(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 390 602 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
30.11.2011 Bulletin 2011/48

(21) Application number: **11158883.6**

(22) Date of filing: **18.03.2011**

(51) Int Cl.:
F25B 39/04 *(2006.01)* ***F25D 11/02*** *(2006.01)*
F25B 49/02 *(2006.01)*

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(30) Priority: **27.05.2010 TR 201004253**

(71) Applicant: **Vestel Beyaz Esya Sanayi Ve Ticaret A.S.**
45030 Manisa (TR)

(72) Inventors:
- **Aktas, Oner**
  45030, Manisa (TR)
- **Karayilan, Tekin**
  45010, Manisa (TR)
- **Muminoglu, Fatih**
  45030, Manisa (TR)
- **Kayikci, Murat**
  45030, Manisa (TR)
- **Kayikci, Bora**
  45030, Manisa (TR)

(74) Representative: **Cayli, Hülya**
Paragon Consultancy Inc.
Koza Sokak No: 63/2
GOP
06540 Ankara (TR)

(54) A condenser coil unit for cooler devices

(57) The cooler device (A) of the invention comprises at least one cooler compartment (1) and a freezer compartment (2); a single cooling system that adjusts the temperature of all the compartments (1, 2); at least one temperature detector (3) that measures the temperature of the cooler compartment (1); at least one temperature detector (4) that measures the outside temperature; a control unit which is connected to the cooling system and the said detectors (3, 4), and which regulates the operation of the device (A). Located in the evaporator (7) of the device (A), there are separate condenser coil units (8a, 8b) connected to each other which are for the cooler compartment (1) and the freezer compartment (2). In accordance with the outside ambient temperature, the path the cooling fluid takes through the cooler compartment condenser coil unit (8a) can be adjusted.

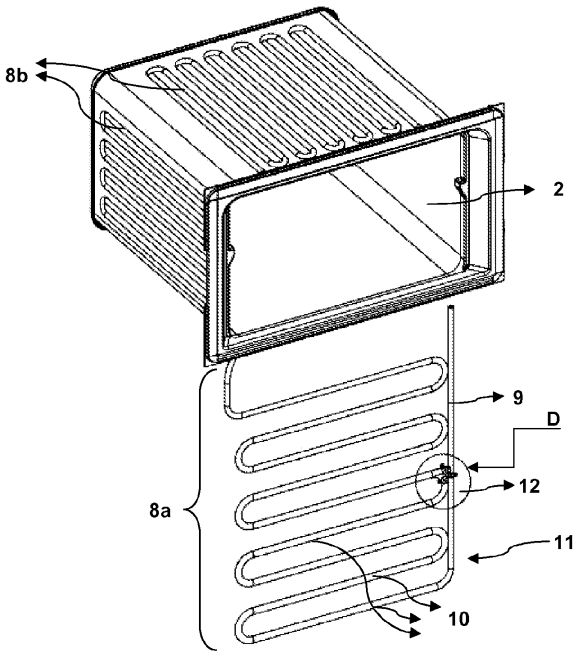

Figure – 2

EP 2 390 602 A2

Description

Technical Field

[0001] This invention relates to cooler devices for food products that have more than one storage compartments and the temperature control of these compartments within said cooler devices.

Background Art

[0002] As it is known, there are usually more than one storage compartments in the cooler devices which are used to store food products. Adjusting the temperature in these compartments which have the functions of cooling and freezing to a desired level in accordance with the cooling capacity of the device and maintaining the temperature at that level has an importance in terms of preserving food.

[0003] For instance, in devices with cooler and freezer compartments, the temperature inside the device is determined by temperature detectors in the cooler compartment and accordingly, the cooling system of the device adjusts its operation. However, when these devices are used in places of low temperature, it is observed that the temperature of the cooling compartment reaches the desired level very quickly, but not in all cases may the desired level of temperature in the freezer compartment be obtained. Especially in cooler devices comprising one cooling system, in which this system controls the temperature of more than one compartment, this situation causes problems.

[0004] In the published patent application EP1344998 of prior art, a cooler device wherein the temperature of cooler and freezer compartments are adjusted by a single cooling system is disclosed. In this cooler device, when needed, an electrical heater in the cooler compartment is activated to decrease the temperature inside to the desired level; the cooling system is reactivated by means of the thermo regulator in this compartment, which detects the increase in the compartment temperature and efforts are made to rapidly decrease the temperature of the freezer compartment. However, these heaters both increase the power consumption and are disadvantageous in financial terms.

Brief Description of the Invention

[0005] This invention is intended for the devices that control the temperature of more than one compartment with one cooling system to reach the desired storage temperature in low ambient temperatures.

[0006] The cooler device of the invention comprises at least one cooler compartment and freezer compartment; a single cooling system that controls the temperature of all compartments; at least one temperature detector for measuring the temperature of the cooler compartment; at least one temperature detector for measuring the outside temperature; and a control unit which relates to the said detectors and regulates the operation of the device. For the cooler compartment and the freezer compartment, there are separate condenser coil units connected to each other, and the path the fluid follows through the cooler condenser coil is controlled by means of isolating valves. The group constituted by these condenser coils is called cooler device evaporator.

[0007] In the invention, if the data obtained from the detector measuring the outer temperature is below the predefined operation threshold limit, the control unit adjusts the condenser coil unit in the cooler compartment and ensures that the fluid in the condenser coil unit flows less. Therefore, while ensuring that the cooler compartment cools in a longer period of time, it provides more time for the freezer compartment to decrease to the desired temperature level at the same time. In other words, with this invention, by shortening the condenser coil unit in the cooler compartment, the cooler compartment is ensured to cool later then usual.

Aim of the Invention

[0008] The aim of this invention is to provide a system for the storage of food products, which cools more than one compartment with a single cooling system and adjusts the temperature of the compartments in the cooler devices.

[0009] Another aim of the invention is to create a system which adjusts the temperature of the compartments to the desired level when the cooler device is used in low ambient temperatures.

[0010] One other aim of the invention is to create a condenser coil unit which has an adjustable cooling capacity in order to adjust the temperatures of cooler and freezer compartments in the said cooler device.

[0011] Another aim of the invention is to provide a cooler device which is safe, simple and cheap to produce.

Description of the Figures

[0012] An exemplary cooler device of the invention and the said condenser coil unit is illustrated in the accompanying figures, wherein;

Figure 1 is a general view of the device.
Figure 2 shows a general perspective view of the condenser coil units in the cooler device.
Figure 3 is a detailed view of a part of Figure.2.

[0013] All parts represented in the figures are each assigned individual reference numerals which are listed as below:

Cooler device (A)
Cooler compartment (1)
Freezer compartment (2)
Temperature detector (3)

Temperature detector (4)
Condenser (5)
Compressor (6)
Evaporator (7)
Cooler compartment condenser coil unit (8a)
Freezer compartment condenser coil unit (8b)
Return pipe (9)
Isolating valve (9a)
Main condenser coil pipe (10)
Isolating valve (10a)
End point (11)
Intermediate coupling point (12)
Transition pipe (13)
Isolating valve (13a)
Detail point (D)

Disclosure of the Invention

[0014] The cooling device (A) of the invention, used to store the food products, has the feature of adjusting the temperature of more than one compartment (1, 2) with one cooling system. The said cooler device (A) of this invention, comprising especially at least one cooler and freezer compartments (1, 2), operates in a way that the temperature of the freezer compartment (2) is lower than the temperature of cooler compartment (1). The device (A) has at least one temperature detector (3) that adjusts the temperature of the cooler compartment (1) and is located in this compartment (1). In accordance with the value the temperature detector (3) measures, the device control unit to which said detector (3) is connected (not shown in the figure but regulates the device (A)) operates the cooling system of the device (A) until the temperature of the cooler compartment (1) decreases to the desired level and stops when it reaches the desired level.

[0015] The cooling system of the device (A) is a system using units such as a compressor (6), a condenser (5), and an evaporator (7). The cooling system whose capacity and operation period is adjusted by the control unit of the device (A) cools both the freezer compartment (2) and the cooler compartment (1) at the same time. In this cooling system, separate condenser coil units (8a, 8b) are used for cooler compartment (1) and freezer compartment (2), wherein these condenser coil units (8a, 8b) are connected to each other. In other words, the cooling fluid going through one condenser coil unit (8a or 8b) goes through the other condenser coil unit (8a or 8b), and then returns to the compressor (6) and goes on operating its cooling cycle. Each condenser coil unit (8a, 8b) comprises of at least one pipe with successive inflections which provide the most optimum path for the cooling fluid to boost its cooling performance. The cooling fluid, while going through a condenser coil unit (8a, 8b) cools the compartment it flows through by the surfaces of contact it creates in the cooler compartment (1) and the freezer compartment (2).

[0016] Under normal conditions, when the temperature of the cooler compartment (1) decreases to the desired level (according to the level the temperature detector (3) measures in the cooler compartment (1)), the cooling system stops and therefore, it would not be possible for the freezer compartment (2) to cool more. When the cooler device (A) operates in low ambient temperature, the temperature of the cooler compartment (1) can quickly be decreased to the desired level. However, within this short period of time, there are cases when the freezer compartment (2) cannot be adjusted to the desired temperature. In this situation, by using at least one temperature detector (4) to detect the temperature level outside the device (A), the operation of the device (A) in regulated according to the low ambient temperature. Hence, via the data coming from the temperature detector (4) measuring the outside temperature (or by controlling the operation frequency of the compressor (6) by control unit), the control unit, interrupting the condenser coil unit (8a) in the cooler compartment (1), ensures that it takes a shorter path by changing the path the cooling fluid in the condenser coil unit (8a) takes. Therefore, while ensuring that the cooler compartment (1) cools later than usual; it also buys time for the temperature in the freezer compartment (2) to decrease to the desired level. To put it in other words, with this invention, by shortening the path the fluid in the condenser coil unit (8a) takes (in this way, the capacity of the unit (8a) is decreased), it is ensured that the cooler compartment (1) cools later than usual. In Figures 2 and 3, details of the necessary design for the operation of this feature of the device (A) are disclosed.

[0017] In Figure 2, a general perspective view of the condenser coil units (8a, 8b) provided in the said device (A) is given. According to that, one of these units (8b) is used for a freezer compartment (2) while the other (8a) is used for a cooler compartment (1). With this invention, there has been some changes in the condenser coil unit (8a) located in the cooler compartment (1), the details of which is shown in Figure 3.

[0018] As shown in Figure 2-3, the cooling fluid coming through the freezer compartment condenser coil unit (8b) reaches the return pipe (9) by going through a main condenser coil unit pipe (10) the further path of which is extended via sequenced inflections. So, the fluid flowing through the return pipe (9) completes the path it takes in the evaporator (7). The main condenser coil unit pipe (10) is connected to the return pipe (9) both by the end point (11) and by at least one intermediate coupling point (12). The cooling liquid entering the cooler compartment condenser unit (8a) from the freezer compartment condenser coil unit (8b) goes from the end point (11) through the return pipe (9) in the normal operation process of the device (A). In case of the device's (A) operating in low ambient temperature, the cooling fluid reaches the return pipe (9) via the intermediate coupling point (12) and thus, it is ensured that the fluid goes through one part of the condenser coil unit (8a) instead of the whole. Hence, the cooling capacity of the condenser coil unit (8a) is decreased. This, as mentioned above, provides more time

for the freezer compartment (2) to be cooled.

[0019] In Figure 3, the structural details of the intermediate coupling point (12), shown as detail point (D) in Figure 2, are shown. In this coupling point (12), there is a transition pipe (13) where the return pipe (9) unites with the main condenser coil unit pipe (10). In this pipe (13), there is an isolating valve (13a) that controls the flow of the fluid from the main condenser coil unit (10) to the return pipe (9). Apart from that, there is also one more isolating valve (9a) controlling the flow between the end point (11) and the return pipe (9). In addition to that, in the main condenser coil unit pipe (10), in a part after the transition pipe (13), there is another isolating valve (10a) regulating the flow of the fluid in the main condenser coil unit pipe (10).

[0020] Under normal operation conditions of the device (A), the cooling fluid moves inside the condenser coil unit (8a) in a direction of "Y" as shown in figure 3. This movement is ensured provided that the valves (9a, 10a) on the return and main pipes (9, 10) are open and the valve (13a) in the transition pipe is closed. With the "Y" directed flow, the fluid circulates the whole condenser coil (8a).

[0021] If the device (A) is at low ambient temperature, the cooling liquid moves inside the said condenser coil unit (8a) in the direction of "Z" as shown in figure 3. This movement is ensured provided that the valves (9a, 10a) on the return and main pipes (9, 10) are closed; the valve (13a) in the transition pipe (13) is open. With the "Z" directed flow, the fluid follows a shorter path in the condenser coil (8a).

[0022] As mentioned above, the capacity of the condenser coil unit (8a) in the cooler compartment (1) is adjusted by the help of the control unit. The valves (9a, 10a, 13a) used for this objective are similar to the electrical isolating valves (for instance, solenoid valves). The control unit adjusts the condenser coil unit (8a) by taking into consideration the value measured by the outer temperature detector (4) and the operation frequency of the compressor (6) (the compressor (6) operates less frequently at low ambient temperatures). By allowing the user to have options on the control unit when desired, the adjustment of condenser coil unit (8a) can be rendered optional.

Claims

1. A cooling device (A) for food products; comprising at least one cooler compartment (1) and a freezer compartment (2); a single cooling system comprising involves a compressor (6), a condenser (5) and an evaporator (7) and which adjusts the temperature of all compartments (1,2); at least one temperature detector (3) that measures the temperature of the cooler compartment (1); at least one temperature detector (4) that measures the outside temperature; a control unit which is connected to the cooling system and the said detectors (3, 4) and which regulates the operation of the device (A), **characterized in that** it comprises separate condenser coil units (8a, 8b) connected to each other for the cooler compartment (1) and the freezer compartment (2), and that the path the cooling fluid takes which goes through the cooler compartment condenser coil unit (8a) is adjustable in accordance with the outer ambient temperature.

2. A cooling device (A) according to Claim 1, **characterized in that** the said condenser coil unit (8a) comprises a main condenser coil unit pipe (10) whose path is extended with successive inflections; and a return pipe (9) which is connected to the main condenser coil unit pipe (10) both by the end point (11) and at least one intermediate coupling point (12).

3. A cooling device (A) according to Claim 2, **characterized in that** the cooling fluid flowing through the main condenser coil unit pipe (10) gets into the return pipe (9) from the end point (11) under normal operation conditions.

4. A cooling device (A) according to Claim 2, **characterized in that** the cooling fluid flowing through the main condenser coil pipe (10) goes into the return pipe (9) from the intermediate coupling point (12) under low outer temperature conditions.

5. A cooling device (A) according to Claim 2, **characterized in that** it comprises a transition pipe (13) connecting the return pipe (9) with the main condenser coil pipe (10) on the main intermediate coupling point (12).

6. A cooling device (A) according to Claim 5, **characterized in that** it comprises an isolating valve (13a) which controls the flow of the cooling fluid from the main condenser pipe (10) to the return pipe located in the transition pipe (13); an isolating valve (9a) which controls the transition of the cooling fluid from the end point (11) to the return pipe (9) located in the return pipe (9); an isolating valve (10a) which regulates the flow of the fluid in the main condenser coil pipe (10), in the next part after the transition pipe (13).

7. A cooling device (A) according to claim 6, **characterized in that** under normal operation conditions of the device (A), the valves (9a, 10a) located in the main condenser coil and the return pipes (10, 9) are open; the valve (13a) located in the transition pipe is closed.

8. A cooling device (A) according to claim 6, **characterized in that** under low outside ambient temperatures, the valves (9a, 10a) located in the main con-

denser coil and return pipes (10, 9) are closed; the valve (13a) located in the transition pipe is open.

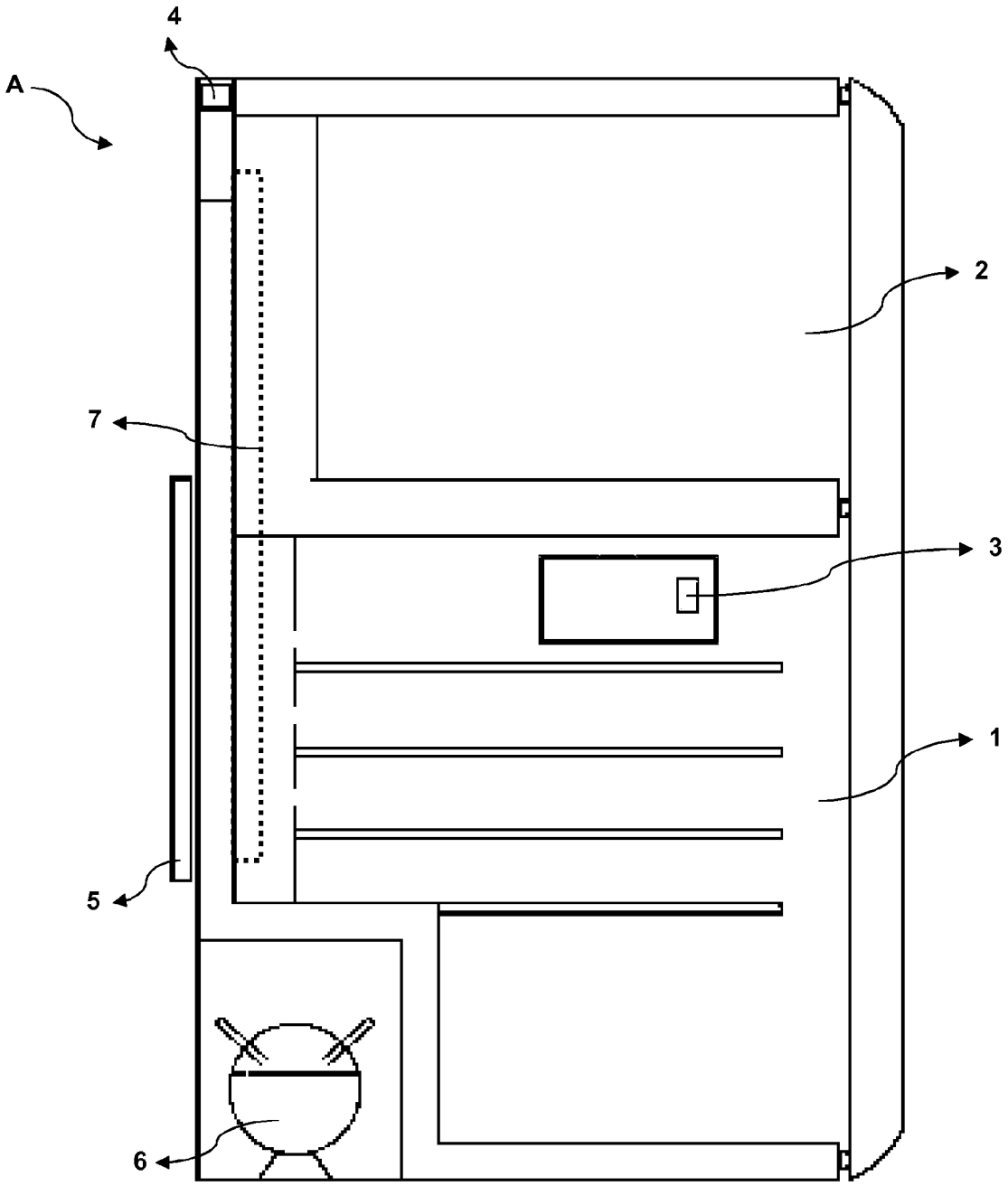

Figure – 1

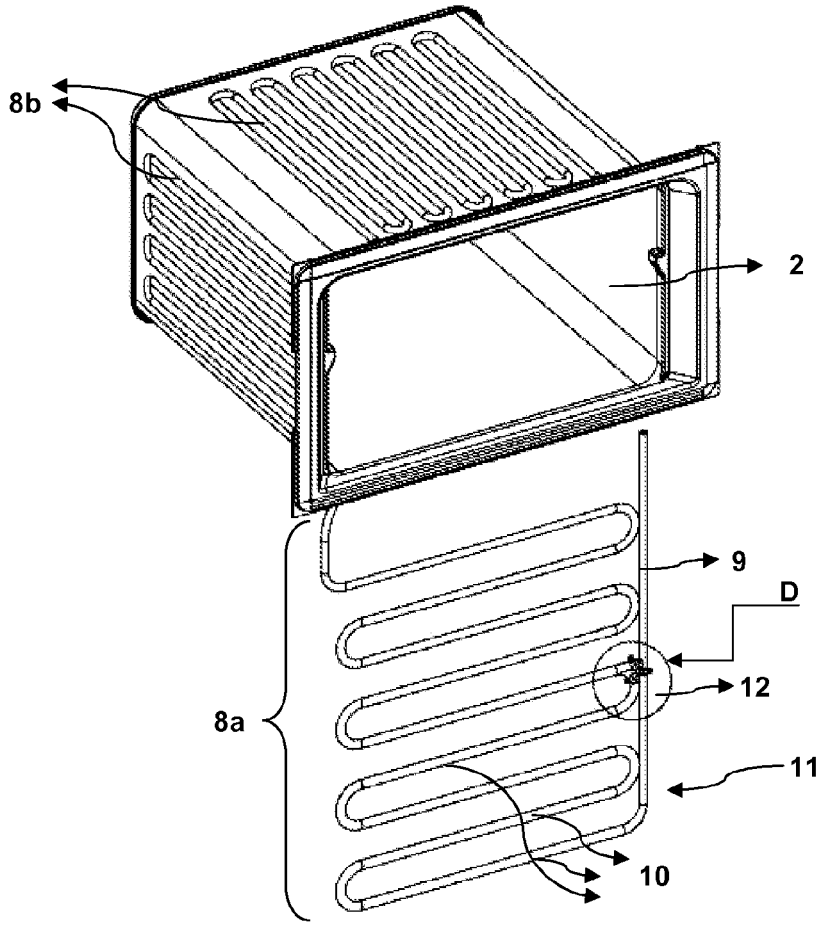

Figure – 2

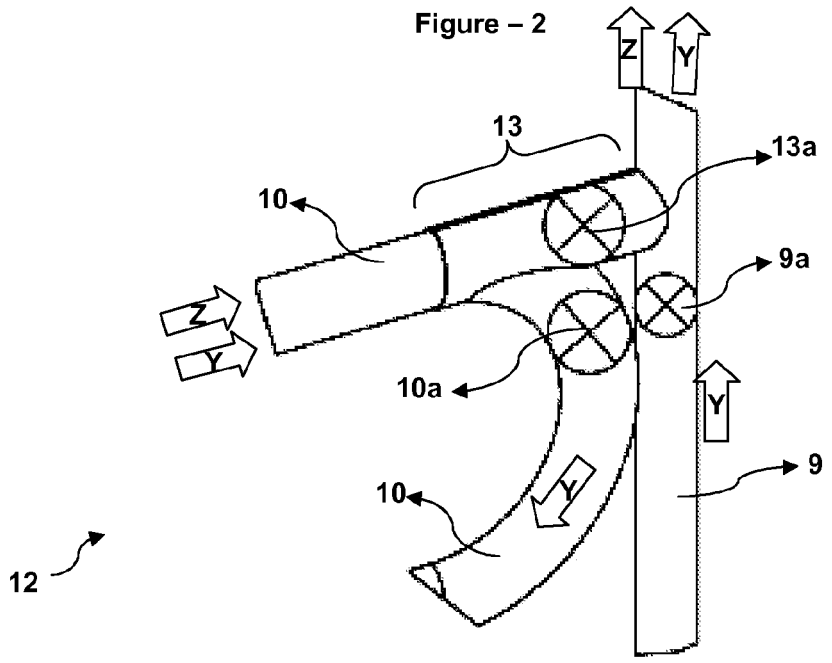

Figure – 3

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- EP 1344998 A **[0004]**