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54 **Production of brushes.**

57 A method of making rotary driven brushes, particularly road-sweeping brushes, by arranging bunches of bristles (2) so that their one ends (2a) extend into a mould (3) for forming the brush base (1), and applying into the mould (3) around the ends (2a) of the bristles a quick-setting liquid plastics material, generally a micro-cellular elastomeric polymer material such as polyurethane foamed by adding water thereto, and allowing the plastics material to set to secure the brush base to the bristles.

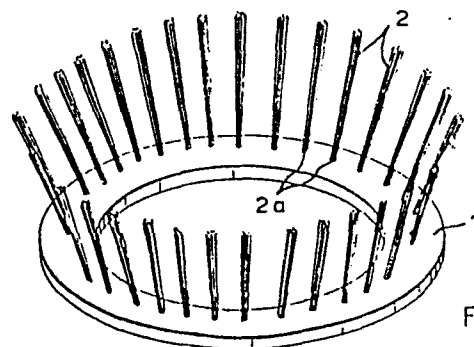


FIG. 1

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"PRODUCTION OF BRUSHES"

This invention relates to the production of rotary driven brushes. More particularly, the invention relates to the production of brushes for road-sweeping vehicles or any other mechanically driven rotary
5 sweeping machines.

Traditionally, brushes for road-sweeping vehicles (hereinafter referred to as road-sweeping brushes) have been manufactured by taking a plywood base in which are formed a series of holes for receiving bunches or tufts
10 of bristles, which are then folded through the holes and secured to the wooden base, for example by stapling.

More recently, a technique has been developed for producing road-sweeping brushes having a plastics, usually polypropylene, base and also having tufts of
15 plastics bristles, again usually of polypropylene. In this technique the tufts of bristles are so arranged that their one ends extend into an annular mould into which the polypropylene for forming the base is melted and applied and allowed to set around the bristles, thus
20 securing the bristles to the brush base. However, this method has the disadvantage that the polypropylene base material is only injected over a relatively small segment of the base mould, before being injected into an

adjacent mould segment, and so on until the base is completely formed.

This leads to two drawbacks, the first being that the process of forming the brush base around the
5 bristles takes a long time, perhaps one hour for forming a single base; and the second being that because of the batchwise nature of the base forming, areas of weakness or "cold/hot lines" are formed between the adjacent
batches or segments of polypropylene constituting the
10 completed base, as a result of which the brush is likely to crack at such areas of weakness. Road-sweeping brushes produced by this technique therefore have a high failure rate of about 5%.

We have attempted to overcome these disadvantages by
15 selecting a suitable material for the brush base which will set in a relatively short time and which permits the whole brush base to be formed in a single operation, and as a result the present invention has been accomplished.

20 Accordingly, the present invention in one aspect provides a method of making a rotary driven brush, comprising arranging bunches of bristles so that their one ends extend into a mould for forming the brush base, and applying into the mould around the said one ends of
25 the bristles a quick-setting liquid plastics material, and allowing the plastics material to set to secure the

brush base to the bristles.

The plastics material will be one which sets in a relatively short time, and is most suitably any elastomeric polymer material having a micro-cellular structure. A particularly suitable material has been
5 found to be polyurethane modified to be marginally foamed, for example by adding water thereto, but any other material meeting the requirement of quick setting may be used in the invention.

10 While polyurethane, or any other suitable material, is preferably caused to foam by adding water thereto, a micro-cellular structure may equally be obtained in other ways, for example by air injection or by filling the polymer material with low density articles such as
15 hollow glass spheres. Polyurethane in which slight foaming is induced by water absorption may suitably have a specific gravity of about 0.7.

In the method of the invention the plastics material flows easily and will set and harden around the bristles
20 in about 3 minutes, using a polyurethane as described above. Thus road-sweeping brushes and other rotary driven brushes can be produced much more quickly than hitherto, and in addition the whole brush base is manufactured in a single operation, whereby there are
25 avoided areas of weakness as occur in the road-sweeping brushes of the prior art. The bases of brushes

manufactured according to the invention thus have high impact resistance, leading to low failure rate.

The brush bristles may be suitably made of a plastics material, although of a material different from that of the plastics base, for example, polypropylene or nylon, but other thermoforming extrudable materials could be used. Alternatively, the bristles may be made of horsehair or wires for example.

While the method of the invention is particularly suitable for the production of brushes for road-sweeping vehicles, it will be apparent that the method is equally applicable to the production of brushes for other rotary sweeping machines, particularly mechanically driven rotary sweeping machines.

When the method of the invention is utilized for producing road-sweeping brushes, the base will be usually annular, with bunches of bristles extending obliquely outwards from the plane of the annular base.

In producing road-sweeping brushes there is provided an annular mould above which is arranged a jig for holding bunches of bristles at an oblique angle with their lower ends disposed within the mould. A suitable micro-cellular elastomeric polymer material is then filled into the mould and allowed to set and harden around the bristles, within a few minutes. The moulding is then removed from below the jig and placed in a

drying area, with the bristles supported by a drying jig which may be simply a circular hole of greater diameter than the base mould formed in a plate arranged above the mould. After drying, the completed brush is then
5 removed.

The invention will be further described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of a road-sweeping
10 brush made by the method according to the invention;

Figure 2 is a plan view of a mould for the base of a road-sweeping brush; and

Figure 3 is a schematic sectional view of an apparatus for producing a road-sweeping brush according
15 to the invention.

Figure 1 shows a road-sweeping brush produced according to the invention which comprises an annular base 1 foamed of micro-cellular elastomeric polymer material, e.g., polyurethane foamed by adding water
20 thereto, and bunches 2 of polypropylene bristles having their one ends 2a secured in the base 1 and being disposed so as to extend obliquely outwards from the base.

Although the bristles extend obliquely with respect
25 to the base as shown in Figure 1, it will be understood that the bristles may extend at any angle from

vertically upwards to radially outwards with respect to the base.

Such a brush may be suitably produced in the following manner, in which reference will be made to Figures 2 and 3. The bristles are arranged in bunches and their one ends 2a are applied onto a hot plate to fuse them together. The bunches 2 of bristles are then placed to be held by a jig (Figure 3) which comprises an annular plate 5 having therein a series of holes or other apertures 5a in which the bristles are placed with their lower ends 2a resting in an annular mould 3 (better shown in Figure 2). The jig 5 is supported in position by any suitable means 6. As shown in Figure 2, the mould 2 has four equiangularly spaced recesses 3a formed in its outer periphery, for forming spaces for receiving bolts when the finished brush is installed on a road-sweeping vehicle. The mould 3 also has four jig supports 4.

With the bristles thus in position as shown in Figure 3, the micro-cellular elastomeric polymer material is poured into the mould 3 and allowed to set and harden around the ends 2a of the bunches of bristles, which procedure takes a few minutes only. The polymer material also penetrates to some extent between the individual bristles of each bunch 2.

The moulding of the thus formed brush base 1 is then removed to a drying area. During the drying, the bristles may be conveniently supported by a drying jig (not shown) which may take any form but which is conveniently a plate with a single central aperture of greater diameter than the mould 3, against which aperture the bristles rest.

CLAIMS

1. A method of making a rotary driven brush, characterized by comprising arranging bunches of bristles (2) so that their one ends (2a) extend into a mould (3) for forming the brush base (1), and applying
5 into the mould around the said one ends of the bristles a quick-setting liquid plastics material, and allowing the plastics material to set to secure the brush base to the bristles.

2. A method as claimed in claim 1, characterized in
10 that the said quick-setting liquid plastics material is a micro-cellular elastomeric polymer material.

3. A method as claimed in claim 2, characterized in that the said micro-cellular elastomeric polymer material is a polyurethane foamed by adding water
15 thereto.

4. A method as claimed in any of claims 1 to 3, characterized in that the brush bristles are of a thermo-forming extrudable material.

5. A method as claimed in claim 4, characterized in
20 that the brush bristles are of polypropylene.

6. A method as claimed in any of claims 1 to 5, characterized in that the brush is a road-sweeping brush, and in that the brush base is formed in an annular mould.

7. A method as claimed in claim 6, characterized in that the brush bristles extend obliquely outwards from the plane of the annular base, and in that during the moulding of the base the bristles are held in a jig (5) disposed above the base mould, the said jig having a series of apertures (5a) therein for supporting the bristles.

8. A rotary driven brush comprising a brush base (1) having bunches of bristles (2) extending therefrom, characterized in that the said base has been formed around the ends (2a) of the bristles by applying a quick-setting liquid plastics material which is allowed to set to secure the brush base to the bristles.

9. A brush as claimed in claim 8, characterized in that the brush base is formed from a micro-cellular elastomeric polymer material.

10. A brush as claimed in claim 8 or 9, characterized by being a road-sweeping brush, and in that the brush base is annular.

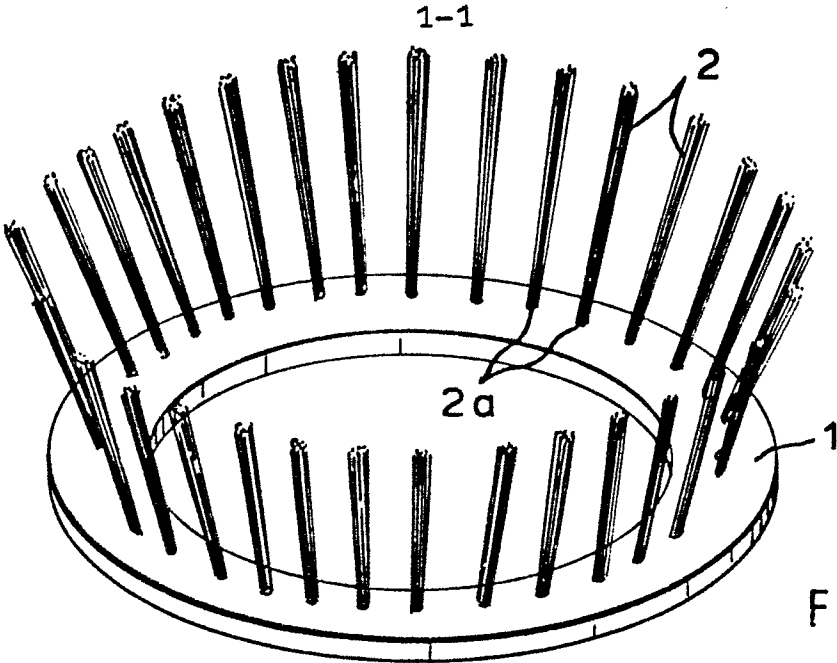


FIG. 1

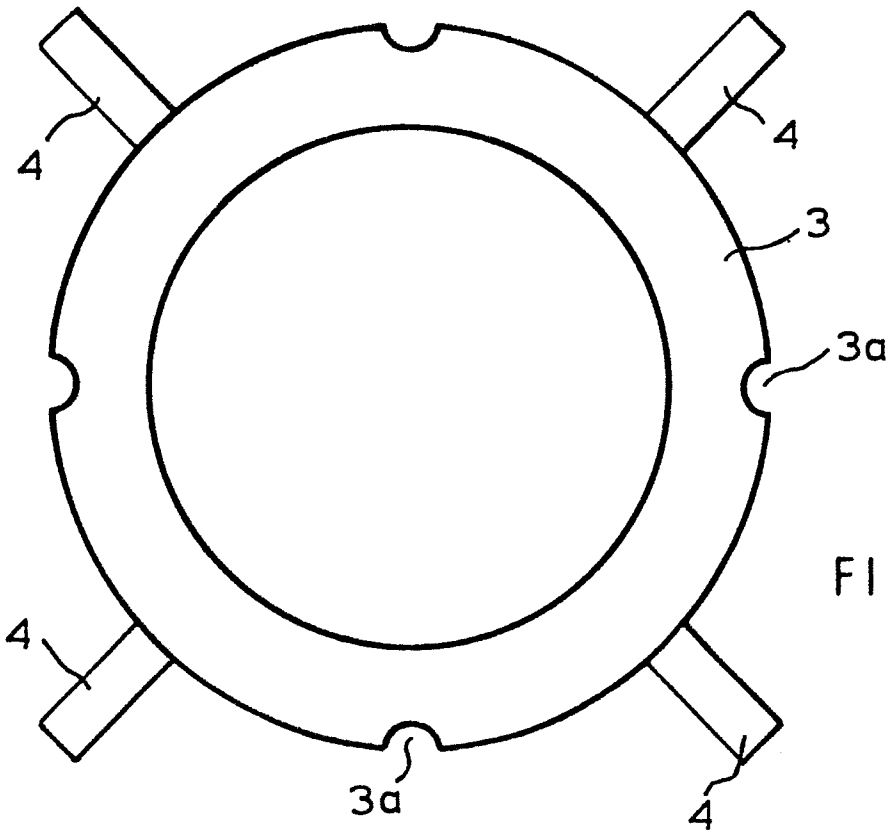


FIG. 2.

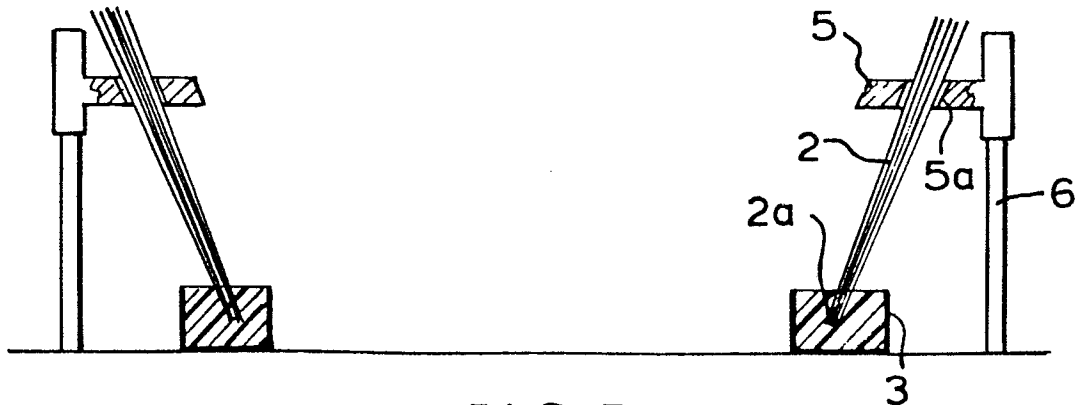


FIG. 3.