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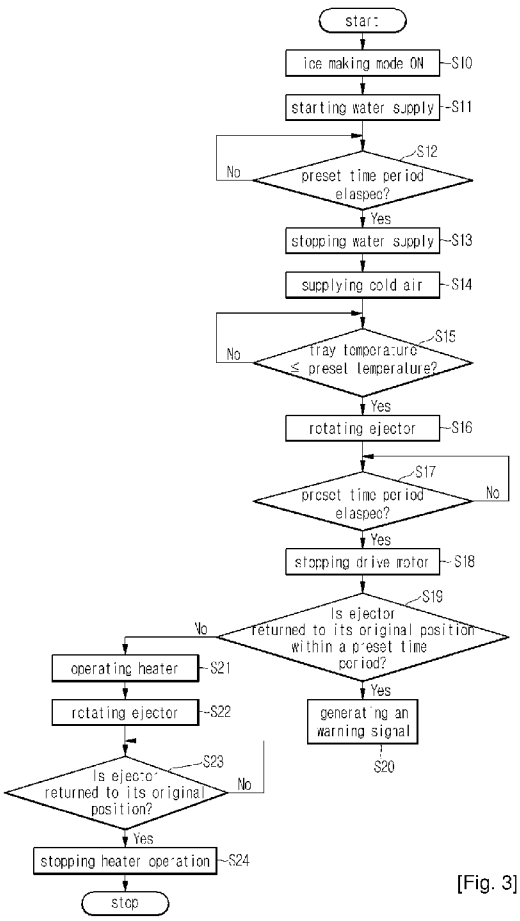
(54) Title: SYSTEM AND METHOD FOR ICE MAKING OF REFRIGERATOR



[Fig. 3]

(57) Abstract: The present invention relates to a system and a method for ice making of a refrigerator and, more particularly, to an ice maker of a refrigerator, which reduces unnecessary power consumption by controlling the operation of a heater according to the presence of a liquid for freezing.

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Description

SYSTEM AND METHOD FOR ICE MAKING OF RE-FRIGERATOR

Technical Field

[1] This document relates to a system and a method for ice making of a refrigerator.

Background Art

[2] A typical refrigerator is divided in a refrigerating chamber and a freezing chamber, where the refrigerating chamber is maintained at a temperature of about 3~4℃ to freshly store foodstuffs and vegetables for a long time and the freezing chamber is maintained at a subzero temperature to store meats and foodstuffs in a frozen state.

[3] In recent years, an ice maker, which allows to easily get ice-cubes by automatically accomplishing a series of processes related to the ice-making without need for operating it, and a dispenser, which allows to dispense ice-cubes or water from the outside, have been added to the refrigerator so that users may appreciate the convenience of them.

[4] The general ice maker includes a tray constituting an ice making chamber in which ice-cubes are formed, a water supply unit formed at one side of the tray to supply water into the ice making chamber, a heater installed at a lower surface of the tray, an ejector for discharging ice-cubes formed in the tray to the outside, a drive motor for driving the ejector, an ice bank for storing ice-cubes formed in the tray after receiving them, and an ice full sensing device for detecting the amount of ice filled in the ice bank.

[5] The water supply unit may be connected to a water supply source disposed at the outside of the refrigerator or may be a water container such as a water tank itself, and it supplies water into the tray.

[6] The heater is installed at the lower surface of the tray, and it allows ice cubes to be easily separated from the tray as the ice-cubes are melt by heating the tray.

[7] The ejector discharges ice-cubes from the tray as it is rotated by the drive motor.

[8] Meanwhile, the conventional ice maker determines whether liquid in the tray is completely frozen or not by means of the temperature value of the tray. In other words, a control unit does not check whether liquid or a frozen object is placed in the tray at all. Therefore, an ice moving process is carried out when the temperature of the ice making container is equal to the predetermined temperature, even though no water is supplied into the tray by some reason. That is, the heat is operated to move ice-cubes.

[9] According to this controlling method, there is a problem in that unnecessary power consumption is generated.

Disclosure of Invention

Technical Problem

[10] The present invention is proposed to solve this and other problems, and an object of the present invention is to provide an ice maker and a method for ice making of a refrigerator, which is capable of checking whether liquid is present in an ice making container before moving ice-cubes.

Technical Solution

[11] To achieve these objects and other advantages and in accordance with the purpose of the invention, as embodied and broadly described herein, there is provided an ice making system of a refrigerator, including: a tray in which water for making ice is received; a control unit for determining whether water is supplied into the tray and whether an ice making process is finished; an input unit for inputting an ice-making command to the control unit; a water supply unit for supplying water into the tray; a heater for heating the tray when the ice making process is finished; and an ejector for separating ice formed in the tray, wherein the heater is selectively operated according to whether water is supplied into the tray or not.

[12] Also, in another aspect of the present invention, there is provided a method for ice making of a refrigerator, including the steps of: supplying cold air into a tray as an ice making mode is turned on; measuring surface temperature of the tray; rotating an ejector according to the surface temperature of the tray; determining whether the ejector is returned to its original position within a preset time period; and

[13] supplying water or operating a heater according to the determined result.

Advantageous Effects

[14] The ice making system and method of the refrigerator according to the embodiments of the present invention may check whether liquid is present in the tray or not, and thus, control and display thereof may be accomplished.

[15] Also, power consuption is reduced by eliminating unnecessary heat generation of a heater and unnecessary operation of a motor.

Brief Description of the Drawings

[16] Fig. 1 is an external perspective view of an ice maker according to a preferred embodiment of the present invention.

[17] Fig. 2 is a block diagram showing an ice making system of a refrigerator according to a preferred embodiment of the present invention.

[18] Fig. 3 is a flowchart showing a method for ice making, which is accomplished in an ice making system according to a preferred embodiment of the present invention.

Mode for the Invention

[19] Hereinafter, the preferred embodiments of present invention will be explained in detail with reference to the accompanying drawings. However, the concept of the

present invention is not to be limited to these embodiments and those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims.

[20] Figure 1 shows an ice maker according to a preferred embodiment of the present invention in an external perspective view.

[21] Referring to Fig. 1, the ice maker 10 according to the preferred embodiment of the present invention includes a tray 12 in which water for ice-making is received, an ejector 14 provided at an upper side of the tray 12 to scoop the made ice, a control box 11 provided at a side of the tray 12, and an ice detecting lever 16, of which one end is pivotably connected to the control box 11 and the other end is pivotably connected to one end of the tray 12.

[22] Specifically, a drive motor is provided in the control box 11 to rotate the ejector 14. And, an ice full sensor 35 is installed in the control box 11, and the ice full sensor 35 is connected with an end of the ice detecting lever 16.

[23] More particularly, the ice full sensor 35 detects whether ice cubes are fully filled in an ice storage container by sensing rotation angle of the ice detecting lever 16. For example, if the ice detecting lever 16 is rotated within a predetermined angle, the ice making mode may be finished by determining that ice cubes are fully filled therein.

[24] Also, the tray 12 is made of a highly heat conductive material, for example aluminium. And, water supply into the tray 12 is accomplished by a water supply guide 4 formed at one side.

[25] Also, in order to determine whether ice making is completed, a temperature sensor 39 for detecting the temperature of the tray 12 is installed at the lower part of the tray 12.

[26] Also, a heater 33, which is to apply a small amount of heat so that the finished ice is separated from the tray 12, is installed at the lower part of the tray 12. Therefore, if the ice making process is finished as cold air is supplied for a predetermined time, the heater 33 generates heat and ice attached to a surface of the tray 12 is spaced therefrom. The ice, which is spaced in this way, is separated from the tray by rotation of the ejector 14. And, the ice, which is separated in this way, is dropped into an ice storage container (not shown) disposed at the lower side. Here, a stripper 6 is provided on the upper surface of a front side of the tray 12 in order to prevent the separated ice from re-introducing into the tray 12. The strippers 6 are arrnaged from a front plate 18 to the rear at regularly spaced intervals. And, during the ice moving process, the ejector 14 is rotated and passed between adjacent strippers 6.

[27] Figure 2 shows an ice making system of a refrigerator according to a preferred embodiment of the present invention in a block diagram.

[28] Referring to Fig. 2, the ice making system 30 according to the embodiment of the

present invention includes a timer 31 for determining current time or time period, a water supply valve 32 for controlling the amount of water supplied into a tray 12, a heater 33 generating heat for detaching ice cubes from the tray, a drive motor 34 for driving an ejector 14 and the like, an ice full sensor 35 for detecting whether ice cubes are fully loaded in an ice storage container, a temperature sensor 39 for detecting surface temperature of the tray, an input unit 36 for receiving commands related to the operation of the ice maker (hereinafter, referred to as an "operation control command") from the user, a display unit 37 for displayinginformation about the operational state of the refrigerator or ice maker to the user, and a control unit 38 for automatically accomplishing a series of ice-making processes.

[29] Specifically, the timer 31 calculates information about current date and time (for example, current year date, time and elapsed time) and send the information to the control unit 38. The timer 31 may be a program embedded in a microprocessor in the control unit 38.

[30] The water supply valve 32, heater 33, drive motor 34, ice full sensor 35 and temperature sensor 39 carry out their own functions to make ice, as described in the above. However, the water supply valve 32 may supply water or liquid (for example, juices) to the tray 12, as it is connected to the water supply source, such as waterworks, or the storage container, such as water tanks.

[31] Also, the input unit 36 is to input the operation control command from the user, it may be a conventional button key, a static electric type key or an input means, such as a touch pad, attached to a front of the display unit 37. This operation control command relates to an operation of the ice maker, for example if the ice making command is input, the ice maker always carries out the ice making process according to the given command until other commands are input. Or, if the ice making cease command is input, the ice maker promptly ceaces the ongoing ice making process and maintains this state until other commands are input. Alternately, the operation control command relates to an input about the operational time period of the ice maker, it may be composed of a start time for the ice making (for example, hours 08-20) and/or a close time for the ice making (for example, hours 21-07).

[32] Also, the display unit 37 displays information about the operational state of the refrigerator and/or ice maker. That is, the display unit 37 may display information, such as whether the ice maker is in use, the state where the ice making command is input, the state where the ice making cease command is input, or whether the operational time period is set.

[33] Also, the display unit 37 may further display the state of the refrigerator (for example, a preset temperature of the freezing chamber, a preset temperature of the refrigerating chamber, a service mode of the dispenser, current time and date and

weather).

[34] Also, the control unit 38 may serve to control the freezing and refrigeraing processes as welk as the ice making process, however the explanation thereof will be omitted here.

[35] Figure 3 shows a method for ice making, which is accomplished in an ice making system according to a preferred embodiment of the present invention in a flowchart.

[36] Referring to Fig. 3, an ice making mode is on by means of the input command by the user or the reservation command (S10). Further, water supply is started (S11), and the water supply is stopped (S13) after elapsing a predetermined time period (S12).

[37] Specifically, if the water supply process is finished, cold air is supplied into the tray 12 (S14). Further, it is determined that whether the temperature of the tray 12 is dropped below the preset temperature (around - 5°C), as the temperature of the tray 12 is detected by the temperature sensor 39 (S15). Further, if the surface temperature of the tray is dropped below the preset temperature, it is determined that the ice making process is completed and therefore the ejector 14 is rotated (S16). Further, it is determined that the preset time is elapsed (S17), the rotation of the drive motor is stopped when the preset time is elapsed (S18). Here, the preset time refers to a time period that allows the ejector to be rotated for a round in the state that no water is received in the tray 12 or before freezing.

[38] More specifically, it is determined wehther the ejector 14 is returned to its original position within a predetermined time period (S19). And, if the ejector 14 is returned to its original position within the predetermined time period, the display unit 37 may display no water signal, water supply informing signal or water supply valve warning signal (S20), as the control unit 38 concluded that no water is supplied into the tray 12.

[39] As another method, it is also possible to carry out the water supply process (S11) for one more time without displaying the water supply informing signal or warning signal on the display unit 37.

[40] Meanwhile, if the ejector 14 is not returned to its original position within the predetermined time period, that is, in case that the rotation of the ejector 14 is not achieved, the heater starts to operate as it is determined that the ice making process is completed (S21). And, the ejector 14 is rotated simultaneously with or with a certain time lag after the operation of the heater (S22). Specifically, the tray 12 is instaneously heated by operating the heater 33, ice cubes are separated from the tray as the ejector 14 is rotated.

[41] Also, it is determined whether the ejector is returned to its original position (S23), the heater stops to operate as the ice moving process is determined to be completed (S24).

[42] According to the control method, the control unit may determined whether water is supplied into the tray 12, and unnecessary power consumption may be prevented as the

heater is stopped while water is not supplied.

Claims

[1] An ice making system of a refrigerator, comprising:
a tray in which water for making ice is received;
a control unit for determining whether water is supplied into the tray and whether an ice making process is finished;
an input unit for inputting an ice-making command to the control unit;
a water supply unit for supplying water into the tray;
a heater for heating the tray when the ice making process is finished; and
an ejector for separating ice formed in the tray, wherein the heater is selectively operated according to whether water is supplied into the tray or not.

[2] The ice making system according to claim 1, wherein the heater is operated only when water is supplied into the tray.

[3] The ice making system according to claim 2, wherein the heater is operated according to whether the rotation of the ejector is achieved within a preset time period.

[4] The ice making system according to claim 2, wherein the ejector is rotated when the heater is operated,
and wherein the heater stops operating when the ejector is returned to its original position.

[5] A method for ice making of a refrigerator, comprising the steps of:
supplying cold air into a tray as an ice making mode is on;
measuring surface temperature of the tray;
rotating an ejector according to the surface temperature of the tray;
determining whether the ejector is returned to its original position within a preset time period; and
supplying water or operating a heater according to the determined result.

[6] The method according to claim 5, wherein if the ejector is returned to its original position within the preset time period, the water supply process is carried out as it is determined that water is not supplied into the tray.

[7] The method according to claim 5, wherein if the ejector is returned to its original position within the preset time period, water supply signal or water supply error signal is displayed.

[8] The method according to claim 5, wherein if the ejector is not returned to its original position within the preset time period, the heater operates as it is determined that the ice making process is completed.

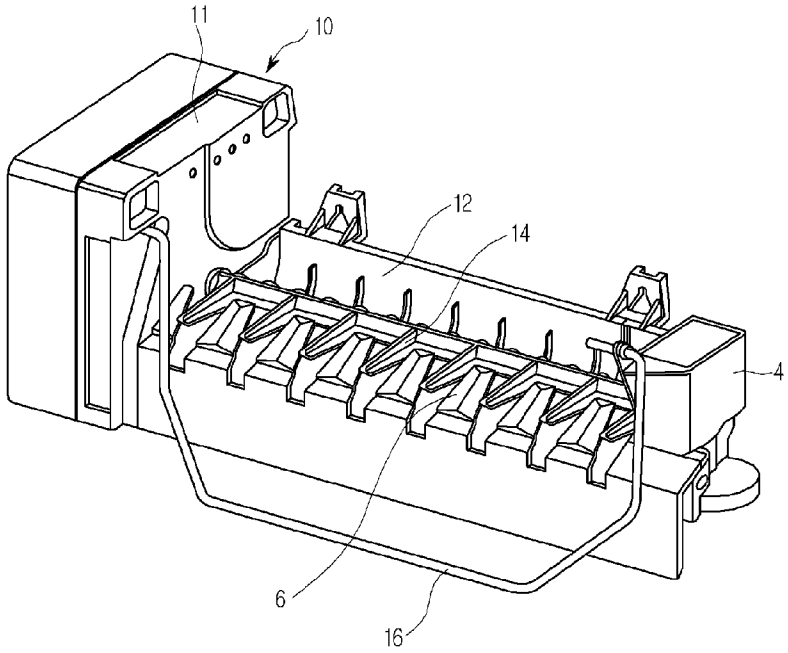
[9] The method according to claim 8, wherein the ejector is rotated as soon as the heater starts to operate.

[10] The method according to claim 8, wherein the heater operates until an ice moving process is completed.

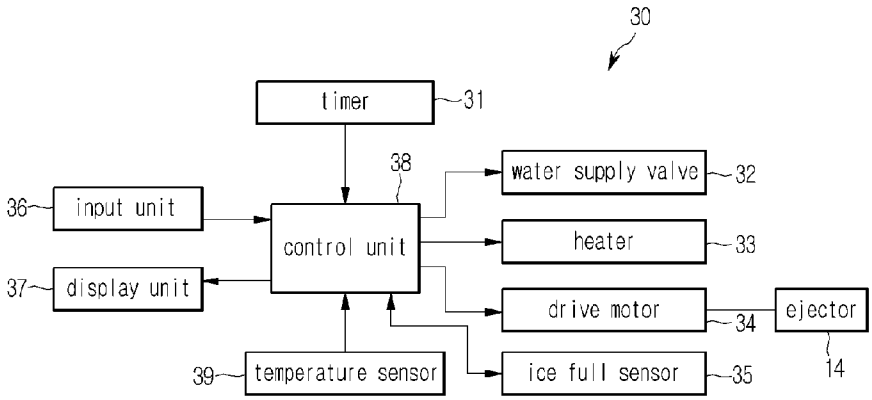
[11] The method according to claim 5, wherein the water supply process is carried out before supplying cold air.

[12] The method according to claim 5, wherein it is determined that the water supply process is completed if a preset time has been elapsed after supplying water.

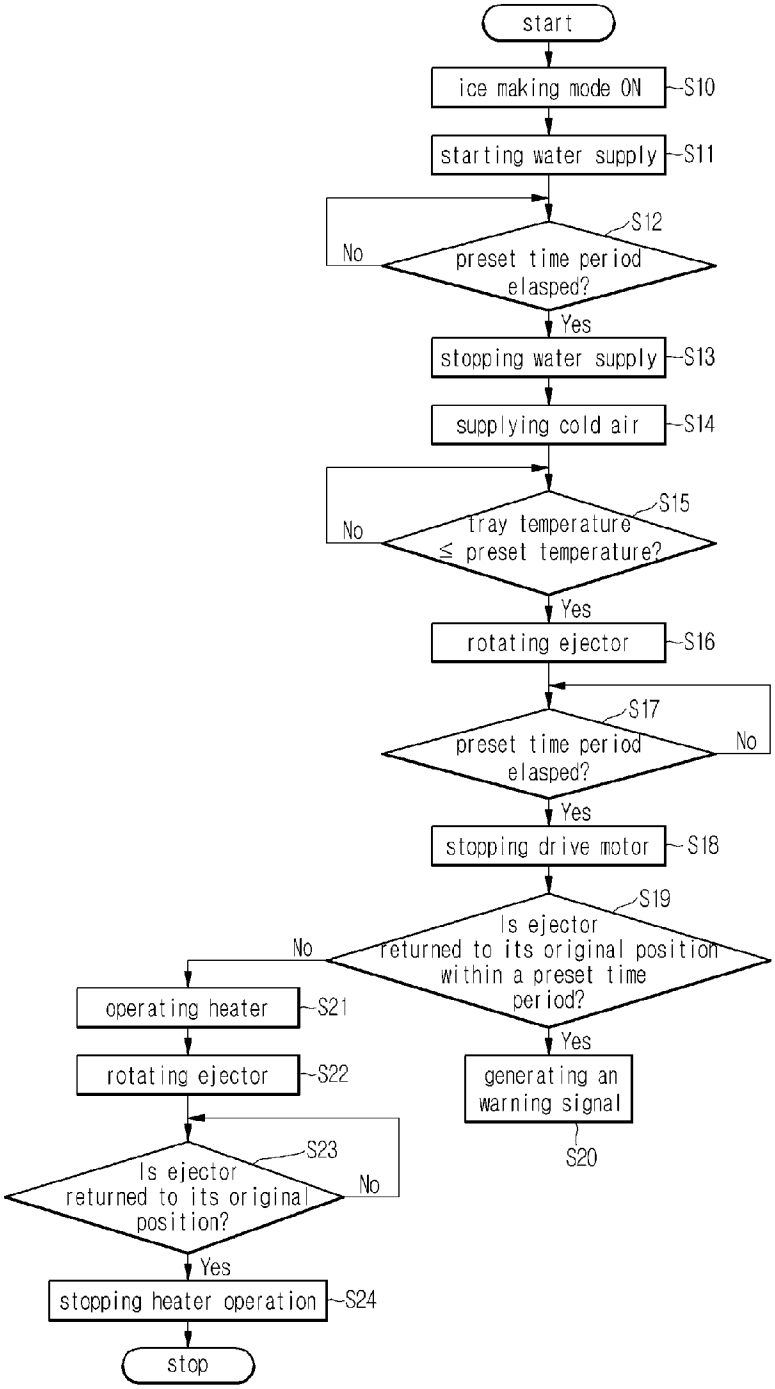
[Fig. 1]


11
10
12
14
4
6
16

[Fig. 2]


30
timer
31
38
water supply valve
32
36
input unit
control unit
heater
33
37
display unit
drive motor
34
ejector
14
39
temperature sensor
ice full sensor
35

[Fig. 3]


start
ice making mode ON
S10
starting water supply
S11
S12
preset time period elasped?
No
Yes
stopping water supply
S13
supplying cold air
S14
S15
tray temperature ≤ preset temperature?
No
Yes
rotating ejector
S16
S17
preset time period elasped?
No
Yes
stopping drive motor
S18
S19
Is ejector returned to its original position within a preset time period?
No
Yes
operating heater
S21
rotating ejector
S22
generating an warning signal
S20
S23
Is ejector returned to its original position?
No
Yes
stopping heater operation
S24
stop

INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2008/001945

A. CLASSIFICATION OF SUBJECT MATTER

F25C 5/08(2006.01)i

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)

IPC 8 : F25C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility model since 1975
Japanese utility models and applications for utility model since 1975

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKIPASS (KIPO Internal) & Keywords: "ice", "making", "heater", and "ejector"

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	KR 10-2007-0021922 A (SAMSUNG ELECTRONICS CO., LTD. et al.) 23 February 2007 See claims 1-13 and figures 1-6	1-12
A	KR 10-2007-0024040 A (LG ELECTRONICS INC.) 2 March 2007 See claims 1-5 and figures 1-6	1-12
A	JP 2006-300482 A (HOSHIZAKI ELECTRIC CO., LTD.) 2 November 2006 See claims 1-8 and figures 1-10	1-12
A	US 5329786 A (WILLIS, J. L. et al.) 19 July 1994 See claims 1-3 and figures 1-10	1-12

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
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"P" document published prior to the international filing date but later than the priority date claimed
"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
"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
"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
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
20 AUGUST 2008 (20.08.2008)	**20 AUGUST 2008 (20.08.2008)**
Name and mailing address of the ISA/KR Korean Intellectual Property Office Government Complex-Daejeon, 139 Seonsa-ro, Seo-gu, Daejeon 302-701, Republic of Korea Facsimile No. 82-42-472-7140	Authorized officer HWANG, Joon Seok Telephone No. 82-42-481-8431

Form PCT/ISA/210 (second sheet) (July 2008)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/KR2008/001945

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
KR 10-2007-0021922 A	23.02.2007	US 2007-039335 A1	22.02.2007
KR 10-2007-0024040 A	02.03.2007	None	
JP 2006-300482 A	02.11.2006	None	
US 5329786 A	19.07.1994	None	