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(54)

CONTROL PANEL FOR HOUSEHOLD APPLIANCES AND HOUSEHOLD APPLIANCE THEREOF

(57)

Control panel (3) for household appliances (2) comprising: a support structure (31), adapted to be fixed to an outer casing (21) of a household appliance (2); and control elements (4), adapted to at least partly permit the control of the household appliance (2) with which the control panel (3) can be associated.

Said control elements (4) comprising: at least one selector (5) associated with a knob (50); and at least one key (45). Said support structure (31) comprises a first

surface (31F), adapted to be visible by a user.

Said control elements (4) being positioned in suitable housings (32) obtained in said support structure (31).

At least one of said control elements (4) is at least partly projecting from a first surface (31F).

Said at least one selector (5) is of electromagnetic type and comprises: a magnet (53); and an integrated circuit (56), adapted to detect and determine the variations of the magnetic field.

Fig.1B

EP 3 360 458 A1

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Description

[0001] The present invention relates to a control panel for household appliances comprising electromagnetic selector and to the relative household appliance.

[0002] For the purpose of the present invention, by household appliance it is meant a device such as for example a washing machine, a dishwasher, an oven, a drier, hob, a hood, or devices such as boilers, conditioning devices, etc., all adapted to be used in a domestic environment.

[0003] Control panels for household appliances are known, comprising a knob designed to rotate around its own axis so as to select a particular function or configuration of the household appliance.

[0004] Said knob usually is associated with a selector device, which is manufactured with a sliding contact technology.

[0005] This type of selector, in order to meet safety and operation requirements provided for by law and/or established by market needs, must be able to ensure the preservation of its electric/mechanical features for the selection of the different functions even after a large number of rotations of the selector, for example more than a million revolutions. These operation specifications require special treatments of the contacts in order to maintain their electric conductivity features unchanged over time, even if the device has been subjected to numerous revolutions.

[0006] Therefore, currently known selectors have a useful life that cannot be extended any further and, as a consequence, they will not be able to pass possible new tests and/or to meet stricter operation requirements.

[0007] Sliding contact selectors have a further technical limitation due to the small number of possible positions that can be assumed by the device; positions which can be associated with the same number of specific functions of the household appliance. This limit is basically caused by the existence of numerous mechanical restrictions for their manufacturing.

[0008] These technical problems are particularly serious in household appliances, in particular among the ones mentioned above.

[0009] The object of the present invention is to solve the aforesaid technical problems providing a control panel comprising an electromagnetic selector.

[0010] An aspect of the present invention relates to a control panel having the features set forth in appended claim 1.

[0011] A further aspect of the present invention relates to a household appliance having the features set forth in appended claim 10.

[0012] The accessory features of the panel and of the household appliance are set forth in the respective dependent claims.

[0013] The features and advantages of the panel and of the household appliance will be best understood upon perusal of the following detailed description of the control

panel and of the household appliance, and upon the accompanying drawings, wherein:

- figures 1A and 1B show a possible explanatory and non-limiting embodiment of the control panel according to the present invention wherein figure 1A shows the panel in an axonometric view; figure 1B shows the panel of figure 1A in an exploded view;
- figures 2A and 2B show the selector shown in figure 1B; in particular, figure 2A shows the selector in an exploded view; figure 2B shows a sectional view of the selector;
- figure 3 shows a household appliance comprising a control panel according to the present invention;
- figure 4 schematically shows the electric connection between the control panel and the household appliance.

[0014] With reference to the aforesaid figures, reference number 3 indicates the control panel as a whole; whereas, hereinafter, reference number 2 indicates a generic household appliance of the type mentioned above.

[0015] Control panel 3 is especially adapted to be associated with household appliances 2.

[0016] Control panel 3 comprises: a support structure 31, which is adapted to be fixed to an outer casing 21 of a household appliance 2; control elements 4, which are adapted to at least partly permit the control of household appliance 2 with which control panel 3 can be associated.

[0017] Said control elements 4 comprising: at least one selector 5 associated with a knob 50; and at least one key 45.

[0018] In a preferred embodiment, the key is comprised in the functions of selector 5 itself.

[0019] Said support structure 31 comprises a first surface 31F, adapted to be visible by a user, for example panel 3 being positioned on a side of household appliance 2 which is accessible and/or visible by a user.

[0020] Said control elements 4 are positioned in suitable housings 32 obtained in said support structure 31 of panel 3.

[0021] At least one of said control elements 4 is at least partly projecting from said first surface 31F. Indeed, control elements 4, such as for example selector 5 and/or one or more keys 45, are at least partly visible relative to support structure 31 as they protrude, for example since they at least partly project from said first surface 31F.

[0022] Said at least one selector 5 is electromagnetic. Said electromagnetic selector 5 comprises, in turn: a magnet 53, for example a permanent magnet or an electromagnet; and an integrated circuit 56, adapted to detect and determine the variations of a magnetic field, in particular the magnetic field of magnet 53.

[0023] Therefore, changes in the position of magnet 53 lead to consequent changes in the magnetic field in the space surrounding selector 5. These changes in the magnetic field can be detected by integrated circuit 56.

[0024] Generally speaking, said control panel 3 can be considered as a user interface of a household appliance 2. Indeed, through control elements 4, the user can send commands to household appliance 2 and/or, if necessary, receive information of the operation of household appliance 2 itself.

[0025] In a possible embodiment of panel 3, support structure 31 comprises, besides said first surface 31F, a second surface 31B.

[0026] The mechanisms and the electric/electronic circuits of control elements 4 are fixed to said second surface 31B. The mechanisms and the circuits of control elements 4 are fixed to the second surfaces 31B in the most suitable ways. For example, the movable parts of control elements 4 are fixed so that they can move relative to support structure 31, whereas the electric or printed circuits, where the electric and/or electronic circuits are comprised, are fixed to said second surface 31B in a static manner.

[0027] Said second surface 31B usually is invisible to the user during the normal operation of household appliance 2. Preferably, said second surface 31B is substantially parallel to said first surface 31F, thus being invisible.

[0028] Moving on to the manufacturing details of selector 5, in a preferred, though non-limiting embodiment thereof, besides said magnet 53 and said integrated circuit 56, said selector 5 comprises: a covering element 51; a shaft 52, and a body 55.

[0029] Said shaft 52, at one end, is connected to knob 50; whereas, at the opposite end, it comprises abutment elements 522.

[0030] Said body 55 comprises, in turn, a mechanism 552, adapted to interact with said abutment elements 522 of shaft 52.

[0031] The interaction between mechanism 552 and abutment elements 522 allows the user perceive, in particular in quantitative terms, the rotation to which selector 5 is subjected.

[0032] Said covering element 51 is arranged above said body 55, so as to enclose the components of selector 5. Said shaft 52 projects beyond said body 55 and said covering element 51, as you can clearly see in the accompanying figures.

[0033] Said shaft 52 is at least capable of rotation around and axis "K". Said axis "K" substantially is the longitudinal axis of shaft 52 itself.

[0034] In a preferred embodiment of selector 5, said magnet 53 is a permanent magnet.

[0035] In a preferred embodiment of selector 5, said magnet 53 is fixed to said shaft 52. Said magnet 53 is fixed to shaft 52 so as to move with it in an integral manner. In this way, the rotation of shaft 52 consequently leads to a rotation of magnet 53. The rotation of magnet 53 causes a change in the magnetic field in its vicinity, in particular in the direction of the magnetic field lines. These variations of the magnetic field and, in particular, of the position of the field lines can be detected by integrated circuit 56.

[0036] Generally speaking, said integrated circuit 56 is capable of determining every movement of magnet 53, which moves with shaft 52 in an integral manner. Therefore, a rotation of selector 5 and, in particular, of shaft 52 causes integrated circuit 56 to generate an electronic signal, which will be a function of the change of position undergone by magnet 53.

[0037] In a preferred, though non-limiting embodiment, said selector 5 is fixed to a printed circuit 6. Said printed circuit 6 comprises electronic circuits adapted for the operation at least of said selector 5. In a preferred embodiment, there is only one printed circuit 6 for all control elements 4 comprised in control panel 3 according to the present invention.

[0038] Generally speaking, said printed circuit 6 is adapted to be electrically connected to a control unit 22 of household appliance 2.

[0039] Preferably, said integrated circuit 56 is electrically connected to said printed circuit 6; preferably, said integrated circuit 56 is fixed, through welding, to printed circuit 6. Above integrated circuit 56 there is placed the mechanical part of selector 5, which is mechanically fixed to printed circuit 6.

[0040] In a preferred, though non-limiting embodiment, said covering element 51, said shaft 52 and said body 55 are made of plastic materials. In this way, the manufacturing costs of selector 5 are significantly reduced.

[0041] In a preferred embodiment of selector 5, selector 5 comprises an elastic element 54.

[0042] Said elastic element 54, for example a spring, is adapted to permit variations of position of shaft 52 along said axis "K". The variation of position along the axis "K" of shaft 52 will lead to a variation also of the position of magnet 53, as well, since said magnet 53 is fixed to said shaft 52.

[0043] Preferably, said elastic element 54, positioned in body 55, exerts a pushing force upon shaft 52, which is held by covering element 51, which, in turn, is fixed to body 55. Therefore, said shaft 52, by moving along said longitudinal axis "K", can move close to or and away from said body 55 and/or said covering element 51. In this way, magnet 53 will be able to change its distance relative to said integrated circuit 56. Therefore, integrated circuit 56 will detect a variation of the magnetic field and, in particular, a variation of the intensity of the magnetic field.

[0044] Generally speaking, said integrated circuit 56 is capable of determining both variations of the position of the field lines, caused by the rotation of magnet 53 associated with shaft 52, and variations of the intensity of the field, for example caused by the movement of shaft 52 along said axis "K".

[0045] In this embodiment, selector 5 is capable of permitting the selection of a specific function both following the rotation of shaft 52 and following a movement along the axis "K", hence also fulfilling the function of a switch.

[0046] In this embodiment, the function of the key is comprised in the features of selector 5. In this specific embodiment, selector 5 fulfills both its classic function of

selector and that of a key associated with a pushbutton. Therefore, this solution allows you to increase the functions of control elements 4 comprised in control panel 3 according to the present invention.

[0047] Preferably, control panel 3 and/or household appliance 2 comprise a processing unit 65. Said processing unit 65 is adapted to determine the axial position and the absolute angular position of magnet 53, based on the data obtained from integrated circuit 56.

[0048] In a first embodiment, said processing unit 65 can be an independent integrated circuit, which is electrically connected to printed circuit 6, to which said selector 5 is also connected. In an equivalent embodiment, said processing unit 65 is integrated in said integrated circuit 56 of selector 5. This embodiment involves an integrated circuit 56 having greater calculation and processing abilities.

[0049] In yet another embodiment, said processing unit 65 is comprised in control unit 22 of household appliance 2.

[0050] According to a preferred embodiment, said processing unit 65 is comprised in control panel 3 and processing unit 65 can be electrically connected to said control unit 22 of household appliance 2.

[0051] In a preferred, though non-limiting embodiment, said shaft 52 comprises, at its end where there are said abutment elements 522, a housing. Said housing is centered relative to said axis "K", along which and/or around which said shaft 52 moves. In a preferred embodiment, said magnet 53 is positioned in said housing obtained in shaft 52. In this way, magnet 53 is perfectly centered relative to any movement of shaft 52.

[0052] Selector 5, comprised in control panel 3 according to the invention, is free from contactless sliding electrical contacts, as there are no sliding electrical contacts and/or electrical contacts that are in contact with one another. Indeed, selector 5 used the magnetic field variations generated by magnet 53 in order to determine the movements of shaft 52.

[0053] Control panel 3 is especially adapted to be comprised in a household appliance 2. Said household appliance 2 comprises, in turn: an outer casing 21; a control unit 22; and a control panel 3 according to the invention.

[0054] Said household appliance 2 preferably is a washing machine, a dishwasher, an oven, a drier, a hob, a hood, or a boiler.

[0055] Generally speaking, said household appliance 2 can comprise actuators 23 and/or sensors 24.

[0056] Said actuators 23 are, for example, motors, pumps, etc., all adapted to permit the execution of typical functions of household appliance 2. Said actuators 23 will not be described any further, as they are already known to a person skilled in the art.

[0057] Said sensors 24 are, for example, temperature, pressure, humidity sensors, etc., adapted to control operating parameters of household appliance 2. Said sensors 24 will not be described any further, as they are already known to a person skilled in the art.

[0058] Figure 1A shows panel 3 in an axonometric view. Said control panel 3 substantially is an instrument board where you can find different control elements 4, such as for example a selector and a plurality of keys 45.

[0059] The embodiment shown herein reveals, in particular and by mere way of non-limiting example, an instrument board of a washing machine.

[0060] The figure shows an explanatory embodiment of the conformation of board 3. Indeed, the shape of support structure 31 will be determined by the shape of household appliance 2 with which panel 3 can be associated.

[0061] In figure 1A you can see arrows, which indicate the possible movements of knob 50 connected to shaft 52 of selector 5.

[0062] This figure shows how this embodiment comprises both a pushbutton switch function and a rotary selection function.

[0063] Figure 1A substantially shows panel 3, which can act as a user interface.

[0064] Figure 1B shows panel 3 of figure 1A in an exploded view; wherein you can see control panel 3 in an exploded view. The figure reveals knob 50, support structure 31 and printed circuit 6 with which selector 5 is associated, in particular through welding, in order to permit the electronic connection.

[0065] Figure 1B shows part of housing 32 where said control elements 4 are positioned, in particular you can see housing 32 where selector 5 is placed when it is associated with control panel 3.

[0066] Figure 2A shows selector 5 in an exploded view. Figure 2A reveals the following parts of selector 5: covering element 51, shaft 52 comprising abutment elements 522, a magnet 53, preferably a permanent magnet, an elastic element 54, and a body 55. In particular, said elastic element 54, for example a helical spring, is adapted to be compressed.

[0067] Furthermore, you can see how body 55 comprises a mechanism 552. Said abutment elements 522 and said mechanism 552, when coupled to one another, create a rotation perceiving system for the user. The figure further shows printed circuit 6 or PCB to which integrated circuit 56 is connected. Said integrated circuit 56 is adapted to detect the position of magnet 53, in particular both the angular position and the axial distance, along said axis "K".

[0068] Figure 2B shows a sectional view of selector 5, where you can see the interaction between abutment elements 522 and mechanism 552, so as to create the rotation perceiving system. The figure clearly reveals that shaft 52 is capable of rotating relative to body 55 in both rotation direction.

[0069] Figure 2B also shows how shaft 52 projects beyond covering element 51. The projecting part of shaft 52 is adapted to be coupled to knob 50.

[0070] Body 55 further comprises retaining elements, adapted to be mechanically fixed to a support, such as for example printed circuit 6.

[0071] Figure 2B further shows the arrangement of integrated circuit 56 relative to magnet 53. Said magnet 53 is fixed to said shaft 52 and moves with it in an integral manner. In the explanatory embodiment shown, said magnet 53 is positioned in a housing obtained in shaft 52.

[0072] The shape of selector 5 requires spring 54 to allow shaft 52 to move along the axis "K", as indicated by the arrows. Therefore, magnet 53 can change its distance from integrated circuit 56.

[0073] Figure 3 shows a household appliance comprising a control panel 3 according to the present invention. The embodiment shown reveals a dishwasher comprising a control panel 3 according to the invention.

[0074] The position of control panel 3 relative to household appliance 2 depends on the conformation of household appliance 2 itself.

[0075] Figure 4 schematically shows the electric interconnection between control panel 3 and household appliance 2.

[0076] This figure reveals how control unit 22 of household appliance 2, besides monitoring said sensors 24 and controlling actuators 23, is capable of communicating with said control panel 3. In this figure, you can see how processing unit 65, adapted to process the data generated by control elements 4 of control panel 3, can be comprised in control panel 3 itself and/or in said control unit 22.

[0077] The figure further reveals how the number of sensors and actuators can change based on the features of household appliance 2.

[0078] Control panel 3 according to the invention has a longer useful life, thanks to the fact that it comprises an electromagnetic selector 5 with the features described above. Indeed, selector 5 is free from sliding contacts, as sliding contacts are more likely to be subjected to faults due to wear.

[0079] Panel 3 according to the invention increases the functions that can be implemented by a household appliance 2, with the same number of control elements 4. Indeed, selector 5 allows you to implement both the rotation function and the pushbutton function. Furthermore, selector 5 allows you to increase the number of positions in its rotation, thus increasing the number of different functions that can be selected. Thanks to selector 5 according to the invention, there are no more electronic/mechanical limitations to the creation of the different positions of the selector, as the electronic functionality can be implemented thanks to a customizable computer program, without the mechanical restrictions present in the solution of the prior art.

[0080] This solution adds, next to a rotary selection function of the electromagnetic type, a pushbutton function, which is also electromagnetic. Selector 5, thanks to the presence of integrated circuit 56, allows you to detect both the angular and the longitudinal absolute position of magnet 53 associated with shaft 52.

[0081] Therefore, selector 5 according to the invention also acts as an encoder, since it has a very high resolution.

tion.
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NUMERICAL REFERENCES

5	Household appliance	2
	Outer casing	21
	Control unit	22
	Actuators	23
	Sensors	24
10	Control panel	3
	Support structure	31
	First surface	31F
	Second surface	31B
15	Housings	32
	Control elements	4
	Key	45
	Selector	5
	Knob	50
20	Covering element	51
	Shaft	52
	Abutment elements	522
	Magnet	53
25	Elastic element	54
	Body	55
	Mechanism	552
	Integrated circuit	56
	Printed circuit	6
30	Processing unit	65
	Axis	"K"

Claims

1. Control panel (3) for household appliances (2) comprising:

- a support structure (31), adapted to be fixed to an outer casing (21) of a household appliance (2);
- control elements (4), adapted to at least partly permit the control of the household appliance (2) with which the control panel (3) can be associated;

said control elements (4) comprising:

- at least one selector (5) associated with a knob (50) ;
- at least one key (45);

said support structure (31) comprises a first surface (31F), adapted to be visible by a user;
said control elements (4) being positioned in suitable housings (32) obtained in said support structure (31);
at least one of said control elements (4) being at least

partly projecting from said first surface (31F);
said at least one selector (5) being of electromag-
netic type and comprising, in turn:

- a magnet (53);
- an integrated circuit (56), adapted to detect and
determine the variations of a magnetic field.

2. Panel according to claim 1, wherein said support
structure (31) comprises, in addition to said first sur-
face (31F), a second surface (31B), to which the
mechanism and the electric/electronic circuits of the
control elements (4) are fixed. 10

3. Control panel according to claim 1, wherein, in ad-
dition to said magnet (53) and said integrated circuit
(56), said selector (5) comprises: 15

- at least one covering element (51),
- a shaft (52), which, at one end, is connected
to the knob (50) and, at the opposite end, com-
prises abutment elements (522) ; 20
- a body (55) comprising a mechanism (552),
adapted to interact with said abutment elements
(522), thus allowing the user to perceive the ro-
tation caused to the selector (5) ; 25

said covering element being arranged on said body
(55); said magnet (53) is a permanent magnet and
is fixed to said shaft (52) so as to move with it in an
integral manner. 30

4. Panel according to any of the previous claims,
wherein said selector (5) is fixed to a printed circuit
(6); 35
said printed circuit (6) being electrically connectable
to a control unit (22) of the household appliance (2).

5. Panel according to claim 3 or 4, wherein said selector
(5) is comprising an elastic element (54), adapted to
enable position changes, along an axis (K), of the
shaft (52) to which the magnet (53) is fixed. 40

6. Panel according to any of the previous claims,
wherein there is provided a processing unit (65), 45
adapted to determine the axial position and the ab-
solute angular position of the magnet (53), based on
the data obtained from the integrated circuit (56);
said processing unit (65) is electrically connectable
to said control unit (22) of the household appliance 50
(2).

7. Panel according to any of the previous claims,
wherein said magnet (53) is positioned in a housing
obtained in said shaft (52). 55

8. Panel according to any of the previous claims,
wherein said selector (5) is free from sliding electrical

contacts.

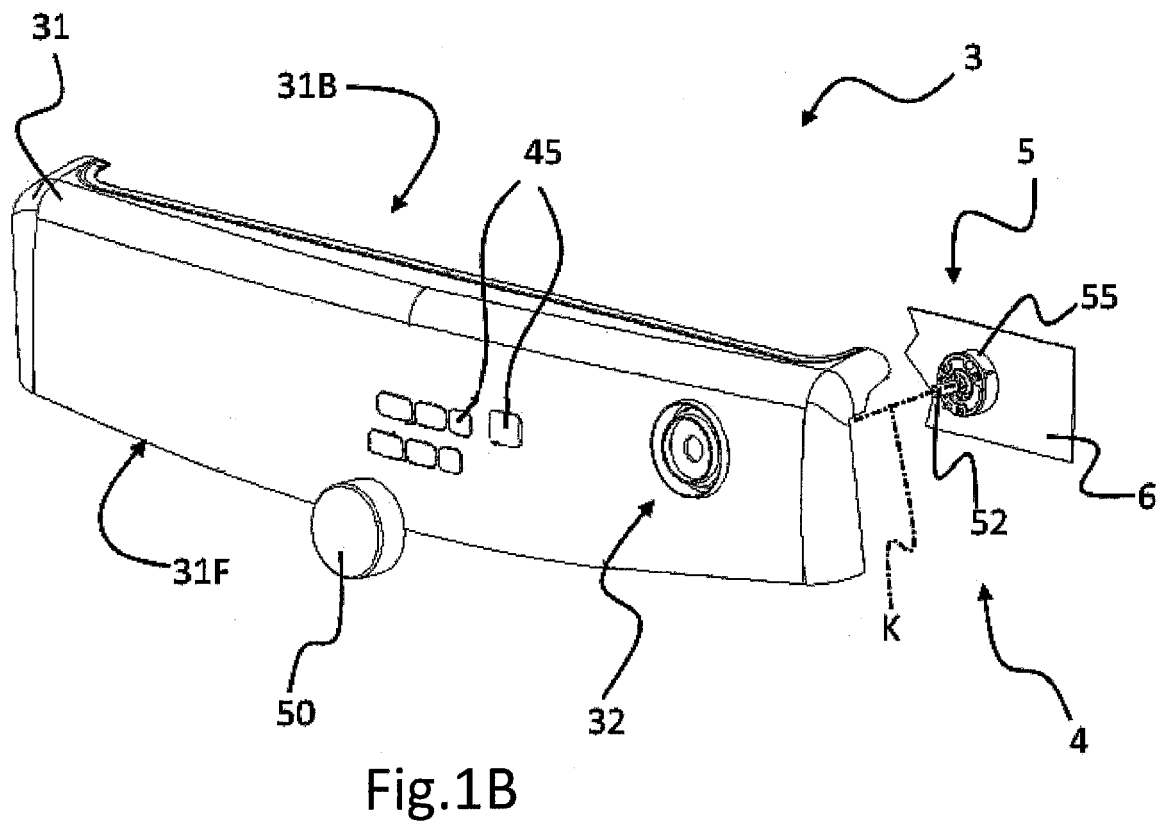
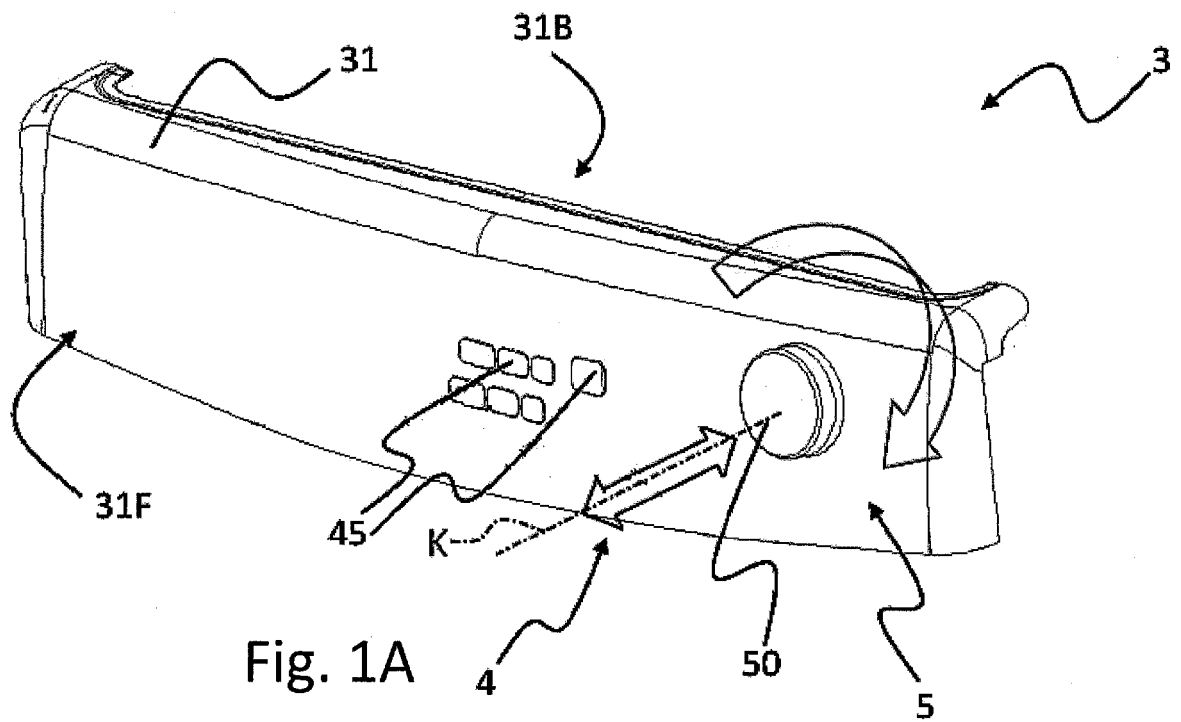
9. Panel according to claim 2, wherein said covering
element (51); said shaft (52) and said body (55) are
made of plastic materials. 5

10. Household appliance (2) comprising:

- an outer casing (21);
- a control unit (22); and
- a control panel (3);

said household appliance being **characterized in
that** the control panel (3) is a control panel according
to any of the previous claims.

11. Household appliance according to claim 10, wherein
it is a washing machine, a dishwasher, an oven, a
drier, a hob, a hood, or a boiler.



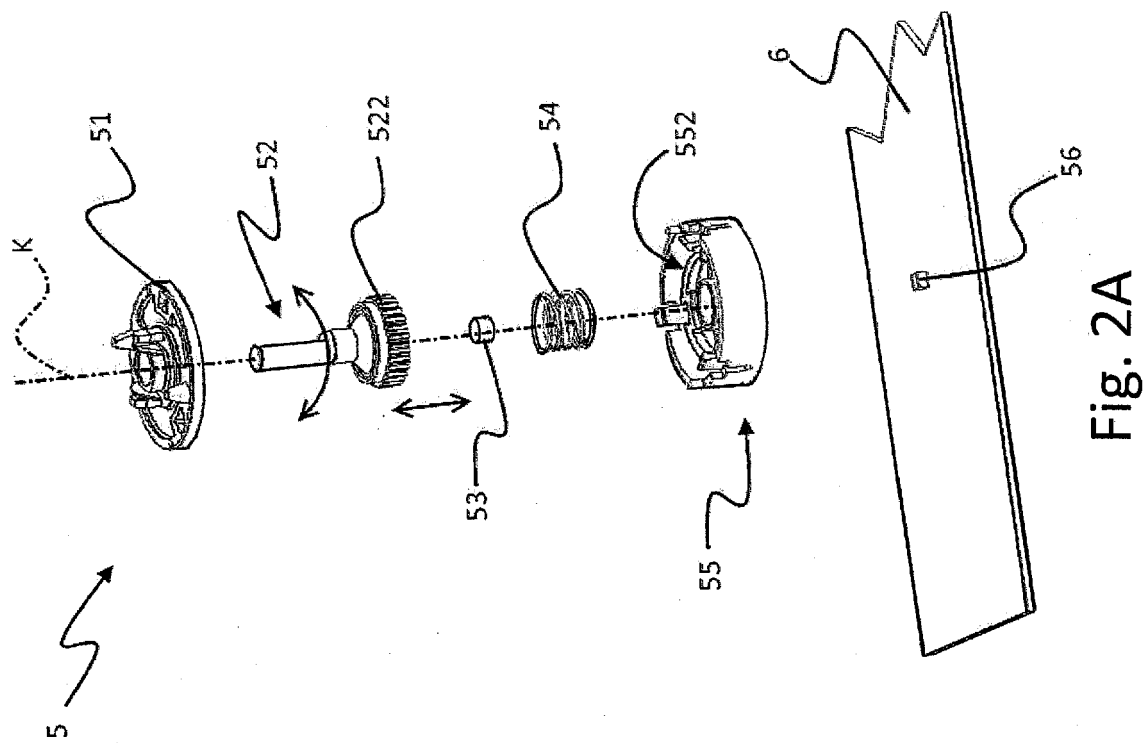


Fig. 2A

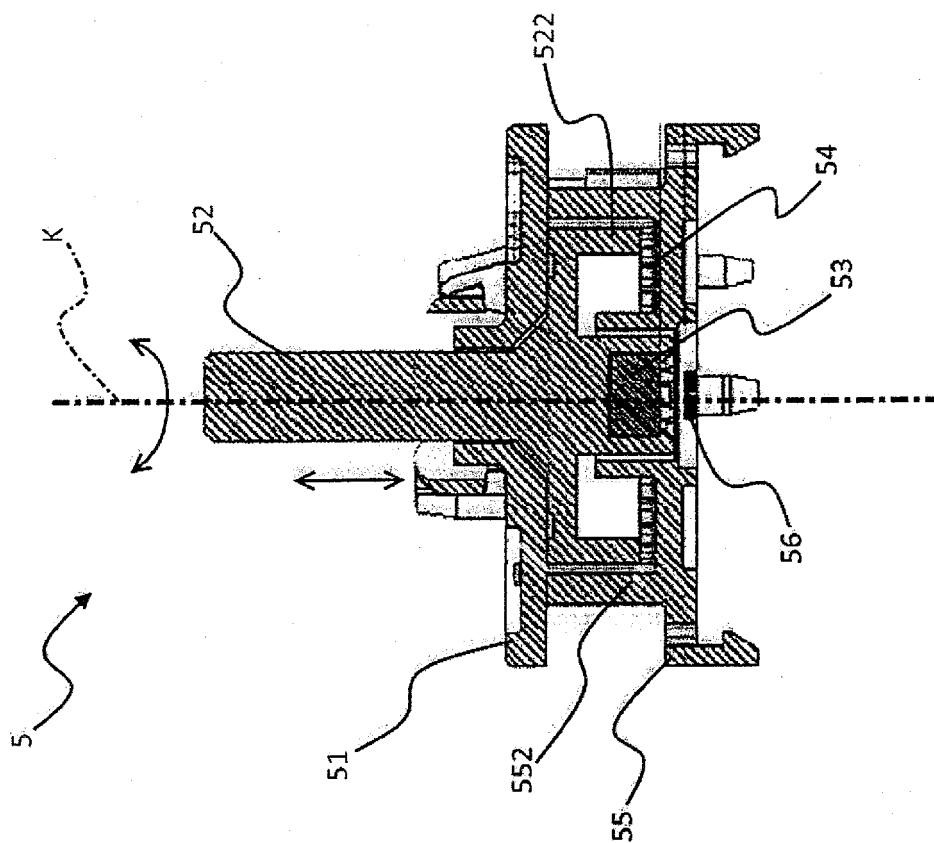


Fig. 2B

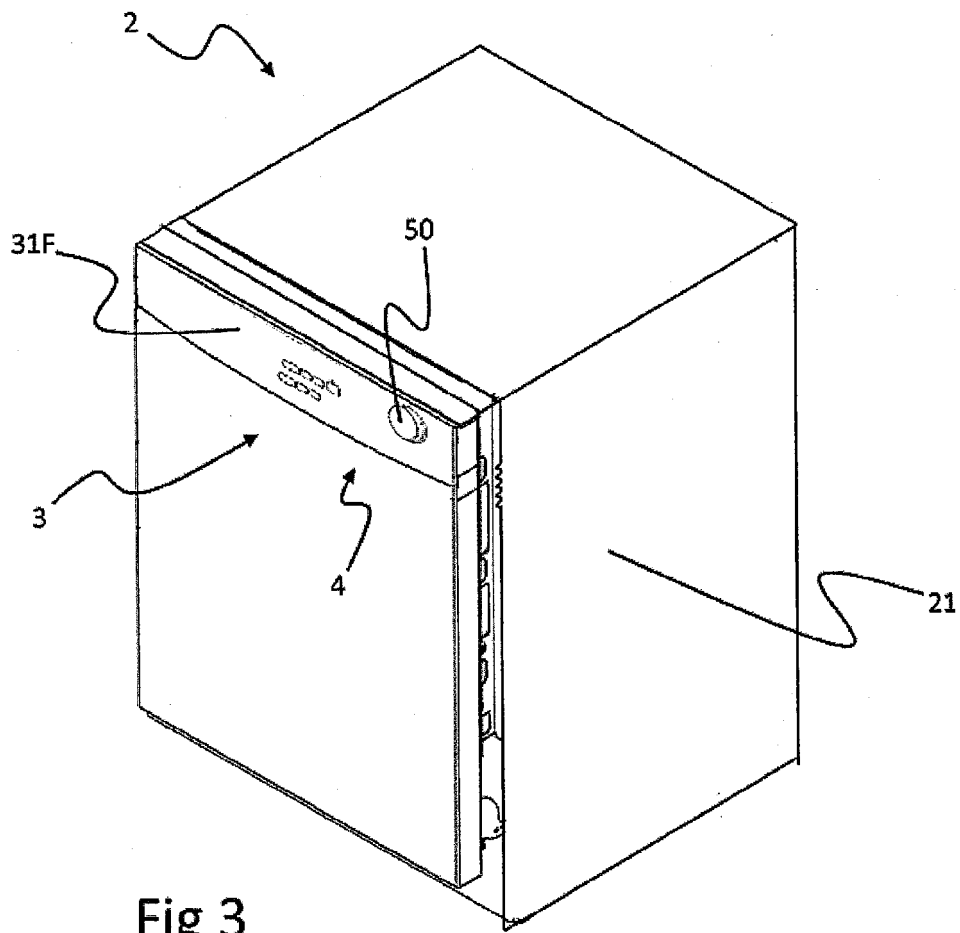


Fig 3

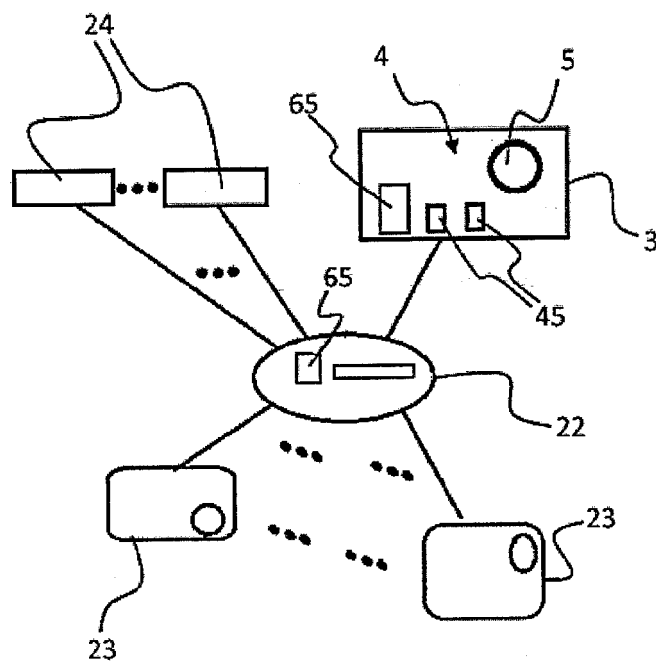


Fig 4



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 Application Number
 EP 18 15 5480

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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	

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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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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