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Key operated lock

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ABSTRACT.

A key actuated lock (1) comprising a housing (2) having a bore (5) in which is mounted a barrel assembly including key positionable locking elements (17,18,19,20,21) disposed between front and rear keeper elements (11,22). The locking elements (17-21) have radially extending lugs (24,25) which randomly engage keyways (8,9) in the bore (5) . The barrel assembly elements are interconnected by means (27,28) which retain a predetermined rotational relationship between adjacent elements and which allow guided sliding relative movement between adjacent elements. Insertion of a bitted key into profiled openings (26) in the locking elements (17-21) removes all lugs (24,25) from the keyways (8,9) allowing the barrel assembly to be rotated in the housing bore (5).

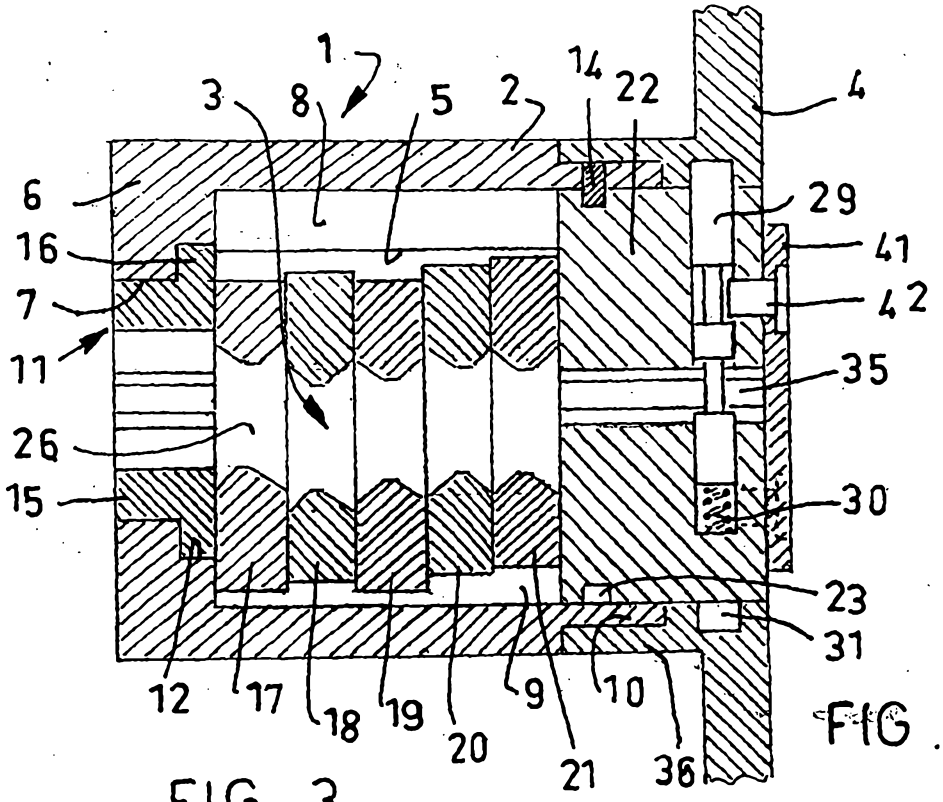

FIG. 1.

FIG. 3.

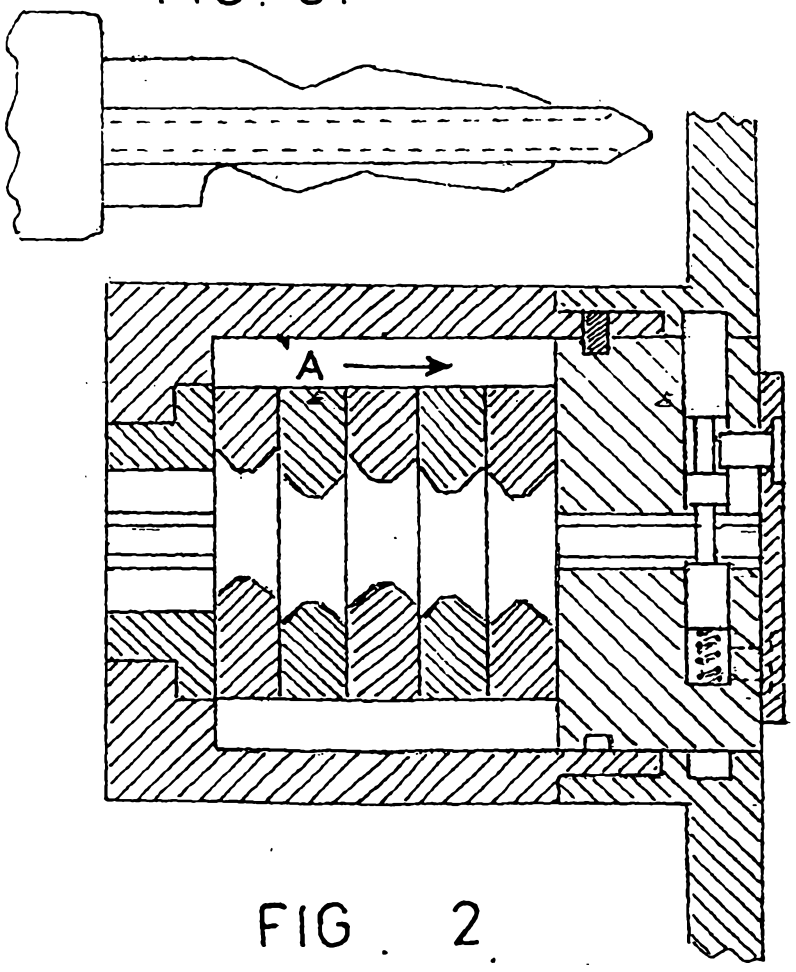

FIG. 2.

AUSTRALIA
Patents Act 1990

COMPLETE SPECIFICATION

FOR A STANDARD PATENT
ORIGINAL

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Invention Title: KEY OPERATED LOCK

Details of Associated Provisional Application PQ1280 filed 30.06.1999

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

KEY OPERATED LOCK

FIELD OF INVENTION.

This invention relates to a key released lock for use with a locking element, such as a slide bolt.

BACKGROUND TO THE INVENTION.

Locks having a key actuated barrel assembly for movement of a coupled use are common and many types of barrel assemblies have been developed over the years. Almost all of the barrel assemblies devised to date have included pins or like elements of different lengths which in a rest position interlock the barrel assembly and a barrel housing and which can be moved to a barrel release position by the insertion into the barrel assembly of an appropriately shaped key.

Most of the locking pins or like elements used are very small and there has been great reliance in the past on springs to position the locking pins in the rest position. It has also been common to rely on very small degrees of engagement between the locking pins and pin receiving openings to interlock the barrel assembly and the barrel housing.

OBJECTS OF THE INVENTION.

The present invention has as its objects the provision of a key actuated barrel assembly with few parts (compared to known barrel assemblies), which are robustly constructed, and an arrangement with substantial engagement between parts that interlock the barrel assembly with its

housing, no springs are used to position locking elements of the barrel assembly and a very large number of "combinations" are possible.

BROAD STATEMENTS OF THE INVENTION

Broadly, the present invention provides a key actuated lock comprising a housing having a bore in which is housed a barrel assembly including a plurality of key positionable locking elements each with a through opening provided with key engagable surfaces, said locking elements each have radially extending lug means engageable in longitudinal keyways in said bore with the overall diametrical size of each locking element across said lugs approximating but being less than the diameter of said bore, said locking elements are interconnected by means which maintain a predetermined rotational relationship between adjacent elements and which allow guided sliding relative movement between adjacent elements, the arrangement being such that insertion through the key openings of said locking elements of a key profiled to correspond with a barrel combination determined by the relative radial positions of said key engageable surfaces of said locking elements will position said locking elements so that the lugs thereof will lie within said bore to allow said barrel assembly to be rotated relative to said housing.

More specifically stated, the present invention provides a key actuated lock comprising a housing with an elongated bore and a barrel assembly mounted in the bore so as to be rotatable relative to said housing when a plurality of key positionable barrel assembly elements engageable with the

housing are positioned so as to be free of engagement with said housing, the housing bore includes a first zone having a pair of diametrically opposed longitudinal channels and other zones, the key positionable barrel elements are disposed between front and rear keeper elements which are rotatably supported in said other zones of said bore and are restrained against axial movement relative to said housing, body parts of the elements of the barrel assembly are interconnected by means which retain a predetermined rotational relationship between adjacent elements and which allow guided sliding movement between adjacent elements in parallel planes which are substantially normal to a longitudinal axis of the housing bore, the body parts of the key positionable elements are each provided with radially extending lug means sized to enter into the channel means, for each key positionable element the sum of the radial heights of lug means when added to the diametrical size of its body part adjacent the lug means approximates but is less than the diameter of the housing bore thereby allowing said key positionable elements to be rotated in said bore, the lug heights of the key positionable elements are varied to provide a combination for a barrel assembly, a key opening through said front keeper element and each of said key positionable elements, for each key positionable element the key opening has key engageable ends offset from the axis of said housing bore in relationship to the height of its lug means so that on insertion into the barrel assembly of a key for the barrel assembly combination the key positionable elements will be radially moved to position all of said lug means within the bore of the housing thereby allowing the barrel assembly to be rotated in said housing bore by said key.

GENERAL DESCRIPTION OF THE DRAWINGS.

Fig.1 is a transverse sectional elevation of one form of a barrel assembly of the present invention having a barrel assembly with five locking elements which are shown in rest positions where they interlock the barrel assembly and the housing of the barrel assembly,

Fig.2 is a view similar to Fig.1 with the barrel assembly locking elements in a key positioned housing release condition,

Fig.3 is a side view of a typical key for the barrel assembly of Figs.1 and 2,

Fig.4 is an exploded view showing the elements of the lock of Figs. 1 and 2,

Figs.5 to 9 are front views of the five locking elements of the Fig.1 barrel assembly,

Figs.10 to 13 are front views of the locking elements in different transverse and rotational positions relative to the bore of the housing for the barrel assembly, the positions being achieved by moving the locking elements by inserting the correct key into the barrel assembly and then rotating the barrel assembly,

Figs.14 to 34 illustrate forms and shapes of members of the barrel assembly, and

Fig.35 is an end view in the direction of the arrow A in Fig.2 of a lock mounting member.

DETAILED DESCRIPTION OF THE DRAWINGS.

In Figs.1 and 2 there is illustrated a lock 1 comprising a housing 2 for a barrel assembly 3, the housing 2 is coupled to a mounting member 4. The housing 2 includes a bore 5 with an end 6 having a central opening 7 and a counterbore 12 to respectively rotatably accept a body 15 and a flange 16 of a front end keeper element 11 of the barrel assembly 3. There are two longitudinal diametrically opposed keyways 8 and 9 running the length of the bore 5. The housing 2 at the open end of the bore has a circumferential flange 10.

The barrel assembly 3 is comprised of the front end keeper element 11, five locking elements 17,18,19,20,21 and a rear end keeper element 22. The keeper element 22 is held captive in the bore 5 by a circlip (or the like) 14 mounted in the flange 10 and entered into the peripheral groove 23 in the keeper element 22. The barrel assembly 3 is thus retained securely within the housing 2. Each locking element has the same general features, see Figs.5 to 9, including a pair of diametrically opposed lugs 24 & 25 extending outwardly from the locking element body part and a central slot 26 in the body part aligned with the lugs, two channels 27 in the front face of each locking element and on the rear face each locking element has two ribs 28 aligned respectively with the channels 27. The keepers 11 and 22 are likewise provided with channels 27 and ribs 28. In this way all of the elements of the barrel assembly are maintained in a given rotational relationship and each of the locking elements can move relative to adjacent elements in a plane which is substantially normal to the axis of the housing

bore 5.

The lugs 24,25 have a width such that they will fit neatly into the keyways 8 and 9. The spacing apart of the distal (curved) surfaces of the lugs 24,25 are the same for all locking elements and is such that the locking elements (when "centred" by engagement by a key to disengage the lugs from the keyways 8,9) can rotate within the bore 5, see Figs.10 to 13. The centering of the locking elements relative to each other and the members 11 and 22 is achieved whilst maintaining the locking members and the members 11 and 22 coupled together by sliding movement between the channels 27 and the ribs 28 previously described. As it is the combined heights of the lugs 24 and 25 above the body part of the locking element (the body parts are the same for all locking elements) that is critical it could be that the height of one lug could be zero and the height of only one lug could fulfill the above requirement. It follows however, that for all of the locking elements the sum of the heights of the lugs added to the diametrical size of the body part of the locking element adjacent the lugs will approximate but be less than the diameter of the housing bore 5.

It is to be noted that some of the slots 26 have a length different to that of their neighbours. The possibility of different lug heights and different slot lengths multiplied by a number of locking elements gives an extremely large "combination" possibility for the barrel assembly of the present invention.

The barrel assembly is coupled to the mounting member 4 by a sleeve 36 of the mounting member 4 closely embracing the flange 10 of the housing 2. Not shown, but provided, are splines, or key and keyways , or a dog type clutch (or similar means) between the housing 2 and the member 4 which will prevent the housing 2 from rotating relative to the housing 4 but which allows axial separation of the housing 2 from the member 4. The axial separation is prevented by a latch comprising a pin 29 slidably housed in the keeper element 22 and biassed by a spring 30 to an extended condition so that the end of the pin 29 engages in a continuous groove 31 in the lock mounting member 4, thereby allowing the barrel assembly when actuated by a key to rotated relative to the mounting member 4. It will be noted that the pin 29 extends into the key slot 35 through the keeper element 22. A lock release master key can be used to remove the lock from the mounting member 4. The lock release master key has an extended nose portion which, when entered fully into the slot 35, engages the pin 29 and moves it axially. The axial movement is limited by the pin 42 but is sufficient, on part rotation of the barrel assembly by means of the key, to align the free end of the pin 29 with an axial slot 40 which is transverse to the groove 31 and intersects the groove 31, see Fig.35. The lock can then be removed from the mounting member 4 by applying a withdrawing force on the key to move the pin 29 along the axial slot 40 and at the same time disengage the rotation preventing device, of suitable form as suggested above.

Suitable (releasable) driving means couples the barrel assembly keeper

element 22 to the bolt of a latch, in the illustrated example (Figs.1,2 & 4) this is a plate 41 fixed by screws to the keeper element 22.

Figs.14,15,16 show pins 38 and slot 39 as substitutes for the coupling channels 27 and ribs 28 (as illustrated in Figs.17 to 19) of the locking elements 17 to 21, and the keeper elements 11 and 22, Other connection means can be used to achieve the required relationship between the barrel assembly elements.

Figs.20 to 22 show typical profiles for the slots 26 through the locking elements 17 to 21 with the profiles matched by the profiles of the key as illustrated in Fig.3, to give the required centring effect for the locking elements, as previously described.

Fig.23 and 24 are respectively a front view and a sectioned elevation of the barrel assembly front keeper element 11. A regular use key having the cross-sectional shape of the key slot 37 and suitable profiling, as discussed above, can be used to actuate the barrel assembly.

Figs.25 to 28 provide side, end and sectional views of the keeper element 22 to assist with the understanding of the form of the keeper element 22.

Fig.29 illustrates the pin 29 and Figs.30 and 31 illustrate the plate 41 fixed to the barrel assembly.

Fig.32 illustrates barrel assembly elements shaped (in the key slot zone) for actuation by a "standard" key, say for a guest in a hotel room where the door was fitted with the barrel assembly of this invention, the key cross-sectional shape is a shown in the centre sketch.

Fig.33 illustrates barrel assembly elements shaped (in the key slot zone) for actuation by a standard key and a master key allowing management in a hotel (or in a like situation) to open all locks of the present type. The guest's key cross-sectional shape is marked A and the master key cross-sectional shape is marked B. In the right hand sketch of Fig.33 the barrel assembly locking element would be provided with an A track and a B track for engagement by the key shapes A and B. In this example, the surfaces of the B track would be formed at the time the A track was formed with a relationship of the B track to the A track such that lands B1 and B2 on the master key (but not provided on the guest's key) would move the barrel assembly elements to the barrel release position in the same way as the bitting of the guest's key moves the barrel assembly locking elements to the barrel release position. This arrangement can be simply described as one where primary surfaces of the ends of the key openings in the key positionable elements of a barrel assembly (the track A referred to above) provide a combination which is unique to that barrel assembly, and other surfaces of the ends of the key openings in the key positionable (locking) elements (the track B referred to above) provide a service combination which is common to a range of barrel assemblies, and will actuated that range of barrel assemblies, although each barrel assembly

in the range has its own unique combination for guest use. Naturally the key opening in said front keeper element 11 allows entry into the barrel assembly of keys for both said unique and service combinations.

Fig.34 takes the above concept a stage further with three key forms identified A,B,C. In this arrangement one track could be standard for the hotel room guest, one track could be for cleaning staff which would allow access to guest rooms and store rooms housing cleaning supplies and linen, and one track could be for the master key which would allow access to all rooms including those to which the cleaning staff are to be access barred.

The foregoing is a description of a presently preferred embodiment of the invention and variations of several barrel assembly parts. It is to be understood that changes can be made to parts of the barrel assembly as hereinbefore described without departing from the inventive concepts herein disclosed.

Claims:

1. A key actuated lock comprising a housing having a bore in which is housed a barrel assembly including a plurality of key positionable locking elements each with a through opening provided with key engagable surfaces, said locking elements each have radially extending lug means engageable in longitudinal keyways in said bore with the overall diametrical size of each locking element across said lugs approximating but being less than the diameter of said bore, said locking elements are interconnected by means which maintain a predetermined rotational relationship between adjacent elements and which allow guided sliding relative movement between adjacent elements, the arrangement being such that insertion through the key openings of said locking elements of a key profiled to correspond with a barrel combination determined by the relative radial positions of said key engageable surfaces of said locking elements will position said locking elements so that the lugs thereof will lie within said bore to allow said barrel assembly to be rotated relative to said housing.

2. A key actuated lock comprising a housing with an elongated bore and a barrel assembly mounted in the bore so as to be rotatable relative

to said housing when a plurality of key positionable barrel assembly elements engageable with the housing are positioned so as to be free of engagement with said housing, the housing bore includes a first zone having a pair of diametrically opposed longitudinal channels and other zones, the key positionable barrel elements are disposed between front and rear keeper elements which are rotatably supported in said other zones of said bore and are restrained against axial movement relative to said housing, body parts of the elements of the barrel assembly are interconnected by means which retain a predetermined rotational relationship between adjacent elements and which allow guided sliding movement between adjacent elements in parallel planes which are substantially normal to a longitudinal axis of the housing bore, the body parts of the key positionable elements are each provided with radially extending lug means sized to enter into the channel means, for each key positionable element the sum of the radial heights of lug means when added to the diametrical size of its body part adjacent the lug means approximates but is less than the diameter of the housing bore thereby allowing said key positionable elements to be rotated in said bore, the lug heights of the key positionable elements are varied to provide a combination for a barrel assembly, a key opening through said front

keeper element and each of said key positionable elements, for each key positionable element the key opening has key engageable ends offset from the axis of said housing bore in relationship to the height of its lug means so that on insertion into the barrel assembly of a key for the barrel assembly combination the key positionable elements will be radially moved to position all of said lug means within the bore of the housing thereby allowing the barrel assembly to be rotated in said housing bore by said key.

3. A lock as claimed in claim 2 wherein said rear keeper is adapted for coupling to a security device to be actuated by rotation of said barrel assembly.

4. A lock as claimed in claim 2 or claim 3 wherein said lock is adapted for releasable coupling to a lock mounting member through rotation preventing means and latching means, where said latching means is moved from a latching position to a release position by a latch release key inserted through the key openings of said front keeper element and said key positionable elements into the key opening of said rear keeper element.

5. A lock as claimed in claim 4 in combination with a lock mounting member, wherein said lock mounting member includes a circular track to receive a free end of said latching means allowing a barrel assembly when key actuated to rotate relative to said lock mounting member to align the free end of said latching means when in the release position with an axial track intersecting said annular track, axial movement of said lock relative to said lock mounting member achieving disengagement of both said rotation preventing means and said latching means and separation of said lock from said lock mounting member.

6. A lock as claimed in either claim 4 or claim 5 wherein said latching means is spring biassed to said latching position.

7. A lock as claimed in any one of the claims 2 to 6 wherein one or more of said key positionable elements have a single lug means.

8. A lock as claimed in any one of the claims 2 to 7 wherein the means which retain a predetermined rotational relationship between adjacent elements and which allow guided sliding movement between adjacent elements in parallel planes which are normal to a longitudinal axis of the

housing bore are engaged ribs and channels respectively on adjacent elements.

9. A lock as claimed in any one of the claims 2 to 6 wherein the means which retain a predetermined rotational relationship between adjacent elements and which allow guided sliding movement between adjacent elements in parallel planes which are normal to a longitudinal axis of the housing bore are engaged pins and slots respectively on adjacent elements.

10. A lock as claimed in any one of the claims 2 to 9 wherein primary surfaces of the ends of the key openings in said key positionable elements of a barrel assembly provide a combination which is unique to that barrel assembly and other surfaces of the ends of the key openings in said key positionable elements provide a service combination which is common to a range of barrel assemblies each of which has its own unique combination, and wherein the key opening in said front keeper element allows entry into said barrel assembly of keys for both said unique and service combinations.

11. A key actuated lock substantially as hereinbefore described with reference to any one of the accompanying drawings.

Dated this 26th day of June, 2000

TECHNOSEARCH PTY. LIMITED
By its Patent Attorney
Robert Halliday

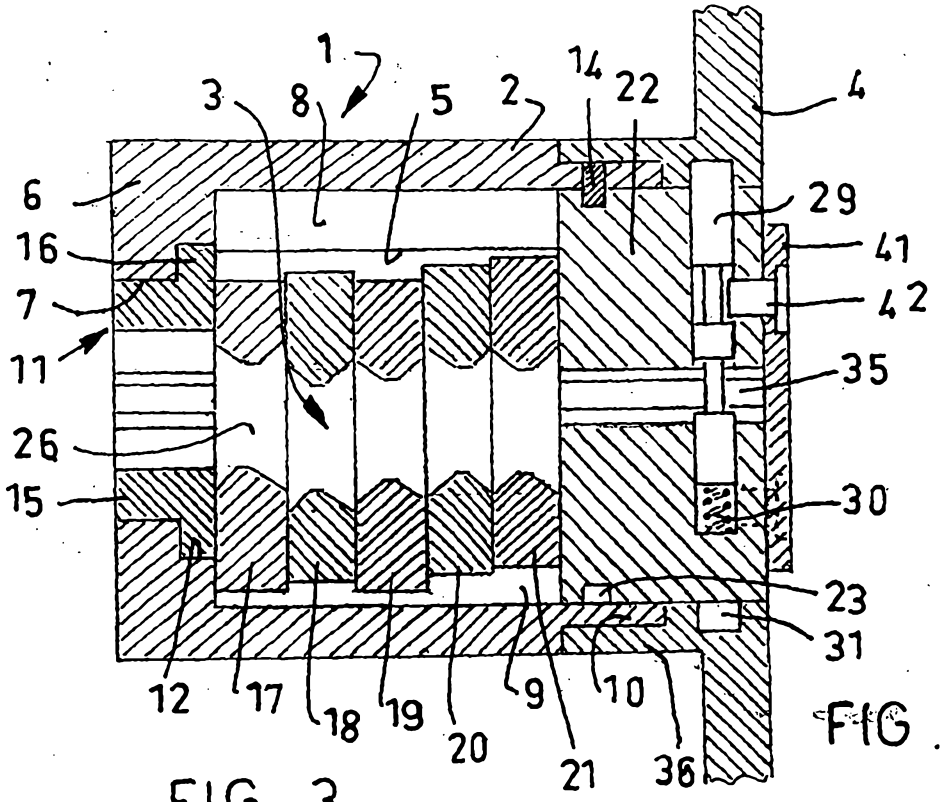


FIG. 1.

FIG. 3.

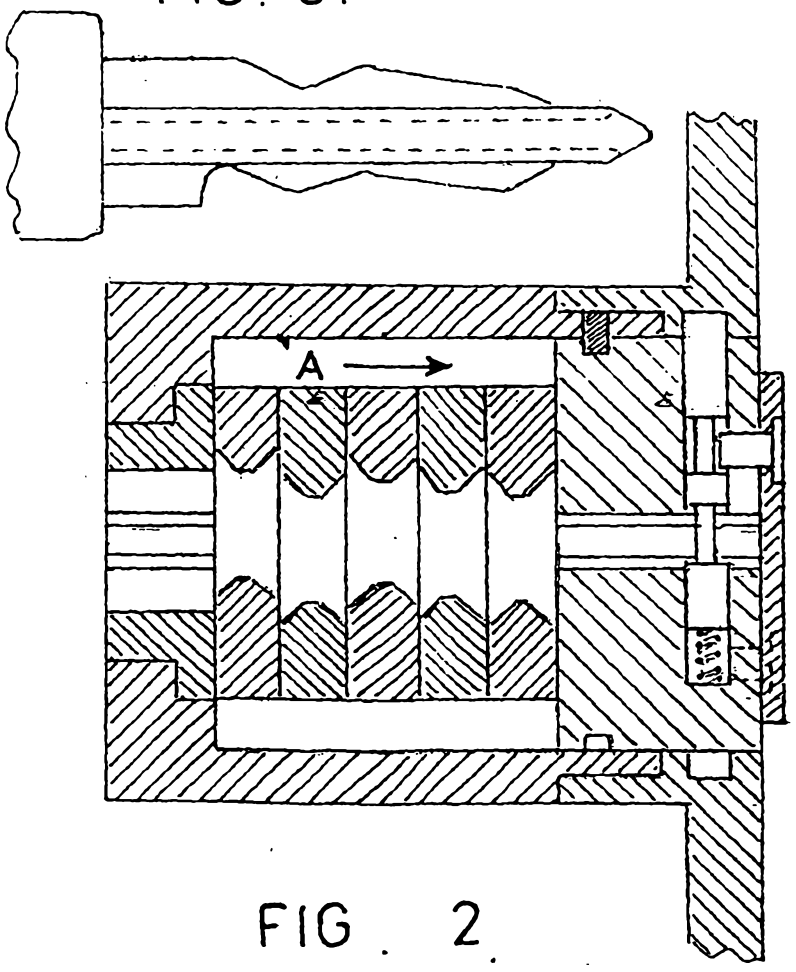


FIG. 2.

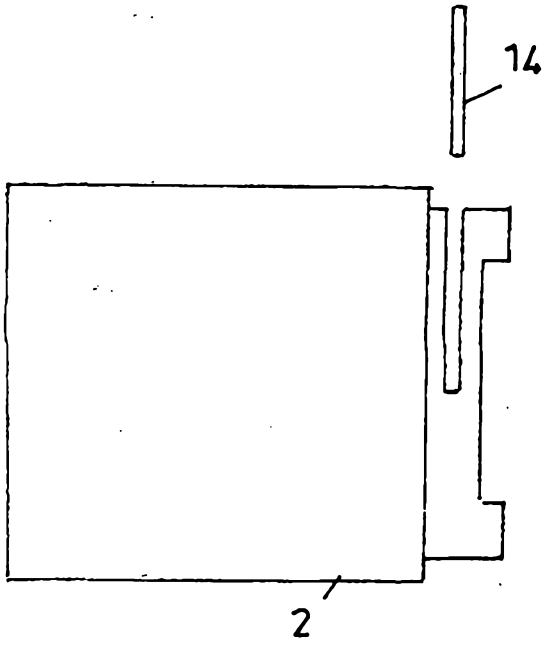
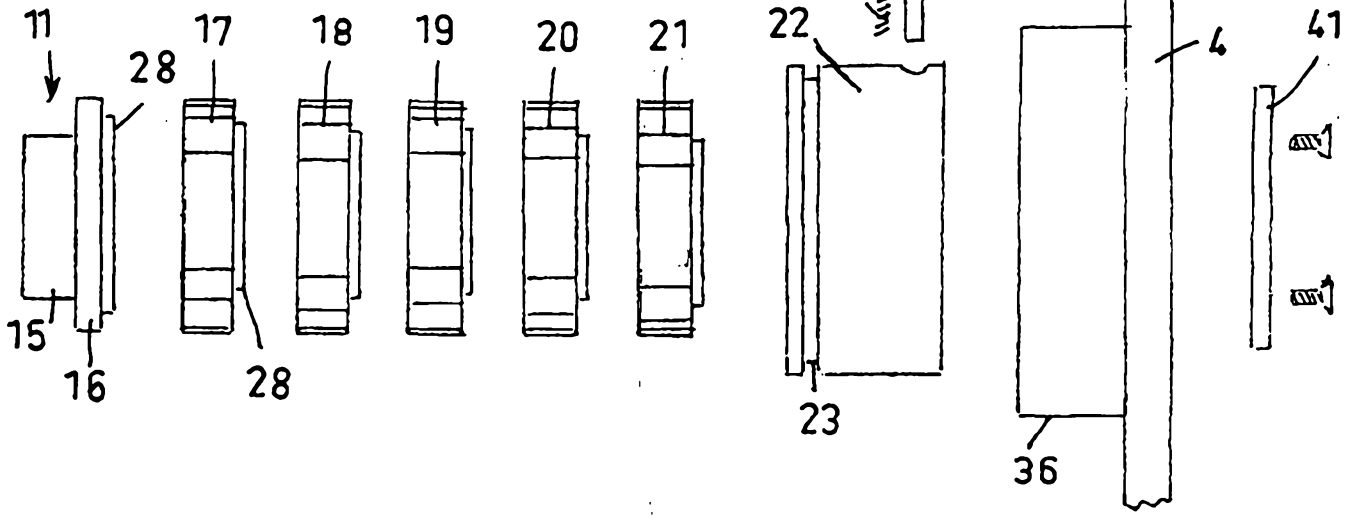


FIG. 4.



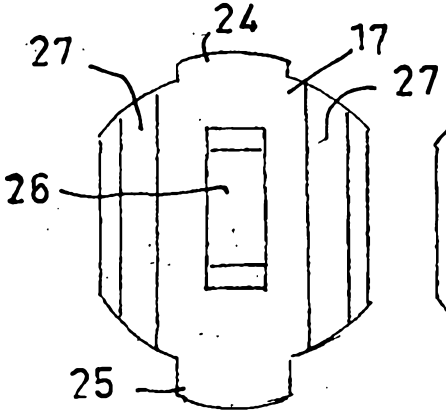


FIG. 5.

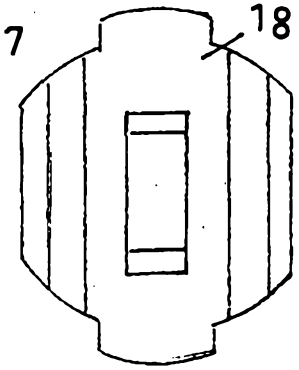


FIG. 6.

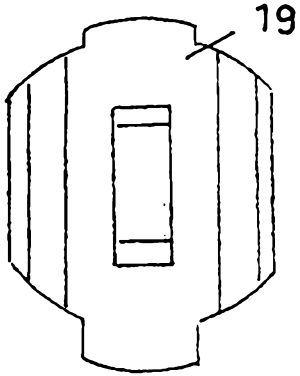


FIG. 7.

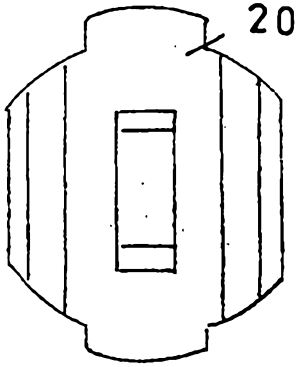


FIG. 8.

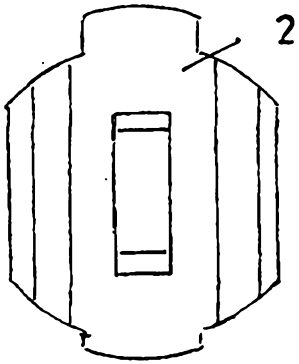


FIG. 9.

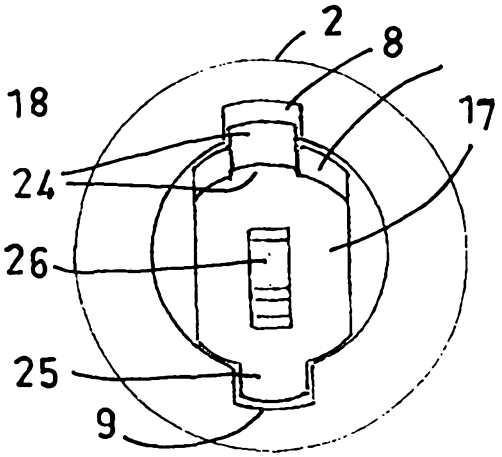


FIG. 10.

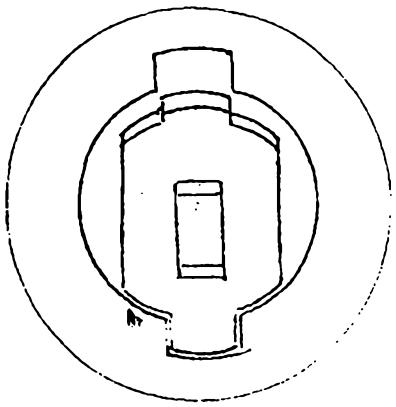


FIG. 11.

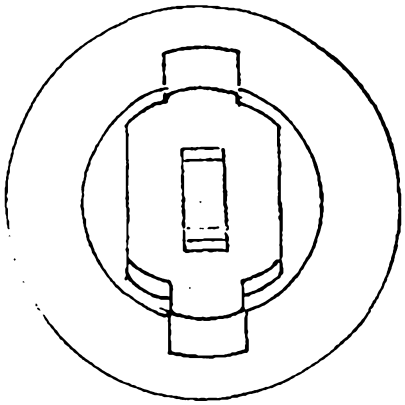


FIG. 12.

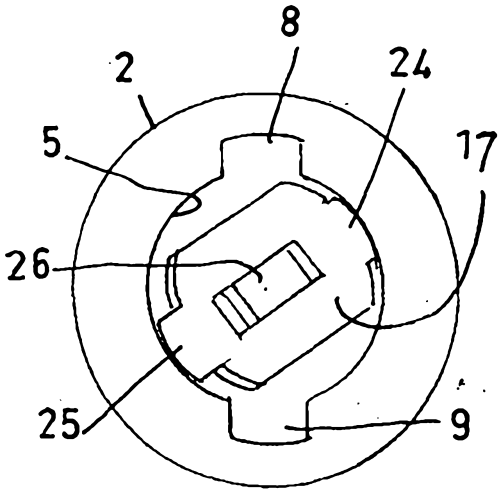


FIG. 13.

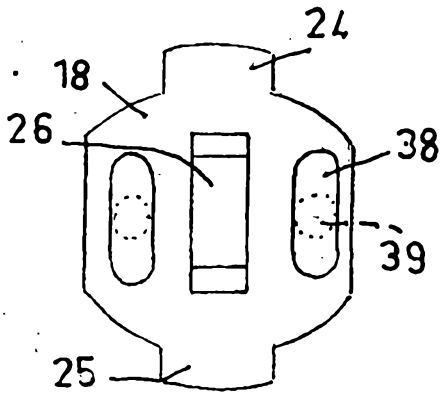


FIG. 14.

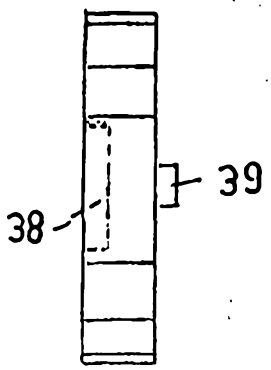


FIG. 15.

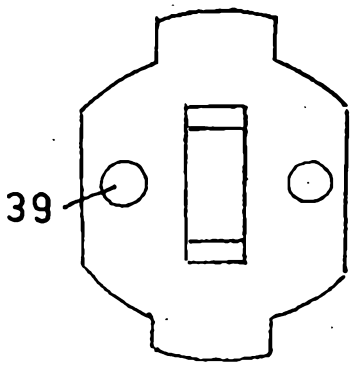


FIG. 16.

FIG. 17.

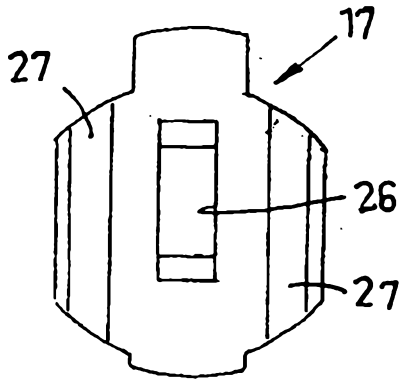


FIG. 18.

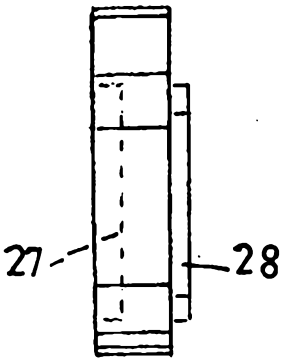
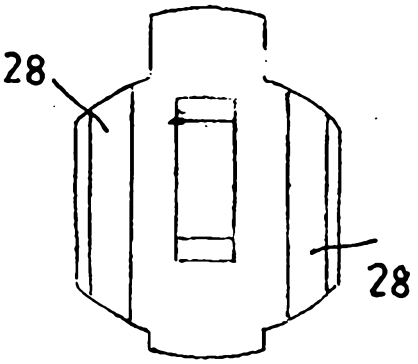


FIG. 19.



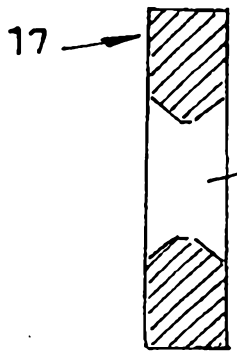


FIG. 20.

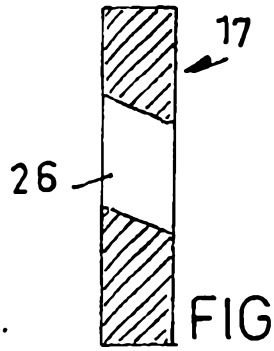


FIG. 21.

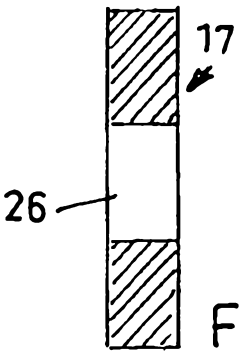


FIG. 22.

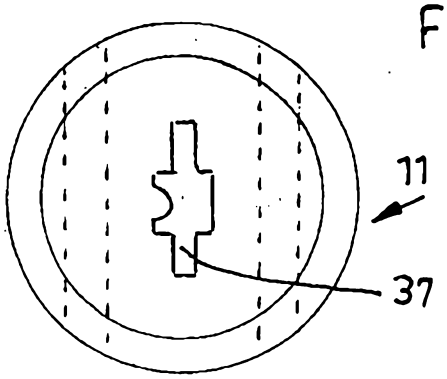


FIG. 23.

FIG. 24.

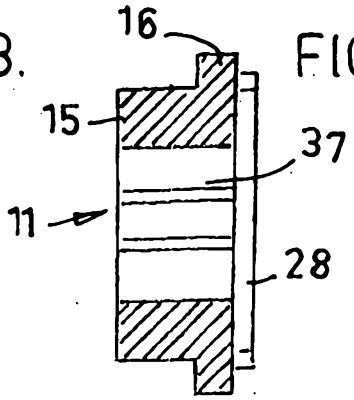


FIG . 25.

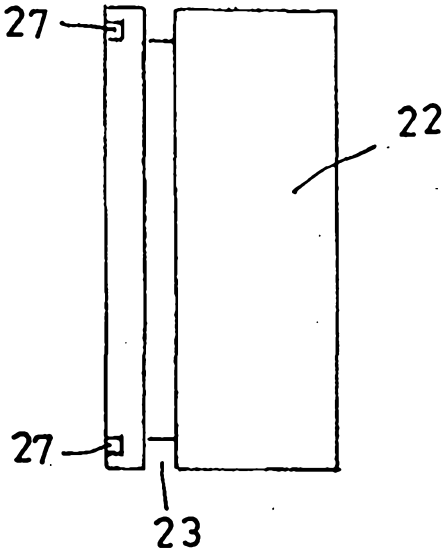
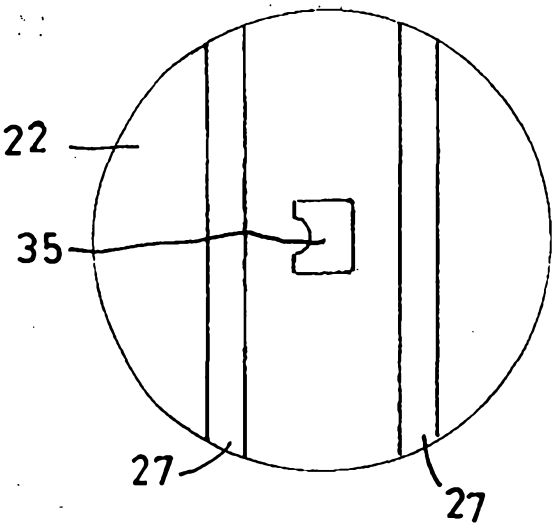


FIG . 26.



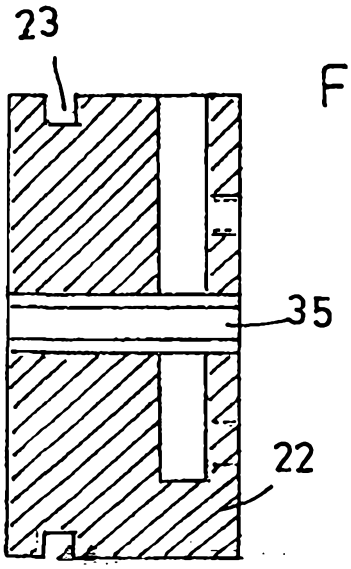


FIG . 27.

FIG . 28.

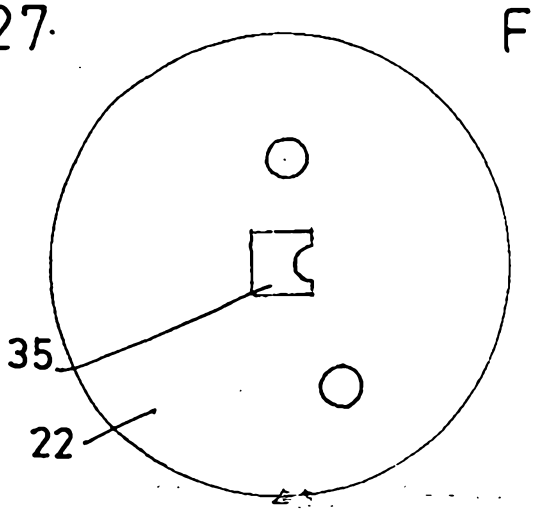


FIG . 29.

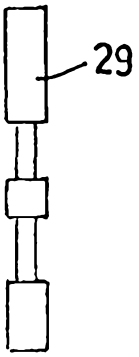


FIG . 30.

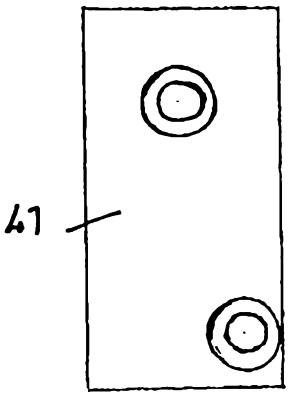


FIG . 31.

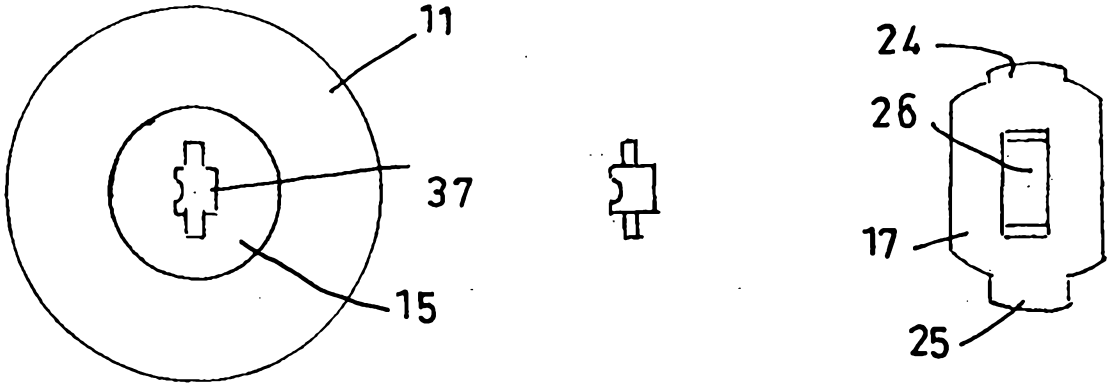


FIG . 32.

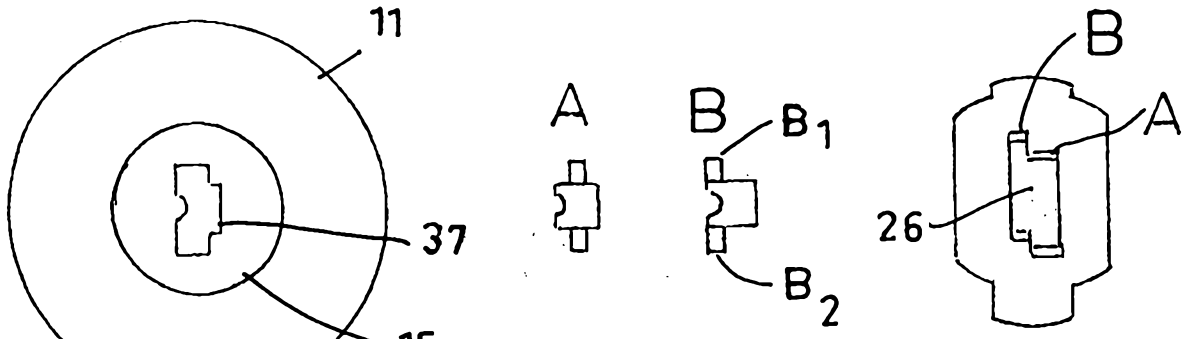


FIG . 33.

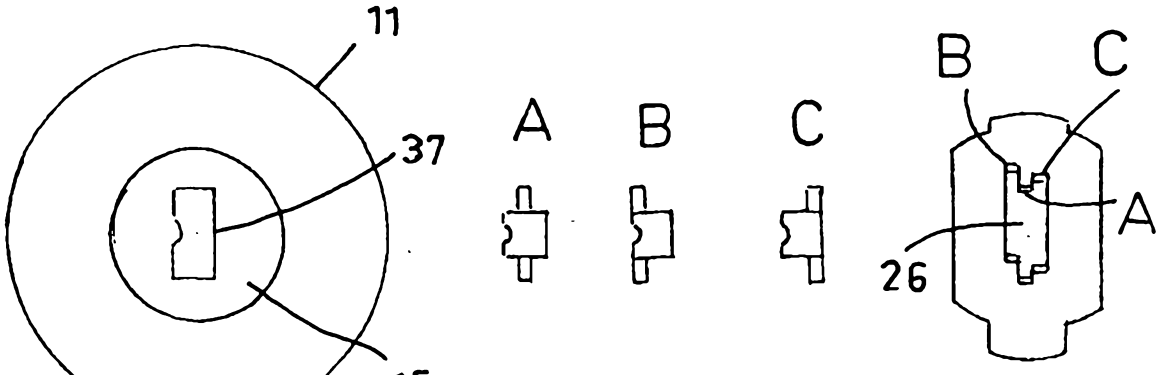


FIG . 34.

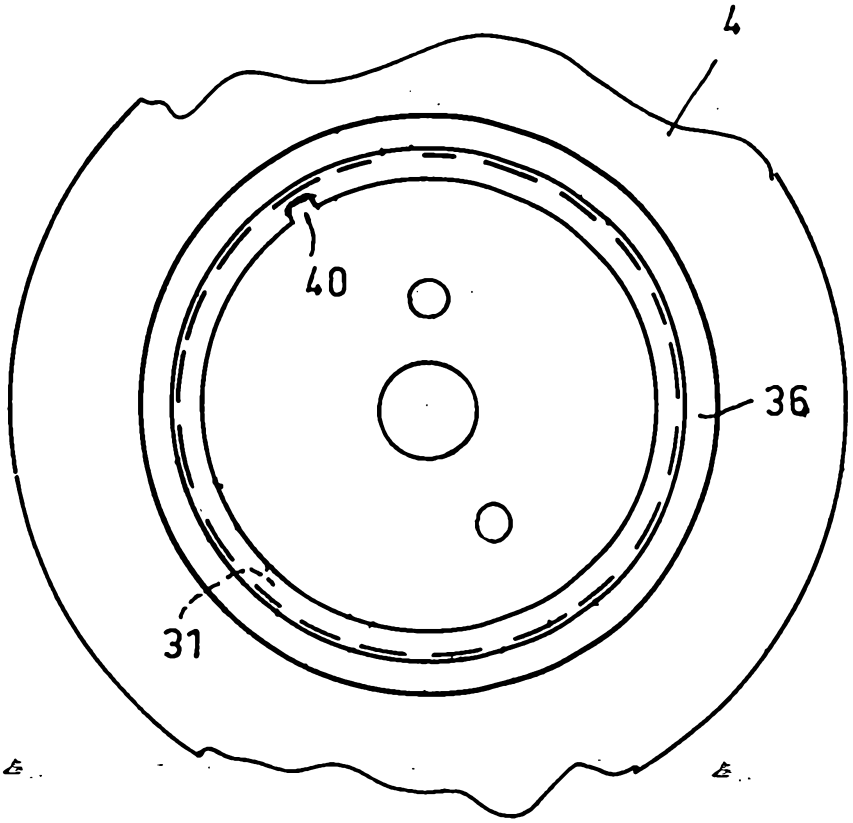


FIG. 35.