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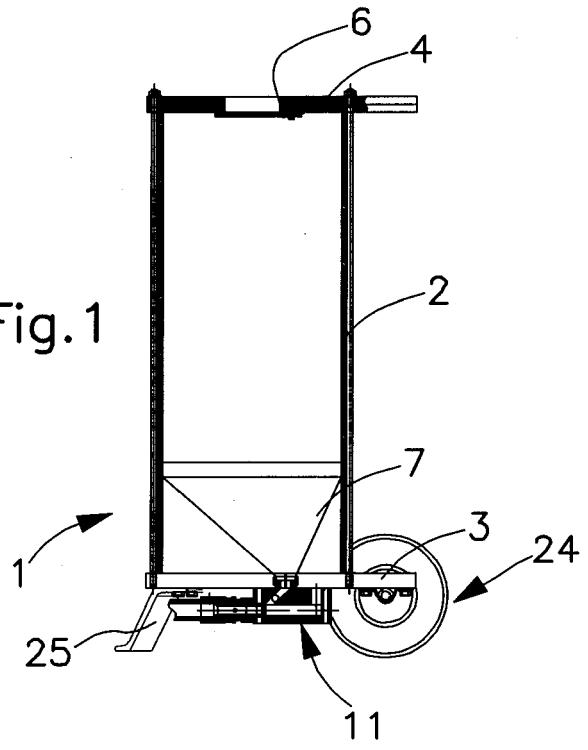
(54) PORTABLE APPARATUS FOR CLEANING SURFACES

(57) The portable apparatus for cleaning surfaces comprises a tank (2) associated at the top of a base (3), said tank (2) comprising at least one chamber (5) predisposed to contain an abrasive material. At least one mixing valve (11) is associated with the base (3) and internally shapes a passage channel (12) predisposed to receive said abrasive material, said mixing valve (11) being predisposed to mix said abrasive material with a predetermined amount of compressed air. The apparatus comprises at least a conveying member (7) mounted inside said tank (2), at a lower portion of said tank (2).

Fig.1



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Description

Technical Field

[0001] The present invention relates to a portable apparatus for cleaning surfaces, in particular of artifacts, buildings, architectural elements and the like.

Prior Art

[0002] It has long been known the use of apparatuses for cleaning surfaces through a process known as sandblasting.

[0003] The sandblasting consists in propelling a jet of compressed air and abrasive material on the surface to be treated to remove the superficial layer of material. Alternatively, sandblasting can be used for creating inscriptions or images on marble, stone, wood or glass.

[0004] Traditional cleaning apparatuses comprise a tank for abrasive material connected to a mixing valve which internally shapes a mixing chamber.

[0005] The mixing valve can be mounted on a base of the tank and communicates with the tank through a discharge opening made on the base.

[0006] In the mixing chamber is generally conveyed a predetermined flow of compressed air, produced by a compressor, mixed to the abrasive material. To the mixing valve is connected, through connecting means, a sprayer gun provided with commands for spraying, through a suitable nozzle, a jet of air and abrasive material.

[0007] An example of apparatus for cleaning surfaces is shown is patent US 2014/0065933.

[0008] A kind of such apparatuses is provided with a conveying member mounted inside the tank, at a lower portion of the tank. The conveying member is provided with a first opening adapted to receive the abrasive material and with a second opposed opening for the discharge of the abrasive material towards the mixing valve. The second opening is coaxial to the discharge opening made on the base of the tank for conveying the material towards the valve.

[0009] The conveying member is arranged such as to ease the outflow of the abrasive material towards the mixing valve thereby ensuring the almost complete removal of the abrasive material from the tank.

[0010] The apparatuses comprising the conveying member are generally used in case it is required to obtain a fine finishing of the surfaces, for example in case of restoration, or in case different tests are performed with different materials in order to identify the material which is most appropriate for the treatment to be performed. The need felt in both cases is that of preventing traces of abrasive material remaining in the tank, and therefore ensuring that a contamination of an abrasive material with a different kind of an abrasive material does not take place, for example the contamination of abrasive materials having grains of different sizes.

[0011] An example of an apparatus comprising a conveying member is illustrated in patent US 2013/0092764. The apparatus comprises a tank, suitable for receiving a predetermined quantity of abrasive material, which shapes inside a funnel shaped portion adapted to ease the conveying of the abrasive material towards a discharge opening. The tank is supported by a support base, and with the support base is associated a mixing valve for mixing the abrasive material received from the discharge opening with a flow of compressed air.

[0012] Patents US 5,618,177 e US 847,269 show further examples of apparatuses for cleaning surfaces which are provided with respective members for conveying an abrasive material housed inside a tank adapted to contain the abrasive material.

[0013] Further examples of apparatuses provided with a conveying member associated with a mixing valve are shown in patents US 3399492, US4534139, FR 637593, WO 2016/020877.

[0014] A drawback of the above mentioned kind of apparatuses is that the discharge of the abrasive material from the tank is difficult, when an excessive quantity of abrasive material, compared to the one which is needed, is inserted.

[0015] For removing the excessive abrasive material, a possible solution is overturning the machine, thereby enabling the outflow of the abrasive material from an upper opening of the tank which is generally used for loading the material into the tank. However, such operation causes fatigue to the operator, because the machine is heavy and difficult to handle.

Disclosure

[0016] The object of the present invention is to solve the above mentioned problems, devising an apparatus for cleaning surfaces which permits to discharge the abrasive material in optimal way.

[0017] A further object of the invention is to provide an apparatus for cleaning surfaces which permits to reduce the time taken by the discharge of the abrasive material.

[0018] Another object of the present invention is to provide an apparatus for cleaning surfaces, which is of simple constructional and functional design, provided with safe and reliable use, as well as a relatively low cost.

[0019] The aforementioned objects are achieved, according to the present invention, by the portable apparatus for cleaning surfaces according to claim 1.

[0020] The portable apparatus for cleaning surfaces comprises a base, a tank associated with the top of the base, comprising at least one chamber adapted to contain an abrasive material, at least one mixing valve associated with said base and internally shaping a passage channel predisposed to receive the abrasive material from the tank, said mixing valve being predisposed to mix the abrasive material with a predetermined amount of compressed air. The apparatus further comprises at least one conveying member mounted inside the cham-

ber of the tank, at a lower portion of the same tank.

[0021] According to the invention, the mixing valve is provided with a protruding portion comprising at least one portion of said passage channel, said protruding portion being inserted inside a through hole obtained in said base, so that the passage channel is communicating with the conveying member.

[0022] According to a prerogative of the invention, the protruding portion of the mixing valve shapes at its top, in use, a support seat for the terminal portion of the conveying member. In particular, the terminal portion has a shape conjugated to the support seat so as to being inserted inside the protruding portion and thus creating a direct connection between the conveying member and the passage channel in order to facilitate the flowing of the abrasive material during use of the apparatus, and to facilitate the discharge of the abrasive material, for example for replacing the material to feed, by the said through hole during a discharge phase of the apparatus.

[0023] In particular, the above mentioned shape defines a shoulder inside the protruding portion which permits to support, in use, the terminal portion of the conveying member and to take advantage, for the outflow of the abrasive material, for example in case of voiding of the tank, of the width of the hole of the base of the apparatus, simply removing the protruding portion of the mixing valve. Therefore, the discharge of the material takes place quicker and easier than in the case of the known apparatuses.

[0024] Preferably, the protruding portion is contained, in an assembled condition, within the thickness of said base.

[0025] Advantageously, said hole of the base has a diameter substantially equal, unless a play, to the diameter of the base circumference or of the circumference circumscribed to the base polygon of said protruding portion of the mixing valve. Such feature permits to modify the size of the protruding portion of the valve and therefore of the through hole so as to enable a quick discharge of the remaining abrasive material from the tank at the end of a treatment. In this way, a reduction of the discharge time of the material from the tank is also achieved.

[0026] Preferably, the said diameter of said hole of the above mentioned base has a value greater or equal to 30 mm.

[0027] Preferably, the said diameter of said hole has a value in the range between 30 mm and 60 mm.

[0028] Preferably, the protruding portion extends along a longitudinal direction starting from a surface of said mixing valve adapted to be associated with the base during assembly. Preferably, at least a portion of said passage channel extends along a median longitudinal axis of said protruding portion, for at least a part of said protruding portion.

[0029] Advantageously, the protruding portion shapes, at its top, an opening arranged above at least a portion of the passage channel and communicating with the passage channel.

[0030] In practice, the passage channel comes out in the mentioned opening, thereby defining the said shoulder.

[0031] Preferably, the said opening has a diameter greater than the diameter of the transverse section of the passage channel so as to define a support seat for the conveying member. In practice, the dimensional difference between the transverse sections of the opening and of the passage channel determines that it is defined a transverse surface on which the said conveying member is in support.

[0032] Preferably, said conveying member comprises, at its top, a first opening for receiving the abrasive material and a terminal portion opposed to said first receiving opening, said terminal portion defining a second opening for discharging the material and being adapted to being arranged into said support seat.

[0033] Preferably, the said terminal portion is circular shaped.

[0034] Preferably, the cited support seat has a shape conjugated to the said terminal portion.

[0035] Preferably, the said first receiving opening of the conveying member has a section greater than the said second discharge opening. In other words, the conveying member has transverse sections decreasing from the first opening to the second opening. In practice, the said conveying member can be substantially funnel shaped.

[0036] Advantageously, the said apparatus comprises handling means connected to the base adapted to enable moving said apparatus easily.

[0037] Preferably, such handling means are made up of a pair of wheels associated with the said base of the apparatus for manually pushing or drawing the apparatus.

Description of drawings

[0038] The details of the invention will become more evident from the detailed description of a preferred embodiment of the portable apparatus for cleaning surfaces according to the invention, illustrated by way of example in the accompanying drawings, in which:

Figure 1 shows a lateral sectional view of the apparatus for cleaning surfaces according to the present invention.

Figure 2 shows a top view of the apparatus.

Figure 3 shows a magnified lower portion of the apparatus shown in Figure 1

Figures 4 and 5 respectively show a longitudinal sectional view and a top view of a detail of the apparatus.

Figure 6 shows a view of a pair of details of the apparatus during a step of assembly.

Best mode

[0039] With particular reference to such Figures, it has

been indicated as a whole with 1 the portable apparatus for cleaning surfaces according to the invention.

[0040] The apparatus 1 comprises a tank 2 associated with a base 3 and closed at its top by closure means 4. Preferably, the closure means 4 are constituted by a lid.

[0041] In particular, the tank 2 is mounted at the top of the base 3.

[0042] The tank 2 is adapted to receive at least one abrasive material.

[0043] Abrasive materials can be, for example, mineral or vegetable or ferrous metal materials. Carbonates of the sodium bicarbonate type can also be used.

[0044] In particular, the tank 2 includes at least one chamber 5 predisposed to contain an abrasive material.

[0045] The Figures show an apparatus that is provided with one chamber, thus the following description relates to this embodiment.

[0046] Preferably, the base 3 and the cover 4 are made of shaped plates of light material, for example of aluminum.

[0047] The cover 4 is provided with at least one loading opening 6 adapted to enable the insertion of an abrasive material inside the chamber 5 of the tank 2. The loading opening 6 is closed by a cover element which is removable or openable while the material is being loaded.

[0048] Inside the tank 2, in a lower portion of the tank 2, a conveying member 7 is mounted, adapted to facilitate the transport of the abrasive material from the tank 2 towards a mixing valve, as will be better explained below.

[0049] The conveying member 7 shapes at the top a first receiving opening 8 arranged to collect the abrasive material.

[0050] In a position opposed to the first receiving opening 8, the conveying member 7 comprises a terminal portion 9 that defines a second discharge opening 10.

[0051] Preferably, the first receiving opening 8 has a larger section than the second discharge opening 10. The conveying member 7 has an internal surface that converges from the first opening 8 to the second opening 10. In other words, the conveying member 7 is substantially funnel shaped.

[0052] Preferably, the terminal portion 9 has a circular ring shape, in particular a cylindrical tubular shape.

[0053] The conveying member 7 has a hollow conical shape which facilitates the flow of the material from the first receiving opening 8 to the second discharge opening 10.

[0054] Preferably, the conveying member 7 has hollow cone shape with an oblique median axis (see Figure 1). The second discharge opening 10 is therefore eccentric with respect to the median longitudinal axis of the tank 2 containing the conveying member 7.

[0055] The conveying member 7 is preferably mounted coaxially to a passage channel shaped by the mixing valve, as specified better hereafter.

[0056] At least one mixing valve 11 adapted to receive the abrasive material stowed in tank 2 and to mix the abrasive material with a predetermined quantity of compressed air is associated with the base 3.

[0057] The compressed air is conveyed inside the mixing valve 11 by a compressed air conveying circuit which comprises compressed air conveying means, not shown in the figures, adapted to convey the compressed air into the mixing valve 11 and in the chamber 5.

[0058] The compressed air is supplied by a compressor and conveyed by means of a supply circuit, both not shown, to the conveying circuit associated with the apparatus 1.

[0059] The mixing valve 11 internally shapes a passage channel 12 in which the abrasive material coming from the tank 5 is conveyed.

[0060] The passage channel 12 is associated with an shutter member 13 adapted to be operated to vary the section of the channel 12 and thereby regulate the amount of abrasive material that is mixed with the flow of compressed air.

[0061] The shutter member 13 is associated with adjustment means, not shown, which enable the shutter member 13 to be actuated and to perform the adjustment.

[0062] The mixing valve 11 is provided with a protruding portion 14 that comprises at least one portion of the passage channel 12.

[0063] The protruding portion 14 may have, for example, a prismatic or cylindrical shape.

[0064] The protruding portion 14 extends along a longitudinal direction starting from a surface 15 of the mixing valve 11 adapted to be associated, in particular in abutment, with the base 3 during assembly.

[0065] The passage channel 12 extends along a median longitudinal axis A of the protruding portion 14, at least for a portion of the protruding portion 14.

[0066] This protruding portion 14 forms an upper opening 16 above the passage channel 12, being in communication with the passage channel 12. In practice, the passage channel 12 comes out in the opening 16 of the protruding portion 14.

[0067] Preferably, the opening 16 has a diameter d1 greater than the diameter d2 of the transverse section of the passage channel 12 so as to define a support seat for the conveying member 7. In practice, the difference in size between the transverse sections of the opening 16 and of the passage channel 12 implies that a shoulder 17 is defined, within which the terminal portion 9 of the conveying element 7 is intended to be placed in support. In other words, the shoulder 17 is a transverse surface on which the conveying member 7 is placed in support, in use.

[0068] The support seat is then delimited by the shoulder 17 and by an inner perimeter wall of the protruding portion 14, which defines the opening 16 itself.

[0069] The support seat advantageously has a shape conjugated to the shape of the terminal portion 9 of the conveying member 7.

[0070] Preferably, the support seat has a circular shape.

[0071] The protruding portion 14 is inserted inside a

through hole 18 made on the base 3 (see Figure 3 and Figure 6).

[0072] The hole 18 has a diameter d3 substantially equal, unless a play, to the diameter d4 of the outer circumference or circumference circumscribed to the external polygonal profile of the protruding portion 14.

[0073] By way of example, the diameter d3 of the hole 18 has a value of about 30 mm.

[0074] Preferably the diameter d3 has a value greater or equal to 30 mm.

[0075] Even more preferably, the diameter d3 has a value in the range between 30 mm and 60 mm.

[0076] Sealing means, not visible in the figures, is interposed between the inner wall of the hole 18 and the protruding portion 14 of the mixing valve 11, in order to ensure that the compressed air inserted in the chamber 5 of the tank 2 is maintained at the pressure set during the use of the apparatus.

[0077] The mixing valve 11 forms within it an inlet channel 19 of the compressed air and a mixing channel 20, which is communicating with the inlet channel 19 of the compressed air and with the passage channel 12 of the abrasive material.

[0078] The mixing channel 20 preferably extends along a central axis B of the mixing valve 11 and defines a mixing chamber.

[0079] At one end the mixing channel 20 has a nozzle 21 adapted to be connected to an attachment member 22 which enables a quick connection of the mixing valve 11 with suitable connecting means 23.

[0080] The connecting means 23 comprise, for example, a flexible hose.

[0081] The connecting means 23 are connected to spraying means.

[0082] Preferably, the spraying means consists of at least one dispensing gun through which a flow of compressed air and at least one abrasive material is dispensed to treat a surface.

[0083] Preferably, handling means 24 is mounted on the base 3, adapted to enable the apparatus to be moved easily in the working space. Preferably, the handling means 24 comprises a pair of wheels.

[0084] The base 3 can also be provided with support feet 25 for stabilizing the apparatus when it is placed resting on the floor or on a working surface.

[0085] The operation of the portable surface cleaning apparatus is easily understood from the above description.

[0086] Initially, the operator selects the abrasive material to be used in the treatment and inserts it in the chamber 5 of the tank 2.

[0087] At the start of the compressor, the compressed air is conveyed through the supply circuit to the apparatus circuit and the conveying means transports the compressed air into the chamber 5 and into the mixing valve 11.

[0088] The operator then activates the dispensing gun to direct a flow of compressed air and at least one mixed abrasive material towards the surface to be treated.

[0089] When the operator ends the treatment with a predetermined abrasive material and a part of this material remains inside the chamber 5, the operator completely removes the material from the chamber 5 of the tank 2. In particular, the aforementioned step provides for disassembling the mixing valve 11 from the base 3 and then disengaging the protruding portion 14 from the hole 18 of the base 3.

[0090] In this way the abrasive material is directed by the conveying member 7 directly towards the through hole 18 of the base 3 through which it emerges from the tank 2.

[0091] Once the abrasive material is discharged from hole 18, the equipment is ready for later use.

[0092] According to a different embodiment of the invention, it is possible to provide that the tank 2 comprises two chambers 5 adapted to contain respective abrasive materials.

[0093] The description made for the embodiment of the apparatus comprising one chamber 5 is the same in the case of the two chambers 5, providing for the components already described for each chamber 5. In particular, in each chamber 5 a conveying member 7 is mounted and a pair of mixing valves 11 are associated with the base 3. Each conveying member 7 is arranged coaxially with the passage channel 12 of a respective mixing valve 11.

[0094] The protruding portions 14 of the mixing valves 11 are inserted inside respective through holes 18 made on the base 3.

[0095] According to this embodiment, the step of completely removing the material from the chambers 5 of the tank 2 obviously includes disassembling both the valves 11 and thus enabling the discharge of the abrasive materials from the respective chambers 5 through the through holes 18.

[0096] The portable surface cleaning apparatus achieves the intended object of optimally discharging the abrasive material.

[0097] This object is due especially to the provision of a mixing valve provided with a protruding portion which is inserted in a through hole of the base.

[0098] The aforementioned features permit to discharge the abrasive material from the conveying member to the mixing valve in an efficient way, while enabling a hole to be made on the basis of dimensions suitable for unloading the material easily at the end of a treatment.

[0099] A prerogative of the present invention relates to the fact that the diameter of the hole made on the base is substantially equal, unless a play, to the circumferential diameter circumscribed to the base polygon or to the base circumference of the protruding portion of the valve. In this way it is possible to play on the sizing of the protruding portion of the valve to provide a through hole for the outflow of the material that is functional.

[0100] This feature also permits to reduce the time required to discharge the remaining material from the tank

at the end of a treatment since it is possible to change the size of the protruding portion of the valve and therefore the hole diameter so as to have a discharge speed of the optimal material.

[0101] A further aspect to be considered is that the operations required to perform the complete discharge of the material from the chamber of the tank can be carried out quickly and are simple to perform. It is in fact sufficient to disassemble the mixing valve enabling the free exit of the material from the hole of the base. Therefore, complicated and laborious operations are not necessary.

[0102] The apparatus described as an example is susceptible of numerous modifications and variations depending on the different needs.

[0103] In the practical embodiment of the invention, the used materials, as well as the shape and the dimensions, may be of any type according to requirements.

[0104] Should the technical features mentioned in any claim be followed by reference signs, such reference signs were included strictly with the aim of enhancing the understanding of the claims and hence they shall not be deemed restrictive in any manner whatsoever on the scope of each element identified for exemplifying purposes by such reference signs.

Claims

1. Portable surface cleaning apparatus comprising
   a base (3);
   a tank (2) associated at the top of said base (3), said tank (2) comprising at least one chamber (5) predisposed to contain an abrasive material;
   at least one mixing valve (11) associated with said base (3) and internally shaping a passage channel (12) predisposed to receive said abrasive material from said tank (2), said mixing valve (11) being predisposed to mix said abrasive material with a predetermined amount of compressed air;
   at least one conveying member (7) mounted within said chamber (5) of said tank (2), at a lower portion of said tank (2), said conveying member (7) comprising, at the top, in use, a first opening (8) for receiving the abrasive material and a terminal portion (9) opposed to said first receiving opening (8), said terminal portion (9) defining a second opening (10) for discharging said material, said conveying member (7) having a transverse section decreasing from said first opening (8) to said second opening (10);
   said mixing valve (11) being provided with a protruding portion (14) comprising at least one portion of said passage channel (12), said protruding portion (14) being inserted inside a through hole (18) obtained in said base (3), so that said passage channel (12) is communicating with said conveying member (7),
   characterized in that
   said protruding portion (14) shapes at the top, in use, a support seat for said terminal portion (9) of said conveying member (7), said terminal portion (9) having a shape conjugated to said support seat so as to be inserted inside said protruding portion (14) and thus creating a direct connection between said conveying member (7) and said passage channel (12) in order to facilitate the flow of said abrasive material during use of said apparatus, and to facilitate the discharge of said abrasive material through said through hole (18) during a discharge operation of said apparatus.

2. Apparatus according to claim 1, **characterized in that** said conveying member (7) is funnel shaped.

3. Apparatus according to claim 1 or 2, **characterized in that** at said protruding portion (14) said passage channel (12) comes out into an opening (16), between said opening and said passage channel (12) being defined a shoulder (17) shaping said support seat for said terminal portion (9).

4. Apparatus according to claim 3, **characterized in that** said opening (16) has a diameter (d1) greater than the diameter (d2) of said passage channel (12).

5. Apparatus according to claim 2 or 3, **characterized in that** said terminal portion (9) has a circular shaped cross section.

6. Apparatus according to one of the preceding claims, **characterized in that** said protruding portion (14) is contained, in an assembled condition, within the thickness of said base (3).

7. Apparatus according to one of the preceding claims, **characterized in that** the diameter of said hole (18) of said base (3) has a value greater or equal to 30 mm, preferably a value between 30 mm and 60 mm.

8. Apparatus according to one of the preceding claims, **characterized in that** said protruding portion (14) is inserted into said hole (18) of said base (3), being constrained or coupled thereto through sealing means.

9. Apparatus according to claim 8, **characterized in that** said protruding portion (14) is coupled to said hole (18) of said base (3) with reduced play.

10. Apparatus according to one of the preceding claims, **characterized in that** said hole (18) of said base (3) has a diameter (d3) substantially equal, unless a play, to the diameter (d4) of said protruding portion (14), said protruding portion (14) being substantially cylindrical, or of a circumference circumscribed to a base polygon of said protruding portion (14), being

said protruding portion (14) substantially prismatic.

11. Apparatus according to one of the preceding claims, **characterized in that** said protruding portion (14) extends along a longitudinal direction starting from a surface (15) of said mixing valve (11), adapted to be associated in contact with said base (3) during assembly.

12. Apparatus according to one of the preceding claims, **characterized in that** said at least a portion of said passage channel (12) extends along a median longitudinal axis (A) of said protruding portion (14), for at least a part of said protruding portion (14).

13. Apparatus according to one of the preceding claims, **characterized in that** it comprises handling means (24) connected to said base (3) adapted to enable moving said apparatus easily.

14. Apparatus according to claim 13, **characterized in that** said handling means (24) comprises a pair of wheels, configured for manually pushing or drawing said apparatus.

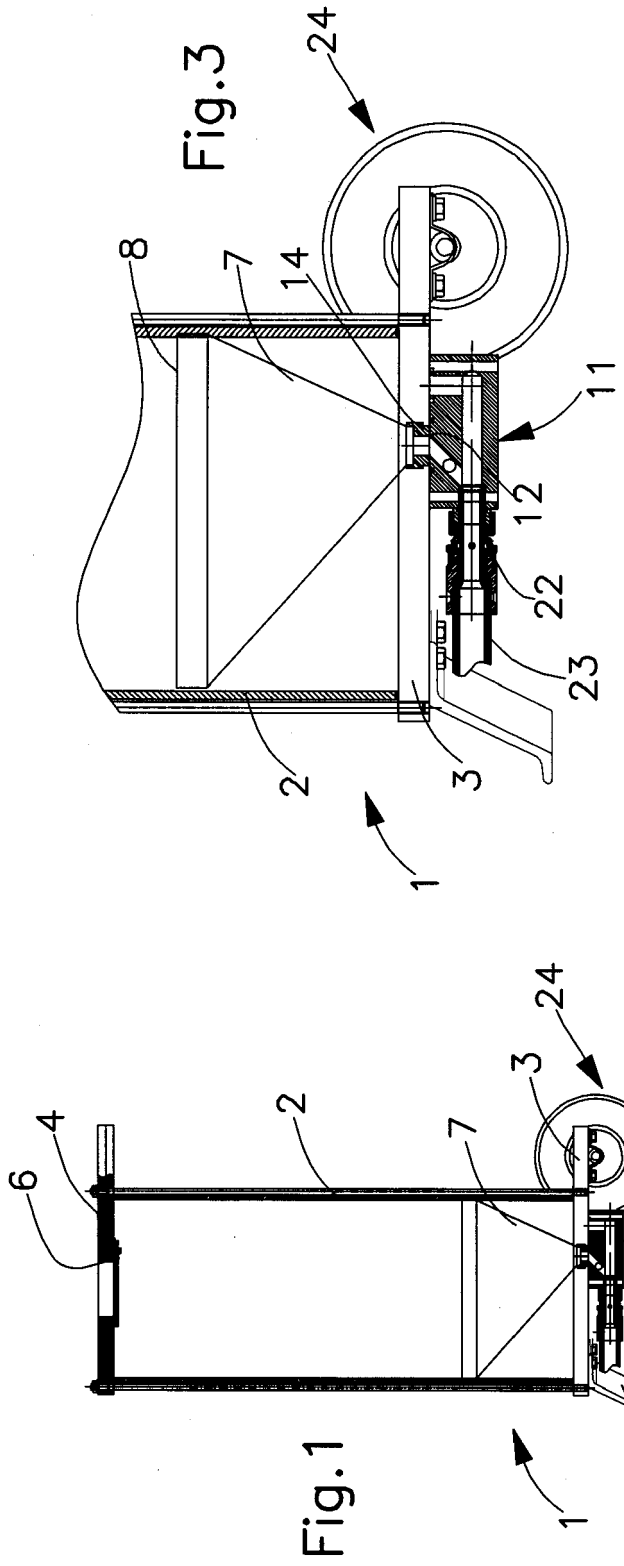

Fig.3

Fig.2

Fig.1

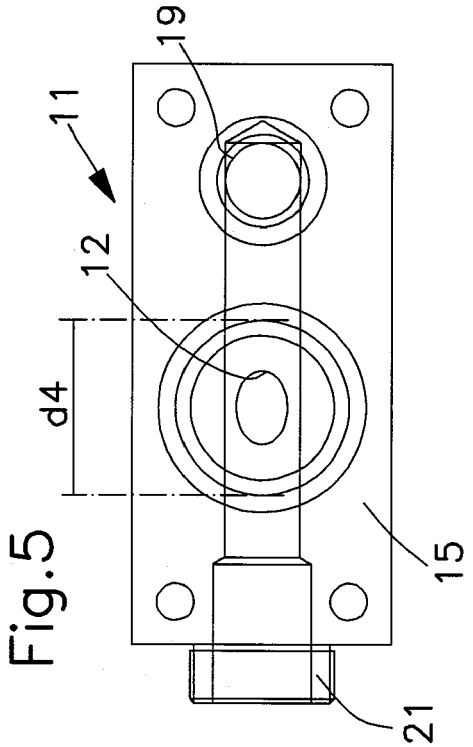

Fig.5

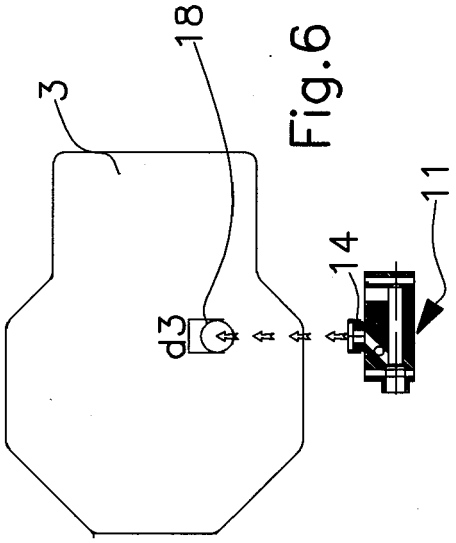

Fig.6

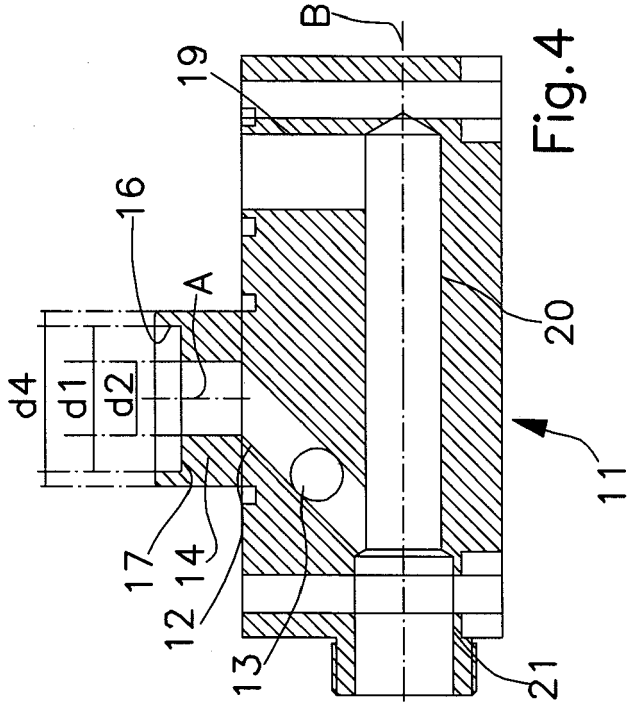

Fig.4

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EUROPEAN SEARCH REPORT

Application Number
EP 18 20 9333

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A	EP 1 539 424 B1 (GRECHISHKIN OLEG IVANOVICH [RU]) 23 May 2007 (2007-05-23) * figure 7 *	1-5	
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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
The Hague	19 March 2019	Carmichael, Guy

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 18 20 9333

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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19-03-2019

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