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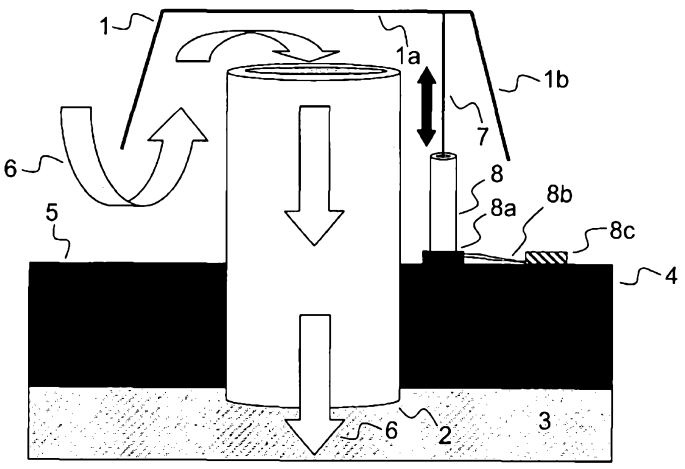
(54) Title: DEVICE AND METHOD FOR DOSING OR SHUTTING OFF PRIMARY COMBUSTION AIR IN THE PRIMARY HEATING ROOM OF HORIZONTAL COKE-OVEN CHAMBERS

(54) Bezeichnung : VORRICHTUNG UND VERFAHREN ZUR DOSIERUNG ODER ABSPERRUNG PRIMÄRER VERBRENNUNGSLUFT IN DEN PRIMÄRHEIZRAUM VON HORIZONTALEN KOKSOFENKAMMERN

FIG. 1



(57) Abstract: The invention relates to a device and to a method for shutting off and dosing primary combustion air, which flows through an air supply into the primary combustion chamber of a coke-oven chamber, and wherein said device is designed as an inverted cup, downwardly open hollow cone or massive cone, for example, and wherein said device is manually or automatically let into or open for supplying air, so that the device for dosing and shutting off closes the air supply in a number of stages between two and infinite. By way of the device, the ventilation of a coke chamber oven with primary air can be controlled such that the primary air is precisely dosed and let into the primary heating room of a coke-oven chamber depending on the installation site in a precisely distributed manner.

(57) Zusammenfassung:
[Fortsetzung auf der nächsten Seite]

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Die Erfindung betrifft eine Vorrichtung und ein Verfahren zur Abdeckung von und Dosierung von primärer Verbrennungsluft, die durch eine Luftzuführung in den primären Verbrennungsraum eine Koksofenkammer strömt und diese Vorrichtung beispielsweise als umgedrehter Becher, als nach unten offener Hohlkegel oder als massiver Kegel geartet ist, und diese Vorrichtung manuell oder automatisiert in die Vorrichtung zur Luftzuführung ein- oder aufgelassen wird, so dass die Vorrichtung zur Dosierung und Abdeckung die Luftzuführung in einer Stufenzahl von zwei bis unendlich schließt. Durch die Vorrichtung kann die Belüftung eines Kokskammerofens mit Primärluft so gesteuert werden, dass die Primärluft genau dosiert und je nach Aufstellungsort genau verteilt in den Primärheizraum einer Koksofenkammer eingelassen wird.

Device and method for dosing or shutting off primary combustion air in the primary heating room of horizontal coke-oven chambers

[0001] The invention relates to a device for dosed proportioning and cutoff of air supply devices feeding primary combustion air into the primary heating space of a coke oven chamber, said device being configured as a cover that can be stage-wise moved away from the air supply device so as to be able to exactly regulate the quantity of air streaming in. The number of stages may range from two stages to an indefinite number of stages so as to be able to regulate the entering stream of air in an arbitrarily fine manner. At the same time, this device also serves to cover the air supply device against weather impacts. The device distinguishes itself from prior art in technology in that it is situated outside the coke oven chamber on the air supply device, thus being easily accessible. Owing to the arrangement of this device, the dosed proportioning can be easily controlled and even be automated. The present invention also relates to a method for dosed proportioning of primary combustion air in a primary heating space of a coke oven chamber with the inventive device.

[0002] Any discussion of the prior art throughout the specification should in no way be considered as an admission that such prior art is widely known or forms part of common general knowledge in the field.

[0003] Carbonization of coal is often accomplished in coke ovens of the “Non-Recovery” or “Heat Recovery” type which completely burn the coking gases evolving on coal carbonization and which utilize the heat of combustion from coking gases to heat the coal during the coke making process. With the “Heat-Recovery“ type, the heat from burnt coking gas utilized to heat the coal cake is additionally exploited by a steam generator to generate energy, for example by means of a turbine installed further downstream. Coke ovens are typically utilized in configurations of several coke oven chambers arranged one behind the other, with consecutively arranged configurations of coke oven chambers of the “Non-Recovery” or “Heat Recovery” type being called coke oven banks, and consecutively arranged configurations of coke oven chambers of the conventional type being called coke oven batteries.

[0004] Coking gas evolving on coal carbonization possesses a remarkable calorific value. To achieve a uniform distribution of coking heat generated in non-conventional coke oven chambers by combustion of coking gas, the coking gas is burnt in two steps. The evolving coking gas is initially conducted into a gas space located above the coke cake within the coke oven chamber where it is burnt with a sub-stoichiometric quantity of air. This air is called

primary air or primary combustion air. The gas space above the coke cake is frequently called primary heating space. Partly burnt coking gas from the primary heating space is then passed via so-called “downcomer” channels into a secondary heating space where the coking gas is completely burnt. Thereby, the coke cake is also heated from below, thus achieving a uniform heating of the coke cake from all sides. This leads to an improved and – above all – uniform quality of coke produced.

[0005] A controlled combustion of coking gas in two steps calls for a precisely dosed supply of air both into the primary combustion space and into the secondary combustion space of a coking chamber. Devices known from prior art in technology, however, frequently are of a very simple design and configuration so that a precisely dosed proportioning is impossible or they are so arranged that a distribution of combustion air can only be accomplished at a few or hardly accessible positions of a coke oven chamber. For the supply of secondary combustion air, a dosed proportioning of air supply in general is simpler, because the supply is not accomplished directly into the secondary combustion space, but via so-called secondary air soles arranged beneath the secondary combustion heating space and connected via the vertical channels to the actual secondary heating space.

[0006] WO 2006/128612 A1 describes a device for supplying primary combustion air into a coking chamber of a “Non-Recovery” or “Heat Recovery” type coke oven. By way of this device, it is prevented that the primary heating space of the coking chamber is spatially unevenly ventilated and that heat distribution in the coking chamber is uneven. By way of this device, primary air is admitted at a plurality or multitude of positions in the top ceiling of the coke oven chamber so that the admittance of primary air is exactly rated and variably controlled throughout the duration of the coking time. In this manner, it is prevented that aspirated combustion air reacts already immediately as it enters into the oven and that combustion is limited only to the entry area of primary air. The control of air admittance is accomplished by a control element not described here more closely.

[0007] US 6187148 B1 describes a valve as a device for regulating a pressure setoff between primary heating space and secondary heating space or secondary air soles of a “Non-Recovery” or “Heat Recovery” type coke oven which is utilized to establish a pressure setoff between primary heating space and secondary heating space of a coke oven chamber. Since a negative pressure prevails in the coke oven chamber especially at the beginning of the coking process as the cold coal cake is pressed in, the admittance of primary air which in the afore-mentioned teaching is accomplished through apertures in the coke oven chamber door

and in flaps arranged there above, is only poorly controllable. For this reason, the invention provides for valves in the „downcomer" channels which cater for a pressure setoff between the primary heating space and secondary heating space of a coke oven chamber. If required, the valves can also be utilized for admitting secondary combustion air into the secondary heating space. A control of the admittance of primary combustion air is not described. The valves are easy to handle, because they are accommodated in the coke oven chamber sides averted from the door and because they are equipped with a revolving tube serving as shutoff device. A revolving tube, however, tends to get stuck at prevailing high temperatures and therefore it is susceptible to repairs. Likewise, the space demand for such a device is quite substantial.

[0008] Therefore, it would be of substantial benefit to avail of a simple device by means of which primary combustion air is conducted through the top ceiling of a coke oven chamber, with it being possible for this device to be comprised of a simple tube, shut-off by another device or controlled in a dosed manner in terms of its gas flow rate. Conducting it through the top ceiling is much simpler and requires less space. Moreover, mounting the control device outside the coke oven chamber and outside the actual air supply device would be much simpler and easier to service.

[0009] It is an object of the present invention to overcome or ameliorate at least one of the disadvantages of the prior art, or to provide a useful alternative.

[0010] According to a first aspect, the invention provides a device for dosed proportioning and cutoff of primary combustion air fed into the primary heating space of horizontal coke oven chambers, wherein

at least one aperture for supply of primary combustion air is arranged in the top ceiling of at least one coke oven chamber of a coke oven bank or coke oven battery, wherein

this aperture possesses a cover which covers the air supply on the outer side, with it being possible to withdraw this cover gradually so as to partially open the aperture for the supply of air, thus enabling the admittance of air, and

the number of stages for withdrawal of the cover and for opening the air supply ranging between two and an infinite number.

[0011] Unless the context clearly requires otherwise, throughout the description and the claims, the words “comprise”, “comprising”, and the like are to be construed in an inclusive sense as opposed to an exclusive or exhaustive sense; that is to say, in the sense of “including, but not limited to”.

[0012] Advantageously, at least in a preferred form the invention provides a device that allows for a dosed proportioning of primary combustion air into the primary heating space of a coke oven chamber, said dosed proportioning to be accomplished by means of a device that is mounted onto non-controlled air supply devices and shutting-off the air supply device as well as dosing or regulating it in terms of gas flow rate. Preferably the device for dosed proportioning is mountable on a single air supply device so as to allow for both an individual and multiple mounting of this device. Moreover, the device shall allow for both a stage-wise and infinite control and regulation. Finally, it shall be possible to regulate the device for dosed proportioning and cutoff both manually and by means of a motor-driven actuator so as to allow for its automation, if required.

[0013] Advantageously, at least in a preferred form the invention provides a device configured as a cover that can be put onto the device for air supply. This device configured as a lid accomplishes the dosed proportioning by being lifted off from the air feeder, which can be accomplished both by taking it off vertically and by unfolding it laterally away. By way of this procedure, the device is easy to mount and operate and calls for only little maintenance, too. Advantageously owing to the external attachment, the device is also easily installable into existing coke oven chambers with air feeders through the coke oven chamber top ceiling. Take-off can be accomplished by introduction of snap-in stoppers both in at least two stages and – in absence of these stoppers – by articulated joints providing sufficient retention by counter-weights in infinite graduation, or in other words, take-off can be accomplished infinitely.

[0014] The actual device is preferably configured as a cover and can be shaped like an inverted cup, For example. After all, it means that it is a plate that is provided with a downwardly molded collar-shaped circumference. But it may also be a hollow cone comprised of a downwardly open side and thus covering the air supply device with the tip in upward direction as if it were a hat. Finally, the dosed proportioning device may be comprised of a massive cone which is moved in with the tip in downward direction into the air supply device, thus shutting it off gradually.

[0015] Advantageously a simple and infinite or gradual dosed proportioning of primary combustion air into a coke oven chamber is feasible in this manner. The device can be mounted on a single air supply device or on several air supply devices. The invention possesses the benefit in that the interior of the coke oven chamber wall is protected from weather impacts. Particularly in tropical regions, heavy rain showers occur quite frequently and

regularly, thus posing a major problem to the operation of horizontal coke oven chambers. In the event of heavy rain falls, water again and again penetrates through the primary air feeders into the coke oven chamber, which may substantially disturb the oven operation and which may destroy the oven brickwork. By way of the inventive device, penetration of water during rain falls is reliably prevented.

[0016] Preferably in the most frequently applied layout, the air supply or air supplies themselves are configured as tubes so that the inventive device sits like a lid on the tube, thus shutting the tube off. The tubes can be conducted both simply perpendicularly through the top ceiling or be configured as U tubes which terminate with their open end downwardly. In this case, the inventive cutoff device is seated horizontally mirrored with the collar-shaped bulge positioned in upward direction. The air supply devices may also have a rectangular cross-section and be conducted perpendicularly or obliquely through the top ceiling.

[0017] In a very simple embodiment, the air supply devices may also be configured as simple channels, with it then being impossible to provide for a controlled introduction. The channels may also be fabricated from brickwork, then forming an entry port in the coke oven top. The air entry port may also have an upwardly directed projection made of brickwork. On the inner side of the coke oven chamber top ceiling, the air feeding devices may have any arbitrary configuration and they may also be comprised of inserts to direct the introduced primary air. The channels or tubes for air supply may be provided with a sealing material in the top ceiling.

[0018] The inventive device for dosed proportioning and cutoff itself may also have any arbitrary shape. The inventive device serving as cover may be shaped like a disk which is comprised of a collar-shaped cover directed towards the coke oven chamber so that the cover has a cross-section that has the shape of an inverted cup, with it being required for it to have a cross-section larger than the air feeder to be covered in order to be able to realize the inventive function. The cup may have any arbitrary shape. The cup may have the central interface of a straight line with two straight lines branching off at an angle of 60°. However, the cup may also have the shape of a swung “W”, with the cups being used in inverted form.

[0019] However, the inventive device may also be configured as an inverted hollow downwardly open cone, with the hollow cone and the central interface having the shape of an inverted “V”. At the point of the largest cross-section, the inverted hollow cone is larger in cross-section than the air feeder to be covered. The “V”, too, may have a swung shape or, in

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other words, it is not ending in an acute tip. The hollow cone may have any arbitrary shape as long as it fulfils its task of covering.

[0020] In a very simple embodiment, the device for covering and dosed proportioning may be configured as a simple flap which is not fastened to the air feeder device. The device can be raised or lowered by means of a rod with a movement mechanism.

[0021] Finally, the cover may also have the shape of a massive cone which is moved into the air-feeding device so that the air-feeding device or the tube is shut as the cone is moved-in. The massive cone may also be configured as a hollow cone, though closed towards all sides. It also fulfils the covering function as it is moved with the tip into the air-feeding device, thus shutting it off. It will probably be less costly in production. The covering inventive device may also have the shape of a simple plate as long as it fulfils its covering function. Finally, the covering inventive device may also have any arbitrary shape as long as it fulfils its inventive task.

[0022] The inventive device may be fabricated from any arbitrary material that sufficiently withstands high temperatures prevailing at the coke oven chamber top. This may be stainless steel, for example, but it may also be made of ceramics or stone. The inventive insert can also be equipped with seals or barricading devices.

[0023] On its inner side, the inventive device may have thickenings that can be moved into the air supply device, thus providing for an additional tight shutoff. These are preferably made of refractory material. This is helpful, especially during the start-up phase. These thickenings can be raised or lowered with bolting devices towards the inventive device for covering and dosed proportioning.

[0024] The inventive device can be moved away from the air supply so that it opens the air-feeding device. If the air-feeding device is an inverted cup, then it can be moved away from the air-feeding device by raising it. In its closed position, it simply rests on the tube so that it is shut. In an exemplary embodiment, the cup is downwardly connected to a rod so that it is linked to a hydraulic lifting cylinder. This hydraulic lifting device raises or lowers the inverted cup so that it shuts the tube when lowered. The device can be lowered or raised in two stages („open“-„closed“) or in any arbitrary number of stages.

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[0025] The device for opening or closing can also exercise the desired function when swung away laterally. This is advantageously accomplished through an articulated joint device which is fastened to the covering device. It can swing away in any arbitrary direction. The swinging procedure, too, can be accomplished in a number of stages ranging from two to infinite ("step-less").

[0026] If the covering device is a massive cone, it is generally moved only by raising or lowering, because in general it is impossible to swing it away. In principle, however, any device is conceivable that moves the covering device to and from the air-feeding device.

[0027] As a rule, the cover is larger in cross-section than the air-feeding device or than the tube in order to be able to ensure a complete covering. Even an incompletely covering device is conceivable, but is implemented only rarely. Typically the largest cross-sections for an inventive cover range from 80 to 280 millimeters. Typically the largest cross-sections for air supplies or tubes equipped with the inventive cover range from 50 to 250 millimeters. In a typical embodiment, the tubes are 50 to 1200 mm high.

[0028] On its inside, the air supply may be provided with air-conducting devices. On its inside, the inventive device may for example be provided with a bottleneck that exerts a Venturi effect on the gas streaming in. Thereby, the velocity of the air flow streaming-in is increased. The air supply can also be provided with baffle plates. On the inside of the coke oven chamber, the air supply may also be provided with gas-conducting devices or spouts. If the covering device is a plate or a cup, then it can be provided with an aperture or a sight glass that allow for taking insight or getting access to the areas situated under the cover.

[0029] In most applications, the air feeders are so arranged that they are mounted individually and in a multitude on the top of coke oven chambers. However, it is also possible to utilize collective pipes which centrally aspirate air and distribute it to the individual air feeders. An example for a collective pipe serving for discharge of gas from several coking chambers equipped with gas-discharging pipes is disclosed in GB 384092. Flaps (18) serving as proportioning device are provided within the individual gas-discharging pipes. A proportioning device mounted from the outside and having a covering effect is not disclosed therein. As proposed in the present invention, a collective pipe which supplies primary combustion air from the outside and distributes it into the individual air feeder pipes of the primary combustion space(s) of a coke oven battery or coke oven bank can therefore also be

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provided with an inventive device for cutoff or dosed proportioning on the outer end of the collective pipe averted from the coke oven chamber.

[0030] The inventive device is easy to mount, it is a low-cost device and easy to maintain and/or easy to clean from contamination.

[0031] According to another aspect, the invention provides a method for dosed proportioning or cutoff of primary combustion air fed into the primary heating space of horizontal coke oven chambers, wherein

primary combustion air is admitted through one aperture in the top ceiling of a coke oven chamber into the primary heating space of a coke oven chamber of a coke oven bank or coke oven battery, and

this primary combustion air serves for partial combustion of the coking gas which streams on coal carbonization into the gas space situated above the coke cake and within the coke oven chamber, and

the partially burnt coking gas thus obtained streams through appropriate channels into a secondary heating space situated beneath the coking chamber where the partially burnt coking gas is completely burnt with secondary combustion air, and

the apertures for admittance of primary combustion air are provided with a device arranged outside the coke oven chamber and accomplishing a dosed proportioning of primary combustion air or a cutoff of the admittance of primary combustion air into the coking space of a coke oven chamber, and

the device is utilized for dosed proportioning or cutoff of primary combustion air in the primary combustion space of a coke oven chamber.

[0032] To execute the inventive method it is possible to arrange the device for dosed proportioning and cutoff on only one air feeder of one or several coke oven chamber(s) of a coke oven battery or coke oven bank and to utilize it for controlling the admittance of air. It can be mounted at any arbitrary position, with it also being possible that there are further air admittance devices which are non-controlled. It is also possible for the inventive device to sit on several air feeders of one or several coke oven chamber(s) of a coke oven battery or coke oven bank and to be utilized for control and regulation of the air admittance. For example, all air feeders of a coke oven chamber can be provided with the inventive device for cutoff. These can in any case be controlled and regulated individually or simultaneously.

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[0033] For example, the actuation of the inventive device for cutoff can be accomplished manually. To this effect, a handle actuated manually after climbing-up onto the top of a coke oven chamber may be mounted on the cover. Its actuation can also be accomplished manually from a remote position by utilizing a lever, a rope tackle or a linkage. The drive of the inventive device can also be performed hydraulically or electrically. For example, this can be executed directly at the cover or from a remote position, for example via a lever. If a hydraulic or electrical device is applied, the method can also be automated, for example with a process control system. Sensors may also be utilized for this purpose which for example pick-up the temperature or oxygen content in the coke oven chamber or in the primary heating space. Sensors that pick-up the position of the inventive device can also be utilized. Finally, it is also possible to utilize the device if a slight and constant negative pressure is generated by means of a blower or compressor in the air-feeding device.

[0034] The inventive device is easy to mount because it is attached from the outside onto the air feeder device and it is also easy to retrofit in existing installations. It requires little maintenance and it is easy to clean from contamination. By its type of arrangement, the demand for space needed by the device and the coke oven chamber equipped therewith is little. By applying the inventive device, the air admittance into a primary heating chamber is easy to control so that an evenly distributed air supply into the primary heating space and an accordingly improved quality of the coke thus obtained is achieved. The inventive device for covering and dosed proportioning can be operated by applying a method that is easy to automate and that can be controlled by measuring parameters in the coke oven chamber.

[0035] The design and layout of the inventive device is elucidated by way of twelve drawings, with the design and layout of the present invention not being restricted to these embodiments.

[0036] FIG. 1 describes an inventive device (1) for dosed proportioning and cutoff of an air feeder (2) into the primary heating space (3) of a coke oven chamber (4). To be seen of the coke oven chamber is its top ceiling (5) and part of the primary heating space (3). The actual inventive device for covering (1) is configured as an inverted cup (1a) which has a round, collar-shaped cover (1b) directed towards the coke oven chamber through which the air inflow current (6) is cut-off, because it rests on the air supply device.(2). The barricading device is fastened on the inside with a rod (7). This in turn is linked to a hydraulic cylinder (8) which is moved up and down by way of an appropriate hydraulic device. The hydraulic device is moved

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by the motor-driven actuator (8a) which is connected via connecting cables (8b) to a control unit (8c).

[0037] Fig. 2 shows the same device that has been opened by a hydraulic cylinder (8a). The hydraulic cylinder (8) moves the rod (7) upwards which also moves the cup (1a) upwards. Thereby, the air feeder for supply of primary air (6) is opened. Here, the device (1) is comprised of an inspection port (9) with a handle (9a) suitable for inspecting the interior. FIG. 3 also shows the same device (1) which instead of the inspection port comprises a thickening (1c) arranged in the interior of the inverted cup (1a) and movable into the air feeder device (2), thus closing it tightly. This device, too, can be automatically moved by a rod (7) with a hydraulic cylinder (8). FIG. 4 also shows the same device (1) which comprises a thickening (1c) arranged in the interior of the inverted cup (1a) that can be sunk by way of a bolting device (1d), i.e. separately from the inventive flap (1) , into the air feeder device (2). This device (2), too, can be automatically moved by a rod (6) with a hydraulic cylinder (7).

[0038] FIG. 5 also describes an inventive device (1) for dosed proportioning and cutoff of an air feeder device (2) into the primary heating space (3) of a coke oven chamber (4). The shutting device is configured as a hollow inverted cone (1c) which is open towards the bottom. The hollow cone carries a handle (10) by means of which the entire hollow cone (1e) can be swung away manually (10a) towards the side. The hollow cone itself is fastened via a rod with articulated joints (7a). On the side of the top (5) directed inwardly into the coke oven chamber, the air feeder device (2) is provided with spouts (11). FIG. 6 shows the device (1) with the hollow cone (1e) in opened position. Primary air (6b) is introduced in a well directed form through the spouts (11).

[0039] FIG. 7 also describes an inventive device (1) for dosed proportioning and cutoff of an air feeder device (2) into the primary heating space (3) of a coke oven chamber (4). The device (1) is comprised of a massive closed cone (1f) which is moved into the aperture (2a) of the air-feeder device (2), thus closing it tightly. The air-feeder device (2) is comprised of bottlenecks to increase the gas velocity (12) for primary air (6) streaming in. Fig. 8 shows this device (1f) in closed position. The movement is caused by a hydraulic cylinder (8) which is operated via a hydraulic actuator device. This in turn is controlled via a motor-driven actuator (8a) connected via connecting cables (8b) to a control unit (8c). To be seen beneath the coke oven chamber top (5) is the primary heating space (3).

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[0040] FIG. 9 describes an inventive device (1) for dosed proportioning and cutoff of an air feeder device (2) into the primary heating space (3) of a coke oven chamber (4). In this drawing, one can only see the cover on the air feeder device (2). In the central cross-section, it is shaped as a swung "W" (1g). Thereby, it can better cover the tube serving as air-feeding device (2).

[0041] FIG. 10 describes an inventive device (1) which is configured as a simple flap (1h) so that it covers the air supply by unfolding it downwardly (1i) Downward unfolding is controlled by a lever (7) which is moved by a hydraulic cylinder (8). It is moved by a motor-driven actuator (8a). The flap is movably suspended to a bearing rod (1j).

[0042] FIG. 11 describes an inventive device (1) which covers an air feeder device (2) supplying air into a coke oven chamber (4), with both devices being fabricated of mineral or stone-like material. The inventive device for covering and dosed proportioning (1) is configured as an inverted cone (1k) which is made of a ceramic material. The device for air feed (2) into a coke oven chamber (4) is fabricated from masonry bricks (2a) which form a bricked air supply channel (2b) formed as a projection. The device for dosed proportioning and covering (1) is opened by unfolding it laterally away.

[0043] FIG. 12 finally shows the arrangement of the inventive device (1) in a horizontal coke oven chamber (4) of the „Non-Recovery" or „Heat-Recovery" type. The inventive device for dosed proportioning and cutoff (1) is configured as a lid with a round, collar-shaped sleeve (1b) which is arranged above the air feeder device (2) which is configured here as a tube. It can be swung away laterally by means of an articulated joint device (7a), thus opening or closing the air supply (2). To be seen here are the coke cake (13), the coke oven chamber doors (14), the „downcomer" channels (15) including apertures (15a), the secondary heating space (16) and the secondary air sole (17).The secondary air sole (17) contains apertures (17a) which are also equipped with devices for dosed proportioning and cutoff that control and regulate the secondary air stream.

[0044] List of Reference Symbols

1	Device for dosed proportioning and cutoff
1a	Inverted cup
1b	Round, collar-shaped cover
1c	Thickening

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1d	Bolting device
1e	Hollow cone
1f	Massive, closed cone
1g	Inverted cup as a swung “W”
1h	Flap
1i	Flap positions of downward unfolding
1j	Bearing rod
1k	Inverted-over hollow cone made of masonry bricks
2	Air feeder device
2a	Masonry bricks of the air feeder device
2b	Air-feeding channel bricked-up as a projection
3	Primary heating space
4	Coke oven chamber
5	Top of the coke oven chamber
6	Air stream
7	Rod
7a	Articulated joints for moving the rod
8	Hydraulic cylinder
8a	Positioning motor
8b	Connecting cable
8c	Control unit
9	Inspection port including handle
10	Grip for opening
10a	Manual opening:
11	Spouts
12	Bottlenecks to increase gas flow velocity, “Venturi” effect
13	Coke cake
14	Coke oven chamber doors (with opening device)
15	“Downcomer“ channels
15a	Apertures of “downcomer“ channels
16	Secondary heating space
17	Secondary air sole
17a	Device for dosed proportioning and cutoff of secondary air sole aperture

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Claims

1. A device for dosed proportioning and cutoff of primary combustion air fed into the primary heating space of horizontal coke oven chambers, wherein

at least one aperture for supply of primary combustion air is arranged in the top ceiling of at least one coke oven chamber of a coke oven bank or coke oven battery, wherein

this aperture possesses a cover which covers the air supply on the outer side, with it being possible to withdraw this cover gradually so as to partially open the aperture for the supply of air, thus enabling the admittance of air, and

the number of stages for withdrawal of the cover and for opening the air supply ranging between two and an infinite number.

2. A device for dosed proportioning or cutoff of primary combustion air fed into the primary heating space of horizontal coke oven chambers as defined in claim 1, wherein the air feeder(s) are configured as simple and vertical tubes leading through the top ceiling of a coke oven and thus supplying the primary heating space with primary air.

3. A device for dosed proportioning or cutoff of primary combustion air fed into the primary heating space of horizontal coke oven chambers as defined in claim 1 or claim 2, wherein the cover is configured as a disk having a round collar-shaped cover directed towards the coke oven chamber so that it has a cross-section having the shape of a cup, this cover being larger in cross-section than the air feeder to be covered.

4. A device for dosed proportioning or cutoff of primary combustion air fed into the primary heating space of horizontal coke oven chambers as defined in claim 1 or claim 2, wherein the cover is configured as a hollow downwardly open cone which at the position of the largest cross-section is greater in cross-section than the air feeder to be covered.

5. A device for dosed proportioning or cutoff of primary combustion air fed into the primary heating space of horizontal coke oven chambers as defined in any of the preceding claims 1 to 4, wherein the cover has a thickening on the side facing the air feeder device into the coke oven chamber, said thickening moving into the air feeder device during the closure procedure and thus closing it tightly.

6. A device for dosed proportioning or cutoff of primary combustion air fed into the primary heating space of horizontal coke oven chambers as defined in claim 5, wherein the thickening is fabricated of a refractory material.

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7. A device for dosed proportioning or cutoff of primary combustion air fed into the primary heating space of horizontal coke oven chambers as defined in claim 5 or claim 6, wherein the thickening can be raised or lowered in its height versus the device for covering and dosed proportioning by means of a bolting device.

8. A device for dosed proportioning or cutoff of primary combustion air fed into the primary heating space of horizontal coke oven chambers as defined in any one of the preceding claims 3 to 7, wherein the cover is connected to a rod that can be moved by a mechanical device in vertical direction so that the cover opens or closes the air feeder by the vertical movement.

9. A device for dosed proportioning or cutoff of primary combustion air fed into the primary heating space of horizontal coke oven chambers as defined in any one of the preceding claims 3 to 7, wherein the cover is connected to a rod that moves the cover by an articulated joint device in lateral direction away from the air feeder so that the cover opens or closes the air feeder by the lateral off-movement.

10. A device for dosed proportioning or cutoff of primary combustion air fed into the primary heating space of horizontal coke oven chambers as defined in claim 1 or claim 2, wherein the cover is configured as a massive or covered cone and can be moved with its tip into the air feeder, thus covering it.

11. A device for dosed proportioning or cutoff of primary combustion air fed into the primary heating space of horizontal coke oven chambers as defined in claim 10, wherein the cover is connected to a rod that moves the cover by an articulated joint device in lateral direction away from the air feeder so that the cover opens or closes the air feeder by the lateral off-movement.

12. A device for dosed proportioning or cutoff of primary combustion air fed into the primary heating space of horizontal coke oven chambers as defined in any one of the preceding claims 1 to 11, wherein the air feeder is configured as a tube having a cross-section of 50 to 250 millimeters at the position of the largest cross-section, and that the cover has a cross-section of 80 to 280 millimeters at the position of the largest cross-section.

13. A device for dosed proportioning or cutoff of air supply for primary combustion air fed into the primary heating space of horizontal coke oven chambers as defined in any one of the

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preceding claims 1 to 12, wherein the air feeder is configured as a tube which in its interior comprises a bottleneck that exerts a Venturi effect increasing the air flow velocity on the air streaming-in.

14. A device for dosed proportioning or cutoff of primary combustion air fed into the primary heating space of horizontal coke oven chambers as defined in any of the preceding claims 1 to 13, wherein the cover comprises an aperture or sight glass through which the areas located beneath the cover are accessible and can be visually inspected.

15. A device for dosed proportioning or cutoff of primary combustion air fed into the primary heating space of horizontal coke oven chambers as defined in any one of the preceding claims 1 to 14, wherein the air feeder tubes in the primary combustion space are connected to a collective tube that feeds primary combustion air from the outside and distributes it into the individual air feeder tubes of the primary combustion space(s) of a coke oven battery or coke oven bank, and that the device for cutoff or dosed proportioning is arranged on the outer end of the collective tube averted from the coke oven chamber.

16. A method for dosed proportioning or cutoff of primary combustion air fed into the primary heating space of horizontal coke oven chambers, wherein

primary combustion air is admitted through one aperture in the top ceiling of a coke oven chamber into the primary heating space of a coke oven chamber of a coke oven bank or coke oven battery, and

this primary combustion air serves for partial combustion of the coking gas which streams on coal carbonization into the gas space situated above the coke cake and within the coke oven chamber, and

the partially burnt coking gas thus obtained streams through appropriate channels into a secondary heating space situated beneath the coking chamber where the partially burnt coking gas is completely burnt with secondary combustion air, and

the apertures for admittance of primary combustion air are provided with a device arranged outside the coke oven chamber and accomplishing a dosed proportioning of primary combustion air or a cutoff of the admittance of primary combustion air into the coking space of a coke oven chamber, and

the device is utilized for dosed proportioning or cutoff of primary combustion air in the primary combustion space of a coke oven chamber.

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17. A method for dosed proportioning or cutoff of primary combustion air fed into the primary heating space of horizontal coke oven chambers as defined in claim 16, wherein the device sits on only one air feeder of one or several coke oven chamber(s) of a coke oven battery or coke oven bank and is utilized for controlling and regulating the admittance of air.

18. A method for dosed proportioning or cutoff of primary combustion air fed into the primary heating space of horizontal coke oven chambers as defined in claim 16, wherein the device sits on several air feeders of one or several coke oven chamber(s) of a coke oven battery or coke oven bank and is utilized for controlling and regulating the admittance of air.

19. A method for dosed proportioning or cutoff of primary combustion air fed into the primary heating space of horizontal coke oven chambers as defined in any one of the preceding claims 16 to 18, wherein the device(s) is (are) actuated manually.

20. A method for dosed proportioning or cutoff of primary combustion air fed into the primary heating space of horizontal coke oven chambers as defined in any one of the preceding claims 16 to 18, wherein the device(s) is (are) actuated manually via a lever, a linkage or a rope tackle.

21. A method for dosed proportioning or cutoff of primary combustion air into the primary heating space of horizontal coke oven chambers as defined in any one of the preceding claims 16 to 18, wherein the device(s) is (are) actuated hydraulically.

22. A method for dosed proportioning or cutoff of primary combustion air fed into the primary heating space of horizontal coke oven chambers as defined in any one of the preceding claims 16 to 18, wherein the device(s) is (are) actuated by an electric motor.

23. A method for dosed proportioning or cutoff of primary combustion air fed into the primary heating space of horizontal coke oven chambers as defined in any one of the preceding claims 16 to 22, wherein the supply of primary combustion air is accomplished via a blower or compressor operating at a slight, though constant positive pressure.

24. A device for dosed proportioning and cutoff of primary combustion air fed into the primary heating space of horizontal coke oven chambers, substantially as herein described with reference to any one of the embodiments of the invention illustrated in the accompanying drawings and/or examples.

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25. A method for dosed proportioning or cutoff of primary combustion air fed into the primary heating space of horizontal coke oven chambers, substantially as herein described with reference to any one of the embodiments of the invention illustrated in the accompanying drawings and/or examples.

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FIG. 1

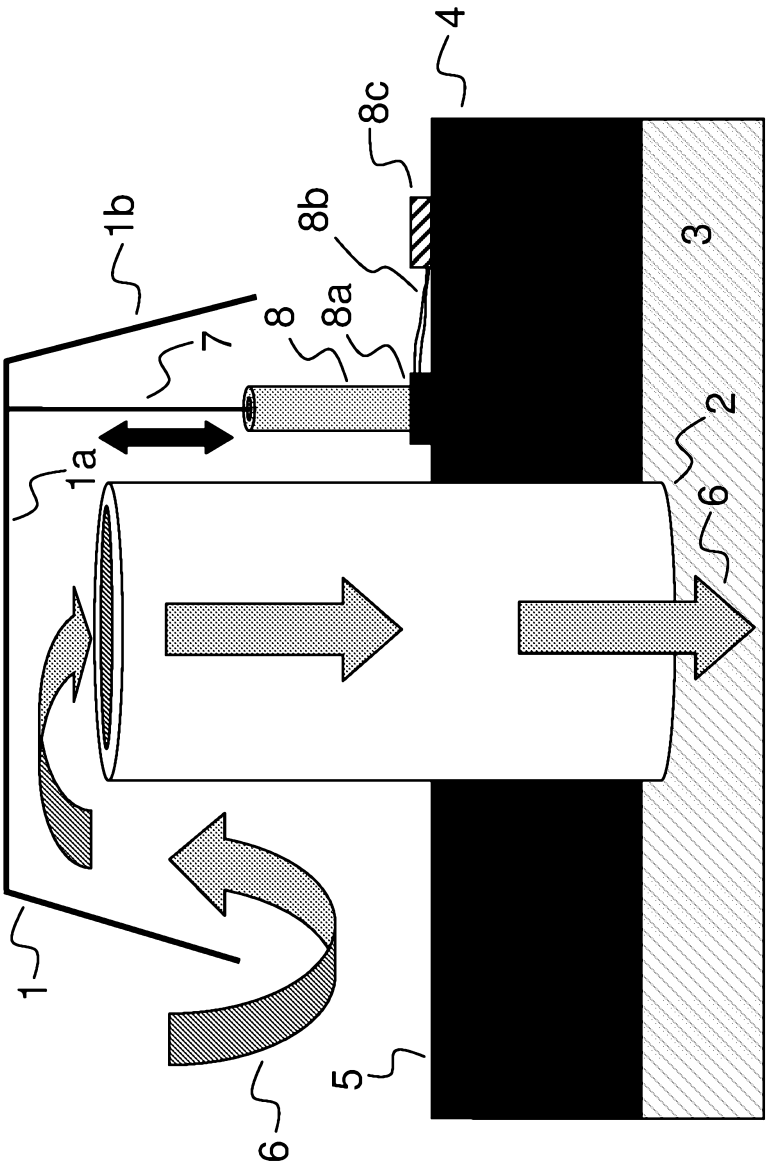

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FIG. 2

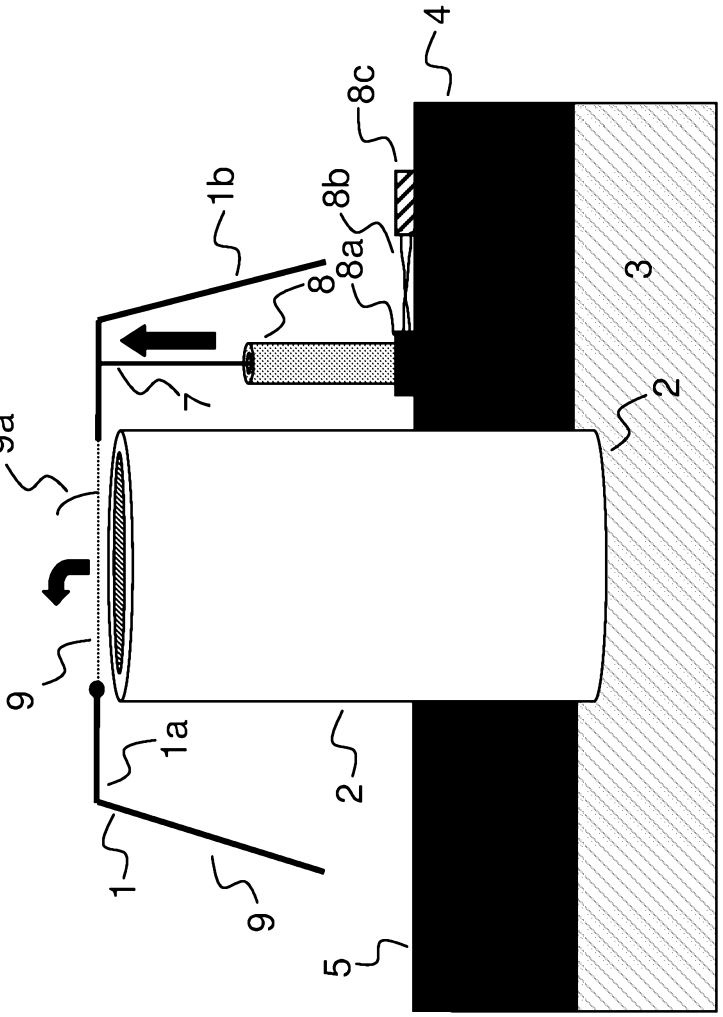

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FIG. 3

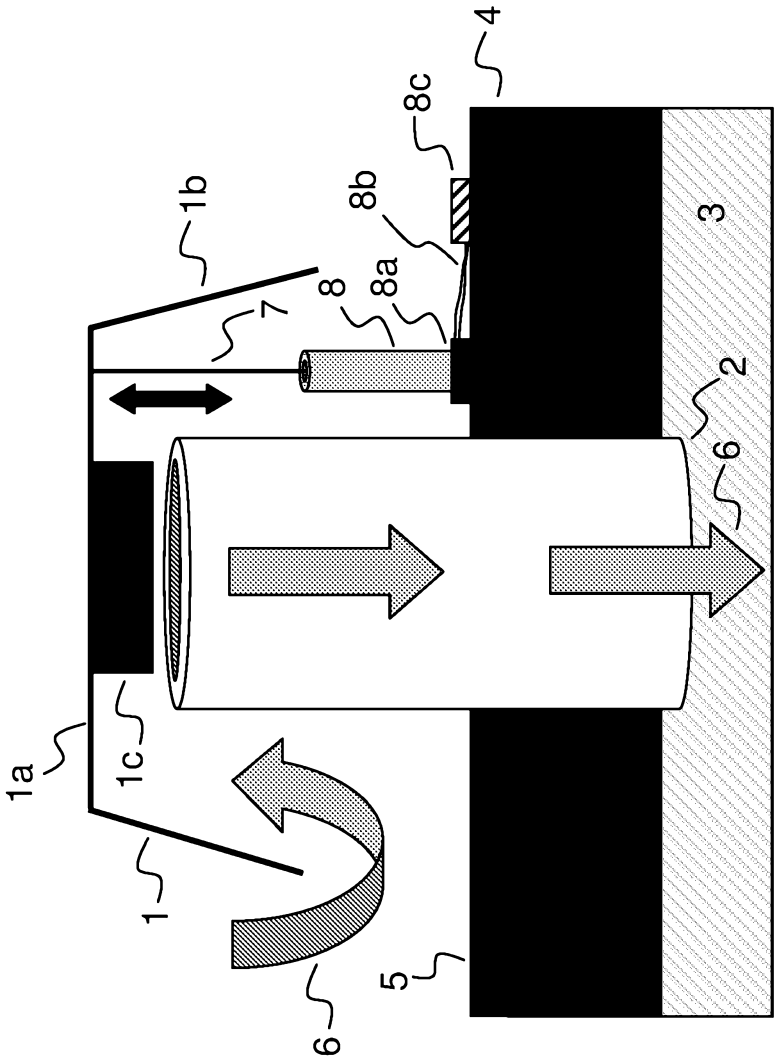

FIG. 4

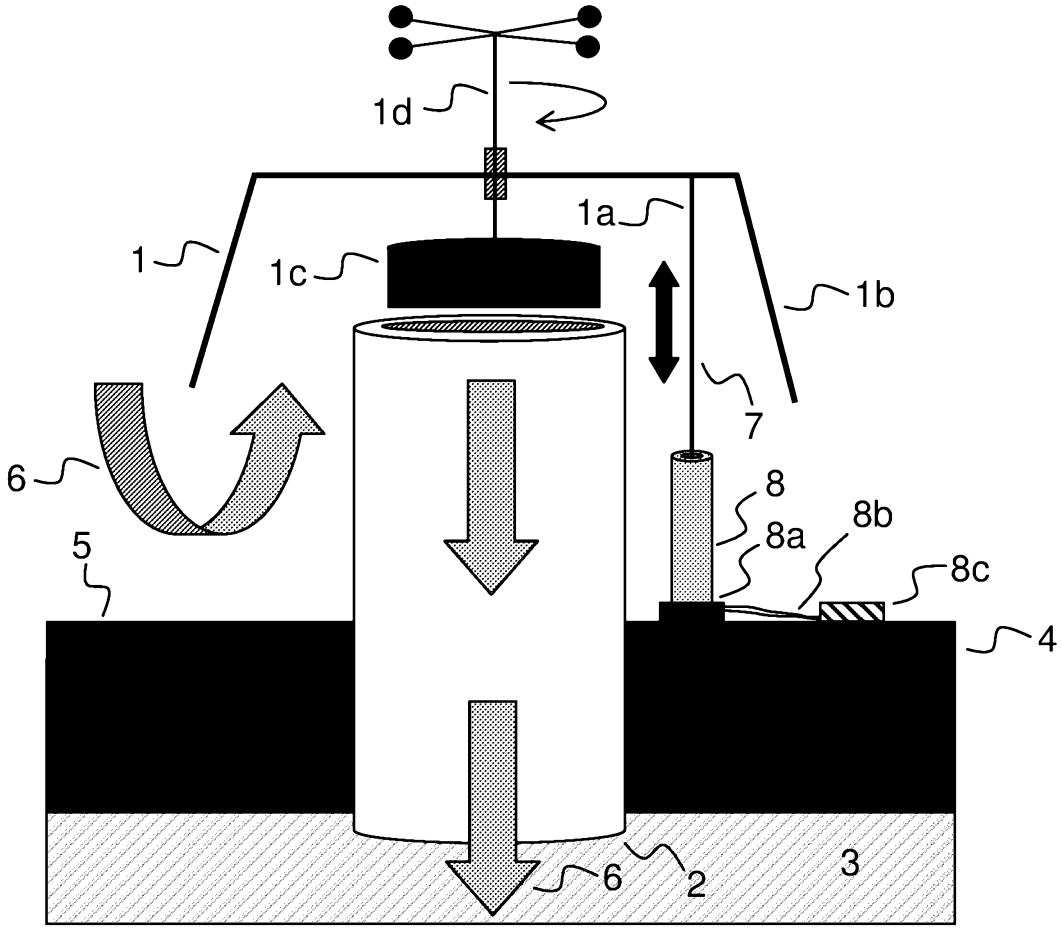

FIG. 5

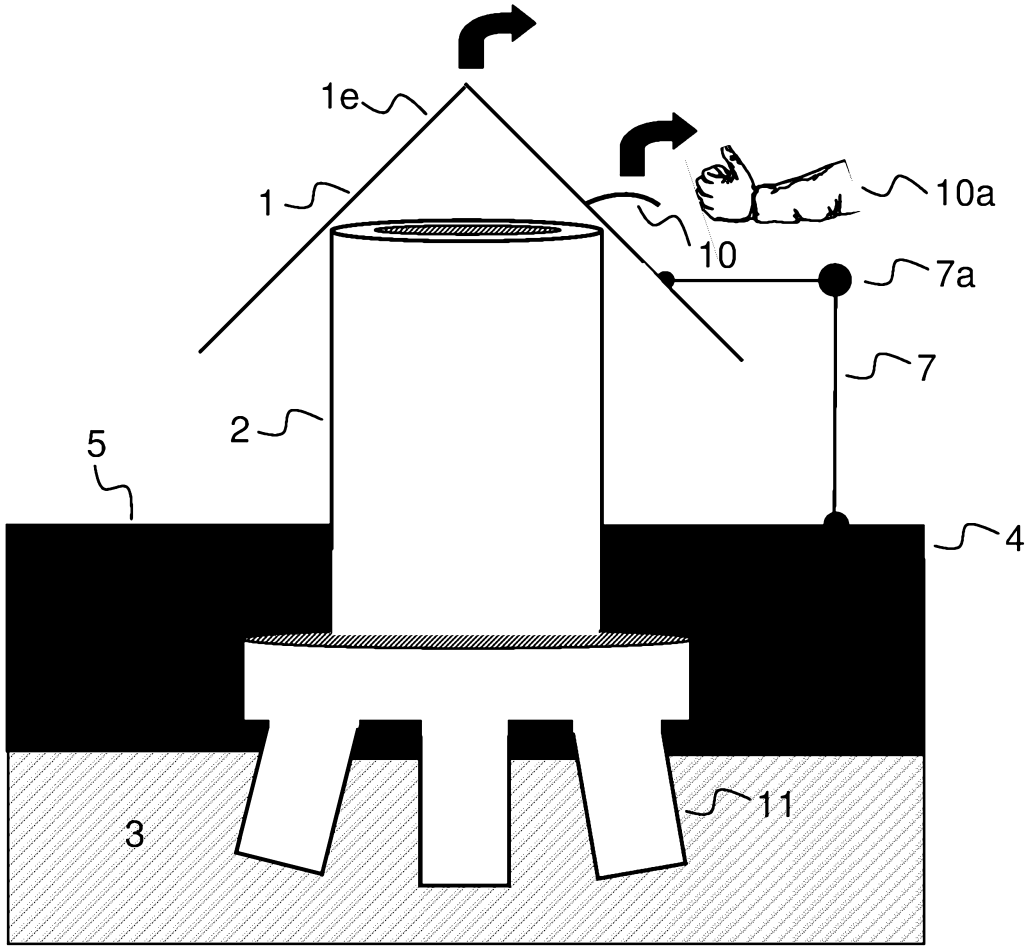

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FIG. 6

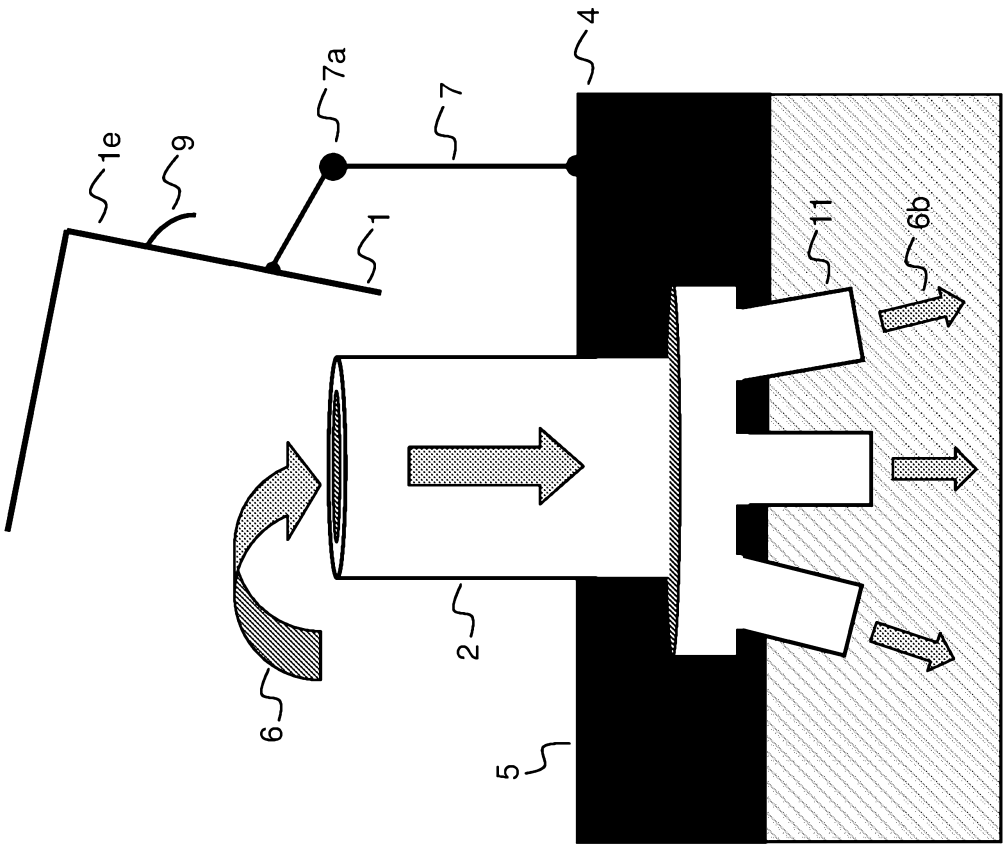

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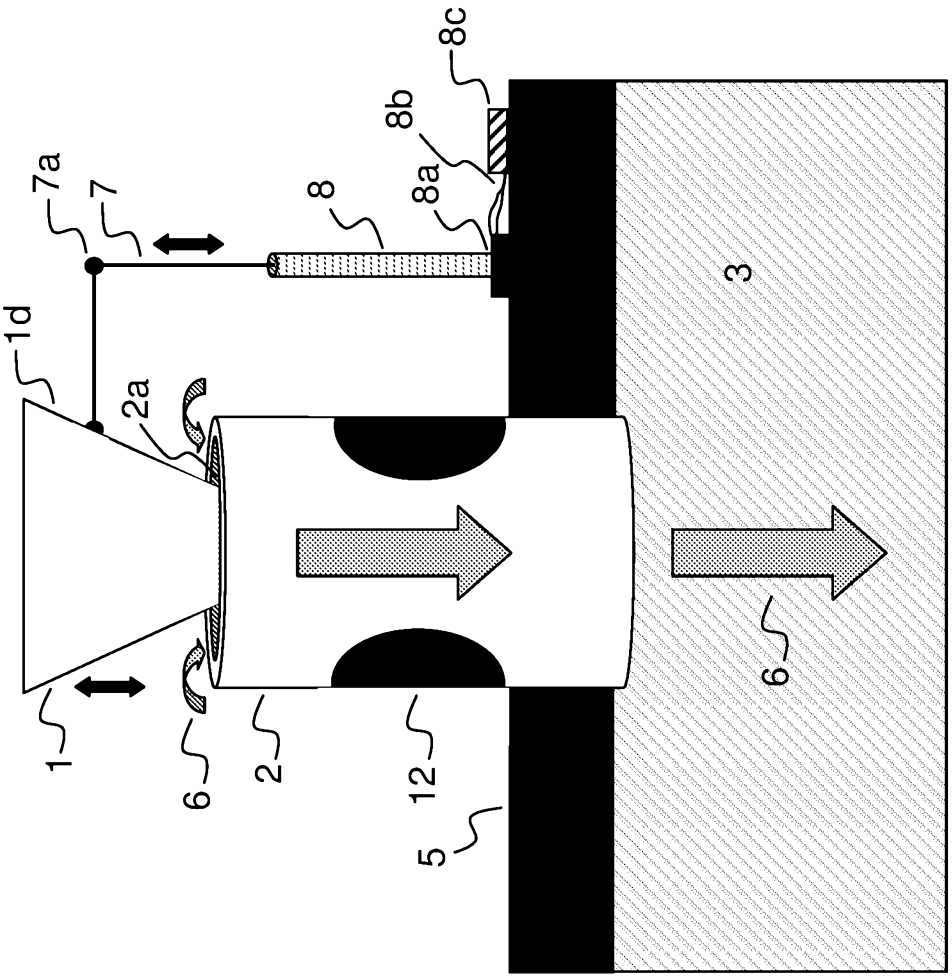
FIG. 7



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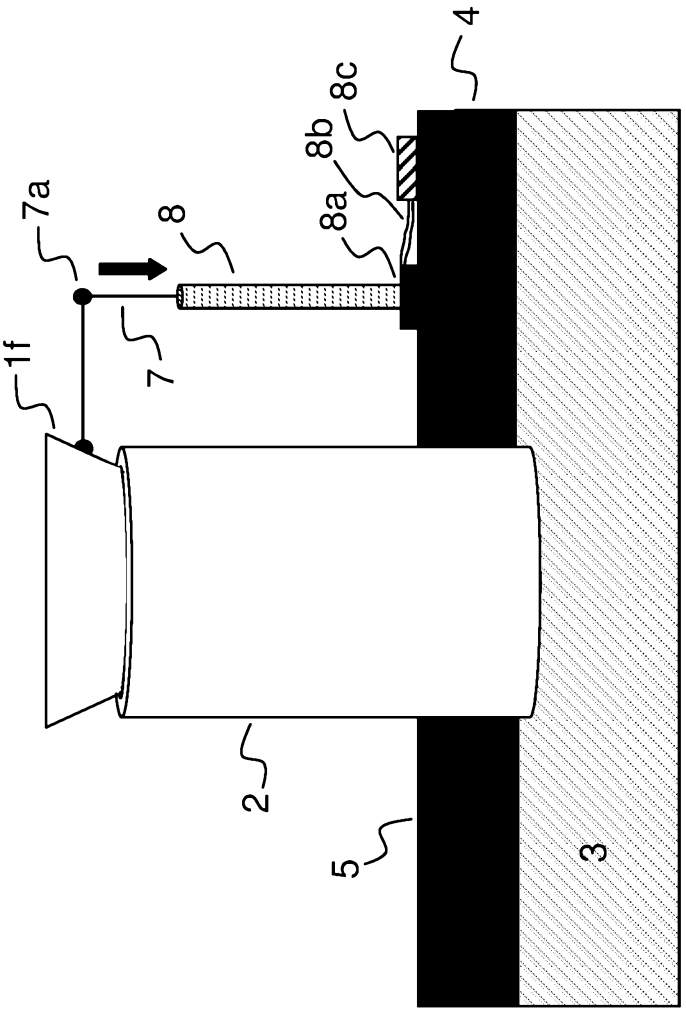

FIG. 8

FIG. 9

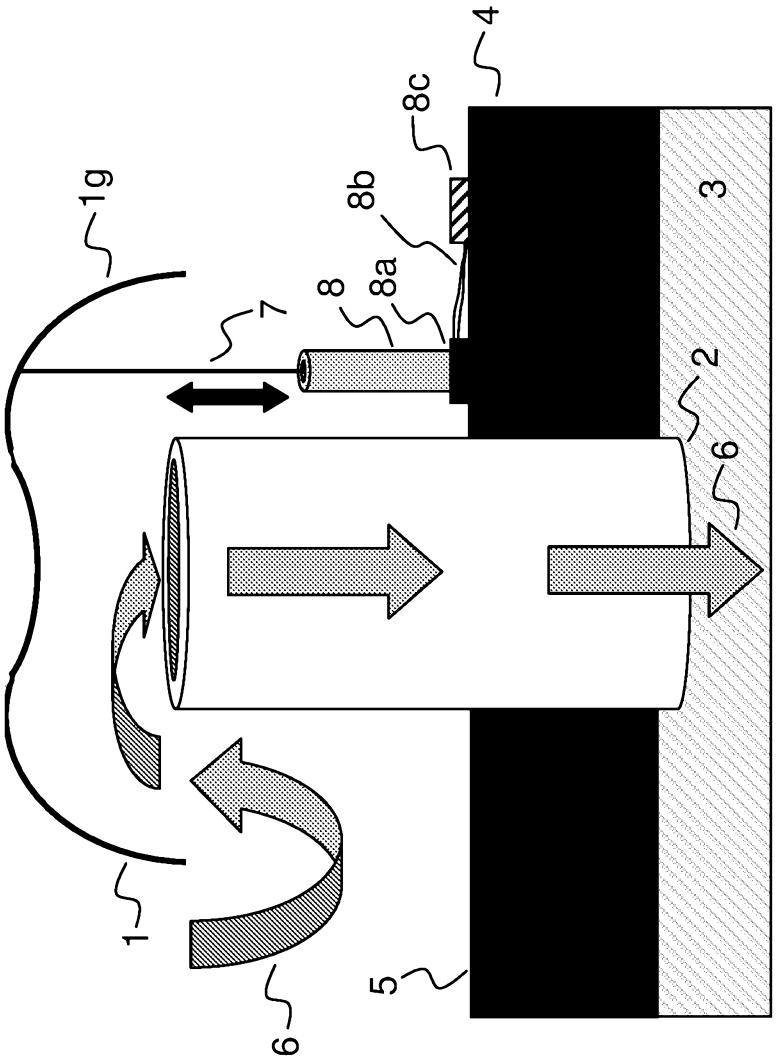

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FIG. 10

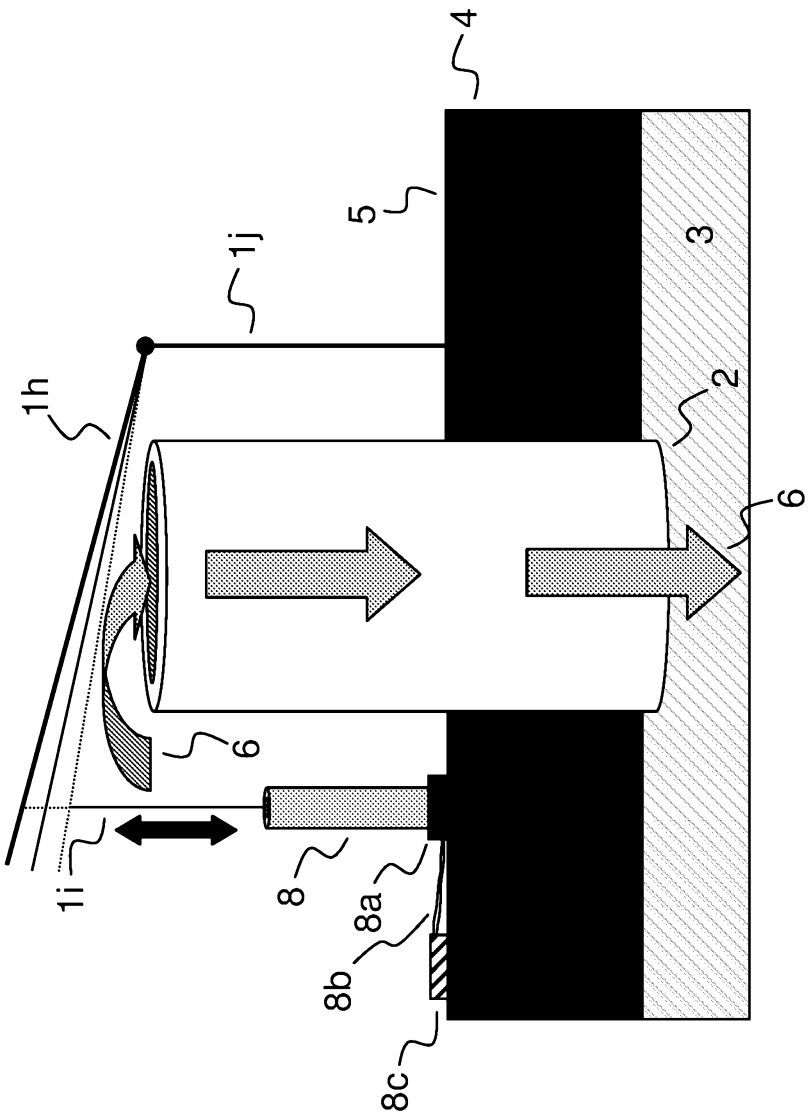

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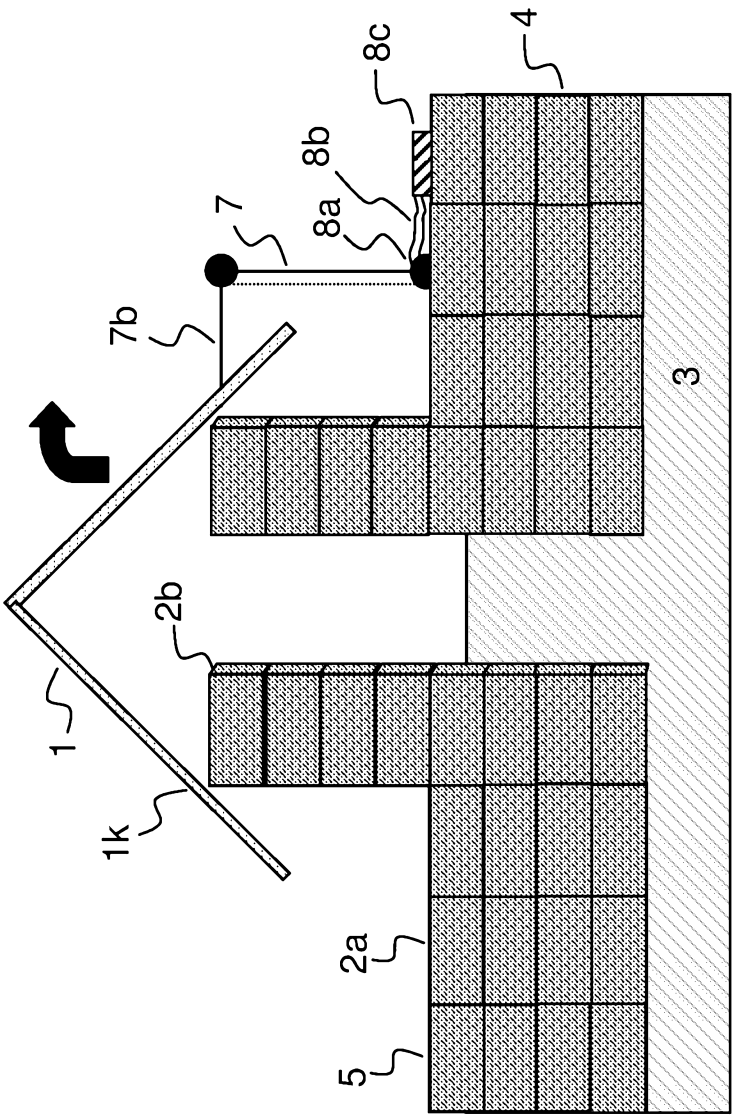
FIG. 11



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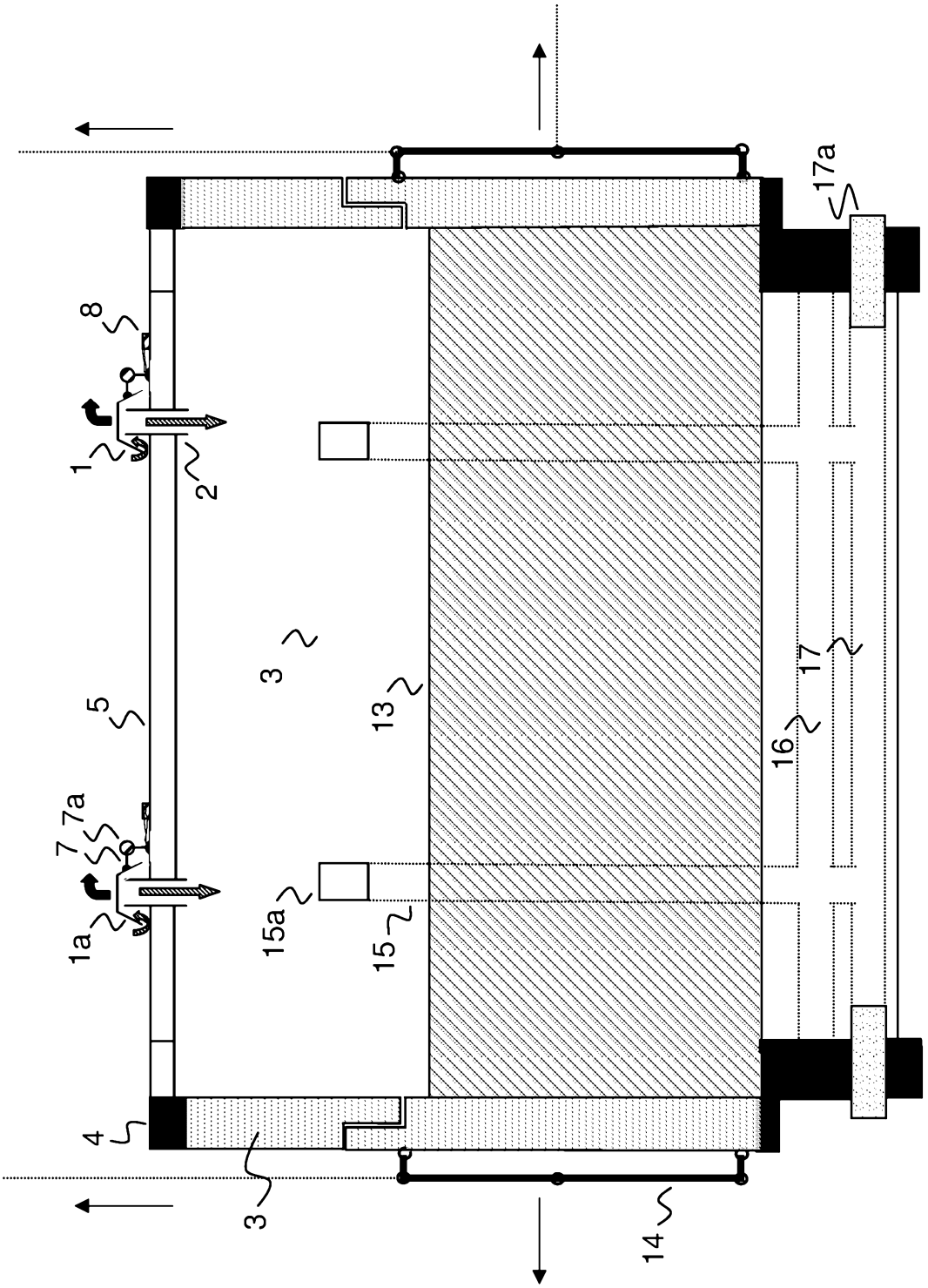

FIG. 12