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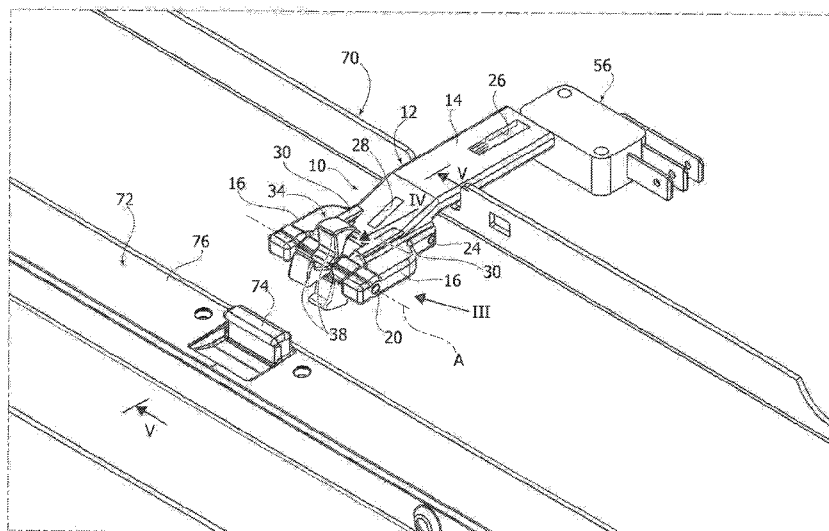
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(54) Title: DOOR-LOCK DEVICE FOR HOUSEHOLD APPLIANCES, IN PARTICULAR FOR DISHWASHERS

FIG. 2



(57) Abstract: Door-lock device for appliances, in particular for dishwashers, comprising: - a support (12), - a lock wheel (34) rotationally carried by said support (12) around an axis of rotation (A), wherein the lock wheel (34) comprises a hub (36) and a plurality of locking arms (38) radially protruding from said hub (36), wherein said hub (36) comprises a plurality of retention surfaces (46), and - at least one retention element (48) elastically pressed into contact with said hub (36) to hold the lock wheel (34) in a plurality of locking positions.



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SPECIFICATION

DOOR-LOCK DEVICE FOR HOUSEHOLD APPLIANCES, IN PARTICULAR FOR
DISHWASHERS5 Field of the invention

This invention concerns a door-lock device for appliances, in particular for dishwashers.

Description of the related technique

EP-A-2643535 of the same Applicant describes a door-lock
10 device for appliances, in particular for dishwashers, comprising a support frame, a lock element rotationally carried by the support frame around an axis which is transversally movable with respect to the support frame. The lock element cooperates with elastic means that make the lock element rotate between a first
15 set position wherein the lock element engages a door strike and a second set position wherein the lock element does not engage the door strike.

The door-lock device known from EP-A-2643535 is subject to certain inconveniences, among which:

- 20 - a floating mechanism is necessary to rearrange the lock element after the opening of the door;
- the lock element is held in a set manner in the open position and in the closed position by means of helical springs under traction which exhibit lesser characteristics as regards
25 duration and reliability,
- the door-lock device comprises a high number of components and it is hardly compact.

Purpose and synthesis of the invention

The aim of this invention is that of supplying a door-lock
30 device for appliances that overcomes the inconveniences of the prior art.

According to this invention, this purpose is achieved by a door-lock device having the characteristics forming the object of

claim 1.

As regards the invention, the claims are an integral part of the teaching provided.

Brief description of the drawings

5 This invention will be described in detail with reference to the annexed drawings, data that are provided merely as an example and without limitation, wherein:

- Figure 1 is an exploded perspective view of a door-lock device according to this invention,

10 - Figure 2 is a perspective view illustrating the door-lock device of Figure 1 mounted on an appliance,

- Figure 3 is a partially sectioned perspective view of the part indicated by the arrow III in Figure 2,

15 - Figure 4 is a perspective view of the part indicated by the arrow IV in Figure 2, and

- Figures 5 and 6 are axial sections along the V-V line of Figure 2 illustrating the closing phase of the door.

Detailed description

20 With reference to Figure 1, the number 10 indicates a door-lock device for appliances, in particular for dishwashers.

The door-lock device 10 comprises a support 12 which can be made up of injection molded plastic material. The support 12 can comprise a central part 14 and two support arms 16 extending from the central part 14 according to a general forked configuration.
25 The two support arms 16 carry a first pivot 18 which defines an axis of rotation A which is fixed with respect to the support 12. The pivot 18 can be inserted through the respective holes 20 of the support arms 16 aligned in relation to each other along the axis A, and which retain the opposite ends of the first pivot 18.

30 The support 12 can carry a second pivot 22 which is parallel to the first pivot 18 and inserted in holes 24 of the central part 14.

The central part 14 of the support 12 can have a first

guidance groove 26 and a second guidance groove 28 which are orthogonally oriented with respect to the axis of rotation A.

The support 12 can comprise two guidance portions 30 having their respective seats 32 orthogonally oriented to the axis of rotation A. The guidance portions 30 can be located adjacent to the respective support arms 16 and on the inside with respect to the support arms 16. The central part 14, the support arms 16 and the guidance portions 30 of the support 12 can be formed in one sole piece, for example, of injection molded plastic material.

The door-lock device 10 comprises a lock wheel 34 rotationally carried by the support 12 around the axis A. The lock wheel 34 comprises a hub 36 and a plurality of locking arms 38 radially protruding from the hub 36. The hub 36 has a hole 40 through which the first pivot 18 extends. The hub 36 and the locking arms 38 can be formed in one sole piece, for example, of injection molded plastic material or of zinc alloy (for example, zamak). The locking arms 38 can be equidistantly arranged from one another, at an angle. In one or more embodiments, four locking arms 38, equidistantly arranged from one another at an angle of 90°, can be foreseen.

With reference to figures 3 and 4, each locking arm 38 can have a radial stop surface 42 and a head having a circumferential protrusion 44.

The hub 36 can have two elongated sections in the direction of the axis A, located on opposite sides with respect to the locking arms 38. Each section of the hub 36 has an external cam surface, with a plurality of retention surfaces 46 which are identical to one another and spaced at an angle to one another around the axis A. The number of retention surfaces 46 can be equal to the number of the locking arms 38.

The lock wheel 34 can be rotated around the axis A, allowing for an angular extension greater than 360°. The lock device 10 comprises at least one retention element to hold the lock wheel

34 in a locking position. With reference to Figure 1, in the illustrated embodiment, the door-lock device 10 comprises two retention elements 48 which cooperate with respective sections of the hub 36. The retention elements 48 are housed within their
5 respective seats 32 of the guidance portions 30 of the support 12 and are movable with reference to the support 12 in a direction that is orthogonal with respect to the axis of rotation A. The retention elements 48 cooperate with respective helical springs 50, under compression, which press the retention elements 48
10 against the respective sections of the hub 36. The retention elements 48 have head surfaces 52 which can have a form which is complementary to that of the retention surfaces 46 of the hub 36. As illustrated in Figure 4, each retention element 48 is housed in a respective seat 32 of the respective guidance portion 30 in
15 a sliding manner along a direction that is orthogonal to the axis of rotation A. The head surface 52 of each retention element 48 is pressed into contact with the respective section of the hub 36. Each helical spring 50, under compression, is housed in a respective seat 32 and is arranged between a rear wall of the
20 seat 32 and an inside wall of the retention element 48. The helical springs 50 elastically press the retention elements 48 in contact with one of the retention surfaces 46 of the hub 36. The elastic force of the springs 50 retains the lock wheel 34 in a set position. In order to make the lock wheel 34 rotate around
25 the axis A, it is necessary to apply a torque to the wheel that is sufficient to make the retention elements 48 retract into their respective seats 32 against the force of the springs 50. The shape of the retention surfaces 46 can be asymmetrical in such a way that the necessary torque to make the lock wheel 34
30 rotate in an unlock direction (clockwise direction in Figures 3 and 4) is greater than the torque necessary to make the lock wheel 34 rotate in a lock direction (counter-clockwise direction in Figures 3 and 4).

With reference to Figures 1 and 3, the door-lock device 10 can comprise a door detection indicator 54 which cooperates with a door detection switch 56. The door detection indicator 54 is carried by the support 12 in a movable manner along a direction B which is orthogonal with respect to the axis of rotation A. The door detection indicator 54 can have a protrusion 56 which engages the first guidance groove 26 of the central part 14 and an edge 58 which engages the second guidance groove 28 of the central part 14. The door detection indicator 54 has a eyelet 60 through which the second pivot 22 of the support 12 is inserted, in such a way to define two end positions of the door detection indicator 54 with respect to the support 12. The door detection indicator 54 has a first end 62 which cooperates with the appliance door and a second end 64 which cooperates with a button 66 of the door detection switch 56. The door detection indicator 54 cooperates with a helical spring 68 which tends to elastically push the door detection indicator 54 towards the appliance door.

Figure 2 schematically shows the door-lock device 10 fixed to an upper cross member 70 of a dishwasher basin. The support 12 of the door-lock device 10 can be fixed to the dishwasher basin by means of a snap engagement or one with fastening screws. The means to fix the support 12 to the dishwasher basin are not shown. In Figure 2 the support of the door detection switch 56 is also not shown. In Figure 2 the door detection switch 56 is shown oriented transversally, in such a way that the door detection indicator 54 directly operates the button 66 of the switch 56. Alternatively, the door detection switch 56 could be oriented parallel to the direction of movement of the door detection indicator 54 and, in this case, the button 56 could be operated by means of a cam. In dishwashers provided with an automatic door-opening device, the support 12 of the door-lock device 10 could be fixed to the movable element of the automatic door-opening device.

In Figure 2, the number 72 indicates a dishwasher door that is articulated around a lower horizontal axis. The door 72 comprises a strike 74 protruding from an upper edge 76 of the door 72.

5 With reference to Figure 5, as the door 72 closes, the strike 74 comes into contact with the circumferential protrusion 44 of one of the locking arms 38 of the lock wheel 34. The movement of the strike 74 in the closing direction, indicated by the arrow C in Figure 5, provokes the rotation of the lock wheel
10 34 around the axis A in the direction indicated by the arrow D.

Figure 6 shows the door 72 in the closed position. In this position, with respect to the position of Figure 5, the lock wheel 34 is rotated by an angle equal to the angular pitch between the locking arms 38. The radial wall 42 of one of the
15 locking arms 38 blocks the strike 74 in the closed-door position. The strike 74 in the closed-door position comes into contact with the door detection indicator 54 and pushes it towards a closed-door position in which the indicator 54 pushes the button 66 of the door detection switch 56. In this state, the door detection
20 switch 56 sends a signal which indicates that the door 72 is closed and locked.

In the configuration of Figure 6, the door 72 opens in the direction indicated by the arrow E and provokes a rotation of the lock wheel 34 in the direction indicated by the arrow F.

25 The shape of the heads of the locking arms 38 is such that the force required to close the door 72 is less than the force required to open it. This because, during the closing (Figure 5), the strike 74 engages a locking arm 38 at a distance H1 from the axis of rotation, which is greater than the distance of
30 engagement H2 in the opening phase (Figure 6). Moreover, the retention surfaces 46 of the hub 36 can be asymmetrical in such a way to require a lesser torque for the rotation of the lock wheel 34 in the closing direction and a greater torque of the lock

wheel 34 in the opening direction.

The opening and closing force can vary depending on the application, using springs 50 having different stiffness.

The door-lock device according to this invention can present
5 one or more of the following advantageous elements:

- the device has a more compact design than that of other devices that are currently on the market;

- the device does not require a bistable floating mechanism given that the lock wheel 34 always has a locking arm in the
10 engagement position;

- the device uses springs under compression that have a greater lifespan and reliability than the traction springs;

- the device has a lower number of components than that of other devices that are currently on the market.

15 Naturally, notwithstanding the basic principles, it is possible that there are variations, including considerable ones, in the construction particulars and the embodiments, when compared to that which is described and illustrated, without however straying from the scope of protection. Said scope of
20 protection is defined in the claims below.

CLAIMS

1. Door-lock device for appliances, in particular for dishwashers, comprising:

- 5 - a support (12),
 - a lock wheel (34) rotationally carried by said support (12) around an axis of rotation (A), in which the lock wheel (34) comprises a hub (36) and a plurality of locking arms (38) radially protruding from said hub (36), wherein said hub (36)
10 comprises a plurality of retention surfaces (46), and
 - at least one retention element (48) elastically pressed into contact with said hub (36) to hold the lock wheel (34) in a plurality of locking positions.

2. Device according to claim 1, in which said support (12)
15 comprises two support arms (16) carrying a first pivot (18) defining said axis of rotation (A).

3. Device according to claim 1, comprising two retention elements (48) which act upon respective hub sections which protrude laterally from parts that are opposite to said locking
20 arms (38).

4. Device according to claim 3, wherein said retention elements (48) are housed within their respective seats (32) of said support (12) and are movable in a direction that is orthogonal with respect to said axis of rotation (A).

25 5. Device according to claim 4, wherein said retention elements (48) are elastically pushed towards said retention surfaces (46) of the hub (36) by means of respective helical springs (50), under compression.

6. Device according to claim 1, comprising a door detection
30 indicator (54) carried by the support (12) and movable in a direction that is orthogonal with respect to said axis of rotation (A).

7. Device according to claim 6, wherein said door detection

indicator (54) has a eyelet (60) engaged by a second pivot (22) carried by the support (12) and which defines two end positions of the door detection indicator (54) with respect to the support (12).

5 8. Device according to claim 6, wherein the door detection indicator (54) has a first end (62) which cooperates with a strike (76) of the door (72) and a second end (64) which cooperates with a button (66) of a door detection switch (56).

10 9. Device according to claim 6, wherein the door detection indicator (54) cooperates with a spring (68) arranged to push the door detection indicator (54) towards a strike (76) of the door (72).

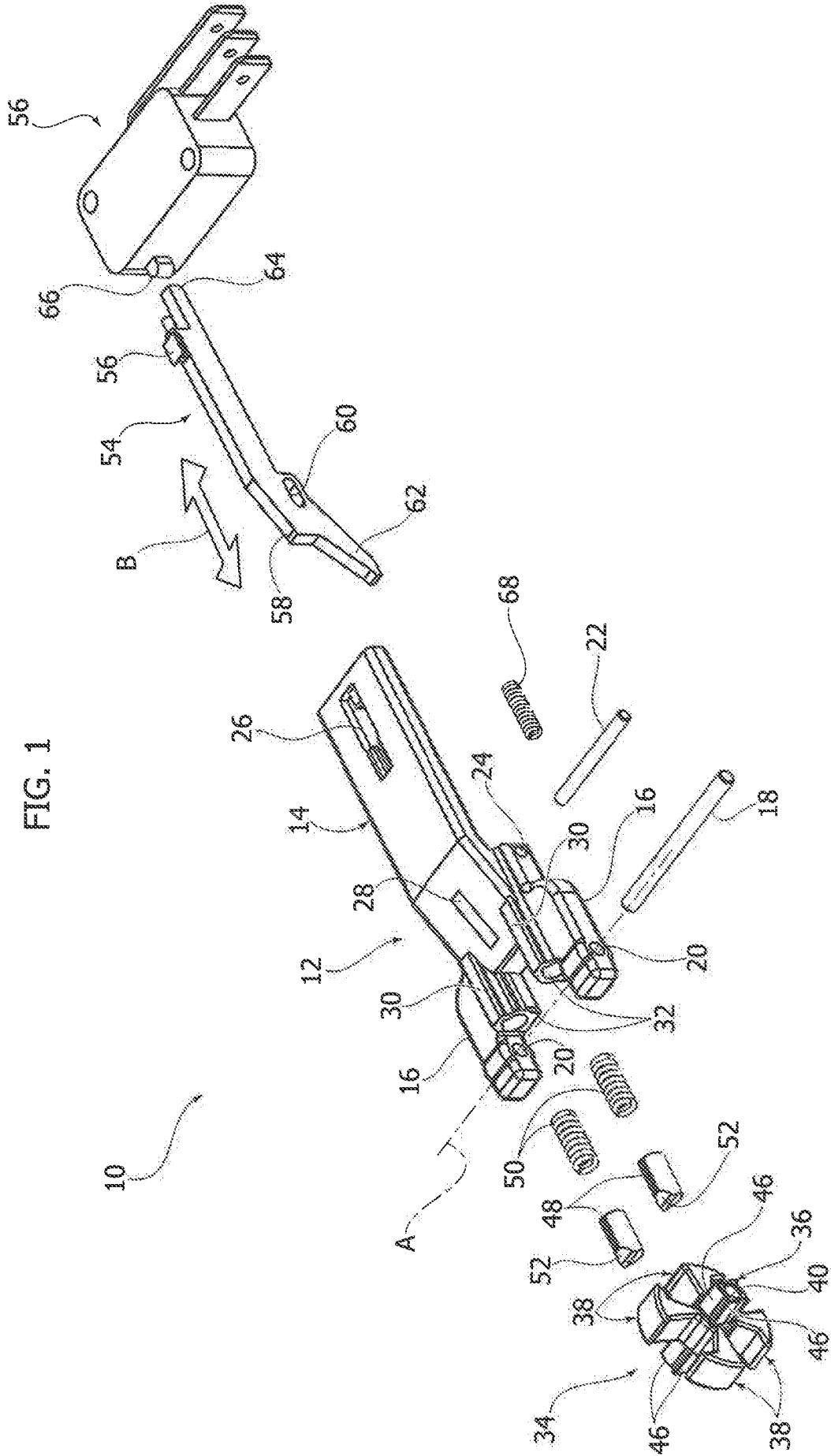


FIG. 1

FIG. 2

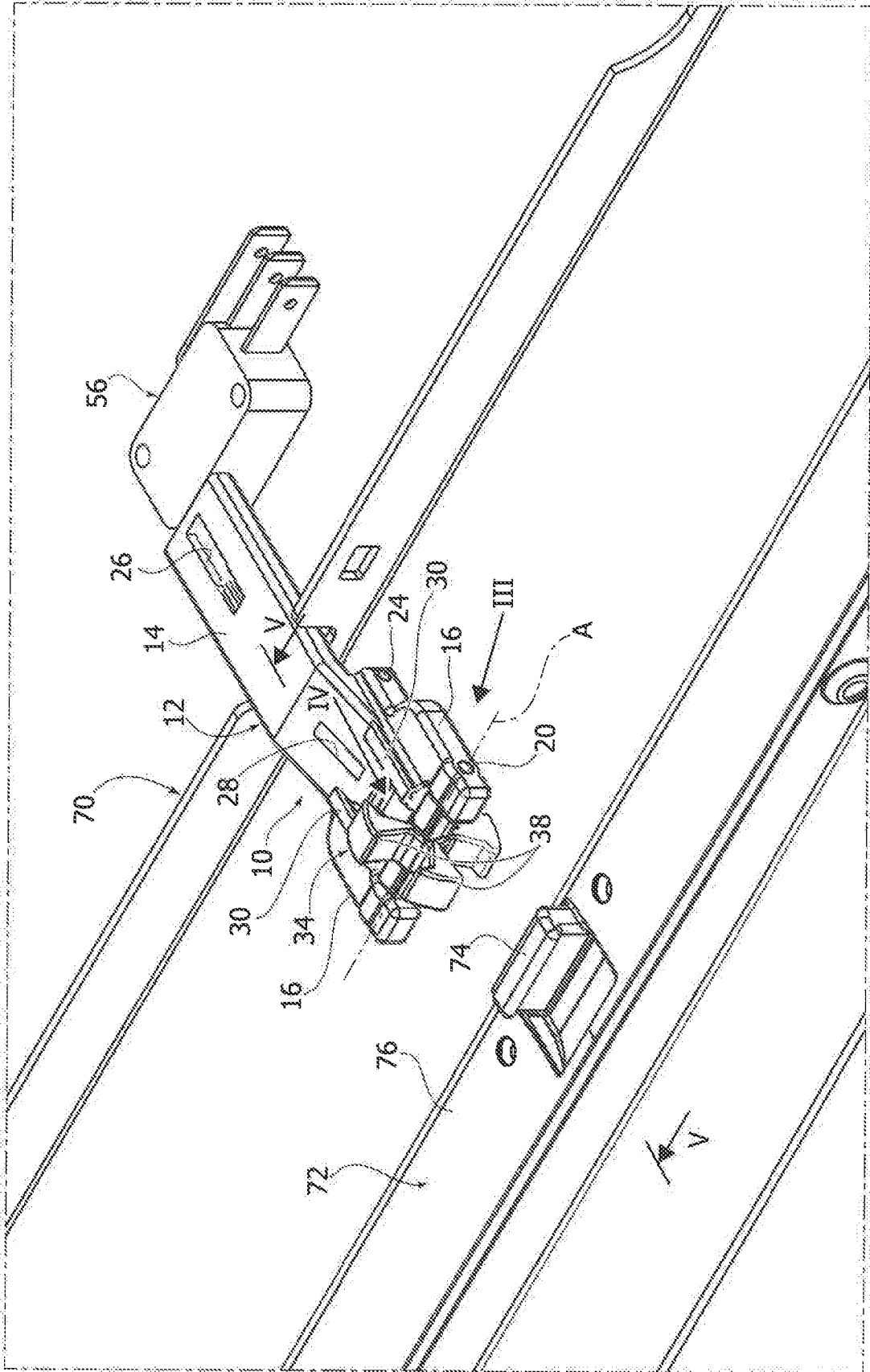


FIG. 3

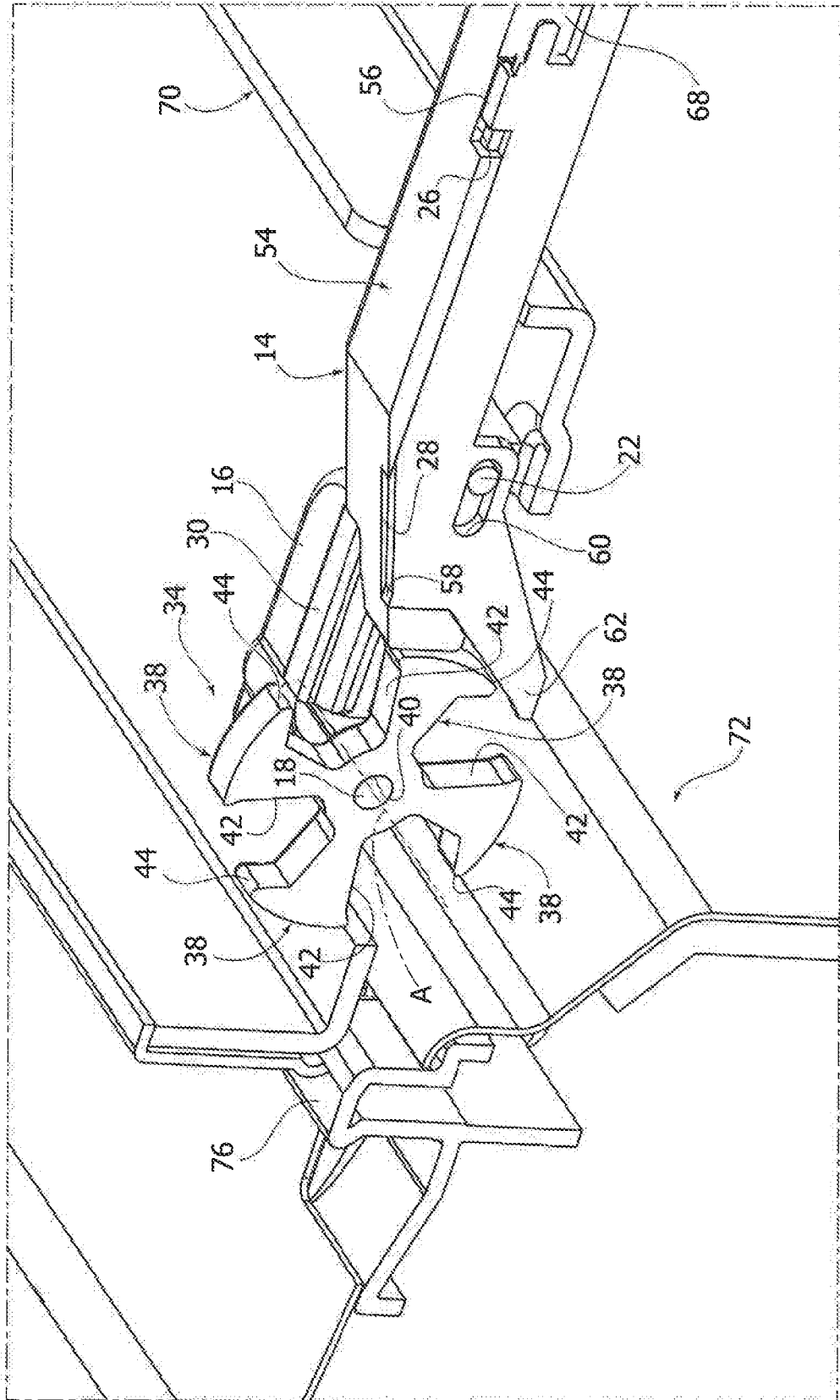


FIG. 4

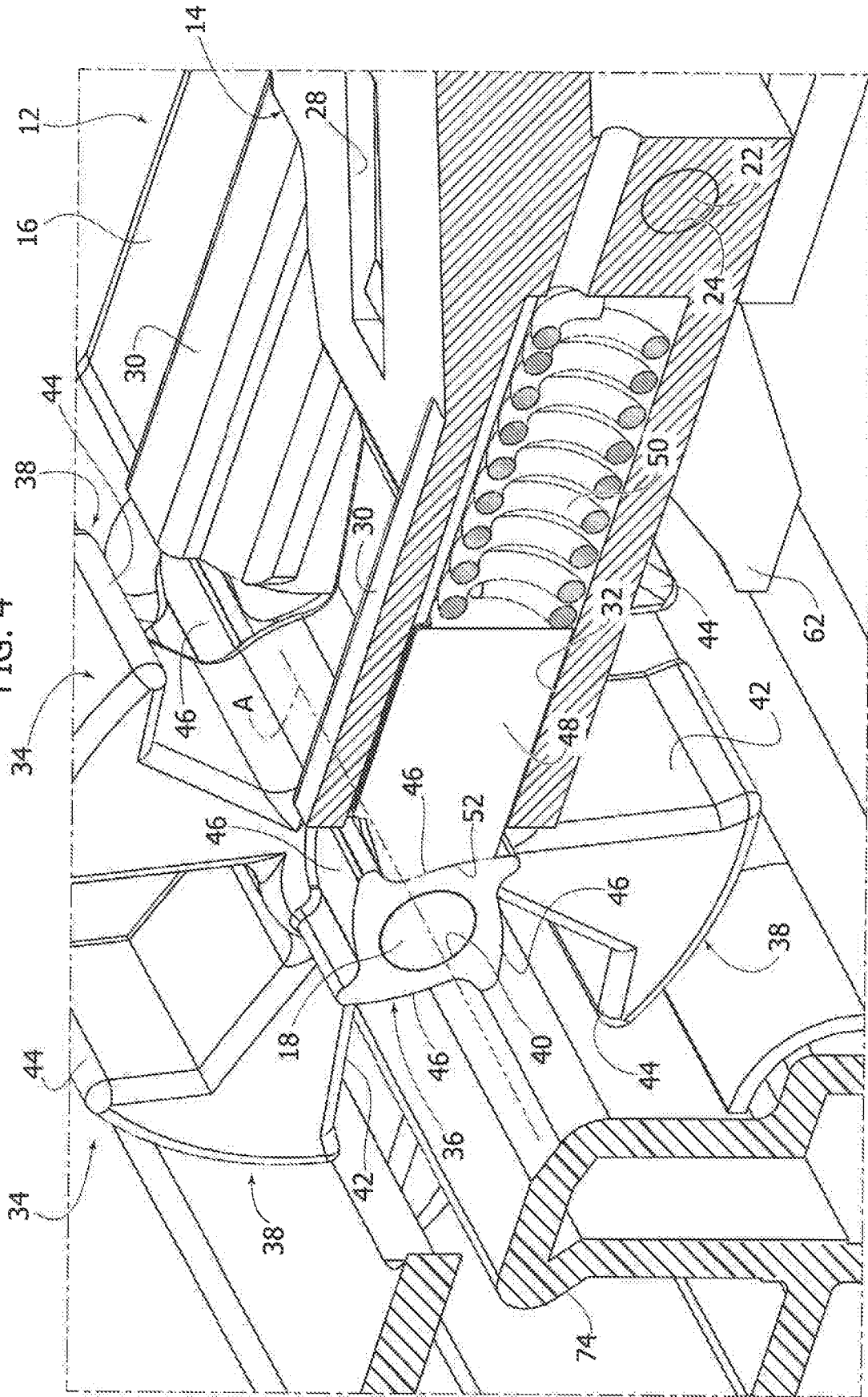


FIG. 5

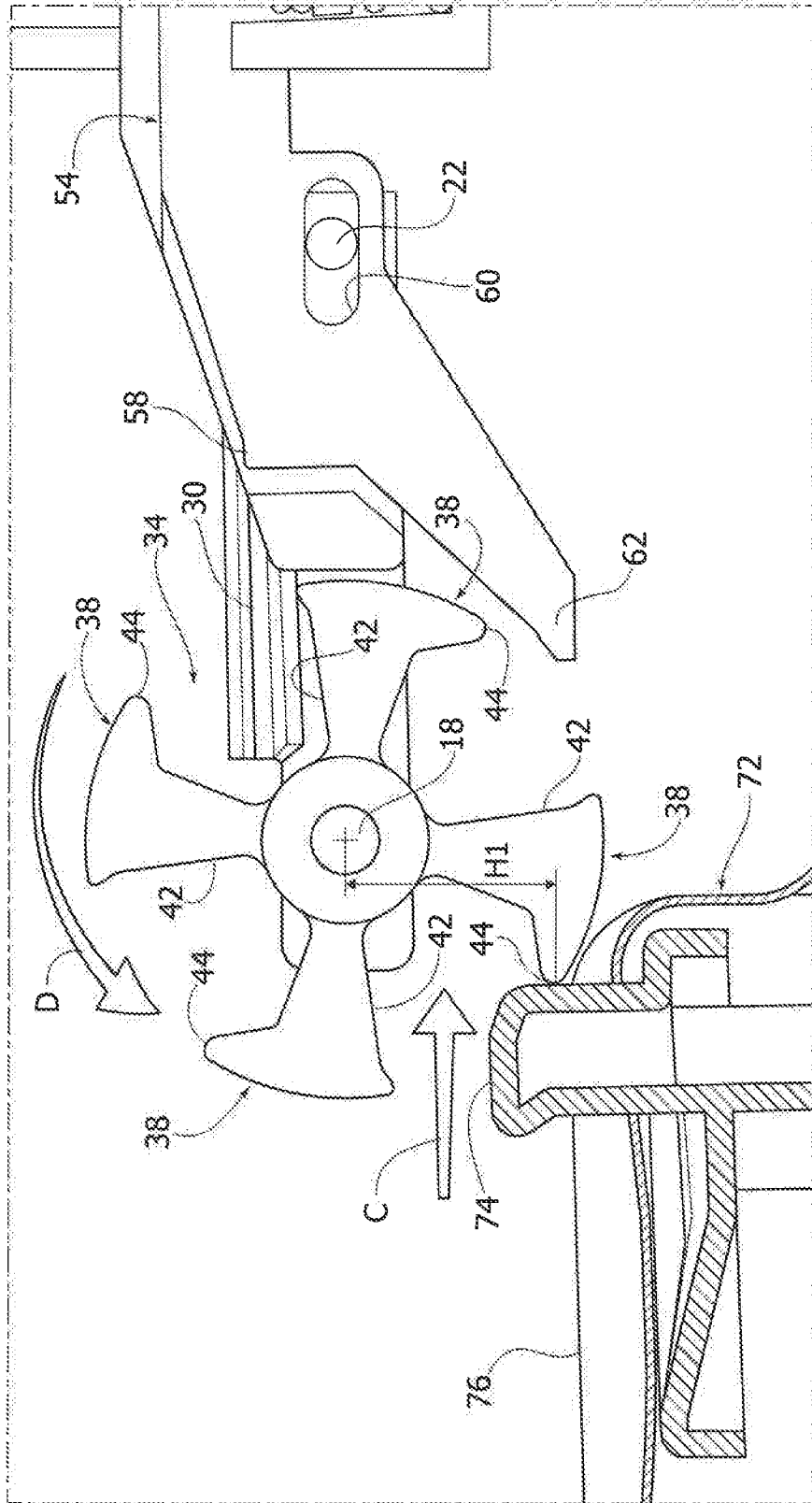
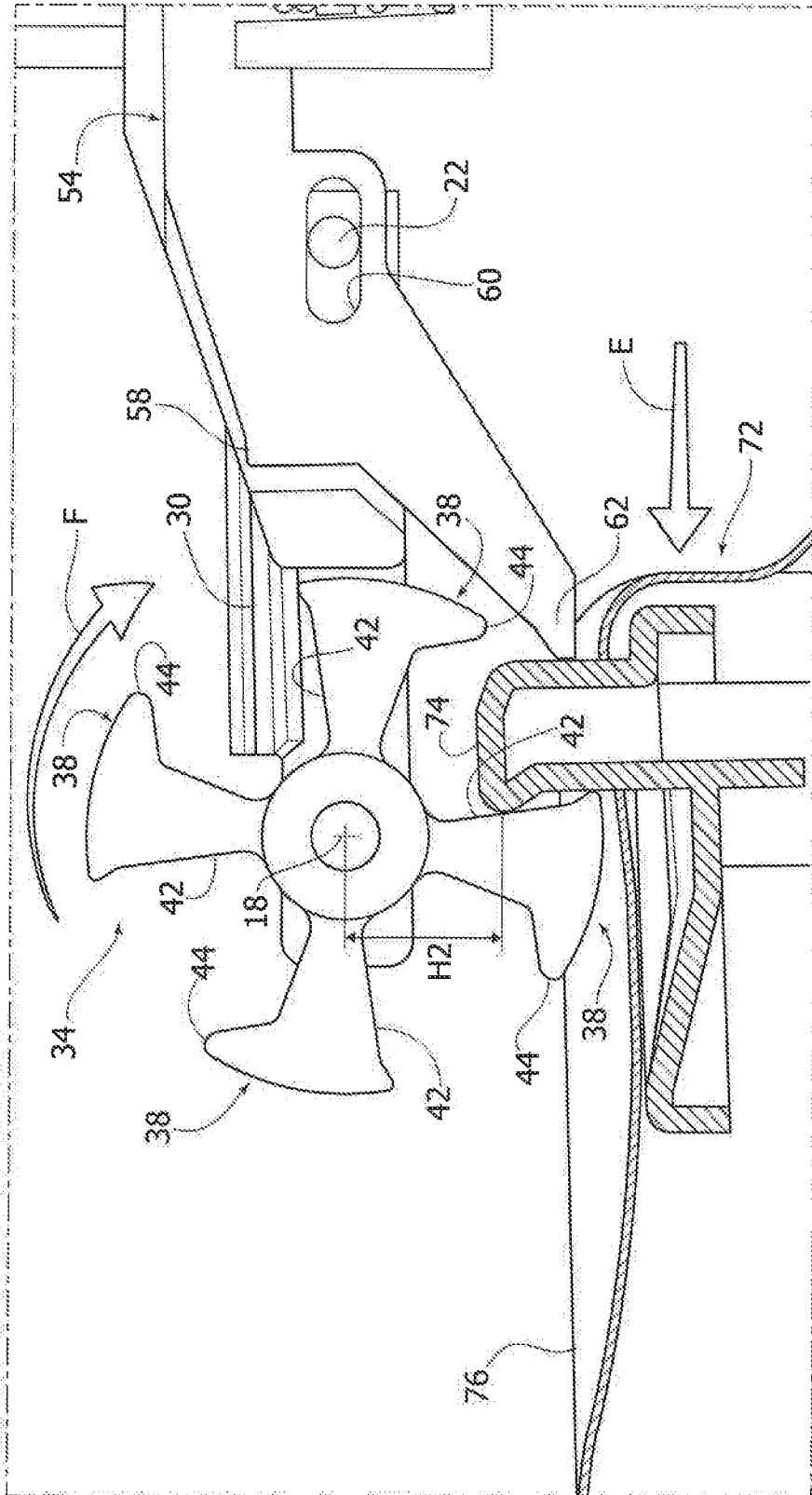


FIG. 6



INTERNATIONAL SEARCH REPORT

International application No
PCT/US2018/043447

A. CLASSIFICATION OF SUBJECT MATTER
INV. E05C19/02 E05B15/00 A47L15/42
ADD.
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED
Minimum documentation searched (classification system followed by classification symbols)
E05C E05B A47L D06F
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Y	the whole document	6-9
X	US 3 291 512 A (WERNER LEWIN GUNNAR ERIK) 13 December 1966 (1966-12-13)	1,2
X	GB 500 987 A (WILLIAM BATES) 20 February 1939 (1939-02-20)	1
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	paragraph [0024] - paragraph [0026]; figures 5-8	
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Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents :

<p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p>	<p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"&" document member of the same patent family</p>
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Date of the actual completion of the international search 20 August 2018	Date of mailing of the international search report 28/08/2018
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Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer Ansel, Yannick
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INTERNATIONAL SEARCH REPORT

International application No
PCT/US2018/043447

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 2015/150051 A1 (ELECTROLUX APPLIANCES AB [SE]) 8 October 2015 (2015-10-08) page 8, line 32 - page 9, line 10; figures 1-4 -----	6-9

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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