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NOTICE OF ENTITLEMENT

I/We Michael GRAF STRACHWITZ

of ANNABERGSTR. 57-D/6500
MAINZ
GERMANY

being the applicant(s) and nominated person(s) in respect of an application for a patent for an invention entitled MAGNETIC WATER ACTIVATING PROCESS AND APPARATUS FOR REDUCING CORROSION AND LIME DEPOSITS FROM FLOWING WATER (Application No. 13784/92), state the following:

1. The nominated person(s) has/have, for the following reasons, gained entitlement from the actual inventor(s):

   THE NOMINATED PERSON IS THE ACTUAL INVENTOR.

2. The nominated person(s) has/have, for the following reasons, gained entitlement from the applicant(s) listed in the declaration under Article 8 of the PCT:

   THE APPLICANT AND NOMINATED PERSON IS THE BASIC APPLICANT.

3. The basic application(s) listed in the declaration under Article 8 of the PCT is/are the first application(s) made in a Convention country in respect of the invention.

DATED: 8 September 1993

Michael GRAF STRACHWITZ

GRIFFITH HACK & CO.

Patent Attorney for and
on behalf of the applicant

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MAGNETIC WATER ACTIVATING PROCESS AND APPARATUS FOR REDUCING CORROSION AND LIME DEPOSITS FROM FLOWING WATER

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(56) Prior Art Documents
AU 76087/91 C02F 1/48
AU 73399/91 C02F 1/48
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(57) Claim

1. A process for reducing corrosion and lime deposits on a surface caused by impurities in water retained by or contacting a surface, comprising the steps of applying a magnetic field on flowing water to produce magnetically treated water; and, passing by impinging flow ~~or component flow~~ at high flow speed said magnetically treated water over said surface exposed to corrosion and deposition of lime to flush said surface.

15. An apparatus for reducing corrosion and lime deposits caused by impurities in water retained by or in contact with a surface, comprising:

a magnetic treatment device in which water flowing spirally in a tube is subjected to the action of magnetic field; and

a deflecting device which guides water emerging from the magnetic treatment device in the form of a flow or a number of component flows directly to said surface and which is of a configuration such as to direct each flow to impinge on said surface and to flow past said surface.

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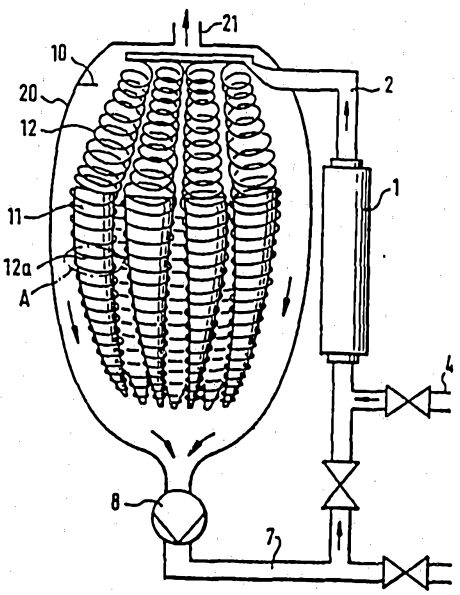
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AUSTRALIAN PATENT OFFICE * 92 Bis * 10/12/92

(54) Title: MAGNETIC WATER ACTIVATING PROCESS AND APPARATUS FOR REDUCING CORROSION AND LIME DEPOSITS FROM FLOWING WATER

(57) Abstract

Reducing corrosion and lime deposits caused by water impurities on surfaces exposed to water is performed by the presence of magnetically treated water. It is found that the reduction of corrosion or encrustation is much more effective if water from a magnetically treatment unit (1) is passed over the affected surfaces to flush them as directly as practically possible and at as high a flow speed of practically possible. Water that has been used to flush these surfaces is recycled through the magnetic treatment apparatus (1) by means of a pump (8) and used to flush the affected surface again. Deflecting devices of the magnetically treated water are useful for flushing the affected surfaces effectively. A helical heat deflector inside a pipe can produce a spiral flow in a pipe for bringing as much of the treated water into contact with the walls of a pipe. A system of nozzles (10) is useful for directing flows of treated water along the walls of a tank. A spiral loop (12) with perforations facing a heating element or a cluster (11) of heating elements is useful for directing magnetically treated water at surfaces of heating elements. Magnetically treated water can similarly be used in cooling towers and air treating installations.



MAGNETIC WATER ACTIVATING PROCESS AND APPARATUS FOR REDUCING CORROSION AND LIME DEPOSITS FROM FLOWING WATER

Field of the Invention

The invention relates to a process and apparatus for reducing corrosion and lime deposits from salts in water solution by means of magnetic action exerted on water that is caused to flow past surfaces exposed to corrosion or encrustation.

Background of the Invention

The action of magnetic fields on flowing water is already known to activate water so that it can prevent lime deposits on metal surfaces and even remove existing lime deposits therefrom. It is assumed that this effect is due to the fact that magnetic action exerted on flowing water produces a small number of "activated" centers which act as crystal seeds on which lime is separated, mainly in a finely granular form, and then remains dispersed. The effectiveness of the activated centers remains preserved over a certain period, 48 hours at the longest. It appears that protection of metal surfaces against corrosion is maintained by the "activated" water forming a thin protective film of lime, while the formation of limestone is prevented or existing encrustations removed. This physical treatment of the water is performed without chemical additives, but requires a careful mutual adaptation of the quantity of water flowing through and the number, arrangement and strength of the magnetic fields acting thereon. The process and an apparatus suitable for its performance are disclosed, for example, in German Utility

Model 89 13 274, the disclosure of which is hereby incorporated by reference. In such a device water flowing spirally in a tube is subjected to magnetic fields.

In practice it has been found that although this prior art process is basically usable, it often fails to produce the required results to an adequate extent - i.e., more particularly it often only inadequately prevents or removes lime deposits. The invention is intended to obviate this disadvantage. It is based on the discovery that to achieve success the water, after being adequately by the magnetic treatment, must achieve participation in sufficiently intensive contact with the surfaces to be protected against, or freed from, lime deposits.

Summary of the Invention

It is an object of the process and apparatus of this invention to enhance the effectiveness of the magnetically treated water for the required purpose by the feature that after emerging from the magnetic treatment device, the water flushes the surfaces to be treated with as high a flow speed as possible and as directly as possible.

According to the present invention there is provided a process for reducing corrosion and lime deposits on a surface caused by impurities in water retained by or contacting a surface, comprising the steps of applying a magnetic field on flowing water to produce magnetically treated water; and, passing by impinging flow ~~or component flow~~ at high flow speed said magnetically treated water over said surface exposed to corrosion and deposition of lime to flush said surface.

It is desirable for the largest possible proportion of the water volume to come into contact with the surface to be treated. If "activated" water is stationary for a time, for example, in pipes or tanks, thereby at least partially losing its effectiveness within a relatively short time, according to preferred embodiments of the invention the required effect is ensured by the feature that at least some of the stationary water is drawn off by a circulating pump for recycling in an ancillary____

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circuit to the magnetic treatment device and again passed therethrough, so that the water reacquires its previous effectiveness.

To achieve as high a flow speed as possible and intensive flushing of the surfaces to be treated by such processes and apparatus at low cost and with low pressure losses, it has been found convenient to lead the stream of water in a spiral path opposite the surfaces of a tube, which are to be treated, and in larger tanks to direct component flows of recycled and magnetically treated water through nozzles directed towards wall surfaces and/or surfaces of heating elements to be treated.

The processes according to the invention are effective for both cold and hot water and also, for example, in air-conditioning plants and cooling towers and in steam generators or continuous flow heaters, the precondition in each case being merely that liquid, magnetically treated water flows over the surfaces of metal, ceramic material or plastics which are to be kept free from lime deposits or corrosion.

For removing lime deposits from a heater immersed in a tank or boiler it is effective to use a spiral tube closed at its end and having holes directed inwardly towards a cluster of heating elements. It may be useful to suspend a receptacle in the tank below the heating elements for collecting encrustations that are loosened by the magnetically treated water.

Brief Description of the Drawings

The invention will be further explained by the following embodiments diagrammatically illustrated in the drawings, wherein;

Fig. 1 shows an arrangement according to the invention in a water pipe,

Fig. 2 shows an arrangement according to the invention in a domestic water distribution system,

Fig. 3 is a longitudinal section through a cold water tank having an apparatus according to the invention,

Fig. 4 is a cross-section through the tank shown in Fig. 3,

Fig. 5 shows a hot water boiler having deflecting devices according to the invention,

Fig. 6 shows a small hot water boiler having deflecting devices according to the invention,

Fig. 7 shows a steam generator having deflecting devices according to the invention,

Fig. 8 shows an air scrubber (cooling tower wet chamber) having deflecting devices according to the invention, and

Fig. 9 shows a continuous flow gas heater having devices according to the invention.

In the drawings like members or members of like effect have like reference numerals.

Description of the Invention

Fig. 1 illustrates diagrammatically the use of the invention in a system of pipes for cold or hot water. The water is first

treated in a magnetic treatment device 1 constructed, for example, in the manner described in German Utility Model 89 13 274. For clarity the treatment device 1 is shown separately from a water pipe 2 which is connected sealing-tight to the treatment device in the usual manner, for example, by a screwed muff. Disposed in the water pipe 2 is a deflecting device 3 according to the invention in the form of a preferably double spiral of sheet material whose external diameter is somewhat smaller than the internal diameter of the water pipe and which is also otherwise so dimensioned that as low a pressure loss as possible takes place in the water in the pipe. The spiral confers a radial component on the flow of water in the pipe 2; by centrifugal effect the water is brought more intensively to the inside wall of the pipe and comes into contact therewith over a longer distance than in the case of a merely axial flow. As a result the effectiveness of the magnetically treated water to prevent lime deposits is enhanced. When the pipe is made of metal, however, a desirable thin protective anti-corrosion layer is formed on the inside wall of the water pipe 2. The desired spiral flow is maintained by the water even after leaving the approximately 20 cm long spiral deflecting element 3, so that the desired effect also takes place in the adjoining pipe portion. In accordance with the requirements, after a certain pipe length of approximately 20 m a further deflecting element 3 according to the invention is incorporated in the pipe, to further enhance the effectiveness of the magnetically treated water.

Fig. 2 shows diagrammatically an arrangement according to the invention in a domestic water distributing pipe system. Water entering through a supply pipe 4 first passes through a magnetic treatment device 1, passes through a water pipe 2, in which possibly a deflecting element 3 according to the invention is incorporated, and is then distributed to pipes 5 extending to the tapping places 6. Each of the pipes can have a considerable length, for example, in a multi-storey residential building, and as a rule water is not continuously taken from the pipes. However, if water remains stationary in the pipes for a prolonged period or flows at only a low speed, lime deposits may form on the inside walls of the pipes, since the effectiveness of the magnetically treated water is not enough to prevent this. This effectiveness is enhanced according to the invention by the feature that a branch pipe 7 branches off from the water tapping pipes 5 adjacent the tapping places 6. The branch pipe 7 in the form of a collective main leads water to the inlet of a circulating pump 8, which delivers the water back to the magnetic treatment device 1. In this way a continuous flow of magnetically treated water is maintained throughout the pipe system and prevents the formation of lime deposits. In case a substantially larger quantity of water is temporarily tapped off than in the normal case, a second magnetic treatment device 1a is automatically connectable in parallel by means not shown.

Fig. 3 is a longitudinal section through a cold or hot water tank having an apparatus according to the invention. A tank 9

has a supply 4 and a removal pipe 6. Lime deposits are prevented in the tank by an ancillary circuit comprising a magnetic treatment device 1 from which magnetically treated water is passed through the pipe 2 to nozzles 10 which are distributed parallel with one another at a vertical and horizontal distance from one another over the height and circumference of the tank and which each conduct the magnetically treated water in a component flow against the tank wall, so that a circular flow is formed in the tank, as shown diagrammatically in Fig. 4. A circulating pump 8 draws water from the tank through an ancillary pipe 7, to supply the water continuously to the magnetic treatment device 1.

Fig. 5 shows diagrammatically a hot water boiler having a supply pipe 4 and a discharge pipe 6 and also a cluster of heating elements 11 (shown diagrammatically) whose electric connections are not shown. As in the case of the cold water tank (Fig. 3), a circulating pump 8 produces an ancillary circuit of recycled magnetically treated water in which the water drawn by the circulating pump passes through the magnetic treatment device 1 and the pipe 2 to deflecting elements 10 and 12, the deflecting elements 10 being, as in the case of the cold water tank (Fig. 3), sets of parallel nozzles which discharge in parallel and at a distance from one another on the inside wall of the boiler, where they produce a circular flow (Fig. 4). A tube spiral 12 is also provided which serves as a deflecting element for the water flow and encloses the cluster of heating elements 11. The tube spiral

is closed at its end, but is formed with openings 12a distributed over its length from which magnetically treated water flows in the direction of the heating elements 11, to keep the elements free from lime deposits. Since lime deposits mainly form at the heating elements 11 but are loosened by the magnetically treated water, an intercepting open tank 13 is provided below the cluster of heating elements 11 to intercept the loosened lime deposits. It can be cleaned and removed, for example, from a normally closed lateral access hole (not shown).

Fig. 6 shows a small hot water boiler as used, for example, in kitchens. The apparatus has a water supply pipe 4 and a removal pipe 6, as well as a casing 15 and a glass hood 16. The glass hood 16 forms the actual hot water tank in which, adjacent its bottom, a heating coil 17 extends horizontally and has electric connections. These electric connections and the inner piping connections of the supply to, and discharge from, the hot water tank are not shown. Also accommodated in the casing 15 is a magnetic treatment device 1 connected through the pipe 2 to a slotted flushing nozzle 18a which acts as a deflecting element and from which magnetically treated water is passed in a horizontal flow over the heating coil 17 to a suction slot 18b through which circulating pump 8 draws water to recycle it through the magnetic treatment device 1. In this way again the magnetically treated water is passed directly and in a continuous flow over the surfaces to be kept free from lime deposits.

Fig. 7a shows, highly simplified and to a reduced scale, an industrial steam generator comprising heating elements 11 which are contained in a casing 20 made up of two shells and whose electric connections are not shown. The heating elements are immersed in water contained in the lower part of the tank and evaporate the water. The steam is drawn off through a top pipe 21. Water is supplied to the steam generator via pipe 4, magnetic treatment device 1 and the connected pipe 2. The tube spirals 12 enclosing the heating elements 11 serve as deflecting elements 12 for water supplied by the pipe 4. Similarly to the case of the hot water boiler illustrated in Fig. 5, the tube spirals are closed at their unconnected ends and formed over their length with holes 12a (Fig. 7b) from which magnetically treated water emerges in the direction of the walls of the heating elements 11, to wash around the heating elements intensively and prevent lime deposits thereon. The nozzles 10 disposed in the upper portion of the steam generator are connected to the water supply pipe 2 by means not shown and serve the same purpose as the similarly designated nozzles in the hot water boiler illustrated in Fig. 5. They pass magnetically treated water directly to the inside wall of the tank. To maintain the circulation of the magnetically treated water, some water contained in the tank 20 is continuously drawn off by the circulating pump 8 and recycled by the pipe 7 to the magnetic treatment device 1, from which the water returns through pipe 2 to the steam generator and more particularly to the spiral tubes 12 and to nozzles 10.

Fig. 8 is a diagrammatic exploded view of an air scrubber such as is used as a cooling tower wet chamber. The air flows in the direction indicated by arrows F, through slots 22a between spaced-apart parallel flat lamellae 22, into a filter chamber 28. The air flow is moistened in known manner by water emerging from nozzles which are constructed on nozzle connections 26 disposed one beside the other opposite the lamellae and spray and water in the direction of the lamellae 22. The air is therefore moistened by the atomized water and in contact with the sprayed lamellae 22. However, according to the invention this sprayed water is previously passed through the magnetic treatment device 1 before the water passes through the pipe 2 to the nozzle connections 26. The sprayed water running down the lamellae is collected in filter chamber sump 24, then sucked in by circulating pump 8 through pipe 7 and pumped back through the magnetic treatment device 1.

For the more effective prevention of lime deposits on the lamellae and walls, according to the invention a flow of magnetically treated water which has come from the magnetic treatment device 1 is passed via pipe 2a and a manifold supply pipe 29 to the top end of the lamellae 22 disposed one beside the other and arrives at that place in a manifold cavity which is constructed at the upper ends of the lamellae and from which it

re-emerges near each lamella through at least one flushing slot 23. The magnetically treated water then runs down the lamellae to the sump 24, moistening the lamellae and keeping them free from lime deposits.

Lastly, the magnetically treated water is also taken through nozzles to the walls of the filter chamber, to keep these walls also free from lime encrustations. The nozzles 10 are the outlet openings of a frame-shaped pipe 25 which extends with a substantially rectangular contour under the cover of the filter chamber 28 adjacent the side walls, the lamellae and the side of the filter chamber opposite the lamellae. To make the drawing clearer, in Fig. 8 the tube frame 25 is shown lifted upwards. The magnetically treated water is supplied through a connecting pipe 2b which is connected to the magnetic treatment device 1. As usual, the filter chamber is accessible through a large window 30 for cleaning and removal of lime sludge.

Fig. 9 shows a continuous flow gas heater in which the water supplied via supply pipe 4 and connecting pipe 4a first passes through a magnetic treatment device 1 and then a heating coil 2c enclosing a chimney 32 heated by a burner 31, before the water passes into an intermediate vessel 33 and from there to a removal pipe 6. According to the invention an ancillary circuit is provided which recycles water from the intermediate vessel 33 via circulating pump 8 and pipe 7 to the magnetic treatment device 1 and from there through the heating coil 2c, but only while there is no removal of heating water 6, so that the heating flame is

out. In this way lime separation in the heating coil and the pipes is even more effectively prevented.

As already mentioned, the invention can be used quite in general to prevent deposits of lime from water not only on metal, but also on ceramic or plastic surfaces.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. A process for reducing corrosion and lime deposits on a surface caused by impurities in water retained by or contacting a surface, comprising the steps of applying a magnetic field on flowing water to produce magnetically treated water; and, passing by impinging flow ~~or component flow~~ at high flow speed said magnetically treated water over said surface exposed to corrosion and deposition of lime to flush said surface.

2. A process according to claim 1, wherein following the step of passing magnetically treated water over said surface at least a portion of the treated water so used is subjected, in a recycling circuit, to the reapplication of said magnetic field and returned for subsequent passing over said surface.

3. A process according to claim 2, wherein water flow in the recycling circuit is continuously maintained.

4. A process according to any one of claims 1 to 3, wherein in said step of passing magnetically treated water over said surface the flow speed of the treated water is increased by means of a deflecting element producing a plurality of component flows.

5. A process according to any one of claims 1 to 3, wherein, prior to said step of passing magnetically treated water over said surface, said magnetically treated water is caused to flow in at least one spiral flow by means of at least one deflecting element disposed in a water flow path of said treated water and thereafter said spiral flow continues during said step of passing treated water to over said surface exposed to corrosion and deposits of lime, in order to flush said surface.

6. A process according to any one of claims 1 to 4, wherein said surface is an interior surface of a tank and, in the step of passing magnetically treated water over said surface to flush it, the magnetically treated water is passed horizontally or vertically towards said tank and then along said surface by means of at least one nozzle disposed in said tank.

7. A process according to any one of claims 1 to 4, wherein said surface is an interior surface of a curved tank and said magnetically treated water is passed in a spiral flow horizontally or vertically in contact with said surface and in the direction of curvature thereof by at least one nozzle.

8. A process according to any one of claims 1 to 4, wherein said surface comprises the surface of an array of lamellae and said magnetically treated water is passed from above through at least one nozzle onto said surface.

9. A process according to claim 8, wherein the magnetically treated water flows from inside said lamellae over said surface through one or more slots present in said array of lamellae.

10. A process according to claim 4, wherein said surface comprises the surface of a plurality of tubular heating elements arranged in a cluster disposed in a tank and said component flows of the magnetically treated water are directed onto said surface through openings in a spiral tube which is closed at one end and which is disposed inside said cluster of tubular heating elements.

11. A process according to claim 4, wherein said surface comprises the surface of each of a plurality of plate shaped heating elements arranged in a cluster disposed in a tank and said component flows of the

magnetically treated water are directed onto said surface through openings in a spiral tube which is closed at one end and which is disposed inside a cluster of plate-sha ed heating elements.

12. A process according to claim 4, wherein said surface comprises the surface of each of at least one tubular heating element and said component flows of the magnetically treated water are directed onto said surface through openings in a spiral tube which is closed at one end and which surrounds said surface.

13. A process according to claim 4, wherein said surface comprises the surface of each of at least one plate-shaped heating element and said component flows of the magnetically treated water are passed onto said surface through openings in a spiral tube which is closed at one end and which surrounds said surface.

14. A process according to claim 5 wherein said surface to be flushed by magnetically treated water is the inside wall of a tube through which the magnetically treated water flows.

15. An apparatus for reducing corrosion and lime deposits caused by impurities in water retained by or in contact with a surface, comprising:

a magnetic treatment device in which water flowing spirally in a tube is subjected to the action of magnetic field; and

a deflecting device which guides water emerging from the magnetic treatment device in the form of a flow or a number of component flows directly to said surface and which is of a configuration such as to direct each flow to impinge on said surface and to flow past said surface.

16. An apparatus according to claim 15, wherein said surface comprises an inside wall of a water pipe, and said deflecting device is one of a plurality of deflecting devices for causing the flow of magnetically treated water to flow along said inside wall spirally in relation to the axis thereof, said deflecting devices being disposed in or axially adjacent to said water pipe.

17. An apparatus according to claim 15 wherein said surface comprises an inside wall of a water tank and said deflecting device is constituted by a plurality of nozzles each of which directs a proportion of the flow of magnetically treated water substantially tangentially along said inside wall of the water tank, and said apparatus further comprises a circulating pump mounted for drawing water out of the water tank and connected for continuously recycling the water from the water tank and through the magnetic treatment device.

18. An apparatus according to claim 15 wherein said surface comprises the surface of each heating element in a cluster of heating elements of a water heating system disposed in a tank, wherein the deflecting device has the form of a spiral tube into which said magnetically treated water is led to flow and which is closed at one end and is formed with holes distributed over its length, said cluster of heating elements being surrounded by said spiral tube, whose holes are so constructed and arranged so that the flows of magnetically treated water emerging therefrom are directed at adjacent ones of said heating elements and wherein said apparatus further comprises a circulating pump for continually recycling water from the tank to the magnetic treatment device.

19. An apparatus according to claim 18 wherein said surface is one of a plurality of surfaces and said deflecting device is one of a plurality of deflecting

devices and each of said plurality of surfaces is surrounded by a respective one of said plurality of deflecting devices.

20. An apparatus according to claim 15 wherein said surface comprises a first surface constituted by the surface of each heating element of a cluster of heating elements and a second surface constituted by the surface of an inside wall of a cylindrical tank in which said cluster is disposed and wherein said deflecting device comprises a first deflecting device in the form of nozzles which direct a portion of the flow of magnetically treated water substantially tangentially to said second surface and a second deflecting device having the form of a spiral tube which is closed at one end and surrounds said first surface and is formed with holes distributed over its length, said holes being so constructed and arranged that the flows of magnetically treated water emerging therefrom are directed at adjacent ones of said heating elements, and wherein said apparatus further comprises a circulating pump for continually recycling water from the tank to the magnetic treatment device.

21. An apparatus according to claim 18, 19 or 20 further comprising an intercepting tank open at the top for collecting lime deposits which is disposed below the cluster of heating elements enclosed by the tube spiral.

22. An apparatus according to claim 15 wherein said surface comprises the surface of a heating coil in a water boiler, said heating coil disposed horizontally over a bottom of boiler, wherein the deflecting device is in the form of a flushing slot which directs said magnetically treated water to flow horizontally over the heating coil towards a suction slot connected to a circulating pump for recycling water drawn through the suction slot to the magnetic treatment device whose outlet is connected to the

flushing slot.

23. An apparatus according to claim 15 wherein said surface is one of a plurality of surfaces, each of said plurality of surfaces being the surface of individual ones of a plurality of heating elements of a steam generator and said deflecting device is one of a plurality of deflecting devices, each deflecting device being in the form of a spiral tube which is closed at one end and is formed with holes distributed over its length, each spiral tube surrounding one of said heating elements disposed in a boiler of the steam generator, and the holes being so constructed and arranged that the flows of magnetically treated water emerging therefrom are directed to an adjacent heating element, and wherein said apparatus further comprises a circulating pump connected and mounted for continuously drawing off water from the steam generator for recycling and supplying recycled water to the magnetic treatment device.

24. An apparatus according to claim 15 wherein said surface comprises an inside wall of an air scrubber or cooling tower having moistening and the exterior surface of lamellae provided in said scrubber or cooling tower, and wherein said deflecting device is located in the upper part of said cooling tower or air scrubber and is in the form of nozzles which direct a portion of the flow of magnetically treated water over the inside wall of the air scrubber or cooling tower and along the moistening lamellae, and wherein said apparatus further comprises a circulating pump connected and mounted for continuously drawing water rom a sump of the air scrubber or cooling tower and recycling water therefrom to the magnetic treatment device.

25. An apparatus according to claim 24, characterised in that the moistening lamellae have the configuration of hollow deflecting elements formed with holes from which

magnetically treated water emerges and flows over the exterior of the lamellae.

26. An apparatus according to claim 15 wherein said surface comprises the exterior surface of moistening lamellae in an air scrubber or cooling tower and said deflecting device is located in the upper part of a cooling tower or air scrubber and directs a portion of the flow of magnetically treated water over the moistening lamellae through flushing slots which are provided at the upper end of the moistening lamellae and from which magnetically treated water flows down over the exterior surface of the lamellae, and wherein said apparatus further comprises a circulating pump connected and mounted for continuously drawing water from a sump of the air scrubber or cooling tower and recycling water therefrom to the magnetic treating device.

27. A process for reducing corrosion and lime deposits caused by impurities in water substantially as herein described with reference to and as illustrated by any one or more of the accompanying drawings.

28. An apparatus for reducing corrosion and lime deposits caused by impurities in water substantially as herein described with reference to and as illustrated by any one or more of the accompanying drawings.

Dated this 31st day of August 1995.

MICHAEL GRAF STRACHWITZ
By his Patent Attorneys:

GRIFFITH HACK & CO.
Fellows Institute of Patent
Attorneys of Australia.

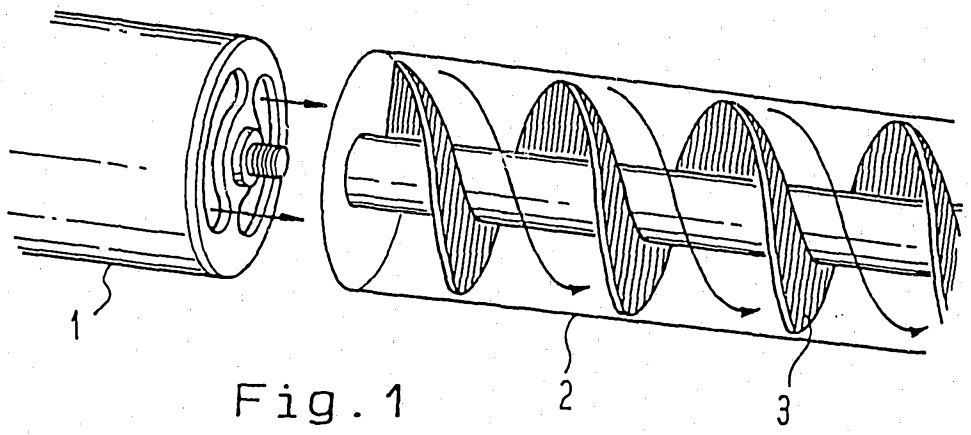


Fig.1

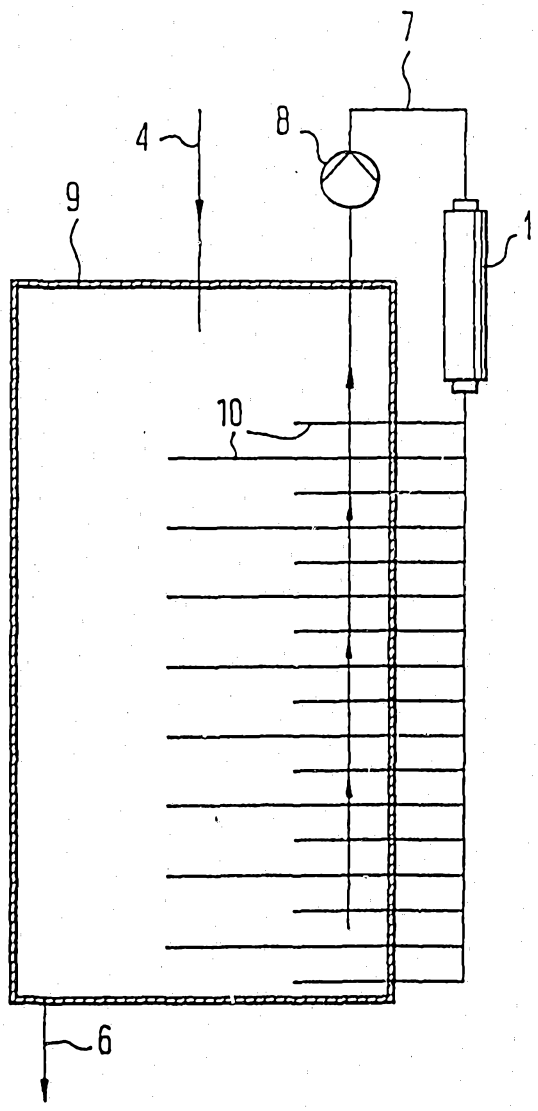


Fig.3

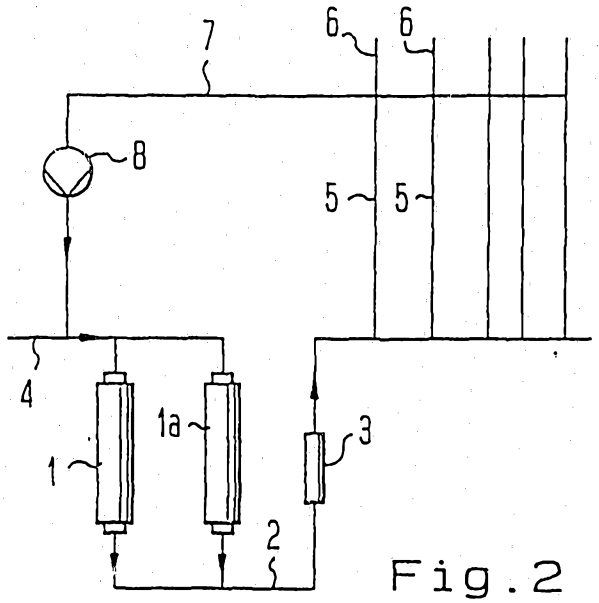


Fig.2

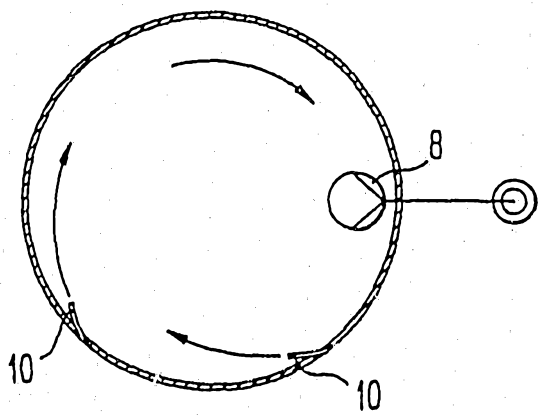


Fig.4

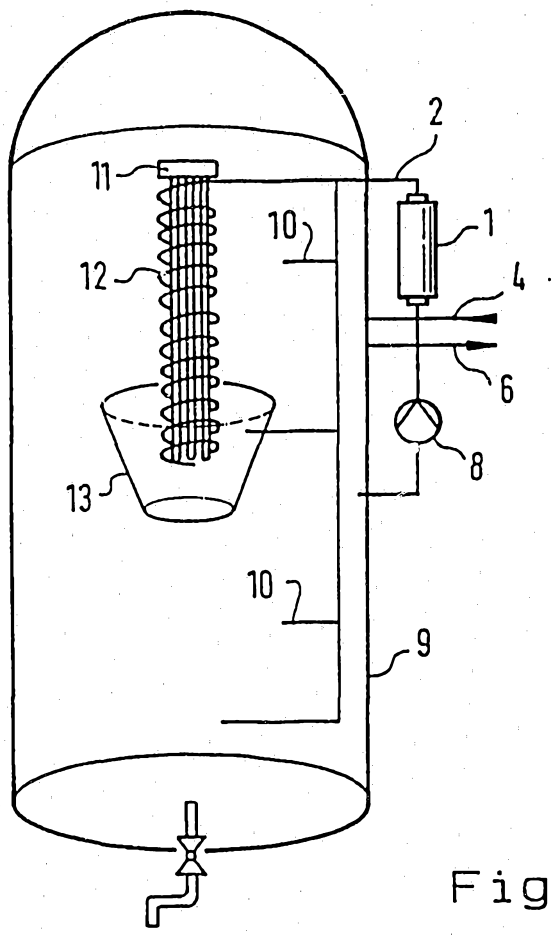


Fig.5

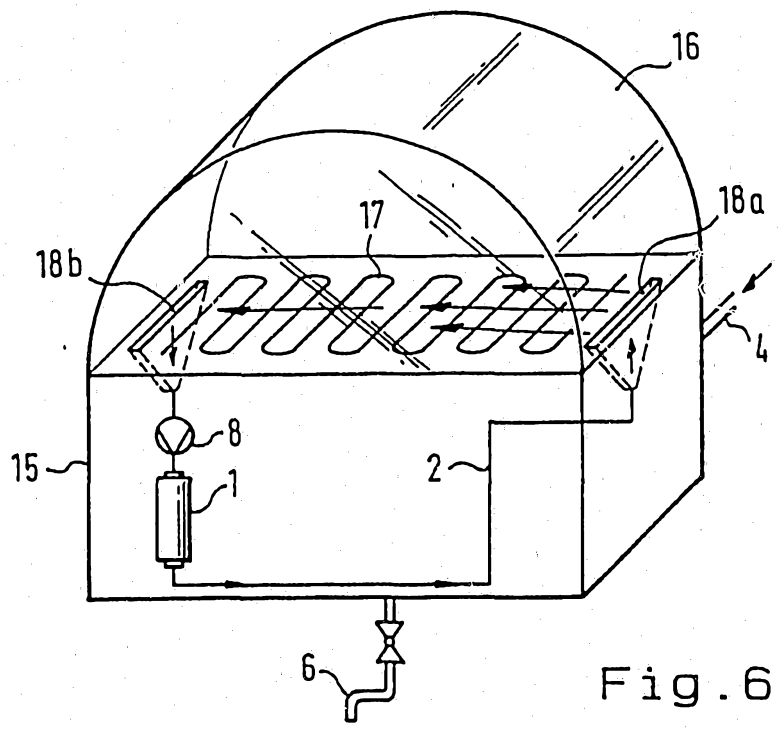


Fig.6

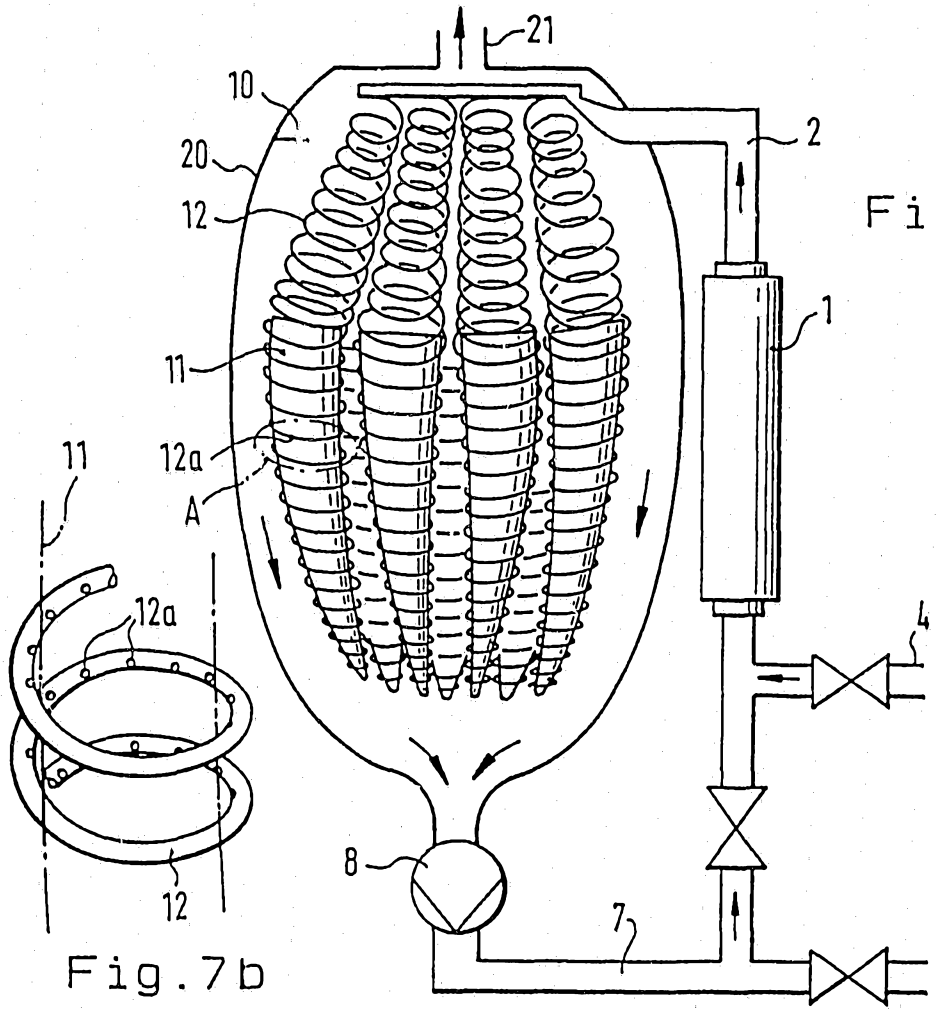


Fig.7a

Fig.7b

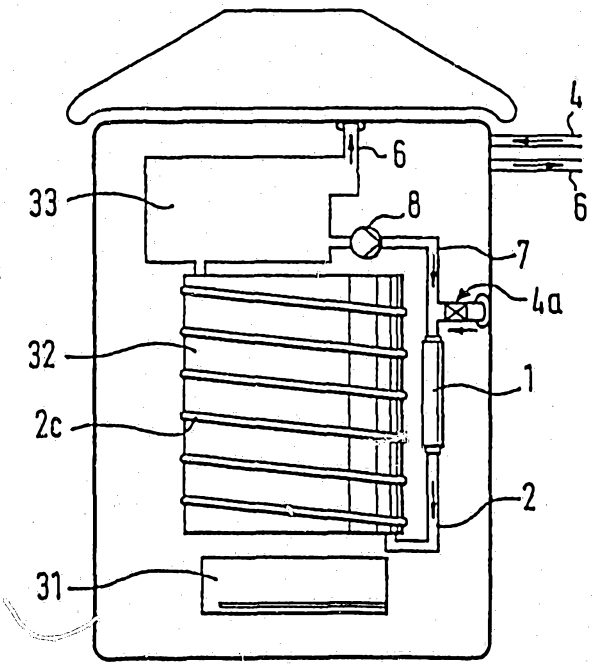


Fig.9

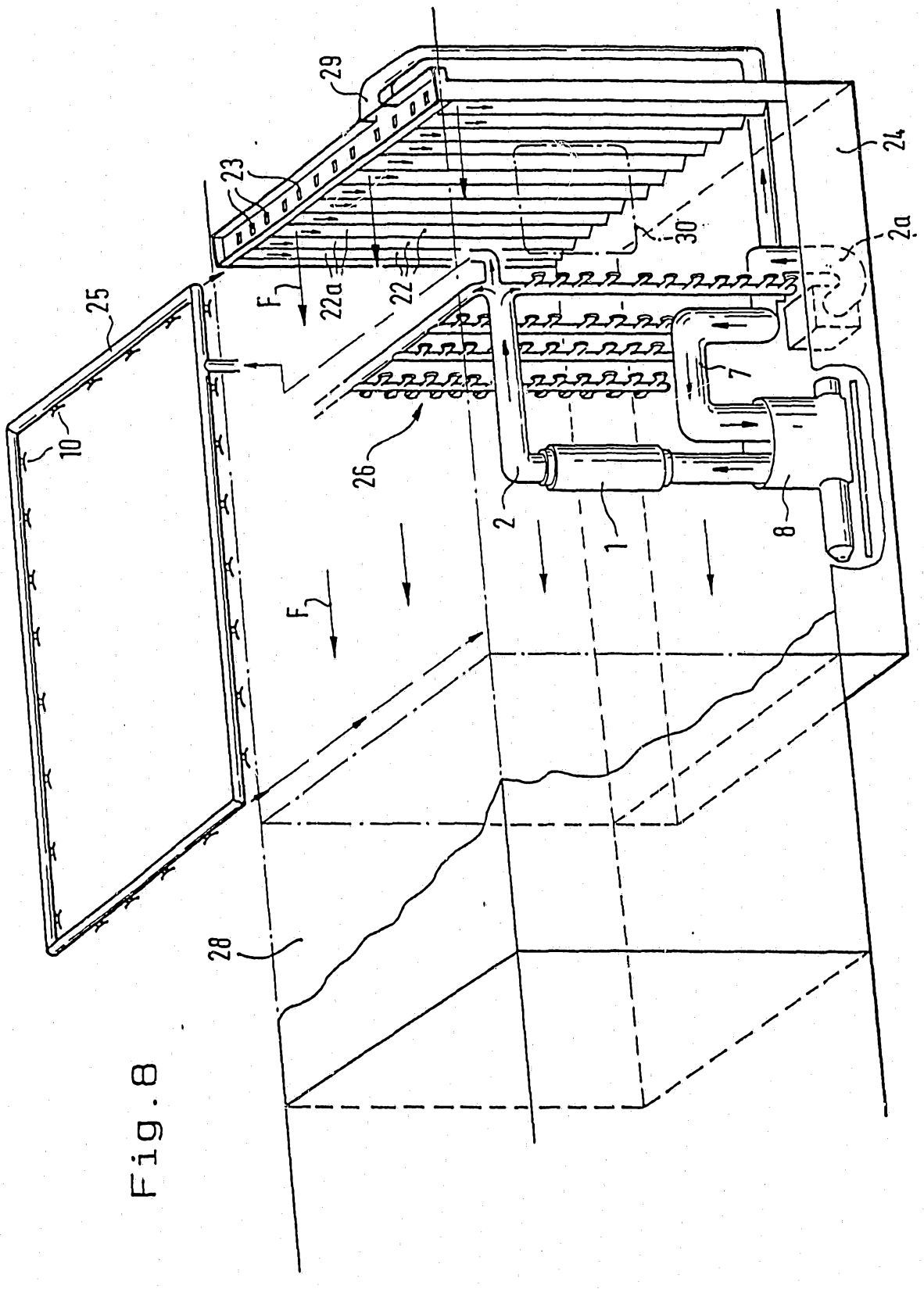


Fig.8

INTERNATIONAL SEARCH REPORT

International Application No PCT/EP 92/00580

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)[6]

According to International Patent Classification (IPC) or to both National Classification and IPC

Int.Cl. 5 C02F1/48

II. FIELDS SEARCHED

Minimum Documentation Searched[7]

Classification System	Classification Symbols
Int.Cl. 5	C02F

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched[8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT[9]

Category[10]	Citation of Document,[11] with indication, where appropriate, of the relevant passages[12]	Relevant to Claim No.[13]
A	US,A,4 611 615 (PETROVIC) 16 September 1986 see column 3, line 25 - column 4, line 35	1,15
A	EP,A,0 057 500 (KEMTUNE) 11 August 1982 see page 3, line 23 - line 34	2,3
A	DE,A,3 843 514 (DEUS) 28 June 1990 see abstract	1

* Special categories of cited documents :[10]

"A" document defining the general state of the art which is not considered to be of particular relevance

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
27 APRIL 1992	19. 05. 92
International Searching Authority	**Signature of Authorized Officer**
EUROPEAN PATENT OFFICE	MASPERS H.M.C.

Form PCT/ISA/210 (second sheet) (January 1985)

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO. EP 9200580 SA 57348

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 27/04/92
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
US-A-4611615	16-09-86	None		
EP-A-0057500	11-08-82	US-A-	4320003	16-03-82
		AT-T-	9084	15-09-84
		CA-A-	1159013	20-12-83
		JP-C-	1295042	26-12-85
		JP-A-	57136990	24-08-82
		JP-B-	60017594	04-05-85
DE-A-3843514	28-06-90	None		