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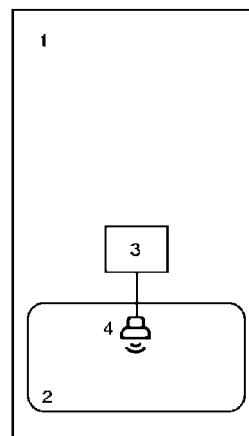
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(54) **REFRIGERATOR WITH AN IMPROVED PRESERVATION OF VEGETABLES AND FRUITS**

(57) The present invention relates to a refrigerator (1) and a method of controlling the refrigerator (1). The refrigerator (1) comprises a compartment (2) for refrigerating vegetables and fruits stored therein, a control unit

(3) and a sound source (4) for treating vegetables and fruits in the compartment (2) with soundwaves, the sound source (4) being controlled by the control unit (3).

Figure 1



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Description

[0001] The present invention relates to a refrigerator and a method of controlling the refrigerator wherein sound technology is used for preserving freshness and nutrition of vegetables and fruits stored in a compartment of the refrigerator.

[0002] Freshness and nutritive values of vegetables and fruits stored in refrigerators decrease with time. This is mainly due to decreasing levels of vitamins and antioxidants, as well as development of microorganisms. In order to slow down this process, various technologies are employed in refrigerators, such as treating vegetables and fruits with light. It has also been demonstrated by research that plants are responsive to other stimulants, such as ambient sounds. Exposure to sounds may help boost synthesis of components such as vitamins, antioxidants, nectars, and may increase the rate of photosynthesis in vegetables and plants.

[0003] In the state of the art, United States patent application US2008066475A1 discloses a refrigerator which uses illumination technology for food preservation.

[0004] In the Korean patent KR101791563B1, a method for delaying the ripening of fruits using sound treatment is disclosed.

[0005] The aim of the present invention is realization of a refrigerator and a control method thereof, wherein freshness and nutrition of vegetables and fruits are preserved for an extended time by simulating preharvest ambient conditions. An objective of the invention is to provide a refrigerator wherein sound technology is used in stimulating vegetables and fruits in order to extend their shelf lives. A related objective is to increase customer satisfaction by preserving natural taste and smell of vegetables and fruits for an extended period, in a cost effective and eco-friendly manner.

[0006] Refrigerator realized in order to attain the aim of the present invention, explicated in Claim 1 and the respective claims thereof, comprises a compartment for refrigerating vegetables and fruits stored therein, and a control unit.

[0007] In a preferred embodiment, the refrigerator further comprises at least one sound source for stimulating vegetables and fruits stored in the compartment with sound waves, wherein the control unit is configured to control operation of said at least one sound source.

[0008] The at least one sound source is adapted to apply soundwaves into the compartment for extending shelf life of vegetables and fruits stored therein. In preferred embodiments, the control unit is configured to control operation of said at least one sound source according to a 24-hour cycle comprising a daytime period (Td) and a nighttime period (Tn). The control unit may be configured to activate said at least one sound source such that the sound source outputs at least one type of sound for at least one predetermined period during the daytime period (Td) and/or such that the sound source does not output said at least one type of sound during the nighttime

period (Tn). In this way, periodical ambient sounds in preharvest conditions of plants can be simulated.

[0009] The at least one type of sound comprises biophonic sounds, such as sounds of insects, birds, etc. The control unit may be configured to control said at least one sound source such that the sound source outputs biophonic sounds for a first predetermined period (T1) at the beginning of the daytime period (Td) and/or for a third predetermined period (T3) at the end of the daytime period (Td), but does not output any biophonic sound for a second predetermined period (T2) between the first and third predetermined periods (T1, T3). Biophonic sounds can thus be applied at specific intervals of the daily cycle where they occur most intensely in nature, which helps better imitating natural sound cycles.

[0010] The at least one type of sound may additionally or alternatively comprise a background sound at a frequency and/or at a frequency range between 50 Hz - 20kHz. The background sound may be designed to represent the combination of sounds in the background, like a background noise. The at least one type of sound may further comprise non-biophonic sounds, such as sound of rain, wind, or sounds arising from human activity. By combining biophonic, non-biophonic, and/or background sounds, a more realistic ambient sound simulation can be obtained. This helps better stimulation of vegetables and fruits, providing improved preservation in the refrigerator.

[0011] In some embodiments of the invention, the refrigerator further comprises at least one light source for stimulating vegetables and fruits stored in the compartment with light. The control unit may be further configured to control operation of said at least one light source in accordance with operation of the sound source. For example, the control unit can control the light source and the sound source such that one or more instances of activation, deactivation and/or a change of operating state of these sources coincide. Vegetables and fruits being treated both by sound and light are exposed to enhanced stimulation and their shelf life and nutrition can be preserved for further extended time.

[0012] The control unit may be configured to activate said at least one light source during the daytime period (Td) and deactivate said at least one light source during the nighttime period (Tn). The control unit may be configured to control said at least one light source such that the light source emits light at a first wavelength for a first predetermined period (T1') at the beginning of the daytime period (Td), at a second wavelength for a second predetermined period (T2') in the middle of the daytime period (Td), and at a third wavelength for a third predetermined period (T3') at the end of the daytime period (Td).

[0013] Duration and/or start times of first, second and third predetermined periods used for operating the sound source (T1, T2, T3) and those used for the light source (T1', T2', T3') may be the same.

[0014] According to another aspect of the invention,

there is provided a method of controlling the refrigerator. The method comprises: starting the method, playing biophonic sounds during a first predetermined period (T1) at the beginning of a daytime period (Td), stopping biophonic sounds during a second predetermined period (T2) in the middle of the daytime period (Td), playing biophonic sounds during a third predetermined period (T3) at the end of the daytime period (Td), and stopping biophonic sounds during a fourth predetermined period (T4) during a nighttime period (Tn). Thus, biophonic sounds for treating the vegetables and fruits are applied at the first predetermined period (T1) and the third predetermined period (T3). Biophonic sounds are muted, or alternatively brought to a lower level, at other times, namely, at the second and fourth predetermined periods (T2, T4).

[0015] The method may further comprise: playing background sound and/or non-biophonic sounds during the daytime period (Td), preferably during the first, second and third predetermined periods (T1, T2, T3) continuously, and stopping the background sound and/or non-biophonic sounds during the fourth predetermined period (T4) during the nighttime period (Tn).

[0016] According to an embodiment of the invention wherein the refrigerator further comprises at least one light source for stimulating vegetables and fruits stored in the compartment with light, the method further comprises: stimulating vegetables and fruits stored in the compartment with light, synchronously with sound. In particular, the method may further comprise: emitting light at a first wavelength for a first predetermined period (T1') at the beginning of the daytime period (Td), emitting light at a second wavelength for a second predetermined period (T2') in the middle of the daytime period (Td), emitting light at a third wavelength for a third predetermined period (T3') at the end of the daytime period (Td), and stop emitting light during a fourth predetermined period (T4') during a nighttime period (Tn).

[0017] The refrigerator and the method of controlling the refrigerator realized in order to attain the aim of the present invention is illustrated in the attached figures, where:

Figure 1 is a schematic diagram of a refrigerator according to an embodiment of the invention,
Figure 2 is a schematic diagram of a refrigerator according to another embodiment of the invention,
Figure 3 is a flow diagram of the method of controlling the refrigerator according to an embodiment of the invention.

[0018] The elements illustrated in the figures are numbered as follows:

1. Refrigerator
2. Compartment
3. Control unit
4. Sound source

5. Light source

[0019] The refrigerator (1) comprises a compartment (2) for refrigerating vegetables and fruits stored therein, and a control unit (3) designed to control functioning of the refrigerator (1).

[0020] In a preferred embodiment, the refrigerator (1) further comprises at least one sound source (4) for stimulating vegetables and fruits stored in the compartment (2) with sound waves. The control unit (3) is configured to control operation of said one or more sound source (4). (Figure 1)

[0021] The control unit (3) may be configured to operate said at least one sound source (4) to output sound waves at frequencies between 50 Hz - 20 kHz, and at a volume between 0 - 110 dB. One or more different types of sounds can be output from said one or more sound source (4). Sounds may comprise recorded, processed, and/or artificially generated sound samples. At least some of the sounds may be stored in a memory, for example as sound files. To this end, the refrigerator (1) may comprise a memory module accessible by the control unit (3).

[0022] One or more sound sources (4) are preferably placed in the compartment (2), for example on a back wall, on at least one side wall, and/or on a cover of the compartment (2). Sound sources (4) may be speakers. Each one of sound sources (4) may be controlled to output different types of sounds or components thereof individually or in combination.

[0023] In preferred embodiments, the control unit (3) is configured to control operation of the sound source (4) according to a 24-hour cycle comprising a daytime period (Td) and a nighttime period (Tn). The control unit (3) may be configured to activate the sound source (4) such that the sound source (4) outputs at least one type of sound for at least one predetermined period during the daytime period (Td). The control unit (3) may further be configured to control the sound source (4) such that the sound source (4) does not output said at least one type of sound, or alternatively outputs said at least one type of sound only at a relatively low volume, during the nighttime period (Tn).

[0024] There may be more than one type of sounds played by the sound source (4) under control of the control unit (3). A specific type of sound may also comprise several sound components, such as separate audio channels. The control unit (3) is arranged to control each one of sound types and each component therein individually. Accordingly, the control unit (3) can start, stop, adjust the volume of a specific type of sound and/or an individual sound component therein independently.

[0025] The daytime period (Td) and the nighttime period (Tn) are defined as complementary parts of a 24-hour period. The daytime period (Td) includes, but is not limited to, the time interval between consecutive sunrise and sunset times. In preferred embodiments of the invention, the daytime period (Td) extends to additionally

include a certain time period immediately before the sunrise and/or immediately after the sunset. Thus, the daytime period may cover the time period between dawn and dusk.

[0026] A type of sound employed in the invention is biophonic sounds. These non-human sounds produced by living organisms in nature may comprise sounds of birds and insects. Biophonic sounds used by the refrigerator (1) are preferably pre-recorded sounds and may be grouped into components or sub-files. For example, one or more sound sources (4) may be controlled by the control unit (3) to output sounds of birds and sounds of insects at different times, for different durations, and/or at different volumes, in order to reflect the sound patterns observed in the nature.

[0027] For purposes of the invention, the daytime period (Td) is considered to comprise three predetermined periods (T1, T2, T3) at the beginning, middle, and end of it. In preferred embodiments, the three predetermined periods (T1, T2, T3) add up to the daytime period (Td). The first predetermined period (T1) is a period around the time of sunrise, the second predetermined period (T2) is a period around noon, and the third predetermined period (T3) is a period around the time of sunset. Each one of these predetermined periods can have a duration of up to six hours. By way of example, said periods may cover the following times: T1 (4 am - 10 am), T2 (10 am - 4 pm), T3 (4 pm - 8 pm), Tn (8 pm - 4 am). Information indicating start, end, duration, and sequence of periods Td, T1, T2, T3, and Tn are defined and stored in a memory unit in a manner accessible by the control unit (3). Given that the timing of biophonic sounds in nature are dependent sunrise and sunset, each one of predefined periods may be dynamically adjusted according to current time of the year and/or a current location. The control unit (3) may be configured to carry out the adjustment automatically.

[0028] According to an embodiment, the control unit (3) is configured to control said at least one sound source (4) such that the sound source (4) outputs biophonic sounds for the first predetermined period (T1) and/or for the third predetermined period (T3), but does not output any biophonic sound for the second predetermined period (T2). This pattern follows from the fact that sounds of birds and insects typically reach to maximum levels at around sunrise and sunset.

[0029] In addition to or as an alternative to biophonic sounds, the refrigerator (1) may use a background sound. The background sound can be output continuously, periodically, or intermittently. The background sound is preferably output during the daytime period (Td) and lowered or muted during the nighttime period (Tn). The background sound may be at a fixed frequency between 50 Hz - 20 kHz, or at certain frequency range therein.

[0030] Another possible type of sound used for stimulation of vegetables and fruits is non-biophonic sounds. Non-biophonic sounds may comprise the sound of rain, wind and sounds produced by human activity. Non-bio-

phonic sounds may be pre-recorded sounds and may be grouped into components or sub-files, each of which may be output at different times, for different durations, and/or at different volumes, in order to reflect the sound patterns observed in the nature.

[0031] According to an embodiment of the invention, refrigerator (1) further comprises at least one light source (5) for stimulating vegetables and fruits stored in the compartment (2) with light. The control unit (3) is further configured to control operation of said at least one light source (5) in accordance with operation of the sound source (4). (Figure 2) The control unit (3) controls the light source (5) to emit light preferably at a wavelength between 400 nm and 730 nm. Combined application of sound waves and light further enhances the simulation of ambient conditions in the nature. The synergistic effect of sound and light treatment provides further extended preservation of freshness and nutrition of vegetables and fruits.

[0032] The control unit (3) may be configured to activate said at least one light source (5) during the daytime period (Td). The control unit (3) may be further configured to deactivate or dim said at least one light source (5) during the nighttime period (Tn).

[0033] The control unit (3) may be configured to control said at least one light source (5) such that the light source (5) emits light at a first wavelength for a first predetermined period (T1') at the beginning of the daytime period (Td), at a second wavelength for a second predetermined period (T2') in the middle of the daytime period (Td), and at a third wavelength for a third predetermined period (T3') at the end of the daytime period (Td). Emission of light at different wavelengths during different periods of the daytime period (Td) imitates the effect of sunlight changing along the day. In a preferred embodiment, the first wavelength is between 400 nm and 520 nm, the second wavelength is between 520 nm and 610 nm, and the third wavelength is between 610 nm and 730 nm.

[0034] In a further embodiment, the refrigerator (1) comprises means for identification of vegetables and/or fruits stored in the compartment (2), and automatically adjusting sound and/or light treatment algorithm by the control unit (3) accordingly. Adjusting of algorithms may comprise adaptive changes in selection, timing, duration, frequency, and/or wavelength of sound/light treatment. The means of identification may comprise a camera for identifying the content of the compartment (2). Additionally or alternatively, vegetables and/or fruits placed in the compartment (2) can be inputted by the user of the refrigerator (1) via a user interface.

[0035] The method of controlling the refrigerator (1) comprises: starting (100) the method, playing (111) biophonic sounds during the first predetermined period (T1), stopping (112) biophonic sounds during the second predetermined period (T2), playing (113) biophonic sounds during the third predetermined period (T3), and stopping (114) biophonic sounds during the fourth predetermined period (T4).

[0036] In the method, playing the sound denotes stimulating the food in the compartment (2) with soundwaves propagating from at least one sound source (4). Stopping the sound, on the other hand, means muting a respective sound such that vegetables or fruits in the compartment (2) are not stimulated with soundwaves of respective sound. In some embodiments of the invention, however, it is also possible to significantly reduce the volume of a specific sound (for example, a background sound) instead of completely muting it.

[0037] The method may start (100), when the refrigerator (1) is energized, at a predefined point of time within the 24-hour cycle, for example with the beginning of the daytime period (Td). Alternatively, the method starts (100) at a point corresponding to a current time, such as clock time transmitted to the control unit (3) from an internal clock of the refrigerator; or from a point selected by the user.

[0038] The method may further comprise playing (121, 131) background sound and/or non-biophonic sounds during the daytime period (Td), and stopping (122, 132) the background sound and/or non-biophonic sounds during the fourth predetermined period (T4) during the nighttime period (Tn). The fourth predetermined period (T4) may be the entire nighttime period (Tn).

[0039] In an embodiment wherein the refrigerator (1) comprises at least one light source (5), the method further comprises stimulating vegetables and fruits stored in the compartment (2) with light, synchronously with sound. Thus, sound and light stimulation are applied based on the same cycle, and in one or more of the predetermined time periods (Td, T1, T2, T3) at the same time. Accordingly, the method may further comprise emitting (141) light by the light source (5) at a first wavelength for the first predetermined period (T1'), emitting (142) light by the light source (5) at a second wavelength for the second predetermined period (T2'), emitting (143) light by the light source (5) at a third wavelength for the third predetermined period (T3'), and stopping emitting (144) light by the light source (5) during the fourth predetermined period (T4'). (Figure 3) In a preferred embodiment, the first wavelength is between 400 nm and 520 nm, the second wavelength is between 520 nm and 610 nm, and the third wavelength is between 610 nm and 730 nm. Emitting light denotes stimulating the food in the compartment (2) with light from at least one light source (5). Stopping emitting light, on the other hand, means discontinuing treatment of vegetables or fruits in the compartment (2) with light for the respective time period.

[0040] Preferably, respective predetermined periods for sound stimulation (T1, T2, T3, T4) and starting time thereof are the same as those for light stimulation (T1', T2', T3', T4'). However, it is also possible that at least one of the starting times and/or duration of predetermined periods for application of sound and light differs by a predefined time margin.

[0041] At least some, and preferably all steps of the method of controlling the refrigerator (1) are carried out

automatically by the control unit (3) and one or more sound source (4) and light source (5) controlled by the control unit (3).

[0042] With the present invention, freshness and nutrition of vegetables and fruits are preserved for longer by simulating, within the refrigerator (1), sound cycles in growing habitats of fruits and vegetables. For this purpose, different types of sounds with varying audio characteristics are applied to the compartment (2) with a time pattern reflecting the nature. In some embodiments, the preservation effect is further improved by combining sound stimulation with light stimulation, both being preferably aligned with the same 24-hour cycle.

Claims

1. A refrigerator (1) comprising a compartment (2) for refrigerating vegetables and fruits stored therein, and a control unit (3), **characterized in that** the refrigerator (1) further comprises at least one sound source (4) for stimulating vegetables and fruits stored in the compartment (2) with sound waves, wherein the control unit (3) is configured to control operation of said at least one sound source (4).
2. A refrigerator (1) as in claim 1, wherein the control unit (3) is configured to control operation of said at least one sound source (4) according to a 24-hour cycle comprising a daytime period (Td) and a nighttime period (Tn).
3. A refrigerator (1) as in claim 1 or 2, wherein the control unit (3) is configured to activate said at least one sound source (4) such that the sound source (4) outputs at least one type of sound for at least one predetermined period during the daytime period (Td).
4. A refrigerator (1) as in claim 3, wherein the control unit (3) is configured to deactivate said at least one sound source (4) during the nighttime period (Tn).
5. A refrigerator (1) as in claim 3 or 4, wherein said at least one type of sound comprises biophonic sounds.
6. A refrigerator (1) as in claim 5, wherein the control unit (3) is configured to control said at least one sound source (4) such that the sound source (4) outputs biophonic sounds for a first predetermined period (T1) at the beginning of the daytime period (Td) and/or for a third predetermined period (T3) at the end of the daytime period (Td), but does not output any biophonic sound for a second predetermined period (T2) between the first and third predetermined periods (T1, T3).
7. A refrigerator (1) as in any one of claims 3 to 6, wherein said at least one type of sound comprises a back-

ground sound at a frequency and/or at a frequency range between 50 Hz - 20kHz.

8. A refrigerator (1) as in any one of claims 3 to 7, wherein said at least one type of sound comprises non-biophonic sounds. 5
9. A refrigerator (1) as in any one of preceding claims, wherein the refrigerator (1) further comprises at least one light source (5) for stimulating vegetables and fruits stored in the compartment (2) with light, wherein the control unit (3) is further configured to control operation of said at least one light source (5) in accordance with operation of the sound source (4). 10
10. A refrigerator (1) as in claim 9, wherein the control unit (3) is configured to activate said at least one light source (5) during the daytime period (Td) and deactivate said at least one light source (5) during the nighttime period (Tn). 15 20
11. A refrigerator (1) as in claim 9 or 10, wherein the control unit (3) is configured to control said at least one light source (5) such that the light source (5) emits light at a first wavelength for a first predetermined period (T1') at the beginning of the daytime period (Td), at a second wavelength for a second predetermined period (T2') in the middle of the daytime period (Td), and at a third wavelength for a third predetermined period (T3') at the end of the daytime period (Td). 25 30
12. A method of controlling a refrigerator (1) according to any one of preceding claims, the method comprising: 35
starting (100) the method,
playing (111) biophonic sounds during a first predetermined period (T1) at the beginning of a daytime period (Td), 40
stopping (112) biophonic sounds during a second predetermined period (T2) in the middle of the daytime period (Td),
playing (113) biophonic sounds during a third predetermined period (T3) at the end of the daytime period (Td), and 45
stopping (114) biophonic sounds during a fourth predetermined period (T4) during a nighttime period (Tn). 50
13. A method as in claim 12, wherein the method further comprises:
playing (121, 131) background sound and/or non-biophonic sounds during the daytime period (Td), and 55
stopping (122, 132) the background sound and/or non-biophonic sounds during the fourth

predetermined period (T4) during the nighttime period (Tn).

14. A method as in claim 12 or 13, wherein the refrigerator (1) further comprises at least one light source (5) for stimulating vegetables and fruits stored in the compartment (2) with light, wherein the method further comprises stimulating vegetables and fruits stored in the compartment (2) with light, synchronously with sound.
15. A method as in claim 14, wherein the method further comprises:
emitting (141) light at a first wavelength for a first predetermined period (T1') at the beginning of the daytime period (Td),
emitting (142) light at a second wavelength for a second predetermined period (T2') in the middle of the daytime period (Td),
emitting (143) light at a third wavelength for a third predetermined period (T3') at the end of the daytime period (Td), and
stop emitting (144) light during a fourth predetermined period (T4') during a nighttime period (Tn).

Figure 1

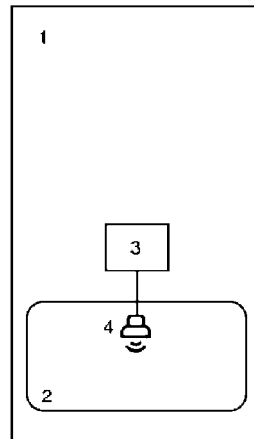


Figure 2

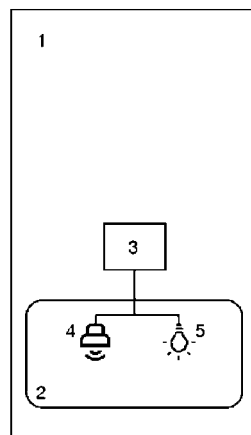
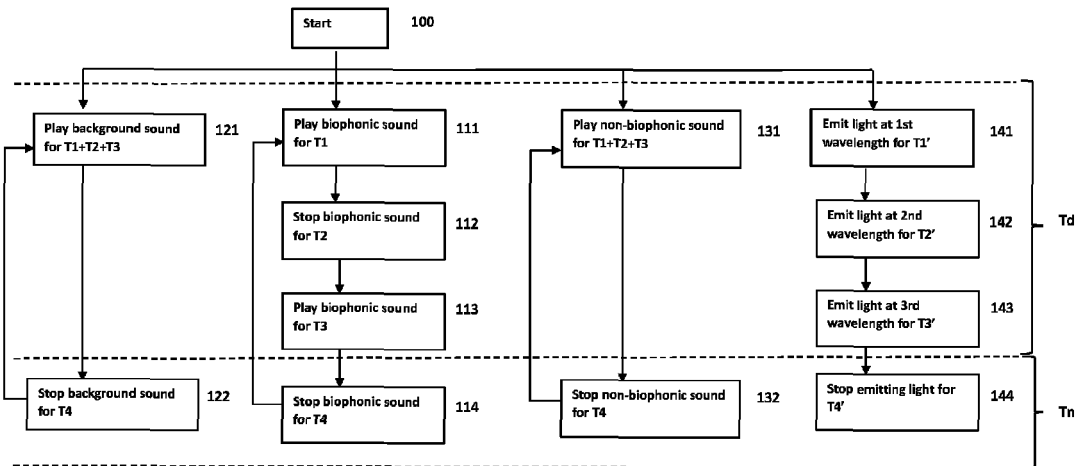


Figure 3





EUROPEAN SEARCH REPORT

Application Number

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EPO FORM 1503 03.82 (P04C01)

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	JP 2006 254835 A (MATSUSHITA ELECTRIC IND CO LTD) 28 September 2006 (2006-09-28)	1-4, 8, 9	INV.
Y	* the whole document *	10, 11	F25D25/02
A		5, 6, 12-15	F25D29/00
Y	JP 2017 083120 A (MITSUBISHI ELECTRIC CORP) 18 May 2017 (2017-05-18) * the whole document *	10, 11	
X	JP 2013 170760 A (TOSHIBA CORP; TOSHIBA CONSUMER ELECT HOLDING ET AL.) 2 September 2013 (2013-09-02) * the whole document *	1-4, 7, 8	
X	KR 2005 0043828 A (KIM DONG HWON [KR]) 11 May 2005 (2005-05-11) * the whole document *	1-4, 7, 8	
X	KR 2009 0002540 A (WON JONG MOON [KR]) 9 January 2009 (2009-01-09) * the whole document *	1-4, 7, 8	TECHNICAL FIELDS SEARCHED (IPC)
X	JP H09 191836 A (MATSUSHITA ELECTRIC IND CO LTD) 29 July 1997 (1997-07-29) * the whole document *	1-4, 7, 8	F25D
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 11 March 2022	Examiner Kolev, Ivelin
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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 21 20 0078

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2006254835 A	28-09-2006	NONE	
JP 2017083120 A	18-05-2017	JP 6176307 B2	09-08-2017
		JP 2017083120 A	18-05-2017
JP 2013170760 A	02-09-2013	NONE	
KR 20050043828 A	11-05-2005	KR 20040052787 A	23-06-2004
		KR 20050043828 A	11-05-2005
		KR 20050051597 A	01-06-2005
KR 20090002540 A	09-01-2009	NONE	
JP H09191836 A	29-07-1997	JP 3533803 B2	31-05-2004
		JP H09191836 A	29-07-1997

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 2008066475 A1 [0003]
- KR 101791563 B1 [0004]