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(54) **Method and device for manufacturing brushes**

Verfahren und Vorrichtung zur Bürstenherstellung

Procédé et dispositif pour la fabrication des brosses

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Description

[0001] The present invention concerns a method and device for manufacturing brushes.

[0002] It is known that brushes can be made by forming openings in brush bodies, more particularly by boring holes and by subsequently inserting brush fibers in the shape of brush bundles in these openings.

[0003] It is also known that the above-mentioned openings can be provided at different angles in the brush body in order to thus insert brush fibers at an angle. This is for example the case when brushes are made whose brush bundles are arranged in the shape of a fan, such as for example scrub brushes, brooms and the like.

[0004] In order to manufacture such brushes, it is known to provide the brush bodies in a positionable brush body holder and to thus present them to a boring tool. By turning the brush body holder, the brush body provided therein is placed at different angles in front of the boring tool, which makes it possible to provide openings at an angle.

[0005] As a result of the rotation of the brush body holder, the distance as of the side of the brush body in which the openings are to be formed to the front side of a drill which is present in the boring tool is not always the same, however, such that, apart from an actual to-and-fro boring movement, also a depth compensation will have to be provided for.

[0006] In order to realize such a depth compensation, apart from the actual boring movement, use is traditionally made of a boring tool on the one hand which, in order to bring about the boring movement, carries out a specific to-and-fro movement if a positionable brush body holder whose centre of rotation can be shifted by means of a drive element on the other hand, such that, thanks to said shift, it becomes possible to realize a depth compensation. A disadvantage of this technique consists in that two entirely separated drives are required, namely to move the boring tool to and fro and to shift the positionable brush body holder. Another disadvantage consists in that such a brush body holder, which cannot only be positioned, but which must also be slidable, is difficult to apply in brush manufacturing machines which make use of what is called a turret with which the brush bodies can be presented to the boring tool, a filling tool and possible other tools respectively, as this requires a rather complex construction.

[0007] In order to realize the actual boring movement and the depth compensation, it is also known to fix the boring tool on a first carriage which can only be moved to and fro over a fixed course length to realize the actual boring movement, whereby this first carriage is fixed in a movable manner on a second carriage with which the depth compensation is carried out. Every carriage hereby has its own drive. A disadvantage of this known embodiment consists in that it is rather complex and takes up quite a lot of space, since two carriages as well as two drive elements are required.

[0008] Moreover, the actual boring movement is obtained in these known devices by means of a cam drive, as a result of which the drill will always go to and fro over a fixed course length. This course length is adapted to the largest depth of hole which is customary when manufacturing brushes, which may amount to some 40 mm. When brushes are manufactured whereby the depth of hole is smaller, for example 10 mm, the boring tool will carry out an unnecessary large movement, which results in that the production speed is adversely influenced.

[0009] With the above-described method, the speed and the course of the to-and-fro boring movement can usually not be set, so that the openings will always be drilled with the same speed of penetration and drawback speed. This is disadvantageous in that the boring will not be optimal, and in that for example the rate of speed of the boring is larger than would be optimally required. Moreover, in case of a to-and-fro boring movement which cannot be set, it is not possible to take the material into account out of which the brush body has been made, nor to reckon with the thickness of the used drill or the like.

[0010] The present invention aims a method and a device for manufacturing brushes, more particularly for providing openings for brush fibers in a brush body, whereby one or several of the above-mentioned disadvantages are excluded.

[0011] To this aim, the invention initially concerns a method for manufacturing brushes whereby openings for bundles of fibers are provided in a brush body, to which end the brush body, while it is placed in a positionable brush body holder, is being presented to a boring tool, whereby a single drive element is provided which can relatively move the boring tool and the brush body holder to and fro in relation to each other according to the boring direction in order to carry out the boring operation, characterized in that a control unit is provided for controlling the above-mentioned drive element, such that during each boring cycle, a boring movement, as well as a depth compensation as a function of the position taken by the positionable brush body holder, is realized. By making use of a single drive element, it is possible to provide the openings without the necessity of using two carriages, several drive elements, multiple cam drives or a slidable brush body holder.

[0012] The whole is preferably conceived such that the drill head can be placed in several positions as a function of a control, without thereby being bound to certain fixed course lengths. Thanks to the fact that the movement of the boring tool is no longer bound to a fixed course length, the boring tool can be controlled such that not only a depth compensation can be realized, but also the course length can be optimized at the same time as a function of the depth to be bored, such that no unnecessary course is being taken. Moreover, the immediate speed of the boring tool moving to and fro can be adjusted, such that for example the rate of speed and the drawback speed of the to-and-fro boring movement can be optimized.

[0013] Preferably, the drive element consists of a controllable positioning motor which is coupled to the carriage, either or not via a transmission. Such a motor allows for a very simple control. More particularly, an electric drive element will be used to this end, such as a servomotor of the rotating or linear type.

[0014] The invention is particularly useful when manufacturing brushes with rather large brush bodies, whereby a considerable depth compensation has to be provided for, which may strongly vary during the production of one and the same brush.

[0015] Secondly, the invention also concerns a device for manufacturing brushes, more particularly according to the above-mentioned method, whereby this device comprises at least a boring device and whereby this boring device in turn at least consists of a positionable brush body holder and a boring tool, whereby a single drive element is provided which can relatively move the boring tool and the brush body holder to and fro in relation to each other according to the boring direction so as to carry out a boring operation, and whereby the device is further provided with a control unit controlling the above-mentioned drive element, such that during each boring cycle, a boring movement, as well as a depth compensation as a function of the position taken by the positionable brush body holder, is realized.

[0016] In order to better explain the characteristics of the invention, the following preferred embodiments of the invention are described as an example only without being limitative in any way, with reference to the accompanying drawings, in which:

figure 1 represents a section of a brush which can be realized with a device according to the invention;
 figures 2 and 3 schematically represent a known device in two different positions;
 figures 4 and 5 schematically represent a device according to the invention in two different positions;
 figure 6 schematically represents a variant of a device according to the invention.

[0017] Figure 1 represents a brush 1, traditionally consisting of a brush body 2 in which openings 3 have been formed, in which brush fibers 4 in the shape of bundles of fibers 5 have been inserted. At least a number of the openings 3 and bundles of fibers 5 are situated at different angles, as a result of which, as represented, it is possible to realize for example an insertion in the shape of a fan.

[0018] Figures 2 and 3 represent a known boring device 6 with which openings 3 can be formed at different angles in a brush body 2. This boring device 6 is composed of a positionable brush body holder 7 and a boring tool 8.

[0019] The brush body holder 7 is fixed around a point of rotation 9 in a positionable manner, around which it can be positioned by means of a non-represented drive, and thus can be presented to the boring tool 8 in different angular positions.

[0020] The boring tool 8 comprises a drill head 10, in which can be provided a drill 11 to form the openings 3, and a motor 12 to drive the drill head 10 in a rotating manner.

[0021] The boring tool 8 is provided on a first carriage 13 which can be moved to and fro as such over a fixed course length D1 in order to realize the actual boring movement, whereas this first carriage 13 is in turn fixed on a second carriage 14 with which can be carried out a depth compensation over a variable distance D2. The carriages 13 and 14 are each driven separately by means of the respective drives 15 and 16 which are only represented schematically, whereby at least the drive 15 consists of a cam drive.

[0022] In order to provide openings 3 in a brush body 2, said brush body 2 is clamped in the brush body holder 7. By positioning the brush body holder 7, openings 3 can be provided at different angles, as is respectively represented in figures 2 and 3. From these figures it is clear that, as a result of the rotation of the clamped brush body 2, the point A will be situated more to the right than the point B in figure 3, such that as a function of the place where an opening 3 is formed, a depth compensation has to be provided for, at least when all the openings 3 have to be realized with the same or practically the same depth and/or in order to prevent that the brush body 2 is being bored right through.

[0023] This is done, as mentioned above, by changing the position of the second carriage 14, by moving it over a distance D2, while the first carriage 13 is constantly moved to and fro over the same course length D1.

[0024] It is clear that the boring device 6 of figures 2 and 3 has the disadvantages mentioned in the introduction.

[0025] Figures 4 and 5 represent a boring device 17 according to the present invention comprising a positionable brush body holder 18 and a boring tool 19.

[0026] The positionable brush body holder 18 can be positioned around a point of rotation 20 and it can be placed in different angular positions in front of the boring tool 19 by means of a schematically represented drive device 21.

[0027] The boring tool 19 comprises a drill head 22 which can be driven in a rotating manner by means of a motor 23.

[0028] The boring device 17 is special in that only one common drive element 24 is used to realize the to-and-fro movement for the boring as well as to provide for a depth compensation.

[0029] In the given example, use is made to this end of only one carriage 25 upon which the actual boring tool 19 has been provided, whereby this carriage 25 can be moved by means of a single drive element 24.

[0030] The drive element 24 can be of any nature whatsoever. Use is preferably made, however, of an electric servomotor of the rotating or linear type, which can enforce a to-and-fro movement to the carriage 25, possibly via a suitable transmission element, such as a spindle or

the like. Instead of a servomotor, use can also be made of other drive elements.

[0031] Naturally, the whole is provided with a control unit 26 controlling the drive element 24, such that during each boring cycle, a boring movement as well as a suitable depth setting is realized as a function of the position taken by the positionable brush body holder 18, as is clear from figures 4 and 5 respectively. It is clear that the connection between the angular position and the required depth compensation can be geometrically derived from the arrangement and can be partly determined by means of the required boring results, and that an appropriate control can be realized as such.

[0032] An additional advantage of this control unit 26 is that the immediate speed of the to-and-fro boring operation can be controlled, such that for example the rate of speed, the speed of penetration and the drawback speed of the boring operation can be optimized. Thus, for example, it is possible to select a slow rate of speed, whereas the speed of penetration can be set higher and the drawback speed even higher still if necessary, in order to speed up the boring operation.

[0033] Figure 6 represents a variant whereby only the drill head 22 can be moved, whereas the motor 23 is arranged in a fixed manner. Use is hereby made of a transmission 27 which allows the drill head 22 to be shifted by means of the carriage 25, while the rotational movement of the motor 23 can nevertheless be still transmitted to the drill head 22. As is schematically represented, such a transmission 27 may consist of a geared shaft 28 which can be shifted in the longitudinal direction and which works in conjunction with a gear wheel 29 driven by means of the motor 23.

[0034] It should be noted that the invention is not restricted to applications whereby the brush body holder 18 can be positioned around a point of rotation 20 which is formed of a specific axis of rotation. Thus, for example, the invention can also be applied to embodiments whereby the brush body holder 18 can carry out other positioning movements, for example around a point of rotation 20 allowing for a rotation in different directions, such as a ball joint, or in a different direction by means of a suspension with several axes of rotation. Nor is it excluded to realize the invention with a boring tool 19 provided on a positionable table, while the brush body holder 18 is either or not arranged in a fixed manner.

[0035] Although in the embodiment described above as an example, at least the drill head 22 is moved to and fro in relation to the brush body holder 18, it is not excluded to move the brush body holder 18 to and fro in order to carry out the boring operation, while the drill head 22 is arranged in a fixed manner. Also a boring operation which is carried out by moving the brush body holder 18 to and fro, as well as the drill head 22, is within the bounds of possibility.

[0036] The method of the invention can be easily derived from the above-described operation of the boring device 17.

[0037] The invention is by no means limited to the above-described embodiments given as an example and represented in the accompanying drawings; on the contrary, such a method and device for manufacturing brushes is limited only by the claims.

Claims

1. Method for manufacturing brushes whereby openings (3) for bundles of fibers (5) are provided in a brush body (2), to which end the brush body (2), while it is placed in a positionable brush body holder (18), is being presented to a boring tool (19), whereby a single drive element (24) is provided which can relatively move the boring tool (19) and the brush body holder (18) to and fro in relation to each other according to the boring direction in order to carry out the boring operation, **characterized in that** a control unit (26) is provided for controlling the above-mentioned drive element (24), such that during each boring cycle, a boring movement, as well as a depth compensation as a function of the position taken by the positionable brush body holder (19), is realized.
2. Method according to claim 1, **characterized in that** the boring tool (19), or at least a drill head (22) thereof, is provided on a carriage (25) which is moved by means of the above-mentioned drive element (24).
3. Method according to claim 1 or 2, **characterized in that**, for the drive element (24), use is made of an electric drive element (24), more particularly a controllable positioning motor.
4. Method according to any of the preceding claims, **characterized in that** the immediate speed of the above-mentioned relative to-and-fro movement of the boring tool (19) in relation to the brush body holder (18) is set by means of the control of the drive element (24).
5. Method according to any of the preceding claims, **characterized in that** the above-mentioned control of the drive element (24) provides for a depth compensation which takes the relative positioning of the brush body (2) in relation to a drill head (22) into account.
6. Device for manufacturing brushes, in particular according to the method of any one of claims 1 to 5, whereby this device comprises at least a boring device (17) and whereby this boring device (17) in turn at least consists of a positionable brush body holder (18) and a boring tool (19), whereby a single drive element (24) is provided which can relatively move the boring tool (19) and the brush body holder (18) to and fro in relation to each other according to the

boring direction so as to carry out a boring operation, **characterized in that** the device is further provided with a control unit (26) controlling the above-mentioned drive element (24), such that during each boring cycle, a boring movement, as well as a depth compensation as a function of the position taken by the positionable brush body holder (19), is realized.

7. Device according to claim 6, **characterized in that** the boring tool (19), or at least its drill head (22), can be moved to and fro by means of a carriage (25), whereby this carriage (25) is controlled by the above-mentioned drive element (24). 10
8. Device according to claim 6 or 7, **characterized in that** the drive element (24) consists of a controllable positioning motor. 15
9. Device according to any one of claims 6 to 8, **characterized in that** the drive element (24) consists of an electric drive element. 20
10. Device according to any one of claims 6 to 9, **characterized in that** the drive element (24) consists of a servomotor of the rotating or linear type. 25

Patentansprüche

1. Verfahren zur Herstellung von Bürsten, wobei in einem Bürstenkörper (2) Öffnungen (3) für Faserbündel (5) angebracht werden, zu welchem Zweck der Bürstenkörper (2), während er in einer positionierbaren Bürstenkörperhalterung (18) plaziert ist, einem Bohrwerkzeug (19) vorgelegt wird, wobei ein einziges Antriebselement (24) vorgesehen ist, welches das Bohrwerkzeug (19) und die Bürstenkörperhalterung (18) relativ in Bezug zueinander gemäß der Bohrrichtung hin- und herbewegen kann, um den Bohrvorgang auszuführen, **dadurch gekennzeichnet, dass** eine Steuereinheit (26) zur Steuerung des vorgenannten Antriebselements (24) vorgesehen ist, sodass während jedes Bohrzyklus sowohl eine Bohrbewegung als auch eine Tiefenkompensation in Funktion der von der positionierbaren Bürstenkörperhalterung (19) eingenommenen Position verwirklicht wird. 30 35 40 45
2. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** das Bohrwerkzeug (19), oder mindestens ein Bohrkopf (22) davon, auf einem Schlitten (25) angebracht ist, der mittels des vorgenannten Antriebselements (24) bewegt wird. 50
3. Verfahren nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** für das Antriebselement (24) von einem elektrischen Antriebselement (24) Gebrauch gemacht wird, spezieller einem steuerbaren 55

Einstellmotor.

4. Verfahren nach einem der vorgenannten Ansprüche, **dadurch gekennzeichnet, dass** die augenblickliche Geschwindigkeit der vorgenannten relativen Hin- und Herbewegung des Bohrwerkzeugs (19) in Bezug auf die Bürstenkörperhalterung (18) mittels der Steuerung des Antriebselements (24) eingestellt wird. 5
5. Verfahren nach einem der vorgenannten Ansprüche, **dadurch gekennzeichnet, dass** die vorgenannte Steuerung des Antriebselements (24) für eine Tiefenkompensation sorgt, welche die relative Positionierung des Bürstenkörpers (2) in Bezug auf einen Bohrkopf (22) berücksichtigt. 10
6. Vorrichtung zur Herstellung von Bürsten, spezieller gemäß dem Verfahren nach einem der Ansprüche 1 bis 5, wobei diese Vorrichtung mindestens eine Bohrvorrichtung (17) umfasst und wobei diese Bohrvorrichtung (17) an sich mindestens aus einer positionierbaren Bürstenkörperhalterung (18) und einem Bohrwerkzeug (19) besteht, wobei ein einziges Antriebselement (24) vorgesehen ist, welches das Bohrwerkzeug (19) und die Bürstenkörperhalterung (18) relativ in Bezug zueinander gemäß der Bohrrichtung hin- und herbewegen kann, um einen Bohrvorgang auszuführen, **dadurch gekennzeichnet, dass** die Vorrichtung weiter mit einer Steuereinheit (26) versehen ist, die das vorgenannte Antriebselement (24) steuert, sodass während jedes Bohrzyklus sowohl eine Bohrbewegung als auch eine Tiefenkompensation in Funktion der von der positionierbaren Bürstenkörperhalterung (19) eingenommenen Position verwirklicht wird. 15 20 25 30 35 40 45
7. Vorrichtung nach Anspruch 6, **dadurch gekennzeichnet, dass** das Bohrwerkzeug (19), oder mindestens sein Bohrkopf (22), mittels eines Schlittens (25) hin- und herbewegt werden kann, wobei dieser Schlitten (25) durch das vorgenannte Antriebselement (24) gesteuert wird. 50
8. Vorrichtung nach Anspruch 6 oder 7, **dadurch gekennzeichnet, dass** das Antriebselement (24) aus einem steuerbaren Einstellmotor besteht. 55
9. Vorrichtung nach einem der Ansprüche 6 bis 8, **dadurch gekennzeichnet, dass** das Antriebselement (24) aus einem elektrischen Antriebselement besteht. 60
10. Vorrichtung nach einem der Ansprüche 6 bis 9, **dadurch gekennzeichnet, dass** das Antriebselement (24) aus einem Servomotor vom rotierenden oder linearen Typ besteht. 65

Revendications

1. Procédé pour fabriquer des brosses, par lequel on prévoit des ouvertures (3) pour des faisceaux de fibres (5) dans un corps de brosse (2), à l'effet duquel le corps de brosse (2), lorsqu'il est placé dans un support orientable de corps de brosse (18), est présenté à un outil de forage (19), par lequel on prévoit un élément d'entraînement unique (24) qui peut mettre en oeuvre un déplacement relatif de l'outil de forage (19) et du support de corps de brosse (18) l'un par rapport à l'autre dans un mouvement alternatif conformément à la direction de forage dans le but de mettre en oeuvre l'opération de forage, **caractérisé en ce qu'on** prévoit une unité de commande (26) qui commande l'élément d'entraînement (24) mentionné ci-dessus, de telle sorte qu'au cours de chaque cycle de forage, on met en place un mouvement de forage ainsi qu'une compensation de profondeur en fonction de la position prise par le support de corps de brosse orientable (19). 5 10
2. Procédé selon la revendication 1, **caractérisé en ce que** l'outil de forage (19), ou au moins une tête de forage (22) de ce dernier, est prévu sur un chariot (25) qui se déplace au moyen de l'élément d'entraînement susmentionné (24). 15 20
3. Procédé selon la revendication 1 ou 2, **caractérisé en ce que**, pour l'élément d'entraînement (24), il est fait usage d'un élément d'entraînement électrique (24), plus particulièrement d'un moteur d'orientation réglable. 25 30
4. Procédé selon l'une quelconque des revendications précédentes, **caractérisé en ce que** la vitesse immédiate du mouvement alternatif relatif mentionné ci-dessus de l'outil de forage (19) par rapport au support de corps de brosse (18) est réglé au moyen de la commande de l'élément d'entraînement (24). 35 40
5. Procédé selon l'une quelconque des revendications précédentes, **caractérisé en ce que** la commande susmentionnée de l'élément d'entraînement (24) procure une compensation de profondeur qui prend en compte le positionnement relatif du corps de brosse (2) par rapport à une tête de forage (22). 45
6. Dispositif de fabrication de brosses, en particulier conformément au procédé selon l'une quelconque des revendications 1 à 5, par lequel ce dispositif comprend au moins un dispositif de forage (17) et par lequel ce dispositif de forage (17) est constitué à son tour au moins par un support de corps de brosse orientable (18) et par un outil de forage (19), par lequel on prévoit un élément d'entraînement unique (24) qui peut soumettre à un déplacement relatif l'outil de forage (19) et le support de corps de brosse (18) dans un mouvement alternatif l'un par rapport à l'autre conformément à la direction de forage de façon à mettre en oeuvre une opération de forage, **caractérisé en ce que** le dispositif est muni en outre d'une unité de commande (26) qui commande l'élément d'entraînement susmentionné (24), de telle sorte qu'au cours de chaque cycle de forage, on met en place un mouvement de forage ainsi qu'une compensation de profondeur en fonction de la position prise par le support de corps de brosse orientable (19). 5 10
7. Dispositif selon la revendication 6, **caractérisé en ce que** l'outil de forage (19) ou au moins sa tête de forage (22) peut effectuer un mouvement alternatif au moyen d'un chariot (25), ce chariot (25) étant commandé par l'élément d'entraînement susmentionné (24). 15 20
8. Dispositif selon la revendication 6 ou 7, **caractérisé en ce que** l'élément d'entraînement (24) est constitué d'un moteur d'orientation réglable. 25 30
9. Dispositif selon l'une quelconque des revendications 6 à 8, **caractérisé en ce que** l'élément d'entraînement (24) est constitué d'un élément d'entraînement électrique. 35 40
10. Dispositif selon l'une quelconque des revendications 6 à 9, **caractérisé en ce que** l'élément d'entraînement (24) est constitué d'un servomoteur de type rotatif ou de type linéaire. 45 50 55



