July 29, 1969 N. R. ADLER ET AL 3,457,832

KEY CUTTER DEVICE

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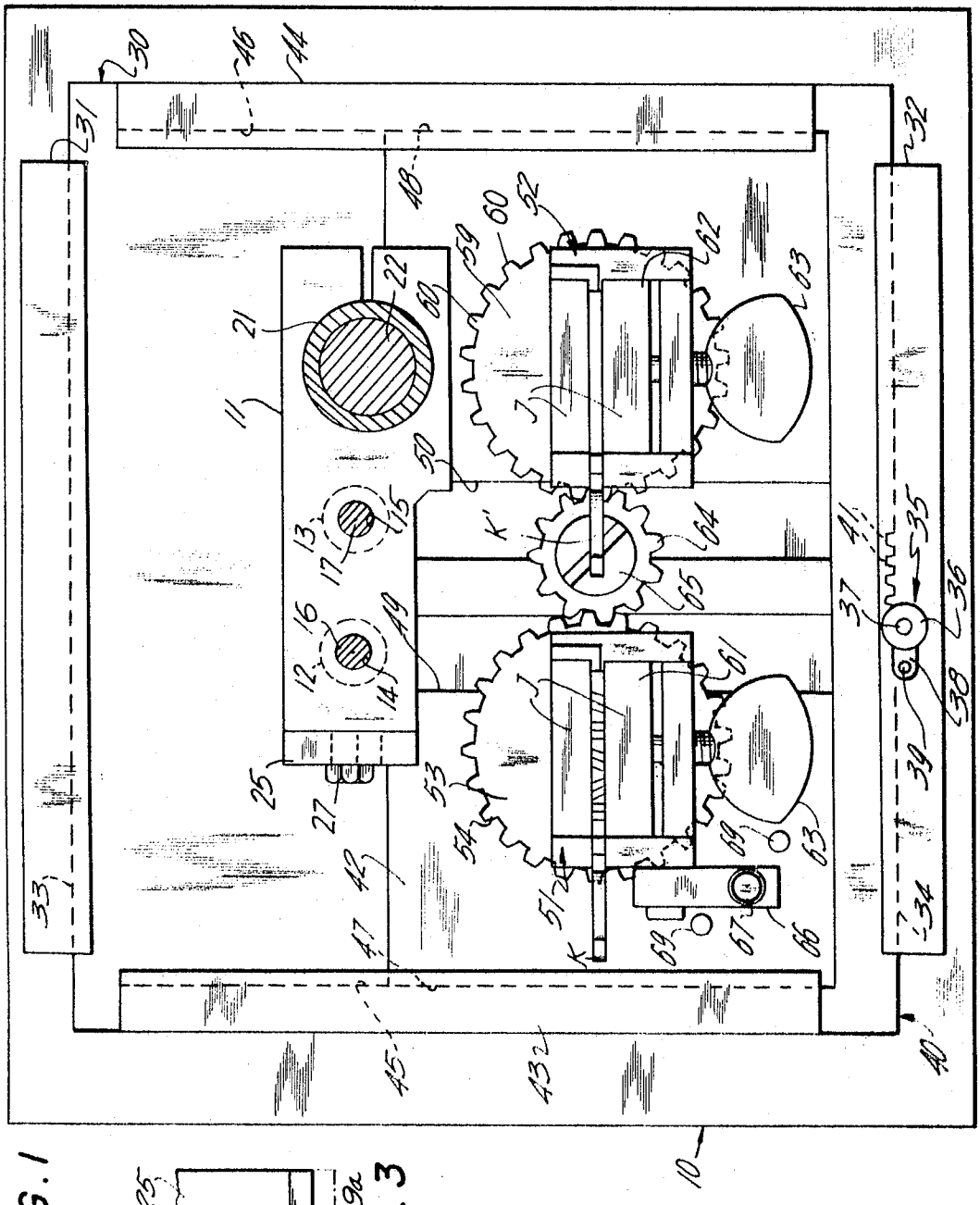


FIG. 1

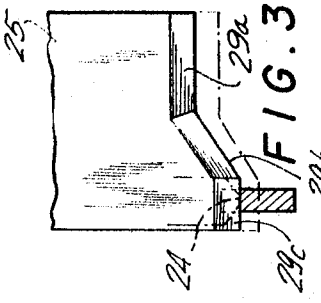


FIG. 3

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FIG. 2

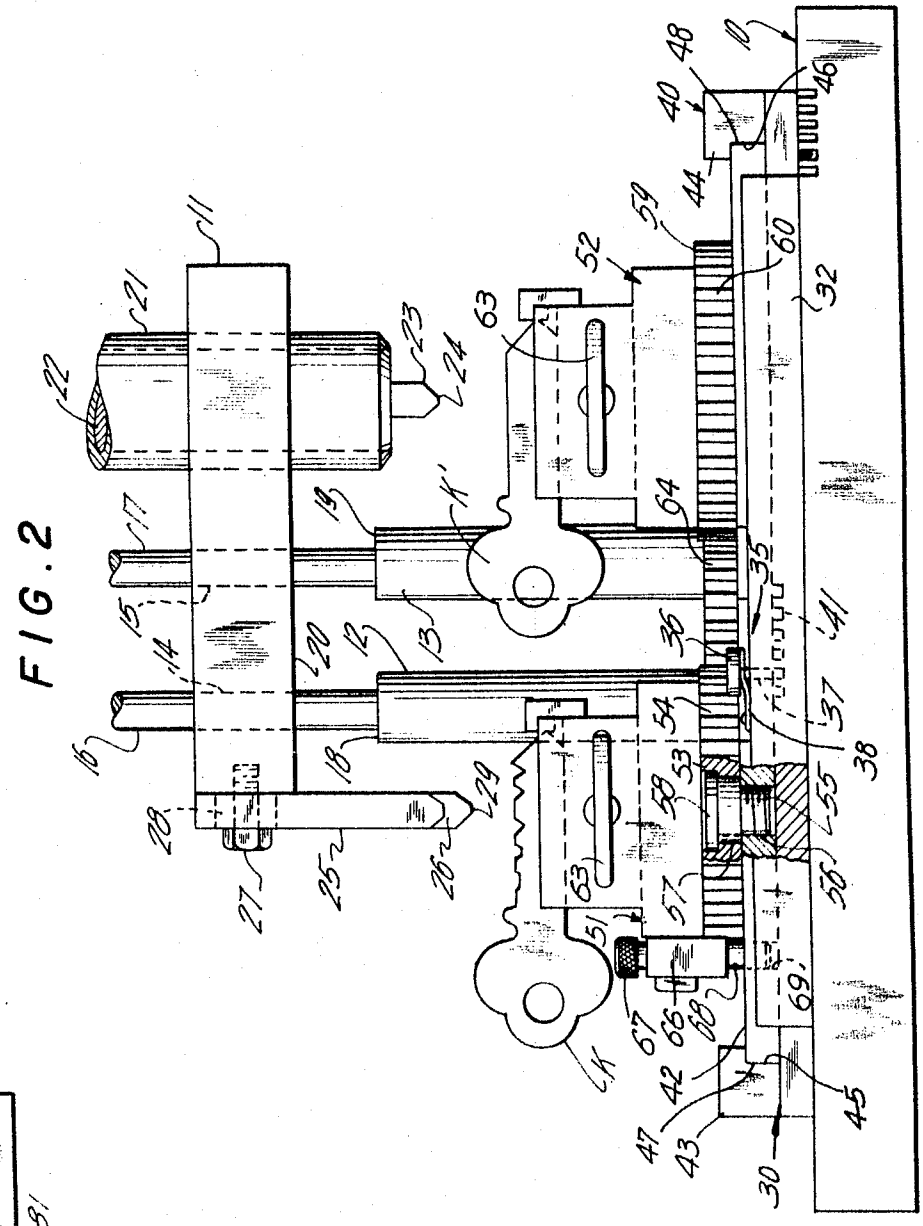
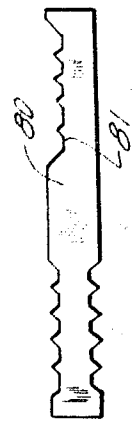


FIG. 4



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KEY CUTTER DEVICE

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Continuation-in-part of applications Ser. No. 663,024. and Ser. No. 663,094, Aug. 24, 1968. This application Aug. 24, 1967, Ser. No. 663,083

Int. Cl. B23b 1/16

U.S. Cl. 90—13.05 9 Claims

ABSTRACT OF THE DISCLOSURE

A key cutter device for duplicating a bitted key from a pattern key or a key simulation, the device being particularly adapted for duplicating keys having bit portions which are angularly directed with respect to the plane of the body portion of the key.

CROSS REFERENCES

This application is a continuation-in-part of our applications filed on even date herewith and entitled:

(1) Code Key Cutter Device, application Serial No. 663,094.

(2) Plunge Actuated Cutter for Keys Having Angularly Directed Bits, application Serial No. 663,024.

BACKGROUND OF THE INVENTION

Field of the invention

This invention is in the field of key duplicating equipment and, more particularly, key duplicating equipment for reproducing keys having bits formed at an angle to the plane of the key blank.

Description of the prior art

Various key cutting machines are known. In accordance with one known principle, a pattern key to be simulated and a key blank are clamped in predetermined related positions with respect to a carriage carrying a cutter and a stylus disposed in comparable predetermined relationship. The cutter and stylus are moved relative to the key and key blank, with the stylus tracing the pattern of the cut key and causing the key cutter to form a configuration identical to that of the pattern key in the key blank.

While numerous machines operating on such principle have been successfully employed, it has never been possible heretofore to utilize such devices to duplicate keys wherein some or all of the bits are disposed at an angle with respect to a plane passing through the axis of the key.

Certain types of locks heretofore known operate on principles which require the bitting of the key to be disposed at an angle with respect to the plane described by the key blank. Heretofore it has been necessary either to hand file such keys, if field duplication is desired, or to reproduce the same in the factory by the use of specialized manufacturing equipment. Efficient field duplication has been essentially impossible and the difficulty of obtaining replacement keys without recourse to the factory has, in large measure, circumscribed the market for lock mechanisms requiring such keys.

SUMMARY OF THE INVENTION

A key cutting machine for cutting keys, and particularly keys having one or more bits disposed at an angle to the longitudinal axis of the key blank, from a pattern key or simulation, comprising a profiled cutter, clamps for mounting the key and key blank in predetermined position and stylus means for heightwisely orienting a cut

to be formed in the blank in accordance with the depth of a notch or bit formed in the pattern key and traced by the stylus, the combination being characterized by means for angularly orienting the pattern key and the blank to the cutter while maintaining the pattern key and blank in parallel relationship so that the key and key blank are moved together with respect to the stylus and cutter and at an angle corresponding to the angle of the bit with respect to the axis of the key.

Accordingly, it is an object of the invention to provide a key cutter for cutting a blank to correspond with a pattern key, the pattern key including bits formed at angles with respect to the longitudinal axis of the key.

It is a further object of the invention to provide a cutter device of the type described which is foolproof, simple in operation and accurately reproduces the configurations of a pattern key or simulation.

To attain these objects and such further objects as may appear herein or be hereinafter pointed out, reference is made to the accompanying drawings, forming a part hereof, in which:

FIGURE 1 is a plan view of a key cutter device of the type described;

FIGURE 2 is a front elevational view of the cutter of FIGURE 1;

FIGURE 3 is a section taken on the line 3—3 of FIGURE 1;

FIGURE 4 is a view of a key simulator for use in adjusting the depth of cut where no pattern key is available.

In accordance with the invention, **10** is the base of a key cutting machine which may be secured to the horizontal surface of a workbench or the like. To the base **10** there is affixed, for vertical movement, a cutter and stylus carriage **11**. A pair of vertical guide rods **12, 13**, affixed to the base, form a mounting for the carriage **11**.

The carriage is provided with a pair of vertically directed slide apertures **14, 15**, through which slide apertures are passed slide studs **16, 17**, respectively, forming continuations of the rods **12, 13**. The junction of the narrower portions **16, 17** with the wider components of the rods **12, 13** is defined by stop shoulders **18, 19**, respectively, the carriage being shown in a raised position for purposes of illustrating detail.

It will be understood that in normal operating position, the carriage is gravitationally maintained so that the under surface **20** of the carriage, in the areas directly surrounding bearing apertures **14, 15**, lies against the stop shoulders **18, 19** defining the lowered position of the carriage.

The carriage incorporates a spindle sleeve **21** affixed thereto, a rotor **22** within the spindle sleeve being connected to the drive shaft of a motor (not shown). Preferably the motor is mounted on the carriage so that the motor weight will increase the force with which the carriage is pressed downwardly.

A rotary cutter **23** is mounted within a chuck formed at the lower extremity of the spindle **22**, the lowermost end of apex **24** of the cutter extending a predetermined distance beneath the carriage. A stylus member **25** is mounted in spaced relation to the cutter **23**. The stylus includes at its lower edge a guide blade portion **26**, which will be more fully described hereinafter.

Adjustment means in the form of a lock bolt **27** passes through slot **28** formed in the stylus **25**, the adjustment bolt permitting the operating portion **29** of the stylus to be aligned in the same vertical plane as the apex **24** of the cutter **23**.

To the base **10** there is mounted for lateral slidable movement a slide carriage **30**. The carriage **30** is guided in its lateral movements by laterally directed end guides **31, 32** which overlap portions of the surface of the car-

riage **30** and include vertical side walls **33, 34**, respectively, which abut the front and rear vertical walls of the carriage **30**, to permit the desired side to side movement of the carriage while preventing any forward or rearward or up and down movement thereof.

On the front guide **32** is mounted a detent member **35** including a lift knob **36** and a depending detent pin **37**. The knob and pin are yieldably compressed by a blade spring **38**, one end of which is affixed to the pin **37** and the other end of which is secured to the guide **32** as by a bolt **39**. The forward end **40** of the carriage **30** is provided with a series of spaced-apart detent notches **41**. It will be observed that by lifting the knob **36**, the carriage may be slid laterally until the knob is again released, whereupon the detent pin **37** will fall into one of the notches **41**, preventing further lateral movement of the carriage **30**.

A key clamp support **42** is mounted on the platform **30**, the clamp support being permitted a range of forward and rearward movement. For this purpose, a pair of front to rear extending guides **43, 44** are fixed to the carriage **30**, the guides including forwardly and rearwardly extending vertical walls **45, 46**, respectively, engaging the side edges **47, 48**, respectively, of the clamp support **42**. Portions of the guides **43, 44** upwardly lap the upper surface of the clamp support so as to permit forward and rearward movement thereof while preventing side to side relative movement between the support and the carriage **30**, or upward and downward movement of the clamp support.

The clamp support **42** is provided with forwardly and rearwardly extending slot portions **49, 50**, spaced to coincide with the vertical guide rods **12, 13**, to permit the forward and rearward movement of the support **42** without interference from said rods.

Clamp assemblies are provided for pattern key K and for key blank K'. These clamp assemblies **51, 52** are mounted to the clamp support **42**, to be movable to a plurality of angles with respect thereto. For this purpose, clamp assembly **51** includes a base **53** having a toothed peripheral portion **54**. A stud **55** is threaded into a complementally formed aperture **56** in support **42**, the upper end of the stud extending within a bearing aperture **57** formed in a bearing seat **58** affixed to the base **53**. It will thus be seen that the base may be rotated about the axis of the stud **55**.

The clamp assembly **52** is similarly provided with a base **59** having a toothed periphery **60**, the base **59** being pivotally mounted to the clamp support **42** by a bearing mechanism (not shown) identical with the pivotal mounting for the base **53**.

The bases **53, 59** carry more or less conventional key vises **61, 62**, respectively, each of which incorporates opposed jaws J shiftable between clamping and unclamping position by the thumb screws **63, 63**. The toothed portions **54** and **60** are interconnected by an intermediate gear **64** which is rotatably mounted on bearing shaft **65** thereof into the clamp support **42**. The gear **64** meshes with the gear portions **54, 60** of the base **53, 59**, respectively, so that rotation of one of said bases would induce an equal rotation of the other said base in the same direction.

The vises **51, 52** may be set in a selected angular position by a detent mechanism next to be described.

The base member **53** includes an offset arm **66** carrying a vertically shiftable plunger **67**, including pin **68** which is normally spring biased downwardly. A series of detent seats **69** (three being illustrated) are spaced in an arcuate path about the axis of rotation of the base member **53**.

From the foregoing it will be readily recognized that the angular orientation of the vises **51, 52** with respect to the tracer blade or stylus **25** may be varied by lifting the plunger **67** against the spring biasing force and rotating the base member **53** until the plunger is in registry with a selected one of the detents **69**, whereupon the plunger may be released, locking the base at the desired angle.

It will be understood that rotation of the base **53** will, by reason of the geared relationship previously described, induce a concomitant rotation of the base **59** carrying vise **52**.

As best seen in FIGURE 3 the stylus **25** is longitudinally extended, including a lead portion **29***a*, a vertical cam component **29***b* and operating portion **29***c*. The height of the surface **29***a* is so oriented that when the under-surface **20** of the carriage **11** rests against shoulders **18, 19**, the portion **29***a* will be slightly higher than the upper edge of any key or key blank clamped in vises **51, 52**. Similarly, in said initial position, the portion **29***c* is disposed at a level beneath the depth of the last cut to be formed in any key. The cam surface **29***b* provides a smooth transition between the aforementioned portions.

OPERATION

The device is operated by clamping a pattern key K in the vise **51** and a key blank K' in the vise **52**. The vises, in accordance with known practice, include stop means engaging either a key shoulder or the tip of the key so as precisely lengthwisely to position the pattern key and the key blank relative to each other a distance apart corresponding exactly with the spacing of the cutter **24** the working surface **29** of the stylus.

With the keys appropriately clamped, detent **36** is lifted and the carriage **30** is laterally adjusted to the position of the first cut, at which position the notches **41** will be disposed directly beneath plunger pin **37** of the detent. The detent may then be released, locking the carriage against further lateral movement.

The first bit of the pattern key is then observed and the angularity of the key and key blank is adjusted so that the angularity of the first bit conforms to the axis of the stylus. Thus, if the first cut of the key is perpendicular to the blade of the key, the vises should be locked in the perpendicular position shown in FIGURE 1.

If the first cut is from left to right, as shown in said FIGURE 1 (the second cut of the key illustrated in FIGURE 1 being shown at a left to right angle), detent **67** is lifted and the vise is rotated in the manner previously set forth, so as angularly to orient the key and key blank with respect to the stylus by dropping the detent **67** in the proper, in this instance the upper, detent aperture **69**.

The cam clamp support **42** is then manually shifted rearwardly, with the spindle rotating the cutter **24**. Initially, the surface of the pattern key will pass beneath the lead surface **29***a* of the stylus, with further rearward movement directing the cam surface against the appropriate portion of the cut. Continued rearward pressure will result in the carriage **11** being cammed vertically upward a distance which is dependent upon the depth of the cut of the portion of the pattern key which is engaged by the stylus As the cam support **42** continues to be shifted rearwardly to the point where the stylus portion **29***c* is seated in the appropriate bit of the pattern key, the rotating cutter **24** will be directed against the side of the key blank and will mill away a section of the key blank. Since the heights of the key and the key blank are the same, and since the low points of the stylus and miller are disposed in the same vertical plane, the section milled from the key blank will be of the same height as that formed in the pattern key. Stop means are provided to prevent undue rearward movement of the clamp support **42**.

After the formation of the first cut, the clamp support **42** is shifted forwardly, during which forward movement any portions of the key blank not fully milled away will be removed. With the clamp support in forward position, detent **37** is again shifted, the latter shifting of the carriage being effective to provide the proper position of the key and key blank for the second cut.

The operation is thereupon repeated, i.e. the angle of

the key and key bank is set to correspond with the angle of the next succeeding cut of the key and the inward and outward cutting passes of the clamp support effected. The carrier is again laterally indexed for each succeeding cut, whereupon, after formation of the last cut, the blank will be completely formed into a proper key for the operation of the lock.

There is shown in FIGURE 4 a key simulator **80** clamped in the pattern vise, the simulator functioning as a substitute for a key, to provide a heightwise orientation of the stylus. While different simulators for left hand cuts, for right hand cuts, and for the various heightwise orientations may be provided, it is sufficient, if the base **81** of the cuts is made wider than normal, to utilize the stimulator for left and right hand as well as straight cuts, the tilting of the key or key blank clamps or turrets providing the angular alignment of the cuts, the broadened base portions **81** functioning merely as heightwise orienting means.

The simulator of FIGURE 4 is shown as having three separate heights or depths of cut, the simulator being mounted and demounted between the formation of each cut where succeeding cuts are of different heights.

Obviously, where the simulator is employed, some form of coding of the key to be proudced is required to indicate the cut angle and depth of the cuts.

From the foregoing it will be seen that there is provided a key cutting device for simulating cuts or bittings of a pattern key, including angled cuts. The device is simple to operate and is essentially foolproof, and permits the formation by locksmiths of keys which were formerly available only from the factory.

While the device is illustrated in connection with a stylus and cutter assembly which is lifted by shifting movement of the key and key blank, it will be readily recognized as within the spirit of the present invention to make th stylus and cutter assembly forwardly and rearwardly movable.

Also, it will be further recognized that some of the benefits of the invention may be achieved by employing a stylus and cutter assembly which are vertically movable by manual or automatic means rather than by the forward and rearward movement of the key and key blank.

Having thus described the invention and illustrated its use, what is claimed as new and is desired to be secured by Letters Patent is:

1. A key cutter for forming a key having bits angularly related to the plane of the key, comprising a base, a slide member mounted for movement on said base in a linear path, first and second side by side disposed vise members rotatably mounted to said slide member about spaced, parallel pivot axes for holding a key blank and a key, said pivot axes being perpendicular to said linear path, coupling means on said slide connecting said vises for tandem pivotal movement about said axes, indexed locking means interposed between at least one said vise and said slide member for locking said vises in one of a series of indexed, rotated positions about said axes, a carriage mounted on said base for movement toward and away from said base, key cutter means and key tracer means mounted on said carriage, said cutter and tracer means being spaced apart a lateral distance equal to the lateral spacing of said pivot axes, said cutter and tracer means, when said carriage is moved toward said base, being positioned to engage the blade portions, respectively, of a key blank and a key mounted in said vises when said slide member is moved in said linear path.

2. A device in accordance with claim **1** where in said carriage is yieldably urged toward said base, said cutter means and tracer means are equally spaced from said base, and said tracer means includes a cam portion positioned to engage said key and cam said carriage away from said base.

3. A device in accordance with claim **1** wherein said slide member is shiftable laterally parallel with a line drawn between said axes to successive, indexed, lateral positions, whereby successive portions of said key and key blank are aligned with said tracer means and said cutter means, respectively.

4. A key cutter device comprising, in combination, a base, a slide member mounted on said base for movement in a first plane, first and second vise members for holding a key blank and key, respectively, mounted on said slide member for pivotal movement about parallel axes, said vise members each having parallel jaw portions, coupling means connecting said vise members for maintaining said jaw portions of one said vise member parallel with the jaw portions of said other vise member in all rotated positions of said vise members about said pivot axes, carriage means mounted to said base for movement relative to said vise members in a path perpendicular to a line drawn between said pivot axes of said vise members, tracer means on said carriage positioned to engage a portion of a key in said second vise member when said carriage is shifted in said path and shift said carriage away from said base a distance in accordance with the height of the engaged portion of said key, and cutter means on said head for cutting said blank at a position in accordance with the spacing of said carriage from said base.

5. A key cutter device comprising, in combination, a base, a slide member mounted on said base for movement in a first plane, first and second vise members for holding a key blank and a key, respectively, mounted on said slide member for pivotal movement about parallel axes, said vise members each having parallel jaw portions, coupling means connecting said vise members for maintaining said jaw portions of one said vise member parallel with the jaw portions of said other vise member in all rotated positions of said vise members about said pivot axes, and key cutter and tracer head means mounted to said base for movement in a path perpendicular to a line drawn between said pivot axes of said vise members for tracing said key and guiding said head to form cuts in said blank in accordance with the depth of the cuts in said key.

6. A device in accordance with claim **4** and wherein said slide member is shiftable laterally parallel to a line drawn between said pivot axes to successive, lateral, indexed positions, whereby successive portions of said key and key blank are aligned with said tracer means and said cutter means, respectively.

7. In a key cuttter of the type in which a cutter and tracer in fixed relative position are moved into engagement respectively with a key blank and key and in which the engagement between the tracer and the key determines the position of engagement of the cutter and key blank, the improvement which comprises, first and second vise members for holding a key and key blank, respectively, in parallel spaced relation, first and second spaced pivot means supporting said first and second vise members for pivotal movement about spaced pivot axes, and coupling means linking said vises for tandem rotation, rotation of one said vise being accompanied by an equal rotation of the other said vise in the same direction.

8. A device in accordance with claim **7** and including index means for locking said vises in a plurality of predetermined rotated positions.

9. A device in accordance with claim **7** wherein said cutter and tracer are moved relative to said key and key blank in a direction perpendicular to a line drawn between said pivot axes.

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GERALD A. DOST, Primary Examiner