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SPRUSON & FERGUSON

AUSTRALIA

PATENTS ACT 1990

**PATENT REQUEST: STANDARD PATENT**

I/We, the Applicant(s)/Nominated Person(s) specified below, request I/We be granted a patent for the invention disclosed in the accompanying standard complete specification.

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**[54] Invention Title:**

Lock

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**[31] Appl'n No(s):**

100,107

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**[33] Country:**

IL

**[32] Application Date:**

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DATED this EIGHTEENTH day of NOVEMBER 1992

Mul-T-Lock Ltd.

By:



Registered Patent Attorney

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INSTR CODE: 52885

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Australia

Patents Act 1990

NOTICE OF ENTITLEMENT

I, John Gordon Hinde, of Spruson & Ferguson, St Martins Tower, 31 Market Street, Sydney, New South Wales 2000, Australia, being the patent attorney for the Applicant(s)/Nominated Person(s) in respect of an application entitled:

Lock

state the following:-

The Applicant(s)/Nominated Person(s) has/have entitlement from the actual inventor(s) as follows:-

The Applicant(s)/Nominated Person(s), by virtue of a Contract of Employment between the actual inventor(s) as employee(s) and the Applicant(s)/Nominated Person(s) as employer(s), is a person entitled to have the patent assigned to it if a patent were granted on an application made by the actual inventor(s).

The Applicant(s)/Nominated Person(s) is/are the applicant(s) of the basic application(s) listed on the Patent Request. The basic application(s) listed on the Patent Request is/are the application(s) first made in a Convention Country in respect of the invention.

DATED this 4 day of January, 19 93

.....  
John Gordon Hinde

IRN:

INSTR CODE:



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**(12) PATENT ABRIDGMENT (11) Document No. AU-B-28475/92**  
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**LOCK**
- International Patent Classification(s)  
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- (56) Prior Art Documents  
**US 3499209**
- (57) Claim

1. A lock comprising:  
a lock housing;  
a lock cylinder disposed in the housing and defining a keyway extending therethrough from a first end of the cylinder to a second end of the cylinder, the first end of the cylinder defining a key entry opening and the second end of the cylinder defining a foreign material egress opening at the keyway;  
a locking element; and  
a locking mechanism arranged to be operated by the cylinder for selective locking of the locking element,  
wherein the lock housing is formed with an egress aperture aligned with the keyway adjacent the second end of the cylinder, whereby foreign material can be forced out of the keyway and out of the lock housing.

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**COMPLETE SPECIFICATION**

FOR A STANDARD PATENT

ORIGINAL

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Invention Title: Lock

The following statement is a full description of this invention, including the best method of performing it known to me/us:-

## FIELD OF THE INVENTION

The present invention relates to locks generally, and to door locks and padlocks in particular.

## BACKGROUND OF THE INVENTION

5 There exist a great variety of locks, many of them having specialized purposes. Applicant has, in the past, developed locks including, for example, reinforced padlocks described in applicant/assignee's U.S. Patents 4,464,915 and 4,548,058.

10 When padlocks or cylinder door locks are employed in high vandalism environments, they may readily be jammed by the insertion into the keyway thereof of a foreign material, such as paper, wood, plastic or the like.

15 Padlocks and tumbler mechanisms which have an opening in the interior end of their respective keyways are described in the following United States Patents: 965,409, 3,499,209, and 3,820,364. These publications do not appear to specify any functions for these openings.

## SUMMARY OF THE INVENTION

It is the object of the present invention to overcome or substantially ameliorate the above disadvantages.

There is disclosed herein a lock comprising:

5

a lock housing;

a lock cylinder disposed in the housing and defining a keyway extending therethrough from a first end of the cylinder to a second end of the cylinder, the first end of the cylinder defining a key entry opening and the second end of the cylinder defining a foreign material egress opening at the keyway;

10

a locking element; and



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a locking mechanism arranged to be operated by the cylinder for selective locking of the locking element,

wherein the lock housing is formed with an egress aperture aligned with the keyway adjacent the second end of the cylinder, whereby foreign material can be forced  
5 out of the keyway and out of the lock housing.

It is preferred that said lock further comprise an anti-vandalism reinforcement element.

It is preferred that said reinforcement element be removably mounted to said lock housing via a fastener which removably engages said egress aperture.

10 It is preferred that said egress aperture be threaded.



Preferably said lock cylinder comprises:

a cylinder housing defining at least one bore;

a plug disposed in a bore and defining a keyway extending therethrough from  
an exterior end thereof to an interior end thereof and having a key ingress opening at  
5 said exterior end and an egress opening at said interior end, the egress opening being  
configured and arranged to allow foreign bodies inserted into the keyway to pass  
through the egress opening upon insertion of a key fully into the keyway; and

a key-operated locking assembly operative in response to insertion of a key  
into the plug and rotation of the key and the plug in its bore, the key-operated locking  
10 assembly being configured so as not to substantially block the egress opening, whereby





a foreign body located in the keyway can be displaced axially along the keyway and out of the bore past the key operated locking assembly.

Typically said key-operated locking assembly comprises:

a rotatable lock operating element; and

- 5 a key insertion activated engagement assembly which provides rotational engagement between the plug and the rotatable lock operating element only when a key is inserted into said keyway by at least a predetermined amount.

It is preferred that said key insertion activated engagement assembly comprise

- a spring loaded member mounted in said plug and arranged to be displaced by key  
10 insertion into engagement with said rotatable lock operating element.



It is preferred that said at least one bore comprise a pair of coaxial bores, and that said key operated locking assembly be disposed intermediate said pair of coaxial bores.

Preferably a plug having a keyway is disposed in each of said pair of coaxial  
5 bores, said plugs being joined together for common rotation and being arranged such that the keyways thereof are coaxial, such that the egress opening of one bore lies adjacent the ingress opening of the other bore.

It is preferred that said lock be a padlock and said housing be a padlock housing.

10



## BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be understood and appreciated more fully from the following detailed description, taken in conjunction with the drawings in which:

5        Fig. 1 is a pictorial illustration of a door lock having foreign matter inserted in the key slot thereof;

Fig. 2A is a sectional illustration of a single-cylinder door lock constructed and operative in accordance with a preferred embodiment of the present invention;

10       Fig. 2B is a sectional illustration corresponding to Fig. 2A, but showing foreign material being forced out through the key slot;

Fig. 2C is a sectional illustration of a single-cylinder door lock which is a variation of the lock of Fig. 2A;

15       Fig. 3 is an enlarged pictorial illustration of part of the apparatus of Fig. 2A;

20       Fig. 4A is a sectional illustration of a double-cylinder door lock constructed and operative in accordance with a preferred embodiment of the present invention;

Fig. 4B is a sectional illustration corresponding to Fig. 4A, but showing foreign material being forced out of one side of the double cylinder and into the other side thereof.

25       Fig. 4C is a sectional illustration corresponding to Figs. 4A and 4B, but showing foreign material being forced out through the key slot;

Fig. 5 is a sectional illustration taken along the lines V - V of Fig. 2B.

Fig. 6 is a pictorial illustration of a padlock constructed and operative in accordance with a preferred embodiment of the present invention;

5 Figs. 7A and 7B are sectional illustrations of the padlock of Fig. 6 respectively showing a jammed padlock prior to unjamming thereof and during unjamming thereof; and

Figs. 8A and 8B are illustrations of a preferred locking mechanism for use in the padlock of Figs. 6, 7A and 7B in respective locked and unlocked orientations.

#### DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

Reference is now made to Fig. 1, which illustrates a door lock cylinder 10 in the key slot 11 of which foreign matter, such as a matchstick 12, has been inserted, as by an act of vandalism. The present invention seeks to provide a door lock which enables the foreign matter, such as matchstick 12, to be conveniently cleared from the key slot 11, without requiring removal of the cylinder from the door or other disassembly.

Reference is now made to Figs. 2A - 5, which illustrate door locks constructed and operative in accordance with preferred embodiments of the present invention and including a two-sided cylinder housing 20. Figs. 2A - 2C, 3, and 5 illustrate a single lock cylinder embodiment of the invention and Figs. 4A - 4C illustrate a double lock cylinder embodiment of the invention.

In accordance with the single cylinder embodiment, as shown in Fig. 2A, a single lock cylinder 22 is disposed in one side of housing 20 and a manually operable lock handle assembly 24 is disposed in engagement with the other side thereof. Lock cylinder 22 may be any conventional lock cylinder suitable for disposition in a two-sided cylinder housing and has a key slot 26 with which communicate a plurality of locking pins 28.

Disposed at the interior end of lock cylinder 22 is a key operated locking assembly, which is seen particularly in Fig. 3 and includes a key engagement member 30, whose inward displacement is limited by a limiting bar 32, which is fixedly seated across key slot 26 in lock cylinder 22. Key engagement member 30 is normally maintained in spaced relationship with respect to limiting bar 32 by a compression spring 34, as seen

Fig. 2A.

Compression spring 34 is disposed between key engagement member 30 and an axial pin assembly 36, which includes an axially extending pin 38, a retaining ring 40 and a compression spring 42, normally retaining the pin 38 in a retracted position with respect to retaining ring 40, such that pin 38 does not normally operatively engage a yoke member 44. The relative positions of the various elements of key operated locking assembly in the absence of insertion of a key in key slot 26 are illustrated in Fig. 2A, which also shows the presence of foreign matter such as a matchstick 46 in the key slot 26.

As seen in Fig. 2A, the cylinder 22 is retained in cylinder housing 20 by means of a conventional retaining ring 48, while handle assembly 24 is retained therein by a conventional retaining ring 50. It is seen that handle assembly 24 operatively engages yoke 44 for rotation thereof by means of a protrusion 54 which engages a corresponding slot 56 in yoke 44.

It is a particular feature of the present invention that handle assembly 24 is formed with a generally hollow portion 52, which communicates with the interior of the key slot 26, so as to permit foreign matter which has been placed in the key slot 26 to be forced out through key slot 26 into the interior of hollow portion 52, as illustrated generally in Fig. 2B.

It may be appreciated from a consideration of Figs. 3 and 2B, that when a key 60 is fully inserted into the key slot 26, as illustrated in Fig. 2B, the forward edge of the key displaces key engagement member 30 axially until it engages

limiting bar 32. This forward axial movement compresses spring 34 and forces pin 38 axially forward through retaining ring 40, while compressing spring 42. The extension of pin 38 axially forward brings it into operative engagement with a correspondingly shaped recess 66 (Fig. 3) formed in yoke 44, such that rotation of key 60 produces rotation of cylinder 22 and corresponding rotation of thus operatively engaged pin 38 and yoke 44, thereby providing locking operation.

Fig. 2B also illustrates how the forward edge of key 60 is operative to force foreign material such as matchstick 46 out of the key slot 26, alongside limiting bar 32 and into the hollow volume defined by hollow portion 52. It is noted that when necessary, accumulated foreign material inside portion 52 may be removed either by removing a handle element 68 therefrom or by removing handle assembly 24 from cylinder housing 20 as by disengagement of retaining ring 50.

According to one preferred embodiment of the present invention, as shown in Fig. 2C, a channel 70 is formed in handle element 68 which communicates with the environment via an aperture 72. A particular advantage of this feature is that a foreign body may pass through aperture 72, thereby removing the foreign body without removing either handle element 68 or handle assembly 24.

In the double cylinder embodiment, as shown in Fig. 4A, a first lock cylinder 122 is disposed in one side of housing 20 and a second lock cylinder 123 is disposed in the other side thereof. Lock cylinders 122 and 123 may be any conventional lock cylinders and are, preferably, both of the same type. Cylinders

122 and 123 include respective key slots 126 and 127 with which communicate respective sets of locking pins 128 and 129, of which one set is preferably an exact duplicate of the other set.

5 The key operated locking assembly is disposed between the interior ends of lock cylinders 122 and 123 and includes key engagement members 130 and 131, whose inward displacements are limited by limiting bars 132 and 133, which are fixedly seated across key slots 126 and 127, respectively, in lock cylinders 122 and 123. Key engagement members 130 and 131 are normally  
10 maintained in spaced relationship with respect to limiting bars 132 and 133 by compression springs 134 and 135.

Compression spring 134 is disposed between key engagement member 130 and an axial pin assembly 136, and spring 135 is disposed between key engagement member 131 and an axial  
15 pin assembly 137. Assemblies 136 and 137 include axially extending pins 138 and 139, retaining rings 140 and 141 and compression springs 142 and 143, normally retaining pins 138 and 139 in respective retracted positions with respect to retaining rings 140 and 141, such that neither pin 138 nor pin 139  
20 normally operatively engage a yoke member 144. The relative positions of the various elements of the key operated locking assemblies in the absence of insertion of a key in either of key slots 126 and 127 are illustrated in Fig. 4A, which also shows the presence of foreign matter such as a matchstick 146 in key  
25 slot 126.

As seen in Fig. 4A, cylinders 122 and 123 are retained in cylinder housing 20 by means of conventional retaining rings



148 and 149.

It may be appreciated from a consideration of Fig. 4B, that when a key 160 is fully inserted into key slot 126, as illustrated in Fig. 4B, the forward edge of the key displaces key engagement member 130 axially until it engages limiting bar 132. This forward axial movement compresses spring 134 and forces pin 138 axially forward through retaining ring 140, while compressing spring 142. The extension of pin 138 axially forward brings it into operative engagement with a correspondingly shaped recess 166 (Fig. 3) formed in yoke 144, such that rotation of key 160 produces rotation of cylinder 122 and corresponding rotation of the operatively engaged pin 138 and yoke 144, thereby providing locking operation.

Although not shown in the drawings, it should be appreciated that, similarly, rotation of yoke 144 is also achieved when key 160 is fully inserted into key slot 127 and rotated. In such a case, pin 139 operatively engages and rotates yoke 144.

Fig. 4B also illustrates how the forward edge of key 160 is operative to force foreign material such as matchstick 146 out of the key slot 126, alongside limiting bar 132 and into key slot 127.

Reference is now made to Fig. 4C, which illustrates a preferred procedure for completely removing foreign material from both of cylinders 122 and 123 by employing a removing tool 170, which preferably includes an unpointed, narrow, thin, flat and slightly elastic blade 172 at least twice as long as either of cylinders 122 and 123. Fig. 4C illustrates how the forward edge

of blade 172 of tool 170 is operative to force foreign material 146 through key slot 127 and to the outside thereof, thereby completely unjamming the door lock. It should be appreciated that tool 170 may equally be used for ejecting foreign material  
5 from key slot 126.

Reference is now made to Figs. 6, 7A and 7B, which illustrate a padlock constructed and operative in accordance with a preferred embodiment of the present invention and including a housing 210, typically formed of a relatively soft metal, such as  
10 iron, and which is preferably surrounded by a reinforcing sleeve 212, typically formed of heat-treated steel.

Disposed in appropriately sized volumes in housing 210 are a lock cylinder 214, which may be of conventional construction and which defines a keyway 216, extending from a  
15 first end 218 of the cylinder to a second end 220 thereof. The cylinder 214 is arranged in operative engagement with first and second locking levers 222 and 224, which are illustrated in Figs. 8A and 8B, and which are operative for selectably locking a yoke 226 within the housing 210.

Additional reinforcing means 228 may be provided  
20 partially surrounding yoke 226 and may be bolted onto housing sleeve 212 by means of bolts 230. A keyway protection plate 232 is disposed adjacent the first end 218 of the cylinder 214 and lies between the first end of the cylinder 214 and a key entry  
25 aperture 234 formed in sleeve 212.

In accordance with a preferred embodiment of the present invention, means are provided for enabling foreign

material 236, which is located within the keyway 216, to be evacuated therefrom. In the embodiment illustrated herein, a volume 238 is provided within housing 210 for accommodating foreign material 236 when it is forced from the keyway, as by  
5 insertion thereinto of a key 240. According to one embodiment of the invention, volume 238 may communicate with an aperture 242 in housing 210 so as to permit egress of the foreign material 236 from the housing.

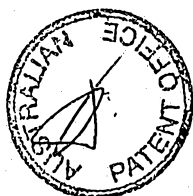
In the illustrated embodiment, aperture 242 is threaded  
10 so as to accommodate bolt 230, which serves to removably attach reinforcing means 228 to housing 210 as explained above. Alternatively, volume 238 may be eliminated and the keyway 216 may communicate directly with an egress aperture at the second end 220 of the cylinder 214. The egress aperture may be normally  
15 blocked by any suitable means to prevent ingress thereto of foreign matter.

Referring briefly to Figs. 8A and 8B, which illustrate locking levers 222 and 224, it is seen that the levers are configured to allow passage of foreign material 236 therethrough,  
20 as seen particularly in Fig. 7B.

It will be appreciated by persons skilled in the art that the present invention is not limited by what has been particularly shown and described hereinabove. Rather the scope of the present invention is defined only by the claims which follow:

The claims defining the invention are as follows:

1. A lock comprising:
  - a lock housing;
  - a lock cylinder disposed in the housing and defining a keyway extending
  - 5 therethrough from a first end of the cylinder to a second end of the cylinder, the first end of the cylinder defining a key entry opening and the second end of the cylinder defining a foreign material egress opening at the keyway;
  - a locking element; and
  - a locking mechanism arranged to be operated by the cylinder for selective
  - 10 locking of the locking element,
  - wherein the lock housing is formed with an egress aperture aligned with the keyway adjacent the second end of the cylinder, whereby foreign material can be forced out of the keyway and out of the lock housing.
2. A lock according to claim 1, further comprising an anti-vandalism
- 15 reinforcement element.
3. A lock according to claim 2, wherein said reinforcement element is removably mounted to said lock housing via a fastener which removably engages said egress aperture.
4. A lock according to claim 2 or claim 3, wherein said egress aperture
- 20 is threaded.
5. A lock according to any one of the preceding claims, wherein said lock cylinder comprises:
  - a cylinder housing defining at least one bore;
  - a plug disposed in a bore and defining a keyway extending therethrough from
  - 25 an exterior end thereof to an interior end thereof and having a key ingress opening at said exterior end and an egress opening at said interior end, the egress opening being configured and arranged to allow foreign bodies inserted into the keyway to pass through the egress opening upon insertion of a key fully into the keyway; and
  - a key-operated locking assembly operative in response to insertion of a key
  - 30 into the plug and rotation of the key and the plug in its bore, the key-operated locking assembly being configured so as not to substantially block the egress opening, whereby a foreign body located in the keyway can be displaced axially along the keyway and out of the bore past the key operated locking assembly.
6. A lock according to claim 5, wherein said key-operated locking
- 35 assembly comprises:
  - a rotatable lock operating element; and



a key insertion activated engagement assembly which provides rotational engagement between the plug and the rotatable lock operating element only when a key is inserted into said keyway by at least a predetermined amount.

7. A lock according to claim 6, wherein said key insertion activated  
5 engagement assembly comprises a spring loaded member mounted in said plug and arranged to be displaced by key insertion into engagement with said rotatable lock operating element.

8. A lock according to claim 5, wherein:  
said at least one bore comprises a pair of coaxial bores; and  
10 said key operated locking assembly is disposed intermediate said pair of coaxial bores.

9. A lock according to claim 8, wherein a plug having a keyway is disposed in each of said pair of coaxial bores, said plugs being joined together for common rotation and being arranged such that the keyways thereof are coaxial, and  
15 such that the egress opening of one bore lies adjacent the ingress opening of the other bore.

10. A lock according to any of the preceding claims, wherein said lock is a padlock and said housing is a padlock housing.

11. A lock substantially as hereinbefore described with reference to Figs.  
20 2A, 2B, 3 and 5, or Fig. 2C, or Figs. 4A to 4C or Figs. 6 to 8B.

DATED this Twenty-fourth Day of April 1995

**Mul-T-Lock Ltd**

Patent Attorneys for the Applicant  
SPRUSON & FERGUSON

25



## Lock

### Abstract of the Disclosure

A method for operating a locking device in vandalism-prone environments including the steps of providing a lock including a lock  
5 cylinder (22) defining a keyway (26) having an egress opening in the interior end thereof, the egress opening being configured and arranged to allow foreign bodies (46) inserted into the keyway to pass through the egress opening upon insertion of the key (60) and removing a foreign body (46) from the lock.




Figure 2A.

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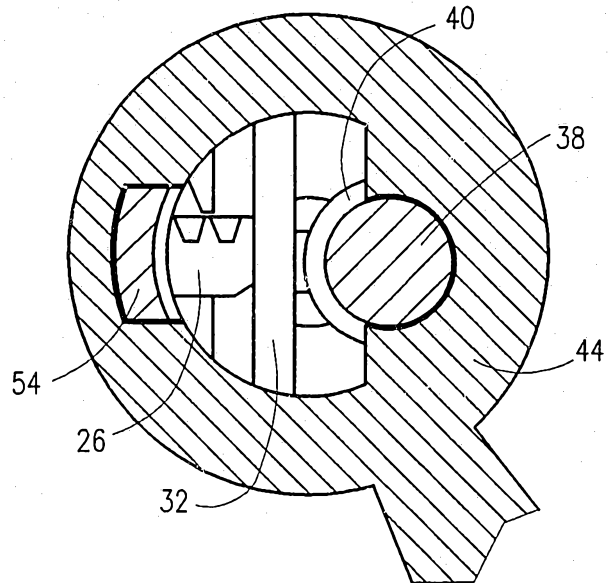


FIG. 5

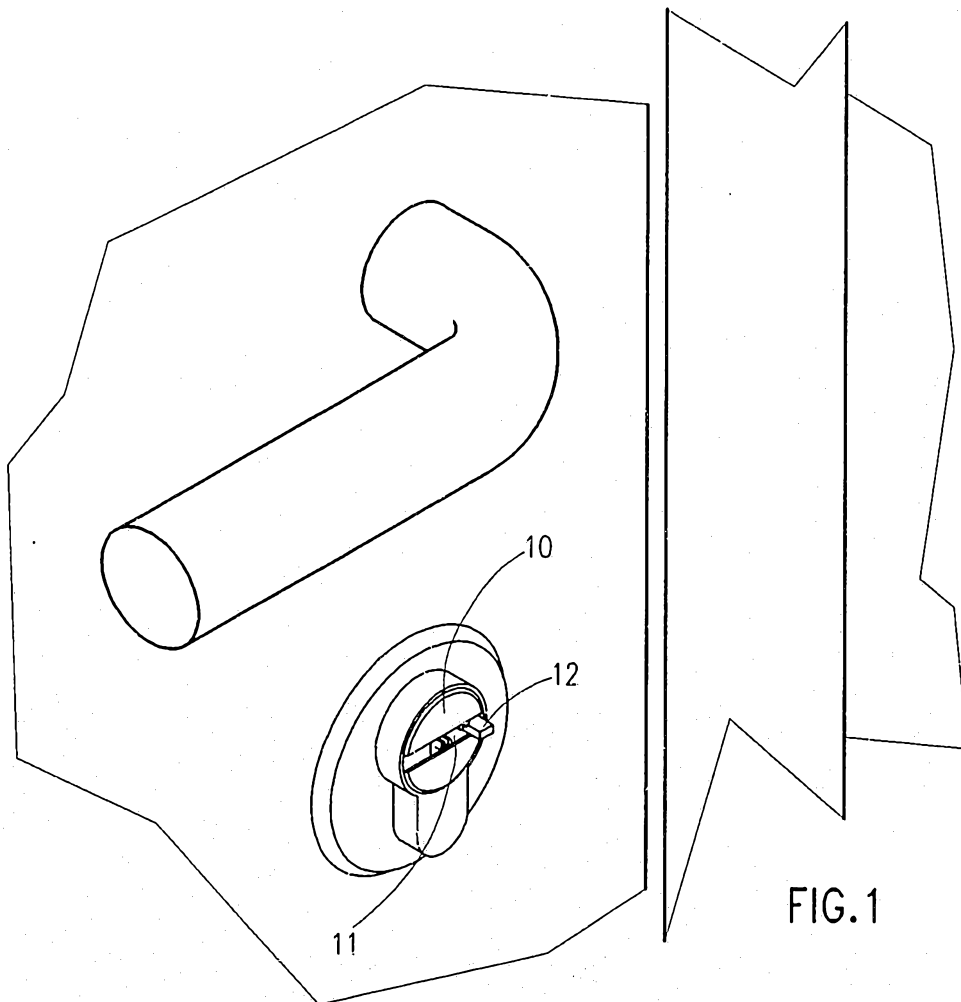
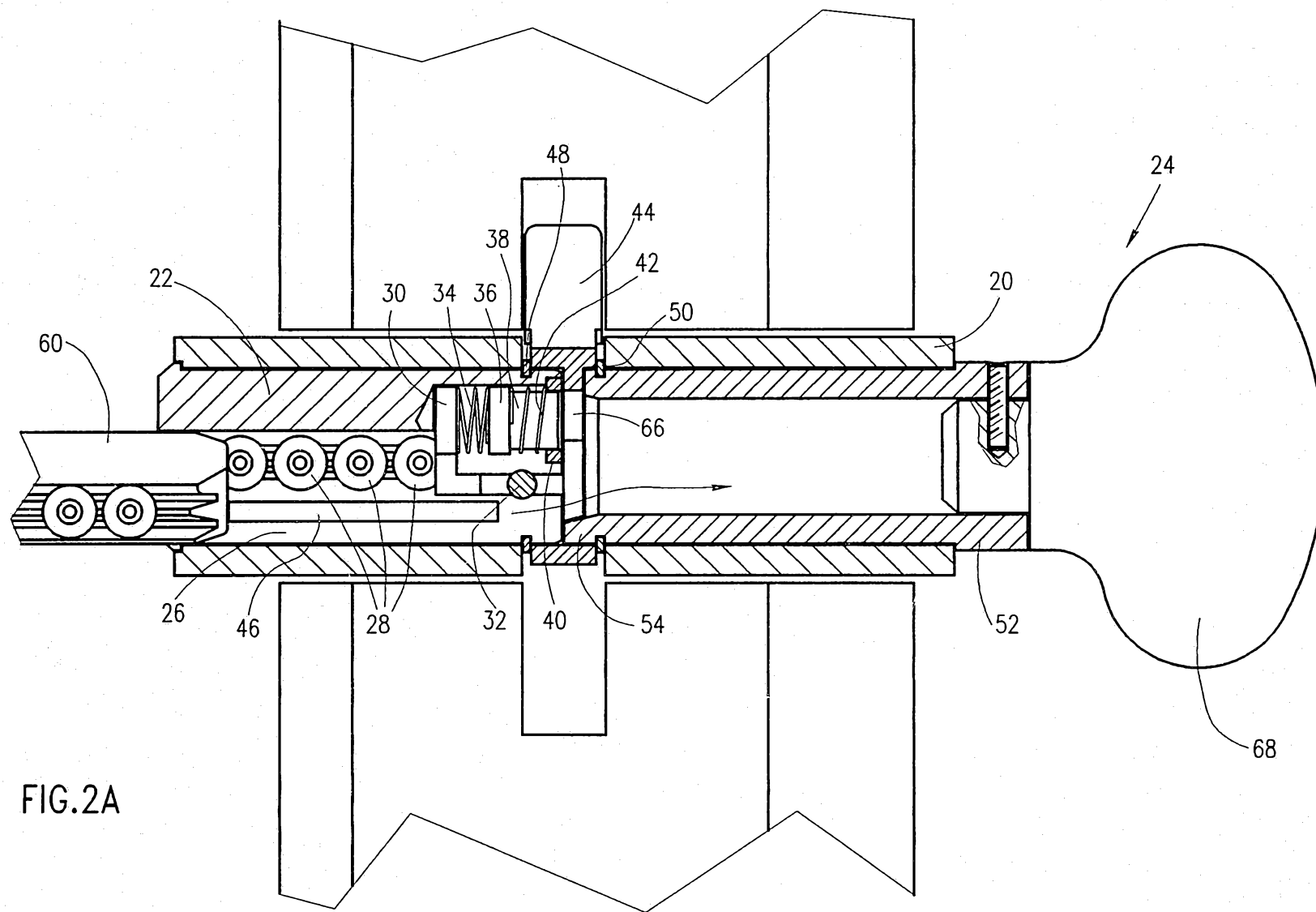


FIG. 1



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11 30 2875

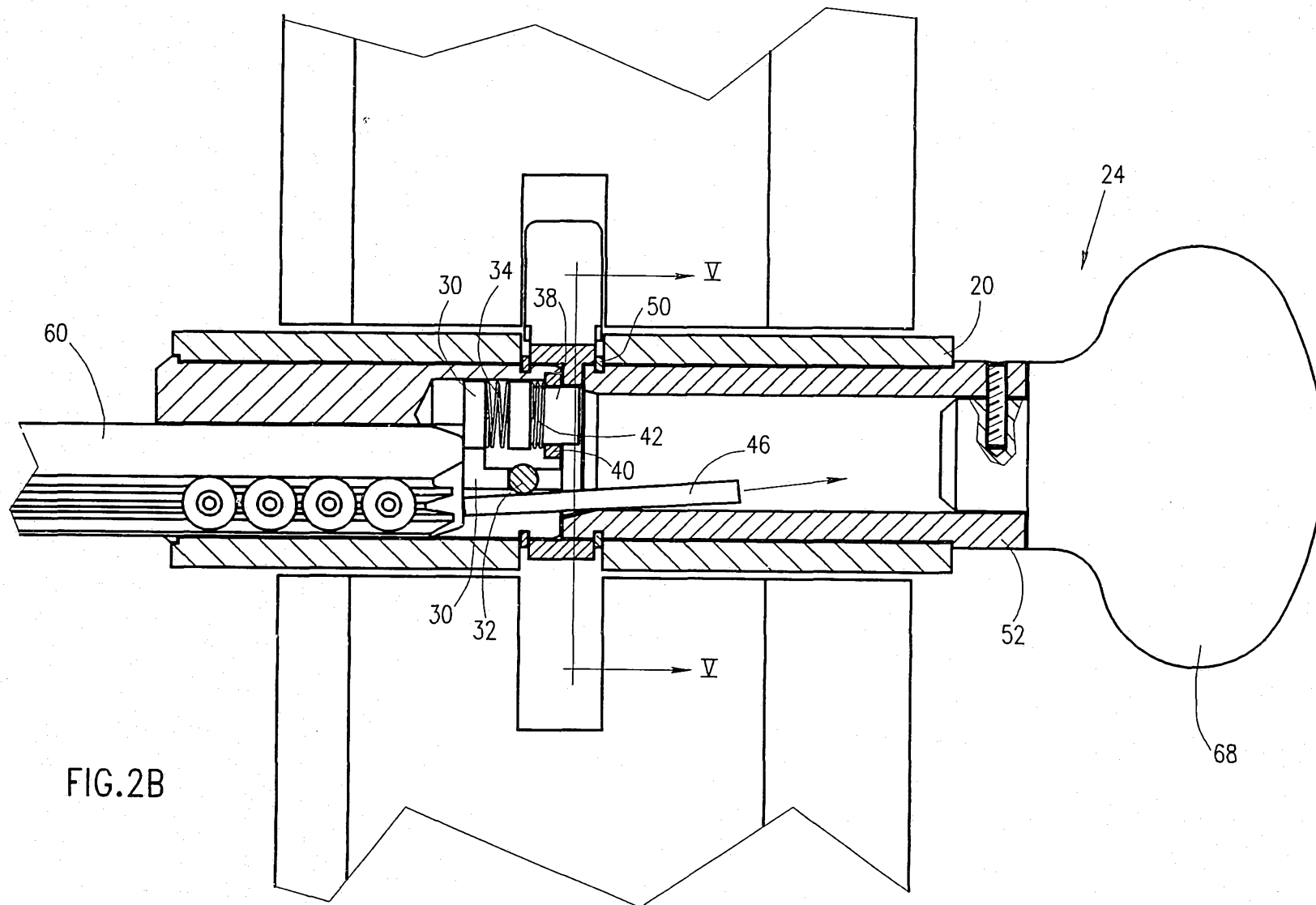


FIG. 2B

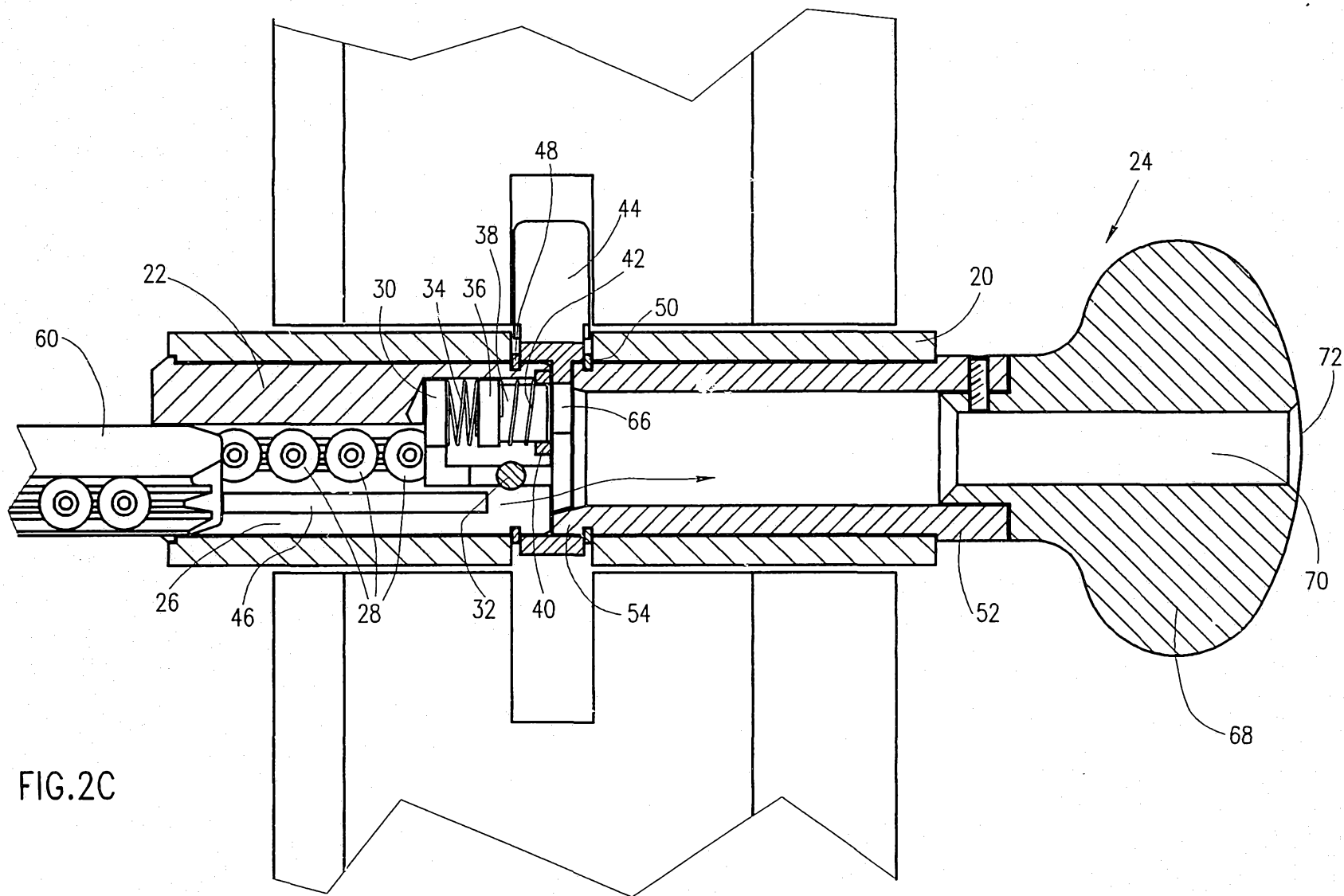


FIG. 2C

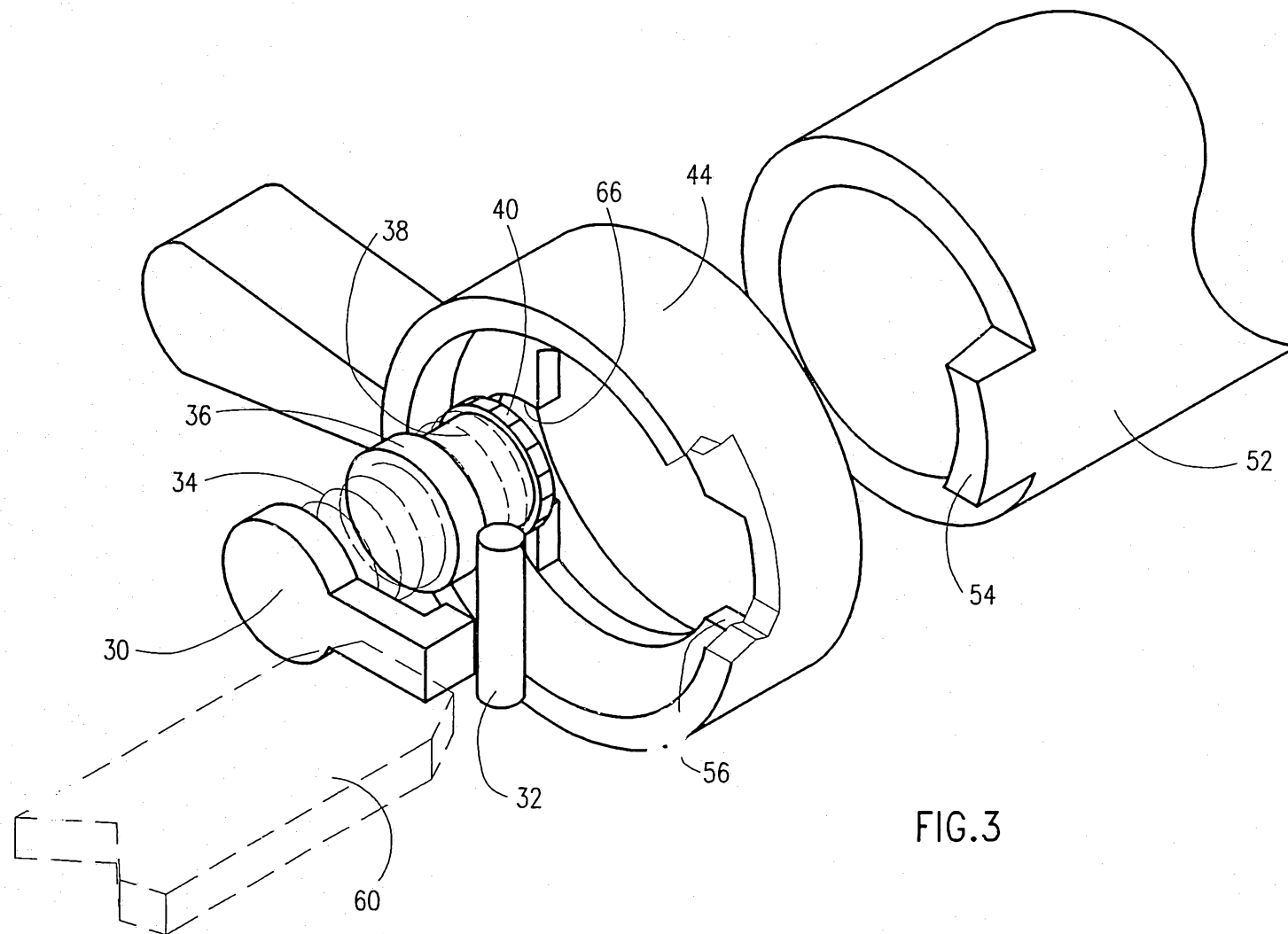


FIG.3

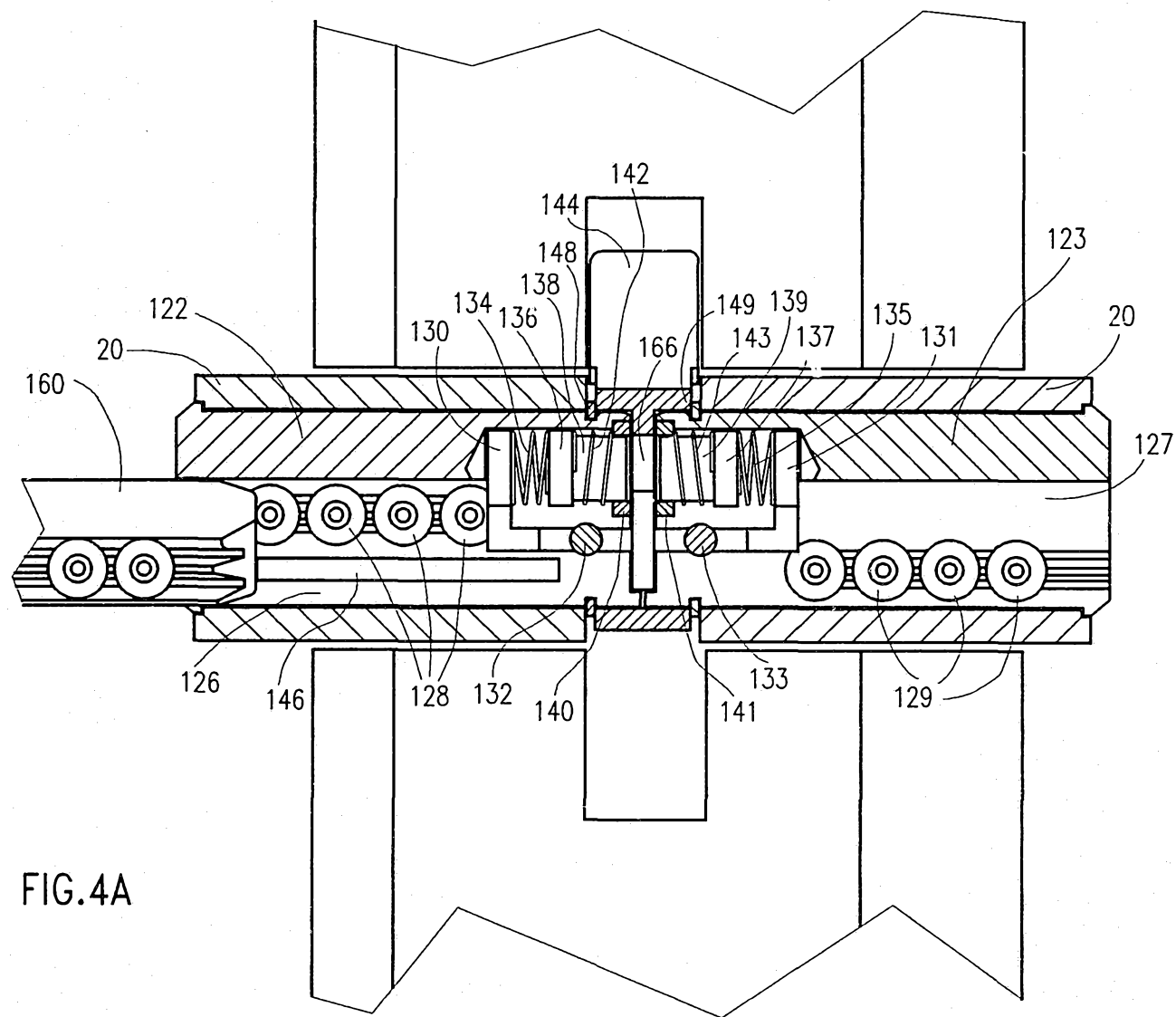


FIG.4A

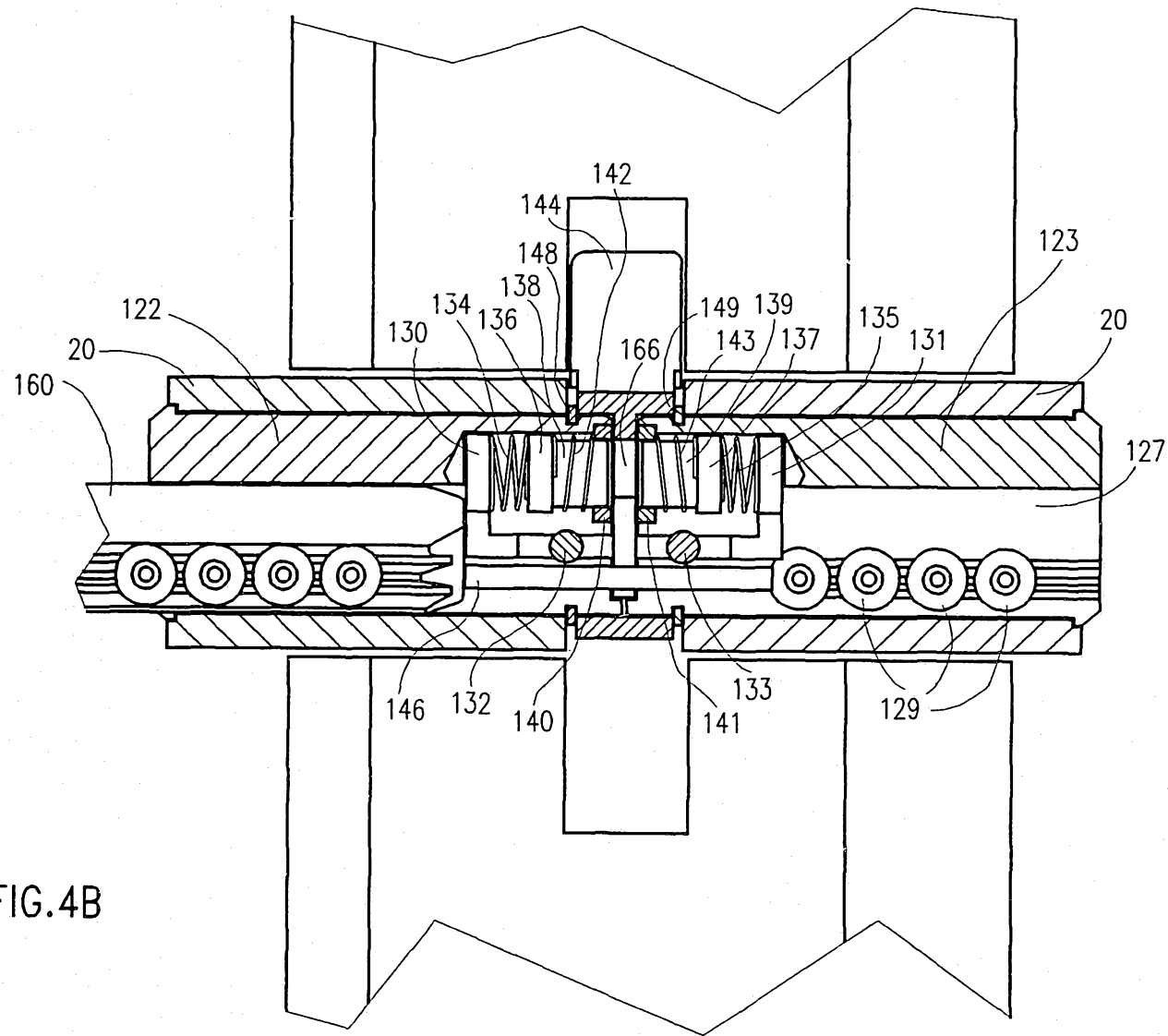
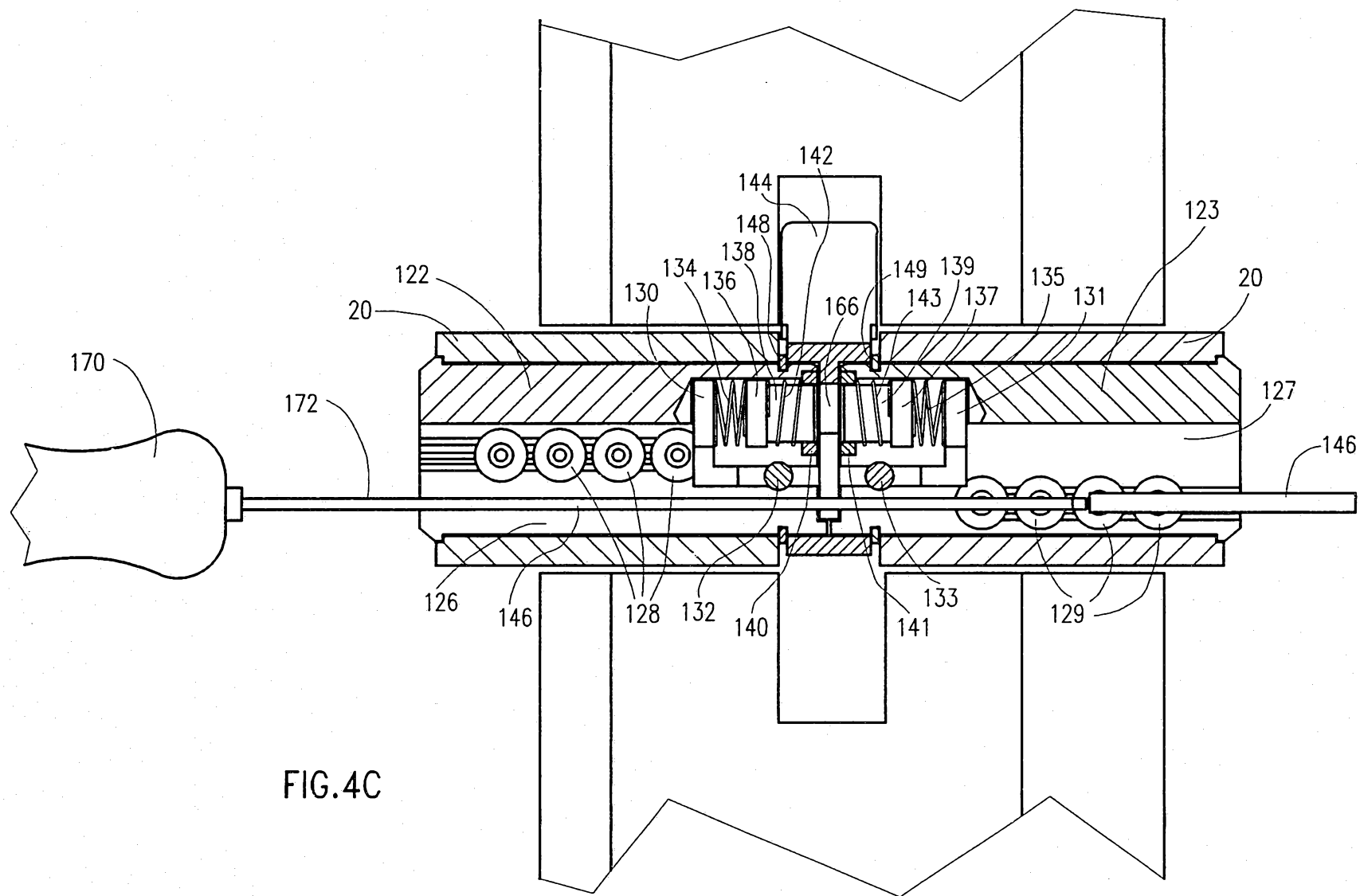


FIG.4B



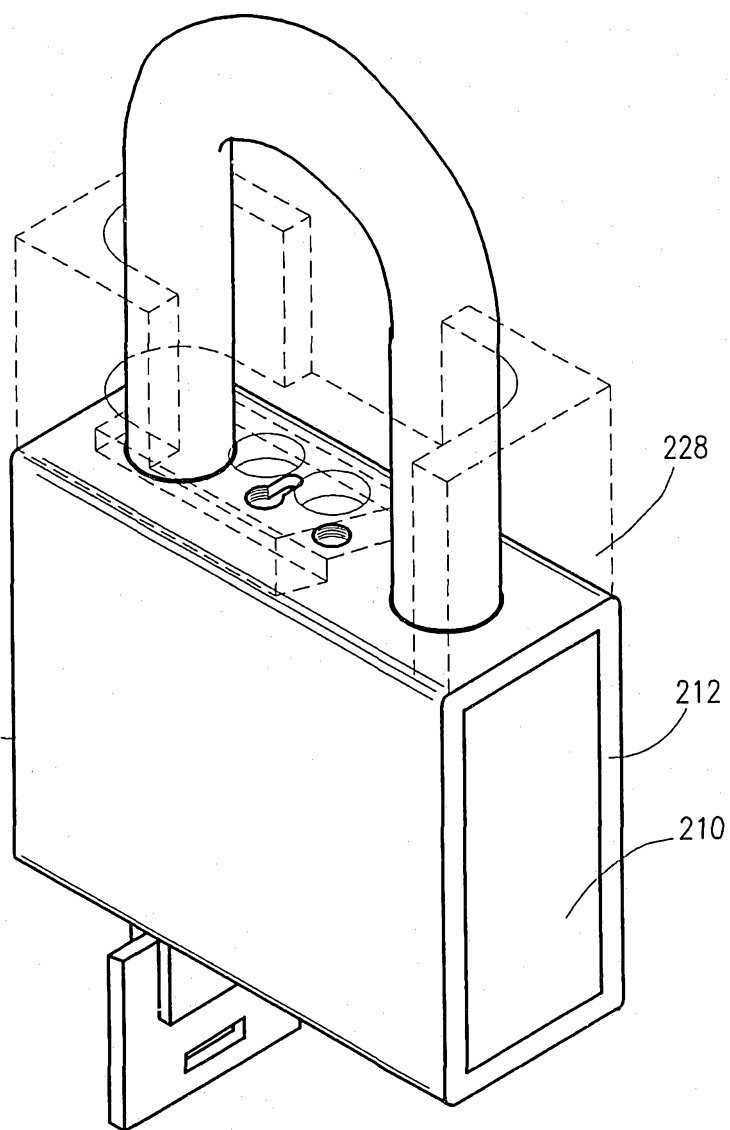


FIG. 6

FIG.7A

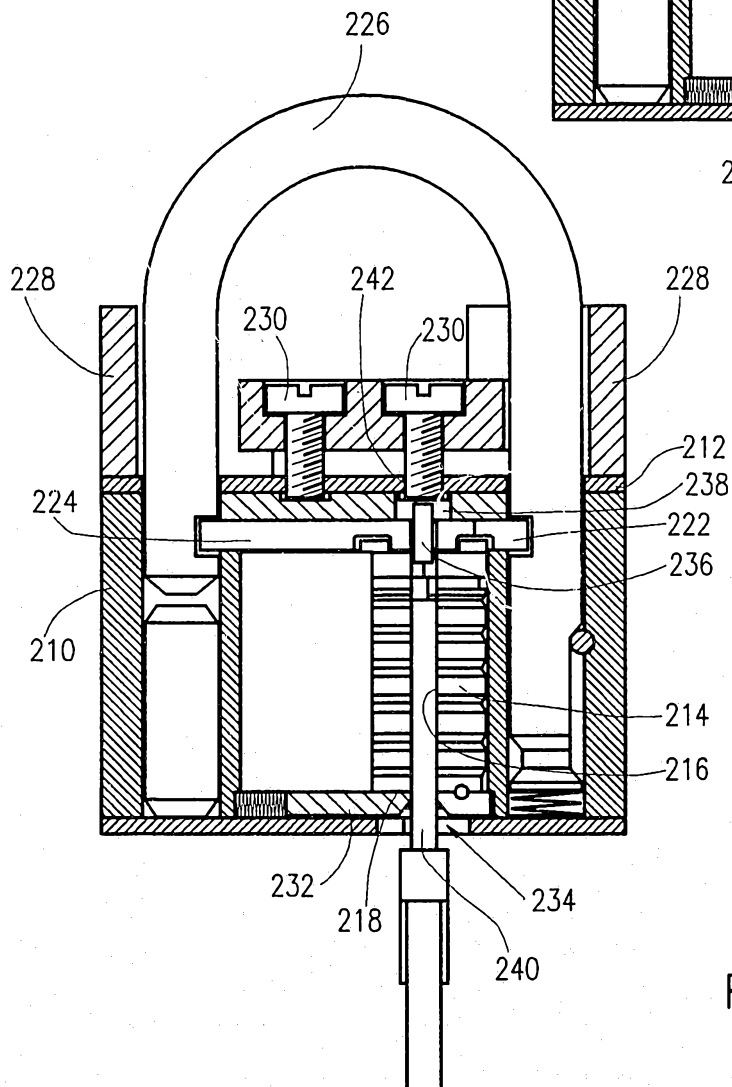
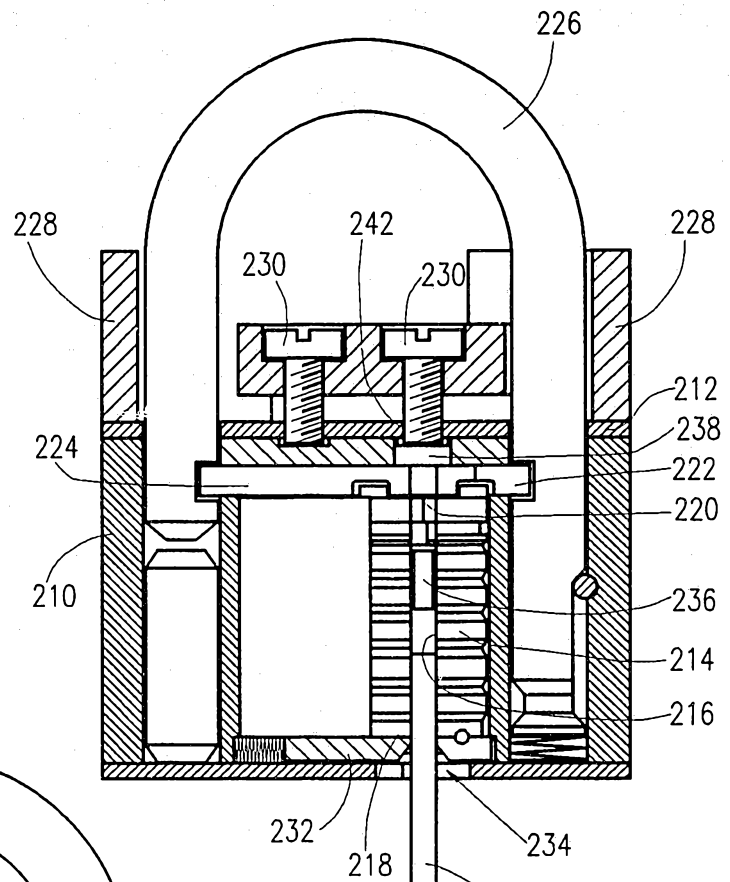


FIG.7B



