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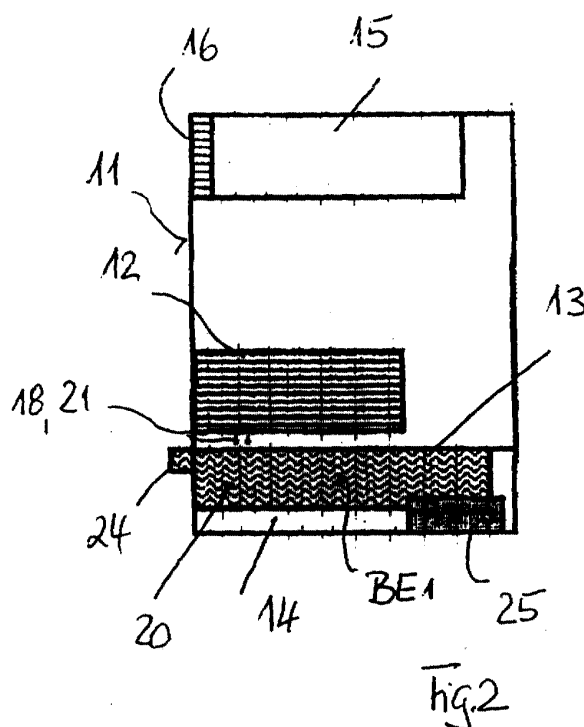
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(54) **Condensation tumble dryer with heat exchanger and condensate collecting device**

(57) The invention relates to a condensation laundry dryer (10), having a heat exchanger (12) and a condensate collecting means (20) beneath the heat exchanger (12) as well as a bottom assembly (13) provided with operational units and airflow channels for the process air and the cold air. With a uniform basic structure for

the condensation laundry dryer (10) and two different assemblies, which are insertable in accommodation chambers of the dryer housing (10), as well as a condensate collecting vessel (20), the basic structure can easily be selectively completed with a different condensate collecting means.



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Description

[0001] The invention concerns a condensation tumble dryer with a heat exchanger and a condensate collecting device below the heat exchanger and also an under-structure comprising functional units and air conduction ducts for the processing air and the cooling air.

[0002] This embodiment of condensation heat exchanger is known from DE-AS 23 07 912 and EP 0 434 169 A2. The condensation tumble dryers differ in the embodiment of the condensate collecting device.

[0003] In the case of the condensation tumble dryer in accordance with DE-AS 23 07 912, a collection vessel is provided below the heat exchanger, which collects the condensation water that drains from the heat exchanger. The collecting vessel is removable and is flexibly supported on a weighing system. Once the level in the collecting vessel reaches a certain height, the collecting vessel will have dropped so far against the spring resistance, that it activates a switch device through a lever mechanism and switches off the condensation tumble dryer. The weighing system only releases the switching device and hence the condensation tumble dryer operation, once the collecting vessel has been removed, emptied and replaced. This known condensation collection device is simple and cost-effective but rather unwieldy to handle, since the collection vessel is arranged in the base of the dryer casing.

[0004] In the case of the condensation tumble dryer in accordance with EP 0 434 169 A2, fitted below the heat exchanger is a sump vessel from which a pump extracts the collected condensation water and feeds it to a collecting vessel. This collecting vessel is arranged in the upper area of the dryer casing and is therefore easy to access and remove. In this case, the pump is also assigned a switching device, which specifies the point at which the collecting vessel should be emptied and guarantees safe operation of the condensate collecting unit. This condensate collecting device is therefore more costly in terms of components and installation.

[0005] In the case of both condensate collecting devices, the understructure is matched specifically to the system used. This means that there are two different embodiments of condensate tumble dryer.

[0006] The task of the invention is to create a condensate tumble dryer of the embodiment mentioned above, which as an option can be fitted with one of the known systems of condensate collecting devices and whereby it is also possible to modify the condensate collecting device at a later date.

[0007] This task is solved in accordance with the invention, in that the understructure transfers the condensate water that drains from the heat exchanger to a condensate outlet, such that in the area of the understructure in the dryer casing, a first mounting chamber is created for the fitting of a module, which has a condensate inlet that can be coupled to the condensate outlet of the understructure or alternatively fitted in a first embodi-

ment with a collecting vessel with weighing system and switching device or in a second embodiment with sump vessel, pump and switching device and such that in the dryer casing, a second mounting chamber is created for an additional condensate collecting vessel, which is only fitted and connected to the pump outlet when the unit with pump is being operated in the second mounting chamber.

[0008] The dryer casing fitted with the two mounting chambers can alternatively be fitted with various components, so that the basic structure of the two condensate collecting devices remains identical. This is a significant advantage in the manufacture of condensation washer-dryers with various condensate collecting devices, since it is only the use of the module with collecting vessel, weighing system and switching device or module with sump vessels, pump, switching device and also a collecting vessel that determines the ultimate embodiment of the condensation tumble dryer. Since the requisite components are easy to remove and replace, the condensate collecting device can also be changed at a later date. Hence, the components can be designed to have specific functions, whilst at the same time being combined into one component group.

[0009] The first condensate collection device proposes that the first mounting chamber is arranged below the understructure and is open towards the front of the dryer casing and that the used module, used with its condensate inlet sealed, is coupled to the condensate outlet of the understructure. Thus, a sealed bridge is achieved between the understructure and the collecting vessel, such that in the condensate outlet of the understructure, a sealing element with sealing faces is supported around the condensate inlet on the used module and that the module in the area of the coupling point is bolted to the understructure or is held under pressure at this point.

[0010] The signal required to empty the collecting vessel is achieved in that in a first embodiment, the module, with the collecting vessel angled away from the condensate inlet and supported by a spring component, can be adjusted, limited in dependence of the condensation water level and that at a given position, the switching device is actuated and the tumble dryer switched off. Once switched-off, it is not possible to operate the dryer again until the collecting vessel has been removed, emptied and replaced. The collecting vessel in the lower position controls the switching device via a lever mechanism, once it has carried out a certain adjustment, on the basis of the level of the collected condensate water.

[0011] In the case of the second type of condensate collecting device, which has the second module embodiment, the sump vessel is fitted with a siphon and, angled away from condensate inlet, transferred into a chamber into which the pump is fitted. The seal between the understructure and the sump vessel can be achieved in the same way as when using the module with collecting vessel.

[0012] In order to achieve an optimum use of space within the dryer casing, in the case of one embodiment, the weighing system and the switching device and the pump with switching device are adapted to the empty space below the understructure.

[0013] The handling of the condensate collecting device is simplified by making the mounting areas accessible from the front of the dryer casing. This can also improve the optimum overall impression of the condensate tumble dryer, if the embodiment is such that the module fitted inside the first mounting area, in the first embodiment, encloses the first mounting chamber in the front area and is fitted with a handle, and that the collecting vessel fitted inside the second mounting chamber, encloses the second mounting chamber in the front area itself or by means of a panel and is fitted with a handle, which means that when using a first embodiment module, the front of second mounting chamber is sealed by means of a panel.

[0014] The invention is explained in more detail by way of one of the embodiments illustrated in the drawings. The following are shown:

Fig. 1: a schematic of the basic embodiment of the condensation tumble dryer,

Fig. 2: a schematic of the condensation tumble dryer with the first module comprising collecting vessel, weighing system and switching device,

Fig. 3: a schematic of the condensation tumble dryer with the second module comprising sump vessel, pump and switching device and also the additional condensate collecting vessel,

Fig. 4: the connection between the collecting vessel and the understructure,

Fig. 5: the transition between the collecting vessel and the weighing system with switching device

Fig. 6: the connection between the sump vessel and the understructure, and

Fig. 7: the pump with switching device fitted into the sump vessel.

[0015] In Fig. 1, the dryer casing designated with 10 has the two mounting chambers 14 and 15, which are accessible from the front 11. Of the usual functional units in the condensation tumble dryer, only the components essential to this invention - the heat exchanger 12 and the understructure 13 arranged below - are stated. The understructure provides for the mounting of functional units such as blower, heater and to complete the ducting system for the processing and cooling air. The first

mounting chamber 14 is created below the understructure, whilst the second mounting chamber 15 is arranged in the upper part of the dryer casing 10. This basic structure as shown in Fig. 1, which is complete apart from the condensation collecting device, is now used for two embodiments of condensation tumble dryers.

[0016] As Fig. 2 shows, the condensation tumble dryer can be fitted with a first embodiment of condensate collecting device, which has a first module BE1 with collecting vessel 20 and weighing system 25, as described in more detail by Figs. 4 and 5. This first module BE1 is used in the first mounting chamber 14, wherein fitting and removal is simplified by way of a handle 24, which is fitted in the area of the front side 11 on the wall of the first module BE1 which encloses the first mounting chamber 14. Once the first module BE1 is in the fitted condition, the condensate outlet 18 of the understructure 13 is coupled to the condensate inlet 21 of the collecting vessel 20, so that the condensation water which drains from the heat exchanger 12 and which is collected above understructure 13, is transferred to the collecting vessel 20 of the first module BE1. The unoccupied second mounting chamber 15 is covered with a panel 16.

[0017] The basic structure shown in Fig. 1 can however also be fitted with a second embodiment of condensate collecting device, as shown in Fig. 3. In this case, a second module BE2 comprising sump vessel 40 with pump 45 and switching device 48 is fitted into the first mounting chamber 14. The understructure 13 is coupled to sump vessel 40 in exactly the same way as indicated by reference numbers 18 and 41, wherein 41 is the condensate inlet on the sump vessel 40. A panel 17 can be used to cover the first mounting chamber 14 with the fitted second module BE2. Fitted into the second mounting chamber 15 is an additional condensate collecting vessel 55, which is connected to the pump outlet 47 of pump 45, as shown by the connection 50 and the connecting lugs 56 of the condensate collecting vessel 55. Thus, the connection 50 can also comprise an overflow pipe, which when a set filling level in the condensate collecting vessel 55 is reached, returns the rest of the condensate water to the sump vessel 40. All the requisite functions are controlled by the second module BE2, as indicated by the switching device 48. The condensate collecting vessel 55 is also fitted with a handle 57 in the area of the front side 11.

[0018] The partial view shown in Fig. 4 comprises a section of the heat exchanger 12 and the understructure 13 arranged below in the area of the front side. The understructure 13 collects the condensate water that drains from the heat exchanger 12 and transfers it via a condensate outlet 18 to the condensate inlet 21 of the collecting vessel 20. Thus, the understructure 13 has a drilled hole, into which a sealing element 19 is inserted, which is supported on and sealed to a sealing face around the condensate inlet 21 of the collecting vessel 20. The collecting vessel 20 is supported on a section

22 of the dryer casing, which is fitted with a sloping insert 23. Hence, the collecting vessel 20, by inserting into the first mounting chamber 14, presses flush against the sealing element 19. The handle 24 of the collecting vessel 20 projects somewhat beyond the front side 11 of the dryer casing 10.

[0019] As Fig. 5 shows, the first module BE1 has a weighing system 25 with switching device 30, wherein the collecting vessel 20 can be removed from the weighing system 25 and the switching device 30. The end of the collecting vessel 20 angled away from the condensate inlet 21 is supported on an adjuster 26, which is held on section 26 by a spring 27. The lower end of the spring 27 is supported on a casing 29 of the weighing system 25. The adjuster 26 controls along a set path a lever mechanism 28, which actuates the switching device 30. This results in the condensation tumble dryer being switched off, if the collecting vessel 20 is holding the set level of condensate water and has to be emptied. The collecting vessel 20 can now be emptied. As is clearly seen, only the collecting vessel 20 can be removed, wherein the end of the collecting vessel 20 releases its contact with adjuster 26. The structural embodiment of the weighing system 25 with switching device can be varied. It should simply be noted that the opposing sides of weighing system 25 and understructure 13 are modified to suit each other.

[0020] In the case of the second type of condensate collecting device, fitted into the first mounting chamber 14 is a second module BE2, which comprises a sump vessel 40 with siphon, as shown in Figs. 6 and 7. The sump vessel 40 with the condensate inlet 41 is sealed by the sealing element 19 in the same way. Since the module BE2 can continue to remain in the first mounting chamber 14, in the area of the condensate inlet 41, the sump vessel 40 is bolted to the understructure 13. After the siphon, the sump vessel forms a chamber 49, fitted into which is the pump 45 with the switching device 48. The outlet 47 of the pump 45 is accessible from within the understructure 13, which means that the connection 50 as shown in Fig. 3 to the condensate collecting vessel 55 fitted into the second mounting chamber 15 can be produced.

[0021] The opposite sides of pump 45 and switching device 48, and also understructure 13 are modified to suit each other and can be fitted with securing elements for a solid, releasable securing of module BE2. Controlled by the switching device 48, the running wheel 46 of pump 45 extracts the condensate water from the sump vessel 40 which it transfers to the outlet 47 and through the connection 50 to the condensate collecting vessel 55 in the second mounting chamber 15.

Claims

1. Condensate tumble dryer with a heat exchanger and a condensate collecting vessel below the heat

exchanger and also an understructure with functional units and air conduction ducts for the processing and cooling air, characterised in that

the understructure (13) transfers the condensate water that drains from the heat exchanger (12) to a condensate outlet (18), such that in the area of the understructure (13) in the dryer casing (10), a first mounting chamber (14) is created for the fitting of a module (BE1 or BE2), which has a condensate inlet (21) that can be coupled to the condensate outlet (18) of the understructure (13) and either in a first embodiment, fitted with a collecting vessel (20) with weighing system (25) and switching device (30) or in a second embodiment fitted with sump vessel (40), pump (45) and switching device (48), and that in the dryer casing (10), a second mounting chamber (15) is created for an additional condensate collecting vessel (55), which is only fitted in the second mounting chamber (15) and connected with the pump outlet (47) if the module (BE2) with pump (45) is fitted.

2. Condensation heat exchanger in accordance with Claim 1, characterised in that

the first mounting chamber (14) is arranged below the understructure (13) and is open to the front side (11) of the dryer casing (10), and that the fitted module (BE 1) with its condensate inlet (21) is coupled flush to and sealed with the condensate outlet (18) of the understructure (13).

3. Condensation tumble dryer in accordance with Claim 2, characterised in that

fitted into the condensate outlet (18) of the understructure (13) is a sealing element (19) with sealing faces, that the sealing faces are supported on the condensate inlet (21) on the fitted module (BE1 or BE2), and that in the area of the coupling point, the module (BE1 or BE2) is bolted to the understructure (13) or held under pressure against the same.

4. Condensation tumble dryer in accordance with one of the Claims 1 to 3, characterised in that

in the first embodiment, the module (BE 1),with the collecting vessel (20) angled away from the

condensate inlet (21) and supported by a spring element (27), can be finitely adjusted in dependence of the level of the condensate water, and

that at a set position, the switching device (30) is actuated and the tumble dryer is switched off. 5

5. Condensate tumble dryer in accordance with one of the Claims 1 to 3, characterised in that 10
with the second embodiment of module (BE 2), the sump vessel (40) is fitted with a siphon and, angled away from the condensate inlet (41), is transferred to a chamber (49) into which the pump (45) is fitted. 15

6. Condensation tumble dryer in accordance with Claim 4, characterised in that 20
the weighing system (25) and the switching device (30) and the pump (45) with switching device (30) are adapted to the empty space below the under-structure.

7. Condensation tumble dryer in accordance with Claim 5, characterised in that 25
the pump (45) with switching device (48) and the understructure (13) angled towards each other are modified to suit each other. 30

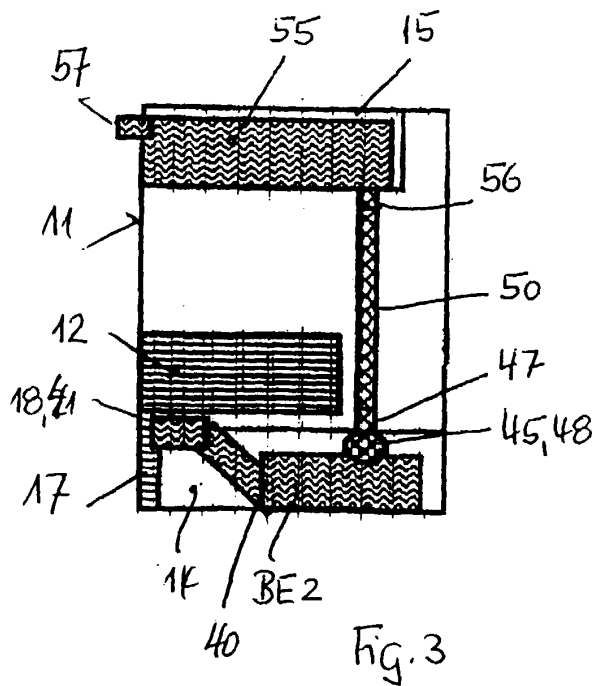
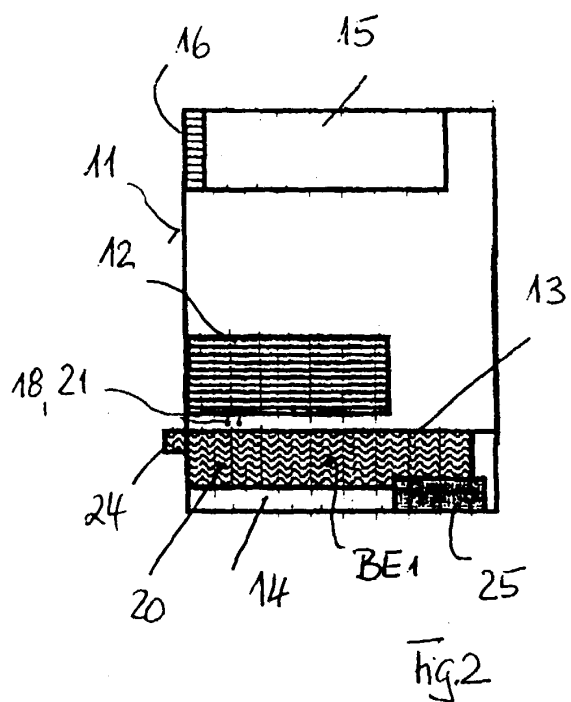
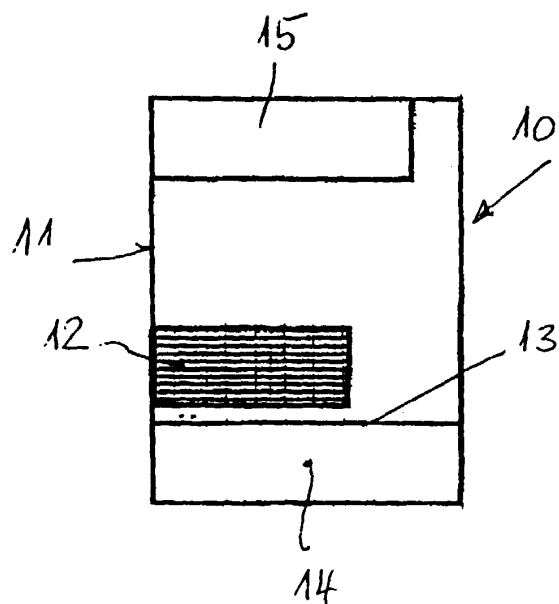
8. Condensation tumble dryer in accordance with one of the Claims 1 to 7, characterised in that 35
the mounting chambers (14, 15) are accessible from the front side of the dryer casing (10).

9. Condensation tumble dryer in accordance with Claim 8, characterised in that 40
the first embodiment of module (BE 1) fitted into the first mounting chamber (14) encloses the first mounting chamber (14) in the area of the front side (11) and is fitted with a handle (24).

10. Condensation tumble dryer in accordance with Claim 8, characterised in that 45
the collecting vessel (55) fitted into the second mounting chamber (15) encloses the second mounting chamber (15) in the area of the front side (11) either itself or by means of a panel (17) and is fitted with a handle (57). 50

11. Condensation tumble dryer in accordance with Claim 10, characterised in that 55
when fitting the first embodiment of module (BE 1), the second mounting chamber (15) is sealed in the

area of the front side (11) by a panel (16).



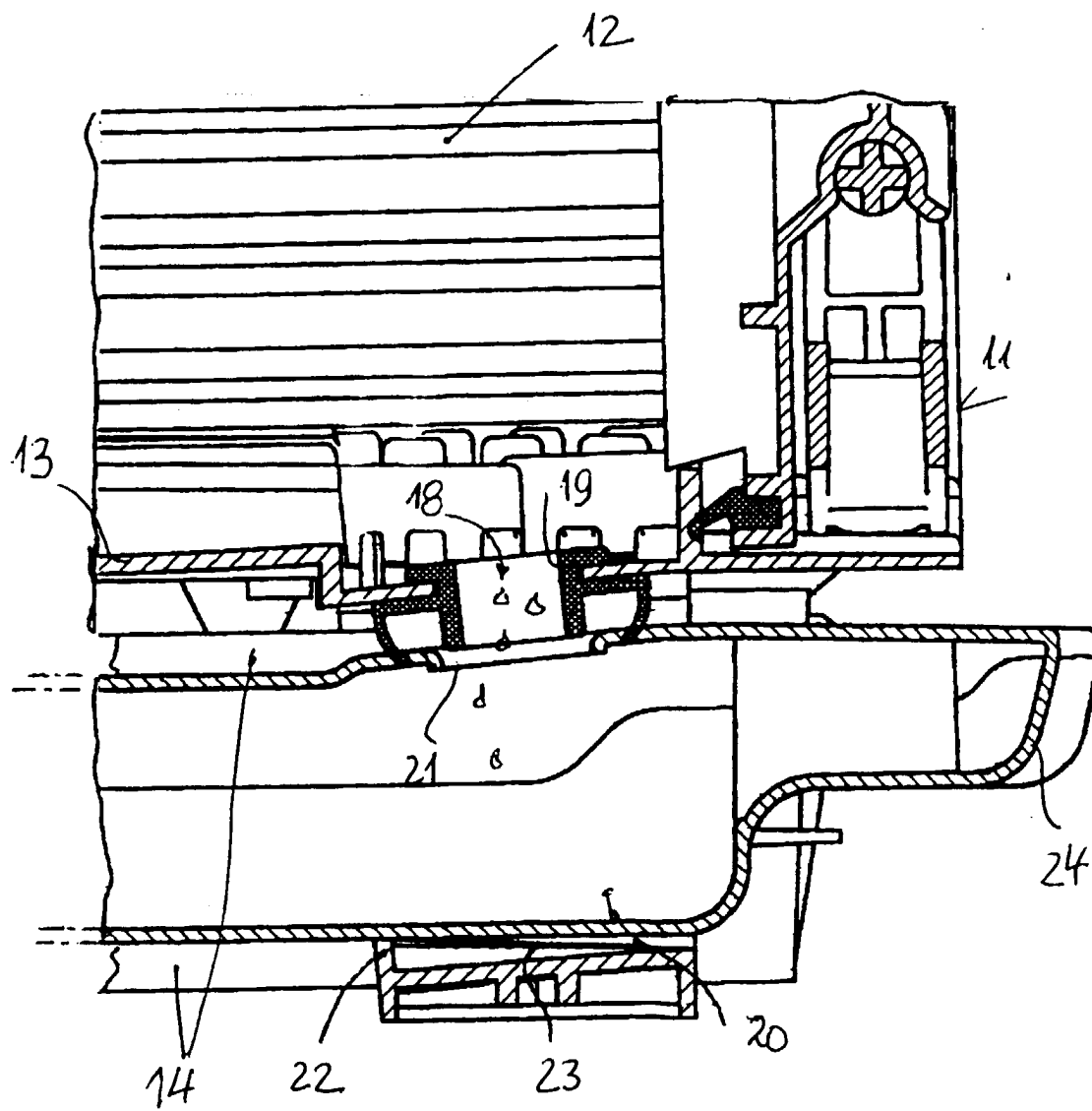


Fig 4

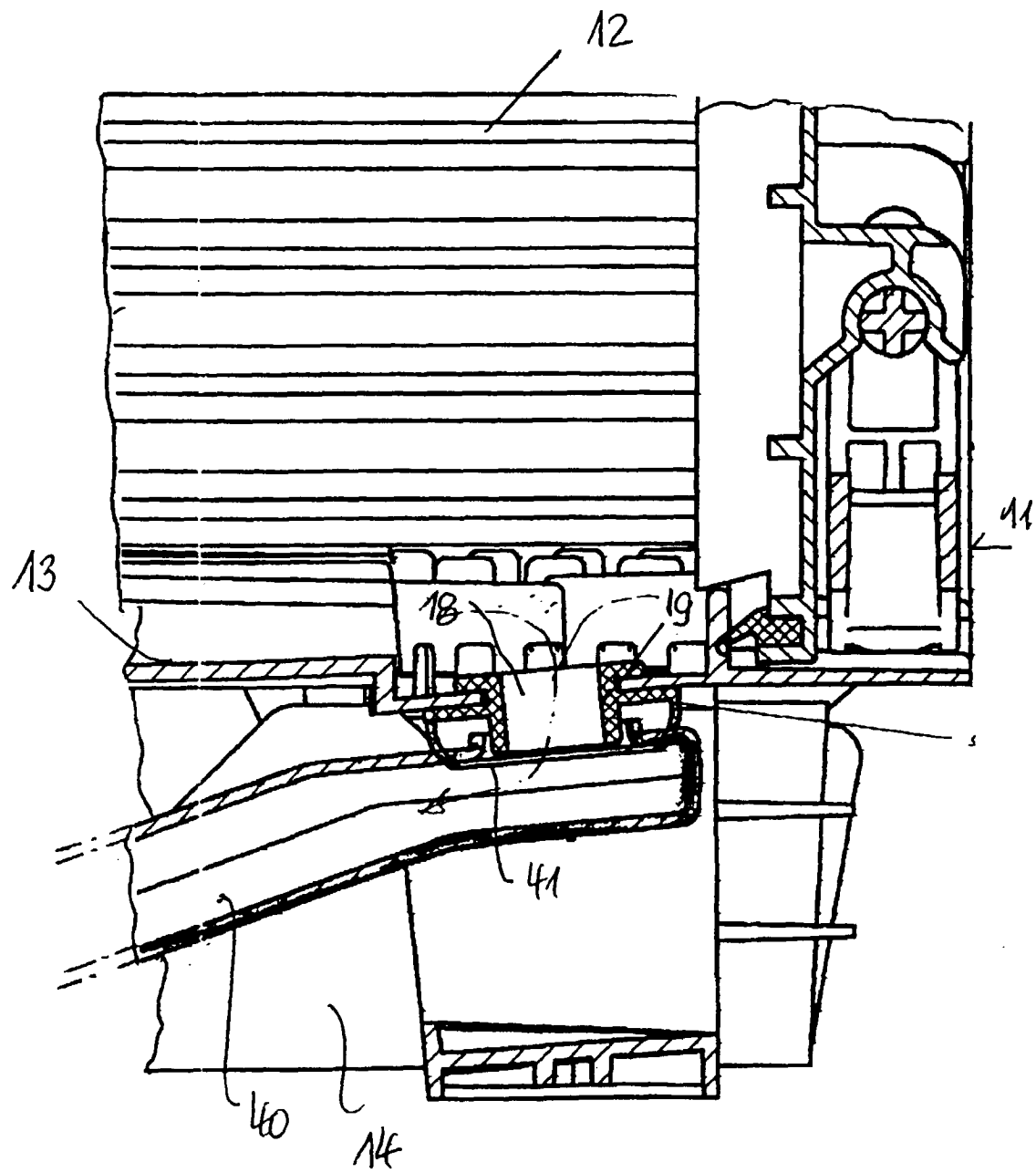


Fig. 6

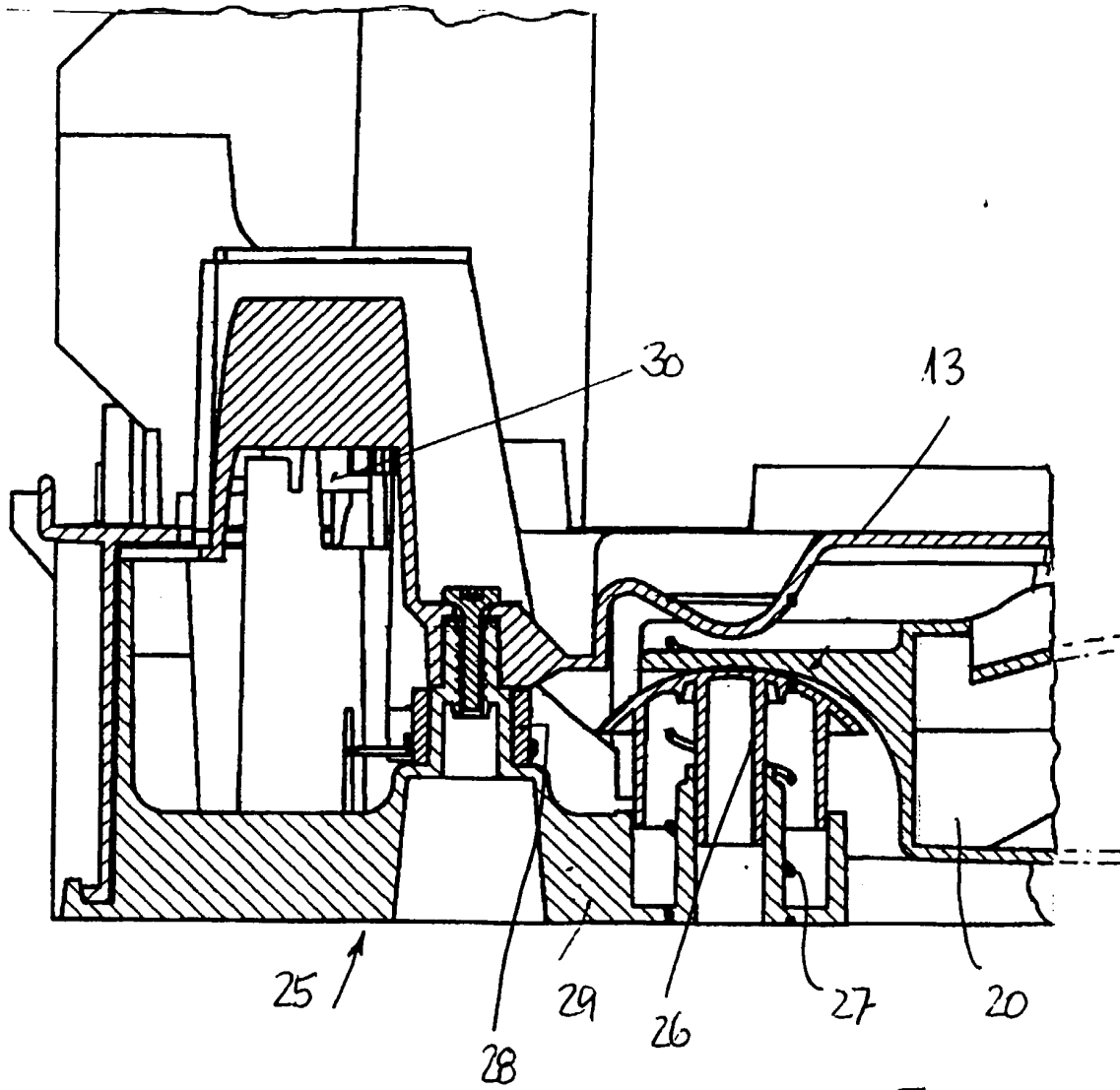


Fig. 5

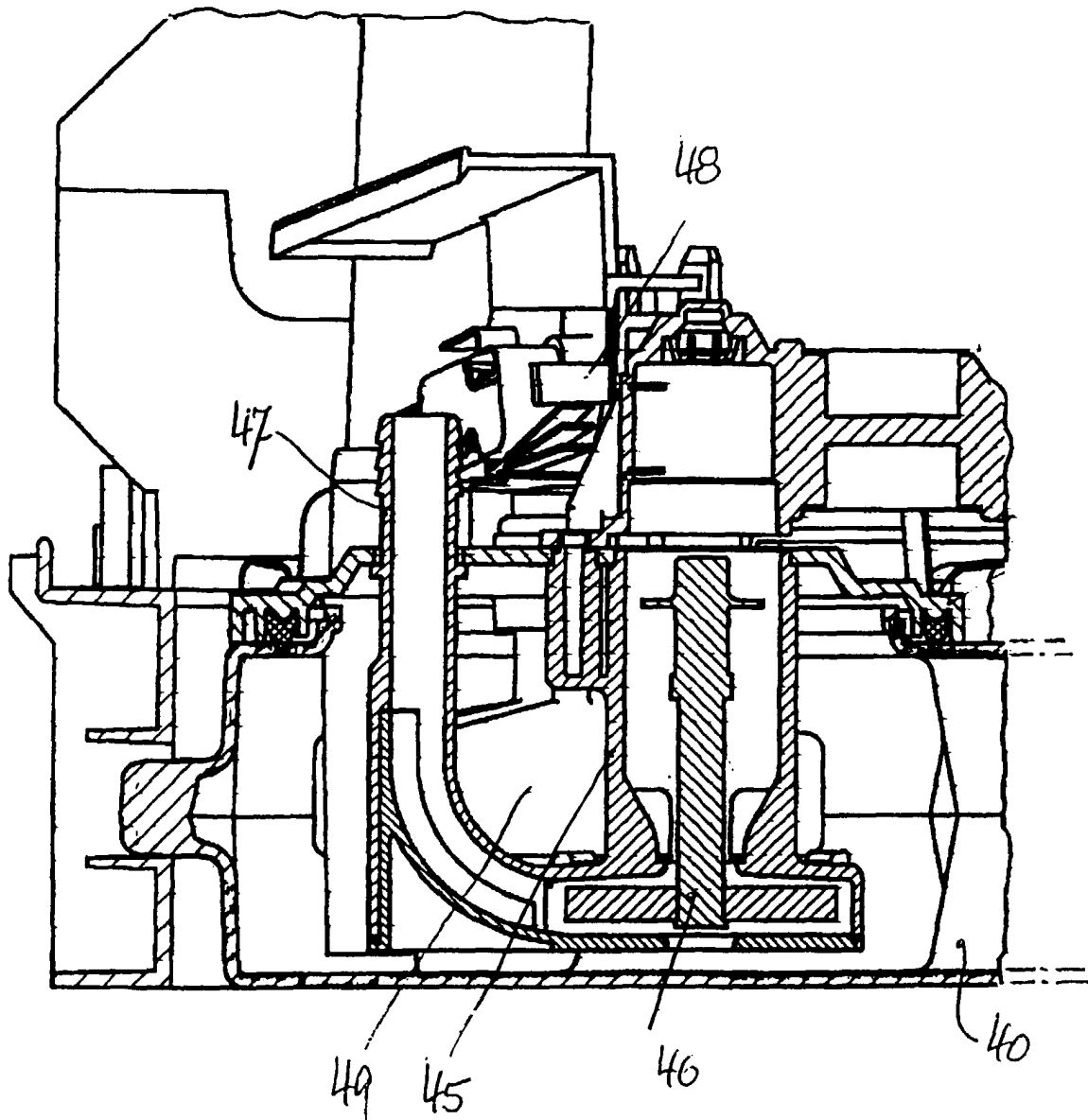


Fig. 7



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EUROPEAN SEARCH REPORT

Application Number
EP 00 12 3841

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Place of search THE HAGUE		Date of completion of the search 27 March 2001	Examiner Fairbanks, S
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