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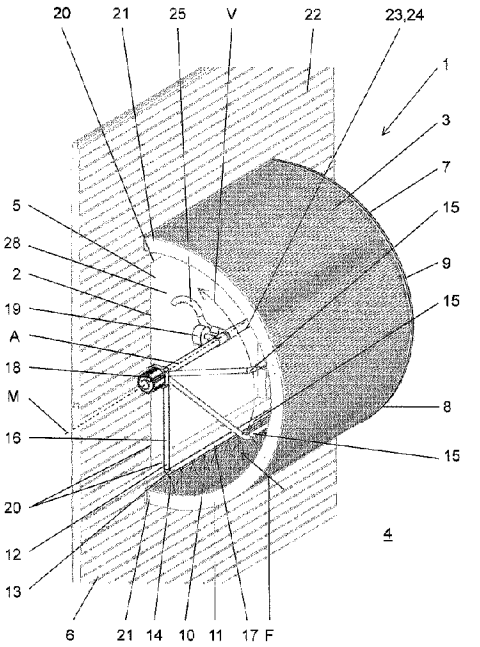
(54) Titre : ELEMENT FILTRANT COMPRENANT UNE UNITE DE NETTOYAGE POUR DE GROS DEBITS VOLUMETRIQUES

(54) Title: FILTER ELEMENT WITH CLEANING UNIT FOR LARGE VOLUME FLOWS



(57) Abrégé/Abstract:
A filter arrangement (1) comprises a plane (6) with an opening (2) that passes through the plane (6), and a filter element (3) arranged above said opening (2) in order to filter a fluid, in particular a gaseous fluid, wherein the fluid can be guided from a raw fluid side (4) to a filter side (5) through the filter element (3) and the opening (2) and can be cleaned via the filter element (3), characterised in that the filter element (3) extends away from the plane (6) at least via a first section (7) of the plane (6) and extends back to the plane (6) via a second section (8) that adjoins the first section (7) either directly or indirectly. An intermediate chamber (28) is delimited by the sections (7, 8) and the plane. The filter arrangement (1) also comprises a cleaning unit (12) that is arranged in said intermediate chamber (28).

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(54) Title: FILTER ELEMENT WITH CLEANING UNIT FOR LARGE VOLUME FLOWS

(54) Bezeichnung : FILTERELEMENT MIT REINIGUNGSEINHEIT FÜR GROSSE VOLUMENSTRÖME

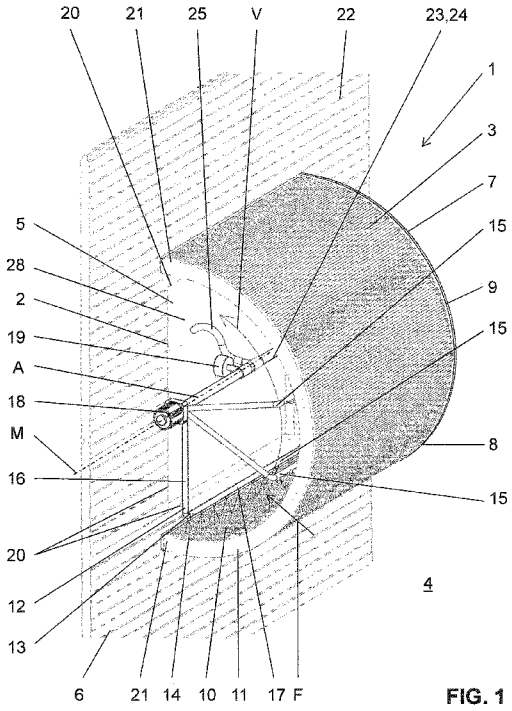

FIG. 1

(57) Abstract: A filter arrangement (1) comprises a plane (6) with an opening (2) that passes through the plane (6), and a filter element (3) arranged above said opening (2) in order to filter a fluid, in particular a gaseous fluid, wherein the fluid can be guided from a raw fluid side (4) to a filter side (5) through the filter element (3) and the opening (2) and can be cleaned via the filter element (3), characterised in that the filter element (3) extends away from the plane (6) at least via a first section (7) of the plane (6) and extends back to the plane (6) via a second section (8) that adjoins the first section (7) either directly or indirectly. An intermediate chamber (28) is delimited by the sections (7, 8) and the plane. The filter arrangement (1) also comprises a cleaning unit (12) that is arranged in said intermediate chamber (28).

(57) Zusammenfassung: Eine Filteranordnung (1) umfasst eine Ebene (6) mit einer die Ebene (6) durchdringende Öffnung (2) und ein über dieser Öffnung (2) angeordnetes Filterelement (3) zur Filterung eines Fluides, insbesondere eines gasförmigen Fluides, wobei das Fluid von einer Rohfluidseite (4) zu einer Filterseite (5) durch das Filterelement (3) und die Öffnung (2) hindurchführbar und durch das Filterelement (3) reinigbar ist, dadurch gekennzeichnet, dass sich das Filterelement (3) von dieser Ebene (6) mindestens über einen ersten Abschnitt (7) von der Ebene (6) weg erstreckt und über einen zweiten Abschnitt (8), der sich direkt oder indirekt dem ersten Abschnitt (7) anschliesst, auf die Ebene (6) zurück erstreckt. Durch die Abschnitte (7, 8) und die Ebene wird ein Zwischenraum (28) begrenzt. Die Filteranordnung (1) umfasst weiterhin eine Reinigungseinheit (12), welche in besagtem Zwischenraum (28) angeordnet ist.

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TITLE

Filter element with cleaning unit for large volume flows

TECHNICAL SCOPE

The present invention relates to a filter element for large volume flows, and more particularly to a filter arrangement including a plane with an opening which penetrates the plane and a filter element which is arranged over said opening for filtering a fluid wherein the fluid is guidable from an unfiltered side through the filter element and the opening to a filter side and can be cleaned by the filter element.

PRIOR ART

Exhaust air from stalls, such as, for example, stalls for raising or keeping animals, has to be filtered on account of legal regulations. In this case, the exhaust air is cleaned, for example of dust particles before the exhaust air is supplied back to the surrounding area.

Stalls in which filter cartridges are used as filter elements are known from the prior art. Typically, such filter cartridges have a very large filter area. On account of the design of these types of filter cartridges, the medium to be cleaned, in this case therefore the air, has typically to be guided through openings which are relatively small in cross section, which results in serious pressure losses. The pressure losses massively impair the efficiency of the filter. In addition, the volume flow per unit time is also negatively influenced by the small cross sections. It is possible to compensate for the pressure losses by means of the arrangement of blowers. As an alternative to this, several such cartridge filters can also be

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arranged side by side such that the required volume flow is achieved. Both measures are certainly realizable in practice, but lead to a large amount of additional expenditure with reference to assembly time and financial means.

In many applications the exhaust air from a stall is additionally also guided via a heat exchanger such that the heat is able to be utilized again. The pressure losses and/or the reduction in the volume flow have a negative effect on the heat exchanging operation in this respect also.

SUMMARY OF THE INVENTION

Proceeding from said prior art, the object underlying the invention is to provide a filter arrangement which overcomes the disadvantages of the prior art. In particular, the filter arrangement is to be usable in a more efficient manner.

Such an object is achieved by the filter arrangement disclosed herein. Accordingly, the filter arrangement includes a plane with an opening which penetrates the plane and a filter element which is arranged over said opening for filtering a fluid, (such as a gaseous fluid), wherein the fluid is guidable from an unfiltered side through the filter element and the opening to a filter side and is cleanable by the filter element. The filter element extends away from the plane from said plane at least over a first portion and extends back to the plane over a second portion which connects directly or indirectly to the first portion. Consequently, the filter element therefore extends in portions at a spacing from the plane over the plane. An intermediate chamber is defined by the portions and the plane. In addition, the filter arrangement includes a cleaning unit for cleaning the filter element which is arranged in said intermediate chamber. The cleaning

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unit includes air nozzles by means of which the filter element can be acted upon with compressed air. Deposits on the filter element can be removed from the filter element from the filter side in the direction of the unfiltered side. The cleaning unit may be movable into an end position from a rest position as a result of the pulse when air exist from the air nozzles. The air nozzles are pivotable such that the direction of movement of the cleaning unit is modifiable. The air nozzles are preferably pivotable from a first stable position into a second stable position such that in the first stable position the cleaning unit is movable from the rest position into the end position and in the second stable position the cleaning unit is movable from the end position into the rest position; or wherein the cleaning unit is moved from the end position into the rest position by means of a counterweight.

The advantage of the arrangement of the two portions which extend from the plane or to the plane is that the filter area is able to be increased, as a result of which the volume flow of the fluid to be cleaned is also able to be chosen to be larger. In addition, a favorable ratio between the opening cross section and the filter surface can be established simply by the degree of projection of the plane through the filter element. The advantage of the arrangement of the cleaning unit in said intermediate chamber is that the filter is able to be cleaned very simply and in an extremely efficient manner.

Said plane can be, for example, a wall, a floor and/or or a roof of a building, the opening then being an opening in said wall or floor or roof.

The cleaning unit is preferably arranged in the region of the filter side and is realized so as to be movable relative to the filter element over the filter element.

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The cleaning unit, in this case, provides a cleaning action such that the contaminants adhering to the unfiltered side are detached from the filter in a simple manner. In a particularly preferred manner, the cleaning unit is realized so as to be pivotable to the filter.

The cleaning unit preferably includes air nozzles or openings by means of which the filter element can be acted upon with compressed air, wherein deposits on the filter element can be removed from the filter element in the direction of the unfiltered side. As a result of the arrangement on the filter side and the provision of the corresponding air flow, the filter element can be cleaned in such a manner that the contaminants fall away from the filter on the unfiltered side. Consequently, the filter side, that is the clean side, is not loaded with the contaminants. Other types of cleaning are also conceivable.

The cleaning unit preferably comprises the form of a bracket with two bearing arms and one bracket arm which connects the bearing arms, wherein said air nozzles are arranged in the bracket arm.

The cleaning unit is preferably realized so as to be pivotable about an axis which preferably corresponds to said center axis.

The cleaning unit is preferably movable by means of a motor from a rest position into an end position or from the end position into the rest position.

As an alternative to this, the cleaning unit is movable into an end position from a rest position as a result of the pulse when air exits from the air nozzles. The air nozzles are preferably located in an angular manner with respect to the direction of movement of the

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cleaning unit or in the direction of movement of the cleaning unit.

The air nozzles are preferably pivotable such that the direction of the movement is modifiable. In a particularly preferred manner, the air nozzles are pivotable to said bearing arms. In a particularly preferred manner, the air nozzles are pivotable from a first stable position into a second stable position. In the first stable position the cleaning unit can be moved from the rest position into the end position and in the second stable position the cleaning unit can be moved from the end position into the rest position.

In a particularly preferred manner, the cleaning unit includes two bearing arms and one bracket arm which is pivotable to the bearing arms, wherein said air nozzles are arranged in the bracket arm. As a result of the pivotability of the bracket arm, the pivotability of the air nozzles can be achieved in a particularly simple manner.

The bracket arm is in connection with the bearing arms by way of a mechanism, wherein the mechanism includes a rocker lever with a spring which assumes substantially two stable positions. The positions are the first and the second position.

In addition, stop means are preferably arranged which interact with the rocker lever, wherein the rocker lever is movable into the stable positions by the stop means and wherein in each case at least one stop means is arranged in the rest position and end position. The rocker lever moves into contact with the stop means when the rest position or the end position is reached, as a result of which the air nozzles are pivoted.

Depending on the installation site, the movement from the end position into the rest position can also be

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effected by means of a counterweight, the cleaning unit then being movable from the end position into the rest position by means of the counterweight. In other words: The cleaning unit is movable from a rest position into an end position as a result of the angular arrangement of air nozzles and as a result of the pulse when the air exits from the air nozzles and is movable from the end position into the rest position as a result of a counterweight.

The filter element preferably extends in a semi-circular manner away from the plane or toward the plane about a center axis which extends in the or parallel to the plane. The filter element consequently is in the form of half a hollow cylinder which is cut through the center axis. As an alternative to this, the filter element can also be realized in an elliptical or angular manner, in particular in a hexagonal or octagonal or polygonal manner.

The center axis preferably extends in the horizontal or in the vertical. As a result, the filter element is able to be oriented in different ways and can be aligned according to the requirements of the user.

In a preferred manner, the filter element extends from said plane right into the unfiltered side. Contaminants, consequently, do not pass to the filter side when the filter is being cleaned, but remain in the contaminated region. The advantage of the filter extending right into the unfiltered side is consequently that the filtered-out contaminants are able to be removed simply and securely from the filter element in the unfiltered side.

The filter area is preferably greater than the cross sectional area of the opening by a factor within the range of between 10 and 50, in a particularly preferred manner within a range of between 15 and 30.

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Particularly good results have been achieved in practice with such ratios.

The filter arrangement additionally includes at least one side wall, wherein the at least one side wall extends over intermediate chambers between the plane and the edge of the filter element. As a result of the side wall, said intermediate chambers are correspondingly closed such that the fluid to be guided from the unfiltered side to the filter side has forcibly to pass the filter element.

In other words, the filter element and where applicable the side wall extend completely over the cross section of the opening such that contaminated fluid has forcibly to pass through the filter element before the opening is reached.

The filter element preferably includes a pleated filter, in particular produced from a polyester nonwoven material. Other materials are also conceivable.

The filter element, in particular when used in a stall, preferably comprises a filter surface of at least 15 m^2, in a particularly preferred manner of at least 20 m^2. The cross section of the opening is preferably approximately 1 m^2. The filter element is preferably an air filter.

In a particularly preferred manner, the filter element extends adjacent the edges of the opening and along the edges of the opening or lies at a comparatively small spacing from the edges.

The filter arrangement preferably additionally includes a heat exchanger which is arranged on the filter side downstream of the filter element in the direction of flow of the fluid.

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A stall for raising or keeping animals includes at least one floor, at least one side wall which stands away from said floor and defines a stall interior, and a roof which closes off the stall interior at the top. In addition, the stall includes at least one filter arrangement according to the above description, said opening being arranged in said side wall and/or said roof, wherein the plane is spanned by the side wall and/or the roof.

Further embodiments are disclosed herein.

BRIEF DESCRIPTION OF THE DRAWINGS

Preferred embodiments of the invention are described below by way of the drawings which serve purely for explanation and are not to be seen as restricting, in which drawings:

figure 1 shows a perspective view of a filter arrangement according to a first embodiment;

figure 2 shows a side view of the filter arrangement according to figure 1;

figure 3 shows a perspective view of the filter arrangement according to figure 1 without the filter element;

figure 4 shows a perspective view of the complete filter arrangement according to figure 1;

figure 5 shows a further perspective view of the filter side of the filter arrangement according to figure 1;

figure 6 shows a further embodiment of the filter arrangement according to figure 1; and

figure 7a shows a perspective view of a filter arrangement according to a further embodiment;

figure 7b shows a view of a detail in figure 7a;

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figure 8 shows a top view of the filter arrangement according to figure 7a; and

figure 9 shows a further view of figure 8.

DESCRIPTION OF PREFERRED EXEMPLARY EMBODIMENTS

Figure 1 shows a filter arrangement for filtering a fluid, in particular a gaseous fluid, such as air. The filter arrangement 1 serves for removing contaminants in the fluid. Such filters can be used, for example, for filtering exhaust air of stalls. The contaminated fluid in this application is, for example, air mixed with dust, the dust having to be removed from the air. Obviously, the filter arrangement can also be used in other areas of application, not only in stalls.

The filter arrangement 1 according to figure 1 includes a plane 6 which is defined, in this case, by a wall 22, an opening 2 which is arranged in the plane 6 and a filter element 3 which is arranged over said opening 2 for filtering the fluid. In a general form it can also be said that the opening 2 is arranged in the plane 6. The fluid, in this case, can be guided from an unfiltered side 4 through the filter element 3 and the opening 2 to a filter side 5. This is shown in a corresponding manner by the arrow F. An unfiltered side 4 is to be understood as the side where the fluid is contaminated by the contaminants. On the filter side 5, which lies opposite the unfiltered side 4 with reference to the filter element 3, the fluid is cleaned of the contaminants by the filter element 3 and can consequently be deemed as decontaminated.

With reference to the plane 6, it can also be said in other words that the side edges 5 of the opening 2 span said plane 6.

The filter element 3 extends from said plane 6 or from the wall 22 away from the plane 6 over a first portion

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7. The filter element extends back onto the plane 6 over a second portion 8, which connects directly or indirectly to the first portion 7. In other words, it can therefore be said that the filter element 3 is raised from the plane 6 and extends at least in portions detached from said plane 6. The advantage of said detachment, in this case, is the increase in the filter area with the cross section of the opening 2 remaining the same.

In addition, it can easily be recognized from figures 1 and 2 that the filter arrangement 1 additionally includes a cleaning unit 12 for cleaning the filter element 3. The filter element 3 or the portions 7 and 8 and the plane 6 define an intermediate chamber 28 in which a cleaning unit 12 is arranged.

The filter area is preferably greater than the cross sectional area of the opening by a factor within the range of between 10 and 50, in a particularly preferred manner within the range of between 15 and 30. Particularly good results have been achieved in practice with such ratios. The filter area is to be understood as the effective surface of the filter medium of the filter.

Figure 1 shows a particularly preferred realization of the filter element 3. In this case, the filter element 3 extends in a semi-circular manner away from the plane 6 or toward the plane 6 about a center axis M which extends in the plane 6. Consequently, the first portion 7 and the second portion 8 are provided by said semi-circle. The first portion 7 and the second portion 8 connect directly to one another in this case. It can also be said in other words that in the particularly preferred embodiment, the filter element 3 extends in a concave manner from the plane 6 over the opening 2.

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As an alternative to this, the center axis M can also extend parallel to and at a spacing from the plane 6, the filter element 3 then extending substantially perpendicular to the plane 6 over a portion 21 between the plane 6 and the semi-circular realization.

In the present embodiment, the center axis M extends in the horizontal. As an alternative to this, the center axis M can also extend in the vertical, as a result of which the filter element 3 is arranged in a correspondingly pivoted manner.

The filter element 3 preferably extends from said plane 6 right into the unfiltered side 4. The advantage of this is that when the filter element 3 is cleaned, the dust particles or other contaminants filtered out on the unfiltered side 4 are able to be removed in a simple manner. In addition, the contaminants can be removed on the unfiltered side 4, the advantage of which is that the contaminants do not have to be removed on the cleaner filter side 5. In this case, the filter element 3 can be cleaned, for example, by hand using a brush or with compressed air. A preferred cleaning device will be described further below.

In addition, the filter arrangement 1 according to figures 1 to 6 includes at least one side wall 9. In the present embodiment with the filter element 2 realized in a semi-circular manner, two side walls 9 are necessary, this also being shown in figures 3 and 4. The filter element 2 is not shown in figure 3 for reasons of clarity. The side walls 9 extend, in this case, over intermediate chambers 10 between the plane 6 and the edge 11 of the filter element 3. The filter element 2 is preferably connected to the side walls 9 by way of a casting compound. The casting compound, in this case, acts at the same time as a sealing element. As an alternative to this, a seal can be provided between the side wall 9 and the filter element. The

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side walls 9 prevent the contaminated fluid passing in an uncontrolled manner to the opening 2. Passing in an uncontrolled manner is to be understood in this context as the fluid passing through without passing the filter element 3.

The filter element 3 and, where applicable, the side wall 9 preferably extend completely over the entire cross section of the opening 2. Consequently, it is ensured that a contaminated fluid has forcibly to pass through the filter element 3 before the opening 2 is reached. Consequently, it is not possible for contaminated fluid to pass through the opening 2 in an uncontrolled manner from the unfiltered side and it can be prevented.

In other embodiments which are not shown, the filter element 3 can also comprise the form of a sphere which extends right into the unfiltered side 4 from the plane 6. This could be advantageous precisely in the case of circular openings as the filter element 3 then extends over the distance in a spherical manner from the plane 6.

The filter element 3 preferably includes a pleated filter produced from a polyester non-woven material. Such filters are typically capable of filtering particles in the fluid that are greater in size than 1 µm.

The filter surface, in particular when used in a stall, is preferably in excess of 15m², in a particularly preferred manner in excess of at least 20m². In the case of such a filter surface, volume flows of several thousand m³/h can be implemented or carried out. The cross section of the opening 2, in the case of said dimensions of the filter, is preferably a good 1m², as a result of which a sufficiently large opening cross

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section with minimum pressure losses is able to be provided.

The cleaning unit 12, which can easily be seen in figures 1 and 2, is preferably arranged in the region of the filter side 5 and is realized so as to be movable relative to the filter element 3. The advantage of the movable realization is that the cleaning unit 12 is movable over the filter element 3 such that all points of the filter element 3 are captured by the action of the cleaning unit 12.

The cleaning unit 12, in this case, includes air nozzles or openings 13, by means of which the filter element 2 can be acted upon with compressed air 14. The compressed air 14, in this case, flows from the filter side 5 to the unfiltered side 4, that is in the opposite direction to the fluid to be cleaned. As a result of the compressed air 14, deposits on the filter element 3 are removed from the filter element 3 in the direction of the unfiltered side 4. The deposits, in this case, correspond substantially to the contaminants that have been filtered from the fluid. On account of the fact that the compressed air is provided in the direction of the unfiltered side 4, the deposits are also detached from the filter element 2 in the region of the unfiltered side 4. Consequently, the filter side 5 is not contaminated with the deposits during the cleaning operation.

In the present embodiment, the cleaning unit 12 includes a bracket 15 with two bearing arms 16 and one bracket arm 17 which connects the bearing arms 16. Said air nozzles 13 are arranged in the bracket arm 17. The cleaning unit 12 is mounted so as to be rotatable about an axis A by means of the bearing arms 16. The bracket 15 is shown in different positions in figures 1 and 2. The bracket 15, in this case, is pivotable along the arrow V.

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The axis A, about which the cleaning unit 12 is pivotable, preferably corresponds to said center axis M. The axis A and the center axis M, in this case, extend in a collinear manner with respect to one another.

The cleaning unit 12 can be moved, as shown in the figures, for example by means of a motor 18 from a start position into an end position and back. The motor 18, in this case, moves the cleaning unit 12 from a start position into an end position and then back again into the start position.

As an alternative to this, the cleaning unit can also be moved, however, as a result of the arrangement of the air nozzles 13 and as a result of the pulse when the air exits from the air nozzles 13. In this connection, it is possible to dispense with the motor 18. In this event, the air nozzles 13 must be oriented at the same time such that a corresponding movement can be provided. Consequently, the air nozzles 13 move the cleaning unit 12 from the start position into the end position. For the movement from the end position into the start position, the cleaning unit 12 then further comprises a counterweight 19 which ensures that the cleaning unit 12 is movable again from the upper end position into the start position. The counterweight 19, in this case, is arranged in an eccentric manner with respect to the axis A or M. In another embodiment, as shown in figures 7a to 9, the movement from the start position or rest position into the end position and from the end position into the start position is effected by means of pivotable air nozzles 13. In this case, it is possible to dispense with the counterweight.

The movement of the cleaning unit 12 can easily be seen further in figure 2. In this case, the cleaning unit 12

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is shown in the start position and is moved along the arrow V into the end position. The cleaning unit is shown in the end position by the reference 12'.

The movement of the cleaning unit 12 from the start position into the end position, in this case, can be effected continuously or, however, in a pulsed manner. In the case of continuous movement, in a preferred manner the compressed air 14 is supplied continuously to the air nozzles 13 such that a constant cleaning action is permitted. However, supplying the compressed air in a pulsed manner is also conceivable if the level of contamination is low. In the case of the pulsed movement, the compressed air 14 can be supplied both in a pulsed manner and continuously.

The compressed air itself is supplied to the air nozzles 13 by means of a compressed air connection 23. The compressed air connection 23, in this case, includes a bar 24 which communicates with the bracket 15 or the bearing arms 16, as well as a hose 25. The hose 25 communicates with the compressed air source and guides the compressed air to the bar 24. The compressed air can be supplied to the compressed air nozzles 13 by means of said bar 24, the brackets 15 serving as supplying means and being realized in a corresponding manner as tubes.

Figure 5 now shows yet another perspective view of the filter arrangement 1. In this case, the view is shown substantially from the filter side 5 and once again the arrangement of the filter element 3, of the side walls 9 and of the cleaning unit 12 can easily be seen.

Figures 7a, 7b, 8 and 9 show a further embodiment of the filter arrangement 1. Identical parts are provided with identical references and comprise substantially identical features as described by way of figures 1 to 5. The essential difference is the movement of the

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cleaning unit 12, which in the embodiment according to figures 7a, 7b, 8 and 9 is effected by means of pivoting the air nozzles 13 such that pulses can be delivered in different directions by means of the air nozzles, as a result of which the cleaning unit 12 is pivotable in different directions. Said embodiment is used in a particularly advantageous manner whenever the center axis M or the axis A extend in the vertical.

Figures 7a and 7b show that the cleaning unit 12 is movable from a rest position or start position into an end position as a result of the angular arrangement of the air nozzles 13 and as a result of the pulse when the air exits from the air nozzles 13. The air nozzles 13 are pivotable such that the direction of movement of the cleaning unit can be modified.

The pivotability of the air nozzles 13 is shown particularly well in figures 8 and 9. The cleaning unit is pivoted in the anti-clockwise direction GUZ in figure 8. The air nozzles 13, in this case, are oriented in a corresponding manner such that the air jet 34 delivers the pulse in the corresponding direction. The air nozzles 13 are oriented in such a manner in figure 9 that the air jet 34 delivers the pulse in the direction such that the cleaning unit is moved clockwise ZU.

The pivotability and the position of the air nozzles 13 is now explained in more detail by way of figures 7a and 7b.

The air nozzles 13 are pivotable from a first stable position into a second stable position. In the first stable position, the cleaning unit 12 is movable from the rest position into the end position and in the second stable position the cleaning unit 12 is movable from the end position into the rest position.

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In the preferred embodiment, the cleaning unit 12 includes substantially two bearing arms 16 and one bracket arm 17 which is pivotable to the bearing arms 16. Said air nozzles 13 are arranged in the bracket arm 17. The bracket arm 17 is mounted on the bearing arms 16 by means of bearing points 35. The bearing points, in this case, are realized such that said pivotability is permitted. The bearing points 35 can also be realized as a mechanism.

The mechanism 35 shown in figure 7b, which is a view of a detail of figure 7a, connects the bracket arm 17 to the bearing arms 16. The mechanism 35 includes a rocker lever 31 with a spring 32. The rocker lever 31 can essentially assume two stable positions. The rocker lever 31, in this case, includes a first lever part 36 and a second lever part 37 which is connected so as to be pivotable to the first lever part 36. The first lever part 36 is connected to the bearing arm 16 so as to be pivotable and the second lever part 37 is connected fixedly to the bracket arm 17. The spring 32 connects the first lever part 36 to the second lever part 37 and ensures that when the lever parts 36, 37 are at an angle to one another, the angular position is held.

The spring 32, in this case, is a tension spring which is suspended from a bolt 38 on the lever part 36, 37.

In a particularly preferred manner, stop means 33 are arranged which interact with the rocker lever 31. When the rocker lever 31 contacts the stop means, the rocker lever 31 is movable from the one stable position into the other stable position. In each case at least one stop means 33 is preferably arranged in each case in the rest position and in the end position. Consequently, the stop means 33 ensure the triggering of the pivoting of the air nozzles 13 to the arms such that reversal of the movement can be achieved.

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Figure 6 shows a further embodiment or area of application of the filter arrangement 1 according to the above description. In this case, the filter arrangement 1, which is provided according to the above description, additionally includes a heat exchanger 27 which is arranged on the filter side 5 downstream of the filter element 3 when viewed in the direction of flow of the fluid. By way of the heat exchanger 27 the heat present in the exhaust air or in the decontaminated fluid is able to be exchanged prior to delivery to the surrounding area by way of a heat exchanger. In this case, the heat exchanger is heated up in a corresponding manner and the exhaust air is cooled down in a corresponding manner. The heat exchanger can then be used, for example, for heating the space in which the contaminated fluid occurs. A conventional tubular heat exchanger or a cross-flow heat exchanger with plates can preferably be used as a heat exchanger 27.

The advantage of the arrangement of the heat exchanger 27 on the filter side 5 is that the heat exchanger 27 does not come into contact with the contaminated fluid. Consequently, depositing of the contaminants on the heat exchanger 27 is correspondingly avoided, the effectiveness or the efficiency of the heat exchanger not diminishing over time.

The exhaust air, which has been cleaned by the filter element 3 and cooled by the heat exchanger 27, can then be supplied in a corresponding manner to the surrounding area by means of an exhaust air channel 26.

In a particularly preferred manner, the above-mentioned filter arrangement 1 can be used in a stall for raising and/or keeping animals. Such a stall typically includes a floor, at least one side wall which stands away from said floor and defines a stall interior and a roof

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which closes off the stall interior at the top. The floor, side wall and/or roof, in this case, provide the plane 6. The opening 2, in this case, is arranged in said side wall or said roof or said floor, said plane 6 then being spanned substantially by the side wall and/or the roof and/or the floor. The stall interior, in this case, provides the contaminated side, that is the unfiltered side 4. The surrounding area outside the stall, in this case, is the filter side 5. The filter arrangement 5, in this case, is preferably arranged in such a manner that said filter arrangement extends right into the stall interior. As a result, during the cleaning operation the cleaning unit 12 ensures that the particles of dust, which lie on the filter element 3, are blown into the stall interior again, that is into the unfiltered side 4. Consequently, during the cleaning process, the filter element 2 is acted upon in the direction of the unfiltered side 4 from the filter side 5 with compressed air in the direction of the unfiltered side 4, as a result of which the contaminants, which can be removed from the filter element 2 during the cleaning process, are moved in the direction of the unfiltered side 4.

In a particularly preferred manner, the filter arrangement is arranged so as to be movable to the opening 2. For example, the filter arrangement can be arranged in guide rails such that the filter arrangement is able to be moved away from the opening 2 in said guide rails. In this case, when cleaning the stall, the farmer is able to push the filter arrangement away in a corresponding manner. The farmer being able to move the filter arrangement 1 toward the roof is advantageous precisely in the case of openings that are arranged in the bottom region of the side wall because during cleaning jobs it is also necessary for the farmer to clean the floor with corresponding machines. The advantage of moving the cleaning arrangement away in the direction of the roof, in this

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case, is that the farmer does not touch the cleaning arrangement 1 with the tractor or similar equipment and damage or even destroy it.

Looking at figure 1, it can additionally easily be seen that several filter elements 3 can be arranged side by side. For this purpose, the opening 2 has to be realized in a correspondingly larger manner and it is possible to dispense with the side wall 9 between the individual filter elements 3. As an alternative to this, the side walls 9 of two adjacent filter elements 2 can also be provided with a corresponding opening 2.

With reference to the arrangement of the filter element 2 it can also be said that the filter element 2 is also able to be arranged in a separate filter chamber which communicates with the chamber in which the fluid is contaminated, the filter chamber then providing the unfiltered side.

In addition, it must be noted that the filter arrangement 1 according to the invention can also be used in various other areas of application. For example, a production facility such as feed mills or welding workshops or wood processing facilities etc. may be mentioned here.

In summary, it can be established that the advantage of the arrangement of the filter element 3 which extends from the plane 6 with the opening 2 is that there are not any cross sectional reductions present in the region of the filter arrangement 1. Consequently, it is possible to reduce pressure losses in the region of the filter element 3 in a corresponding manner. In addition, the filter element 3 can be cleaned particularly well as a result of the feature of the filter element 3 projecting away from the plane 6.

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In addition, the ratio between the cross section of the opening 3 and the surface of the filter element 3 or of the filter surface can be varied in a simple manner and adjusted to the desired ratio.

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LIST OF REFERENCES

1 Filter arrangement
2 Opening
3 Filter element
4 Unfiltered side
5 Filter side
6 Plane
7 First portion
8 Second portion
9 Side wall
10 Intermediate chambers
11 Edge
12 Cleaning unit
13 Air nozzles
14 Compressed air
15 Bracket
16 Bearing arm
17 Bracket arm
18 Motor
19 Counterweight
20 Side edge
21 Portion
22 Wall
23 Compressed air connection
24 Bar
25 Hose
26 Exhaust air channel
27 Heat exchanger
28 Intermediate chamber
30 Mechanism
31 Rocker lever
32 Spring
33 Stop
34 Air jet
35 Bearing pointsFirst lever partSecond lever part
36 Bol

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What is claimed is:

1. A filter arrangement including a plane with an opening which penetrates the plane and a filter element which is arranged over said opening for filtering a fluid wherein the fluid is guidable from an unfiltered side through the filter element and the opening to a filter side and can be cleaned by the filter element, wherein the filter element extends away from the plane from said plane at least over a first portion and extends back to the plane over a second portion which connects directly or indirectly to the first portion such that the filter element extends over the plane with the portions, wherein an intermediate chamber is defined by the portions and the plane, wherein the filter arrangement additionally includes a cleaning unit which is arranged in said intermediate chamber,

wherein the cleaning unit includes air nozzles by means of which the filter element can be acted upon with compressed air, wherein deposits on the filter element can be removed from the filter element from the filter side in the direction of the unfiltered side,

wherein the cleaning unit is movable into an end position from a rest position as a result of a pulse when air exits from the air nozzles,

wherein the air nozzles are pivotable such that the direction of movement of the cleaning unit is modifiable,

wherein the air nozzles are pivotable from a first stable position into a second stable position such that in the first stable position the cleaning unit is movable from the rest position into the end position and in the second stable position the cleaning unit is movable from the end position into the rest position; or wherein the cleaning unit is moved from the end

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position into the rest position by means of a counterweight.

2. The filter arrangement as claimed in claim 1, wherein the cleaning unit is arranged in the region of the filter side and is realized so as to be movable or pivotable over the filter element relative to the filter element.

3. The filter arrangement as claimed in any one of claims 1 to 2, wherein the cleaning unit is realized so as to be pivotable about an axis.

4. The filter arrangement as claimed in any one of claims 1 to 3, wherein the cleaning unit comprises the form of a bracket with two bearing arms and one bracket arm which connects the bearing arms, wherein said air nozzles are arranged in the bracket arm.

5. The filter arrangement as claimed in any one of claims 1 to 4, wherein the air nozzles are arranged in an angular manner with respect to the direction of movement of the cleaning unit or wherein the air nozzles are arranged in the direction of movement of the cleaning unit.

6. The filter arrangement as claimed in any one of claims 1 to 3 and 5, wherein the cleaning unit includes two bearing arms and one bracket arm which is pivotable to the bearing arms, wherein said air nozzles are arranged in the bracket arm.

7. The filter arrangement as claimed in claim 6, wherein the bracket arm communicates with the bearing arms by way of a mechanism, wherein the mechanism includes a rocker lever with a spring which assumes two further stable positions, wherein the rocker lever is movable into the

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further stable positions by stop means and wherein in each case at least one of the stop means is arranged in the rest position and end position.

8. The filter arrangement as claimed in claim 7, wherein the stop means are arranged to interact with the rocker lever.

9. The filter arrangement as claimed in any one of claims 1 to 8, wherein the filter element extends in a semi-circular manner and/or elliptical manner and/or angular manner away from the plane or toward the plane about a center axis, which extends in the plane or parallel to the plane, and/or wherein the filter element lies adjacent edges of the opening and along the edges of the opening or at a comparatively small spacing from the edges of the opening.

10. The filter arrangement as claimed in any one of claims 1 to 8, wherein the filter element extends in a hexagonal or octagonal or polygonal manner away from the plane or toward the plane about a center axis, which extends in the plane or parallel to the plane, and/or wherein the filter element lies adjacent edges of the opening and along the edges of the opening or at a comparatively small spacing from the edges of the opening.

11. The filter arrangement as claimed in claim 9 or 10, wherein the center axis extends horizontally or vertically.

12. The filter arrangement as claimed in any one of claims 1 to 11, wherein the filter element extends from said plane right into the unfiltered side.

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13. The filter arrangement as claimed in any one of claims 1 to 12, wherein the filter arrangement additionally includes at least one side wall, wherein the at least one side wall extends over the intermediate chamber between the plane and an edge of the filter element.

14. The filter arrangement as claimed in any one of claims 1 to 13, wherein the filter element and, where applicable, the side wall, extend completely over a cross section of the opening such that contaminated fluid has forcibly to pass through the filter element before the opening is reached.

15. The filter arrangement as claimed in any one of claims 1 to 14, wherein the filter element includes a pleated filter, and/or the filter element comprises a filter surface of at least 15 m^2 or of at least 20 m^2, and/or in that the filter element is an air filter.

16. The filter arrangement as claimed in claim 15, wherein the pleated filter is produced from a polyester nonwoven material.

17. The filter arrangement as claimed in any one of claims 1 to 16, wherein the arrangement additionally includes a heat exchanger which is arranged on the filter side downstream of the filter element in the direction of flow of the fluid.

18. The filter arrangement as claimed in any one of claims 1 to 17, wherein the ratio of filter area is greater by a factor within the range of between 10 and 50 or within the range of between 15 and 30 than a cross sectional area of the opening.

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19. The filter arrangement as claimed in any one of claims 1 to 18, wherein the fluid is a gaseous fluid.

20. A stall for raising or keeping animals, said stall including at least one floor, at least one side wall which stands away from said floor and defines a stall interior, and a roof which closes off the stall interior at the top, wherein the stall additionally includes at least one filter arrangement as claimed in any one of claims 1 to 19 and wherein said opening is arranged in said side wall and/or said roof, wherein the plane is spanned by the side wall and/or the roof.

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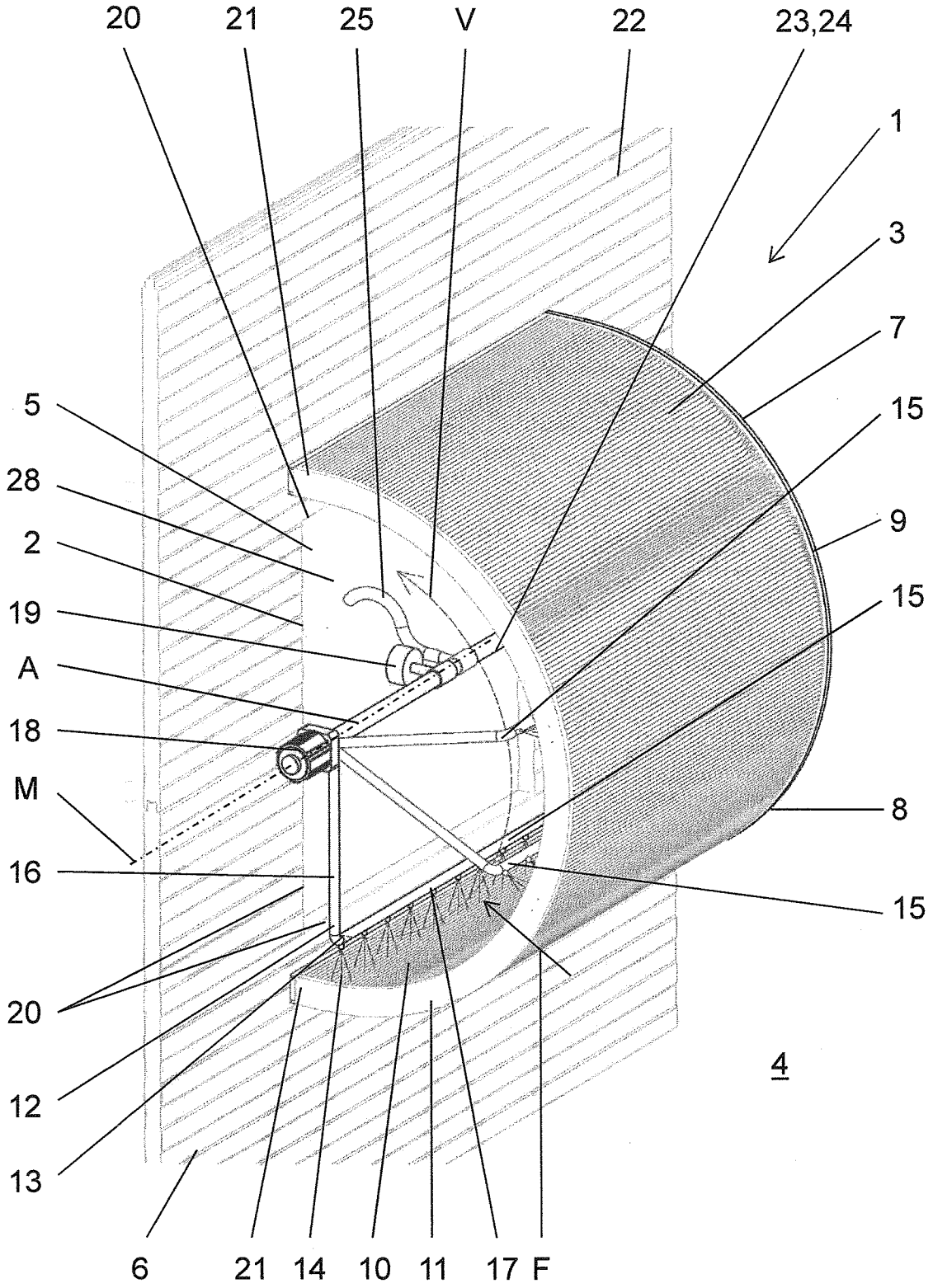
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FIG. 1

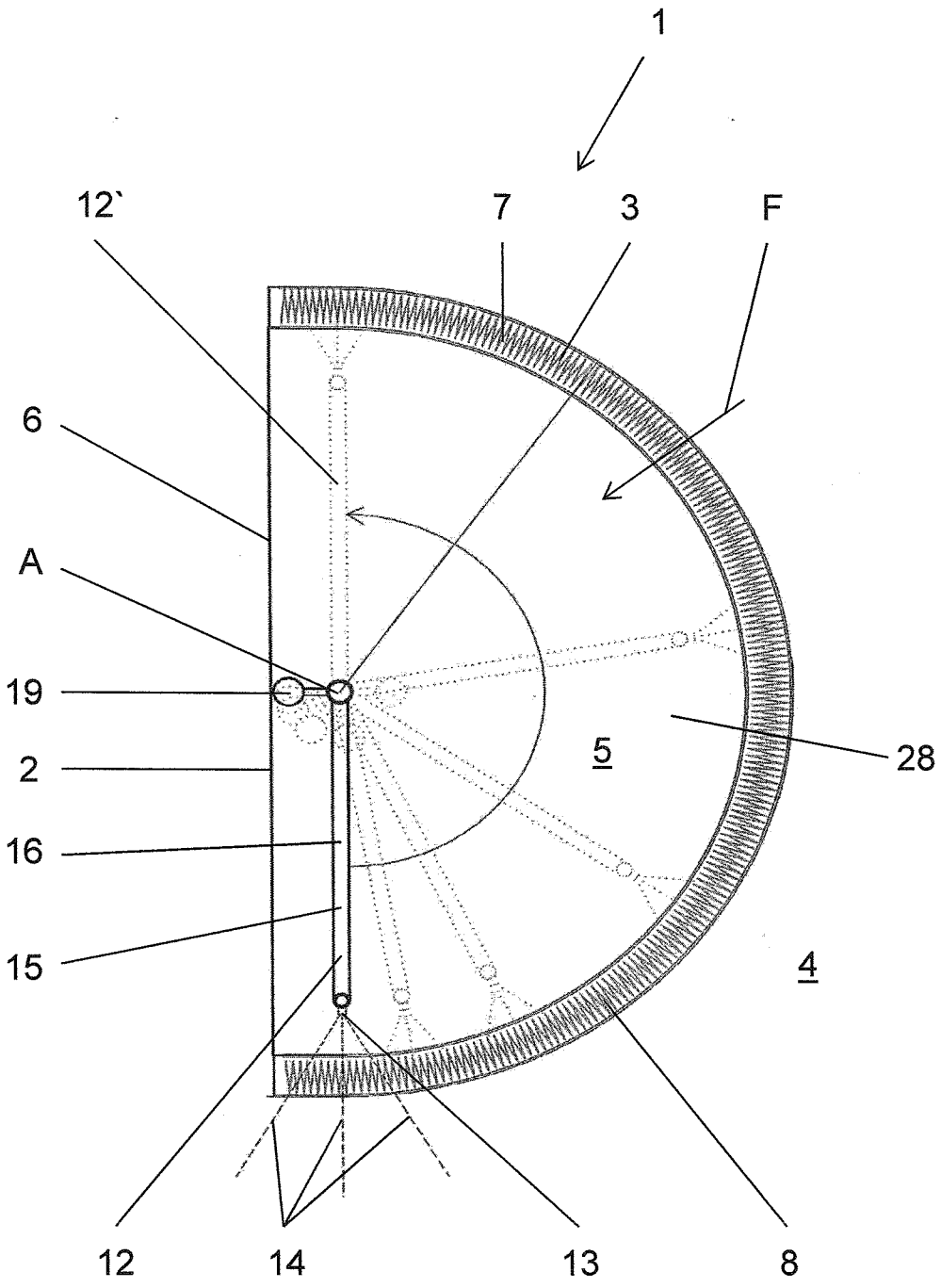

FIG. 2

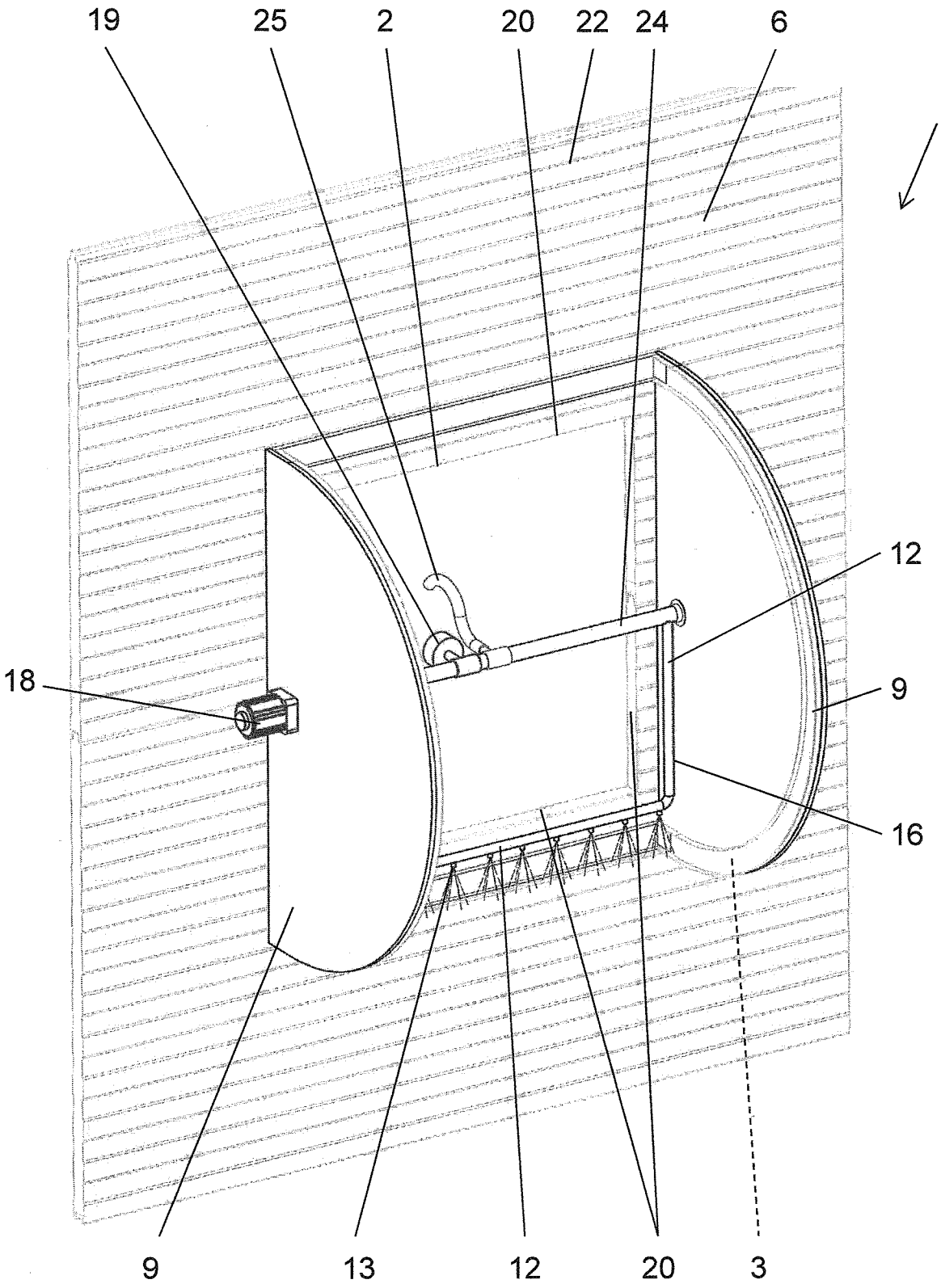

FIG. 3

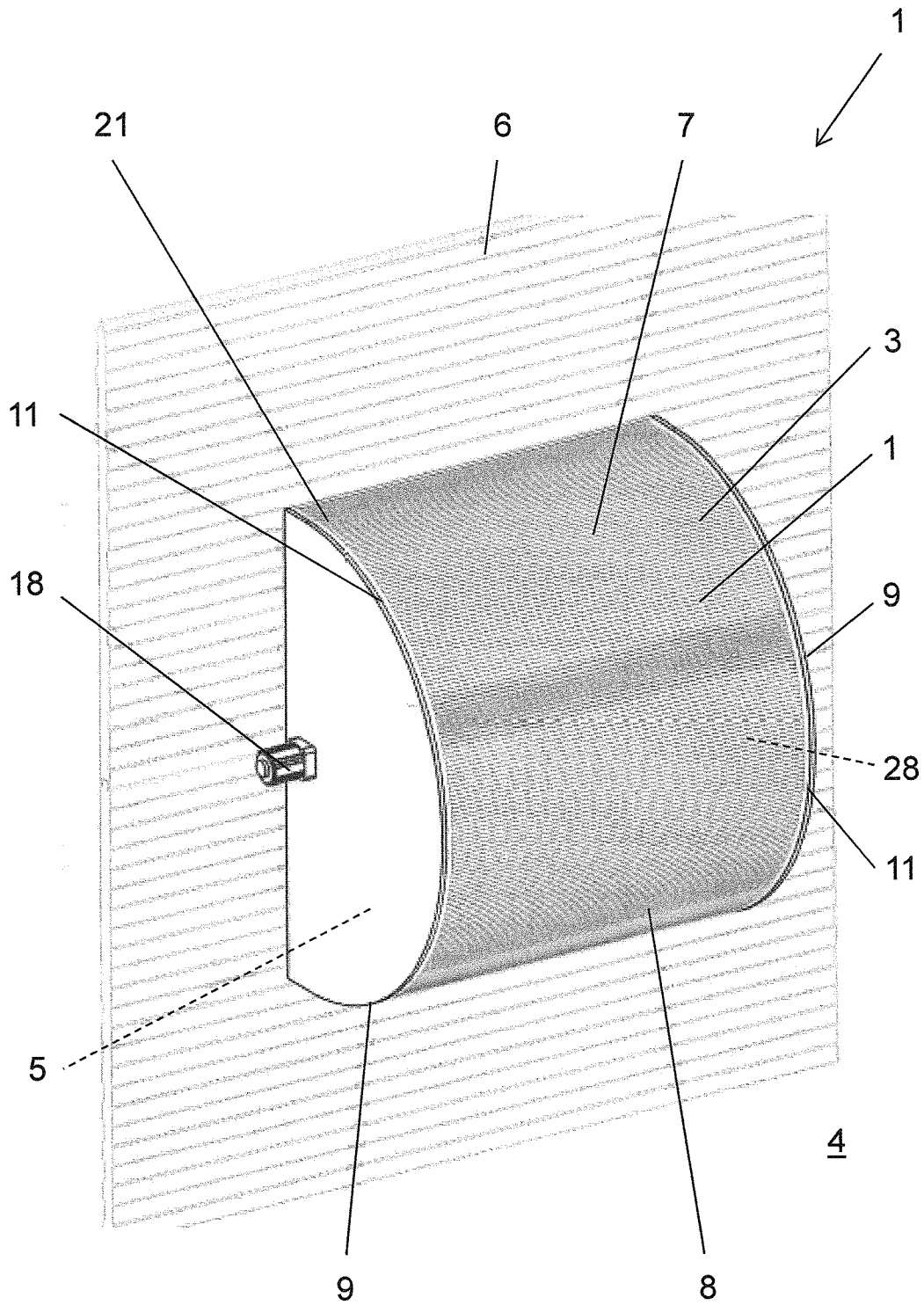

FIG. 4

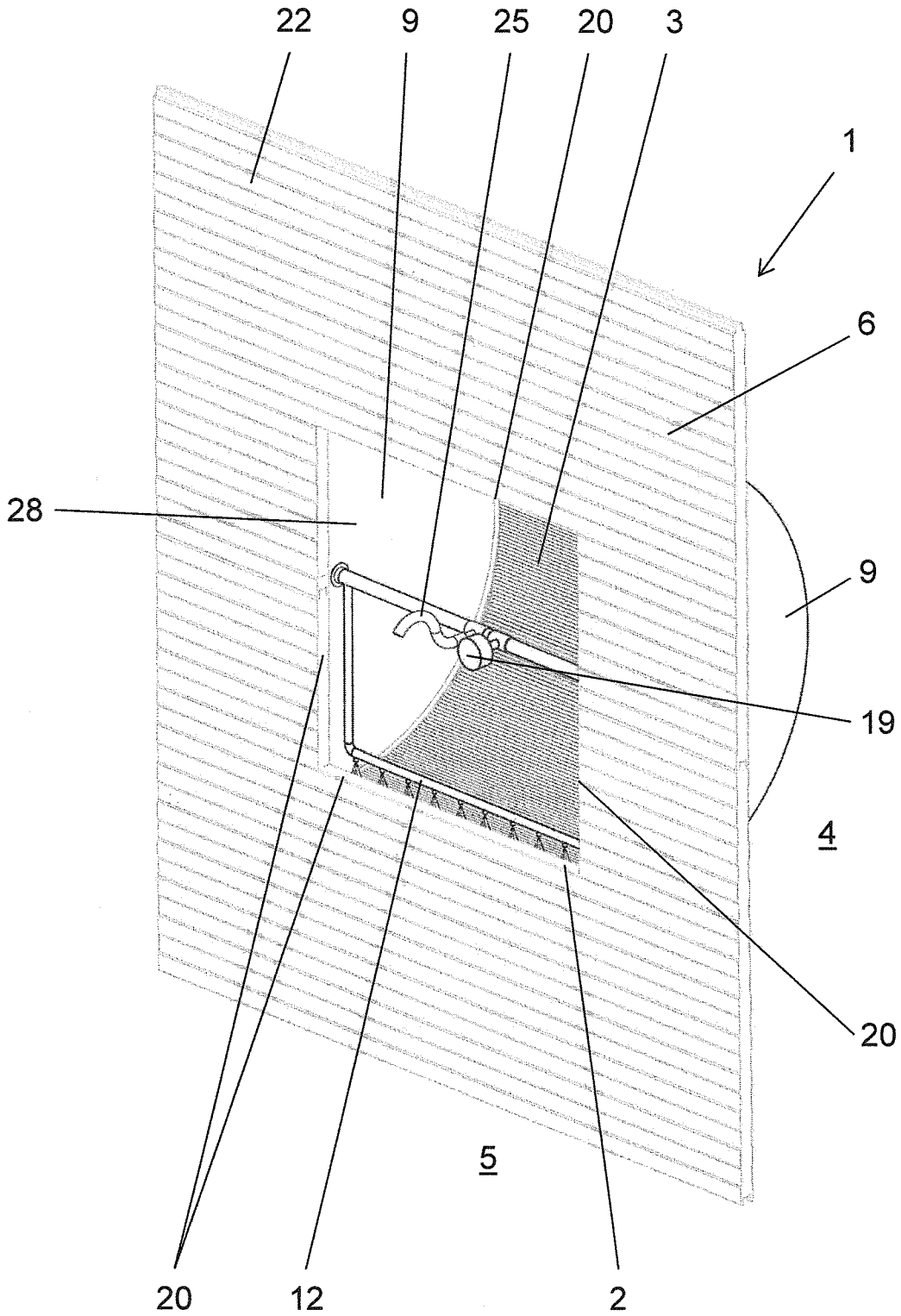

FIG. 5

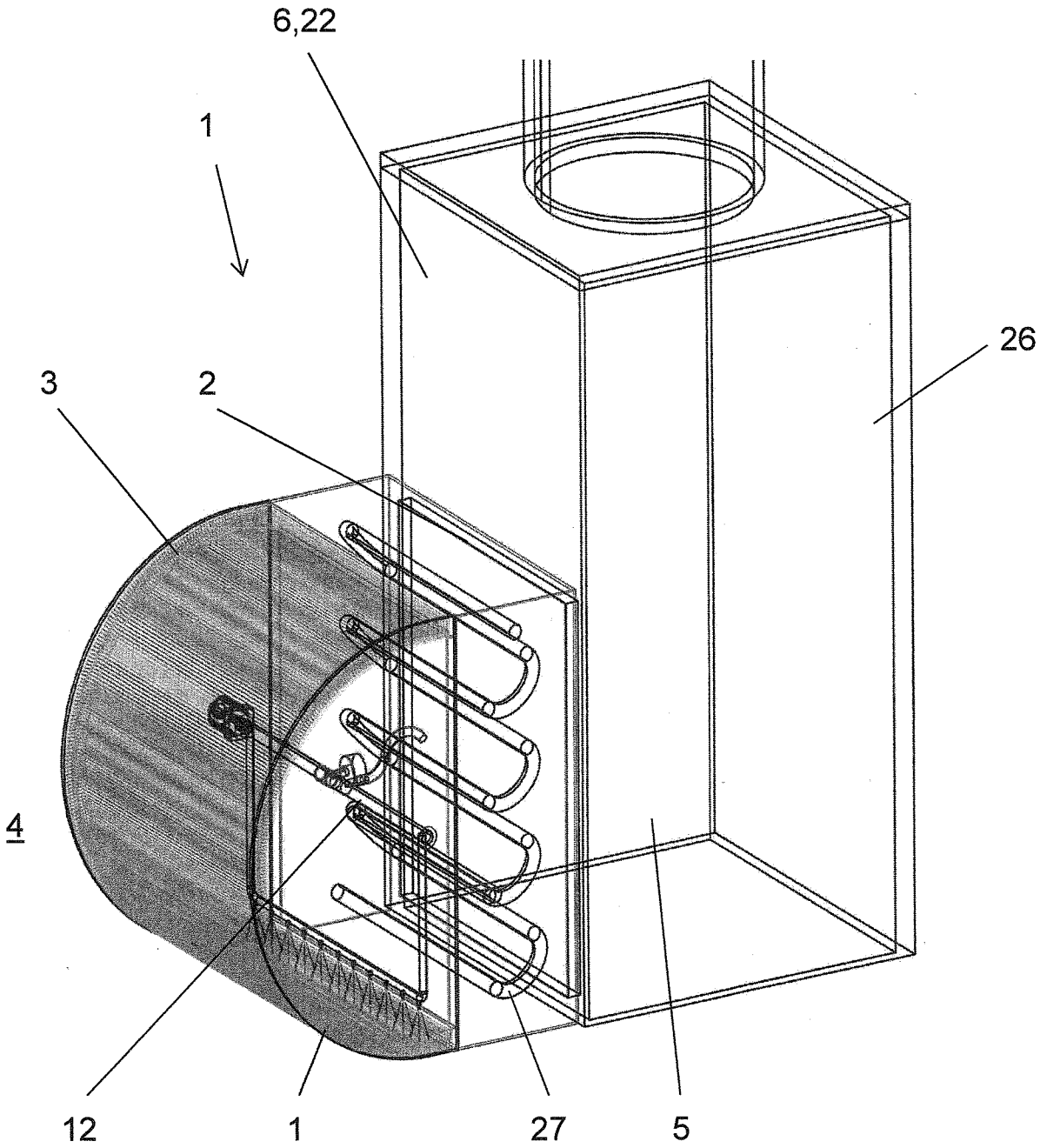

FIG. 6

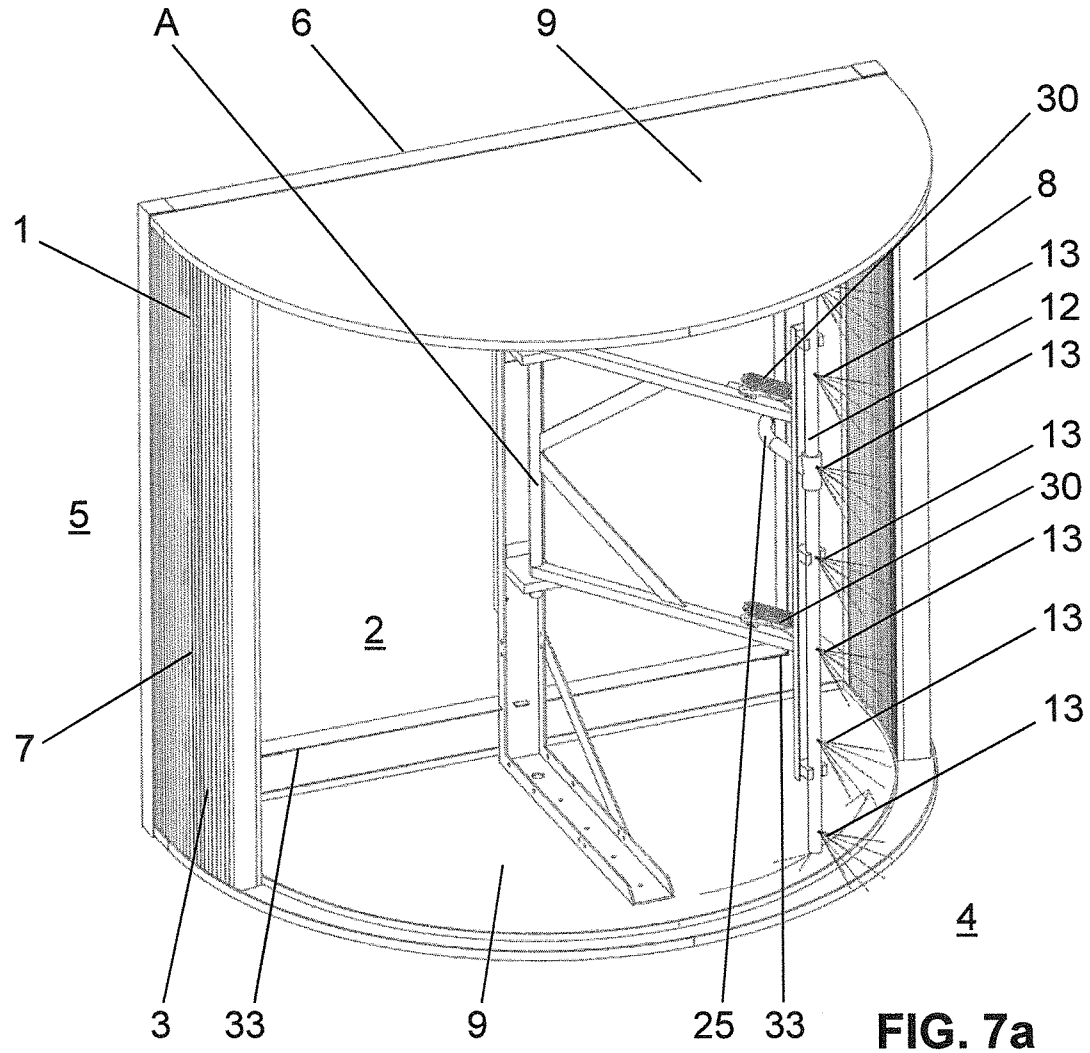
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FIG. 7a

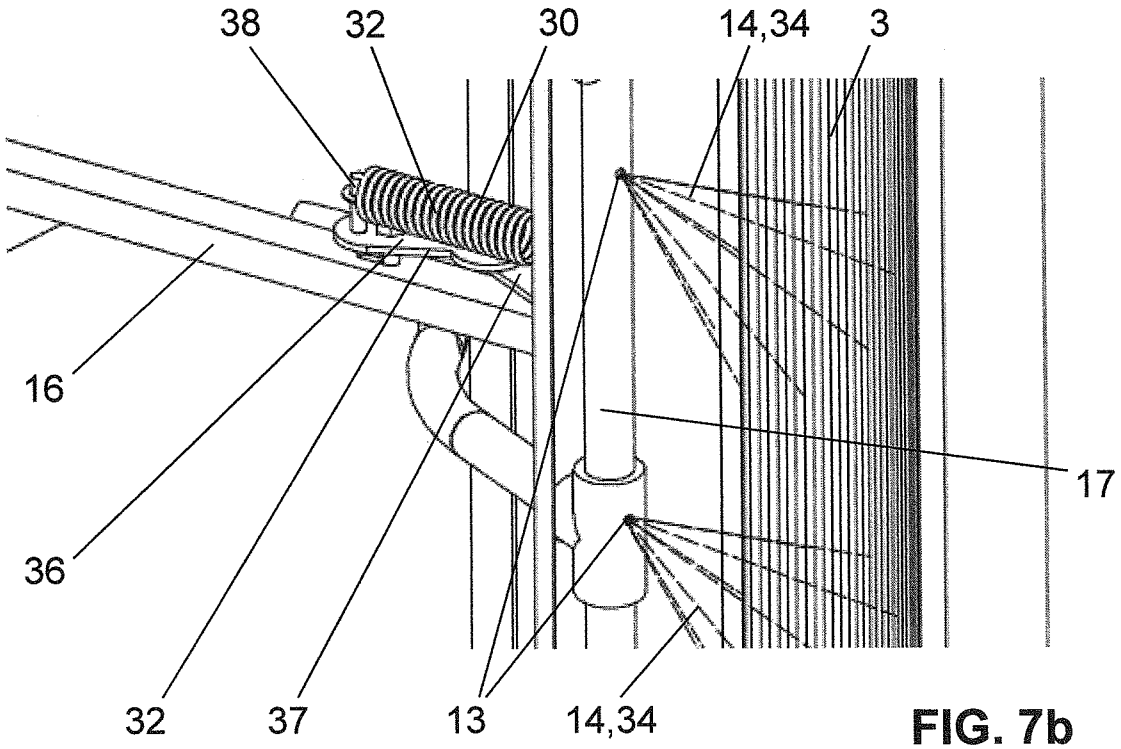
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FIG. 7b

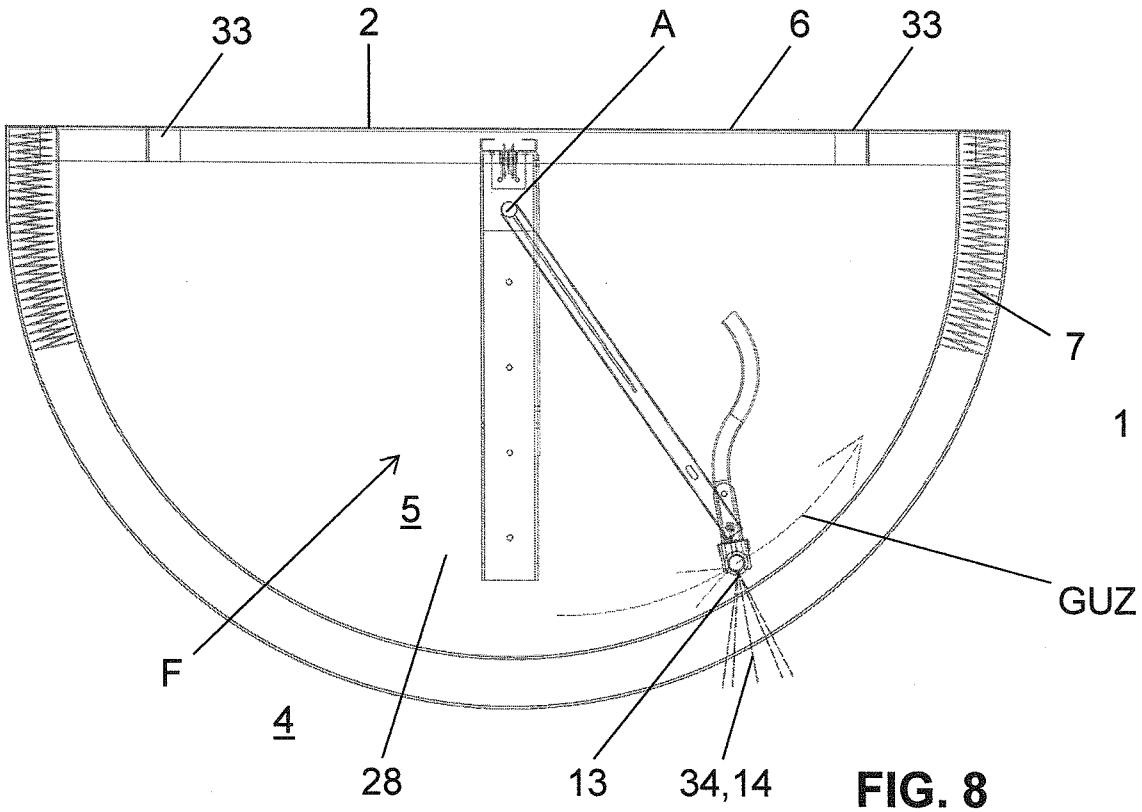


FIG. 8

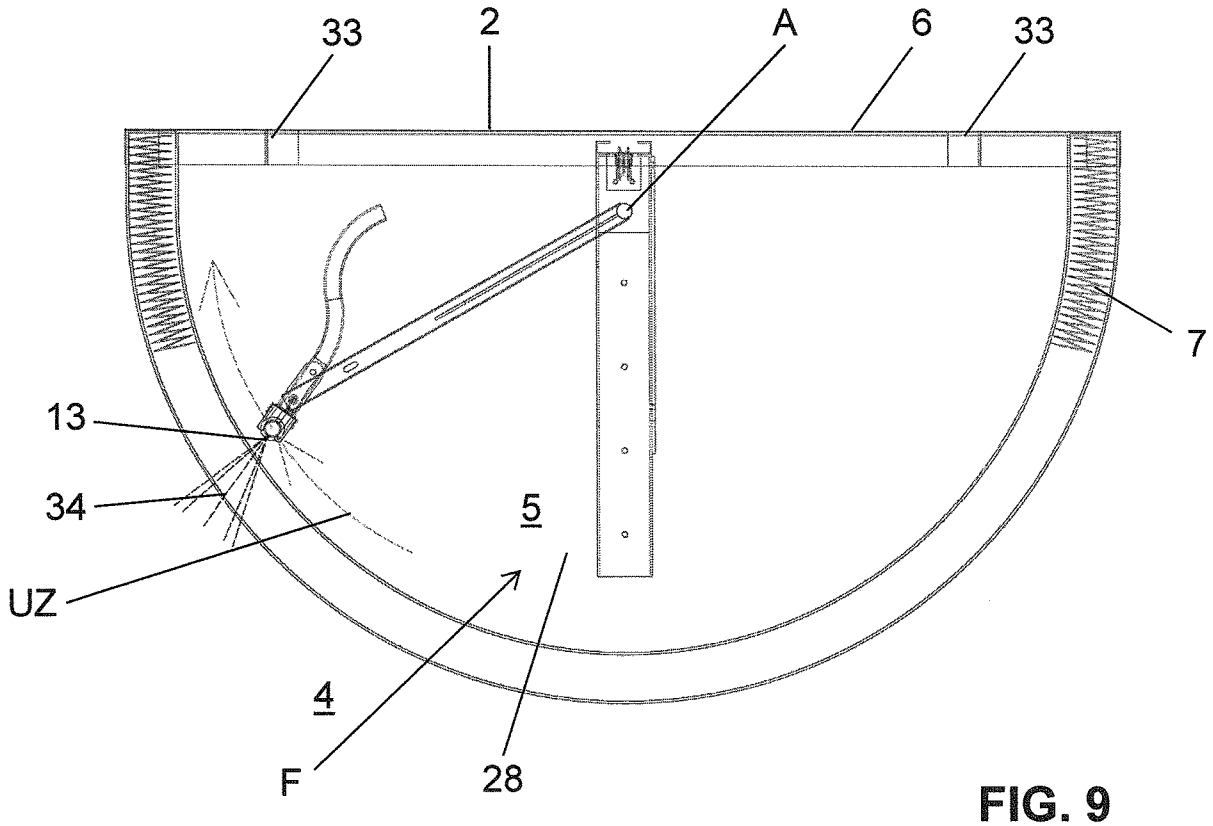
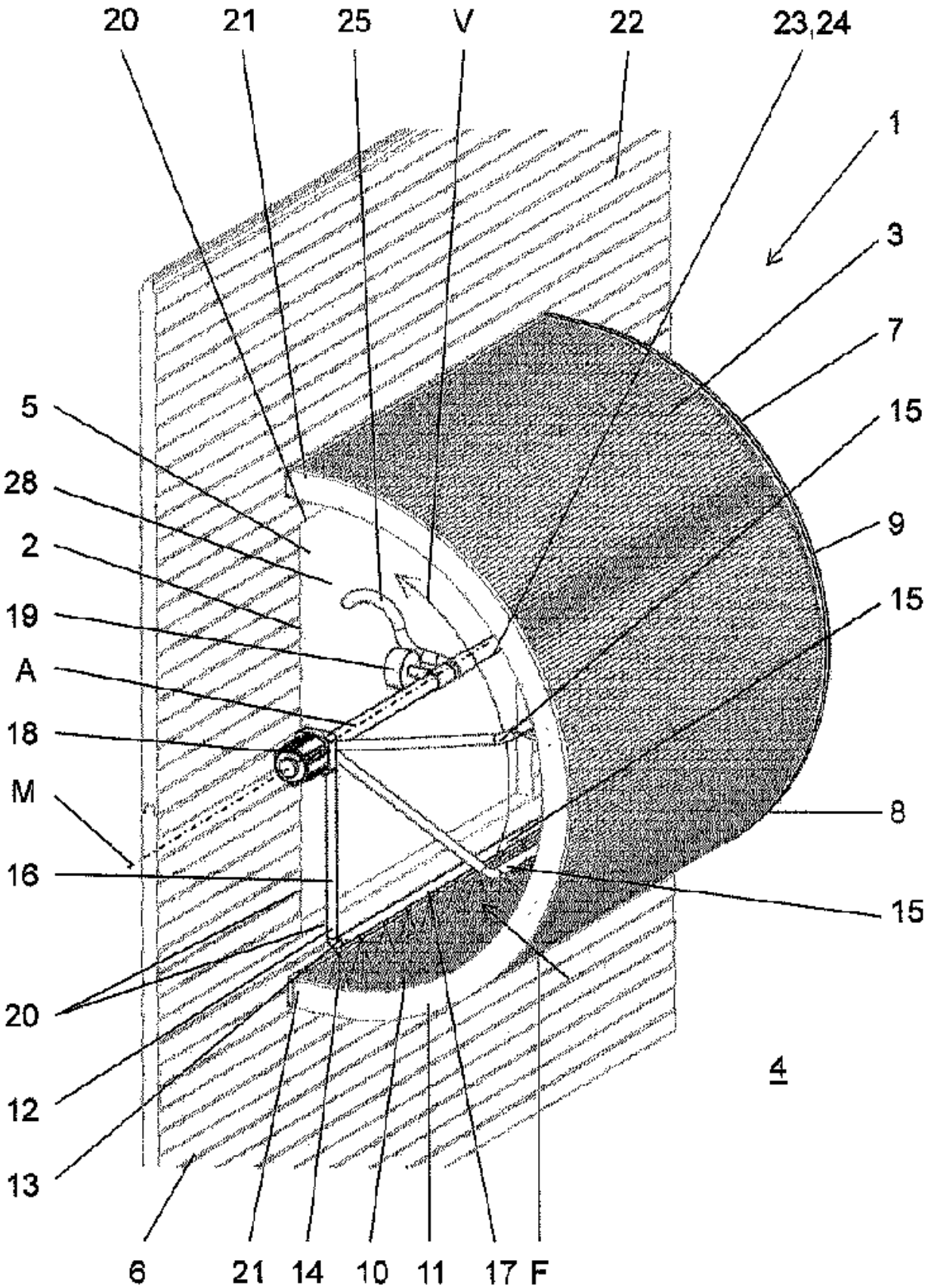


FIG. 9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