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(71) Applicant: **FARAL S.p.A.**
Via Ponte Alto N. 40
I-41011 Campoggaliano (MO) (IT)

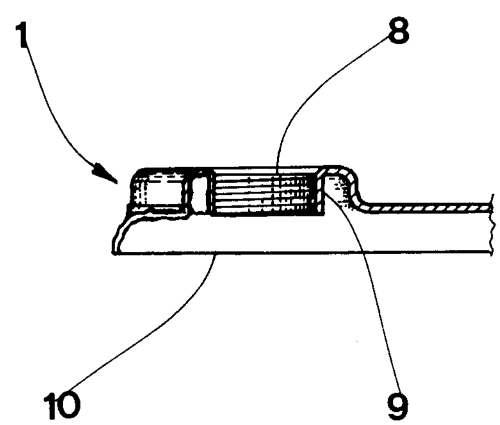
(72) Inventor: **Vezzani, Giancarlo**
Via Carpi 6
I-42018 S.Martino in Rio (Emilia) (IT)

(74) Representative: **Lanzoni, Luciano**
BUGNION S.p.A.
Via Emilia Est, 25
I-41100 Modena (IT)

(54) **A process for manufacturing radiator elements for central heating plants.**

(57) The invention relates to a process for manufacturing radiator elements for central heating plants, comprising a deep-drawing phase in which a half-shell (1) is formed, provided with a cylindrical element (9) coaxial to a through-hole (8) and a thread-making phase of the internal surface of the said cylindrical element (9).

Fig.2



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The invention relates to a process for manufacturing radiator elements for central heating plants.

In particular, the invention relates to internally hollow radiator elements provided with holes for passage of a thermal carrier fluid, which elements are usually connected one to another by means of nipples situated at the passage fluid holes.

At present radiator elements are constructed by means of substantially two process categories, the first of which envisages casting processes, normally using cast iron or aluminium alloys, while the second envisages sheet metal (usually steel) pressing to produce a half-shell, which is subsequently welded, usually flash-welded, to an identical half-shell. The present invention belongs to the second above category.

Some known processes construct radiators using two different types of radiator element. The first type is an intermediate radiator element, comprising a head-piece obtained by welding together two half-shells. Pipes are welded, usually flash-welded, to the head pieces. By varying the length of the pipes radiator elements of different heights can be obtained.

The second type has an end element consisting in an intermediate element on one side of which internally-threaded pipe-couplings are welded, usually at the fluid passage holes.

Figure 5 shows a part of a half-shell of the second type of radiator, comprising a pipe-coupling. The pipe-couplings are provided with coupling nipples for a connection of the radiator to a thermal-carrier fluid distribution plant, or for its connection to another end radiator element.

The complete radiator is made up of an assembly of the above elements. Assembly is generally performed by spot-welding at the fluid passage holes.

Other processes exist in which radiator elements are made which have four threaded pipe-couplings, two for each side of the element, which are welded at the fluid passage holes. The assembly of the radiator in this case comprises the use of nipples to connect each radiator element to the another.

A drawback of the radiators made with the above known processes is that stocking the elements necessary for the construction of the radiators is costly, since different types of elements are used as well as different types of components for the elements.

A further drawback is that the assembly of a radiator requires a high number of welding operations.

A principal aim of the present invention is to eliminate the above-mentioned drawbacks by providing a process which enables the work times and operations necessary for the construction of radiator elements of the above-described type to be reduced.

An advantage of the present invention is that it simplifies stocking as well as reducing the costs attached to it, by using a limited number of modular components.

A further advantage is that it requires only a limited number of welding operations to realise a complete radiator.

These aims and advantages and others besides are all attained by the invention of the present application, as it is characterised in the claims, which essentially envisage a deep-drawing phase of a unit of sheet metal provided with an initial hole in which, at a pre-established height, an annular crown circumscribing the said hole is folded to form a cylindrical element, which element will subsequently be provided with a thread.

Further characteristics and advantages of the present invention will better emerge from the detailed description that follows, of an embodiment of the invention, herein illustrated purely in the form of a non-limiting example in the accompanying figures, in which:

- figure 1 is a schematic partial plan view of a half-shell obtained with the present process;
- figure 2 is a sectioned schematic partial lateral view from below of figure 1;
- figure 3 is a schematic partial plan view of a unit of sheet metal obtained from a first phase of the process and destined to the subsequent phases of the said process;
- figure 4 is a schematic sectioned plan view in vertical elevation of the deep-drawing phase of the process;
- figure 5 is a schematic sectioned partial view of a product made according to a known procedure.

In figure 5 a half-shell 19 is shown for radiator elements constructed according to a known process, done by means of deep-drawing a unit of sheet metal provided with an initial hole.

The half-shell 19 exhibits a hole 18, through which a thermal-carrier fluid will flow between two consecutive radiator elements.

The diameter of the through-hole 18 is the same as that of the initial hole in the sheet metal unit presented for deep-drawing.

A pipe-coupling 17, internally threaded and arranged internally of the half-shell 19 and coaxially to the through-hole 18, is provided for screw-coupling to a nipple.

The pipe-coupling 17 is separately made and welded to the half-shell 19 after the said half-shell 19 has been deep-drawn. With reference to figures 1 and 2, 1 denotes a half-shell obtained according to the present process, comprising a through-hole 8, a threaded cylindrical element 9 coaxial to the through-hole 8, an edge 10 and three half-columns 11.

The half-shell 1 is made through a process comprising the three following phases.

An initial hole 7 is obtained on a flat unit of sheet metal 6 realised by means of, for example, shearing or metal-beating.

The holed sheet metal 6 is then deep-drawn to form a half-shell 1. During the drawing a bending operation is also performed, towards the inside of the half-shell 1, to form an annular crown 5 which surrounds the initial hole 7, and thus to give rise to a cylindrical element 9.

In Figure 3, where an interrupted plan view of the already-holed unit of sheet metal 6 is shown, the annular crown 5 is represented by a broken line.

The through-hole 8 is made on the initial hole 7 by plastically deforming the material surrounding the hole 7 during the course of the deep-drawing.

The hole 7 has a smaller diameter than that of the through-hole 8.

The height of the annular crown 5 is about the same as the difference between the diameter of the through-hole 8 and the diameter of the initial hole 7. The internal surface of the cylindrical element 9 is subsequently threaded by rolling.

In figure 4 a stage of the deep-drawing phase, according to the invention, is schematically represented, in which the unit of sheet metal 6, positioned between an upper half-die 2 and a lower half-die 3 is bent and wound about the half-dies until it takes on their shape.

The upper half-die 2 exhibits a shaped body 4 which acts on the unit of sheet metal 6 coaxially to the initial hole 7, plastically deforming the annular crown 5 as described in precedence.

Obviously different tools might be chosen, both in terms of shape and arrangement. For example, the initial hole 7 might be obtained directly at the drawing press by specially shaping the tools.

The shape and the size of the sheet metal 6 unit must be chosen very carefully, because of the deformations they will be subjected to during the drawing process in order to obtain a product having the desired shape characteristics.

The thread-making phase can be performed, if so desired, by shaving rather than rolling. Rolling has the advantage of strengthening the thread.

A radiator element is made by bringing two half-shells 1 together along their respective edges 10 and welding them. The welding phase is performed by means of the TIG process.

Thus an element is obtained which is internally hollow and provided with two through-holes 8 for passage of the thermal carrier fluid from one radiator element to the adjacent ones.

A plurality of such elements, arranged consecutively one to another and connected by means of nipples, constitutes a whole radiator body.

To ensure a good seal, a frontal gasket is interposed between two consecutive radiator elements, at a junction zone.

The TIG process ensures the best guarantee of quality constancy of the joint. Also, it helps to avoid a subsequent finishing and cleaning phase of the welding bead, since there is no flash line. Obviously alternative welding methods can be used. The radiator element undergoes an anticorrosion treatment. This permits, in the construction of radiators obtained from sheet metal, of considerably increasing the average life of the radiators in comparison to non-treated ones of a similar metal thickness.

Claims

1. A process for making radiator elements for central heating plants, comprising the following phases:
   - obtaining an initial hole (7) in a unit of sheet metal (6) having predetermined size and shape;
   - a deep-drawing of the holed sheet metal (6) unit to form a half-shell (1) provided with a through hole (8) made on the initial hole (7) previously obtained;
   - bringing together and welding together two half-shells (1) to obtain an internally hollow single internally hollow radiator element;
   - characterised in that;
   - the initial hole (7) has a smaller diameter than the through hole (8);
   - during the deep-drawing phase a bending of the half-shell (1) is performed, forming thus an annular crown (5) having a height which is about equal to a difference between the through hole (8) diameter and the initial hole diameter (7), to form a cylindrical element (9) which is coaxial to the through-hole (8);
   - it has, after the deep-drawing phase, a thread-making phase of an internal surface of the cylindrical element (9).

2. A method as in claim 1, characterised in that the threading phase is performed by a rolling technique.

3. A method as in claim 1, characterised in that the welding is performed by a TIG process.

4. A method as in claim 1, characterised in that a surface of the radiator element (1) undergoes

an anti-corrosion treatment.

Fig.4

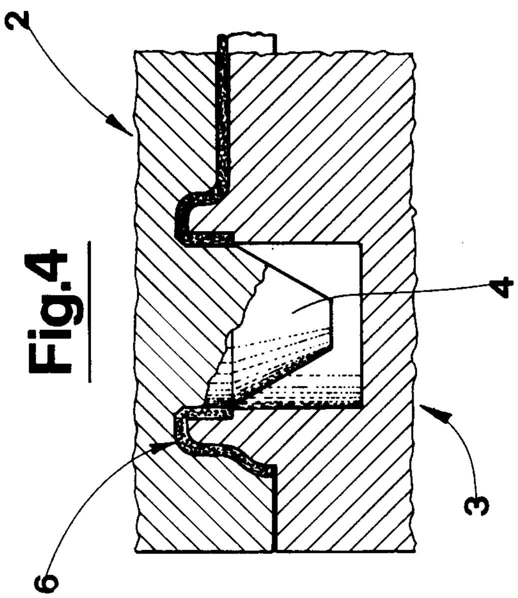


Fig.3

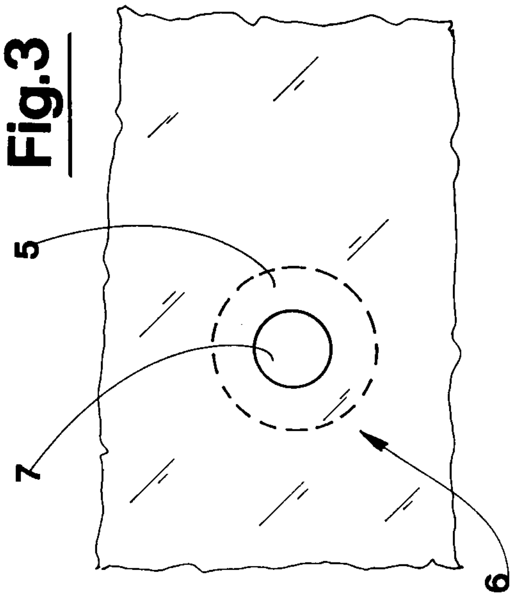


Fig.5

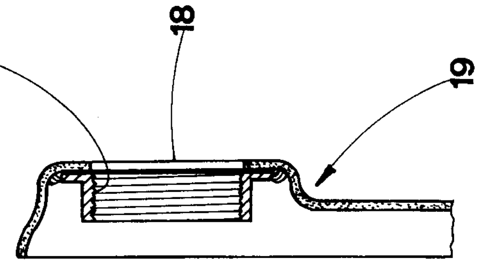


Fig.2

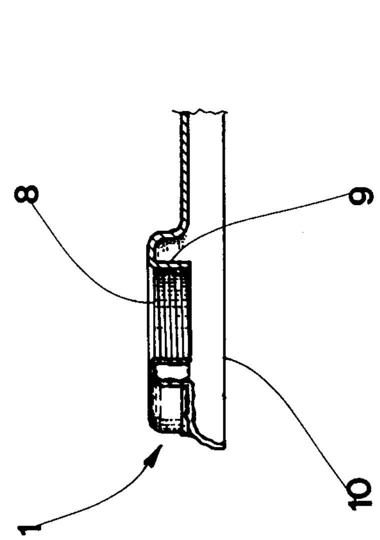
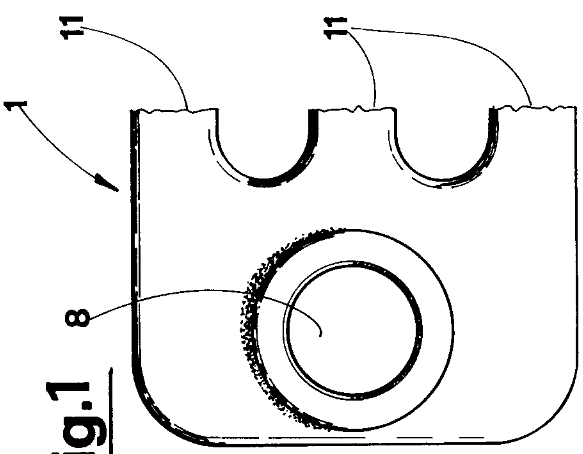


Fig.1



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EUROPEAN SEARCH REPORT

Application Number
EP 93 83 0392

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)
Y	DE-C-11 32 082 (RHEINSTAHL EISENWERK HILDEN) * claims 1-3; figure 1 * ---	1	B21D53/04
Y	US-A-2 021 960 (KRAMER) * claims 1-3; figures 2-5 * ---	1	
A	US-A-3 693 568 (MC KEE) * claim 1; figures 1,2 * ---	1	
A	GB-A-1 007 886 (SILVIO SALA) * page 2, line 84 - line 89; claims 1,2; figures 9-11 * ---	1	
A	US-A-4 109 501 (TOYOO KOZIMA) * claim 1; figures 1-5 * -----	1	

TECHNICAL FIELDS SEARCHED (Int.Cl.5)

B21D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	15 June 1994	Schlaitz, J

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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