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(54) **System for the dosing of additives/inhibitors containing magnesium oxide applied to fuels used for the production process of Clinker/cement in rotary furnaces and steam generating boilers**

(57) This invention refers to a system that is automated and controlled through a software; for the storage and application of additives and/or sulfur inhibitors containing magnesium oxide and their accurate dosing in solid or liquid fossil and alternate fuels, preferably used in rotary furnaces for the production of Clinker/cement

and in steam generating boilers. Additionally, this invention is characterized for having the power to increase the use of fossil and alternate fuels without altering the characteristics of cements or concretes as the final product of cement.

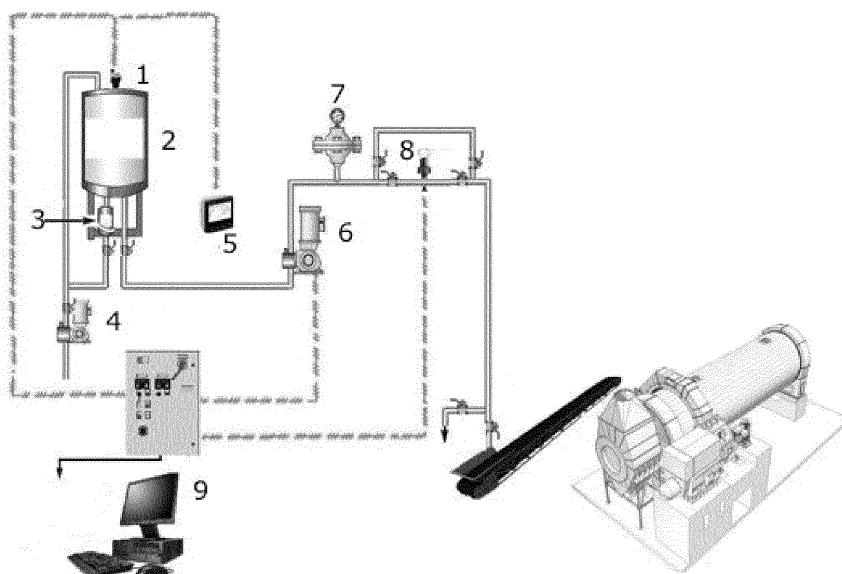


FIG. 1A

Description

Field of the invention

[0001] This invention is located in the field of cement production, specifically this invention refers to a system that is automated and controlled by means of a software, for the storage and application of additives and/or sulfur inhibitors containing magnesium oxide and their accurate dosing in solid or liquid fossil and alternate fuels, preferably used in Clinker/cement production furnaces and in steam generating boilers.

Background of the invention

[0002] The world trend in the cement industry goes towards the use of alternate fuels that are increasingly polluted with sulfur, aluminum, silicon and vanadium impurities, mainly with the purpose to reduce the manufacturing costs of Clinker/cement and in the steam generating boilers with little success. The foregoing arises from the instability of operations, loss of production and damage caused to equipments by corrosion.

[0003] In the last few years, the largest companies that manufacture cement and generate electric power nationwide have focused on developing mechanical systems to solve a chemical problem; nevertheless, they have not been successful because they have preferred to look for other solutions rather than handling dosed additives in fossil, alternate and liquid fuels, that will solve problems arising out of harmful components in fuels.

[0004] There are additives on the market that cannot be successfully used due to their difficult handling and preservation in storage tanks; furthermore, their dosing also becomes complex, which reduces their effectiveness with time.

[0005] In this way, the MX 128425 document outlines the formation of a modified Portland cement, which includes the steps to subject the crude Clinker mixture of Portland cement including alumina to calcination in the absence of incorporated water steam, but in the presence of a calcium halide.

Summary of the invention

[0006] Therefore, the purpose of this invention is to provide a system that is automated and controlled through a software for the storage and application of additives and/or sulfur inhibitors containing magnesium oxide, and their accurate dosing in liquid or solid fossil and alternate fuels, preferably used in rotating furnaces for the production of Clinker/cement and in steam generating boilers.

[0007] Another objective of this invention is to provide a system that will also allow to increase the stability of the operation by maintaining the calcination lines free of adherences and sticking in rotary furnaces for the production of Clinker/cement and for steam generating boilers;

in the same way, it allows to eliminate the rings that are formed in the furnace pipe when solid fossil fuels are used.

[0008] Furthermore, one additional objective of this invention is to provide a system that also carries out and stabilizes the dosing of the additive/inhibitor in variable quantities according to the Clinker production of each rotary furnace or calcination line in particular (during the production of cement) and/or the quantities of fuel consumed in the calcination line or in the steam generating boilers.

[0009] An additional advantage of the invention is to provide a system that considerably supports world ecology by diminishing harmful emissions to the environment, since rotary furnaces for the production of Clinker/cement may be considered to be great reactors that owing to their design, any type of alternate fuels such as tires, petrochemical residues and oil drill sludge, organic debris, solvents, plastics, etc. may be burnt/consumed to obtain calorific power.

[0010] In the same vein, it is known in the prior art that when an obstruction/scale/ring occurs in the system, it is necessary to resort to the cleaning of the affected area with high-pressure water pumps, these pumps cause a strong thermal shock that may produce avalanches of hot stuff; if high security measures are not taken, a human life can be lost. In this way, the system of this invention succeeds in reducing possible labor accidents caused by non scheduled stops to repair the cement line production and steam generating boilers, and also eliminates the need of an additional cleaning system.

Brief description of the figures of the invention

[0011]

Figure 1A shows a general scheme of the system according to this invention applied to solid fuels. Figure 1B shows a general scheme of the system according to this invention applied to liquid fuels.

Figure 2 refers to the image of a solid fuel conveyor belt where the dosing of the additive containing magnesium oxide is carried out.

Figure 3 shows a graphic where the positive effect of the additivation system is observed together with the additive containing magnesium oxide, according to this invention.

Figure 4 refers to a graphic that shows the improvement in the production of a cement rotary furnace treated with the system subject matter of this invention.

Detailed description of the invention

[0012] This invention refers to a system that is auto-

mated and controlled through a software, for the storage and application of additives and/or sulfur inhibitors containing magnesium oxide and their accurate dosing in liquid or solid fossil and alternate fuels, preferably used in rotary furnaces for the production of Clinker/cement and in steam generating boilers.

[0013] In a first mode of the invention, the system allows to dose sulfur inhibiting additives containing magnesium oxide to a solid type fuel, such as petroleum coke. Thus, such system comprises the following stages and components:

- An ultrasonic level sensor (1);
- Tank(s) (2) that store the additive containing magnesium oxide, such tank(s) have on the upper part the ultrasonic sensor level (1) in order to send inventory signals to an electronic control system, the tank(s) are manufactured with a special material to avoid their degradation by chemical components;
- A recirculation pump (3) that ensures homogeneity during the dosing time of the additive composed of magnesium oxide, in order for the additive to be effective at the time it is consumed in particular in the main burners and pre-calcination of each furnace in the production of Clinker and steam generating boilers.
- A transfer pump (4) for the reception of the material and filling of tanks;
- A display (5) that allows to check the dosing parameters on site regarding the quantity of dosing that is being carried out at that time, also, it allows to automatically increase or reduce the dosing when required, including manually. Additionally, it allows to review inventories in tanks and send data signals to the switchboard that will subsequently send the same information to the central control room;
- A dosing pump (6) that operates through a diaphragm system and that may be both electric and pneumatic, which manually receives on and off and dosing increase or decrease signals on site by means of the control display or at the same time remotely from the central control room. Additionally, such dosing pump (5) is specifically designed to support any wear over time arising out of the chemical composition of the additive containing magnesium oxide;
- A pulse dampener (7) that receives variable pump pulses and transforms them into constant dosing quantities without variations, because the dosing pump (5) acts through pulses, where the pump internal components do not have contact with the additive;
- A fluxometer (8) that sends information to the field display (5) and at the same time to the central control room with regards to the quantity of additive being dosed each time; and
- A field switchboard (9), where all the information of the system is collected in order to be sent to a central

control room, such board has an analogous signal, preferably between 4 and 20 mA; additionally, it is possible to see and handle information through a computer comprised of a specific software that allows to carry out different functions, including making dosing adjustments, activating/deactivating alarms, making an inventory of the additive and turning the system on/off.

[0014] As shown in Figure 1A, the exit of the additive/sulfur inhibitor containing magnesium oxide is directed to the petroleum coke conveyor belt to subsequently direct the material to the mill.

[0015] In a second mode of this invention, the system allows for the dosing of a liquid-type fuel of the additive/sulfur inhibitor that contains magnesium oxide.

[0016] Figure 1B outlines the second mode of this invention, where the system comprises the same elements that the dosing system for solid fuels, and additionally comprises a manometer (10) and a valve (11).

[0017] According to this invention, all the components of the dosing system are ordered and controlled in terms of the functionality thereof through a Programmable Logic Controller (PLC) with a software specifically designed to ensure the proper operation of the system according to the specific requirements of each furnace and boiler. The software also allows controlling the correct dosing and additionally provides, either remotely or on site or both remotely and on site, statistical data on the operation, which in turn allows increasing the stability of the operation, as well as the production and performance of the equipments.

[0018] By adding an additive/sulfur inhibitor containing magnesium oxide, through the system subject matter of this invention, to solid and/or liquid (fossil or alternate) fuels, a process of elimination/reduction of scales and rings causing instability in calcination lines in the cement industry as well as the formation of scales that diminish productivity in steam generation in boilers is achieved. In the same way, the corrosion in equipments is successfully eliminated/reduced as well as the "acid rain" that is commonly due to the use of liquid and solid fossil fuels, and alternate fuels with any contents of sulfur, vanadium, silicon and aluminum.

[0019] It is known in the prior art that the magnesium oxide -based additives are difficult to handle because of their density, viscosity and abrasiveness. In this way, the authors of this invention have found that the dosing system solves the problems of injection of the additive/inhibitor in the recommended dose, besides the fact that this kind of system has never been used in solid fossil fuels such as petroleum coke, consequently this invention outperforms any other invention described in the state of the art.

[0020] In the case of the cement industry, the system/dosing subject matter of this invention is automatically activated when the solid fuel conveyor belt is turned on, which is the place where the dosing of the additive

containing magnesium oxide is carried out before it enters into the coke mill (Figure 1A and 2), the system is automatically turned off at the time the conveyor belt stops. Additionally, in the case of liquid fuels used in the steam generating boilers, the pump is permanently activated while the boiler is in operation.

[0021] Figure 3 shows a graph where the positive effect of the additivation system is seen together with the sulfur inhibiting additive containing magnesium oxide, it can be seen on the upper part how the temperatures are recovered along the cement rotary furnace after the injection of the product has started, in the case of steam generating boiler, stability of the pressure thereof may be seen. The furnace "cleaning" action is a conjunction/combination of this system, in the lower part it is seen how the furnace is completely polluted by the harmful material of untreated fossil fuels.

[0022] Figure 4 shows the improvement in the production of a cement rotary furnace treated with the system subject matter of this invention, a feeding of 160 ton/h of the furnace and an 8.7% increase in the feeding of the furnace are achieved.

Claims

1. A system to store and dose the additives/inhibitors in fuels, which is characterized because it comprises:

- An ultrasonic level sensor (1);
- Storage tank(s) (2) of additives/inhibitors;
- A recirculation pump (3) that homogenizes the additives/inhibitors during the time of the dosing;
- A transfer pump (4) to receive the additives/inhibitors and filling of tanks;
- A displayer (5) that allows to check dosing parameters on site regarding the quantity of dosing being carried out at that time;
- A dosing pump (6) that operates through a diaphragm system and that may be both electric and pneumatic, which manually receives on and off and dosing increase or decrease signals on site by means of the display (5) or at the same time remotely from the central control room;
- A pulse dampener (7) that receives variable pump pulses and transforms them into constant dosing quantities without variations because the dosing pump (5) acts through pulses, where the internal components of the bomb do not have contact with the additive;
- A fluxometer (8) that sends information to the field display (5) and at the same time to the central control room regarding the quantity of additives/inhibitors that are being dosed at all times; and
- A switchboard on site (9), where all the information of the system is collected in order to be sent to a central control room.

2. The system according to claim 1, characterized because the additives/inhibitors contain magnesium oxide.

3. The system according to claim 1, characterized also because the tank/tanks (2) have the ultrasonic level sensor (1) on the upper part in order to send inventory signals to an electronic control system.

4. The system according to claim 1, characterized because the tank(s) (2) are manufactured with a special material to avoid their degradation by chemical components.

5. The system according to claim 1, characterized also because the display (5) automatically, including manually, increases or reduces the dosing when required, allows to review inventories in tanks and sends data signals to the switchboard that will subsequently send the same information to a central control room.

6. The system according to claim 1, characterized because the dosing pump (6) is specifically designed to support the wear it may have over time arising out of the chemical composition of the additive containing the magnesium oxide.

7. The system according to claim 1, characterized because the board (9) has an analogous signal, preferably between 4 and 20 mA.

8. The system according to claim 1, characterized because the board (9) allows also to see and handle information through a computer and a programmable logic controller that comprises a specific software that allows in turn to carry out different functions, including making dosing adjustments, making an inventory of the additive and turning the system on/off.

9. The system according to claim 1, where the dosing of additives/inhibitors may be carried out to solid and liquid fuels.

10. The system according to claim 9, where fuels are fossil fuels and alternate fuels.

11. The system according to claim 1, characterized because it additionally comprises a manometer (10) and a valve (11) if the dosing is carried out to a liquid fuel.

12. The system according to claims 1 to 11, characterized also because it carries out the dosing of additives/inhibitors containing magnesium oxide.

13. The system according to claims 1 to 11, characterized because it succeeds in eliminating/reducing

scales and rings causing instability in calcination lines in the cement industry, as well as the formation of scales that diminish productivity in steam production in boilers; in addition, it eliminates/reduces equipment corrosion and the acid rain, due to the use of liquid and solid fossil fuels, alternate fuels with any contents of sulfur, vanadium, silicon and aluminum.

14. The system according to claim 13, characterized because it allows to feed the furnace with 160 ton/h, and an increase of 8.7% in the feeding of the furnace.

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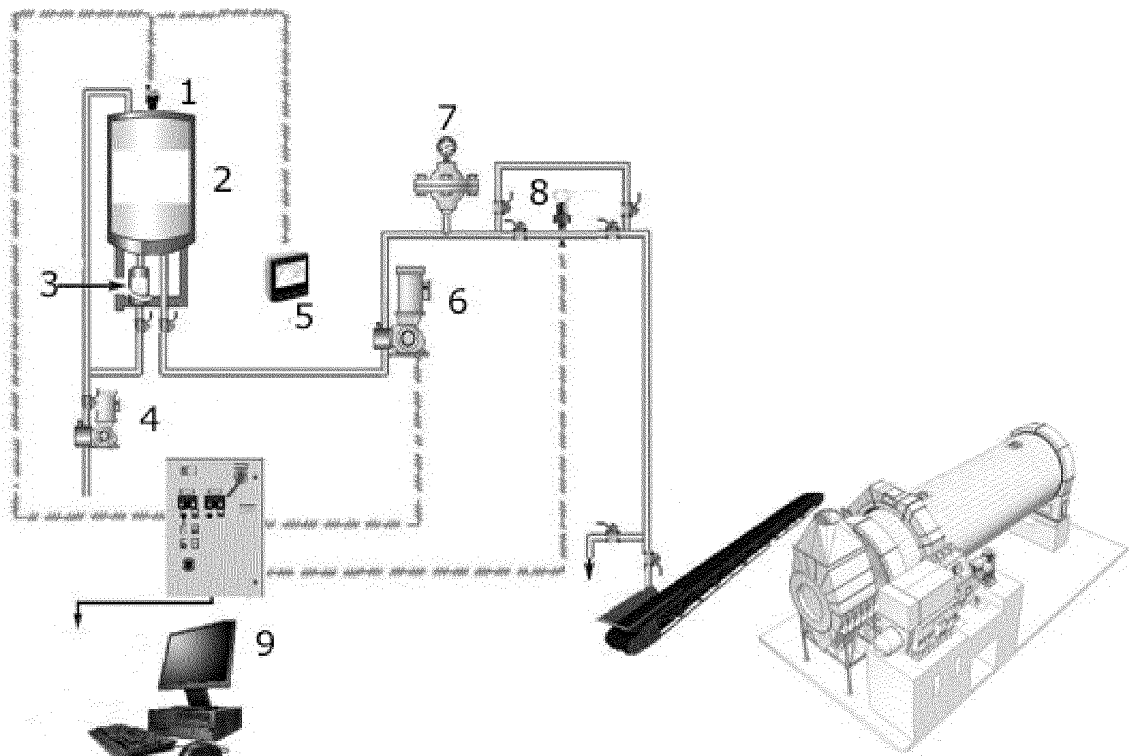


FIG. 1A

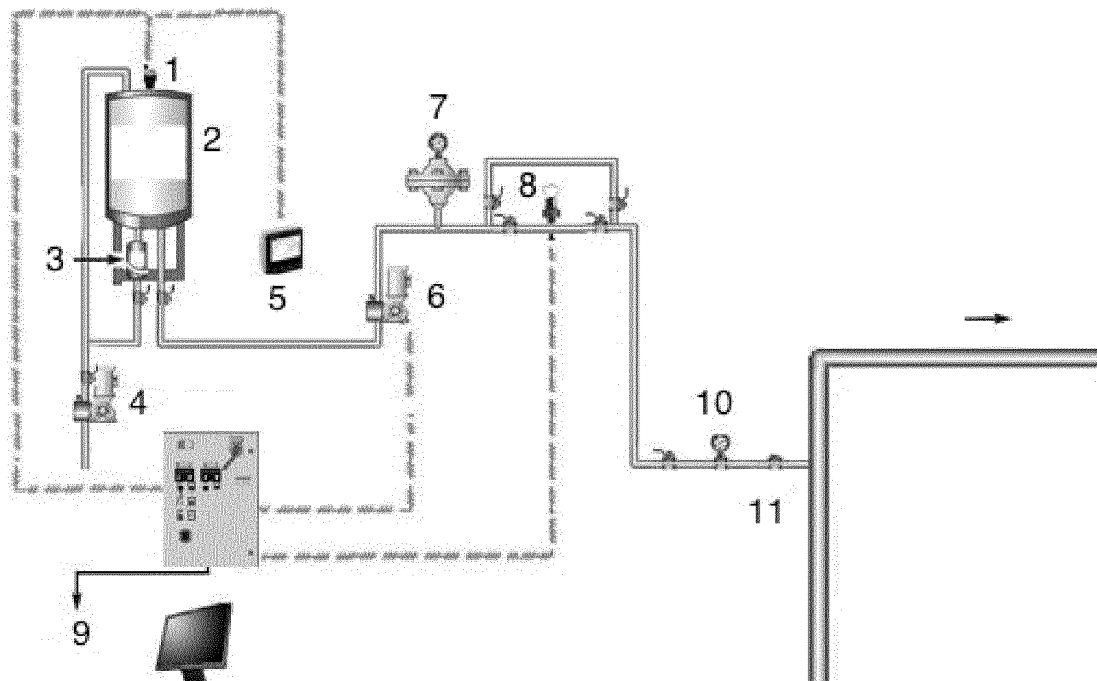


FIG. 1B

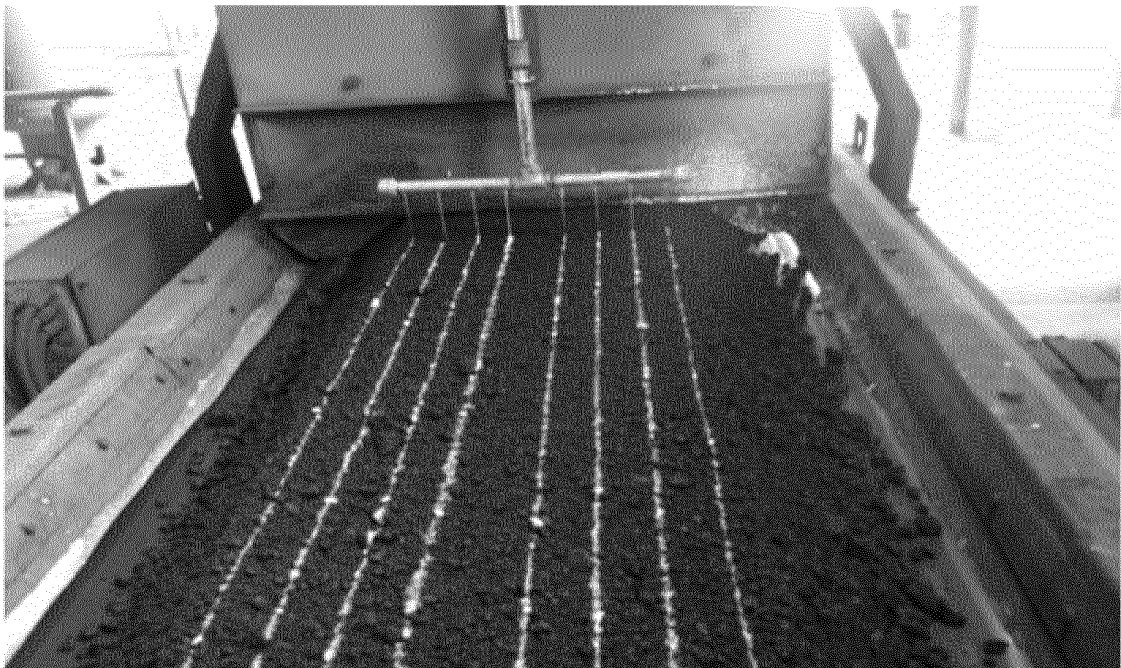


FIG. 2

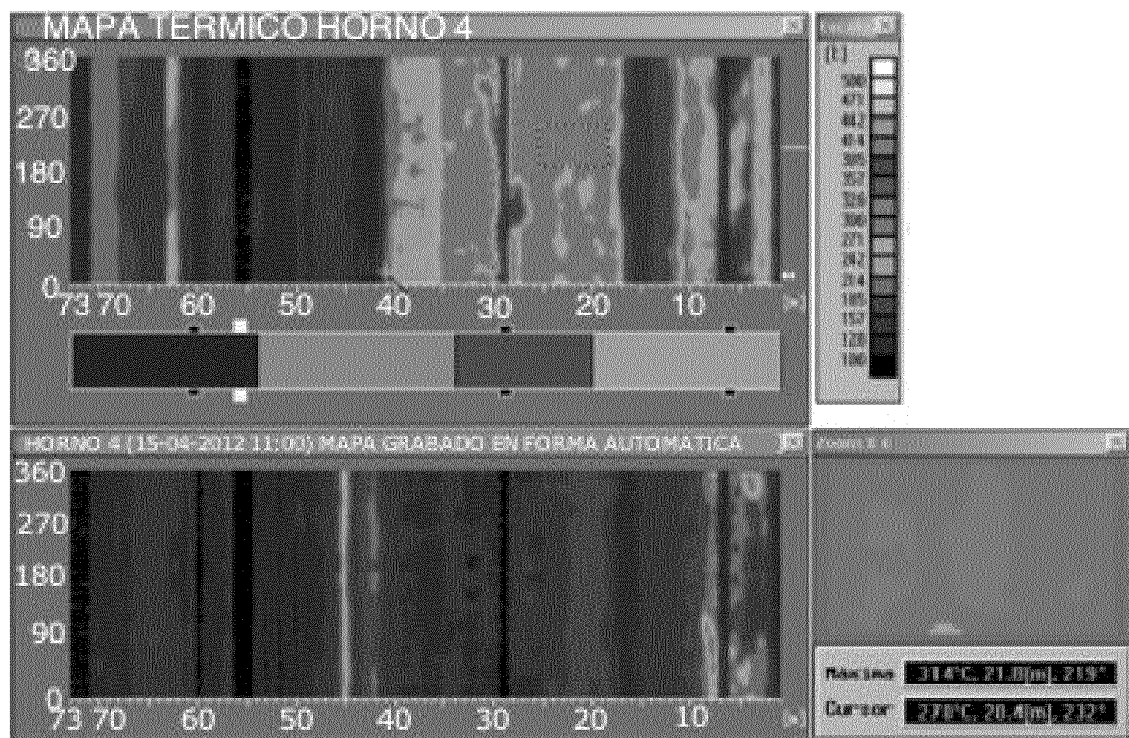


FIG. 3

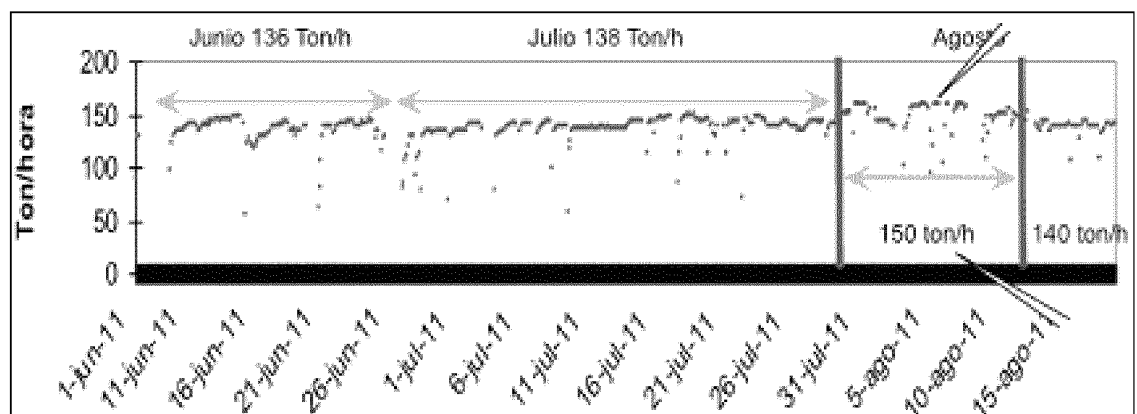


FIG. 4



EUROPEAN SEARCH REPORT

Application Number
EP 14 18 1246

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 22 January 2015	Examiner Gavriliu, Alexandru
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03 82 (P04C01)

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ON EUROPEAN PATENT APPLICATION NO.**

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REFERENCES CITED IN THE DESCRIPTION

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