



(51) International Patent Classification:
F25B 43/00 (2006.01)

(21) International Application Number:
PCT/EP201 1/056524

(22) International Filing Date:
26 April 2011 (26.04.2011)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
2020/CHE/2010 15 July 2010 (15.07.2010) IN

(71) Applicants (for all designated States except US):
ROBERT BOSCH GMBH [DE/DE]; Postfach 30 02 20,
70442 Stuttgart (DE). **Bosch Limited** [IN/IN]; Post Box
No 3000, Hosur Road, Adugodi, Bangalore 560030 (IN).

(72) Inventor; and

(75) Inventor/Applicant (for US only): **VENKATESH, Gk**
[IN/IN]; Bosch Limited, Post Box No 3000, Hosur Road,
Adugodi, Bangalore 560030 (IN).

(74) Common Representative: **ROBERT BOSCH GMBH**;
Postfach 30 02 20, 70442 Stuttgart (DE).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— without international search report and to be republished upon receipt of that report (Rule 48.2(g))

(54) Title: A METHOD TO INDICATE FILTER REPLACEMENT IN A REFRIGERANT RECOVERY AND RECHARGE DEVICE

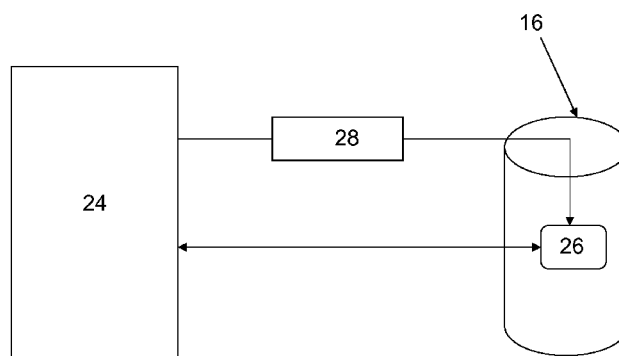


FIGURE 2

(57) Abstract: A method to indicate filter replacement in a refrigerant recovery and recharge device (10) and a refrigerant recovery and recharge device (10) is disclosed. The device (10) is adapted to be connected to a refrigeration equipment (12). The device (10) comprising a filter (16) adapted to filter said refrigerant and removal contaminants in said recovered refrigerant. The filter (16) comprising a fuse (26) adapted to indicate when the filter (16) should be replaced.

Title

A method to indicate filter replacement in a refrigerant recovery and recharge device.

This invention related to a method to indicate filter replacement in a refrigerant recovery and recharge device.

State of the art:

US patent publication numbered 20080000240 discloses a refrigerant filter change indication method. For the purpose of indicating that the filter d checking the life of the filter the volumetric flow of refrigerant in the filter is checked. When the amount of refrigerant flowing through the filter has crossed a certain limit it is indicated that the filter should be replaced.

Advantages of the invention

The method to indicate filter replacement in a refrigerant recovery and recharge device according to the independent claims have the following advantages.

Brief description of the accompany drawings:

Different modes of the invention are disclosed in detail in the description and illustrated in the accompanying drawing:

Figure 1 illustrates a Refrigerant recovery and recharge device with various components; and

Figure 2 illustrates a block diagram representing the devices involved in indicating filter replacement.

Detailed description:

Figure 1 illustrates a refrigerant recovery and recharge device 10 with various components. While recovering and recharging refrigerant the refrigerant recovery and recharge device 10 is connected to a refrigeration equipment 12. The refrigerant recovery and recharge device 10 comprises at least a valve block 14 which establishes a connection between the refrigeration equipment 12 and the refrigerant recovery and recharge device 10. A filter 16 is present in the refrigerant recovery and recharge device 10. The filter 16 helps to trap moisture or other particulate matter which may be present in the refrigerant while recovering the refrigerant from the refrigeration equipment 12. The refrigerant then passes through a compressor 18 and is stored in a refrigerant storage tank 20. Refrigerant storage tank 20 is placed on a load cell 22 to check the weight of the refrigerant recovered. The refrigerant recovery and recharge device 10 has a controller 24 means which is used to electronically control the working of the valve block 14, the filter 16, the compressor 18 and the refrigerant storage tank 20. In figure 1 the darker connection between the controller 24 and the other components indicates that data communication takes place between the controller and the other components of the refrigerant recovery and recharge device 10.

In refrigerant recovery and recharge devices filters are employed for the removal of moisture, particulate matter and the like. The removal of moisture, particulate matter and the like is done when the refrigerant passes through the filter. After many cycles of refrigerant recovery from the refrigeration equipment it is observed that the filter becomes less effective which may be because the filter element may get saturated and non-functional. The saturation and non-functionality of the filter may result in particulate matter being conveyed to the remaining components of the refrigerant recovery and recharge device. This may

in turn effect the working of those components and reduce the life of the components.

Hence there is need that the filter should be replaced periodically when the effectiveness of the filter reduces beyond a certain limit. However the filter should be randomly replaced. In certain cases it is possible that the filter element is replaced before the filter element gets saturated. This would increase the cost of working refrigerant recovery and recharge device. Thus it is essential that the filter be replaced only after a certain amount of refrigerant has passed through the filter.

In conventional devices which measure the amount of refrigerant that has passed through the filter. Volumetric flow of the refrigerant through the filter may be measured using a mass flow meter which is used to measure the volume of the refrigerant that flows through the filter. Once certain volume of the refrigerant has passed through the filter the refrigerant recovery and recharge device indicates that the filter should be replaced. The indication may be audio or visual or the like indication.

In accordance with this invention there is provided a filter for use in a refrigerant recovery and recharge device and a method for indicating that the filter should be replaced. Figure 2 illustrates a block diagram representing the devices involved in indicating filter replacement. The filter 16 comprises a fuse 26 which is used to check if the filter needs to be replaced. The controller 24 is adapted to send a signal to a fuse blow circuit 28. The fuse blow circuit 28 may be external as shown in figure 2 or may be integral part of the controller 24. The fuse blow circuit 28 renders the fuse 26 inoperative when the signal is received from the controller 24. When the fuse 26 is rendered inoperative an audio and /or visual indication indicating that the filter 16 should be replaced is provided in the refrigerant recharge and recovery device 10.

The working of the filter and the method of indicating filter replacement will be explained hereinafter. In one embodiment of the invention the amount of refrigerant that has passed through the filter 16 is determined by the weight of the refrigerant storage tank 20. A load cell 22 is normally used to measure the weight of the refrigerant that is recovered. Depending on the weight of the refrigerant recovered, the amount of refrigerant flowing through the filter 16 is monitored. If the amount of refrigerant recovered either over one cycle of recovery or many cycles of recovery is higher than a set limit, then this indication is provided to the controller in the refrigerant recovery and recharge device 10. The controller 24 in the refrigerant recovery and recharge device 10 sends a signal to the fuse blow circuit 28 to render the fuse 26 inoperative. Before continuing the recovery in the next cycle the controller 24 in the refrigerant recovery and recharge device 10 checks if the fuse 26 is intact. If the controller 24 encounters that the fuse 26 is blown out then controller 24 not only provides an indication of the same but also completely stops the working of the refrigerant recovery and recharge device 10. The indication to replace the filter may be in the form of a warning light glowing on the front panel of the refrigerant recovery and recharge device 10 with a audio beep type warning or a voice command indicating that the filter should be replaced.

The working of the refrigerant recovery and recharge device 10 is resumed only after a new filter 16 is fitted into the refrigerant recovery and recharge device 10. Even after the new filter 16 is installed in the refrigerant recovery and recharge device 10 the controller 24 checks if the fuse 26 is intact. If the fuse 26 is not intact it is an indication that the filter 16 being used does not match the requirement of the refrigerant recovery and recharge device 10 and it should be replaced. In such a case the working of the refrigerant recovery and recharge device 10 remains stopped or suspended. When the controller 24 recognizes that the fuse 26 is present it is an indication that the filter 16 being installed is new.

Thus the controller 24 not only provides an indication when the filter should be replaced but also an indication if the filter 16 being used is in proper working condition to be effective for filtering contaminants from the refrigerant.

In accordance with another embodiment of this invention there is also provided a mass flow meter which measures the mass of the refrigerant that flows through the filter. Based on the reading of the amount of refrigerant flowing through the filter an indication if the filter 16 should be replaced or not is provided by the controller in the refrigerant recovery and recharge device 10.

It should be understood that the embodiment of the invention as shown in the diagram is only illustrative and does not restrict the scope of this invention. The scope is clearly defined in the claims and the specification is used to explain the working of the invention.

Claims:

1. A method to indicate filter replacement in a refrigerant recovery and recharge device (10), said method comprising the following steps:
 - (i) connecting said refrigerant recovery and recharge device (10) to a refrigeration equipment (12) through a valve block (14);
 - (ii) recovering refrigerant from said refrigeration equipment (12), said refrigerant flowing through said filter (16) while recovery;
 - (iii) measuring refrigerant flowing through said filter (16);
 - (iv) rendering the filter (16) inoperative if amount of refrigerant recovered exceeds a limit;
 - (v) indicating that said filter needs replacement when said filter (16) is rendered inoperative.
2. The method as claimed in claim 1, wherein rendering the filter (16) inoperative involves making the fuse (26) inoperative.
3. The method as claimed in claim 1 and 2, wherein said refrigerant recovery and recharge device (10) is inoperative by making the fuse (26) inoperative.

4. The method as claimed in claim 3, wherein said refrigerant recovery and recharge device (10) is operative only when said inoperative filter (16) is replaced with a new filter (16) with a new fuse (26).
5. A refrigerant recovery and recharge device (10) using the method as claimed in claim 1, said device adapted to be connected to a refrigeration equipment (12), said device (10) comprising at least:
 - (i) a valve block (14) adapted to establish connection between the refrigerant recovery and recharge device (10) and the refrigeration equipment (12) and recover refrigerant;
 - (ii) a compressor (18) adapted to compress said recovered refrigerant;
 - (iii) a refrigerant storage tank (20) adapted to store said compressed recovered refrigerant; and
 - (iv) a controller (24) adapted to control the working of said valve block (14), said compressor (18) and said refrigerant storage tank (20);characterized in that, said device (10) comprising a filter (16) adapted to filter said refrigerant and removal contaminants in said recovered refrigerant, said filter comprising a fuse (26) adapted to indicate when the filter should be replaced.
6. The device as claimed in claim 5, wherein said device comprises a load cell (22) adapted to measure the weight of the refrigerant recovered from said refrigeration equipment (12) by said refrigerant recovery and recharge device (10)
7. The device as claimed in claim 6, wherein filter replacement indication is provided in dependence of amount of refrigerant recovered.

8. The device as claimed in claim 7, wherein said device comprises a flow meter adapted determine the amount of refrigerant flowing through said filter (16).
9. The device as claimed in claim 8, wherein filter replacement indication is provided in dependence of weight of refrigerant recovered.
10. The device as claimed in claim 5, wherein said device comprising a filter replacement indicator, said filter replacement indicator being a audio or visual indicator.

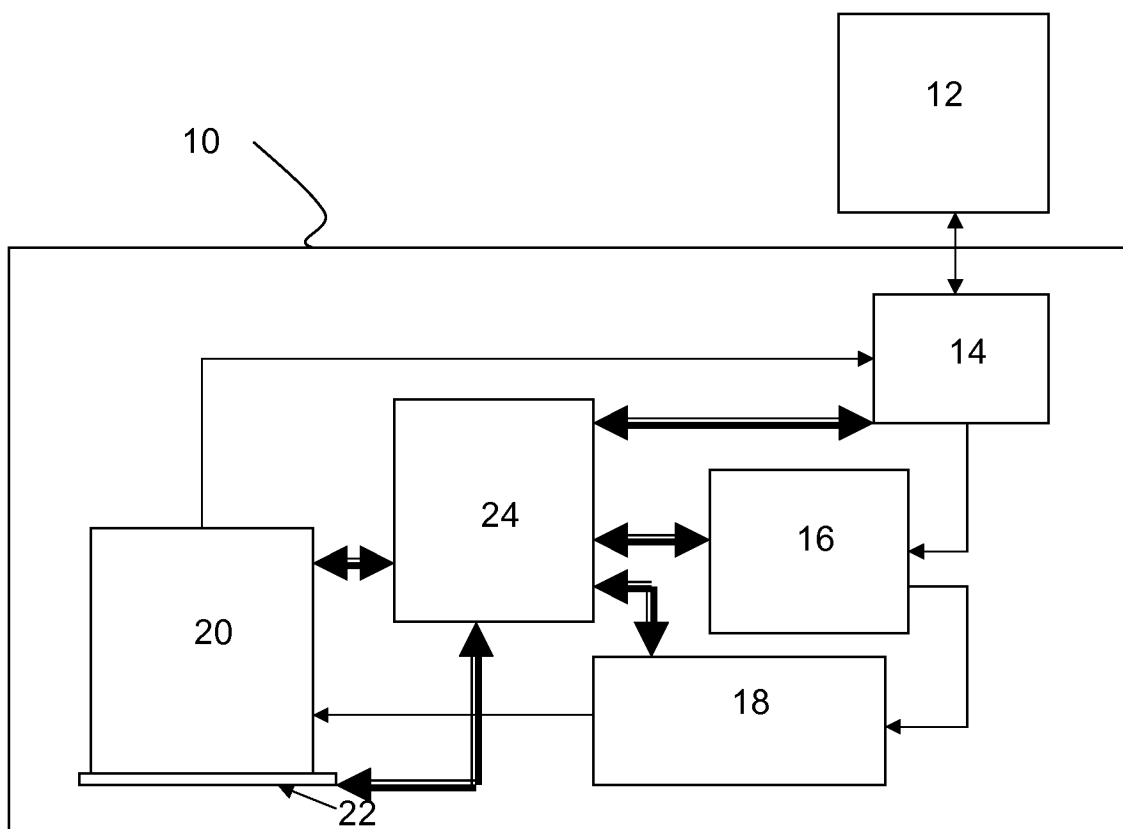


FIGURE 1

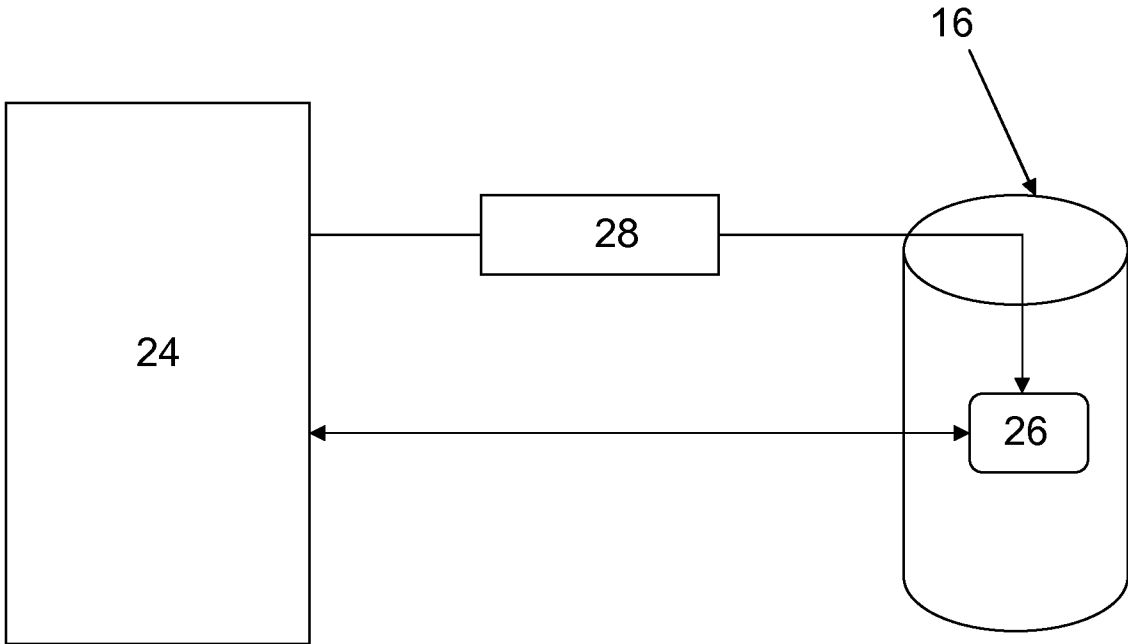


FIGURE 2