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(54) **IMPROVED HOOK-DOOR-LOCK DEVICE ASSEMBLY FOR HOUSEHOLD APPLIANCES AND
HOUSEHOLD APPLIANCE PROVIDED WITH SUCH AN ASSEMBLY**

(57) The present invention concerns a hook-door-lock device assembly (1) for a household appliance that is provided with a door, comprising a door-lock device (2) and a hook (3), fixable to the door of a household appliance, said hook (3) being intended to engage with said door-lock device (2), characterized in that said assembly (1) comprises contrast means (32), arranged so as to keep said hook (3) in a predefined position, and in that said door-lock device (2) comprises

an engaging relief (23) shaped so that: when said door is closed, said hook (3) engages with said engaging relief (23), overcoming the resistance of said contrast means (32); and when said door is opened, said hook (3) disengages from said engaging relief (23), overcoming the resistance of said contrast means (32).

The present invention also concerns an electric household appliance.

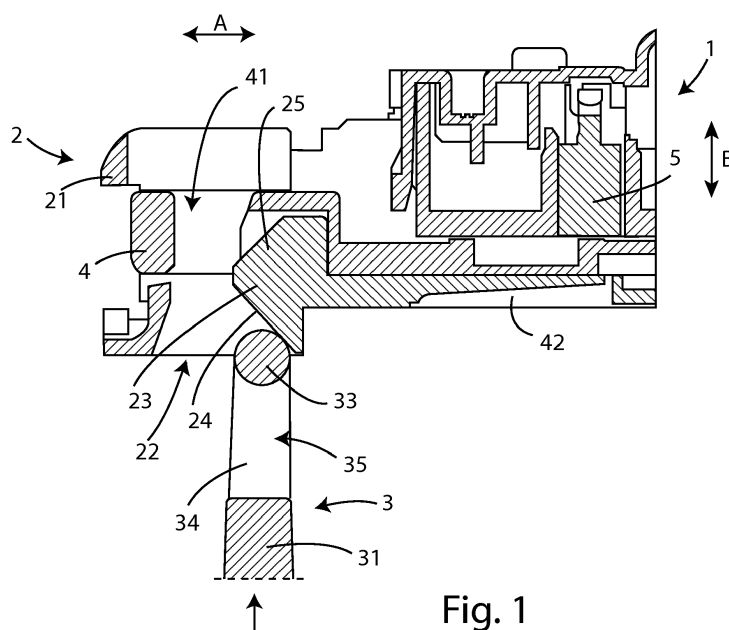


Fig. 1

Description

[0001] The present invention relates to an improved hook-door-lock device assembly for household appliances and household appliance provided with such an assembly.

[0002] More specifically, the invention concerns a door-lock device for washers designed and realized, in particular, to allow the opening of the related door by a child, who may have been introduced internally, but which can be used for any type of household appliance.

[0003] In the following, the description will be directed to a washing machine but it is clear that the same should not be considered limited to this specific use.

[0004] As is well known there are currently several types of door-lock devices for household appliances such as washing machines, dishwashers and the like.

[0005] The update of existing legislation in terms of washing machines includes, among other things, an opening minimum force, typically set at about 70N, for safety reasons, for, in case of a child introduces inside the drum of the washing machine and unintentionally closes the door, he is able to open the door itself, e.g. with the legs or pushing with his arms. These normative requirements are also often referred to as "Child Safety".

[0006] On the basis of the above, door-lock devices of the latest generation must have a configuration such that, in combination with other factors or technical elements of the washing machine or household appliances in general, such as gaskets, hinges, etc., can guarantee an opening from the inside of the household appliance door in the above-mentioned terms.

[0007] This function, also known as "Pull to Open", is currently obtained in commercially available door-lock devices by using a hook-slider system or by means of rotating hooks.

[0008] A door-lock device according to the prior art generally comprises an opening, wherein a hook can be inserted, and a slider, movable from a first position to a second locking position of the door.

[0009] When the door is closed, the hook is inserted into the door-lock through said opening. The end of the hook is generally bulky and shaped so as to push said slider from said first position to said second position, thereby holding the hook and then the door.

[0010] A technical problem of the solution described above is that the hook has the end that is introduced into the door-lock device, as said relatively bulky, in order to interfere with the slider and to slide it from an unlocking position to a locking position.

[0011] Therefore, the opening must have dimensions proportional to that of the hook, which usually are such as to allow a child to insert a finger.

[0012] Alternatively, the door-lock devices according to the prior art comprise a so called bridge hook, which is associated with an appropriate mechanical structure of the door-lock device, which is generally rather complex, for which, therefore, much maintenance is required.

[0013] In this case, the technical problem of this solution is that the door-lock has a high mechanical complication and a remarkable thickness due to the presence of a rotating hook, suitable to pass from a disengagement position to an engagement position with the door hook, wherein it is rotated with respect to the disengagement position.

[0014] It is apparent that the solutions disclosed in the prior art are expensive in terms of cost and design.

[0015] In the light of the above, it is an object of the present invention to propose a hook-door-lock device assembly having a simple technical structural configuration that allows the opening of a household appliance door from the inside by a child.

[0016] Another object of the invention is to provide a hook-door-lock device assembly that prevents any risk for a child to insert a finger inside the door hook opening obtained on the door-lock device itself.

[0017] It is therefore a specific object of the present invention a hook-door-lock device assembly for a household appliance that is provided with a door, comprising a door-lock device and a hook, fixable to the door of a household appliance, said hook being intended to engage with said door-lock device, characterized in that said assembly comprises contrast means, arranged so as to keep said hook in a predefined position, and in that said door-lock device comprises an engaging relief shaped so that: when said door is closed, said hook engages with said engaging relief, overcoming the resistance of said contrast means; and when said door is opened, said hook disengages from said engaging relief, overcoming the resistance of said contrast means.

[0018] Always according to the invention, said contrast means could comprise a contrast spring.

[0019] Still according to the invention, said contrast spring could be arranged so as to exert on said hook a counter force to a predefined rotation angle of said hook with respect to a rotation axis.

[0020] Further according to the invention, said engaging relief could have a first surface, facing and inclined towards the outside of said door-lock device, and a second surface adjacent and inclined in the opposite direction with respect to said the first surface, facing towards the inside of said door-locking device.

[0021] Advantageously according to the invention, said door-lock device could comprise a containment casing, whereon an opening is obtained, through which said hook is insertable, and said engaging relief could be arranged or obtained on one side of said opening.

[0022] Preferably according to the invention, said hook could comprise a base, said contrast means acting on said base, an engagement portion, fixed with two braces to said base, intended to interfere with said engaging relief, said engagement portion, said braces and said base identifying a slot, such that, when the door is closed, said engaging relief is inserted in said slot.

[0023] Always according to the invention, said door-lock device could comprise a slider, movable between a

rest position and an operating position, having a first window, and when said door is closed, said hook is inserted in said first window, interfering with said slider, so as to pass it from said rest position to said operating position; and when said door is opened, said hook is extracted from said first window, interfering with said slider so as to pass it from said operative position to said rest position.

[0024] Still according to the invention, said first window of said slider could be arranged in correspondence of said opening, when said slider is in said rest position.

[0025] Further according to the invention, said slider could have a second opening and said door-lock device could also comprise a locking pin movable between an unlocked position and a locked position, in which it is inserted in said second window of said slider, engaging said slider.

[0026] It is further object of the present invention an electric household appliance, such as a washing machine or the like, comprising a chassis, having a compartment delimited by an access opening to said compartment, and a door, hinged to said chassis, for closing said access opening to said compartment, characterized in that said electric household appliance comprises a hook-door-lock device assembly as defined above, wherein said door-lock device is installed on said chassis close to said opening for the access to said compartment, and said hook is installed on said door, so as to be inserted in said opening of said door-lock device when the door is closed.

[0027] The present invention will be now described, for illustrative but not limitative purposes, according to its preferred embodiments, with particular reference to the figures of the enclosed drawings, wherein:

figure 1 is a side sectional view of a hook-door-lock assembly for household appliances according to the present invention in the opening position of the door; figure 2 shows a plan view of the door-lock according to the present invention; figure 3 shows a perspective view of a hook according to the present invention; figure 4 shows a perspective view of the hook according to the present invention; figure 5 is a side view of the hook-door-lock assembly for household appliances according to the present invention while the door is closed; and figure 6 shows a lateral sectional view of the hook-door-lock assembly for household appliances according to the present invention in the closure position of the door.

[0028] In the various figures, similar parts will be indicated by the same reference numbers.

[0029] Referring to figures 1-4, it can be seen a hook-door-lock device assembly 1 according to the present invention.

[0030] In particular, the hook-door-lock device assembly 1 comprises essentially a door-lock device 2 and a

hook 3, the latter being integral with a door (not shown in the figure) of a household appliance (not shown in the figure), such as a washing machine or the like.

[0031] The household appliance comprises a chassis having a compartment delimited by an access opening to said compartment, and a door hinged to said chassis for closing said access opening to said compartment.

[0032] The door-lock device 2 can be installed on said chassis, close to said access opening to said compartment. The hook 3 is installed on said door so as to interfere, as defined below, with said door locking device 2 when the door is closed.

[0033] The door locking device 2 comprises a containment casing 21, whereon an opening 22 is formed.

[0034] Said opening 22 has on one side an engaging relief 23 having a first surface 24 facing outwardly of said containment casing 21 and inclined toward the outside of said door-lock device 2, the function thereof will be better described below; and a second surface 25 adjacent to said first surface 24, but inclined in the opposite direction and in particular facing inwardly of said containment casing 21.

[0035] Said lock-door device 2 also includes a slider 4 having a substantially planar shape, movable in the directions indicated by the double arrow A, between a rest position (as shown in figure 4) and an operating position.

[0036] The slider 4 also has a first window 41, arranged in correspondence of said opening when said slider 4 is in said rest position, and a second window 42. The operation of said first 41 and said second window 42 will be better described below.

[0037] The door-lock device 2 also includes a locking pin 5, which moves substantially perpendicular with respect to said slider 4.

[0038] Said locking pin 5 is arranged in correspondence of said second opening 42 of said slider 4 when said slider 4 is in said operating position.

[0039] Said locking pin 5 is movable in the directions indicated by the double arrow B between an unlocked position, in which it is lifted, and a locked position, in which it is lowered and inserted into said second window 42 of said slider 4, engaging with said slider 4.

[0040] In particular, said locking pin 5 is moved by means of suitable means from said unlocked position to said locked position, when the household appliance is activated.

[0041] The hook 3 is of the "bridge" type and comprises a base 31 fixed to the door of the household appliance and rotatable with respect to an axis R, as shown by the arrow C, and an engagement portion 33, fixed with two braces 34 to said base 31.

[0042] Said engagement portion 33, said braces 34 and said base 31 individually define a slot 35, which in this case is closed.

[0043] A contrast spring 32 is associated to this hook, acting on the base 31 and fixed thereon.

[0044] The hook 3 is arranged so that when the door is closed, the engagement portion 33 interferes with said

first surface 24 of said engaging relief 23.

[0045] The operation of the hook-door-lock assembly 1 for household appliances described above is carried out as follows.

[0046] When the door is open, the hook 3 is not inserted in said opening 22, the slider 4 is in said rest position and said second window 42 is not arranged in correspondence of said locking pin 5, so that said pin 5 is not capable of passing from the unlocked to the locked position, due to the size of the slider 4.

[0047] Referring to figure 5, when the door of the household appliance is closed, the engagement portion 33 of said hook 3 interferes with said first surface 24 of said engaging relief 23. The force whereby the door is closed overcomes the contrasting force of the contrast spring 32, so that the hook 3 rotates with respect to the rotation axis R.

[0048] Subsequently, said engagement portion 33 slides over the whole first surface 24. At the end of said first surface 23, said engagement portion 33 or said braces 34 of said hook 3 slide on said second surface 25, entering in said opening 41 and interfering with said slider 4. In this way, said engaging relief 23 is inserted into said slot 35 of said hook 3.

[0049] Due to the action of the contrast spring 32, said engagement portion 33 (or said braces 34) of said hook 3 pushes said slider 4 by moving it from said rest position to said operating position, in which, as said, said second window 42 arranges in correspondence of said locking pin 5.

[0050] In this way, as it can be seen in figure 9, the hook 9, and in particular the engagement portion 33, remains locked between said second surface 24, which partially defines said opening 22, and the edge of said first window 41.

[0051] In such a configuration, if a child by mistake enters for example within the drum of a washing machine, exerting a predetermined force on the door from the inside would cause the engaging portion 33 of said hook 3 to slide on said second surface 25 of said engaging relief 23 of said containment casing 21, rotating said hook 3 of a predetermined angle with respect to the position the door normally assumes when it is open, overcoming the force of the contrast spring 32, until said engaging relief 23 disengages from said slot 35 of said hook 3.

[0052] If the force exerted for opening the door exceeds a predetermined threshold, the engagement portion 33 of said hook 3 is able to run the whole second surface 25 of said engaging relief 23, by passing said slider 4 from said operating position to said rest position, to reach said first surface 24 of said engaging relief 23 so that the contrast spring eases the sliding of said engagement portion 33 of said hook 3, by facilitating the ejection of the hook 3 from said opening 22, as well as the opening of the door, thereby allowing the child to go out.

[0053] If, on the other hand, when the door is closed, the household appliance is operated, then the locking pin

5 passes from said unlocked position to said locked position, engaging and inserting in said second window 42 and blocking the door closed.

[0054] In addition to the above, the shape of the hook 3 according to the present invention allows the realization of opening 22 small enough to prevent the insertion of the fingers of a child therein.

[0055] An advantage of the hook-door-lock assembly is that of allowing a simplified design of the door-lock device, providing at the same time a high level of safety.

[0056] The present invention has been described for illustrative but not limitative purposes, according to its preferred embodiments, but it is to be understood that modifications and/or changes can be introduced by those skilled in the art without departing from the relevant scope as defined in the enclosed claims.

Claims

1. Hook-door-lock device assembly (1) for a household appliance that is provided with a door, comprising a door-lock device (2) and a hook (3), fixable to the door of a household appliance, said hook (3) being intended to engage with said door-lock device (2),

characterized

in that said assembly (1) comprises contrast means (32), arranged so as to keep said hook (3) in a predefined position, and

in that said door-lock device (2) comprises an engaging relief (23) shaped so that:

- when said door is closed, said hook (3) engages with said engaging relief (23), overcoming the resistance of said contrast means (32); and
- when said door is opened, said hook (3) disengages from said engaging relief (23), overcoming the resistance of said contrast means (32).

2. Assembly (1) according to claim 1, **characterized in that** said contrast means comprises a contrast spring (32).

3. Assembly (1) according to claim 2, **characterized in that** said contrast spring (32) is arranged so as to exert on said hook (3) a counter force to a predefined rotation angle of said hook (3) with respect to a rotation axis (R).

4. Assembly (1) according to any one of the preceding claims, **characterized in that** said engaging relief (23) has a first surface (24), facing and inclined towards the outside of said door-lock device (2), and a second surface (25) adjacent and inclined in the opposite direction with respect to said the first surface (24), facing towards

the inside of said door-locking device (2).

5. Assembly (1) according to any one of the preceding claims, **characterized**
in that said door-lock device (2) comprises a containment casing (21), whereon an opening (22) is obtained, through which said hook (3) is insertable, and
in that said engaging relief (23) is arranged or obtained on one side of said opening (22). 5 10

6. Assembly (1) according to any one of the preceding claims, **characterized in that** said hook (3) comprises a base (31), said contrast means (32) acting on said base (31), an engagement portion (33), fixed with two braces (34) to said base (31), intended to interfere with said engaging relief (23), said engagement portion (33), said braces (34) and said base (31) identifying a slot (35), such that, when the door is closed, said engaging relief (23) is inserted in said slot (35). 15 20

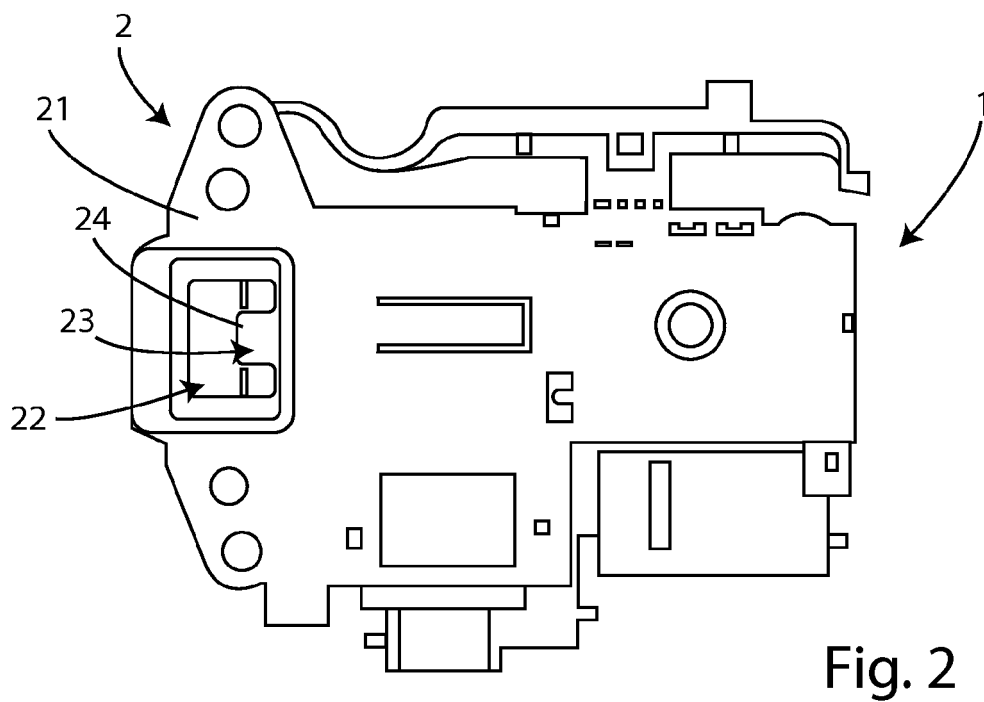
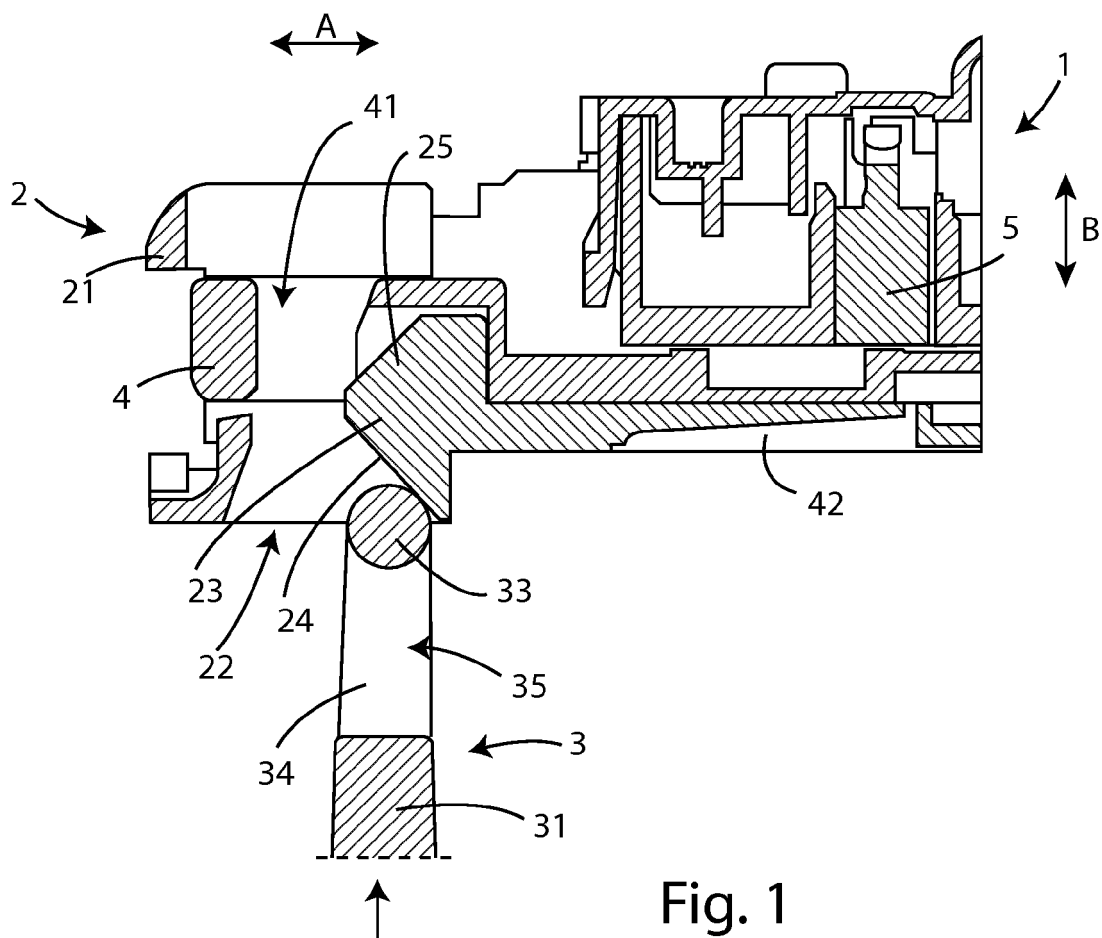
7. Assembly (1) according to any one of the preceding claims, **characterized**
in that said door-lock device (2) comprises a slider (4), movable between a rest position and an operating position, having a first window (41), and
in that when said door is closed, said hook (3) is inserted in said first window (41), interfering with said slider (4), so as to pass it from said rest position to said operating position; and when said door is opened, said hook (3) is extracted from said first window (41), interfering with said slider (4) so as to pass it from said operative position to said rest position. 25 30 35

8. Assembly (1) according to claim 7, when dependent on claim 5, **characterized in that** said first window (41) of said slider (4) is arranged in correspondence of said opening (22), when said slider (4) is in said rest position. 40

9. Assembly (1) according to any one of claims 7 or 8, **characterized**
in that said slider (4) has a second opening (42) and
in that said door-lock device (2) also comprises a locking pin (5) movable between an unlocked position and a locked position, in which it is inserted in said second window (42) of said slider (4), engaging said slider (4). 45 50

10. Electric household appliance, such as a washing machine or the like, comprising
a chassis, having a compartment delimited by an access opening to said compartment, and
a door, hinged to said chassis, for closing said access opening to said compartment, 55
characterized in that said electric household appliance comprises a hook-door-lock device assembly

(1) according to any one of claims 1-9, wherein said door-lock device (2) is installed on said chassis close to said opening for the access to said compartment, and said hook (3) is installed on said door, so as to be inserted in said opening (22) of said door-lock device (2) when the door is closed.



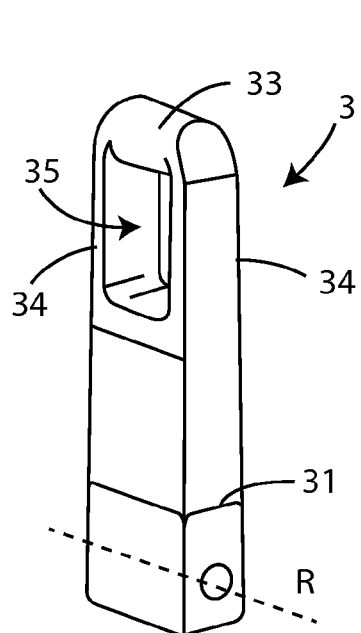


Fig. 3

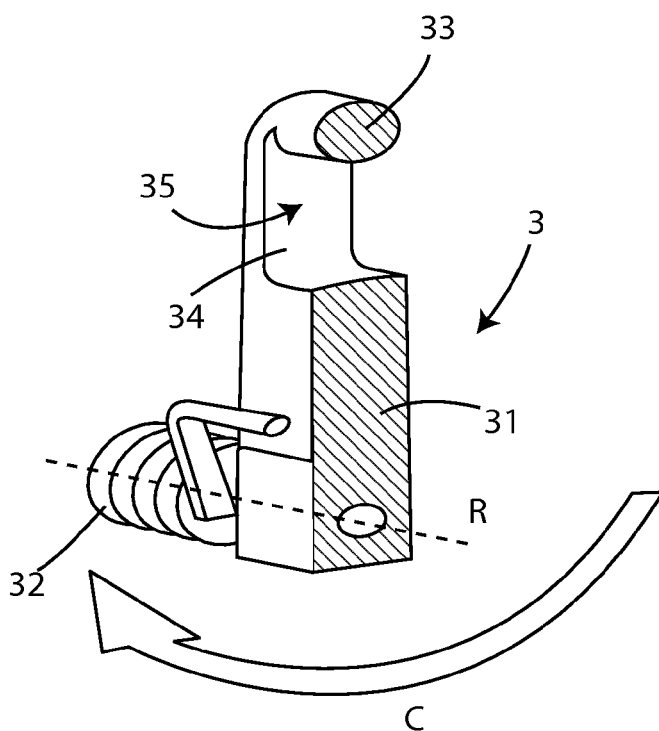


Fig. 4

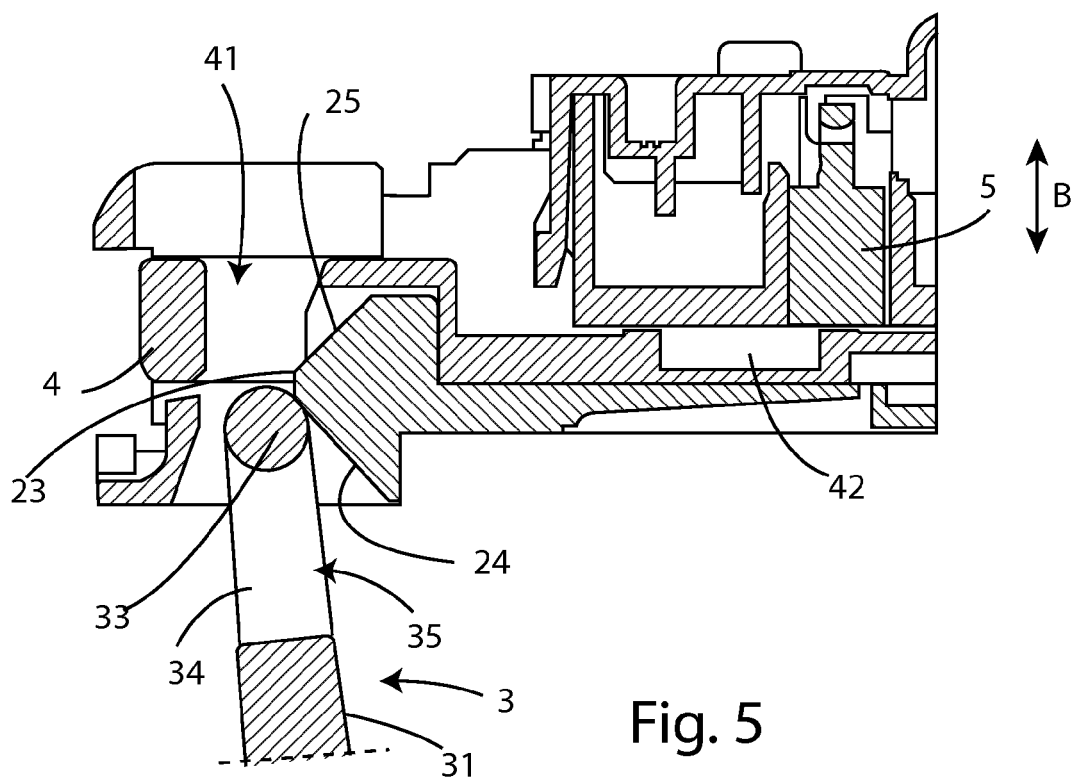


Fig. 5

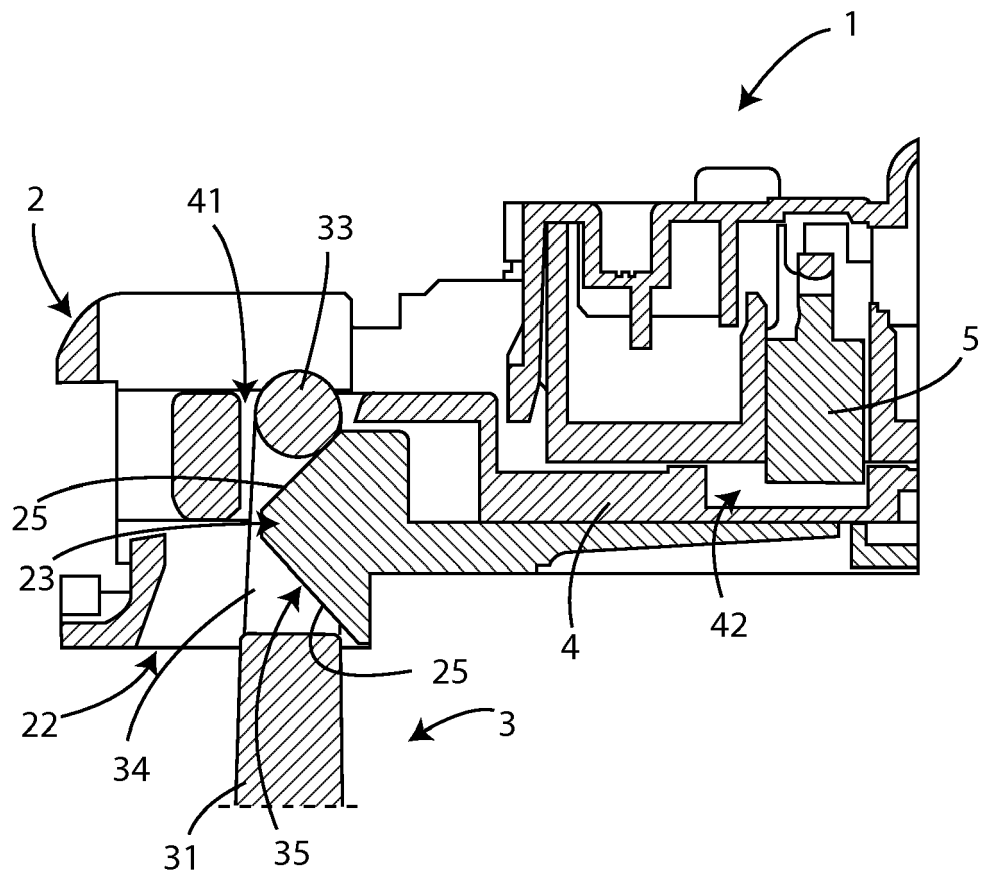


Fig. 6



EUROPEAN SEARCH REPORT

Application Number
EP 17 17 8335

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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	EP 2 154 287 A1 (ELETTRONICA ROLD SRL [IT]) 17 February 2010 (2010-02-17) * the whole document *	1-10	INV. D06F37/42 A47L15/42
A	WO 01/81696 A1 (BITRON SPA [IT]; PROMUTICO FABRIZIO [IT]) 1 November 2001 (2001-11-01) * page 3, paragraph 3 - paragraph 4; figure 1 *	6	
			TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 27 November 2017	Examiner Jeziński, Krzysztof
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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27-11-2017

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