APPARATUS FOR FILTERING A MATERIAL AND A BLOW CONDUIT USED IN CONNECTION THEREWITH

Abstract: The present invention relates to an apparatus for filtering a material and a blow conduit for use in connection therewith. According to a preferred embodiment of the invention the apparatus may be utilized e.g. in the causticizing process of the pulping industry for separating lime mud and liquor. Especially the invention relates to the construction of the filtrate valve and the blow conduit of the filtering device used in the filtering.
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Apparatus for filtering a material and a blow conduit used in connection therewith

The present invention relates to an apparatus for filtering a material and a blow conduit used in connection therewith. According to a preferred embodiment of the invention the apparatus may be utilized e.g. in the causticizing process of the pulping industry for separating lime mud and white liquor. Especially the invention relates to the construction of the blow conduit used in connection with the filtrate valve of the filtering device used in the filtering process.

The present invention relates to an apparatus, which may be e.g. a pressurized disc filter, as presented in Fig. 1 or US-patent 4,929,355. The apparatus according to the invention may, of course, be applied in both an atmospheric disc filter and various drum filters. Said pressurized disc filter comprises a pressure-proof substantially cylindrical casing positioned horizontally so that a horizontal shaft may be arranged between the closed pressure ends of the cylinder.

Discs, preferably formed of sectors, are arranged on the shaft with a spacing from each other, said discs being preferably formed of sectors, as is known from various publications handling with disc filters, e.g. US-patent 3,948,779. Further, as known from prior art, said shaft is preferably provided with as many channels in the axial direction as there are sectors in the discs, as also disclosed in the latter US-patent. The purpose of said channels is to lead the filtrate passed into the discs through their perforated surfaces, covered with a filter cloth, out of the device via a filtrate valve/filtrate valves arranged either at one end of the shaft or both ends of the shaft. Additionally, chutes are arranged in the lower part of the device, on the descending portion of the discs and on both sides of the discs which chutes in most cases extend approximately to the height of the shaft of the filtering device. The deposited material is removed from the discs into these chutes by appropriate means and these chutes lead the precipitated material out of the device. This has been presented in e.g. the above mentioned US patent 4,929,355.

Said removal means may comprise various mechanical scrapers or liquid or gas sprays, by means of which the precipitated material is scraped off the perforated surface of the
discs/sectors. This removal is often assisted by arranging a pressurized air blow via the
discs, the channels in the shaft and the filtrate valve for blowing off material from each
sector surface being in the blow zone.

In some cases, e.g. in white liquor and lime mud filters, the material is filtered upon a
so-called precoat layer. In such a case, in a normal running situation, the lime mud cake
is scraped off the precoat layer by means of a scraper or liquid sprays and gas blow is
used only when renovating the precoat layer.

In a pressurized filter the filtering process is often intensified by arranging both positive
pressure inside the shell of the filtering device and suction inside the filter discs. Said
suction can be arranged by means of e.g. a suction leg, a vacuum pump or the like ar-
ranged in connection with filtrate discharge.

The filtrate valve mentioned above is a significant component in view of the operation
of said device, which filtrate valve in a prior art device is as illustrated in Figure 2. The
filtrate valve is a device by means of which multiple filtrate flows from the rotating
shaft of the filtering device are combined to form one filtrate discharge flow passing via
one stationary discharge pipe. Further, by means of the filtrate valve the blow for re-
leasing material is directed via the filtrate channel of the shaft to filter sectors from
which material is being removed. One of the problems in this prior art solution has been
e.g. the non-rotating wear plate of the filtrate valve, which plate has had ports with the
same spacing and radial distance from the center line of the shaft as there are filtrate
channels on the shaft and which is tightly pressed against the end of the shaft, or more
precisely, against the wear plate arranged at the end of the shaft. Said problem is further
complicated by the fact that, as seen in Fig. 1, the internal pressure of the pressure shell
of the device can extend its effect to almost the whole surface area of the filtrate valve,
pressing the valve onto the end of the shaft, whereby the sliding surfaces of the wear
plates are subjected to a significant pressure load.
A specific lubrication system has been developed for said construction, by means of which system lubricant, preferably grease, is guided between the wear plate of the end of the shaft and the wear plate of the filtrate valve for increasing the lifetime of the sliding surfaces and ensuring the sealing. The lubrication system requires a separate device, which forms an additional object of maintenance. A failure of the system or insufficient maintenance may lead to lubricant run-off, which results in accelerated wearing and shortened replacement interval of the wear plate. The replacing of the wear plate is a demanding task, because said wear plate is located inside the pressure shell of the filtering device and, further more, behind the whole filtrate valve. Thus, in order to replace the wear plate, all liquid and other conduits at the end of the shaft have to be dismantled, the service access of the filtrate device at the end of the shaft has to be opened and the whole filtrate valve removed before it is possible to change the wear plate. Additionally, proactive service is not possible, as it is not possible to check the condition of components demanding maintenance without dismantling the filtrate valve.

By means of the construction according to a preferred embodiment of the present invention the filtrate valve is separated from the pressurized space of the filtering device so that the condition of the filtrate valve may be monitored during the operation of the filtering device. At the same time said solution also makes it possible to substantially simplify the construction of the filtrate valve compared to prior art filters.

When utilizing the apparatus according to the present invention, the maintenance is simplified, as the filtrate valve is connected to the pressure shell of the apparatus. This new solution allows locating the filtrate valve on the outer surface of the shell, whereby the monitoring and maintenance may be carried out via inspection glasses and holes on the outer surface of the shell. In the new solution, the component corresponding to the wear plate may be serviced from outside the filter without dismantling the shaft and the bearing assemblies. One additional advantage worth mentioning is if the filtrate valve is located on the outer surface of the filter casing and a new central shaft is changed, the capacity of the filtering device may be increased by adding to the end of the filtering device in place of the old filtrate valve at least one filter disc.
Above mentioned problems are solved by means of the apparatus according to the present invention, the purpose of which is to
- substantially simplify the construction of the device,
- substantially facilitate the maintenance of the apparatus by allowing the maintenance to be carried out from outside the pressure casing,
- decrease the production costs of the apparatus,
- decrease the service and maintenance costs,
- eliminate the need for grease lubrication,
- make the use of the internal space of the pressure casing of the filtering device more efficient, because according to the invention the filtrate valve may be connected to the pressure casing of the filtering device, whereby more filtering surface may be arranged inside the pressure casing, and
- allow the functions to be carried out either with or without blow depending on the construction of the central shaft.

It is possible to achieve said purposes with an apparatus, the characteristic features of which are disclosed in the appended claims.

In the following, the apparatus according to the invention is described in more detail with reference to the accompanying figures, of which
Fig. 1 illustrates a prior art pressurized disc filter
Fig. 2 illustrates a prior art filtrate valve,
Fig. 3 illustrates a filtrate valve and blow conduit in section via line A – A of Fig. 5, both according to a preferred embodiment of the invention
Fig. 4 illustrates a filtrate valve and blow conduit according to a second preferred embodiment of the invention,
Fig. 5 illustrates a filtrate valve according to Fig. 3 seen from the direction of the end of the filtering device,
Fig. 6 illustrates a filtrate valve and blow conduit according to a third preferred embodiment of the invention,
Fig. 7 illustrates the construction of a blow conduit according to a preferred embodiment of the invention, and
Fig. 8 illustrates the construction of a blow conduit according to a second preferred embodiment of the invention.

The prior art pressurized disc filter 10 illustrated in Fig. 1 comprises a pressure proof essentially cylindrical shell 12 positioned horizontally so that a horizontal shaft 18 may be arranged between the closed pressurized ends 14 and 16 of the cylinder. Discs 20, preferably formed of sectors, are attached on said shaft 18, positioned in a distance from each other, as known from various publications describing disc filters. Further, as known from prior art, said shaft is provided with preferably axial channels 22, the number of which equals the number of sectors in the disc 20. The purpose of said channels 22 is to lead from the discs 20 the filtrate passed into the internal space of the discs 20 through their perforated surface out of the device 10 via filtrate valve 24 arranged at the end of the shaft 18. Additionally, chutes are arranged at the bottom part of the device, on the descending side of the discs 20 extending most usually approximately to the height of the shaft 18 of the filtering device, to which chutes the material deposited on the discs 20 is removed from the discs by appropriate means 28 and which chutes 26 lead the deposited material out of the device 10. Said removing means 28 may comprise various mechanical scrapers or liquid or gas sprays, by means of which the deposited material is scraped off the perforated surface of the discs/sectors 20, which is covered by a filter cloth. This removal is often assisted by means of pressurized air blow via the discs 20, the channels 22 in the shaft 18 and the filtrate valve 24, by means of which blow material is blown off from each sector surface being in the removal zone.

In a pressurized filter the filtering is often intensified by arranging both positive pressure inside the shell of the filtering device and suction inside the filter discs. Said suction can be arranged e.g. by means of a suction leg or the like arranged in connection with filtrate discharge. For the construction described in the above, this has the disadvantage that the filtrate valve is completely located inside the pressure shell, whereby practically all measures connected with the maintenance inevitably require opening the pressure shell
and taking all measures in connection therewith. In the illustration of Fig. 1 it is also seen, how the internal pressure of the pressure shell of the filtering device may affect the surface of the filtrate valve on the right hand side of the valve to a remarkably greater extent than on the left hand surface of the valve. This leads to great loading caused by pressure on the wearing surfaces between the non-rotating valve and the rotating shaft.

Fig. 2 illustrates in more detail the construction of a prior art filtrate valve 24. The filtrate valve 24 comprises a body 30 located inside the pressure shell of the filtering device and is supported by adjusting rods 32 onto a flange 34 at the end of the filtering device, which flange forms part of the pressure casing of the filtering device. In the center of the body 30 of the filtering device 24 there is arranged an opening for the shaft of the discs so that the bearing application of the shaft may be arranged e.g. in connection with the flange 34 at the end. The body 30 is further provided with a wear plate 36 located against the corresponding wear plate 38 arranged at the end of the shaft 18 of the filtering device. By means of the adjustment rods 32 and springs preferably arranged in connection therewith, the force pressing the wear plates together may be regulated. The main purpose of the wear plates 36 and 38 is to form a sealing between the rotating shaft 18 and the body 30 of the non-rotating filtrate valve 24. In practice, by means of said wear plates a sealing is formed which keeps the pressurized space of the filtering device and the subatmospheric pressure space inside the filtrate valve apart, thus ensuring the operation of the device. In one construction the wear plate located on the side of the shaft and rotating together with the shaft is provided with a port for each filtrate channel of the shaft. The only essential feature of the wear plate 38, though, is that it keeps the filtrate channels bringing in filtrates apart from the filtrate channel, wherethrough pressurized air is blown onto the discs for removing material from the perforated surface of a certain sector/s of the discs. Just accordingly, the wear plate 36 may be provided with openings for each filtrate channel, but most usually the wear plate 36 comprises kind of two rings having different diameters, which rings are connected by a sealing section surrounding the blow opening and additionally by a few essentially radial bridges arranged only for strengthening the construction.
In the construction illustrated in the figure, the body 30 of the filtrate valve 24 further comprises an annular space 40 inside the conical surface, into which space the filtrate channels 22 open via wear plates 36 and 38. In the construction according to the figure, the annular space 40 is defined on the side opposite the wear plate 36 by a substantially radial disc 42, onto which disc the adjustment rods 32 with their springs are supported. In the lower part of the space 40 there is arranged an opening 44 and in the opening a blow conduit 46, wherethrough the filtrate is led out from the filtrate valve 24 and the filter 10. The filtrate valve 24 is further provided with a second conduit 48, which leads through the disc 42 directly to the wear plate 36. Via said conduit 48, material is blown off from the surface of the disc.

Figure 2 illustrates also how the shaft of the filtering device extends with a smaller diameter, through the body of the filtrate valve essentially up to the flange 34. In the construction according to the figure, there is a conical casing 50 attached on the flange 34, which casing extends to the vicinity of the shaft and covers inside it both the actual mechanical sealing and the bearing assembly of the shaft in relation to the flange 34.

In some constructions the filtrate valve is further provided with a second filtrate discharge, which in practice means that the internal space of the body 30 is divided to at least two spaces separated from each other and the wear plate/s is/are constructed so that part of the filtrate channels open through them to each of said spaces of the filtrate valve. Naturally, one additional opening leading via the wear plates is needed for the blow air. It is also possible to arrange in the filtrate valve a chamber for the blow air, in which case the blow air conduit ends at the disc 42.

The construction becomes especially complicated in case of a so-called preclean filter, in which the blow is used only to remove the so-called preclean layer from the filtrate surface. Because the preclean layer is removed from the filtrate surface relatively seldom, said filtrate channel on the shaft used for the blow has to be used for filtrate removal always when preclean removal is not taking place. This means that the blow conduit of the filtrate valve has to be connected, on one hand, to the pressurized air piping in order
to allow the blow and, on the other hand, to the filtrate removal devices for leading the
filtrate out of the apparatus.

Fig. 2 illustrates also how each of the conduits has been connected to its own pipeline by
means of a flexible joint, the purpose of which is to allow small motions required by the
adjustment rods of the filtrate valve.

It is seen from Fig. 1 and also from Fig. 2 that all constructions on the right hand side of
the filtrate valve, such as adjustment rods 32, the bearing assemblies of the shaft and the
sealings thereof, remain exposed to the effect of the material being treated. In practice
this means that lime mud or some other material being filtered is accumulated in layers
e.g. on the adjustment rods 32 hampering the operation of the rods 32.

It has to be stated about the construction illustrated in the Figure that all conduits, ad-
justment rods and the like leading through the flange are located in a pressurized space,
which requires especially thorough sealing of their inlets in the flange. This leads to ex-
pensive and in many cases also excessively complicated constructions. That is the case
especially if the material to be treated is some hot and/or corrosive chemical.

The filtrate valve comprises additionally devices not shown in the Figure. These include
e.g. pipes feeding lubricant between the wear plates and sealing water channels required
by the mechanical sealing of the shaft.

Figure 3 illustrates a filtrate valve 124 according to a preferred embodiment of the in-
vention, which valve is meant to be used in new filters or filters renewable by slightly
increased investments. It comprises a flange attached at the end of the filtering device,
extruding from which flange there is a body 130, which in the embodiment of the Figure
is essentially conical (from the point of manufacturing technique, a hexagonal, octago-
nal or cylindrical form would be more preferable). At the farther end of said body, seen
from the device, which end in this embodiment is the more tapered one, there is ar-
ranged a bearing application 132 and sealing 134 of the shaft 118. In other words, com-
pared to the solution shown in Fig. 2, in which solution the filtrate valve was located in
the pressurized space inside the pressure shell of the apparatus, the filtrate valve ac-
cording to the invention is located in connection with the pressure shell, whereby the
filtrate valve may be serviced from outside the pressure shell.

The sealing 140 between the flange 126 and the shaft 118 is arranged at the inner edge
of the flange 126, by means of which sealing the internal space 142 of the filtrate valve
is thus isolated from the pressurized internal space of the filtering device. In the em-
embodiment of the Figure the sealing is effected so that a relatively narrow ring 138 is at-
attached at the inner edge of the flange 126 and a glide sealing 140 known per se is ar-
ranged between the inner circumference of the ring and the surface of the shaft 118 lo-
cated in a distance therefrom. In other words, the pressure prevailing in the internal
space 142 of the filtrate valve is essentially equal to the pressure in the filtrate channels
122 of the shaft or further under the filtering surfaces. Unlike the prior art construction
shown above in Figure 2, in the embodiment of Figure 3 the filtrate channels 122 of the
shaft 118 open directly into the internal space 142 of the filtrate valve 124 without any
filtrate valve or the like with a pair of wear plates located at the end of the shaft. From
space 142 the filtrate is led out via a conventional filtrate conduit 144. In addition to the
radial embodiment of Fig. 3, the sealing between the shaft 118 and the flange 126 can as
well be effected by means of axial sealing.

Even though the construction of the embodiment of figure 3 to some extent resembles
the prior art solution of Figure 2, the distinct difference is that in the prior art solution
the filtrate valve had no kind of communication with the outer shell of the filtering de-
vice, but was located completely in the pressurized internal space of the filtering device.
That resulted in earlier described disadvantages, which have been eliminated by means
of the solution according to the invention by arranging the filtrate valve to be partially
defined by the outer casing of the filtering device or even to form a part thereof.

Further Figure 3 illustrates how the removal apparatus, i.e. the blow apparatus, for the
filtered material or the precoat layer comprises a blow conduit 150 preferably attached
to the cover 154 of the service access 152 arranged in the body 130 of the filtrate valve 124 so that the whole blow apparatus may be readily removed without the need to remove any other component. This is an essential advantage compared to the earlier solution, in which the whole filtrate valve and in connection therewith the whole bearing application and sealing of the other end of the filtering device as well as the filtrate piping had to be removed in order to remove the wear plates of the filtrate valve from the shaft.

Thus, the blow apparatus comprises a blow conduit 150, the end of which conduit inside the filtrate valve 124 is located within a distance from the front surface 156 of the shaft 118. Said end of the conduit 150 inside the filtrate valve is provided with a sealing 158, by means of which the connection between the conduit 150 and the filtrate channel 122' of the shaft in the blow stage opening into the front surface 156 is sealed to be essentially airtight. According to a preferred embodiment of the invention, said sealing 158 is arranged to be movable so that the sealing 158 is pressed against the front surface 156 of the shaft only for the time of the blow. Thus the dragging between the sealing 158 and the front surface 156 is minimized, which naturally means minimizing the wearing of both the sealing and the front surface. The transfer of the sealing 158 to the sealing position may be effected e.g. by means of a pneumatic cylinder 160. If desired, the cylinder may also be a double-action cylinder, which means that the cylinder 160 may also be used for quick removal of the sealing from the front surface 156 of the shaft. The same function may also be effected by spring-actuated return of the cylinder. Naturally it is possible to utilize other transfer methods as well, of which e.g. various electrical methods may be mentioned. Further, the material of the sealing may now more readily be chosen so that it will not need separate lubrication required by prior art construction. Further, it is naturally possible to arrange a sliding surface or wearing plate on the front surface of the shaft, against which surface or plate the sealing 158 is pressed. Preferably the material of said sliding surface has been chosen so that the friction properties of it are as compatible as possible with the corresponding property of the sealing 158 in order to minimize the sliding friction during the blow and, respectively, the wearing.
The filtrate valve construction presented in Figure 3 may also be applied for modernizing older filters. In such a case, both the filtrate valve and the shaft of the filtering device need to be replaced, because in the earlier construction the filtrate channels of the shaft of the filtering device open to the end of the shaft far inside the filtering device. However, there are good reasons for said kind of modernization. Completely depending on both the general construction of the filtering device and the dimensioning of the old filtrate valve, the shaft of the new filtering device may be provided with one or more new filter discs, whereby the capacity of the filtering device may be significantly increased. Thus the implementation of the solution according to the invention may eliminate the need to purchase a whole new filtering device, since the required capacity increase can be realized by adding one or two new discs in the filter.

Figure 4 illustrates a solution according to a second preferred embodiment of the invention, which solution makes it possible to replace the prior art filtrate valves presented in Figure 2 with the filtrate valve according to the present invention. It is a so-called direct retrofit solution, in which the filtrate valve often demanding laborious maintenance has been replaced with a solution having longer maintenance intervals and being essentially more maintenance-friendly than earlier solutions. In the illustration of Figure 4, the parts and components known already in connection with Figure 3 are shown by the same two-digit reference numbers but replacing the preceding “1” with a “2”.

The solution of Fig. 4 is based on separating the filtrate valve, or in this case more likely the end of the shaft 218, from the rest of the internal space of the filtering device so that there is no need for a filtrate valve as such for leading filtrates from the filtrate channels into a suction channel or suction leg any more. Said separation is effected by arranging according to this figure a conical casing 264 between the shaft 218 and the flange 226 attached to the end of the filtering device. In sealing said stationary casing 264 in relation to the rotating shaft 218, a radial sealing 240 may be applied between the shaft and the casing 264, in this Figure conical, which extends from the flange 226 towards the interior of the filtering device. Naturally, many other sealing solutions are possible, the only essential issue being that they maintain the pressure difference between the internal
space of the filtering device and the internal space 242 of the filtrate valve and naturally also prevent the material to be filtered from entering the internal space 242 of the filtrate valve.

As a matter of fact, this Figure is the most illustrative in showing the differences between the prior art technique and the technique according to the present invention. When the prior art technique required that the whole inner and outer circumferences of the filtrate channels of the shaft have to be sealed by slide sealing, the solution according to the invention requires only one slide sealing for separating the filtrate space from the pressurized space. Nevertheless, the solution according to the invention is in practice a simple and reliable construction, which even in its basic configuration has a significantly longer service life than said prior art sealing.

If the sealing required by the blow is made so that is may be opened as in the figure, whereby the sealing surfaces are not in touch with each other the whole time, the service life of the sealing will be essentially increased compared to known solutions.

Fig. 5 illustrates a filtrate valve according to Fig. 3 seen from the end. In addition to some details of Fig. 3, the Figure illustrates also two service accesses 146 with covers 148, wherethrough the internal constructions of the filtrate valve 124, including the blow conduit and the device in connection therewith for moving the sealing, are readily accessible, if required. Further, the casing of the filtrate valve may be provided with one additional opening with a cover straight above the shaft, whereon the shaft may be supported when the sealing and/or bearing assemblies thereof require servicing.

Fig. 6 illustrates a filtrate valve 324 and blow conduit 350 according to a third preferred embodiment of the invention. The construction in question is applicable mainly to the applications of Fig. 3, i.e. new installations or major modernizations, in which constructions the filtrate valve 324 is located essentially completely outside the end wall of the apparatus. Unlike earlier embodiments, the body 330 attached to the flange 326 of the filtrate valve is cylindrical, although it may naturally be also polygonal or even conical,
as illustrated earlier in Fig. 3. In the solution of the Figure, the internal space 342 of the filtrate valve has been separated from the internal space of the filtering device by means of radial sealing 340 which in the embodiment of the Figure is formed of two sealing rings 340’ and 340’’ pressed in place by a pusher 341. In this embodiment the blow conduit 350 is formed of a pipe 351 extending directly through the end wall 331 of the filtrate valve and a pipe 353 connected to pipe 351 from the side direction, which pipe 353 also leads through the end wall 331.

Fig. 7 illustrates a blow conduit 550 according to a preferred embodiment of the invention. Actually the blow conduit in question is applicable to be used e.g. in connection with the filtrate valve presented in connection with Figure 6. The blow conduit of the Figure is formed of pipes 551 and 553 attached to the end flange 531 of the filtrate valve 524, either directly to the flange itself or to an opening in the cover of the flange (which is a more maintenance-friendly arrangement). Inside the pipe 551 there is arranged a plunger 555, the pipe 551 having a sealing ring 558 arranged at the end thereof extending to the internal space 542 of the filtrate valve 524. An opening is arranged in the wall of the pipe 551, to the edges of which opening the pipe 553 is attached. The plunger 555 is mainly hollow so that only the end of the plunger extending inside the pipe 551 is completely closed. The pipe 551 is connected to a pressure medium source, preferably to a pressurized air system, so that the pressure of the pressure medium system may be led inside the pipe 551 when desired. In such a situation the plunger 555 moves to the left and seals the internal space 557 of the plunger and the filtrate channel 522 on the shaft. As the plunger moves to the left, the opening leading through the wall of the plunger into the hollow internal space 557 of the plunger is opened so the pressurized air from the pipe 553 is free to extend its effect via the internal space of the plunger and the filtrate channel into the inside of the sectors of the filtering device at the blow phase.

Even though the Figure does not illustrate any special device or arrangement for returning the plunger from the sealing position back to position shown in the Figure, it may naturally be easily realized, if desired. One way is to arrange a spring between the plunger 555 and the pipe 551 so that when the plunger is moved to the left in the pipe
the spring is tightened, and when the pressure from the pipe 551 is released, the spring returns the plunger to the position shown in the figure. Naturally, a second way would be to arrange in connection with the plunger also means for returning the plunger to its initial position by utilizing a pressure medium.

Fig. 8 illustrates a blow conduit 650 according to yet another preferred embodiment of the invention. In this embodiment the end flange or end plate of the filtrate valve is provided with a flange 652 and attached thereto is a small-sized actuating cylinder 654, inside which cylinder there is a pipe 656 wherethrough the blow air is led under the filtering surface. A sealing ring 658 is arranged at the end of the pipe 656 according to the embodiment presented earlier. A ring 660 sealed in relation to both the pipe 656 and the actuating cylinder 654 is arranged surrounding the pipe 656 and attached thereto, which ring 660 together with the pipe 656 acts as plunger for the cylinder 654. A channel 662, 664 for the pressure medium is arranged at each end of the cylinder, the pressure medium being led sequentially to each end of the cylinder 654 in order to move the sealing ring 658 against the end surface of the shaft and apart from it. Preferably an elongated pipe 666 is arranged in connection with the cylinder 654, which pipe acts both as guiding member for the pipe 656 of the blow conduit and sealing of the internal space of the filtrate valve in relation to the flange 652 attached to the end plate of the filtrate valve and the pipe 656 (sealing ring 668). In practice the described device operates so that when a pressurized air flow into the filtrate channel of the shaft is desired, pressure medium is led to the outer end of the cylinder 654, whereby pipe 656 moves inside the cylinder to the left and the sealing ring 658 seals the flow connection with the shaft. Just accordingly, when the flow connection close-off is desired, pressure medium is led to the inner end of the cylinder 654, whereby the blow conduit moves to the right apart from the sealing connection. Due to the function mode it is obvious that the blow conduit has to be fastened by means of a flexible tube element 670 or a telescopic connection to the blow air source.

About the embodiment of Fig. 8 it may further be stated that the cylinder 654 may be attached, in addition to the flange attached to the end plate of the filtrate valve, also di-
rectly to the end plate, thus eliminating the manufacture of one extra component. Further, it is worth noticing that the blow conduit of Fig. 8 is readily removed from inside the filtrate valve, at least when the opening in the end plate of the filtrate valve is made large enough for the sealing ring 658 to be removed via the same opening. This kind of construction of the blow conduit is very user- and maintenance-friendly, as also the pressure medium conduits 662 and 664 required for transferring the pipe 656 are outside the filtrate valve.

As seen from the above, the invention has succeeded in developing a very reliable and dependable filtrate valve construction and blow conduit. The reliability is very strongly based on minimizing the size and number of wearing components in the device, as well as the time they are exposed to wearing. As already mentioned before, the method and apparatus according to the invention may be utilized in connection with both disc and drum filters. Said apparatuses may also be either pressurized or under atmospheric pressure. And further, the materials being treated may be either fiber suspensions of the wood processing industry, various liquors, lime mud or some other liquid or suspension requiring filtering. It has to be noted from the above, that the constructions presented are only exemplary solutions among the many variation inside the scope of the invention determined by the appended claims.
CLAIMS

1. Apparatus for filtering a material comprising one or several filtering surfaces arranged on a rotating shaft (118, 218), which filtering surface/s is/are arranged at least partly submerging into the material suspension being filtered, channels (122, 122', 222', 522) for leading the filtrate off the filtering surface/s arranged in connection with said shaft (118, 218), a filtrate valve (124, 224, 324, 524) for leading the filtrate from said filtrate channels (122, 122', 222', 522) located in connection with the shaft (118, 218) to outside the apparatus, and devises in connection with the filtrate valve (124, 224, 324, 524) for effecting return blow via at least one filtrate channel (122', 222', 522) for cleaning part of the filtering surface, said devices comprising a conduit (150, 250, 350, 550) for introducing blow air to the filtrate valve (124, 224, 324, 524), characterized in that said blow air conduit (150, 250, 350, 550, 650) has been sealed detachably with a filtrate channel (122', 222', 522) being in the blow phase and opening into the internal space (142, 242, 342, 542) of the filtrate valve (124, 224, 324, 524) so that in connection with said blow conduit (150, 250, 350, 550, 650) there are arranged devices (160, 260, 555, 654) for continuously opening and closing said sealing.

2. Apparatus according to claim 1, characterized in that said sealing comprises a sealing (158, 258, 558, 658) arranged at the end of the blow conduit (150, 250, 350, 550, 650) located in the internal space (142, 242, 342, 542) of the filtrate valve (124, 224, 324, 524).

3. Apparatus according to claim 2, characterized in that said sealing (158, 258, 558, 658) may be moved by means of a transfer device (160, 260, 555, 654) between the sealing position and the position detached from the surface to be sealed (156).

4. Apparatus according to claim 1, characterized in that said devices (150, 158, 160; 250, 258, 260; 350, 351, 353; 550, 551, 553, 555, 558; 650, 656, 658) for effecting the return blow may be removed from inside the filtrate valve (124, 224, 324, 524) via a service access (152).
5. Apparatus according to claim 3, characterized in that said transfer device (160, 260, 654) is a pneumatic cylinder.

6. Apparatus according to claim 3, characterized in that said transfer device is a plunger (555) arranged inside the pipe (551) forming part of the blow conduit (550).

7. Apparatus according to claim 3, characterized in that said transfer device comprises a cylinder (654) arranged in connection with the end plate of the filtrate vale, via which cylinder a pipe (656) belonging to the blow conduit (650) is led.

8. Apparatus according to claim 7, characterized in that a ring (660) acting as the plunger of the cylinder is attached outside said pipe (656) inside the cylinder (654).

9. Blow conduit for use in connection with a disc or drum filter for cleaning the filtering surface or part thereof, said blow devices comprising a conduit (150, 250, 350, 550, 650) for introducing blow air to a filtrate channel (122’, 222’) arranged in connection with the shaft of said filter, characterized in that said blow conduit comprises a sealing (158, 258, 558, 658), by means of which the blow conduit (150, 250, 350, 550, 650) is sealed subsequently in relation to each filtrate channel (122’, 222’) for leading the air flow from the conduit (150, 250, 350, 550) to the filtrate channel (122’, 222’) and devices (160, 260, 555, 654) for continuously closing and opening said sealing.

10. Valve according to claim 9, characterized in that said closing and opening devices (160, 260, 555, 654) are actuated by a pressure medium, electrically or by a spring.

11. Apparatus according to claim 9, characterized in that said closing and opening device is a plunger (555) arranged inside the pipe (551) forming part of the blow conduit (550).
12. Apparatus according to claim 9, characterized in that said closing and opening device comprises a cylinder (654) arranged in connection with the end plate of the filtrate valve, via which cylinder a pipe (656) belonging to the blow conduit (650) is led.

13. Apparatus according to claim 9, characterized in that a ring (660) acting as the plunger of the cylinder is attached outside said pipe (656) inside the cylinder (654).
Fig. 8
**INTERNATIONAL SEARCH REPORT**

**A. CLASSIFICATION OF SUBJECT MATTER**

**IPC7:** B01D 33/48, B01D 33/82

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

**IPC7:** B01D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE, DK, FI, NO classes as above

Electronic database consulted during the international search (name of database and, where practicable, search terms used)

**EPO INTERNAL**

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

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<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
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<td>A</td>
<td>WO 9606667 A2 (PYROX, INC.), 7 March 1996 (07.03.96), page 9, line 26 - page 11, line 30</td>
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<td>GB 887095 A (AUTOMATIC COAL CLEANING COMPANY LIMITED), 17 January 1962 (17.01.62)</td>
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<td>A</td>
<td>US 4180461 A (SIGMUND C. LANGVIK), 25 December 1979 (25.12.79)</td>
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<tr>
<td>A</td>
<td>US 3948779 A (CLIFFORD E. JACKSON), 6 April 1976 (06.04.76)</td>
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Further documents are listed in the continuation of Box C. See patent family annex.

- * Special categories of cited documents
  - "A" document defining the general state of the art which is not considered to be of particular relevance
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  - "O" document referring to an oral disclosure, use, exhibition or other means
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  - "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
  - "X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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  - "&" document member of the same patent family

**Date of the actual completion of the international search:** 21 November 2001

**Date of mailing of the international search report:** 23-11-2001

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