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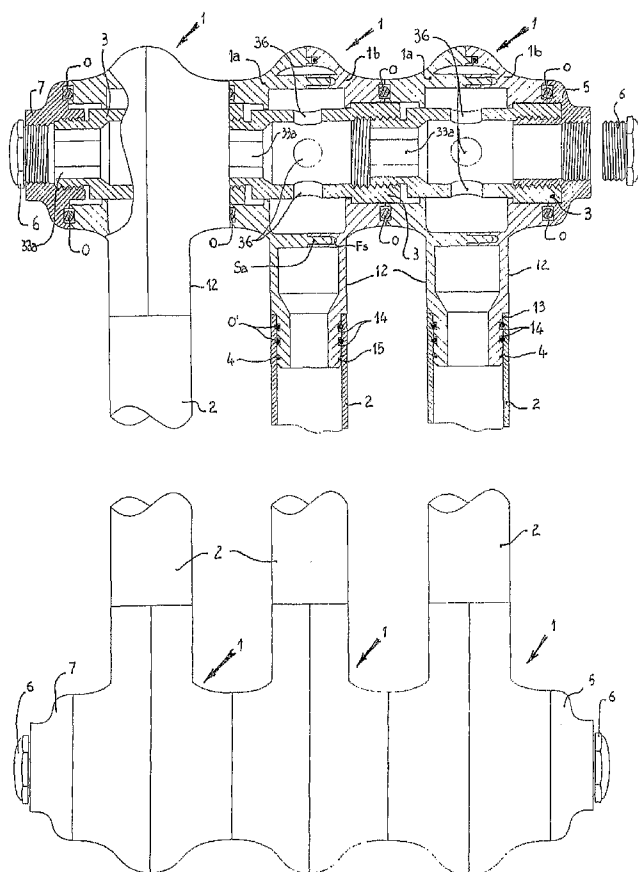
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(54) Title: A PRODUCTION SYSTEM FOR RADIATORS, FOR HEATING PLANTS



(57) Abstract: A production system for radiators, for heating plants, the system being obtained by simple assembly of two radiator half-shells (1a, 1b) and two connecting and fastening elements (3 and 4), in which a final complete radiator is obtained using only mechanical systems and without any welding, two flanges (5, 7) also being included. The final radiator of the system is composed of a plurality of single radiator elements (1) made of two radiator half-shells (1a, 1b) and a length of cylindrical pipe (2) applied to a single radiator element (1), while the two connecting and fastening elements (3, 4) are constituted by a threaded sleeve for connecting and fixing the two half-shells (1a, 1b) constituting a radiator element (1) to one another by a screwing action. The radiator elements so composed and connected will be provided in the part that extends from the cylindrical tract (12) and departs therefrom following on with short recessed tracts (14 and 15), in the recessed track (15) with an elastic washer (4) which enables irreversible connection of a relative length of cylindrical pipe (2) to the radiator element (1).



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Description

A Production System for Radiators, for Heating Plants.

Technical Field

The invention relates to a special system of radiator production for heating plants, briefly consisting in the assembly of special basic elements which are easily obtainable using known means and processes.

In the system of the invention, the wide variety of possibilities of choice of
5 basic elements, including the dimensions of some of the elements, enables obtaining a final product which includes radiators of considerably various sizes and shapes. The simplicity and rapidity of the assembly operations of the various components of each single radiator further enables production of only the types of radiators requested and in the right numbers. This helps to
10 avoid useless and expensive storage of finished products.

Background Art

The prior art describes devices known as radiators which are normally used in water- and steam-operated heating plants to provide correct amounts of heat in rooms. These devices are generally constituted by hollow bodies having
15 shapes and dimensions that vary, obtained with various materials and production processes; hot water, and in a few cases steam, both at low pressures, are made to run through these radiators; the water or steam are produced in boilers.

Technical and technological progress have enabled various new production
20 and application methods to be developed.

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One of the prime solutions, among the most well-known, and still considerably popular, is forming single elements by cast-iron casting; each element is made up of a number of tubular conduits, i.e. the columns, which are arranged coplanar as well as parallel to one another. The elements connect
5 at ends thereof to respective hollow bodies which constitute single manifolds. Each of these manifolds is provided with holes for enabling reciprocal connection of several of the elements, by means of nipples. Clearly the elements must be produced in various types, each type being basically characterised by a number and length of the columns it is made up of, so for
10 each single type of element heating bodies, i.e. radiators, can be built having heat emission surfaces which are directly proportional to the number of elements assembled together. It follows that especially in the first stage of production it will be necessary to make holes in a large number of the elements of various typologies and store them all. Thereafter, anticipating
15 customer requests, groups of the elements will have to be assembled, each having a specific number of the elements (of various types), before once again being stored.

Obviously forecasting the quantities of radiators to be produced with this type of solution is always very much guess-work, and as a result the producer is
20 forced to develop his production on the basis of poorly-reliable hypotheses, and clearly he or she must always maintain a large warehouse in order to stock an adequate range of units and elements.

The connecting-up operation, too, of the elements needed to form a full body of a radiator is considerably laborious; indeed, a special tool is needed,
25 following a process which requires considerable attention and the attentions of several experienced personnel, not to mention the long working times. Clearly the need to produce considerable quantities of initial products to

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assemble, plus the need to keep a good number of assembled products, imply much effort and very high capital investment which is kept practically "frozen" in the warehouse, also adding to costs in terms of storage space. Add to this the costs of the assembly operations of the elements in order to obtain
5 the various types of finished radiators, and total production costs are very high.

The development of special welding techniques together with the improvement of the pressing processes and the contemporary improvement in the characteristics of steel used in pressing have enabled development, in the
10 field of the invention, of new production solutions, the main and best known of which will be summarised herein below and commented upon with the aim of highlighting the limitations and difficulties, both in terms of production and application, as well as the various drawbacks inherent in each one.

One of the known solutions consists in forming a rectangular plate from a
15 suitable steel sheet by a simple cutting and deep pressing process. A plurality of longitudinal recesses is pressed into the rectangular plate, which recesses are equi-distanced and parallel to one another, and are interconnected perpendicularly at ends thereof by further transversal recesses. By joining two of these plates by welding, the plates being arranged so that the relative
20 longitudinal recesses are opposite one another and facing the outside, a finished radiator is obtained. Clearly this process implies the use of a press for each type of radiator and therefore a considerable use of capital. Furthermore, the welding operations are quite expensive, as they imply the use of special and expensive equipment and apparatus as well as further
25 costly manual milling operations to remove the aesthetic defects resulting from the welding operations. Also, the problems of storage remain unsolved; indeed, they worsen.

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A further known solution, quite widely adopted, consists, once more, in using a steel sheet and cutting and shaping it by pressing into rectangular plates conformed in such a way as to develop two half-shells exhibiting some parallel longitudinal recesses orthogonally connected at ends thereof by
5 respective transversal recesses.

Two half-shells obtained thus are arranged in opposite positions so that the longitudinal recesses and the transversal recesses form respective cavities equivalent to conduits corresponding to the columns and the manifolds of the elements mentioned above in the introduction hereto.

10 This solution too exhibits considerable drawbacks, indeed contains all of the drawbacks of the other prior art realisations previously described. A further solution which is useful to the present summary due to a certain similarity with the solution of the invention is one which includes the use of lengths of cylindrical pipes which are welded at ends thereof; the hollow bodies having
15 the "manifold" conformation. These hollow bodies ("single manifolds") are formed by two half-shells formed from suitable sheet steel, once more by cutting and pressing operations, which are welded to one another.

Obviously this solution too, apart from containing practically all of the drawbacks listed herein above in reference to the other prior art realisations,
20 exhibits a very long welding seam which is therefore expensive and produces ugly surface irregularities, such as drops of molten material and waste products which in part, i.e. those parts on view, are manually removed using special tools and operations such as hammering, scraping, filing, milling, and which in part are left untouched due to being inaccessible, possibly being
25 inside the element itself.

The main aim of the present invention is therefore to obviate the various above-described drawbacks, which aim is achieved by the new system of

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production of tubular radiators which includes, for the formation process of heating elements (radiators) of a tubular type, a simple and rapid assembly operation of hollow inter-connectable elements which are connected by threaded sleeves in order to develop manifolds of widely variable dimensions, to which lengths of cylindrical pipes of variable lengths are connected, the connection of the hollow elements to one another as well as their connection to the lengths of pipe being obtained without use of welding.

Disclosure of Invention

To better understand the characteristics and advantages of the system of the present invention, a preferred but non-exclusive embodiment is now described and claimed by way of non-limiting example, with reference to the accompanying figures of the drawings, in which:

Figure 1 is a partially-exploded lateral view of a radiator of the invention;

Figures 2, 3, 4, 5 and 6 are front external views of the conformations of some hollow elements used for the formation of manifolds of radiators;

Figure 7 is a section along line I-I of figure 6;

Figure 8 is a front external view of a first half-shell forming the male part of a hollow element;

Figure 9 is a lateral view of the first half-shell illustrated in figure 8;

Figure 10 is a front internal view of the first half-shell illustrated in figures 8 and 9;

Figure 11 is a section view according to line II-II of figure 10;

Figure 12 is an external front view of a second half-shell which is symmetrically complementary to the half-shell of figure 8, and is the female complement of the hollow element resulting from the coupling with the first half-shell;

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Figure 13 is a corresponding lateral view of the second half-shell, illustrated in figure 12;

Figure 14 is an internal front view of the second half-shell illustrated in figures 12 and 13;

5 Figure 15 is a section view according to line III-III of figure 14;

Figure 16 is an external view of the threaded sleeve used to connect up the first half-shell and the second half-shell illustrated in the preceding figures from 8 to 15, as well as various quantities of hollow elements formed by the connection of the two half-shells;

10 Figures 17 and 18 are lateral view of the sleeve of figure 16;

Figure 19 is a section view according to line IV-IV of figure 18; figure 20 is a front view illustrating the conformation of the countersunk elastic "washer" used for fixing the connection of tubular lengths to respective coupling sleeves starting from a hollow element of the type

15 illustrated in figures from 2 to 15;

Figure 21 is a section view according to line V-V of figure 20;

Figures 22 and 23 are an enlarged view of a detail illustrating the application of the elastic washer illustrated in figures 20 and 21 on a corresponding coupling sleeve of a relative hollow element and respectively the arrangement of the washer in the position preceding the application of a tubular length to a relative coupling sleeve, and the final arrangement in which the tubular length is applied on the coupling sleeve;

20 Figures 24 and 28 are an external front view of a possible conformation of flanges applicable and fixable to ends of a relative group of hollow elements of the type illustrated from figure 2 to figure 15 and interconnected to one another with the threaded sleeve illustrated in the preceding figures 16, 17, 18 and 19;

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Figures 25 and 29 are lateral views of the flanges illustrated respectively in figures 24 and 28;

Figures 26 and 30 are section view respective according to line VI-VI of figure 24 and VII-VII of figure 28;

5 Figure 27 is a lateral view of the conformation of a cap which can be applied to the flange illustrated in figures 24, 26 and 28;

Figure 31 also illustrates an external lateral view of the conformation of a further cap which is applicable to the flange illustrated in figures 25, 27 and 29;

10 Figure 32 is a detailed illustration, in a completely exploded view, of the connection by threaded sleeves of the type illustrated in figure 19, of couples of complementary half-shells illustrated in figures 11 and 15, as well as some of the resulting hollow elements and the application with an irreversible connection of a length of pipe to a corresponding sleeve starting from a
15 hollow element.

The common details in the above figures are denoted by the same reference numbers.

For reasons of descriptive clarity reference will first be made to figures from 2 to 29 in order to describe in detail the conformation of the single elements
20 which according to the present invention enable obtaining, by simple assembly made only using reciprocal mechanical coupling systems, a radiator of wide-ranging dimensions and characteristics.

Briefly, the basic elements are initially four in number, as follows:

the hollow element 1 formed by assembly of two half-shells 1a and 1b;

25 a length of cylindrical pipe 2;

a threaded sleeve 3;

an elastic washer 4.

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To the above elements single flanges can be added, or flanges with accessories and sizes and conformations that are variable according to the different applications.

The hollow element 1 will now be described in detail.

- 5 With reference to figures between 2 and 5, some of the various possible external conformations of the hollow element 1 are shown, precisely the one illustrated in figure 2 in which two short bodies depart from the hollow element 1(2), which short bodies form hollow cylindrical elements 12 for connection, as will be described herein below, to two lengths of cylindrical
- 10 pipe 2, up to the element of figure 6 in which six short cylindrical elements 12 depart from the hollow element 1(6) for connection to six lengths of cylindrical pipe. Obviously the number of hollow cylindrical elements 12 departing from a single hollow element 1 can be even greater than the maximum number illustrated herein.
- 15 For reasons of clarity, the hollow element 1 is also denoted by a further number in brackets, which indicates the number of hollow cylindrical elements departing therefrom; for example the element with six cylindrical elements 12 departing from it is indicated as follows: 1(6), while the one with two cylindrical elements 12 departing from it is denoted as follows: 1(2).
- 20 In order to describe in detail the overall conformation of the hollow element 1 reference will also be made to the following group of figures, precisely from figure 7 to figure 15, in which the hollow element 1 is illustrated in full detail. For reasons of clarity and simplicity, as well as for description, the various parts of the male half-shell 1a are represented in figure 7 and in figures 8, 9,
- 25 10 and 11 not only by numbers but also with the added letter a, while the various parts of the female half-shell are represented in figure 7 and in figures 12, 13, 14 and 15 not only by numbers but also with the added letter b. Also

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for reasons of clarity and simplicity, reference will be made to half-shells (1a, 1b) and a relative hollow element 1 obtained therewith which forms only two hollow cylindrical elements therefrom, of the same conformation and using the same assembly and construction process for elements with three, four, 5 five, six etc. hollow cylindrical elements departing therefrom.

In figure 7 the hollow element 1 is constituted essentially by a covering formed by assembly of two complementary half-shells 1a and 1b. The half-shells 1a, 1b are specular and shall be called hereinafter the male half-shell 1a and the female half-shell 1b. The male half-shell 1a and the female half-shell 10 1b differ in that as can be seen in figure 7, and in figures 11 and 15, the flat surfaces BA of the edges of the male half-shell 1a and all of the surfaces BA exhibit a small rim M while in the flat surfaces BB of the female half-shell 1b corresponding grooves F are afforded to receive the rims M. The rim M will engage, as will be described herein below, in the corresponding groove F. 15 Further, the two half-shells 1a and 1b posteriorly exhibit a hollow circular protrusion.

Still with reference to figures 10 and 11, for the male half-shell 1a, and figures 14 and 15, for the female half-shell 1b, the male half-shell 1a preferably exhibits three projecting elements or pins Sa, which correspond, in 20 the female half-shell 1b, to three holes Fb. Like the rim M on the male half-shell 1a fitting into the groove F, the pins Sa will fit into the holes Fb.

Above and concentrically of the external arch of the male half-shell 1a and the female half-shell 1b, on the opposite side of the surfaces BA and BB there will be a circular through-hole C which is afforded within a cylindrical cavity 25 C1 which is part of the posterior protrusion of the male and female half-shells 1a and 1b up to the end of the half-shells 1a, 1b, creating a through hole C-C1 which terminates posteriorly of the half-shells 1a-1b. In the posterior part of

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the half-shells 1a-1b there is a rectangular-section circular groove 11 which contains o-rings O, which will be better explained herein below.

The half-shells 1a, 1b terminate inferiorly in a first short cylindrical tract 12 which is reduced by a suitable cylindrical amount determined by the cylindrical tracts 13. Recesses 14 alternate with the cylindrical tracts 13,
5 which recesses 14 are short cylindrical tracts that are shorter than the other cylindrical tracts 13. The recesses 14 are for housing further o-rings O, the use of which will be better described herein below. Further, close to the free end of the final cylindrical tract 13, which terminates in a 45° bevel, figures 8
10 to 15 and figures 22, 23 and 32 illustrate a recess 15 which is less high but not shallower than the recesses 14, which will house an elastic washer 4 of known type illustrated in figures 20 and 21.

With special reference to figures from 1 to 32, the cylindrical element 2 is constituted by a length of known common piping.

15 With particular reference to figures 16, 17, 18 and 19, as well as figures 1 and 32, a sleeve 3 is illustrated. The sleeve 3 is externally formed as follows: it is composed of two consecutive cylinders 31 and 32 which decrease in diameter and terminate with a threaded tract 33. The first cylindrical tract 31 of the sleeve 3 is shorter than the following cylindrical tract 32. A further short
20 threaded tract 33 follows the short cylindrical tract 32. The sleeve 3 is hollow; the hollow tract 31a corresponding to the cylindrical tract 31 is internally threaded over the whole length of the tract 31a, and then follows on within the cylindrical tract 32 with a hollow cylindrical part 32a, while internally of the short threaded tract 33 there is a cavity with prismatic hexagonal shape
25 33a.

Centrally of the cylindrical tract 32 there are preferably through-holes 36 to the internal hollow part 32a. The internal tract 31a of the first cylindrical tract

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31 has a female thread 33 which starts from the cylindrical tract 32 for reasons that will be explained herein below.

With reference to figures 20 and 21, an elastic washer 4 is illustrated, formed from a ring provided at a circumferential part thereof with a brief interruption.

5 Slightly-inclined short tracts 41 extend externally thereof.

With reference to figures 24, 25, 26 and 27, and again in 28, 29, 30 and 31, the following elements are included.

In figures 24 to 26, an internally-hollow flange 5 is illustrated. This flange 5, as shown in figures 24 and 25, has on one side thereof a short tract 51
10 provided with a hexagonal facing, and is very similar to normal nuts for bolts. It has an external mantle 52 and is preferably curved. The mantle 52 is interrupted by a flat circular surface 53 which is perpendicular thereto. In figures 25 and 26 it can be seen that a short externally-threaded part extends from this mantle 52. Figure 26, which illustrates the flange 5 of figure 25 sectioned according to line VI-VI of figure 24, shows that the thread of the
15 externally-threaded part 54 starts internally of the curved mantle of figure 25. Furthermore, figure 26 shows that the flange 5 is internally provided with a thread 55 which begins at the same start point of the short tract 51 provided with a hexagonal facing. The thread 55 follows on at least up until the start of
20 the externally threaded tract 54. The flange 5 is further provided with a rectangular groove 53' for housing o-rings.

In figures from 28 to 30, a second flange 7, very similar to the flange 5, is illustrated. The second flange 7 is different from the first flange 5 in that it does not have a threaded projecting part 54 but instead has a short externally
25 cylindrical tract 71. The second flange 7 is also hollow, and is provided, as can be seen in figure 30, with two threaded tracts 71' and 72 having different diameters. More precisely, with reference to figure 30, which is a section

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view according to lines VII-VII of figure 28, the tract 71' has a larger diameter and therefore a larger thread than the tract 72 which also begins line the threaded tract 52 of figure 25 in the same zone as the hexagonal tract. The thread 72 ends at the threaded tract 71'. The second flange 7 is
5 interrupted by a circular flat surface 73 which is also provided with a groove 73' for housing an o-ring.

Following from the description of a preferred embodiment of the invention, a preferred system of construction thereof will now be made.

With reference to figures 1 and 32, which illustrate a preferred assembly of
10 the above-described elements, the operator will first take the two half-shells 1a, 1b (illustrated in figures from 2 to 15), and before coupling them will carry out two operations.

In the groove F of the female half-shell 1b he will insert a seal which can be fashioned from an o-ring, preferably by cutting it; this will increase the seal
15 of the radiator when assembled.

After positioning the seal the operator will use a thin layer of a suitable glue, such as a hard-wearing resin or the like on surface BA of the male half-shell 1b.

After performing the above operations, the operator takes the two half-shells
20 and joins them. The coupling is done when the surfaces BA and BB are perfectly superposed and the resin is well-spread. Also the recess F of the female half-shell 1b will meet perfectly with the projecting part M of the male half-shell 1a and the pins Sa will engage precisely and solidly in the holes Fb. The hollow element, i.e. the radiator element 1, is thus obtained. The pins Sa
25 in the holes Fb have the aim of stiffening the radiator element 1 and preventing crushing thereof following the compression thereof during assembly. After having completed assembly of a predetermined number of

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the radiators 1, the operator applies suitable o-rings in the recesses 14 and the elastic washers 4 in the recess 15. Then the operator screws together a flange 5 and a sleeve 3, by engaging the external threaded part 54 of the flange 5 to the internal threaded part 31a of the sleeve 3, thus forming a single solidly-
5 connected part. Then, through the cavity C1 and therefore the hole C, and first positioning an o-ring in the hollow zone 11' of the radiator element 1 (corresponding to the hollow zone 53' of the flange 5), the operator inserts in a radiator element 1 a first of a series of sleeves 3 coupled as above-described to the flange 5, bringing the flange 5 to strike with the surface 53 thereof
10 against the surface 11 of the radiator element 1. When a first block of elements 5, 3 and 1 is formed, the operator screws a second sleeve 3 to the previous sleeve 3 of the group consisting of elements 5, 3, 1. Precisely, the operator uses a hexagonal key in the hollow part having a hexagonal section 35 and screws the sleeve 3 by the thread 31a thereof, which sleeve 3 then
15 engages with the thread 33 of another, preceding sleeve 3. A further o-ring O is then inserted in the cavity 11' and a second radiator element 1 attached by repeating the previous stage of screwing a further sleeve 3 to the preceding sleeve 3 and in this way forming a plurality of sleeve-radiator-element couplings. When the operator has built up to a predetermined number of the
20 coupled elements, the flange 7 is used to close off the series of couplings, with the thread 71' screwing onto the thread 33 of the sleeve 3.

Once this has been done, the lower cylindrical parts 13 are added, starting with the short cylindrical tracts 12 which form a single block of the radiator element 1 and the pipes 2. The lower cylindrical parts 13 are introduced
25 simply by pressing the pipe 2 towards the cylindrical tract 12 of the radiator element 1. When, as in figure 1, the pipe 2 strikes against the surface formed by the changed of section obtained by the difference of section in passing

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from the cylindrical tract 12 to the cylindrical part 13, the pipe 2 is solidly coupled to the radiator element 1. This solid coupling is in effect a friction coupling between elastic washer 4 and the internal surface of the pipe 2 and can be observed in figures 22 and 23 and relative large-scale representations.

5 Figure 22 shows the lower circular part of the radiator element 1, with the tracts 13, 14 and 15, detached from the pipe 2 and enlarged. The elastic washer 4 with its projections 41 are shown, while figure 23 shows the following stage, i.e. the introduction of one of the lower cylindrical ends, which start from the lower cylindrical pipe 12 with the cylindrical tract 13
10 having a smaller section but having a larger section than the cylindrical tracts 14 and 15 internal thereof of the radiator element 1 in the pipe 2, and the enlarged view of the detail of the elastic washer 4 indicates that the projections 41 flex and grip by friction, due to their elastic thrust onto the pipe 2, i.e. against the internal surface of the pipe 2.

15 The first described process (assembly of parts 5-3-1 and 3-1 with closure using the flange 7) is repeated at the other end of the pipe 2 with the series of radiator element 1, sleeves 3, flanges 5 and 7 forming a second "single block". To close the open ends of the flanges 5 and 7 which will not be used for introducing the heating fluid, identical threaded caps 6 (figures 27 and 31)
20 are screwed on, by screwing one cap 6 by its thread 61 into the threaded part 55 of the flange 5 and another radiator cap 6 by its thread 61 into the thread 72 of the flange 7.

Two flanges 5 and/or 7 will remain open in order to be connected, respectively, one to the water inlet pipe and the other to the radiator discharge
25 pipe which will send the heating fluid into circulation.

Claims.

- 1). A production system for radiators, for heating plants, wherein the system is obtained by simple assembly of two radiator half-shells (1a, 1b) and two connecting and fastening elements (3 and 4), in which a final complete radiator is obtained using only mechanical systems and without any welding; the system including application of two flanges (5, 7).
- 2). The system of claim 1, wherein the final radiator is composed of a plurality of single radiator elements (1) made of two radiator half-shells (1a, 1b) and a length of cylindrical pipe (2) applied to a single radiator element (1), while the two connecting and fastening elements (3, 4) are constituted by a threaded sleeve for connecting and fixing the two half-shells (1a, 1b) constituting a radiator element (1) to one another by a screwing action, and for connecting and fixing a radiator element (1) to at least a further radiator element (1), and by an elastic washer for irreversibly connecting a length of the cylindrical pipe (2) to the radiator element (1).
- 3). The system of any one of the preceding claims, wherein the sleeve when positioned internally of the radiator element (1) projects at ends thereof from the radiator element (1) in order to be solidly screwingly engageable to further sleeves on either side thereof.
- 4). The system of any one of the preceding claims, wherein the radiator element (1) can include a variable number of cylindrical elements departing there-from in order to realise from a minimum number of two vertical columns to a maximum number of vertical columns which is compatible with the mechanical resistance of a material the radiator element is made of.

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5) The system of any one of the preceding claims, wherein as well as the variability of the number of columns which can be applied, the system also enables a considerable variation of height of the final radiator to be obtained.

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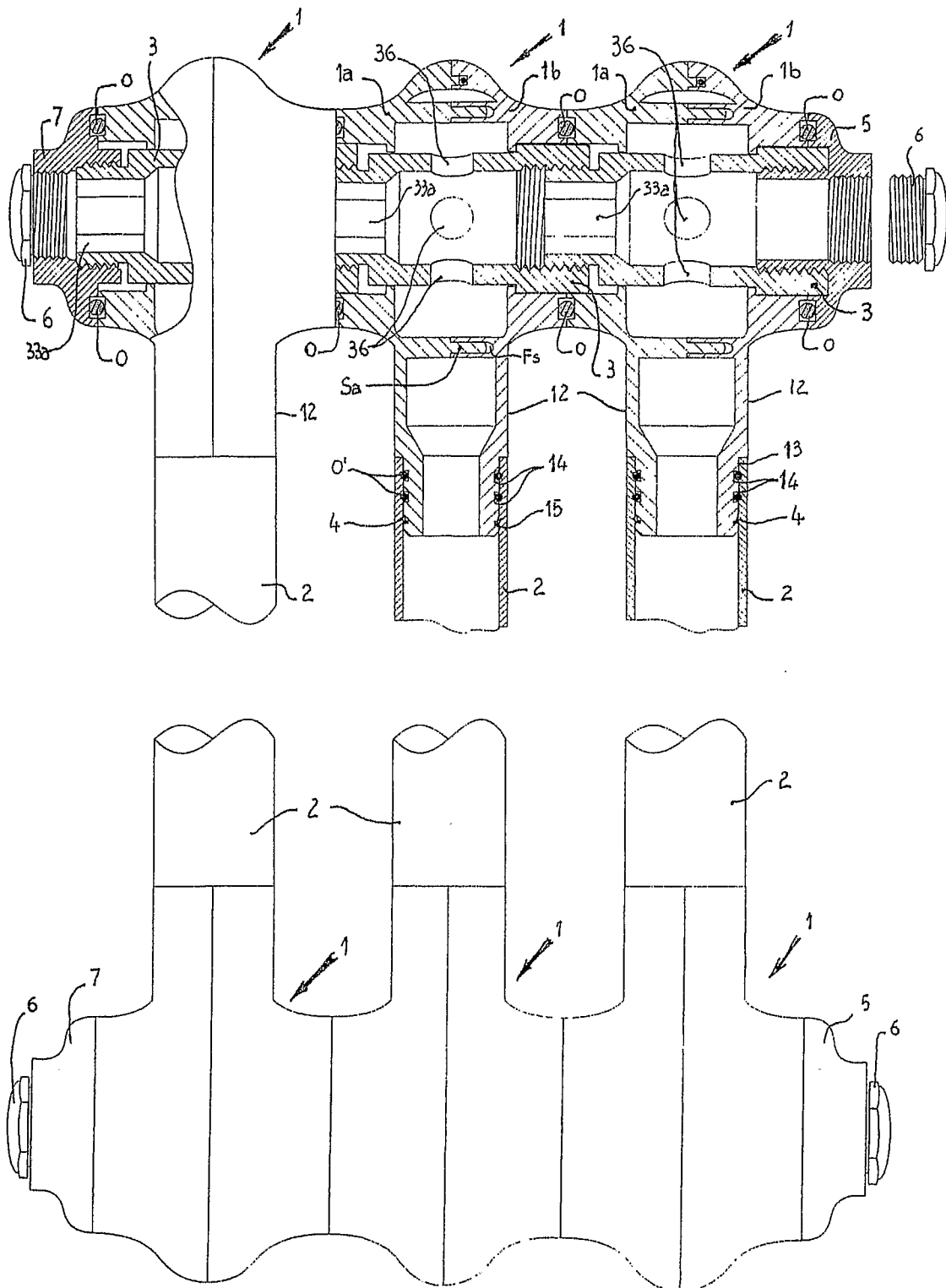


Fig. 1

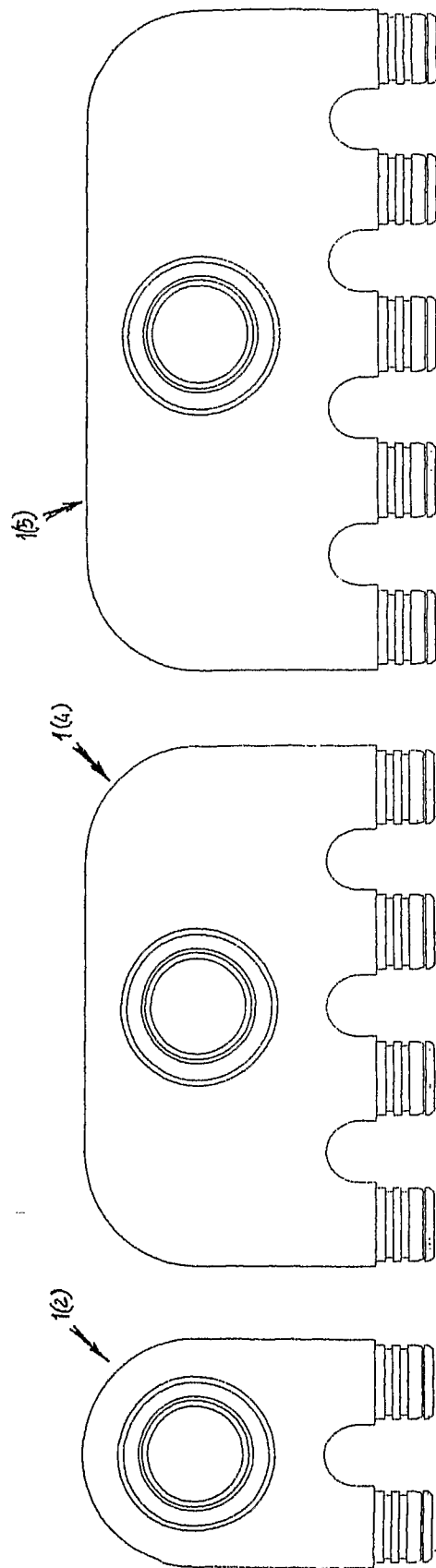


Fig. 5

Fig. 4

Fig. 2

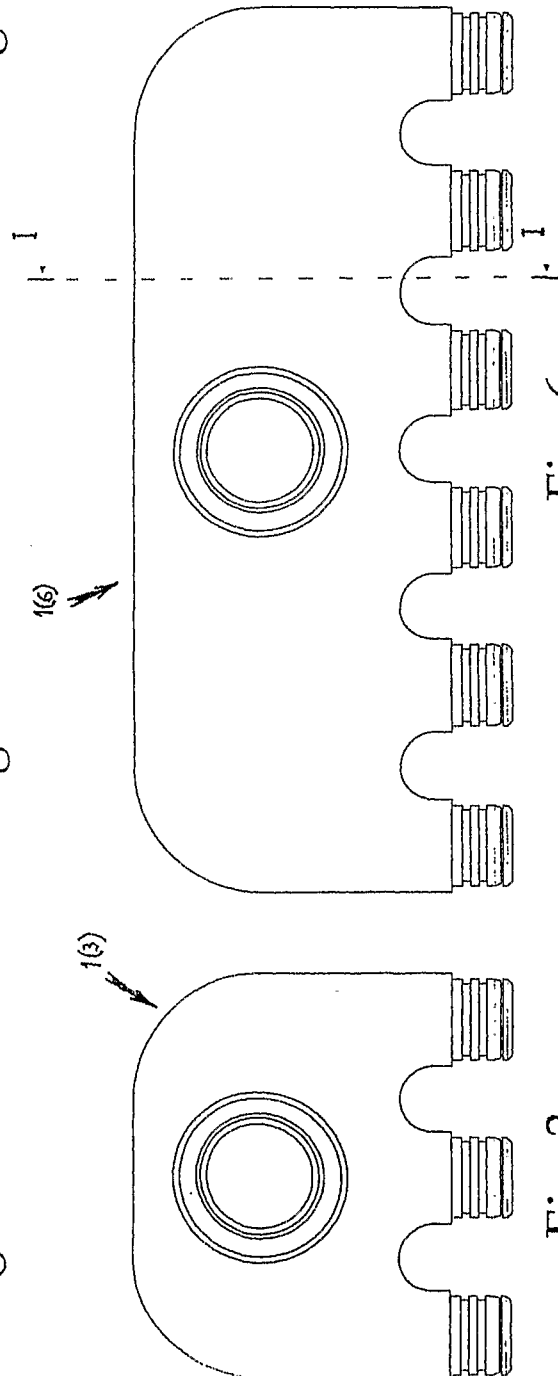
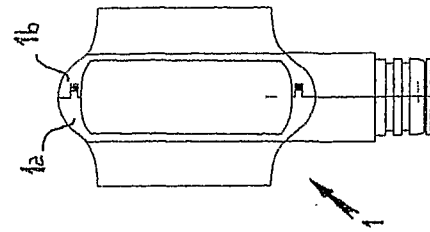


Fig. 6

Fig. 3

Fig. 7



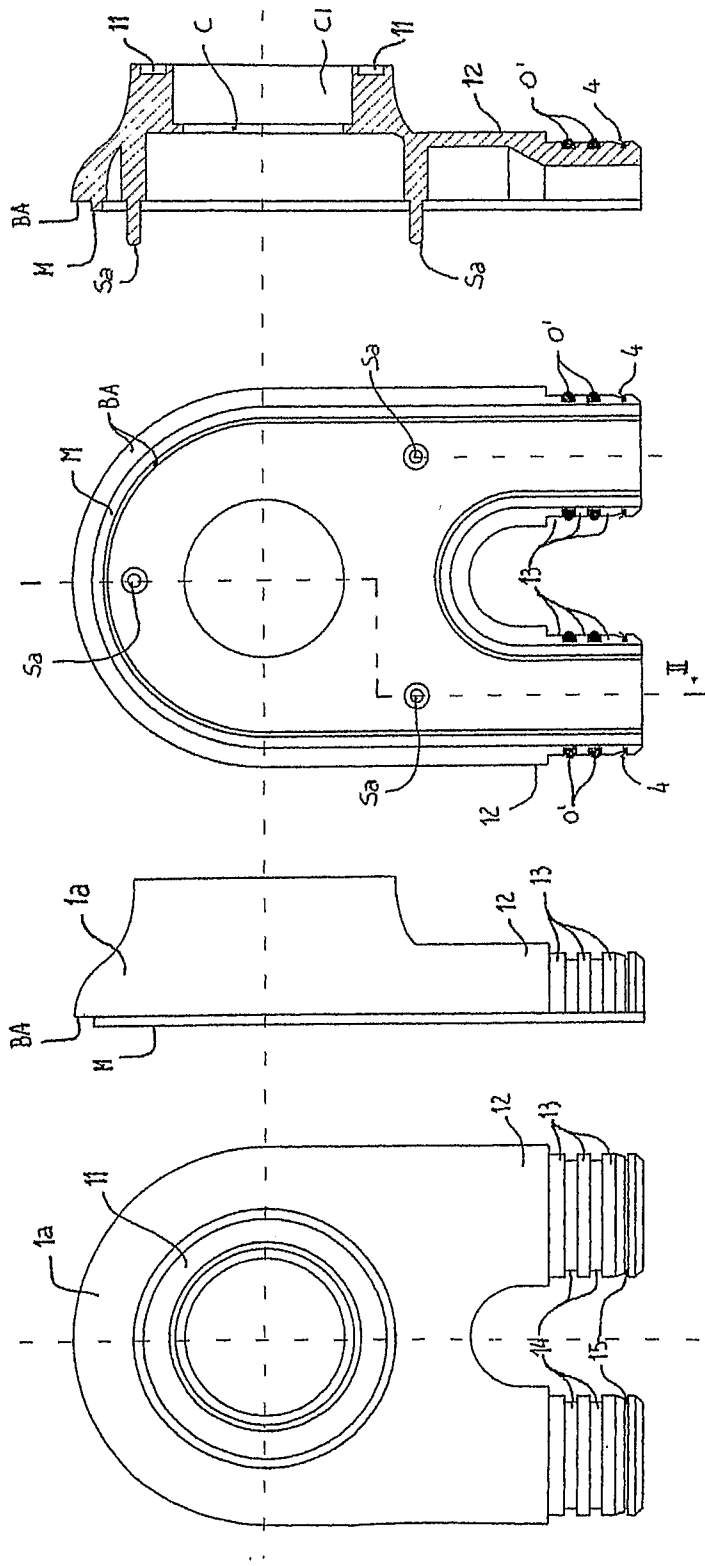


Fig.11

Fig.10

Fig.9

Fig.8

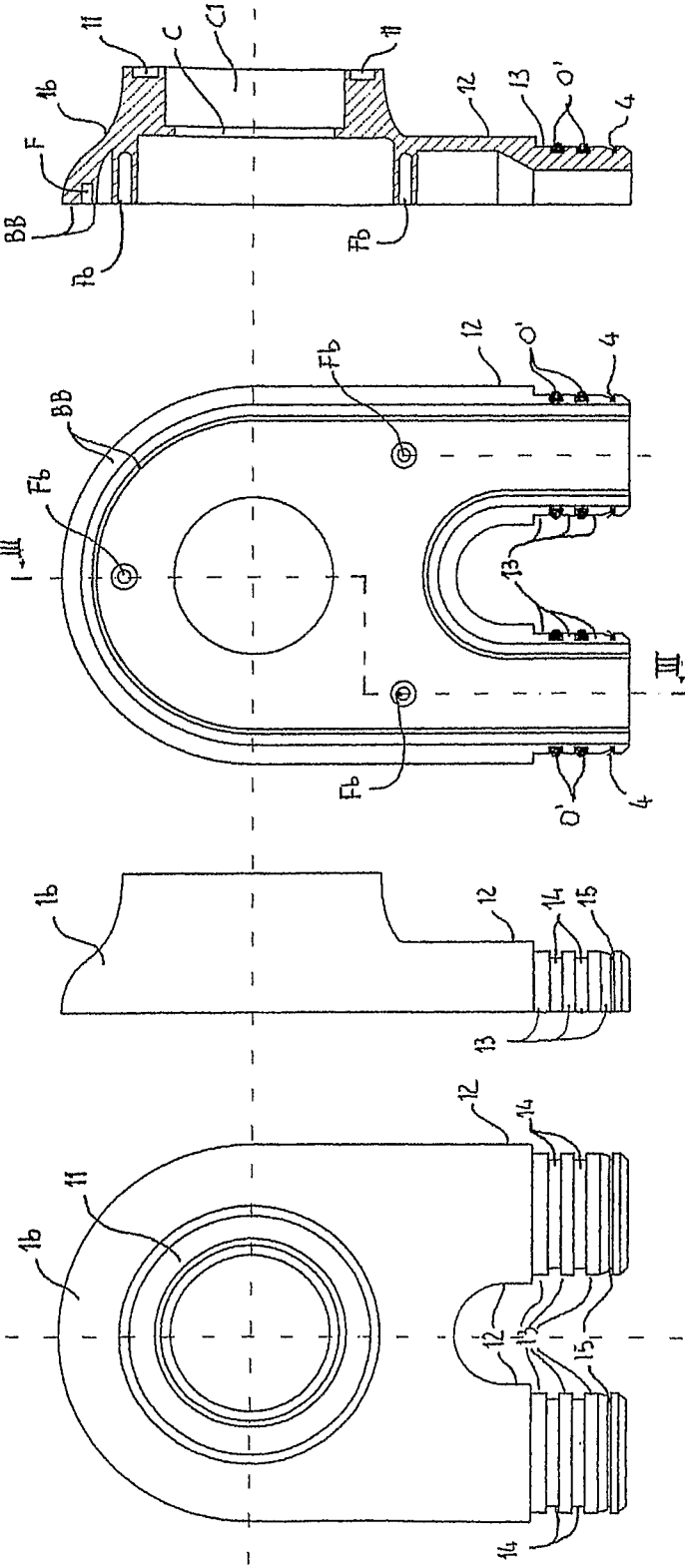
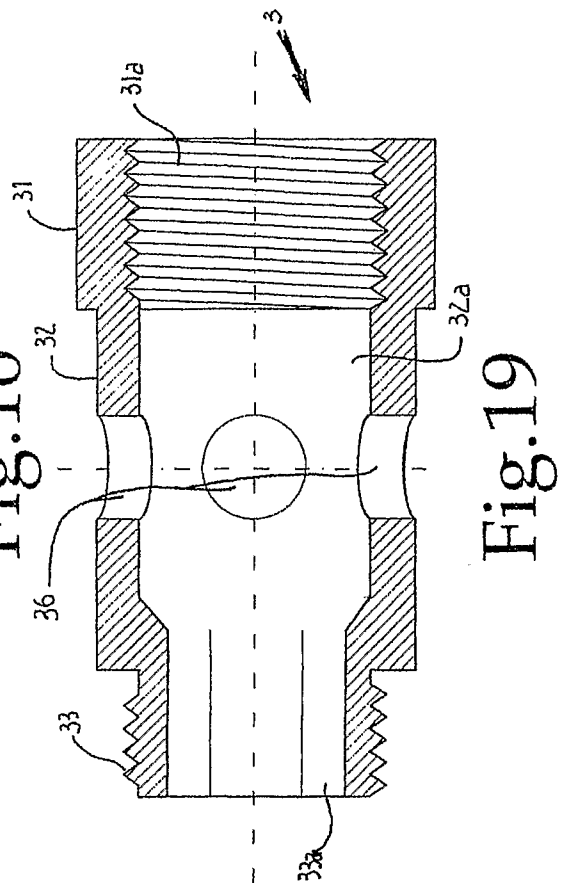
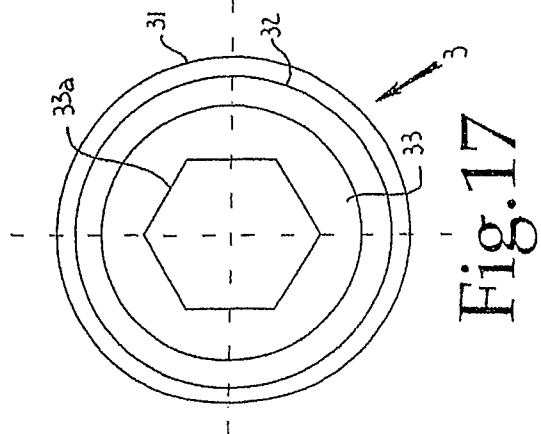
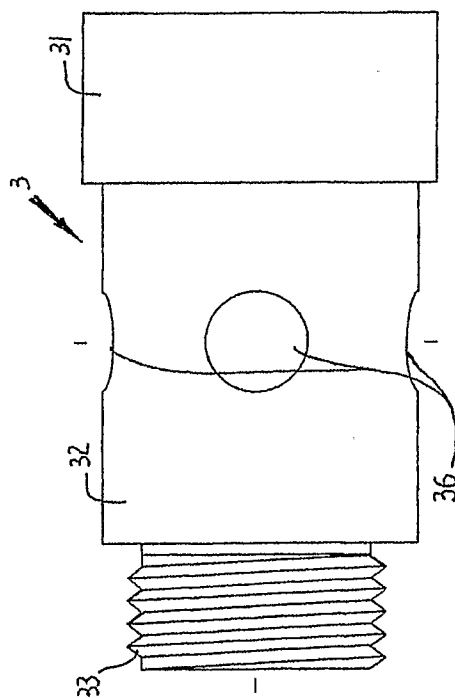
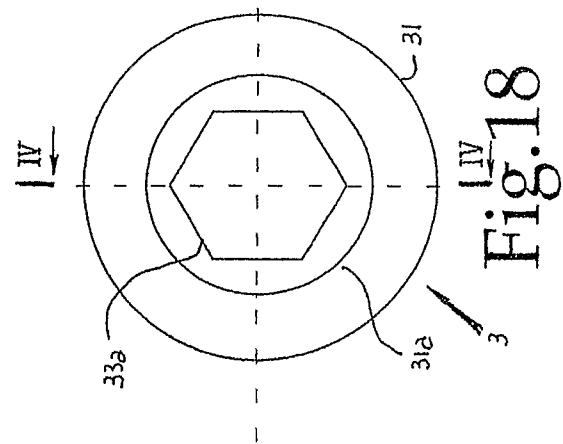


Fig.15

Fig.14

Fig.13

Fig.12



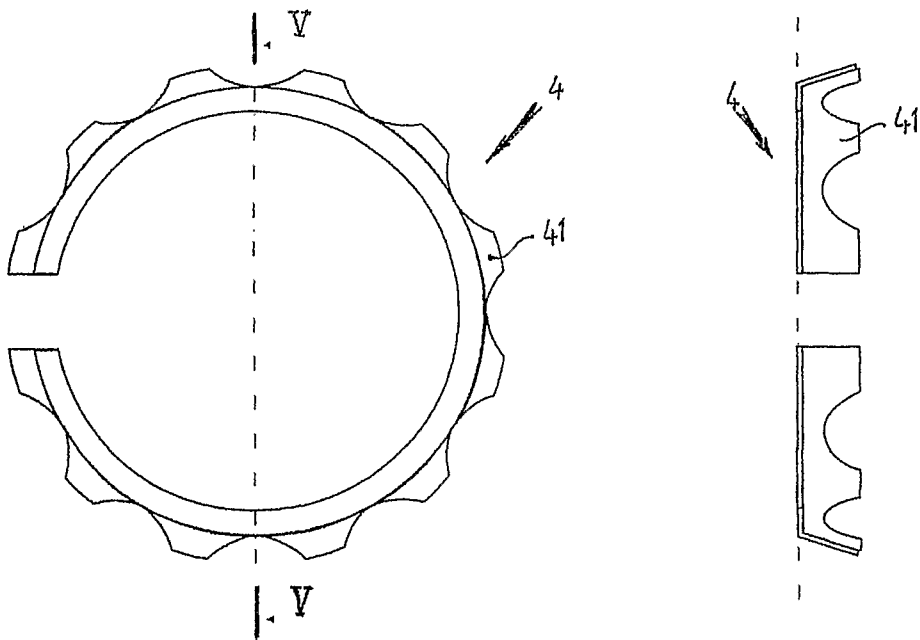


Fig. 20

Fig. 21

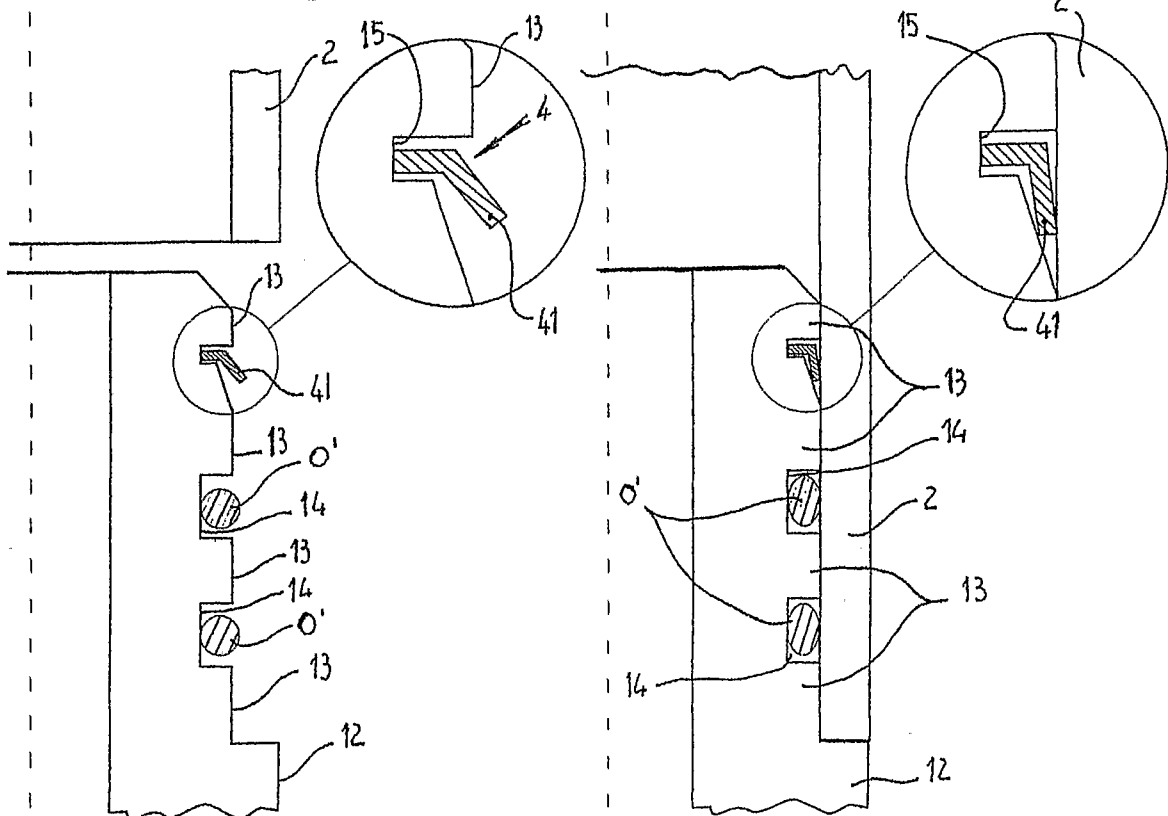


Fig. 22

Fig. 23

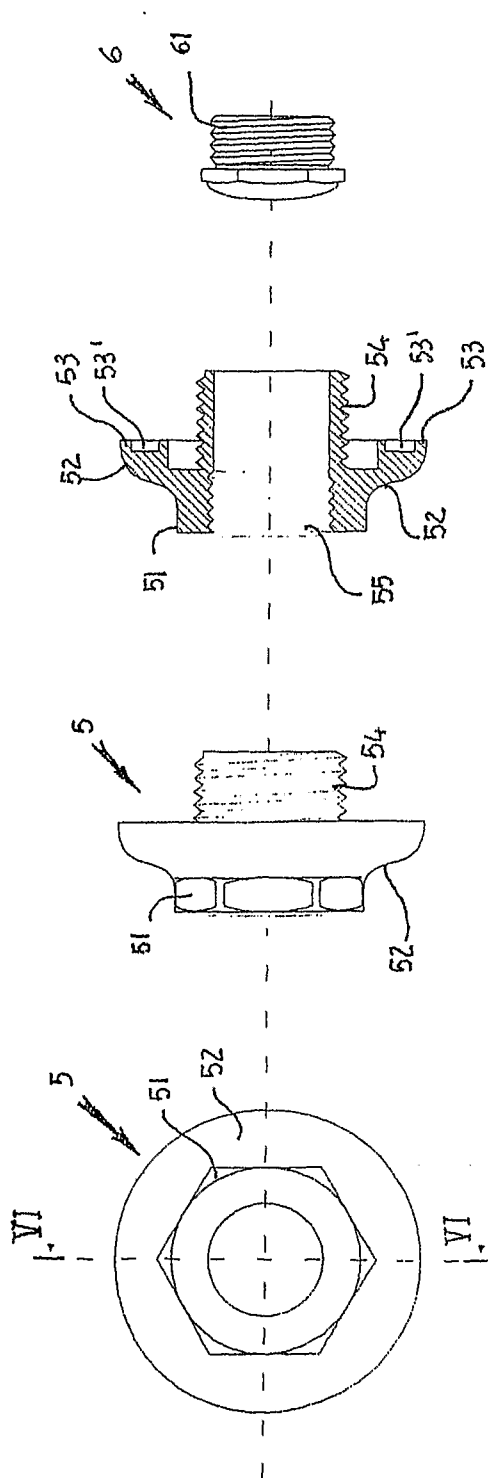


Fig. 27

Fig. 26

Fig. 25

Fig. 24

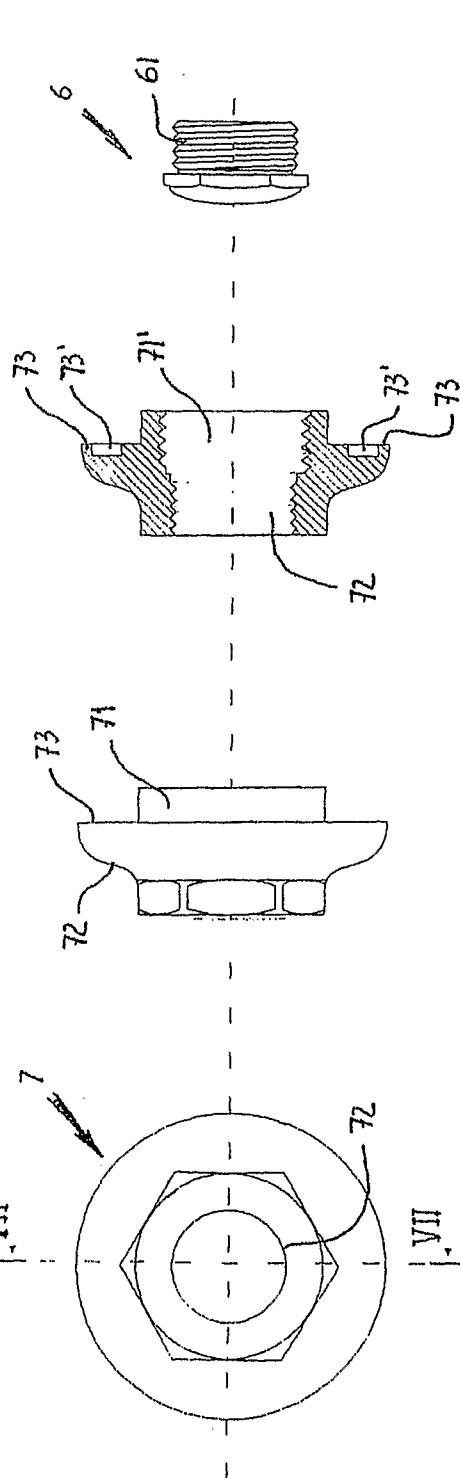


Fig. 31

Fig. 30

Fig. 29

Fig. 28

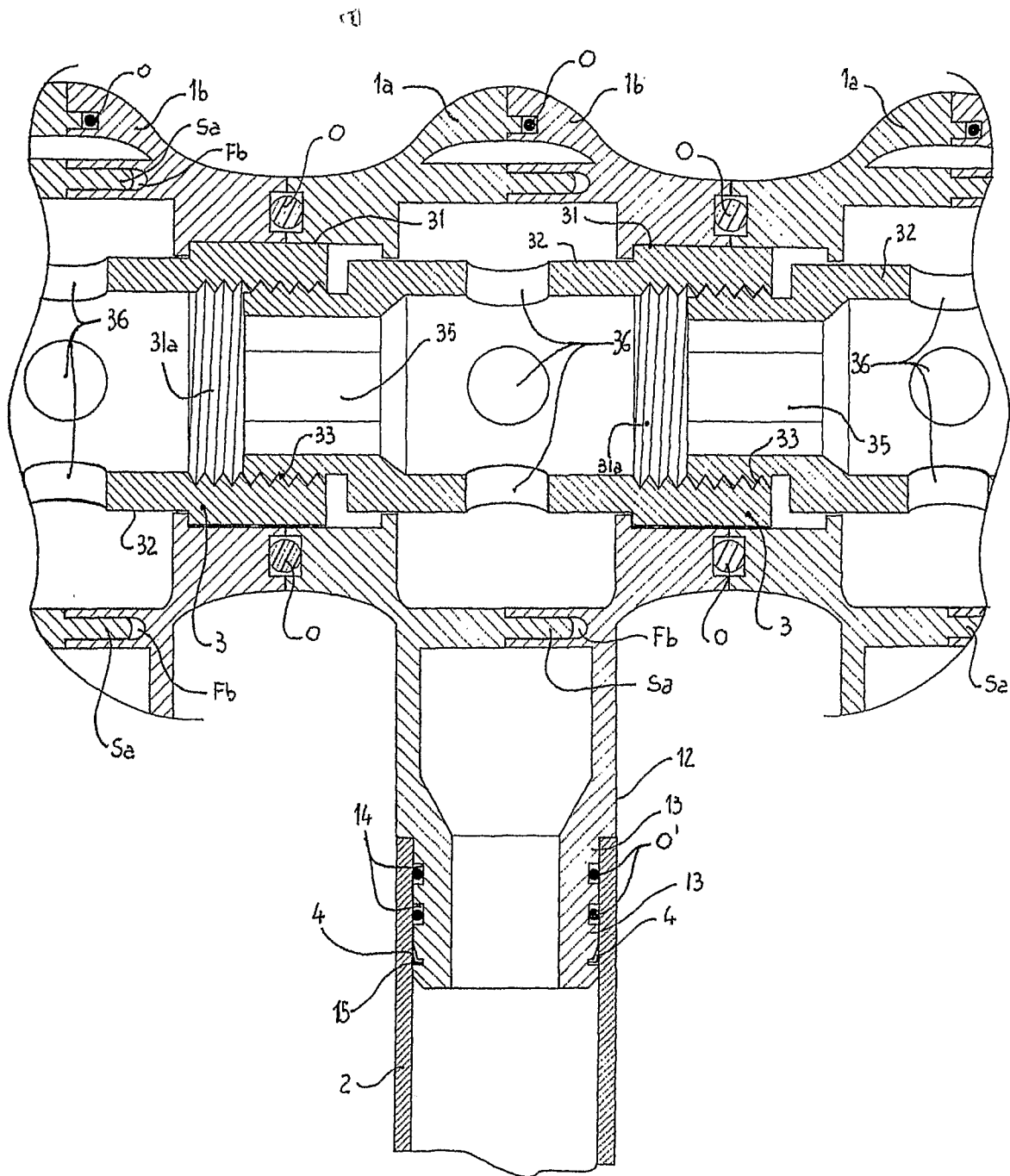


Fig.32

INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2006/001630

A. CLASSIFICATION OF SUBJECT MATTER
INV. F28F9/26

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
F28F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 317 423 C (GUTMANN) 16 December 1919 (1919-12-16) figures	1-5
X	GB 657 692 A (ESTABLISSEMENTS THOMAS DEFAWES) 26 September 1951 (1951-09-26) figures	1-5
X	DE 833 400 C (E ANGRICK FA) 6 March 1952 (1952-03-06) figures	1-5
X	FR 1 457 847 A (LICINI) 24 January 1966 (1966-01-24) figures	1-5

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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Date of the actual completion of the international search

4 December 2006

Date of mailing of the international search report

08/12/2006

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2006/001630

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 317423	C	NONE	
GB 657692	A	26-09-1951	NONE
DE 833400	C	06-03-1952	NONE
FR 1457847	A	24-01-1966	NONE