HU000027635T2

(19) **HU** (11) Lajstromszám: **E 027 635** (13) **T2**

MAGYARORSZÁG
Szellemi Tulajdon Nemzeti Hivatala

EURÓPAI SZABADALOM
SZÖVEGÉNEK FORDÍTÁSA

(21) Magyar ügyszám: **E 12 167413**
(22) A bejelentés napja: **2012. 05. 10.**

(51) Int. Cl.: ***B01D 53/50*** *(2006.01)*
B01D 53/34 *(2006.01)*

(96) Az európai bejelentés bejelentési száma:
EP 20120167413
(97) Az európai bejelentés közzétételi adatai:
EP 2532416 A1 **2012. 12. 12.**
(97) Az európai szabadalom megadásának meghirdetési adatai:
EP 2532416 B1 **2016. 02. 24.**

(30) Elsőbbségi adatok:
102011051022 **2011. 06. 10.** **DE**

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(54) **Füstgáz kénmentesítése víznyerési lehetőséggel**

Flue gas desulphurisation with water recovery potential

The invention relates to a flue gas treatment plant comprising a flue gas desulphurisation plant with associated flue gas cooler designed as a spray washer and located downstream of the flue gas path of the flue gas desulphurisation plant, which can be brought into a pipework connection, conveying desulphurised flue gas and comprises a connected cooling water cycle, wherein a cooling tower is located in the cooling water cycle, and the cooling water cycle is disposed in pipework connection with the flue gas desulphurisation plant.

Furthermore, the invention relates to a flue gas treatment method in which the flue gas is desulphurised in a flue gas desulphurisation plant with the addition of process water and is subsequently cooled in a flue gas cooler by means of cooling water depending on an operating mode selected in each case from alternatively adjustable operating modes, wherein the cooling water is cooled in a cooling water cycle with cooling tower arranged therein and supplied to the flue gas cooler and/or to the flue gas desulphurisation plant.

Inter alia, flue gas desulphurisation plants (FGD) are used in conventional, fossil-fuel fired power stations. In these flue gas desulphurisation plants, the flue gas is exposed to a treatment with a sulphur-binding absorption agent. This absorption agent can be a limestone-containing suspension, wherein the limestone comprises predominantly calcium carbonate ($CaCO_3$). This so-called limestone wash has become the most widely established non-regenerative process worldwide. In this method, process water is supplied to the flue gas desulphurisation plant in addition to the limestone suspension within the contraflow washer of the flue gas desulphurisation plant in contraflow to the flue gas rising therein. In fact, different, but always considerable quantities of process water are required depending on the size of the steam generator associated with the flue gas desulphurisation plant, on the fuel used and on the loading range, during operation of the flue gas desulphurisation plant. The required process water is supplied through external lines, wherein spring water often also serves as a process water source. In water-rich regions, the supply of a flue gas desulphurisation plant with process water does not represent a major problem. However, if a power station and a flue gas desulphurisation plant associated with the latter are built in a region which is water-scarce and without large regional water reserves, the latter may optionally have to be supplied over large distances in order to secure the demand for process water, for example, by means of a pipeline. Moreover, the construction and maintenance of a pipeline are associated with high investment, operational and maintenance costs depending on size and length. Furthermore, in politically unstable regions, there is a risk of water theft through tapping of the pipeline or sabotage of the constructed pipeline. This can restrict or even stop the operation of the power station.

Connecting a flue gas washer downstream of a flue gas desulphurisation plant in which the flue gas is cooled by means of a supplied, cool washing medium is known from the prior art, for example, from DE 10 2007 043 331 A1.

The washing medium is drawn from the flue gas washer, conveyed via a heat exchanger and fed back into the cycle of the flue gas washer. A part of the washing medium can also be supplied to the flue gas desulphurisation plant connected upstream.

The invention is based upon the object of providing a solution which allows a flue gas desulphurisation which saves cooling and process water and recovers cooling and process water.

With a flue gas treatment plant of the type designated in greater detail above, this object is achieved as specified in device claim 1.

With a flue gas treatment method of the type designated in greater detail above, this object is achieved according to the invention as specified in method claim 4.

Further expedient embodiments and advantageous developments of the invention form the subject matter of the respective dependent claims.

With the basic idea underlying the invention, a flue gas desulphurisation is possible which saves cooling and processing water and recovers cooling and processing water. With corresponding dimensioning of the water reservoir, a stand-alone flue gas desulphurisation is possible at every operating time of the flue gas desulphurisation, that is, at every season of the year, by means of a respective operating mode. This is achieved through an effective exploitation and design of the cooling capacity. In periods with cooler ambient temperatures, in the case of the cooling of the flue gas in the flue gas cooler, a cycle cooling water excess is generated from the flue gas through condensation, which is placed into (intermediate) storage in the water reservoir. In times of higher, that is, warmer ambient temperatures, the cooling water cycle is then fed and supplemented with additional water from the water reservoir and accordingly, a sufficiently high cooling water mass-flow is supplied both to the flue gas desulphurisation plant and also to the flue gas cooler.

In this context, the switching into the respective operating mode takes place depending on season and/or time of day, depending on the ambient temperature available for the cooling.

The flue gas treatment plant according to the invention is therefore expediently fitted with a closed, air-cooled system for the cooling of the cooling water cycle water or processing water. In embodiment, the invention therefore provides that the cooling tower or the heat exchanger embodies a dry cooling for the cooling water cycle water. Similarly, according to embodiment of the invention, it is provided that the cooling tower or the heat exchanger comprises an air cooling with indirect heat transfer to the cooling cycle water.

In further development of the invention, in order to achieve a sufficient condensation (out) of water from the flue gas into the flue gas cooler, it is advantageous, that the flue gas cooler comprises a cooling capacity cooling the flue gas to a temperature below the flue gas desulphurisation plant output-temperature.

In order to realise different operating modes with regard to the flue gas path and/or the cycle water or process water path depending on season and/or time of day and respectively prevailing external ambient temperature, the flue gas treatment plant is further characterised in that a first controllable cooling water distribution of the cycle cooling water is embodied in the pipework connection, which distributes the cycle water into a water reservoir supply line leading into the water reservoir and/or into a cooling water or process water supply line leading to the flue gas desulphurisation plant and/or into a connecting line disposed in pipework connection with the flue gas cooler. Through the controllable distribution of the cycle cooling water embodied and arranged in the cooling water cycle, the latter can be supplied in a targeted manner depending on control or regulation to one or more of the elements: water reservoir, flue gas desulphurisation plant and flue gas cooler.

The embodiment of a further controllable distribution of the cooling water with which a control of cooling or process water drawn from the water reservoir can also be realised is advantageous here. In further embodiment of the flue gas treatment plant, the invention therefore provides that a second controllable cooling water distribution is embodied in the pipework connection which distributes cooling water from a water reservoir outlet line disposed in pipework connection with the water reservoir into the cooling water or process water supply line leading to the flue gas desulphurisation plant and/or to the connecting line disposed in pipework connection with the flue gas cooler.

In order also to provide the possibility, depending on the respectively set operating mode, of allowing the flue gas leaving the flue gas desulphurisation plant to flow past the flue gas cooler, it is expedient and advantageous, according to a further embodiment of the invention, for a controllable flue gas distribution of the flue gas to be embodied in the pipework connection conveying the desulphurised flue gas, which distributes the flue gas into a flue gas supply line leading to the flue gas cooler and/or into a flue gas outlet line not leading to the flue gas cooler.

In the case of the flue gas treatment plant according to the invention, since it is possible, with a corresponding dimensioning of the water reservoir, to operate the latter in a stand-alone manner with regard to any external cooling or process water supply, the invention further provides that the flue gas treatment plant comprises no external or additional process water and/or cooling water supply. This is then possible, if the maximal receiving capacity of the water reservoir is designed in such a manner that it contains and can release the cooling or process water volume to be added to the cooling cycle water at times of higher ambient temperature. The maximal storage capacity is therefore designed for the maximal water reserve required for the respective time of year.

As explained above, the basic idea underlying the flue gas treatment process is to arrange a water reservoir in the cooling water cycle of the cooling or process water downstream of the heat exchanger or cooling tower and, depending on the respectively selected operating mode, which depends, in each case, upon the exterior ambient temperatures, to supply cooled cycle cooling water to the water reservoir and/or to remove cycle cooling water from the water reservoir and supply it as cooling or process water to the flue gas desulphurisation plant and/or to the flue gas cooler. As a result, in the case of sufficiently cool ambient temperature, more water is withdrawn through condensation from the flue gas, by cooling it to a temperature disposed below the flue gas desulphurisation plant output temperature, than would be necessary for the actual flue gas desulphurisation process. By contrast with conventional plants, this additionally withdrawn and recovered water is placed into intermediate storage in the water reservoir and, in times of higher exterior ambient temperature supplied to the cooling water cycle or to the desulphurisation plant again as cooling or process water.

Within the framework of the various operating conditions and process conditions selectable from a plurality of operating modes, the invention provides that a first operating mode consists in supplying the desulphurised flue gas to the flue gas cooler and supplying heated cooling cycle water from the flue gas cooler to the cooling tower or to the heat exchanger and supplying it as cooled cooling or process water to the flue gas desulphurisation plant and/or to the flue gas cooler and the water reservoir.

A second, alternative operating mode of the flue gas treatment process is characterised in embodiment of the invention in that desulphurised flue gas is supplied to the flue gas cooler, and heated cooling cycle water from the flue gas cooler is supplied to the cooling tower or to the heat exchanger and supplied as cooled cooling or process water, preferably exclusively, to the flue gas desulphurisation plant and/or to the flue gas cooler.

Furthermore, in a third alternative operating mode, the invention provides that the desulphurised flue gas is supplied to the flue gas cooler, and heated cooling cycle water from the flue gas cooler is supplied to the cooling tower or to the heat exchanger and supplied as cooled cooling or process water to the flue gas desulphurisation plant and/or to the flue gas cooler, and cycle cooling water is withdrawn from the water reservoir and supplied to the flue gas desulphurisation plant and/or to the flue gas cooler.

Finally, a fourth operating mode is characterised in that desulphurised flue gas is supplied to a flue gas outlet line not leading to the flue gas cooler, and cycle cooling water is removed from the water reservoir and supplied as (cooled) cooling or process water to the flue gas desulphurisation plant.

By way of example, the invention is explained in greater detail in the following with reference to a drawing. The drawings show:

Fig. 1	in schematic presentation, the overall configuration of a flue gas desulphurisation plant according to the invention and;
Figs. 2 - 5	in schematic presentation, the plant configuration in different operating modes.

Fig. 1 shows a flue gas treatment plant designated as a whole with 1, which comprises a flue gas desulphurisation plant 2 embodied in the form of a contraflow washer and a flue gas cooler 3 embodied in the form of a spray washer. At the flue gas outlet side, the flue gas desulphurisation plant 2 comprises a flue gas line 5 leading to a controllable flue gas distribution 4 for the flue gas. From the controllable flue gas distribution 4, a flue gas supply line 6 leads to the flue gas cooler 3, into which the latter opens. A flue gas outlet line 7 merges into a waste gas line 8 leading to the chimney. At the flue gas outlet side, the flue gas cooler 3 comprises a flue gas line 9, which opens into a distribution 10, by means of which it is disposed in pipework connection with the flue gas outlet line 7 and the waste gas line 8 leading to the chimney. Via a flue gas supply line 11 opening into the flue gas desulphurisation plant 2, the flue gas originating from the combustion chamber or respectively the steam generator of a fossil-fuel fired power station is introduced, after it has flowed through an electro-filter, into the flue gas desulphurisation plant 2. In the exemplary embodiment, a limestone-containing liquid in the form of a suspension 12 is supplied as absorption agent to the flue gas desulphurisation plant as desulphurisation medium. The gypsum suspension 13 and waste water 14 formed during the desulphurisation with the limestone suspension are removed from the flue gas desulphurisation plant. The flue gas cooler 3 comprises an associated cooling water cycle designated as a whole with 15. A cooling tower 16 with dry cooling for the cooling water cycle water is arranged in the cooling water cycle 15. Cooling water or process water originating from the flue gas cooler 3, heated after contact with the flue gas flowing through the flue gas cooler 3, is supplied to the cooling tower 16, via a cooling tower supply line 17, and cooled indirectly there within a line portion 18 by cool air flowing in contraflow from bottom to top within the cooling tower. The cooling water or process water flows out from the cooling tower 16 via a cooling tower outlet line 19 to a first controllable cooling water distribution 20. A cooling water or process water feedback line 21 is connected to this first controllable cooling water distribution, by means of which the cooling water or process water can be fed back cooled into the flue gas cooler 3. Furthermore, a water reservoir supply line 22 is connected to the first controllable cooling water distribution 20, by means of which cooled cooling water or process water can be conveyed into a water reservoir 23. The water reservoir 23 further comprises a water reservoir outlet line 24, which opens into a second controllable cooling water distribution 25. Via a connecting line 26, the first controllable cooling water distribution 20 and the second controllable cooling water distribution 25 are disposed in a fluid-conveying connection with one another and with the cooling water or process water feedback line 21. The second controllable cooling water distribution is connected via a cooling water or process water supply line 27 to the flue gas desulphurisation plant 2. Further necessary and conventional pumps 28, not explained in greater detail, are arranged in the various lines.

The cooling capacity of the dry cooling of the cooling tower 16 is designed in such a manner that, by means of the cooling water supplied via the cooling-water or process-water feedback line 21 to the flue gas cooler 3, a temperature is achieved and set in the flue gas cooler 3 of the flue gas flowing via the respective flue gas supply line 6 which is disposed below the flue gas desulphurisation plant outlet temperature, with which the flue gas flows into the flue gas pipeline 5.

In Figs. 2 to 5, various alternative operating modes and running methods of the flue gas treatment plant 1 are now presented schematically, wherein the lines or plant components or elements not used in the respective operating mode are shown with dashed lines.

Fig. 2 shows a first operating mode or operating condition designated as "wastewater oversupply". This is run when sufficiently cool ambient temperatures are present, and optionally, a low or excessively low water level is present in the water reservoir 23. In this first operating mode, the flue gas desulphurised in the flue gas desulphurisation plant 2 is conveyed via the flue gas line 5, the controllable flue gas distribution 4 and the flue gas supply line 6 into the flue gas cooler 3, before it then passes through the flue gas line 9 and the distribution 10 into the waste gas line 8. In the case of this first operating mode, the cooling water or process water heated in the flue gas cooler 3 is pumped via the cooling tower supply line 17 into the cooling tower 16 or air cooling tower. It enters into an indirect contact with the ambient air there, in the line portion 18. The now (re-)cooled cooling water or process water is supplied by means of the cooling tower outlet line 19 to the first controllable cooling water distribution 20. In this first operating mode, the latter is adjusted in such a manner that cooling water is conveyed into the connecting line 26, and from there through the second controllable cooling water distribution 25 and the cooling water or process water supply line 27 into the flue gas desulphurisation plant 2, and also cooling water is supplied through the cooling water or process water feedback line 21 to the flue gas cooler 3. Furthermore, cooling water or process water is introduced into the water reservoir supply line 22 and supplied by means of this line to the water reservoir 23. In the case of sufficiently cool ambient temperatures, this operating mode is retained until the water reservoir is filled up to its provided maximal filling level 29. The maximal filling level 29 can be adapted to the water reserves required for the respective period of a year.

In the case of the second operating mode presented in Fig. 3, sufficiently cool ambient temperatures are present and a sufficiently filled water reservoir 23 is present, so that the latter need not or cannot be filled any further. In this second operating mode, the flue gas desulphurisation plant 2 and the flue gas cooler 3 operate in equilibrium. Once again, as already in the first operating mode, the flue gas is supplied from the flue gas desulphurisation plant 2 to the flue gas cooler 3 and from the latter into the waste gas line 8. The warmed or heated cooling water or process water is supplied in turn from the flue gas cooler 3 to the cooling tower or air cooling tower 16, then in the first controllable cooling water distribution 20 but still only in the line 26, the cooling water or process water feedback line 21 branching from the latter and via the second controllable cooling water distribution 25 to the line 27. In this context, an equilibrium is adjusted, to the extent that the re-cooled cooling water or process water is distributed uniformly or in a respectively desired ratio to the cooling water or process water feedback line 21 and the cooling water or process water supply line 27, so that the mass flow introduced into the flue gas desulphurisation plant 2 of cooling water or process water is equal to the mass flow of heated cooling water, which is drawn from the flue gas cooler 3 via the cooling tower supply line 17.

In a third operating mode illustrated in Fig. 4, the operating condition of a "wastewater undersupply" is presented. This third operating mode adjusts itself or is adjusted when the ambient temperatures are too high for a sufficient or desired cooling of the cooling water. In this third operating mode, as in the case of the previously described operating modes, the flue gas is conveyed from the flue gas desulphurisation plant 2 into the flue gas cooler 3 and from the latter into the waste gas line 8. In turn, the re-cooled cooling water is supplied via the cooling water or process water feedback line 21 to the flue gas cooler 3 and via the lines 26 and 27 to the flue gas desulphurisation plant 2. However, the cooling water or process water flowing out of the cooling tower 16 or air cooling tower into the cooling tower outlet line 19 comprises a higher temperature especially by comparison with the first and the second operating mode. With the cooling water or process water comprising this higher temperature, only a lower mass of water would be condensed from the flue gas. In particular, this would not be sufficient for the operation of the flue gas desulphurisation plant 2. However, in order to guarantee a continuous desulphurisation of the flue gas desulphurisation plant 2, it is provided in this third operating mode that a part of the cooling water or process water previously recovered during earlier operating phases in other operating modes, stored in the water reservoir 23, is supplied via the water reservoir outlet line 24 to the second controllable cooling water distribution 25 and into the cooling water or process water supply line 27 or, if required, also additionally fed into the connecting line 26 and accordingly supplied to the respectively connected plant units. In this third operating mode, the additional cooling water or process water fed into the system from the water reservoir 23 compensates the lower mass flow of water withdrawn from the flue gas.

With the use of a fourth operating mode presented in Fig. 5, such high temperatures are present that a cooling of the process water or cooling water is not possible. In this fourth operating mode, the flue gas leaving the flue gas desulphurisation plant 2 flows past the flue gas cooler 3, in that, in the controllable flue gas distribution 4, it is introduced directly into the flue gas outlet line 7 and conveyed from there through the distribution 10 into the waste gas line 8. The process water required in the flue gas desulphurisation plant 2 is provided from the water reservoir 23 and introduced via the water reservoir outlet line 24, the second controllable cooling water distribution 25 and the cooling water or process water supply line 27 into the flue gas desulphurisation plant 2. Accordingly, in this mode also, the process water required in the flue gas desulphurisation plant originates, 100% and exclusively, from the water reservoir 23.

Beyond this, the flue gas treatment plant 21 as a whole is connected with no other fluid line supplying cooling water or process water from externally. In all four operating modes, the system therefore operates in a stand-alone manner with regard to the cooling water and process water.

Overall, a flue gas treatment plant 1 is provided by the invention, of which the flue gas desulphurisation plant 2 and its associated flue gas cooler 3 together operate and can be operated in a stand-alone manner, both with regard to the cooling water and/or the process water. No external supply of cooling water or process water, for example, by means of a pipeline, is necessary, so that the problems mentioned in the introduction and the costs associated with this are overcome. The necessary cooling water or process water is provided and (re-)cooled in a stand-alone manner within the plant.

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SBGK Szabadalmi Ügyvivői Iroda

Füstgáz kénmentesítése víznyerési lehetőséggel

SZABADALMI IGÉNYPONTOK

1. Füstgázkezelő berendezés (1), amely magában foglal egy füstgáz-kénmentesítő berendezést (2) egy hozzárendelt permetező mosóként kialakított és füstgáz-szállításhoz viszonyítva a füstgáz-kénmentesítő berendezés (2) után kapcsolt füstgáz-hűtővel (3), amely egy kénmentesített füstgázt szállító vezetékes kapcsolatba (5,6) hozható (4) a füstgáz-kénmentesítő berendezéssel (2), és van egy kapcsolódó hűtővízköre (15), amely hűtővízkör (15) technológiai vagy hűtővize a füstgáz-hűtőn (3) átáramló füstgázzal érintkezésbe hozható, és a füstgázból kondenzációval létrehozott hűtőköri-vízfelesleg hűtve egy, a hűtővízkörből (15) táplált víztárolóban (23) tárolható, amely a hűtővízkörrel (15) és a füstgáz-kénmentesítő berendezéssel (2) egy technológiai és/vagy hűtővizet betápláló vezetékes kapcsolatba (24, 26, 27) hozható, továbbá a hűtővízkörben (15) el van helyezve egy hűtőtorony (16), és a hűtővízkör (15) a füstgáz-kénmentesítő berendezéssel (2) vezetékes kapcsolatba (26, 27) hozható, azzal jellemezve, hogy a hűtőtoronynak (16) léghűtése van közvetett hőátadással a hűtőköri-vízre, és a víztároló (23) áramlási irányban a hűtőtorony (16) után van elhelyezve, és hogy a vezetékes kapcsolatban (26, 27) a köri-hűtővíznek ki van alakítva egy első szabályozható hűtővíz-elosztása (20), amely a hűtőtoronyból jövő köri-hűtővizet egy, a füstgázkezelő berendezés (1) alternatív módon beállítható azon üzemmódjaiból kiválasztott üzemmód függvényében, amelyekben a füstgázkezelő berendezés (1) az évszaktól és/vagy a napszaktól függően a hűtéshez rendelkezésre álló környezeti hőmérséklet függvényében van üzemeltetve, egy, a víztárolóba (23) szállító víztároló-tápvezetékbe (22) és/vagy a füstgáz-kénmentesítő berendezéshez (2) szállító vezetékes kapcsolatba (26, 27) és/vagy a füstgáz-hűtővel (3) vezetékes kapcsolatban (21, 26) álló összekötő vezetékbe tudja elosztani, és hogy a vezetékes kapcsolatban (26, 27) ki van alakítva egy második szabályozható hűtővíz-elosztás (25), amely egy, a füstgázkezelő berendezés (1) alternatív módon beállítható üzemmódjaiból kiválasztott üzemmód függvényében, amelyekben a füstgázkezelő berendezés (1) az évszaktól és/vagy a napszaktól függően a hűtéshez rendelkezésre álló környezeti hőmérséklet függvényében van üzemeltetve, a hűtővizet egy, a víztárolóval (23) vezetékes kapcsolatban álló víztároló-vételivezetékből (24) a füstgáz-kénmentesítő berendezéshez (2) szállító, hűtővíz- vagy technológiaivízszállító-vezetékbe (27) és/vagy a füstgáz-hűtővel (3) vezetékes kapcsolatban álló összekötő vezetékbe (26) tudja elosztani.

2. Az 1. igénypont szerinti füstgázkezelő berendezés (1), azzal jellemezve, hogy a

kénmentesített füstgázt szállító vezetékes kapcsolatban (5,6) ki van alakítva egy szabályozható füstgáz-elosztás (4), amely a füstgázt egy, a füstgáz-hűtőhöz (3) szállító füstgázszállító-vezetékbe (6) és/vagy egy nem a füstgáz-hűtőhöz (3) szállító füstgázelszállító-vezetékbe (7) osztja el.

3. Az 1. vagy a 2. igénypont szerinti füstgázkezelő berendezés (1), azzal jellemezve, hogy nincs külső vagy kiegészítő technológiai víz és/vagy hűtővíz táplálása.

4. Füstgázkezelési eljárás, amelynek során a füstgázt egy, az 1-3. igénypontok egyike szerinti füstgázkezelő berendezéssel (1) kezeljük, amely füstgázt a füstgáz-kénmentesítő berendezésben (2) technológiai víz hozzáadása közben kénmentesítjük, ezután elvezetjük a permetező mosóként kialakított füstgáz-hűtő mellett, vagy ezután a permetező mosóként kialakított füstgáz-hűtőben (3) hűtővízzel hűtjük, amely hűtővizet egy, a füstgáz-kénmentesítő berendezéssel (2) és a füstgáz-hűtővel (3) vezetékes kapcsolatban (26, 27) álló hűtővízkörben (15) egy a hűtővízkörben (15) elhelyezett hűtőtorony (16) segítségével alulról felfelé szembeáramló hűtőlevegővel közvetve hűtjük, és a füstgáz-hűtőhöz (3) és/vagy a füstgáz-kénmentesítő berendezéshez (2) szállítjuk, továbbá a technológiai vagy hűtővíz érintkezésbe kerül a füstgáz-hűtőn (3) átáramló füstgázzal, és a füstgázból kondenzációval létrehozott köri-hűtővízfelesleget hűtve egy víztárolóban (23) tároljuk, amely a hűtővízkörrel (15) és a füstgáz-kénmentesítő berendezéssel (2) egy technológiai vagy hűtővizet betápláló vezetékes kapcsolatba (24, 26, 27) hozható, ezenkívül a füstgázkezelő berendezés (1) alternatív módon beállítható azon üzemmódjaiból kiválasztott üzemmód függvényében, amelyekben a füstgázkezelő berendezést (1) az évszaktól és/vagy a napszaktól függően a hűtéshez rendelkezésre álló környezeti hőmérséklet függvényében üzemeltetjük, hűvösebb környezeti hőmérsékletetek idején a füstgázból kondenzációval létrehozott köri-hűtővízfelesleget hűtve az áramlási irányban a hűtőtorony (16) után elhelyezett és a hűtővízkörből (15) táplált víztárolóhoz (23) szállítjuk, és a víztárolóban (23) tároljuk, és/vagy a hűtővízkör (15) hűtőtoronyban (16) hűtött hűtővizét a füstgáz-kénmentesítő berendezéshez (2) és a füstgáz-hűtőhöz (3) szállítjuk, továbbá melegebb környezeti hőmérsékletek idején a hűtővízkört (15) a víztárolóból (23) vett, tárolt köri-hűtővízzel tápláljuk kiegészítőleg, amelyet hűtő- vagy technológiai vízként a füstgáz-kénmentesítő berendezéshez (2) és/vagy a füstgáz-hűtőhöz (3) szállítunk.

5. A 4. igénypont szerinti füstgázkezelési eljárás, azzal jellemezve, hogy az alternatív üzemmódok közül egy első üzemmódban a kénmentesített füstgázt a füstgáz-hűtőhöz (3) szállítjuk, a füstgáz-hűtőből (3) a felmelegedett hűtőköri-vizet pedig a hűtőtoronyhoz (16) szállítjuk, és hűtött hűtő- vagy technológiai vízként a füstgáz-kénmentesítő berendezéshez (2) és a füstgáz-hűtőhöz (3) és a víztárolóhoz (23) szállítjuk.

6. A 4. igénypont szerinti füstgázkezelési eljárás, azzal jellemezve, hogy az

alternatív üzemmódok közül egy második üzemmódban a kénmentesített füstgázt a füstgáz-hűtőhöz (3) szállítjuk, a füstgáz-hűtőből (3) a felmelegedett hűtőköri-vízet pedig a hűtőtoronyhoz (16) szállítjuk, és hűtött hűtő- vagy technológiai vízként a füstgáz-kénmentesítő berendezéshez (2) és/vagy a füstgáz-hűtőhöz (3) szállítjuk.

7. A 4. igénypont szerinti füstgázkezelési eljárás, azzal jellemezve, hogy az alternatív üzemmódok közül egy harmadik üzemmódban a kénmentesített füstgázt a füstgáz-hűtőhöz (3) szállítjuk, a füstgáz-hűtőből (3) a felmelegedett hűtőköri-vizet pedig a hűtőtoronyhoz (16) szállítjuk, és hűtött hűtő- vagy technológiai vízként a füstgáz-kénmentesítő berendezéshez (2) és/vagy a füstgáz-hűtőhöz (3) szállítjuk, továbbá a víztárolóból (23) tárolt köri-hűtővizet veszünk, és a füstgáz-kénmentesítő berendezéshez (2) és/vagy a füstgáz-hűtőhöz (3) szállítjuk.

8. A 4. igénypont szerinti füstgázkezelési eljárás, azzal jellemezve, hogy olyan magas hőmérsékletek esetén, amikor a hűtőköri-víz hűtése a hűtőtoronyban (16) nem lehetséges, akkor az alternatív üzemmódok közül egy negyedik üzemmódban a kénmentesített füstgázt egy nem a füstgáz-hűtőhöz (3) szállító füstgázelszállító-vezetékhez (7) szállítjuk, a víztárolóból (23) tárolt köri-hűtővizet veszünk, és hűtő- vagy technológiai vízként a füstgáz-kénmentesítő berendezéshez (2) szállítjuk.

(A meghatalmazott)

[illegible] Dobosz Katalin
[illegible]
SBGK [illegible] Ügyvivői Iroda
[illegible]

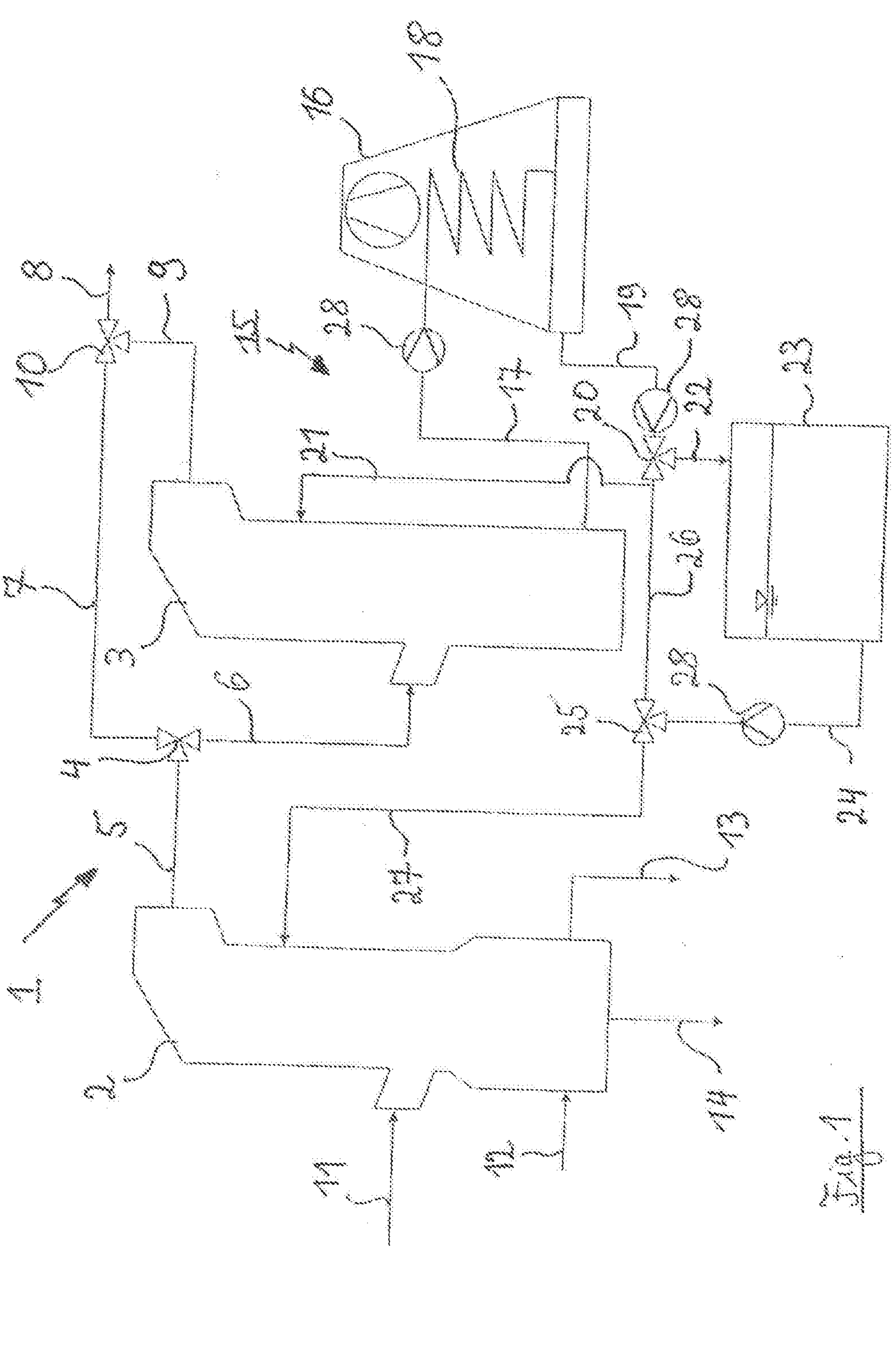

Fig. 1

2/5

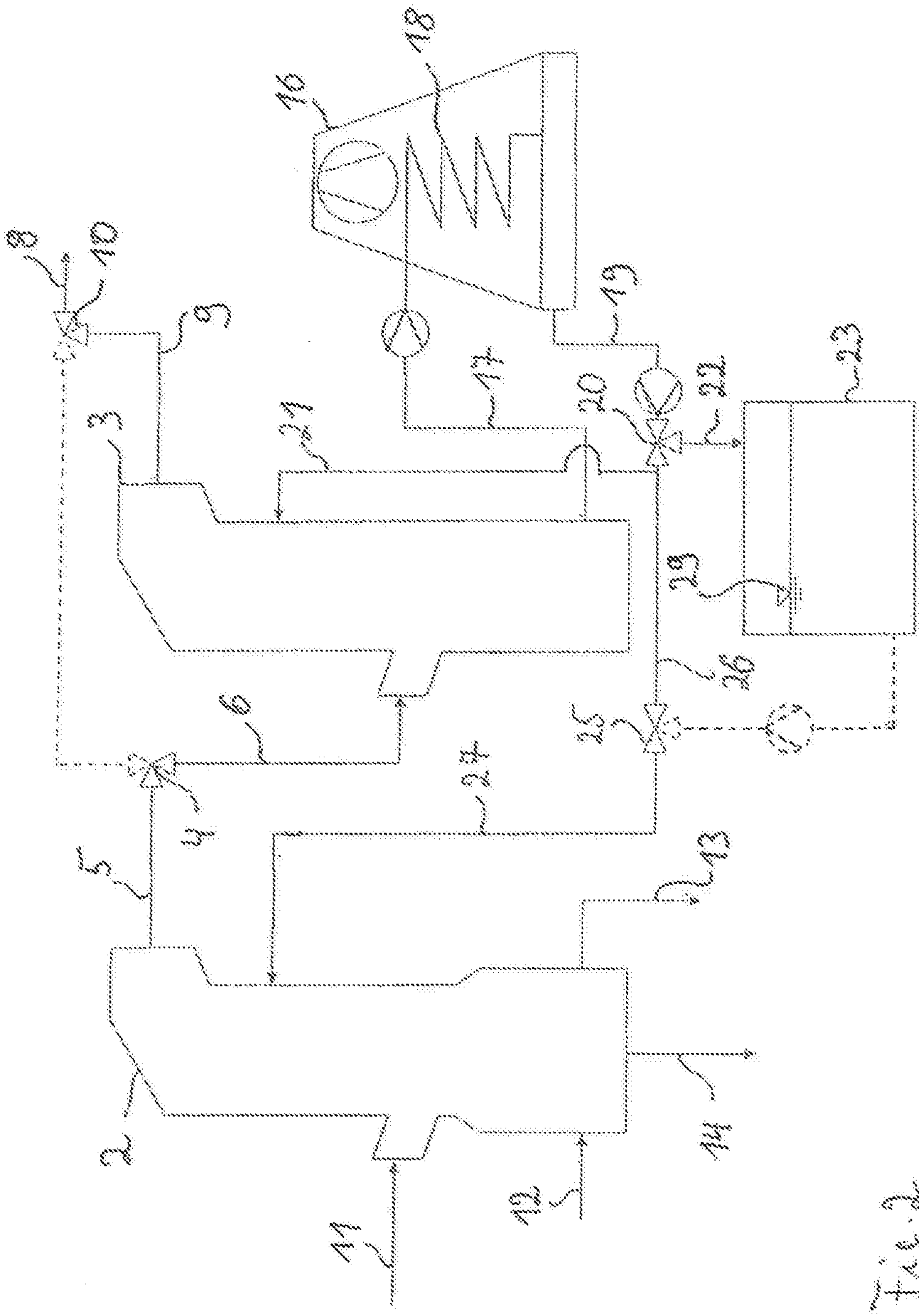

Fig. 2

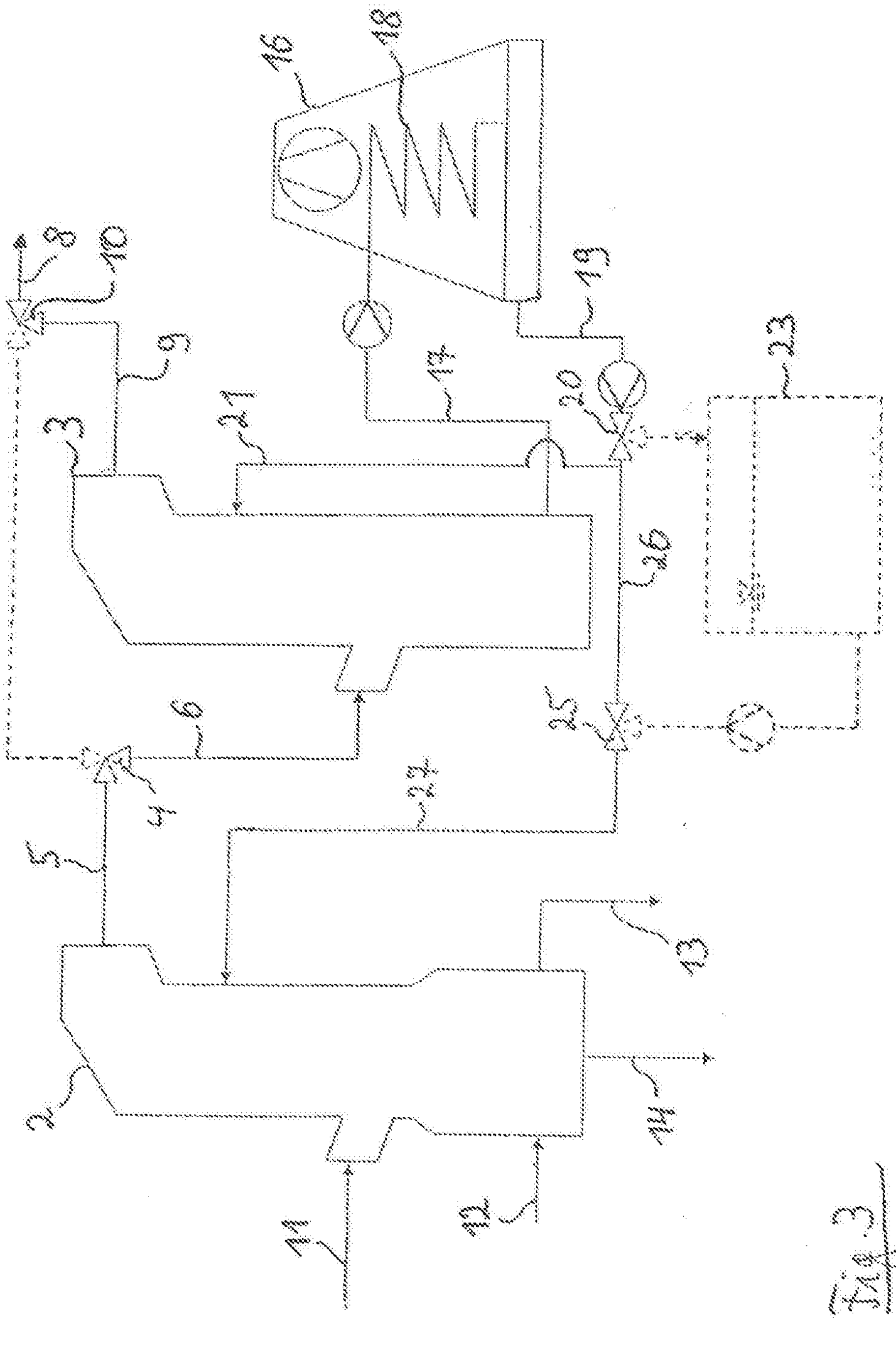

Fig. 3

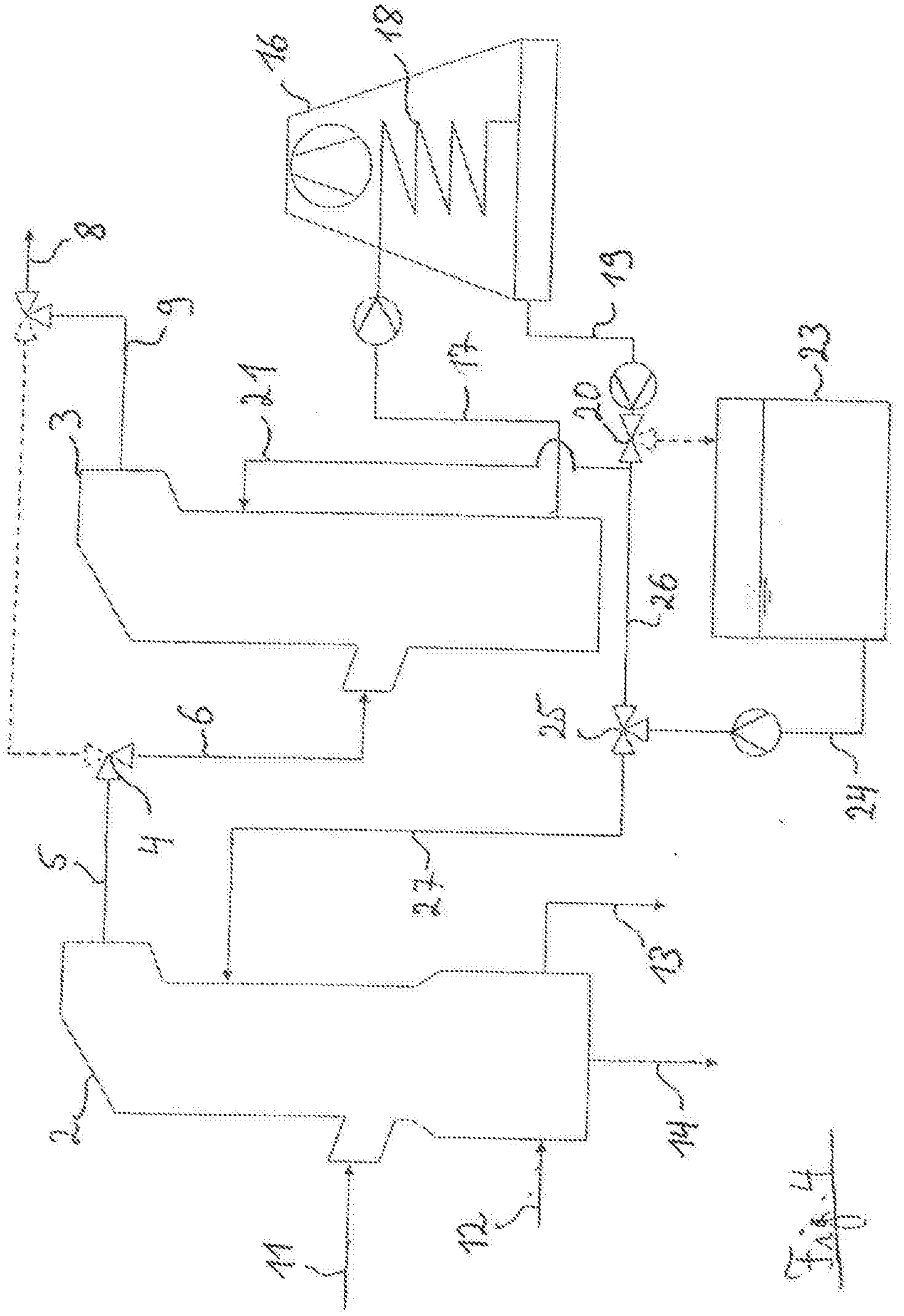

Fig. 4

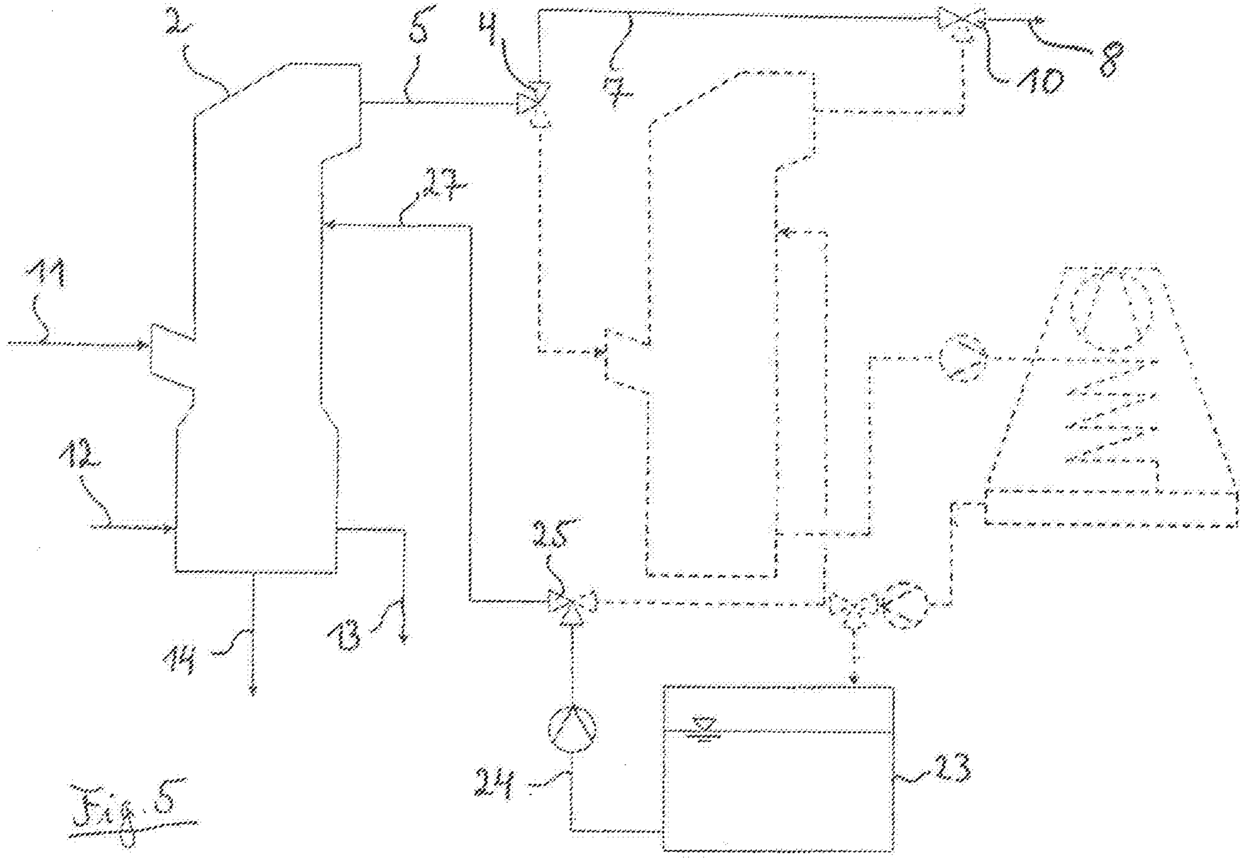

Fig. 5