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(54) **Portable gap filling machine**

(57) A portable gap filling machine (1), of the type normally used in the field of building, which comprises a container (7) for the building mix to be dispensed (8), a dispensing tip (9) and, interposed between them on a connecting duct (6), a unit for pumping the mix. The pumping unit comprises a peristaltic pump (5), which is driven by an autonomously powered motor drive; the pumping unit is compact and lightweight.

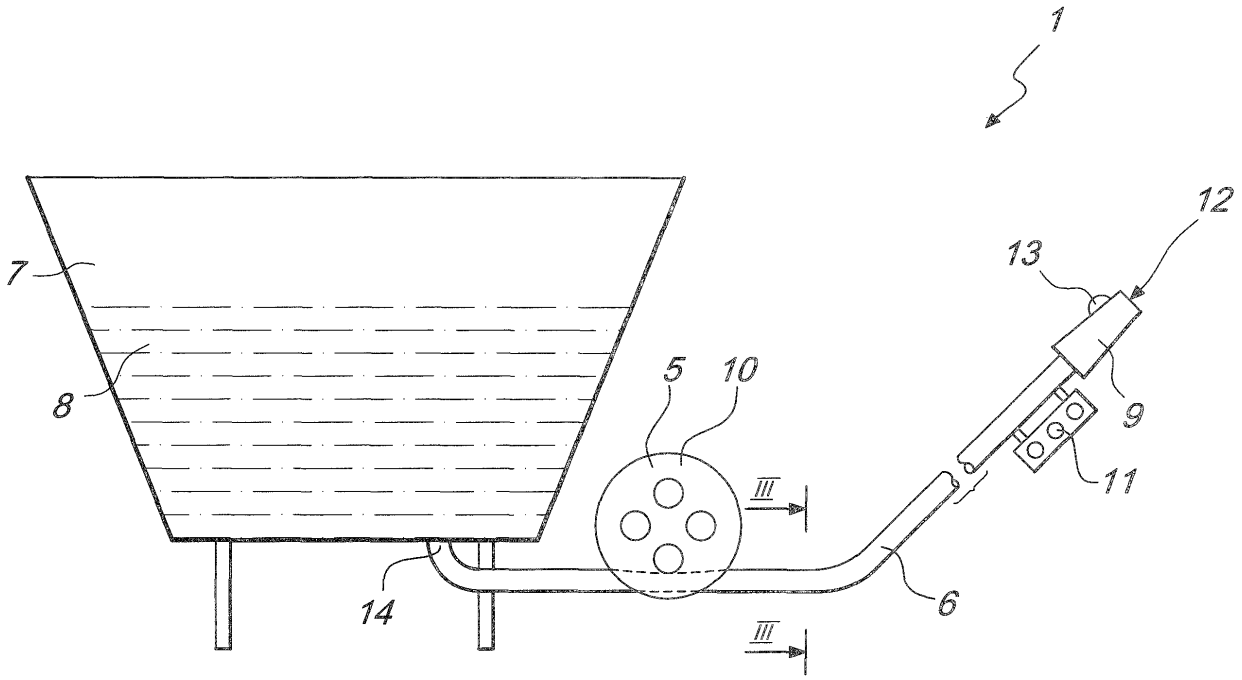

Fig. 1

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Description

[0001] The present invention relates to a portable gap filling machine adapted to fill gaps (or chases), understood as the free interspaces between contiguously arranged structural elements in the building sector, for example two bricks or two tiles.

[0002] Various kinds of gap filling machine for dispensing cement mixes, readymixes, fiber-filled mortars, adhesives and resins are currently commercially available; they are motorized by electric motors which are powered by generators or directly by the 220 V mains; other machines of the pneumatic type are powered by compressed air (compressors).

[0003] These gap filling machines have drawbacks.

[0004] These devices are composed of a pump which is actuated by a motor which moves it, a container for the product to be dispensed, a hose and a gun at the end of the hose to inject the mix into the gaps (openings which are narrow but even quite long) of walls, floors or others.

[0005] In view of the power required to dispense the products listed above, these machines are powered by means of bulky and heavy equipment, making them awkward to carry especially if the operator has to work on scaffolding or in environments which are otherwise inconvenient.

[0006] Gap filling machines supplied by mains current necessarily have to be used where mains current is indeed available.

[0007] Another drawback is observed when the flow must be blocked momentarily; in view of the inertia of the jet dispensed by the gun, when the pump is switched off, further outflow of product occurs for a few moments.

[0008] Further, particularly in the case of gap filling machines with pneumatic pumps (which have a ball valve which controls the passage and stopping of the dispensed mixes), a severe drawback occurs when the gap filling work has to be suspended temporarily: the dispensed products have the characteristic of drying rapidly, a condition which is also dictated by the outside environment (for example in the summer, when temperatures are higher, drying occurs quickly), and this is more evident for dense and sandy products. This causes the jamming of the apparatus because the cement mix has indeed hardened inside the pump or inside the opening/closure valve and in any case no longer allows to inject the product.

[0009] Accordingly, in current gap filling machines it becomes indispensable to disassemble the apparatus so as to be able to wash and clear the unit of the presence of the product that has hardened, causing considerable waste of time: continuous dispensing (or dispensing with extremely short pauses) of the product is therefore clearly a constraint. Moreover, said product is contained in high-capacity hoppers, which must be emptied completely before suspending the service.

[0010] At the end of the duct, current gap filling machines use guns or in any case handgrips which have a nozzle which can have different dimensions depending on the type of gap that it is intended to fill: in any case, the dispensing element is rigid and especially not suitable for any instantaneous deformation thereof imparted manually by the operator when the gap to be filled assumes an irregular shape.

[0011] As regards instead the uniformity of the jet that is delivered, here, too, current gap filling machines encounter limitations: the pumps that are used, be they of the piston, screw or other type (known in current devices), have a continuous flow which is rather uneven, especially when very dense products are used.

[0012] The aim of the present invention is to provide a portable gap filling machine which obviates these drawbacks by being lightweight, easy to carry and adapted to work autonomously without using the electric mains or bulky and sometimes even dangerous power supplies.

[0013] Within this aim, an object of the present invention is to provide a portable gap filling machine in which it is possible to suspend the dispensed jet without running the risk of product drying.

[0014] Another object of the present invention is to provide a portable gap filling machine which has low costs, is relatively simple to provide in practice and safe in application.

[0015] This aim and these and other objects that will become better apparent hereinafter are achieved by the present portable gap filling machine, of the type normally used in the field of building, which comprises a container for the building mix to be dispensed, a dispensing tip, and, interposed between them on a connecting duct, a unit for pumping said mix, characterized in that said pumping unit comprises a peristaltic pump which is driven by an autonomously powered motor drive, said pumping unit being compact and lightweight.

[0016] Further characteristics and advantages of the invention will become better apparent from the following detailed description of a preferred but not exclusive embodiment of a portable gap filling machine illustrated by way of non-limiting example in the accompanying drawings, wherein:

Figure 1 is a schematic side view of a portable gap filling machine according to the invention;

Figure 2 is a schematic top view of a portable gap filling machine according to the invention;

Figure 3 is a front sectional view, taken along the line III-III of Figure 1.

[0017] With reference to the figures, the reference numeral 1 generally designates a portable gap filling machine according to the invention.

[0018] The gap filling machine 1 is composed of an electric motor 2, which is powered by a-low voltage, high-capacity battery 3; it further comprises a reduction unit 4, which is adapted to transmit motion at the correct rotation rate to a pump 5 which is keyed on the output shaft of the reduction unit 4.

[0019] The pump 5 is a pump of the peristaltic type, i.e., of the type based on the peristalsis effect, i.e., the sliding of a choke along a tube, which has the effect of squeezing through it the fluid contained therein. Such pumps are generally constituted by a rotor which is provided with a plurality of rollers. By turning, the rollers squeeze a rubber hose against a cylindrical wall.

[0020] The pump 5 acts on a tubular duct 6, which is arranged between the bottom of a container 7 (which constitutes the magazine for storing the material 8 on which the gap filling machine 1 acts), and a dispenser 9 for the material 8.

[0021] The dispensed product (material 8) thus flows within the duct 6.

[0022] The dispenser 9 is provided with a suitable end nozzle (which optionally can also be replaced in order to choose the most suitable diameter for each different application), by means of which it is possible to direct the material 8 in the gaps (understood as the free interspaces between structural building components, for example two bricks or two tiles, which are arranged contiguously).

[0023] The duct 6, in the embodiment shown in Figure 3, is constituted by an inner core 6a and an outer sheath 6b: in order to optimize the operation of the peristaltic pump 5 and ensure the maximum duration of the gap filling machine 1, the inner core 6a is made of a material such as silicone (which is adapted to withstand a large number of successive deformations without suffering any damage, since it is an elastically deformable material), while the outer sheath 6b is made of a material which is highly resistant to wear (due to the fact that the duct 6 will be exposed to the outside environment, which particularly in the case of building yards is particularly aggressive both mechanically and chemically).

[0024] The operation of the machine according to the invention is as follows: the peristaltic pump 5 generates the chosen pressure (according to an embodiment of particular practical interest, a maximum of approximately 9 bars) required for the normal performance sought in the building sector in the filling of gaps in walls, floors or others: the limited power needed by the pump 5 to generate the required pressure allows to use a low-voltage electric motor 2 which is particularly small and lightweight. Accordingly, this ensures greater safety in the workplace; it is thus possible to use a reduction unit 4 which also is compact and therefore lightweight, such as to provide a gap filling machine 1 which weighs approximately 10 kg in total.

[0025] Advantageously, the duct 6, in its portion comprised within the pump 5, is subjected to continuous and successive squeezing by the rollers 10 of the pump 5: for this reason, the adoption of an ordinary silicone tube with a thickness of a few millimeters might be insufficient to ensure a good durability of the entire device.

[0026] In order to reach the pressure of approximately 9 atmospheres (indicated with reference to a solution of particular practical interest), it would in fact be necessary to use a silicone hose of considerable size and with a thickness far greater than the one used in invention (this would also entail the use of a more powerful and therefore bulkier motor, which would no longer be suitable to be driven by a small battery).

[0027] As mentioned earlier, the duct 6 is constituted by an inner core 6a and by an additional high-strength outer sheath 6b reinforced with textile inserts: in this way, the characteristics of the inner core 6a allow to achieve the intended pressure even with a low-power motor 2, and the outer sheath 6b protects the inner core 6a, which would otherwise yield once the operating pressure is reached.

[0028] A further important advantage provided by the present invention is as follows: given the use of a peristaltic pump 5, it is possible to reverse the direction of rotation of the pump 5, thus interrupting the jet of dispensed product; in this manner, there is no leakage of product (material 8) when dispensing is suspended: obviously, by doing this the mix 8 is pumped back toward the container 7 for containing the product 8 (substantially a hopper) until the amount that is present in the duct 6 is depleted: all this allows to avoid dirtying the environment where work is being performed.

[0029] If the suspension of work must be longer, it is necessary to stop the motor 2.

[0030] The use of a potentiometer, in a control panel 11 arranged proximate to the handgrip (dispenser 9), allows to vary the amount of product 8 that is dispensed by varying the rotation rate of the pump 5. The control panel 11 also comprises the stop and start buttons and optionally the button for activating reverse motion.

[0031] When momentary pauses in dispensing occur, small hardenings of the product may also occur at the tip 12 of the dispenser 9: this is obviated by squeezing and accordingly breaking up these agglomerations directly at the free dispensing end, which is in fact advantageously made of soft material which is deformable for this purpose.

[0032] According to a constructive solution of particular practical interest, a protrusion 13 has been applied directly to the nozzle and can be squeezed, thus blocking the outflow of the injected product 8.

[0033] In order to make the gap filling machine 1 portable, a substantially compact hopper (container 7) has been used, accordingly allowing to carry it by hand and using amounts of product 8 to be dispensed which are adapted to ensure continuous service for periods compatible with the requirements of the building sector.

[0034] It is further possible to release any agglomerations that might have formed at the inlet of the pump 5: since the pump is arranged at the base of the container 7, by acting with a screwdriver or an appropriately provided tool it is possible to free directly the drawing portion 14 of the duct 6.

[0035] It has thus been shown that the invention achieves the intended aim and objects.

[0036] The invention thus conceived is susceptible of numerous modifications and variations, all of which are

within the scope of the appended claims.

[0037] A possible variation of certain practical interest is the possibility of transfer all the controls (start, stop, rotation rate changes, et cetera) to a wireless remote control arranged in another location with respect to where they have been arranged now.

[0038] Another possible variation consists in providing a duct 6 which is constituted by a single tubular element of a suitable mix reinforced with structural filaments (a mesh or fabric embedded in the mix in order to give the necessary mechanical strength).

[0039] All the details may further be replaced with other technically equivalent ones.

[0040] In the exemplary embodiments shown, individual characteristics, given in relation to specific examples, may actually be interchanged with other different characteristics that exist in other exemplary embodiments.

[0041] Moreover, it is noted that anything found to be already known during the patenting process is understood not to be claimed and to be the subject of a disclaimer.

[0042] In practice, the materials used, as well as the shapes and dimensions, may be any according to requirements without thereby abandoning the scope of the protection of the appended claims.

[0043] The disclosures in Italian Patent Application No. RA2005A000036 from which this application claims priority are incorporated herein by reference.

[0044] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. A portable gap filling machine, of the type normally used in the field of building, comprising a container (7) for the building mix to be dispensed (8), a dispensing tip (9) and, interposed between them on a connecting duct (6), a unit for pumping said mix, **characterized in that** said pumping unit comprises a peristaltic pump (5) which is driven by an autonomously powered motor drive, said pumping unit being compact and lightweight.

2. The gap filling machine according to claim 1, **characterized in that** said motor drive comprises an electric motor (2), which is substantially of the type powered at low voltage by a respective battery (3) and connected to a reduction unit (4).

3. The gap filling machine according to claim 1, **characterized in that** said peristaltic pump (5) comprises a plurality of moving elements (10), which interfere with the surface of said connecting duct (6) for the transfer of the building mix (8) to be dispensed from said container (7) to said dispenser (9).

4. The gap filling machine according to claims 1 and 2, **characterized in that** it has a low-voltage electric motor (2) which is adapted to transmit motion, by means of said reduction unit (4), to the pump (5) in order to pressurize the product (8) to be dispensed.

5. The gap filling machine according to one or more of the preceding claims, **characterized in that** said battery (3), connected to the power supply terminals of said electric motor (2), is of the high-capacity type, adapted to provide power to a continuous service, said motor (2) operating even for several consecutive hours.

6. The gap filling machine according to one or more of the preceding claims, **characterized in that** said reduction unit (4) is keyed on the shaft of said electric motor (2) which drives said pump (5), said reduction unit (4) having a reduction ratio which is substantially equal to the ratio between the nominal rotation rate of said motor (2) and the nominal rotation rate of said pump (5).

7. The gap filling machine according to one or more of the preceding claims, **characterized in that** said battery (3) is of the rechargeable type and can optionally be disconnected in case of direct power supply from the electric mains by means of a suitable voltage transformer.

8. The gap filling machine according to one or more of the preceding claims, **characterized in that** said electric motor (2) and the corresponding reduction unit (4) are of the bidirectional type and can rotate in the two possible directions of rotation, making said pump (5) bidirectional in order to return the mix (8) that is present in the duct (6) back into said container (7).

9. The gap filling machine according to one or more of the preceding claims, **characterized in that** said duct (6) is made of a material which is mechanically tough and easily deformable, such as for example a hose made of sheathed silicone material.

10. The gap filling machine according to one or more of the preceding claims, **characterized in that** said container (7) is constituted by a hopper for containing the product (8) to be dispensed, which is arranged directly above the drawing portion (14) of the duct (6) which leads to said peristaltic pump (5), said hopper (7) being open in an upper region for the simple removal of unintended blockages of the inlet of said drawing portion (14).

11. The gap filling machine according to one or more of the preceding claims, **characterized in that** said duct (6) comprises, substantially proximate to said dispenser (9), the elements (11) for controlling said motor drive, said elements (11) being adapted for the forward, reverse, stop and flow-rate variation controls.

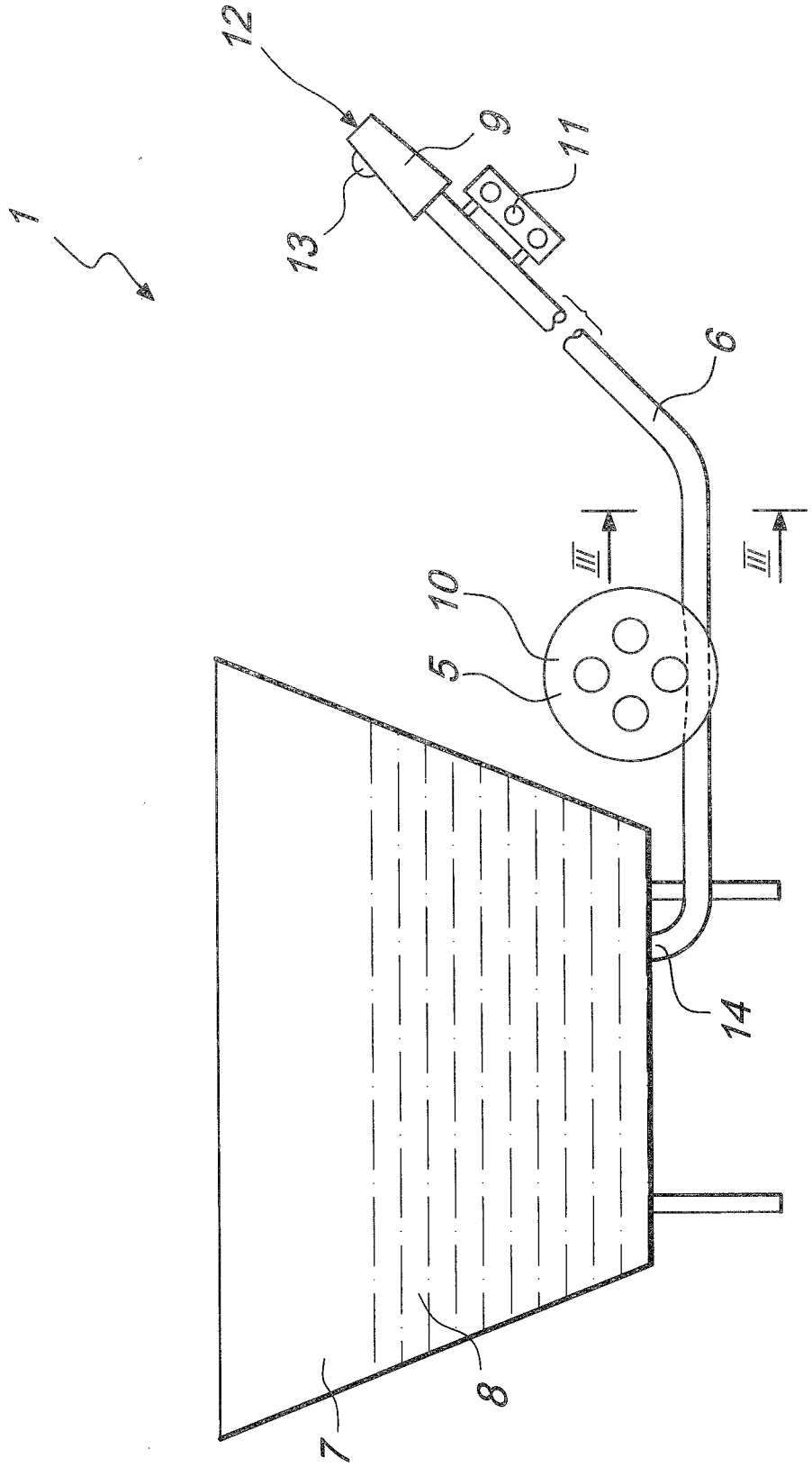

Fig. 1

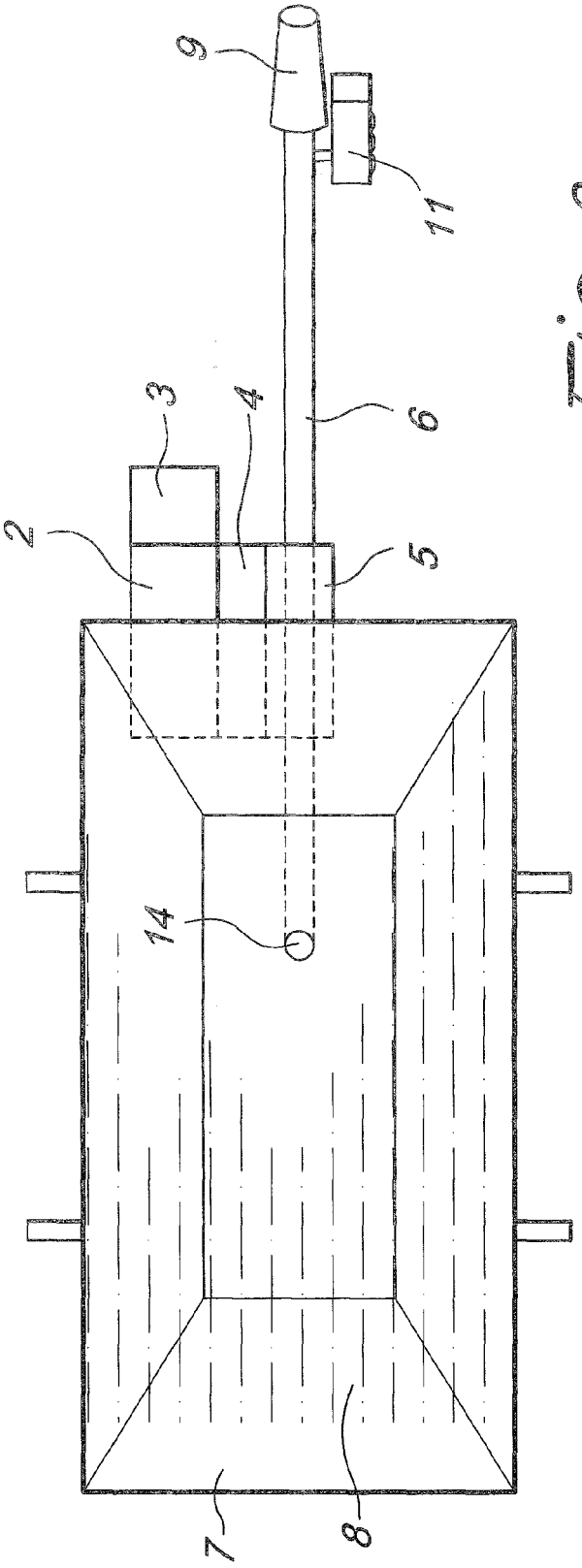

Fig. 2

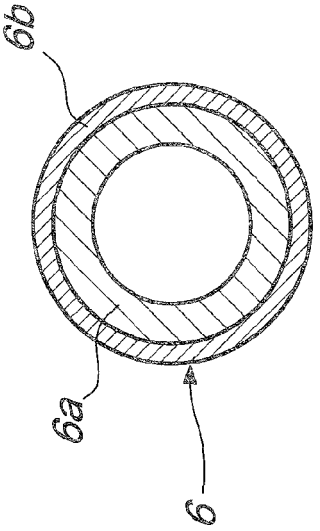

Fig. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 06 12 1713

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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	8 January 2007	Scharl, Willibald

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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