rexresearch.com

Stephan AUGUSTIN

Watercone

---

http://www.caledonenterprise.com/printArticle/50267 **(Friday June 6 2008)**
Caledon Enterprse (Bolton, Ontario, Canada)

BMW Designer Invents Watercone

It may not exactly fall under the usual automotive news but a BMW Group employee was honoured for his solution for a cheap, mobile device for producing drinking water.

On May 26 in Brussels, an international jury presented the National Energy Globe Award 2007 to BMW Group designer Stephan Augustin for his invention of the so called Watercone, a device for generating clean drinking water.

Guests at the awards ceremony included Mikhail Gorbachev, Jose Manuel Barroso, and Kofi Annan.
The Watercone is a solar-powered cone-shaped desalinator that generates fresh drinking water from salt or brackish water.

With its rigid outer skin, this plastic cone can be used floating on water or on damp ground.

The sunrays shining on the Watercone cause the water to evaporate under the cone and condense on the inside of the cone. The droplets of water then accumulate in a collector trough. The water can be poured out of the opening at the tip of the Watercone into a container or drunk directly. The water is purified through the condensation as if it were undergoing a single-stage distillation process.

Around 1.6 litres of drinking water a day can be obtained by using this invention. This means that the Watercone could play a major part in solving a number of problems.

UNICEF experts estimate that 5,000 children still die each day from diarrheal diseases caused by dirty drinking water. Using the Watercone, people living in coastal regions in Africa, Asia, and South America can also obtain drinking water from sea water. In addition, this device also eliminates heavy metals and other pollutants when used near rivers.

The Watercone is made from hard-wearing, unbreakable Bayer Makrolon polycarbonate with an anti-UV coating and has a guaranteed working life of at least five years.

The Watercone was even tested in the BMW wind tunnel showing it could cope with wind speeds of up to 55 km/h without any problems. This means that it is largely unaffected by weather.

CARE Deutschland carried out a pilot project in the coastal town of Zinjibar in Yemen, where it generally rains only three times a year.

Consequently, the fishermen have to travel into the interior, sometimes up to 15 km, to find clean drinking water even though they live right by the sea. CARE handed out 100 Watercones to ten fishermen's families. The water quality produced was analyzed and found to be perfect. The people in the village went one further: they said the drinking water from the Watercone tasted better than bottled water.

Augustin, an industrial designer, came up with the idea of the Watercone on holiday on the Canaries. As he looked across the sea, he brooded about how to convert the rich stocks of sea water in the oceans into a daily ration of drinking water.

"I wanted to use my professional knowledge and my experience to offer people who suffer from water shortage a humanitarian service in the form of a practical design", says Augustin.

United States Patent Application 20050098423

Device for Recovering Drinking Water from Condensate...

Augustin, Stephan
(May 12, 2005)

(Also published as: **ES2261738T // WO03040040 (A3) // WO03040040 (A2) // EP1448481 (A3) // EP1448481 (A2)**

Abstract

A device for recovering drinking water from condensate consists of a self-supporting moulded part 11 consisting of a transparent synthetic resin such as PET or PC, which is resistant to UV radiation. The moulded part 11 presents an open bottom area 16 with a collecting channel 15 on the edge side, with the collecting channel 15 presenting an inner wall 18 oriented towards the circumferential surface 12 and serving, at the same time, as floating aid, and with the moulded part 11 being provided with a pouring opening in its upper section 13. For the manufacture of this device, a vacuum is created in a special deep-drawing tool not only in the region of the circumferential surface to be produced but also in the region of the collecting channel to be formed, and the moulded part is separated from a separated deep-drawing tool element outside the zone of the collecting channel.

Inventors: Augustin, Stephan; (Munchen, DE)

Correspondence Name and Address:

JENKINS & WILSON, PA
3100 TOWER BLVD
SUITE 1400
DURHAM
NC
27707

US
U.S. Current Class: 202/83
U.S. Class at Publication: 202/083
Intern'l Class: C10B 001/00

Description

[0001] The present invention relates to a device for drinking-water recovery from condensate, as well as to a method of manufacturing this device and a deep-drawing tool for carrying through this method.

[0002] The present invention particularly involves a device suitable for water-borne applications, specifically at sea, and applications ashore for collecting water as condensate, that has evaporated under the influence of solar radiation. Within the general framework of this envisaged application, a seawater desalination, operated on solar energy, is envisaged, too.

[0003] Mobile inflatable seawater desalination devices have been known already for cases of emergency in the marine, which comprise an inflatable PVC ring as floating base and a separate conical transparent PVC sheet over this floating base, which serves as condensation surface. There, the condensate is collected between the outside of the ring and the inside of the cone, with the sheet cone, which is dimensionally unstable, being maintained in the required shape by means of supporting rods.

[0004] What must be considered to be a disadvantage in that known device is the fact that the sheets are easily damaged and may easily be perforated in particular. Moreover, a structure including rods is extremely troublesome and requires an appropriate assembly in order to avoid malfunctioning. The manufacture of the individual parts of the device is comparatively expensive and there are also disadvantages in terms of handling with respect to cleaning of the sheets due to their flexibility. Apart therefrom the sheets can be exposed to mechanical loads within limits only and are sensible to outside weather conditions such as wind and rain. Finally, the discharge of the collected condensate is inconvenient and problematic because the condensate must be poured out via the underside of the device while some condensate may also be lost.

[0005] The U.S. Pat. No. 3,415,719 discloses a foldable device for the recovery of condensed water that is operated on solar energy, which consists of an inflatable transparent plastic body in which a collector receptacle permeable to water vapour is provided as bottom element for collecting the condensate, which device is to be placed on a water body. The aforementioned disadvantages apply substantially to this device, too, specifically the problems in terms of handling and dimensional stability.

[0006] The document WO 00/03779 discloses a device for recovery of condensed water, which comprises a conical bonnet whose lower end presents an integral inward fold to form a collecting channel and for receiving a bottom plate with an evaporating arrangement. This evaporating plate is surrounded by an additional buoyancy ring. In addition to the aforementioned disadvantages, the expensive manufacture of this device with an inflatable floating ring, the complex configuration of the evaporating plate, as well as their assembly to create a ready-to-use device must be considered to constitute a further disadvantage.

[0007] The present invention is hence based on the problem of providing a device of the type outlined by way of introduction, as well as a method of manufacturing same and a deep-

drawing tool for carrying through the method, which presents a comparatively simple structure and permits an easy and unproblematic handling or manufacture, respectively, with a high efficiency.

[0008] In accordance with the invention, this problem is solved by the respective features in the Patent Claims 1, 18 or 19. Preferred features improving the invention in an expedient manner can be derived from the respective dependent Claims.

[0009] Due to the inventive configuration of the device, definite advantages are achieved in terms of manufacture, use and utilisation. The bonnet-shaped, particularly conical or frusto-conical or pyramidal, moulded part expediently consists of a strong but flexible material such as PET, PE, PP or PC. In this manner, a sufficient mechanical strength is achieved to resist damage that could be caused by pointed objects. Moreover, there is no deformation under the influence of wind. The functional integrity is therefore not impaired by exterior weather conditions such as rain, wind and the like.

[0010] Due to the geometry of the moulded part, the invention provides the expedient feature that the condensate-collecting channel performs the function of a floating body at the same time when the device is employed on water surfaces. An additional floating body or buoyancy ring can therefore be dispensed with. The device can be expediently moulded as an integral part and in series so that it can be manufactured at a low price, which is particularly expedient for an application in developing countries.

[0011] The fact that the moulded part does not include a bottom with an evaporating section must be considered to be a further advantage. As a result, problems with algae and the formation of crusts are not created. The device is simple to clean and is ready for use immediately, without being inflated and without a supporting structure.

[0012] In accordance with another embodiment of the invention, a pouring opening is provided at the tip of the moulded part for pouring out the condensate. Being appropriately placed, this opening cannot be soiled, or water cannot flow out in an undesirable manner.

[0013] In correspondence with an expedient further embodiment of the invention, the pouring opening can be closed with a screw plug and can hence be intuitively used as a drinking bottle. At the same time, the device can also be used as rain-collecting receptacle after it has been turned upside down, due to its dimensionally stable design.

[0014] Finally, a further advantage of the provision of a preferably closable discharge opening in the upper section of the moulded part, particularly at the tip of a cone or a pyramid, resides in the fact that the moulded part as a whole must be tilted by 180.degree. for pouring out the condensate. The quantity of the recovered drinking water can even be increased expediently by the condensate drops present on the inner wall, which can also be poured out.

[0015] According to a further embodiment of the invention, the moulded body is manufactured from two moulded parts disposed on top of each other, which are adapted to be fastened on each other in the bottom zone. As a result, a so-called double-wall structure is obtained, which permits the achievement of a particularly high efficiency in condensate recovery. To this adds the fact that any condensate dripping prematurely off the outside skirt is collected at the inner wall of the channel, which extends in parallel with the outside skirt, and does not drip off into the free bottom area. Another expedient aspect of the raised inner opening is the appropriate protection from the undesirable penetration of waves on which the

device is floating.

[0016] All of the embodiments of the inventive device present a further advantage when the inner side of the circumferential surface is provided with a non-fogging coating and when its outside surface is resistant to scratching.

[0017] Apart from the simple manufacture, which involves only little waste, also the provision of holding openings is expedient for the device composed of two parts, particularly deep-drawn elements, which openings have the two functions of holding handles and of anchoring or fastening the device. Adhesives or other connecting means with bacteria- and algae-preventing substances are expediently provided for bonding the two moulded parts.

[0018] In all the embodiments of the inventive device, filter cartridges may be inserted in the zone of the pouring opening in order to filter out sand, dust, bacteria, etc. and/or mineral cartridges may be provided for the addition of minerals. When the bonnet surface, particularly the surface of the cone, is slightly vaulted, a higher stability is achieved. Eyes provided in the zone of the pouring opening below the collar contribute to the dimensional stability and are extremely resistant to tearing up in an expedient manner.

[0019] Moreover, in correspondence with another embodiment of the invention, the outside skirt may be enlarged by moulded-in zones and/or shaped raised sections, particularly in the form of grooves or corrugations, in order to enlarge the condensation area and to achieve better cooling. An additional heat-collecting effect may additionally be achieved with a cloth of material that is permeable to vapour, which cloth is stretched over the underside of the moulded body and prevents, at the same time, a contamination by the washing of the waves. Moreover, additional closable openings may be provided for drainage in the zone of the collecting channel.

[0020] In conclusion, the inventive device provides for a simple and intuitive handling, with the condensate-collecting channel not only providing an appropriate holding handle but also a floating aid, with a simple design. The device does not require maintenance, can be stacked and is ready for use immediately without any further attachments or superstructures.

[0021] Due to the envisaged moulded shape, the moulded bodies can also be safely stacked without any problems whilst the stacks so formed are easy to transport by means of a supporting rod projecting through the open pouring openings.

[0022] The inventive method of manufacturing a device for drinking-water recovery from condensate in correspondence with the features defined in claim 18 provides for a special vacuum treatment for the deep-drawing operation by additional lateral exhaustion in the zone of the collecting channel to be formed, as well as for a separation of the moulded part from a separated deep-drawing tool element outside the zone of the collecting channel. Due to the special additional exhaustion in the zone of the collecting channel to be formed, it is possible to shape expediently rearwards engaging sections of the moulded part completely in correspondence with the desired shape while the finished moulded part is simple to separate subsequently from a separated deep-drawing element. This method allows for an extremely simple and efficient production of devices, particularly devices with rotational symmetry.

[0023] The deep-drawing tool, which is additionally provided for carrying through the method presenting the features defined in claim 19, is expediently formed to comprise a principal section and an attachment section, which permits the moulding of the envisaged collecting channel at the edge side with a constant wall thickness and a constant outside

contour. As a result, a rearwards engaging zone of the moulded part is well moulded, which would otherwise not be sufficiently considered in the application of a vacuum in the zone of the principal section. The air suction bores provided for forming the collecting channel are preferably formed in the attachment section and connected to suction air ducts in the principal section.

[0024] In correspondence with a preferred further embodiment, the attachment section presents a peripheral rounded mould edge for forming an inner edge of the collecting channel, with the attachment section preferably comprising a stop for a separating tool that is preferably formed on the rounded mould edge.

[0025] In correspondence with another embodiment of the invention, the attachment section has a bipartite configuration in order to be able to provide a manufacture of the suction air ducts, a suction plane and of suction air ducts in the attachment section.

[0026] In the following, the invention will be explained in more details with reference to the attached drawings wherein:

[0027] **FIG. 1** is a perspective side view of a first embodiment of an inventive device;

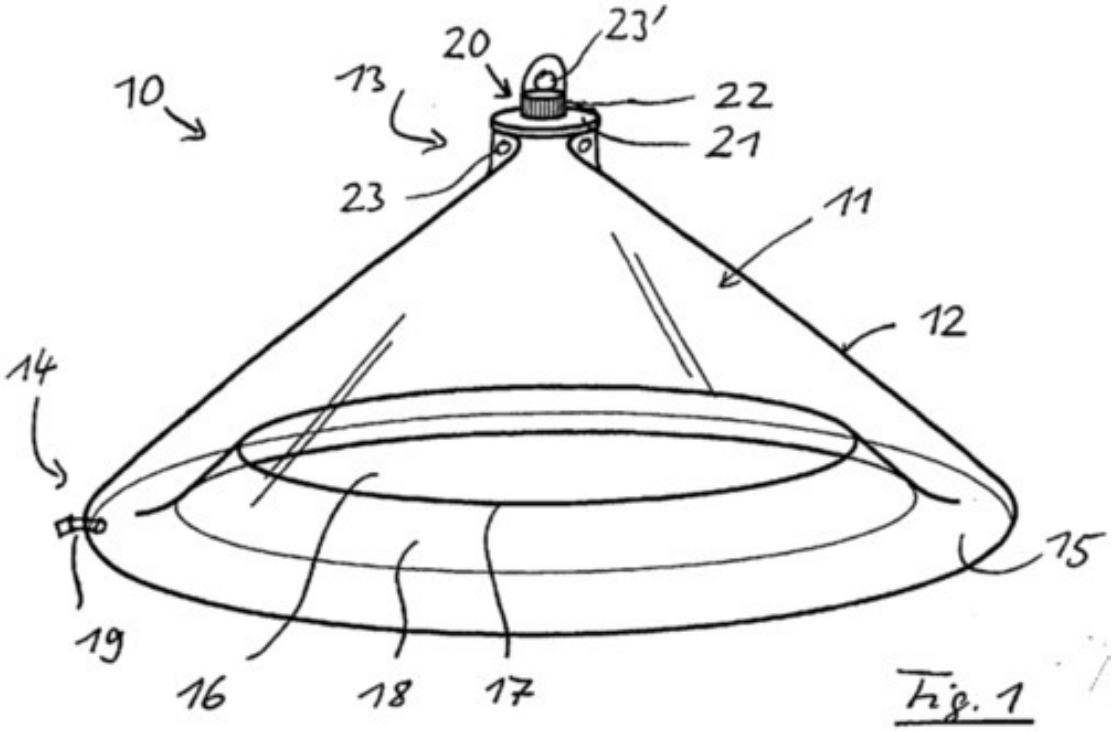
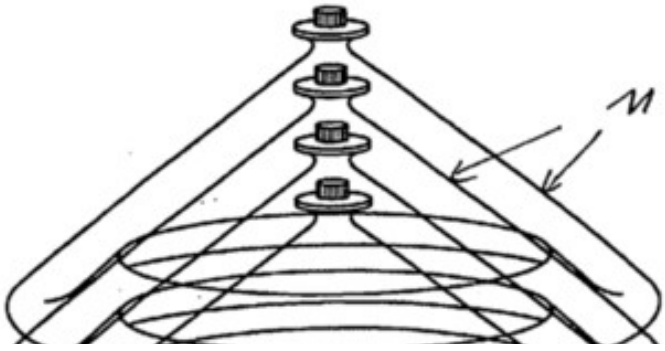


Fig. 1

[0028] **FIG. 2** is a schematic illustration of 4 devices according to FIG. 1, which are stacked on top of each other;



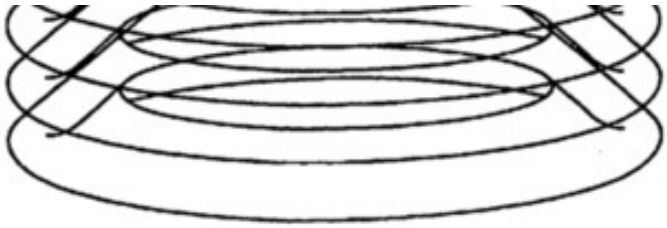


Fig. 2

[0029] **FIG. 3** shows another embodiment of the invention for explaining the principle of operation;

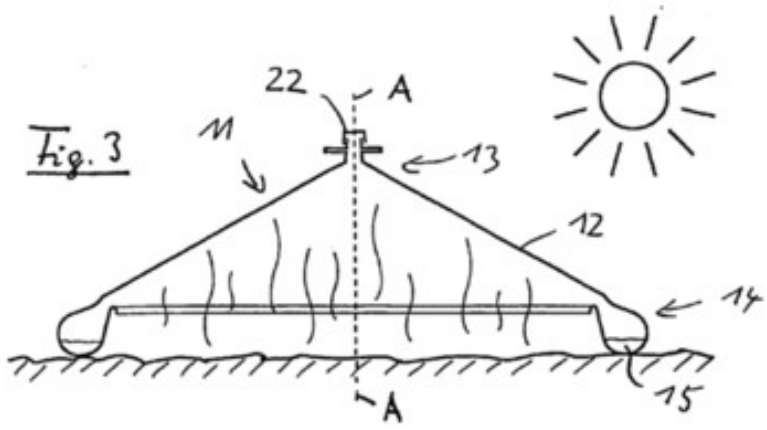


Fig. 3

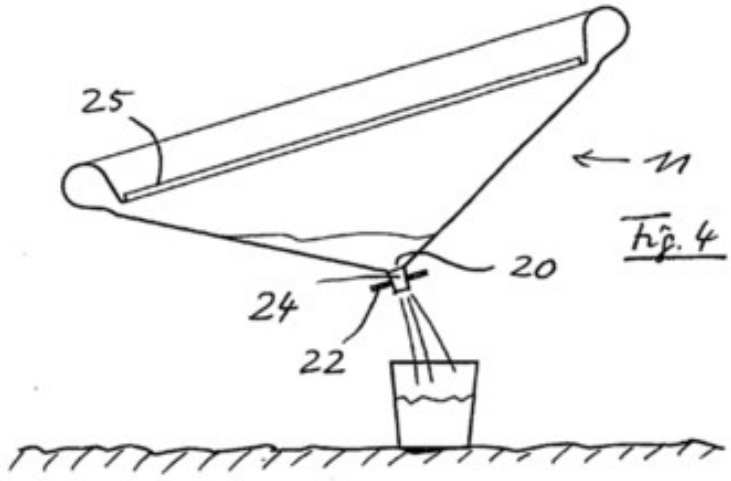


Fig. 4

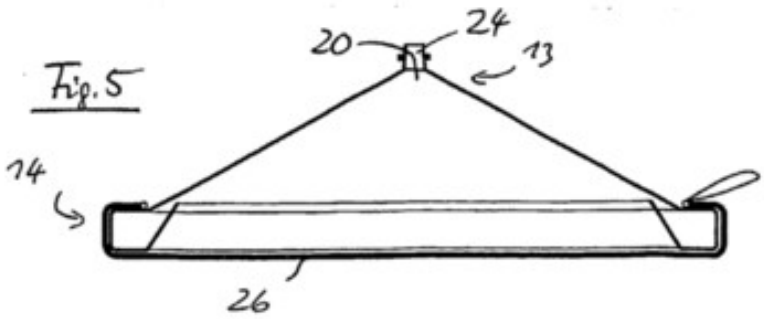


Fig. 5

[0030] **FIG. 4** illustrates the embodiment according to FIG. 3 in a schematic section in a condition in which the condensate is poured out;

[0031] **FIG. 5** is a view of another embodiment of an inventive device in which a black cloth permeable to water is stretched over the bottom area to provide protection from the washing

of the waves and for achieving a greater evaporation heat;

[0032] **FIG. 6** shows a schematic view of a further embodiment of the invention;

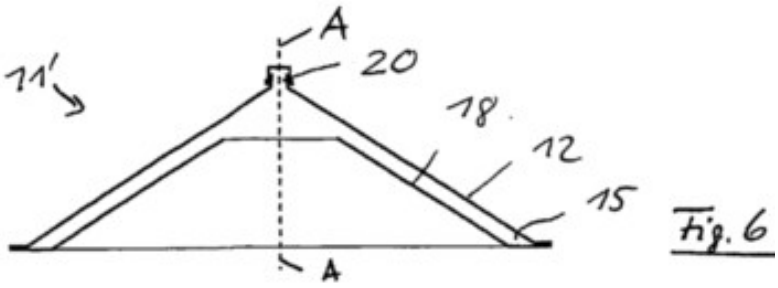


Fig. 6

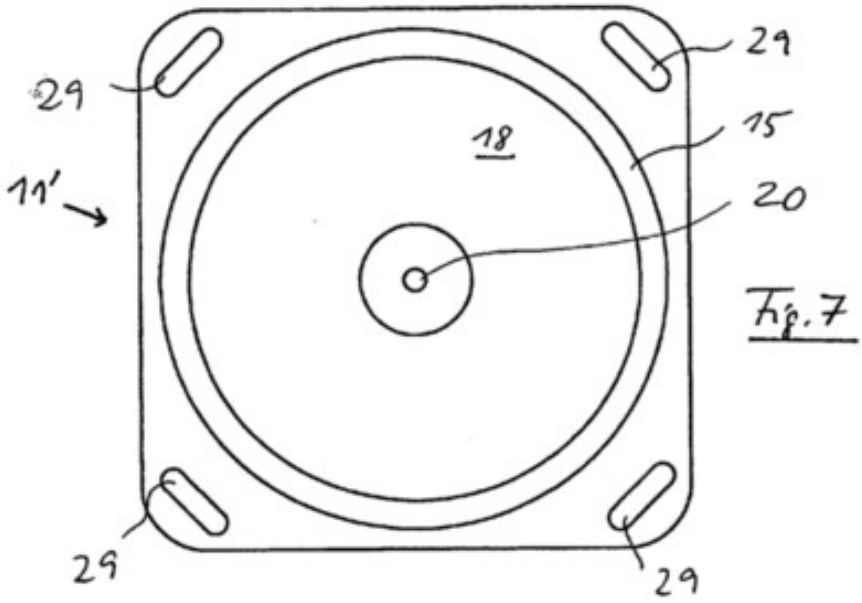


Fig. 7

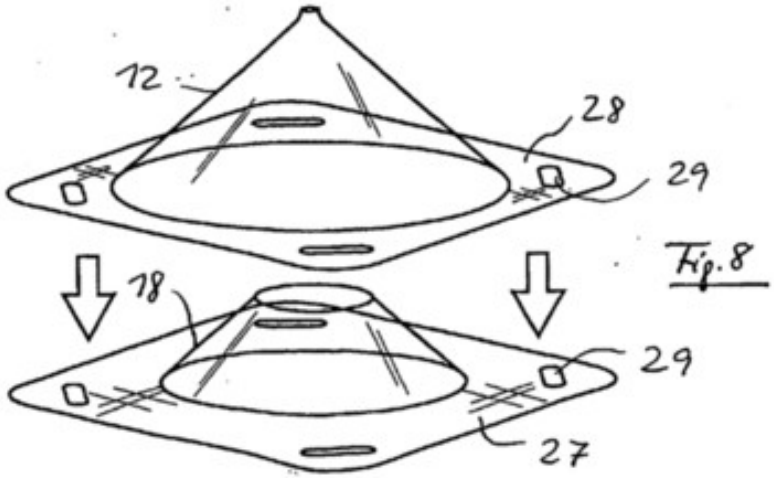


Fig. 8

[0033] **FIG. 7** is a view of the device according to FIG. 6 from below;

[0034] **FIG. 8** is an illustration of the assembly of the device according to FIG. 6;

[0035] **FIGS. 9 to 12** show various embodiments of devices presenting different geometries of the outside wall;

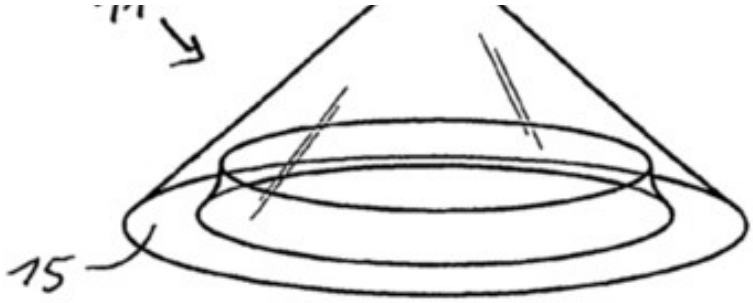


Fig. 9

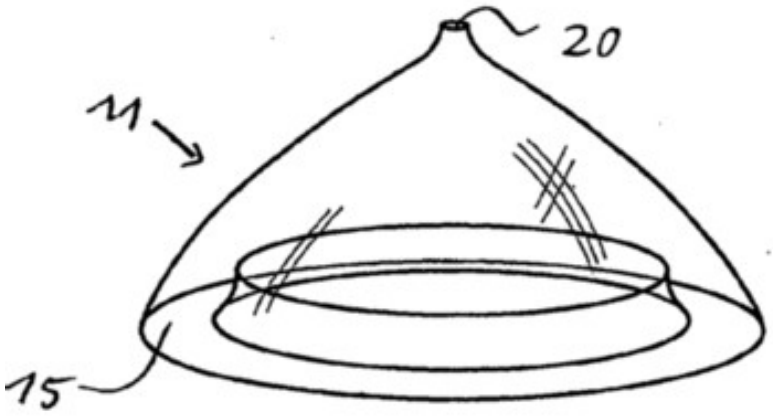


Fig. 10

Fig. 11

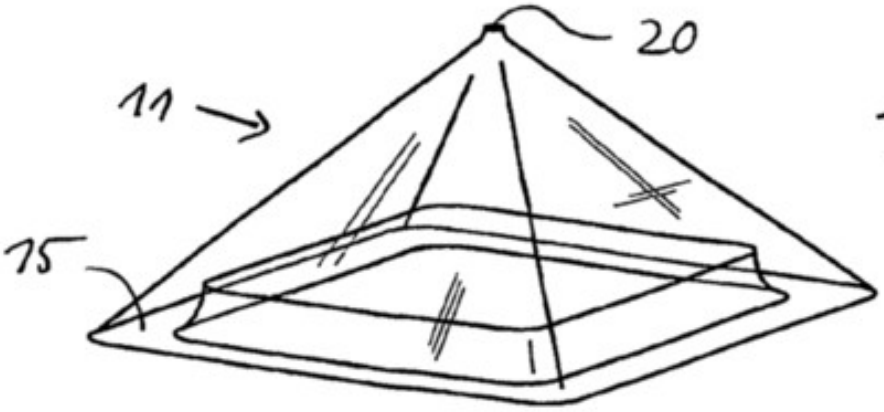


Fig. 12

[0036] **FIGS. 13 to 15** illustrate a schematic perspective side view, a view from below and a sectional view along the line XIII-XIII in FIG. 13;

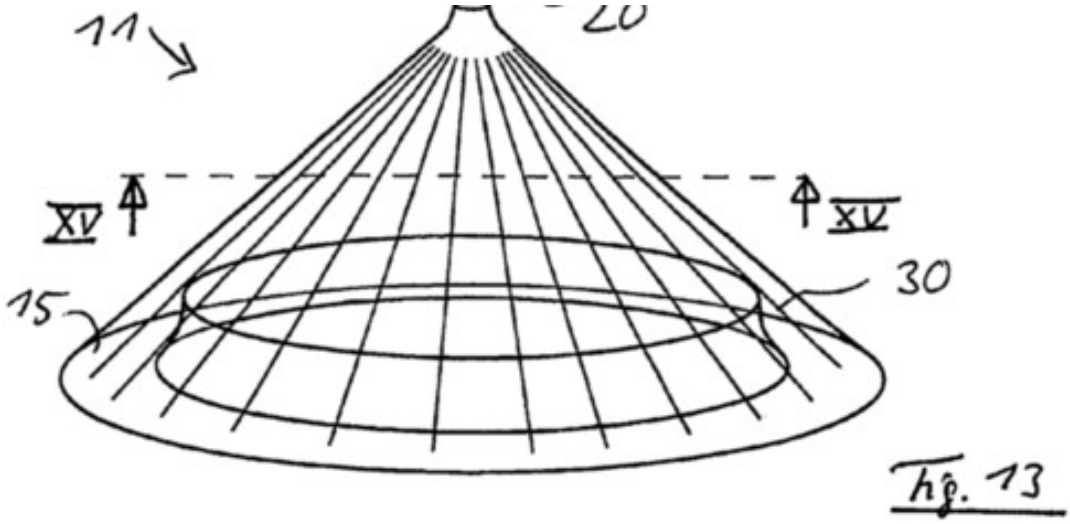


Fig. 13

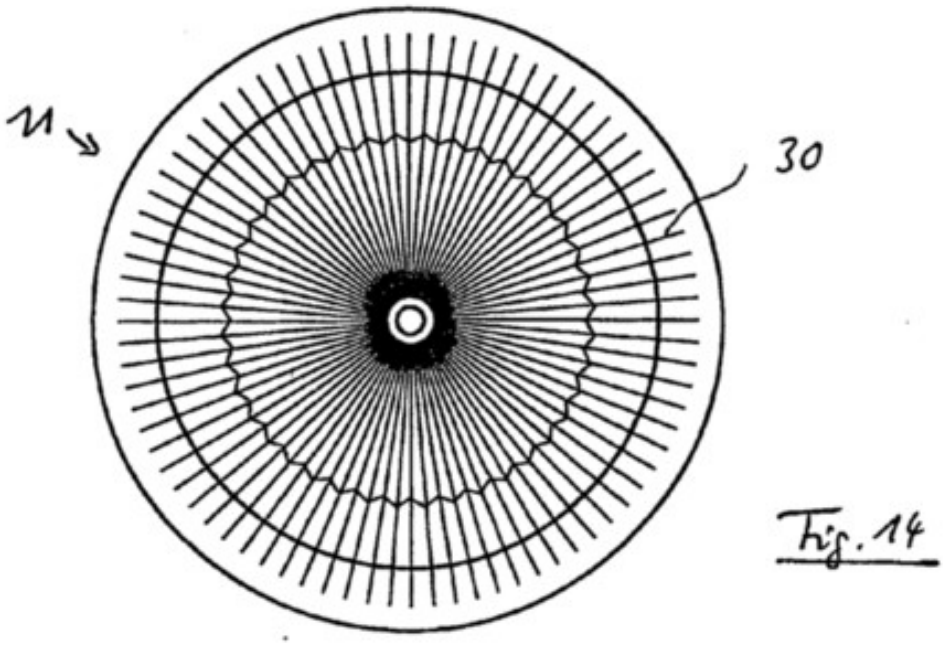
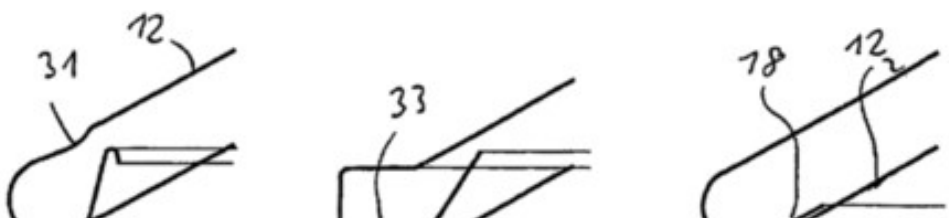


Fig. 14

Fig. 15

[0037] **FIGS. 16 to 18** show various geometries of collecting channels adapted to be stacked;



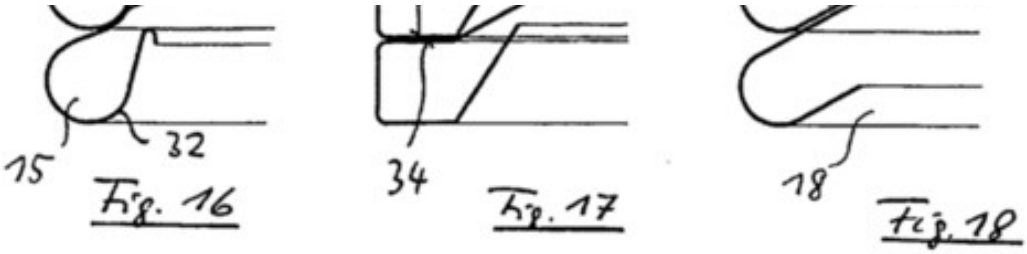


Fig. 16 Fig. 17 Fig. 18

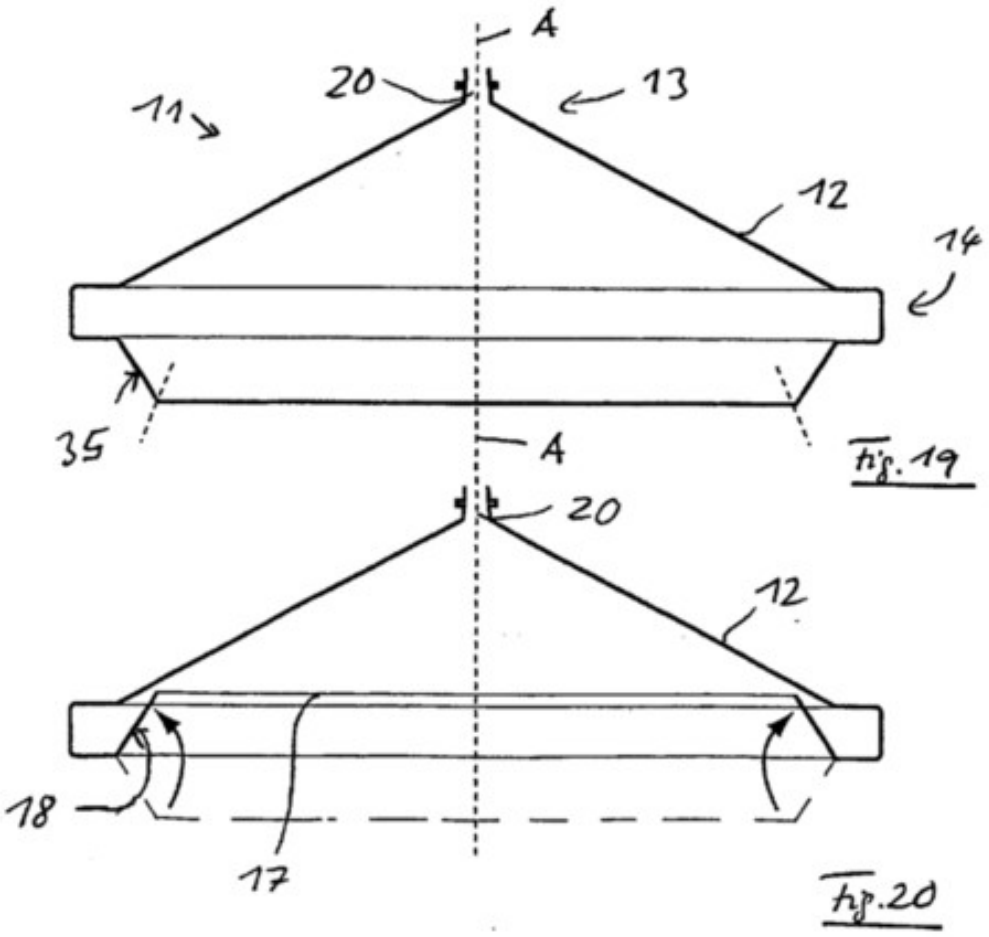
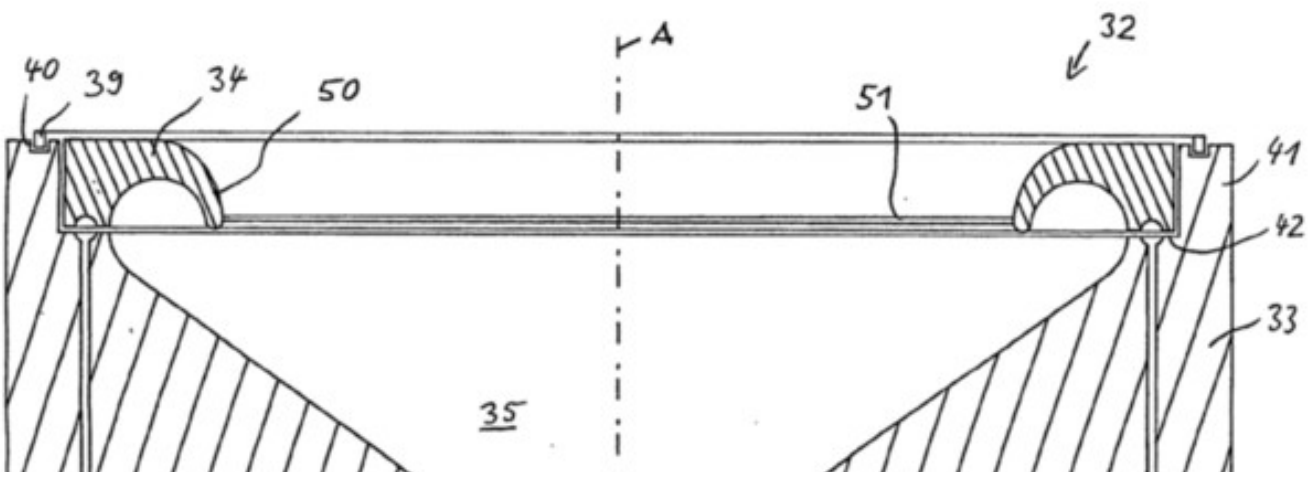


Fig. 19

Fig. 20

[0038] **FIGS. 19 and 20** are schematic views of steps for the manufacture of an embodiment of an inventive device;

[0039] **FIG. 21** shows a schematic sectional view taken through an embodiment of an inventive deep-drawing tool for the manufacture of a device presenting rotational symmetry;



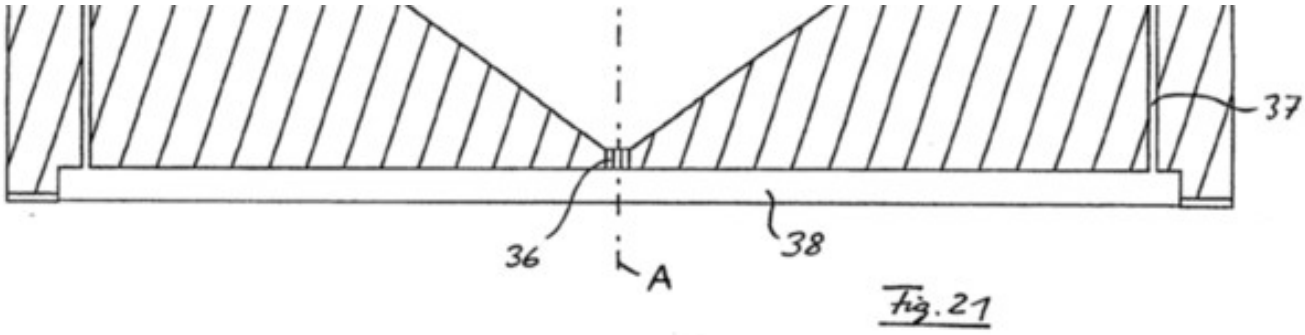


Fig. 21

[0040] **FIG. 22** is a partial sectional view at an enlarged scale in the upper left area in FIG. 21 for the illustration of air suction bores; and

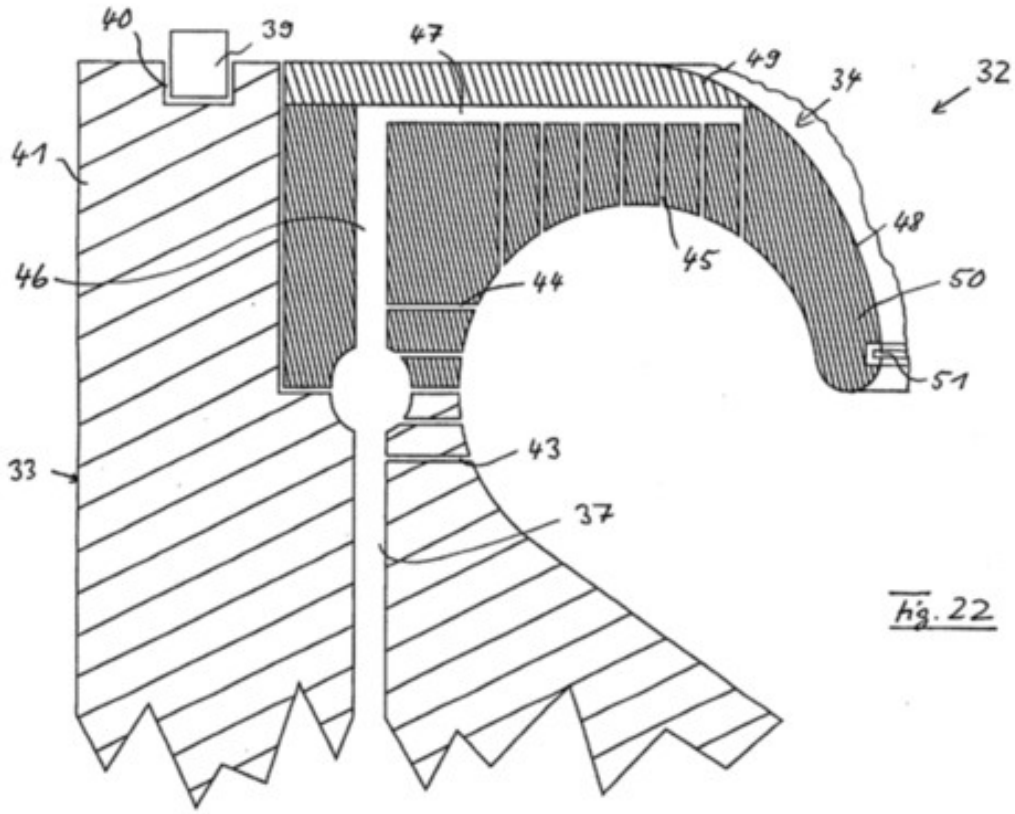


Fig. 22

[0041] **FIGS. 23 to 27** illustrate individual steps in the manufacture of one embodiment of the inventive device, using an inventive deep-drawing tool.

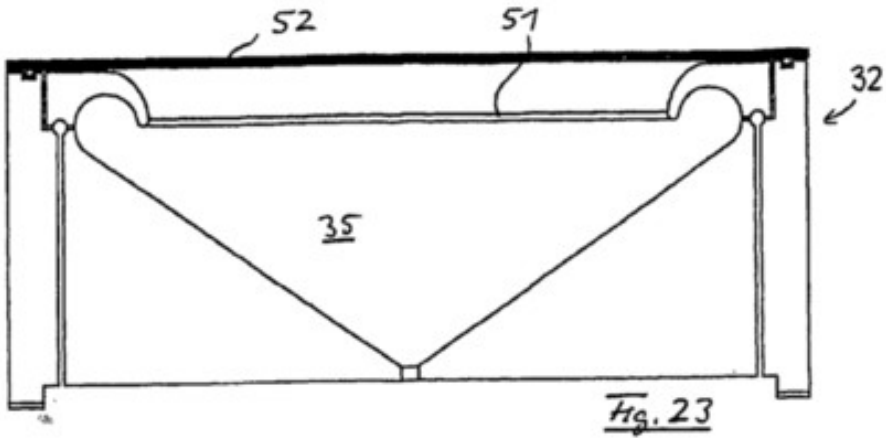


Fig. 23

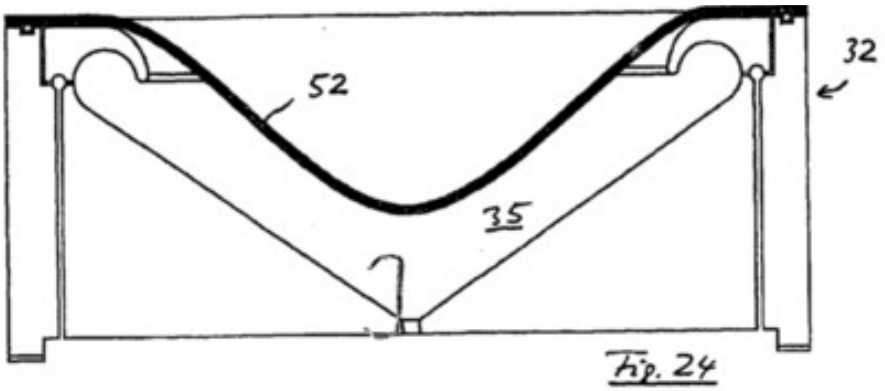


Fig. 24

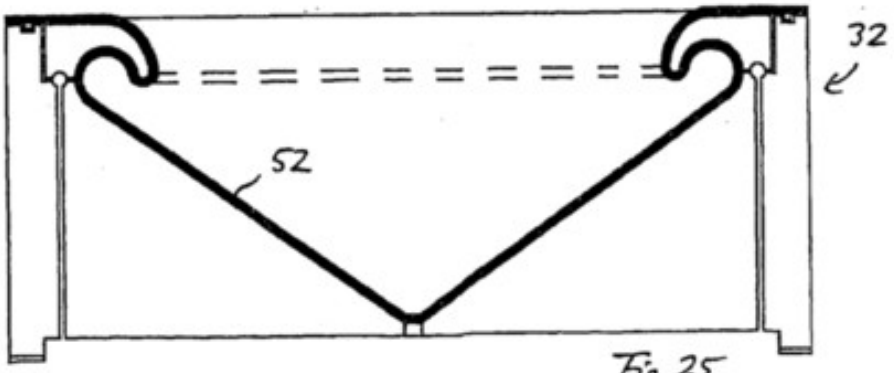


Fig. 25

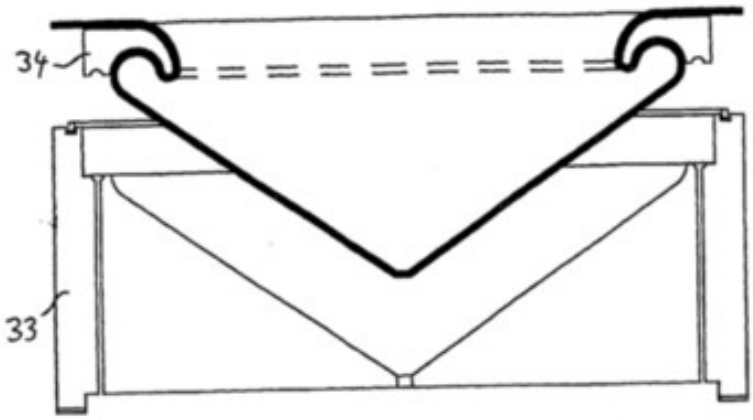


Fig. 26

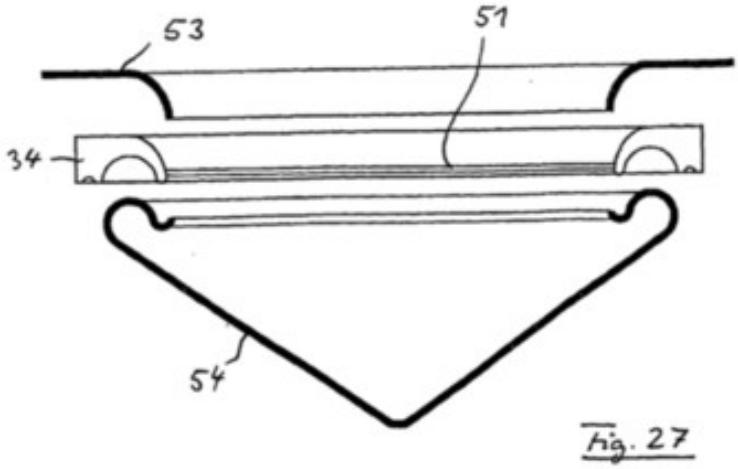


Fig. 27

[0042] FIG. 1 illustrates a first embodiment of an inventive device for recovering drinking

water from condensate. The device 10 consists of a conical moulded part 11 presenting a circumferential surface 12 that extends from an upper section 13 of the moulded part to a lower section 14. The moulded part 11 is of rotational symmetry and consists of a transparent synthetic resin such as PET and PC.

[0043] In the lower section, an inwardly projecting collecting channel 15 is integrally formed on the edge side on the moulded part 11, which serves, at the same time, as floating aid. The collecting channel 15 surrounds an open bottom area 16 that is formed by the upper edge 17 and the inner wall 18 of the collecting channel 15. The inner wall 18 of the collecting channel 15 extends approximately in parallel with the circumferential surface 12.

[0044] A drainage opening 19 is provided in the lower section of the collecting channel 15 for discharging the condensate in its entirety, which can be closed by means of a closing element not illustrated here. A pouring opening 20 is formed in the upper section 13 of the moulded part 11, which comprises a collar 21 on the outside as well as a threaded tubulure with a screw-on lid 22 as closing element. Additional lateral integrally formed parts 23 are moulded between the collar 21 and the circumferential surface 12 as well as upper integrally formed parts 23' on the cover, which serve to increase the stability in the upper section and serve as holding handle and for additional attachment. In the simplest basic form of the device according to FIG. 1, the device has only a configuration as roughly indicated in the stacked form in FIG. 2, with the stack of moulded bodies 11 according to FIG. 2 presenting an extreme dimensional stability and offering the possibility to pass a rod therethrough, after removal of the screw-on covers 22, for simple transportation. FIGS. 2 and 3 serve to explain more details of the handling of one embodiment of the inventive device. In variation from the embodiment shown in FIG. 1, this embodiment comprises a filter cartridge 24 in the zone of its pouring opening 20 while the inner wall 18 of the collecting channel is configured to extend in the direction towards the open bottom area as a peripheral protective edge 25 that serves as return stop for salt and waste water, as is schematically roughly indicated in FIG. 4 in the pouring condition.

[0045] As is illustrated in FIG. 3, the moulded part 11 is disposed either on a moist ground or on the surface of a water body. Under the influence of solar heat, the water is caused to evaporate in the zone of the free bottom area, with the water vapour depositing on the inner surface of the circumferential surfaces 12 in the form of a condensate and flowing down along the circumferential surface up to the collecting channel 15 under the influence of gravity. When a sufficient quantity of condensate has accumulated in the collecting channel 15 the moulded part 11 is seized by its upper section 13 and turned upside down so that the water accumulated in the collecting channel will flow out through the pouring opening 20 from which the cover 22 has been removed before. With a swinging movement of the moulded part, the remaining condensate quantity that has not yet flown down into the collecting channel 15 can be expediently collected and poured out, too.

[0046] In the embodiment shown in FIG. 5, the inner wall is shown to present a straight surface, in distinction from the schematic view in FIGS. 3 and 1, with the lower section of the moulded part 14 being flared in an appropriate form to the outside at the side of the edge for receiving cloth attachment means. The reference numeral 26 identifies a black cloth stretched over the free bottom area 16, which cloth is permeable to water and serves as protection against the washing of the waves and to achieve a higher evaporation heat.

[0047] The FIGS. 6 and 7 are a schematic side view and a view from below of a double-walled moulded part 11' that consists of a lower moulded part 27 and an upper moulded part

28, as is shown in FIG. 8. The upper moulded part, and likewise the lower moulded part, is configured as a deep-drawn element and consists of a conical section that comprises an approximately square bottom section at its lower end, which extends in the lateral direction. The lower moulded part 27 has an equally approximately square bottom plate from which rises a frusto-conical integrally moulded part in the centre, which constitutes the inner wall 18 of the collecting channel 15. As can be seen in FIG. 6, the inner wall 18 and the outside skirt 12 extend approximately in parallel almost into the upper section 13 of the moulded part 11'. In operation of the device, condensate accumulates in the comparatively wide collecting channel 15 that is formed between the inner wall 18 and the outside skirt 12. The reference numeral 29 identifies continuous elongate holes serving as holding handles and as opening for fastening the device.

[0048] According to the illustration in FIG. 8, the upper moulded part 28 is centrally placed on the lower moulded part 27 and bonded there or fastened by appropriate locking means for the manufacture of the device according to FIGS. 6 and 7, with the holding openings 29 being aligned in both bottom sections. The two moulded parts 27 and 28 may also be connected to each other by means of a bacteria- and algae-preventing adhesive or silicone, respectively.

[0049] FIGS. 9 to 12 show various geometries of the outside wall of the moulded body 11, with additional integrally moulded parts such as the collar, the holding handle and the draining opening being omitted for simplification. According to FIG. 1, the device comprises a conical moulded part whilst according to FIG. 10, the circumferential surface is vaulted to the outside in the manner of a bonnet. This furnishes a further improvement of the stability. The configuration according to FIG. 11 is another possibility, with the circumferential surface presenting a shape similar to a hemisphere. The pyramidal configuration of the circumferential surface according to FIG. 12 provides for a maximum utilisation of the area.

[0050] In FIG. 13, the fact is schematically indicated in a device according to FIG. 11, that the circumferential surface may be enlarged by a zigzag-shaped design including grooves for an enlargement of the surface and in order to permit a better control of the down flow of the condensate drops. It is also possible to provide some other integrally moulded-in guiding elements instead of the illustrated grooves 30, which extend from the upper section 13 to the lower section 14 of the moulded body 11.

[0051] FIG. 14 shows a view from below of the device according to FIG. 13, and FIG. 15 roughly indicates the sectional profile extension along the line XV-XV in FIG. 13 in a schematic form.

[0052] The FIGS. 16 to 18 illustrate various geometric shapes of collecting channels for reliable and safe stacking of moulded bodies 11. In the lower section of the circumferential surface 12 as shown in FIG. 16 a peripheral moulded-in section 31 is provided that serves to receive a section 32 of the collecting channel 15 having a complementary curvature.

[0053] According to FIG. 17, the lateral shaping of holding sections in a manner similar to the embodiment of according to FIG. 5 ensures that the devices can be stacked in a reliable manner in the precise position because here the lower surface 33 of the upper moulded body rests on the upper horizontal surface 34 of the lower moulded body.

[0054] FIG. 18 shows a further embodiment that provides for proper stacking of the moulded parts 11, wherein the inner wall 18 extends in parallel with the circumferential surface 12 and is supported like a sheet.

[0055] For the manufacture of a device according to the embodiment illustrated in FIG. 5, the FIGS. 19 and 20 illustrate the appropriate steps of operation. FIG. 19 is a schematic view of a blow-shaped moulded part without a collecting channel. The moulded part 11 is provided with an open section 35 tapering in a conical shape in a downward direction and having a bottom part that is subsequently cut away. As is illustrated in FIG. 20, then the section 35 is swung in after heating or tilted upward as inner wall 18.

[0056] Now an embodiment of the inventive deep-drawing tool as well as the method of manufacturing a device for recovery of drinking water from condensate will be explained in more details with reference to FIGS. 21 to 27. FIG. 21 illustrates a schematic section taken through a deep-drawing tool 32 of rotational symmetry, which consists of a principal section 33 and an attachment section 34. In the principal section 33, a cavity 35 for forming the wall section of a bonnet-shaped moulded part, a moulded-in zone 36 for a pouring opening of the moulded part, lateral suction ducts 37, which lead from a suction cavity 38 provided in the lower section of the principal section 33 to the attachment section 34, as well as a peripheral seal 39 are illustration, which is disposed in a recess 40 that is provided on the upper side of a peripheral edge section 41 at the upper end of the principal section 33. The edge section 41 extends up to a shoulder 42 that constitutes a bearing surface for the attachment section 34. Like in FIGS. 19 and 20, the line A-A identifies the axis of symmetry or rotation, respectively, of the moulded body to be produced.

[0057] FIG. 22 is an enlarged sectional view of further details in the area of the left upper section of the deep-drawing mould 32. Here, air suction bores 43 to 45 can be seen particularly clearly, which open into the zone of the collecting channel to be formed in the moulded part. Here, the suction bores 43 are still formed in the principal section 33 and open directly into the annular suction duct 37 whilst the ducts 44 and 45 lead to the air suction duct 46 or to a suction cavity 47, respectively, which is connected to it. For reasons of manufacturing technology, here the attachment section 34 is formed with a principal section 48 and a cover-shaped annular part 49 that closes the suction cavity 47 at the top. The principal section 48 is provided with a peripheral rounded mould edge 50 that has a finger-like cross-sectional area in the sectional view of FIG. 22. The reference numeral 51 identifies a stop moulded in the mould edge for a separating tool. This stop serves to separate the moulded part from the attachment part 34 after removal from the conical funnel or cavity 35, respectively, of the mould. The outside contour of the mould edge 50 is rounded so that as much material as possible can be drawn into the interior space in the zone of the collecting channel to be produced on the edge side of the moulded part during the deep-drawing operation, without tearing the material.

[0058] The inventive method will now be described with reference to the schematic views in FIGS. 23 to 27 in more details. In the starting position according to FIG. 23, in a first step of operation, a heated sheet 52 made of a thermoplastic transparent synthetic resin with a seal on the edge side is placed on the schematically illustrated deep-drawing tool 32. Then, a vacuum is applied in the deep-drawing tool 32 for shaping the sheet 52, with the sheet 52 being shaped into the deep-drawing tool 32 according to FIG. 24 and then according to FIG. 25, whilst the vacuum being extracted through the opening 36 (FIG. 21) of the principal section 33 as well as through the air suction bores 43 to 45, which are explained in FIG. 22, in the zone of the collecting channel to be formed on the edge side of the moulded part.

[0059] According to FIG. 26, then the cooled moulded part is removed from the principal section 33 of the mould, together with the attachment section 34, and in the last step, the moulded part is then separated along the stop 51, which furnishes, on the one hand, a section

53 of the moulded part and, on the other hand, the finished moulded part 54, both detached from the attachment part 34.