predetermined longitudinal axis to move a longitudinal edge of the key against the cutter, means mounting said key support for longitudinal movement so that said support by rotating will enable the cutter to cut a series of bitting surfaces to different depths at points along the longitudinal edge of the key, and means mounting said cutter in position so that the cutting contact between the cutter and key will lie substantially on a line extending to the predetermined axis about which the key support rotates, whereby the cutter will form all of the bitting surfaces in radial relation to a particular point regardless of the depth to which each surface is cut.

4. In a machine of the class described for bitting keys for a rotary tumbler lock, said keys being bitted by forming bitting surfaces at different depths in longitudinal edges of the keys with the surfaces extending across said edges, a bitting cutter, a support for holding a key relatively to said cutter, means mounting said key support for rotation to move a longitudinal edge of the key against the cutter, means mounting said key support for longitudinal movement so that said support by rotating will enable the cutter to cut a series of bitting surfaces to different depths at points along the longitudinal edge of the key, and said bitting surfaces when formed to different depths lying in angular relation to one another due to the rotation of said key support.

5. In a machine of the class described for bitting keys for a rotary tumbler lock, said keys being bitted by forming bitting surfaces at different depths in longitudinal edges of the keys with the surfaces extending across said edges, a bitting cutter, a support for holding a key relatively to said cutter, means mounting said key support for rotation about a longitudinal axis that is in offset relation to the key, said support by rotating about said axis moving a longitudinal edge of the key against the cutter and enabling the cutter to cut a bitting surface to different depths in the key, and means mounting said cutter in position so that the cutting contact between the cutter and key will lie substantially on a line extending to said axis about

which the key support rotates, whereby to form the bitting surface in radial relation to a particular point regardless of the depth to which it is cut.

6. In a machine for bitting keys that are utilized to rotate tumblers about a particular axis in a lock, said keys being bitted by forming bitting surfaces at different depths in longitudinal edges of the keys with the surfaces extending across said edges, a bitting cutter, a support for holding a key so that a longitudinal edge of the key is against said cutter, means mounting said key support for rotation to move the key about an axis that is equivalent to the axis about which the lock tumblers rotate, and said support by moving the key about said axis enabling the cutter to cut bitting surfaces to different depths in the key, while cutting these surfaces at angles to effect predetermined surface contact between the key and the rotating lock tumblers regardless of the depth to which the bitting surfaces are cut.

7. In a machine of the class described for bitting keys for a rotary tumbler lock, a pair of bitting cutters, a support for holding a key in position with one edge of the key in opposite relation to each cutter, means mounting said key support for rotation to enable the cutters to cut complementary bitting surfaces to different depths in the edges of the key, and means mounting said cutters in position so that the cutting contact between the cutters and the key will lie substantially on lines extending to a particular point, whereby the cutter will form the complementary bitting surfaces in substantially the same angular relation to one another on the opposed edges of the key, regardless of the depth of cut.

8. In a machine for bitting keeys that are utilized to set lock tumblers that have key coacting surfaces formed at a particular radial distance from an axis in which the tumblers rotate, a pair of bitting cutters, a support for holding a key in position with one edge of the key in opposed relation to each cutter, means mounting said key support for rotation about a predetermined axis to move the key on a radius equivalent to the radial distance of the key coactting surfaces of the lock tumblers, said support by rotating enabling the cutters to cut complementary bitting surfaces to different depths in the opposed edges of the key, and means mounting said cutters in position so that the cutting contact between each cutter and the key will lie substantially on a line extending to said axis about which the key support rotates, whereby the cutters will form the complementary bitting surfaces to extend substantially in radial relation to the axis of the lock tumblers regardless of the depth to which those surfaces are cut.

9. In a machine of the class described for bitting keys for a rotary tumbler lock, a bitting cutter, a support, for holding a key relatively to said cutter, means mounting said key support for rotation to move a key against the cutter, means mounting said key support for longitudinal movement to enable the cutter to form a series of bitting surfaces on the key, a relatively stationary template, said template including surfaces corresponding to and proportionally larger than the surfaces of a series of bittings that may be cut on the key, a follower mounted for movement on said template surfaces, and means connecting said template and the key support for proportional movements as the key support rotates and moves longitudinally, so as to facilitate the cutting of the bitting surfaces to an accurate shape on the key.

10. In a machine for bitting keys that are utilized to set lock tumblers that have opposed key coacting surfaces in predetermined relation to an axis in which the tumblers rotate, a pair of bitting cutters, a support for holding a key in position with one edge of the key in opposed relation to each cutter, means mounting said support to move the key longitudinally and also to rotate the key relatively to the cutters about an axis equivalent to the axis about which the lock tumblers rotate, whereby to effect the cuting of a complementary series of bitting surfaces on each edge of the key, with said bitting surfaces in substantially the same relation to the axis of rotation as are the key coacting surfaces of the lock tumblers, a relatively stationary template on the machine, said template including surfaces corresponding to and proportionally larger than the surfaces of a series of bittings that may be cut on the key, a follower mounted for movement on said template surfaces, and means connecting said template and key support for proportional movements as the key support rotates and moves the key longitudinally, so as to facilitate the cutting of the complementary bitting surfaces on the key to an accurate shape that will enable those surfaces to have substantially a surface contact with the key coacting surfaces of the lock tumblers.

11. In a machine of the class described for bitting keys for a rotary tumbler lock, said keys being bitted by forming bitting surfaces to different depths in longitudinal edges of the keys with the surfaces extending across said edges, a bitting cutter, a support for holding a key relatively to said cutter, means mounting said key support and cutter for rotation relatively to one another about a longitudinal axis to effect an arcuate movement between a longitudinal edge of the key and the cutter, said cutter forming a bitting surface at different depths in said edge depending upon the extent of said arcuate movement, and said cutter being so positioned on its mounting that the cutting contact between the cutter and key will lie substantially on a line extending to said longitudinal axis, whereby to form the bitting surface in radial relation to a particular point regardless of the depth to which it is cut.

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