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(54) Method and machine to produce needle-shaped foliage

(57) Method to produce artificial needle-shaped foliage (34) of the type comprising at least two longitudinal wires (16) twisted together so that, between the spirals defined thereby, a plurality of transverse filaments (35) are retained, able to simulate needle-shaped leaves, said method providing to use longitudinal wires (16) consisting of fibre rovings and comprising at least the following steps:

- said rovings (16) are impregnated with polymerizable resin (19);
- said rovings (16) are positioned and cut to size and said transverse filaments (35) are interposed between every pair of super-imposed rovings (16);
- said rovings (16) are reciprocally twisted together and kept in a twisted position;
- the resin (19) impregnating said rovings (16) is polymerized.

Machine to produce artificial needle-shaped foliage achieving the method as above comprising, in co-ordinated co-operation, at least an assembly (11) to feed said rovings (16), an assembly (12) to impregnate said rovings (16) with polymerizable resin (19), a making up assembly (13) and an assembly (14) to polymerize the resin (19) impregnating said rovings (16).

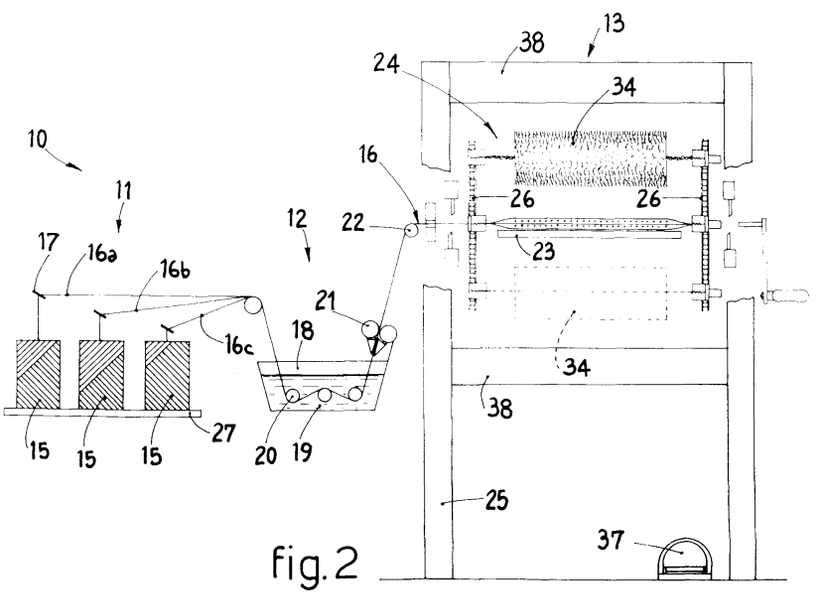

fig.2

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Description

FIELD OF THE INVENTION

[0001] This invention concerns a method and a machine to produce artificial needle-shaped foliage which is completely transparent to radio frequencies, as set forth in the respective main claims.

[0002] The artificial needle-shaped foliage according to the invention is used particularly, if not exclusively, to produce artificial trees used to camouflage antennas or other similar installations.

BACKGROUND OF THE INVENTION

[0003] The state of the art includes artificial trees used particularly, though not exclusively, to camouflage antenna poles or similar.

[0004] Among the different types of artificial tree proposed there are those able to reproduce conifers, wherein the artificial needle-shaped foliage is obtained substantially with the same technology used to make bristle-type cleaners used to clean the inside of bottles, or the barrels of firearms.

[0005] For this particular application, however, instead of two metal wires twisted together, which could interfere with the signals transmitted/received by the antenna, two wires made of plastic material are used and, instead of the bristles, filaments of green plastic material are used, able to simulate the needle-shaped leaves.

[0006] The plastic filaments are retained by the spirals formed by the twisted wires and are made definitively solid to the latter by applying polymerizable resins.

[0007] This method has several disadvantages: in particular, it is difficult to apply the polymerizable resin to the two twisted wires.

[0008] The present Applicant has devised and embodied this invention to overcome these shortcomings and to obtain further advantages.

SUMMARY OF THE INVENTION

[0009] The invention is set forth and characterized in the respective main claims, while the dependent claims describe other innovative characteristics of the invention.

[0010] Purpose of the invention is to provide a method, and the relative machine, to produce artificial needle-shaped foliage, which will be simple, fast, economical and extremely functional.

[0011] Another purpose of the invention is to provide an efficient machine which will not occupy much space.

[0012] The artificial foliage to which the invention refers is of the type comprising two or more longitudinal wires twisted together in such a manner that, between the spirals defined thereby, a plurality of transverse filaments are retained, able to simulate needle-shaped leaves.

[0013] According to the invention, the longitudinal wires consist of rovings of fibre with high mechanical resistance, and the transverse filaments are made of plastic material.

[0014] In a preferential but not restrictive embodiment, the rovings are made of glass fibre which, apart from being very resistant, has limited weight and costs, a good chemical inertia and optimum compatibility with any type of polymerizable resin whatsoever.

[0015] To be more exact, the glass fibre and the resin are coupled together in a very homogeneous manner since the rovings exert substantially an action of absorption on the resin itself.

[0016] The method according to the invention comprises in sequence at least the following steps:

- the rovings are impregnated with polymerizable resin;
- the rovings are positioned and cut to size and the needle-shaped transverse filaments are interposed between every pair of super-imposed rovings;
- the rovings are reciprocally twisted together and kept in a twisted position;
- the resin used to impregnate the rovings is polymerized.

[0017] A machine according to the invention able to achieve said method comprises, in sequence, at least an assembly to feed the rovings, an assembly to impregnate the rovings with polymerizable resin, a making up assembly and an assembly to polymerize the resin.

[0018] According to one embodiment of the invention, the impregnation assembly comprises at least a container able to contain a defined polymerizable resin, inside which the rovings are made to pass before being sent to the making up assembly.

[0019] The making up assembly comprises at least a work plane on which both the rovings and the needle-shaped filaments (arranged orthogonal to the rovings) are laid and kept in a correct position.

[0020] The work plane is able to co-operate at least with cutting to size means, means to retain the ends of the cut rovings and means able to twist the cut rovings together.

[0021] The assembly to polymerize the resin comprises catalyzer means able to set off or accelerate the process of polymerization of the resin.

[0022] According to a variant, the resin used is of the type able to be polymerized by means of ultra-violet rays and the catalyzer means comprise sources of ultra-violet light.

[0023] According to a preferential embodiment of the invention, the polymerization assembly comprises a plurality of movable stations, each of which is able to temporarily retain a single article of made-up artificial needle-shaped foliage and to pass, following a defined path, in correspondence with the catalyzer means.

[0024] According to a variant of the invention, the path

is closed so that the zone where the products to be polymerized are made up and the zone where the polymerized products are to be discharged can possibly coincide in the same work position.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025] These and other characteristics of the invention will become clear from the following description, given as a non-restrictive example, of a preferential form of embodiment with reference to the attached drawings wherein:

Fig. 1 is a schematic side view of a machine according to the invention able to produce artificial needle-shaped foliage;
Fig. 2 is a part front view of the machine shown in Fig. 1;
Fig. 3 shows an enlarged detail of Fig. 2;
Fig. 4 is a schematic view of the artificial needle-shaped foliage made with the machine in fig. 1;
Fig. 5 is an enlarged section from A to A of Fig. 4;
Fig. 6 shows an enlarged detail of Fig. 4.

DETAILED DESCRIPTION OF PREFERRED FORM OF EMBODIMENT

[0026] The machine 10 according to the invention shown in the attached Figures is able to produce artificial needle-shaped foliage 34 of the type shown in Fig. 4, and will be described in more detail hereafter; it comprises in its essential parts a feed assembly 11, an impregnation assembly 12, a making up assembly 13 and a polymerization assembly 14.

[0027] The feed assembly 11 comprises a supporting frame 27 able to support a defined number of spools 15 of rovings 16 of fibres with high mechanical resistance such as, for example, glass fibre.

[0028] In this case three spools are provided, respectively 15a, 15b and 15c, each able to supply a respective roving 16a, 16b, 16c.

[0029] The rovings 16a-16c are sent through respective wire-guides 17 to the impregnation assembly 12 which comprises a tank 18 able to contain a polymerizable resin 19.

[0030] The tank 18 is equipped with guide elements 20 able to take the rovings 16 to be immersed in the resin 19 and with squeezer elements 21 able to eliminate from the rovings 16 emerging from the tank 18 any possible excess resin 19.

[0031] In this case, the resin 19 is of the type able to be polymerized, as will be described hereafter in more detail, by ultra-violet light.

[0032] The rovings 16 impregnated with resin 19 are then conveyed through guide and tensioning elements 22 to the making up assembly 13 which comprises a work plane 23.

[0033] The work plane 23 is able to co-operate, both on the right and on the left, with elements 28 to cut the rovings 16 to size, in this case two shears, and with a pair of counter-opposed grippers, or clamps, 29 able to retain the ends of the rovings 16 which have been cut to size.

[0034] In this case retaining elements 33 are also provided, in this case consisting of two superimposed jaws able to retain the ends of the rovings 16 of the spools 15 after the trailing end has been cut by the left cutting elements 28.

[0035] Each pair of counter-opposed grippers 29 is associated with a respective chain with rollers 26, which defines a desired, closed path, and is driven by a drive crown 30, keyed onto a motorized shaft 30a, and returned by a driven crown 31, which is keyed onto an idler shaft 31a.

[0036] The motorized shaft 30a is kinematically coupled with motor means which can be selectively activated step-wise by the operator by means of a pedal 37.

[0037] In this case, the shafts 30a and 31a are supported by a frame 25 which, according to a variant, can be regulated in width to allow to make up artificial needle-shaped foliage 34 of any length.

[0038] Above and below the chains 26 there is a plurality of lamps 32 able to emit ultra-violet rays so as to polymerize the resin 19 impregnated into the rovings 16.

[0039] The lamps 32 are covered by screens 38 able to prevent the ultra-violet light from spreading into the surrounding environment.

[0040] Each article of artificial foliage 34 made up on the work plane 23 is moved by the chains 26 for a complete lap of the polymerization assembly 14 so that the same operator can perform both the making up operations and also those to unload the polymerized finished product while still remaining in the same position.

[0041] According to a variant, the work plane 23, which is located at a height such as to allow the operator to perform the making-up and unloading operations in a sitting position, is movable so that it can assume a position of non-interference with the articles of artificial foliage 34 to be unloaded.

[0042] The machine according to the invention functions as follows.

[0043] The operator removes a first roving 16a arriving from the impregnation assembly 12 and positions it on the work plane 23 attaching it to the two counter-opposed grippers 29.

[0044] He then lays down a first layer 35a of needle-shaped filaments 35 arranging them transverse to the underlying roving 16a.

[0045] Having done this, the operator removes a second roving 16b, positions it above the layer 35a and attaches it to the two grippers 29 and then covers it with a second layer 35b of needle-shaped filaments 35.

[0046] At this point, the operator removes a third roving 16c and positions it above the second layer 35b taking care to attach it to the grippers 29 too.

[0047] At this point, he activates the left-hand cutting elements 28 and simultaneously cuts to size all three rovings 16.

[0048] By activating the right-hand cutting elements 28, on the contrary, the operator aligns the right-hand ends of the three rovings 16 with each other.

[0049] According to a variant, the left-hand and right-hand cutting elements 28 are able to be activated simultaneously.

[0050] At this point, the operator associates a crank 36 to one of the two grippers 29, in this case the right-hand one, and performs a pre-determined number of rotations which cause the three rovings 16a-16c to be twisted together, as shown in detail in Fig. 6.

[0051] Having done this, the operator removes the crank 36 from the gripper 29, moves the work plane 23 into the position of non-interference and, acting on the pedal 37, makes the chains 26 advance by one step.

[0052] Then, when the eventual finished article of artificial foliage 34 has been removed from the new pair of grippers 29 which is located in correspondence with the work plane 23, the operator can begin a new making up sequence.

[0053] It is obvious that modifications or additions may be made to this invention, but these shall remain within the field and scope thereof.

Claims

1. Method to produce artificial needle-shaped foliage (34) of the type comprising at least two longitudinal wires (16) twisted together so that, between the spirals defined thereby, a plurality of transverse filaments (35) are retained, able to simulate needle-shaped leaves, the method being characterized in that it provides to use longitudinal wires (16) consisting of fibre rovings and in that it comprises at least the following steps:

   - said rovings (16) are impregnated with polymerizable resin (19);
   - said rovings (16) are positioned and cut to size and said transverse filaments (35) are interposed between every pair of super-imposed rovings (16);
   - said rovings (16) are reciprocally twisted together and kept in a twisted position;
   - the resin (19) impregnating said rovings (16) is polymerized.

2. Machine to produce artificial needle-shaped foliage achieving the method as in Claim 1, the machine being characterized in that it comprises, in co-ordinated cooperation, at least an assembly (11) to feed said rovings (16), an assembly (12) to impregnate said rovings (16) with polymerizable resin (19), a making up assembly (13) and an assembly (14) to polymerize the resin (19) impregnating said rovings (16).

3. Machine as in Claim 2, characterized in that said feed assembly (11) comprises a supporting frame (27) able to support a defined number of spools (15) of rovings (16) and the same number of wire-guide elements (17).

4. Machine as in Claim 2, characterized in that said impregnation assembly (12) comprises at least a container (18) able to contain said polymerizable resin (19) and cooperating with guide and tensioning means (20) able to take said rovings (16) into immersion in said polymerizable resin (19) and squeezer means (21) located downstream of said container (18) and able to eliminate any possible excess resin (19) absorbed by the rovings (16).

5. Machine as in Claim 2, characterized in that said making up assembly (13) comprises at least a work plane (23) on which both said rovings (16) and said transverse filaments (35) are able to be laid and kept in the correct position.

6. Machine as in Claim 5, characterized in that said work plane (23) is able to co-operate with means (28) to cut the rovings (16) to size, with means (29) to retain the cut ends of said rovings (16) and with rotary means (36) able to twist together said rovings (16) which have been cut to size.

7. Machine as in Claim 5, characterized in that said rotary means comprise a crank (36) able to co-operate with said retaining means.

8. Machine as in Claim 5, characterized in that said work plane (23) is able to selectively assume a work position used during the making up of the artificial needle-shaped foliage (34) or a position of non-interference with the moving parts of the machine (10).

9. Machine as in Claim 2, characterized in that said polymerization assembly comprises flexible drawing means defining a plurality of stations each able to maintain in the correct position a single article of artificial needle-shaped foliage and catalyzer means (32) able to co-operate with said stations to set off or accelerate the process of polymerization of the resin (19) impregnating the rovings (16).

10. Machine as in Claim 8, characterized in that said flexible drawing means comprise a counter-opposed pair of chains (26) defining a closed path achieved by at least a motorized toothed crown (30) and by at least a driven toothed crown (31).

11. Machine as in Claim 8 and 9, characterized in that said stations are defined by means (29) to retain the cut ends of said rovings (16), said retaining means (29) being associated with the chains (26) in corresponding positions.

12. Machine as in Claim 8 and 9, characterized in that said catalyzer means (32) comprise ultra-violet lamps.

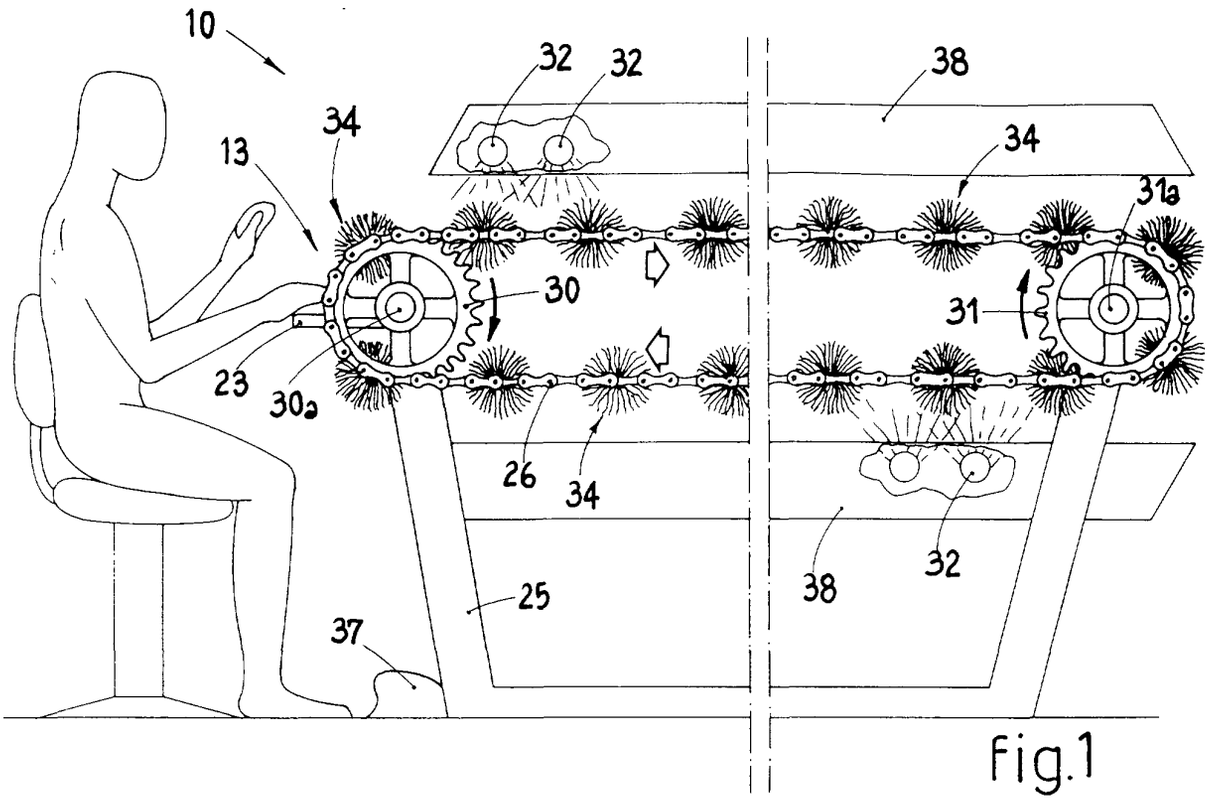
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Fig.1

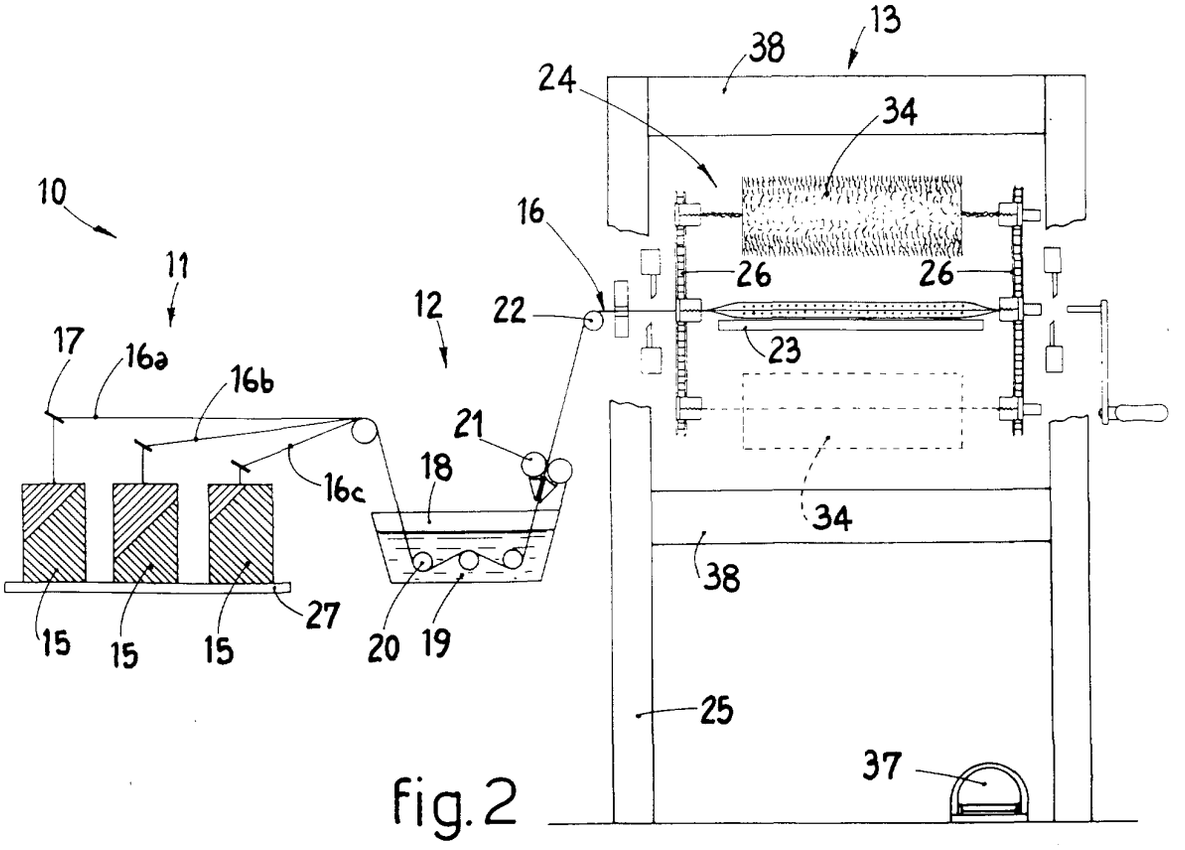
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Fig.2

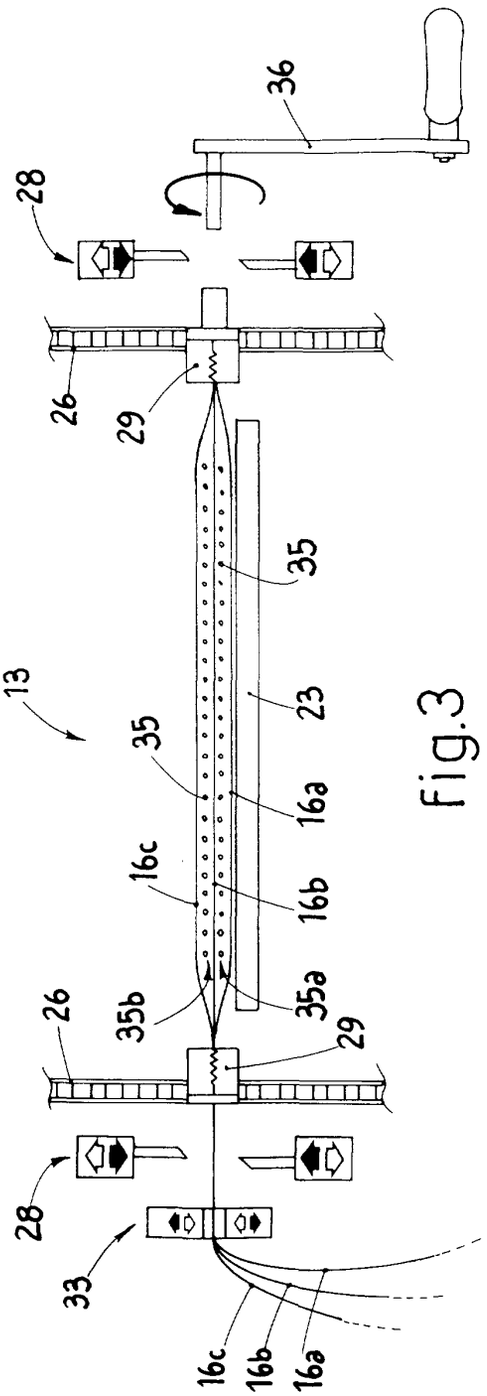

Fig.3

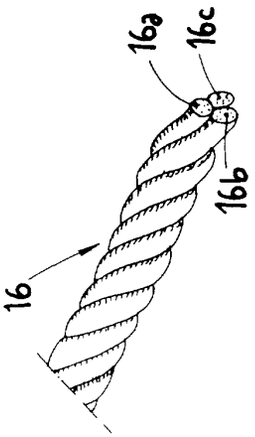

Fig.6

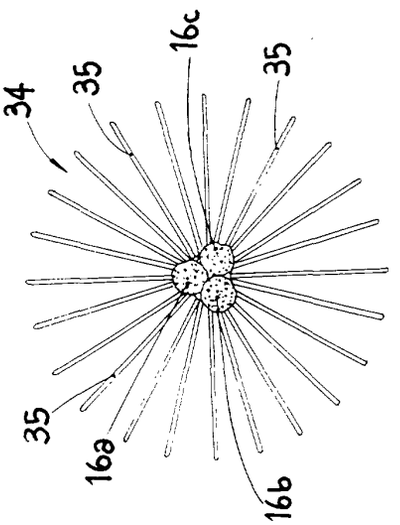

Fig.5

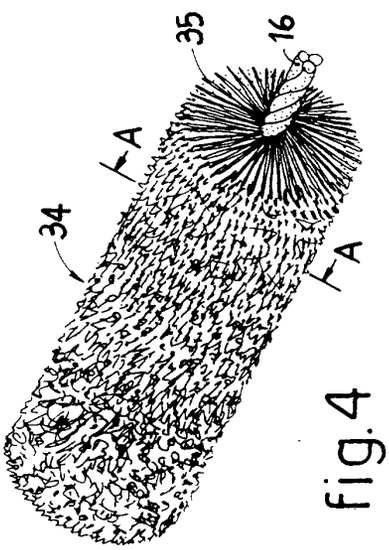

Fig.4

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 00 11 0066

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	US 4 789 571 A (KINDERMAN ABRAHAM S ET AL) 6 December 1988 (1988-12-06) * column 2, line 32 - line 35 * * column 3, line 53 - line 57 * * column 4, line 41 - line 48 *	1,2	A41G1/02 A46D3/05 A41G1/04 A47G33/06
A	GB 2 201 336 A (SWIFT THOMAS RICHARD) 1 September 1988 (1988-09-01) * page 2, line 22 * * page 4, paragraph 1 - paragraph 2; figure 2 *	1,2	
A	US 3 343 357 A (GOODRIDGE) 26 September 1967 (1967-09-26) * column 1, line 24 - line 27 * * column 1, line 46 - line 47 * * column 2, line 28 - line 29 *	1	
A	US 3 616 009 A (ROST LEE F ET AL) 26 October 1971 (1971-10-26) * claim 1; figure 1 *	1	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)
A41G A46D A47G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	27 October 2000	Monné, E

CATEGORY OF CITED DOCUMENTS

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27-10-2000

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4789571 A	06-12-1988	CA 1302704 A	09-06-1992
GB 2201336 A	01-09-1988	AU 1298888 A WO 8806418 A	26-09-1988 07-09-1988
US 3343357 A	26-09-1967	NONE	
US 3616009 A	26-10-1971	NONE	

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