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(54) **Sweeping apparatus, method for producing a sweeping apparatus, and cleaning apparatus**

(57) The invention relates to a method for manufacturing a sweeping apparatus provided with brush elements. Brush elements and a disc provided with receiving elements are herein provided. A brush element is placed in a receiving element and is herein supported in the longitudinal direction. At least two brush elements

are fixed substantially in one work operation. The invention is characterized by arranging the brush element in the receiving element in a direction substantially transversely of the longitudinal direction of the brush element, and fixing by engaging the brush elements in a transverse direction. The receiving elements are open in the cross-section.

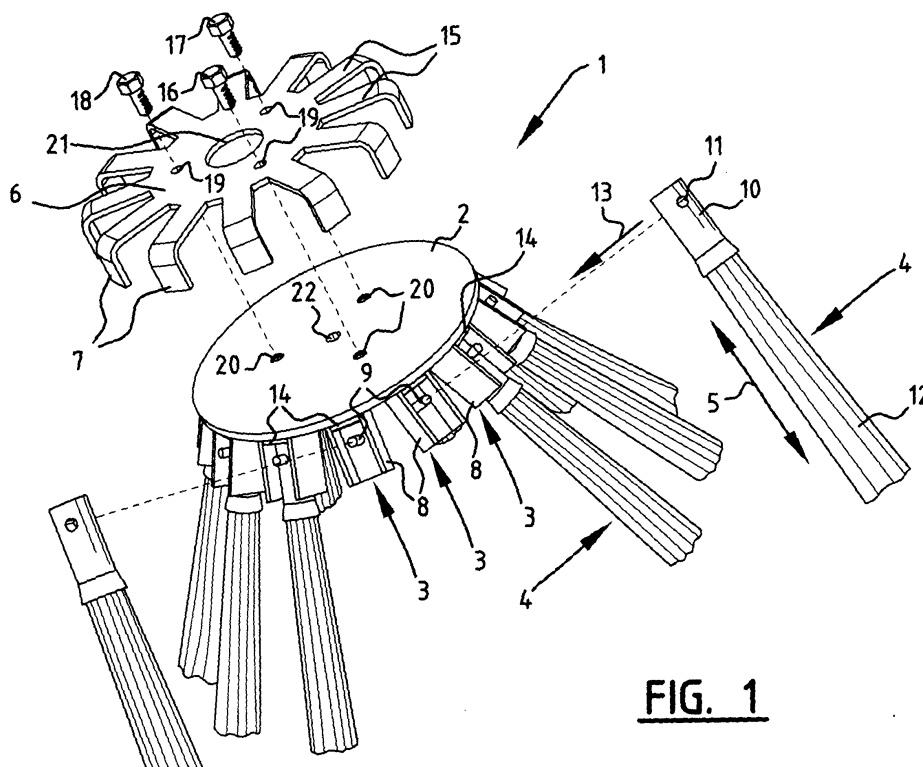


FIG. 1

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Description

[0001] The invention relates to a method for manufacturing a sweeping apparatus provided with brush elements, comprising of providing brush elements and a disc provided with receiving elements, placing a brush element in a receiving element, supporting the brush element in the longitudinal direction of the brush element and fixing at least two brush elements substantially in one work operation. The invention also relates to a sweeping apparatus for a sweeping machine, for instance for removing dirt from a surface.

[0002] Such a method is known from DE 39 37 053. Shown herein is a disc which is provided with recesses having the brush elements accommodated therein, wherein the brush elements can be fixed in the disc by closing the disc on the top with a cover disc.

[0003] A drawback of this disc is that the brush elements must be arranged through the disc and received in the disc from one side. Space to allow insertion of the brush element must therefore be created on the insertion side of the disc. In addition, the brush elements must be moved through the disc when they have to be replaced. Through use however, the brush elements are frayed and no longer fit through the relevant recess. The invention has for its object to provide a sweeping apparatus wherein a number of brush elements can more easily be arranged and fixed in one work operation. Another object of the invention is to enable easy removal of brush elements.

[0004] This object is achieved according to the invention by arranging the brush element in the receiving element in a direction substantially transversely of the longitudinal direction of the brush element, and fixing by substantially engaging the brush elements in a direction substantially transversely of the brush elements. A transverse direction is a direction at generally right angles to the longitudinal direction of the brush element. By engaging in a transverse direction of the brush element a longitudinal side of the brush element is engaged. The preferably elongate brush element can hereby be placed in the receiving element by displacing the brush element substantially in a transverse direction thereof. Space is hereby saved and arranging or replacing of the sweepers becomes easier. The arranging of the brush elements has the advantage compared to the prior art that they can also be replaced easily. By engaging on a longitudinal side of the brush element, this element can also be removed from the receiving element in a transverse direction and replaced.

[0005] At least two brush elements are fixed by engaging, in particular clamping, the brush elements in the transverse direction. This transverse direction will often correspond with the placing direction. This engagement results in fixing of the brush element in the receiving element. A number of brush elements can be placed before the brush elements are fixed. Instead of a receiving element, other means can also be used for partly orient-

ing and fixing a number of brush elements. Suitable as receiving element is any means which partly orients and/or supports a brush element.

[0006] It is noted that it is known from NL 1002801 to receive brush elements in a receiving element, wherein the brush elements are inserted from the bottom in a lengthwise direction, and wherein a single brush element is fixed by means of a stop member.

[0007] A brush element consists for instance of a bundle of wires with a sleeve. The metal or plastic sleeve is accommodated in the receiving element. The wire bundle consists for instance of pieces of steel cable.

[0008] Brush elements are preferably fixed by engaging at least two brush elements substantially in one work operation in a direction in the plane of the disc, preferably a radial direction of the disc. The receiving elements are arranged along the periphery of the disc. The substantially transverse direction of the placed brush elements then corresponds with the plane, preferably a radial direction, of the disc. The received brush elements in the receiving elements are enclosed and fixed on a radial side.

[0009] A recess which is arranged in the brush element is preferably pushed over a pin lying in a receiving direction. The brush element is hereby fixed in the receiving elements in a lengthwise direction, and the brush element can only be arranged in the receiving elements in a transverse direction. The pin co-acts with a recess in for instance the sleeve of the brush element. Sliding of the brush elements onto the pins has the result that the brush elements are received in the receiving elements and that they cannot be removed from the receiving elements in the lengthwise direction. This is particularly advantageous when the disc is situated in a horizontal position and the brush elements protrude obliquely herefrom. Gravity exerts a force on the brush elements, which force is directed out of the receiving elements. The pins prevent this. All brush elements can be received in the receiving elements, and then fixed in one work operation.

[0010] The invention also relates to a sweeping apparatus for a sweeping machine, for instance for removing dirt from a surface, comprising a disc which is provided with at least two receiving elements arranged distributed over the periphery thereof for holding fast at least one brush element, and at least one engaging means for engaging at least two brush elements, wherein the receiving element and the engaging means can co-act so that the engaging means can hold at least two brush elements in at least two receiving elements.

[0011] According to the invention the engaging means can engage on the brush element in a direction at least substantially transversely of the lengthwise direction of the brush element. The preferably elongate brush element can hereby be placed in the receiving element in a direction transversely of the lengthwise direction of the brush element, and subsequently be engaged and fixed. The engaging means holds at least two

brush elements. It hereby becomes possible to replace the brush elements quickly and hold the brush elements fixedly in the receiving element by fixing the engaging means. Because the brush element can be removed from the receiving element in a direction transversely of the lengthwise direction, the brush elements can be removed and/or replaced rapidly.

[0012] The receiving element preferably comprises at least one supporting means which can support the brush element in at least a longitudinal direction of the brush element. The position of the brush element in the receiving element is hereby supported in longitudinal direction.

[0013] It is favourable to provide the receiving element with an orienting means for substantially guiding the brush element in a receiving direction of the receiving element. The brush element can hereby be received in the receiving element in a specific manner. The receiving direction of the receiving element is hereby determined. It is usual to receive the brush elements with the sleeve in the receiving element and to have the wire bundle protrude, preferably at an angle, from the disc.

[0014] The receiving element preferably has a U-profile. Such a profile is open on one side. This is the side along which the brush element is received in the receiving element. According to the invention the open side runs substantially parallel to the longitudinal direction of the brush elements for receiving, so that they can be placed in the receiving element with a movement transversely of the longitudinal direction.

[0015] The engaging means can preferably engage on a remote radial side of the brush element. When the sweeping apparatus is used for sweeping, the radial upright side of the receiving elements is the side on which the least forces will be exerted, and this is thereby particularly suitable as an engaging/holding means. In addition, use can be made of the space available in the radial direction to arrange the engaging means.

[0016] The engaging means preferably comprise a second disc which is provided with at least one flange for engaging on at least two brush elements. The second disc can lie on the first disc and, with the flange, lie over the edge of the first disc so that an engaging means is formed in the radial direction. The flange prevents the brush elements received in the receiving elements from possible release from the receiving element. The position of the brush elements is hereby locked.

[0017] The second disc can preferably be placed on the first disc and the flange is an all-round standing edge. An all-round standing edge can be used instead of arms as flange. Such a construction is very strong, whereby the great forces which can occur during sweeping can be absorbed.

[0018] It is advantageous that the engaging means can engage on the side of the brush element situated on the open side of the U-profile. The open side of the U-profile is hereby closed and the brush element is held fast in the receiving element.

[0019] The supporting means is preferably a pin. The receiving element is preferably provided with a pin lying substantially in a receiving direction. The conical or square pin can hereby co-act with a correspondingly formed recess in the sleeve of the brush element, whereby the pin, when the brush element is placed over the pin in a direction transversely of the longitudinal direction, prevents the brush element being able to shift in the longitudinal direction. A plurality of brush elements can hereby be placed in the receiving elements, wherein they are held in these receiving elements, wherein the pin prevents gravity from causing the brush elements to drop out of the receiving elements. The pin is used to guide the brush element to their position, wherein the direction of arrangement of the brush element in the receiving element is in fact controlled.

[0020] According to an embodiment the brush element is provided with a sleeve in which a recess is arranged which can co-act with the pin. The recess in the sleeve in any case has a directional component transversely of the longitudinal direction of the brush element.

[0021] According to a further embodiment, the receiving element has a receiving direction for the brush element which forms a sharp, not right angle with the plane of the disc.

[0022] The invention also relates to a cleaning vehicle provided with a sweeping apparatus according to the invention.

[0023] The invention will be further described with reference to the annexed drawings, in which:

- figure 1 shows a perspective view of a sweeping apparatus according to a first embodiment of the invention,
- figure 2 shows a perspective view of a second embodiment of a sweeping apparatus according to the invention,
- figure 3 shows a partly cut-away sweeping apparatus according to the second embodiment of the invention.

[0024] Sweeping apparatus 1 comprises a disc 2 to which is attached a number of receiving elements 3. Receiving elements 3 can be connected to the disc at a for instance acute angle, for instance by welding. Arranged over the periphery of the disc are several receiving elements 3 which are oriented obliquely outward. Such a form is usual for sweeping apparatus which can be used to clean a surface, in particular for a sweeping apparatus of a sweeping machine. The sweeping machine is for instance a vehicle for cleaning the street or removing weeds in a park and the like.

[0025] A brush element 4 comprises a sleeve 10 with a recess 11. A known brush element 4 consists of a piece of steel cable, i.e. a piece of cable consisting of strands of steel wire twisted together. Other brush elements known to the skilled person can also be used.

[0026] Brush element 4 has a longitudinal direction 5.

Steel cables 12 extend in the longitudinal direction. On an outer end is arranged the sleeve 10 in which the cables are received. Such an element is also known as a tuft.

[0027] Receiving element 3 has a U-shaped profile 8 of substantially rectangular form with two standing walls. Such a profile is suitable for receiving both a round sleeve 10 and a rectangular sleeve of brush element 4. Sleeve 10 is tubular and has a diameter which is smaller than the receiving space in U-shaped profile 8. Pin 9 arranged in the receiving element can co-act with recess 11 in the sleeve, so that sleeve 10, and therewith the brush element 4, is placed over pin 9 as according to arrow 13. The receiving direction 13 lies transversely of the longitudinal direction 5 of brush element 4.

[0028] When disc 2 is held in an active position, i.e. substantially horizontally, brush elements 4 will hang loosely downward in receiving elements 3, wherein pin 9 prevents the brush elements dropping downward, i.e. being able to shift in the longitudinal direction of the brush element.

[0029] Receiving element 3 is also provided with a rear wall 14 arranged in the longitudinal direction of the receiving element transversely of the standing sides of U-profile 8. Rear wall 14 forms a support during placing of sleeve 10 in receiving element 3 in the longitudinal direction 5. The co-action which takes place between U-shaped profile 8, pin 9 and a rear wall 14 has the result that brush elements 4 stand away at an angle to disc 2, thereby forming a usual sweeping apparatus 1. The invention also relates however to other embodiments.

[0030] The brush elements 4 received in receiving elements 3 are fixed by means of the second disc 6. In the embodiment of figure 1 this disc 6 has a number of arms 15 provided with flanges 7. The number of arms 15 corresponds to the number of receiving elements 3. The width of flange 7 corresponds to the open space of U-profile 8. Arranging of the second disc 6 on disc 2 results in flanges 7 engaging in transverse direction of brush element 4, which is thereby fixed in the receiving element. The flange engages on a longitudinal side of the sleeve of the brush element and herein presses in a direction transversely of the longitudinal direction of brush element 4. There can be instead an engagement or clamping with an engaging means on a longitudinal side of elongate brush element 4. Fixing is here substantially understood to mean limiting of the freedom of movement of brush element 4 in the six directions of movement.

[0031] Flange 7 engages on sleeve 10. The diameter of disc 2 is smaller than the diameter of disc 6, so that flanges 7 engage over the edge of disc 2 and can lie against sleeve 10.

[0032] According to the embodiment of figure 1, the second disc 6 is fastened with three bolts 16, 17, 18 provided with spring means, wherein the bolts engage through the respective recesses 19 in disc 6 and can be screwed into recesses 20 in disc 2. The springs (not

shown, for instance a coil spring) are arranged so that flange 7 is held up when tufts are changed. Disc 6 is thus not fixed rotatably to disc 2. A drive motor (not shown) in a sweeping machine can engage on recess 22 of disc 2 through the recess 21 in disc 6, whereby the sweeping apparatus 1 can be rotated and can be used to sweep surfaces.

[0033] According to the embodiment of figure 1, receiving element 3 already limits the freedom of movement of brush elements 4 in five directions, and only a disc 6 is required to clamp or fix brush element 4.

[0034] Numerous other embodiments are possible. It is possible to work with two half discs corresponding to second disc 6. The first half of the brush elements can hereby be fixed while the other brush elements can be removed. A connection other than a screw connection of the second disc to the disc is possible. It is also possible to place the second disc on the underside of the first disc, wherein the arms of the disc protrude outward between receiving elements 3 and engage round the open side of the U-profile of the receiving element. The U-profile opening can also be oriented radially inward.

[0035] It is also possible to rotate the receiving elements according to the invention a quarter-turn or a half-turn relative to disc 2 compared to the embodiment shown in figure 1. The brush elements are then still arranged in the receiving elements in a direction transversely of the longitudinal direction 5, and an engaging means in the form of a disc 6 can be used to limit the last degree of freedom.

[0036] The invention combines two aspects, viz. fixing of a plurality of brush elements 4 in one work operation, for instance screwing on the second disc 6, and receiving of the brush elements 4 in the receiving element in a transverse direction 13, whereby less work space is necessary for replacing the brush elements.

[0037] Sleeve 10 is a tubular sleeve with a substantially round cross-section. Such a sleeve shape can be received in the substantially rectangular shape of receiving elements 3 and engaged with the second engaging means 6.

[0038] Figure 2 shows a second embodiment of the invention wherein brush elements 30 with a substantially rectangular sleeve 31 provided with a recess 32 are placed in receiving elements 33. The arranging of sleeve 31 in receiving elements 33 greatly limits the freedom of movement of brush element 30. Pin 34 co-acts with recess 32, whereby brush element 30 is supported in the longitudinal direction 35 when it is placed in receiving element 33. Receiving element 33 has a U-shaped profile in which the sleeve 31 can be received. A rear wall 36 is once again arranged in the U-shaped profile. Brush elements 30 are received in the receiving elements by means of a movement 37 transversely of longitudinal direction 36.

[0039] According to the embodiment of figure 2, pin 34 lies perpendicularly of the longitudinal direction of the fixed brush elements. It is however possible for the pin

to lie at an angle which is not a right angle.

[0040] The receiving elements are connected to a disc 38, which is provided around the centre with a standing edge 39 provided with a screw thread 40. This screw thread can co-act with screw thread 41 on the second disc 42. Second disc 42 is provided with a flange 43 extending over the whole periphery. Mounting of second disc 42 on first disc 38 through the co-action of screw threads 40 and 41 causes the flange 43 to engage over the edge of disc 38 on brush elements 30 arranged in receiving elements 33. All brush elements are fixed in one work operation in a direction transversely of the longitudinal direction 35 of the brush elements. The direction of engagement by flange 43 lies transversely of the longitudinal direction of the brush element. The flange clamps on a longitudinal side of the brush element.

[0041] In addition to the screw connection, a further clamping connection can be arranged between the two discs 38 and 42, whereby the second disc cannot come loose from the first disc 38.

[0042] Figure 3 shows disc 42 mounted on disc 38, wherein the edge 39 is visible. Shown is the manner in which flange 43 extends over disc 38 and engages on a side of the sleeve 31 lying parallel to the longitudinal axis 35 of brush element 30. The engaged side or fixed side of sleeve 31 is situated radially outward from disc 38.

[0043] Use of a disc 42 with a flange 43 ensures a good clamping of brush elements 30 in the receiving elements, since such a disc with flange has a considerable rigidity. Such a disc can withstand great forces.

[0044] According to an embodiment (not shown), the second disc can also be arranged on the underside of the first disc, wherein the openings of U-shaped profiles 33 are rotated 180° and point inward.

[0045] This engaging means for fixing brush elements 30 in receiving elements 33 can be designed in many different ways. In each case however, more than one brush element is fixed in receiving elements.

Claims

1. Method for manufacturing a sweeping apparatus provided with brush elements, comprising of providing brush elements and a disc provided with receiving elements, placing a brush element in a receiving element, supporting the brush element in a longitudinal direction of the brush element and fixing at least two brush elements substantially in one work operation, **characterized in that** the method further comprises arranging the brush element in the receiving element in a direction substantially transversely of the longitudinal direction of the brush element, and fixing by engaging the brush elements in a transverse direction.

2. Method as claimed in claim 1, **characterized by** fixing brush elements by engaging at least two brush elements in a radial direction substantially in one work operation.

3. Method as claimed in claim 1 or 2, **characterized by** sliding a recess in the brush element onto a pin lying in a receiving direction in the receiving element.

4. Sweeping apparatus for a sweeping machine, for instance for removing dirt from a surface, comprising a disc which is provided with at least two receiving elements arranged distributed over the periphery thereof for holding fast at least one brush element, and at least one engaging means for engaging at least two brush elements, wherein the receiving element and the engaging means can co-act so that the engaging means can hold at least two brush elements in at least two receiving elements, **characterized in that** the engaging means can engage in a direction at least substantially transversely of the lengthwise direction of the brush element.

5. Sweeping apparatus as claimed in claim 4, **characterized in that** the receiving element comprises at least one supporting means which can support the brush element in at least a longitudinal direction of the brush element.

6. Sweeping apparatus as claimed in claim 4 or 5, **characterized in that** the receiving element comprises an orienting means for substantially guiding the brush element in a receiving direction of the receiving element.

7. Sweeping apparatus as claimed in any of the claims 4-6, **characterized in that** the receiving element has a U-profile.

8. Sweeping apparatus as claimed in any of the claims 4-7, **characterized in that** the engaging means can engage on a remote radial side of the brush element.

9. Sweeping apparatus as claimed in any of the claims 4-8, **characterized in that** the engaging means comprise a second disc which is provided with at least one flange for engaging on at least two brush elements.

10. Sweeping apparatus as claimed in claim 9, **characterized in that** the second disc (6) can be placed on the first disc, and the flange is an edge raised all round.

11. Sweeping apparatus as claimed in at least claim 7, **characterized in that** the engaging means can en-

gage on the side of the brush element situated on the open side of the U-profile.

12. Sweeping apparatus as claimed in at least claim 5, **characterized in that** the supporting means is a pin. 5

13. Sweeping apparatus as claimed in claim 12, **characterized in that** the brush element is provided with a sleeve in which is arranged a recess which can co-act with the pin. 10

14. Cleaning vehicle provided with a sweeping apparatus as claimed in any of the claims 4-13. 15

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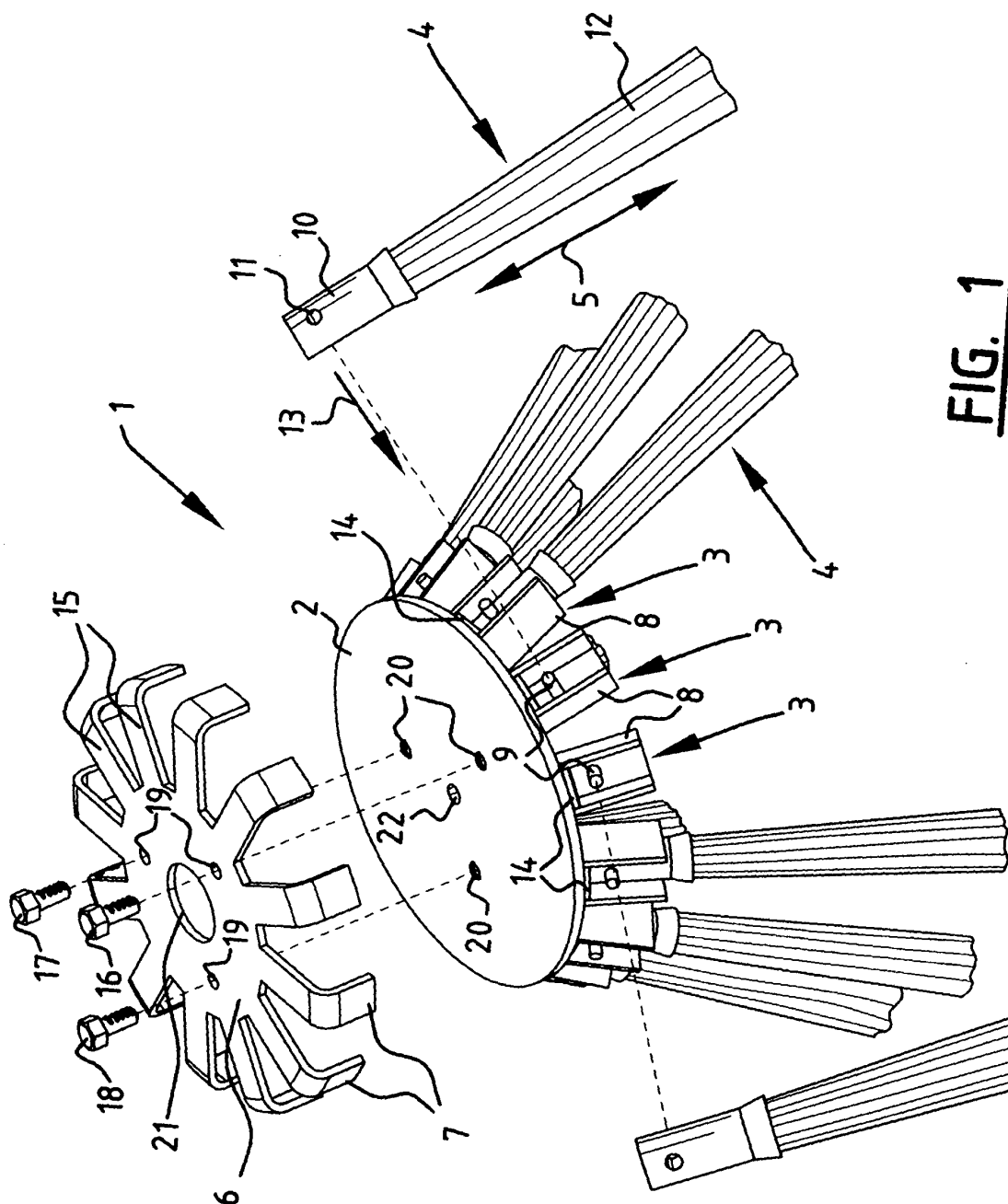


FIG. 1

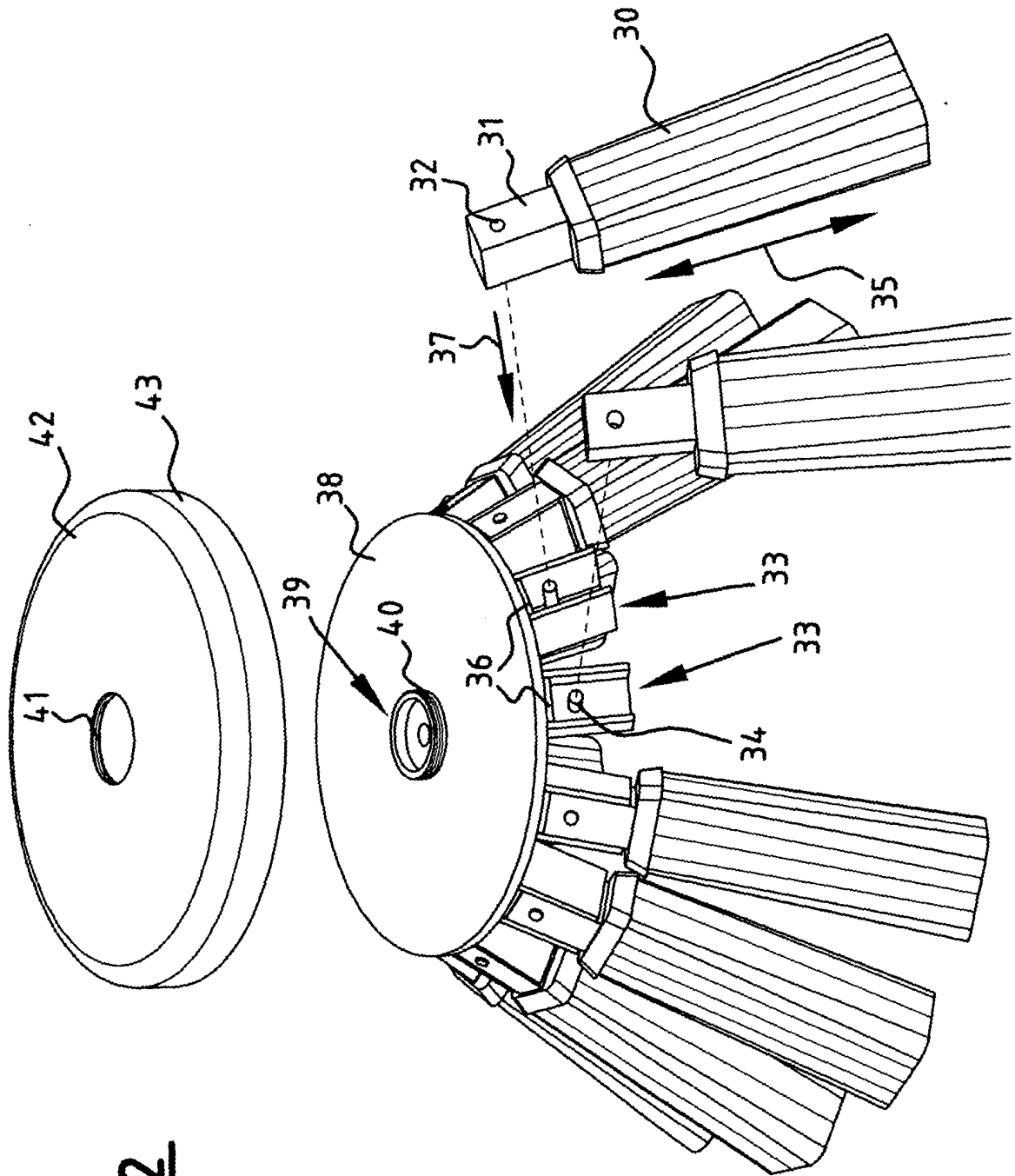


FIG. 2

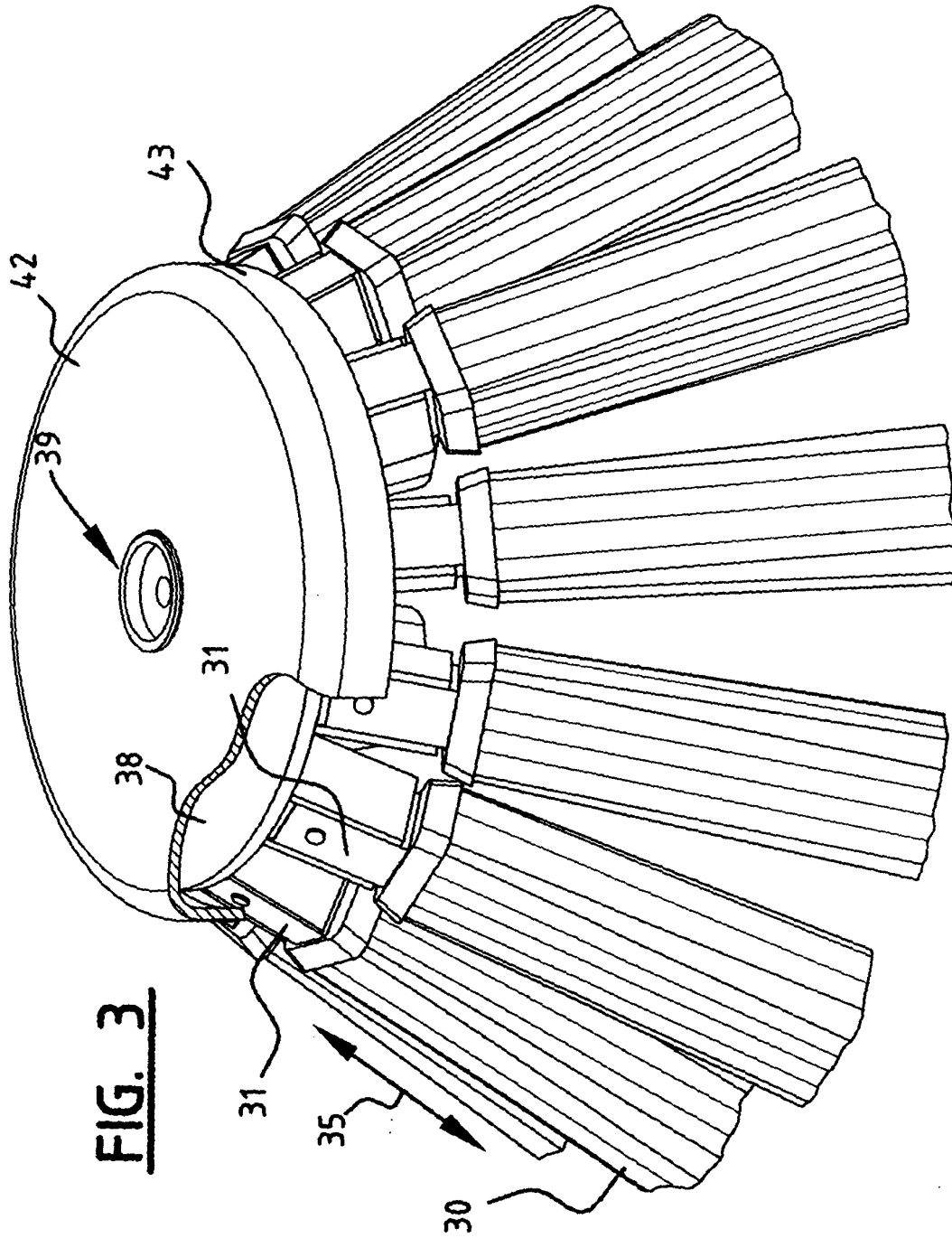


FIG. 3



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EUROPEAN SEARCH REPORT

Application Number
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The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 4 February 2004	Examiner Triantaphillou, P
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention 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			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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