(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 095 529**
A1

(12) # EUROPEAN PATENT APPLICATION

(21) Application number: **82200667.2**

(22) Date of filing: **01.06.82**

(51) Int. Cl.³: **E 05 B 37/02**

(43) Date of publication of application: **07.12.83**
Bulletin 83/49

(84) Designated Contracting States: **AT BE CH DE FR GB IT LI LU NL SE**

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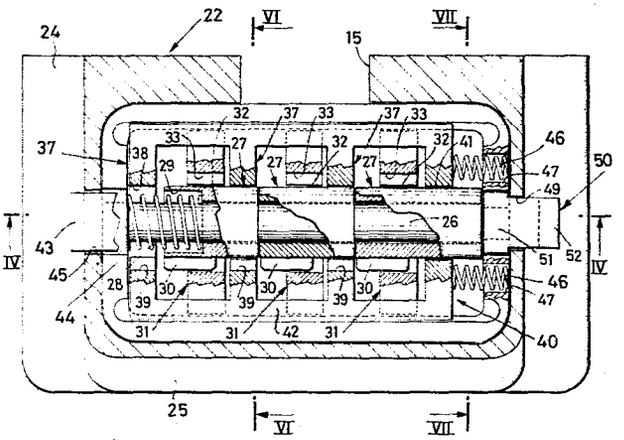
(54) **Combination lock particularly suitable for small-size portable containers, such as bags, handbags and beauty-cases.**

(57) The lock has a bolt (43) integral with a frame (42) elastically stressed in closed position. From the frame (42) there transversally extend some parallel walls (37) alternated to numbered wheels (31) connected for the rotation to sliding bushes (27) disposed in succession. The bushes (27) have radial projections (30) which, when they are disposed according to the choosen combination, can combine with radial recesses (39) of the inner holes (38) of said walls (37) to allow the opening sliding of the walls (37) together with the frame (42) and the bolt (43). On the contrary for the combination change there is caused the sliding in opposite sense of the bushes (27) until to release them from the respective wheels (31).



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"Combination lock particularly suitable for small-size portable containers, such as bags, handbags and beauty cases".

* * * * * * *

The present invention relates to a combination lock particularly suitable for small-size portable containers, such as bags, handbags and beauty-cases, as well as for cabinets and so on.

There are already known combination locks for suitcases of various shape and size, in which a bolt elastically stressed in closed position is locked in such position or let free to move back in open position, under the control of a suitable knob, according to the angular positions of two or more numbered wheels disposed adiacent to one ancther.

Particularly it is very used a kind of lock, invented by the same Applicant of the present application, in which the opening movement of the bolt is dependent on a corresponding axial sliding of a succession of bushes connected for the rotation, but not for the axial sliding, to said wheels (a bush for every wheel) and rotatably and slidingly mounted on a pin passing through aligned holes of said wheels and of fixed walls alternated to said wheels. The bushes and the passing holes of said fixed walls are provided with respective radial complementary projections and recesses, which cause such sliding of the bushes, and therefore the opening of the lock, to be allowed only when all the bushes, by means of the respective wheels, are angularly disposed in such a way that said projections and said reces

ses are aligned with each other, that is when it is formed the chosen "combination". In the same angular conditions it can also be made the change of the combination, which includes the control of a similar axial sliding of the bushes, in the same sense of that allowing the opening of the bolt but of a greater entity. With such a sliding it is released the rotational connection between bushes and wheels, which is otherwise assured by the engagement of said projections of the bushes in the one or the other of a circumferential succession of radial notches of the inner hole of the respective wheels. These latter can thus be rotated independently from the bushes, so as to modify the respective angular positions which correspond to the opening angular condition of the bushes, that is the respective numerals of the opening combination of the lock.

The locks of this kind, certainly valid for many applications, lend themselves badly to those uses in which the reduced bulk constitutes a merit that cannot be renounced, as for example in bags, handbags, beauty-cases and other small-size containers, such as cabinets.

In fact in such locks it is practically impossible to contain the bulk within narrow limits, being necessary to provide in their inside a free space sufficient to allow not only the opening movement of the bolt but also the more extensive movement of combination change. Such a free space is evidently cause of bulk per se, and at the same time is also cause of an asymmetric di

sposition of the wheels, which is compensated by correspondingly extending the lock at the opposite part with consequent further increase in size. Furthermore it is clear that the elastic reaction to the extensive movement of the combination change must be assured by a spring of suitable length, which is in its turn cause of bulk. If then, for example for a beauty-case, one wants that the usual rectangular lock becomes square, so as to operate with a rotating mask which can be positioned around it, this could be obtained only by increasing the width of the lock until it becomes equal to the length, and therefore increasing the lock size: the result would be really very bad from both the aesthetic and economic point of view.

The object of the present invention is then to realize a combination lock, which is of reduced bulk and for this reason can be realized not only of rectangular shape but also of square shape.

According to the invention such an object is reached by a lock comprising a bolt elastically stressed in closed position, a plurality of rotating wheels disposed next to each other and means able to subordinate the movement of the bolt to an open position to the rotation of all the above mentioned wheels to respective prefixed angular positions, said means comprising a plurality of parallel walls alternated to said wheels, a pin passing through aligned holes of said wheels and of said walls and a succession of bushes rotatably and slidingly mounted on said pin and engaged in said holes of respective wheels so as to be connected to

them for the rotation but axially sliding with respect to them, said bushes and said holes of said walls being provided with radial complementary projections and recesses able to allow the mutual sliding of said bushes and said walls only if all the bushes are disposed in a predetermined angular position as a consequence of the rotation of all the wheels to said prefixed angular positions, characterized in that said parallel walls extend transversally from a sliding frame rigidly connected to said bolt.

The lock according to the invention is therefore of the same kind of the previously described known bolt, but, unlike it, has the bolt integral with the walls alternated with the rotating wheels, so that during the bolt opening the above mentioned walls slide with respect to the bushes and not viceversa. The sliding of the bushes, in opposite sense with respect to the movement of the walls, on the contrary, can be controlled for the combination change.

Therefore there are no more two movements of different entity in one sense, but two movements in opposite senses, whose stroke can be opportunely limited. Consequently the space to be left available for the execution of such movements can be reduced to minimum, so as to make possible a more contained bulk. In such sense a valid contribution is given by the fact that, the stroke being reduced, shorter springs can be used and, being reduced the free space for such strokes, the asymmetricity of the bushes and thus the greatest lenght requested for compensating the same are also reduced.

The bulk being reduced, the lock according to the invention evidently lends itself very well also for uses rejected until now to the old kind locks, therein comprised that of a square (or approximately square) lock.

The features of the present invention will be better comprised through the following detailed description of an embodiment illustrated by way of non-limitative example in the enclosed drawings, in which:

Fig. 1 shows in top plan view a lock according to the invention combined with a mask of approximately square shape to realize a closure particularly suitable for beauty-cases;

Fig. 2 shows separately in perspective view said lock and said mask;

Fig. 3 shows the assembly of said lock and said mask in section along line III-III of Fig. 1;

Fig. 4 shows the assembly of said lock and said mask in section along line IV-IV of Fig. 1, as well as along line IV-IV of Fig. 5;

Fig. 5 shows the only lock in section along line V-V of Fig. 4;

Fig. 6 shows said lock in section along line VI-VI of Fig. 5;

Fig. 7 shows said lock in section along line VII-VII of Fig. 5.

In drawings is illustrated a combination lock 11, which together with a mask 12 which turns around it (Figs. 1 and 2) realizes a closure particularly suitable for beauty-cases (as well as for other small-size contai-

ners like cabinets, bags and handbags). The lock is evidently destined to be fixed to a container base or casing, while the mask is to be fixed to the relative cover or door.

The mask 12 is constituted by a fixed part 13, which is provided with a central projection 13 which can be inserted in a corresponding central cavity 15 of the lock for positioning and centering reasons, and by a rotating U-shaped part 16, which is connected to the fixed part 13 by means of a hinge pin 17 and is provided with a control knob 18. The two parallel sides of the rotating part 16 are further provided with two cavities 19 and 20, the second of which is completely open downwards (Fig. 4); the purposes of said cavities will be explained farther on.

The lock 11 includes in its turn a parallelepipedal casing 21, which is closed upwardly by a cover 22 including said cavity 15 and provided with three symmetrical windows 23. Around the casing 21, under the cover 22, there is disposed and fixed a flat rib 24, which together with a lower step 25 of the cover 22 operates as support base for the rotating part 16 of the movable mask 12 (Figg. 3 and 4) when this one is in a closed position; the fixed part 13 on the contrary abuts behind the assembly constituted by the cover 22 and the flat rib 24, with the projection inserted in the cavity 15 (Figs. 1 and 3).

Inside the casing 21 is situated the mechanism of the lock, which includes a horizontal fixed pin 26, on which there are assembled in a rotating and axially

sliding way three cilindrical bushes 27 stressed in the rest position illustrated in Figs. 3 and 4 by a spring 28 mounted on the pin 26 and partially inserted in an axial cavity 29 of one of the bushes.

As it is clearly evident in Figs. 3, 5 and 6, every bushes 27 is provided with a radial projection 30, which extends only for a part of the lenght of the bush. At such radial projections there are mounted on the bushes 27 respective parallel wheels 31, everyone of which projects outwards the cover 22 through one of the windows 23 and has a central through-hole 32 provided with a circumferential succession of radial notches 33 (Fig. 3) in a selected one of which is slidingly inserted the radial projection 30 of the respective bush for the rotational connection between bush and wheel. Every wheel 31 is further provided outwardly with angular positioning notches 34, with which cooperates a respective folded elastic tab 35 extending from a fixed plate 36 fixed to the bottom of the casing 21 (Figs. 3 and 4). Between the one and the other of said notches 34 there are impressed or cut over every wheel 31 the numbers from 0 to 9 which, visible one at a time from outward, identify in numerical form the angular position assumed each time by the wheel.

With the three wheels 31 are alternated the same number of parallel walls 37, everyone of which is provided with a cilindrical central hole 38 aligned with the holes 32 of the wheels 31 and provided with a radial recess 39 complementary with the radial projection 30 of the bushes 27 (Fig. 6). Said walls 37 together

with a further parallel wall 40 provided with a perfectly cilindrical hole 41 (that is without recess 39), extend from a sliding frame 42, which is situated on the top of the casing 21 and forms a single piece with a beveled tip bolt 43 coming out from the casing 21 and from the overlying cover 22 through aligned cavities 44 and 45. Two springs reacting against the rib 24 outside the casing 21 (from which they come out through holes 47, Figs. 5 and 7) stress the frame 42 and therefore the bolt 43 in the position of Figs. 4 and 5, in which, with the movable mask 12 in closed position, the bolt 43 engages in the cavity 19 (beveled too) of the rotating part 16 of the mask (Fig. 4).

Through aligned windows 48 and 49 of the opposite part of the casing 21 on the contrary comes out outside the same casing and the cover 23 a pin 50, which has its inner part 51 abuted against the end of the nearest bush 27 (Figs. 4, 5 and 7) and its outer part 52 situated, with the mask 12 in closed position, in the cavity 20 of the rotating part 16 of the mask (Fig. 4).

From the described structure derives the following working of the lock illustrated in the drawings and, more generally, of the one according to the invention.

In the condition illustrated in Fig. 5, all the bushes 27 have their radial projections 30 aligned with the complementary recesses 39 of the walls 37. Such common angular condition of the bushes 27, obtainable by forming through the wheels 31 the preselected "combination", allows the bolt 43 to go back with the fra-

me 42 and the walls 37, when so stressed by the lower beveling of the cavity 19 of the rotating wall of the mask, to allow the release of the mask 12 from the lock 11 for the container opening. Just after, the bolt 43 is stressed by the springs 46 to return in the starting position, from which it is for the moment still removed, by making use of its upper beveled part, during the closing of the mask 12.

On the contrary if even one of the bushes 27 were disposed in a different angular position as a result of the missed formation of the prefixed numerical combination, the radial projection 30 of that bush would abut against the adjacent wall 37 and would prevent the sliding frame 42 and therefore the bolt 43 from coming back to the open position. Because of the engagement between the bolt 43 and the cavity 19 of the mask 12, this latter would thus remain locked in closed position.

On the other hand the opening combination can be changed by disposing all the bushes 27 in the opening position, that is by rotating the wheels 31 until to form the same combination, and then by pushing the pin 50 towards the inside of the casing 21, so as to cause the succession of bushes 27 to axially slide until to release their radial projections 30 from the inner holes of the respective wheels . Then these latter can be rotated independently from the bushes until to choose a different notch 33 to be engaged with the projection 30 of the respective bush, so as to fix a different angular position, that is a different number, which cor

responds to the opening angular condition of the bush. When this has been made, the pin 50 is released, repairing the engagement, however modified, between bushes and wheels.

As it can be detected from Fig. 5, the movements to which the sliding frame 42 and the succession of bushes 27 must be subjected, in opposite senses, for the opening movement of the bolt and, respectively, for the combination change, are very limited, as well as it is limited the space to be left free to allow such movements. The same springs 28 and 46 are thus of limited length and furthermore partially situated in preconstituted cavities or holes. Finally this allows to limit the length of the lock very much, maintaining however the desired conditions of symmetricity of the wheels 31.

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CLAIMS

1. Combination lock particularly suitable for small-size portable containers, such as bags, handbags and beauty-cases, as well as for cabinets and so on, comprising a bolt elastically stressed in closed position, a plurality of rotating wheels disposed next to each other and means able to subordinate the movement of the bolt to an open position to the rotation of all the above mentioned wheels to respective prefixed angular positions, said means comprising a plurality of parallel walls alternated to said wheels, a pin passing through aligned holes of said wheels and of said walls and a succession of bushes rotatably and slidingly mounted on said pin and engaged in said holes of respective wheels so as to be connected to them for the rotation but axially sliding with respect to them, said bushes and said holes of said walls being provided with radial complementary projections and recesses able to allow the mutual sliding of said bushes and said walls only if all the bushes are disposed in a predetermined angular position as a consequence of the rotation of all the wheels to said prefixed angular positions, characterized in that said parallel walls extend transversally from a sliding frame rigidly connected to said bolt.

2. Combination lock according to claim 1, characterized in that for the combination change there are provided control driving means to cause the axial sliding of said bushes in opposite sense with respect to that of the opening movement of said bolt, said axial sli-

ding being of such an entity as to cause the brief angular release between said bushes and the respective wheels for the independent rotation of these latter in different prefixed angular positions.

3. Combination lock according to claim 2, characterized in that said sliding frame is elastically stressed in closed position by at least one spring partially situated in a corresponding cavity of an outer casing and said succession of bushes is elastically stressed in rest position by at least one spring partially situated in an axial cavity of one of said bushes.

Fig.3

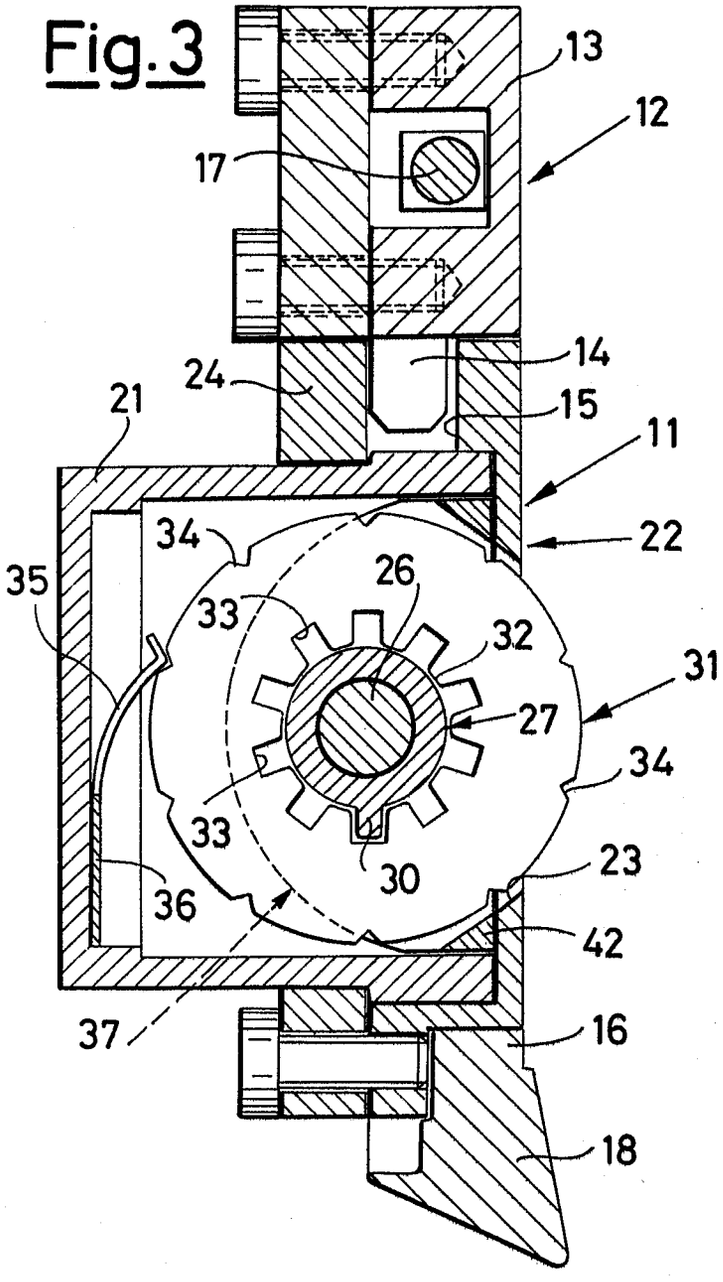

Fig.1

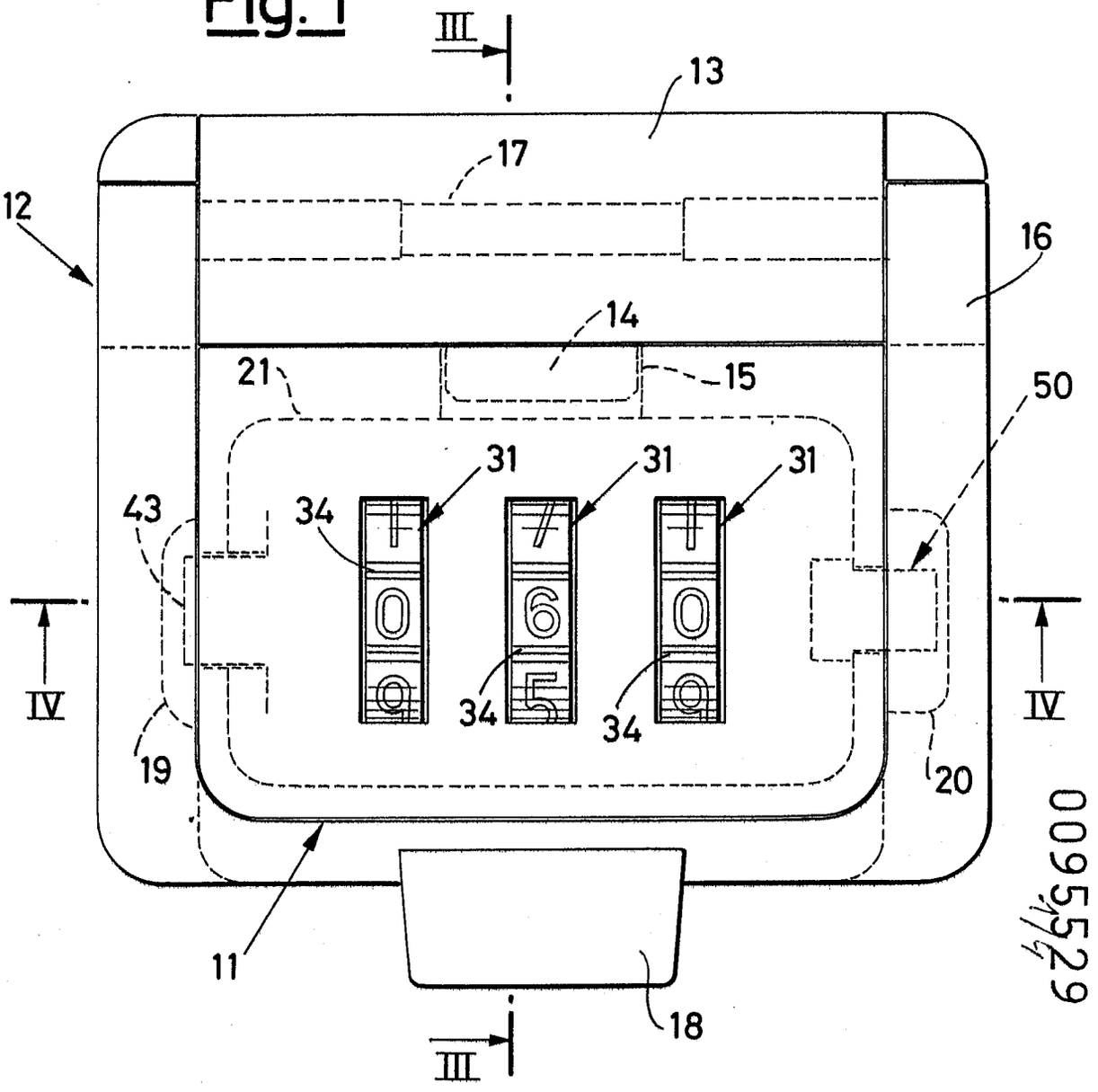

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Fig.2

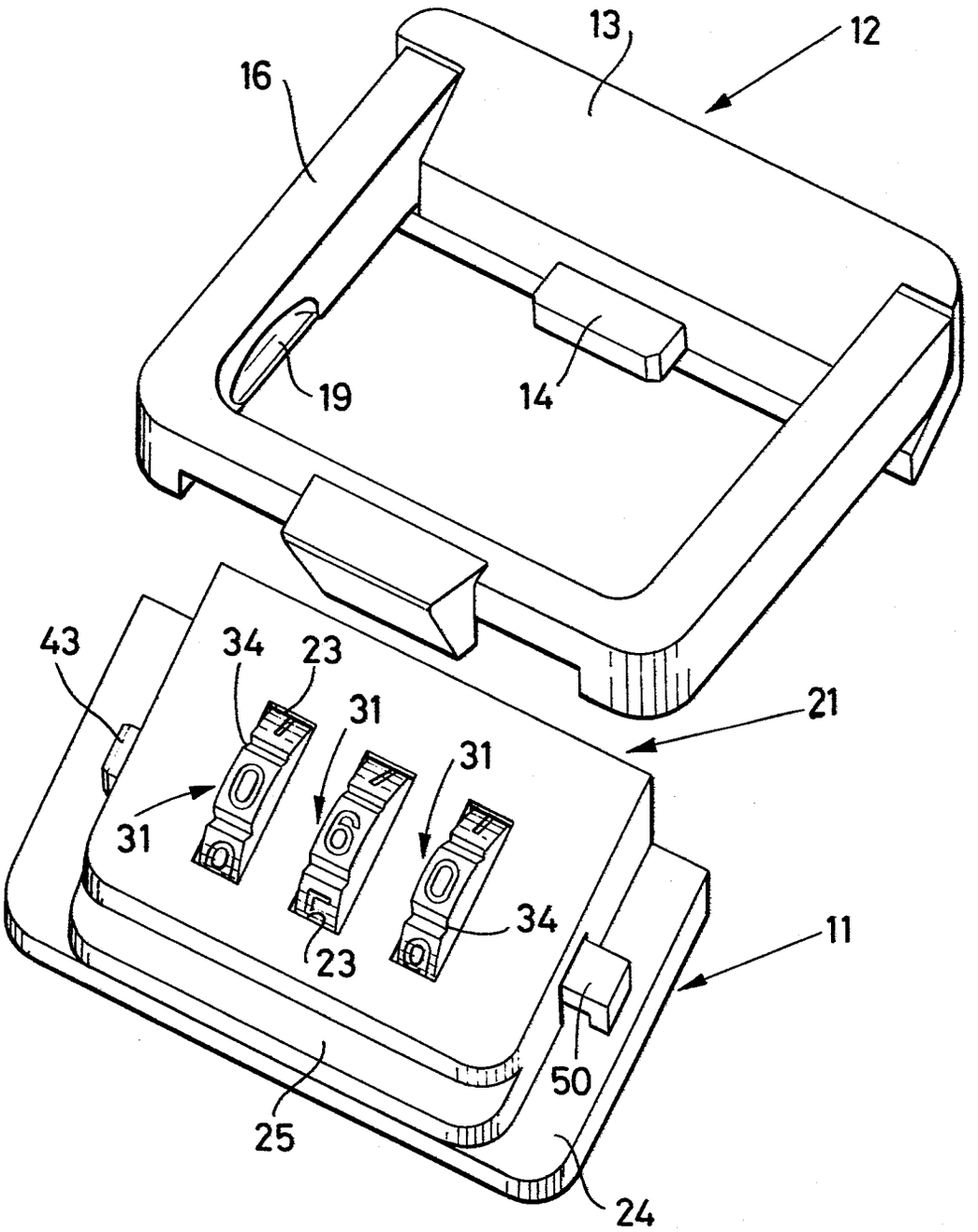

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Fig. 4

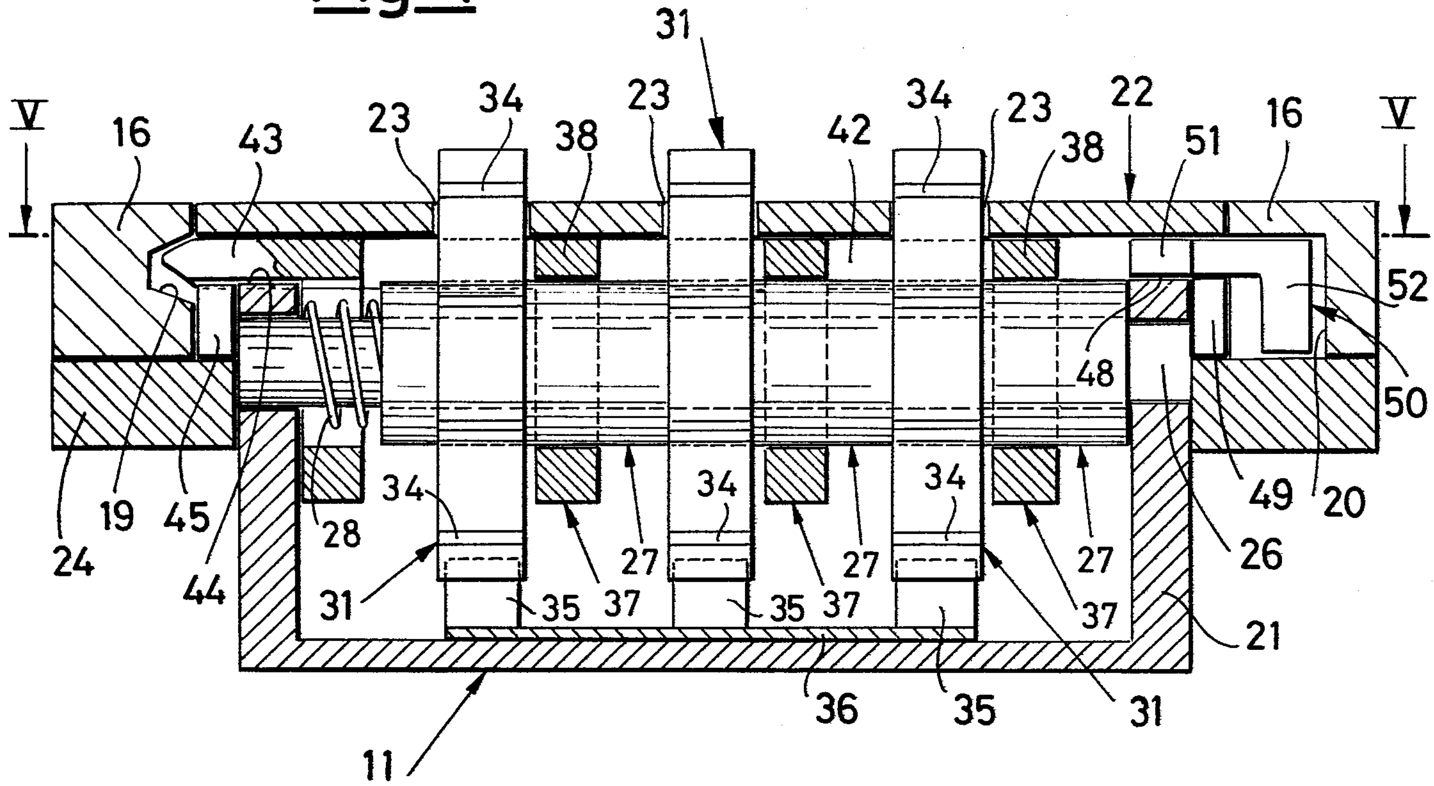

Fig. 5

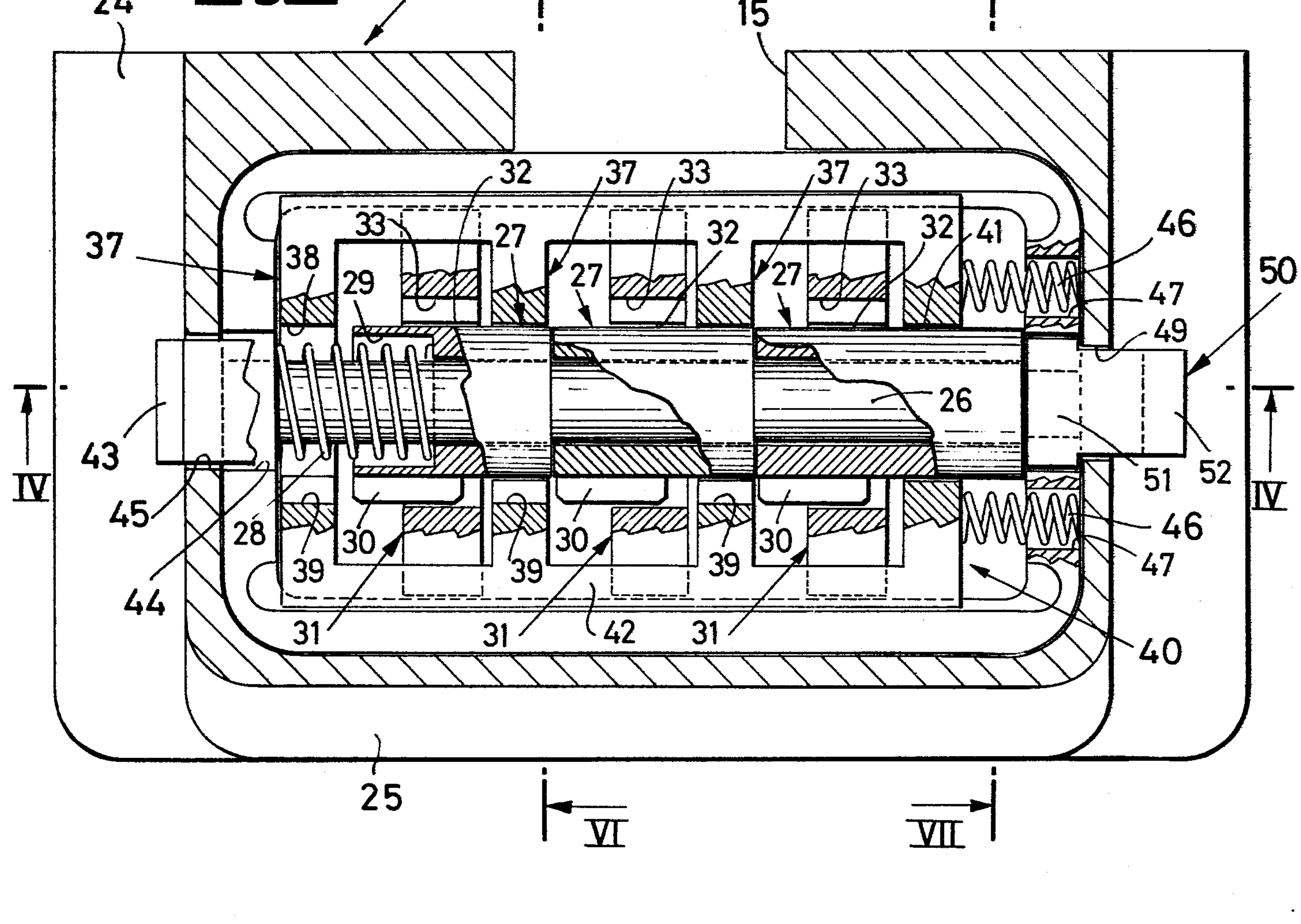

Fig.6

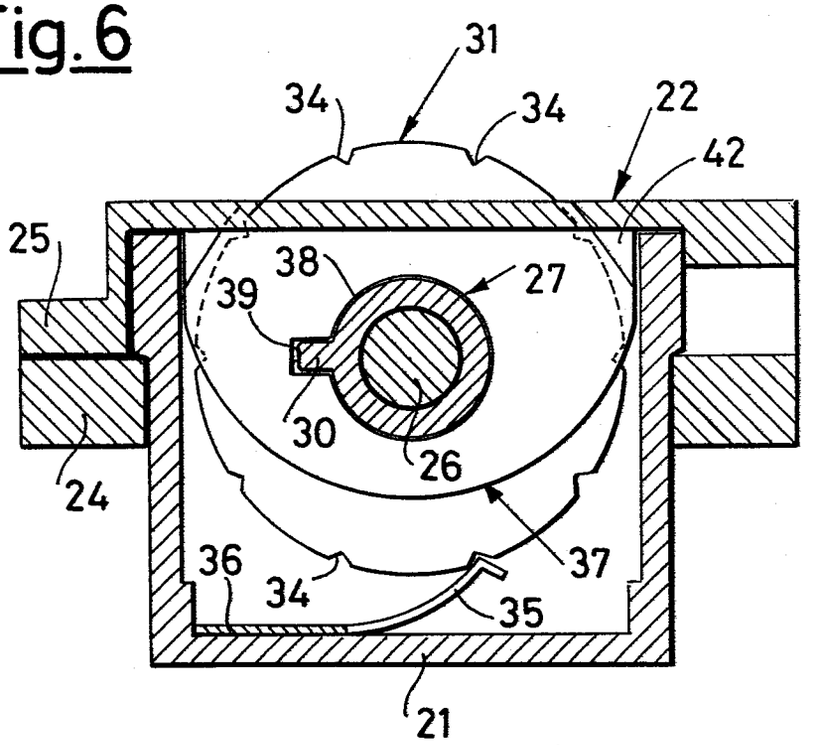
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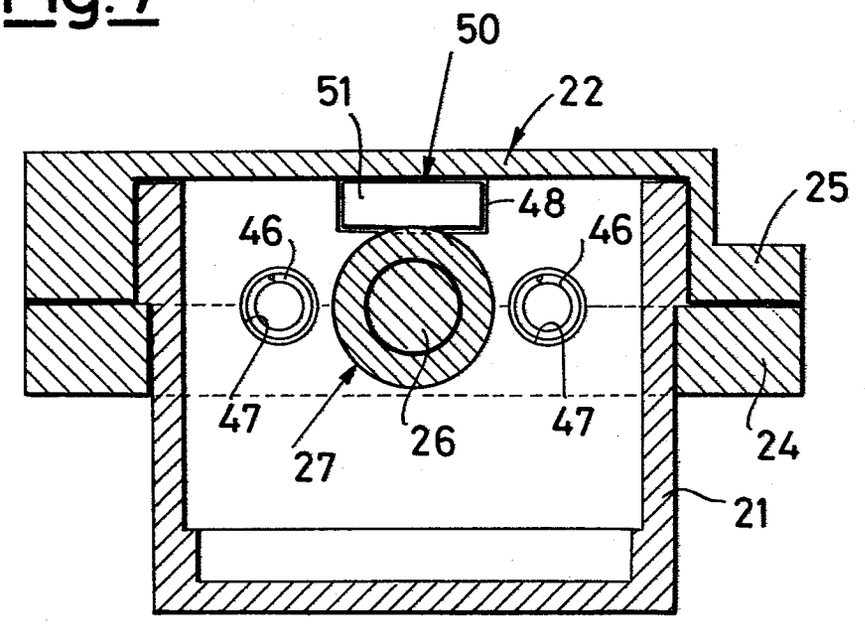
Fig.7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European Patent Office

EUROPEAN SEARCH REPORT

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Application number

EP 82 20 0667

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
X	--- US-A-3 416 338 (GEHRIE) *The whole document* -----	1,2	E 05 B 37/02

TECHNICAL FIELDS SEARCHED (Int. Cl. ³)

E 05 B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	03-02-1983	VAN BOGAERT J.A.M.M.

CATEGORY OF CITED DOCUMENTS

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