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

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Description

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 adjacent to one another.

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 recesses 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 disposition 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.

US—A—3416338 (which represents the prior art part of the claim) discloses, on the other hand, a combination lock, in which the bolt is separated from the bushes and made integral with a sliding frame, from which there extend 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 bushes may be caused to slide in opposite sense, on the contrary, for the combination change.

According to US—A—3416338, therefore, there are not two movements of different entity in one sense, but two movements in opposite senses, whose stroke can be suitably limited. Consequently, the space to be left available for the execution of such movements may be reduced to full advantage of the general bulk.

The combination lock of the above mentioned U.S. patent, however, shows drawbacks in connection with the resilient action exerted on the sliding frame and the succession of bushes for holding them in rest position. This action is due to a single spring reacting between one end of the succession of bushes and a confronting bracket made integral with the sliding frame. Such an arrangement makes critical the selection of a suitable single spring, which should be both yielding enough to make easy the lock opening and stiff enough to avoid unintentional combination change.

The object of the present invention is then to realize a combination lock which is of reduced bulk and also solves any spring problems.

According to the invention such an object is reached by a combination lock comprising a bolt resiliently biassed in closed position, a plurality of rotating wheels disposed close to each other and means able to subordinate the movement of the bolt to an open position by 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 and extending transversally from a sliding frame rigidly connected to said bolt, 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 slidable with respect to them, said bushes being biassed in a rest position by at least one first spring, 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, there being further provided combination change means including 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 sliding 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, characterized in that said sliding frame is resiliently biassed in closed position by at least one second spring partially situated in a corresponding cavity of an outer casing and said at least one first spring is partially situated in an axial cavity of one of said bushes.

The combination lock according to the invention therefore maintains the provisions of US—A—3416338 as regards the two movements in opposite senses for the lock opening and the combination change, so that its bulk is advantageously reduced and a square shape, may also be realized for possible use of the lock on beauty-cases or the like. Moreover, any spring problem is solved therein, by employing separate springs for stressing the sliding frame and the succession of bushes in their respective rest positions.

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 lcok 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 the 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 containers 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 that cover 22 operates as support base for the rotating part 16 of the movable mask 12 (Figs. 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 cylindrical 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 length of the bush. At such radial projections there are mounted on the bushes 27 respective parallel wheels 31, every one 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, every one of which is provided with a cylindrical 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 cylindrical 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 abutted 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 frame 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 corresponds 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.

Claim

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 (43) resiliently biassed in closed position, a plurality of rotating wheels (31) disposed close to each other and means able to subordinate the movement of the bolt (43) to an open position by the rotation of all the above mentioned wheels (31) to respective prefixed angular positions, said means comprising a plurality of parallel walls (37) alternated to said wheels (31) and extending transversally from a sliding frame (42) rigidly connected to said bolt (43), a pin (26) passing through aligned holes (32, 38) of said wheels (31) and of said walls (37) and a succession of bushes (27) rotatably and slidingly mounted on said pin (26) and engaged in said holes (32) of respective wheels (31) so as to be connected to them for the rotation but axially slidable with respect to them, said bushes being biassed in a rest position by at least one first spring (28), said bushes (27) and said holes (38) of said walls (37) being provided with radial complementary projections (30) and recesses (39) able to allow the mutual sliding of said bushes (27) and said walls (37) only if all the bushes (27) are disposed in a predetermined angular position as a consequence of the rotation of all the wheels (31) to said prefixed angular positions, there being further provided combination change means including control driving means (50) to cause the axial sliding of said bushes (27) in opposite sense with respect to that of the opening movement of said bolt (43), said axial sliding being of such an entity as to cause the brief angular release between said bushes (27) and the respective wheels (31) for the independent rotation of these latter in different prefixed angular positions, characterized in that said sliding frame (42) is resiliently biassed in closed position by at least one second spring (46) partially situated in a corresponding cavity (47) of an outer casing (21) and said at least one first spring (28) is partially situated in an axial cavity (29) of one of said bushes (27).

Patentanspruch

Kombinationsschloss, insbesondere für kleine tragbare Behälter, wie Taschen, Handtaschen und Schminktaschen, sowie auch für Schränke usw., mit einem nachgiebig in gesschlossener Lage ge-

haltenen Riegel (43), einer Mehrzahl von eng nebeneinander angeordneten Rädern (31) und Mitteln, die geeignet sind, die Bewegung des Riegels (43) in die geöffnete Lage von der Drehung aller genannten Räder (31) in entsprechende Vorbestimmte Winkellagen abhängig zu machen, wobei die genannten Mittel eine Mehrzahl von parallelen, abwechselnd zu den genannten Rädern (31) angeordneten Wänden (37), die quer von einem, fest mit dem genannten Riegel (43) verbundenen, verschiebbaren Rahmen (42) abstehen, einen durch zueinander ausgerichtete Löcher (32, 38) der genannten Räder (31) und der genannten Wände (37) hindurchgeführten Stift (26) und eine Aufeinanderfolge von auf dem genannten Stift (26) dreh- und verschiebbar angeordneten und in die genannten Löcher (32) von betreffenden Rädern (31) derart eingreifenden Hülsen (27) umfassen, dass sie drehfest mit ihnen verbunden, jedoch axial ihnen gegenüber verschiebbar sind, wobei die genannten Hülsen durch mindestens eine erste Feder (28) in eine Ruhelage gedrückt sind, wobei die genannten Hülsen (27) und die genannten Löcher (28) der Wände (37) mit radialen komplementären Vorsprüngen (30) und Ausnehmungen (39) versehen sind, die geeignet sind; eine gegenseitige Verschiebung der genannten Hülsen (27) und der genannten Wände (37) nur dann zuzulassen, wenn alle Hülsen (27) sich in einer vorbestimmten Winkellage, infolge der Verdrehung aller Räder (31) in die genannte vorbestimmte Winkellage befinden, wobei ferner Mittel zur Veränderung der Kombination vorgesehen sind, welche ein Steuerantriebsmittel (50) zur Herbeiführung der axialen Verschiebung der genannten Hülsen (27) in entgegengesetzten Sinn in bezug auf jenen der Oeffnungsbewegung des genannten Riegels (43) aufweisen, wobei die genannte axiale Verschiebung von einer derartigen Weite ist, dass eine kurze Freigabe in Drehrichtung zwischen den genannten Hülsen (27) und den betreffenden Rädern (31) zur unabhängigen Verdrehung der letzteren in unterschiedliche vorbestimmte Winkellagen herbeigeführt wird, dadurch gekennzeichnet, dass der verschiebbare Rahmen (42) durch mindest eine zweite Feder (46) nachgiebig in geschlossener Lage gehalten ist, welche Feder teilweise in einer entsprechendën Ausnehmung (47) eines Aussengehäuses untergebracht ist, während die mindestens eine erste Feder (28) teilweise in einer axialen Ausnehmung (29) einer der genannten Hülsen (27) untergebracht ist.

Revendication

Serrure à combinaison convenant en particulier aux conteneurs portatifs de faibles dimensions, tels que des sacoches, sacs à main et trousses de beauté, ainsi qu'à des coffrets et ainsi de suite, comprenant un pêne (43) rappelé élastiquement à une position de fermeture, plusieurs molettes rotatives (31) disposées proches les unes des autres, de même que des moyens aptes à subordonner le mouvement du pêne (43) à une position d'ouverture à la rotation de toutes les molettes (31) mentionnées à des positions angulaires respectives qui sont préfixées, ces moyens comprenant plusieurs parois parallèles (37) alternant avec les molettes (31) et s'étendant transversalement depuis un châssis coulissant (42) relié rigidement au pêne (43), un axe (26) traversant des ouvertures alignées (32, 38) des molettes (32) et des parois (37), ainsi qu'une série de coussinets (27) montés rotatifs et coulissants sur l'axe (26) et engagés dans les ouvertures (32) des molettes (31) respectives, de manière à être accouplés en rotation aux molettes mais à pouvoir coulisser axialement par rapport à celles-ci, les coussinets étant rappelés élastiquement à une position de repos par au moins un premier ressort (28), les coussinets (27) et les ouvertures (38) des parois (37) étant pourvus de protubérances (30) et d'évidements (39) radiaux complémentaires, capables d'autoriser seulement le coulissement relatif des coussinets (27) et des parois (37) si tous les coussinets (27) ont été amenés à une position angulaire prédéterminée par suite de la rotation de toutes les molettes (31) auxdites positions angulaires préfixées, la serrure comprenant en outre des moyens de changement de combinaison, comprenant un moyen de manoeuvre (50) pour produire le coulissement axial des coussinets (27) en sens inverse du mouvement d'ouverture du pêne (43), ce coulissement axial étant de nature à produire la brève libération angulaire nécessaire entre les coussinets (27) et les molettes (31) respectives pour la rotation indépendante de ces dernières à d'autres positions angulaires préfixées, caractérisée en ce que le châssis coulissant (42) est rappelé élastiquement à la position de fermeture par au moins un second ressort (46) qui est situé en partie dans une cavité (47) correspondante d'un boîtier extérieur (21) et que le premier ressort (28) est situé en partie dans une cavité axiale (29) d'un des coussinets (27).

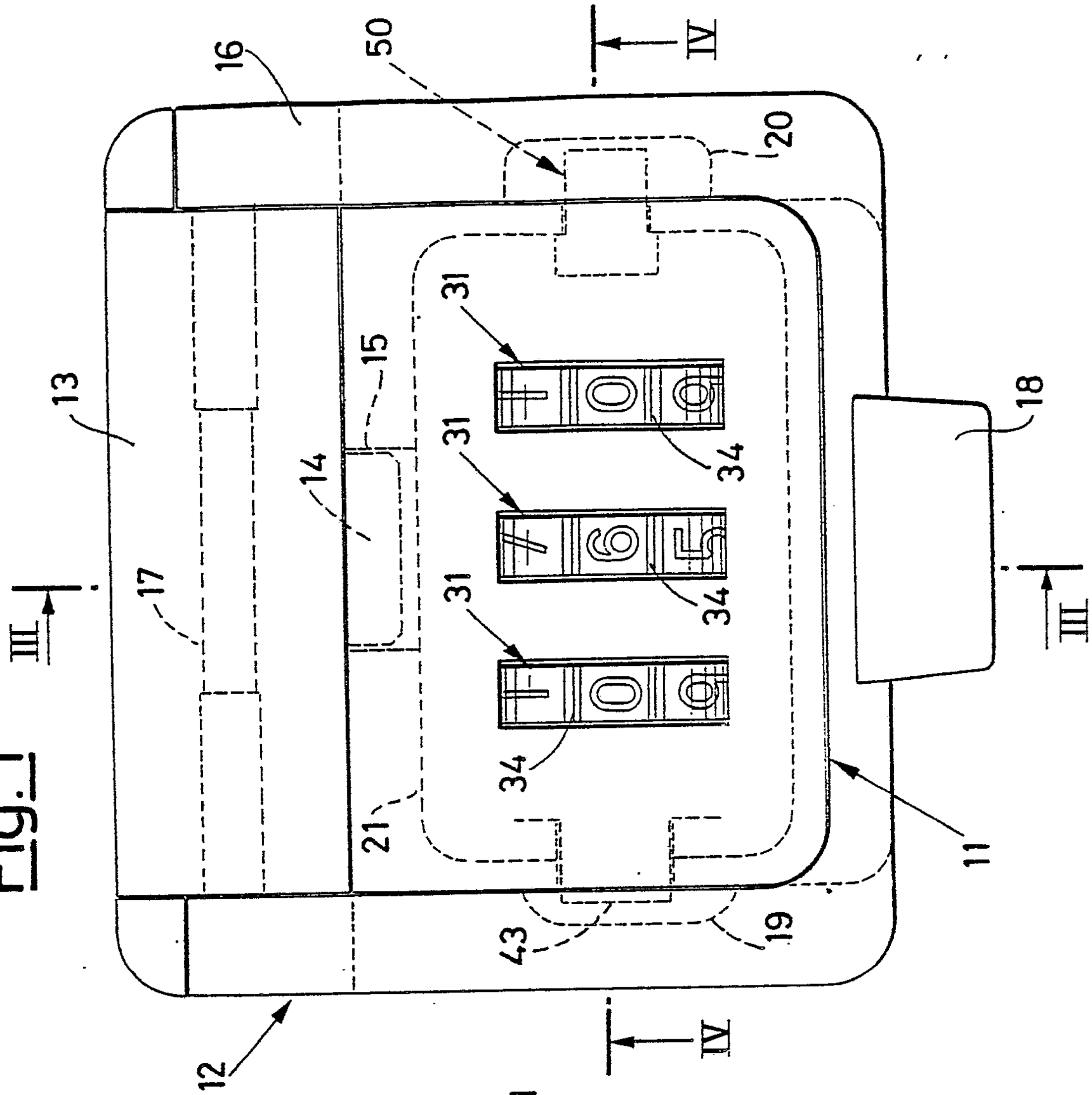

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Fig.1

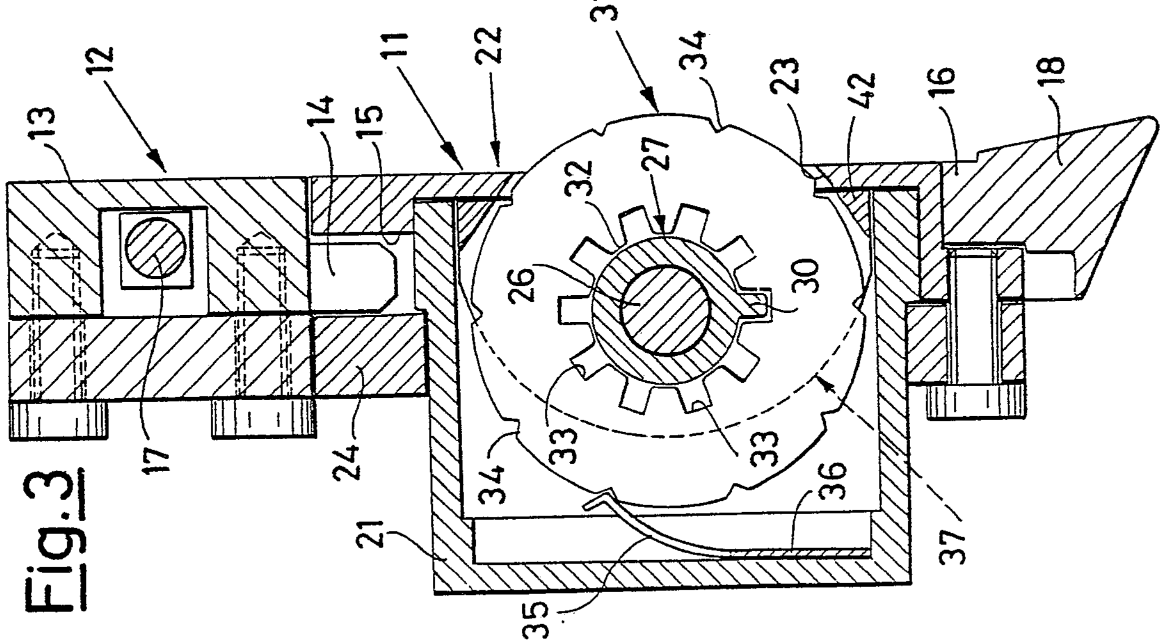

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Fig.3

Fig.2

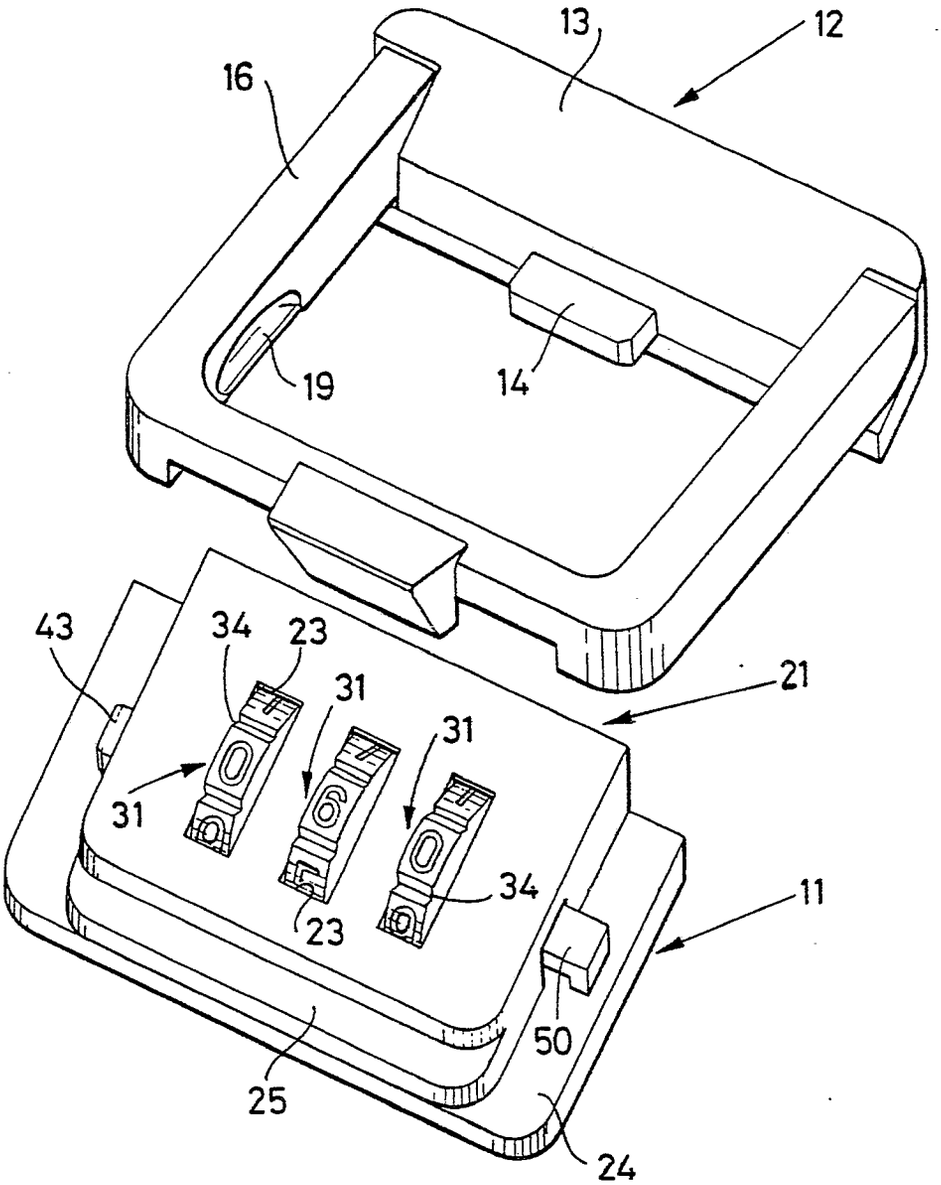

Fig.4

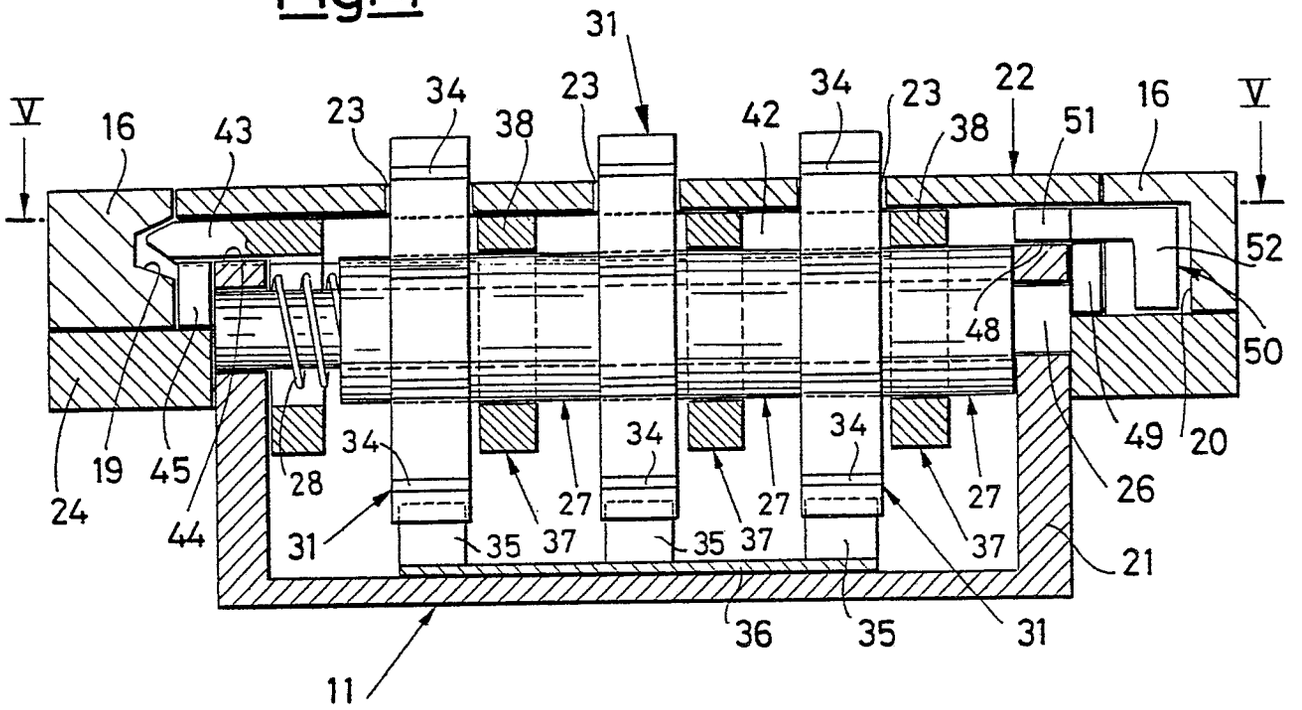
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Fig.5

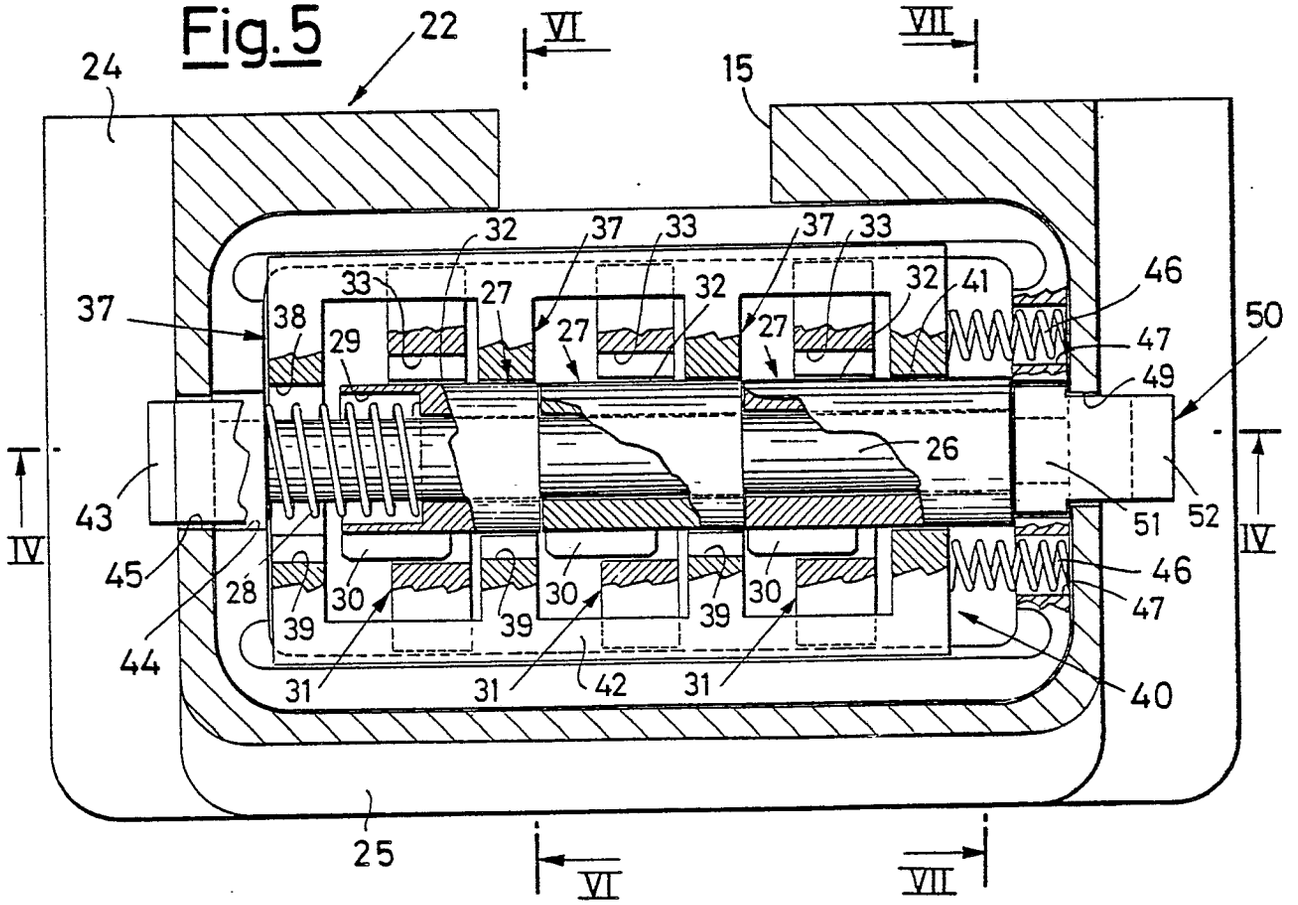
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Fig.6

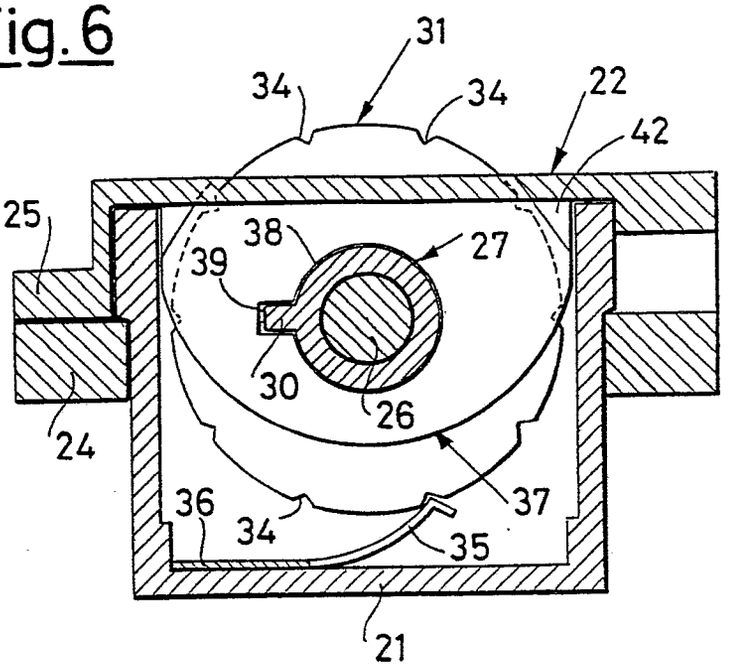
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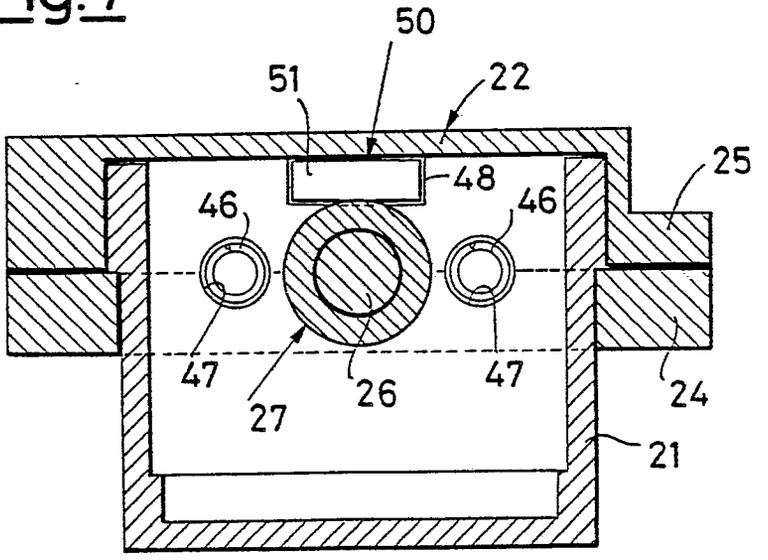
Fig.7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