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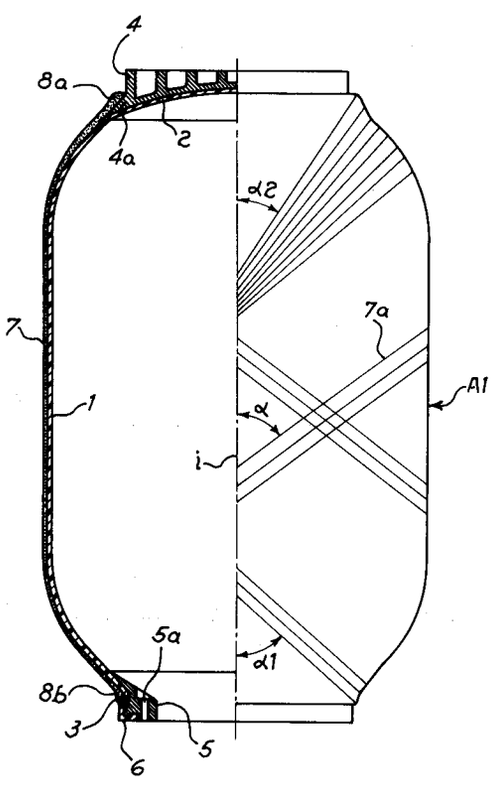
(54) Elliptical shaped tank for hot water in domestic plants.

(57) A storage heater or tank for boilers for domestic use that consists of an envelope (1) of substantially elliptical, cylindrical or like shape having partly spherical ends fitted with a base flange (4) and an inlet flange (5) for access and attachment, such envelope of plastic material being intended to ensure a watertight seal and being lined with one or more layers (7) of high-tensile fibres arranged in a circumferential sense with various slopes relative to the generatrix or to the axis (i) of the envelope, such lining layers being capable of withstanding the axial and radial stresses generated by the contents and by the pressure inside the envelope. the end flanges being also made integral with the envelope by part of the lining of fibres having a lower slope relative to the axis and being associated with synthetic adhesive resin to relieve respectively the tensile and shear stresses to which the said fibres are subjected.

Fig.1



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In the construction of boilers for the production of hot water for hygienic and central-heating applications, particularly for domestic use, provision is made for a hot-water tank or heater which is maintained at a high temperature by the flow of hot water through a suitably protected internal coil made of copper or steel tube, to provide the user with a larger quantity of water for sanitary purposes when required. Such tank is usually made of metal the thickness of which is capable of withstanding the pressure of the water main, plus a considerable overpressure, and is subject to all the known disadvantages of weight, endurance, rust, puncture or the like. Such disadvantages are particularly troublesome where the boiler unit is located on a wall or in a room which is in constant use.

The technical problem which arises is therefore that of providing such unit with a tank of high tensile strength, rustproof and non-toxic, while weighing substantially less than known ordinary tanks made of metal.

According to the invention, the solution to such technical problem lies in a tank consisting of an envelope of plastic material, with an external flange for the supporting base and an internal attachment flange for the inlet aperture, which is not intended to withstand the axial and radial loads caused by the pressure and weight of the water contained therein but only to provide a watertight seal, such envelope being lined with layers of high-tensile fibres, such as glass fibres, carbon fibres or the like associated with a synthetic resin, structured in such a way that the fibres are stressed even at the spherical ends of the envelope in which are housed the end flanges, the fibres having a variable slope relative to the longitudinal axis of the envelope.

These and other features will become apparent from the description of a method of implementation given by way of example and illustrated in the accompanying figures, in which:
Fig. 1 shows a cross-section in the axial plane containing the major diameter, and figs. 2 and 3 show respectively an axial view of the sealing flange end and of the tank bottom end.

With reference to such figures, the hot-water tank or heater forming part of a boiler unit operating on gas or the like is comprised of an envelope of plastic material 1, for example high-density polyethylene or the like, shaped by the blow-moulding process, which has a bottom 2 and an inlet 3 both substantially spherical in shape, to which bottom 2 is fitted a supporting flange 4 and to which inlet 3 is fitted a counterflange 5 located inside the inlet and attached by means of folded neck 6 of envelope 1.

According to the invention, the wall thickness of envelope 1, made of plastic material, is fairly low and is not intended to make an appreciable contribution to the structural resistance to radial and axial stresses caused by the pressure and weight of the water contained in the tank.

On such envelope 1 is placed a lining 7 of composite material consisting of high-tensile fibres, arranged according to directions capable of making optimum use of the tensile strength features and impregnated with synthetic or like resins so as to remain bonded to envelope 1. The most appropriate fibres are fibres with a high modulus of elasticity which ensure suitable deformation between the fibre composite and the plastic envelope.

Such fibres include, for example, carbon fibres, glass fibres and the like.

The arrangement of the fibres should satisfy numerous requirements, including balancing of the longitudinal and transverse tensile stresses and the ability to lay continuous fibres following the profile of the lining surface, which is not symmetrical, according to the known theory of filament winding, there being present the curved portion 8a - 8b at both ends.

It is therefore necessary that stressing in the axial sense be withstood also, in the area with which it is concerned, by the composite material, and transmitted by the latter beyond its ends to the internal core.

This is made possible by the arrangement of the filaments in non-geodetic lines on the surface of core 1. This means that the fibres, which are subjected to tensile stress even if orientated along geodetic lines, should, on being arranged according to trajectories other than geodetic trajectories, withstand shear stress, and such stress should be transmitted to the impregnating resin; in this manner, moreover, the fibres can withstand part of the axial stress even where the structure of the composite is not symmetrical, and can progressively transfer such stress to the internal core via the resin. To this end the fibres of middle layer 7a are suitably arranged to form an alpha angle of 55° with the corresponding generatrix "i" of the cylindrical shell in the area marked A1, which angle corresponds to balancing of the axial and circumferential stresses on the cylindrical shell.

The slope of the fibres relative to axis "i" of the envelope is varied according to the end diameter of the flange and the diameter of the convex part of envelope 1. As can be seen in the lower part of fig. 1, the trend of the fibres having a general alpha slope in the middle becomes steeper, with an alpha angle 1 at the end of sealing flange 3, the latter being spherically curved then becoming cylindrical at the neck where, together with internal flange 5, there is imparted radial tensile strength and support to the first length of the bottom of envelope 1. On the opposite side where the base is located, supporting flange 4 is fully

external and lip 4a, which is adapted to curvature 2 of envelope 1, is retained by the fibres having alpha slope 2, which also brings about an enlargement of thickness 8a similar to that at inlet end 8b.

The fibres can of course be arranged in several overlapping layers with each layer sloping in opposite directions, the whole being made integral by means of the resin associated with the fibre which is wrapped around the envelope. Provision may also be made for one or more layers of fibres arranged in a circumferential sense with a slope approaching 90° in the middle and slightly less at the ends of the envelope, to provide a cover for access to and protection of the internal layers, without performing specific supporting functions.

Provision is also made for the flange at inlet 5 to be attached, by means of screws or the like inserted in holes 5a thereof, to a sealing flange, not shown, equipped with attachments for the entry and exit of the water, for the heating coil and for any measuring instruments such as a pressure gauge, a thermometer and the like.

Numerous alternatives may be made to the equipment described above as an example of implementation, according to the shape and dimensions of the boiler, its application and the like, without thereby departing from the scope of the invention.

Claims

1. A storage heater or tank for boilers for domestic use, characterized in that it consists of an envelope of substantially elliptical, cylindrical or like shape having partly spherical ends fitted with a base flange and an inlet flange for access and attachment, such envelope of plastic material being intended to ensure a watertight seal and being lined with one or more layers of high-tensile fibres arranged in a circumferential sense with various slopes relative to the generatrix or to the axis of the envelope, such lining layers being capable of withstanding the axial and radial stresses generated by the contents and by the pressure inside the envelope, the end flanges being also made integral with the envelope by part of the lining of fibres having a lower slope relative to the axis and being associated with synthetic adhesive resin to relieve respectively the tensile and shear stresses to which the said fibres are subjected.

2. A heater or tank as in claim 1, characterized in that such high-tensile fibres are arranged in a multiplicity of layers in a crisscross pattern and sloping symmetrically in relation to one another.

3. A heater or tank as in the previous claims, characterized in that such end flanges are provided with a peripheral annular zone having a convex part adapted to that of the envelope and being provided with a zone capable of supporting the turns of the layers of fibres which extend from the envelope to such annular zone of the flanges.

4. A heater or tank as in the previous claims, characterized in that provision may be made for subsequently lining the layers of sealing fibres with additional layers of fibres for protection, use or wear according to the intended application of the heater.

Fig.1

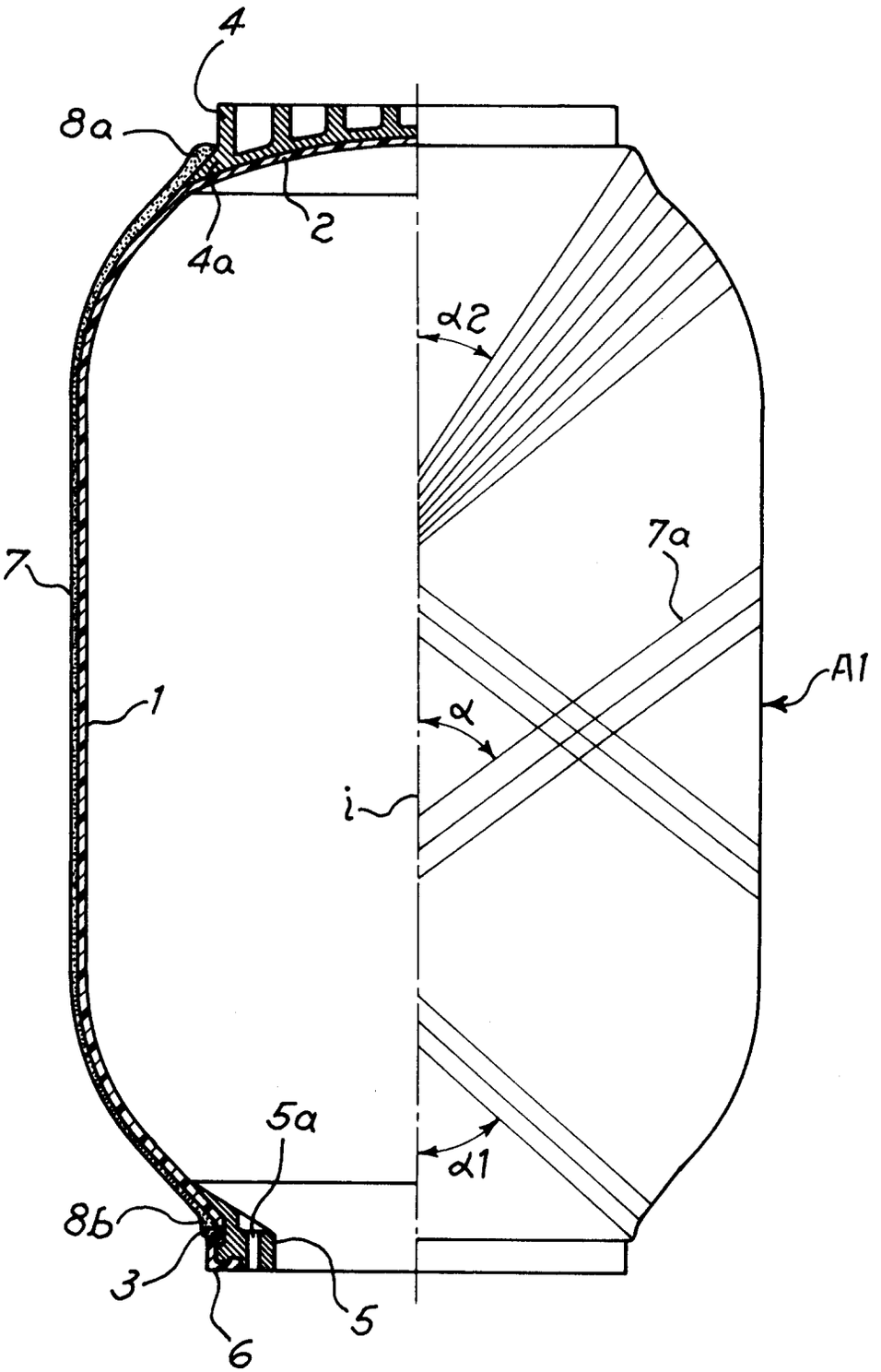


Fig.3

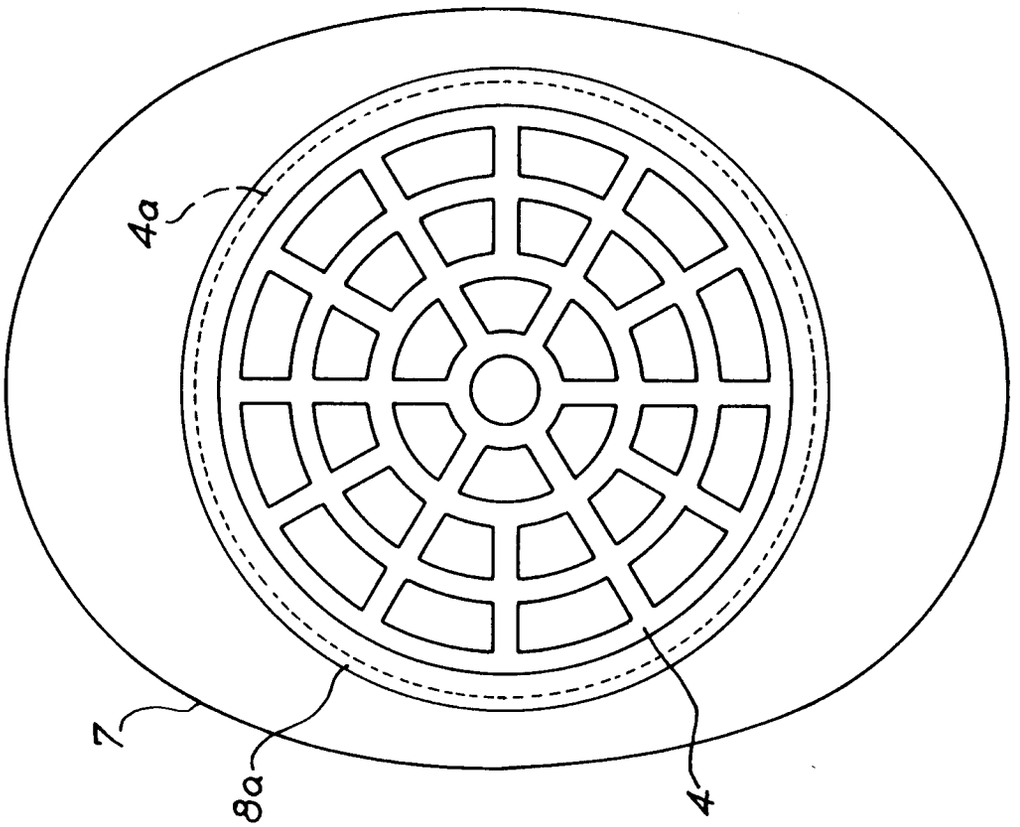
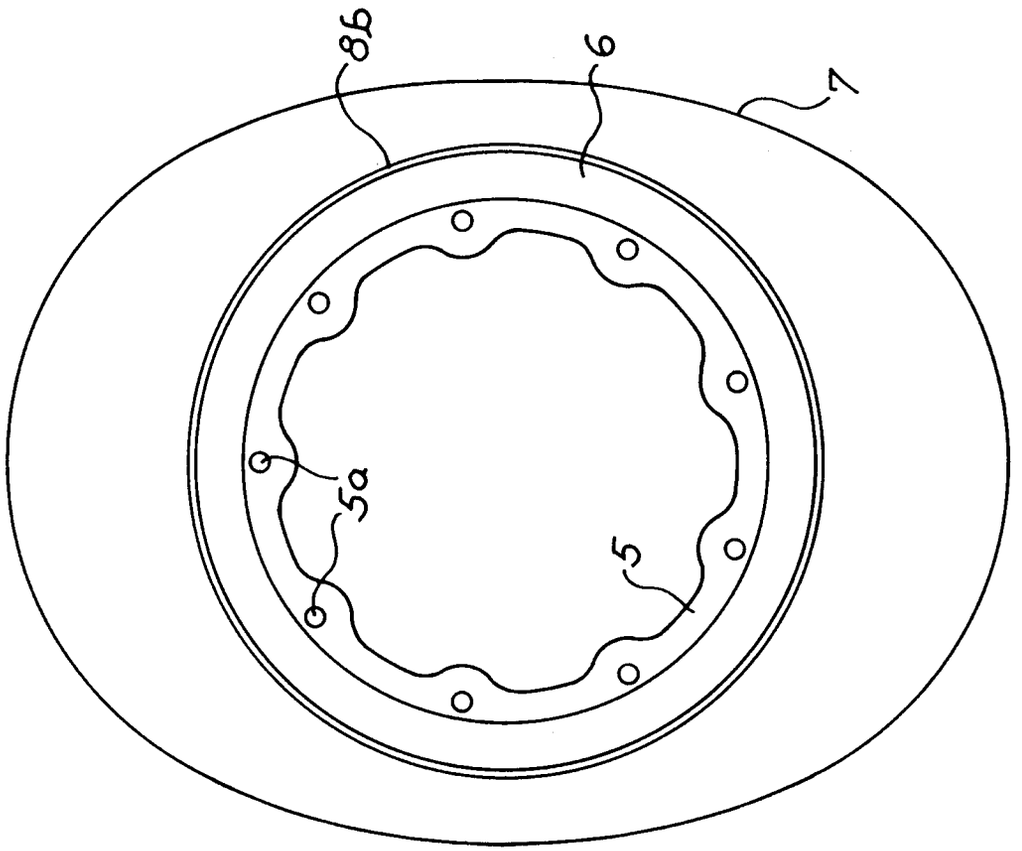


Fig.2



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EUROPEAN SEARCH REPORT

Application Number

EP 92 20 1077

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)
A	DE-A-3 010 958 (STIEBEL ELTRON GMBH & CO KG) * claims; figures *	1	F24H1/18
A	EP-A-0 191 655 (COMMISSARIAT A L'ENERGIE ATOMIQUE) * claims; figures *	1	
A	FR-A-2 448 482 (STIEBEL ELTRON GMBH & CO KG) * figure 1 *	1,2	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

F24H
B29C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	10 NOVEMBER 1992	VAN GESTEL H.M.

CATEGORY OF CITED DOCUMENTS

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