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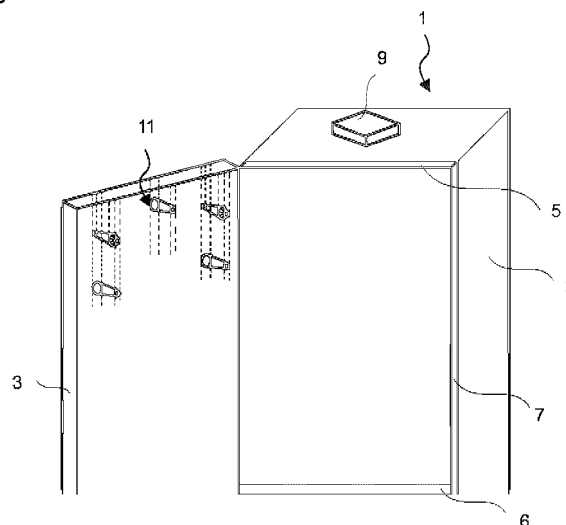
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(54) **A REFRIGERATOR HAVING VOICE RECOGNITION FEATURE**

(57) The present invention relates to a refrigerator (1) comprising a body (2); a door (3) which is arranged on the body (2) and which provides access into the body (2); a sealing member (4) which is disposed onto the door (3) and which provides leakproofing; an upper edge (5), a lateral edge (6) and a lower edge (7) onto which the sealing member (4) is seated when the door (3) is closed; at least one microphone (8) which is provided on the body

(2); a control unit (9) to which the audio data received from the microphone (8) is transmitted and which is programmed to process the audio data; at least one speaker (10) which enables the control unit (9) to inform the user; and at least one cavity (11) which is positioned on the body (2) so as to align with the microphone (8) or the speaker (10).

Figure 1



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Description

[0001] The present invention relates to a refrigerator wherein voice recognition is performed more effectively and precisely.

[0002] Today, the interaction between the household appliances and the user increases day by day and such appliances recognize a lot of commands in various ways. Especially, household appliances such as refrigerators which are used frequently in daily life connect to the home network based on the commands of the user or the condition of the appliance and can interact with the user by means of a keyboard, a microphone or a speaker.

[0003] Refrigerators wherein the human-machine interaction continuously improves can receive the commands of the user by means of a microphone and the process received from the control center can be announced to the user by means of a speaker. Problems may be encountered in the reception of the sound by the microphone due to the position of the refrigerator door or the structure of the space the refrigerator is placed. Separate microphones have to be used for the open and closed positions of the refrigerator door and this increases the cost and the labor requirements of cabling and the interior design of the appliance. In the state of the art, there are no sufficient solutions which enable the voice recognition and voice processing systems used in the refrigerators to operate in a more stable manner at all times, even when the door is open or closed or when the refrigerator surfaces are covered. The microphone has to be near the outer surface of the refrigerator when the refrigerator door is closed, and the microphone has to be positioned on the inner surface, facing the user when the refrigerator door is open. A channel in which the sound travels with decreased loss, enabling the user commands to be recognized more effectively is not available. Furthermore, considering the number of microphones required and the distances of the microphones to the control unit in order to prevent the sound from being scattered, such solutions are complex and expensive.

[0004] In the state of the art Chinese Patent Application No. CN108253713, a refrigerator is disclosed, comprising a microphone assembly which is positioned near the door hinge and which enables the voice recognition feature to always remain active.

[0005] In the state of the art International Patent Application No. WO2018077149, a voice recognition method is disclosed, wherein the position of the user is determined by monitoring the sound coming from the sound source around the refrigerator based on time and the precision of the voice recognition is improved.

[0006] The aim of the present invention is the realization of a design for improving cost effectiveness and precision in the microphone or speaker placement for the voice recognition feature.

[0007] The refrigerator realized in order to attain the aim of the present invention, explicated in the claims comprises a body; a door which is arranged on the body and

which provides access into the body; a sealing member which is disposed onto the door and which provides leak-proofing; an upper edge, a lateral edge and a lower edge onto which the sealing member is seated when the door is closed; at least one microphone which is provided on the body; a control unit to which the audio data received from the microphone is transmitted and which is programmed to process the audio data; at least one speaker which enables the control unit to inform the user; and at least one cavity which is positioned on the body so as to align with the microphone or the speaker. The cavity which forms a sound channel to pick up the voice of the user and enables the voice recognition feature to be improved has a concave surface. This cavity may be cylindrical, spherical or conical. Thus, the sound is prevented to a certain extent from being scattered and distorted, and a better voice transmission and recognition performance is achieved at any user position for digital speech processes widely used in the refrigerators.

[0008] In an embodiment of the present invention, the refrigerator comprises the cavity which is positioned on the door and which surrounds the microphone by being positioned between the part outside the sealing member and the upper, lateral or lower edge when the door is closed. The cavity may be open at both ends or at only one end. Said cavity which is formed by drilling or cutting out the door creates a direct sound channel for the microphone and the speaker positioned thereunder when the user speaks with the refrigerator when the door is closed. Since the microphone or the speaker is positioned on the upper, lower or lateral edges when the door is in the open position, the same performance level can be achieved with a more compact design in both cases without the need for using additional microphones or speakers.

[0009] In another embodiment of the present invention, the refrigerator comprises the cavity which surrounds the microphone and which is in the form of a cone with the surface having the larger diameter facing outside the refrigerator. Thus, a channel which narrows down from outside inwards picks up the sound with minimum loss and the voice recognition performance is improved.

[0010] In another embodiment of the present invention, the refrigerator comprises the cavity which surrounds the speaker and which is in the form of a cone with the surface having the smaller diameter facing outside. Thus, a channel which narrows down from inside outwards minimizes the loss for the sound output to the user by the speaker and the voice command performance is improved.

[0011] In another embodiment of the present invention, the refrigerator the cavity which aligns with at least one microphone positioned on the lateral edge. Using the cavity and the microphone on the lateral edge provides an additional sound channel other than the upper and lower edges of the refrigerator when the refrigerator is open or closed, providing an alternative arrangement option. Thus, a cost effective solution is provided which eliminates the need for using extra material in cases

where the upper and lower edges are not suitable for placement.

[0012] By means of the refrigerator of the present invention, the voice recognition performance is improved with the placement of the microphone and the speaker.

[0013] The refrigerator realized in order to attain the aim of the present invention is illustrated in the attached figures, where:

Figure 1 - is the perspective view of the refrigerator.

Figure 2 - is another perspective view of the refrigerator and the sealing member.

[0014] The elements illustrated in the figures are numbered as follows:

1. Refrigerator
2. Body
3. Door
4. Sealing member
5. Upper edge
6. Lower edge
7. Lateral edge
8. Microphone
9. Control unit
10. Speaker
11. Cavity

[0015] The refrigerator (1) realized in order to attain the aim of the present invention, explicated in the claims, comprises a body (2); a door (3) which is arranged on the body (2) and which provides access into the body (2); a sealing member (4) which is disposed onto the door (3) and which provides leakproofing; an upper edge (5), a lateral edge (6) and a lower edge (7) onto which the sealing member (4) is seated when the door (3) is closed; at least one microphone (8) which is provided on the body (2); a control unit (9) to which the audio data received from the microphone (8) is transmitted and which is programmed to process the audio data; at least one speaker (10) which enables the control unit (9) to inform the user; and at least one cavity (11) which is positioned on the body (2) so as to align with the microphone (8) or the speaker (10). When the refrigerator (1) is needed to interact with the user, the voice of the user is picked up by the microphone (8), the audio data is processed by the control unit (9) and the user is informed by means of audio warnings.

[0016] The refrigerator (1) of the present invention comprises the cavity (11) which has a concave surface enabling the voice of the user to be picked up in order to improve the performance of the voice recognition feature. Said cavity (11) can be provided in any section of the body (2) and can be closed at one end or can be open at both ends. By means of the specific structure of the cavity (11), the sound is prevented to a certain extent from being scattered and distorted and a better voice transmission performance is achieved at any user posi-

tion in digital speech processes widely used in the refrigerators (1).

[0017] In an embodiment of the present invention, the refrigerator (1) comprises the cavity (11) which is open at both ends, which is positioned on the door (3) and which surrounds the microphone (8) by being positioned between the part outside the sealing member (4) and the upper, lateral or lower edge (5, 6, 7) when the door (3) is closed. Said cavity (11) which is formed by drilling, molding or cutting out the door (3) creates a direct sound channel for the microphone (8) or the speaker (10) positioned thereunder when the user interacts with the refrigerator (1) when the door (3) is closed. For example, by means of the microphones (8) which are positioned outside the regions corresponding the upper, lower or lateral edges (5, 6, 7) of the gaskets on the door (3), the same performance can be achieved in a cost effective manner directly when the door (3) is open and by means of said cavity (11) when the door (3) is closed without the need for using additional microphones (8). Thus, when compared to the designs wherein separate microphones (8) are used in and outside, the electrical connection between the control unit (9) and the microphone (8) and the cabling process become more compact.

[0018] In another embodiment of the present invention, the refrigerator (1) comprises the cavity (11) which surrounds the microphone (8) and which is in the form of a cone with the surface having the larger diameter facing outside the body (2). The shape of this structure which is an upside down cone may change to a certain extent based on whether the same is positioned on the door (3) of the refrigerator (1) or on the body (2). Thus, the cavity (11) which narrows down from outside inwards picks up the sound with minimum loss and the voice recognition performance is improved.

[0019] In another embodiment of the present invention, the refrigerator (1) comprises the cavity (11) which surrounds the speaker (10) and which is in the form of a cone with the surface having the smaller diameter facing outside the body (2). Said cavity (11) which narrows down outwards enables the volume of the sound to be increased acoustically and the amplitude thereof to be partially increased. By means of the conical design of a sound channel which narrows down from inside outwards for the sound output to the user by the speaker (10), the sound is transmitted with the minimum loss and the voice command performance is improved.

[0020] In another embodiment of the present invention, the refrigerator (1) comprises the cavity (11) which is aligned with at least one microphone (8) positioned on the lateral edge (7). Using the cavity (11) and the microphone (8) on the lateral edge (7) provides an additional sound channel other than the upper and lower edges (5, 6) of the refrigerator (1) when the refrigerator (1) is open or closed, providing an alternative arrangement option. For example, in order to obtain an improved voice recognition performance, the lateral edge (7) is used in addition to a microphone (8) disposed onto the upper sur-

face of the body (2) when the door (3) is opened and the design can be modified according to the different opening directions (from right to left or from left to right) of the door (3). When the user opens the door (3) towards left or right, an improved voice recognition can be provided by means of the microphone (8) on the lateral edge (7). Thus, a cost effective solution is provided which eliminates the need for using extra material in cases where the upper and lower edges (5, 6) are not suitable for placement.

[0021] By means of the refrigerator (1) of the present invention, the voice recognition performance is improved with the placement of the microphone (8) and the speaker (10).

eral edge (7).

Claims

1. A refrigerator (1) comprising a body (2); a door (3) which is arranged on the body (2) and which provides access into the body (2); a sealing member (4) which is disposed onto the door (3) and which provides leakproofing; an upper edge (5), a lateral edge (6) and a lower edge (7) onto which the sealing member (4) is seated when the door (3) is closed; at least one microphone (8) which is provided on the body (2); a control unit (9) to which the audio data received from the microphone (8) is transmitted and which is programmed to process the audio data; at least one speaker (10) which enables the control unit (9) to inform the user; and at least one cavity (11) which is positioned on the body (2) so as to align with the microphone (8) or the speaker (10), **characterized by** the cavity (11) which has a concave surface enabling the voice of the user to be picked up.
2. A refrigerator (1) as in Claim 1, **characterized by** the cavity (11) which is positioned on the door (3) and which surrounds the microphone (8) by being positioned between the part outside the sealing member (4) and the upper, lateral or lower edge (5, 6, 7) when the door (3) is closed.
3. A refrigerator (1) as in Claim 1 or 2, **characterized by** the cavity (11) which surrounds the microphone (8) and which is in the form of a cone with the surface having the larger diameter facing outside the body (2).
4. A refrigerator (1) as in any one of the Claims 1 to 3, **characterized by** the cavity (11) which surrounds the speaker (10) and which is in the form of a cone with the surface having the smaller diameter facing outside the body (2).
5. A refrigerator (1) as in any one of the Claims 1 to 4, **characterized by** the cavity (11) which is aligned with least one microphone (8) positioned on the lat-

Figure 1

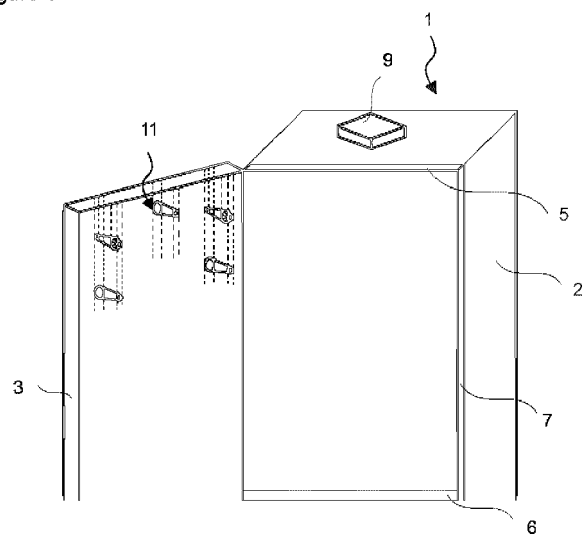
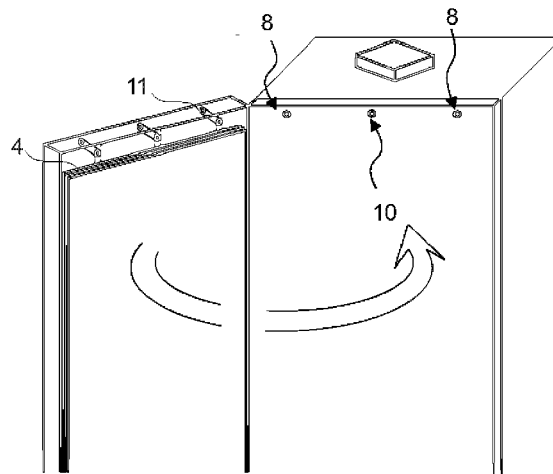


Figure 2





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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			

**ANNEX TO THE EUROPEAN SEARCH REPORT
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