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(71) Applicant: **BORLETTI CLIMATIZZAZIONE S.r.l.**
Frazione Masio, 24
I-10046 Poirino (Torino)(IT)

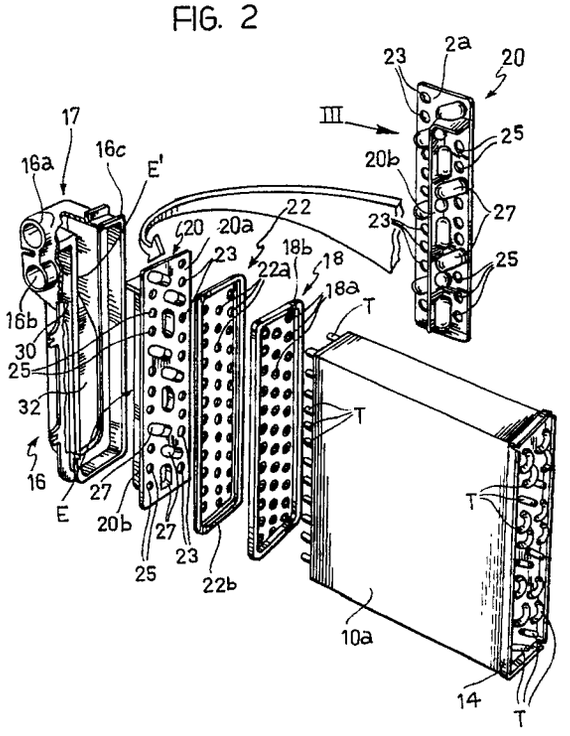
(72) Inventor: **Aimone, Adelio**
Via Valdellatorre 48
I-10044 Pianezza (Torino)(IT)

(74) Representative: **Bosotti, Luciano et al**
c/o Jacobacci-Casetta & Perani S.p.A. Via Alfieri, 17
I-10121 Torino(IT)

(54) Water-tube heat exchanger for a motor vehicle air-conditioning system, having a header with a baffle for dividing the flow.

(57) A water-tube radiator for a motor-vehicle air-conditioning system includes a header with a cover (16) of polymeric material welded ultrasonically to a flow-dividing baffle (20) with a flat base portion (20a) which faces the tube plate (is) with the interposition of a flat gasket (22) of elastomeric material. The base portion (20a) of the baffle (20) has a plurality of U-shaped connectors (27) arranged to cause the liquid to pass tube-side more than twice without the need for more than one flow-dividing baffle.

FIG. 2



EP 0 421 955 A1

A WATER-TUBE EXCHANGER FOR A MOTOR-VEHICLE AIR-CONDITIONING SYSTEM, HAVING A HEADER WITH A BAFFLE FOR DIVIDING THE FLOW

The present invention relates to a liquid-gas heat exchanger with water tubes, particularly for a motor-vehicle air-conditioning system, of the type including a header with a tube plate, a cover and a baffle for dividing the flow.

In current solutions, one side of the flow-dividing baffle is connected to the convex cover of the header and the other side is connected to the tube plate with the interposition of a gasket. It is thus possible to form a water-tube heat exchanger in which the water passes tube-side twice. If one wishes to increase the number of times the liquid passes tube-side, and hence the efficiency of the exchanger, it is necessary to use several flow-dividing baffles which complicate the manufacture of the exchanger and can create sealing problems between the baffles and the tube plate.

The object of the present invention is to provide an exchanger of the type specified at the beginning of the description, which allows the liquid to pass tube-side several times without complications in the structure of the exchanger.

According to the invention, this object is achieved by virtue of the fact that the flow-dividing baffle is interposed sealingly between the cover and the tube plate and has liquid-channelling means for causing the liquid to pass tube-side several times.

Preferably, the baffle has a flat base portion facing the tube plate and a flow-dividing portion substantially perpendicular to the base portion and having a free edge connectible to the cover of the header by pressure or by ultrasonic welding.

By virtue of these characteristics, an exchanger with water tubes can be formed with three or more "rows" (that is, with sets of finned tubes arranged substantially in three different parallel planes) and a flow-divider, without complications in the assembly of the exchanger, in the arrangement of the baffles or in the positioning of the liquid-inlet and -outlet connectors.

Further advantages and characteristics of the exchanger according to the invention will become clear from the detailed description which follows, purely by way of non-limiting example, with reference to the appended drawings, in which:

Figure 1 is a perspective view of an exchanger according to the invention,

Figure 2 is an exploded perspective view of the exchanger of Figure 1,

Figure 3 is a view of a detail of Figure 2 on an enlarged scale,

Figure 4 is a section taken on the line IV-IV of Figure 1,

Figure 5 is a section taken on the line V-V of Figure 1,

Figure 6 is a section taken on the line VI-VI of Figure 1,

Figure 7 is a section taken on the line VII-VII of Figure 1,

Figure 8 is a section taken on the line VIII-VIII of Figure 1, and

Figure 9 is a section taken on the line IX-IX of Figure 1.

With reference to the drawings (Figure 1), a liquid-gas heat exchanger with three rows of water tubes suitable for installation in a motor-vehicle air-conditioning system is generally indicated 10. The exchanger 10 has a finned matrix 10a composed of finned U-shaped tubes arranged between a header 12 and a tube-support frame 14.

The header 12 includes a convex cover 16 of polymeric material which has a recessed portion 17 formed with two lateral connectors 16a and 16b for respective connection to inlet and outlet tubes for the liquid, a metal tube plate 18 with a plurality of holes 18a for the passage of the tubes T, and a baffle 20 of polymeric material whose characteristics will become clear from the following description (Figure 2).

The baffle 20 has a flat base portion 20a which faces the tube plate 18 with the interposition of a flat gasket 22 of elastomeric material having a plurality of holes 22a for the passage of the ends of the tubes T, and a substantially L-shaped, flow-dividing portion 20b perpendicular to the base portion 20a. The latter has two series of through-holes 23 and 25 respectively, arranged on opposite sides of the portion 20b of the baffle 20, as well as a plurality of elongate recessed portions 27 with substantially channel-shaped cross-sections arranged in correspondence with adjacent pairs of tubes T in an arrangement which, as shown clearly in Figures 2 and 3, forces the liquid circulating in the tubes in the central plane of the matrix 10a to be conveyed either into other tubes in the central plane (the recesses indicated A in Figures 3 and 5) or into tubes in planes parallel to the central plane of the matrix (the recesses indicated B in Figures 3 and 5).

The portion 20b of the ale 20 has a free edge E which is connected (by pressure or by ultrasonic welding), during the assembly of the exchanger, to the corresponding edge E′ of a central baffle plate 30 formed on the base wall 32 of the cover 16 of the header 12 (Figure 8).

As can clearly be seen in Figures 8 and 9, the edge E of the portion 20b of the baffle 20 is V-

shaped and corresponds in shape to a V-shaped recess formed in the edge E′ of the baffle plate 30.

During the assembly of the exchanger, the edge of the metal tube plate 18, indicated 18b, is folded over a shaped edge 16c of the cover 16 with the interpositon of the edge 22b of the flat gasket 22. The latter is therefore used both to effect a seal between the cover 16 and the tube plate 18 and to effect a seal between the baffle 20 and the tube plate 18 in order to prevent the leakage of liquid between its various passages tube-side (Figures 2 and 8).

When the exchanger 10 is in use, the fluid admitted by the connector 16a is forced by the portion 20b of the baffle 20 to pass through the first series of holes 23 and to flow along a first set of U-shaped tubes of the matrix 10a and back again. After its first two passages through the matrix 10a, the liquid is returned thereto by the U-shaped recesses 27 and thus passes twice more through the matrix of finned tubes 10a. The liquid returning from its fourth and last passage through the matrix of tubes flows through the second series of holes 25 and is conveyed to the outlet connector 16b of the exchanger 10 (Figure 2).

Although the embodiment described relates to an exchanger with three "rows", that is, with finned tubes arranged in three parallel planes, the solution according to the present invention may also be applied to different exchangers to provide the same advantages.

Claims

1. A heat exchanger, particularly a liquid-gas or a liquid-liquid heat exchanger with tubes for a motor-vehicle air-conditioning or cooling system, of the type including at least one header (12) with a tube plate (18), a cover (16) and a baffle (20) for dividing the flow, characterized in that the baffle (20) is interposed sealingly between the cover (16) and the tube plate (18) and has liquid-channelling means (27, A, B) for causing the liquid to pass tube-side several times.

2. An exchanger according to Claim 1, characterized in that the baffle (20) has a flat base portion (20a) which faces the tube plate (18) and a flow-dividing portion (20b) substantially perpendicular to the base portion (20a) and having a free edge (E) for connection to the cover (E′, 30, 32, 16) of the header (12).

3. An exchanger according to Claim 2, of the type in which the liquid passes through the tube side four or more times, characterized in that the flat base portion (20a) of the baffle (20) has a first series of holes (23) coaxial with the tubes (T) which admit the liquid to the tube matrix (10a) and a second series of holes (25) coaxial with the tubes (T) which discharge the liquid from the tube matrix (20a), and a plurality of U-shaped connectors (27) integral with the baffle (20).

4. An exchanger according to Claim 3, characterized in that a flat sealing gasket (22) of elastomeric material is interposed between the flat base portion (20a) and the tube plate (18) and has a plurality of holes (22a) for the passage of the tubes (T) of the tube matrix (10a).

5. An exchanger according to any one of Claims 2-4, characterized in that the cover (16) of the header (12) has a flat base portion (32) with an integral baffle plate (30) substantially perpendicular to the base portion (32) and having a free edge (E′) which is adapted to be connected end-to-end to the free edge (E) of the flow-dividing portion (20b) of the baffle (20).

6. An exchanger according to any one of the preceding claims, characterized in that it has only one header (12) and one matrix of U-shaped tubes (T).

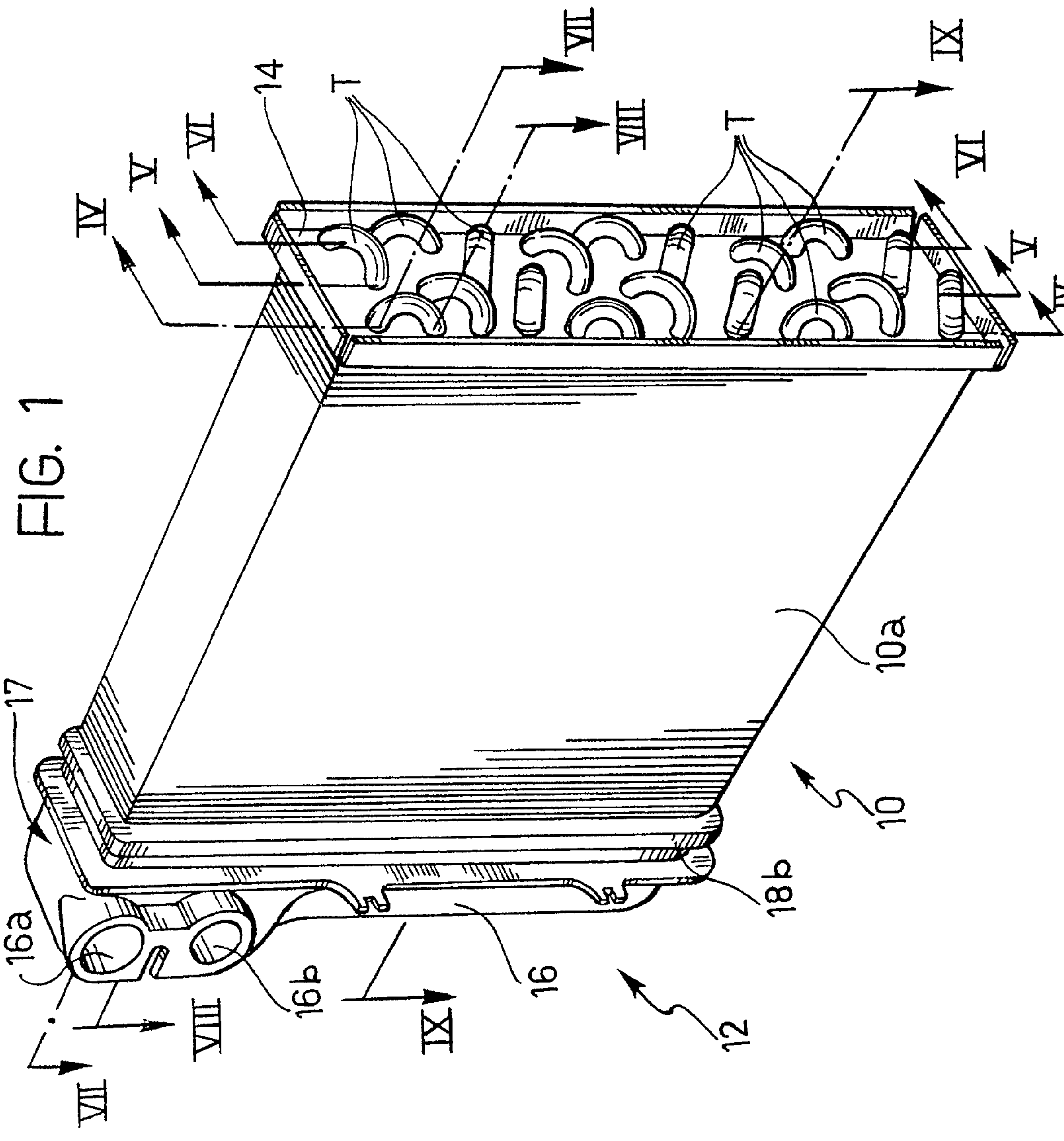


FIG. 1

FIG. 2

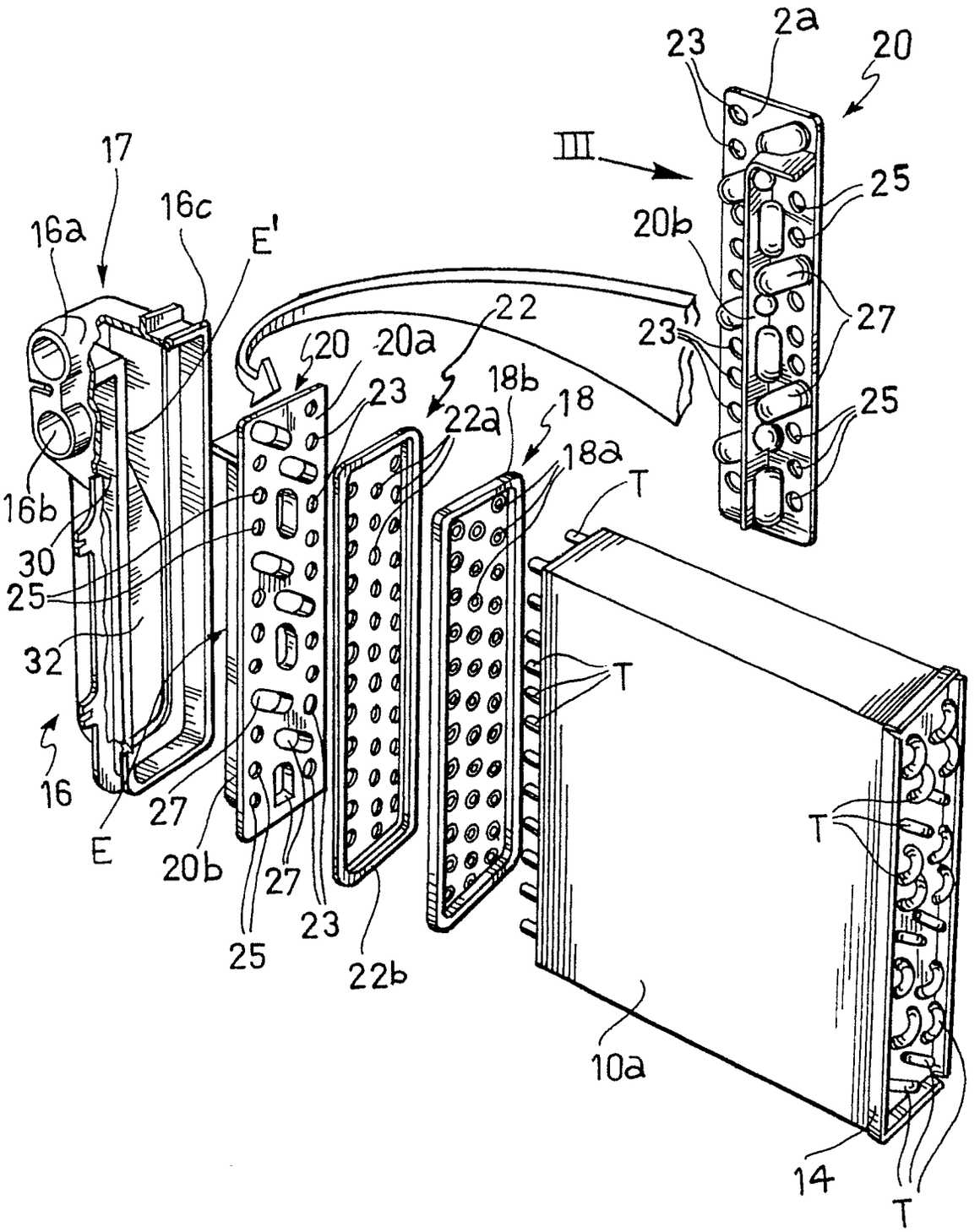

23
2a
20
III
25
20b
27
23
25
22
20
20a
23
22a
18b
18
18a
T
17
16a
16c
E'
16b
30
25
32
16
E
27
20b
27
23
25
22b
T
T
T
10a
14
T

FIG. 3

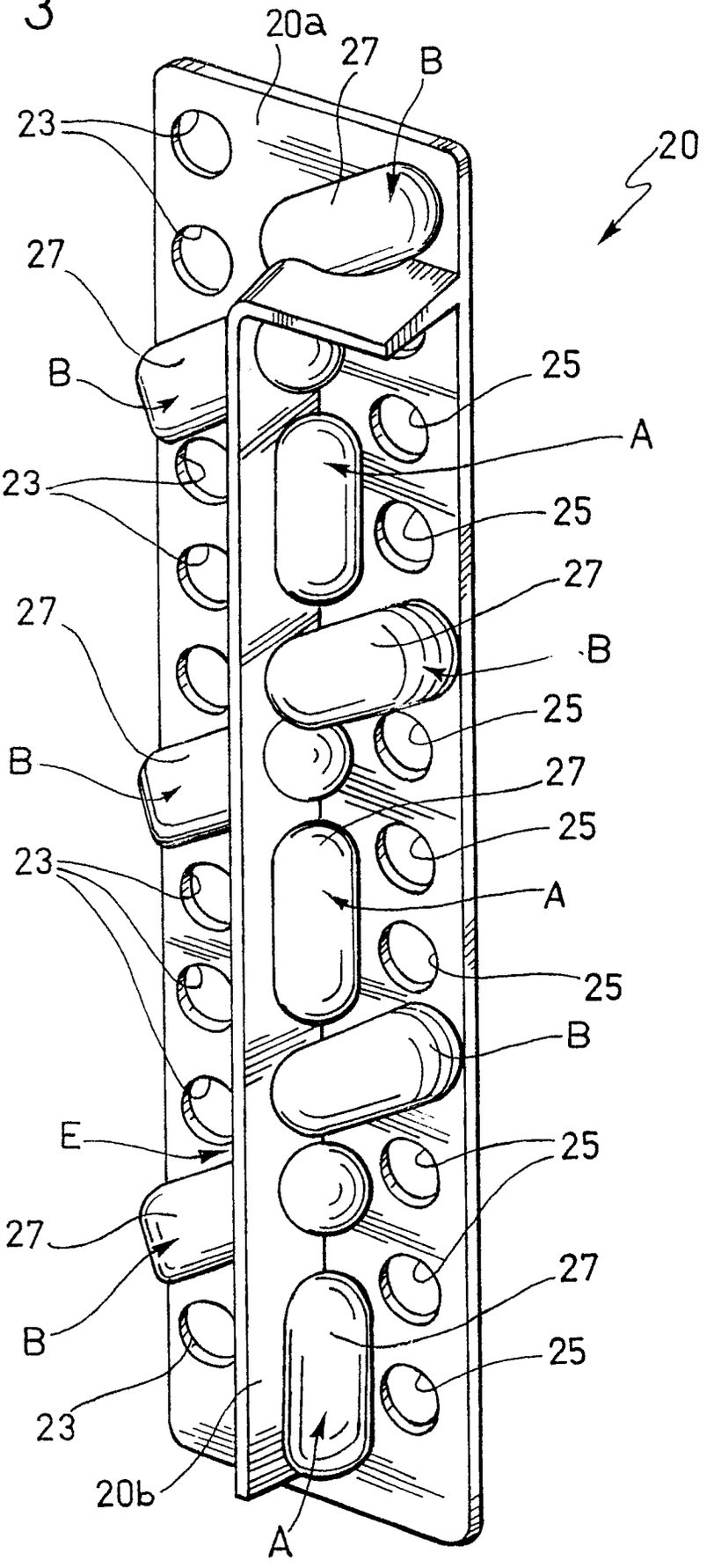

20a
27
B
23
20
27
B
25
A
23
25
27
27
B
B
25
27
B
25
23
A
25
B
E
25
27
27
B
25
23
20b
A

FIG. 4

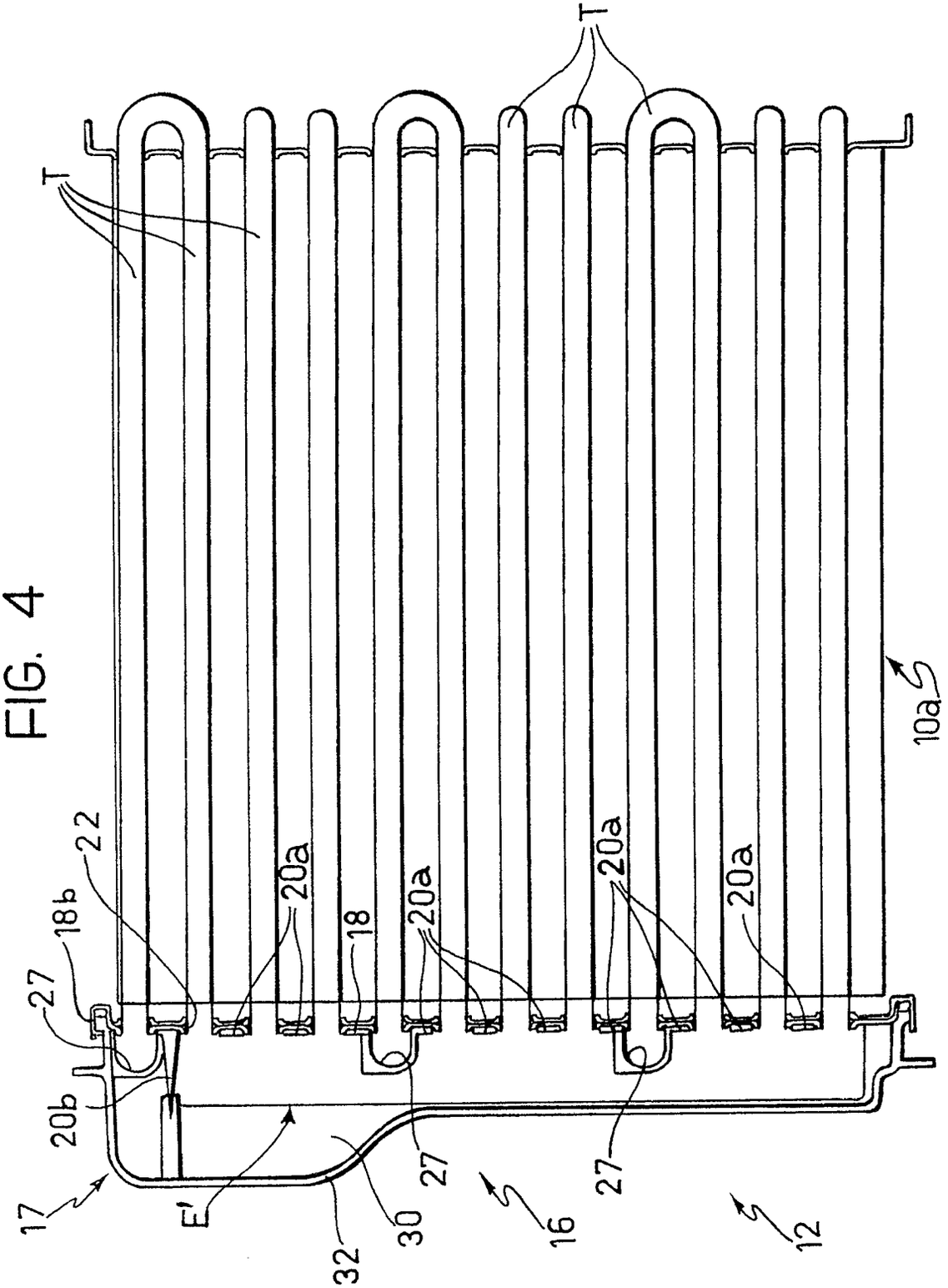


FIG. 5

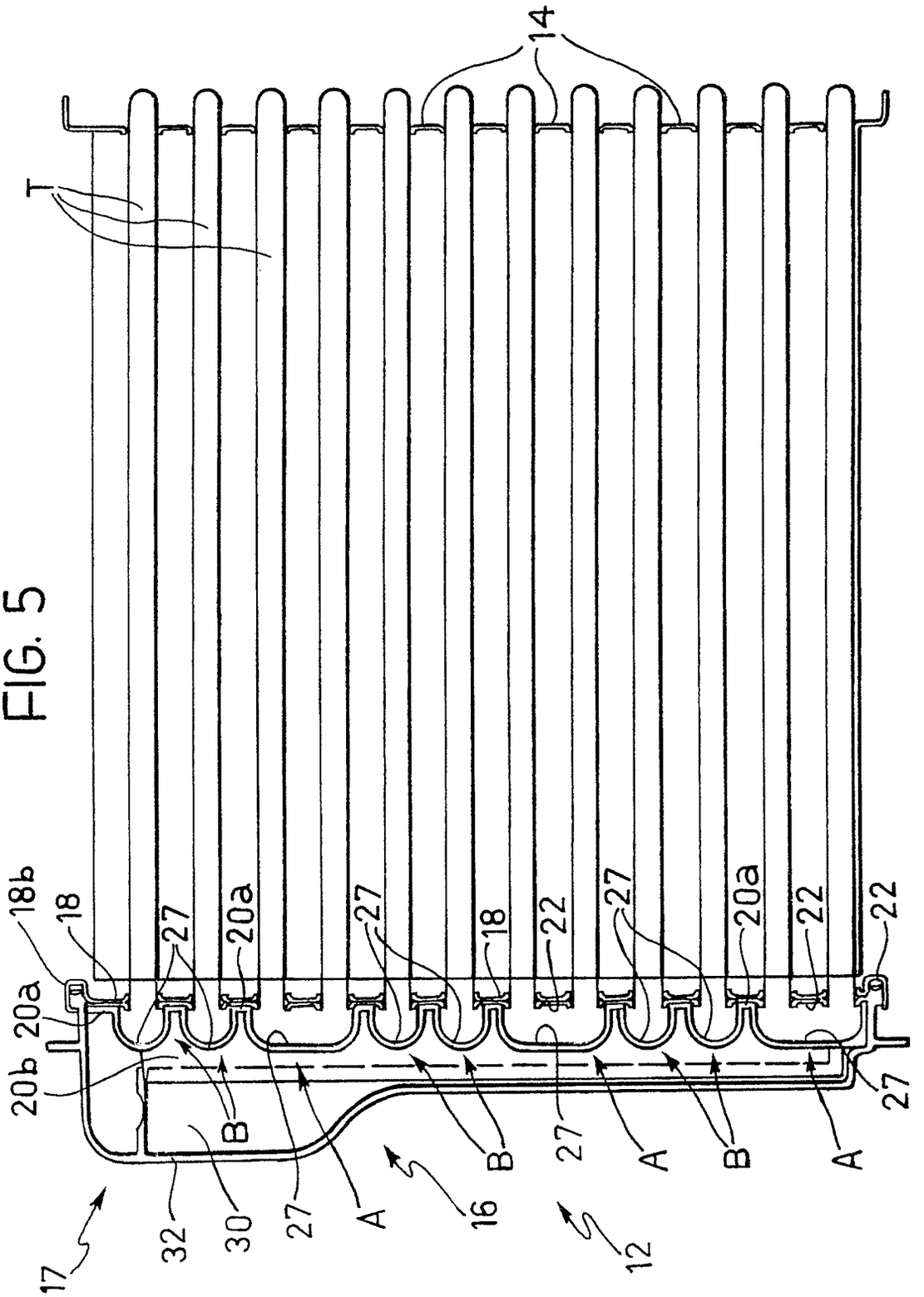
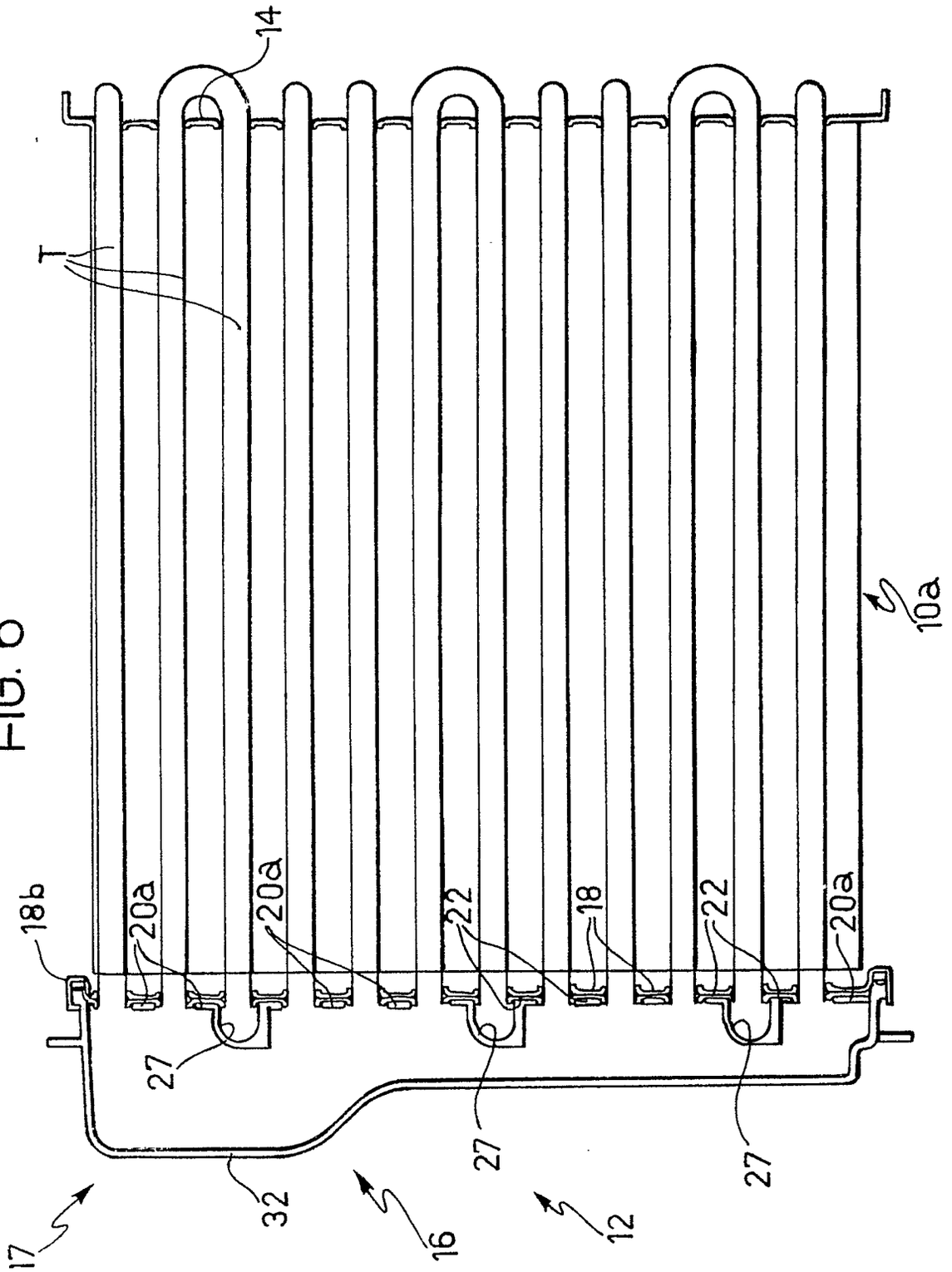

14
T
18b
18
27
20a
27
18
22
27
20a
22
22
20b
20a
27
B
B
27
A
B
A
32
30
27
A
16
12
17

FIG. 6



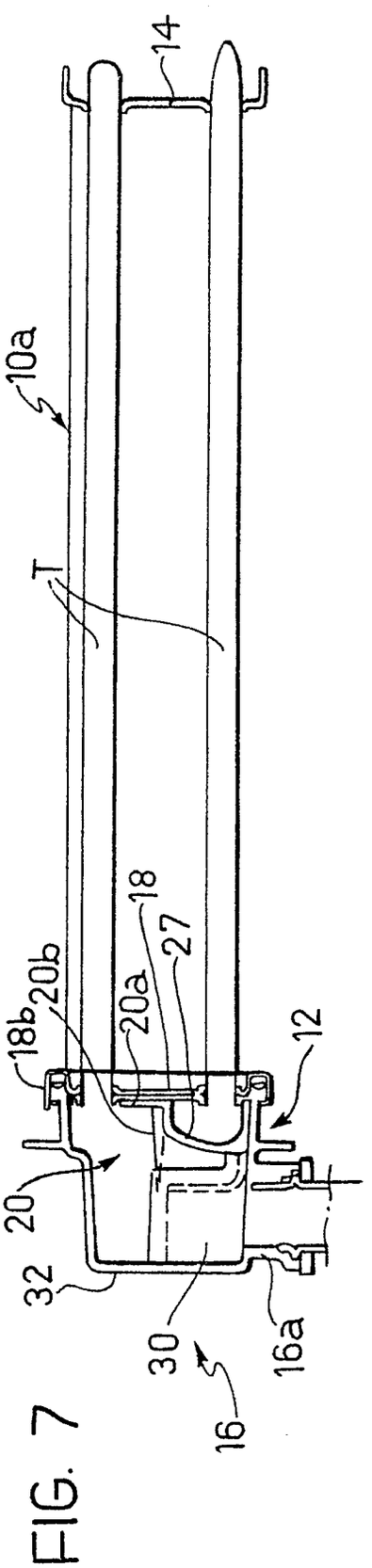


FIG. 7

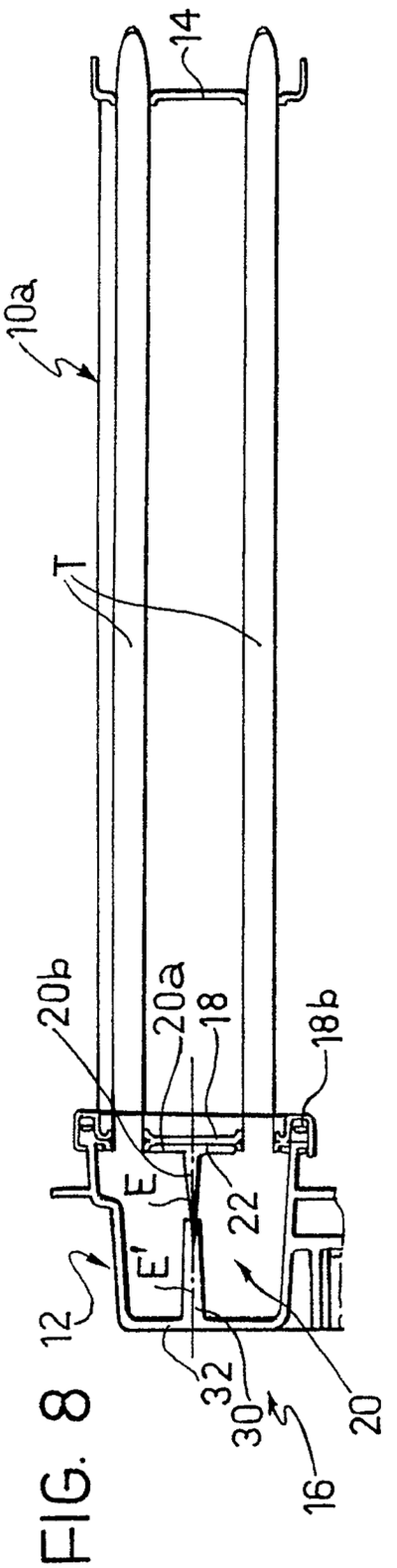


FIG. 8

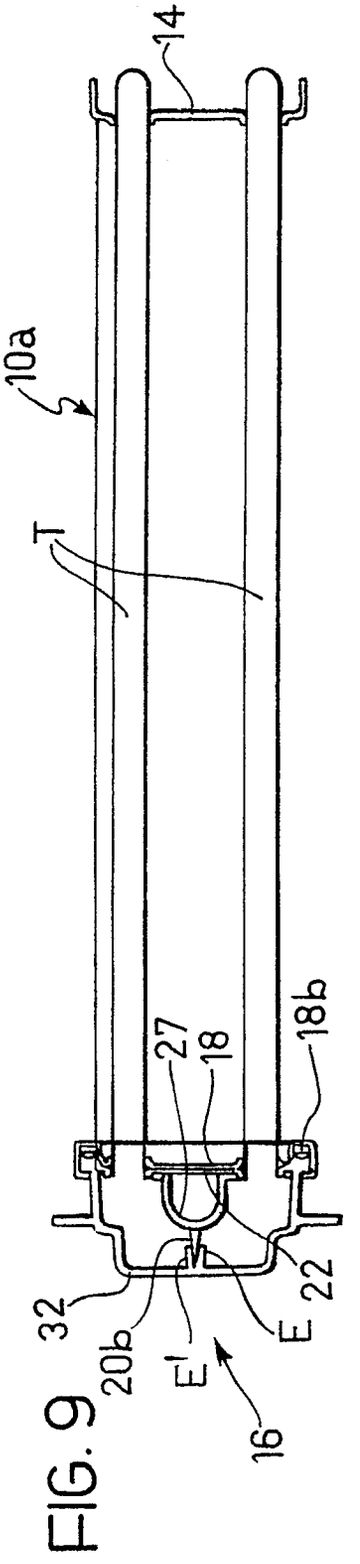


FIG. 9

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EUROPEAN SEARCH REPORT

Application Number

EP 90 83 0429

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	FR-A-2 509 447 (SÜDDEUTSCHE KÜHLERFABRIK BEHR GmbH & CO. KG) * Page 16, line 3 - page 17, line 20; figures 20,21 *	1,6	F 28 F 9/02
A		2-5	
X	EP-A-0 328 414 (ACR HEAT TRANSFER LTD) * Column 4, line 60 - column 5, line 59; figures 2-7 *	1,6	
A		2-5	
A	FR-A-2 573 190 (S.A. DES USINES CHAUSSON) * Page 3, line 21 - page 4, line 11; figures 1-3 *	1	
A	DE-A-2 300 881 (MODINE MANUFACTURING CO.) * Page 2, line 23 - page 4, line 8; figures 1-3 *	1	
A	FR-A-2 390 692 (MANGEOL) * Page 2, lines 19-29; figure 2 *	1	
A	DE-A-3 733 866 (SÜDDEUTSCHE KÜHLERFABRIK BEHR GmbH & CO. KG) * Figure 2 *	1,2	
A	US-A-4 114 397 (TAKAHASHI et al.) * Column 2, line 38 - column 3, line 38; figures 3-5 *	1	TECHNICAL FIELDS SEARCHED (Int. Cl.5) F 28 F F 25 B

The present search report has been drawn up for all claims

Place of search	Date of completion of search	Examiner
The Hague	11 January 91	BELTZUNG F.C.

CATEGORY OF CITED DOCUMENTS

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