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(54) **Title:** WATER DESALINATOR

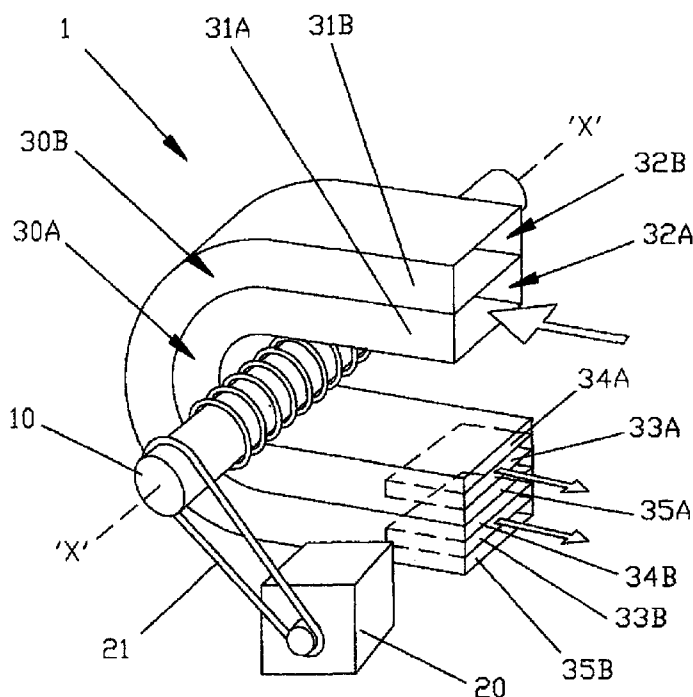


Figure 2

(57) **Abstract:** The invention relates to a salt water desalinator (1). Desalinator (1) has a rotatable magnet (10) having a N and S polarity at the ends of a rotational axis creating a toroidal magnetic field, means (20) to rotate the magnet, and at least two adjacent and stacked water conduit (30A,30B) adjacent the magnet each having a water inlet (32A,32B) and a first water outlet (33A,33B) at a centre of the conduit and a second water outlet (35A,35B) around the first water outlet. In use salt water can be passed into the conduit water inlet with said magnet rotating and positive and negative ions in the water migrating away from the conduit centre whereby water can be extracted from the first water outlet which is ion free, and the remaining salt water being extracted from said second water outlet.

Title: Water Desalinator

The present invention relates to a water desalinator.

It is known to provide a desalinator for converting salt sea water into fresh water. Such desalinators usually operate on a reverse osmosis principle in which saltwater is forced through a membrane to effectively filter out the salt particles in solution. A problem with these is that membranes are expensive resulting in an expensive product, and the membranes can easily become clogged with contaminants. It is also known the separate salt water passing through a single pipe into salt and fresh water using a magnetic field. Such known devices however are inefficient since much of magnetic energy is wasted.

The invention seeks to provide an improved desalinator.

According to the present invention there is provided a salt water desalinator comprising:

- a) a rotatable magnet having a N and S polarity at the ends of a rotational axis creating a torroidal magnetic field,
- b) means to rotate the magnet, and
- c) at least two adjacent and stacked water flow conduits adjacent the magnet, each water flow conduit having a water inlet and a first water outlet at a centre of the conduit and a second water outlet around the first water outlet,

in use salt water can be passed into each conduit water inlet with said magnet rotating and positive and negative ions in the water migrating away from the conduit centre whereby water can be extracted from the first water outlet of each conduit which is ion free, and the remaining salt water being extracted from said second water outlet of each conduit.

Preferably each conduit lies at substantially 90 degrees to the axis of the magnet.

The magnet may be a permanent magnet or electro-magnet.

Each conduit may be in an equatorial or polar position relative to the magnet.

Preferably each conduit is a first pipe and the first water outlet is a second smaller pipe concentric with the first pipe. The second pipe may be at one end of the first pipe. The pipe may be rectangular in cross section.

Preferably each conduit is formed of plastics.

In one embodiment each conduit is generally U-shaped with the rotating magnet between the arms of the U-shaped pipe. In another embodiment each conduit is a linear pipe.

A method of desalinating water comprising rotating a magnetic field adjacent at least two adjacent spaced conduits through which salt water is passed, and extracting fresh water from the centre of each conduit.

Embodiments of the invention will now be described with reference to the accompanying drawings in which:

Figure 1 shows a schematic view of a magnet

Figure 2 shows a schematic view of a first embodiment of a desalinators,

Figure 3 shows a schematic view of a stack of four conduits instead of two conduits in Figure 2,

Figure 4 shows a schematic view of a second embodiment of a desalinators, and

Figures 5A and 5B show a conduits of a desalinators in polar and equatorial positions around a magnet.

Referring to Figure 1 there is shown a magnet 10. Magnet 10 is formed from a cylindrical core 11 having a rotational axis X-X. Core 11 supports windings 12 powered by a DC voltage source 13.

Ends of core 2 have a N and S polarity at the ends of the rotational axis creating a toroidal magnetic field illustrated by the curved lines and arrows.

Referring to Figure 2 there is shown a salt water desalinators 1.

A rotatable magnet 10 is provided, of the type shown in Figure 1, having a N and S polarity at the ends of a rotational axis creating a torroidal magnetic field.

A motor 20 driving a belt 21 (or other rotating device) is provided to rotate the magnet 10 at high speed.

A first water flow conduit 30A is provided adjacent the rotating magnet 10 and lying at 90 degrees to the magnet 10. Conduit 30A is generally U-shaped with the magnet 10 between the arms of the U-shaped conduit. Conduit 30A has a first pipe 31A rectangular in cross section and has a water inlet 32A. A first water outlet 33A is provided by a second smaller pipe 34A at a centre of the conduit concentric with and at one end of the first pipe 31A, and a second water outlet 35A around the first water outlet 33A. A second water flow conduit 30B is provided adjacent the rotating magnet 10 and lying at 90 degrees to the magnet 10. Second water flow conduit is adjacent and radially spaced from first water flow conduit 30A. Conduit 30B is generally U-shaped with the magnet 10 between the arms of the U-shaped magnet. Conduit 30B has a first pipe 31B rectangular in cross section and has a water inlet 32B. A first water outlet 33B is provided by a second smaller pipe 34B at a centre of the conduit concentric with and at one end of the first pipe 31B, and a second water outlet 35B around the first water outlet 33B.

In use a supply of salt water can be passed into the conduit water inlets 32A,32B with magnet rotating 10. Positive Na^+ and negative and Cl^- ions in the water migrate away from the conduit centre whereby pure water can be extracted from the first water outlets 33A,33B which is ion free, and the remaining salt water can be extracted from the second water outlets 35A,35B and returned to the supply of salt water. The positive ions will tend to migrate towards magnet 10 and the negative ions will tend to migrate away from the magnet leaving pure electrically neutral water in the middle.

The curved conduits mean that the magnetic field is parallel to the conduit at all points to give the greatest yield of fresh water. The curve could be of uniform radius of curvature or different shape, e.g. parabolic.

For the magnet to be successful in creating charge flow, the product of velocity and magnetic field strength ($v \times B$) must be as large as possible. This means that the magnet 10 has to spin as fast as possible and the magnetic field needs to be saturated at some maximum value. However it may be possible to work at lower speeds. Ideally one may want to work out desalination at the lowest speed and magnetic field that effects charge separation. This uses the least energy.

When the magnet is spinning and there is water flow through conduits 30A,30B, there are two points at which power must be applied. The salt water flow through the magnetic field create a

back pressure, and the exert a back torque on the rotating magnet. Thus the power P consumed is the sum of $\omega \tau$ and $\Delta P \dot{V}$.

If the direction of flow of water through a stacked conduit is the opposite direction to the rotation of the magnet, then maximum relative velocity is achieved resulting in greater efficiency.

Conduits 30A,30B are ideally made of plastics as opposed to metal so that the magnetic field can penetrate the salt water flowing through the conduit. First pipes 31A,31B and second pipes 33A,33B could be circular in cross section.

The magnet 10 may be a permanent magnet instead of an electro-magnet.

In practice it is envisaged that instead of two “stacked” conduits 30A,30B, a multi-stack of curved conduits 30A,30B,30C,30D could be provided such as shown in Figure 3.

Referring to Figure 4 there is shown a salt water desalinator 40.

A rotatable magnet 10 is provided, of the type shown in Figure 1, having a N and S polarity at the ends of a rotational axis creating a torroidal magnetic field.

A motor 20 driving a belt 21 is provided to rotate the magnet 10 at high speed.

A first water flow conduit 40A is provided adjacent the rotating magnet 10 and lying at 90 degrees to the magnet 10. Conduit 40A is generally linear. Conduit 40A has a first pipe 41A rectangular in cross section and has a water inlet 42A. A first water outlet 43A is provided by a second smaller pipe 44A at a centre of the conduit concentric with and at one end of the first pipe 41A, and a second water outlet 45A is around the first water outlet 43A. A second water flow conduit 40B is provided adjacent the rotating magnet 10 and lying at 90 degrees to the magnet 10. Conduit 40B is generally linear. Conduit 40B has a first pipe 41B rectangular in cross section and has a water inlet 42B. A first water outlet 43B is provided by a second smaller pipe 44B at a centre of the conduit concentric with and at one end of the first pipe 41B, and a second water outlet 45B is around the first water outlet 43B.

In use a supply of salt water can be passed into the conduit water inlets 42 with magnet rotating 10. Positive Na^+ and negative Cl^- ions in the water migrating away from the conduit centre whereby pure water can be extracted from the first water outlets 43A, 43B which is ion free, and the remaining salt water can be extracted from said second water outlets 45A, 45B and returned to the supply of salt water. The positive ions will tend to migrate towards magnet 10 and the negative ions will tend to migrate away from the magnet leaving pure electrically neutral water in the middle.

In practice it is envisaged that instead of two linear conduits 40A, 40B, a multi-stack of linear conduits could be provided.

Conduits 40A,40B are ideally made of plastics as opposed to metal so that the magnetic field can penetrate the salt water flowing through the conduit. First pipes 41A,41B and second pipes 43A,43B could be circular in cross section. The magnet 10 may be a permanent magnet instead of an electro-magnet.

As shown in Figure 5A a stack of conduits could be in an equatorial position. Alternatively a stack of conduits could be in a polar position as shown in Figure 5B. Furthermore conduits could be provided in both polar and equatorial positions or between these positions around a rotating magnet. Also two or more stacks could be provided in both polar and/or equatorial positions.

Instead of the stacked conduits being rectangular cross section, they could be curved to make sure the magnetic field lines are parallel to or normal to the cross sectional shape of the conduits to maximise the efficiency of the desalinator.

The invention also relates to a method of desalinating water comprising rotating a magnetic field adjacent at least two adjacent radially spaced conduits through which salt water is passed, and extracting fresh water from the centre of each conduit.

The invention may take a form different to that specifically described above.

Further modifications will be apparent to those skilled in the art without departing from the scope of the present invention.

CLAIMS

1. A salt water desalinator comprising:

a) a rotatable magnet having a N and S polarity at the ends of a rotational axis creating a torroidal magnetic field,

b) means to rotate the magnet, and

c) at least two adjacent and stacked conduits adjacent the magnet, each water flow conduit having a water inlet and a first water outlet at a centre of the conduit and a second water outlet around the first water outlet,

in use salt water can be passed into each conduit water inlet with said magnet rotating and positive and negative ions in the water migrating away from the conduit centre whereby water can extracted from the first water outlet of each conduit which is ion free, and the remaining salt water being extracted from said second water outlet of each conduit.

2. A salt water desalinator according to claim 1, wherein each conduit lies at substantially 90 degrees to the axis of the magnet.

3. A salt water desalinator according to claim 1 or 2, wherein the magnet is a permanent magnet or electro-magnet.

4. A salt water desalinator according to claim 1, 2, or 3, wherein each conduit is a first pipe and ~~the first water outlet is a second smaller pipe concentric with the first pipe.~~
5. A salt water desalinator according to claim 4, wherein the second pipe is at one end of the first ~~pipe.~~
6. A salt water desalinator according to claim 4 or 5, wherein the pipes are rectangular in cross ~~section.~~
7. A salt water desalinator according to any preceding claim, wherein each conduit is formed of ~~plastics.~~
8. A salt water desalinator according to any preceding claim, wherein each conduit is generally U-shaped with the rotating magnet between the arms of the U-shaped pipe.
9. A salt water desalinator according to any of claims 1 to 7, wherein each conduit is a linear ~~pipe.~~
10. A salt water desalinator substantially as hereinbefore described with reference to and as ~~shown in the accompanying drawings.~~

11. A method of desalinating water comprising rotating a magnetic field adjacent a conduit through which salt water is passed, and extracting fresh water from the centre of the conduit.

12. A method of desalinating water substantially as hereinbefore described.

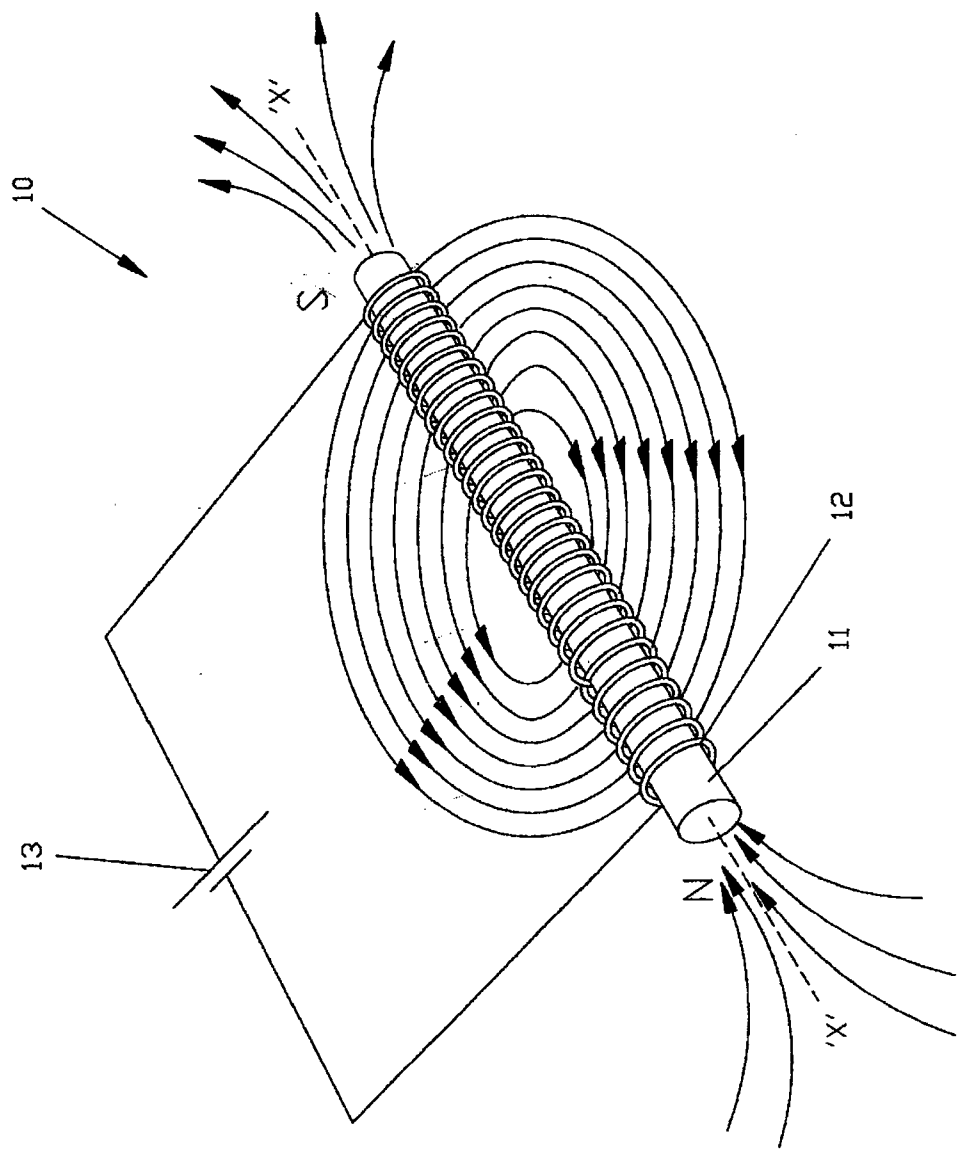


Figure 1

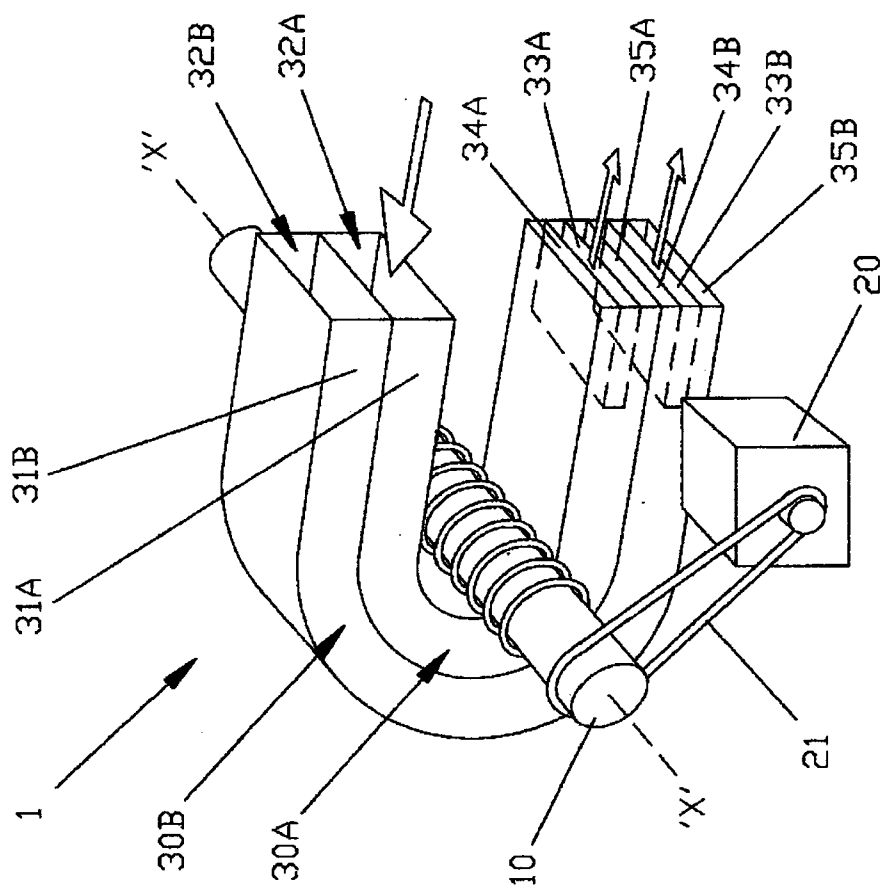


Figure 2

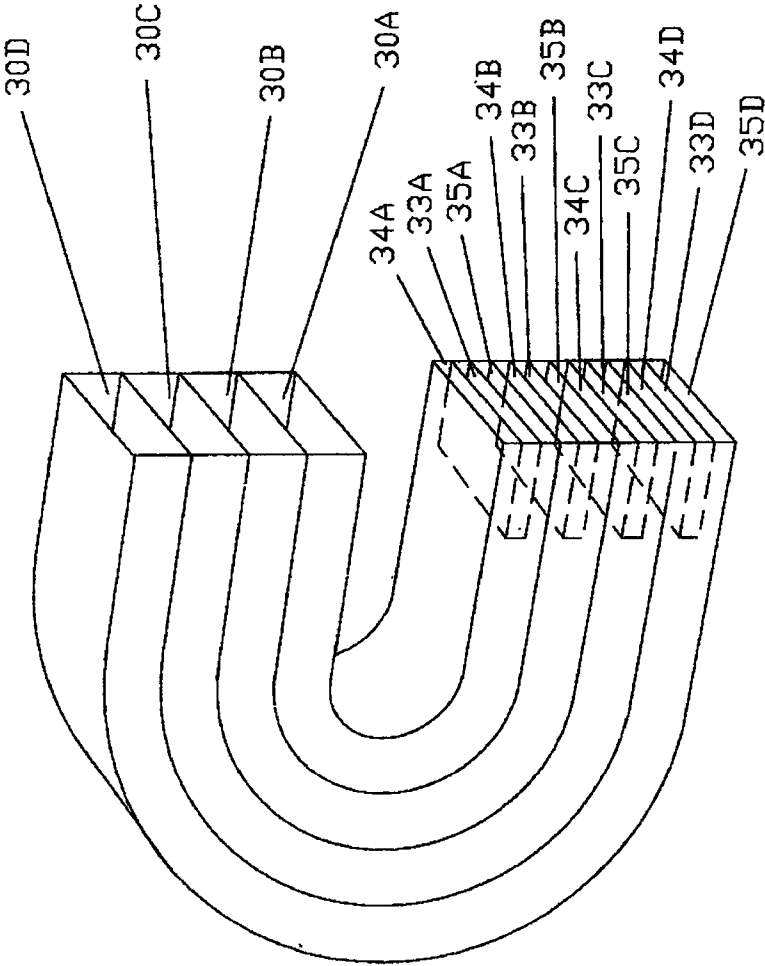


Figure 3

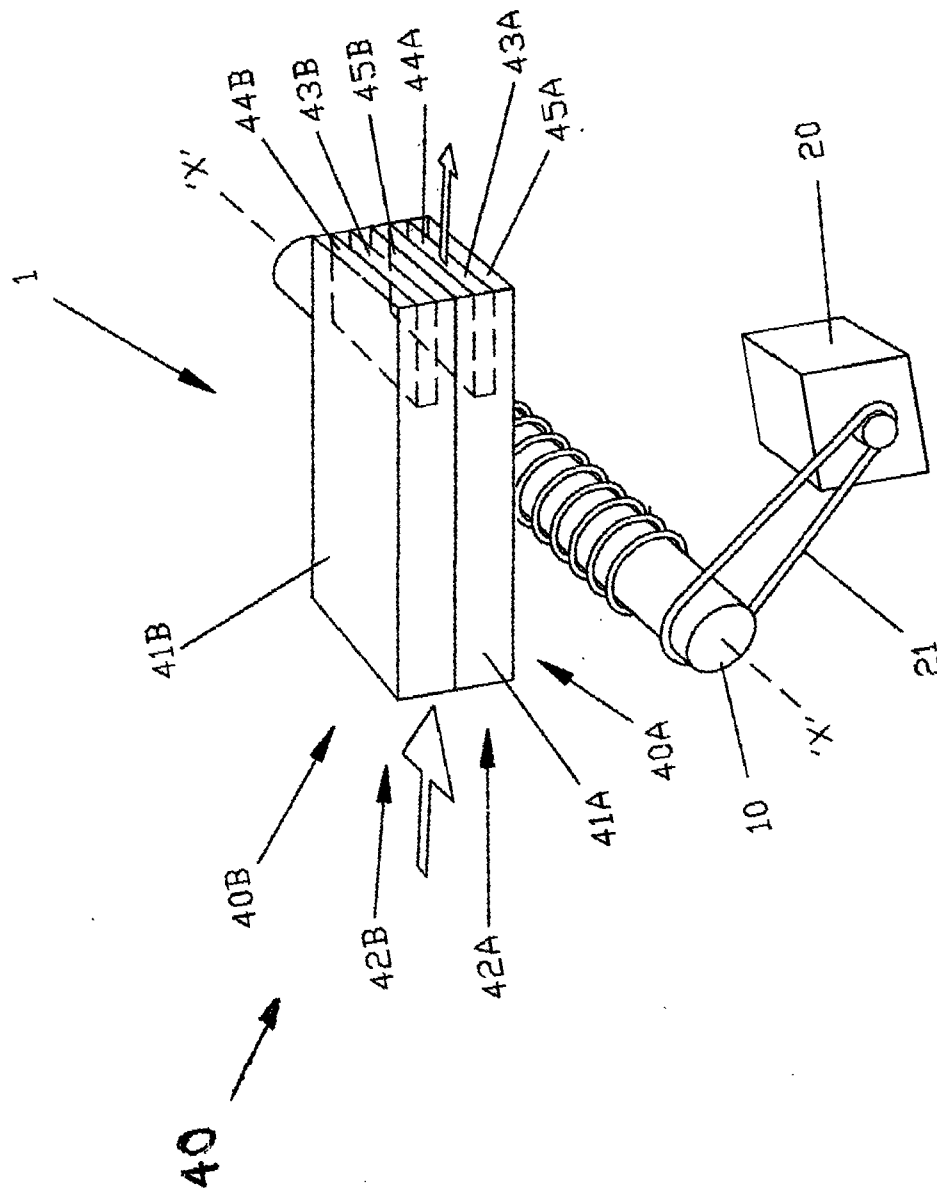


Figure 4

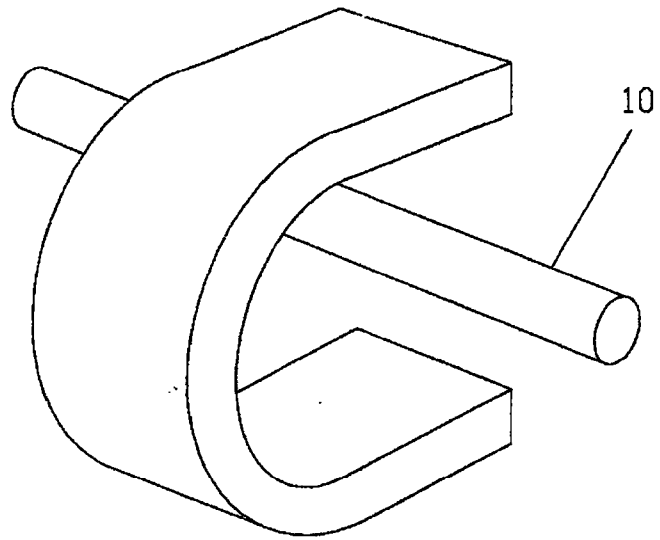


Figure 5A

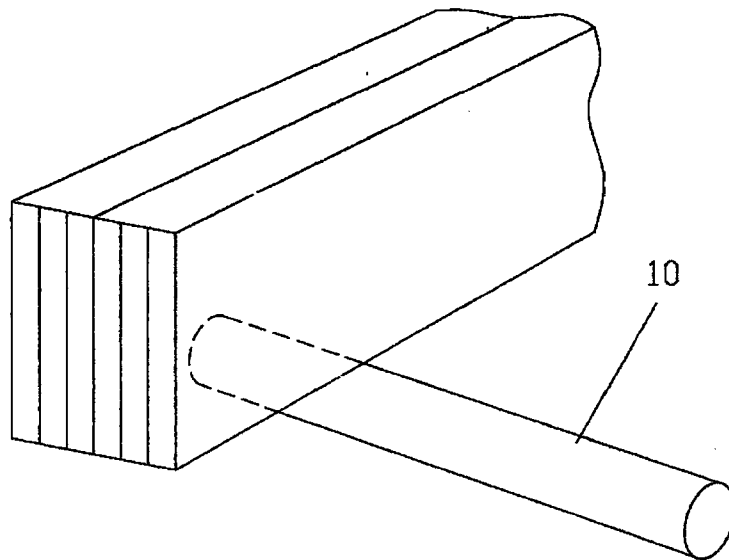


Figure 5B

INTERNATIONAL SEARCH REPORT

International application No

PCT/GB2013/000270

A. CLASSIFICATION OF SUBJECT MATTER

ADD. C02F103/08 C02F1/48 B03C1/023

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)

C02F B03C

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 practicable, 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	US 5 200 071 A (SPIEGEL MICHAEL S [US]) 6 April 1993 (1993-04-06)	1-12
Y	figures 1-5 column 7, line 15 - column 8, line 25 claims 1-3	1-12
Y	----- US 2008/264869 A1 (HOLLAND HERBERT W [US] HOLLAND HERBERT WILLIAM [US]) 30 October 2008 (2008-10-30) figures 1-3 paragraphs [0098] - [0122]	1-12
Y	----- FR 2 692 645 A1 (APSI SARL [FR]) 24 December 1993 (1993-12-24) figures 1-9 page 3, line 17 - page 6, line 32 ----- -/-	1-12



Further documents are listed in the continuation of Box C.



See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search

29 August 2013

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INTERNATIONAL SEARCH REPORT

International application No

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2011/132477 A1 (NUCHIMASU KK [JP]; TAKAYASU MASAKATSU [JP]) 27 October 2011 (2011-10-27) figures 1-9 page 9 paragraphs [0012] - [0020] -----	1-12

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/GB2013/000270

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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