United States Patent
Borcoman et al.

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[54] **INSTALLATION FOR THE TREATMENT, BY IMMERSION IN A LIQUID, OF PARTS OR OF MATERIALS, ESPECIALLY FOR THE HEAT TREATMENT OF PREFABRICATED CONCRETE ELEMENTS IN HOT WATER**

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** **134/79,** 134/134, 134/142, 134/156, 134/159, 308/9

[51] **Int. Cl.**.....**B08b 3/10,** B08b 9/02

[58] **Field of Search**.....134/79, 142, 153, 156, 159, 134/134; 15/64; 118/426, DIG. 12

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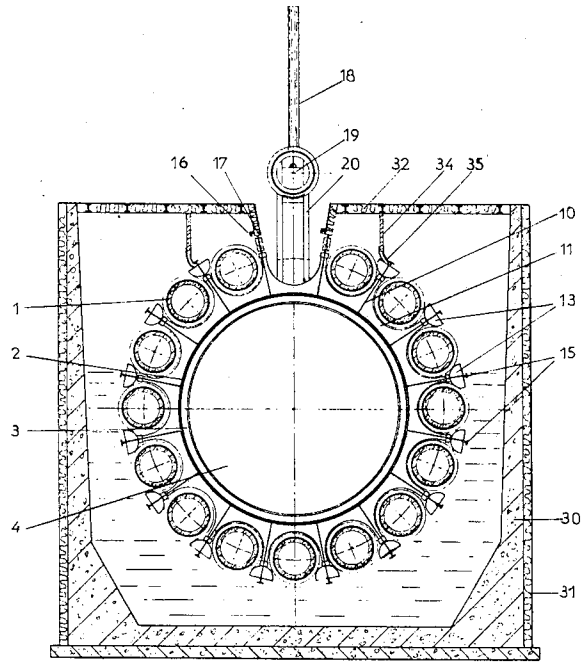
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[57] **ABSTRACT**

The installation comprises an assembly of a float cylinder with a horizontal axis and immersed totally or partially in a tank containing the liquid. Fixing means on the cylinder fix the parts or materials on its outer surface. Automatic means introduce the parts or materials into the fixing means and extract them after treatment. The cylinder is rotated and in the course of rotation the parts or materials held by the fixing means are immersed in a liquid and subjected to the appropriate treatment. The float cylinder may be a casing rigidified by hoops and drums, rigidified in turn by gussets. Sliding gates, walls or rubber curtains may be included to divide the treatment tank into pre-heating, isothermal and cooling zones. When the fixing means include an open type recess an automatic blocking device formed by stakes, springs and levers may be provided to co-operate with cams mounted in openings in the fixed walls of the tank. When the fixing means comprise a closed type recess it is provided with annular supports and rollers mounted on the cylinder.

8 Claims, 8 Drawing Figures



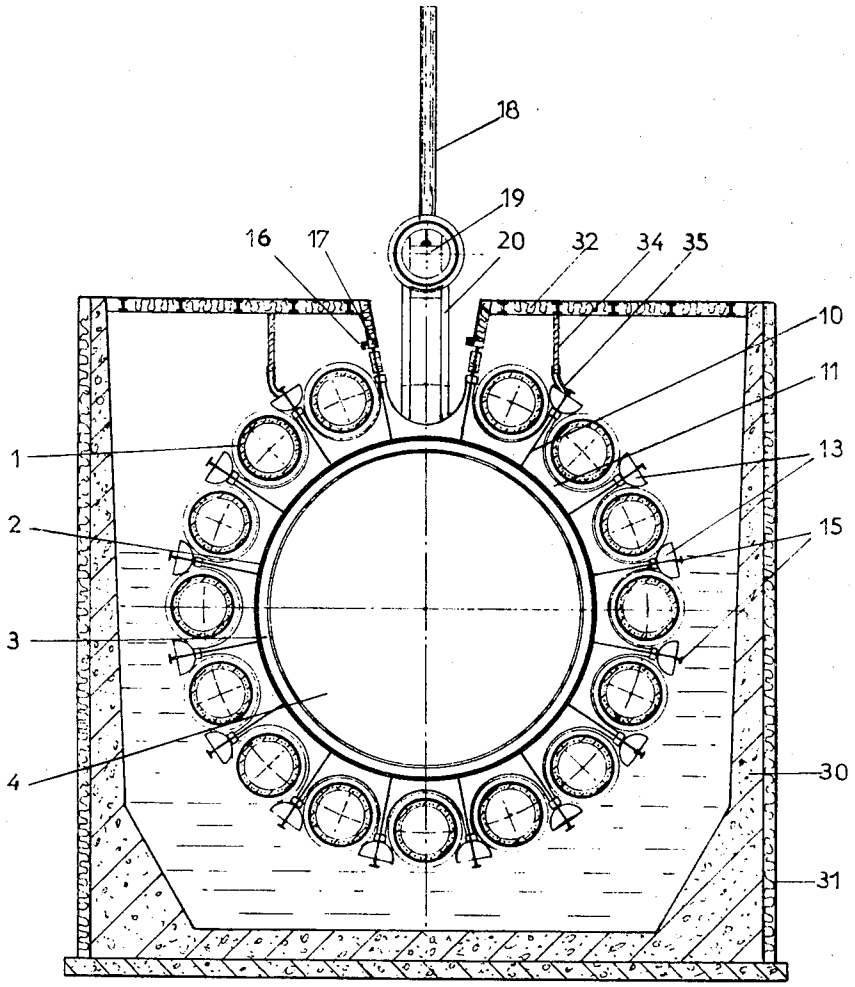


FIG. 1

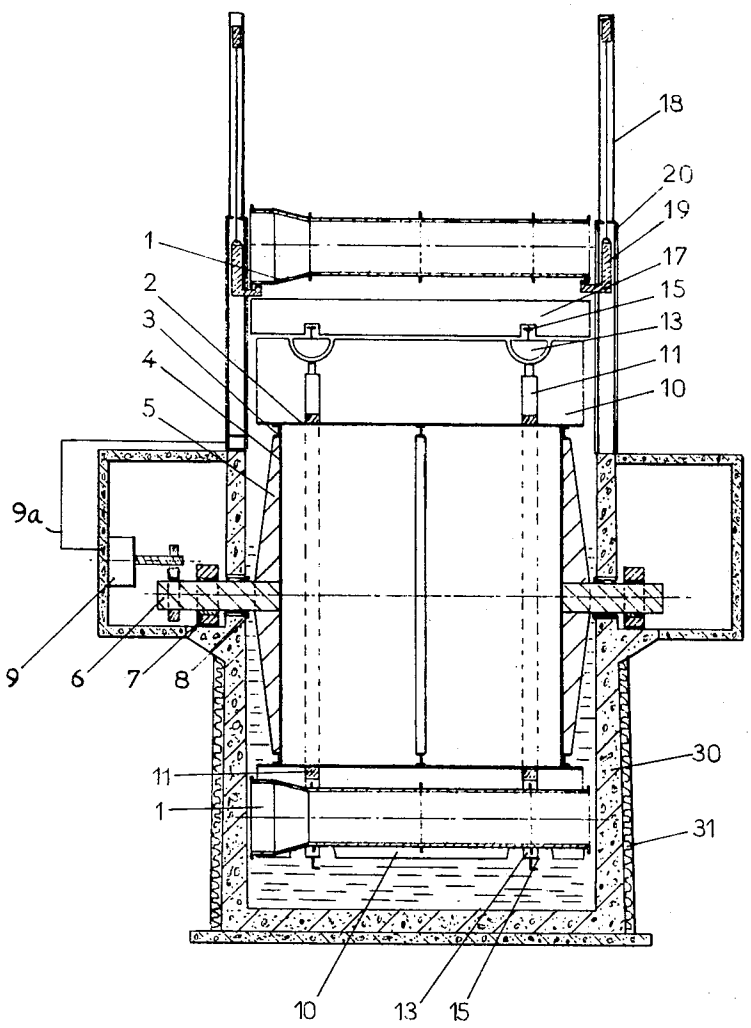
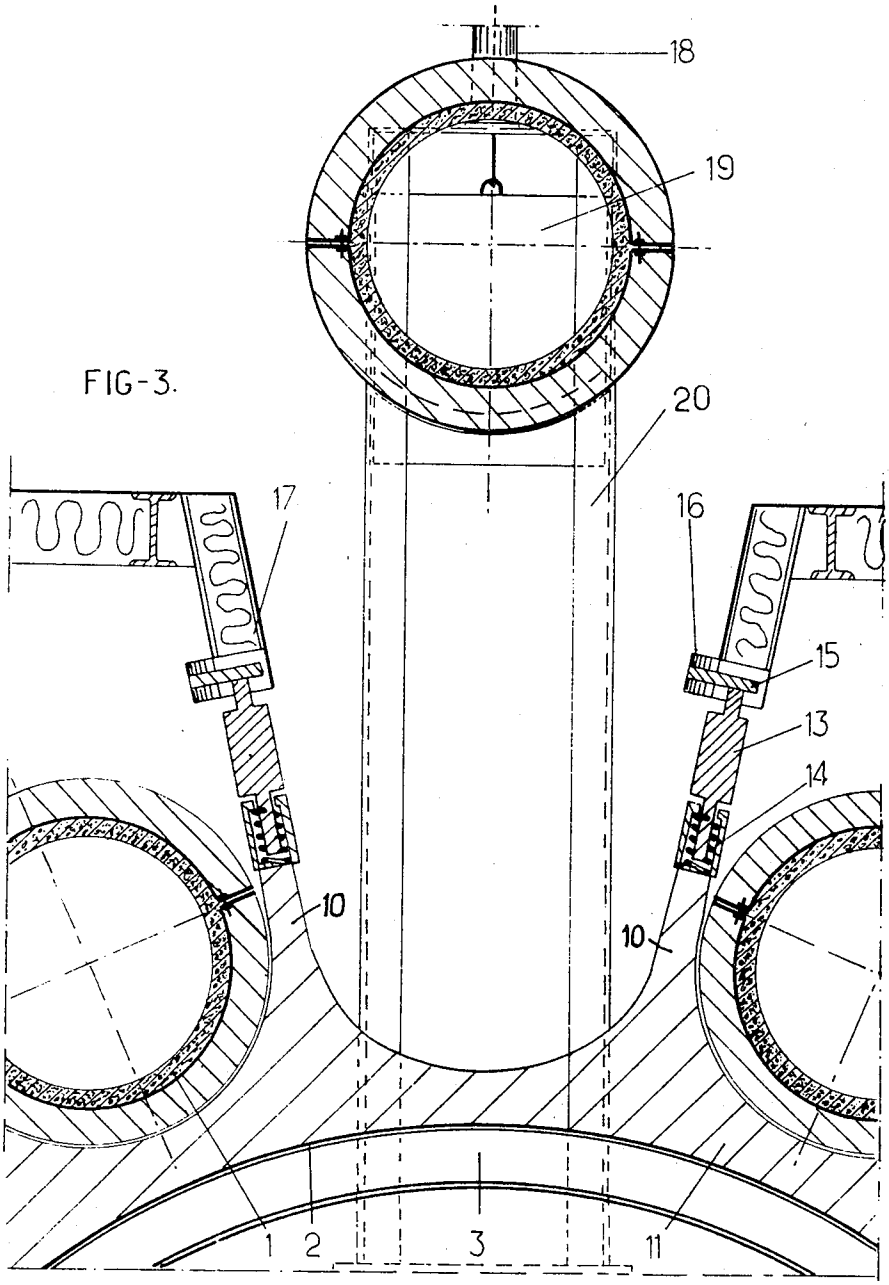
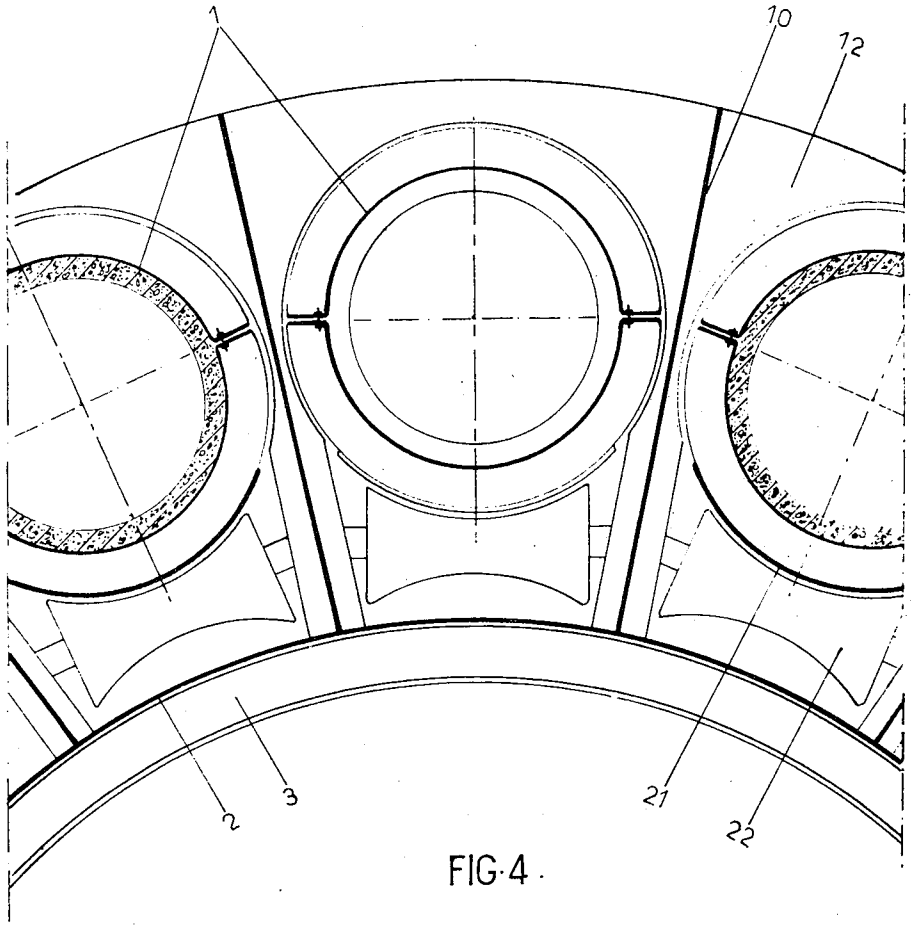


FIG 2

FIG-3.





FIG·4·

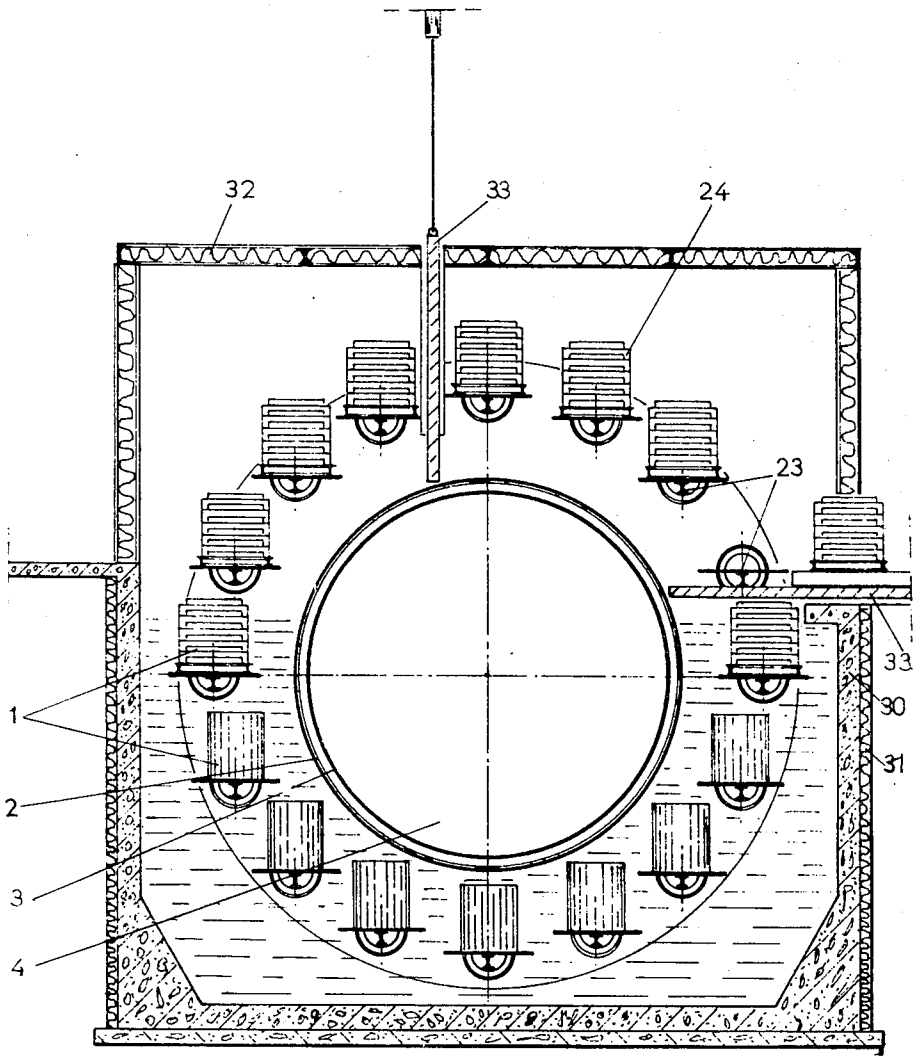


FIG 5

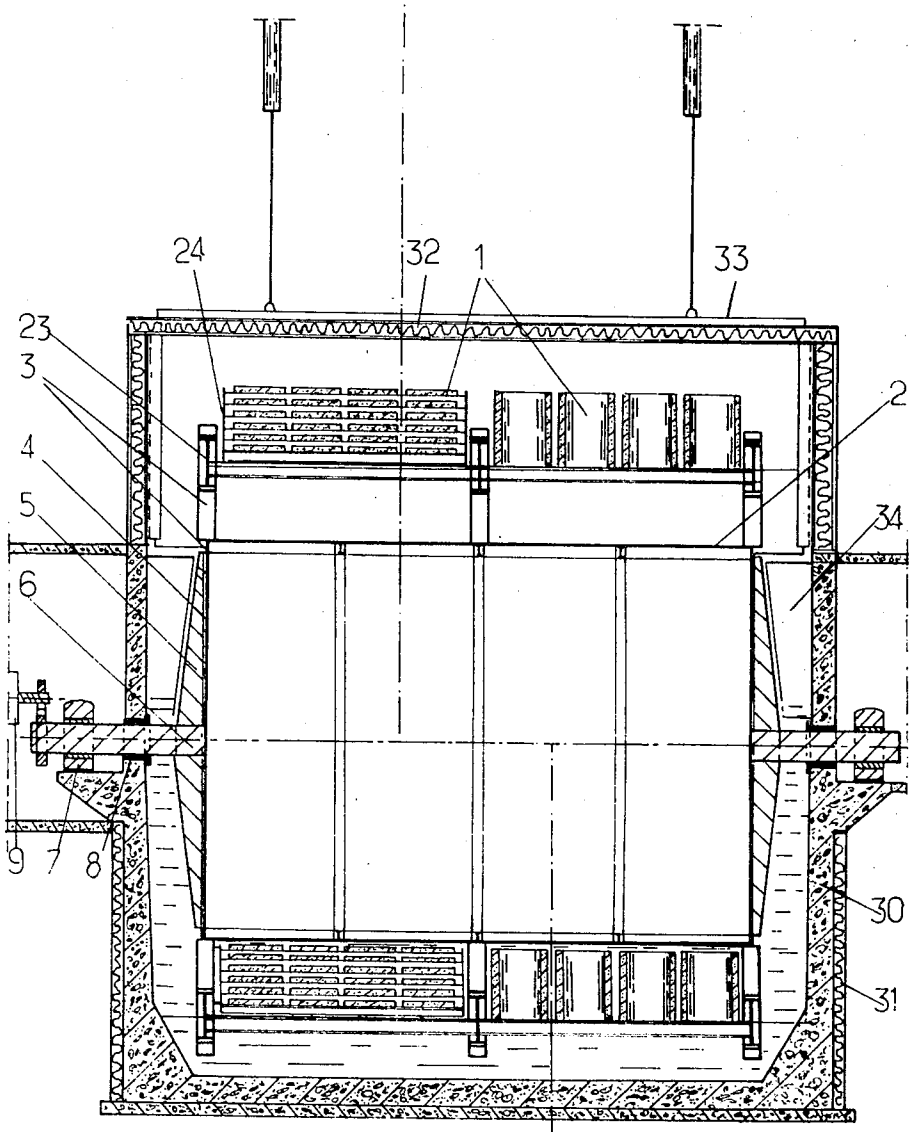


FIG-6

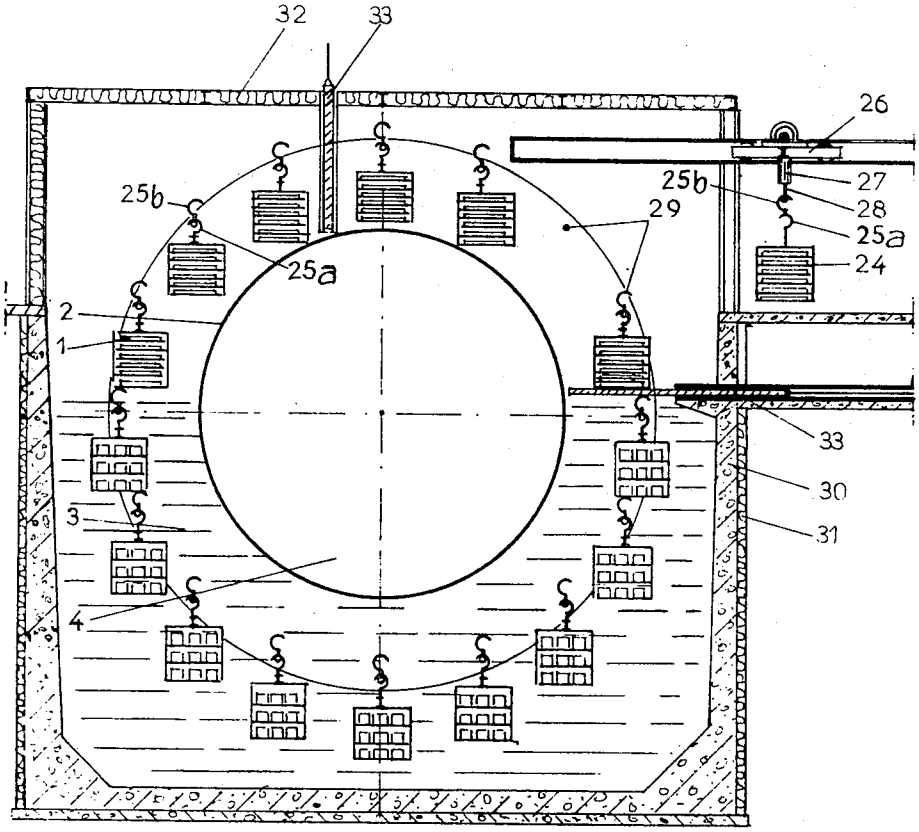


FIG. 7.

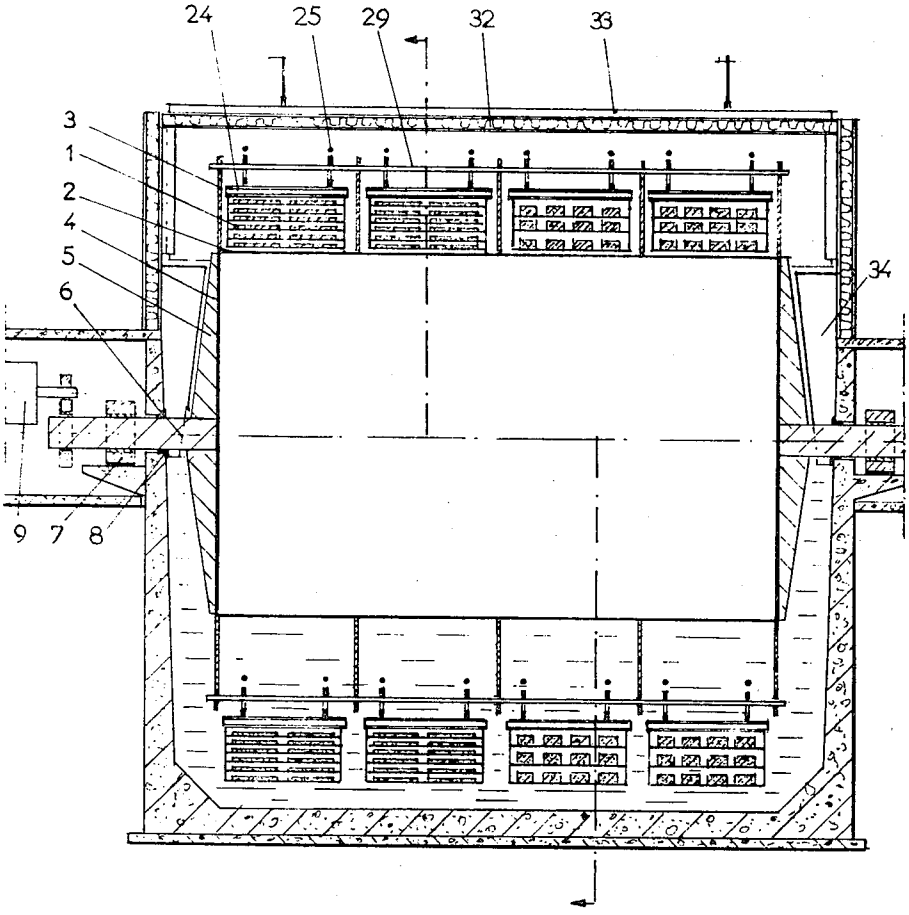


FIG. 8.

INSTALLATION FOR THE TREATMENT, BY IMMERSION IN A LIQUID, OF PARTS OR OF MATERIALS, ESPECIALLY FOR THE HEAT TREATMENT OF PREFABRICATED CONCRETE ELEMENTS IN HOT WATER

The present invention relates to an installation for the treatment, by immersion in a liquid, of parts or of materials, especially for the heat treatment in hot water of pre-fabricated concrete elements.

There are numerous installations for effecting heat treatment of pre-fabricated concrete elements among which, those most current, use ovens or tunnels heated by steam, hot air, infra-red rays, pulsed gas etc. The installations which use ovens have a very long treatment cycle, a large consumption of heat energy and electrical energy (for the manipulation of the moulds) as well as restricted possibilities of adjustment and automatization. Moreover their exploitation is costly and they impose dangerous working conditions. The installations which utilize tunnels introduce an improvement as regards the consumption of energy and the possibilities of adjustment but do not resolve the problems of capital costs, costs of exploitation and of maintenance of saturation humidity. There are also known installations which utilize vertical chambers in which the moulds are transported in continuous movement or stepwise. These installations retain generally the drawbacks of tunnels, of being superior from the point of view of the quality of the heat treatment and by the reduction of the steam necessary. Other installations, which use hermetically closed moulds, introduce a substantial reduction of the heat treatment cycle but have limited possibilities of adjustment and of reduction of handling and are costly in exploitation and investment costs. The known installations which use the immersion of the pre-fabricated products in hot water, occupy much surface area, have considerable losses of steam, a high consumption of energy and require a large number of operations with much handling. These drawbacks are frequent also in installations for carrying out similar treatments in other heavy, chemical industries, wood industries, etc.

It is an object of the invention to provide an installation which enables these drawbacks to be avoided.

According to the invention, an installation for the treatment, by immersion in a liquid, of parts or materials, especially for the heat treatment in hot water of pre-fabricated concrete elements, is characterized by the fact that it comprises, on one hand, a float cylinder with a horizontal axis immersed totally or in part in a tank containing a liquid, the said cylinder being equipped with fixing means for the parts on its outer surface, on the other hand, automatic means for introducing the above said parts in the fixing means and to extract them after treatment and, finally on the other hand, means for driving the cylinder in rotation, the assembly being such that in the course of the rotation of the latter the parts held by the fixing means are immersed in the liquid and undergo the appropriate treatment.

The installation can be constructed in three principal variations according to the placing in position of the parts on the cylinder: in recesses (variant "A"), on platforms (variant "B") and by suspension (variant "C"). Each of these principal variants can be carried out according to several variations of flow technology

which differ essentially by the place of introduction and the place of emergence of the parts.

In the following are described three embodiments of the installation according to the invention and according to the three principal variations of the invention, with reference to FIGS. 1, 2, 3, 4, 5, 6, 7 and 8, given purely by way of illustrative but non-limiting examples.

In the drawings there are shown:

FIG. 1, a transverse section of one embodiment of an installation constructed in accordance with variation "A," for the heat treatment of stressed pipes of prestressed concrete or for other treatments of various heavier parts,

FIG. 2, a longitudinal section of the embodiment of the installation "A,"

FIG. 3, a section of a recess of the open type at the moment when the part is withdrawn;

FIG. 4, a section of a recess of the closed type;

FIG. 5, a cross section of another embodiment of an installation according to the invention, constructed according to variation "B," for the heat treatment of slabs and pipes of simple concrete or for other treatments of parts of average dimensions;

FIG. 6, a longitudinal section of the installation "B;"

FIG. 7, a cross section of another embodiment of an installation according to the invention, constructed according to variation "C" for the heat treatment of agglomerates or for other treatments of parts and of materials in containers and of parts which can easily be suspended;

FIG. 8 lastly, a longitudinal section of the installation of type "C."

As shown in these drawings, the installation according to the invention comprises: a float cylinder, a drive mechanism, devices for positioning parts 1 on the float cylinder and a tank of hot water. The cylinder is formed from a metallic casing 2, rigidified by rings 3, and by two circular end plates 4, for sealing the heads. The end plates 4, rigidified in their turn by gussets 5, serve also for fixing the cylinder on the supporting axles 6. The support of the cylinder is effected in bearings 7 mounted outside the tank. The axles pass through the tank by means of sealing parts 8. For the driving of the cylinder, which is effected stepwise, use is made of a mechanism of the usual type 9, with a motor of very small power since it involves the rotation of an assembly balanced on a central axis and whose weight is reduced by the immersion of the cylinder and of the parts. In certain cases, the total weight can be completely balanced by the level of the liquid. The positioning of the parts on the cylinder is effected differently according to the three principal variations of the invention. For installations constructed according to variation "A," (FIGS. 1 to 4), use is made of recesses, in which the parts are positioned by means of a fixing device, and of a device for extraction and introduction. The recesses have two longitudinal walls 10, and supports which are either of open type 11 (FIGS. 1 to 3), when the manipulation of the parts is effected in the radial sense, preferably vertically, or of annular type 12(FIG. 4), when the manipulation is effected along the direction of the generators of the cylinder. For the first case, the fixing is carried out by means of stakes 13 (FIGS. 1 to 3), held in the closed position by torsion springs 14, and by levers 15, fixed

perpendicularly to the heads of the stakes, so that at the moment when the part arrives above and the cylinder is stopped, the levers turn the stakes by 90°, in touching the cams 16, mounted laterally in the openings of the fixed walls 17, and at the moment when the cylinder starts, the levers are released from the cams 16 and the stakes come back automatically to the closed position under the effect of the springs 14. The extraction and introduction device for the parts includes two hydraulic jacks 18 (FIG. 2), two sliding plates with brackets 19, connected to the rods of the jacks by hinges, two guide paths 20, and a control system 9a shown diagrammatically. The arrest of the float cylinder automatically releases the jacks which draw the mould above the tank. After replacement of the mould, the descent of the jacks is actuated, which position the mould filled with fresh concrete in the recess. For the case where the manipulation of the parts must be effected axially, use is made, as illustrated in FIG. 4, of a mechanism which displaces the parts, provided with roller plates 21, on the rollers 22, mounted at the bottom of the recesses. The positioning of the parts for installations of the type "B" (FIGS. 5 and 6) is effected by means of platforms 23, mounted so as to remain horizontal in the course of the rotation of the cylinder, and by means of customary lifting mechanisms.

For installations of the type "C" there are used containers 24, (FIG. 7), provided with a stem equipped with two hooks 25*a*, 25*b* arranged one below the other, in the same plane, and turning their concavity in opposite directions. In the case of FIG. 7, the lower hooks 25*a* turn their concavity towards the cylinder and the upper hooks 25*b* turn their concavity in the opposite direction.

The means for introduction and extraction of the parts 1 comprise a suspended carriage 26, provided with a lifting mechanism 27, extending vertically below the carriage, and a bar-frame 28 hung to the lifting mechanism 27. This bar-frame 28 is adapted to cooperate with the upper hook 25*b* so as to ensure the hooking of the container 24 and the displacements of the latter by the carriage 26. The float cylinder is equipped with suspension or support bars 29 extending in the direction of the generators of the cylinder. To introduce the parts 1 into the treatment installation, the carriage 26 is displaced towards the cylinder, the latter being stopped in a position such that, for a suitable displacement of the carriage 26, a free support bar 29 is engaged in the concavity of the hook 25*a*; a downward movement of the lifting mechanism 27, is then actuated, which causes the descent of the container 24 and the co-operation of the hook 25*a* with the bar 29. The downward movement of the mechanism 27 is allowed to continue until the bar-frame 28 is disengaged in the vertical direction of the hook 25*b*. The return of the carriage 26 is then actuated the container 24 remaining hooked to the bar 29. To extract the parts 1 from the installation, it suffices to effect the reverse operations from those previously described.

The tank comprises walls of reinforced concrete 30, or metal, a heat insulating layer 31, and a cover 32, fixed or dismountable. The heating of the water is carried out by one of the methods already known: steam under pressure, super heated water, electrical current etc. In each case, a thermostat is mounted in the heating system which controls the starting and stopping of the water heating as a function of the minimal temperature and of the maximal temperature set. The enclosure of the tank can if necessary be compartmentalized into zones of pre-heating, isothermal and cooling, according to the respective technological requirements, by means of sliding gates 33, fixed walls 34, and rubber curtains 35. The movements of the sliding gates 33 are synchronized with the rotation of the float cylinder so that when the latter is rotated, the said sliding gates 33 are eclipsed by a movement of translation to enable the passage of the parts 1 and of the containers 24. In certain cases, there can be mixed in the heating water various substances intended to improve sealing, finishing etc. When the installation is used for various other treatments, the tank and the float cylinder are constructed and protected according to the respective liquid.

The installation according to the invention can be used in the industry of pre-fabricated concrete products, in the chemical industry, in heavy industry, in the wood industry, etc., for carrying out technological processes by immersion of the parts or of the materials, in various liquid materials, as for example for effecting heat treatments, acid treatments, impregnations, degreasings etc.

As is self-evident and as emerges already from the preceding description, the invention is in no way limited to those of its embodiments, nor to those of its methods of production of its various parts, which have been more particularly described; it embraces, on the contrary, all variations.

We claim:

1. An installation for the heat treatment of prefabricated concrete elements by immersion in a liquid, comprising in combination a tank for containing the liquid in which the elements are to be immersed, an assembly comprising a float cylinder, means for supporting said float cylinder in the tank for rotation about the horizontal axis of said cylinder, and fixing means for supporting the elements on the outer surface of the cylinder, said tank having walls which rise above said horizontal axis of the cylinder so that the level of the liquid in the tank can rise above the level of said horizontal axis and the weight of the cylinder and the charge of elements supported by the cylinder being at least partly balanced by the liquid displaced thereby, automatic means for introducing the elements into said fixing means, and for extracting the elements from said fixing means after treatment, said introduction and extraction of said elements being effected in a zone located above the level of said horizontal axis of said cylinder, drive means for rotating the cylinder such that during the rotation of the cylinder the elements are held immersed in the liquid by the fixing means and hence undergo heat treatment by immersion, and means for thermally isolating said zone from the rest of the tank.

2. Installation according to claim 1 further comprising partitioning means for dividing said tank into preheating and cooling zones.

3. Installation according to claim 2 wherein said partitioning means comprises sliding gates.

4. Installation according to claim 2 wherein said partitioning means comprises rubber curtains.

5. Installation according to claim 1 wherein the float cylinder comprises a rigid cylindrical casing with two circular end plates, said end plates having rigidifying gussets, two axles mounting the cylinder in the tank and two external bearings and sealing parts supporting said axles.

6. Installation according to claim 1 wherein said fixing means include a recess of open type, provided with longitudinal walls and semi-annular supports and an automatic blocking device for the parts in the recess, formed by stakes held in blocking position by springs and by levers, the tank has fixed walls with openings therein, and cams are mounted in said openings so as to come into contact with the levers and to turn the stakes by 90° at the moment when the part arrives facing the introduction and extraction means and when the float cylinder stops.

7. Installation according to claim 1, wherein said automatic means comprise two hydraulic jacks fixed at the heads of the tank in the vertical plane passing through the axis of the cylinder and a sliding mechanism provided with two guide faces and with two plates with brackets, connected to the rods of the jacks by hinges.

8. Installation according to claim 1, wherein said automatic means comprise containers, adapted to carry the parts and provided with a stem with two hooks situated one below the other in a same plane and turning their concavity in opposite directions, and a suspended carriage, to which is attached a lifting mechanism, provided with a bar frame adapted to co-operate with the upper hook of said stems, and the float cylinder is equipped with suspension bars extending along the direction of the generators of the cylinder adapted to co-operate with the lower hooks of said stems, the assembly being such that to engage a container to a free bar this container is suspended by its upper hook to the bar frame, a movement of the suspended carriage is actuated so that the free bar of the float cylinder is engaged in the concavity of the lower hook and, finally, a downward movement of the lifting mechanism is actuated so as to cause engagement of the container on the bar by its lower hook at the same time as the separation of the upper hook with respect to the bar frame.

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