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(54) Device and method for filling a defect in a surface of a wooden article

(57) Device (1) for filling defects (30) in a surface (31) of a wooden article (3), that comprises a movable nozzle (19) for a filling material (26) and which comprises a reservoir (12) connected to the nozzle (19) for the filling material (26), characterised in that the device (1) is provided with a flat end part (16) with an end face (17) that extends around the nozzle (19) and is arranged to push the end face (9) against the surface (31) of the wooden article (3) to be treated and to allow it to move over the article (3) in contact with this surface (31).

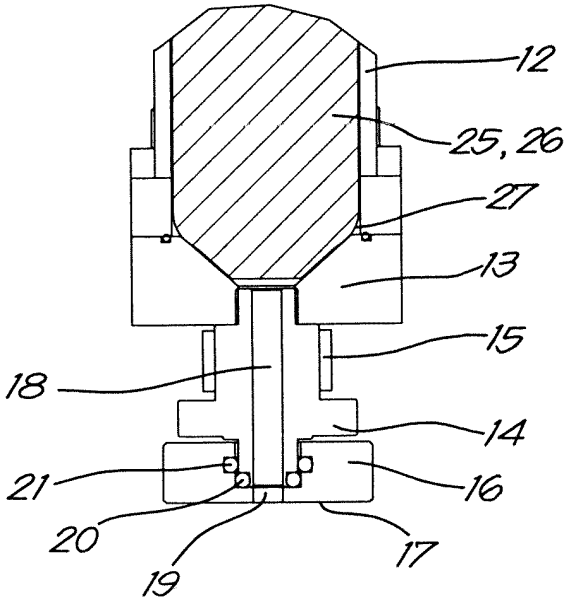

Fig.3

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Description

[0001] The present invention relates to a device and a method for filling a defect in a surface of a wooden article and to a cartridge filled with filler for filling such defects.

[0002] More specifically the invention relates to the filling of concave defects such as cracks, holes and remnants of knots, that can be present in wood, and which become visible on the surface when sawing into pieces or planks of wood.

[0003] Such defects are usually filled during or after the manufacture of a wooden article, for example wooden planks for floors, but also other wooden articles such as wall planks, panelling, wooden profiles, window or door frames, windowsills, etc.

[0004] When this filling is automated for cost reasons, it is normally done in a device that allows a liquid thermoplastic filling material to flow into a defect, and then allows it to harden by cooling down.

[0005] Measures have to be taken for this, for example a seal around the defect to be treated and/or a precise dosage of the filling material to prevent it coming out of the defect. Generally this is not possible and a surplus has to be removed by a supplementary abrasive treatment. Such a hardened thermoplastic filling material is generally of such a hardness that it cannot be easily abraded away.

[0006] A further disadvantage of the use of a liquid filling material is that it hardens without porosity. This means that the surface structure is different to that of the surrounding wood, and above all that there is a different effect of a pigment or other wood treatment products penetrating into the wood, that are often used afterwards. This primarily yields visual differences that are perceived as unattractive by an end user.

[0007] When the liquid filler is coloured before application in order to better match the colour of the surrounding wood, this also gives the disadvantage that the colour cannot easily be changed, such that the flexible application of an installation is impeded.

[0008] Although wood filler pastes that do not have the said disadvantages are known, they are not applied in automated devices because they are not liquid and thus difficult to apply and dispense.

[0009] In addition, due to their limited flow a defect cannot be properly filled without the paste being worked into the defect by repeated movements with a spatula, such that they are not very suitable for automated application.

[0010] Also, when such a paste is used an irregular protrusion is left behind when a nozzle, through which such a paste is applied, is removed from a defect that is filled with a quantity of paste, because due to the viscosity of the paste it is dragged along with the nozzle and distorts before it breaks off and thereby leaves behind a protrusion.

[0011] The purpose of the present invention is to provide a solution to at least one of the aforementioned and other disadvantages by providing a device for filling defects in a surface of a wooden article, that comprises a movable nozzle for a filling material and which comprises a reservoir connected to the nozzle for the filling material, whereby the device is provided with a flat end part with an end face that extends around the nozzle and is arranged to push the end face against the surface of the wooden article to be treated and to allow it to move over the article in contact with this surface.

[0012] Such a device enables, thanks to the end face and the possibility to move this end face over the surface, a measured quantity of filler to be spread flat, so that there are no or fewer protrusions, and thus no or less need to perform a correcting operation after filling the defect in order to remove protrusions.

[0013] In a preferred embodiment the flat end part is mounted so that it can move in such a way that the orientation of the end face can be changed.

[0014] This thus involves a tilting movement of the end face with respect to the surface.

[0015] In other words this means that the orientation of the end face, which is normally completely horizontal, in other words the same as the normal orientation of the surface to be treated, can change.

[0016] As a result of this changeable orientation, the end face can fit well to the surface to be treated, which, certainly around defects and because of these defects, can have a local orientation that deviates slightly from the orientation of the surface as a whole. In this way the leakage of filler is prevented when filling the defect and the filler is spread more evenly.

[0017] This movability can be achieved for example by making a part of the device, including the reservoir and the nozzle, slightly movable so that this part can settle in the local orientation of the surface at a defect, or in a further preferred embodiment, because the flat end part is movably mounted with respect to the reservoir, whereby the reservoir is not movable or is mounted in the device in such a way that only movements with directional components perpendicular to the surface and/or parallel to the surface are possible.

[0018] As a result only a small part, i.e. the end part, needs to be fastened to the rest of the device so that the end part can tilt, which makes the total device more stable. This enables a lasting contact of the entire end face, also during a movement in contact with the surface.

[0019] In a preferred embodiment the device is equipped to pressurise the reservoir in order to push the filler out of the nozzle.

[0020] In this way a reliable measure can be obtained, whereby as a result of the pressure the filler can properly and completely fill a defect.

[0021] Preferably a release valve for the pressure in the reservoir is provided to release the pressure more quickly, and thus to better control the stop of the flow of filler.

[0022] In another preferred embodiment the device is intended to work with cartridges of filler to be placed in the reservoir, and these cartridges are formed by a flex-

ible, or compressible, supple sleeve that is filled with the filler and which is closed at both ends, and which is intended to be opened at one end before use.

[0023] This has the advantage that an easy replaceability of the filler is obtained, and also thatpartly used cartridges of filler, for example of a certain colour, can be removed and used again later when the type of filler is desired again.

[0024] In a further preferred embodiment the device is provided with a heating element for the filler.

[0025] This is important because the viscosity of a filler, and thus the quantity that is dispensed over a certain time, is highly temperature dependent. By providing a heating element that can heat the entire reservoir for example, or just the filler in the nozzle, the viscosity can be better controlled.

[0026] The invention further relates to a cartridge filled with filler for defects in a wooden surface, whereby the cartridge comprises a flexible, or supple, sleeve that is closed at both ends, whereby the two main components of the filler are a hardenable binder and a porous powder.

[0027] On account of the sleeve closed at two ends and the consistency of the filler, such a cartridge is normally sausage shaped.

[0028] This has the advantage that colours and/or qualities of filler can be easily exchanged, because a partially used cartridge can be removed from the reservoir and closed off again, and a cartridge with another colour and/or quality can be inserted in the reservoir.

[0029] On account of the sausage shape of the cartridge only a very small quantity of filler remains after taking off a cartridge, at the end of the reservoir near the nozzle, and thus only a very limited amount of cleaning work is required when changing the colour and/or quality.

[0030] As a result the exchange can be done quickly and easily and there is only a very limited loss of filler as a result of an exchange.

[0031] Preferably the filler is a paste and the porous powder at least partly or entirely consists of powdered wood.

[0032] As a result, the colourability and other properties of wood are approximated as well as possible.

[0033] The invention also concerns a combination of a device as described above and a cartridge as described above, whereby the cartridge is intact or whereby the closure at one end of the cartridge is opened or removed.

[0034] The invention further concerns a method for filling a defect in a surface of a wooden article, whereby a movable nozzle, around which a flat end part with an end face is affixed, is placed above the defect with the end face parallel to and against the surface to be treated, whereby filler is then introduced into the defect via the nozzle, and whereby the flat end part, with the end face in contact with the surface, then makes a movement parallel to the surface over a distance that is such that at the end of the movement the nozzle is not above the defect.

[0035] Thanks to this method a quantity of filler deposited in a defect is spread more evenly so that there are no or fewer protrusions when removing the nozzle.

[0036] In a preferred variant of the method, use is made of a flat end part that is movably mounted in such a way that the orientation of the end face can vary with respect to the surface of a wooden article to be treated, in which the end part adopts an orientation that is such that the end face is parallel to the surface directly connecting to the defect.

[0037] In this way a leakage of filler when filling the defect is prevented and the filler is spread more evenly.

[0038] In a further preferred variant of the method, the end part is placed under a first pressure against the surface whereby the filler is introduced into the defect by a reservoir placed under a second pressure for the filler so that it flows out of the nozzle, and whereby the first and second pressures are such that the second pressure is insufficiently high to remove the end part from the surface.

[0039] In this way a good filling of the defect is obtained, as well as the prevention of leakage of filler during introduction into the defect.

[0040] In a further preferred variant of the method the second pressure is removed before the nozzle has reached a position that is not directly above the defect, whereby the movement parallel to the surface is continued until the end face is no longer above the defect.

[0041] This variant prevents excess filler being dispensed, which can unnecessarily foul the surface, and no movement is made perpendicular to the surface while there is still contact between the device and the filler in the defect, such that parts of filler protruding out of the surface are avoided.

[0042] With the intention of better showing the characteristics of the invention, preferred embodiments of a device, a combination, a cartridge and a method according to the invention are described hereinafter by way of an example, without any limiting nature, with reference to the accompanying drawings, wherein:

Figure 1 schematically shows a device according to the invention;
figure 2 shows the part of the device of figure 2 indicated by F2 on a larger scale;
figure 3 shows the part of the device of figures 1 and 2 indicated by F3;
figure 4 shows a cartridge according to the invention; and
figures 5 to 9 show successive stages of a method according to the invention.

[0043] The device 1 shown in figure 1 comprises a conveyor belt 2 for wooden floor planks 3 that can move in the direction of the arrow P.

[0044] The device 1 further comprises a subdevice 4 to locate a defect in a surface, a control unit 5 and a filling station 6. The filling station 6 is connected to a source 7 of compressed air, for example a compressor or a stock of pressurised air.

[0045] The subdevice 4 comprises a light source 8 that is mounted relatively low in the subdevice 4 and a camera 9 that is connected to the control unit 5.

[0046] The filling station 6 comprises a movable carriage 10 that can move in two horizontal directions perpendicular to one another, as indicated by the arrow Q-Q' for one of the two horizontal directions. The carriage 10 can be suspended on rails for example, and can be moved in the horizontal plane by means of a drive, for example an electric motor, that is connected to the control unit 5.

[0047] An applicator 11 is fastened to the carriage 10 in such a way that it can be moved as a whole vertically with respect to the carriage 10 by a drive, as indicated by the arrow R-R'. This drive can be a pneumatic drive for example or an electric motor and is coupled to the control unit 5.

[0048] The applicator 11 is shown in detail in figures 2 and 3, and comprises a reservoir 12 for filler, and this reservoir 12 has a chamfered end on the underside. A detachable cap 13 is fastened to the reservoir 12.

[0049] A nozzle 14 is fastened below the cap 13 that is provided with heating 15. Under the nozzle 14 there is an end part 16 with a straight end face 17.

[0050] A channel 18 runs through the cap 13, the nozzle 14 and the end part 16, whose bottom end forms a nozzle 19.

[0051] The end part 16 is suspended from the nozzle 14 via two rubber O rings 20, 21, whereby the bottom O ring 20 is compressible and thereby gives a certain movability of the end part 16 with respect to the nozzle 14, and the top O ring 21 primarily acts as the seal of the channel.

[0052] On its top the applicator 11 in the reservoir 12 is provided with a pressure piece 22 that can move in the reservoir 12. Above the pressure piece 22 in the top wall of the applicator 13 there is a release valve in the form of a fast venting valve 23. The applicator 11 is provided with a brace 24 through which the applicator 11 is connected to the carriage 10.

[0053] The fast venting valve 23 is connected to the compressed air source 7 and is connected to the control unit 5.

[0054] Figure 4 shows a cartridge 25 filled with filler 26. The cartridge consists of a flexible, supple sleeve 27 in which the filler 26 is located. The sleeve 27 is closed at both ends 28, for example with a metal clamp 29. The cartridge 25 and the reservoir 12 of the device 1 are adapted to one another with regard to size.

[0055] The filler 26 is a paste that is primarily formed from a binder and powdered wood, for example fine sawdust. Various additives can be added to the paste, for example pigments or additives to control the rheological properties.

[0056] The operation of the device 1 is very simple and as follows.

[0057] First the device 1 is filled with a cartridge 25 with filling paste 26. This is done by a taking the cap 13 off the applicator 11, cutting open a cartridge 25 close to the end 28 and inserting it in the reservoir 12 with the open end 28 oriented downwards, and then by putting the cap 13 back on again.

[0058] In order to facilitate the filling of the reservoir 12, the device 1 can be constructed such that the entire applicator 11 can be temporarily brought to a horizontal position.

[0059] Then a floor plank 3 is laid on the conveyor belt 2 and moved by the conveyor belt 2 in the direction of the arrow P to below the subdevice 4 in order to locate a defect in a surface.

[0060] The camera 9 in this subdevice takes a picture of the floor plank 3, which is preferably lit at a low angle of incidence for better contrast.

[0061] The image is processed by the subdevice 4, whereby the position of a defect 30 or defects and the surface of each defect 30, in this case a hole, is determined, and whereby these data are made available to the control unit 5. It goes without saying that a floor plank 3 can also be free of defects, in which case the further procedure is not implemented.

[0062] Of course alternatively the control unit 5 can be equipped to do the image processing.

[0063] Then the floor plank 3 is brought by the conveyor belt 2 to below the filling station 6.

[0064] The further operation of the device is essentially explained on the basis of figures 5 to 9.

[0065] When the floor plank 3 is under the filling station 6, the carriage 10 is moved horizontally under the control of the control unit 5 until the nozzle 19 is above the defect, as shown in figure 5.

[0066] Then the applicator 11 is moved downwards under the control of the control unit 5, until the end face 17 is pushed against the surface 31 of the floor plank 3 around the defect 30 with a certain force that results in a first pressure.

[0067] This surface 31 can have a somewhat different orientation around the defect 30 than the overall surface of the floor plank. A good fit of the end face 17 to the surface 31 is hereby obtained because the end part 16 can be tilted with respect to the nozzle 13, whereby the bottom O ring 20 is compressed under the effect of the pressure with which the applicator 11 is pushed downwards at the side where this is necessary for a good fit of the end face 17 to the surface 31.

[0068] Then, under the instruction of the control unit 5, the reservoir 12 is placed under pressure above the pressure piece 22. This is done via the fast venting valve 23, by allowing compressed air out of the compressed air source 7.

[0069] As a result of this the pressure piece 22 moves downwards, whereby it pushes on the cartridge 25 and compresses it, such that filler 26 flows out of this cartridge via the channel 18 and the nozzle 19 and flows into the defect 30.

[0070] In order to prevent air accumulating under the pressure piece 22 and impeding a controlled emptying

of the cartridge 25, a venting hole is provided in the reservoir 12 close to the cap 13.

[0071] This situation is shown in figure 6.

[0072] The flow speed of the filler 26 at a certain pressure is determined beforehand, so that the control unit 5 can control the quantity of filler 26 to be introduced in the defect 30 by means of the time during which the pressure is maintained.

[0073] Because of the pressure at which the filler 26 is introduced into the defect 30, the defect 30 is completely filled and no unfilled parts remain.

[0074] When this time is longer than the time needed to fill the defect 30, the further flow of the filler is prevented, or at least impeded, by the good fit of the end face 17 to the surface and the fact that the pressure at which the filler 26 is applied is not sufficient to remove the end face 17 from the surface 31 against the pressure with which it is pushed against the surface 31.

[0075] As soon as the desired quantity of filler 26 is introduced into the defect 30, the applicator 11 is moved horizontally over the floor plank 3 under the control of the control unit 5, while the end face 17 remains pushed against the surface 31. This is indicated in figure 7 by the arrow S.

[0076] During this horizontal movement the pressure in the reservoir is switched off by the control unit 5. This is done by stopping the supply of compressed air and by letting the compressed air in the reservoir 12 flow away to the outside air via the fast venting valve 23, that hereby acts as a release valve, before the nozzle 19 has reached a position that is no longer above the defect 30. As a result the flow of filler 26 is almost immediately stopped.

[0077] The horizontal movement of the applicator 11, with the end face 17 in contact with the surface 31, as indicated by the arrow S, is continued until, as shown in figure 8, the end face 17 is no longer above the defect 30. Hereby the filler 26 is spread cleanly flat in the defect 30.

[0078] Then, as indicated in figure 9, the applicator 11 moves upwards so that the end face 17 is at a distance from the surface 31, whereby the filling of the defect 30 is ended, and the device 1 is ready to fill another defect in the same or a different floor plank.

[0079] The filler 26 can now harden, after which further processing of the floor plank 3 can take place.

[0080] If the temperature at which the method is implemented is less than a predetermined temperature limit, whereby the flow behaviour of the filler 26 is insufficient, the heating 15 can be switched on by the control unit 5.

[0081] The present invention is by no means limited to the embodiments described as an example and shown in the drawings, but a device, cartridge and method according to the invention can be realised in all kinds of variants and in different ways, without departing from the scope of the invention.

Claims

1. - Device (1) for filling defects (30) in a surface (31) of a wooden article (3), that comprises a movable nozzle (19) for a filling material (26) and which comprises a reservoir (12) connected to the nozzle (19) for the filling material (26), **characterised in that** the device (1) is provided with a flat end part (16) with an end face (17) that extends around the nozzle (19) and is arranged to push the end face (9) against the surface (31) of the wooden article (3) to be treated and to allow it to move over the article (3) in contact with this surface (31).

2. - Device (1) according to claim 1, **characterised in that** the flat end part (16) is movably mounted in such a way that the orientation of the end face (17) can be changed.

3. - Device (1) according to claim 2, **characterised in that** the flat end part (16) is movably mounted with respect to the reservoir (12), and the reservoir (12) is not movable or is mounted in the device (1) in such a way that only movements with directional components perpendicular to the surface (31) and/or parallel to the surface (31) are possible.

4. - Device (1) according to any one of the previous claims, **characterised in that** it is equipped to push the end part (16) under pressure against the surface (31) of a wooden article (3) to be treated, whereby the end face (17) has an orientation parallel to the surface (31).

5. - Device (1) according to any one of the previous claims, **characterised in that** it is provided with or intended to be connected to a device (4) in order to locate a defect (30) in a surface (31) that operates on the basis of an image analysis of the surface (31).

6. - Device (1) according to any one of the previous claims, **characterised in that** it is equipped to place the reservoir (12) under pressure in order to thereby push the filler (26) out of the nozzle (19).

7. - Device (1) according to claims 6, **characterised in that** it is provided with a release valve (23) for the pressure in the reservoir (12).

8. - Device (1) according to any one of the previous claims, **characterised in that** it is intended to operate with cartridges (25) of filler (26) placed in the reservoir (12), and these cartridges (25) are formed by a flexible sleeve (27) that is filled with the filler (26) and which is closed at both ends (28), and which is intended to be opened at one end (28) before use.

9. - Device (1) according to any one of the previous

claims, **characterised in that** it is provided with a heating element (15) for heating the filler (26).

10. - Combination of a device (1) according to any one of the claims 1 to 9 and a cartridge (25) that is filled with filler (26) for defects (30) in a wooden surface (3), whereby the cartridge (25) comprises a flexible sleeve (27) that is closed at at least one end (28), and whereby the two main components of the filler (26) are a hardenable binder and a porous powder.

11. - Method for filling a defect (30) in a surface (31) of a wooden article (3), whereby a movable nozzle (19), around which a flat end part (16) with an end face (17) is affixed, is placed above the defect (30) with the end face (17) parallel to and against the surface (31) to be treated, whereby filler (26) is then introduced into the defect (3) via the nozzle (19), and whereby the flat end part (16), with the end face (17) in contact with the surface (31), then makes a movement parallel to the surface (31) over a distance that is such that at the end of the movement the nozzle (19) is not above the defect (3).

12. Method according to claim 11, **characterised in that** use is made of a flat end part (16) that is movably mounted in such a way that the orientation of the end face (17) can vary with respect to the surface (31) of a wooden article (3) to be treated, in which the end part (16) adopts an orientation that is such that the end face (17) is parallel to the surface (31) directly connecting to the defect (30).

13. - Method according to claim 11 or 12, **characterised in that** the end part (16) is placed against the surface (31) under a first pressure, whereby the filler (26) is introduced into the defect (30) by placing a reservoir (12) for the filler (26) under a second pressure so that it flows out of the nozzle (19), whereby the first and second pressures are such that the second pressure is insufficiently high to remove the end part (16) from the surface (31).

14. - Method according to claim 13, **characterised in that** the second pressure is removed before the nozzle (19) has reached a position that is not directly above the defect (30), whereby the movement parallel to the surface (31) is continued until the end face (17) is no longer above the defect (30).

15. - Method according to any one of the claims 11 to 14, **characterised in that** it makes use of a device (1) according to any one of the claims 1 to 9 or of a combination according to claim 12.

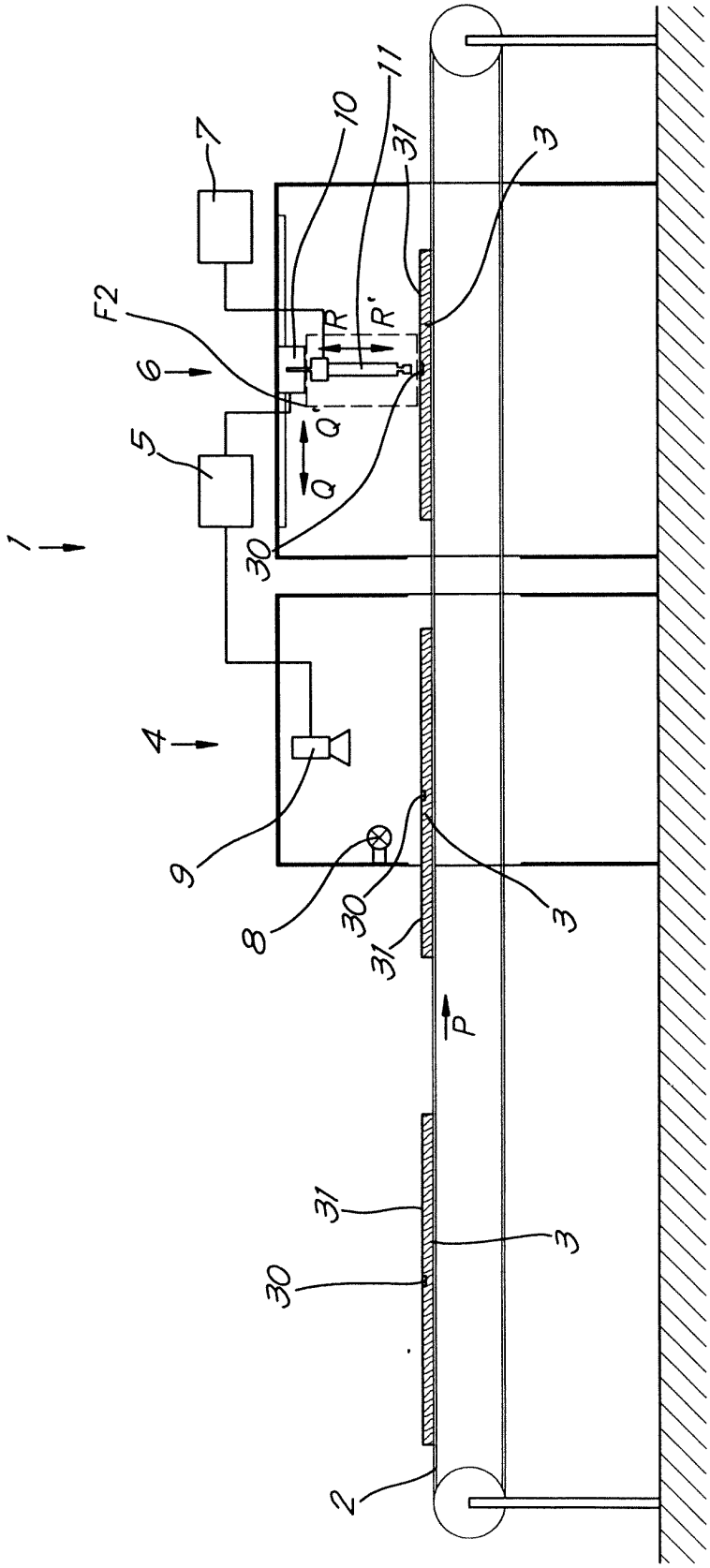

Fig.1

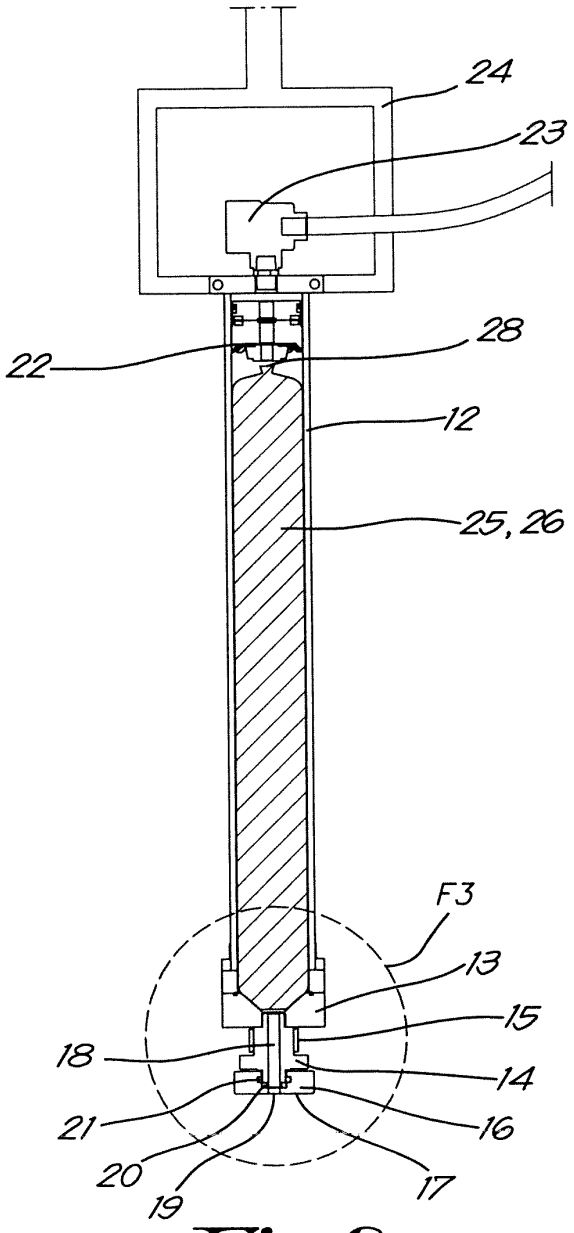
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Fig.2

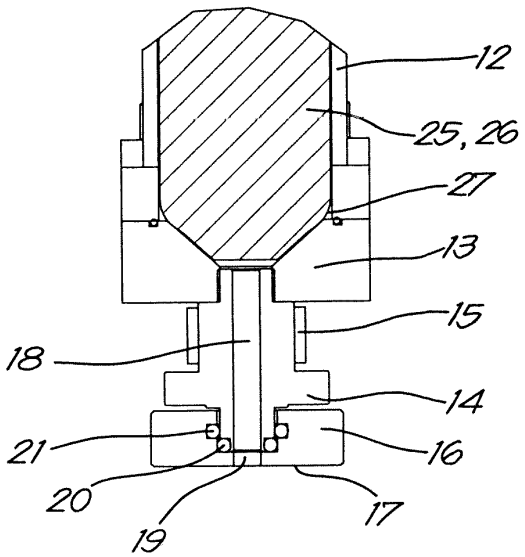
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Fig.3

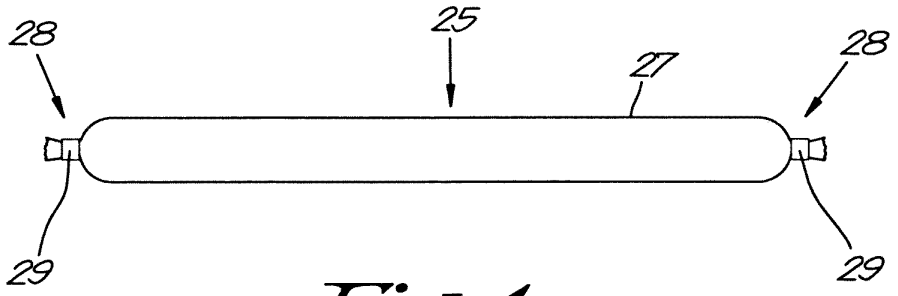

Fig.4

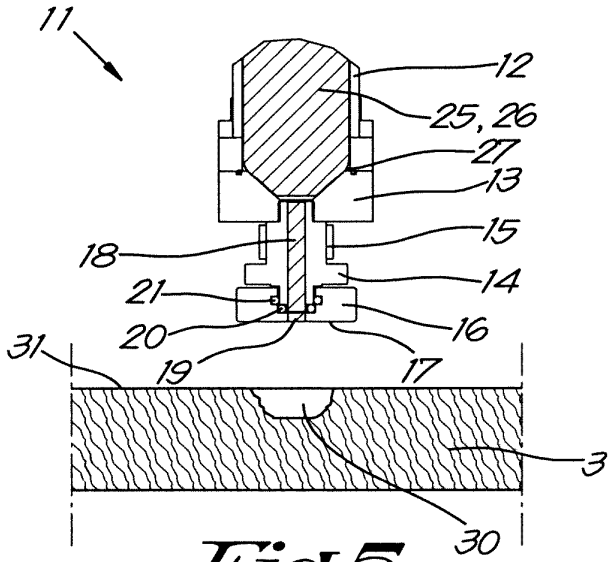

Fig.5

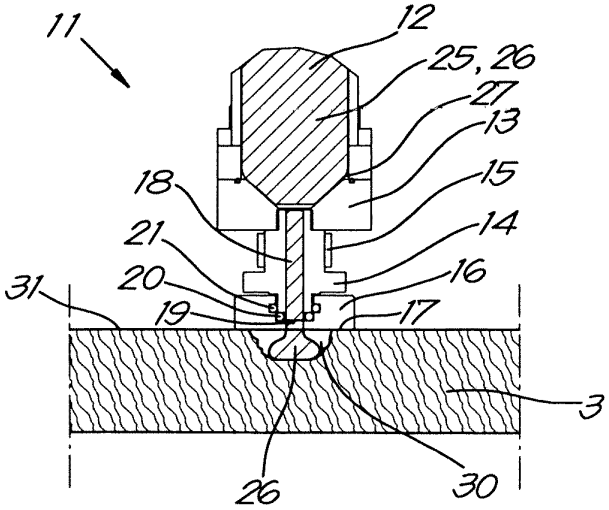

Fig.6

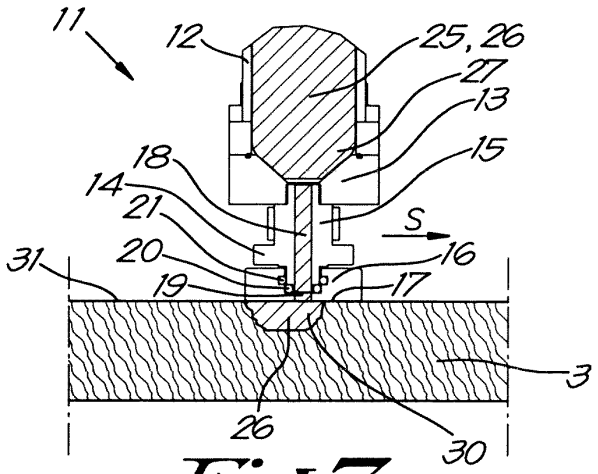

Fig.7

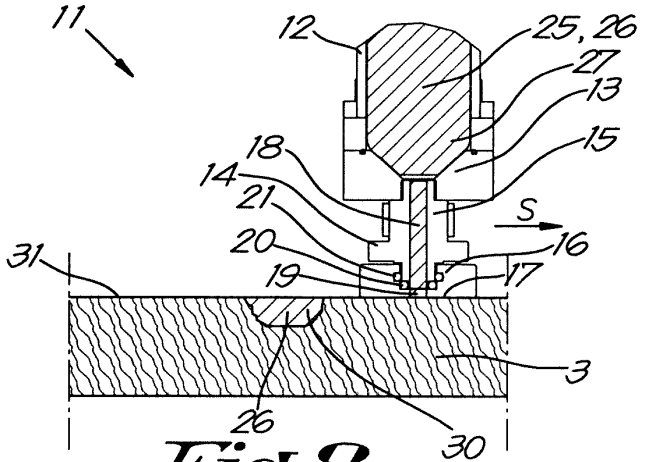

Fig.8

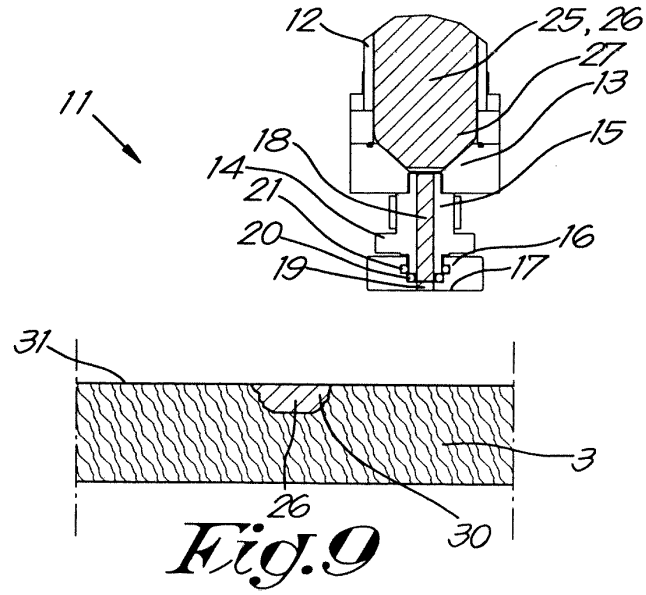

Fig.9

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EUROPEAN SEARCH REPORT

Application Number
EP 13 00 2469

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2007/240639 A1 (WANG FRANK [TW] ET AL) 18 October 2007 (2007-10-18)	1-4,6-9	INV. B05C5/02
A	* paragraph [0023] * * figures 9a,9b *	5,10-15	B05C11/02

X	DE 36 25 448 A1 (HILTI AG [LI]) 11 February 1988 (1988-02-11) * column 4, line 63 - column 5, line 27 * * figures 5,6 *	1-4,6-9	

A	US 5 779 853 A (CLINE AMOS E [US]) 14 July 1998 (1998-07-14) * column 2, line 60 * * figures *	10-15	

TECHNICAL FIELDS SEARCHED (IPC)

B05C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	7 June 2013	Roldán Abalos, Jaime

CATEGORY OF CITED DOCUMENTS

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P : intermediate document

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E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

1 EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 13 00 2469

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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07-06-2013

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2007240639 A1	18-10-2007	NONE	
DE 3625448 A1	11-02-1988	NONE	
US 5779853 A	14-07-1998	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82