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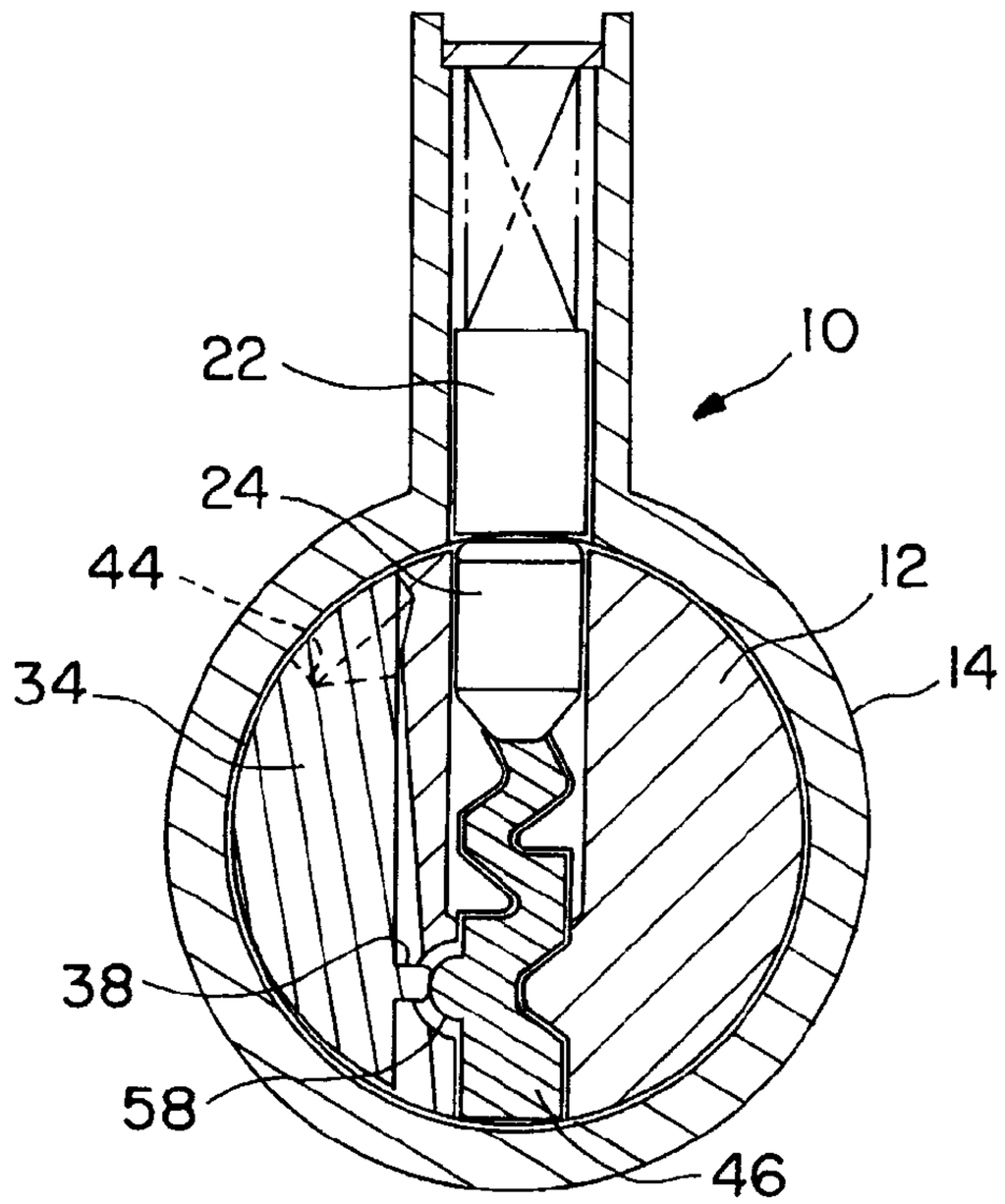


(57) Abrégé/Abstract:
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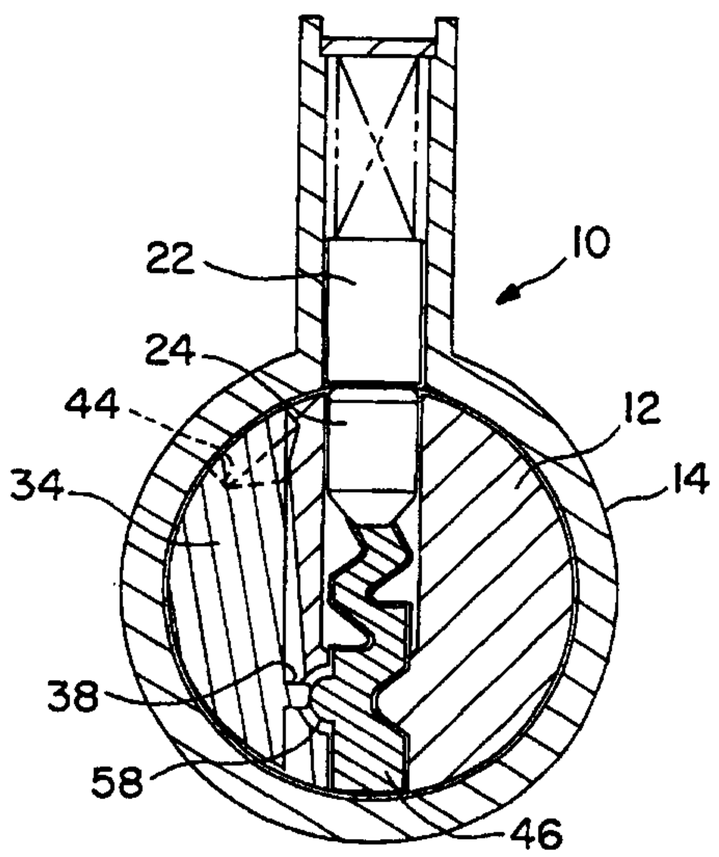


(57) Abstract

A cylinder lock (10) comprises a shell (14), a core (12), and a plurality of pin tumbler stacks (22, 24). The core includes an outer surface, a keyway and a cut-out offset from, but alignable with, at least one of the tumbler stacks. A plate (34) disposed on the cut-out is movable between a first position, wherein the plate acts as an extension of the core surface to prevent a tumbler stack from entering the cut-out, and a second position, wherein the plate does not prevent a tumbler stack from entering the cut-out. Upon insertion of an authorized key (46) having a projection (58) extending from a side thereof, the projection urges the plate from the second position to the first position to permit the core to rotate to an unlocked position. Upon the insertion of a properly bitted key, but without the projection, only partial rotation is permitted whereupon the tumbler stack enters the cut-out to thereby render the lock inoperable and trap the unauthorized key within the keyway.

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# LOCK SYSTEM WITH KEY TRAPPING

## Background of the Invention

### (1) Field of the Invention

The present invention relates to enhancements in the providing of security to areas through which access is afforded by means of a door and, particularly, to increasing the difficulty of obtaining an unauthorized key for operation of a lock installed in such a door. More specifically, this invention is directed to mechanical locking systems and, especially, to a novel lock and key which, in combination, provide access control, the lock "trapping" any other key which is employed in an attempt to defeat the lock. Accordingly, the general objects of the present invention are to provide novel and improved methods and apparatus of such character.

### (2) Description of the Prior Art

Mechanical locks which employ one or more linear arrays of pin tumbler stacks are, of course, well known in the art. The pin tumbler stacks of such locks are radially displaceable, with respect to the axis of rotation of a plug or core, in response to insertion of a key in a keyway provided in the core. The pin tumbler stacks comprise at least an upper or driver pin, which is spring biased toward the axis of core rotation, and a driven or bottom pin. A properly bitted key will cause pin tumbler stack displacement which, typically, causes the interface between the axially aligned driver and bottom pins to be coincident with a shear line defined by the core outer circumference. Thus, a properly bitted key will permit the core, with the bottom pins, to rotate within a shell. Core rotation will, through the action of a cam or tailpiece connected to the core, cause operation of a latch mechanism.

Locks of the type generally discussed above are known in the art as "cylinder" locks. The most common manner of defeating a cylinder lock consists of "manufacture" of an unauthorized key. It is believed fair to state that it is not possible to ensure against defeat simply by designing an intricate keyway and/or through the use of various arrangements of pin

tumbler stacks. Thus, there has been a long-standing desire for a lock which affords increased security and, particularly, a lock which will "trap" any unauthorized key, particularly a partly formed key which is being "patterned" in an attempt to defeat the lock. In addition to key trapping, a high level of security also dictates a unique combination of a lock and key, i.e., a lock system, which affords the lock manufacturer the ability to exercise key control by means of being the sole source of the key portion of the system.

**Summary of the Invention**

The present invention overcomes the above-briefly discussed and other deficiencies and disadvantages of the prior art and, in so doing, provides a novel lock system which is characterized by the use of a key having a unique security feature and which will "trap", i.e., mechanically capture on the keyway, any incorrect key which, lacking the unique security feature, is nevertheless bitted so as to displace the pin tumblers to a position which will enable rotation of the core relative to the shell.

A lock system in accordance with the invention includes a cylinder lock with a core in which, at the longitudinal position of at least one pin tumbler stack, is provided with a cut-out which is generally in the shape of a circular segment. With the lock in the locked state, i.e., prior to rotation of the core relative to the shell, this circular segment will be out of alignment with the pin tumbler stack. The cut-out is in communication with the keyway via an opening provided in a side of the keyway. A plate member or segment is inserted in the cut-out, the plate member being sized and shaped so as to be capable of limited movement within the cut-out and relative to the core, such movement being guided by the internal diameter of the shell. Movement of the plate member may be produced by a unique security feature, namely a camming projection, provided on the side of an authorized key. The camming projection extends through the opening in the keyway side. This camming projection is sized and shaped to protrude outwardly beyond the plane of the side of the blank

from which the key was formed and into the circular sector. The plate member, when caused to move along a path defined by the shell internal diameter in response to contact with a camming projection on an authorized key, will function as an extension of the core and will present an edge which generally corresponds to the shear line. Thus, with an authorized key in the keyway, the core will appear to be uninterrupted to the driver pin of a pin tumbler stack at the location of the cut-out. However, in the case of an unauthorized key, core rotation will cause the outer periphery of the plate member to be displaced below the shear line and, in part, to define an opening into which the driver pin will move once the core has been rotated relative to the shell sufficiently to fully register the pin tumbler chamber in the shell with the cut-out in the core. The driver pin will, accordingly, move radially toward the axis of core rotation so as to bridge the shear line and prevent further core rotation in either the clockwise or counter-clockwise direction. The lock will thus be rendered inoperable and the unauthorized key will be trapped in the keyway.

**Brief Description of the Drawings**

The present invention may be better understood, and its numerous objects and advantages will become apparent to those skilled in the art, by reference to the accompanying drawings wherein like reference numerals refer to like elements in the several figures and in which:

Figure 1 is a side elevation view, partly in section, of a lock in accordance with the present invention;

Figures 2a and 2b are, respectively, cross-sectional side elevation views of the lock of Figure 1 depicting an attempt to operate the lock with an unauthorized key, Figure 2a depicting key insertion and Figure 2b, which is taken along line 2b - 2b of Figure 1, depicting partial rotation and key trapping;

Figures 3a and 3b are views similar to Figures 2a and 2b but depicting operation of the lock with an authorized key;

Figures 4a and 4b are respectively front elevation and rear elevation views of a key blank in accordance with the invention;

Figure 5 is a cross-sectional view, taken along line 5 - 5 of Figure 4b, of the key blank of Figures 4a and 4b; and

Figures 6a and 6b are perspective views of the key blank of Figures 4a and 4b.

**Description of the Disclosed Embodiment**

With reference jointly to Figures 1 - 4, a cylinder lock in accordance with the present invention is indicated generally at 10. Lock 10 comprises a core 12 which may be rotated, about an axis of rotation, relative to a shell 14. Shell 14 includes an extension or bible 16. In the disclosed embodiment, a single linear array of pin chambers, such as chamber 18, are provided in bible 16. The pin chambers 18, with the lock in the locked state as depicted in Figures 2a and 3a, are in registration with pin chambers 20 in core 12. In the disclosed embodiment, pin tumbler stacks comprising an upper or driver pin 22 and a driven or bottom pin 24 are provided in the registered pin chambers. The driver pins 22 are resiliently biased, by means of compression springs 26, radially in the direction of the axis of rotation of core 12. A tailpiece or cam, not shown, will be connected to the end of core 12 disposed at the right as the lock is shown in Figure 1. The tailpiece will be coupled to a latch mechanism or the like so that the lock may be employed to selectively prevent and permit access to a space on one side of a door in which the lock is installed.

The lock as described above is of conventional construction. It will thus be understood by those skilled in the art that the configuration and location of the pin chambers and pin tumbler stacks may be varied without departing from the invention. For example, there may be multiple arrays of pin chambers, radially offset from one another, and the stacks may include any number of pins.

Also in accordance with conventional construction, a keyway 28 (see Fig. 2a) is provided in core 12, the keyway defining a plane. In the

disclosed embodiment, the axes of the pin chambers 18 lie in this plane. The keyway communicates with the pin chambers 20 in the core and has a unique profile, i.e., cross-section, as chosen by the lock manufacturer. A conventional keyway includes a plurality of wards which, in part, define the keyway cross-section. A key which will operate lock 10, i.e., a key which may be inserted in the keyway, must have a blade with side surfaces cut so as to be complementary with these wards. Thus, starting from a key blank with parallel sides, longitudinal cuts may be made so that the blade cross-section matches the keyway cross-section. Additionally, considering the lock depicted in the drawings as an example, the lock having a single linear array of pin tumbler stacks, one edge of the key blade must also be cut, i.e., bitted, such that, upon insertion of the key into the keyway, contact between the irregular upper edge of the key and the bottom pins will, as depicted in Figures 2 and 3, move the pin tumbler stacks against the bias of the springs 26 so as to place the interface between the driver and bottom pins at the shear line between the core 12 and shell 14. Thus, in a conventional cylinder lock, in order to permit relative rotation between the core and shell, the key blank must be provided with longitudinal cuts on the sides to define a profile which matches the keyway cross-section and a key blank having the correct profile must be cut on an edge in accordance with the lock combination defined by the variable length pins which define the individual pin tumbler stacks.

In accordance with the present invention, at the location of at least one of the pin tumbler stacks, a circular segment is cut out of core 12. This segment is defined by a wall 30 on core 12 which, with the exceptions to be discussed below, is straight and continuous between two points of intersection with the shear line. In the disclosed embodiment, the spacing between keyway 28 and wall 30 increases from a first end of the wall located adjacent the bottom of the keyway to an opposite end of wall 30 which is adjacent the outer end of a pin chamber 20 in core 12. An opening 32 in wall 30 provides communication between the keyway and

the space formed by the circular segment cut-out. In the disclosed embodiment, the opening 32 is formed by a semi-circular groove which forms a portion of the keyway profile. Restated, in the region of the circular segment cut-out, the radius of the groove which in part defines the keyway exceeds the thickness of the wall separating the cut-out from the keyway, thus forming an opening 32 with arcuate side walls. The opening 32 is located at the opposite side, when compared to the pin tumbler chamber 20, of a plane which extends through the core axis of rotation and is transverse to the axis of chamber 20.

A movable plate member 34 having a shape which is similar to, but different from, the circular segment cut-out defined by wall 30 is inserted in the cut-out. Plate 34 has a first, straight side 36 which faces wall 30. Side 36 is provided with a cam follower projection 38 which extends into opening 32. Plate 34 also has an arcuate side 40 which extends from a first end of side 36, the radius of side 40 being substantially the same as the radius of core 12. Arcuate side 40 terminates at, i.e. merges with, a second side surface 42, which may be either straight or curved as shown, which extends to the second end of side 36, i.e., the end of side 36 which is disposed above the plane of the top of the keyway as the lock is depicted in Figures 2 and 3. The width of plate 34 is, as may best be seen from Figure 1, less than the diameter of the pin chamber 18 in bible 16. Core 12 is provided with a blind hole or recess 44 which, in part, extends into wall 30. Hole 44 has a size and shape complementary to the lower end of a driver pin 22. The axis of hole 44 intersects the circular segment cut-out. Consequently, plate 34 extends into, and may effectively bridge, blind hole 44. Depending on the position of plate 34, access of pin 22 to hole 44 will either be permitted or blocked. The position of plate 34 is controlled in the manner to be described below.

A key in accordance with the invention is indicated at 46 in Figure 3. The blank from which key 46 was cut is indicated at 48 in Figures 4 and 6. The blade portion of key blank 48, indicated generally at 64, extends from a bow 49 and has a pair of opposite, planar sides 50 and 52

and top and bottom edges 54 and 56. Where key blank 48 deviates from the prior art is in the provision of a camming projection 58 on side 50 of the blade. Camming projection 58 is preferably elongated, as may be seen from Figures 4a and 6a, and has a cross-section which is generally complementary to that of the groove which defines opening 32. A recess 58' is formed in the opposite side of blade 64 in registration with projection 58 as may be seen from Figs. 4, 5 and 6. Recess 58' has a size and shape which is generally complementary to the size and shape of projection 58. Projection 58 is also located below the center line of the blade. Blank 48 will also be provided with longitudinal cuts 60 along the side(s) of the blank as required by the wards in the keyway. A key for operation of lock 10 may be produced by cutting the top edge 54 of blank 48 to provide flats, i.e., the bitting, which will be in registration with the pin tumbler stacks with the key fully inserted in the keyway, these flats being at a "height" so as to displace the individual pin tumbler stacks as appropriate to satisfy the lock combination. A particularly unique feature of key blank 48 resides in the extension of projection 58 beyond the plane of side 50 as best seen from Figures 5 and 6a.

Referring to Figure 2, insertion in keyway 28 of an unauthorized key 66 which satisfies the lock combination save for the camming projection 58 will displace all of the pin tumbler stacks to positions which will permit rotation of core 12 within shell 14. As the core is rotated in the clockwise direction, it will carry the plate member 34. After a relatively small degree of rotation, as depicted in Figure 2b, the plate member will "flop" over so that the side 36 thereof abuts the wall 30, this "flopping" action resulting from either or both of interaction between spring biased driver pin 22 and plate 34 or the influence of gravity. When rotation continues to the point where blind hole 44 is in registration with pin chamber 18, the driver pin 22 will, under the influence of spring 26, be driven into blind hole 44 until it bottoms on the top, i.e., the side 42, of plate member 34. At this point, because driver pin 22 will bridge the shear line, further rotation of the core in either a clockwise or counter-clockwise direction, will be prevented.

Additionally, because of the interaction between the immobilized bottom pins and the top edge of the key blade, the unauthorized key 66 will be trapped in the keyway, i.e., will not be removable.

If the above-described trapping action is desired for both the clockwise and counter-clockwise directions of rotation of core 12 from the position of Figures 2a and 3a, a second plate member 34' (not shown) will be provided and a second camming projection will be formed on the side of the key blade oppositely disposed with respect to projection 58.

As may be seen from Figure 3, the insertion of an authorized key in keyway 28 will result in the establishment of contact between camming projection 58 and the projection 38 on plate member 34. This contact will impart clockwise movement, relative to core 12, of the plate member 34, i.e., the projection 38 functions in the manner of a cam follower and, in so doing, drives the plate member 34 with which it is integral. This movement will be guided by the inner diameter of shell 14 and thus plate member 34 will be driven upwardly such that the junction of sides 36 and 42 is in an abutting relationship with the upper end of wall 30. This abutting relationship causes side 42 of the plate member to bridge blind hole 44. Accordingly, when the core 12 is rotated within shell 12, side 42 of plate 34 will initially prevent driver pin 22 from entering blind hole 44 to a significant degree and, as rotation of the core continues to the position shown in Figure 3b, the arcuate side 40 will contact the bottom of driver pin 24 and cam driver pin against the bias of spring 26 so that rotation of the core to the unlocked position may be accomplished.

While a preferred embodiment has been described, various modifications and substitutions may be made thereto without departing from the spirit and scope of the invention. Accordingly, it is to be understood that the present invention has been described by way of illustration and not limitation.

What is claimed is:

1. A cylinder lock comprising:

a shell, said shell having a forward end, a longitudinally spaced rear end and a longitudinal axis extending therebetween, said shell having an interior surface which defines a core-receiving chamber arranged coaxially with respect to said axis, said shell further having at least a first longitudinal row of pin tumbler receiving chambers, said chambers having axes and communicating with said interior surface, said chamber axes and said longitudinal axis cooperating to define a first plane;

a core disposed within said core receiving chamber of said shell for rotation about said longitudinal axis, said core including a longitudinally extending keyway having opposite sides, said core also including at least a first row of pin tumbler receiving chambers, said core pin tumbler receiving chambers each having an axis and being axially alignable with an associated one of said shell pin tumbler receiving chambers, said core having a generally cylindrical outer surface which cooperates with said shell to define a first shear line therebetween, said core pin tumbler receiving chambers extending between said keyway and said core outer surface, said core additionally having a cut-out at the longitudinal location of one of said core pin tumbler receiving chambers, said cut-out extending into said core from said cylindrical outer surface thereof on one side of said keyway, said cut-out being in communication with said keyway via an opening in a side of said keyway, said cut-out at least in part defining a recess in said core outer surface at said longitudinal locations, said recess being angularly offset from the axis of said one core pin tumbler receiving chamber, said recess being registrable with a shell pin tumbler receiving chamber by rotation of said core relative to said shell, said recess having a cross-sectional size and shape which is commensurate with the cross-sectional size and shape of the shell pin tumbler receiving chamber at said longitudinal location;

a plurality of pin tumblers, said pin tumblers each having at least a bottom pin and a driver pin, the pins of said pin tumblers being in axial alignment when said shell pin receiving chambers are in axial alignment

with said core pin tumbler receiving chambers, said pin tumblers each further comprising a spring for biasing said pins in the direction of said keyway whereby said bottom pins may extend into said keyway and one pin of each of said pin tumblers may extend across said shear line to coact with said core and shell to prevent rotation of said core relative to said shell; and

a plate disposed in said cut-out in said core, said plate being movable relative to said core between first and second positions, said plate having a first outer surface portion which, in said first position of said plate, is displaced from said shear line and, in said position of said plate, is disposed at said shear line whereby said plate first outer surface portion selectively defines either a discontinuity in or substantially a continuation of said outer surface of said core, said plate effectively bridging said core outer surface recess when moved to said second position, said plate further having a projection located to extend into said keyway via said opening whereby force to impart movement to said plate may be delivered to said projection from a key inserted in said keyway.

2. A lock as recited in claim 1, wherein said cut-out in said core has generally the shape of a circular segment.

3. A lock as recited in claim 2, wherein said opening and said recess are located on opposite sides of a second plane, said second plane being generally transverse to said first plane and extending through said longitudinal axis.

4. A lock as recited in claim 1, wherein said plate further includes a second outer bearing surface which cooperates with said shell interior surface to guide movements of said plate relative to said core.

5. A lock as recited in claim 2, wherein said plate further includes a second outer bearing surface which cooperates with said shell interior surface to guide movements of said plate relative to said core.

6. A lock as recited in claim 5, wherein said opening and said recess are located on opposite sides of a second plane, said second plane being generally transverse to said first plane and extending through said longitudinal axis.

7. A lock as recited in claim 1, wherein said plate projection extends into said keyway when said plate is in said first position and wherein said projection is substantially displaced from said keyway when said plate is in said second position.

8. A lock as recited in claim 2, wherein said plate projection extends into said keyway when said plate is in said first position and wherein said projection is substantially displaced from said keyway when said plate is in said second position.

9. A lock as recited in claim 4, wherein said plate projection extends into said keyway when said plate is in said first position and wherein said projection is substantially displaced from said keyway when said plate is in said second position.

10. A lock as recited in claim 1 wherein said cut-out in said core has a width which is less than the diameter of said one core pin tumbler receiving chamber and wherein said recess in said core outer surface is in part further defined by a blind hole which is intersected by said cut-out.

11. A lock as recited in claim 5 wherein said cut-out in said core has a width which is less than the diameter of said one core pin tumbler

receiving chamber and wherein said recess in said core outer surface is in part further defined by a blind hole which is intersected by said cut-out.

12. A lock as recited in claim 11, wherein said plate projection extends into said keyway when said plate is in said first position and wherein said projection is substantially displaced from said keyway when said plate is in said second position.

13. A cylinder lock system comprising:

a key comprising a bow portion and a blade which longitudinally extends from said bow portion, said blade having a pair of spaced side surfaces which are at least in part substantially parallel and interconnected by a pair of edges extending therebetween, at least one of said edges being provided with surface irregularities which define the key bitting, said key further comprising a camming projection extending laterally from one of said side surfaces;

shell means including a shell having a longitudinal axis and an engagement surface traversing an interior portion thereof, said shell means defining at least a first longitudinal row of receiving chambers;

core means mounted within said shell means for rotation about said shell axis, said core means having an outer surface and defining a longitudinally extending keyway, at least a first row of receiving chambers which are alignable with said shell means receiving chambers and a first blind hole which is offset from but alignable with at least one of said shell means receiving chambers, a first shear line being defined between said shell means engagement surface and said outer surface of said core means;

a plurality of pin tumbler means reciprocally mounted within said core means and said shell means receiving chambers, each of said pin tumbler means having a bottom pin which is normally biased into said keyway and a driver pin which is normally disposed adjacent to said bottom pin to define a tumbler shear line therebetween, said pin tumbler

means normally coacting with said core means and said shell means to prevent rotation of said core means relative to said shell means; and

key trapping plate means movably disposed within said shell means for movement between a first position, wherein said plate means permits at least one of said driver pins to cross said first shear line and enter into said blind hole, and a second position wherein said plate means prevents said driver pins from crossing said first shear line;

insertion of said key into said keyway resulting in said camming projection moving said plate means from said first position to said second position and resulting in said key blade surface irregularities causing reciprocation of said pin tumbler means such that said tumbler shear lines are in registration with said first shear line to thereby permit rotation of said core means relative to said shell means.

14. A cylinder lock system as recited in claim 13, wherein said outer surface of said core means is generally cylindrically shaped, wherein said core means defines a cut-out which is at least partially alignable with said one of said shell means receiving chambers, and wherein said plate means is movably mounted within said cut-out.

15. A cylinder lock system as recited in claim 13, wherein said plate means includes a bearing surface which is contoured to generally form a shear line extension of said outer surface of said core when said plate means is in said second position and to be displaced below said first shear line when said plate means is in said first position.

16. A cylinder lock system as recited in claim 14, wherein said plate means includes a bearing surface which is contoured to generally form a shear line extension of said outer surface of said core when said plate means is in said second position and to be displaced below said first shear line when said plate means is in said first position.

17. A cylinder lock system as recited in claim 14, wherein said cut-out extends into said keyway, wherein said plate means includes a projection which at least partially extends into said keyway when said plate means is in said first position and wherein said plate means projection does not substantially extend into said keyway when said plate means is in said second position.

18. A cylinder lock system as recited in claim 16, wherein said cut-out extends into said keyway, wherein said plate means includes a projection which at least partially extends into said keyway when said plate means is in said first position and wherein said plate means projection does not substantially extend into said keyway when said plate means is in said second position.

19. A cylinder lock system as recited in claim 17, wherein said cut-out extends into said keyway at a portion thereof which is located opposite said core means receiving chambers with respect to said longitudinal shell axis.

20. A cylinder lock system as recited in claim 18, wherein said cut-out extends into said keyway at a portion thereof which is located opposite said core means receiving chambers with respect to said longitudinal shell axis.

21. A cylinder lock system as recited in claim 13, wherein said key projection is an elongated projection which extends along the longitudinal direction of said blade.

22. A cylinder lock system as recited in claim 14, wherein said key projection is an elongated projection which extends along the longitudinal direction of said blade.

23. A cylinder lock system as recited in claim 15, wherein said key projection is an elongated projection which extends along the longitudinal direction of said blade.

24. A cylinder lock system as recited in claim 17, wherein said key projection engages said plate means projection to move said plate means from said first position to said second position.

25. A cylinder lock system as recited in claim 19, wherein said key projection engages said plate means projection to move said plate means from said first position to said second position.

26. A cylinder lock system as recited in claim 13, wherein said key blade side surfaces extend substantially the length of said blade and define a pair of substantially parallel planes, the spacing between said parallel plains defining the maximum thickness of said blade, and wherein said camming projection extends beyond a first of said parallel planes, said key blade further having a recess located in registration with said camming projection, said recess being in the side surface of said blade disposed oppositely with respect to said one side surface.

27. A key blank for a key intended for use with a cylinder lock, the lock including a rotatable core which defines a keyway having a top wall intersected by a series of tumbler bores and an irregularly shaped cross-section, the core further having a cut-out which communicates with the key way through a sidewall of the keyway, a moveable member having a cam follower projection which extends into the keyway at said sidewall being disposed in the cut-out, said key blank comprising:

a bow;

an elongated blade extending from said bow and terminating at a blade tip, said blade having a longitudinal axis and a pair of oppositely disposed and spaced edges one of which is adapted for bitting to cooperate with tumbler in said tumbler bores, the spacing between said edges defining the blade width, the blade further having first and second side faces which interconnect said edges, the spacing between said first and second side faces defining the blade thickness, said blade thickness being measured transversely with respect to said blade width and being substantially smaller than said width, said side faces each having an elongated surface which extends substantially the length of said blade, said elongated surfaces respectively defining first and second substantially parallel planes at least prior to cutting said side faces to cause the cross-

section of said blade to be generally complimentary to the cross-section of the lock keyway, said planes defining therebetween the maximum thickness of said blade;

a three-dimensional camming projection extending outwardly from a first of said blade side faces in a region intermediate said bow and blade tip, said camming projection extending beyond said first, said camming projection having a length which is substantially less than the length of said blade, said camming projection having a first cam surface which faces said blade tip, said first cam surface being sized and shaped to engage and deliver a progressively increasing force, directed transversely to said first plane, to a cam follower projection which extends into a keyway which receives said blade to thereby impart motion to the movable member which has the cam follower projection; and

a recess in said second of said blade side faces, said recess being at least in part in registration with said camming projection and having a size and shape which is commensurate with said camming projection.

28. The key blank of claim 27 wherein said camming projection is elongated in the longitudinal direction of said blade.

29. A key blank for a key intended for use with a cylinder lock, the lock including a rotatable core which defines a keyway having an irregularly shaped cross-section, the core further having a cut-out which communicates with the key way, a moveable member having a cam follower projection which extends into the keyway at a side thereof being disposed in the cut-out, said key blank comprising:

a bow;

an elongated blade extending from said bow and terminating at a blade tip, said blade having a longitudinal axis and a pair of oppositely disposed and spaced edges, the spacing between said edges defining the blade width, the blade further having first and second side faces which interconnect said edges, the spacing between said first and second side faces defining the blade thickness, said blade thickness being measured transversely with respect to said blade width and being substantially smaller than said width, said side faces each having an elongated surface which extends substantially the length of said blade, said elongated surfaces respectively defining first and second substantially parallel planes at least prior to cutting said side faces to cause

the cross-section of said blade to be generally complimentary to the cross-section of the lock keyway, said planes defining therebetween the maximum thickness of said blade;

a three-dimensional camming projection extending outwardly from a first of said blade side faces in a region intermediate said bow and blade tip, said camming projection extending beyond said first, said camming projection having a length which is substantially less than the length of said blade, said camming projection having a first cam surface which faces said blade tip, said first cam surface being sized and shaped to engage and deliver a progressively increasing force, directed transversely to said first plane, to a cam follower projection which extends into a keyway which receives said blade to thereby impart motion to the movable member which has the cam follower projection; and

a recess in said second of said blade side faces, said recess being at least in part in registration with said camming projection and having a size and shape which is commensurate with said camming projection,

wherein said camming projection is elongated in the longitudinal direction of said blade.

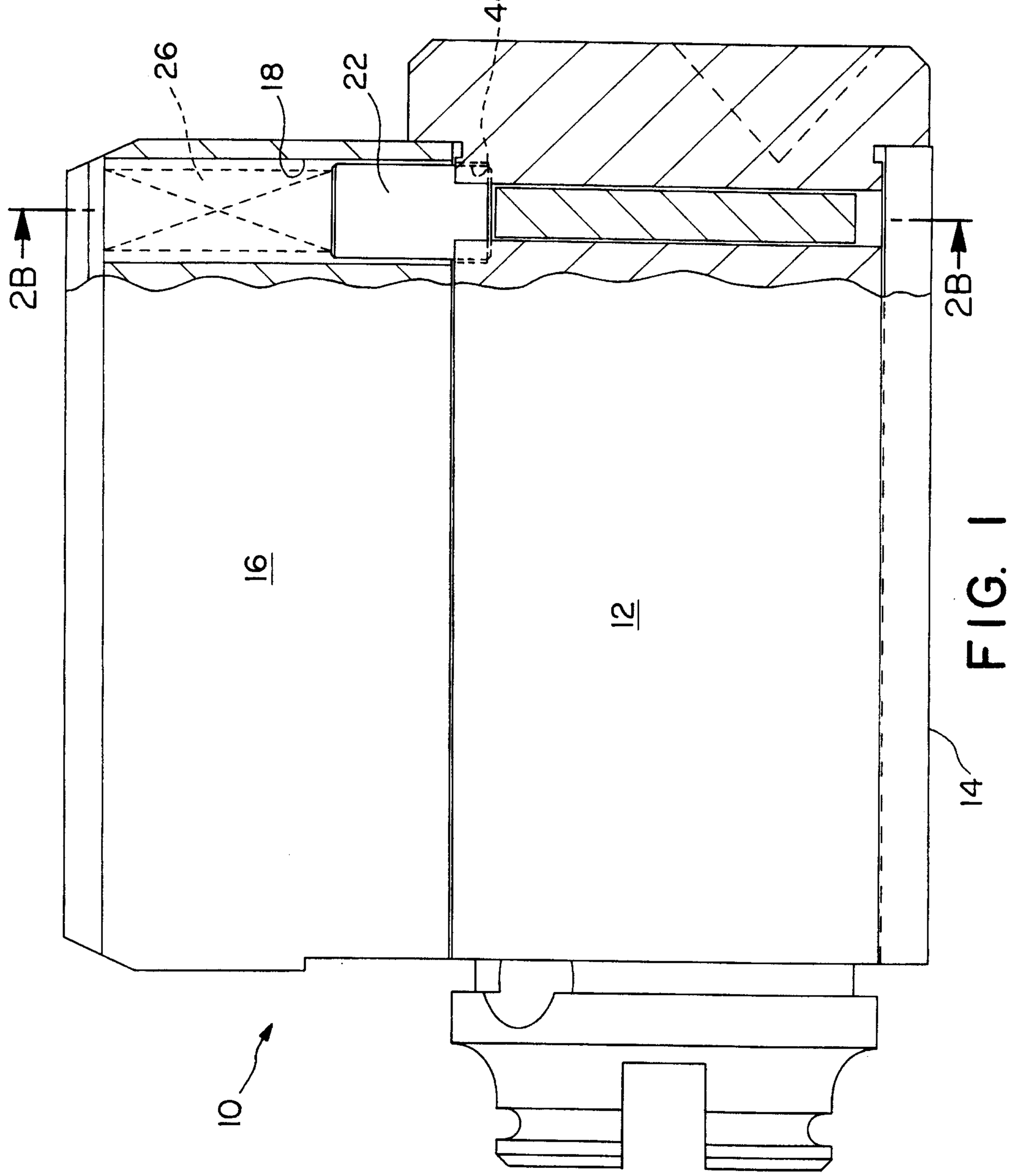


FIG. 1

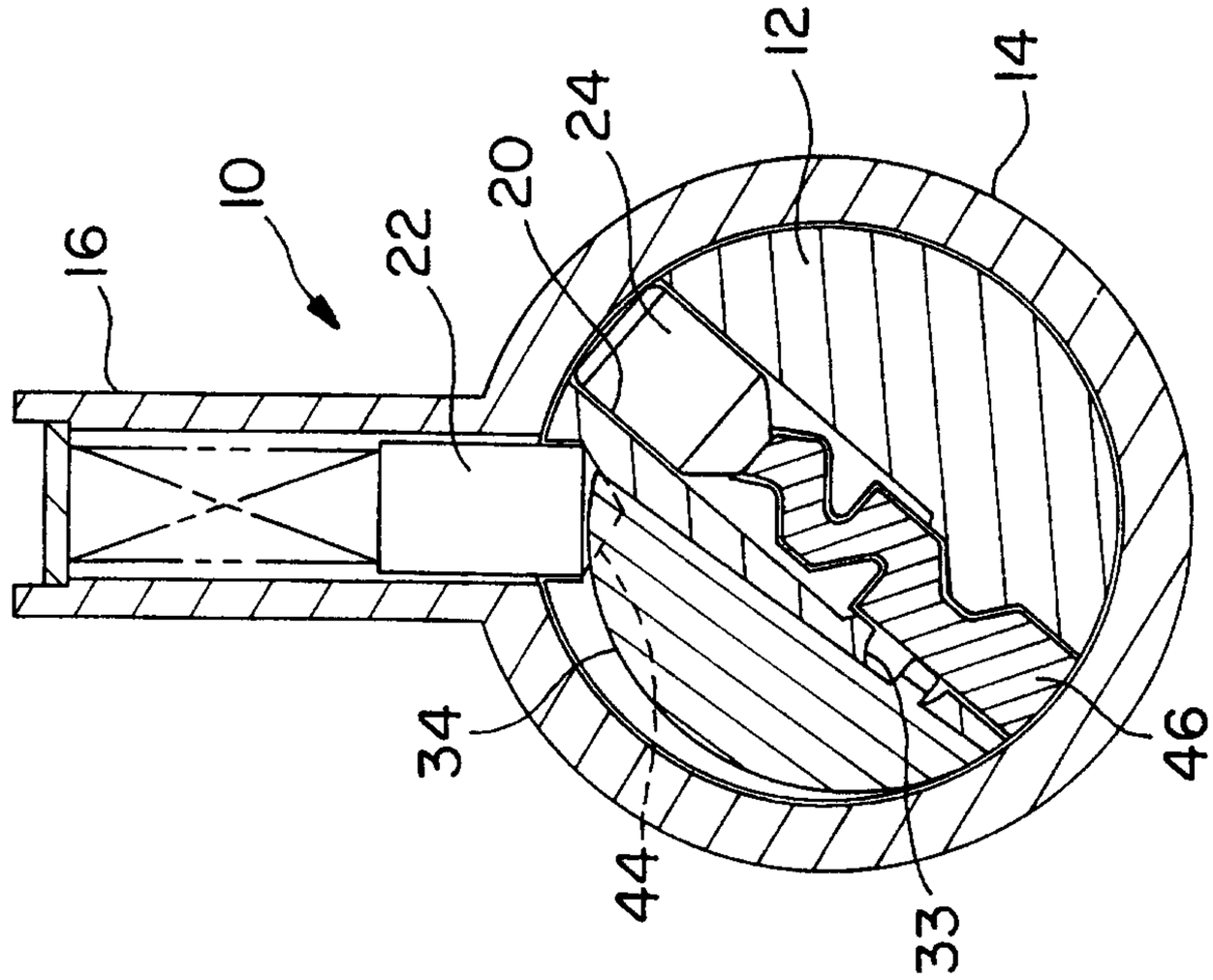
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FIG. 2B

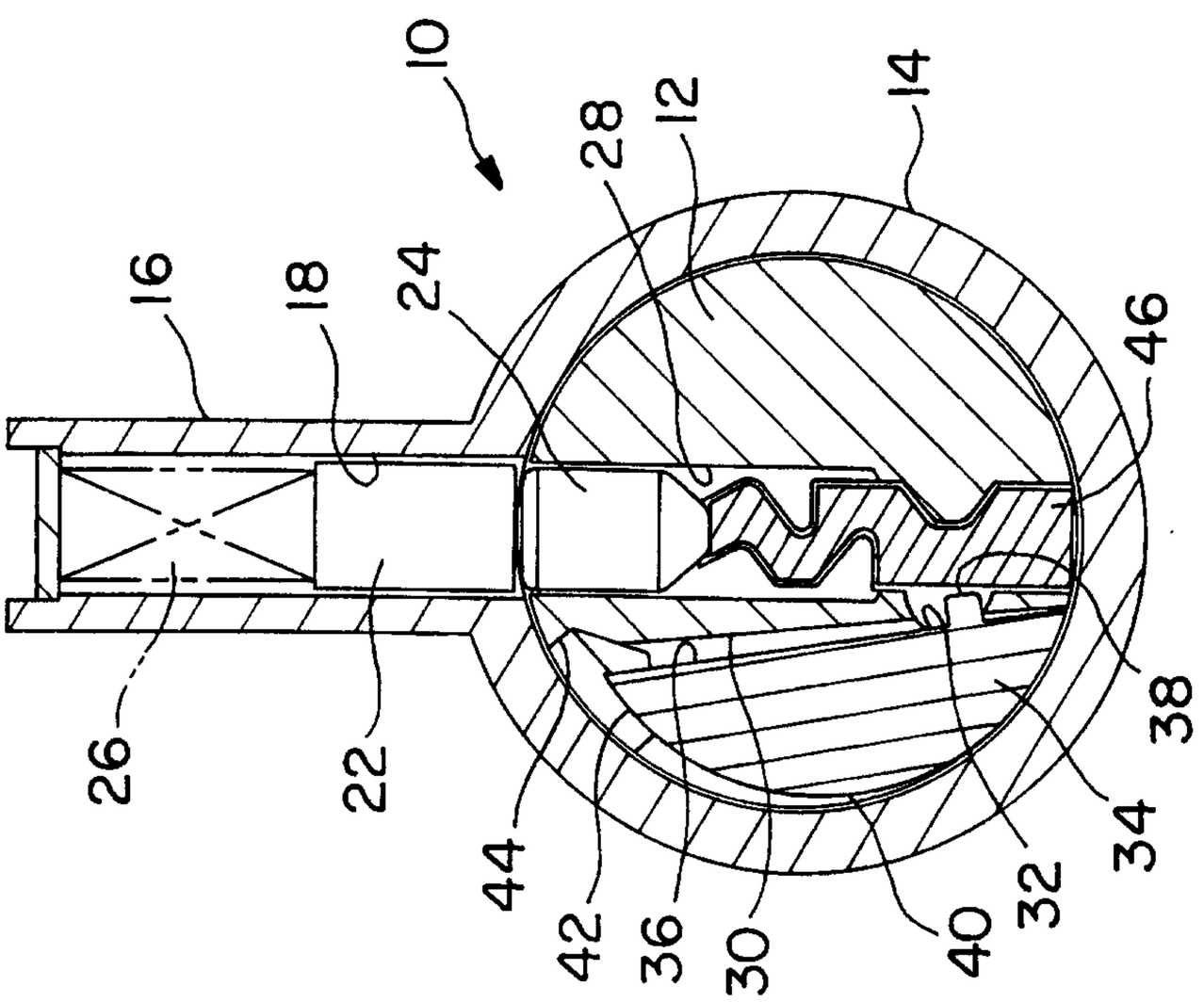
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FIG. 2A

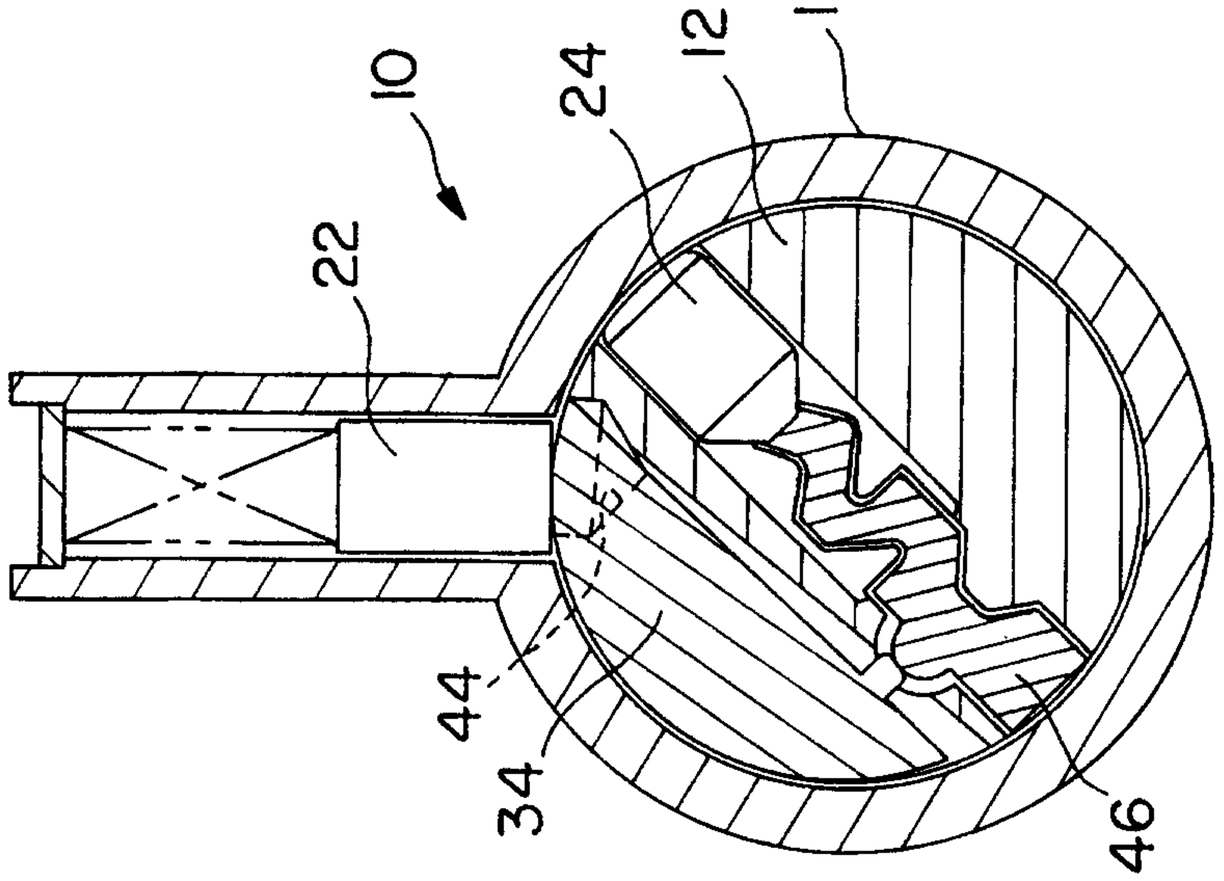



FIG. 3B

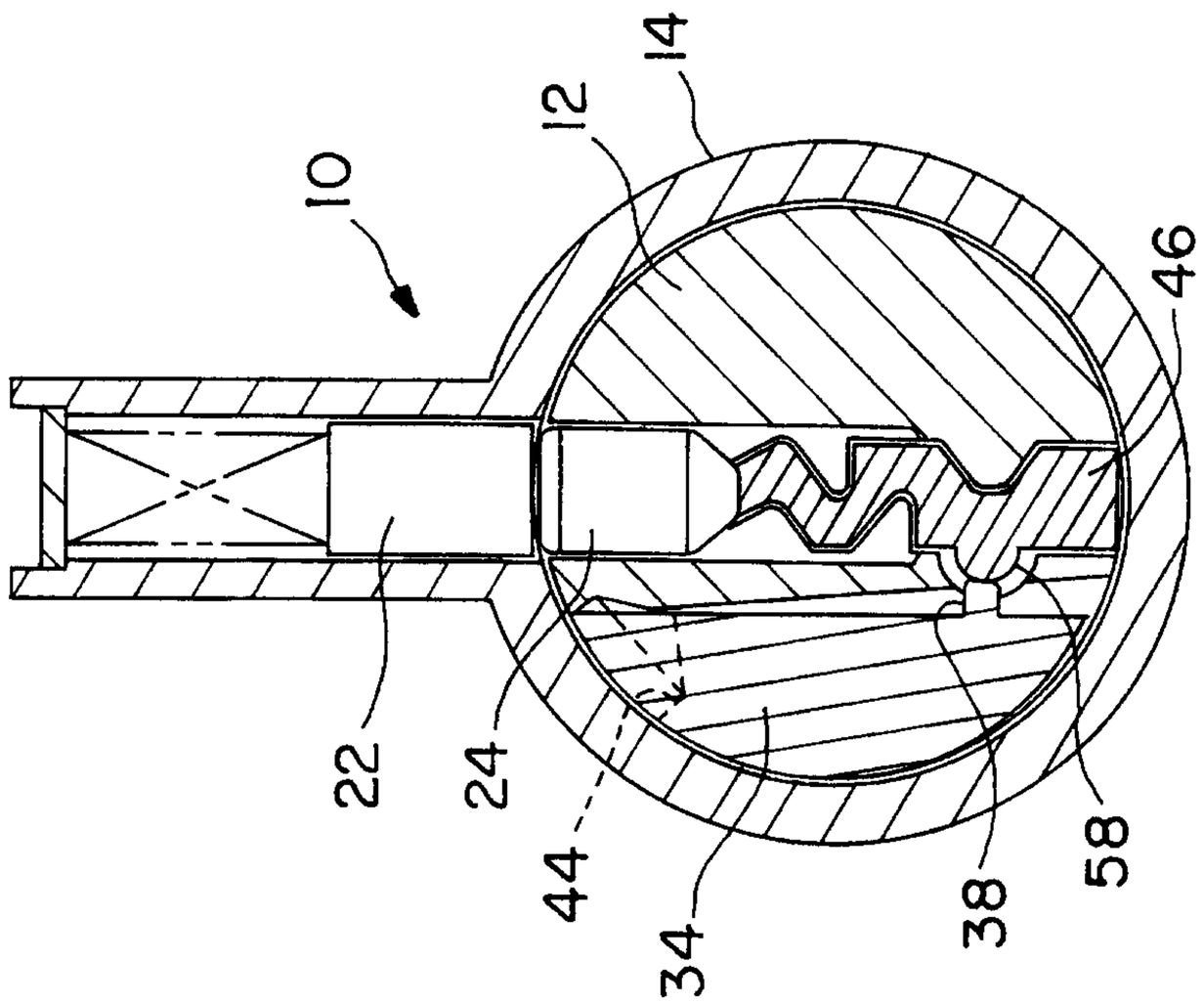



FIG. 3A

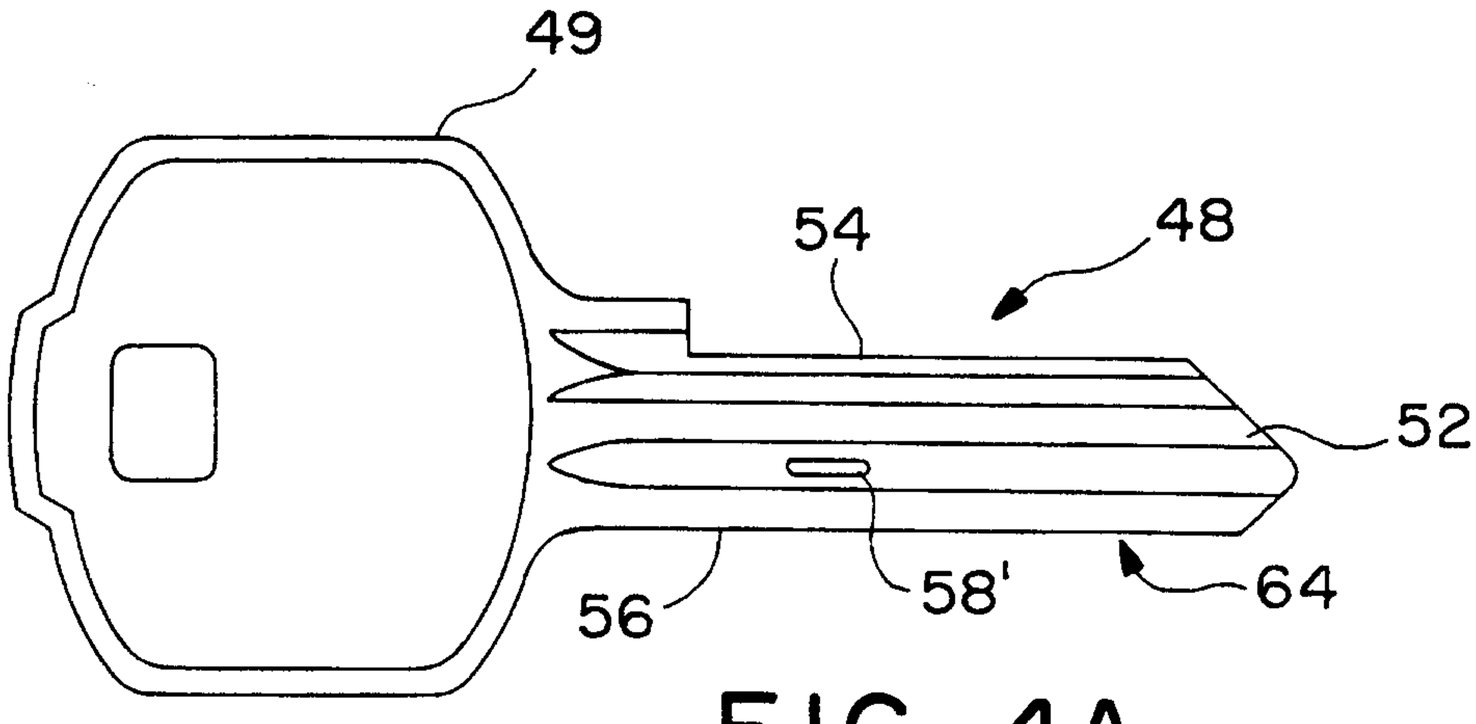



FIG. 4A

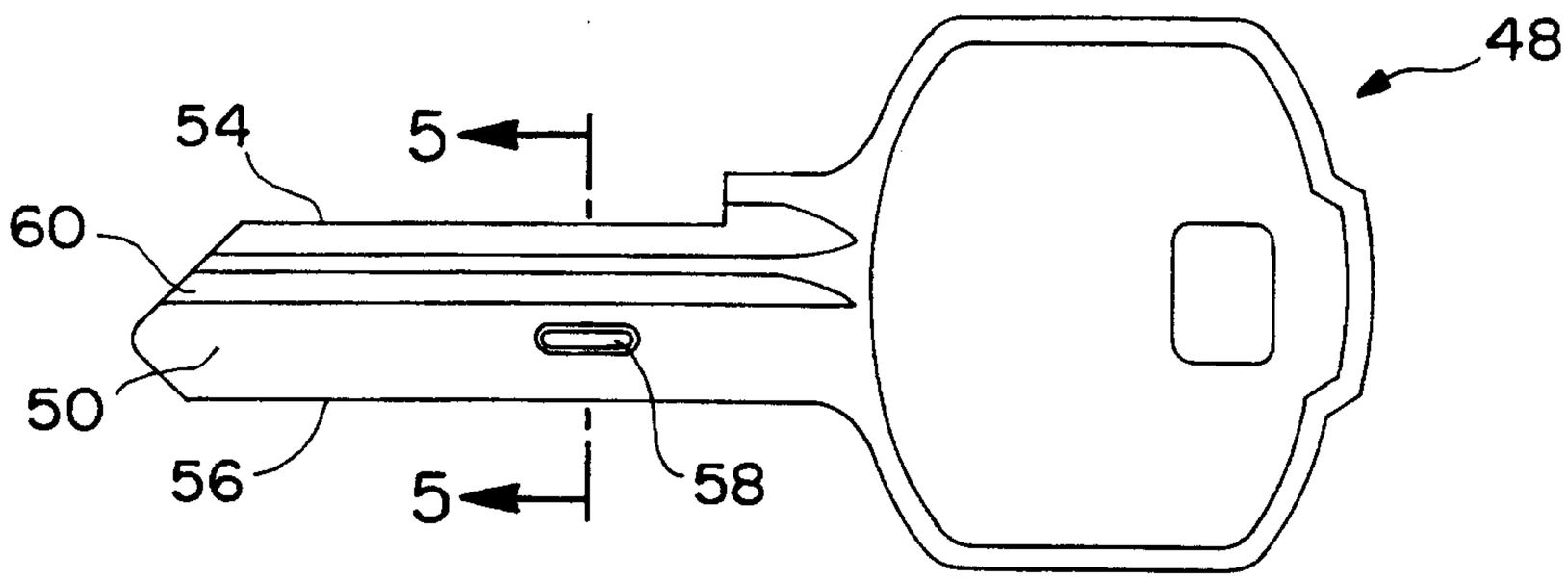



FIG. 4B

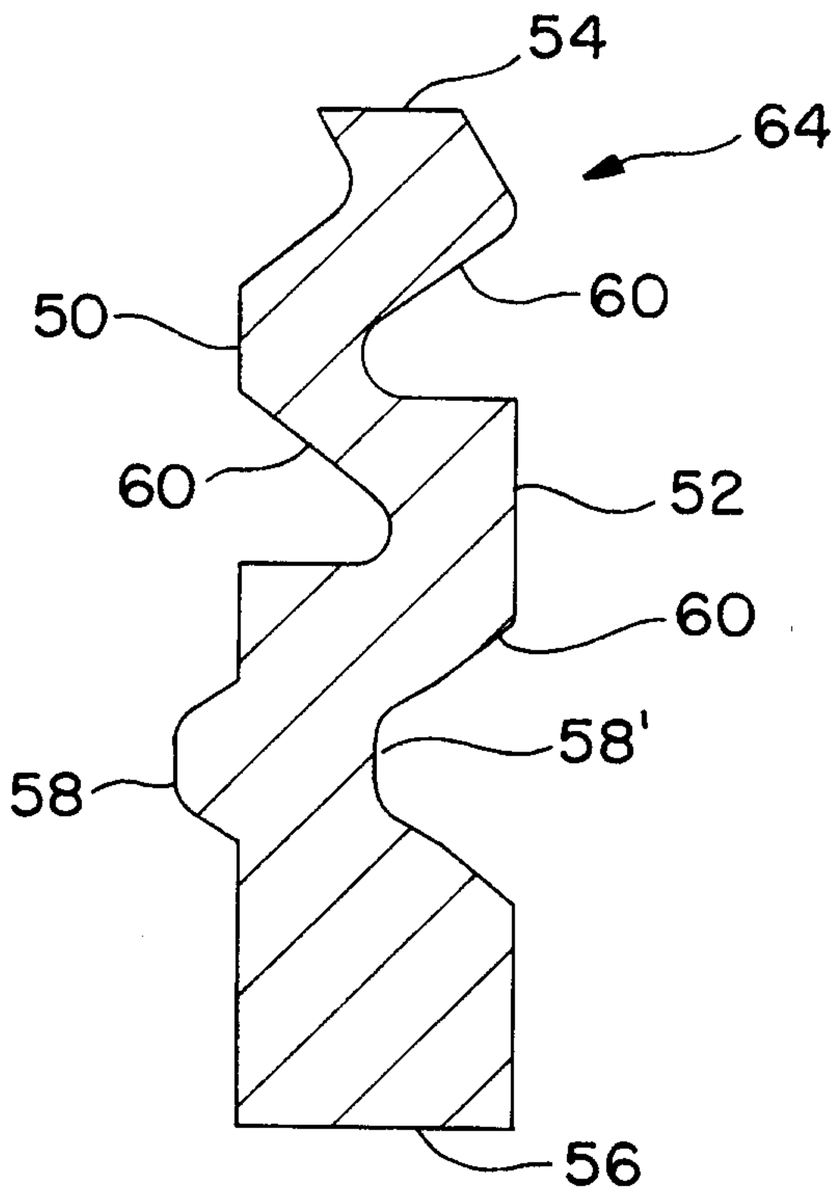



FIG. 5

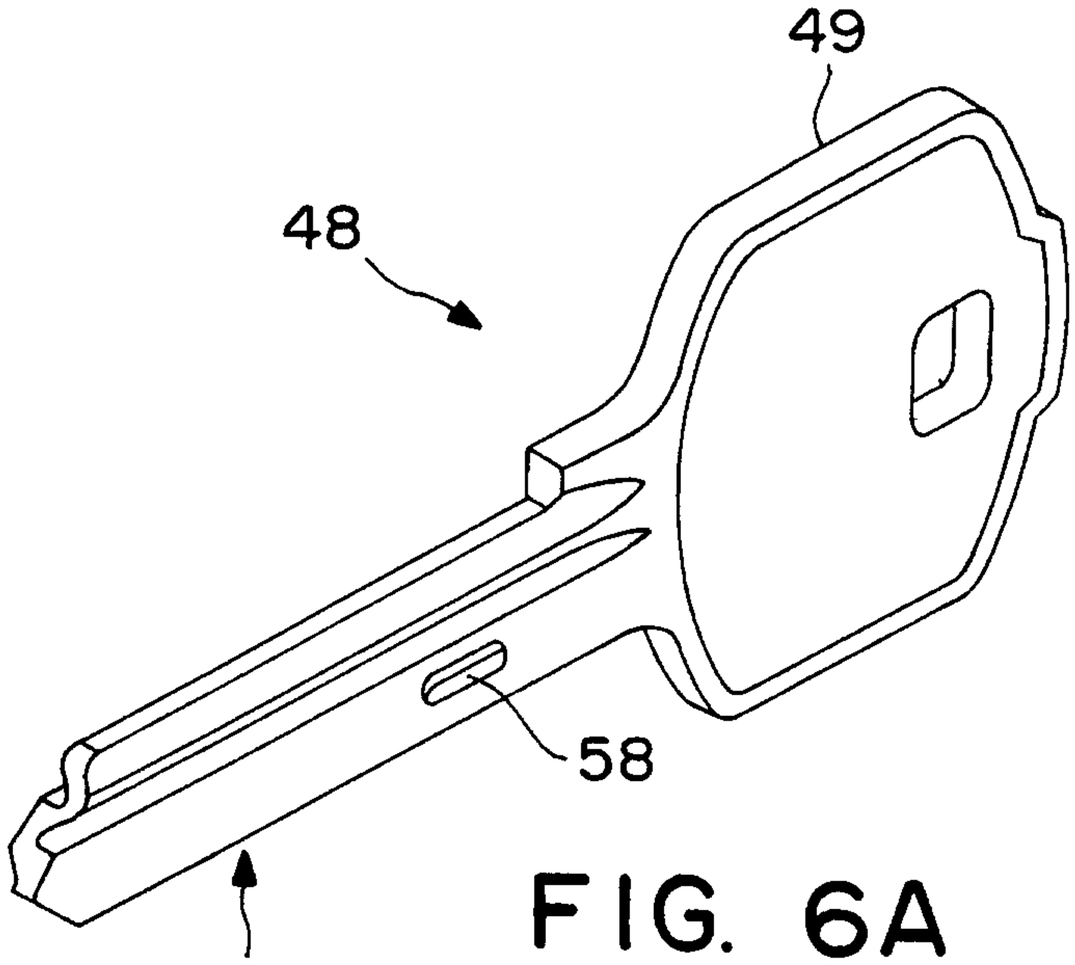



FIG. 6A

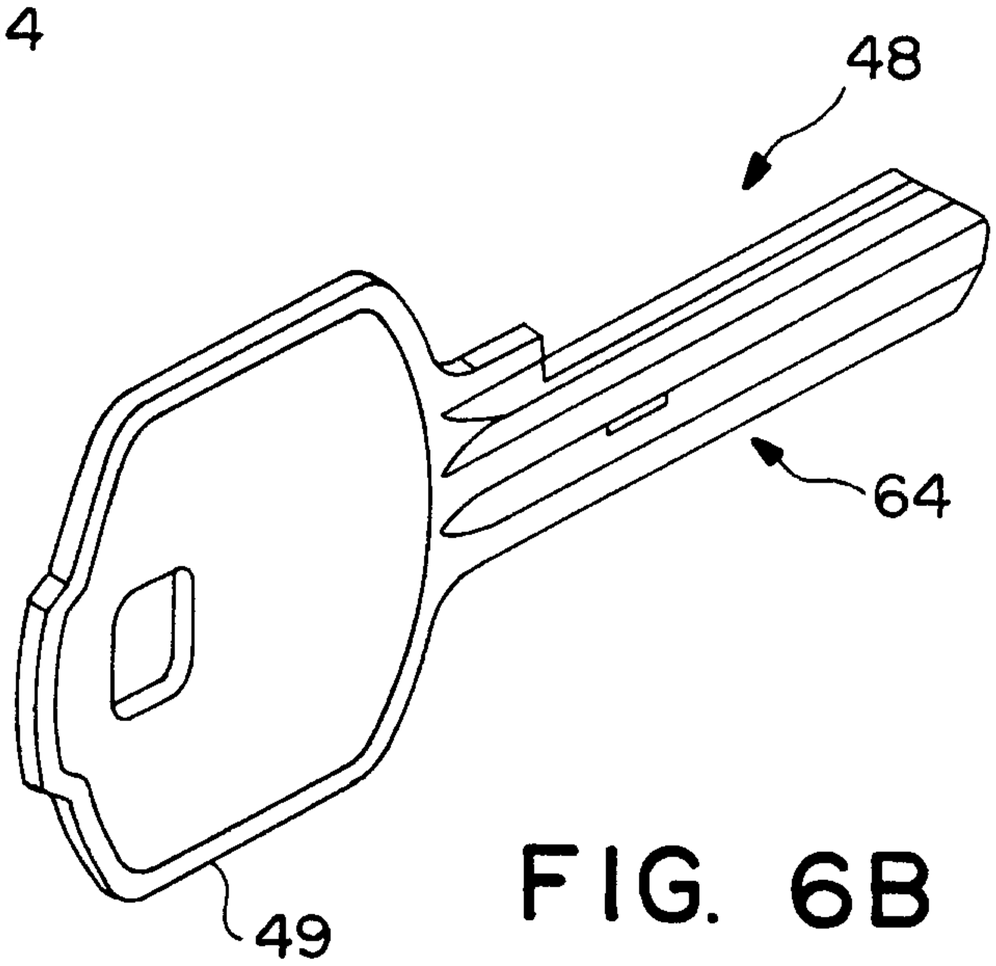
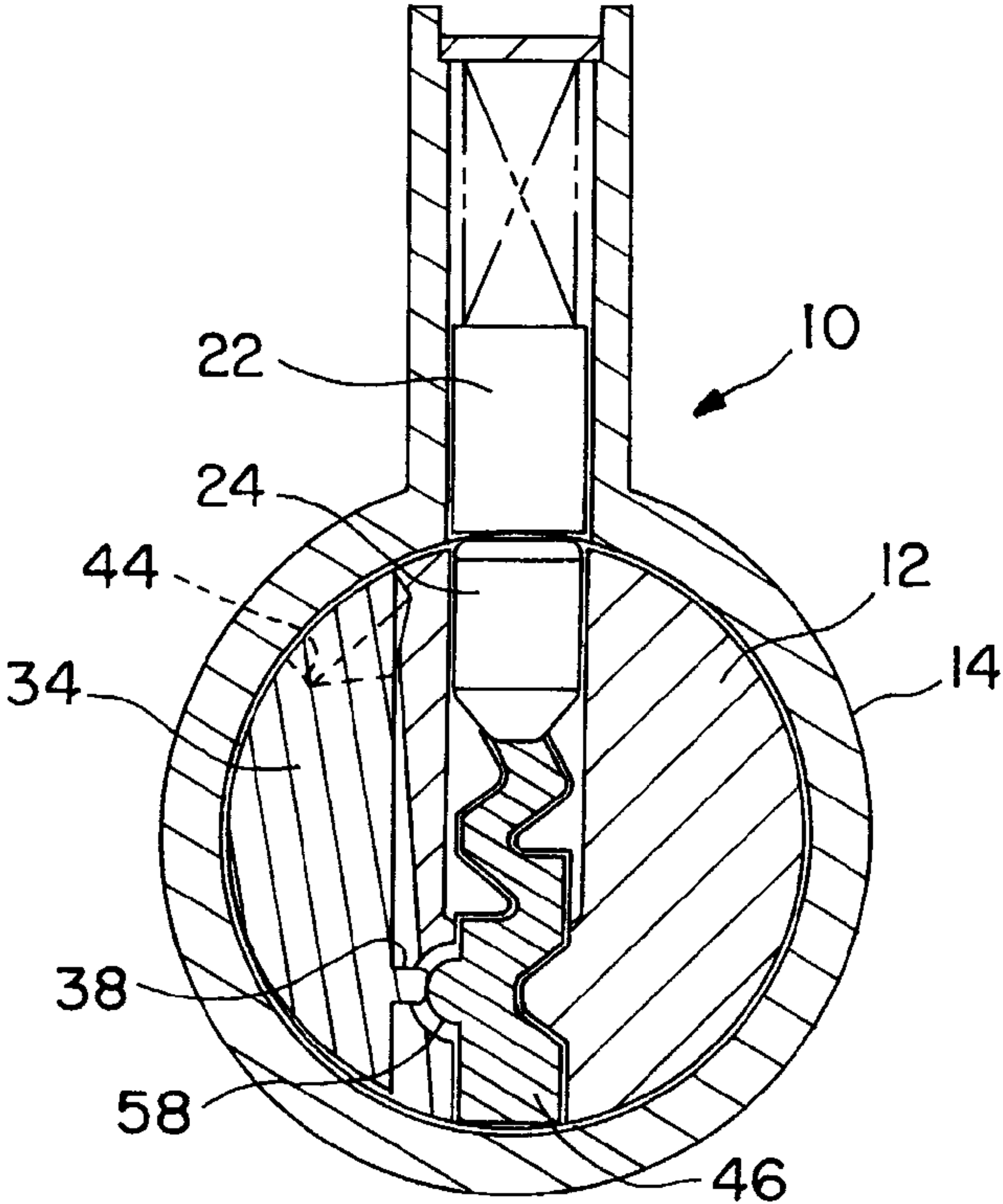



FIG. 6B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