

[54] UTILITY POLE

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[58] Field of Search ..... 138/125, 130, 144, 145, 138/146; 161/139, 144, 161, 176, 178

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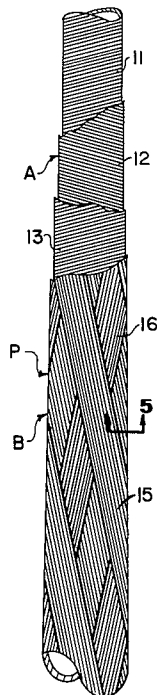
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[57] ABSTRACT

A hollow, elongated, utility pole useful for supporting luminaires and the like and method of making same wherein an inner core section is formed by wrapping filaments, preferably continuous glass filaments treated in a bonding resin, at a relatively wide angle to the longitudinal axis of the pole to form a selected number of layers of filaments with alternate layers of filaments crossing one another in opposite directions. An outer core section of greater weight than the inner core section is formed on the inner core section by wrapping a selected number of relatively narrow bands of filaments, preferably continuous glass filaments treated in a bonding resin, at a relatively slight angle to the longitudinal axis of the pole with alternating bands of filaments crossing each other in opposite directions. The wrapped layers of filaments are heated at a preselected temperature after wrapping for curing to form a rigid structure.

6 Claims, 5 Drawing Figures



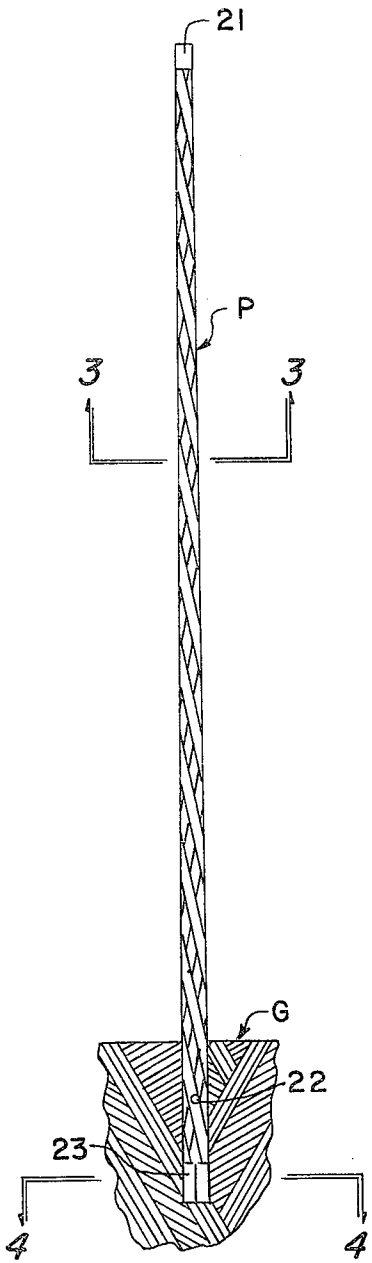


Fig. 1

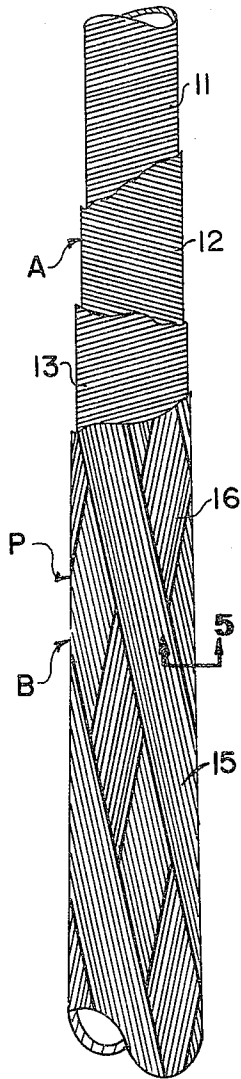


Fig. 2

Fig. 3

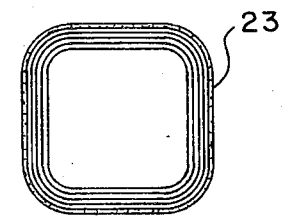
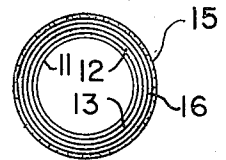


Fig. 4

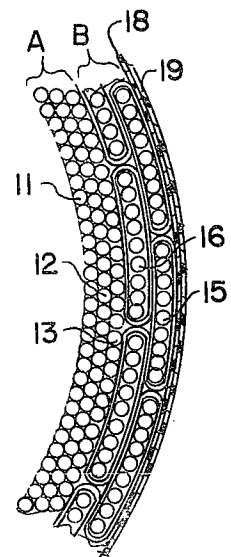


Fig. 5

# 1

## UTILITY POLE

### BACKGROUND OF THE INVENTION

This invention relates generally to pole construction and more particularly to a novel utility pole and method of making same, characterized by having one type of wrapped filament structure for the inner core and another type of wrapped filament structure for the outer cover affording improved impact and fatigue properties.

Relatively long poles on the order of twenty feet or more have a variety of uses among which are for supporting luminaires. Such elongated poles usually must have high impact and fatigue properties as well as being resistant to weather. In the past, both wrapped cardboard cores and pre-made wrapped non-continuous glass filaments with a bonding resin have been used for such applications but they have not been entirely satisfactory for all applications.

Accordingly, it is an object of the present invention to provide a novel and improved hollow, tapered, utility pole which may be readily altered to meet specific size and strength requirements.

Another object of this invention is to provide a novel utility pole having improved impact and fatigue properties as well as being highly weather resistant.

Still a further object of this invention is to provide a novel utility pole characterized by having a novel inner core structure made of wrapped glass filaments or the like extending continuously between the ends of the pole arranged at a relatively wide angle to the longitudinal axis of the pole and an outer cover structure made of wrapped bands of glass filaments or the like arranged on the inner core structure at a relatively small angle to the longitudinal axis of the pole.

In accordance with the present invention in a preferred form shown, a hollow elongated, utility pole tapered to be narrower at the upper end has an inner core section made up of a plurality of layers of filaments treated with a bonding resin extending continuously between the ends of the pole, the filaments being arranged at a relatively wide angle to the longitudinal axis of the pole and preferably in the range of 65 degrees to 85 degrees with alternate of said layers of filaments crossing one another in opposite directions and an outer cover section wrapped over the inner core section made up of bands of filaments treated with a bonding resin extending continuously between the ends of the poles with the bands arranged at a relatively narrow angle to the longitudinal axis of the pole and preferably in the range of 3 degrees to 15 degrees with alternate of the bands crossing each other in opposite directions. The weight of the wrapped outer cover section is greater than the weight of the inner core section. After wrapping the sections, they are heated for curing and form a rigid structure.

Other objects, advantages and capabilities of the present invention will become more apparent as the description proceeds taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a side elevation view of a tapered utility pole for luminaires shown mounted in the ground in an upright position;

FIG. 2 is a fragmentary elevation view of the pole shown in FIG. 1 with portions of the outer layers broken away to show interior construction;

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FIG. 3 is a sectional view taken along lines 3—3 of FIG. 1;

FIG. 4 is a sectional view taken along lines 4—4 of FIG. 1;

FIG. 5 is a sectional view taken along lines 5—5 of FIG. 2.

Referring now to the drawings in FIG. 1 there is shown a hollow elongated pole P embodying features of the present invention for supporting a luminaire. The pole P is mounted upright with a lower end portion submerged below the surface of the ground designated G. The pole shown in general comprises an inner core section generally designated A and an outer cover section generally designated B. The inner core section A shown, in made up of three alternating layers of filaments designated 11, 12 and 13. The layers of filaments are continuous glass filaments and alternate layers cross one another and are arranged at an angle varying from about 65° to 85° to the longitudinal axis of the pole. The thickness of the filaments and the number of layers of filaments varies with the mechanical properties desired. For example, a thin double layer inner core section is desirable where a breakaway feature is required such as to break with an automobile impact. An inner core section of numerous layers at the larger end may be used where maximum bending moments are required.

The outer cover section B consists of a plurality of bands of continuous filaments crossing each other at opposite angles to give a woven effect, two of the crossing bands being designated on the drawings by numerals 15 and 16. These bands of continuous glass filaments which form the outer cover section B are wrapped or laid at an angle from about 3° to 15° to the longitudinal axis of the pole. The number of these bands is determined by the mechanical requirements of the pole and its size. This outer core section B preferably consists of about 55 to 85 percent of the pole by weight.

The outer core section B has one or more protective layers coated over the outer cover section B. As shown, there is provided a layer or coating 18 of an isophthalic chemical resistant polyester resin and a final layer of coating 19 of a weather resistant urethane-type material.

The pole P for use as a post top luminaire is made with a molded top portion 21 and has an aperture 22 for receiving a power wire spaced a selected distance from the bottom end thereof and positioned to be submerged below the ground surface. The lower or butt end portion 23 of the pole has a section which is slightly squared in transverse cross section for safer stacking in storage areas.

In a preferred method of making the glass filament poles above described, the inner core section A is made first. A cellophane band is wrapped on a collapsible tapered mandrel disposed in the expanded position. The cellophane band prevents the glass filaments and resin from bonding to the mandrel. The cellophane bonds to the inside of the inner core section and remains as a part of the pole. In forming the inner core section, glass filaments saturated in a liquid polyester resin, are disposed to form one or more flat bands and are pulled onto the mandrel by the rotation of the mandrel so that each band abuts the adjoining band to form a continuous layer of filaments at a relatively wide angle to the longitudinal axis of the pole on the order of 65° to 80°.

Each subsequent layer is laid at an opposite angle so that alternate layers cross one another. The formed inner core section B is then heated at temperatures in the range of 80° to 280° Fahrenheit to induce polymerization of the polyester with subsequent hardening of the inner core section into a self-supporting structure.

After hardening, the inner core section B is then placed on a rigid metal supporting mandrel. This metal supporting mandrel is equipped with a set of metal pins forming a ring around it parallel to its longitudinal axis whose pins are rigidly affixed to the mandrel. The ring is slightly smaller than the smallest internal diameter of the core and arranged so that the pins protrude about 1 1/2 inches beyond the small end of the inner core section. At the larger end of the inner core section, a large square metal ring, made in sections, is installed. The pins in this large ring protrude about 1 inch beyond the end of the inner core section at an angle of about 45°.

This arrangement consisting of the mandrel, metal pin rings and inner core section is placed on a winding machine and bands of continuous fiberglass filaments are tied to the large pin ring. The winding machine is started and the carriages holding the glass filaments and resin move back and forth along the length of the mandrel while the mandrel turns or rotates on its axis so that the bands are pulled onto the inner core sections at an angle varying from 3° to 15° to the longitudinal axis of the pole. At each end of the carriage travel, moving steel arms are pressed against the bands of glass filaments forcing them into the pin rings where they are held in place until the pole is cured. The number of bands wrapped on the core are determined by the strength and mechanical properties required.

The pole is removed from the machine and placed on a rack in an oven for heat curing. After polymerization has occurred the sections forming the large pin ring are removed. The pole and mandrel assembly is moved to a swing rack and subjected to mechanical shock causing the glass and plastic pole to slide off the mandrel and small ring assembly.

The pole is then placed on a moving rack that rotates the pole and moves it between spray guns that apply a coat of isophthalic polyester resin and a catalyst necessary to polymerize it. After this coat is hardened, the pole is passed before a spray head which applies a final surface coating of a urethane-type material.

By way of illustration and not by way of limitation, a glass filament pole constructed for post top luminaires had the following dimensions:

Total length	23 feet
Total depth in ground	4 feet
Length of top portion	3 inches
Length of butt portion	6 inches
Weight	60 pounds
Wire entrance	1 inch diameter, 24 inches from butt end

This glass filament pole with a polyester resin bonding system exhibited exceptional impact and fatigue properties. The use of weather resistant gel and urethane coatings makes it particularly chemically resistant in that it is inert to said chemicals, smog by-products, mild acids and alkalies, insect sprays, fertilizers, dog urine, de-icing salts and salt water.

A glass filament pole as above described tested for weathering for 1,476 hours in an Atlas Weatherometer exhibited no visible change in appearance and actually

increased in compressive strength. Mechanical deflection tests indicate less than two inches deflection in a 100 mph wind. For the installation of the pole it may be a direct burial in the soil or may be set in plastic foam and the like.

Although the present invention has been described with a certain degree of particularity, it is understood that the present disclosure has been made by way of example and that changes in details of structure may be made without departing from the spirit thereof.

What is claimed is:

1. A hollow tapered pole comprising:

an inner core section tapered inwardly toward the upper end and made up of a plurality of layers of glass filaments treated with a bonding resin, the filaments of each layer being arranged at an angle to the longitudinal axis of the pole from about 65° to 85° with alternate of said layers crossing one another in opposite directions; and

an outer cover section wrapped on said inner core section made up of bands of filaments treated with a bonding resin, the bands of filaments being continuous between the ends of the pole and arranged at an angle to the longitudinal axis of the pole from about 3 degrees to 15° with alternate bonds crossing each other in opposite directions, the weight of the outer cover section being from about 55 percent to 85 percent of the entire weight of the pole.

2. A hollow tapered pole as set forth in claim 1 wherein said pole has a molded top portion and a butt section at the lower end with a squared transverse cross section.

3. A pole as set forth in claim 1 wherein said filaments and bands are continuous glass filaments held together by a thermal-setting polyester resin.

4. A pole as set forth in claim 1 wherein said outer section has a protective coating thereon in the form of a layer of an isophthalic chemical resistant polyester resin on the outer cover section and a final layer of weather resistant urethane material.

5. A pole as set forth in claim 1 wherein said pole is tapered inwardly toward the upper end.

6. A hollow tapered glass filament pole comprising: an inner core section tapered inwardly from the lower end to the upper end made up of polyester a plurality of layers of continuous glass filaments treated with a resin, the glass filaments of each layer being arranged at an angle to the longitudinal axis of the pole between 65° and 85° with alternate of said layers crossing one another in opposite directions;

an outer cover section wrapped on said inner core section, tapered inwardly from the lower end to the upper end, said outer core unit made up of bands of continuous glass filaments treated with a polyester resin, the bands of continuous glass filaments being arranged at an angle to the longitudinal axis of the pole between 3° to 15° with alternate bonds crossing each other in opposite directions, the weight of the outer cover section being from about 55 percent to 85 percent of the entire weight of the pole; and

a protective coating on the outer cover section in the form of a layer of isophthalic chemical resistant polyester resin and a final layer of weather resistant urethane material.

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