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(54) **MOP-HEAD**

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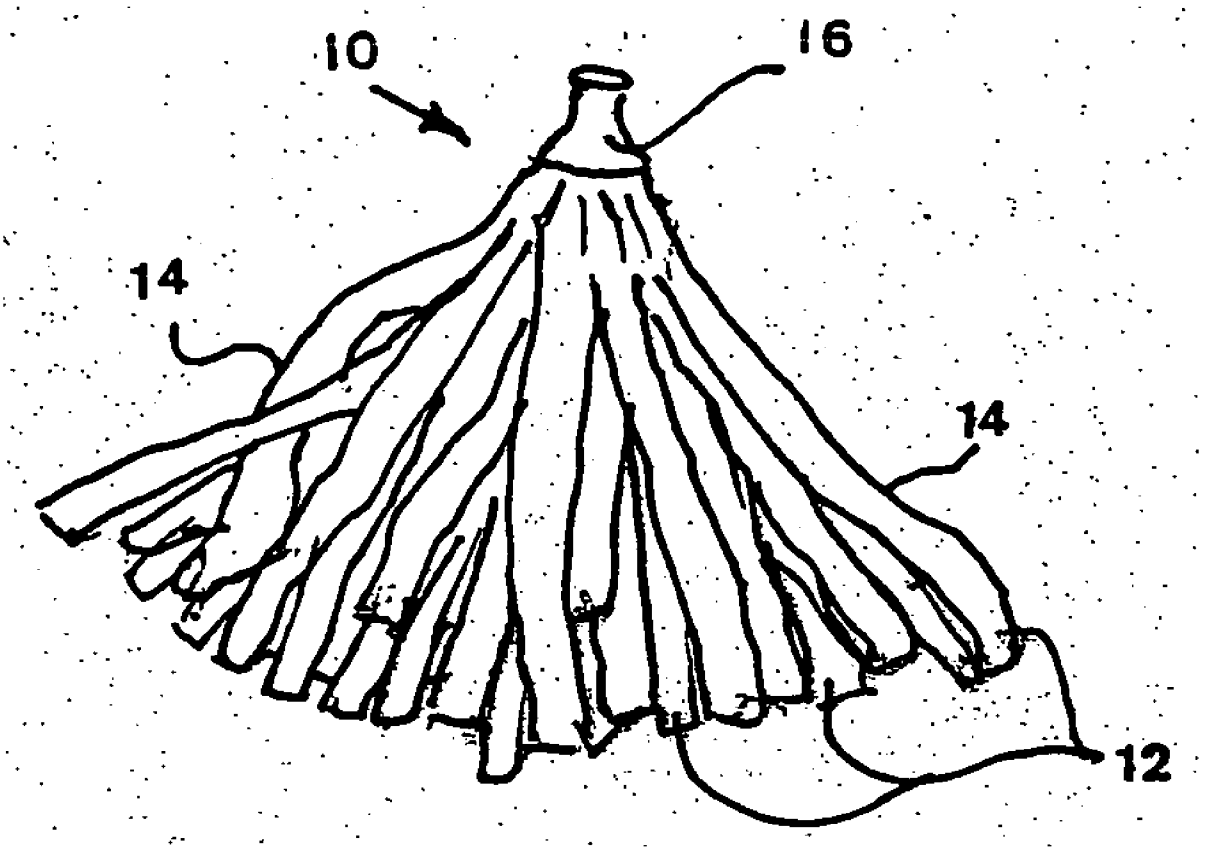
(57) **ABSTRACT**

The invention provides a mop head comprising a multiplicity of water-absorbing cloth strips, each strip being formed from a multiplicity of fiber yarns knitted together in an open array to form holes therebetween, the holes being oriented to maximize capillary action.



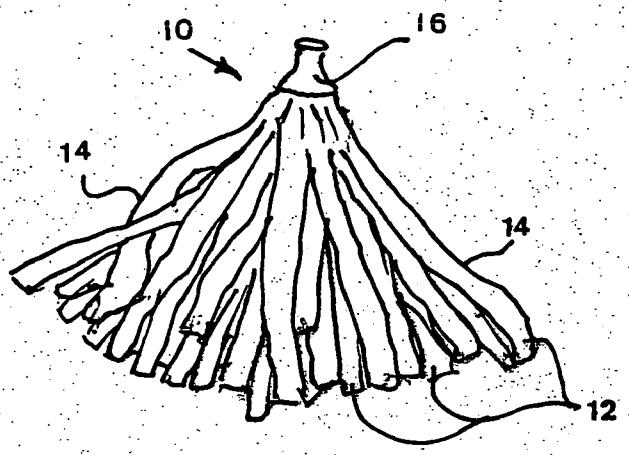

10
16
14
14
12

Fig.1

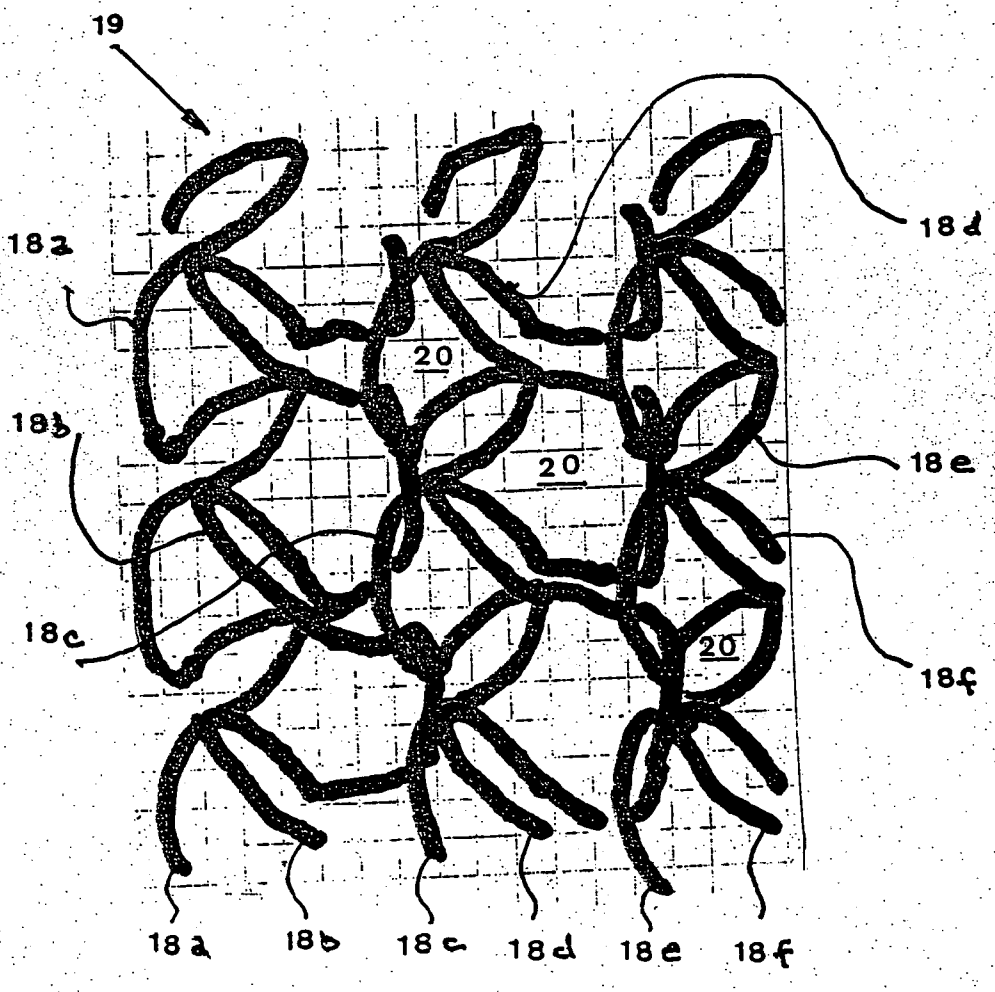

19
18a
18b
18c
18d
18e
18f
20
20
20
18a
18b
18c
18d
18e
18f

Fig.2

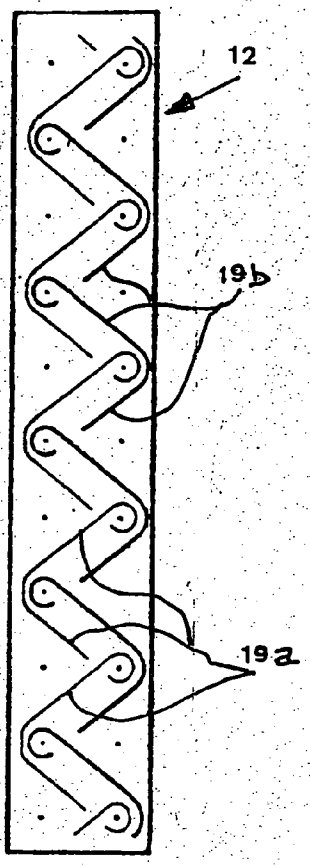


Fig. 3

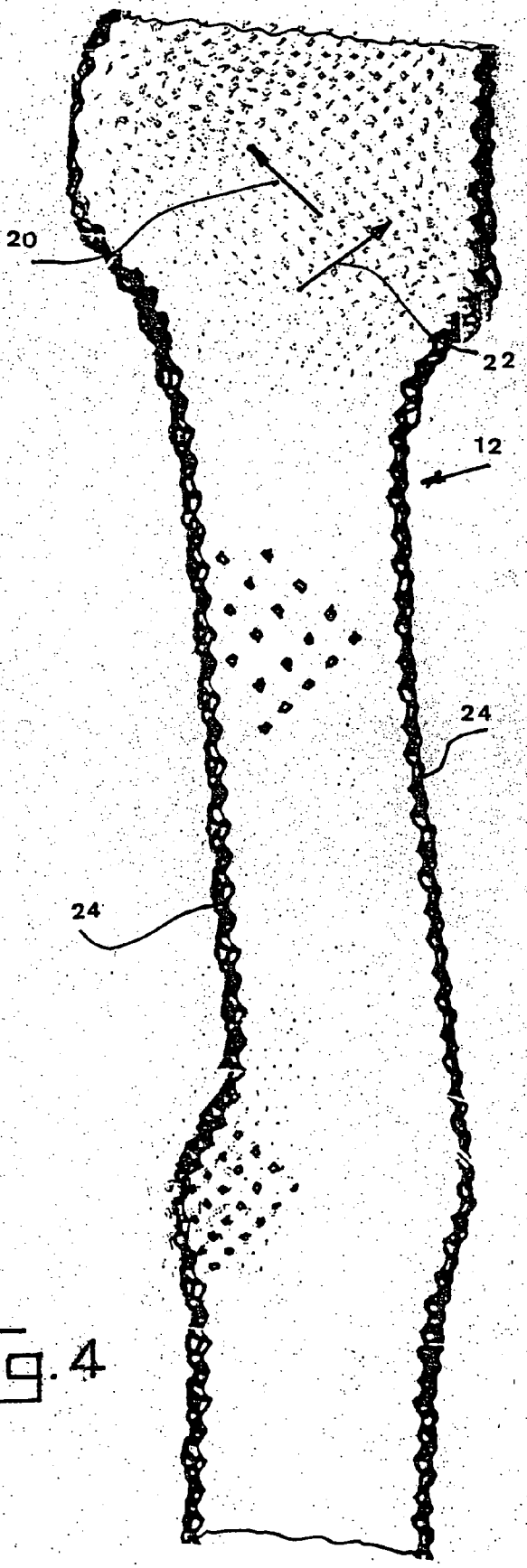


Fig. 4

MOP-HEAD

[0001] The present invention relates to floor cleaning implements. More particularly, the invention provides a durable mop head having high-absorbency for liquids.

[0002] A mop head is expected to meet a number of requirements, some of which have been found in practice to be contradictory to some extent. The material of the mop head must absorb liquids, collect solids, slide easily over a floor surface, resist the shedding of fibers while in use, readily release captured liquids when squeezed, withstand high-temperature washing, be durable and be manufacturable at a low cost.

[0003] In attempting to meet these varied requirements as far as is feasible many different fibers and different forms have been proposed, including heads which have two regions of different composition. A comprehensive review of the prior art is given by Kresse et al. in U.S. Pat. No. 5,887,311, who then disclose a flat mop head having a cover panel, a cotton or viscose central area and a textile hem.

[0004] The mop head disclosed by Bolton et al. in U.S. Pat. No. 6,131,233 is based on hollow tube-like members whose open lower ends are intended to take up liquids by capillary action. However such action can be expected only when the remote end is in actual contact with the liquid to be absorbed. In use it is far more likely that the sides of the flexible material will be in contact with the floor and the liquid thereon, typically an aqueous solution containing soil, a detergent, and assorted undissolved particles.

[0005] While the idea of using capillary attraction has been considered in prior art mop heads, and is helpful in achieving high absorptive capacity, no satisfactory application thereof has yet been marketed.

[0006] It is therefore one of the objects of the present invention to obviate the disadvantages of prior art mop heads and to provide a head which has a high absorptive capacity due to the arrangement of knitted fibers being optimized for encouraging capillary attraction.

[0007] It is a further object of the present invention to provide a mop head with improved durability.

[0008] The present invention achieves the above objects by providing a mop head comprising a multiplicity of water-absorbing cloth strips, each strip being formed from a multiplicity of fibers knitted together in an open array to form holes therebetween, said holes being oriented to maximize capillary action.

[0009] In a preferred embodiment of the present invention there is provided a mop head wherein each of said cloth strips is formed from at least a thousand microfibers.

[0010] In a most preferred embodiment of the present invention there is provided a mop head wherein said fibers are made of polyester.

[0011] In especially preferred embodiments of the present invention said polyester fibers are connected and treated along their edges by thermal treatment so that stitches can not be unstitched during heavy duty use.

[0012] Yet further embodiments of the invention will be described hereinafter.

[0013] The use of polyester as the preferred material for fibers is based on indications that this material has a high surface energy, probably higher than 50 dynes/cm. High surface energy facilitates adhesion to other materials, this being one of the reasons why polyester has long been the preferred material where glass fibers are to be used for reinforcement of a polymer. A practical indication of high surface energy is that polyester is one of the few plastics which can be written upon using an ordinary pencil. While many plastics tend to repel water, it is easy for water to make contact with polyester, and consequently the present inventors propose the use of polyester fibers where the performance of the mop head is a function of how easily water can be contacted and collected thereby.

[0014] The use of polyester is also advantageous in that even the thermoplastic grades of polyester have outstanding heat resistance, the heat deflection temperature at 264 p.s.i. stress being 340° F. (171° C.). Thus washing the mop head at 65° C. or even in boiling water is permissible and will cause no deterioration thereto.

[0015] The invention will now be described in connection with certain preferred embodiments with reference to the following illustrative figures so that it may be more fully understood.

[0016] With specific reference now to the figures in detail, it is stressed that the particulars shown are by way of example and for purposes of illustrative discussion of the preferred embodiments of the present invention only and are presented in the cause of providing what is believed to be the most useful and readily understood description of the principles and conceptual aspects of the invention. In this regard, no attempt is made to show structural details of the invention in more detail than is necessary for a fundamental understanding of the invention, the description taken with the drawings making apparent to those skilled in the art how the several forms of the invention may be embodied in practice.

In the drawings:

[0017] **FIG. 1** is a perspective view of a preferred embodiment of the mop head according to the invention;

[0018] **FIG. 2** is a greatly expanded view of fibers knitted together in an open array as used in the mop head;

[0019] **FIG. 3** is an expanded diagrammatic view of the fiber yarns interconnected by a stitching design as used in the mop head; and

[0020] **FIG. 4** is a photograph of a strip showing the stitching array.

[0021] A mop head **10** is seen in **FIG. 1**. The head **10** grips a multiplicity of water-absorbing cloth strips **12**, the composition of which will be detailed with reference to the following figures.

[0022] Test quantities have been made using the following strip dimensions: Length: 40-50 cm, width: 1-3 cm. The head **10** is composed typically of between 20-50 strips **12**.

[0023] The strips **12** used in the test batch were edge-sealed after applying an anti-burn emulsion to the edges **14** of the strip **12**. The edges **14** were then cut to width by means of a finely-focused flame. Lastly the strips **12** were ironed

and any remaining open-edge portions sealed by contact with a metal element heated to above the melting point of the fiber, i.e. about 360° C.

[0024] A laser can be used as an alternative method of cutting the strips.

[0025] With regard to retention of the strips **12** in the head **10**, the method used in manufacture of the test items was to heat-form a hole (not seen) in the center of the strip **12** and to use said hole for insertion therethrough of a headed fastener (not seen) into the hemi-spherical or hollow cone-shaped holder **16**.

[0026] Referring now to **FIG. 2**, there is seen the loop structure in an enlarged detail of one of the strips **12**. A loop structure comprising a multiplicity of fibers **18***a*, **18***b* etc spun together to form a yarn **19** with an open array. The yarn has holes **20**, which are oriented to maximize capillary action. Holes **20** preferably have a major dimension of between 0.5 and 3 mm. The preferred material for the fibers **18** is polyester, for example a thermoplastic grade thereof. The high surface energy of polyester is helpful in allowing ready contact with water.

[0027] The fibers **18***a*, **18***b* etc. are porous microfibers. Each cloth strip **12** is formed from at least a thousand microfibers. Typically each fiber is a continuous filament.

[0028] **FIG. 3** illustrates part of a strip **12**. Fiber yarns **19***a*, **19***b* are interconnected by a stitching design oriented to maximize capillary action, seen in the following figure.

[0029] In the diagram a break in the line representing the fiber yarn **19***a* indicates passage routing under the fiber yarn **19***b*.

[0030] Seen in **FIG. 4** is a part of one of the cloth strips **12**, showing the general array of the stitch construction referred to in **FIG. 3**. As the stitching is oriented at about 45° to the major axis of the strip **12**, capillary action occurs along 2 upward-leading paths, to the left, arrow **20** and to the right, arrow **22**.

[0031] In the shown embodiment further stitching **24** using a contrasting color was added along the edges to reinforce the edges of the strip **12** and to enhance appearance.

[0032] It will be evident to those skilled in the art that the invention is not limited to the details of the foregoing illustrative embodiments and that the present invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof. The present embodiments are therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed is:

1. A mop head comprising a multiplicity of water-absorbing cloth strips, each strip being formed from a multiplicity of fiber yarns knitted together in an open array to form holes therebetween, said holes being oriented to maximize capillary action.

2. A mop head according to claim 1, wherein said fibers are porous microfibers.

3. A mop head according to claim 1, wherein each of said cloth strips is formed from at least a thousand microfibers.

4. A mop head according to claim 1, wherein said holes between said fiber yarns have a major dimension of between 0.5 and 3 mm.

5. A mop head according to claim 1, wherein said fibers are made of at least 70% polyester.

6. A mop head according to claim 1, wherein said fibers are of a size between 100 and 200 denier.

7. A mop head according to claim 1, wherein said fiber yarns are interconnected by a stitching design oriented to maximize capillary action.

8. A mop head according to claim 1, wherein said polyester fibers are connected and treated along their edges by thermal treatment so that stitches can not be unstitched during heavy duty use.

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