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(54) **Radiator for heater-fans, particularly for passenger car air-conditioning systems.**

(57) A radiator for passenger car air-conditioning systems comprises a radiating pack provided with head plates (17-18) retaining the ends of the pack tube (13), each plate (17-18) being provided with a frame (110-120) of a plastics material engaging in undercut relationship the plate and forming a retaining seat for a cover (111-121) caused to adhere, through a peripheral ridge (NP) thereof, to the frame (110-120).

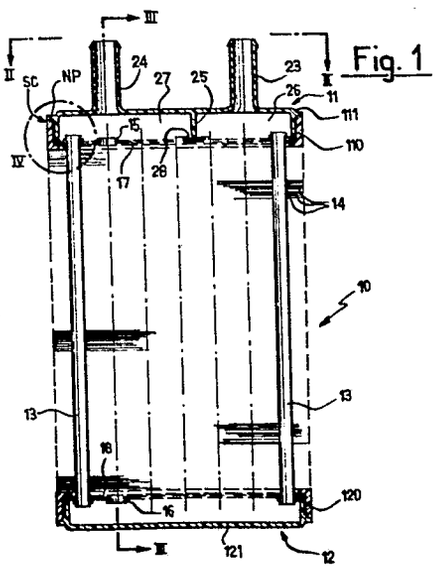

Fig. 1

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This invention relates to a radiating pack-type radiator, as employed in thermo-ventilation systems, particularly for passenger car air-conditioning.

As is known, such radiators generally comprise a metal tube nest with high thermal conductivity, e. g. formed from aluminum, wherein the tubes are interconnected by manifolds and surrounded by a plurality of overlapping laminations or fins to form a pack. The tubes have their ends force fitted in corresponding seats on holding plates, whereto, by means of a welding or brazing process, metal covers are sealingly connected which form the delivery and recycle manifolds for the heating (cooling) fluid which is circulated through the tubes. The manufacturing of such radiators is notoriously a very complicated and expensive one, and moreover, the radiators thus produced are heavy and unreliable, as far as the seal is concerned, owing mainly to the inadequate resistance of the metal weldments to vibration. In an attempt to obviate such shortcomings, it has been already proposed to use in part a plastics material in the manufacture of the manifolds, both for the purpose of lightening the construction, and of eliminating costly metal welding operations.

This invention sets out to provide a radiator of this general type, namely one provided with plastics material manifolds, and is particularly directed to an improved sealed connection system for the covers forming said manifolds to the respective head plates at the tube ends. The invention is further directed to simplifying the radiator manufacturing

process, while retaining the reliability thereof relative to any leakage of the fluid circulated through the radiator.

According the one aspect of the present invention, there is provided a radiator for heater-fans, particularly for passenger car air-conditioning systems, comprising a metal radiating pack and manifolds of a plastics material, and wherein said radiating pack is provided with head plates for retaining the ends of the pack tubes, characterized in that each head plate is provided with a frame of a plastics material which engages in undercut relationship the plate and forms a retaining seat for a cover which is caused to adhere, through a peripheral ridge thereof, to said frame, whereto it is connected in sealed relationship by means of a flush weld.

According to one embodiment of this invention, on the head plate there is fitted -- for sealing purposes -- a peripheral U-like gasket made of an elastomeric material, to one lip whereof the plastics material frame is caused to adhere, to the other lip whereof the inner edge of the cover being caused to adhere. Furthermore, the cover depth is selected to be slightly greater than the corresponding height of the frame, thereby -- as a result of their mutual connection by welding -- said frame and cover are enabled to deform the peripheral gasket.

According to another embodiment of the invention, between the head plate and frame, there is interposed -- again in sealing relationship -- an adhesive or sealing layer.

According to a further embodiment, the peripheral portion of each head plate is embedded by co-pressing

in the plastics material frame.

The invention will be more clearly understood by making reference to the following detailed description and to the accompanying exemplary, though not limitative, drawings, where:

Figure 1 is a schematical longitudinal section view of the improved radiator according to this invention;

Figure 2 is a top plan, partly sectional, view of Figure 1;

Figure 3 is a sectional view taken along the line III-III of Figure 1;

Figure 4 is a detail view, to an enlarged scale, of Figure 1;

Figure 5 is an enlarged scale sectional view similar to Figure 4, but illustrating a variation of this invention; and

Figure 6 is also an enlarged scale sectional view, similar to Figure 4, but illustrating a further variation of this invention.

With reference initially to Figures 1 to 4, the numeral 10 designates generally the radiating pack, 11 designates the top manifold and 12 the bottom one. The radiating pack is formed, in a manner known per se, from a a nest of parallel metal tubes 13 having a high thermal conductivity, e.g. made of aluminum, which are surrounded by a plurality of laminations or fins 14 which are overlapped to form a pack and also formed from aluminum. The ends of the tubes 13 are force-fitted by drawing them into corresponding

seats 15-16 in head plates 17-18 which are effective to interconnect the respective ends of the tubes; the plates, also preferably made of aluminum, being provided with stiffening ribs 19. The manifolds 11-12 are formed from a polymeric material, advantageously a thermoplastic one, and comprise each a frame and cover, respectively 110-111 and 120-121, which are sealingly connected by means of a flush weld.

More specifically, the drawings illustrate how each plate 17,18 is fitted, according to the invention, with a peripheral gasket 20 of U-like shape, which is made of an elastomeric material, advantageously rubber. To the lower lip 201 of the gasket, there adheres the lower horizontal portion of the respective frame 110, or 120, the frames having a substantially L-like cross-sectional profile. Said portion engages in undercut relationship the peripheral edge of the related plate, it being clamped between the end lamination or fin 14 and the plate itself. The vertical portion of the frame extends, therefore, perpendicular to the plate, to form a containment seat for the cover 111, respectively 121; the seat bottom being defined by the related plate 17, respectively 18. Each cover has a bell-like shape and a lower edge B adapted for contact engaging the upper lip 202 of the gasket 20 (Figure 4). Moreover, each cover is provided with a peripheral rib or rim NP intended for adhesion to the top end of the frame vertical portion, whereto it is connected as by welding along the entire

meeting surface SC; the welding being of preference a flush or glossy one. The depth of each cover is selected to be slightly deeper than the height dimension of the seat formed by the corresponding seat such that, to bring the surface of the rim NP to meet the edge of the frame, the cover must be forced against the gasket 2C, which, in undergoing deformation, ensures an effective seal between the cover, plate and frame.

To further improve said seal, rims 22 are provided along the edge of the cover and the horizontal portion of the frame.

As can be clearly seen in the figure, the top or upper cover is provided with two fittings 23-24 for connection to the delivery line and respectively recycle line for the fluid circulated through the radiating pack, and has also an inner septum 25 adapted for defining two manifold chambers 26-27, respectively a delivery one and a recycle one. With said septum, there cooperates a gasket 28 of an elastomer adapted for separating said chambers sealingly, said gasket being carried in a corresponding seat on the plate 17.

In the variation of Figure 5, wherein similar or corresponding parts have been designated with the same reference numerals, it is shown that the plate 17 (or 18) does not comprise the peripheral U-like gasket 20, and that leakage prevention is attained by interposing an adhesive or sealing layer SK between the lower horizontal portion of the frame 110 (or

120) and the plate itself. In this case, it is not required that the edge B of the cover 111 be extended to meet the plate, and it will be sufficient that it extends shortly below the peripheral ridge NP to act exclusively as a centering element for the cover relative to the frame.

Figure 6 shows a further variation, according to which the peripheral edge of the head plate 17 -- and similarly of the plate 18 -- is embedded, for sealing purposes, in the horizontal portion of the corresponding frame 110 -- respectively 120 -- by co-pressing the frame with the plate. Also in this case, it will be sufficient that the edge of the related cover 111 - respectively 121 - extends slightly below the peripheral rim for the sole purpose of centering the cover.

Of course, within the scope of the invention, the constructional details and realization shapes may be amply varied from what has been described and illustrated for example only, without departing from the true spirit of this inventive concept.

CLAIMS:

1. A radiator for heater-fans, particularly for passenger car air-conditioning systems, comprising a metal radiating pack (10) and manifolds (11-12) of a plastics material, and wherein said radiating pack is provided with head plates (17-18) for retaining the ends of the pack tubes (13), characterized in that each head plate (17-18) is provided with a frame (110-120) of a plastics material which engages in undercut relationship the plate and forms a retaining seat for a cover (111-121) which is caused to adhere, through a peripheral ridge (NP) thereof, to said frame, whereto it is connected in sealed relationship by means of a flush weld.

2. A radiator according to Claim 1, wherein the frames (110-120) associated with each head plate (17-18) have an L-like section profile defined by a horizontal portion in engagement with the related plate and a vertical portion forming the retaining seat for the related cover.

3. A radiator according to Claims 1 and 2, characterized in that each head plate (17-18) comprises, fitted onto the edge thereof, a peripheral U-like gasket (20) of an elastomeric material to one lip (201) whereof said plastics material frame (110-120) is caused to adhere and to the other lip (202) whereof the inner edge (B) of said cover (111-121) is caused to adhere.

4. A radiator according to the preceding Claims,

wherein the depth of each cover (111-121) is selected to be slightly greater than the corresponding height of the frame (110-120) such that, following mutual connection by welding, said frame and cover deform the peripheral gasket (20) to provide a tight seal.

5. A radiator according to the preceding claims, wherein the surfaces of the frame (110-120) and covers (111-121) contacting the gasket (20) are provided with ridges adapted to deform said gasket for a tight seal.

6. A radiator according to the preceding claims, wherein the cover (111) of one manifold (11) is provided with connection fittings (23-24) and a septum (25) which seaparates and seals off two chambers (26-27), respectively for delivering and recycling the fluid circulated through the radiating pack, and wherein the septum cooperates with a gasket (28) for the purpose of sealing off said chambers.

7. A radiator according to Claims 1 and 2, wherein between each head plate (17-18) and related plastics material frame (110-120) there is interposed an adhesive or sealing layer (SK).

8. A radiator according to Claims 1 and 2, wherein the peripheral portion of each head plate (17-18) is embedded by co-pressing in the horizontal portion of the related plastics material frame (110-120).

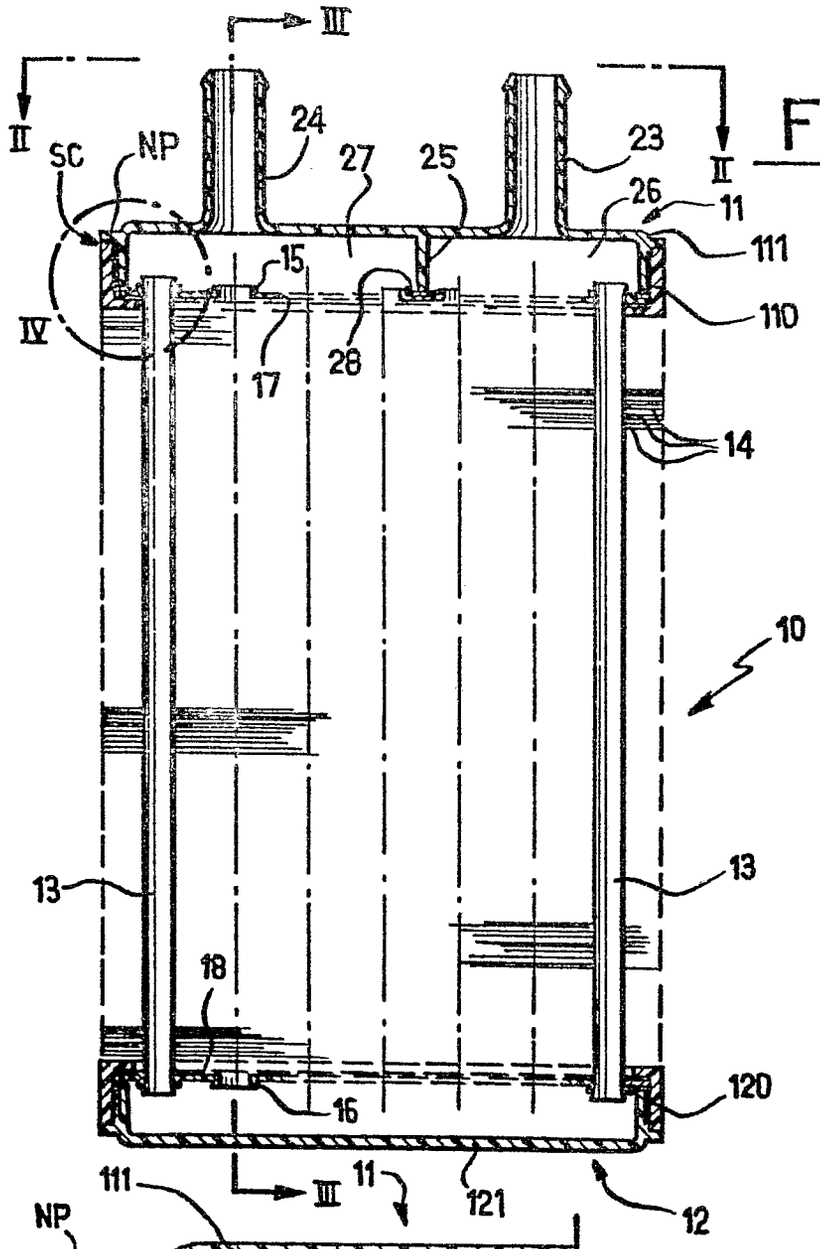

Fig. 1

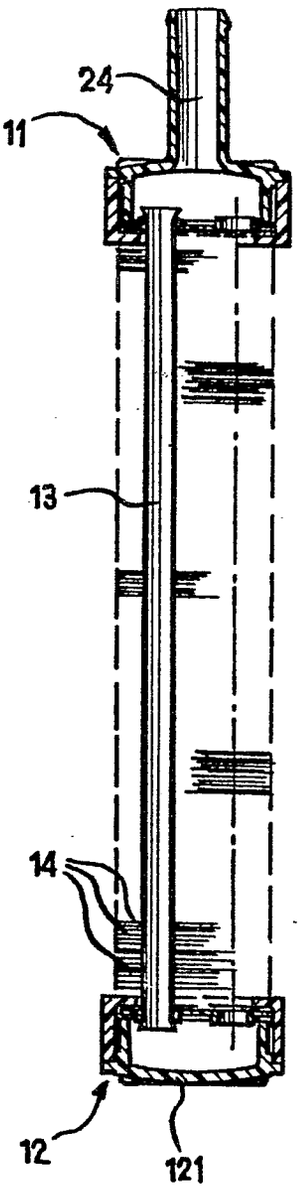

Fig. 3

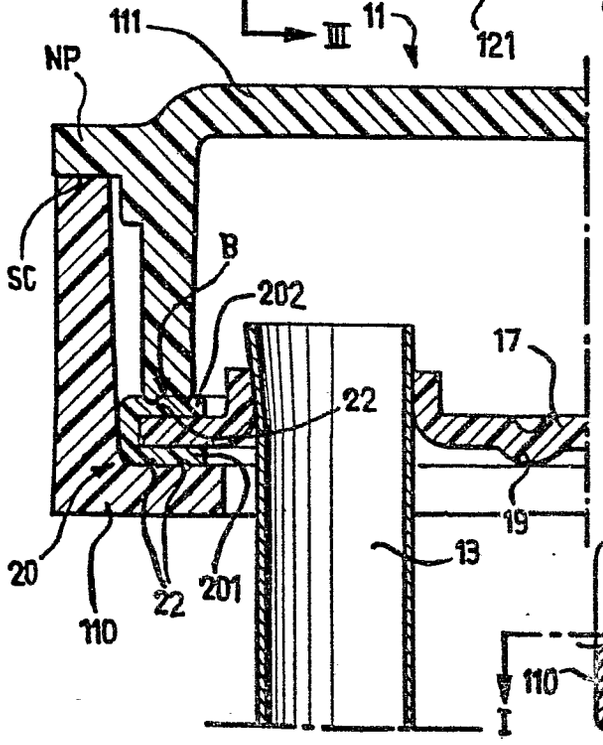

Fig. 4

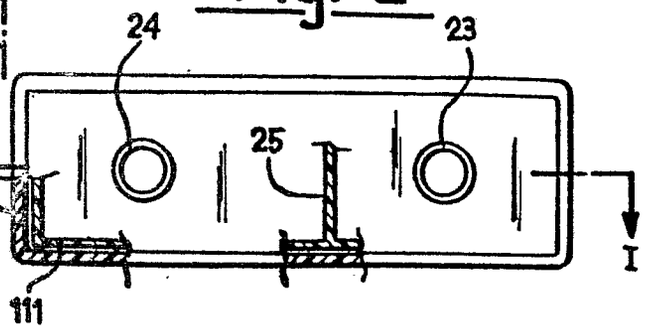

Fig. 2

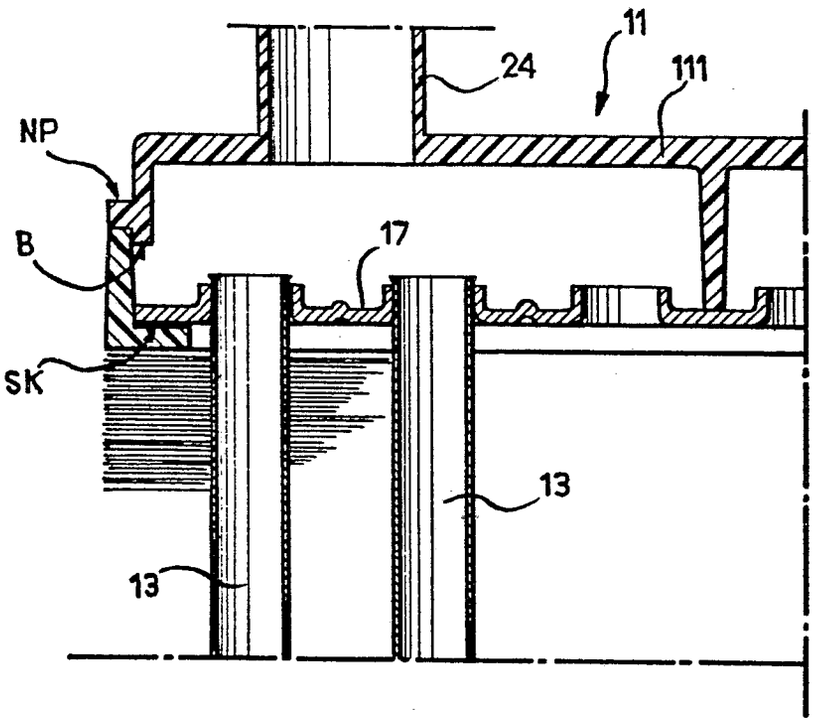

Fig. 5

Fig. 6