

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
19 October 2006 (19.10.2006)

PCT

(10) International Publication Number
WO 2006/108247 A1

(51) International Patent Classification:
F24J 2/07 (2006.01) *F24J 2/54* (2006.01)

(21) International Application Number:
PCT/BA2005/000006

(22) International Filing Date: 5 October 2005 (05.10.2005)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
BAP052046A 11 April 2005 (11.04.2005) BA

KG, KM, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(71) Applicant and
(72) Inventor: KRUPIC, Bakir [BA/BA]; Gradacacka N°22,
71000 Sarajevo (BA).

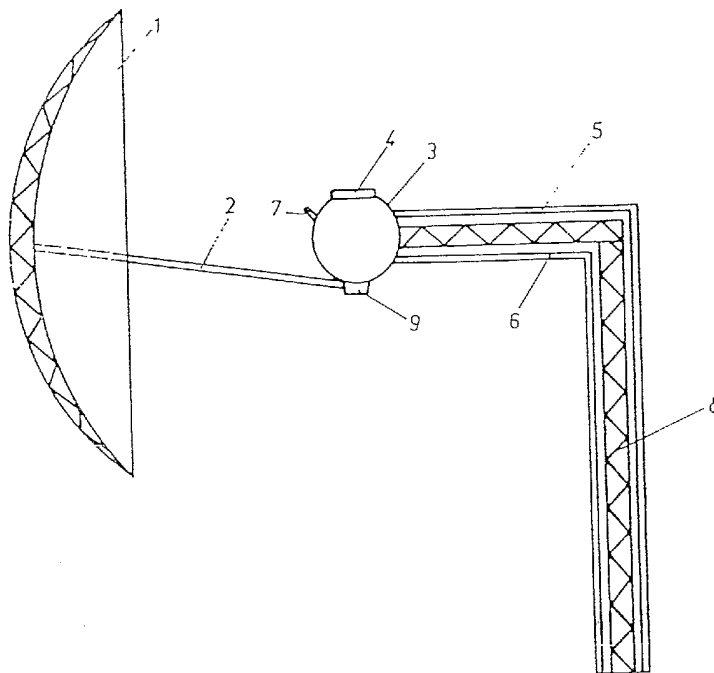
Declaration under Rule 4.17:
— of inventorship (Rule 4.17(iv))

(81) Designated States (*unless otherwise indicated, for every kind of national protection available*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE,

Published:
— with international search report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: ROTARY CONCAVE MIRROR FOR PRODUCTION OF HOT WATER OR WATER STEAM



(57) Abstract: A concave mirror is used for the production of hot water, steam, or for the distillation of seawater. The concave mirror (1) is made of alluminum coated with thin silver-, nickel- or chromium layer and is connected to a water reservoir (3) by a girder (2). The mirror (1) follows the movement of the sun by two electric motors (10 and 12) which through gearwheels (14 and 15) bring the mirror (1) into the needed position.

WO 2006/108247 A1

ROTARY CONCAVE MIRROR FOR PRODUCTION OF HOT WATER OR WATER STEAM

Technical field to which the innovation belongs

This innovation belongs to devices which use solar energy for useful purposes.

According to MKP the innovation is marked as

Technical problem

Technical problem which is solved by this innovation is the way in which solar energy, which is free of cost, is used for a profitable purpose, in this case for getting hot water, steam, and for distillation of seawater, i.e. for getting pure distilled water and salt.

Present state of technique

By now, several ways are known in which energy is used for production of electricity by using thermocells and photocells. Thermocells work on principle of an closed circle made of two different metals soldered to each other; electric current flows if there exists different temperature between two contact points. Solar energy utilization in this case is about 2%. Photocells convert solar energy directly into electricity. When exposed to electricity selenium photocells generate electric current. Utilization of electric energy in this case is also 2% approximately. Up-to-date silicon cells reach the utilization degree up to 15%. Solar energy is also used for heating water by exposing water to solar radiation in a thermally insulated basin with blackened bottom and a glass plate. Solar rays, when concentrated, can generate temperature between 100° and 500° C, even more.

How to solve the technical problem

Concave mirror is used for production of hot water, steam, and for distillation of seawater.

Figure 1 shows side view of the concave mirror made of aluminum coated with thin silver-, nickel- or chromium layer. The Figure shows girder (2) connecting concave mirror to water reservoir (3), reservoir (3) with cover (4), manometer (7), lattice girder of the whole system (8), steel pipe for cold or seawater supply (6), and also steel pipe for hot water or steam outflow (7).

Figure 2 gives the mirror front view with the same details as on Figure 1.

Figure 3 shows moving joint directing the concave mirror always toward the sun, so that the mirror follows moving of the sun from the morning till the evening. This is achieved by two electric motors (10 and 12) which through gearwheels (14 and 15) bring the joint into the needed position, i.e. move it along horizontal and vertical path where gearwheels turn around axes (16

and 17) supplied with pins (18 and 19) and fixed with metal disks (22 and 23) palced around gearwheels.

Figures 3,4,5 and 6 show the position of the concave mirror at 9 am, 12 pm, 3 pm and finally at 6 pm.

Figure 9 shows the water reservoir in the moment when water level lowers to B line. At that moment, valve (30) openes to discharge water into concrete basins through the pipe (29). As that water contains high percentage of salt, water heated in these basins by sun rays evaporates quickly and pure sea salt remains. When water lowers to C line, valve (30) closes and valve (25) openes. At the same moment, pump (26) suplying cold or sea water into the reservoir would start to operate. The pump (26) stops operating when water in the reservoir reaches A line and at the same moment the valve (25) would close. As pipe (32) is connected to the reservoir by pipe (31), like communicating vessel, water level in the reservoir is indicated by a float (35) in each moment, while weight (34) shifts the float (35) downwards by axle (33) and so prevents steam to lift the float, if too light, above the necessary level or even to throw it out of the pipe. Extention piece (48), tied to the weight (34), points by the indicator A1 water level in the reservoir in each moment. The indicator is necessary in case when the pipe which contains the float is made of steel. If the pipe, however, was made of transparent fireproof glass, the indicator should not be necessary.

Drawing 10 shows the other version of reservoir functioning with water in it circulating continually. Cold water or seawater would be supplied to the reservoir continually by the pump (26a) and pipe (24a). Valve (30a) would be opened constantly, in fact more or less closed when necessary. When water level falls under the D line, valve (30a) closes as much as it is necessary to reduce water outflow. In the same way, when water level lifts above the D line, valve (30a) opens more to let larger quantity of water to flow out. Therefore, valve (30a) regulates the constant level of water in the reservoir (3a), i.e. keeps water level always on the D line. As the pipe (32a) is connected with reservoir on principle of communicating vessels, lifting and descending of the piston (34a) would indicate, in each moment, level of water in the reservoir. The piston (34a) serves, just as in the previous version, to descend with the axle when water in the reservoir lowers, while the float (33a) which contains air serves to lift the axle upwards when water in the reservoir lifts or *vice versa* to descend when water in the reservoir lowers.

Drawing 11 shows condenser (38) placed approximately 1 meter under the sea level. Steam under the pressure would be introduced into the condenser (38). As sea temperature ranges approximately from 18⁰ C till 24⁰ C, differences in temperature would cause steam to condense into distilled water very quickly.

The condenser has a star-like shape so that as much of its surface as possible could be in contact with seawater. Condenser (38) is fixed to sea bottom (41) by girders (40).

Ever-moving seawater current would bring fresh seawater constantly.

Accumulator (42), turbin (43), electric generator (44) and turbocompressor (45) and valve (46) would be within the frame of the condenser.

This should be necessary if the concave mirror functioned autochtonously, i.e. on palces at which electricty was unavailable, but if electricity was

available, details under ordinal numbers 42, 43, 44, 45 and 46 would not be necessary.

If it was necessary that the device for production of hot water, steam or for seawater desalinization functioned autochthonously, i.e. on places at which electricity was unavailable, the device would function in the following way:

In the period from 11 am. till 3 pm., when the pressure in the reservoir (3) is at its maximum, 7.92 bars, and when temperature in the reservoir is 170⁰ C, approximately 1/3 of the steam under pressure is being delivered through valve (46) to miniturbine (43) which actuates electric generator (44) to store energy in the accumulator which then actuates concave mirror through the joint both horizontally and vertically, i.e. directs it always toward the sun. Diesel engine (45) serves to actuate electric generator (44) and to load the accumulator (42) in case of any turbine (43) failure or in case of extremely bad weather. Turbocompressor receiving energy also from accumulator (42) serves to shift the steam to the condenser in the afternoon hours when steam pressure in the reservoir (3) is lower than in the condenser.

Device for production of hot water, steam, and for seawater desalinization is completely free of costs. If we are aware that 600 calories (2512 kJ) is necessary for evaporation of one liter of water from 0 degrees till utter evaporation, then we shall see how much it could be saved.

The device is at its optimum operation when the reservoir contains saturated steam at 170⁰ C and under pressure of 7.92 bars. Steam under quoted pressure and temperature in the condenser pounded by seawater of temperature from 18⁰ C till 24⁰ C turns very quickly into distilled water. Utter conversion of steam into water would happen during the night, so that in the morning there would be received large quantity of cooled distilled water, suitable for watering vegetables or fruits.

The device, being utterly free of costs and autochthonous, is extraordinary suitable for warm areas. From the environmental point of view, It should be also noted that its operation is completely pure and without any harmful admixtures.

Besides the above quoted purposes, the device can serve for production of hot water (for hotels, etc.) or steam. In that case tap water should be poured into the reservoir and the condenser would be unnecessary.

Two or three joints are necessary to place the concave mirror in the optimum position toward the sun.

MANUAL OPERATION

When the indicator is at "B1" point, it signifies that water level in the reservoir (3) is at "B" line. In that case it is necessary to stop discharging water steam (28). The next step is to close water intake (25), then open water discharge valve for water with high percentage of salt (30). Discharge water through a pipe (29) and let it into a concrete trough, close valve (30). Water, with high percentage of salt, in concrete trough will be, under influence of sun, transmitted slowly into salt. After having closed water discharge valve (30), open steam discharge valve (28), then salt water intake valve (25) and turn the salt water intake pump on (26).

When indicator reaches "A 1" point, stop intaking water, so that water level in reservoir rests at "A" line. This procedure should be repeated several times during a day, depending both on the climate and season of the land where the device is installed.

One operator can serve 5 or 6 devices.

The largest quantity of water from condenser (38) will be received in early morning. Water at that time will be of temperature most convenient for watering vegetable and fruit planted areas.

Instead of indicator, regulator pipe (32) can be made of fire-proof glass. It is recommended to dye the float (35) in red colour for easy control of its movement. I consider this option more acceptable than the former one. Valve closing and opening procedure is the same as with the pipe (32) with indicator.

Regulator pipe (32), with water in it at the same level as in the reservoir, works on the principle of connected containers, as the float (35) goes up and down just as water in reservoir (3).

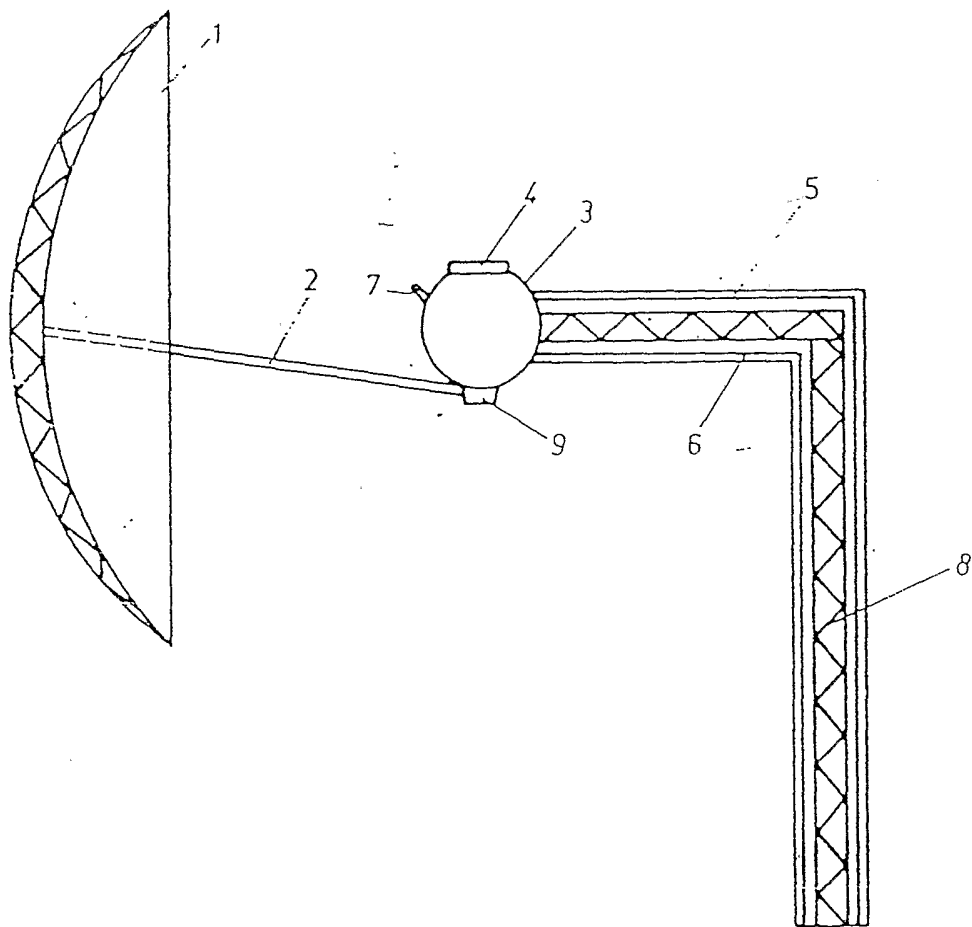
Concave mirror is driven by two electric motors (10 and 12). Horizontal movement is achievable in a rather simple way by help of the electric motor (12): the electric motor (12) is moved evenly by electricity. The motor is regulated in such a way that it turns the concave mirror on the horizontal axes always toward the sun. The motor moves within the radius of 360 degrees. In fact, the motor (12) moves the concave mirror toward the sun during at daily light, and it keeps on moving during the night, so that it is turned toward the sun again in the morning.

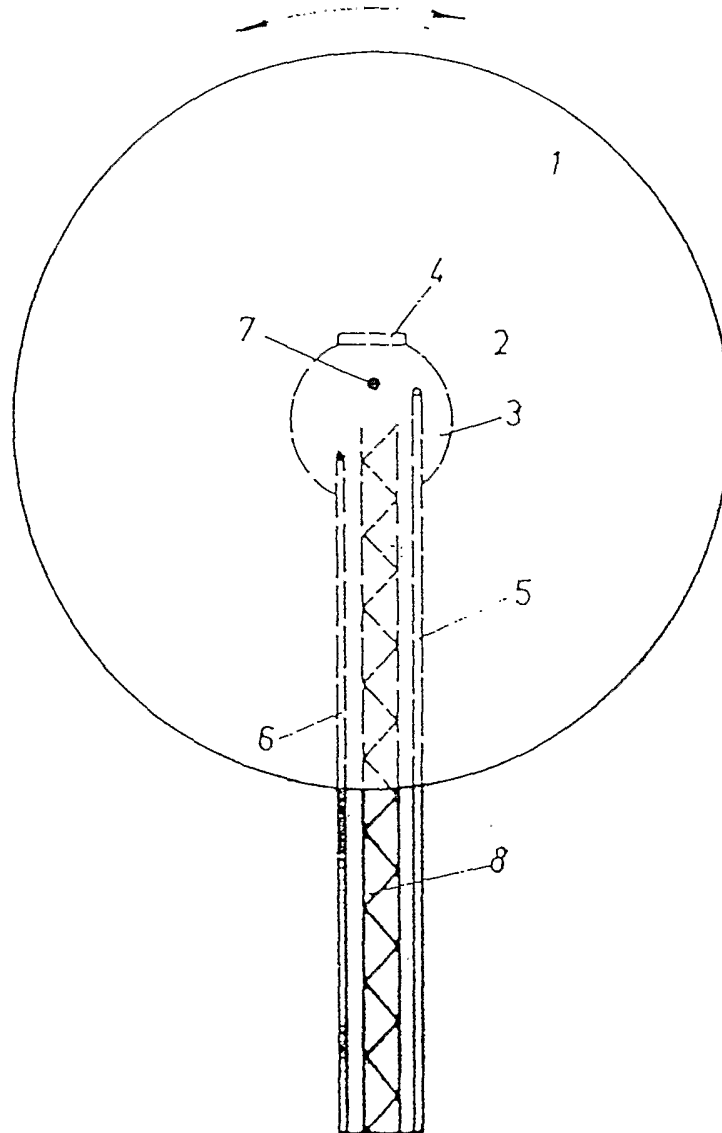
The only problem is moving of the concave mirror on the vertical axes. In fact, this is the only moment where automatic system is necessary, which each day in a year (precisely 180 days) would, through the electric motor (10), direct the concave mirror toward the sun. As the sun has different path each day in a year, this automatic system would monitor movement of the sun and direct sunbeams straight toward the reservoir.

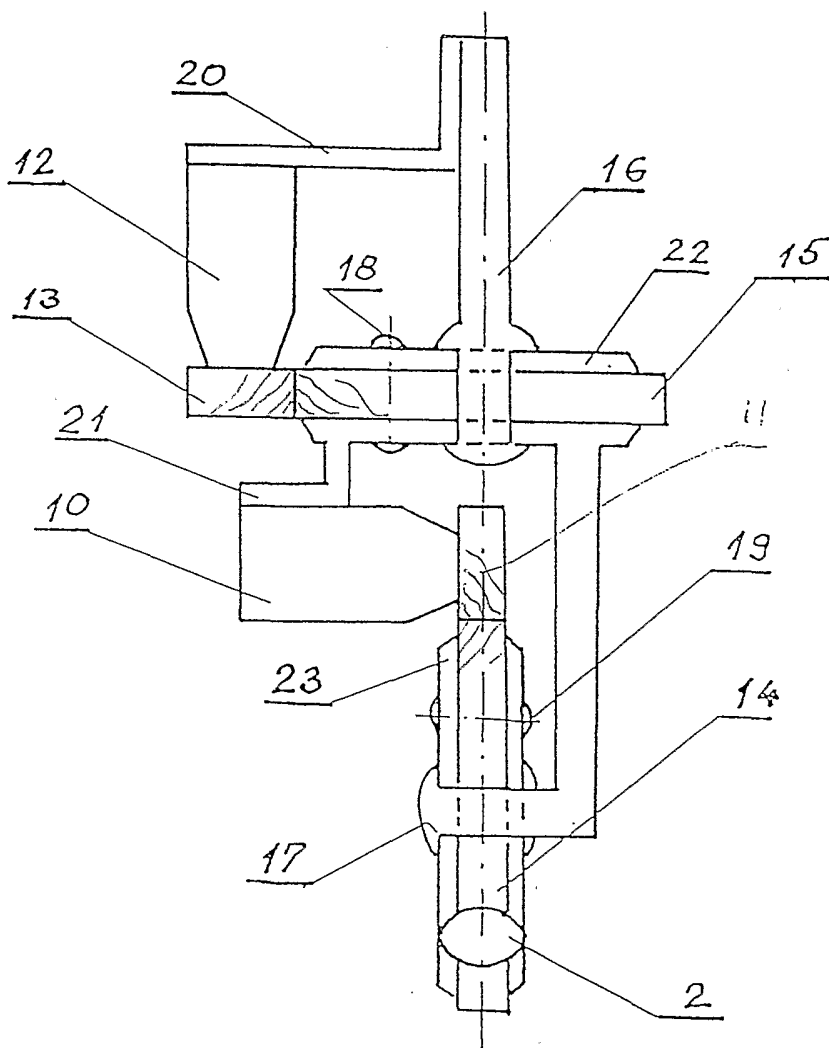
PATENT CLAIM

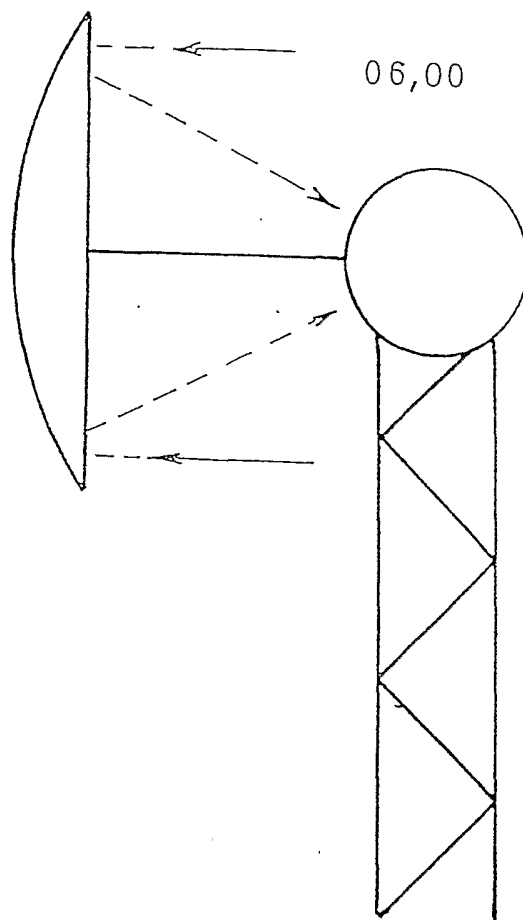
Rotating concave mirror for production of hot water or water steam characterized by that constructed of aluminium, chrome plated inside fastened with a bearer to double joint mechanism placed on water reservoir bottom, which being connected to an electric motor and cog-wheel enables, a concave mirror to be driven on the horizontal axis, while the other electric motor and cog-wheel rotate the mirror on its vertical axis turning so the mirror always toward the sun, so that it follows movement of the sun from its rising in the morning to setting in the afternoon. and it means, that the concave mirror gathers sunbeams during the whole day and reflects them toward a water reservoir in which water is heated to its boiling point and steam from the reservoir is led to a condenser placed below the sea level and due to the great difference between temperature necessary for water steam and temperature of salt water, and water steam from the reservoir is led to a condenser placed below the sea level and transformed into clear destinated water. heated to its boiling point and steam from and due to the great difference between temperature necessary for heating water, water steam heating reservoir is led to a condenser placed below the sea level and so due to the the great difference between temperature necessary for heating water steam and temperature of salt water, water steam is being condensed and transformed into clear desalinated water.

Accumulator, turbine, electric generator and turbocompressor and valve would be within the frame of the condenser and this should be necessary if the concave mirror functioned autochthonously i.e. on place at which electricity was unavailable, but if electricity was available this details would not be necessary.

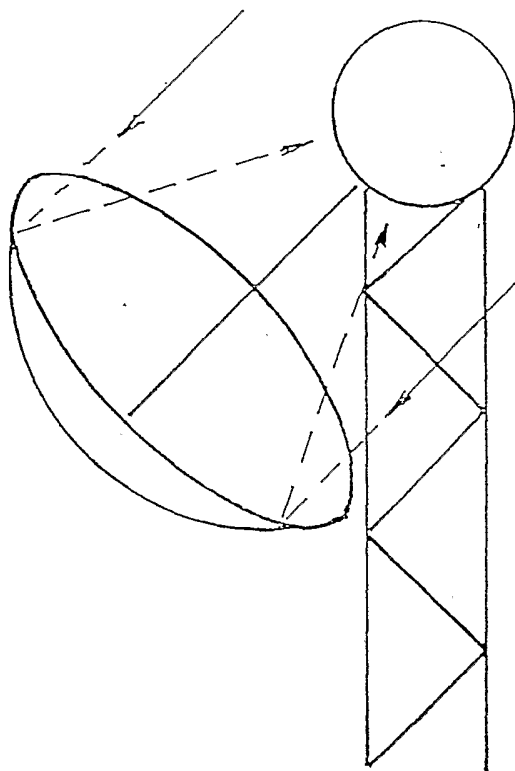




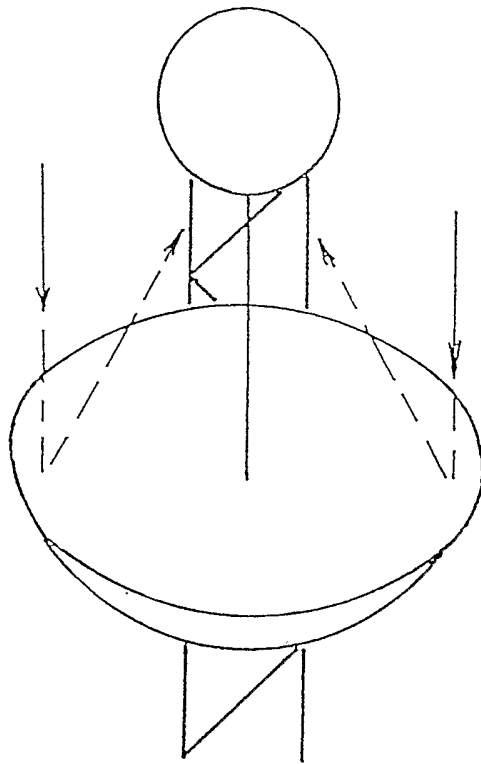




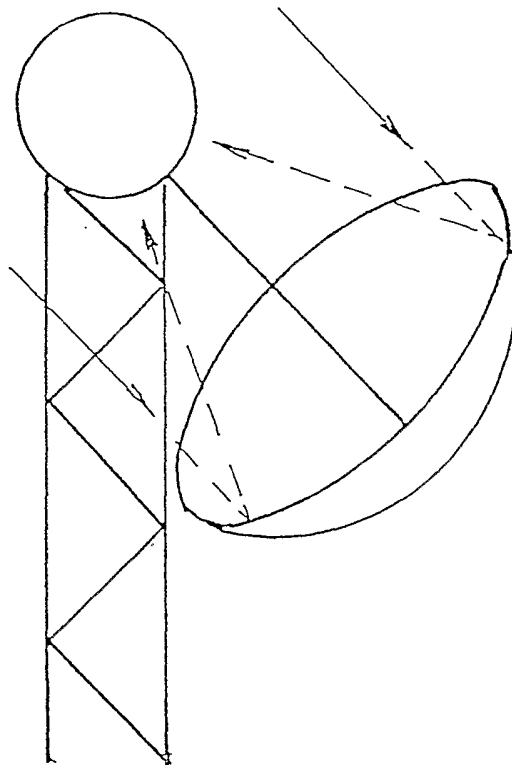
09,00

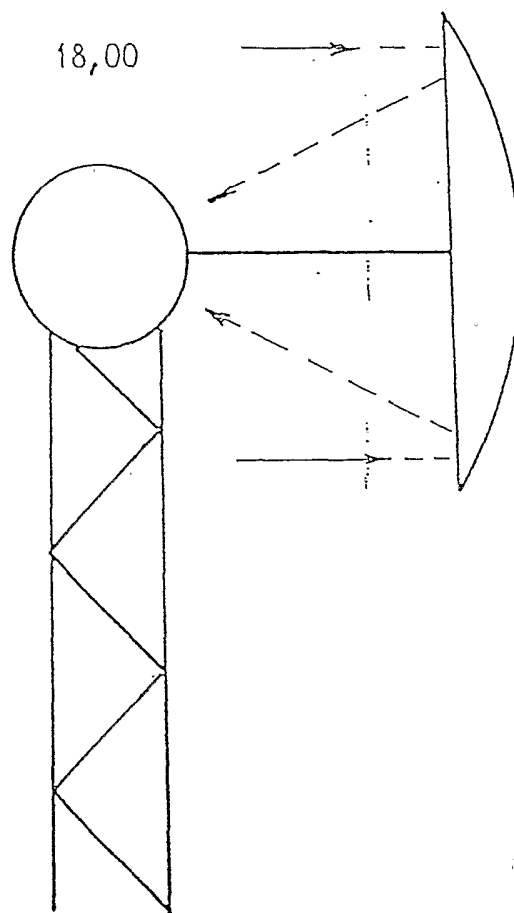


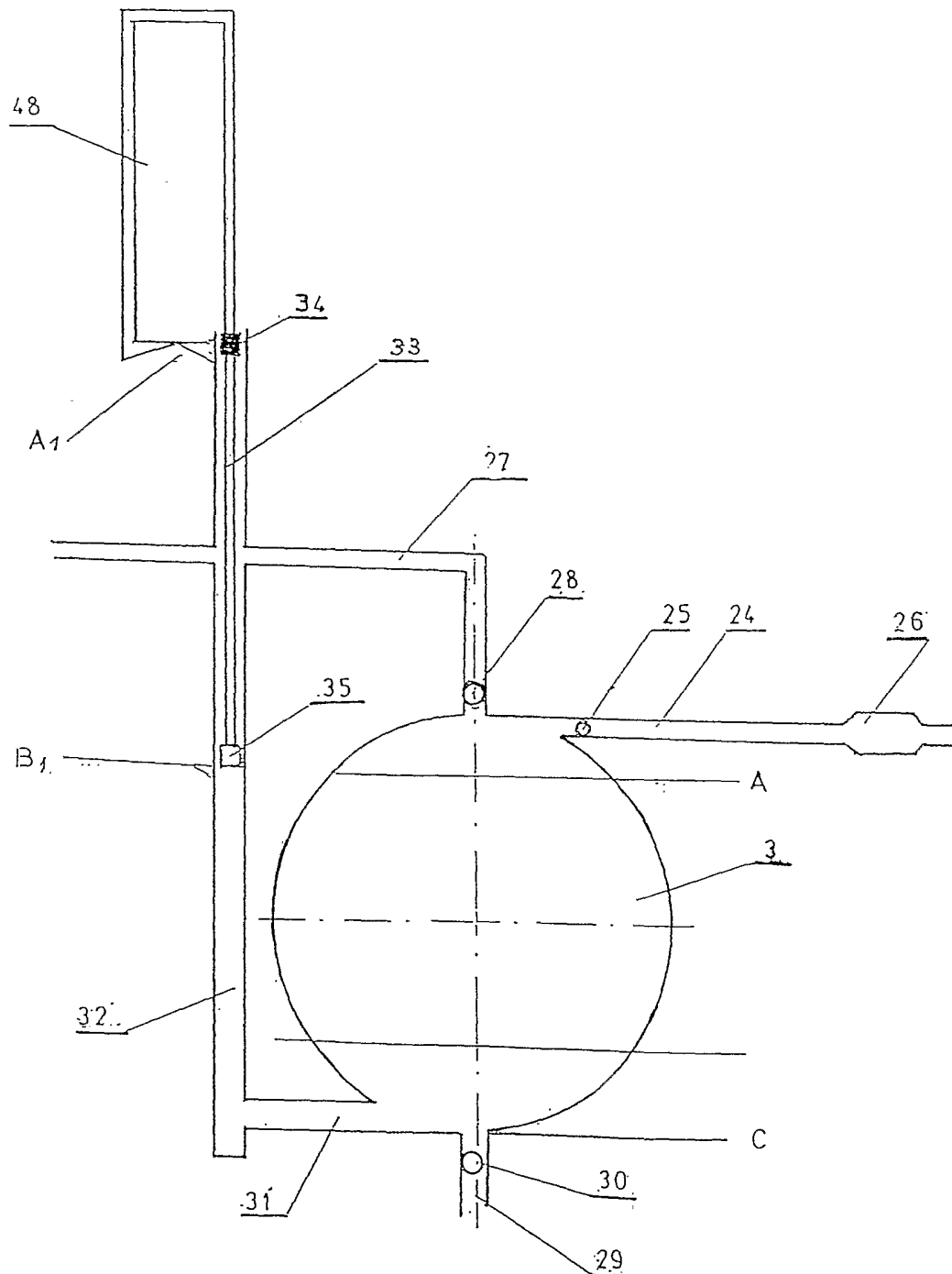
12,00

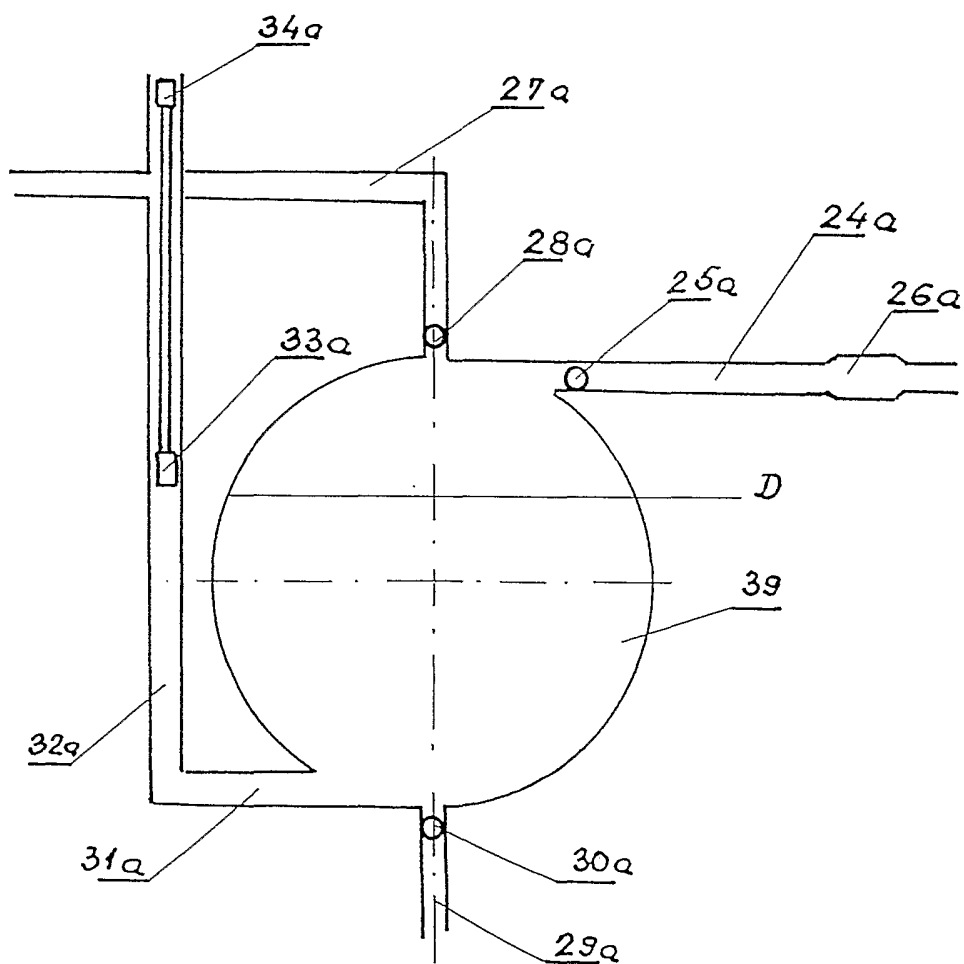


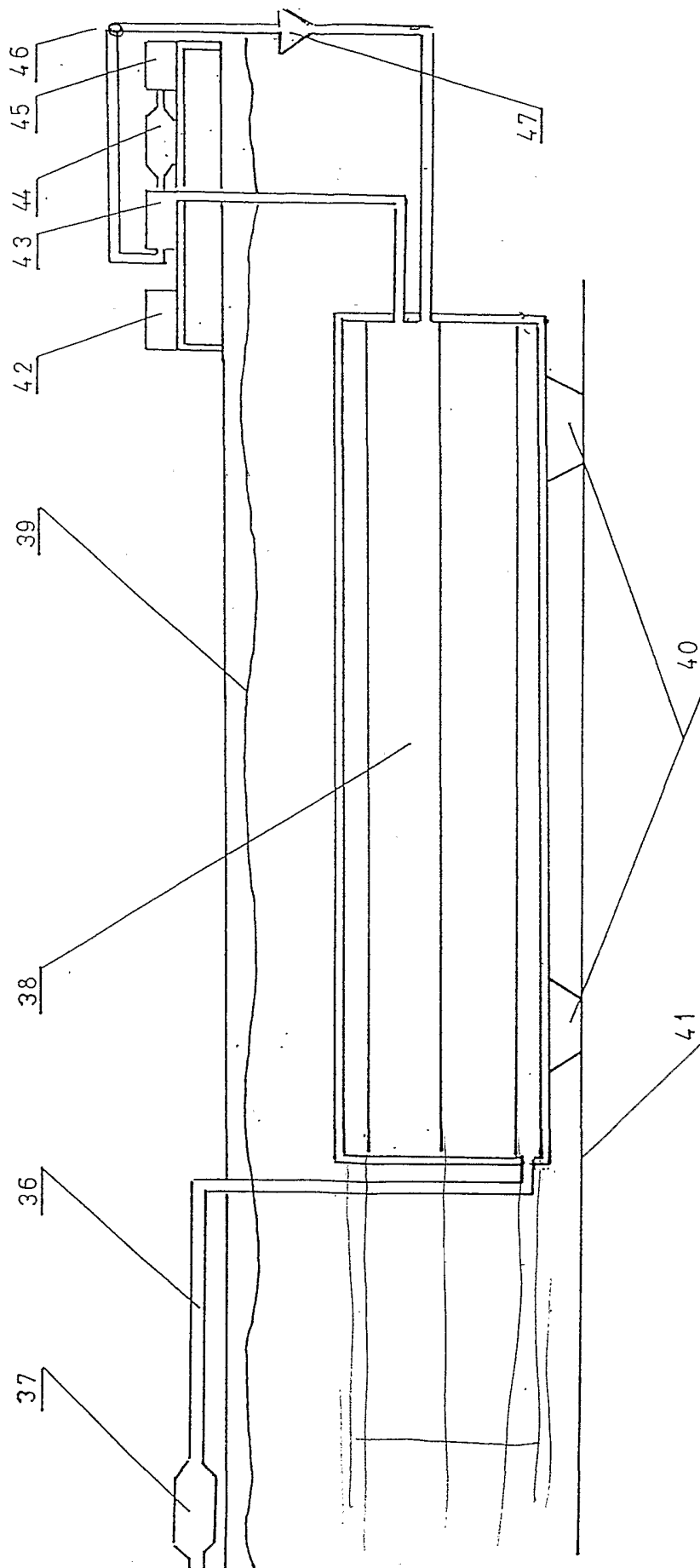
15,00



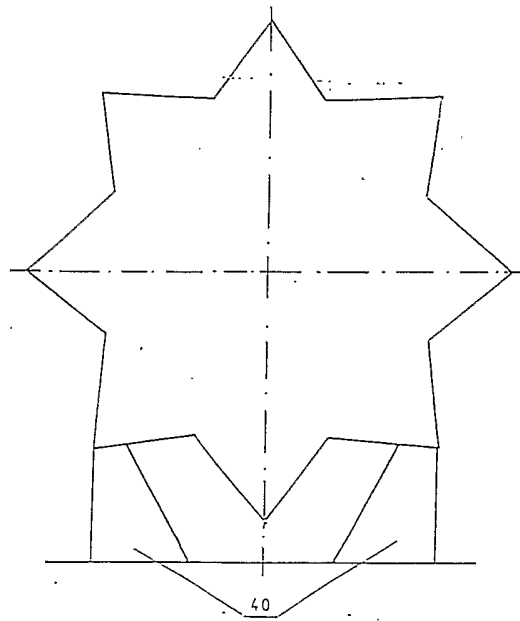








Rodvodny' kondenzator



INTERNATIONAL SEARCH REPORT

International Application No

PCT/BA2005/000006

A. CLASSIFICATION OF SUBJECT MATTER
F24J2/07 F24J2/54

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)
F24J

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, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	FR 2 446 451 A (LASSALLE ELIANE) 8 August 1980 (1980-08-08) the whole document	1
X	WO 90/12989 A (GOEDE, GABOR) 1 November 1990 (1990-11-01) page 9, line 1 - line 20 page 12, line 30 - page 13, line 28; figure 3 page 21, line 10 - line 22; figure 24a	1
X	US 4 252 107 A (HORTON ET AL) 24 February 1981 (1981-02-24) column 3, line 49 - column 5, line 39; figures	1

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *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
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *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

Date of the actual completion of the international search

20 January 2006

Date of mailing of the international search report

27/01/2006

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Mootz, F

INTERNATIONAL SEARCH REPORT

International Application No
PCT/BA2005/000006

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 111 184 A (FLETCHER ET AL) 5 September 1978 (1978-09-05) claim 1; figures -----	1
A	EP 0 045 921 A (BOMIN-SOLAR GMBH & CO KG) 17 February 1982 (1982-02-17) abstract -----	1
A	US 2003/101565 A1 (BUTLER BARRY L) 5 June 2003 (2003-06-05) figures 15-22 -----	1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/BA2005/000006

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
FR 2446451	A	08-08-1980	NONE	
WO 9012989	A	01-11-1990	HU 51370 A	30-04-1990
US 4252107	A	24-02-1981	NONE	
US 4111184	A	05-09-1978	NONE	
EP 0045921	A	17-02-1982	DE 3030033 A1	18-03-1982
US 2003101565	A1	05-06-2003	NONE	