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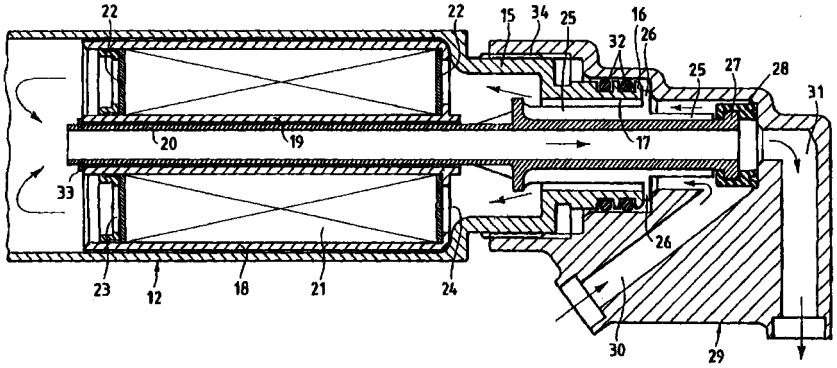
(54) Refrigeration dehydration filter

(57) A refrigerant dehydration filter has an external tube (11,12) sealed at one end to define a return cavity. An internal tube (20) is provided coaxially with the external tube (11,12) and a first external connection (30) is made to the external tube (11,12) with a second external connection (31) being made to the internal tube (20) to facilitate the transfer of refrigerant between the tubes. At least one of the tubes includes desiccating material (21). Preferably, the desiccating material (21) is contained within the external tube (11,12) and the external tube (11,12) provides a substantially larger cross-sectional area compared to the internal tube (20).

Fig.2



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Description

[0001] The present invention relates to a dehydrating filter and a method of assembling such a filter.

[0002] It is well known that air conditioning and/or refrigeration plants need a filter to separate contaminating water from refrigerant and to trap various particles and other impurities. Dehydrating filters are known and are designed primarily to remove water from the refrigerant.

[0003] As used herein, the term "refrigeration system" also includes air conditioning systems and heat pumps etc and the term "refrigerant' should be understood to extend to fluids used in all these types of equipment.

[0004] Compact filters are known in which an input hole into the filter and an output hole from the filter are found on a common base in order to present a compact design and to suit preferred applications. Alternatively, filters are known in which these holes are arranged in different orientations due to their specific intended application. In both of these known examples, assembly problems can occur due to the requisite complexity of the known structures. It is also known for problems to exist in terms of seals. Current models have a degree of structural complexity due to the number of components present. Consequently, this leads to assembly problems with a requirement for many components to be located during the assembly process.

[0005] According to a first aspect of the present invention, there is provided a refrigerant dehydration filter, comprising an external tube sealed at one end to define a return cavity; an internal tube coaxial with said external tube; a first external connection to said external tube and a second external connection to said internal tube to facilitate a transfer of refrigerant between said tubes, wherein at least one of said tubes includes desiccating material.

[0006] In a preferred embodiment, the desiccating material is contained in the external tube and preferably the external tube provides a substantially larger cross-sectional area compared to the cross-sectional area of the internal tube. Preferably, an input flow is directed to said external tube and a return flow is received from said internal tube.

[0007] The present invention will now be described by way of example only, with reference to the accompanying drawings, of which:

Figure 1 is longitudinal side elevation of a dehydrating filter embodying the present invention;
Figure 2 is an enlarged sectional view of part of the filter shown in *Figure 1*; and
Figure 3 is a transverse section of a portion of the filter shown in *Figure 2*.

[0008] A dehydrating filter embodying the present invention is illustrated in *Figure 1*. The filter has a hollow external casing **11**, **12** of a cylindrical shape, in two interconnecting sections. The first of said sections **11** is substantially cup-shaped and is formed from an aluminium extrusion with a relatively thick base portion **13**. Section **11** acts as a cover for a second section **12**, constituting a major portion of the device.

[0009] The second section **12** also has a cylindrical body, open at one end and designed to couple up with the first section **11** by means of soldered joint **14**. The other end of the second section **12** is restricted by a pair of coaxial sleeve sections **15**, **16** that terminate in a hole **17.** The second section **12** houses a filter capsule within its cylindrical volume. This capsule comprises a cup section **18** of cylindrical shape with an external diameter that can fit within the internal diameter of the section of the hollow external casing **12**. The cup **18** has a coaxial tubular section 19 through which a tubular insert **20** passes.

[0010] A free annular space is provided between the external surface of the coaxial tubular section **19** and the internal surface of the cup section **18**. This annular space is filled with a desiccating material **21** located between two annular felt discs, in the form of a cylindrical sandwich but having a hole down its middle. On the other side of the felt washers there is provided at one end a drilled stopper **23**, turned towards the centre of the casing, while at the other end is the drilled base **24** of the cup section **18**.

[0011] The tubular insert **20** passes into the coaxial tubular section **19** of the cup **18** starting off as a plain tubular section and then becoming a toothed or splined section **25** that extends towards the second sleeve **16** of the second part **12** of the casing, passing into it. The outward facing spline end **25** on the tubular insert **20** has an expanded section **26** which abuts the end of the sleeve section **16** preventing the tubular insert **20** from dropping inside the second part of the casing. The end of the tubular insert **20** has an enlarged diameter **27** onto which a gasket **28** is positioned. The gasket **28** prevents the input fluid from mixing with the output fluid from the filter when it is positioned within the base **29** of a condenser in line with a fluid input channel **30** and fluid output channel **31**, as shown in *Figure 2*. A seal is also ensured due to the provision of two O-ring seals **32** mounted beyond the sleeve section **16**.

[0012] The end of the tubular insert **20** facing the inside of the casing has a locating ring or similar **33** that keeps the capsule in position with respect to the tubular insert **20**. The filter has input channels between the internal surfaces of the sleeve section **16** and the splines **25** on the tubular insert **20**. These channels lead into sleeves **15** before passing through the drilled base **24** of the bucket section **18**. Subsequently, the input fluid is admitted into the first felt washer **22**, passing through the desiccating material **21** before reaching the second felt washer **22** followed by the drilled stopper **23** and escapes into the casing **11**, **12**. The fluid moves unimpeded into the open free end of the tubular insert

20 and passing through it escapes at the other coaxial end through the seal **27**. It can be seen that the input and output channels are coaxial and therefore the filter is particularly compact and straightforward.

[0013] Locating ring **33** enables the very rapid assembly of the components of the filter. For example, the casing **11**, **12** is formed in aluminium, while tubular insert **20** is fabricated in a plastic material, such as polyamide and is relatively straightforward to manufacture, The gasket is in hydrogenated nitrile to create a seal.

[0014] During manufacture, the external cylindrical casing is obtained by extrusion with a similar process being used to produce a second section **12** that completes the casing for the filter. Next, the felt washer **22** is inserted into the cup section **18** up against the drilled base **24**. The annular space is then filled with the desiccating material **21** and the second felt washer **22** is positioned in the cup section **18** to contain the desiccating material. Finally, the drilled stopper **23** is put in place by pressing it into the cup section **18**. The capsule is therefore ready to be assembled into the complete filter.

[0015] The second section of the extruded cylindrical casing forms sleeve sections **15**, **16** in an extruded body in aluminium. External threading of this sleeve section **18** is then carried out thereby allowing the filter to be positioned into the hole **29**.

[0016] This is then followed by a greasing stage then the tubular insert **20** is located into hole **17** of the second section **12** of the casing until the widened part **26** of the splines **25** is up against the end of the sleeve section **16** which prevents the tubular insert from entering the second section **12** of the casing.

[0017] The constructed capsule is inserted into the tubular insert **20** and held in place with locating ring **33**. The casing is then assembled by soldering the two sections once they have been brought together at **14**. This is done by fitting the two sections **11**, **12** together and creating an annular solder joint.

[0018] The two O-ring seals are fitted on the external surface of the sleeve section **16**. A ring type gasket **28** is fitted on the large diameter end section **27** of the tubular insert **20**. Once the assembly is completed, an air-tightness test is performed to ensure that performance can be guaranteed in use.

Claims

1. A refrigerant dehydration filter, comprising

an external tube sealed at one end to define a return cavity;
an internal tube coaxial with said external tube;
a first external connection to said external tube and a second external connection to said internal tube to facilitate a transfer of refrigerant between said tubes, wherein
at least one of said tubes includes desiccating material.

2. A dehydration filter according to claim **1**, wherein said desiccating material is contained in said external tube.

3. A filter according to claim **1** or claim **2**, wherein said external tube provides a substantially larger cross sectional area compared to the cross-sectional area of said internal tube.

4. A filter according to any of claims **1** to **3**, wherein an input flow is directed to said external tube and a return flow is received from said internal tube.

5. A filter according to claim **1**, wherein said tubes have a cylindrical cross-section.

6. A filter according to any of claims **1** to **5**, including a tubular insert having an externally splined area.

7. A filter according to claim **6**, in which an outward facing splined end of said tubular insert has a widened end that abuts the end of a sleeve section.

8. A filter according to any of claims **1** to **7**, wherein a tubular insert is terminated with an enlarged diameter end on which a gasket is positioned.

9. A filter according to any of claims **1** to **8**, with termination fittings of a tubular insert of a casing section comprising at one end a locating ring positioned between said tubular insert and said capsule, with the other end widened to abut the end of the sleeve section.

10. A filter according to any of claims **1** to **9**, arranged as a sandwich within a cup section with a drilled bottom end assembled in sequence with an initial felt washer, said desiccating material, a second felt washer and a drilled stopper.

11. A method of manufacturing a refrigerant dehydration filter according to any of claims **1** to **10**, by performing the steps of:

obtaining a hollow external casing and the component parts of said filter;
producing a second section of this extruded casing creating sleeve sections with external threading to one of the sleeve sections;
performing a degreasing stage;
fitting a tubular insert into a hole in the second section of said casing until the widened of splines of the tubular insert abuts up against the end of the sleeve section;
fitting a capsule into said tubular insert; and
fitting a locating ring of the capsule onto the

tubular insert.

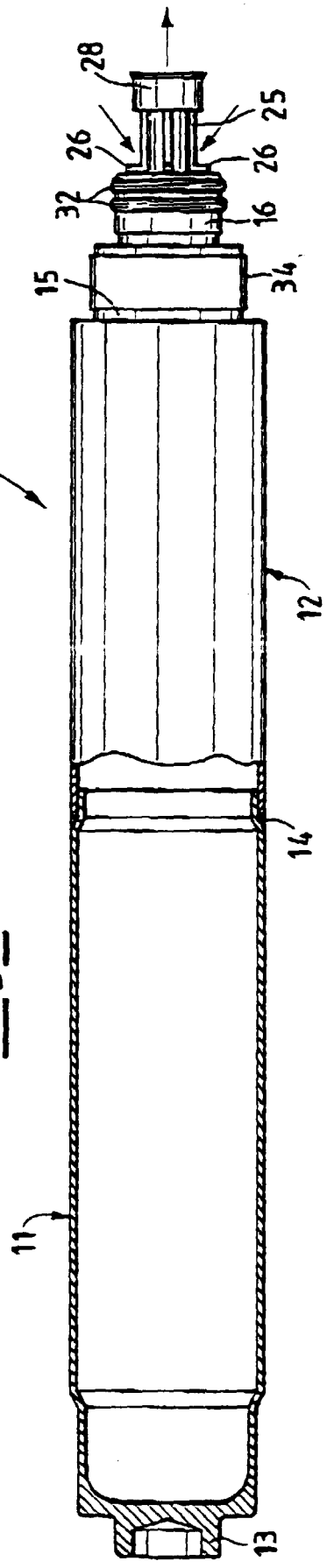
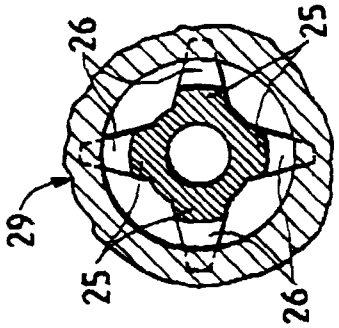
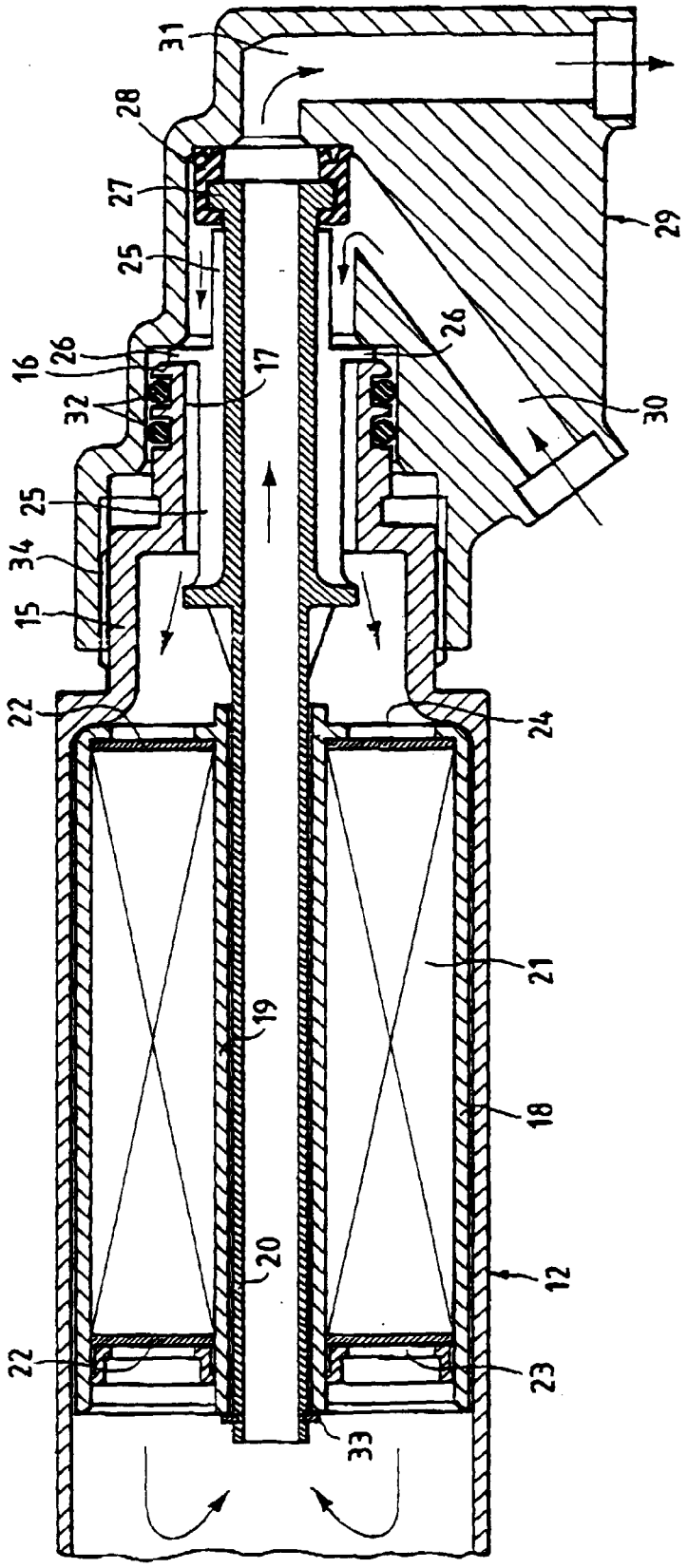


Fig.1

Fig.3





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