

The invention relates to a filtering apparatus in accordance with the precharacterizing clause of Claim 1.

A filtering apparatus of this type is known (EP-B 250 695). It has the advantage that for cleaning the strainer arrangements the supply of melt to the machine downstream of the filtering apparatus, usually an extruder with attached mould, is not interrupted but - albeit at a reduced throughput - runs on continuously, so that a substantial increase in pressure in the flow channel upstream of the filtering apparatus is also avoided. However, it is disadvantageous that there is a relatively long backwashing channel which, moreover, is not flowed through continuously, so that the possibility of thermal damage to the synthetic material therein (cracking) cannot be eliminated.

In another known filtering apparatus of somewhat different construction (EP-A 314 024), four straining nests are provided in a carrier body which is displaceable in its longitudinal direction and lie in pairs one behind the other in the longitudinal direction of the carrier body. In this construction too, it is disadvantageous that parts of the channel running in the housing and used for backwashing are filled with synthetic melt in each production position but are not flowed through, and thus there is a risk of cracking.

The object of the present invention is to further improve the known apparatus, in particular as regards the simplicity of the construction and as regards the increase in the quantity of the melt volume supplied to the strainer to be cleaned, which is equivalent to an improvement in the intensity of backwashing and thus in strainer cleaning, but in particular as regards the shortness of the backwashing channel and the prevention of a synthetic melt stationary therein. This object is achieved by the invention by the features of the characterizing part of Claim 1. In this way, the melt used for backwashing, which branches off from the melt flowing to the discharge channel in the collecting space of the one straining nest, flows only in the

carrier body to the collecting space of the other straining nest to be cleaned, since the backwashing channel, which can be formed by an aperture in the partition wall, does not leave the carrier body and thus is also not guided through the housing or via the outflow channel, as is the case with the constructions described at the outset. Avoiding deflections in the melt flow used for backwashing also brings about better pressure conditions on the inflow side of the straining nest subjected to backwashing, so that a better cleaning is produced since the entire backwashing flow is concentrated at only one straining surface, which by comparison with the known constructions results in an increased flow velocity through the strainer to be backwashed and thus a better cleaning effect.

A further advantage by comparison with the known construction described at the outset resides in the fact that the filtering apparatus according to the invention is functional even with only a single carrier body, whereas, in the case of the known construction described initially, at least two carrier bodies are required. However, it goes without saying that the construction according to the invention can also be applied to apparatus having two or more carrier bodies. In the case of an apparatus having two carrier bodies each having two straining nests, with the construction according to the invention $\frac{3}{4}$ of the straining surface remains actively flowed through, whereas in the case of the known construction mentioned at the outset only half the straining surface remains actively flowed through. By comparison with the latter construction, this means that there are smaller pressure differences between the normal filtering position and the backwashing position. In the same way, the construction according to the invention can be applied to apparatus in which a single carrier body, in particular a piston displaceable in its longitudinal direction, has two or more pairs of straining nests, that is to say four or more straining nests.

Since, in the case of the construction according to the invention, the length of the backwashing channel can be kept very

small and the backwashing channel is continuously flowed through by melt, cracking of the synthetic material in the backwashing channel cannot occur.

A requirement which is always made in the case of backwashing filters is a maximum backwashing flow through the filter to be cleaned in order to achieve good cleaning with only a slightly reduced overall throughput through the filtering apparatus. As emerges from the above, the invention already takes a step in this direction. However, the conditions can be further improved in accordance with a preferred embodiment of the invention. This improvement takes as its starting point the realization that backwashing partial filter surfaces fulfils the conditions mentioned even better. Taking this realization as a starting point, a further development of the invention consists in the fact that different backwashing positions of the carrier body are provided for backwashing different partial regions of the strainer of the respective straining nest, which partial regions are delimited by at least one wall which divides the distributor space of the respective straining nest, leads to the respective strainer and in particular is normal thereto. Any number of these partial regions or the walls associated therewith can be chosen, but for reasons of clarity and simple construction only two partial regions per strainer are recommended. Here, in accordance with a further development of the invention, there is provided for each straining nest a number of inflow channels which corresponds to the number of its strainer partial regions, each of which inflow channels opens into the respective compartment of the distributor space which is associated with the respective strainer partial region, all these inflow channels being connected in the filtering position to the common supply channel, whereas in each backwashing position in each case one of these inflow channels for each straining nest to be cleaned serves to guide away the impurities, whereas the rest of these inflow channels are closed off.

Further features and advantages of the present invention will

emerge from the description of an embodiment, which is illustrated diagrammatically in the drawing. Fig. 1 shows the apparatus in the filtering position, in section through the axis of the carrier body, the latter however being illustrated in side view. Fig. 2 shows the apparatus in accordance with Fig. 1, in section along the line II-II of Fig. 1. Figs. 3 and 4 are sections similar to Fig. 1 and Fig. 2 respectively, but show the apparatus in the backwashing position for the left-hand half of the straining nest at the bottom in Fig. 4. Figs. 5 and 6 are sections similar to Fig. 3 and Fig. 4 respectively, but show the apparatus in the backwashing position for the right-hand half of the straining nest at the bottom in Fig. 6. Figs. 7 and 8 show sections similar to Figs. 1 and 2 respectively, but with a somewhat modified embodiment of the central partition wall between the two straining nests.

The apparatus has a housing 1 which has a supply channel 2 for the thermoplastic synthetic material to be filtered and a discharge channel 3 for the filtered material. On the way from the supply channel 2 to the discharge channel 3, the material flows through a carrier body 4 in the form of a rotational cylinder which is longitudinally displaceable in the direction of its axis 6 in a cylindrical bore 5 in the housing 1. Embedded in the carrier body 4 is a strainer arrangement 7 which has two straining nests 8, 9, each of which comprises two perforated plates between which there lies a filtering insert for filtering the synthetic material. The material to be filtered is supplied to the straining nests 8, 9, in the filtering position of the apparatus (Figs. 1, 2), by means of inflow channels 10, 11 and 12, 13 respectively, which open into distributor spaces 14 and 15 lying in front of the straining nests 8 and 9 respectively. Behind the straining nests 8, 9, as seen in the direction of flow of the melt during the filtering procedure, there lie collecting spaces 16, 17 for the melt, out of which spaces the melt flows through outflow channels 18 and 19 respectively into the discharge channel 3, which is common to both outflow channels, in the direction of the arrows 20. The two inflow channels 10,

11 and 12, 13 of the two straining nests 8 and 9 respectively lie on either side of a central wall 21 which runs normal with respect to the surface of the strainer of the respective straining nest 8, 9 and extends from this strainer as far as the periphery of the carrier body 4, with the result that this wall 21 supports the associated strainer by way of a perforated plate 31 during backwashing, the perforated plate 31 being inserted into a depression 32 in the carrier body 4 with the other components of the straining nest 8, 9. The wall 21 divides the associated distributor space 14 and 15 respectively into two mutually similar compartments 14', 14" and 15', 15" respectively.

The two collecting spaces 16, 17 are separated from one another by a partition wall 22 which runs transversely with respect to the axis of the carrier body 4 and through which a central bore, forming a backwashing channel 23, or an aperture which connects the two collecting spaces 15, 16 passes.

On the side of the supply channel 2, the housing 1 also has two channels 24, 25, each of which serves to remove impurities which have been separated out during backwashing. These channels 24, 25 can lead into a collecting space (not illustrated) for taking up these impurities, or to the outside.

The two outflow channels 18, 19 are offset relative to one another in the direction of the axis 6 by a pitch T (Fig. 1). The spacing T is dimensioned such that in the filtering position illustrated in Figs. 1 and 2 the orifices of both outflow channels 18, 19 are covered by the inlet opening of the discharge channel 3. A funnel-shaped widening of the discharge channel 3 towards the two channels 18, 19 facilitates this. The same pitch T is found on the inlet side, the orifices of the inflow channels 10, 11 and 12, 13, which are arranged in pairs, also being offset relative to one another in the direction of the axis 6. Here too, the arrangement is such that the orifices of these four inflow channels 10 to 13 are entirely covered at the wall of the carrier body 4 in the filtering position (Figs. 1, 2) by the

orifice, widened in the shape of a funnel, of the supply channel 2, with the result that the melt to be filtered is supplied uniformly to all four compartments 14', 14", 15', 15" of the distributor spaces 14, 15. This melt flows through the two filters of the straining nests 8, 9 and is cleaned thereby, and the cleaned melt flows through the outlet channels 18, 19 into the discharge channel 3.

The carrier body 4 cannot be rotated about its axis 6 but can be displaced in the direction of this axis 6 as desired into one of four backwashing positions, of which two are illustrated in Figs. 3, 4 and 5, 6 respectively, namely the backwashing position in which the left-hand half of the straining nest 9 is cleaned (Figs. 3, 4) and the one in which the right-hand half of this straining nest 9 is cleaned (Figs. 5, 6). In the backwashing position in accordance with Figs. 3, 4, the carrier body 4 is displaced downwards out of the filtering position illustrated in Figs. 1, 2 far enough for on the one hand the outflow channel 19 to be closed off by the inner wall 26 of the housing 1, against which the carrier body 4 is guided longitudinally displaceably, and on the other hand for the inflow channels 12, 13 to be closed off. However, the inflow channel 12 is connected to the channel 25 and thus serves as a channel for impurities to be guided away out of the left-hand compartment 15' of the distributor channel 15. The synthetic melt to be cleaned, supplied in the direction of the arrow 27, can thus emerge from the supply channel 2 only into the inflow channels 10, 11 and flows in the direction of the arrow there into the two compartments 14', 14" of the distributor space 14. The melt supplied there passes through the strainer of the straining nest 8 and is cleaned during this, and some of it flows through the outlet channel 18 into the discharge channel 3, from which it flows in the direction of the arrow 28 to the point of use, for example to a screw extruder with attached mould. The rest of the melt flows out of the collecting space 16 in the direction of the arrow through the backwashing channel 23 into the collecting space 17 of the straining nest 9. Since the inflow channel 13 associated with the right-hand compartment

15" of the distributor space 15 is closed off (see Fig. 3), the melt from the collecting space 17 can only emerge through the left-hand half of the strainer of the straining nest 9 into the distributor space 15. For this reason, only the left-hand half of the straining nest 9 is washed by the cleaned melt supplied from the backwashing channel 23 and the impurities caught in this strainer half are freed from the strainer half by this washing melt, are entrained in the direction of the arrow by the flowing melt and are guided through the inflow channel 12, which now acts as an outflow channel, into the channel 25, in which they are guided away in the direction of the arrow 29, e.g. to the said collecting space. As can be seen, during this cleaning procedure, restricted to the left-hand half of the straining nest 9, the supply of melt to the system attached to the discharge channel 3 is maintained and only a small pressure difference is produced in the discharge channel 3 between the normal filtering position (Figs. 1, 2) and the backwashing position (Figs. 3, 4). Since only half the straining nest 9 is washed, the clean melt flow supplied through the backwashing channel 23 is concentrated in this left-hand strainer half, so that twice the flow velocity of the melt and thus an improved cleaning effect are produced through this strainer half.

Similar conditions occur when the right-hand half of the straining nest 9 is to be backwashed. For this purpose, the carrier body 4 is displaced into the position illustrated in Figs. 5 and 6, in which - as in the case of the position in accordance with Figs. 3 and 4 - the outflow channel 19 is closed off with respect to the discharge channel 3 and the inflow channels 12, 13 are also closed off with respect to the supply channel 2. Unlike the position in accordance with Figs. 3 and 4, in the backwashing position in accordance with Figs. 5 and 6 the inflow channel 13 is connected to the channel 25. The melt supplied to the point of use flows, as in the case of the backwashing position in accordance with Figs. 3 and 4, in the direction of the arrow 27 through the supply channel 2 into the two inflow channels 10, 11, from there into the two compartments

of the distributor space 14, passes through the straining nest and flows through the outflow channel 18 into the discharge channel 3. In the collecting space 16, some of the cleaned melt which has passed through the straining nest 8 is branched off and flows through the backwashing channel 23 into the collecting space 17, from which this melt can only pass through the right-hand half of the straining nest 9 into the right-hand compartment 15" of the distributor space 15. The melt flowing at increased velocity through the right-hand strainer half entrains the impurities into the inflow channel 13, from which the impurities are guided away in the direction of the arrow 29 through the channel 25.

The conditions for backwashing the upper straining nest 8 are similar to the previously described backwashing positions in accordance with Figs. 3, 4 and 5, 6 respectively: for backwashing the half of the straining nest 8 lying on the left in Fig. 2, the carrier body 4 for the strainer arrangement 7 has only to be displaced such that although the outflow channel 19 is connected to the discharge channel 3, the outflow channel 18 is not. Furthermore, the two inflow channels 12, 13 must be connected to the supply channel 2 and the supply channel 10 must be connected to the channel 24. The melt used for cleaning the left-hand strainer half then flows out of the supply channel 2 through the two inflow channels 12, 13 into the distributor space 15 and through the straining nest 9 into the collecting space 17 where some of the melt flows to the discharge channel 3. The rest of the cleaned melt flows through the backwashing channel 23 into the collecting space 16 of the straining nest 8, flows through the left-hand half thereof, in doing so cleans the latter and guides the impurities entrained by the melt away through the inflow channel 10 into the channel 24.

The conditions for cleaning the right-hand half of the straining nest 8 are similar; the inflow channel 11 merely has to be brought into connection with the channel 24.

As can be seen, although the carrier body 4 has to be movable into different positions, it does not necessarily have to be displaceable in the longitudinal direction for this purpose. Rather, it is quite possible to achieve the described switching on or off of the individual channels also by rotating the carrier body 4 about its axis 6.

As can be seen, the two straining nests 8, 9 are inserted into appropriate recesses in the carrier body 4 having mutually parallel strainer surfaces. This forms a clear, easily producible arrangement and facilitates assembly and disassembly. However, in order to achieve particular flow conditions, it would also be conceivable to embed the two straining nests 8, 9 in the carrier body 4 in an approximate V-shaped arrangement, just as more than two straining nests can also be provided. It is also possible for each straining nest to be divided into more than two partial regions for backwashing, for which purpose the arrangement of the walls 21 and the channels 10 to 13 merely has to be appropriately multiplied. The use of compartments of the same size into which the distributor spaces are divided is recommended for reasons of uniformity, in particular as regards the throughput discharged through the discharge channel 3, but is not absolutely necessary.

The ratio of the melt flows which flow out of the respective collecting space into the discharge channel 3 and into the backwashing channel 23 respectively during backwashing, or the ratio of the backwashing flow to the complete synthetic material flow flowing through the apparatus is substantially determined by the channel cross-sections. By inserting various choke bodies in these channels, in particular in the backwashing channel 23, the corresponding throughput resistances can be influenced or controlled. A replaceable choke member 30 constructed as a choke nozzle is indicated diagrammatically in Fig. 2. If appropriate, a choke member of this type can also be adjustable as regards its throughflow cross-section.

The variant embodiment illustrated in Fig. 7 and 8 differs from the embodiment described above merely in that the partition wall 22 lying between the two collecting spaces 16, 17 is of thinner construction, in particular in the central portion of the partition wall. As a result of this, on the one hand even more favourable flow conditions are produced for the synthetic material melt, and on the other hand the length of the backwashing channel 23 is limited to a minimum. This backwashing channel 23 thus only needs to be as long as is necessary for securely mounting the choke member 30. The short length of the backwashing channel 23 also facilitates assembly of the choke member 30 and the accessibility thereof for the purpose of replacement or cleaning.

The embodiments illustrated in the drawing are illustrated each with a single supply channel 2 and discharge channel 3 for the sake of simplicity. In practice, it is usually more favourable to provide more than one supply channel 2 and discharge channel 3, in which case the connection conditions mentioned merely have to be ensured.

Claims:

1. Filtering apparatus for thermoplastic synthetic material, having a housing (1) in which at least one supply channel (2) for the material to be filtered and at least one discharge channel (3) for the filtered material are provided, and having at least one carrier body (4) which is guided in the housing (1) such that it is displaceable between a filtering position and a backwashing position, the carrier body (4) being for a strainer arrangement (7) which has at least two straining nests (8, 9), wherein in the filtering position distributor spaces (14, 15) which are arranged on the inflow side of the straining nests (8, 9) are connected by way of inflow channels (10, 11, 12, 13) to the supply channel (2) or supply channels and collecting spaces (16, 17) arranged on the outflow side of the straining nests (8, 9) are connected by way of outflow channels (18, 19) to the discharge channel (3) or discharge channels, and in the backwashing position filtered material is guidable from the collecting space (16, 17) of one straining nest (8, 9) by way of a backwashing channel (23) into the collecting space (16, 17) of another straining nest (8, 9) to be cleaned and, in the event of the outflow channel (18, 19) of this other straining nest (8, 9) being closed, this filtered material is guidable, together with the impurity, through the distributor space (14, 15) of this other straining nest (8, 9) out of the apparatus, characterized in that different backwashing positions of this carrier body (4) are provided for the straining nests (8, 9) located in the same carrier body (4), and the backwashing channel (23) arranged entirely in the carrier body (4) passes through a partition wall (22) of the carrier body (4), lying between the two straining nests (8, 9), and connects directly to one another the collecting spaces (16, 17) of the two straining nests (8, 9) of the same carrier body (4).

2. Filtering apparatus according to Claim 1, characterized in that different backwashing positions of the carrier body (4) are provided for backwashing different partial regions of the

strainer of the respective straining nest (8 or 9), which partial regions are delimited by at least one wall (21) which divides the distributor space (14 or 15) of the respective straining nest (8 or 9), leads to the respective strainer and in particular is normal to the surface of this straining nest.

3. Filtering apparatus according to Claim 2, characterized in that there is provided for each straining nest (8, 9) a number of inflow channels (10, 11 and 12, 13) which corresponds to the number of its strainer partial regions, each of which inflow channels (10, 11 and 12, 13) opens into the respective compartment (14', 14" and 15', 15") of the distributor space (14 and 15) which is associated with the respective strainer partial region, all these inflow channels (10 to 13) being connected in the filtering position to the common supply channel (2), whereas in each backwashing position in each case one of the inflow channels associated with the straining nest to be cleaned serves to guide away the impurities and the other inflow channels associated with this straining nest are closed off.

4. Filtering apparatus according to Claims 2 and 3, characterized in that there is one removal channel (24, 25) for removing impurities in the housing (1) for each straining nest (8, 9), one of which removal channels (24, 25) being connected to a respective inflow channel (10 to 13) in each of the backwashing positions of the carrier body (4), whereas the other removal channels are closed off by the wall of the carrier body (4).

5. Filtering apparatus according to one of Claims 2 to 4, characterized in that each carrier body (4) is a piston mounted displaceably in its longitudinal direction in the housing (1) and having at least two straining nests (8, 9) opposite one another on either side of its axis (6), of which straining nests (8, 9) each has one outflow channel (18 or 19) and at least two of its own inflow channels (10, 11 and 12, 13), which lead to at least two compartments (14', 14" and 15', 15"), which are preferably

approximately the same size, of the distributor space (14 and 15) associated with the respective straining nests (8 and 9), adjacent compartments being separated from one another in each case by a wall (21), and the inflow channels (10, 11 and 12, 13) extending from points on the piston outer surface offset with respect to one another in the axial direction, in the filtering position the orifices of all the inflow channels (10 to 13) being covered by the supply channel (2) and the orifices of the two outflow channels (18, 19) being covered by the discharge channel (3).

6. Filtering apparatus according to Claim 5, characterized in that the orifices of the inflow channels (10 to 13) are offset with respect to one another in the axial direction of the piston forming the carrier body (4) by the same amount as the orifices of the outflow channels (18, 19).

7. Filtering apparatus according to one of Claims 1 to 6, characterized in that the straining nests (8, 9) have mutually parallel straining surfaces.

8. Filtering apparatus according to one of Claims 1 to 7, characterized in that two mutually similar carrier bodies (4) each having two straining nests (8, 9) are arranged in a common housing (1).

9. Filtering apparatus according to one of Claims 1 to 7, characterized in that a single carrier body (4) carries more than two, in particular four, straining nests (8, 9).

10. Filtering apparatus according to one of Claims 1 to 9, characterized in that a choke member, which may be adjustable, in particular an adjustable or replaceable choke nozzle (30), is arranged in the backwashing channel (23) and/or in the removal channel (24, 25) for removing impurities.