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(54) APPARATUS FOR APPLYING PAINT TO PRODUCTS

(57) An apparatus (1) for painting products comprises a conveying system (2), at least one device fixed to a shuttling arm (5) for applying the paint (4), at least one suction system and a plenum (3) that is provided with a longitudinal axis (A) which is perpendicular to a direction of advancement (D) of the products. The shuttling arm (5) has a shape that is at least partially complementary to that of the plenum (3).

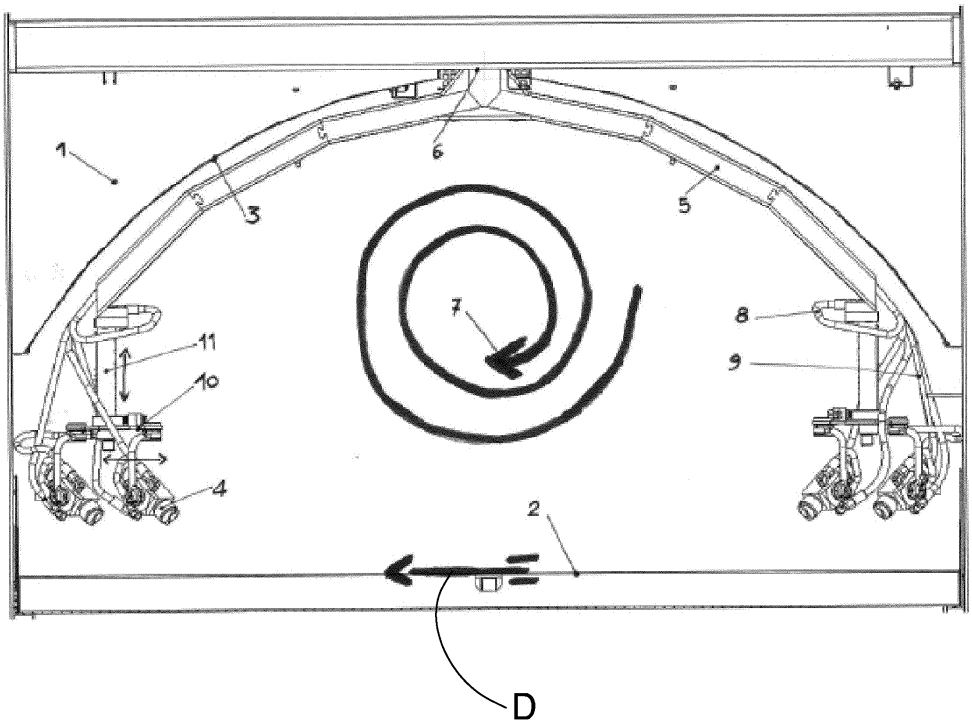

Fig. 1

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Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to the technical field of apparatuses for applying paint to products, in particular to products with a basically flat extent, known on the market as paint spraying booths. The present invention relates to a shuttling arm, to which the following description will make explicit reference without narrowing the scope of the description.

PRIOR ART

[0002] Spraying booths are known that comprise movable automatic devices (reciprocators, carousels, rotating arms) for spray painting products to be painted and which further comprise a conveying system for advancing the products inside the spraying booth in a direction of advancement. The automatic spraying devices apply the paint during the advancement of the products, when the latter are in a painting zone.

[0003] Spray paint application entails that not all the paint hits the product; the paint not applied to the product partly finishes on the product conveying system, and partly hovers in the air in the spraying booth itself. This last portion of sprayed paint is called overspray, and is partially intercepted by the spraying booth suction system.

[0004] Non-intercepted overspray tends to contaminate spraying booth internal walls, gathering on them up to the point of compromising manufacturing quality and leading to an important waste of painted products. Therefore costly maintenance and cleaning of the spraying booth itself become mandatory.

[0005] The overspray intercepted by the suction system is channelled towards filters of the spraying booth, also thanks to an air flow produced by the suction system itself, too. In this path the overspray is controlled in a more proper way thanks to the emission of an air flow from the plenum.

[0006] Recently, the applicant has filed a patent application EP2808091, which discloses, as illustrated in Figures 10 and 11, a spraying booth 12 in which a conveying system 13 is provided that conveys a product 14 in a direction of advancement D and a plenum 15 of curved, in particular semicylindrical shape, having a longitudinal axis of symmetry Y arranged perpendicular to the direction of advancement D of the product 14. Suction means 16 is provided on both sides of the conveying system 13. The spraying booth further comprises two spraying devices 17 arranged on respective shuttling arms, (which are not illustrated), which are arranged slidable on respective guides (which are not illustrated).

[0007] The latter are parallel to the longitudinal axis of symmetry Y of the plenum 15 and are respectively fixed to lateral walls of the spraying booth. The spraying devices 17 are thus arranged facing one another to spray paint from opposite sides of the booth, they are preferably arranged at the same height and are each moved by the respective arm along the respective guide, by a control system of the spraying booth in relation to the portion of product to be painted such as to be translated in the guides along the respective longitudinal axes, which are parallel to the longitudinal axis of symmetry Y of the plenum 15.

[0008] The plenum 15 in combination with the suction means 16 of the cabin 12 generate an air whirl that enables the phenomenon of overspray to be contained.

[0009] Nevertheless, it has been found that the sliding of the spraying devices along the lateral walls of the spraying booth can generate turbulences in the air whirl of the non-applied paint and can lead to this paint being deposited on portions of the walls inside the spraying booth.

[0010] The applicant continued searching in order to further improve the control of overspray, and consequently to limit the soiling of the spraying booth during painting operation.

DESCRIPTION OF THE INVENTION

[0011] The present invention seeks to provide a spraying booth with further improved cleaning features.

[0012] A further object of the present invention is to provide a spraying booth that rarely needs onerous spraying booth cleaning/maintenance operations.

[0013] This aim is obtained with an apparatus having the features of the independent claim. Advantageous embodiments and refinements are specified in the appended claims thereof. The aim is achieved through the combination of a plenum and of a supporting arm of the spraying devices according to the present invention, according to which the arm has a shape that is at least partially complementary to that of the plenum.

[0014] The shape of the shuttling arm, which is as similar as possible to the shape of the plenum, means that the shuttling arm follows the shape of the whirl generated by the combination between the plenum and the suction without disturbing the air whirl itself. Advantageously, the shuttling arm adheres as closely as possible to the plenum, in particular it is at a distance from the plenum ranging from 5mm to 150mm, precisely to avoid interfering as much as possible with the air whirl.

[0015] More advantageously, the shuttling arm has a shape that is symmetrical with respect to a longitudinal axis of symmetry of the plenum and is fixed by a central portion to supporting elements which are in turn fixed at the axis of symmetry of the plenum.

[0016] In other words, still more advantageously, the shuttling arm is supported by an upper central zone of the plenum and follows the shape of the plenum to spray paint on the products from top to bottom so that the overspray paint is hit by the air flow emitted by the plenum and is conveyed in the air whirl generated by the combination between the plenum and the suction, without the

air whirl being disturbed.

[0017] Still another advantage is obtained if the plenum has a curved shape, in particular semicylindrical shape, and if the shuttling arm thus has a curved shape, in particular substantially semicylindrical shape that is at least partially complementary with the shape of the plenum, and if moreover the shuttling arm is positioned to adhere as close as possible to the plenum. This particular embodiment permits an effective control of the overspray inside the spraying booth because the central top portion of the plenum keeps low the whirl that is generated by the suction system and the lateral walls of the plenum maintain the air whirl compressed towards the centre of the spraying booth, the shuttling arm not interfering with the air whirl.

[0018] The advantages of the present invention are due to the improvement in the control of overspray flow. This has several consequences:

- cleaner painting process, which, for the final user, translates into a lower number of wasted painted parts;
- less need for cleaning and maintenance of the spraying booth;
- lower consumption of air expelled by the suction system to get overspray control (lower number of air renewals per time unit);
- a higher portion of paint ends up on the part to be painted;
- a smaller quantity of overspray is generated, which is intercepted in a more efficient way by the suction system.

SHORT DESCRIPTION OF THE DRAWINGS

[0019] The present invention will be disclosed below in one of its embodiments by way of nonlimiting example with the help of the enclosed figures, which show:

- Figure 1 is a frontal schematic view of the spraying apparatus, with some parts removed for the sake of clarity, on a plane that is perpendicular to a conveying system of products and parallel to a direction of advancement of the products;
- Figure 2 is a perspective bottom view of a plenum of the spraying apparatus and of a shuttling arm to which at least one device is fixed for applying the paint;
- Figure 3 is a further perspective view of the plenum in Figure 2;
- Figure 4 is another perspective and schematic view of a part of the plenum of Figure 2, in which some parts have been removed for the sake of clarity to show the shuttling arm and movement means of the shuttling arm comprising supporting elements of the shuttling arm, transmission organs of the shuttling arm and a belt that sets the shuttling arm in motion;
- Figure 5 is a schematic section view of the plenum of Figure 2, according to a plane that is perpendicular to the conveying system of the products and passes through a longitudinal axis of the plenum;
- Figure 6 is a detailed view of Figure 5 to show the shuttling arm and movement means of the shuttling arm;
- Figure 7 is a schematic section view of the plenum of Figure 2, according to the plane that is perpendicular to the conveying system of the products and also perpendicular to a longitudinal axis of the plenum, to show the shuttling arm frontally;
- Figure 8 is a perspective view of a detail of an end of the shuttling arm provided with adjustment guides for adjusting the position of the paint applying device;
- Figure 9 is a schematic view of a control system of the spraying apparatus;
- Figure 10 is an axonometric view of a spraying apparatus according to the prior art that shows an air whirl of non-applied paint;
- Figure 11 is a section view of the spraying apparatus according to the prior art, along a plane that is perpendicular to a conveying system of the products and parallel to a direction of advancement of the products.

PREFERRED EMBODIMENTS OF THE INVENTION

[0020] In this description, alike elements that are common to the various examples illustrated are indicated by the same numbering.

[0021] According to what has been illustrated in figures 1 to 9, with 1 an apparatus for painting products (which are not illustrated) has been illustrated, which is also commonly known as spraying booth. The products can also, e.g., have a basically flat extent.

[0022] The apparatus 1 comprises a flat conveying system 2 (shown in Figure 1) and at least one paint applying device 4, fixed to a shuttling arm 5, at least one suction system (not shown) and a plenum 3 that is provided with a longitudinal axis A which is perpendicular to a direction of advancement D of the products. In particular, the longitudinal axis A shown in Figure 2 is a longitudinal axis of symmetry for the plenum 3 itself.

[0023] The plenum 3 is suitable for blowing air whereas the suction system is suitable for sucking the non-applied paint so that the air emitted by the plenum 3 in combination with the air sucked by the suction system can generate an air whirl 7 (Figure 1) that is uniformly distributed and controlled so that paint particles suspended in the painting zone do not accumulate on the walls of the spraying booth because they are effectively sucked by the suction system.

[0024] The device for applying the paint 4 comprises at least one spray gun 20.

[0025] In the embodiment shown in figures 1 to 9 each paint applying device comprises a plurality of spray guns 20, e.g. four spray guns as in Figures 2 to 4 or two spray guns 20 as in Figures 5 to 8. The number of spray guns

is selected according to the type of painting to be performed and according to the type of product to be painted and for this reason in the present figures two spray-guns 20 or four spray-gun 20 paint-applying devices are shown. The spray guns 20 face a painting zone of the apparatus 1.

[0026] The shuttling arm 5 has a shape that is at least partially complementary to that of the plenum 3.

[0027] The plenum 3 typically has a concave shape and the attached figures show a plenum 3 of curved shape

[0028] Nevertheless, alternative embodiments which are not illustrated can be provided for the plenum because, e.g., the plenum 3 can be made by means of a continuous polyhedral surface or by means of a continuous surface with at least one curved portion.

[0029] The shuttling arm 5 can have a shape that is entirely complementary to the shape of the plenum 3, in the sense that it can follow entirely the profile thereof, or can have a shape that approximates the shape of the plenum 3, following the profile thereof, as will be seen in greater detail below.

[0030] The shuttling arm 5 is hollow and internally both tubes conveying paint 8 and tubes conveying compressed air 9 run, which are received by the paint applying device 4 to spray paint on the products to be sprayed.

[0031] Further, the shuttling arm is covered by a surface finishing, e.g. TEFLON®, which permits easy cleaning of the shuttling arm.

[0032] The spraying apparatus 1 further comprises a belt 6, shown in detail at least in figures 2 to 7, which sets the shuttling arm 5 in motion, the width and the position of the belt 6 being such as to allow the closing of a split 21 where the supporting elements of the shuttling arm 5 slide, so that paint particles cannot enter into the transmission organs (which are not illustrated) of the shuttling arm 5.

[0033] It should be noted that the belt 6 is arranged at the central longitudinal axis of the plenum 3 that is symmetrical for the plenum 3, as will be seen better below.

[0034] The supporting elements support a central portion 5a of the shuttling arm 5.

[0035] The supporting elements comprise a tubular elongated support 22 and a carriage 23. The central portion 5a of the shuttling arm 5 is fixed to the carriage 23, which is slidingly supported by the tubular support 22 by a pair of slide shoes and is fixed to the belt 6 that sets the shuttling arm 5 in motion. When the belt 6 is driven by drive means (which is not illustrated) to drive the shuttling arm 5, the belt drags the carriage 23 which slides on the tubular support 22, in particular, the slide shoes of the carriage slide on a sliding rail 24 (Figure 4, Figure 5 and Figure 6) of the tubular support 22.

[0036] The movement means of the shuttling arm 5, which comprises the belt 6, the tubular support 22, the carriage 23 and transmission organs (which are not illustrated) are such as to enable the shuttling arm 5 to move from a longitudinal end of the plenum 3 to the opposite longitudinal end.

[0037] In detail, the tubular support 22 extends over the entire longitudinal extent of the plenum 3 and the sliding rail 24 extends over the entire length of the tubular support 22, so that the carriage 23 can be slid by the belt 6 over the entire longitudinal extent of the plenum 3 from a longitudinal end of the plenum 3 to the opposite longitudinal end.

[0038] The tubular support 22 is arranged at the longitudinal axis of symmetry of the plenum 3. An elongated seat 25 is obtained in the plenum 3 to house the supporting elements and the transmission elements of the shuttling arm 5.

[0039] A pair of elongated elements 26 are further arranged on the sides of the central portion 5a of the shuttling arm 5 and between the sides the split 21 is defined that is closed by the belt 6, which thus prevents the paint particles entering the seat 25 in which the supporting elements and the transmission organs of the shuttling arm 5 are housed.

[0040] Preferably, the apparatus 1 comprises two paint applying devices 4 and the shuttling arm 5 comprises two lateral portions 5b, which are arranged on opposite sides to the central portion 5a.

[0041] Each lateral portion 5b has a shape that is at least complementary to the shape of the plenum 3 and further supports a respective paint applying device 4.

[0042] Each lateral portion 5b further has an end provided with adjustment guides for adjusting a position of the respective paint applying device 4, the position of the paint applying device 4 in the adjustment guides being adjustable both vertically (moving the paint applying device 4 towards or away from the products to be painted) and horizontally (i.e. moving the paint applying devices 4 towards or away from one another). In fact, the paint applying device 4 comprises a plate 10, which supports the spray guns 20 and is fixed slidably on a vertical guide 11 and on which the position of the spray guns 20 can be adjusted, as the spray guns 20 are mounted slidably on respective horizontal guides (which are not illustrated) that enable the spray guns 20 to slide towards or away from one another.

[0043] The orientation of each spray gun 20 in relation to the painting zone can further be adjusted, because each spray gun 20 can be adjusted according to two rotation axes that are orthogonal to one another.

[0044] Each lateral portion 5b, in addition to the central portion 5a, is further hollow, for housing internally the tubes conveying the paint 8 and the tubes conveying compressed air 9. Further, each lateral portion 5b comprises a respective filter 27 for the paint arranged inside the vertical guide 11 to filter the paint to be applied, that is conveyed to the spray guns 20. The filter 27 is upstream of the spray guns 20.

[0045] The filter 27 is arranged dismantleable at the lower end of the vertical guide 11 to enable a maintenance operator to be able to access and dismantle easily the filter 27.

[0046] The lateral portions 5a of the shuttling arm 5 are made of a plurality of hollow tubular elements 28 that are joined together, e.g. jointed and/or welded, which enable a shuttling arm of the desired stiffness to be made, whilst maintaining the costs limited.

[0047] At this point it is pointed out that by making the lateral portions by means of rectilinear tubular elements 28 it is possible to limit costs further but in this case, if the plenum has a curved shape, the shape of the shuttling arm can only approximate the curved shape of the plenum 3, following any way the profile thereof with a shape that is at least partially complementary to that of the plenum 3.

[0048] The shuttling arm 5 has an axis of symmetry that is parallel to the longitudinal axis of symmetry A of the plenum 3 as lateral portions 5b of the shuttling arm 5 are symmetrical to the central portion 5a of the shuttling arm 5.

[0049] From experimental tests it has emerged that the downflow of the overspray is improved by the profile of the shuttling arm 5 that follows the profile of the plenum 3, when preferably the shuttling arm 5 is slidably fixed at the longitudinal axis of symmetry A of the plenum 3 and is symmetrical thereto with respect to the axis of symmetry A or to an axis parallel to the longitudinal axis of symmetry A.

[0050] Advantageously, as shown in figures 1 to 8, the shuttling arm 5 adheres as much as possible to the plenum and thus has a distance from the plenum comprised in a range between 5mm and 150 mm. In particular, it is the lateral portions 5b of the shuttling arm 5 that adhere as much as possible to the plenum, at a distance from the plenum comprised in a range between 5mm to 150mm.

[0051] In addition, the plenum is of concave shape, in particular it is curved, more in particular of semicylindrical shape.

[0052] As said previously, the association between the position of the shuttling arm 5 adhering to the plenum 3, the semicylindrical curved shape of the plenum 3 and the shape of the shuttling arm 5 that follows the profile of the semicylindrical plenum means that there is maximum spraying efficiency of the spraying booth, improving the downflow of the overspray from the spraying booth 1.

[0053] The spraying apparatus 1 comprises a control system comprising detecting means 29 for detecting the dimensions of the product to be painted and a painting control device 30 that is suitable for adjusting a stroke of the shuttling arm 5 on the basis of the dimension detected by the detecting means 29. To calculate the stroke of the shuttling arm 5, the control device 5 calculates a first end position and a second end position of the tubular support 22 between which the shuttling arm 5 is to be moved in both movement directions. Further, the control device 30 is also suitable for adjusting a sliding speed of the shuttling arm 5 in the tubular support 22, in particular in the sliding rail 24 to optimise painting of the products by decreasing the time required for painting.

[0054] In Figure 9, the stroke of the shuttling arm 5 has been indicated by 31 whereas the movement speed of the shuttling arm 5 has been indicated by 32.

[0055] In use, the conveying system 2 advances the product to be painted to the inside of the spraying apparatus and when the product is in a painting zone, the control device 30 establishes a painting plan for the product on the basis of the dimensions detected by the detecting means 29, and thus establishes the first end movement position and the second end movement position in the tubular support 22 to define the stroke 31 of the shuttling arm 5, and the speed 32 at which this movement is to be run.

[0056] The movement of the shuttling arm 5 and thus the activation of the painting have to be synchronised with an advancing speed of the conveying system 2, as the shuttling arm 5 is suitable for spraying paint during the advancement of each product.

[0057] In order to move the shuttling arm 5 according to the stroke 31 established by the control system 30, drive means of the belt 6 is activated, which belt 6, fixed to the carriage 23, which is in turn fixed to the central portion 5a of the arm 5, drags the arm 5 by sliding the arm on the tubular support.

[0058] A preferred embodiment of the invention of Figure 1 is now illustrated.

[0059] Figure 1 shows the section, on a plan parallel to the direction of advancement of the product to be painted, of the interior of the spraying booth 1.

[0060] Inside the spraying booth 1 there is a conveying system 2 for conveying the products (which are not shown), at least one paint applying device 4 (e.g. a spray gun), and a plenum 3 of the spraying booth having a semicylindrical shape with an axis perpendicular to the direction (shown by the bold arrow) of advancement of the products.

[0061] Sideways to the conveying system 2 two suction tanks (not shown) are present, one for each side, suctioning the overspray.

[0062] The plenum 3 is a ceiling distributing an airflow, capable of generating a uniformly distributed and controlled airflow. The combination of the in-flow and suctioned flow, together with the shape of the plenum, allows an air whirl 7 (shown in the form of a spiralling arrow) to be generated, having its axis perpendicular to the direction of advancement of the products to be painted.

[0063] The shuttling arm 5 supporting at least one painting device 4 has a curved shape complementary to that of the plenum 3, so as to interfere as little as possible with the air whirl 7.

[0064] The arm 5 supporting the paint applying devices 4 shuttles back and forth inside the spraying booth 1 in a direction perpendicular to the direction of advancement of the products, and parallel to the axis of the whirl 7.

[0065] The complementary shape of the arm 5 and of the plenum 3, and the minimal distance between arm 5 and plenum 3, allow the air flow coming from the plenum to keep the arm itself clean, reducing the soiling of the

arm due to overspray.

[0066] The arm 5 preferably has stiffness such as to reduce as much as possible the vibrations of the machine, and in particular of the paint applying devices 4, so as to prevent the falling of possible contaminant particles onto the products.

[0067] The shape and the dimensions of the arm 5 are such as to ensure the desired stiffness.

[0068] In a preferred embodiment, the arm 5 is produced from tubes cut by laser 3D and subsequently welded together. The arm 5 can be made of steel, aluminium, carbon, or composite materials allowing the weight to be reduced while maintaining high stiffness. Preferably the arm 5 is protected by a surface finishing able to withstand solvents, allowing an easy cleaning (e.g. Teflon).

[0069] In the preferred embodiment, the arm 5 is hollow, allowing the tubes conveying paint and compressed air to pass that are necessary for the functioning of the painting devices 4. In

[0070] Figure 1 the tubes 8 conveying paint and the tubes 9 conveying compressed air to the devices 4 are visible. Housing paint and compressing air tubes inside the arm 5 allows a tidier arrangement inside the spraying booth 1 and a lower number of surfaces which can enter into contact with overspray to be obtained.

[0071] A belt 6 sets the arm 5 in motion. The width and the position of the belt 6 are such as to allow the closing of the split where the supporting elements of the arm 5 lie, so that paint particles cannot enter the transmission organs above the spraying booth, and possible dirty particles cannot fall back inside the spraying booths and onto the products.

[0072] This system of sealing the spraying booth by the belt further prevents the formation of airflows which might jeopardize the correct formation of air whirl 7.

[0073] The stroke of the arm 5 is adjustable: it is possible to set its shuttling between two points which can be defined according to the product to be painted; in the preferred embodiment, this adjustment is automatic thanks to the presence of sensors detecting the dimensions of the product.

[0074] The speed of the arm 5 is adjustable: this adjustment occurs on the basis of the advancing speed of the conveying system 2, and of other factors, like e.g. the kind of paint or of guns used.

[0075] The position of the guns fixed to a plate 10 can be adjusted in height thanks to the presence of a vertical adjustment guide 11 allowing the guns to move away from or towards the products to be painted.

[0076] The plate 10 allows moreover the horizontal adjustment of the position of guns for applying the paint even in the direction of the advancing parts (the guns can be moved towards or away from one another.

[0077] The guns can be adjusted according to two rotation axes that are orthogonal to one another, one perpendicular (vertical axis) to the conveying system 2, and one perpendicular (horizontal axis) to the axis of the gun itself.

[0078] Inside the guides 11, upstream of the spraying devices, a filter for the paint is housed, which allows impurities or clots possibly present in the paint to be sprayed to be intercepted, so as to prevent nozzle obstruction and ensuring a uniform paint application. The guns for applying the paint can be replaced by any other commercial type of paint-spraying device.

Claims

1. Apparatus (1) for painting products, comprising: a conveying system (2); at least one device for applying the paint (4) fixed to a shuttling arm (5), at least one suction system, a plenum (3) that is provided with a longitudinal axis (A) which is perpendicular to a direction of advancement (D) of the products; **characterised in that** the shuttling arm (5) has a shape that is at least partially complementary to that of the plenum (3).

2. Apparatus according to claim 1, wherein the shuttling arm (5) is hollow and inside which the tubes run that convey the paint (8) and the compressed air (9) to the paint applying device (4).

3. Apparatus according to claim 1, or 2, wherein the shuttling arm (5) is coated in a surface finish, e.g. TEFLON@, that allows easy cleaning thereof.

4. Apparatus according to any preceding claim, and further comprising a belt (6) that sets the shuttling arm (5) in motion, the width and the position of the belt (6) being such as to allow the closing of a split (21) where supporting elements (22, 23) of the shuttling arm (5) slide, so as to prevent paint particles entering transmission organs of the shuttling arm (5).

5. Apparatus according to claim 4, wherein the supporting elements (22, 23) support a central portion (5a) of the shuttling arm (5a, 5b).

6. Apparatus according to claim 4, or 5, wherein the belt (6) is arranged at a longitudinal axis of symmetry (A) of the plenum (3).

7. Apparatus according to claim 5, or 6, wherein the supporting elements (22, 23) comprise a tubular element (22) and a carriage (23), the central portion (5a) of the shuttling arm (5) being fixed to the carriage (23) and the latter being slidably supported by the tubular element (22) and being fixed to the belt (6) that sets the shuttling arm in motion, the tubular element (22) extending over the entire longitudinal extent of the plenum (3), to allow the shuttling arm (5) to move from one longitudinal end of the plenum (3) to the opposite longitudinal end.

8. Apparatus according to any one of claims 5 to 7, and further comprising a seat (25), obtained in the plenum (3) for housing the supporting elements (22, 23) and the transmission elements of the shuttling arm (5), and a pair of elongated elements (26) arranged on the sides of the central portion (5a) of the shuttling arm (5) between which the split (21) is defined that is closed by the belt (6).

9. Apparatus according to any one of claims 5 to 8, and further comprising two paint applying devices (4), the shuttling arm (5) having further lateral portions (5b) arranged on opposite sides with respect to the central portion (5a), each lateral portion (5a) having a shape that is at least partially complementary to the shape of the plenum (3) and supporting a respective paint applying device (4).

10. Apparatus according to claim 9, wherein each lateral portion (5b) further has an end provided with adjustment guides (10, 11) for adjusting a position of the respective paint applying device (4), the position of the paint applying device (4) in the adjustment guides (10, 11) being adjustable both vertically (by moving the application device towards or away from the products to be painted) and horizontally (i.e. by moving the devices towards or away from one another).

11. Apparatus according to claim 10, wherein each lateral portion comprises a respective filter for the paint (27) arranged inside vertical guides (11) of the adjustment guides (10, 11) for filtering the paint to be applied, in particular the filter (27) being arranged dismantleable at the lower end of the vertical guides (11).

12. Apparatus according to any one of claims 9, to 11, wherein the shuttling arm (5) has an axis of symmetry that is parallel to a longitudinal axis of symmetry (A) of the plenum (3), the lateral portions (5b) of the arm (5) being symmetrical with respect to the central portion (5a) of the shuttling arm (5).

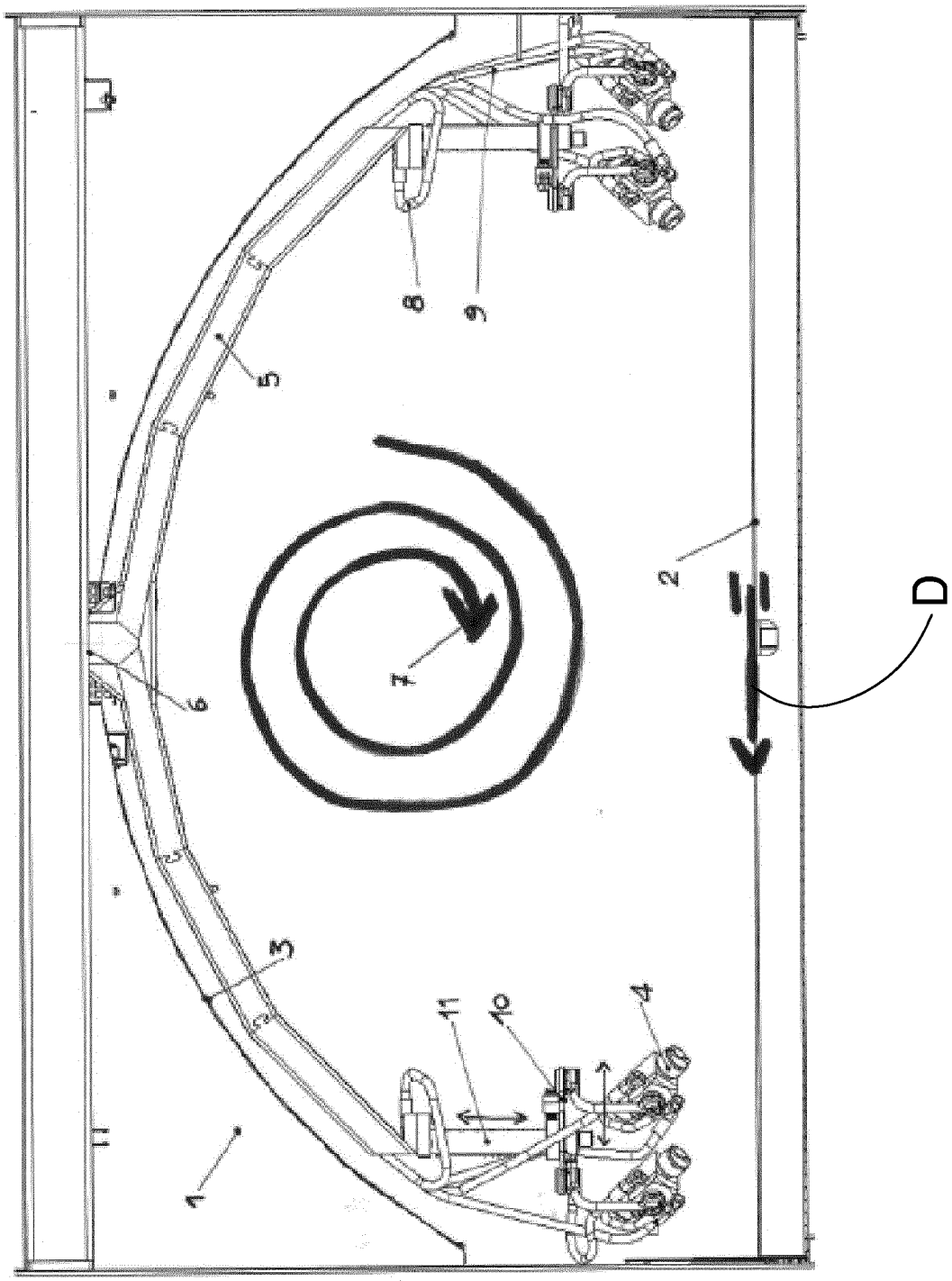
13. Apparatus according to any preceding claim, wherein the shuttling arm (5) has a position that adheres as closely as possible to the plenum (3) without compromising the mobility thereof, in particular it has a distance from the plenum (3) comprised in a range between 5mm to 150mm.

14. Apparatus according to any preceding claim, wherein the plenum (3) is of concave shape, in particular is curved, in particular is of semicylindrical shape.

15. Apparatus according to any preceding claim, and comprising detecting means (29) of the dimensions of the product to be painted and a control device of the painting (30) that is suitable for adjusting a stroke (31) of the shuttling arm (5) on the basis of the dimension detected by the detecting means (29), wherein optionally the control device (30) is suitable for adjusting a speed (32) of the shuttling arm (5).

16. Apparatus (1), in particular according to any one of claims 1 to 15, for painting products with a basically flat extent, comprising a conveying system (2), at least one device (4) for applying the paint fixed to a shuttling arm (5), at least one suction system, a plenum (3) of the spraying booth having a semicylindrical shape with the axis perpendicular to the direction of travel of the product, **characterised in that** the shuttling arm (5) has a curved shape that is complementary to that of the plenum (3) and the position of the arm (5) as closely as possible to the plenum (3) without compromising the mobility thereof.

Fig. 1



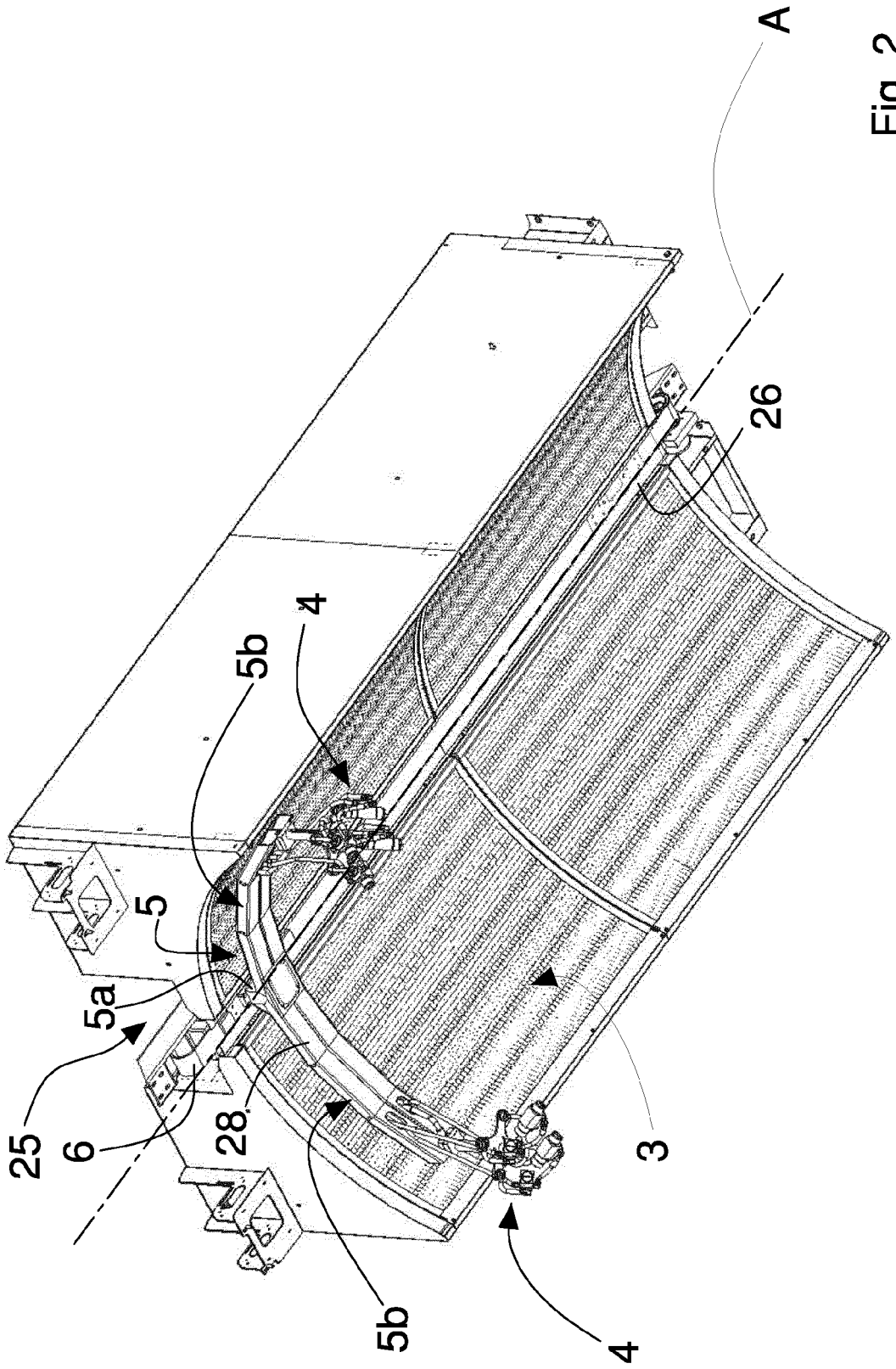


Fig. 2

Fig. 3

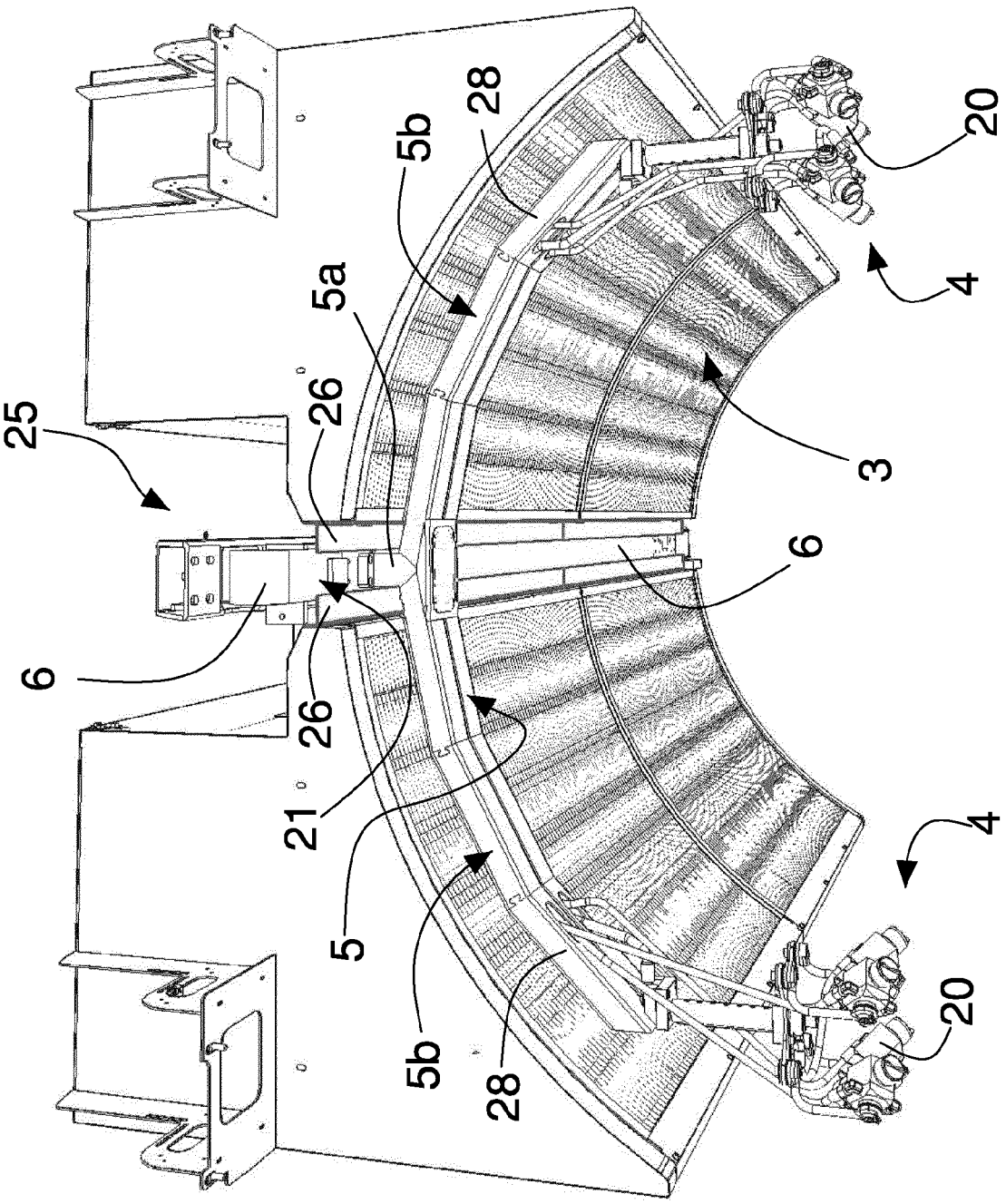
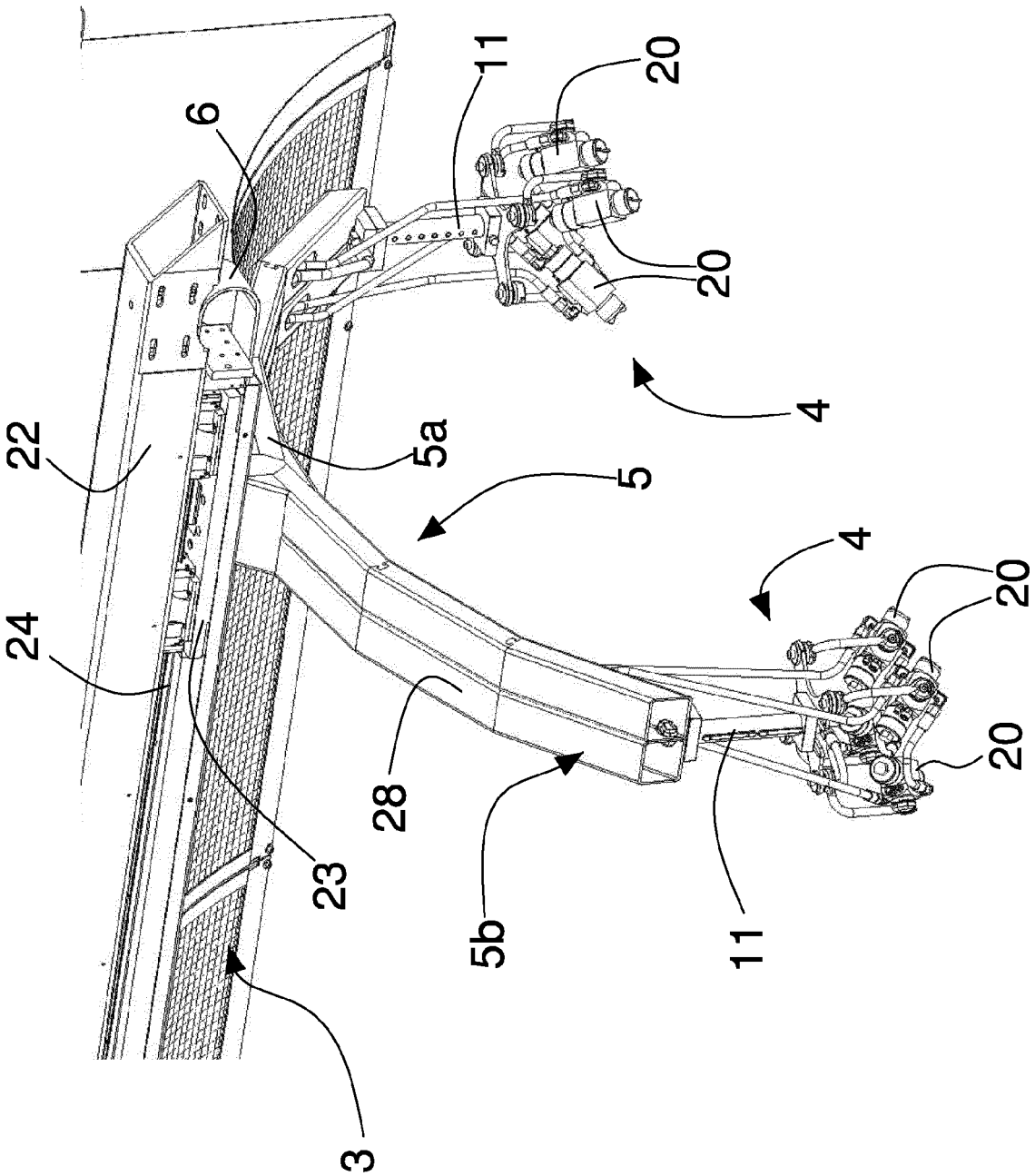


Fig. 4



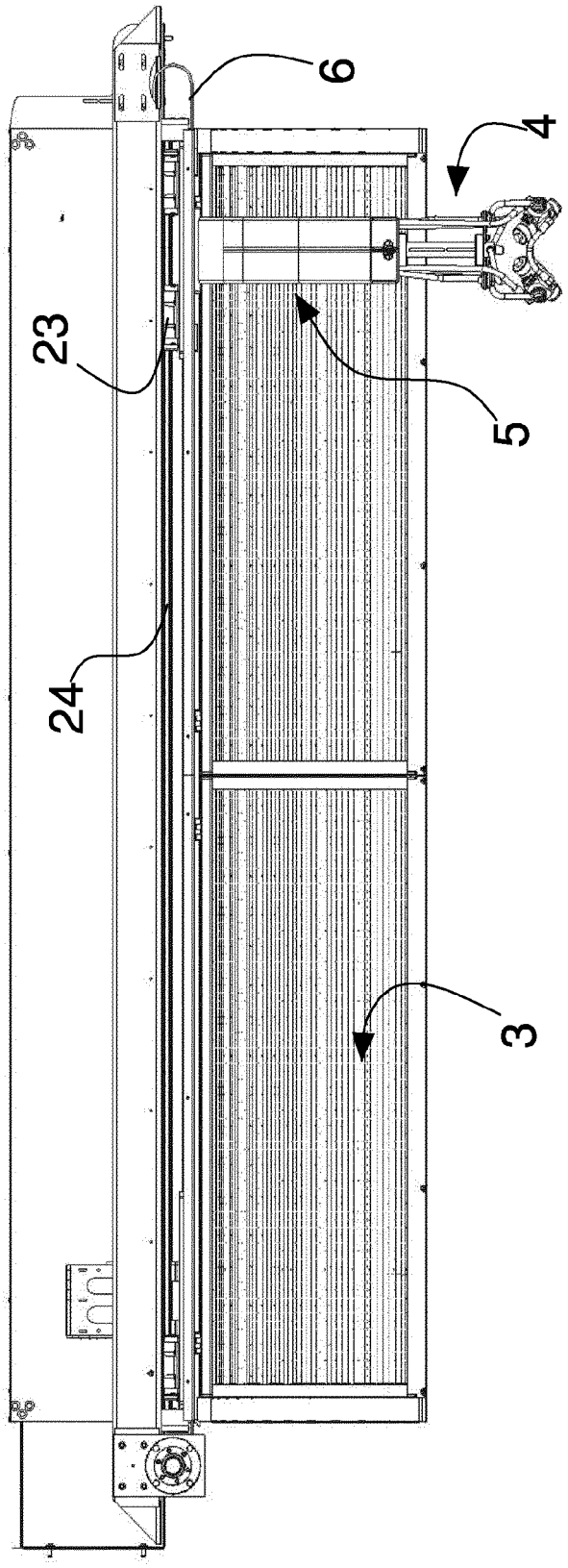


Fig. 5

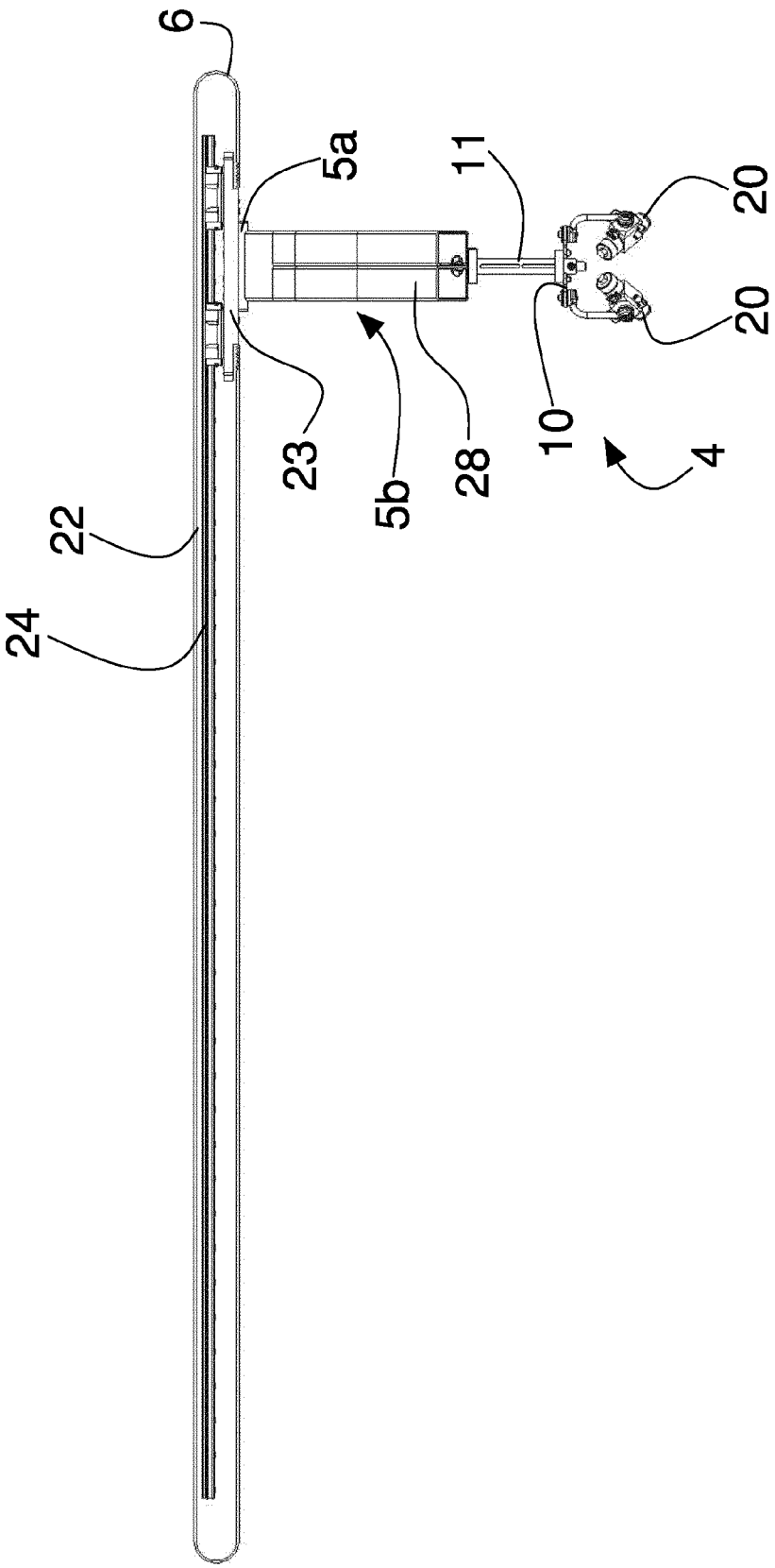


Fig. 6

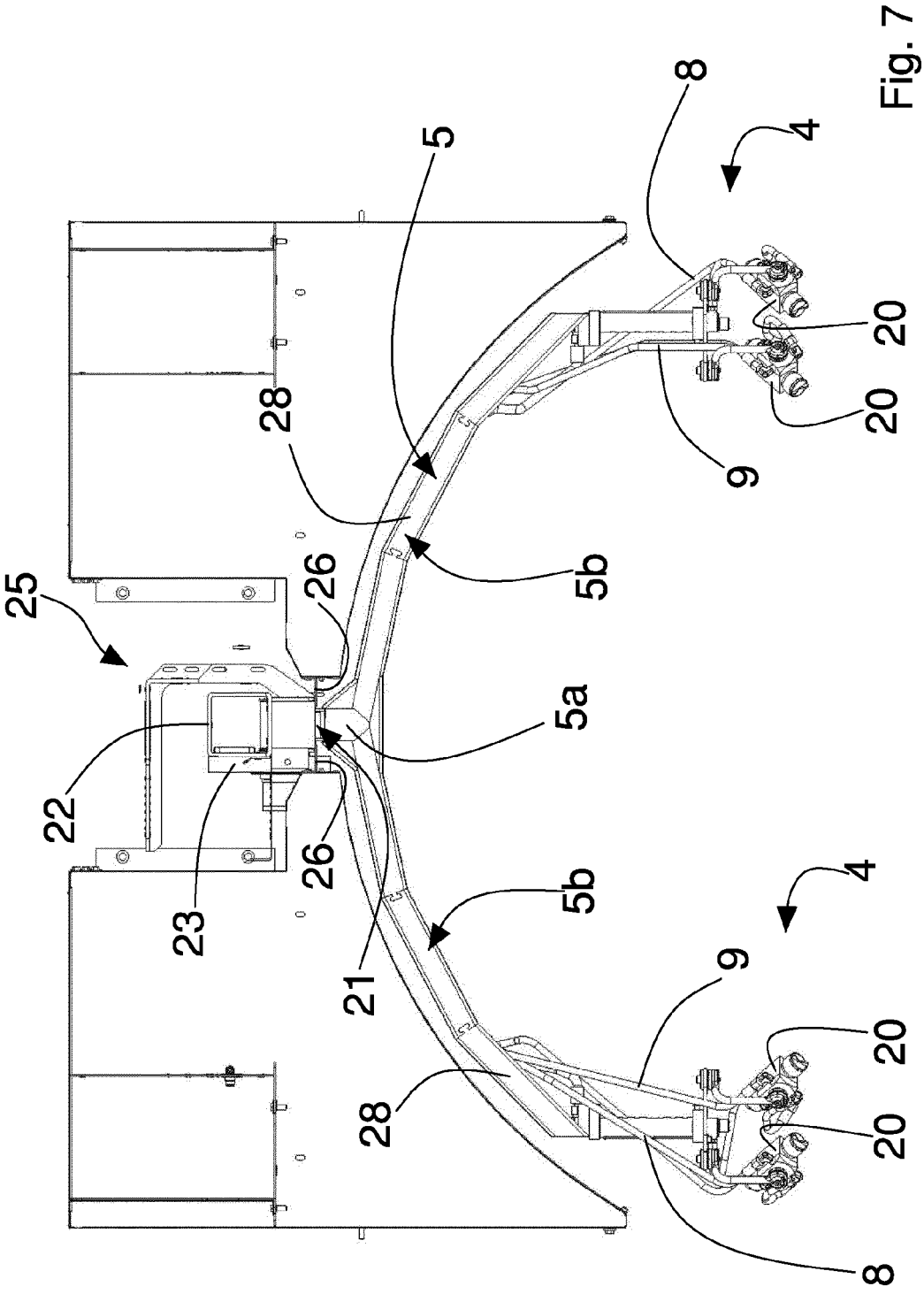


Fig. 7

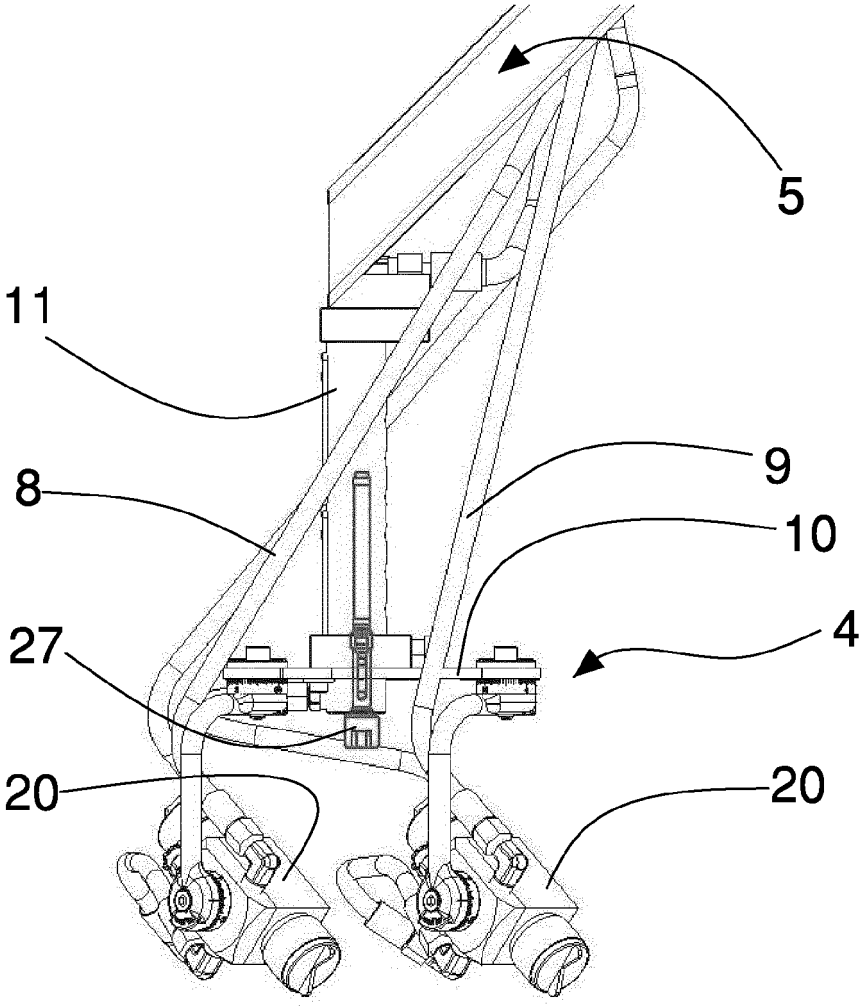


Fig. 8

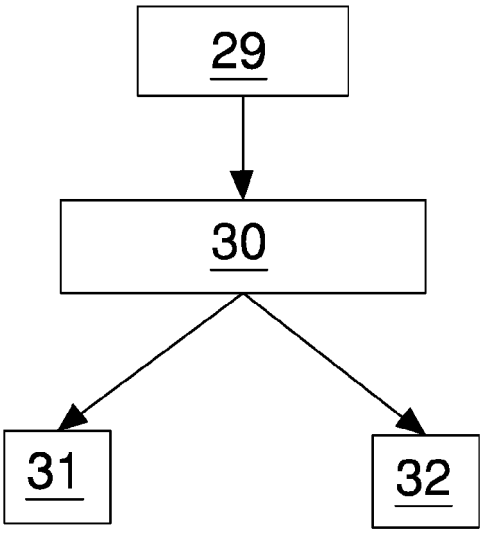


Fig. 9

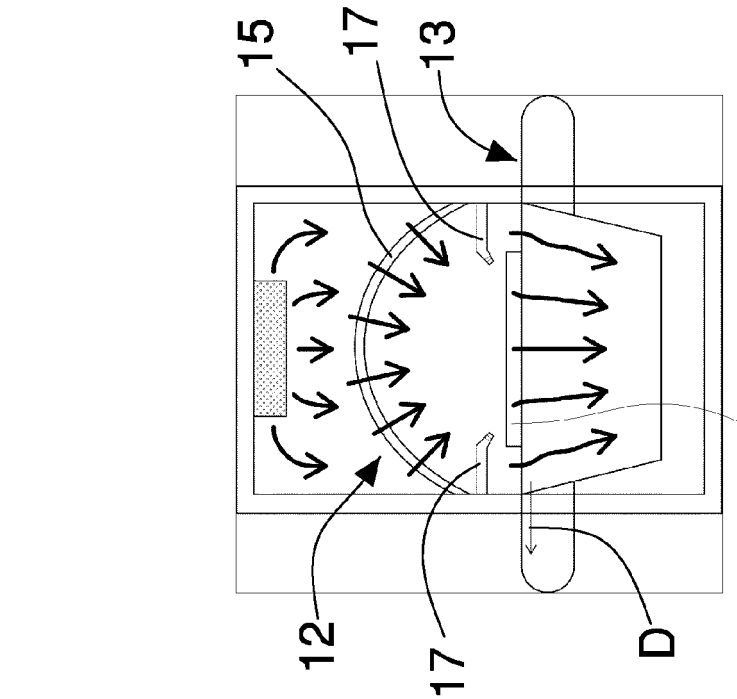


Fig. 11

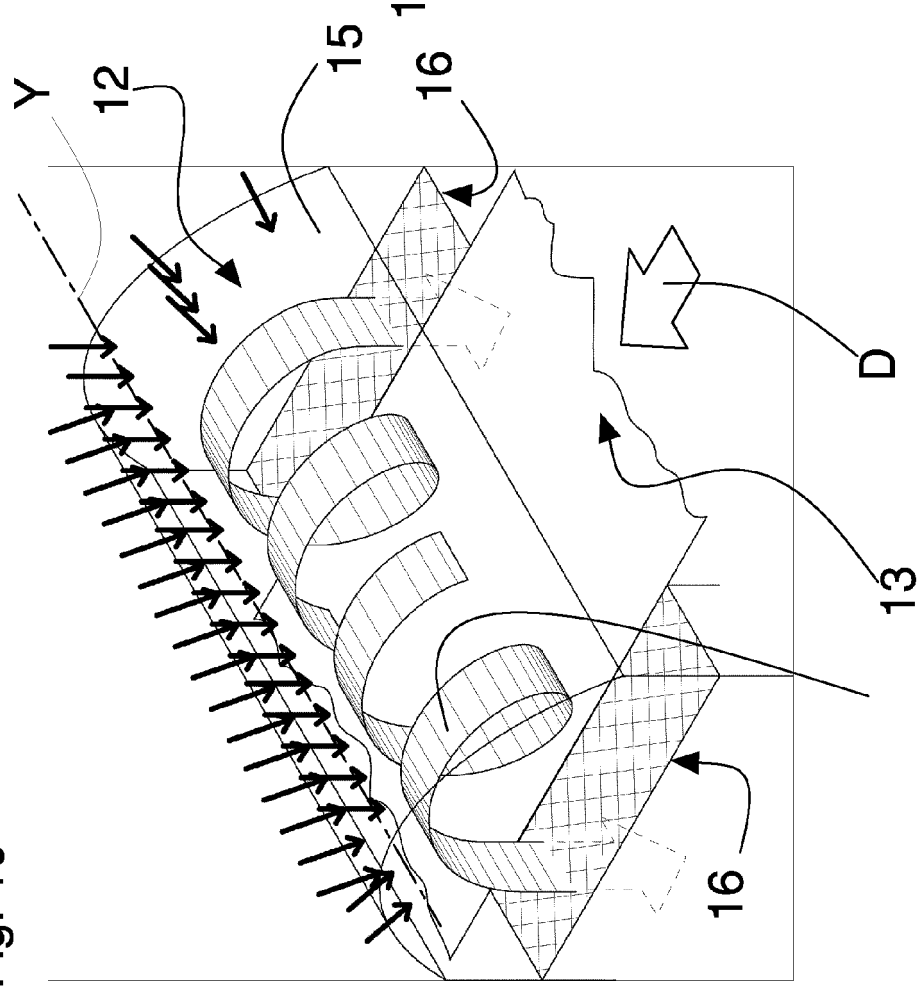


Fig. 10

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EUROPEAN SEARCH REPORT

Application Number
EP 15 18 6126

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	29 January 2016	Moroncini, Alessio

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