

The invention relates to a water purification apparatus having an intake funnel, a casing sealingly connected thereto, and having an insert which has approximately cylindrical casing-like side walls, a sieve cover and a sieve bottom, and into which a granular purifying agent can be filled.

Apparatus of the kind mentioned above is known. Using such apparatus, water which is to be purified and which can be filled into an intake funnel, passes therefrom through a purifying agent, e.g. ion exchangers, active carbons or the like, passes through the insert, and can be collected in a purified state in a collecting container. The important thing is the purifying effect which the purifying agent has on the water flowing through the insert. Therefore, it is desirable to have good throughflow of the purifying agent, on the one hand, and to have a certain period of stay, on the other hand. In order that the purifying agent in powder form is not mixed with the water to be purified, respective sieves are provided on the upper side of the insert facing the wide part of the funnel and on the lower side of the insert. It is first of all assumed that the liquid can easily pass through the sieve slits into the insert, flow through the purifying agent, and issue again through the bottom of the sieve. However, it has been shown that the sieves can become partially blocked, which results in the passage of water becoming much slower or impeded. Various measures have already been taken to avoid blockage of the sieve slits on the cover. There has also been success in substantially excluding blockage of the sieve slits on the bottom by fine powdery particles. However, it is not possible to prevent gases from occurring inside the insert due to certain chemical reactions during purification of the water, these gases tending to flow up and out of the insert or being entrained towards the sieve bottom by the continuous flow of water and having to escape there. In addition, other small air sources above and inside the insert have sometimes resulted in small air- and/or gas bubbles forming beneath the sieve bottom, these bubbles freeing themselves from the bottom of the casing from time to time and rising, but prior to separation, preventing through-flow of the water to be purified.

It is true that an insert has already been created for a water purification apparatus of this kind which contains a generally cylindrical beaker containing the filter material, and which has a closing sieve which can be placed onto the beaker in the form of a cover. If the bottom of this beaker

is also designed like a sieve, there is still the problem of air bubbles which form at the bottom end of the sleeve. However, if an inwardly arranged cylindrical tube is kept free so that the last sieve is arranged in the upper region, then space is lost for storage of the purifying agent. The problem of conveying air from the bottom region of the insert and the casing has therefore not been solved in a satisfactory way. According to EP-A-0219004, the upper and lower end walls are inclined towards the horizontal, and contain a plurality of narrow slits. Thereby, air bubbles arise along the slits at the upper ends.

Therefore, the aim of the invention is to improve the water purification apparatus of the kind mentioned in the introduction in such a way that air and/or gases which collect no longer hinder through-flow, through the sieve bottom, of the water to be purified.

This problem is solved according to the invention in that the sieve bottom has an air collecting chamber which is at least partially drawn up towards the side wall. It has been seen that the air which collects at the bottom or outer end of the insert, and thus also at the bottom of the casing of the intake funnel is not able to be avoided, and is not able to be conveyed away easily inside the insert. Therefore, an air collecting chamber has been created in the region of the sieve bottom where the air or gases occurring could collect, without them forming an obstacle to the functioning of the water purification apparatus. In order to keep the flow of water steady, it is particularly favourable if the air collecting chamber is drawn up towards the side wall. It is sufficient if only one part, a tubular part for example, of the sieve bottom region is radially outwardly drawn up to the side and then in the direction of the sieve cover. It will be appreciated that air tries to escape at the top, so that the air and/or gases formed are collected or drawn off through the drawn up air collecting chamber from the region of the bottom of the sieve, where air is undesirable. Thus, the sieve openings of the bottom can be kept free of an undesirable air or gas mixture, and the flow of water remains unimpeded.

It is also expedient if, according to the invention, the air collecting chamber receives a joint face of the sieve bottom and is closed towards the inside of the insert. Contrary to the openings in the sieve bottom, the air

collecting chamber is thus closed towards the side of the insert. A system of downwardly open tunnels can be imagined, for they pass freely here to the outside, but are closed at the top and do not have any sieve openings. The gas passing through the sieve openings arranged adjacent thereto can then be guided into this tunnel-like space and be collected there or guided into the drawn up region which should preferably be joined to the individual tunnels.

A preferred embodiment of the invention is thus characterised in that the air collecting chamber is in the form of open semi-cylindrical tubes at the bottom of and/or outside the sieve bottom, the tubes being joined together and joined to another approximately chimney-like semi-cylindrical tube which extends at least over a part of the side walls. This other chimney-like semi-cylindrical tube is the part of the air collecting chamber which is drawn up to the side wall. It is larger in the region of the sieve bottom and tapers towards the top space of the insert, i.e. in the direction of the cover, and it is for this reason that the semi-cylindrical tube is said to be chimney-like. This tube is also half cut away in the cross-section, so that the laterally drawn up part of the air collecting chamber is also open outwardly at the side. An air collecting chamber is produced, as can be seen, by inserting the so-called insert which can also be a filter element into the casing of the intake funnel. The casing walls enclose the insert at least in the lateral region, so that the air produced in the bottom region of the sieve bottom can actually be collected in the chimney-like semi-cylindrical tube of the air collecting chamber. The casing must be open downwardly, because the water issuing from the sieve bottom of the insert must also be able to flow to the bottom and out.

Therein, it is expedient according to the invention, if the outwardly open semi-cylindrical tubes of the air collecting chamber, which tubes are disposed in the region of the sieve bottom, are of a star-shaped configuration and preferably extend radially from the outer edge of the sieve bottom to the centre thereof. The tunnel system can be imagined as consisting of outwardly open semi-cylindrical tubes of the air collecting chamber, which tubes are arranged in a star-like configuration, so that air pushed out from the openings anywhere on the sieve bottom is guided into an adjacent semi-cylindrical tube and can be guided upwardly into the chimney-like semi-cylindrical tube of the air collecting chamber. The sieve bottom can,

admittedly, be designed in various ways, but a sieve generally has cross-pieces which surround openings, which cross-pieces can form at least a part of the outwardly open semi-cylindrical tubes of the air collecting chamber in the radial embodiment. The advantageous close adjacent positioning of these semi-cylindrical tubes of the air collecting chamber to the openings of the sieve bottom can be seen, so that gases which are produced, or air which is pushed through the openings, can be conveyed over the entire region of the sieve bottom into the semi-cylindrical tubes and collected in the collecting chamber.

Only an insignificant part of the volume of the insert is occupied by the semi-cylindrical tubes of the air collecting chamber for the purpose of receiving the purifying agent. Hence, in order to still further improve the functioning of the new water purification apparatus, and to compensate for any reduction in volume to be feared by the different semi-cylindrical tubes of the air collecting chamber, according to the invention the sieve bottom has at least one sieve attachment which extends approximately vertically from the surface thereof. As the name suggests, this attachment should be placed on the bottom of the sieve, and should preferably extend downwardly/outwardly. Therein, it is particularly advantageous if the openings are in the form of short slits in the region of the attachment, the slits being arranged so that they are substantially parallel to each other in a ring configuration on the surface of the attachment. The surface of the attachment is preferably that of a truncated cone, wherein the tapering end is disposed at the bottom. The bottom surface which outwardly closes off the truncated cone at the bottom can be closed or also provided with sieve openings. If the surface of the sieve attachment is designed in this way, air which is pushed out with the water can issue from the slits of the sieve attachment, and can be conveyed outside the casing away in an upward direction. This also means that air bubbles formed in the region of the sieve bottom and preferably therebeneath are reduced in number. The truncated cone sieve insert communicates directly with the internal chamber of the insert, so that it can be filled with purifying agent. Thus, it can be seen that the receiving volume of the insert is increased. In addition, issuing air is only partly conveyed into the air collecting chamber because, in the way just described, a certain proportion of the air which is otherwise conveyed in a downward direction escapes to the side and past the casing in an upward direction.

It will be appreciated that the sieve insert is of a design such that it projects downwardly out of the sleeve of the intake funnel, so that a conventional insert, such as currently available commercially, can also be inserted into the casing of the intake funnel like the new insert, with or without sieve attachment. In addition, the air collecting chamber does not take up any additional volume, and so the new insert could no longer be accommodated in the conventional casing. This advantageously ensures that the old insert can be exchanged for a new one. The end user can buy new types of insert at any time, and he can therefore use his old intake funnel with the casing.

It is also expedient according to the invention if the air collecting chamber is arranged adjacent to the, at least one, sieve attachment, and is sealingly connected thereto. This therefore has no adverse effect on the functioning of the air collecting chamber, and functioning of the purification apparatus is increased, because the sealing connection of the sieve attachment to the sieve bottom guarantees that the water is also conveyed into the purifying agent inside the sieve attachment, so that the bed height of purifying agent is increased.

It is also advantageous according to the invention if the casing arranged on the intake funnel is provided on the bottom with a sprinkler cross, through the four openings of which four sieve attachments of the insert are held downwardly and/or project outwardly in such a way that the air collecting chamber is disposed above the region of the sprinkler cross.

The underside of the casing can be designed with a radial inner flange to hold the insert. However, for reasons associated with manufacture, solidity and simpler use, it is expedient if a sprinkler cross is provided at the lower end of the sleeve, wherein there are openings between the radially extending cross-pieces. The sieve attachments can now pass through these openings. Preferably, with a genuine cross with four cross-pieces, there are four corresponding openings, so that there should be four sieve attachments on the bottom of the insert, which sieve attachments fit exactly into the holes of the sprinkler cross. In this way, the entire sieve bottom can be designed in such a way that the sieve openings are only disposed in the sieve attachments which can all be of an approximately truncated conical configuration. The

only remaining part of the sieve bottom is thus the region inside the four sieve attachments which is shaped in a similar way to a cross, so that the semi-cylindrical tubes, extending along this cross, of the air collecting chamber can also be arranged above the cross-pieces of the sprinkler cross, so as to make optimum use of the space available. Therein, it is to be appreciated that the lower edges of the semi-cylindrical shells of the air collecting chamber should be disposed at a spacing from the sprinkler cross of the sleeve so that the air escaping at the sides from the sieve attachments which has not had a chance to escape to the top outside the casing can enter the air collecting chamber.

With another expedient embodiment of the invention, the air collecting chamber in the region of the chimney-like semi-cylindrical tube extends into the upper quarter of the side wall of the insert, and the casing has, in the region of its (of the semi-cylindrical tube's) upper end, an opening for the air or gas collected to escape. The opening into the casing admittedly means that a new water purification apparatus has to be bought which has an intake funnel and a casing, but the new apparatus is very advantageous in that the air collecting chamber can be very small in design, and so all the air issuing in the region of the sieve bottom can be collected by the semi-cylindrical tubes, conveyed into the chimney-like vertical semi-cylindrical tube and conveyed away by this up through the opening in the casing.

It is also favourable according to the invention, if, arranged on the inner side of the approximately cylindrical casing-like casing is a preferably wedge-shaped guide spring. In the foregoing description, the assumption has been made that the casing is of approximately cylindrical casing-like configuration both on the outside and inside, wherein the bottom of the casing is provided with a sprinkler cross in the embodiment described hereinabove. By virtue of the above-mentioned guide spring, a kind of groove projects radially inwardly on the inside of the casing. This groove is the same in design as the chimney-like semi-cylindrical tube on the side wall of the insert, and so the insert, together with the air collecting chamber thereof and the lateral vertical semi-cylindrical tube can be inserted fully into the new casing by means of the guide spring, but only in one specific rotational position. If the end user pushes the insert into the sleeve in a downward direction in an incorrect angular position of rotation, the insert becomes

upright because the cylindrical casing-like outer wall abuts against the radially outer, upper edge of the guide spring. The insert cannot then be completely inserted into the casing, and particularly if sieve attachments are arranged these do not project through the sprinkler cross. On the other hand, the guide spring according to the invention ensures that the insert is in the correct rotary position when inserted into the casing, so that particularly in the case of sieve inserts these fit exactly into the openings between the cross-pieces of the sprinkler cross. In this way, insertion of the filter element (of the insert) is facilitated and guided. Thus, since the chimney-like semi-cylindrical tube of the air collecting chamber should receive this wedge-shaped guide spring and should engage therewith, the design of the wedge-shaped guide spring is adapted to the shape of the chimney-like semi-cylindrical tube of the air chamber. If, according to the preceding embodiment, the semi-cylindrical tubes of the air collecting chamber disposed in the bottom region of the sieve are disposed above the cross-pieces of the sprinkler cross, then the wedge-shaped guide spring is also disposed on the casing, in the extension of this cross-piece of the sprinkler cross. The wedge-shaped guide spring also preferably extends from the bottom of the casing to below the opening, if the particular embodiment has both the wedge-shaped guide spring and the opening. So that the one insert can be exchanged for the other, and so that the one casing can be exchanged for the other, if there is no opening in the sleeve, the wedge-shaped guide spring will only extend up to the place disposed above, disposed outside the position where the opening could be provided.

Further advantages, features and possible applications of the present invention will emerge from the following description of preferred embodiments, given in conjunction with the drawings, wherein:

Figure 1 shows the side view of the insert, without intake funnel and without casing, wherein a view is taken in the direction of the chimney-like, lateral, vertical semi-cylindrical tube,

Figure 2 shows a view of the insert from the side of the sieve bottom, i.e. from the bottom to the top in Figure 3,

Figure 3 shows a partly broken away illustration of the insert, wherein a part of the side wall and a part of the lateral, vertical semi-cylindrical tube of chimney-like configuration is shown in section, and

Figure 4 shows a similar view of the insert as in Figure 3, but wherein the casing is also shown with the guide spring, the intake funnel arranged thereabove and with the receiving container broken away.

Since the collecting container is unimportant and may be of a different design, Figure 4 only shows a part section thereof and it is shown by thin lines without any reference numeral.

The main parts of the actual water purification apparatus can be seen clearly in Figure 4. It consists of the intake funnel 1, the casing 2 sealingly connected thereto, and the insert generally denoted by the reference numeral 3.

The insert, in turn, has approximately cylindrical casing-like side walls 4, a sieve cover 5 and a sieve bottom 6. The purifying agent is not shown, but can easily be imagined as being in the space of the side walls 4.

The particular embodiment of the sieve bottom 6 has an air collecting chamber 7. This chamber consists of individual parts which are characterised by the reference numeral 7 and by other reference numerals, as follows.

Matching the sprinkler cross 8 in the casing 2 shown in Figure 4, the lower edges 9 of the air collecting chamber 7 are disposed in a cross-configuration, as shown in Figure 2, at a spacing d above the top side of the cross-pieces of the sprinkler cross 8.

Figure 2 should be studied in conjunction with Figure 3, because apart from the open semi-cylindrical tubes 11, beneath and/or outside the sieve bottom 6 the air collecting chamber which is generally denoted by the reference numeral 7 consists of the vertical, lateral chimney-like upwardly extending semi-cylindrical tube 12 which is on the left-hand side in Figures 2 and 3,

onto which a view is taken from the outside in Figure 1, and which is arranged on the right-hand side in the illustration in Figure 4.

The semi-cylindrical tubes 11 of the air collecting chamber 7 which are arranged in a cross configuration like a tunnel system extend from the circular outer edge 13 of the sieve bottom 6 to the centre thereof, wherein the lower edges 9 of these semi-cylindrical tubes 11 diverge towards the centre where the tubes 11 widen. By virtue of the increase in size of the semi-cylindrical tubes 11 from the outside to the inside, they also increase in height (or depth, depending on how the drawing is studied), so that in the lateral sectional illustration in Figures 3 and 4, the walls which bring the open semi-cylindrical tube 11 up towards the inside of the insert 3 increase outwardly towards the centre. Only one of the four semi-cylindrical tubes therein is the exception, namely the diameter cross-piece which also contains the lateral vertical semi-cylindrical tube 12. For this reason, the upper walls 14, provided without sieve openings, of the semi-cylindrical tube 11 in the illustrations in Figures 3 and 4 extend from the centre outwardly higher up, but they then open into the lateral, chimney-like semi-cylindrical tube 12.

By virtue of this system of semi-cylindrical tubes, arranged in a cross-like configuration in Figure 2, a downwardly open and upwardly closed air collecting chamber 7 is formed, the semi-cylindrical tubes 11 of which are connected to one another at the centre, and are connected to the other lateral semi-cylindrical tube 12 on the left-hand side in Figures 2 and 3.

By virtue of the sprinkler cross 8 of the casing 2, which cross is only shown in Figure 4, and which is disposed in the region of the first semi-cylindrical tube 11 according to Figure 2, four openings (not shown) are created through which four sieve openings 15 extend. They are designed to be of an approximate frustoconical configuration, but in Figure 2, which gives a plan view of the sieve bottom 6 from below, it can be seen that the cross-section thereof is substantially triangular. This is a result of the shape of the openings between the sprinkler cross 8 which are also substantially triangular. To make optimum use of the space, the sieve attachments 15 are designed such that they fill the openings to a large extent. The openings of the sieve attachments 15 are in the form of slits 16, and the flat bottom

surfaces 17 of the sieve attachments 15 are closed. The slits 16 forming the openings of the sieve bottom 6 are thus the only openings in the sieve bottoms.

Therefore, during operation, the air which is expelled from the bottom of the slits 16 can either rise at the sides of the outer walls of the casing 2, or it arrives, via the open half, at the semi-cylindrical tube 11 of the air collecting chamber 7, where, as a result of the height extent of the upper closed walls 14 of the semi-cylindrical pipe 11 it is guided directly into the lateral vertical semi-cylindrical tube 12 in the form of a chimney and is guided up and away.

In Figure 4, an opening 18 can also be seen at the top of a side wall of the casing 2, disposed at a location where the chimney-like semi-cylindrical tube 12 ends upwardly in the direction of the cover 5, in such a way that rising air flows up through the semi-cylindrical tube 12 and escapes through the opening 18 into the receiving container.

Finally, in Figure 4 it is possible to see the sectionally illustrated wedge-shaped guide spring 19 which fits exactly into the semi-cylindrical tube 12 of the insert 3, engages with the semi-cylindrical tube, but still leaves sufficient space for air flowing up in the semi-cylindrical tube 12 of the air chamber 7 to flow past this wedge-shaped guide spring 19.

If water is filled into the top of the intake funnel 1 according to Figure 4, this water penetrates through the slits of the cover 5, shown schematically, into the insert 3, and it leaves this through the sieve attachments 15 through slits 16, in order to be collected in the receiving container in Figure 4 in a purified state. The air which is entrained therein and which issues through the slits 16 in the sieve bottom 6 arrives at the air collecting chamber 7 and issues in an upward direction through the lateral semi-cylindrical pipe 12 and the opening 18. Functioning and water purification with the new apparatus are thereby considerably improved.



C l a i m s :

1. A water purification apparatus having an intake funnel (1), a casing (2) which is sealingly connected thereto, and having an insert (3) which has approximately cylindrical casing-like side walls (4), a sieve cover (5) and a sieve bottom (6), and in which a granular purifying agent can be introduced, characterised in that the sieve bottom (6) has an air collecting chamber (7) which is at least partially drawn up to the side wall (4).
2. An apparatus according to Claim 1, characterised in that the air collecting chamber (7) receives a joint face of the sieve bottom (6) and is closed towards the inside of the insert (3).
3. An apparatus according to Claim 1 or Claim 2, characterised in that the air collecting chamber (7) is in the form of open semi-cylindrical tubes (11) at the bottom and/or outside the sieve bottom (6), the tubes being joined together and joined to another approximately chimney-like semi-cylindrical tube (12) which extends at least over a part of the side walls (4).
4. An apparatus according to one of Claims 1 to 3, characterised in that the outwardly open semi-cylindrical tubes (11) of the air collecting chamber (7), which tubes are disposed in the region of the sieve bottom (6), are of a star-shaped configuration and preferably extend radially from the outer edge (13) of the sieve bottom (6) to the centre thereof.
5. An apparatus according to one of Claims 1 to 4, characterised in that the sieve bottom (6) has at least one sieve attachment (15) which extends approximately vertically from the surface thereof.
6. An apparatus according to one of Claims 1 to 5, characterised in that the air collecting chamber (7) is arranged adjacent to the, at least one, sieve attachment (15) and is sealingly connected thereto.
7. An apparatus according to one of Claims 1 to 6, characterised in that the bottom of the casing (2) arranged on the intake funnel (1) is provided with a sprinkler cross (8), through the four openings of which four sieve attachments (15) of the insert (3) are held so that they project downwardly and/or outwardly in such a way that the air collecting chamber (7) is disposed above the region of the sprinkler cross (8).



8. An apparatus according to one of Claims 1 to 7, characterised in that the air collecting chamber (7) in the region of the chimney-like semi-cylindrical tube (12) extends into the upper quarter of the side wall (4) of the insert (3), and that the casing (2) in the region of the upper end (of the semi-cylindrical tube 12) has an opening (18) for the air or gas collected to escape (Figure 4).
9. An apparatus according to one of Claims 1 to 8, characterised in that arranged on the inner side of the approximately cylindrical casing-like casing (2) is a preferably wedge-shaped guide spring (19) (Figure 4).