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

(11) **EP 2 119 858 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
18.11.2009 Bulletin 2009/47

(51) Int Cl.:
E05B 73/00 *(2006.01)* *E05B 47/00* *(2006.01)*

(21) Application number: **08156194.6**

(22) Date of filing: **14.05.2008**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MT NL NO PL PT RO SE SI SK TR
Designated Extension States:
AL BA MK RS

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(54) **Fastening device**

(57) The invention relates to a ball lock, for use in, for instance, shoplifting detection tags, wherein the uncoupling function is spatially separated from the clamping device. As a result, a longer pin (10) can be utilized, so that thicker products can be protected and the uncoupling properties can be adjusted per type of uncoupling device. Owing to the construction of the ball lock, it has become very difficult to remove the fastening of the pin through cutting open or burning open with a flame. Through adjustment of the uncoupling part and/or through the coil spring (6) of the ball lock, the force that an uncoupling apparatus is to apply to the lock for uncoupling this can be optimized.

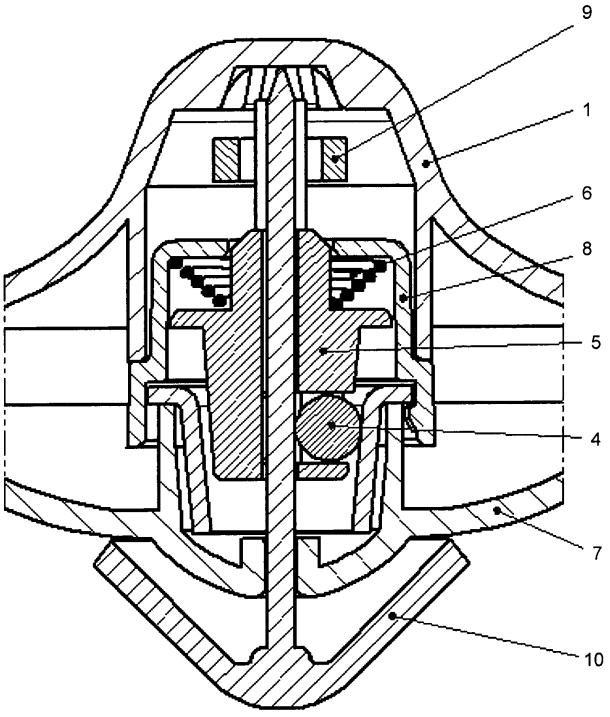

Fig. 3

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Description

[0001] The invention relates to a fastening device used in anti shoplifting tags, hereinafter also called wafers. In this fastening device, hereinafter also called ball lock, a fastening means, hereinafter also called pin, is inserted into a central opening of a housing, in which a part with a conically formed space is present, hereinafter also called lock bush. In this conically formed space, one or several balls are present which are pressed against the pin and the conically formed wall by means of a coil spring or a conical coil spring. In this manner, the pin is clamped in the ball lock by the balls. In the ball lock according to the invention, the balls are partly enclosed by one of the parts, hereinafter also called ball holder. The ball holder is manufactured from a non-magnetically attractive material. This ball holder forces the balls to remain, relative to each other, in one plane perpendicular to the pin. For removing the pin, hereinafter also called uncoupling, use is made of a powerful magnetic field of an uncoupling apparatus. Upon uncoupling, the balls are pulled loose from the conically formed space, whereby the pin can be taken from the ball lock. When the pin is pulled from the ball lock without utilizing an uncoupling apparatus, a particular force is required, hereinafter also called extraction force. The ball lock is a mechanically self-powered construction. Ball locks are known from patent application EP1091063A2 and patent NL1003781 of applicant.

[0002] With the products to be protected against shoplifting, the wafers are fastened to these products. These wafers are electronic detection plates which can be detected when they are present in the electromagnetic field of antennas that are usually positioned at entrances and exits of shopping areas to be protected. The wafer is fastened to the article to be protected by means of a pin which is inserted into the article to be protected, whereupon the pin is inserted into the ball lock of the wafer. The wafer is now protected against fraudulent removal. Upon payment of the secured article, the wafer is removed by the shop staff. Removing the wafer from a secured article is carried out with the aid of a magnetic field of an uncoupling apparatus that uncouples the balls from the pin. If a customer, intentionally or unintentionally, forgets to have the wafer removed, the wafer is detected at the shop exit by the antennas placed there. These will then produce a signal.

[0003] Upon uncoupling the conventional types of ball locks, the magnetic field of the uncoupling apparatus applies an attractive force only on the balls in the ball lock. This construction has several drawbacks:

[0004] Firstly, the maximum applicable length of the pin is limited because otherwise the distance between the balls and the magnetic field of the uncoupling apparatus becomes too great in order to apply sufficient force to the balls and to thus uncouple the ball lock. Utilization of a longer pin is desirable for securing thicker products, such as padded winter clothing.

[0005] Secondly, the lock bush must be manufactured from a non-ferrous metal because otherwise, the magnetic field of the uncoupling apparatus is redirected by the lock bush around the balls and can therefore no longer apply force to the balls in the ball lock. The magnitude of the extraction force is related to the hardness of the lock bush. In order to have the required extraction force, use should be made of an especially hard non-ferrous metal for the lock bush. From a point of view of costs, this material is less favourable than steel.

[0006] Thirdly, the clamping of the pin by the balls in the lock bush can be temporarily interrupted upon a mechanical impulse, for instance a blow on the knob of the wafer. The cause is that the force which the coil spring can apply is relatively light with respect to the mass times the acceleration of the ball holder and balls. This may result in that, directly after the mechanical impulse, the pin is released from the wafer.

[0007] Fourthly, upon heating and, hence, softening of the plastic housing of the wafer by a heat source, such as a flame, the coil spring leaves the wafer and can be removed. As a result, the clamping connection of the balls and the lock bush is terminated so that the pin can be fraudulently removed from the wafer.

[0008] Fifthly, it is possible to remove the coil spring after cutting open the housing of the wafer. As a result, the clamping connection of the balls and the lock bush is terminated, so that the pin can be fraudulently removed from the wafer.

[0009] The object of the invention is to eliminate or improve at least one of the outlined drawbacks. It is also an object of the present invention to provide alternative constructions which are simpler in manufacture and use and which can furthermore be manufactured comparatively inexpensively. Alternatively, an object of the invention is to provide the public with an at least useful choice.

[0010] This object is achieved with a ball lock for use in, for instance, shoplifting detection tags, wherein the uncoupling function of the ball lock is spatially separated from the clamping device. To that end, the invention provides a ball lock for use in, for instance, a wafer for protection against shoplifting, which ball lock is provided with a lock bush having a conical inner wall, a ball holder received in the lock bush so as to be movable in an axial direction thereof, with one or several balls, and a compression spring engaging an axial end of the ball holder, for pressing the ball holder and the at least one ball in the lock bush against the conical inner wall, wherein the ball holder is provided with an axial bore to allow a pin to be received therein and with a surface that links up perpendicularly with the axial bore to force the at least one ball to be able to move only in a plane perpendicular to the axial bore, wherein the ball holder is provided with a projecting part which extends in axial direction from the axial end of the ball holder beyond the compression spring, and wherein the ball lock is provided with an uncoupling part, engaging a free end of the projecting part, which uncoupling part is designed to be attracted by a magnetic field.

[0011] By applying the attractive force of the magnetic field no longer to the balls when uncoupling but to a part that is free from the actual clamping device, this spatial separation is achieved. As a result, a longer pin can be utilized so that thicker products can be protected and the uncoupling properties can be adjusted per type of uncoupling apparatus. Owing to the construction of the ball lock, it has become very difficult to remove the fastening of the pin through cutting open or burning with a flame.

[0012] According to an advantageous feature of the invention, the uncoupling part of the ball lock is designed as a separate element that is connected to the projecting part of the ball holder by means of a snap connection. As a result, the ball lock can not only be assembled in a simple manner, but also, different uncoupling parts can be utilized as desired. Here, it can further be advantageous when the uncoupling part is of annular design.
By adjusting, for instance, the outer diameter of the uncoupling part and/or the sizes of the spring of the ball lock, the force that an uncoupling apparatus must apply to the lock for uncoupling this can be optimized.

[0013] It is also advantageous when the ball lock according to the invention is further provided with a lock housing fitted on the lock bush. More particularly, the lock housing can be fitted on the lock bush by a snap connection. With this, the parts of the ball lock can be assembled in advance as an independent unit. The projecting part of the ball holder projects through the lock housing from the ball lock. The compression spring is completely within the lock housing and is thus better protected against means of force, such as fire or cutting tools.

[0014] The invention further provides a shoplifting detection tag, such as a wafer, to be fastened to articles in a shop, which shoplifting detection tag is provided with a fastening device in the form of a ball lock and an opening, wherein a pin can be inserted through the opening into the ball lock, with, in the ball lock, a conical space defined by a wall, with, included therein, one or several balls and a ball holder, which encloses at least partly the at least one ball and which forces the at least one ball to remain in one plane perpendicular to the pin, wherein the ball holder and the at least one ball are pressed by a spring against the wall of the conical space and the pin, so that, due to the balls clamping themselves in the conical space, the pin cannot be removed, wherein, for removing the pin a powerful magnetic field is to be presented, wherein an uncoupling part, which is designed to be attracted by a magnetic field for releasing the fastening device, is provided at a distance from the conical space and the at least one ball of the ball lock. This results in a fastening device wherein a pin can be inserted through an opening into a ball lock, having therein, in a conical space, one or more balls, completely or partly enclosed by a ball holder which forces the balls to remain in one plane perpendicular to the pin, wherein they are pressed by a spring against the wall of the conical space and the pin, so that due to the balls clamping themselves in the conical part, the pin can not be removed, wherein for removing the pin, a powerful magnetic field is to be presented, wherein the part that is attracted for releasing the fastening device, the uncoupling part, is spatially separated from the parts of the actual clamping part in the ball lock.

[0015] As the uncoupling function is separated from the clamping device, the maximum distance of the ball lock with respect to the magnet construction of the uncoupling apparatus is not limited by decreasing magnetic force, so that the distance of the actual clamping device can come to lie further from the magnet construction, whereby the length of the pin that can be inserted into the lock is no longer limited by the maximum distance between the actual clamping device and the magnet construction of the uncoupling apparatus. Here, it may be of further advantage when the ball holder is provided with a projecting part and that the uncoupling part engages a free end of the projecting part. Here, in particular, the uncoupling part can be provided, by means of a snap connection, on the projecting part of the ball holder. As it is thus possible to fit different sizes of the uncoupling part, it is possible to adjust the uncoupling behaviour of the ball lock to different types of uncoupling apparatuses.

[0016] According to a special feature, the shoplifting detection tag or wafer is provided with a first and second dish part forming an outside, wherein the ball lock is included between the first and second dish parts. Owing to the location of the ball lock in the wafer, the coil spring of the ball lock is difficulty accessible when sabotaged from the outside. Here, it is further advantageous when a top of the first dish part in the proximity of the spring of the ball lock has an outward protrusion such that the outside is at a safe distance from the spring with respect to means of force, such as fire or cutting tools. Owing to this feature, it is not possible to sabotage the ball lock / the clamping device by heating and softening the plastic dish part by means of a flame and thus removing the coil spring from the wafer. Nor is it possible to sabotage the ball lock or its clamping device by removing the coil spring after cutting open the plastic dish part.

[0017] Presently, the invention will be described in further detail, while reference will be made to the appended Figures. In the Figures:

Fig. 1 is a cross section of the known ball lock included in a wafer;
Fig. 2 is a cross section with a top plan view of a ball lock according to the invention;
Fig. 3 is a partial cross section of the ball lock according to the invention with a protective pin placed herein, and placed in a wafer; and
Fig. 4 is a partial cross section according to Fig. 3, but now in a situation where the ball lock is held near the powerful magnetic field of the uncoupling apparatus.

[0018] Fig. 1 shows the known ball lock. The outside of the wafer is provided with two plastic dish parts 1 and

7. In the wafer, the ball lock is fitted. This is provided with a round lock bush 3, made of a special hard type of brass. In this lock bush is placed the ball holder 5. This ball holder is manufactured from a material that is not attracted by a magnet. In this ball holder, there are three tempered steel balls 4. The ball holder and the balls are pressed-on in the lock bush by a coil spring 6. The ball lock is fitted in dish part 1, by a snap connection with lock bush 3.

[0019] Fig. 2 shows the construction of the ball lock according to the invention. Here, for a better understanding, corresponding, but not necessarily identical, parts are indicated with the same reference numerals. The improved ball lock according to the invention is provided with a round, steel lock bush 3. In this lock bush, the ball holder 5 is placed. This ball holder is manufactured from a material which is not attracted by a magnet. In this ball holder there are three tempered steel balls 4. The ball holder and the balls are pressed-on in the lock bush by a conical coil spring 6. This coil spring is dimensioned such that snapping of the fastening of the pin by a mechanical impulse, for instance a blow to the knob of the wafer, is not possible. On the lock bush 3, lock housing 8 is provided, this is a plastic part that is fitted on the lock bus 3 by means of a snap connection. Here, a part of the ball holder projects from the lock. On this projecting part, the uncoupling part 9 is fitted by a snap connection. This uncoupling part 9 is a ring of a material that is attracted by a magnet, such as ferrous metal. The size of the uncoupling part 9, that is fitted last on the ball lock, defines which force the magnet construction of an uncoupling apparatus applies to the lock.

[0020] Fig. 3 shows the ball lock placed in the wafer with fitted pin 10. The outside of the wafer is provided with a first plastic dish part 1 and a second plastic dish part 7. The protecting pin 10 is inserted at the underside into the opening of the wafer. Then, the balls 4 roll along the conical walls of the lock bush 3 upwards against the pressure of the conical coil spring 6. As the balls are placed in the ball holder 5, the balls are forced to remain in one plane perpendicular to the longitudinal direction of the protecting pin, independently of the position of the ball holder. When it is attempted to remove the pin 10 from the ball lock, the balls 4 clamp tight between the conical wall of the lock bush 3 and the pin 10, so that a clamping force is created that is such that the pin cannot be removed. The more tensile force is required for removing the pin, the greater the clamping force. When the top of the first dish part 1 is heated and softens through, for instance, a flame, then, owing to the location of the conical coil spring 6 in lock housing 8, the conical coil spring 6 will not penetrate the softened plastic. Here, the ball lock remains intact. In patent EP1391574A2 of Johan Skellerup, an additional "shield" is described as solution to this problem. With a tag according to the invention, the coil spring is prevented from melting through without the necessity of a shield or a metal part, as was required with a previous type of wafer of applicant. When the top of the first dish part 1 is cut open, it is not possible to remove the conical coil spring 6.

[0021] Fig. 4 shows the situation when at the top of the wafer a powerful magnetic field is provided which comes from an uncoupling apparatus 11. This magnetic field attracts only the uncoupling part 9 of the ball lock, against the spring pressure of the conical coil spring 6. As a result, the balls 4 come to lie somewhat higher in the conical portion of the lock bush 3, so that the balls are free from the conical part and the pin 10. As a result, the clamping of the pin is removed and the pin can be removed from the wafer. By adjusting the outer diameter of the uncoupling part 9, it is possible to optimize the force the magnetic field applies to the ball lock with different types of magnet constructions.

[0022] It is suggested that the design and the operation of the present invention clearly appear from the above description and the accompanying drawings. The invention is not limited to whichever embodiment described herein, and, within the ability of the skilled person, modifications are possible which are understood to fall within the scope of protection. Kinematic inversions are also understood to fall within the scope of protection of the present invention. Furthermore, also properties that are not specifically or expressly described, or are required in the construction according to the present invention can be understood without deviating from the scope of protection.

Claims

1. A ball lock, for instance for use in a wafer for protection against theft, which ball lock is provided with a lock bush having a conical inner wall, a ball holder received in the lock bush so as to be movable in the axial direction thereof, with one or more balls, and a compression spring engaging an axial end of the ball holder, for pressing the ball holder and the at least one ball in the lock bush against the conical inner wall, wherein the ball holder is provided with an axial bore to allow a pin to be received therein and with a surface that links up perpendicularly with the axial bore to force the at least one ball to be able to move only in a plane perpendicular to the axial bore, **characterized in that** the ball holder is provided with a projecting part which extends in axial direction from the axial end of the ball holder beyond the compression spring, and that the ball lock is provided with an uncoupling part, engaging a free end of the projecting part, which uncoupling part is designed to be attracted by a magnetic field.

2. A ball lock according to claim 1, **characterized in that** the uncoupling part is designed as a separate element that is connected to the projecting part of the ball holder by means of a snap connection.

3. A ball lock according to claim 1 or 2, **characterized in that** the uncoupling part is of annular design.

4. A ball lock according to claim 1, 2 or 3, **characterized in that** this is further provided with a lock housing fitted on the lock bush.

5. A ball lock according to claim 4, **characterized in that** the lock housing is fitted on the lock bush by a snap connection.

6. A wafer for protection against theft provided with a ball lock according to one of claims 1, 2, 3, 4 or 5.

7. A shoplifting detection tag, such as a wafer, to be fastened to articles in a shop, which shoplifting detection tag is provided with a fastening device in the form of a ball lock and an opening, wherein a pin can be inserted through the opening into the ball lock, with, in the ball lock, a conical space defined by a wall, with, included therein, one or more balls and a ball holder, which encloses at least partly the at least one ball and which forces the at least one ball to remain in one plane perpendicular to the pin, wherein the ball holder and the at least one ball are pressed by a spring against the wall of the conical wall and the pin, so that due to the balls clamping themselves in the conical space, the pin cannot be removed, **characterized in that** for removing the pin, a powerful magnetic field is to be presented, wherein an uncoupling part, which is designed to be attracted by a magnetic field for releasing the fastening device, is provided spatially at a distance from the conical space and the at least one ball of the ball lock.

8. A shoplifting detection tag according to claim 7, **characterized in that** the ball holder is provided with a projecting part and that the uncoupling part engages a free end of the projecting part.

9. A shoplifting detection tag according to claim 8, **characterized in that** the uncoupling part is provided on the projecting part of the ball holder by means of a snap connection.

10. A shoplifting detection tag according to claim 7, 8 or 9, **characterized in that** it is further provided with a first and second dish part forming an outside, while the ball lock is included between the first and the second dish parts.

11. A shoplifting detection tag according to claim 10, **characterized in that** a top of the first dish part has an outward protrusion in the proximity of the spring of the ball lock, such that the outside is at a safe distance from means of force, such as fire or cutting tools.

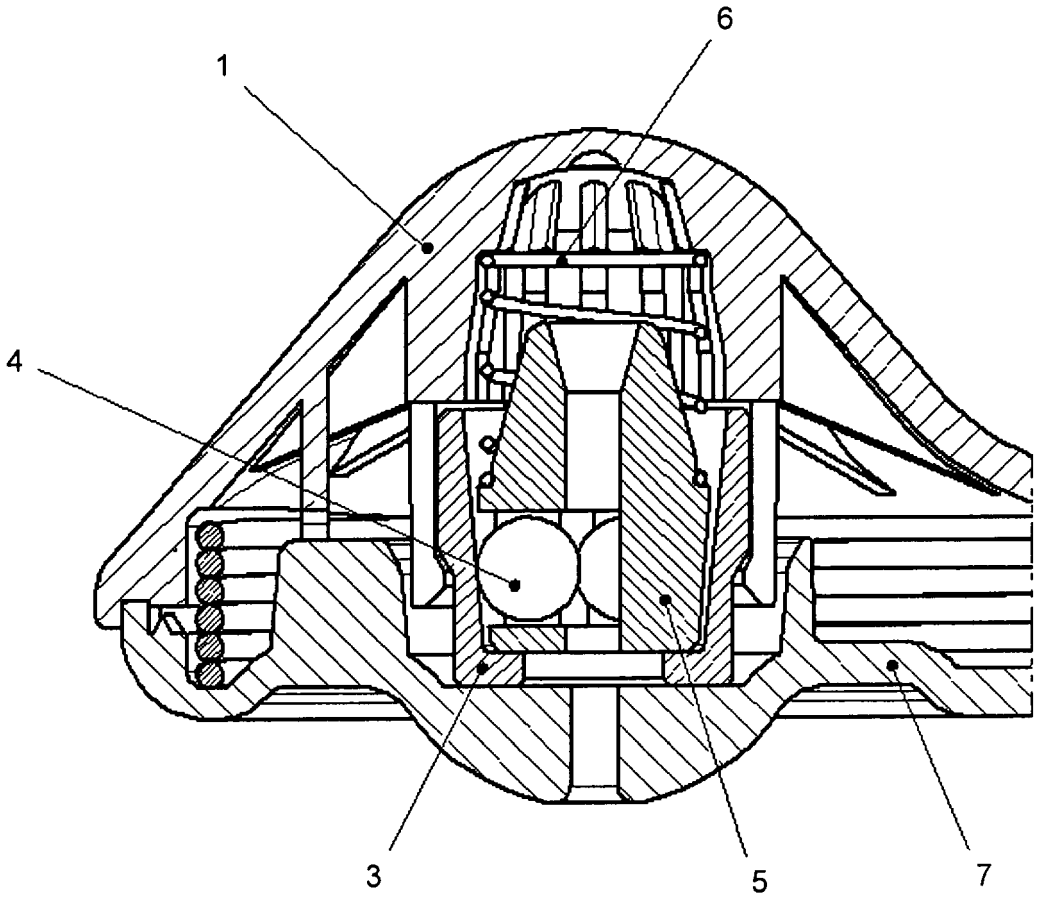
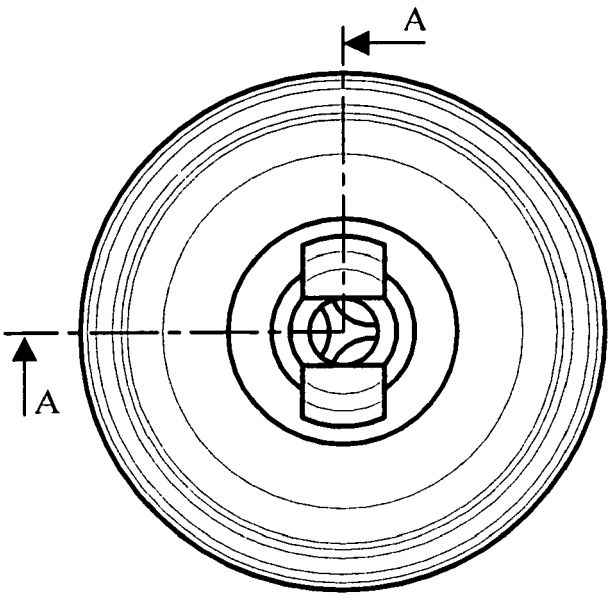


Fig. 1



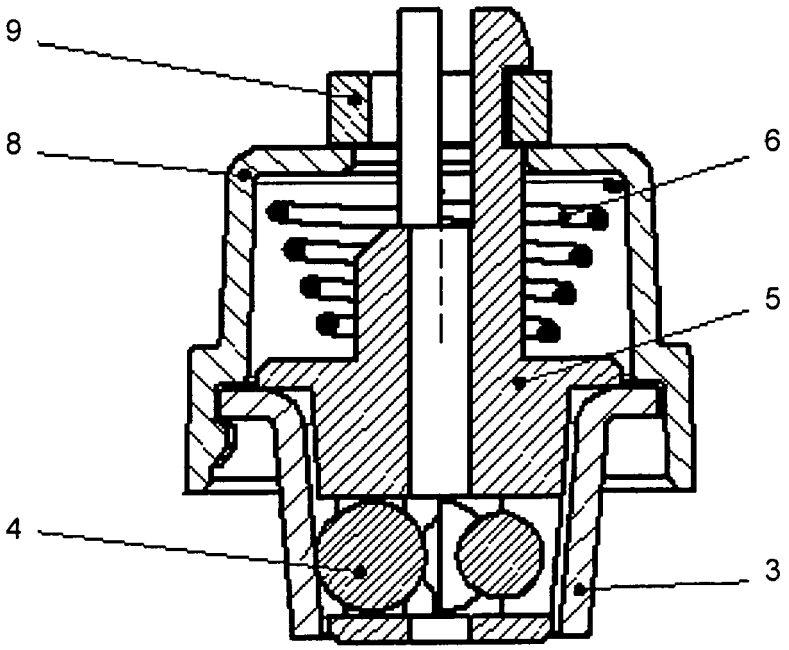


Fig. 2

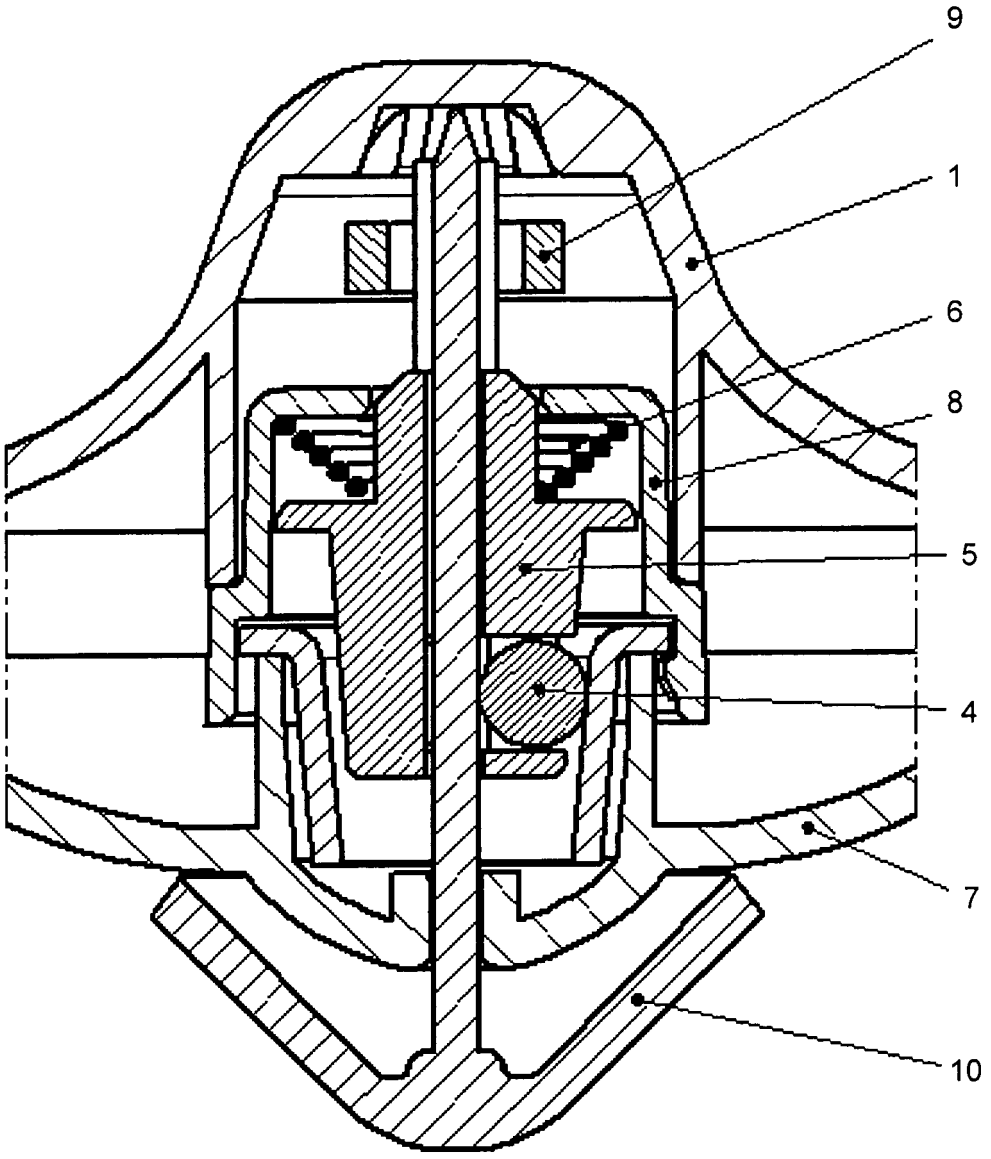


Fig. 3

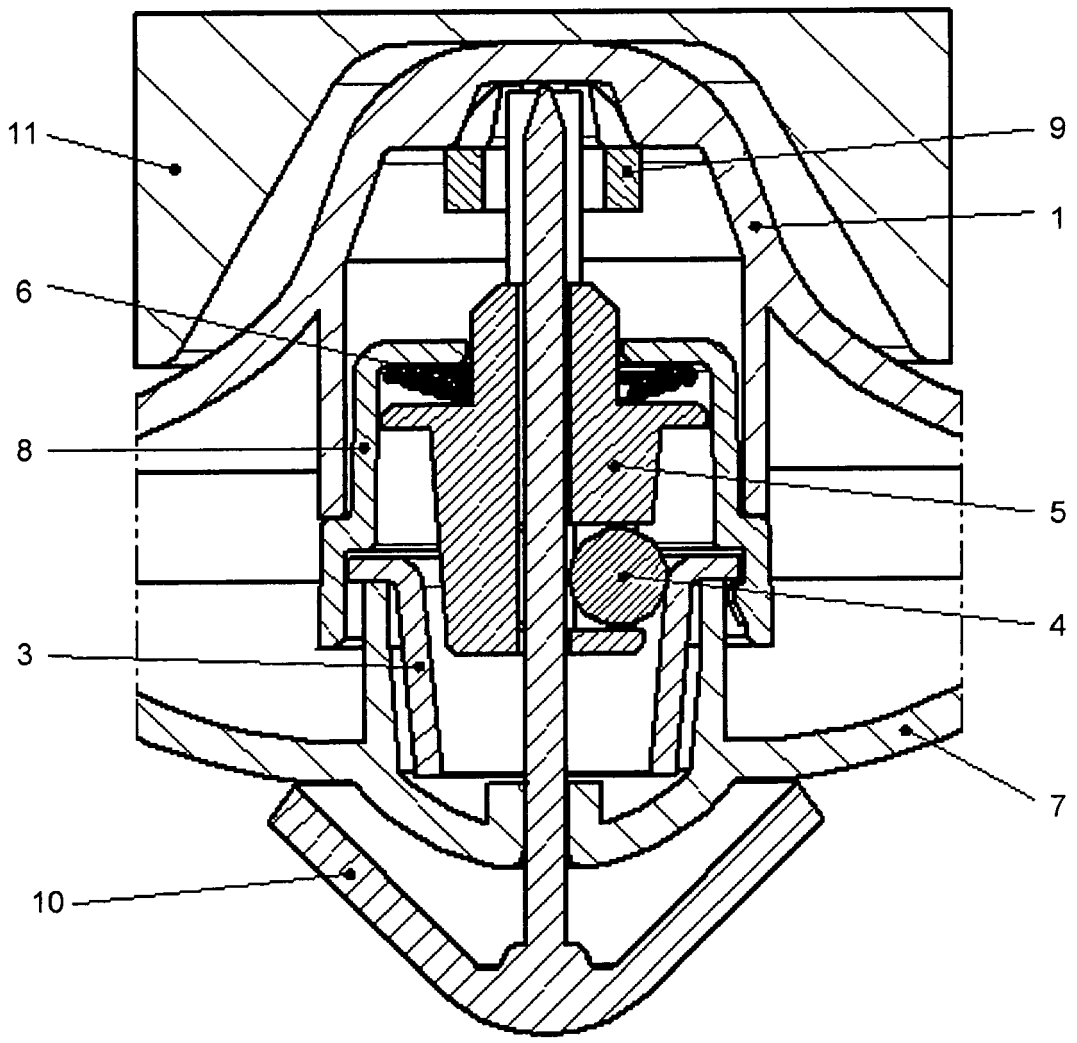


Fig. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 08 15 6194

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 89 03 818 U1 (OTT, FRANK, 6650 HOMBURG, DE; YOKOYAMA, ETSUJI, HIROSHIMA, JP) 18 May 1989 (1989-05-18)	1-4,6-8, 10,11	INV. E05B73/00
Y	* the whole document *	5,9	ADD. E05B47/00
Y	WO 2006/015499 A (STOBA AG [CH]; AICHMANN ORTWIN [AT]) 16 February 2006 (2006-02-16)	5,9	
A	* the whole document *	1,4,6-8, 10,11	
A	US 4 590 461 A (COOPER MICHAEL N [US]) 20 May 1986 (1986-05-20) * the whole document *	1,6,7	
D,A	NL 1 003 781 C2 (NEDAP NV [NL]) 20 February 1998 (1998-02-20) * the whole document *	1,6,7	

TECHNICAL FIELDS SEARCHED (IPC)

E05B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	29 October 2008	Henkes, Roeland

CATEGORY OF CITED DOCUMENTS

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EPO FORM 1503 03.82 (P04C01)

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29-10-2008

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 8903818 U1	18-05-1989	NONE	
WO 2006015499 A	16-02-2006	NONE	
US 4590461 A	20-05-1986	NONE	
NL 1003781 C2	20-02-1998	NONE	

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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Patent documents cited in the description

- EP 1091063 A2 **[0001]**
- NL 1003781 **[0001]**
- EP 1391574 A2 **[0020]**