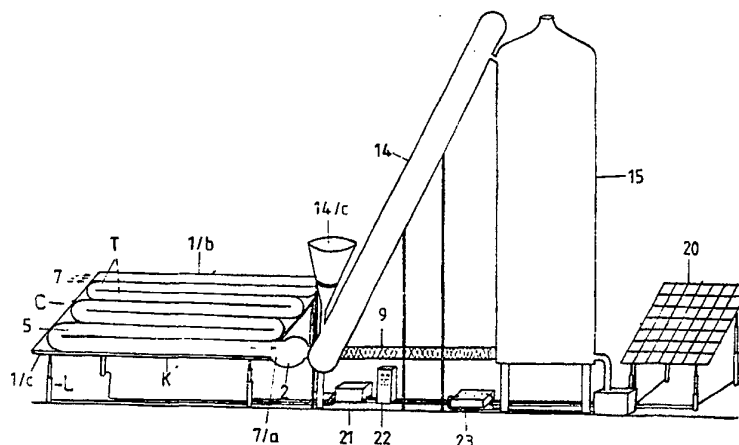




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

|                                                                                                                                                                                                                                                                                                                            |           |                                                                                                                                                                                                                                                                                                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>(51) International Patent Classification <sup>5</sup>:</b><br><b>A23L 3/40, F24J 2/04</b>                                                                                                                                                                                                                               | <b>A1</b> | <b>(11) International Publication Number:</b> <b>WO 95/05754</b><br><b>(43) International Publication Date:</b> 2 March 1995 (02.03.95)                                                                                                                                                                |
| <b>(21) International Application Number:</b> PCT/HU93/00046<br><b>(22) International Filing Date:</b> 23 August 1993 (23.08.93)<br><b>(71)(72) Applicant and Inventor:</b> GÖDE, Gábor [HU/HU];<br>Bőszörményi u. 3/a, H-1126 Budapest (HU).<br><b>(74) Agent:</b> DANUBIA; Bajcs-Zsilinszky út 16, H-1051 Budapest (HU). |           | <b>(81) Designated States:</b> AU, BR, CA, JP, KR, LK, NZ, RU, SD, UA, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).<br><br><b>Published</b><br><i>With international search report.</i> |

**(54) Title:** DEVICE UTILIZING SOLAR ENERGY, ESPECIALLY FOR DRYING AND ROASTING OF AGRICULTURAL-, AS WELL AS FOOD PROCESSING PRODUCTS, FINALIZING DISTILLATION AND EVAPORATION, SEPARATING OF COMPLICATED COMPOUNDS

**(57) Abstract**

A device utilizing solar energy, comprising favourably four supporting-moving mechanisms (L) moving and adjusting the collectors in more than one direction connected to the frame (K), the supporting-moving mechanism's other end is connected to the fix base surface (A), the absorbing plate (5) black coloured and favourably with pyramidal or wedge shape is placed on the insulating plate (1/c) laying on the base plate of the plane collectors (C) placed on the frame (K), translucent covering plate (1/b) covers all the surface, baffles (T) between the base plate and translucent covering plate perpendicular to the base plate and parallel to each others provide an air current path, the farthest baffles (T) form side walls, opposite to the inlet (7) of the air current path installed with filter an outlet (7/a) is provided, the inlet of the air pump house (2) is connected to the outlet (7/a) to which the device (15) utilizing the heat energy is connected.

**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

|    |                          |    |                                          |    |                          |
|----|--------------------------|----|------------------------------------------|----|--------------------------|
| AT | Austria                  | GB | United Kingdom                           | MR | Mauritania               |
| AU | Australia                | GE | Georgia                                  | MW | Malawi                   |
| BB | Barbados                 | GN | Guinea                                   | NE | Niger                    |
| BE | Belgium                  | GR | Greece                                   | NL | Netherlands              |
| BF | Burkina Faso             | HU | Hungary                                  | NO | Norway                   |
| BG | Bulgaria                 | IE | Ireland                                  | NZ | New Zealand              |
| BJ | Benin                    | IT | Italy                                    | PL | Poland                   |
| BR | Brazil                   | JP | Japan                                    | PT | Portugal                 |
| BY | Belarus                  | KE | Kenya                                    | RO | Romania                  |
| CA | Canada                   | KG | Kyrgyzstan                               | RU | Russian Federation       |
| CF | Central African Republic | KP | Democratic People's Republic<br>of Korea | SD | Sudan                    |
| CG | Congo                    | KR | Republic of Korea                        | SE | Sweden                   |
| CH | Switzerland              | KZ | Kazakhstan                               | SI | Slovenia                 |
| CI | Côte d'Ivoire            | LI | Liechtenstein                            | SK | Slovakia                 |
| CM | Cameroon                 | LK | Sri Lanka                                | SN | Senegal                  |
| CN | China                    | LU | Luxembourg                               | TD | Chad                     |
| CS | Czechoslovakia           | LV | Latvia                                   | TG | Togo                     |
| CZ | Czech Republic           | MC | Monaco                                   | TJ | Tajikistan               |
| DE | Germany                  | MD | Republic of Moldova                      | TT | Trinidad and Tobago      |
| DK | Denmark                  | MG | Madagascar                               | UA | Ukraine                  |
| ES | Spain                    | ML | Mali                                     | US | United States of America |
| FI | Finland                  | MN | Mongolia                                 | UZ | Uzbekistan               |
| FR | France                   |    |                                          | VN | Viet Nam                 |
| GA | Gabon                    |    |                                          |    |                          |

Device utilizing solar energy, especially for drying and  
roasting of agricultural-, as well as food processing  
products, finalizing distillation and evaporation, separating  
5 of complicated compounds

Subject of the invention is a device utilizing solar energy,  
especially for drying and roasting of agricultural-, as well  
as food processing products, finalising distillation and  
10 evaporation, separating of complicated compounds. Device  
according to the invention consists of collectors adjustable  
to the direction of the radiation of the sun and a system  
transforming the heat energy accumulated by the collectors to  
a device utilizing the receipted heat energy.

15

Utilisation of the solar energy is the most favourable method  
of generating energy from the point of view of the environment  
protection. Opportunities hidden in the solar energy had been  
recognised in the ancient time but its utilisation on  
20 appropriate level with proper efficiency especially as  
industrial utilization was managed recently. Explanation for  
this is that density of the sun's radiating energy is on  
relatively low level and it is scattered and depends heavily  
on the geographical location, season of the year, period of  
25 the day and angle of incidence of the sunbeam. Because of this  
the full scale of radiated energy is available between the two  
figures of 10 some times Watts per square meters and one kilo  
Watt per square meters density respectively intensity.  
Incidentalility and periodicity of the solar energy current as  
30 well as the small intensity is the limit of the utilization  
for the scattered energy.

Mostly solar energy utilization on industrial scale is made  
with applying the so called plane plate collectors without  
35 concentrating.

Circulation in water getting warm having been filled in the

plane plate collectors constructed as fix, plane receipting screens containing pipe system is generated because they are radiated by direct sunbeam where the warmed water transforms its heat energy in heat exchanger and freon being vaporized there generates electrical current in a turbo generator. /Pumped water transfers its heat energy to freon in the heat exchanger which is vaporizing. Freon gas on over pressure expands in a turbo generator constructed on special way and freon condenses there later./ A so called Rankine circulation is here where the source of heat is the water heated on temperature 60-90 degree Celsius. Top efficiency of this type of systems is between 5-11%. These plane collectors despite of their low level therm dynamical efficiency are suitable for providing electrical energy for agricultural centres and small scale enterprises.

Importance of devices concentrating solar energy is hidden in the high temperature achievable with the optical concentration of the solar energy. Concentration can be achieved with sun following moving of the gathering collectors. Main types of devices are the paraboloid, cylindrical-paraboloid collectors the spherical mirrors and Presnel type lenses.

Processes and devices mentioned before utilise the solar energy on indirect way. Plane collector type devices contain fixed namely not sun following apparatus presently.

Cylindrical paraboloid or different called trough paraboloid collectors belong to the gathering collectors and their rotation is solved in one way only, and the working liquid current in the pipeline located in the focal point vaporizes than heating up to the right temperature it departures from the collector and in the energy transformation system its energy is transformed and the vapour is condensed in the condensator and the liquid streams back under pressure to the pipe line system located in the focal point of the collector. In the pipe line system located in the collector's focus wit

different type system heat transferring substance /i.e liquid sodium/ circulates which transforms its heat energy to the working substance in a heat exchanger.

- 5 Implementation of these type of devices requests high level of cost and very sophisticated technical facilities.

Objective of the invention is to create a device which decreases significantly the disadvantages mentioned previously  
10 and which implements the move /solar following/ of plane collectors and cylindrical paraboloid collectors in two directions and utilizes on economical way the heat energy in the heat absorbing system of the collectors.

- 15 According to the invention the device with plane collector was originated from that condition that the characteristic of the plane collector was recognised which is capable to absorb the not only direct but scattered radiation of light energy - but this advantage can be utilized by the devices used for the  
20 time being because of their fixed position for some hours - with the two directions move capability the functioning period for energy collecting can be extended significantly including the extension of the peak performance period and decreasing the investment cost per manufactured product unit. Extension  
25 of the gathering surface is adjustable according to need with binding elements expediently constructed and matching to the inlets of the plain collectors.

According to the invention the device is based on the  
30 recognition that further with the move of the cylindrical paraboloid collectors further with direct utilization of the heat energy the solar energy utilization can be increased significantly.

- 35 According to the invention the task was done in that way that the move of plane collectors as well as cylindrical paraboloid collectors was implemented and on the base of this the peak

period gathering surface was extended significantly further the working liquid respectively instead of applying heat receiving -heat providing liquid and heat exchanger as well as direct /not closed system/ application of the product under  
5 process and of the plane collector and the cylindrical paraboloid collector decreased the loss factors significantly and the absorbtion of solar energy process was utilized on better way.

10 According to the invention the task was done in the most general way that the move to the direction of the sun was implemented with a supporting - moving device fixed on the back side of the collectors' base plate, further absorbing black coloured plates placed under the translucent covering  
15 plate on the insulating plate on plane collectors' base plate favourably having pyramid or wedge shape are applied /because of good heat absorbtion and surface extension/, and the flowing air path is made more effective with baffles after the inlet furnished with air filter which air is transported by  
20 air pump to the device utilizing the heat energy in this case to the product drying device.

In the case of applying the subject of the invention, cylindrical paraboloid collectors, the product is conveyed  
25 into an absorbing working tube with perforated wall and coloured as black or gray and located in the focal point of the collectors

by a spiral shaft, and in the case of applying more working tubes they are connected to each other with arch pipes, and in  
30 the same time hot air flowing in the cave constructed in the axel line of the spiral shaft of each absorbing working tube together with the heat energy radiated to the focal point effect mutually and make more efficient the process of the product moved in the absorbing working tube.

35

According to the invention the product for process is placed in product feeding container is connected with a sloping,

favourable flexible connecting pipe to the absorbing working tube which end is connected via an outlet pipe to the gathering container.

5 Further the invention will be described on the base of drawings where letters are used to sign the generalized parts of the invention and numbers are used as identification mark in detailed description.

10 Figure 1. introduces the device according to the invention as the general outlined structure including the sketch of opportunity for automatic move in the direction of the sun as well.

15 Figure 2. introduces the device according to the invention as one manufactured form in top-view and in section partly.

Figure 2a. introduces the device according to the invention in side view.

20

Figures 2b. and 2c. introduce the absorbing plate of the device according to the invention in side-view.

Figures 2d. and 2e. introduce the absorbing plate of the  
25 device according to the invention in top-view.

Figure 2f. shows a part of the device on Figure 2a.

Figure 3. introduces the device according to the invention  
30 shown on Figure 3. as axonometric view.

Figure 3b. introduces the air filter of the device according to the invention as axonometric view of one manufactured form.

35

Figure 3c. introduces the coupling part in the air current

path of the device according to the invention as axonometric view of one manufactured form.

Figure 3.d introduces the light diodes applied in the device  
5 according to the invention as one manufactured form.

Figure 4. introduces the device according to the invention as further manufactured form on top-view.

10 Figure 4a. introduces the device according to the invention shown on figure 4. as axonometric view.

Figure 4b. and 4c. introduces the supporting-moving mechanism of the device according to the invention as one and an other  
15 one manufactured form in side-view.

Figure 4d. introduces the device according to the invention shown on figure 4. as manufactured form in side-view.

20 Figure 5. introduces the device according to the invention as further manufactured form on top-view.

Figure 5a. introduces the device according to the invention shown on figure 4. as side-view.  
25

Figure 5b. introduces the absorbing plate of the device according to the invention as top-view.

Figure 6. introduces the devices according to the invention as  
30 sketch of one manufactured form.

Figure 6a. and Figures 6b. introduce the device according to the invention shown on the figure 6. of its driving over container in section and on top-view.

35 Figure 6c. introduce the device according to the invention shown on the figure 6. of its driving part's axonometric view.

Figure 7. introduces the devices according to the invention as sketch of one further manufactured form.

5

Figure 7a. introduces the part of the whirler of the device according to the invention shown on figure 7. in axonometric view.

10 Figure 7b. introduces the drive of the conical wheel of the device according to the invention shown on figure 7. in axonometric view.

Figure 8. introduces the devices according to the invention as  
15 one further manufactured form in sketched axonometric view.

Figure 8a. introduces the devices according to the invention as sketch of one further manufactured form.

20 Figure 8.b introduces the move mechanism of the device according to the invention shown the sketch of one manufactured form on the figure 8. and figure 8a. in section view.

25 Figure 8c. and figure 8d. introduce the spiral shaft of the device according to the invention shown on figure 8. as one manufactured form in one-one axonometric view.

Figure 8e. introduce the air inlet pipe of the device  
30 according to the invention shown on figure 8. in section view.

Figure 8f. introduces one segment of the device according to the innovation with arcing pipe and with binding element of the absorbing working tube and its drive shown on figure 8.  
35 and figure 8a. in sketched axonometric view.

Figure 8g. introduces the mutual driving part of the device

according to the invention in manufactured form shown on figure 8a. and figure 8f. in axonometric view.

Figure 8h. and figure 8i introduce the frame with bearing for  
5 the absorbing working tube of the device according to the invention shown on figure 8. and figure 8a. as manufactured form in sketch.

Figure 8j. introduces the supporting mechanism of the  
10 cylindrical paraboloid collector of the device according to the invention shown on Figure 8. and figure 8a. in manufactured form.

Figure 8k. figure 8l. and figure 8m introduce the coupling  
15 parts of the rotating mechanism of the device according to the invention as sketched manufactured form in view.

Figure 8n. and figure 8o. introduce the pipe coupling element  
20 of the device according to the invention shown on figure 8. and figure 8a. as manufactured form in axonometric view.

On figure 1. the most general structure of the invention utilizing solar energy is introduced where on the place of deployment a supporting-moving leg-structure L transforming  
25 more directions movement is placed which adjustable or controllable with electrical way and its upper part is connected to a frame K. On the base plate of plane collector C placed on frame K an insulating plate lies on which absorbing plate 5 with pyramid or wedge shaped surfaces is  
30 among baffles T, and an air current path is made by it together with the latest. Baffles T are placed perpendicular to the base plate, and translucent covering plate 1/b covers all the surface. Inlet 7 having an air filter is on plane collector C which among the baffles T via outlet 7/a including  
35 pipe line 9 and air pump 2 is connected making an open air current path to the device 15 utilizing heat energy. The air soaked in this way via the inlet 7 flows among the baffles T

and it is warmed up by the absorbing plate 5 warmed by the sunbeam, and via the favourable flexible pipe line 9 connected to the outlet 7/a transported by the air pump 2 it goes to the devices 15 as well as 17 utilizing directly hot air. According to claim the plane collectors with binding element 3.C can be connected together. There is further on figure 1. the drawing of layout of an automatic sun following system where accumulator plantations 23 and control centre 22 are connected to sun plantation unit 20. Hydraulic control centre 21 is connected with pipe lines to the leg-structure L supporting and move the collectors.

Elevator 14 is coupled to device 15 utilizing solar energy which elevator's bottom part is furnished with product holding container 14/c consisting a feeder.

15

With solution introduced on figure 2. and figure 2e. the base plate of plane collector 1 is made to approximately circle form on which baffles 1/a are fixed vertically going along spiral line and distributing the base plate for equal fields. The most inside/outside arcs of baffles 1/a are made as side walls maintaining outside closing of the collectors to side direction. Because of reducing the convection radiation loss insulation plate 1/c with appropriate thickness is mounted on the base plate. Inlet 7 furnished with air filter is located at the farthest point of the spiral line and outlet 7/a and to this connected air conducting pipe 9 or 13 with rigid or flexible wall are located to the approximately circuit shaped space flanked by the most inward point of the spiral line. Air conducting pipe 13 as well as 9 are connected directly to a favourable shaped and planed the dimension properly air pump 2 /ventilator being able to function on more stages. In that case when rigid air conducting pipe 13 for supplying hot air in front of the air pump 2 is implemented than behind the air pump 2 flexible air conducting pipe 9 should be implemented.

35

An absorbing plate 6 convex pyramid shaped on proper way on insulating plate 1/c fixed on the base plate is located on

the surface flanked by the baffles 1/a going along spiral line which gathers/absorbs the heat energy of the incident and scattered solar radiation and it is warming up and transfers the heat energy to the air and warms it up above flanked from  
5 the upside direction by covering plate 1/b. Side walls as well as covering plate 1/b, covering the total surface of the plane collector 1, fixed on the vertical edges of the baffles 1/a on air tight way assures the reflection of heat beams /green house effect/.

10

In an other possible manufactured form absorbing plate 5 black coloured going parallel with bafflers 1/a is shaped to triangle cross section with acute angle and wedge shape. Endeavouring to achieve better efficiency in the wedge-shaped  
15 gape located at the base of the triangle with acute angle additional baffles 5/a run parallel in the high of two third of the slope sides of the triangle on which wedge-shaped baffles in vertical position distributed on proportional way are fixed assuring the turbulent flow.

20

In one possible solution for moving in two direction and for following the sun the plane collector 1 supporting moving lags 10 are employed constructed telescopic way and moved by hydraulic system, which function as hydraulic working  
25 cylinders. The upper end of the supporting moving legs 10/a is formed as spherical joint and it is connected to the collector's down side surface base plate. Different parts of the hydraulic move system /pump. electrical motor, valves control equipment/ are placed in hydraulic centre 21. Holding  
30 legs fasten the house 11 made of insulating material walls containing the air pump 2.

Structure of plain collector 4 with rectangle shape is similar to plain collector 1. Black absorbing plate 5 or 6 is placed  
35 on insulating plate 1/c fixed on the base plate. Baffles 4/a fixed perpendicularly run parallel with side walls on long side and they ark on the sort side. Side walls 4/b of the

plane collector 4 are coated with proper thick insulating layer. Outlet 7/a is located on opposite side of inlet 7 mounted with air filter to which air pump's 2 house is connected directly. Supporting moving legs 10 moved on  
5 hydraulic way are fixed with spherical joint 10/a to the down side surface of the base plate and the equipment for hydraulic movement are located in the hydraulic centre 21.

Plain collector 4 according to the invention in an other  
10 possible manufactured version the inlet 7 without air filter is fabricated in such a way that with a closely matching connector extension 8 an other or according to need more plane collector(s) can be connected in it.

15 Because of the parallel connection of plane collectors 4 flexible air conducting pipe could be coupled between the connector extensions 8 to avoid the shade effect of the collectors.

20 Plane collector 4/B introduced on the figures 4. and 4d is rectangle form and its base plate and insulating plate 1/c and absorbing plate 5 or 6 is formed in similar way as plain collector 4.

Inlets 7 furnished with air filter of plain collector 4/b are  
25 located on the back side perforated flanking walls of the plane collector 4/b. Outlets 7/a are near to the centre of the fastening field and the side walls are constructed parallel. Flexible air conducting pipe 9 is connected to the hot air conducting pipes 13 with rigid insulating wall.

30

Holding moving mechanism 12 moves and supports the plane collector 4/B. This structure contains the elements as follows: Keeping in direction of cogged screed 12/g is made by cogged cam rollers 12/a. Electrical motor 12/b drives bevel  
35 gear 12/h to which axel's end with helicoid gears the double cog-wheel 12/c is coupled and its outside wheel with larger diameter moves the screed 12/g upwards or downwards. Both

moving devices are covered by rectangle shape house 12/i in pipe form up to the necessary height. The highest point of the cogged screed 12/g is formed as spherical joint and it is connected to the down side surface of the plain collector's  
5 base plate.

Figure 5. introduces a plain collector 1/A without baffle. It is plain collector 1/A with proper circuit shape which outside perimetric wall contains perforated inlets 7 furnished with  
10 air filters. There is a circuit shape outlet 7/a in the centre of plain collector 1/A which is conducted through the absorbing plate 5/a the insulating plate 1/c and base plate in vertical direction downwards and the hot air heated up is conducted into the insulated and rigid wall air conducting  
15 pipe 13 to which the flexible air conducting pipe 9 is coupled.

The sun following movement of the plain collector 1/A is created by the holding and moving leg 10 prepared as spherical joint 10/a type via hydraulic system. Absorbing plate 5/a is  
20 made to the shape of triangle with acute angle /wedge-shaped/ which cross section is changing as moving in the collector field to the centre direction that the base of the triangle is getting shorter and angles belonging to the base converge to right angle.

25 Control of collector types have ben introduced for the time being and going to be introduced is made by computer base controlling centre 22 (see figure 1.) which is connected via cable to photodiodes 3, air pump 2, holding move leg 10 or  
30 holding move mechanism 12, hydraulic centre 21, battery unit 23, solar cell unit 20 charging the battery unit 23 and electrical motors 12/b.

All collectors subject to the invention are furnished with  
35 photodiodes 3 on the collectors' side wall. The device according to the innovation is heat energy utilizing device and heat accumulating device can be connected via a valve to

the air path of any one of plain collectors' 1, 1/a 4, 4/a, 4/b flexible air conducting pipe 9 connected to the air pump 2. The heat accumulating device is formed in a container with insulating wall containing air labyrinth made of refractory  
5 bricks or it is as well a container with insulating wall furnished with closed inlet and outlet, in which one or more air path formed as coiler along helical line, where in the space between the container's wall and the coiler is filled with powder having good heat absorbing and heat transferring  
10 ability. The heat accumulating device can be switched on and off with the valve furnished in the hot air system according to the need.

Figure 6. introduces the heat utilizing device using heat  
15 produced by any of the plain collectors 1, 1/a 4, 4/a, 4/b. Structure and elements of the drying container 15 with rectangular cross section standing vertical position: Coat of the drying container 15 is made of expediently steel sheet with proper thickness painted gray or black on the outside  
20 surface and furnished with stiffeners, on which on the upper side there are both the product feeding pipe 14/d and air outlet pipe 15/f on its bottom side there are both the product emptying pipe 15/g and in appropriate high above the bottom plate and parallel to it on side heat air distributing pipe  
25 system 15/d with perforated wall.

Inside the drying container 15 there is an endless drying conveyer 15/a constructed sifter like and moving slantwise downwards and spanned with bearings mounted with rollers with  
30 cylindrical shape 15/b fixed to the side wall or consoles 15/h. At the edge of the conveyer a rim with proper hight and cut vertically in appropriate number according to the need is formulated. Dropping restoring container 15/c is fixed to the wall of the cylinder located between the wall of the cylinder  
35 and rollers with cylindrical shape 15/b.

Drying cylinder 15 is fixed by holding legs 15/e.

On both longer parallel sides of the drying container there are hot air injecting pipes on proper height directed inside with injectors and running around which are connected with one or more pipes to the hot air conducting pipe on the bottom of  
5 the drying container 15.

The drying conveyor's 15/a movement is provided by the outside conveyor moving disk 15/i which is placed on a joint shaft of conveyor moving cylinder roller 15/b inside of the drying  
10 container 15.

Elevator 14 is applied for supplying the product into the drying container 15. There is an endless conveyor belt 14/a expediently constructed with scoops stretched by cylinders  
15 14/b functioning as roller in tube with rectangle cross section. Container 14/c provides the loading up with product prior processing for the elevator 14 which container is coupled to the elevator device via a pipe line on which wall the product goes through and it arrives on the conveyor belt  
20 14/a. The elevator device and the container 14/c are fixed by holding legs 14/e. Outside disc 14/g fixed on the joint shaft with down side cylinder 14/b and the out side conveyor moving disk are driven by electrical motor 16.

25 Figure 7. introduces the drying cylinder 17 standing vertical position which coat is made of expediently steel sheet with proper thickness painted gray or black on the outside surface and furnished expediently with stiffeners. Into the drying cylinder 17 on its upper side via an opening the product  
30 feeding pipe 14/d is coupled and via the covering plate's two or more points the air outlet pipe 17/h is coupled and on its bottom side the product emptying pipe 17/i and in appropriate high above the bottom plate and parallel to it on side heat air distributing pipe system 17/e with perforated wall are  
35 placed. In the centre of the drying cylinder 17 there is rotating shaft 17/c with upside and down side bearings 17/g and fixed with stiffening bars 17/f. On the peak point of the

rotating shaft 17/c and on the centre point of its inside wall a whirler 17/a with conical shape and made of sifter like structure material is placed and fixed with supporting bars 17/j. On vertical direction to the side wall of the conical shape whirler 17/a directly upside on the inside wall of the drying cylinder 17 and lower from the whirler 17/a cornet shape fixed whirler 17/b is coupled with the supporting bars 17/j.

There is a distance between the rotating conical shape whirler's 17/a out side contour/edge and the side wall of the cornet shape fixed whirler 17/b located nearest to the rotating one, which assures the overcome of the product for drying without restrain. Driving of the rotating shaft 17/c is made by electrical motor 16 via driving belt and driving wheel furnished with conical wheel 17/d. Air distributing pipe system 17/e with perforated wall formed in expedient way assures the homogeneous hot air distribution. On the inside wall of the drying cylinder 17 on proper height /from the bottom plate on two third height approximately/ there is a ring form hot air injecting pipe which is connected with conducting pipes going on the wall of the drying cylinder 17 to the hot air conducting pipe. The drying cylinder 17 is fixed by holding legs 17/k.

In morning hours the control unit 22 with computer in control centre in right time according to the program fed in previously in the case of the plain collector 1/A and 4 turns on the hydraulic centre 21 which operates the hydraulic working cylinder of the holding move lags 10 in that way that those located in East direction are moved upwards vertically and those located in West directing are moved down in the same time until the collectors 1, 1/A, 4, 4/A, 4/B are positioned perpendicularly to the direction of the sun. After this the computer evaluates the signal received from the photodiodes 3 and compares it to the stored one in its memory and in the case of deviation it adjusts the direction on the base of the data measured by the photodiodes. During the day the perpendicular movement to the direction of sun /sun following/

is made by the computer according to the fed program checking periodically the movement's accuracy comparing it to the values received from the photodiodes.

All four /in case more than this than all of them/ holding  
5 moving legs' 10 morning starting positions are programmed in  
the computer separately. The daily program contains the total  
way of the working cylinder of holding moving leg 10 in  
millimetre depending on time according to the seasons and  
hours of day /proper to the incident radiation of the sun/.  
10 Thumb rule is that following the setting up working cylinders  
in East direction with the lowest position are moving upwards  
with different pace and working cylinders in West direction  
being on highest position in morning are moving downwards with  
different pace as well.

15

Length of defined way in millimetre of one working cylinder of  
the holding moving leg 10 is set for all minutes of the day  
proper to the season and position of sun. To all minutes of  
the day belongs a working way set in millimetre performed by  
20 the working cylinder.

Move mechanism function introduced with plain collector 4/B:  
The computer starts to operate in the morning time according  
to the calender on the base of the program the electrical  
25 motor 12/b in East direction capable to function ion more  
stage and the motor starts to move the clogged screed 12/g  
vertically downwards with moving cog wheels 12/h and 12/c and  
in the same time the electrical motor 12/a in West direction  
is operated and it moves upwards vertically the clogged screed  
30 with moving the cog wheels.

Accuracy of positioning according to the program is compared  
with the signal received from the photodiodes 3 by the  
computer it adjusts the position angle according to the need.

35

Continuous movement during the day of the collector 1, 1/A, 4,  
4/A, 4/B, 4/C to sun direction in perpendicular way is made by

electrical motor 16 on each holding moving leg separately on periodic operation way decided in the program.

According to the morning set up the control unit with computer  
5 starts to operate the air pump 2 and the air warmed up by the  
absorbing plate 6 located in the gathering field of the  
collectors is pumped via the flexible pipe 9 to the working  
sone, namely it is conducted into the drying container 15 via  
the inlet pipe with perforated wall and via the air  
10 distributing pipe system 15/d and the hot air distributed  
homogenously streams upwards vertically in the container.

After this the control unit with computer starts to operate  
the driving electrical motor 16 which drives the outside  
15 moving disk 15/i and it starts the drying conveyor 15/a and in  
the same time it turns on to rotate the cylinder 14/b with the  
driving of outside wheel 14/b on the under driving shaft of  
cylinder 14/b of the elevator 14 which moves upward the  
conveyor belt 14/a. Product supplied previously into the  
20 container 14/c goes to the shovel containers of the elevator  
belt 14/a because of opening feeder 14/f mounted in the  
connecting pipe and because of the upward movement of the belt  
and the product through the product feeding pipe 14/d spreads  
on drying belt 15/a of the drying cylinder 15. Flexible side  
25 walls with proper height and with cut in on the edge of the  
drying belt 15/a hinders the product to fall down from the  
drying belt 15/a.

The drying belt 15/a achieving the roller 15/b with cylinder  
30 shape pours the product from its surface into the restoring  
container 15/c where from the product comes to the surface of  
the under drying belt 15/a and spreading there homogeneous it  
moves downward together with the belt.

35 This process is repeated until the product goes to outside  
from the drying container via the product emptying pipe 15/g  
into an appropriate container as final product. The product

moving down and meeting with hot air the product loses its moisture contain in the necessary level.

The control unit with computer switch on the electrical motor  
5 16 with more operating stages on such level of rotating which  
is proper for the intensity of the sun radiation and for the  
moisture contain of the product for drying. Level of drying  
can be controlled with operating the feeder 14/f built in the  
inlet pipe of the container 14/c. above this the automatic  
10 control can be programmed with manual adjustment.

Drying cylinder 17 functions as follows. Electrical motor 16  
drives the driving disk installed with conical wheel 17/d and  
it moves the rotating shaft 17/c staying vertically in the  
15 centre of the drying cylinder 17, and the conical shape  
whirlers 17/a fixed on it start to rotate. The product for  
drying brought in via the product feeding pipe 14/d from the  
elevator 14 drops and spreads on the conical shape whirlers  
17/a and from there the product whirls down on the cornet  
20 shape whirler 17/b fixed on the inside surface of the drying  
cylinder where from it whirls slowly down on the conical shape  
whirlers 17/a and from them again to the cornet shape whirler  
17/b and finally via the cornet form gathering device located  
on the bottom of the cylinder and via the product emptying  
25 pipe 17/i the final product goes out and it is gathered in a  
proper receptacle. Hot air goes into the drying container  
through the hot air pipe than via the air distributing pipe  
system 17/e with perforated wall assuring the homogeneous hot  
air distribution the hot air streams upwards in the drying  
30 cylinder 17 meanwhile drying the product going downwards than  
hot air leaves the container on the upper side of the drying  
cylinder 17 via their outlet pipe 17/h.

Figure 8. introduces a collector system formed in plantation  
35 form constructed with cylinder paraboloid set up side by side  
to each other on movable holding plate 18.

The collector system contains expediently six or more than this cylindrical parabolic collectors 18/a connected to each other as functioning and structural elements as well.

- 5 Cylindrical parabolic collector 18/a with requested length and aperture with high reflexing ability on its inside concave surface /high level mirroring/ has in its focal point an absorbing working tube 18/b with proper diameter and on its outside surface black or gray coloured with closed or with  
10 entirely or partially perforated wall, which is fixed by holding bars 18/p on its both ends to the collector's body. Inlet of the absorbing working tube 18/b is closed with a disc on which through goes a spiral shaft 18/c for transporting the product for drying or processing into the absorbing working  
15 tube 18/b. The spiral shaft 18/c is formed pipe like way and among its spirals on the shaft small holes/openings/ starting from the inside cave of the axel are made in quantity according to the need for driving out the hot air streaming in the pipe like inside cave. Driving shaft of the spiral shaft  
20 18/c is fixed in turnable form on the double frame 18/d which has bearings. The spiral shaft's 18/c driving axel furnished with edge and bearing is placed in the wider part of the bearded double frame 18/d on that way that the end of the pipe like cave going along the middle part of the driving axel as  
25 well as its inlet is opposite to the outlet of the hot air inlet pipe 18/f furnished with edge on its extended axel line. On this way the hot air can stream freely coming out from the end of hot air inlet pipe 18/f mounted on fix way to the out side of the double frame 18/d into with bearing the pipe like  
30 cave in the spiral shaft  
18/c rotating in bearing.

On the figures 8c. and 8d. the spiral shaft 18/c was manufactured in solid form and under it there is the air inlet pipe 18/t perforated upside which is for the air conducting in  
35 into the absorbing working tube 18/b. On the upper side of the air inlet pipe holes are made on its wall located in vertical position along the long direction line in that way that these

holes coincide with the holes downwards on the vertical wall of the absorbing working tube 18/b. There are insulating rings by the coinciding holes between the two pipes' wall. The surface of the most upper vertical out side wall of the air inlet pipe 18/t and the lowest part of the wall of the absorbing working tube 18/b are fixed together with permanent binding in such a way that the holes between them coincide and on this way from the air inlet pipe 18/t out streaming hot air via the upper holes streams via the holes on the down side wall of the absorbing working tube 18/b into this tube and through the product driven by the spiral shaft the air leaves the absorbing working tube via the holes on its upper side wall into the open air.

On the figure 8a. the spiral shaft 18/c was manufactured in solid form and above the absorbing working tube 18/b parallel with it a properly planed vapour-drain pipe 18/cs in cross section goes on which is connected by vertical thin pipes with fix binding to the absorbing working tube 18/b with solid wall.

20

Product for processing is placed in the feeding container 19 while the processed product is collected in the receptacle 18/o via the emptying pipes. Coupling pipes 18/r start from the feeding container 19 in rigid wall form which continuous in flexible pipes to the direction of the absorbing working tube 18/b. The collector end of the flexible pipe line is connected to the turnable pipe-stub coming from the left upper side end of the absorbing working tube 18/b according the figure with fix binding. The product feeding and emptying pipes as well as between the neighbouring collectors 18/a arcing pipes on the beginning of the collectors as well as through arcing pipes 18/g on the end of the collectors /latest are the extension of the absorbing working tubes 18/b/ are formed covering each others in such a way that in the covered pipe in the centre of the covering there is an expediently formed aperture with proper dimension that the product can overcome from one pipe to the other without restrain.

Driving of the spiral shaft 18/c is made with the disk fixed on the driving shaft between the beard double frame 18/d. This driving disk is connected with driving belt to the driving mechanism 18/s containing the driving electrical motor, holding frame, cog-wheels, double disks under the move holding plate 18 supporting and move the collectors. Disk mounted on the driving shaft is connected with driving belt to the smaller diameter disk of double one with common axle located vertically under the disk on the driving shaft and it drives the shaft in clockwise direction. Exception from this are the cases of collector 18/a second and fifth from up to down direction according the figure where the spiral shafts 18/c turn opposite clockwise /previous turns in clockwise/ and this rotation is assured by the disk mounted on common shaft with the cog-wheel driven by cog-wheel mounted on the shaft of the bigger disk belonging to the second and fifth collectors 18/a. Driving of the bigger disk is made by a separate electrical motor 18/h able to work on more stages with the same diameter disk on its shaft via cogged driving belt.

Collectors' 18/a move fixed on movable holding plate 18 can be made as follows. On the shaft of the electrical motor 18/h able to work on more stages there is a cog-wheel with fixed binding and it is matching with the cog-wheel moved vertically on the vertical axel by two electric magnet coils and it drives the shaft in the desired /given by the control unit/ direction. Opposite to the cog-wheel on the shaft of the electrical motor the centre of the long shaft is cogged as long as the circumference of the cog-wheel in that way that the centre point /cogging in negative direction/ of the cog-wheel on the long shaft is matching. The electric magnet coil on left side according to the figure installed on the holding table during its functioning moves on the cogged part of the long shaft the cog-wheel beside the side direction turnable wheel installed on its front and backwards moving shaft than in the case of stopping to function the opposite side / being on the other side of the cog-wheel/ wheel moved by electric

magnet coil pushes back the cog-wheel in its original position after stopping the electrical motor 18/h.

A cog-wheel with proper diameter is fixed in the other end of  
5 the halving point of the collector's segment on the other end  
of the long shaft which moves the cogged screed 18/j /or  
cogged chain/ in the right direction and level in front and  
back direction. The cogged screed 18/j goes under the  
cylindrical parabolic collector 18/a located on holding legs  
10 via the centre line of the expediently proper length of the  
holding plate's 18 width. Cogged guide rollers 18/ly placed in  
proper density support and keep in direction the rigid cogged  
screed 18/j on the move mechanism. The shafts of the cogged  
conducting rollers with bearings on both ends are fixed with  
15 supporting console on the holding move plate 18. Both end of  
the cogged screed 18/j are furnished with bumper to avoid the  
over pulling of the screed. Above the cogged screed 18/j there  
is a cog-wheel with proper diameter connected to the previous  
one's cogs in the axel line of the cylindrical parabolic  
20 collector 18/a under its lowest point which cog-wheel is  
connected to the cogged screed to the outside surface of the  
cylindrical parabolic collector 18/a and the cog of cogged  
screed 18/j.

25 There are a down side edge 18/k and an upper side edge 18/sz  
constructed on expedient way and furnished with roll bearings  
on the both long side end of the body of the cylindrical  
parabolic collector 18/a which edges are extended on the total  
width of collector 18/a. Edge 18/k is fixed with solid binding  
30 to the holding legs fastened on the holding move plate 18 in  
the vertical axel of the collector. Cogging 18/m is formed on  
out side of the upper side of the upside edge 18/sz on its  
total length. Cog-wheel 18/l, which is moveable with a  
vertical shaft, is connected to this cogging 18/m. The shaft  
35 of the cog-wheel 18/l is attached to a electro magnetic  
pulling disk which is fixed to the outside of the down part of  
the edge 18/k on that way that the pulling disk turns on or

off the couple between the cog-wheel 18/l and the cogging 18/m depending on the controlling position. Upper edge 18/sz extends into the down side edge 18/k on vertical direction downwards which upper edge's 18/sz down part is formed bearing  
5 like. Guide bar 18/ty is attached to the both side of the upper edge 18/sz which guide bar 18/ty is enclosed by the double screed of down side edge 18/k from down and from both sides directions. There are one-one wedge-shaped buffer on both end of the guide bar 18/ty which buffer impedes over  
10 rotation. Total weight of the collector 18/a is put on the upper edge 18/sz which puts it via the rollers /balls/ embedded into the down side edge 18/k which put it further via the holding legs 18/ny to the holding plate 18. Movement of the holding plate 18 is made by expediently hydraulic operated  
15 holding move legs 10 or holding move mechanism 12 operated by electrical motor 12/b having been introduced previously. The control unit 22 with computer directs according to its prior fed program the collector 1, or 1/A, or 4, or 4/A the solar cell unit 20 and the holding move plate 18 of the cylindrical  
20 parabolic collector to East into the direction of sun in the morning hour than it checks the direction and adjusts the direction according to the need with the signals received from the photodiodes 3.

25 North-South movement of the cylindrical parabolic collector 18/a after setting the holding move plate 18 is made with electrical motor 18/h as follows. The control unit with operating of the pulling disk mounted on the exterior side of the edge 18/k down and with the cog-wheel 18/l fixed on the  
30 shaft of the pulling disk lifts the cog-wheel 18/l out of the cogging 18/m furnished on the upper edge 18/sz and on this way it makes free the movement of the body of the collector 18/a. After this the control unit with starting the electrical motor 18/h moves the cogged screed 18/j with the cog-wheel coupled  
35 to it in the requested direction and measure. The cogged screed 18/j moving on the cogged guide rollers 18/ly rotates the cog-wheel 18/gy which moves the cogged screed 18/j

attached to the external side of the collector and it makes the proper position of the collector to North-South direction.

Move to East-West direction is made by the control unit  
5 continuously than periodically stops this operation according to the need and it makes adjustment of North-South direction as well.

Having stopped the adjustment of direction positioning the  
10 control unit turns on the air pump 2 and after this it opens on requested level the feeding bolt located in the coupling pipe 18/r and in the same time it starts to rotate the spiral shaft 18/c. The spiral shaft 18/c is rotated in that way that the control unit 22 switches on the electrical motor 18/h  
15 operating the driving device 18/s which drives with the disk mounted on its shaft the other disk with bigger diameter than disk with smaller diameter mounted on common shaft respectively in the case of double cod-wheel the disk mounted on the shaft of the upper co-wheel turns it via the belt  
20 driving the disk of the spiral shaft 18/c.

The product moving into the absorbing working tube 18/b is warmed /hot/ up by the mirroring surface of the hot air pumped via the spiral shaft dries it. Final product is gathered via  
25 the outlet pipe in the receptacle 18/0.

Processing level /drying level/ of the product is set by the control unit furnished with computer via selecting the rotation speed of the spiral shaft 18/c as well as the opening level of the feeding bolt located in the coupling pipe 18/r.

30

In an other possible manufactured form the wall of absorbing working tube 18/b and the spiral shaft 18/c is solid and they are manufactured without air injection. Vapour generated in the absorbing working tube 18/b is conducted away by a  
35 separated pipe going above the absorbing working tube 18/b connected to it with small pipes. Vapour generated is condensed in the outlet pipe and it is conducted into a

25

container where it is accumulated. Different vapour outlet per each collector 18/a makes it possible to separate complex materials and compound with heat treatment.

5

10

15

20

25

30

35

## Claims

1. Device utilizing solar energy, especially for drying and roasting of agricultural-, as well as food processing products, with collectors fixed on frame and on the backside  
5 of the frame with a mechanism moving the collectors and with it the collectors adjustable to the direction of the solar radiation, where on the collectors apertures taking off the heat energy exist, characterized in that the one or more, favourably four supporting-moving mechanism /1/ moving and  
10 adjusting the collectors in more direction or controlled by electrical method connected to the frame /K/, and the supporting-moving mechanism's other end is connected to the fix base surface /A/ and the absorbing plate /5/ black coloured and favourably with pyramidal or wedge shape is  
15 placed on the insulating plate /1/c/ laying on the base plate of the plain collectors /C/ placed on the frame /K/ and translucent covering plate /1/b/ covers all the surface, and baffles /T/ between the base plate and translucent covering plate /1/b/ perpendicular to the base plate and parallel to  
20 each others provide air current path, and the farthest baffles /T/ form side wall, and opposite to the inlet /7/ of the air current path installed with filter an outlet /7/a/ is provided, and the inlet of the air pump house /2/ is connected to the outlet /7/a/, which exit the device /B/ utilizing the heat  
25 energy is connected.

2. Device according to claim 1, characterized in that the plain collector is constructed by helical plain collector /1/, and its air current path is constructed in ribbon type way.

3. Device according to claim 1, characterized in that the  
30 plain collector is constructed by plain collector /4/ with rectangle shape, and its air current path is constructed in ribbon type way and arched.

4. Device according to claim 1, characterized in that the plain collector is constructed by plain collector /4/b/ with  
35 rectangle shape, and its inlets /7/ furnished with air filter are placed on the perforated bordering walls of the plain collectors /4/b/, and the outlet/outlets /7/A/ is/are located

near the centre of the plain collector.

5. Device according to claim 1, characterized in that the plain collector is constructed by plain collector /1/A/ with circular shape, and its inlets /7/ furnished with air filter  
5 are placed on the perforated bordering walls of the plain collectors /1/A/, and the outlet /7/A/ is located in the centre of the plain collector/1/A/.

6. Device according to any of the claims 1-5, characterized in that the frame /K/ itself holding the plain  
10 collector is constituted by the base plate of the plain collector.

7. Device according to any of the claims 1-6, characterized in that the leg-mechanism /L/ for holding and moving function is constructed by telescopic leg /10/ for  
15 holding and moving function or by screed /12/g/ moved with cog-wheel.

8. Device according to any of the claims 1-7, characterized in that between the outlet /7/A/ and the device /B/ utilizing heat energy favourably air conducting tube /13/  
20 with insulating rigid wall and/or flexible air conducting tube /9/ is connected to the air pump house's /2/ inlet side and outlet side.

9. Device according to claim 8, characterized in that between the device /B/ utilizing heat energy and the outlet  
25 /7/A/ of the plain collector /C/ serial to the air path of the air pump house /2/ in a container with insulating wall containing air labyrinth made of refractory bricks, or favourable coiler bent in helical line for the air path inside the container as heat accumulator is installed on periodical  
30 way in the space between the container's walls and the coiler filled with powder- or granular substance and having outlet terminal.

10. Device according to claim 8 or 9, characterized in that the device utilizing heat energy is a drying container  
35 /15/ with rectangular cross section standing vertical position on which on the upper side there are both the product feeding pipe /14/d/ and air outlet pipe /15/f/ on its bottom side

there are both the product emptying pipe /15/g/ and in appropriate high above the bottom plate and parallel to it on side heat air distributing pipe system /15/d/ connected with the hot air inlet pipe, and inside the drying container there is an endless drying conveyer /15/a/ constructed sifter like and moving slantwise downwards and spanned with bearings mounted with rollers with cylindrical shape /15/b/ fixed to consoles, and dropping restoring container /15/c/ is fixed to the wall of the cylinder /15/ located between the wall of the cylinder /15/ and rollers with cylindrical shape /15/b/, and the elevator /14/ is connected to the product feeding pipe /14/d/, and the loading container's outlet pipe of the elevator is furnished with the controllable loading equipment /14/f/.

11. Device according to claim 8 or 9, characterized in that the device utilizing heat energy is a drying cylinder /17/ with standing vertical position on which on the upper end there are both the product feeding pipe /14/d/ and air outlet pipe /17/h/ on its bottom end there are both the product emptying pipe /17/i/ and in appropriate high above the bottom plate and parallel to it on side heat air distributing pipe system /17/e/ connected with the hot air inlet pipe, and on the drying cylinder's /17/ central axel there is a rotating shaft /17/c/ on which above each other whirlers /17/a/ with conical shape and made of sifter like mechanism material are fixed, and opposite to all on the drying cylinder's /17/ inside wall whirler /17/b/ with cornet shape and made of sifter like mechanism material is fixed with supporting bars /17/j/ on that way, that distance ensuring the without restrain overcome of product between the rotating cornet shape whirler /17/b/ and the conical shape whirler /17/a/ is formed, and elevator /14/ is connected to the feeding pipe /14/d/.

12. Device utilizing solar energy especially for drying, roasting of agricultural products, finalising distillation and evaporation, separating of complicated compounds, which has cylindrical paraboloid collectors placed on moveable consoling

plate, and on the backside of the device it is furnished with an mechanism for holding and moving the collectors, and an apparatus conducting the collectors' heat energy is connected characterized in that the cylindrical paraboloid collectors

5 /18/a/ oriented parallel are deployed in plantation way on the holding plate /18/ movable in the direction of the sun, and in the focus of each cylindrical paraboloid collectors /18/a/ with concave surface an absorbing working tube /18/b/ on its outside surface black or gray coloured, closed or with

10 entirely or partially perforated wall is fixed on its both ends, and a pipe like spiral shaft /18/c/ for transporting the product for drying is in the absorbing working tube /18/b/, and the absorbing working tubes /18/b/ are connected to each other with direct outlet or over arcing pipe /18/x/, and all

15 solid or cavernous spiral shafts /18/c/ are rotatable with an external drive to the direction of the product's transport and they are installed on a double frame /18/d/ with bearing, and along the centre line of the spiral shaft /18/c/ a pipe like cave is formed which front side is connected to the hot air

20 inlet pipe /18/f/ and its outlet is on the spiral shaft /18/c/ among the spiral plates, and the product for processing is placed in the product feeding container /19/ which product feeding container /19/ is connected with a sloping, favourable flexible connecting pipe /18/p/ to the product receiving side

25 of the absorbing working tube /18/b/, and the end of the absorbing working tube /18/b/ is connected via an outlet pipe to the gathering container /18/o/.

13. Device according to claim 12, characterized in that the spiral shaft /18/c/ is made of solid material and under it

30 the inlet pipe /18/t/ with upside perforated wall for drive in into the heat air absorbing working tube /18/b/ is fixed, and on the upper part of the air inlet pipe /18/t/ in its vertical position alongside holes have been made which coincide with holes directed downwards on the vertical wall of the absorbing

35 working tube /18/b/.

14. Device according to claim 12, characterized in that above the spiral shaft /18/c/ made of solid material and the

absorbing working tube /18/b/ parallel with it in with smaller cross-section a vapour drain-pipe /18/cs/ are connected to thin vertical small pipes with fixed binding to the absorbing working tube /18/b/with solid wall, and outlet/s of the vapour  
5 drain-pipe /18/cs/ is/are connected to gathering container.

1/12

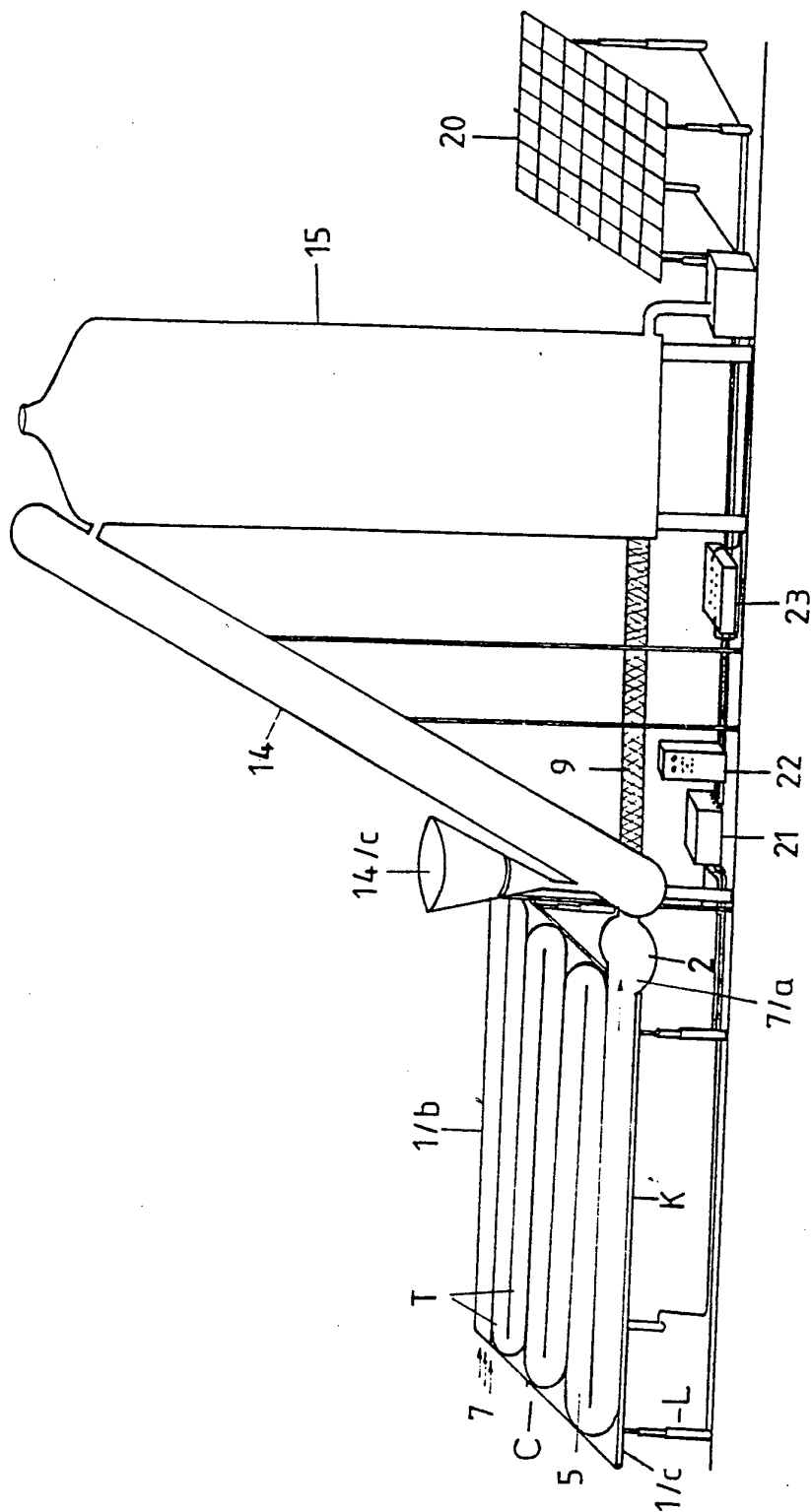


Fig. 1

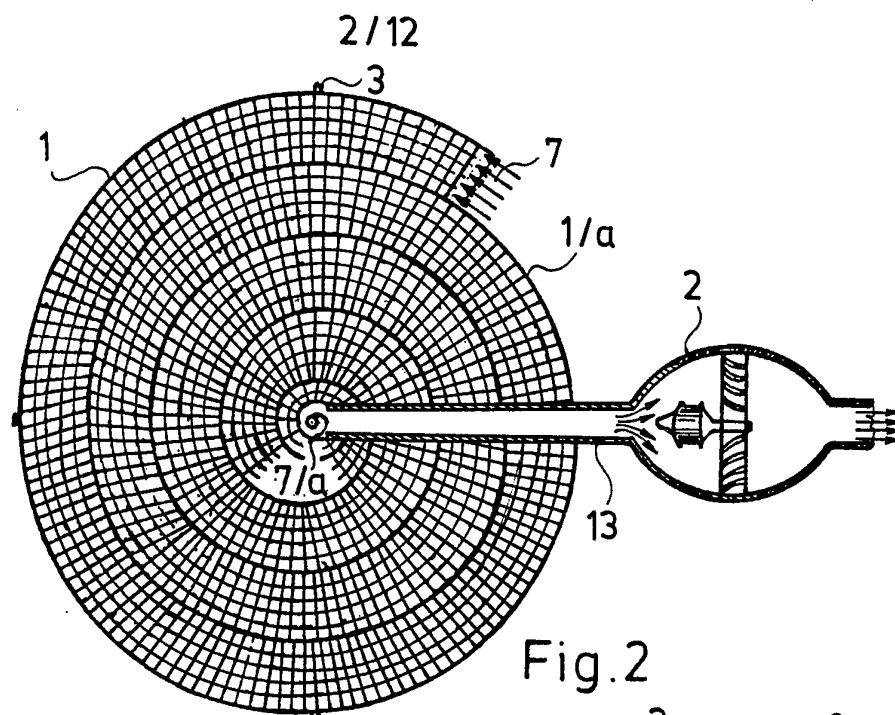


Fig. 2

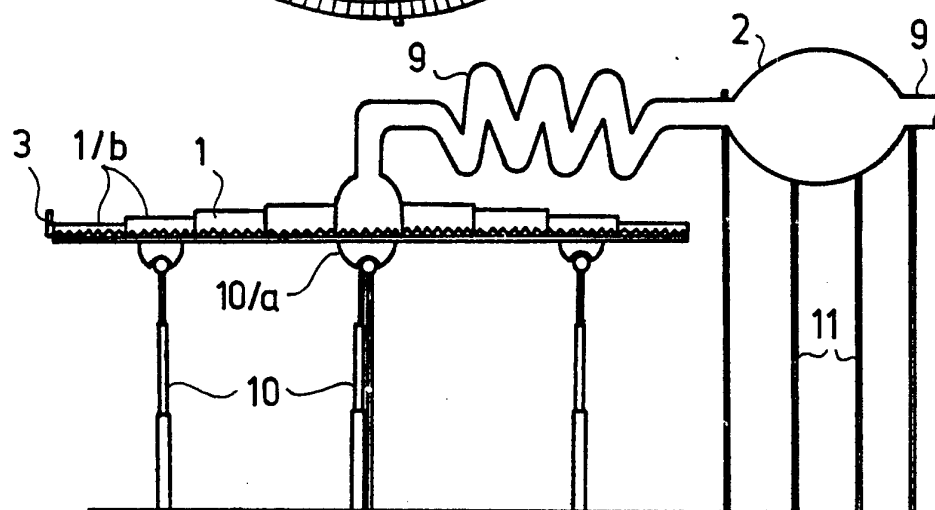


Fig. 2a

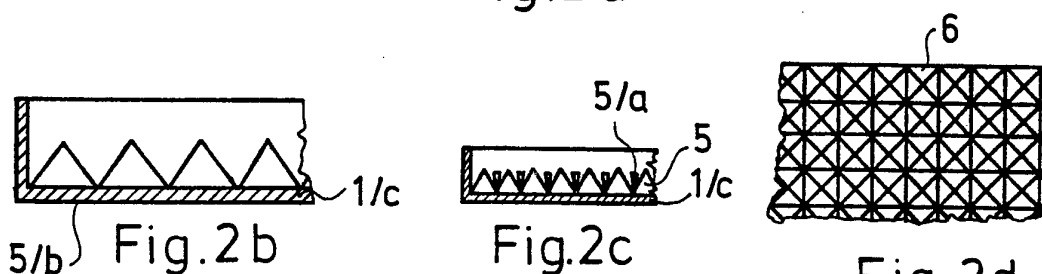


Fig. 2b

Fig. 2c

Fig. 2d

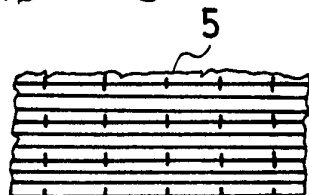


Fig. 2e

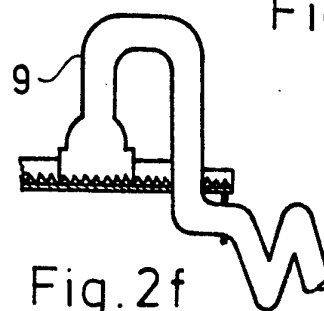
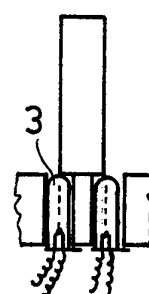
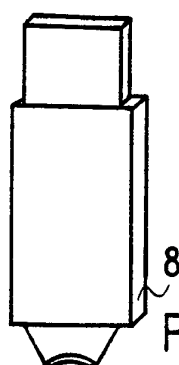
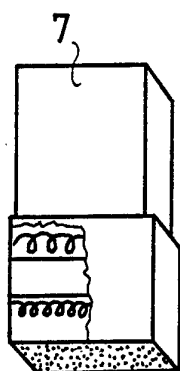
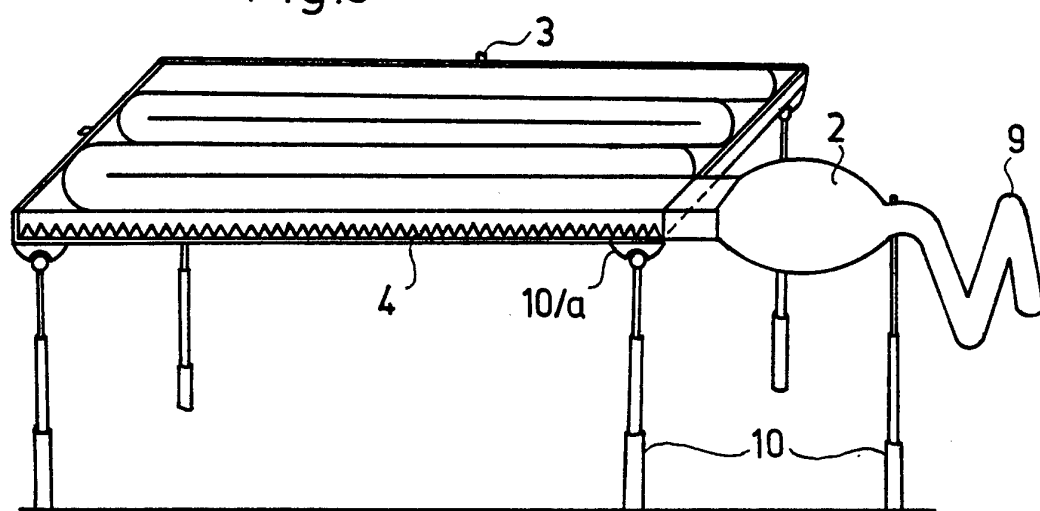
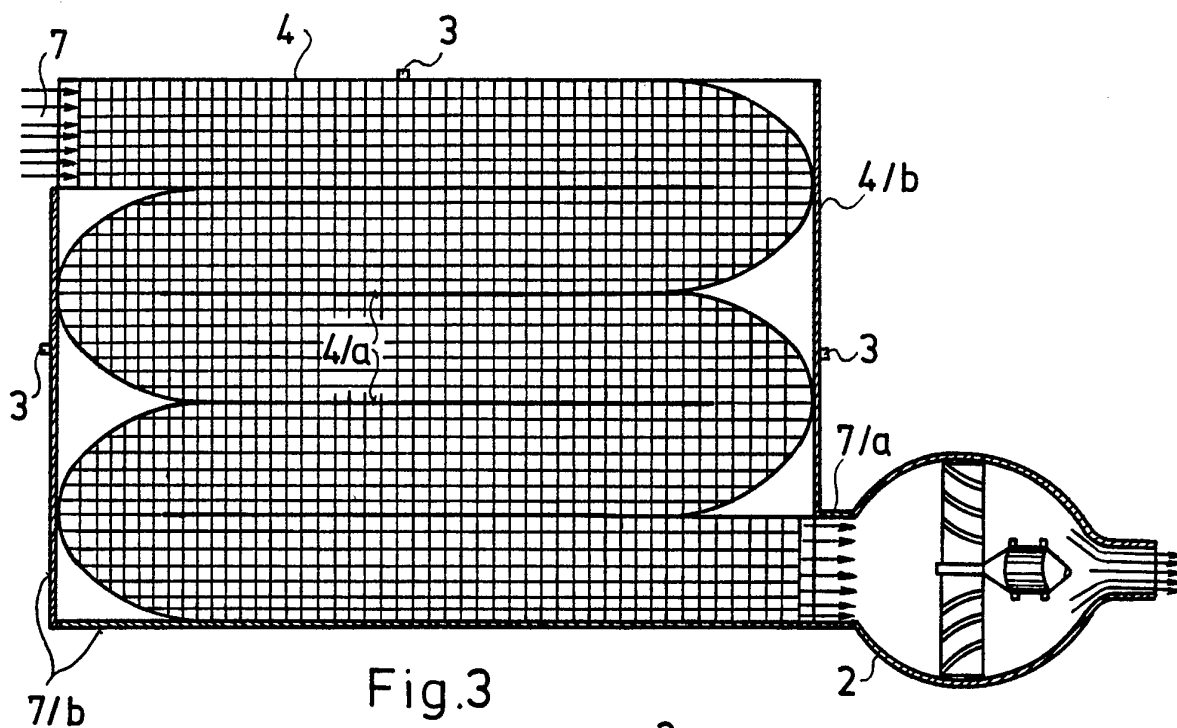
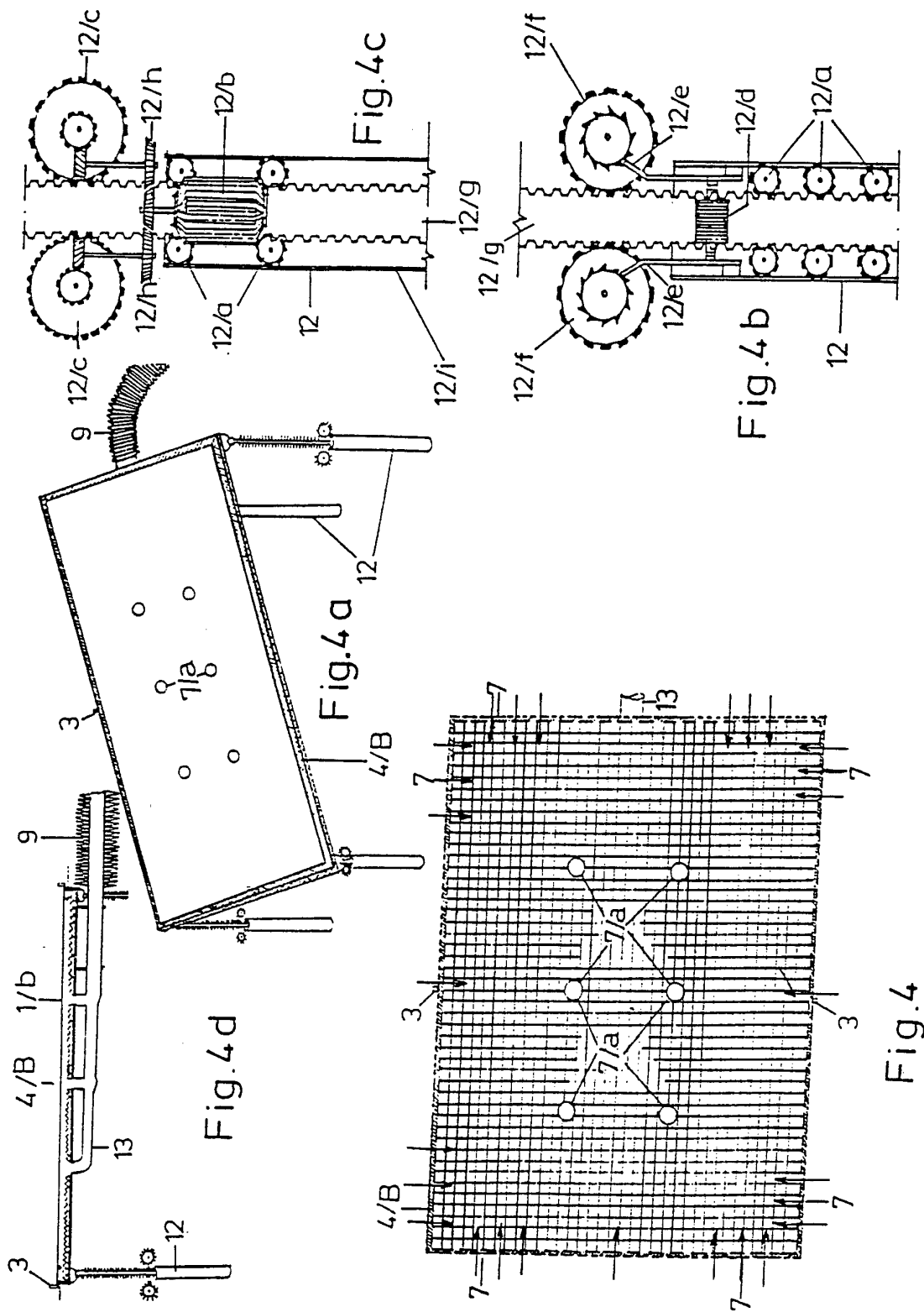


Fig. 2f

3/12





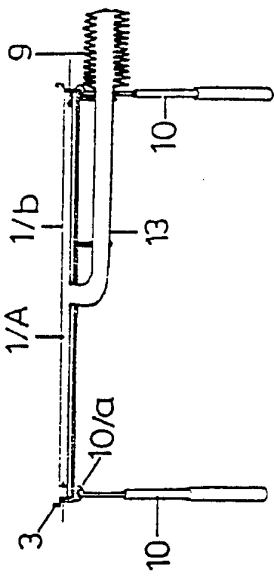


Fig. 5a

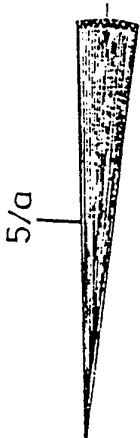


Fig. 5b

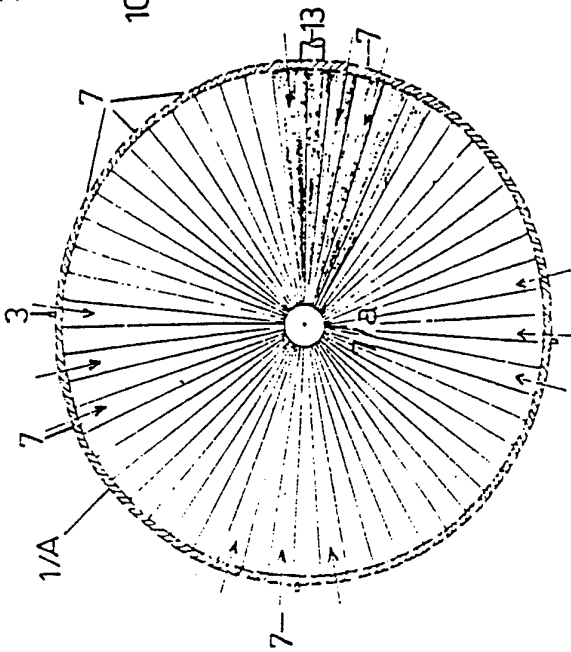


Fig. 5

6/12

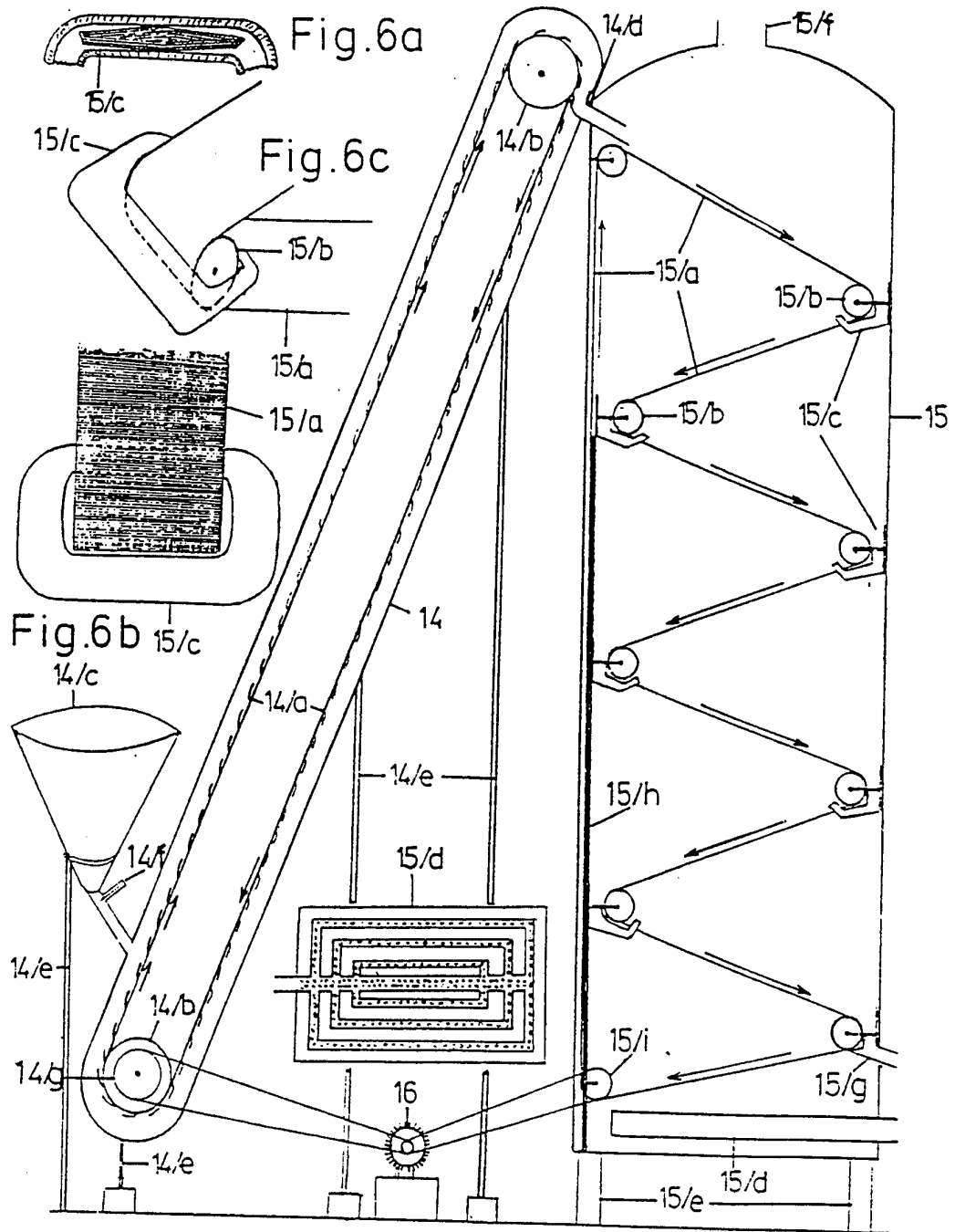


Fig.6

7/12

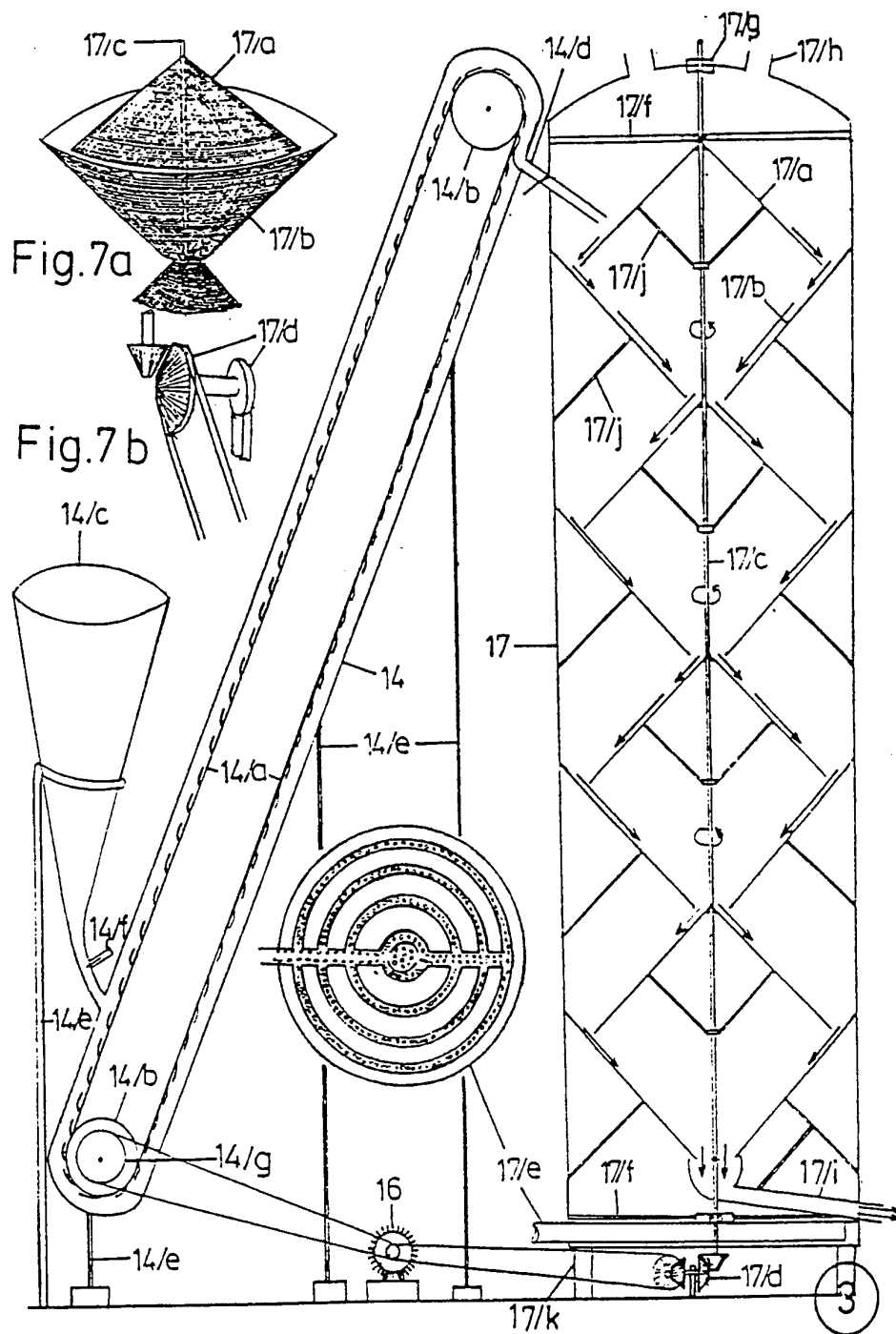
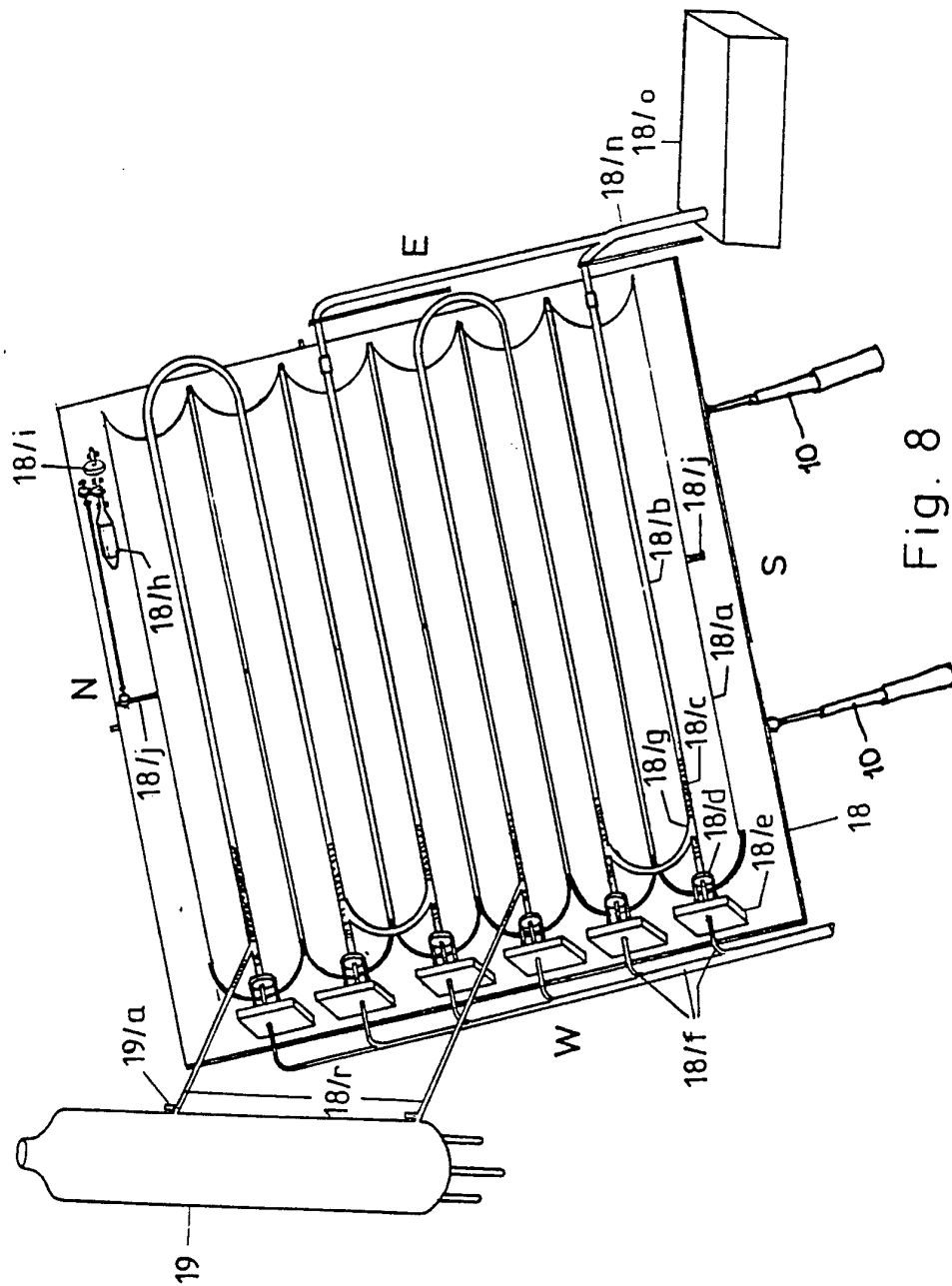


Fig.7



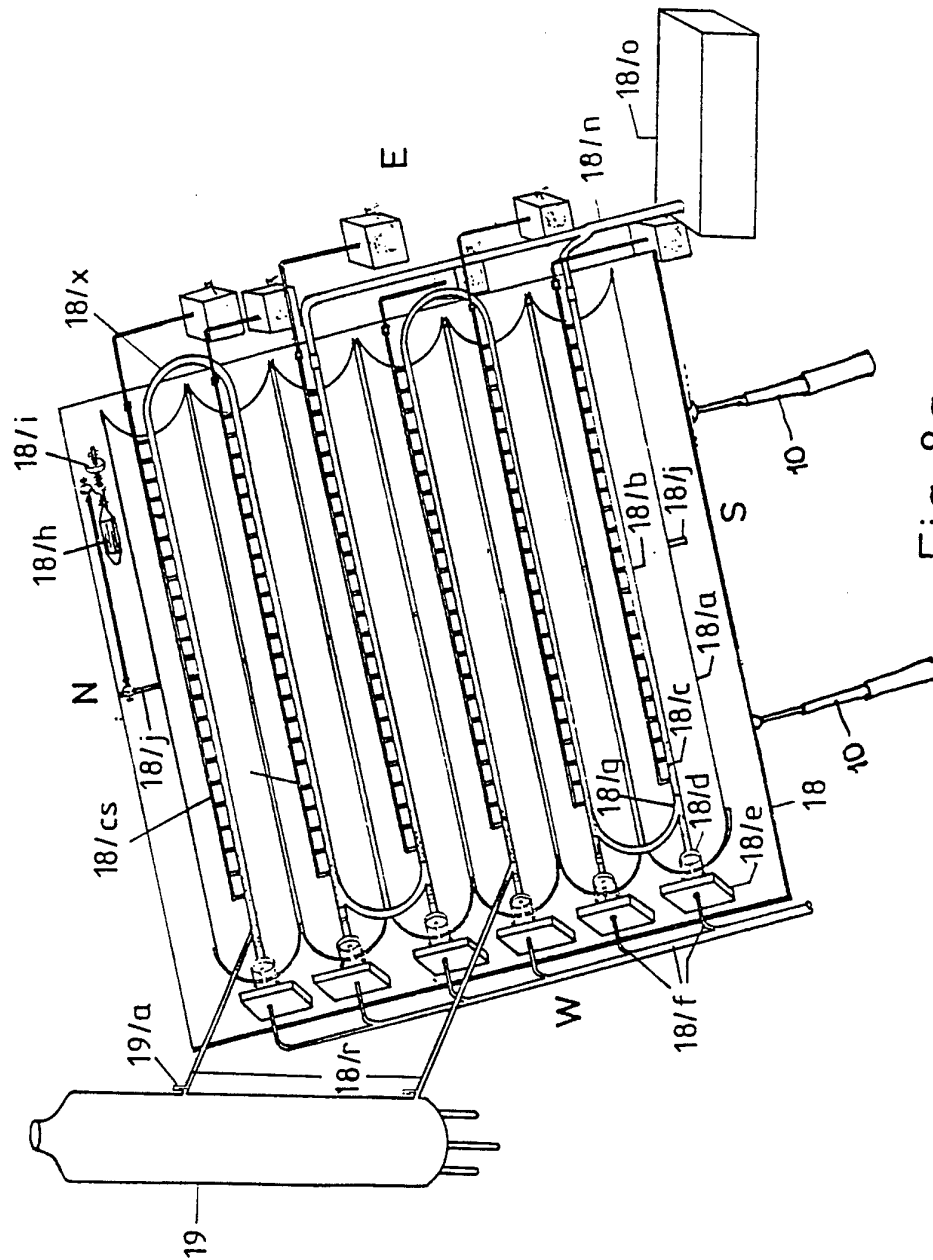


Fig. 8a

10/12

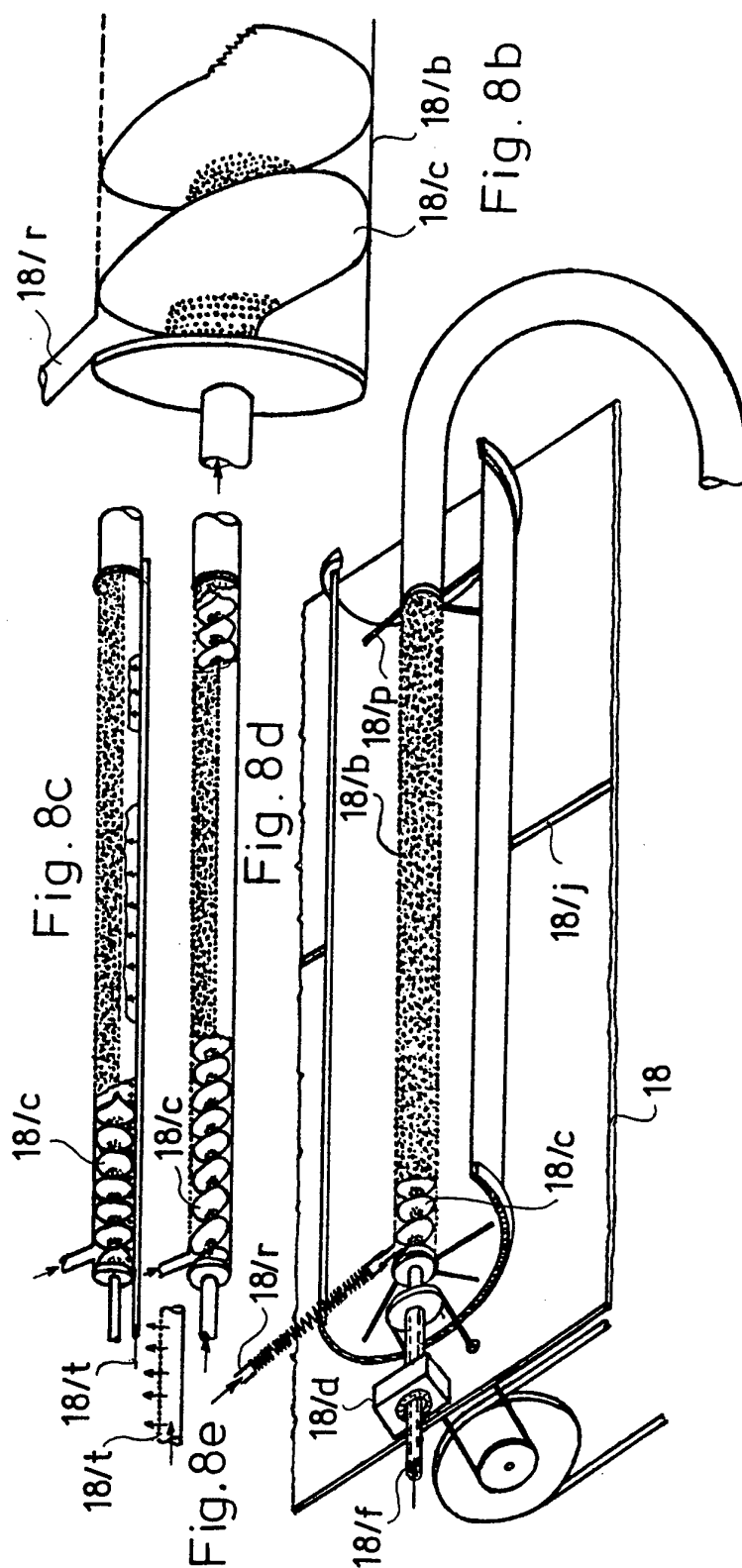


Fig. 8f

11/12

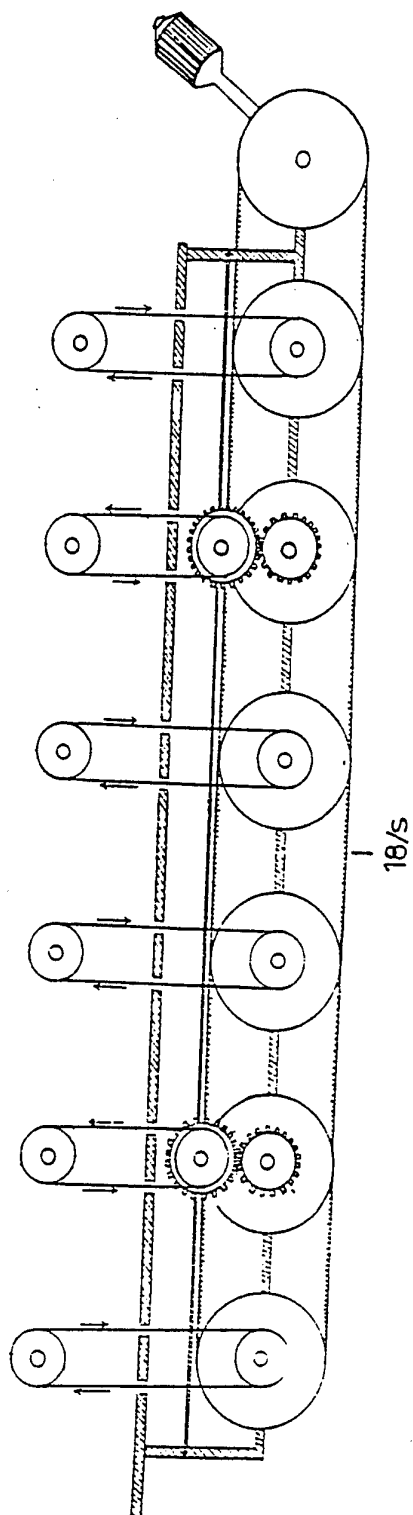


Fig. 8g

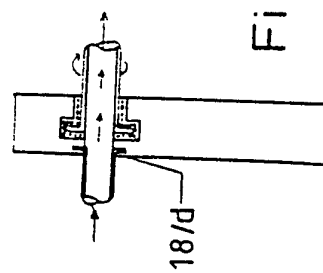


Fig. 8h

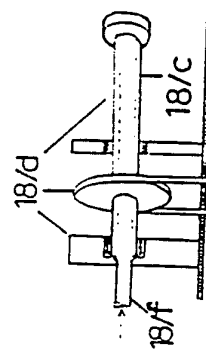


Fig. 8i

12/12

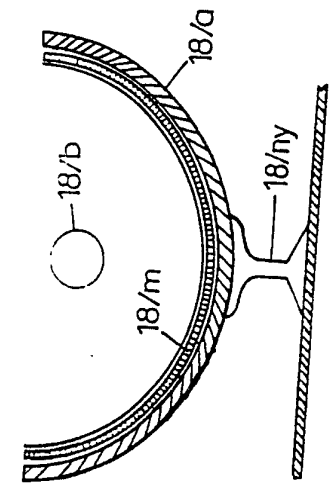


Fig. 8j

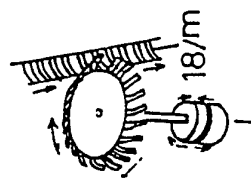


Fig. 8m

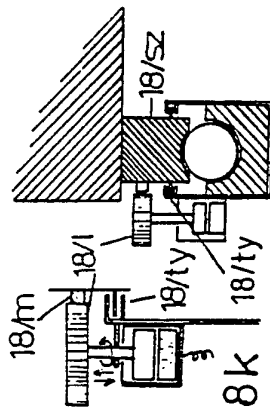


Fig. 8k

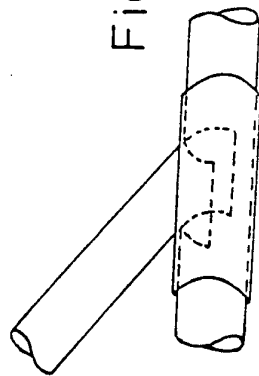


Fig. 8n

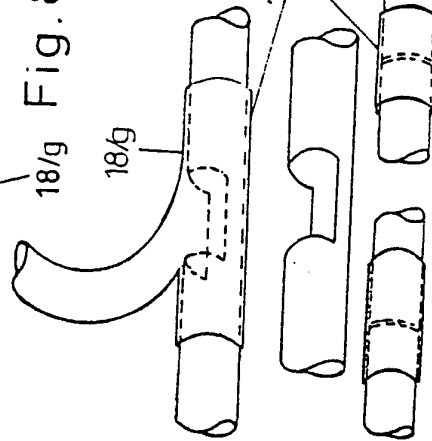


Fig. 8o

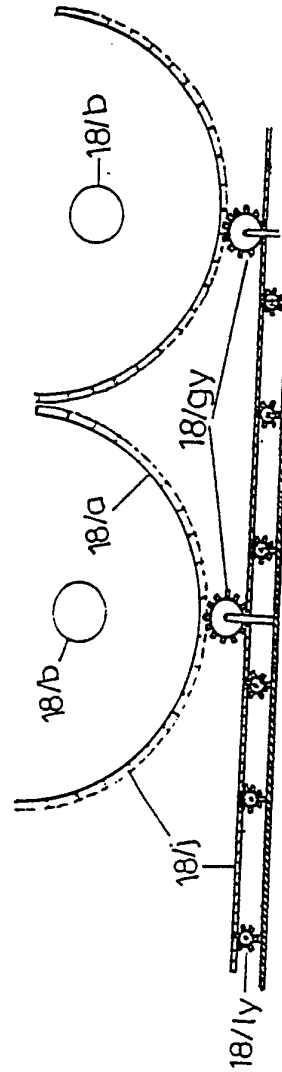


Fig. 8p

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/HU 93/00046

## A. CLASSIFICATION OF SUBJECT MATTER

IPC<sup>5</sup>: A 23 L 3/40; F 24 J 2/04

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)

IPC<sup>5</sup>: A 23 L 3/40, 3/54; A 23 B 4/03, 7/02, 7/03, 9/08; A 23 N 12/00, 12/08, 12/12; F 24 J 2/04, 2/38, 2/40, 2/52

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)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages                                                                                                 | Relevant to claim No. |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| A         | US, A, 4 285 143 (J.E. Hufford et al.), 25 August 1981 (25.08.81), claims.                                                                                                         | 1-5, 8-10, 11         |
| A         | Patent Abstracts of Japan, unexamined applications, Field C, Vol. 10, Nr. 303, 16 October 1986, The Patent Office Japanese Government, page 27 C 378, Nr. 61-115 439 (Takuo Azuma) | 1, 10, 11             |
| A         | US, A, 4 559 926 (B.L. Butler), 24 December 1985 (24.12.85), claims.                                                                                                               | 12-14                 |
| A         | US, A, 4 995 377 (G.E. Eiden), 26 February 1991 (26.02.91), claims.                                                                                                                | 1, 7                  |
|           | ----                                                                                                                                                                               |                       |

☐ Further documents are listed in the continuation of Box C.☒ See patent family 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

"&amp;" document member of the same patent family

Date of the actual completion of the international search

25 April 1994 (24.04.94)

Date of mailing of the international search report

18 May 1994 (18.05.94)

Name and mailing address of the ISA/ AT

AUSTRIAN PATENT OFFICE  
Kohlmarkt 8-10

A-1014 Vienna

Facsimile No. 1/53424/535

Authorized officer

Irmeler

Telephone No. 1/5337066/34

**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

International application No.

PCT/HU 93/00046

| Im Recherchenbericht<br>angeführtes Patentdokument<br>Patent document cited<br>in search report<br>Document de brevet cité<br>dans le rapport de recherche |         | Datum der<br>Veröffentlichung<br>Publication<br>date<br>Date de<br>publication | Mitglied(er) der<br>Patentfamilie<br>Patent family<br>member(s)<br>Membre(s) de la<br>famille de brevets     | Datum der<br>Veröffentlichung<br>Publication<br>date<br>Date de<br>publication   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|--------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| US A                                                                                                                                                       | 4285143 | 25-09-81                                                                       | keine - none - rien                                                                                          |                                                                                  |
| US A                                                                                                                                                       | 4559926 | 24-12-85                                                                       | AU A1 47927/85<br>AU B2 579186<br>IL A0 76551<br>IL A1 76551<br>IN A 164547<br>JP A2 61119949<br>MX A 157999 | 10-04-86<br>17-11-89<br>28-02-86<br>10-06-91<br>01-04-89<br>07-06-86<br>29-12-88 |
| US A                                                                                                                                                       | 4995377 | 26-02-91                                                                       | keine - none - rien                                                                                          |                                                                                  |