The invention relates to a powder pump (100; 100') for conveying coating powder, the powder pump (100; 100') having a powder chamber (10; 10') with a casing tube (1; 1') and a gas-permeable filter element (2; 2') arranged inside the casing tube (1; 1') a first pinch valve (3; 3'), connected to the intake-side end region of the powder chamber (10; 10'), and a second pinch valve (4; 4'), connected to the delivery-side end region of the powder chamber (10; 10'). In order to achieve the effect that the powder pump (100; 100') can be maintained with relatively little effort, according to the invention a first connection element (6; 6') is provided, connected to the first pinch valve (3; 3') and fitted onto or inserted into the intake-side end region of the powder chamber (10; 10'). A second connection element (7; 7) is also provided, connected to the second pinch valve (4; 4') and fitted onto or inserted into the delivery-side end region of the powder chamber (10; 10').
POWDER PUMP FOR CONVEYING COATING POWDER

[0001] The present invention relates to a powder pump for conveying coating powder according to the preamble of independent patent claim 1.

[0002] Accordingly, the invention relates to a powder pump which has a powder chamber with a preferably cylindrical and in particular circular-cylindrical casing tube and a gas-permeable filter element arranged inside the casing tube, with furthermore a first pinch valve, connected to the intake-side end region of the powder chamber, and a second pinch valve, connected to the delivery-side end region of the powder chamber, being provided, and with the powder chamber having at least one connection for alternately creating a positive pressure and a negative pressure in the powder chamber.

[0003] Such a powder pump is known in principle from the prior art. For example, document EP 1 551 558 A1 discloses a powder pump which has a first powder chamber and a second powder chamber, arranged parallel to the first powder chamber. The powder chambers of the powder pump known from this prior art are respectively bounded both on the intake side and on the delivery side by a mechanically actuated pinch valve arrangement.

[0004] To be specific, it is in this case provided that, in the intake-side and delivery-side regions of the powder pump, the powder hoses connected to the respective powder chambers can be deformed by a mechanically actuated rod in order to pinch off or open the hose portion as and when required. The powder chambers of the known pump also each have a gas-permeable filter element. A negative pressure can be set in the powder chambers separately from each other by way of a vacuum connection, as a result of which coating powder can be sucked into the powder chamber by way of the intake-side end region of the respective powder chamber. Subsequently, the pinch valve provided at the intake-side end region of the powder chamber is closed and the pinch valve provided at the delivery-side end region of the powder chamber is opened. The presence of a positive pressure in the powder chamber has the effect that the coating powder previously sucked into the powder chamber is again discharged from the powder chamber by way of the delivery-side end region.

[0005] It has been found in practical use that a powder pump of the type described above has various disadvantages, in particular with regard to its maintenance. In particular, in the case of the known powder pump, a possibly clogged filter element can only be exchanged with relatively great effort, since virtually the complete powder pump has to be unscrewed for this purpose. In particular, the solution known from this prior art does not provide for a filter element to be exchanged without interfering with the structure of the pinch valves. There is consequently the risk of leakages occurring after maintenance or the exchange of the filter element, so that dependable functioning of the powder pump is no longer ensured.

[0006] On the basis of these problems, the present invention is based on the object of developing a powder pump of the type mentioned at the beginning, and as known for example from the document EP 1 551 558 A1, to the extent that it can be maintained with relatively little effort, it being possible in particular for the gas-permeable filter element of the powder chamber to be exchanged without the risk of impairing the functioning of the pump.

[0007] This object is achieved by the subject matter of independent patent claim 1. Advantageous developments are specified in the dependent patent claims.

[0008] In particular, in the case of the solution according to the invention, it is provided that—as a difference from the solution known from the prior art—the intake-side and delivery-side pinch valves of the powder pump are not directly connected to the powder chamber. Rather, the solution according to the invention uses a connection element, which is connected to the first (intake-side) pinch valve and is fitted onto or inserted into the intake-side end region of the powder chamber. Also used is a second connection element, which is connected to the second (delivery-side) pinch valve and is fitted onto or inserted into the delivery-side end region of the powder chamber.

[0009] In addition, the solution according to the invention has a mount in order to receive the powder chamber with the connection elements fitted on or inserted in on both sides. To allow secure fixing of the connection elements fitted on or inserted in on both sides, also provided is an arresting mechanism, with which the connection elements, fitted onto or inserted into the powder chamber on both sides, are arrested in relation to the mount when the powder chamber with the connection elements fitted on or inserted in on both sides has been received by the mount.

[0010] The advantages that can be achieved by the solution according to the invention are obvious: the fact that the corresponding connection elements that are connected to the intake-side pinch valve and the delivery-side pinch valve are fitted onto or inserted into the corresponding end region of the powder chamber means that—for example for the purpose of maintenance—the powder chamber can be separated from the connection elements, and consequently from the corresponding pinch valves, by simply releasing this fitted or inserted connection. Specifically, with the solution according to the invention it is possible in a simple way, for example when exchanging the gas-permeable filter element arranged in the powder chamber, to release the fitted or inserted connection between the corresponding connection element and the powder chamber. The powder chamber with the filter element received therein is subsequently separated from the intake-side and delivery-side pinch valves.

[0011] In order that no powder can escape from the fitted or inserted connections during operation of the powder pump, and consequently in particular that the connection elements fitted on or inserted in on both sides are securely fitted to the powder chamber, it is provided according to the invention that the connection elements fitted onto or inserted into the powder chamber on both sides are arrested in relation to the mount when the powder chamber with the connection elements fitted on or inserted in on both sides has been received by the mount.

[0012] In a preferred implementation of the solution according to the invention, serving as the arresting mechanism are a first bolt, connected to the first connection element and protruding radially from the first connection element, and a second bolt, connected to the second connection element and protruding radially from the second connection element. These two bolts can each be received in a longitudinal slit, provided in the mount and running perpendicularly to the longitudinal direction of the powder chamber. In this way it is ensured that the two connection elements fitted onto or inserted into the powder chamber on both sides cannot move in the longitudinal direction in relation to the powder chamber when the powder chamber with the connection elements fitted
on or inserted in on both sides has been received by the mount, and in particular when the first bolt, protruding radially from the first connection element, and the second bolt, protruding radially from the second connection element, have been received in the corresponding longitudinal slits provided in the mount.

[0013] In a preferred development of the last-mentioned embodiment, it is provided that the arresting mechanism has two first bolts, which are arranged diametrically in relation to each other, are each connected to the first connection element and each protrude radially from the first connection element, the mount having two first longitudinal slits for each receiving one of the two first bolts.

[0014] Alternatively or in addition to this, it is conceivable that the arresting mechanism has two second bolts, which are arranged diametrically in relation to each other, are each connected to the second connection element and each protrude radially from the second connection element, the mount having two second longitudinal slits for each receiving one of the two second bolts.

[0015] The arresting of the connection elements fitted on or inserted in on both sides in relation to the powder chamber can be further improved if the end of the first longitudinal slit is adjoined at right angles by a short transverse slit or if the end of the second longitudinal slit is adjoined at right angles by a short transverse slit. In this way it can be effectively prevented that the powder chamber with the two connection elements fitted onto or inserted into the powder chamber on both sides can slide out of the longitudinal slits again.

[0016] Of course, further solutions also come into consideration for the specific configuration of the arresting mechanism. In particular, it is also conceivable that on the mount itself there are provided radially protruding bolts which engage in corresponding longitudinal slits that are formed respectively in the first and second connection elements.

[0017] With the configuration of the powder chamber described above and the connection elements fitted on or inserted in on both sides it is on the one hand ensured that the connection elements are securely fixed in relation to the powder chamber during the operation of the powder pump, and in particular whenever the powder chamber with the connection elements fitted on or inserted in on both sides has been received in the mount. To exchange the filter element received in the powder chamber, it is merely required to take the powder chamber with the connection elements fitted on or inserted in on both sides out of the mount, the arresting of the connection elements being released at the same time. Consequently, taking the powder chamber out allows the connection elements fitted on or inserted in at the end regions of the powder chamber to be pulled out, in order thereby to release the fitted on or inserted in connection. The filter element can subsequently be exchanged without any problem. The subsequent installation of the powder chamber is performed in the reverse sequence.

[0018] In order to simplify not only the exchange of the filter element but also the maintenance of the pinch valves that are used in the case of the powder pump, it is provided in an advantageous development of the solution according to the invention that the first connection element has a stub-like region, facing the powder chamber, and a tapering region, facing the first pinch valve and tapering conically in the direction of the first pinch valve, the stub-like region of the first connection element being fitted onto or inserted into the intake-side end region of the powder chamber and the conically tapering region of the first connection element being connected to the first pinch valve.

[0019] Alternatively or in addition to this, it is conceivable that the second connection element also has a stub-like region, facing the powder pump, and a tapering region, facing the second pinch valve and tapering conically in the direction of the second pinch valve, the stub-like region of the second connection element being fitted onto or inserted into the delivery-side end region of the powder chamber and the conically tapering region of the second connection element being connected to the second pinch valve.

[0020] Preferably, in the case of the aforementioned embodiments of the powder pump according to the invention, the stub-like region of the first or second connection element and the tapering region of the first or second connection element, tapering conically in the direction of the corresponding pinch valve, are inserted in each other and releasably arrested in relation to each other, preferably with the aid of a screw.

[0021] To exchange one or both pinch valves, it is accordingly merely required to release the arrestment between the stub-like region of the corresponding connection element and the conically tapering region of the connection element, the stub-like region of the connection element remaining firmly connected to the powder chamber and it being possible for the conically tapering region of the connection element together with the pinch valve that is to be maintained or exchanged to be released from the powder pump.

[0022] With regard to the configuration of the pinch valves that are used in the case of the powder pump according to the invention, it is of advantage if each pinch valve has a pinch valve housing with an inlet-side flange region and an outlet-side flange region as well as an elastically deformable valve element, preferably in the form of a hose portion. In this case, the valve element should be arranged inside the pinch valve housing in such a way that the inlet of the pinch valve can be brought into fluidic connection with the outlet of the pinch valve by way of the valve element formed as a hose portion.

[0023] It is of advantage here if the pinch valve housing has at least one connection for feeding compressed air as and when required into the space formed between the inner wall of the pinch valve housing and the valve element arranged inside the pinch valve housing. When feeding in compressed air, a positive pressure is formed in the space between the inner wall of the pinch valve housing and the valve element, as a result of which the valve element is pressed together in the radial direction and the pinch valve is closed. If the pressure in the pinch valve housing is subsequently relieved, the valve element resumes its initial state, so that there is a fluidic connection between the inlet of the pinch valve and the outlet of the pinch valve by way of the valve element.

[0024] In a preferred implementation of the solution according to the invention, it is conceivable here that the pinch valve housing has at least one connection for creating a negative pressure as and when required inside the pinch valve housing. In this way, the opening time of the pinch valve can be reduced.

[0025] The invention is not restricted to the powder pump described above as such, but also includes an arrangement comprising a powder pump of the type described above and a further identical powder pump. This arrangement forms a coating powder conveying device.

[0026] Each powder pump of the coating powder conveying device has at least one gas path, by which the powder
chamber can be connected alternately to a vacuum line, for sucking coating powder into the powder chamber through the open powder-inlet valve while the powder-outlet valve is closed, or to a compressed-air line, for pneumatically discharging a portion of powder present in the powder chamber through the open powder-outlet valve while the powder-inlet valve is closed. The two powder pumps can be alternately switched over to sucking in and discharging powder, it being possible alternately to switch the one pump to intake and the other substantially at the same time to discharge in a first operating phase, and then to switch the one pump to discharge and the other substantially at the same time to intake in a second operating phase.

[0027] In the case of a preferred embodiment of the coating powder conveying device, the gas path contains a suction-air opening and a compressed-air opening in a circumferential housing wall of the powder chamber, a microporous filter tube, which, at least over part of the length or preferably the entire length of the powder chamber, forms the circumferential wall of the powder chamber between the powder inlet and the powder outlet and separates the powder chamber from an annular chamber. The annular chamber is formed between the outer circumference of the filter tube and the inner circumference of the circumferential housing wall and surrounds the filter element formed as a filter tube. The filter tube is permeable to air, but not to coating powder on account of its small pore size. It preferably consists of a sintered material. The suction-air opening preferably opens out into the annular chamber near to the powder outlet, and the compressed-air opening preferably opens out into the annular chamber near to the powder inlet.

[0028] For connecting the suction-air opening and the compressed-air opening to the suction-air line and the compressed-air line, respectively, and for connecting the powder-inlet valve and the powder-outlet valve of the two powder pumps alternately to the compressed-air line and the outside atmosphere and/or a suction line, a valve device or pneumatic subassembly, which has for example two valves and can be controlled by a control device, may be provided.

[0029] Exemplary embodiments of the powder pumps according to the invention are described in more detail below with reference to the accompanying drawings, in which:

[0030] FIG. 1 shows a schematic representation of a coating powder conveying device with two powder pumps arranged parallel to each other according to an exemplary embodiment of the present invention;

[0031] FIG. 2 shows a perspective view of the internal structure of a coating powder conveying device with two powder pumps arranged parallel to each other according to an exemplary embodiment of the present invention;

[0032] FIG. 3 shows a perspective view of the two powder pumps arranged parallel to each other of the coating powder conveying device according to FIG. 2, each in the state in which they have been received in the associated powder chamber mount;

[0033] FIG. 4 shows a longitudinal sectional view of part of a powder pump used in the case of the coating powder conveying device according to FIG. 2;

[0034] FIG. 5a shows an exploded representation of one of the two powder pumps that are used in the case of the coating powder conveying device according to FIG. 2; and

[0035] FIG. 5b shows a perspective view of one of the two powder pumps that are used in the case of the coating powder conveying device according to FIG. 2.

[0036] Initially only with reference to the representation in FIG. 1, a description is given below of the functioning of a coating powder conveying device in which two powder pumps 100, 100' arranged parallel to each other according to an exemplary embodiment of the present invention are used.

[0037] As schematically represented in FIG. 1, each of the two powder pumps 100, 100' arranged parallel to each other has a powder chamber 10, 10', which is formed by a cylindrical, in particular circular-cylindrical, casing tube 1, 1' and a filter element 2, 2' received inside the casing tube. Each powder chamber 10, 10' has a powder inlet 30, 30' with a powder-inlet valve 3, 3' and a powder outlet 31, 31' with a powder-outlet valve 4, 4'. The respective powder-inlet valves 3, 3' are also referred to hereafter as "first valves" or "intake-side valves". The powder-outlet valves 4, 4' are referred to as "second valves" or "delivery-side valves".

[0038] During the intake process, a vacuum (negative pressure) is generated in the powder chamber 10, 10' of the powder pump 100, 100'. This negative pressure sucks the coating powder into the powder chamber 10, 10' by way of the corresponding powder inlet 30, 30'. The fine-porous filter element 2, 2' in the powder chamber 10, 10' separates the powder. During the intake process, the powder chamber 10, 10' is connected to the output side or delivery side B by the delivery-side valve 4, 4'.

[0039] During the conveying process, on the other hand, the intake-side valve 3, 3' on the powder inlet side A of the powder chamber 10, 10' is closed, while the delivery-side valve 4, 4' is opened. The coating powder previously sucked into the powder chamber 10, 10' during the intake process is then forced out of the powder chamber 10, 10' and further conveyed by means of positive pressure, which is built up by compressed air through the fine-porous filter element 2, 2'.

[0040] As the representation in FIG. 1 reveals, the intake process and conveying process alternate between the two powder pumps 100, 100' arranged parallel to each other.

[0041] With reference to the representations in FIGS. 2 to 5, there follows a description of an exemplary embodiment of a coating powder conveying device in which two powder pumps 100, 100' arranged parallel to each other according to an embodiment of the present invention are used.

[0042] Specifically, FIG. 2 shows in a perspective view the internal structure of a coating powder conveying device with two powder pumps 100, 100' arranged parallel to each other according to an exemplary embodiment of the present invention. The coating powder conveying device has two powder pumps 100, 100', each of the two powder pumps 100, 100' having a powder chamber 10, 10' with a cylindrical and in particular circular-cylindrical casing tube 1, 1' and a gas-permeable filter element 2, 2' arranged inside the casing tube 1, 1'. The filter element 2, 2' is preferably a rigid body of sintered material, preferably of sintered metal, for example bronze or aluminum, or sintered plastic or a sintered material mixture.

[0043] Respectively provided at the powder inlet of each powder pump 100, 100' is a first pinch valve 3, 3', connected to the intake-side end region of the powder chamber 10, 10'. A second pinch valve 4, 4' is connected to the respective delivery-side end region of the powder chamber 10, 10'.

[0044] Although in the case of the exemplary embodiment the pinch valves are respectively used as the powder-inlet and powder-outlet valves, they may be of any kind desired.

[0045] In the case of the embodiment represented, the powder-inlet side of the two first (intake-side) pinch valves 3, 3'...
are connected by way of supply-line branches 70c, 70b of a Y connecting piece 70 to a powder supply line, which leads for example to a powder container (not expressly represented in FIG. 2). For this purpose, hose connectors 75 are used, in order to connect the powder-inlet side of the two first pinch valves 3, 3' to the supply-line branches 70c, 70b of the Y connecting piece 70.

[0046] However, instead of a Y connecting piece 70, it is also conceivable to connect the respective powder-inlet sides of the first (intake-side) pinch valves 3, 3' to a powder container or to two different powder containers by way of separate powder supply lines.

[0047] In the case of the embodiment represented, the powder outlets of the two second (delivery-side) pinch valves 4, 4' are connected by discharge-line branches 71c, 71b, for example of a Y-shaped line connecting piece 71, to one end of a powder discharge hose, the other end of which opens out in a further powder container (not represented). The powder discharge line may be a rigid pipeline, but is preferably a flexible hose.

[0048] In the case of the embodiment represented in FIG. 2, the powder chambers 10, 10' of the two powder pumps 100, 100' arranged parallel to each other are each received in a mount 8, 8' and arranged there. The manner in which the powder chambers 10, 10' are arranged and the respective mounts 8, 8' is described in more detail with reference to the following drawings.

[0049] The representation in FIG. 2 also reveals that the exemplary embodiment of the coating powder conveying device has a pump controller 50 and a pneumatic group 51 that can be activated by the pump controller 50, in order to operate the two powder pumps 100, 100' arranged parallel to each other in phase opposition according to the functional principle described above with reference to FIG. 1.

[0050] With reference to the representations in FIGS. 3 to 5, there follows a more detailed description of the structure of each powder pump 100, 100' that is used in the case of the coating powder conveying device according to FIG. 2.

[0051] As revealed in particular by the representation in FIG. 5a, which shows an exploded representation of a powder pump 100 or 100', each powder pump 100, 100' has a casing tube 1, 1' inside which a gas-permeable filter element 2, 2' is arranged. The casing tube 1, 1' with the filter element 2, 2' received inside it forms the powder chamber 10, 10' of the corresponding powder pump 100, 100'.

[0052] Provided at the intake-side end region of the powder chamber 10, 10' is a first (intake-side) pinch valve 3, 3'. A second (delivery-side) pinch valve 4, 4' is connected to the delivery-side end region of the respective powder chamber 10, 10'.

[0053] In the case of the representation in FIG. 5a, the first (intake-side) pinch valve 3, 3' is shown in the assembled state, while the second (delivery-side) pinch valve 4, 4' is likewise shown in an exploded representation. The structure and the functioning of the first and second pinch valves 3, 3', 4, 4' are identical in the embodiment represented.

[0054] Accordingly, each pinch valve 3, 3', 4, 4' has a pinch valve housing 21, 21' with an inlet-side flange 22, 22' and an outlet-side flange 23, 23'. An elastically deformable valve element 24, 24' is received in the pinch valve housing 21, 21'. This elastically deformable valve element 24, 24' is specifically an elastically deformable hose portion. Each flange 22, 22', 23, 23' has a hose connection 77, to which a powder hose can be connected.

[0055] As the representation in FIG. 4 reveals, in the case of each pinch valve 3, 3', 4, 4' the valve element 24, 24' is arranged inside the pinch valve housing 21, 21' in such a way that the inlet of the pinch valve 3, 3', 4, 4' can be brought into fluidic connection with the outlet of the pinch valve 3, 3', 4, 4' by way of the valve element 24, 24' formed as a hose portion.

The pinch valve housing 21, 21' has a connection 9, 9' in order to feed compressed air as and when required into the space 26, 26' formed between the inner wall of the pinch valve housing 21, 21' and the valve element 24, 24' arranged inside the pinch valve housing 21, 21'. When supplying compressed air, the valve element 24, 24' is elastically deformed, so that the fluidic connection between the inlet and the outlet of the pinch valve is interrupted. If, on the other hand, there is no compressed air in the intermediate space between the inner wall of the pinch valve housing 21, 21' and the valve element 24, 24' arranged inside the pinch valve housing 21, 21', the previously elastically deformed valve element 24, 24' reverts to its initial state, in which there is a fluidic connection between the inlet and the outlet of the pinch valve housing.

[0056] A vacuum connection may also be connected by way of the at least one connection 9, 9' of the pinch valve, in order to evacuate the compressed air previously introduced into the intermediate space 26, 26' for rapid opening of the pinch valve.

[0057] As the exploded representation in FIG. 5a reveals, the inlet-side flange 22, 22' and the outlet-side flange 23, 23' of each pinch valve is respectively releasably fastened to the pinch valve housing 21, 21' with the aid of screws 27. In this way, the pinch valve is configured as a component which can be connected to the appropriate powder chamber 10, 10' by way of a corresponding connection element.

[0058] Specifically, each powder pump 100, 100' is provided with a first connection element 6, 6', which is fitted onto or inserted into the intake-side end region of the corresponding powder chamber 10, 10'. This connection element 6, 6' is connected to the first (intake-side) pinch valve 3, 3'. In the same way, each powder pump 100, 100' has a second connection element 7, 7', which is fitted onto or inserted into the delivery-side end region of the powder chamber 10, 10' and connected to the second (delivery-side) pinch valve 4, 4'.

[0059] The representation in FIG. 5a reveals in particular that the first connection element 6, 6' has a stub-like region 16, 16', facing the powder chamber 10, 10', and a tapering region 17, 17', facing the first (intake-side) pinch valve 3, 3' and tapering conically in the direction of the first pinch valve 3, 3'. The stub-like region 16, 16' of the first connection element 6, 6' in this case has been fitted onto or inserted into the intake-side end region of the powder chamber 10, 10', while the conically tapering region 17, 17' of the first connection element 6, 6' has been connected to the first pinch valve 3, 3'.

[0060] The representation in FIG. 4 reveals that, in the case of the preferred embodiment of the present invention, the stub-like region 16, 16' of the first connection element 6, 6' and the tapering region 17, 17' of the first connection element 6, 6' tapering conically in the direction of the first pinch valve 3, 3', are inserted in each other and releasably arrested in relation to each other, preferably with the aid of at least one countersunk screw.

[0061] In the same way, in the case of the preferred embodiment of the present invention it is provided that the second connection element 7, 7', which has been fitted onto or inserted into the delivery-side end region of the powder chamber 10, 10' and connected to the second (delivery-side) pinch...
valve 4, 4', has a stub-like region 18, 18', facing the powder chamber 10, 10', and a tapering region 19, 19', facing the second pinch valve 4, 4' and tapering conically in the direction of the second pinch valve 4, 4'. The stub-like region 18, 18' of the second connection element 7, 7' being fitted onto or inserted into the delivery-side end region of the powder chamber 10, 10' and the conically tapering region 19, 19' of the second connection element 7, 7' being connected to the second pinch valve 4, 4'. Specifically, it is in this case preferred if the stub-like region 18, 18' of the second connection element 7, 7' and the tapering region 19, 19' of the second connection element 7, 7', tapering conically in the direction of the second pinch valve 4, 4', are inserted in each other and releasably arrested in relation to each other, likewise preferably with the aid of at least one countersunk screw 20.

[0062] Suitable O-rings 75 are preferably used for sealing the fitted or inserted connections used in the case of the solution according to the invention.

[0063] In order to be able to securely connect the respective connection elements (first connection elements 6, 6' and second connection elements 7, 7') to the corresponding powder chambers 10, 10', it is provided that the connection elements 6, 6', 7, 7' are respectively fitted onto or inserted into the intake-side or delivery-side end region of the powder chamber 10, 10'. The powder chamber 10, 10' with the connection elements 6, 6', 7, 7' fitted on or inserted in on both sides is subsequently received in a mount 8, 8'. This mount 8, 8' also serves for arresting the connection elements 6, 6', 7, 7', fitted onto or inserted into the powder chamber 10, 10' on both sides, in relation to the mount 8, 8' when the powder chamber 10, 10' with the connection elements 6, 6', 7, 7' fitted on or inserted in on both sides has been received by the mount 8, 8'.

[0064] In the case of the embodiment represented, used for this purpose are a first bolt 11, 11', connected to the first connection element 6, 6', and protruding radially from the first connection element 6, 6', and a second bolt 12, 12', connected to the second connection element 7, 7' and protruding radially from the second connection element 7, 7'. These bolts 11, 12, 11', 12' are received by corresponding longitudinal slits 13, 13', running perpendicularly to the longitudinal direction 1, of the powder chamber 10, 10' when the respective powder chamber 10, 10' with the connection elements 6, 6', 7, 7' fitted on or inserted in on both sides is inserted into the mount 8, 8'.

[0065] As the representation in FIG. 5a reveals, the end of the first longitudinal slit 13, 13' is adjoined at right angles by a short transverse slit 15, 15', in order to prevent unintentional sliding out of the powder chamber 10, 10' received in the mount 8, 8'.

[0066] The invention is not restricted to the exemplary embodiments described above, but is made up of all the features disclosed herein considered together.

1. A powder pump for conveying coating powder, the powder pump having the following:
   a powder chamber with a preferably cylindrical and in particular circular-cylindrical casing tube (1, 1') and a gas-permeable filter element arranged inside the casing tube;
   a first pinch valve, connected to the intake-side end region of the powder chamber; and
   a second pinch valve, connected to the delivery-side end region of the powder chamber;
   the powder pump having at least one connection for alternately creating a positive pressure and a negative pressure in the powder chamber.

wherein
   a first connection element, which is connected to the first pinch valve and is fitted onto or inserted into the intake-side end region of the powder chamber;
   a second connection element, which is connected to the second pinch valve and is fitted onto or inserted into the delivery-side end region of the powder chamber;
   a mount for receiving the powder chamber with the connection elements fitted on or inserted in on both sides; and
   an arresting mechanism for arresting the connection elements, fitted onto or inserted into the powder chamber on both sides, in relation to the mount when the powder chamber with the connection elements fitted on or inserted in on both sides has been received by the mount.

2. The powder pump as claimed in claim 1, the arresting mechanism having a first bolt, connected to the first connection element and protruding radially from the first connection element, and a second bolt, connected to the second connection element and protruding radially from the second connection element; and
   the arresting mechanism also having a first longitudinal slit, provided in the mount and running perpendicularly to the longitudinal direction of the powder chamber, for receiving the first bolt, protruding radially from the first connection element, and a second longitudinal slit, provided in the mount and running perpendicularly to the longitudinal direction of the powder chamber, for receiving the second bolt, protruding radially from the second connection element.

3. The powder pump as claimed in claim 2, the end of the first longitudinal slit being adjoined at right angles by a short transverse slit; or the end of the second longitudinal slit being adjoined at right angles by a short transverse slit.

4. The powder pump as claimed in claim 2, the arresting mechanism having first bolts, which are arranged diametrically in relation to each other, are each connected to the first connection element and each protrude radially from the first connection element, and the mount having two first longitudinal slits for each receiving one of the two first bolts.

5. The powder pump as claimed in claim 2, the arresting mechanism having two second bolts, which are arranged diametrically in relation to each other, are each connected to the second connection element and each protrude radially from the second connection element, and the mount having two second longitudinal slits for each receiving one of the two second bolts.

6. The powder pump as claimed in claim 1, the first connection element having a stub-like region, facing the powder chamber, and a tapering region, facing the first pinch valve and tapering conically in the direction of the first pinch valve,
   the stub-like region of the first connection element being fitted onto or inserted into the intake-side end region of the powder chamber and the conically tapering region of the first connection element being connected to the first pinch valve.

7. The powder pump as claimed in claim 6, the stub-like region of the first connection element and the tapering region of the first connection element, tapering conically in the direction of the first pinch valve, being
inserted in each other and releasably arrested in relation to each other, preferably with the aid of at least one countersunk screw.

8. The powder pump as claimed in claim 1, the second connection element having a stub-like region, facing the powder chamber, and a tapering region, facing the second pinch valve and tapering conically in the direction of the second pinch valve, the stub-like region of the second connection element being fitted onto or inserted into the delivery-side end region of the powder chamber and the conically tapering region of the second connection element being connected to the second pinch valve.

9. The powder pump as claimed in claim 8, the stub-like region of the second connection element and the tapering region of the second connection element, tapering conically in the direction of the second pinch valve, being inserted in each other and releasably arrested in relation to each other, preferably with the aid of at least one countersunk screw.

10. The powder pump as claimed in claim 1, the first pinch valve and the second pinch valve each having the following:
   a pinch valve housing with an inlet-side flange and an outlet-side flange; and
   an elastically deformable valve element in the form of a hose portion,
   the valve element being arranged inside the pinch valve housing in such a way that the inlet of the pinch valve can be brought into fluidic connection with the outlet of the pinch valve by way of the valve element formed as a hose portion,
   the pinch valve housing having at least one connection for feeding compressed air as and when required into the space formed between the inner wall of the pinch valve housing and the valve element arranged inside the pinch valve housing.

11. The powder pump as claimed in claim 10, the pinch valve housing having at least one connection for creating a negative pressure as and when required in the space formed between the inner wall of the pinch valve housing and the valve element arranged inside the pinch valve housing.

12. The powder pump as claimed in claim 10, the inlet-side flange and the outlet-side flange of the pinch valve being respectively releasably fastened to the pinch valve housing with the aid of screws.

13. The powder pump as claimed in claim 10, the tapering region of the first connection element, tapering conically in the direction of the first pinch valve, being connected to the outlet of the first pinch valve by way of the outlet-side flange of the first pinch valve; and
   the tapering region of the second connection element, tapering conically in the direction of the second pinch valve, being connected to the inlet of the second pinch valve by way of the inlet-side flange of the second pinch valve.

14. The powder pump as claimed in claim 1, a control device also being provided, by way of which the first and second pinch valves are activated in such a way that, in an intake phase of the powder pump, the first pinch valve is open and the second pinch valve is closed, while at the same time a negative pressure is created in the powder chamber by way of the at least one connection, and, in a discharge phase of the powder pump, the first pinch valve is closed and the second pinch valve is open, while at the same time a positive pressure is created in the powder chamber by way of the at least one connection.

15. An arrangement comprising a powder pump as claimed in claim 1 and a further identical powder pump, the arrangement also having a first Y piece for connecting a powder line, in particular a powder hose, both to the inlet of the first pinch valve of the powder pump and to the inlet of the first pinch valve of the further identical powder pump, and a second Y piece also being provided, for connecting a powder line, in particular a powder hose, both to the outlet of the second pinch valve of the powder pump and to the outlet of the second pinch valve of the further identical powder pump.

16. The arrangement—as claimed in claim 15, the powder pump and the further powder pump being operated in phase opposition.

* * * * *