

The present invention relates to a filter device for domestic water systems, having a connection housing, which exhibits an inlet connection stub and an outlet connection stub, and having a filter bell which is connected to the connection housing, in which there are arranged a back-flushable, cylindrical main filter and, upstream of the main filter, a cylindrical back-flushing filter which can be shut off, and which filter bell has, at its lower end, a discharge valve for removing the dirty water which accumulates when back-flushing the main filter, said main filter being arranged coaxially on the outside on an axially adjustable carrier tube which can be brought into a position for normal operation and a position for back-flushing operation and has parts of shut-off members, of which one shut-off member is arranged on the outflow side of the back-flushing filter and the other shut-off member is arranged on the inflow side of the main filter, and, in back-flushing operation, the outflow side of the back-flushing filter being connected to that filter side of the main filter which serves in normal operation as outflow side and to the outlet connection stub of the filter device, and the inflow side thereof being connected to the inlet connection stub of the filter device, whereas that filter side of the main filter which serves in normal operation as inflow side is separated from the inlet connection stub and is connected to the discharge valve.

Such a back-flushable filter device has been disclosed, for example, in CH-A-603 213. A disadvantage with this known filter device consists, however, in the fact that the soiled main filter is only cleaned hydraulically in countercurrent and the back-flushing filter is not cleaned at all. It is, however, often the case that during back-flushing, depending on the water pressure, the dirt deposits on the main filter are first flushed away at a specific location, whereupon the entire quantity of flushing water flows through the resulting opening. The main filter is thus not cleaned uniformly and, on the subsequent changeover to normal operation, a

layer of dirt comprising residues and contaminants remains, which then disrupts operation. Tests carried out have shown that it is not possible hydraulically to free the filter surface of deposits in a satisfactory manner by back-flushing alone. The layer formed from contaminants and deposits is of irregular thickness, with the result that, when the back-flushing procedure is carried out, only the weakest point of the layer is flushed away, while the remaining, major part of the layer remains.

The object of the invention is further to develop a filter device for domestic water systems having the features mentioned in the introduction such that satisfactory cleaning, both of the main filter and of the back-flushing filter, takes place, to be precise in one and the same operation, the removal of filtered water being maintained during the back-flushing and cleaning procedure.

This object is achieved, in the case of a filter device of the generic type, in that the main filter and the back-flushing filter are arranged coaxially on the outside on a common carrier tube which, moreover, is designed as a movable part of the discharge valve and can rotate between an open position and a closed position and is, at the same time, axially adjustable, and in that there are provided, both in the region of the main filter and in the region of the back-flushing filter, cleaning brushes which are fixed in place, which engage, on the outer side of the filters, into the filter pores, which extend in the axial direction and with respect to which the filters, for mechanical cleaning of the same, are axially displaced and, at the same time, rotated owing to the adjustment of the common carrier tube.

Although WO-A-87/07850 discloses an apparatus for cleaning liquid filters, in the case of which a back-flushable, cylindrical filter is cleaned by means of brushes which are fixed in place and past which the filter surface is moved by rotating the filter, a somewhat complex control device, which is arranged outside

the filter housing and responds to a specific degree of soiling of the filter, is provided in order to initiate the back-flushing operation. The liquid consumer is not provided with further supplies during the back-flushing operation. An application of this solution of filter cleaning in a filter device according to CH-PS 603 213 would, however, necessitate too high an outlay, in particular when using it in domestic water systems. In contrast, the solution according to the invention has the advantage that, by virtue of the combined axial and rotary movement, which is easy to achieve, of the filter carrier, the control of all the valves for the initiation of the back-flushing operation as well as the cleaning movement can be carried out with comparatively low additional outlay due to a simple drive rotary movement.

An exemplary embodiment of the filter device according to the invention is described in more detail hereinbelow and is represented in the drawing, in which: Figure 1 shows a vertical section through a filter device in the operating state, and Figure 2 shows a vertical section through the same filter device during cleaning.

The filter device exhibits a connection housing 1 which has an annular inlet chamber 2, having an inlet connection stub 3, and a central outlet chamber 4 having an outlet connection stub 5. The inlet connection stub 3 and the outlet connection stub 5 are arranged equiaxially and horizontally in the use position. Furthermore, the connection housing 1 exhibits a further connection stub 6 which opens into the outlet chamber 4 and can be set up, for example, for the connection of a pressure-measuring instrument.

7 designates a filter bell which expediently consists of transparent plastic and is releasably fastened on the connection housing 1 with the aid of a union nut 8. For fastening, the union nut 8 is screwed to the external thread 9 of the connection housing 1. The union nut 8 is supported, by means of its border part 10, against a corresponding annular rib 11 of the filter bell

7 and, in this arrangement, presses the entire filter bell 7, by means of its annular end surface 12, against the planar surface 13 of the connection housing 1. A sealing ring 14 is inserted between the two surfaces 12 and 13.

The inlet chamber 2 opens annularly into the filter bell 7 and concentrically encloses the mouth of the outlet chamber 4 which is provided with a thread 15 for screwing on a guide tube 16 which extends vertically into the interior of the filter bell 7. Beneath the thread, the guide tube 16 exhibits a supporting border 17 and is provided, further down, with radial through-passages 18 which are distributed axially at the same level on the circumference of the guide tube 16. Arranged above and beneath the through-passages 18 is in each case one O-ring 19 and 20, respectively, for sealing purposes, as is explained in more detail further on. A further O-ring 21 is provided in the region of the lower end of the guide tube 16.

Provided equiaxially to the guide tube 16 is a filter carrier 22 which exhibits an annular central part 23 which is equipped with sleeve parts 24 and 25 extending upwards and downwards in the axial direction. This sleeve part 25 of the filter carrier 22 is closed off at the bottom with the aid of a base 26 which has a centrally downwardly extending spindle tube 27 with a through-opening 28. The spindle tube 27 extends through a connection stub 29 of the base part 30 of the filter bell 7, which connection stub 29 is provided with a thread, with the result that, by rotating the spindle tube 27, said connection stub is simultaneously axially displaced. By rotating the spindle tube 27, the filter carrier 22 is also rotated and axially displaced in that it carries out a helical movement together with the sleeve parts 24, 25.

The sleeve part 25 exhibits a number of through-passages 31 which are uniformly distributed on the surface of the sleeve part 25. The said sleeve part 25 serves to receive a correspondingly shaped and

dimensioned main filter 32 which comprises a wire netting and covers the entire surface of the sleeve part 25.

The upwardly extending sleeve part 24 is provided with through-passages 33 which are distributed at the same level on the circumference and, in the lower end position of the filter carrier 22 (according to Figure 1), are located beneath the through-passages 18 of the guide tube 16, whereas, after rotation and axial displacement of the filter carrier 22, they correspond radially with the abovementioned through-passages 18.

As can further be gathered from the drawing, the sleeve part 24 is provided with a correspondingly shaped and dimensioned back-flushing filter 34 which, in turn, comprises a cylindrical wire netting.

Cleaning brushes are provided in order to clean the main filter 32 and the back-flushing filter 34. The main cleaning brushes 35 comprise individual, elongate and narrow brush bodies which extend in the axial direction and are arranged in the filter bell 7 such that they are distributed along the surface of the main filter 32, on the circumference thereof. Each brush body is fastened in a strip-shaped brush carrier 35a, said brush carriers being accommodated on the inner wall of the filter bell 7 in corresponding guides such that, on rotation and axial displacement of the main filter 32, they clean the latter in that the individual brushes penetrate into the pores of the filter. For periodic cleaning or for exchanging the brushes, the latter can be drawn in the axial direction out of the guides (not shown in the drawing).

Provided for cleaning the back-flushing filter 34 are cleaning brushes 36 which are fastened on the carrying arms 37 of a brush carrier. The brush carrier comprises a carrying ring 38 and the (e.g. four) carrying arms 37 which are connected to the ring, are distributed on the circumference of the same and are combined, at their upper end remote from the carrying ring 38, with the aid of an annular retaining plate 39. The guide tube 16 extends through the circular cutout of the retaining

plate 39. The arrangement is such that the retaining plate 39 comes to bear on the supporting border 17 of the guide tube 16. The four carrying arms 37 are expediently fitted with in each case one row of cleaning brushes 36.

5 It should further be pointed out that the fixed carrying ring 38 of the brush carrier for cleaning the back-flushing filter 34 and the movable central part 23 of the filter carrier 22 together form a shut-off member in that, with the combined rotary and axial movement of
10 the central part 23, the latter ultimately comes to bear against a sealing surface 40 of the carrying ring 38 and thus forms a closure which blocks the direct inflow from the inlet chamber 2 to the main filter 32 and, further, through the through-passages 31 into the space 41. There
15 may also be provided on the central part 23, instead of the sealing surface, a sealing ring which, when the central part 23 moves upwards, interacts in a sealing manner with the carrying ring 38.

 The mode of operation of the described device is
20 as follows:

 The connection housing 1 is introduced into the water supply, i.e. into the corresponding line leading into the house, in that the inlet stub 3 and the outlet stub 5 are screwed to the corresponding water lines.
25 Water flows through the inlet stub 3 into the inlet chamber 2 and passes vertically downwards into the filter bell 7. In this arrangement, flow takes place around both the guide tube 16 and the carrying arms 37. The through-passages 33 and 18 do not correspond, with the result
30 that no water passes into the guide tube 16. In addition, the O-rings 20 and 21 have a sealing effect and prevent water, which passes into the through-passages 33, from rising or flowing away. Rather, the flow is guided downwards into the space surrounding the main filter 32
35 and, further, through the pores of the main filter 32 from the outside to the inside and, further, through the through-passages 31 into the inner space 41 of the sleeve part 25. In this arrangement, the water is filtered through the main filter 32 and, in its cleaned state,

risers vertically through the guide tube 16 into the outlet chamber 4, is deflected there and is fed through the outlet stub 5 to the consumer point. Since, in the operating position which can be seen in Figure 1, the openings 33 of the sleeve part 24 do not, as has already been mentioned, communicate with the through-passages 18 of the guide tube 16, but remain closed, the sealing rings 20 and 21 above and beneath the through-passages 33 also being used for this purpose, no water can pass through the back-flushing filter 34 and through the through-passages 33 into the interior of the guide tube 16.

As soon as cleaning of the main filter 32 appears necessary, the spindle tube 27 is rotated with the aid of a suitable device (not shown in any more detail in the drawing), e.g. by means of a hand wheel, with the result that the said spindle tube 27, in addition to being rotated, is also displaced axially, to be precise vertically upwards, as can be seen in Figure 2. By rotating the spindle tube 27, the filter carrier 22 is also rotated and displaced axially upwards. In this arrangement, first of all the two filters 32 and 34 are, with the aid of the fixed brushes 35 and 36, cleaned and freed mechanically of dirt and deposits. Furthermore, in the end position, the through-passages 33 of the sleeve part 24 coincide with the through-passages 18 of the guide tube 16, while the closure member formed by the central part 23 and the carrying ring 38 is closed. Further still, the through-openings 28 of the spindle tube 27 are opened.

In this position, which can be seen in Figure 2, the water passes out of the inlet chamber 2 into the filter bell 7, but cannot flow further downwards since the carrying ring 38 and the central part 23 are blocking the downwards path. In contrast, the path through the through-passages 33 and 18 is free. The water passes into the interior of the guide tube 16 and, from there, some of it flows upwards and some of it flows downwards into the inner space 41 of the filter carrier 22. From there,

the flow progresses through the through-passages 31 in the reverse direction, i.e. from the inside to the outside, the main filter 32 being freed of any remaining dirt and of the rest of the contaminants. The dirty water
5 falls downwards in the annular space between main filter 32 and filter bell 7 and passes through the through-opening 28 and the interior of the spindle tube 27 into a dirty-water container.

In the described manner, on rotation of the
10 spindle tube 27, the two filters, to be precise both the main filter 32 and the back-flushing filter 34, are thoroughly cleaned mechanically with the aid of the associated brushes 35 and 36, respectively. In the cleaning position, hydraulic cleaning takes place in
15 addition in that flow takes place through the main filter 32 in the reverse direction from that in normal operation. Also, the water supply is maintained during the cleaning procedure.

The described filter device is suitable, in
20 particular, for domestic water systems and guarantees optimum filter action which cannot thus be influenced by gradual blocking of the filter bodies. Rather, in addition to the back-flushing of the main filter, both the main filter and the back-flushing filter are mechanically
25 cleaned by the action of brushes. Also, the water supply is maintained during the cleaning process.

It should yet be noted that the described filter device is of very simple construction and comprises parts which can easily be replaced. A large number of the
30 constituent parts, even most of said constituent parts, may be produced from plastic, which also satisfies high hygienic requirements. The parts which are subjected to wear, e.g. the brushes, can be very easily replaced, it also being possible for the layman to carry out, in a
35 rapid and simple manner, any manipulations which are required for this purpose. The production of the filter device is simple and inexpensive, and the filter action remains intact over a long period of time.



Patent claims

1. Filter device for domestic water systems, having a connection housing (1), which exhibits an inlet connection stub (3) and an outlet connection stub (5), and
5 having a filter bell (7) which is connected to the connection housing (1), in which there are arranged a back-flushable, cylindrical main filter (32) and, upstream of the main filter (32), a cylindrical back-flushing filter (34) which can be shut off, and which
10 filter bell has, at its lower end, a discharge valve (27, 28, 29) for removing the dirty water which accumulates when back-flushing the main filter (32), said main filter (32) being arranged coaxially on the outside on an axially adjustable carrier tube (22) which can be brought
15 into a position for normal operation and a position for back-flushing operation and has parts (23; 33) of shut-off members (18, 33; 23, 28), of which one shut-off member (18, 33) is arranged on the outflow side of the back-flushing filter (34) and the other shut-off member
20 (23, 38) is arranged on the inflow side of the main filter (32), and, in back-flushing operation, the outflow side of the back-flushing filter (34) being connected to that filter side of the main filter (32) which serves in normal operation as outflow side and to the outlet
25 connection stub (5) of the filter device, and the inflow side thereof being connected to the inlet connection stub (3) of the filter device, whereas that filter side of the main filter (32) which serves in normal operation as inflow side is separated from the inlet connection stub
30 (3) and is connected to the discharge valve (27, 28, 29), characterized in that the main filter (32) and the back-flushing filter (34) are arranged coaxially on the outside on a common carrier tube (22) which, moreover, is designed as a movable part (27, 28) of the discharge
35 valve (27, 28, 29) and can rotate between an open position and a closed position and is, at the same time, axially adjustable, and in that there are provided, both in the region of the main filter (32) and in the region of the back-flushing filter (34), cleaning brushes (35,



36) which are fixed in place, which engage, on the outer side of the filters (32, 34), into the filter pores, which extend in the axial direction and with respect to which the filters (32, 34), for mechanical cleaning of the same, are axially displaced and, at the same time, rotated owing to the adjustment of the common carrier tube (22).

2. Filter device according to Claim 1, characterized in that the common carrier tube (22) of the filters (32, 34) has an annular central part (23) and an upper sleeve part (24) and a lower sleeve part (25) with base (26) and, with the aid of a spindle tube (27), is mounted in the base part (39) of the filter bell (7) such that it can rotate and be axially displaced, and in that the downwardly extending sleeve part (25) is provided, in order to receive the cylindrical main filter (32), with through-passages (31) which are distributed on the surface of the sleeve part (25).

3. Filter device according to Claim 2, characterized in that there is provided, for the carrier tube (22), a guide tube (16) which extends centrally into the interior of the filter bell (7), is located in the flow path to the outlet (5) and is screwed to the connection housing (1), in that the guide tube (16) is provided with through-passages (18) which are distributed on the circumference of this tube and, in the back-flushing position of the filters (32, 34), correspond with equivalent through-passages (33) of the upper sleeve part (24), surrounding the guide tube (16) concentrically, of the carrier tube (22), and in that the guide tube (16), above and beneath the through-passages (18), is provided with sealing rings (19, 20, 21) which seal the annular gap between the guide tube (16) and the upper sleeve part (24) of the carrier tube (22).

4. Device according to Claim 3, characterized in that, in the lower part of the filter bell (7), rod-shaped main cleaning brushes (35) are distributed, such that they are fixed in place, on the circumference of the filter bell (7).



5. Device according to Claim 4, characterized in that, above the main cleaning brushes (35), further cleaning brushes (36) for cleaning the back-flushing filter (34) are distributed on the outer circumference of the back-flushing filter (34).

6. Device according to Claim 5, characterized in that, in order to receive the cleaning brushes (36) for cleaning the back-flushing filter (34), there are provided corresponding and axially extending carrying arms (37) which are uniformly distributed on the circumference of the back-flushing filter (31) and are combined, at their lower ends, by means of a carrying ring (38) and, at the top, by a common annular retaining plate (39).

7. Device according to Claim 6, characterized in that the retaining plate (39) is arranged around the guide tube (16) and is retained, in a manner in which it cannot move axially and radially, such that it rests on a supporting border (17) of the guide tube (16).

8. Device according to Claim 7, characterized in that the spindle tube (27) has a transverse through-opening (28) which is closed off by a connection stub (29) of the base part (30) of the filter bell (7) in normal operation of the filter device and is open in back-flushing operation.

9. Device according to Claim 1, characterized in that the cleaning brushes (35, 36) are arranged in guides such that they can be exchanged.