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(71) Applicant: **IMAT S.p.A.**

33074 Fontanafredda, Pordenone (IT)

(72) Inventors:

- **Giro, Marino**
33080 Castions Di Zoppola Pordenone (IT)
- **Cauz, Walter**
33074 Fontanafredda Pordenone (IT)
- **Caporusso, Pier Vito**
33078 San Vito al Tagliamento Pordenone (IT)

(74) Representative: **Giugni, Valter**

**PROPRIA S.r.l.,
 Via Mazzini 13
 33170 Pordenone (IT)**

(54) **Wire-and-tube condenser for refrigeration appliances**

(57) Wire-and-tube condenser, which is exposed to vibrations coming from the compressor, comprises a tubular coil (10) defining a plurality of rectilinear tubular sections (12) that extend parallel to each other, are fluidly joined to each other by curved portions (14) and are connected to each other by means of a plurality of rigid metal wires (16), which are welded in an orthogonal direction to both sides of said rectilinear tubular sections.

At least a portion of the tube coil (10) is provided with a further curved section (24), which is inserted, and held securely in place by press-fitting, between the wires (16) welded to the rectilinear tubular sections (12).

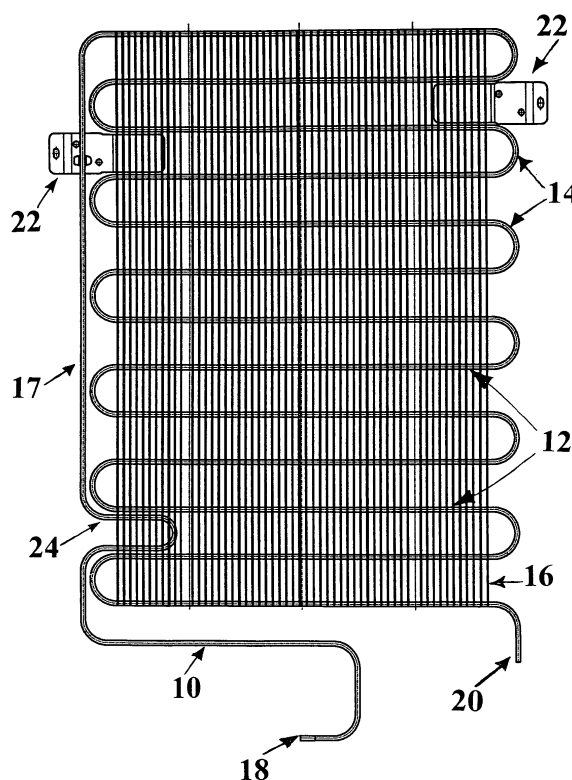


FIG. 1

Description

[0001] The present invention refers to a wire-and-tube condenser for refrigeration appliances and, in particular, the method used for securing the tube carrying the refrigerant medium.

[0002] A condenser of the kind indicated above is essentially formed by a metal tubular conduit coiled into loops, which develops according to a planar surface to define a plurality of rectilinear tubular sections extending parallel to each other. These rectilinear tubular sections are fluidly connected to each other via curved portions, or bend sections, and are joined with each other by means of a plurality of rigid metal wires that are welded on to said rectilinear tubular sections in an orthogonal direction thereto. These metal wires are arranged on both sides of the tubular coil formed by said loops and the wires situated on one side thereof may be offset from those on the other side, such as this is for instance described in US 2,667,762.

[0003] The condenser must then be secured to the back wall of the refrigeration appliance by means of appropriate brackets.

[0004] The refrigerant medium is caused to circulate inside, i.e. flow through the tubular coil of the condenser whenever the compressor of the refrigerating circuit of the appliance is switched on. The compressor being switched on and off, therefore, generates corresponding variations in the pressure of the refrigerant medium, and these variations in turn cause dynamical stresses to be imposed on the condenser, in particular in the initial portion thereof connected to the delivery side of the compressor. As a result, the condenser may be subject to undesirable vibrations giving rise to noise generation.

[0005] In view of solving this problem and giving the condenser the necessary rigidity, there have been proposed, and are currently used, many solutions and methods, actually. For instance, a first solution provides for the delivery tube to be given the required rigidity through the use of plates to be welded to the grid formed by the condenser wires. Alternatively, some wires may be welded thereto to connect the delivery tube to the bend or curved portions of the tubular coil. These solutions, however, have a major drawback in that they usually complicate the manufacturing process of the condenser and may give rise to leakages in the circuit of the refrigerant medium.

[0006] The possibility is further given for appropriate pipe or tube clamps of metal or plastic material to be used to the above-cited purpose. Even in this case, however, the application of additional mechanical parts contributes to complicate the construction of the condenser and the related manufacturing process. Furthermore, in the case that plastic clamps are used, the need arises for special materials to be selected to this purpose, i.e. materials that are resistant to high temperatures and are not subject to aging and downgrading over time.

[0007] It therefore is the object of the present inven-

tion to provide a wire-and-tube condenser for refrigeration appliances providing a more rational and reliable approach to securing the refrigerant-medium delivery tube.

[0008] Within this general object, it is further a purpose of the present invention to provide a wire-and-tube condenser of the above-indicated kind, which is capable of being obtained, i.e. produced through the use of both simple and low-cost means that do not require or imply any substantial modification to the existing manufacturing lines.

[0009] Features and advantages of the present invention will anyway be more readily understood from the description that is given below by way of non-limiting example with reference to the accompanying drawings, in which:

- Figure 1 is a schematical plan view of a wire-and-tube condenser according to the present invention;
- Figure 2 is a partial perspective view of a detail of the condenser shown in Figure 1;
- Figure 3 is a partially cross-sectional and enlarged side view of a peculiar detail of the condenser shown in Figure 1;
- Figure 4 is a schematical plan view of a modified embodiment of the condenser shown in Figure 1.

[0010] A wire-and-tube condenser for refrigeration appliances according to the present invention essentially comprises a tubular coil 10 that defines a plurality of rectilinear tubular sections 12 extending parallel to each other, which are fluidly connected to each other via curved or bend sections 14 and are joined together by means of a plurality of rigid metal wires 16 that are welded on both sides of said rectilinear tubular sections in an orthogonal direction thereto.

[0011] The rectilinear tubular sections 12 usually have the same length and are arranged according to a planar configuration, although condensers may equally be found, the tubular coils of which show a corrugated, wavy or zigzaggy development pattern (as illustrated for instance in US 6,389,695).

[0012] The wires 16 form two web-like surfaces on the two sides of the coil 10, respectively, and the wires of a web-like surface may be aligned with or offset from the wires forming the other web.

[0013] The coil 10 starts with, i.e. is preceded by a rectilinear tubular section 17, the inlet end portion 18 of which is connected with the delivery side of the compressor of the refrigerating circuit (not shown). The outlet end portion 20 of the coil is on the contrary connected with the remainder of the refrigerating circuit of the refrigeration appliance.

[0014] The condenser itself is attached to the rear wall of the refrigeration appliance (not shown) by means of

plates 22, which are usually screwed on the rear corner uprights of the outer casing of the appliance.

[0015] According to the present invention, at least a portion of the tubular coil 10 features an additional curved section 24, which is inserted and secured by press-fitting between the wires 16 welded to the rectilinear tubular sections 12. 5

[0016] It has in fact been found experimentally that the wires 16, when they are welded on to the rectilinear tubular sections 12, tend to somehow warp, although preserving their rigidity. Such distortion results in a reduction in the distance between the wires of a web and the wires of the other web, in the free portion between two adjacent rectilinear tubular sections 12 (Figure 3). As a result, inserting the curved section 24 between the two webs of wire gives rise to a kind of restrained joint that makes it possible for the structure of the coil 10 to be strengthened in its rigidity. A more rigid structure enables in turn to sensibly reduce the vibrations that are brought about in the condenser whenever the compressor is switched on and off, and that are transmitted to the outer casing of the refrigeration appliance. 10 15 20

[0017] In particular, the curved section 24 is provided in the initial portion of the delivery tube 17, close to the extremity 18 that connects to the delivery side of the compressor, i.e. where the pressure of the refrigerant medium is felt more sensibly when the compressor is switched on and, anyway, operated. 25

[0018] As an alternative solution to the embodiment described above, the possibility is given for a similar curved section 24 to be provided (Figure 4), which, instead of being press-fitted in between the wires 16 (as shown in Figure 1), is so shaped as to be able to be welded therebetween. To this purpose, in correspondence of said curved section 24, the coil 10 must be provided with a section 26 that is shorter than the other sections forming the same coil. 30 35

Claims 40

1. Wire-and-tube condenser for refrigeration appliances, such as those intended in particular for household applications, comprising a tubular coil (10) that defines a plurality of rectilinear tubular sections (12) extending parallel to each other, which are fluidly connected to each other via curved portions (14) and are joined with each other by means of a plurality of rigid metal wires (16), which are welded in an orthogonal direction to both sides of said rectilinear tubular sections, **characterized in that** at least a portion of the tubular coil (10) is provided with a further curved section (24), which is inserted, and held securely in place by press-fitting, between the wires (16) welded to the rectilinear tubular sections (12). 45 50 55

2. Wire-and-tube condenser for refrigeration appliances

according to claim 1, in which the coil (10) is preceded by a rectilinear tubular section (17), **characterized in that** said further curved section (24) of the tubular coil (10) is provided in said rectilinear section (17), close to the end portion (18) thereof, through which the refrigerating medium flows into the condenser.

3. Wire-and-tube condenser for refrigeration appliances according to any of the preceding claims, **characterized in that** said further curved section (24) is so shaped as to be able to be welded on between the wires (16) joining the rectilinear tubular sections (12) with each other.

4. Wire-and-tube condenser for refrigeration appliances according to any of the preceding claims, **characterized in that**, in correspondence of said curved section (24), the coil (10) is provided with a section (26) that is shorter than the other sections forming the same coil.

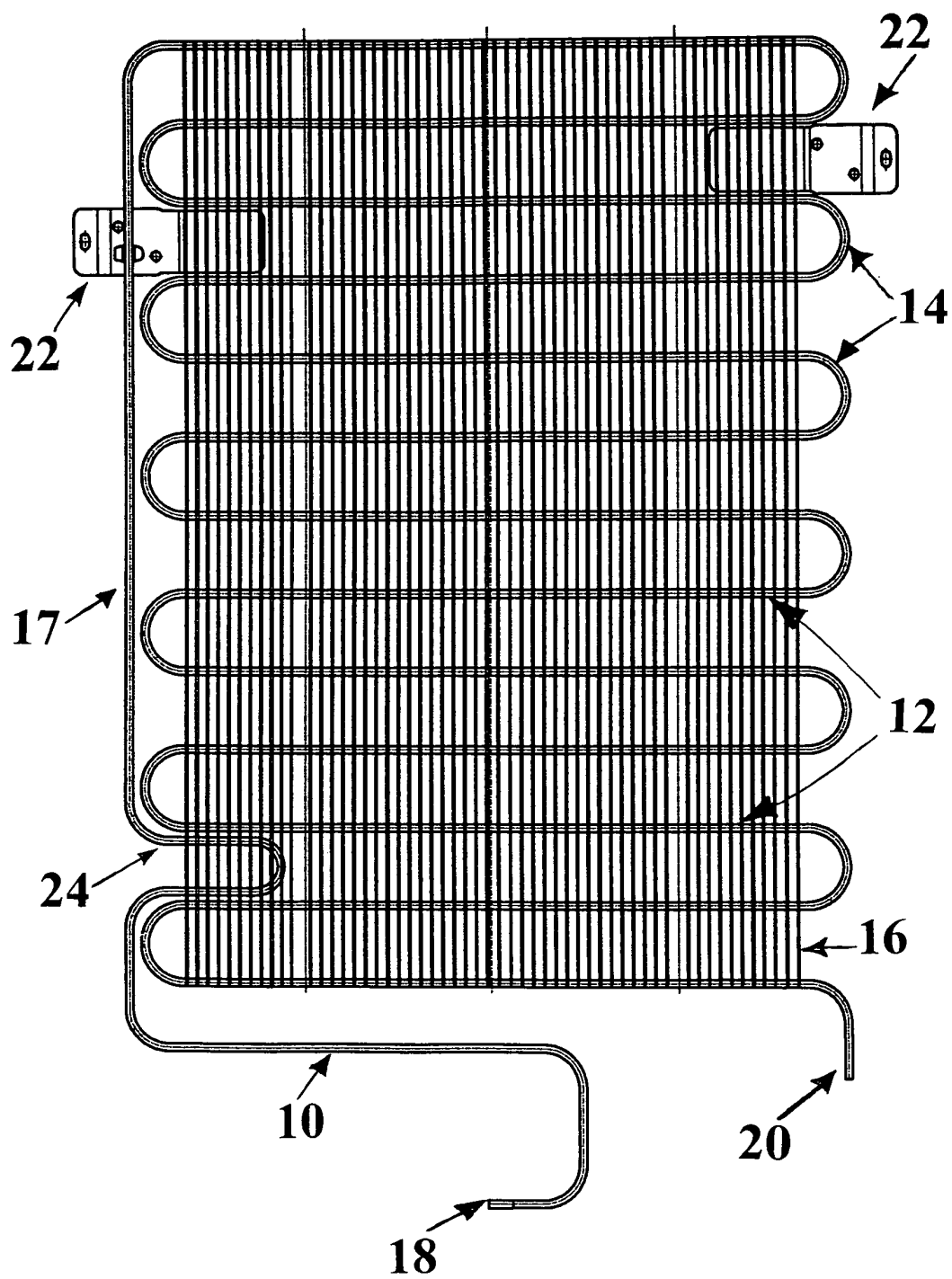


FIG. 1

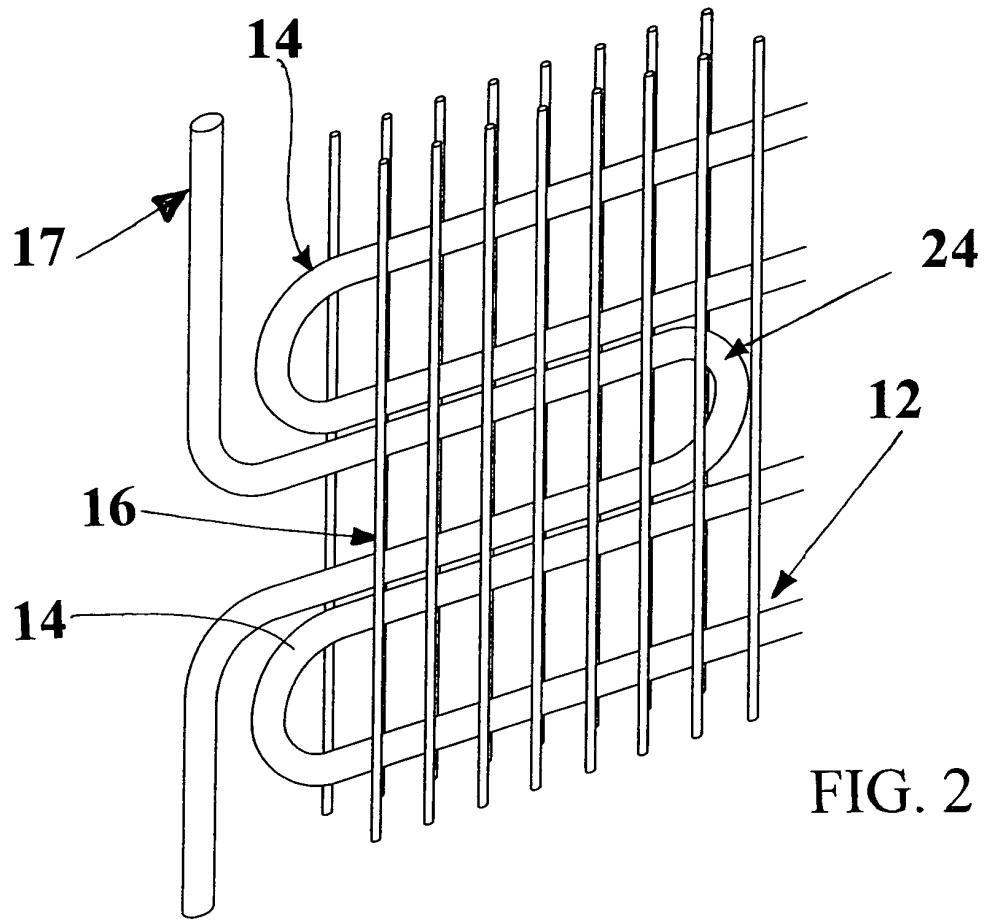


FIG. 2

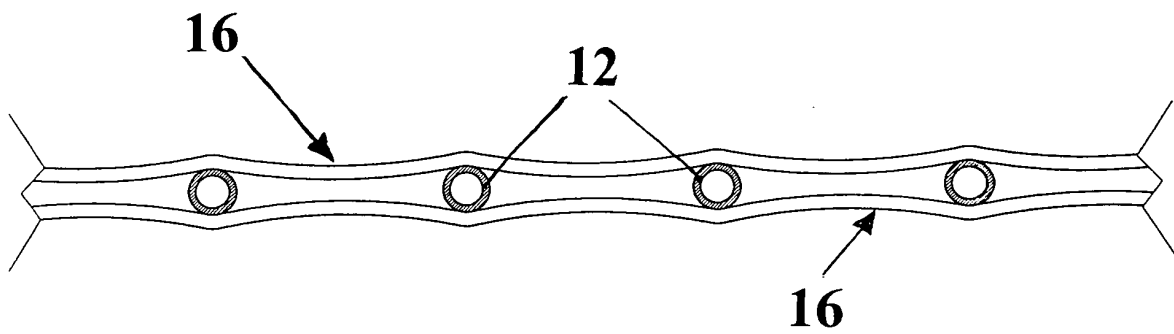


FIG. 3

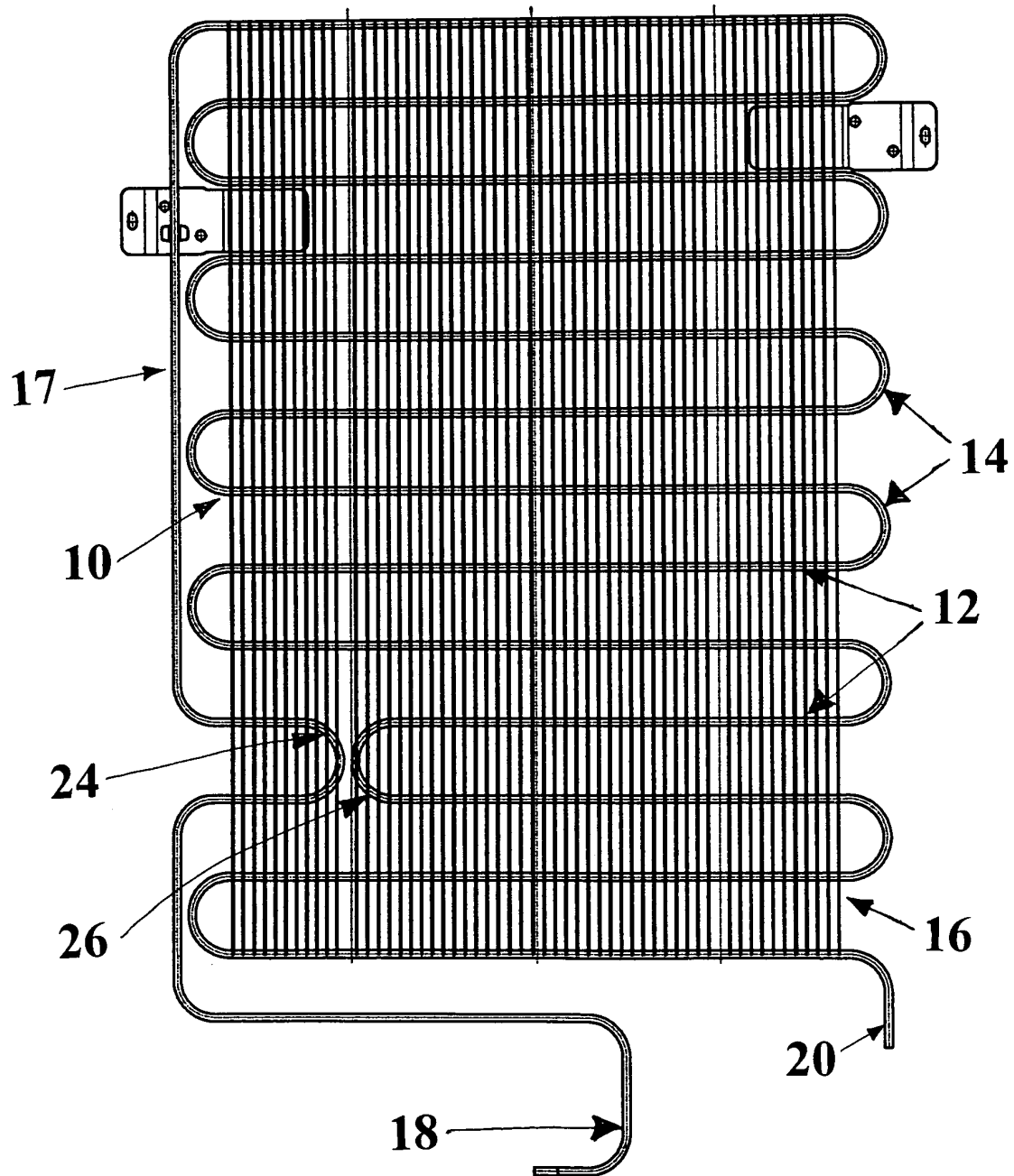


FIG. 4