

12

EUROPEAN PATENT APPLICATION

21 Application number: 87202279.3

51 Int. Cl.4: **A46B 7/06** , B25G 3/38

22 Date of filing: 20.11.87

30 Priority: 28.11.86 NL 8603038

43 Date of publication of application:
01.06.88 Bulletin 88/22

84 Designated Contracting States:
AT BE CH DE ES FR GB GR IT LI LU NL SE

71 Applicant: **AKZO N.V.**
Velperweg 76
NL-6824 BM Arnhem(NL)

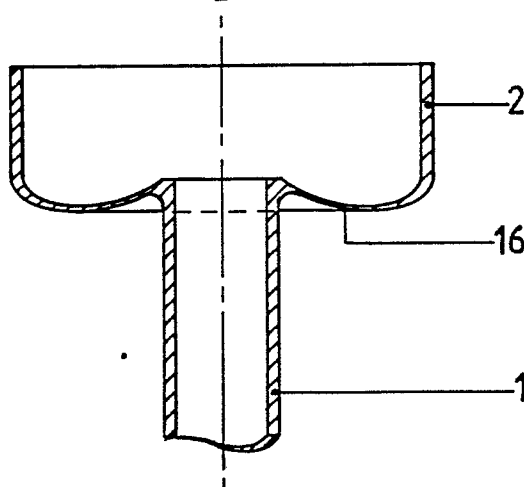
72 Inventor: **van Ommen, Albert**
Revelingseweg 58
NL-8191 KS Wapenveld(NL)

74 Representative: **Sieders, René et al**
AKZO N.V. Patents Department P.O. Box 314
NL-6800 AH Arnhem(NL)

54 **Light-to-handle paintbrush.**

57 The invention pertains to a paintbrush between the handle and the bristle holder of which there is provided a connection which is flexible in two or more directions. The paintbrush is light-to-handle and thicker coatings of paints can be applied with it. In a most preferred embodiment there is provided a transition piece between the bristle holder and the handle which is flexible in all directions, at least part of the bristle holder being sufficiently thin and the material chosen for it being an elastic polymer.

fig. 4



EP 0 269 182 A2

Light-to-handle paintbrush

The invention relates to a paintbrush comprising a handle and a bristle holder with bristles. Although paintbrushes have been in use for centuries, their embodiment has remained essentially unaltered. Even when in the manufacture of the handle and, optionally, the bristle holder use is made of modern materials, such as synthetic materials, the connection between the handle and the bristle holder will always be rigid, although for reasons of costs the wall thickness of these parts will be kept as thin as possible.

In US-A 4 127 296 is disclosed an extension holder for a paintbrush which envisages the use of the standard paintbrush at greater than arm's length with imitation of the flexible movement of the wrist. To this end the handle of a standard paintbrush is flexibly connected to the implement, with the handle being rigidly connected to the bristle holder to ensure proper functioning.

DE-C 482 051 discloses a radiator brush the handle of which may be attached to the bristle holder at different angles. In that case there is no question of the angle between the handle and the bristle holder varying during normal use.

During the use of a standard paintbrush with a rigid connection between the handle and the bristle holder, the bristles will take up such an angle to the surface to be painted as will vary with the pressure exerted by the painter with the brush on the surface to be treated. In the normal position in which the paintbrush is held in the hand, however, the angle of the brush bristles is larger than is desired, and the bristles meet with much resistance. Because of this, and especially when a relatively large brush is used and a relatively large amount of material is applied per unit of time, the painter and the painter's wrist in particular, will quickly be tired.

The invention has for its object to provide a paintbrush which is so light to handle that the use of the paintbrush will be less tiring and moreover thicker coatings of paint can be applied.

The paintbrush according to the invention is characterized in that between the handle and the bristle holder there is provided a connection which is flexible in two or more directions.

The flexible connection causes the angle of the bristles to the surface to be painted to become smaller than will be the case when using a conventional paintbrush with the same bristle length by which the same force is exerted. Also, when using the paintbrush according to the invention the maximum angle between the handle and the normal to the surface to be painted as well as the maximum angle between the surface to be painted and the part of the hand between the fingers and the wrist will be much smaller than when a conventional paintbrush is used. Finally, it has been found that when brushes are moved horizontally across a paint coated substrate of for instance steel, the transverse force exerted on a conventional paintbrush will be up to 23% higher than when a paintbrush according to the invention is used in an otherwise identical embodiment. As a result, the painter will become far less tired. Another advantage is that thicker layers of paint may be obtained. Yet another advantage is that it is easier to apply the paint, especially thicker kinds of paint such as chlorinated rubber paint or epoxy paint. Finally, the present paintbrush permits applying even lightly brushable kinds of paints, such as water-dilutable paints, in a thicker layer than with a conventional paintbrush.

It should be noted that in US-A 4 488 328 a toothbrush is disclosed of which the brush head is capable of limited pivotal movement about an axis transverse to the handle, in order to obtain maximum contact with the teeth for the brush bristles.

US-A 4 575 894 also discloses a toothbrush for brushing teeth according to a medically recommended technique, with which brush the teeth and gums may be cleaned thoroughly and also plaque may be removed. To this end a toothbrush is described which between the bristle holder and the remainder of the toothbrush has a resilient part which resists rotation of the bristle holder due to the forces exerted on the bristle holder with bristles during brushing.

The handle of the paintbrush may be made of any conventional material, usually wood or plastic (including elastomers), and have different cross-sections, for instance round, flat, or oval.

The bristle holder may be made of any suitable material, e.g. metal or some other material, for instance on the basis of a thermosetting or thermoplastic synthetic material. The bundle of bristles, as a rule, may be rectangular, square, round, oval or have some other cross-sectional shape. The length of the bristles outside the bristle holder usually is 1-10 cm and preferably 2-8 cm. The material of the bristles may also be of any conventional kind, such as animal hair, e.g. pig's bristles or horsehair, or a synthetic material, e.g. polyester or polyamide, and in the form of capillaries, if so desired.

According to the invention the flexible connection between the handle and the bristle holder may be formed by a hinged element in combination with leaf springs on either side of at least part of the bristle holder, which leaf springs are fixedly connected to the handle. In an alternative embodiment there are leaf

springs on either side of at least part of the handle, which leaf springs are fixedly connected to the bristle holder. The strength of the leaf springs may be selected in accordance with the desired degree of resilience of the flexible connection. The leaf springs may be made of any conventional material.

A preferred embodiment of the flexible connection consists in that the side of the bristle holder away from the bristles is embedded in or secured to a rubber-like material of the desired elasticity, which material may or may not also be connected directly to the handle. The rubber-like material is usually in the form of a block of a virtually rectangular cross-section, and it preferably possesses a Shore A hardness in the range of 10-80, more particularly of 20-70. The rubber-like material contains an elastomer which is resistant to organic solvents, for instance a fluorocarbon elastomer, a polyurethane, a polychloroprene or a polyisoprene, which may also contain the conventional additives.

The rubber-like material and the handle may be connected to each other in any suitable manner; for instance the rubber-like material may be provided with a cavity which contains the end of the handle, and which connection may be locked if so desired, for instance by means of a bolt and a screw. A preferred embodiment of the connection between the rubber-like material and the handle is formed by a non-flexible metal plate, one end of which is embedded in the rubber-like material and the other is held in the handle. A different embodiment of the connection between the rubber-like material and the handle consists of a clamp which is fixedly connected to the handle and grips the rubber-like material. A further, simple embodiment of the flexible connection between the handle and the bristle holder is formed by a flexible plate or strip. This may be made of any suitable material, for instance a metal or a plastic. An advantage of such constructions is that the bristle holder with bristles is easily exchangeable. If so desired, a flexible connection may be provided between the bristle holder and the handle in two or more places.

The most preferred embodiment of the paintbrush according to the invention is one in which the transition piece between the bristle holder and the handle is flexible in all directions, for instance because at least part of the bottom of the bristle holder can be chosen sufficiently thin and the material chosen for it is an elastic polymer. In this way a flexible hinge is formed between the bristle holder and the handle. As suitable elastic polymers may be mentioned polyurethanes, but preferably polyester elastomers such as copolyetheresters based on polybutylene terephthalate and polyalkylene oxide glycols such as polytetrahydrofuran and ethylene oxide-blocked polypropylene oxide glycols; polyester esterurethanes based on polybutylene terephthalate on the one hand and polycaprolacton and/or polybutylene adipate on the other, which parts are joined by ester and/or urethane bonds; and polyetherester amides. The polybutylene terephthalate part in the elastomers referred to above may optionally contain up to preferably 20 wt.% of polybutylene isophthalate. Said polyester elastomers are commercially available among others from Akzo Plastics under the trademark Arnitel. The above-envisaged elastomers generally have a Shore D hardness of 30-100 and preferably of 50-90. Use may with advantage be made of a copolyetherester composed of 80-92 wt.% of polybutylene terephthalate and 8-20 wt.% of polytetrahydrofuran terephthalate. An essential advantage of these elastomers consists in that they may be processed by injection moulding. These elastomers, moreover, are resistant to solvents and elevated temperatures and also possess excellent tear resistance and resistance to ageing by repeated flexural loading. As a further advantage may be mentioned that the polyester elastomers available can be chosen from a wide range of flexibility moduli, so that in the same mould paintbrushes of different flexibility may be manufactured.

Optionally, the envisaged embodiment permits manufacturing the handle integral with the bristle holder, but it is also possible for the handle to be attached to the bristle holder by means of, say, a screwed connection or a snap connection. Optionally, the edge of the bristle holder may be shaped in a conventional way, for instance so that the bundle of bristles attached to the bristle holder is exchangeable. Advantages to the above-envisaged embodiment are that the pivot of the flexible synthetic hinge is at the shortest possible distance from the bristle holder, the hinge is lightweight and forms a closed unit which is very easy to clean, and the stroke of the hinge is limited.

It is preferred that the synthetic hinge should be flexible to such an extent that when the bristle holder is clamped, a force of 20 N perpendicular to the handle applied at a distance of 20 mm from the hinge will bring about a displacement f (in mm) of the handle of at least $\frac{2,7}{d}$, with d representing the smallest diameter (in mm) of the handle in the plane of the hinge.

The paintbrush according to the invention is especially suited to be used for spreading brushable materials such as paint (including varnish, lacquer, and stain), bitumen, coal tar, carbolineum, glue, filler, and other materials. By the term "paintbrush" are also meant here paint brushes and square brushes which may or may not be equipped with a feeder channel.

The invention also relates to a process for applying paint to a substrate using a paintbrush according to the invention. The invention also relates to the painted substrate thus produced.

The invention will be illustrated with reference to the accompanying schematic drawing.

Figure 1 shows a longitudinal section of a paintbrush in a preferred embodiment.

Figure 2 shows a longitudinal section of a paintbrush in an alternative embodiment.

Figure 3 shows a longitudinal section of a so-called "Airlin brush" which has a feeder channel for the material which is to be applied by brush.

5 Figure 4 shows a longitudinal section of the bristle holder and the starting point of the handle at about actual size of the paintbrush most preferred.

Figure 1 shows a paintbrush comprising a handle 1 and a bristle holder 2 with bristles 3. A non-flexible steel plate 4 is fixedly connected to the handle 1 at one end and embedded in a block of rubber-like material 5 at the other. The material 5 is surrounded by and fixedly connected to a cap 6 which, in its turn, is fixedly connected to the bristle holder 2.

10 In Figures 2 and 3 the parts corresponding to the parts of the paintbrush according to Fig. 1 are referred to by like numerals. In the embodiment according to Fig. 2 the flexible connection between the handle 1 and the bristle holder 2 is formed by a flexible plate 7. This plate 7 has its one end fixedly connected to the handle 1 and has its other end fixedly connected to a screwed connection 8 which, in its turn, is fixedly connected to the bristle holder 2. In this embodiment the bristle holder 2 with the bristles 3 is exchangeable.

Fig. 3 shows a paintbrush in which the material to be brushed may be fed to the bristles 3 through a line 9 and a flexible line 10 and also through a hollow space (not shown) within the bristle holder 2. The transitions of the lines 9 and 10 and of the line 10 to the hollow space 2, respectively, are formed by two connectors 11 and by a coupling nut 12. The two blocks of rubber-like material 13 are fixedly connected to the handle 1 by means of fastening elements 14 and to the bristle holder 2 via a connecting piece 15.

15 In Figure 4 the parts corresponding to the parts of the paintbrush according to Fig. 1 are referred to by like numerals. A flexible connection 16 between the handle 1 and the bristle holder 2, with a thin wall thickness (0,8 mm) is shown here in its simplest and essential embodiment, viz. as a flexible diaphragm hinge made of a polyester elastomer. The shortened part of the handle 1 may of course be given the desired length, or be fitted with for instance a snap connection or a screwed connection to link it to the additional part of the handle, which may optionally be made of a different material. The bristle holder 2 may be provided in a known manner with a bundle of bristles which may be exchangeable or not (not shown here). It is possible, of course, for paintbrushes according to the invention to be provided with the bristle holder according to Fig. 4 having larger or smaller dimensions, for instance with a bristle holder which is about 10-20% smaller.

Example 1

35 Use was made of a brush according to Fig. 1 with as rubber-like material a fluorocarbon elastomer mixed with carbon black and having a Shore A hardness of 60 (available under the trademark Viton of Du Pont de Nemours). The bundle of bristles (length of bristles 6 cm) in the bristle holder was circular in cross-section (small round brush) and elliptical in cross-section (oval brush), respectively. With the two brushes 40 part of a wall was painted using a standard paint. Measured was the thickness of the coating of paint in the dry state. Also evaluated was the ease with which the paint could be applied. The experiments were carried out by experienced and inexperienced persons. The results are given in Table 1. For comparison the experiments were repeated using a conventional brush of identical weight but without the flexible connection between the handle and the bristle holder. It was found that everybody needed more time to carry out the 45 same task than they did when using brushes according to Fig. 1. The results are given in Table 2.

Table 1

	Round brush		Oval brush	
	Experienced user	Inexperienced user	Experienced user	Inexperienced user
Ease of application	good	excellent	excellent	good
Thickness of coating of paint (μm)	53	45	78	86

Table 2

	Conventional brush			
	Round brush		Oval brush	
	Experienced user	Inexperienced user	Experienced user	Inexperienced user
Ease of application	quite adequate	good	quite adequate	quite adequate
Thickness of layer of paint (μm)	32	35	42	67

Example 2

Example 1 using the small round brush was repeated, except that use was made of a paintbrush with the flexible diaphragm hinge according to Fig. 4 made of a copolyetherester composed of 88,7 wt.% of polybutylene terephthalate and 12,3 wt.% of polytetrahydrofuran terephthalate having a Shore D hardness of 74 (commercially available from Akzo Plastics under the trademark Arnitel 74 D). The results obtained with this paintbrush, as well as with a similar conventional paintbrush of identical weight but without the flexible diaphragm hinge are given in Table 3.

Table 3

	Flexible paintbrush		Conventional paintbrush	
	Experienced user	Inexperienced user	Experienced user	Inexperienced user
Ease of application	excellent	excellent	quite adequate	quite adequate
Thickness of layer of paint (μm)	56	51	29	37

35 **Claims**

1. A paintbrush comprising a handle and a bristle holder with bristles, characterized in that between the handle and the bristle holder there is provided a connection which is flexible in two or more directions.

40 2. A paintbrush according to claim 1, characterized in that the side of the bristle holder away from the bristles is embedded in or fixedly connected to a rubber-like material which is also connected to the handle.

3. A paintbrush according to claim 2, characterized in that the rubber-like material possesses a Shore A hardness in the range of 10-80.

45 4. A paintbrush according to claim 1, characterized in that the transition piece between the bristle holder and the handle is flexible in all directions.

5. A paintbrush according to claim 4, characterized in that the bristle holder is made of an elastic polymer.

6. A paintbrush according to claim 5, characterized in that the elastic polymer is a polyester elastomer.

50 7. A paintbrush according to claim 6, characterized in that the polyester elastomer is a copolyetherester composed of 80-92% by weight of polybutylene terephthalate and 8-20% by weight of polytetrahydrofuran terephthalate.

8. A paintbrush according to claim 1 having a bristle holder according to Fig. 4.

9. A process for applying paint to a substrate using a brush, characterized in that the brush used is a paintbrush according to any one of the claims 1-8.

55 10. A painted substrate made according to claim 9.

fig.1

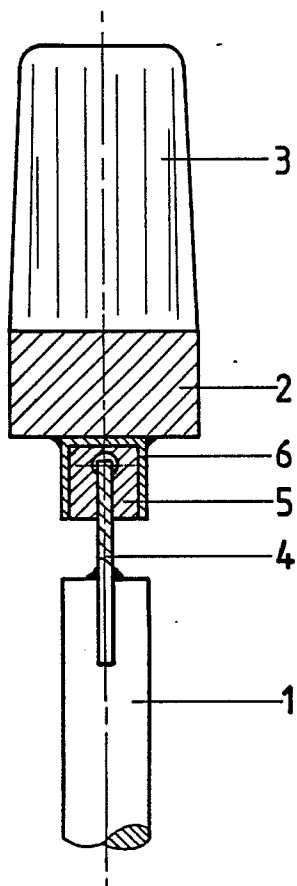


fig.2

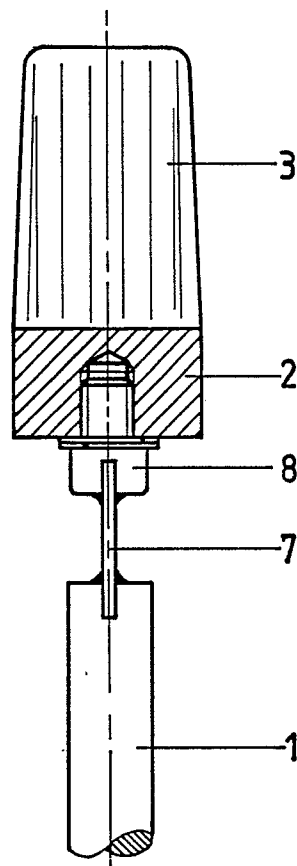


fig.3

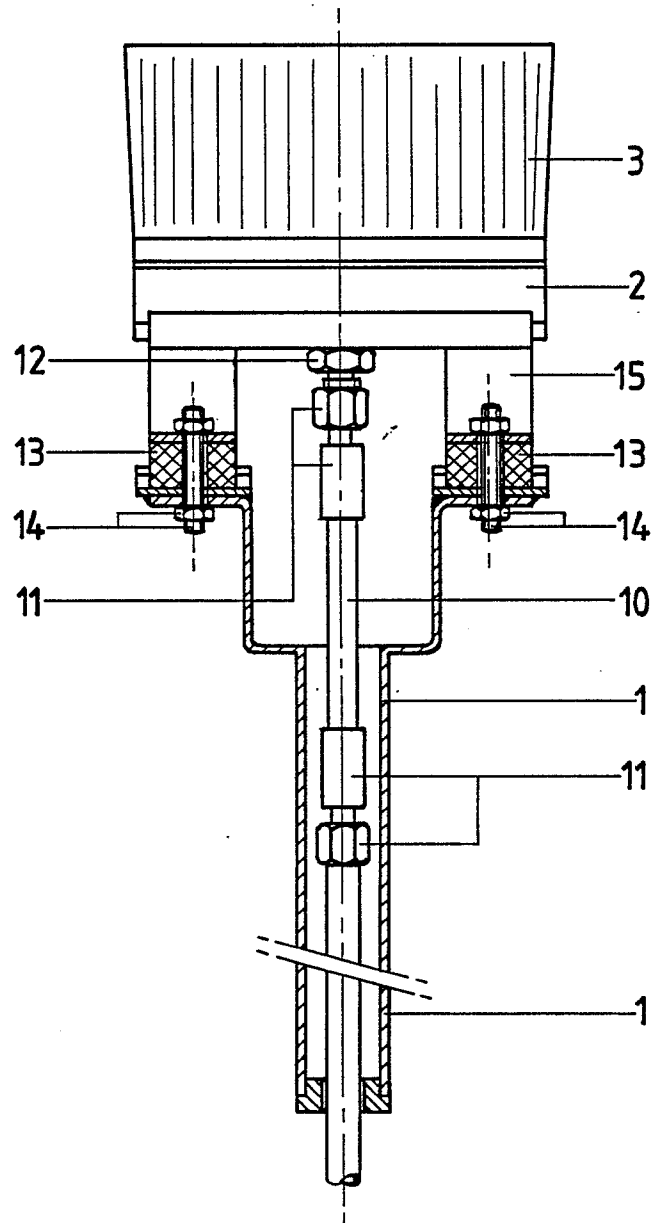


fig.4

