Sept. 11, 1973 K. L. KNOWLTON 3,758,285

METHOD AND APPARATUS FOR MAKING GLASS FIBER SPRAYS

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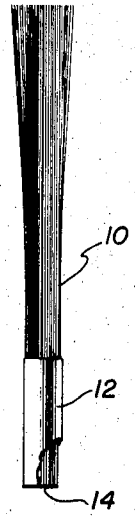


FIG. 1

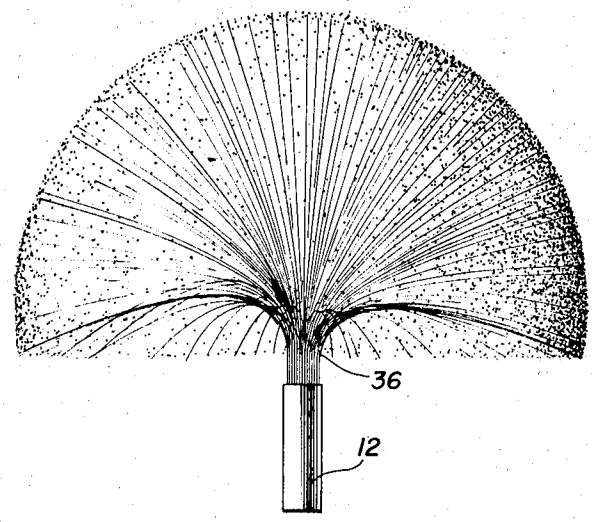


FIG. 2

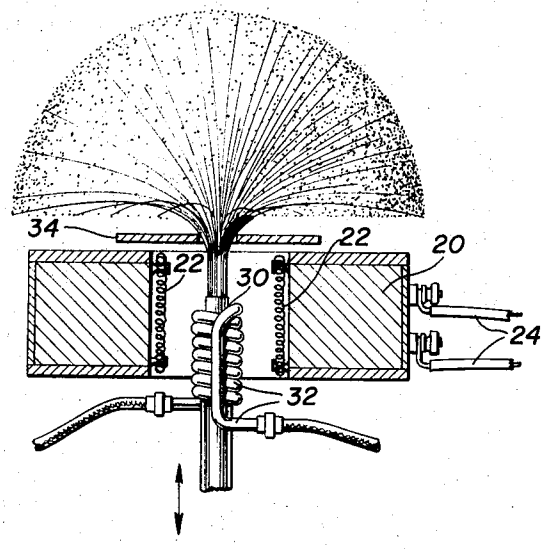


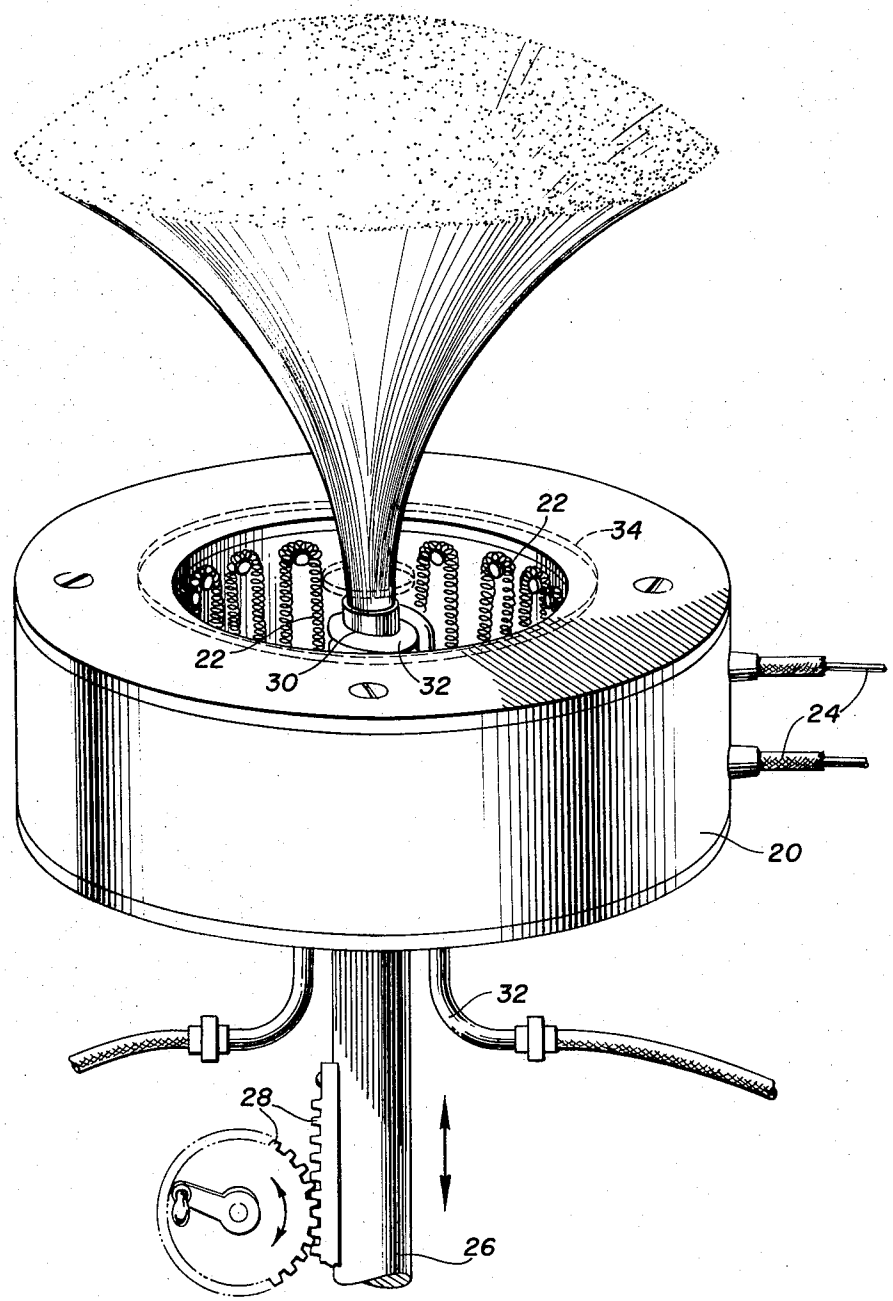
FIG. 4

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METHOD AND APPARATUS FOR MAKING GLASS FIBER SPRAYS

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FIG. 3



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METHOD AND APPARATUS FOR MAKING GLASS FIBER SPRAYS

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U.S. Cl. 65—64 9 Claims

ABSTRACT OF THE DISCLOSURE

Making a glass fiber spray by securing together a bundle of fibers at one end, leaving the other end unsecured, and heating the bundle adjacent the secured end to a point where the outermost fibers in the bundle are caused to sag outwardly with a permanent set, and fibers located inwardly thereof sag to a decreasing degree toward the center portion of the bundle where the fibers are substantially unaffected by the heat.

BACKGROUND OF THE INVENTION

In the past, glass fiber sprays have been time consumingly manufactured by securing the ends of a bundle of fibers and placing the same in a fixture with the loose ends extending upwardly, and thereupon using a sharp cutting tool, shaving the fibers to different degrees of length thereby producing what amounts to a rounded head or bouquet of the glass fibers which tend to bend outwardly to varying degrees. It is the object of the present invention to provide a more uniform spray of better appearance much more quickly and less expensively.

SUMMARY OF THE INVENTION

A plurality of glass fibers are collated and secured in a ferrule or the like at one end of the bundle leaving the other end of the bundle free. The secured end is placed in a fixture in a heating device which surrounds it, and a template or guide about the bundle is provided to hold the outer fibers against flexing outwardly by gravity, at least to a certain degree. A central group of fibers tends to stand upright but with gradually increasing effect the surrounding fibers tend to sag outwardly inasmuch as they are flexible, and the template holds the outer fibers in place against this action at least in part.

Heat is then applied, the heat being preferably arranged annularly about the bunch, and adjacent the template, thereby affecting the outermost fibers in a ring, first and to the greatest degree, with the fibers inwardly therefrom being affected, gradually, to a lesser degree.

At a certain heat the outermost fibers become distorted or warped so that they sag outwardly say for instance to approximately the horizontal or below, at the point where the template holds them, and the fibers that are located inwardly from the outermost fibers are similarly affected to a decreasing degree, the innermost fibers not being affected at all and still retaining their straight stance. The fibers themselves provide some degree of insulation against the heat to enhance this gradual effect.

It is found that by using a certain degree of heat, the degree of sag of the fibers is made permanent, and therefore a spray or bouquet of the fibers is provided in which the ends of the fibers when taken together substantially describe a hemisphere, with the outermost fibers depending below the horizontal, when removed from the template, and the other fibers or at least the ends thereof are arranged on a hemispherical surface providing the spray.

The spray is made much faster and less expensively; better permanent shapes, i.e., bunching are achieved; and shaped of different kinds can be made.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a view in elevation illustrating a bundle of fibers having like ends held in a ferrule, the other ends thereoff being free, part of the ferrule being broken away;

FIG. 2 is a view in elevation illustrating the completed spray;

FIG. 3 is a perspective view illustrating the heating mechanism; and

FIG. 4 is a cross sectional view therethrough.

PREFERRED EMBODIMENT OF THE INVENTION

Glass fibers are drawn-down from solid glass to fine filaments that are flexible, and as is well known they transfer light from end to end. These fibers are sometimes referred to as light pipes, and they are effected by heat as is glass in general. They can be drawn down to a very fine diameter.

A bundle of these glass fibers are collated and preferably the fibers in bundle **10**, FIG. 1, are of substantially equal lengths although this is not necessary to the present invention. They are placed in a tight holding ferrule **12** at corresponding ends, the ferrule and the fibers being co-terminous at **14** and the ferrule being open at both ends. The ferrule is less than the lengths of the fibers, and without further constraint, the unsecured portions thereof, outside the ferrule, will tend to sag somewhat under the effects of gravity. However, should the bundle of fibers of FIG. 1 be held upright, some central fibers would tend to stand straight up while those at the outside edges would tend to flex slightly outwardly.

Referring to FIGS. 3 and 4, there is an annular furnace **20** in this case electric and having an annularly arranged series of heating elements **22** therein supplied by leads **24**, under a timer control as well as a voltage control if desired. Any support or mount may be used for the furnace but it is preferably fixed. Centrally of the furnace is a rod **26** also suitably supported but having a longitudinal, vertical adjustment by any means such as a rack and pinion **28**. This vertically positions the ferrule of the bundle of FIG. 1 in a chuck or socket in the area at **30** in the top end of rod **26**. As shown the end of the ferrule **12** extends slightly out of the socket which is encompassed by a cooling coil **32** insuring that the heat falls on the fibers in the exact area desired, above the ferrule.

If desired, a fixture or template **34** with a hole in it can be used to hold the fibers against too great a gravitational sag and also to ensure the exact point of flex as at **36** in FIG. 2. This template is annular as shown but of course may have other shapes, such as square, triangular, star, etc.

With the heat controlled the outer fiber sag as described above and those inwardly thereof sag to decreasing degrees, the central fibers stand straight and unaffected.

I claim:

1. The method of making a spray of glass fibers comprising the steps of collating a bundle of fibers and securing them at one end of the bundle leaving the fibers free at the other end of the bundle, holding the bundle generally upright with the free fibers uppermost,

heating the fibers annularly from the exterior of the bundle adjacent the secured area thereof thereby affecting the outer fibers to a greater degree and causing them to sag by gravity, with the fibers inwardly from the outwardmost fibers being similarly affected to a lesser degree.

2. The method of claim **1** including the step of holding the fibers at a predetermined point against bending outwardly to a too great degree at room temperature so that the outermost fibers receive a permanent set under the condition of heat adjacent the area of securement.

3. Apparatus for heat forming a glass fiber spray comprising an annular heating member, means centrally located in the heating member receiving a collated bundle of glass fibers with the bundle upright and the upper part of the bundle free and unsecured, and means including an annular template surrounding the bundle temporarily holding at least some of the fibers against the force of gravity during the heating thereof.

4. The apparatus of claim 3 wherein the template includes an inner edge.

5. The apparatus of claim 4 wherein the inner edge is greater in diameter than the bunch of fibers.

6. The apparatus of claim 4 wherein the template is arranged above the heating member in spaced relation thereto.

7. Apparatus for heat forming a glass fiber spray from a collated bundle of substantially equal length fibers secured together at one end for a distance inwardly of said end, the opposite end being free, said apparatus comprising an annular heating member receiving the collated bundle of glass fibers centrally of the heating member in the area of securement of the fibers, with the free ends uppermost, and means including a surrounding template temporarily holding at least some of the fibers in the unsecured area of the bundle against the force of gravity during the heating thereof.

8. The apparatus of claim 7 including a cooling medium for application to the fibers just above the secured area.

9. The apparatus of claim 7 including means to vertically adjust the bundle supporting means relative to the heating member.

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U.S. Cl. X.R.

65—107, 285, DIG. 4, DIG. 7; 240—10 T, P; 264—1, 322; 425—393