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DEVICES, PROCESS AND PRODUCTS INDICATING THE
FREE END OF TEXTILE STRAND WOUND ON A CORE
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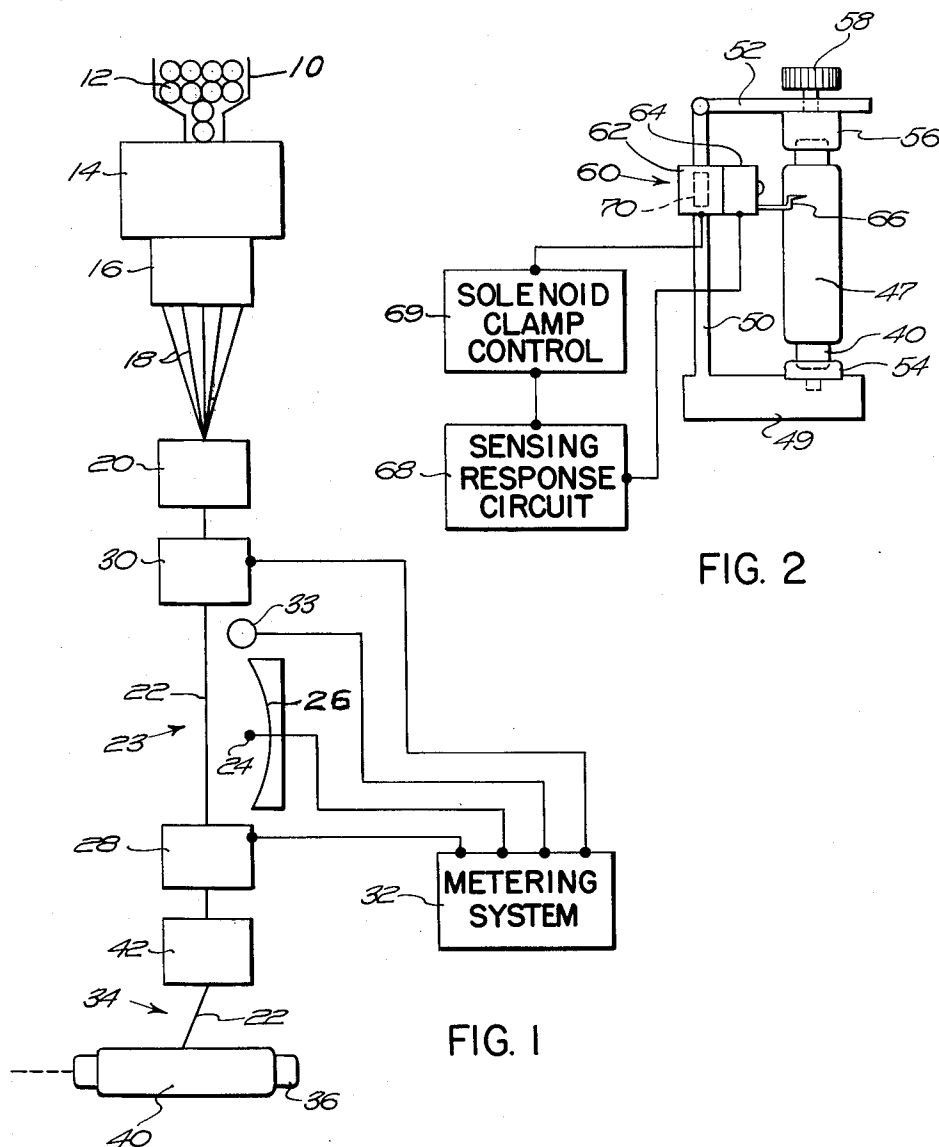


FIG. 2

FIG. 1

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4 Claims. (Cl. 28—1)

The present invention relates to the manufacture and use of textile fibre or yarn, and more particularly, to its winding on a tube or bobbin after drawing, twisting, spinning, and the unwinding of the fibre or yarn from the tube or bobbin before twisting, plying, weaving, knitting or the like.

In the high speed winding of synthetic fibre, yarn or other strand, i.e. glass, nylon, etc., on a tube, bobbin, or other core after drawing, the trailing end of the advancing strand, after being severed from the succeeding supply, becomes rather firmly adherent to the preceding turns of the strand on the core. The adherence of the trailing end is caused, in part, by its not being completely dried following various processing steps and its being snapped sharply into contact with the preceding turns at high speed. In consequence, the free end cannot be distinguished readily from the preceding turns either visually or tactually. However, before the free end may be introduced into a twisting frame, loom or the like, it must be located. In the past, the sense of touch by the finger of an operator in a random fumbling motion, usually accompanied by close visual inspection has been required to locate the free end rapidly. Marking the free end has not been feasible because of the tendency of any visible marking ink to discolor turns of the strand adjacent to the free end. Any such marking ink would tend to run into adjacent turns because the turns of yarn still might be undried following sizing and the marking ink itself still might be undried, having been just applied.

The primary object of the present invention is to provide an answer to the foregoing problem by providing processes, products and devices involving the application to and detection at the trailing end of core wound strand of a dye capable of producing invisible identification without tending to jeopardize the uniformity of the final product.

Other objects of the present invention will in part be obvious and will in part appear hereinafter.

For a fuller understanding of the nature and objects of the present invention, reference should be had to the following detailed description taken in connection with the accompanying drawing wherein:

FIG. 1 is a diagrammatic view of an apparatus for effecting a process by which an invisible medium, in accordance with the present invention, is applied to the trailing end of a length of core wound strand; and

FIG. 2 illustrates a device for detecting the trailing end of core wound strand produced by the apparatus of FIG. 1.

Generally the herein disclosed process of marking the trailing end, in accordance with present invention, involves the steps of advancing a synthetic strand from a first station in which its component filaments are gathered and sized, through a second station in which the strand is predeterminedly dried, and into a third station in which an invisible medium is applied to a trailing length of the strand. This trailing length substantially constitutes at least the equivalent of the circumference of an outer turn of the yarn on the bobbin. In various forms, the invisible medium involves: a radioactive material that spontaneously emits detectable invisible radiation, for example, traces of radioactive carbon dispersed in water; a fluorescent material such as naphthalene, that emits radiation when energized by heat or radiation of predetermined

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character; an infra red or ultra violet dye having a predetermined absorption or emission band outside the visible range, e.g. polycarbocyanines such as diacarbocyanine and tricarbocyanine; an electric charge imparted to the material of the strand itself or to a metal such as aluminum in finely and sparsely dispersed condition; or a magnetic flux imparted to such a metal as soft iron in finely and sparsely dispersed condition.

Generally the herein disclosed process of detecting the trailing end, in accordance with the present invention involves running a sensing head longitudinally along the core until an indication is produced in the circuitry associated with the sensing head that the trailing end has been located. By virtue of the fact that the invisible medium has been applied to a trailing length extending substantially around the core, the rotational position of the core with respect to the sensing head is immaterial. Once located, the trailing end can be disengaged readily from the preceding turns of strand for use in a twisting frame, loom or the like.

FIGURE 1 illustrates diagrammatically apparatus for forming and winding fibreglass yarn on a bobbin in accordance with the present invention. This apparatus comprises a funnel 10, containing a plurality of glass marbles 12. From conduit 10, marbles 12 are directed into an electric furnace 14, where they are heated to form a molten liquid that flows through orifices (not shown) at the lower face of a bushing 16 to produce fibres 18. The diameter of fibres 18 is accurately determined by regulating the viscosity and temperature of the molten mass, the size of the orifices at the lower face of bushing 16, and the rate of speed at which fibres 18 are drawn from bushing 16. From bushing 16, the fibres are drawn through a gathering and sizing station 20. Gathering and sizing are effected by advancing the fibres within station 20 in contact with a pad (not shown) that is charged with a suitable resin, for example, an organic solution of a synthetic organic polymer.

From station 20, composite strand 22 is transmitted through a drying station 23, which includes an electric heating source 24, and a directing device, e.g., a parabolic reflector 26 for orienting, e.g. directing, infra red or radio frequency radiation from source 24 upon strand 22 as it advances through drying station 23. From drying station 23, strand 22 advances through a marking station 28, in which a pad charged with an invisible medium of the above described type is applied to a predetermined length of the strand. Before the invisible medium is applied in marking station 28, the trailing end of this predetermined length from the strand supply is severed in a cutting station 30. The operations of marking station 28, cutting station 30, and drying station 23 are synchronized by a metering system 32, which includes a photoelectric cell 33. Initially metering system 32 energizes drying station 23. After a predetermined length of strand 22 has passed by cell 33, metering system 32 operates to de-energize the elements of drying station 23 and to actuate the elements of cutting station 30. Thereafter, photoelectric cell 33 responds to the absence of strand 22 in order to actuate the elements of marking station 28. Spinning station 34 includes a horizontal rotatable spindle 36, on which a bobbin 40 is secured and a traveller, which may be a conventional spiral, for distributing the strand linearly along the bobbin.

After being severed from the remaining portions of strand 22, by virtue of the force applied to it in spinning station 34, the trailing end 47 becomes intermeshed with other turns upon bobbin 40 and therefore quite difficult to locate. This trailing end may be located in accordance with the present invention by an apparatus of the type now to be described.

FIGURE 2 illustrates a device for detecting the free

end of yarn wound about bobbin 40 in the foregoing way and marked throughout a predetermined length with an invisible medium. The device of FIG. 2 comprises a base 49 from which extends upwardly a standard 50, having at its upper end a pivoted clamp 52. Upwardly extending from base 49 and downwardly extending from clamp 52 are aligned rotatable bosses 54 and 56, which receive the ends of bobbin 40. The rotational position of bosses 54 and 56 is determined by a manually enageable knob 58. Riding along standard 50 is a detector 60 including a carriage 62, a sensing head 64 and a pointer 66.

Carriage 62 and sensing head 64 operate in the following way. Initially detector 60 is manually elevated to the top of standard 50 and allowed to slide downwardly under gravity. While detector 60 is sliding downwardly, sensing head 64 operates to produce a signal in a sensing response circuit 68 when it moves into adjacency with trailing end 47. In consequence, sensing response circuit 68 becomes energized and a solenoid control circuit 69, in response thereto, actuates a clamp 70 in order to halt further downward motion of the carriage. Pointer 66 thereupon indicates the location of trailing end 47. This trailing end may be manually separated from the remaining turns on the bobbin by one hand of an operator while his other hand is in engagement with knob 58. In this way bobbin 40 may be rotated in order to render the trailing end most readily accessible.

Generally, when the invisible medium at trailing end 47 does not spontaneously emit desired radiation, e.g. naphthalene, sensing head 64 is provided with a suitable energization source for the medium, e.g. ultra violet light. When the dye on trailing end 47 is radioactive, e.g. radioactive carbon, sensing head 64 is a suitable radiation counter, e.g. a Geiger counter. When the dye is characterized by electromagnetic radiation having a predetermined peak or trough in the invisible portion of the spectrum, sensing head 64 includes a suitable filter in association with the trough or peak and a suitable photocell. When the invisible medium includes either an electrostatic or a magnetic material, sensing head 64 is a suitable transducer that converts an electrostatic or magnetic variation to an electrical signal.

The overall process shown involves gathering and sizing a plurality of glass fibres 18 in order to form a composite filament 22, predeterminedly drying filament 22 by means of a parabolic heating unit, twisting and spinning the composite strand about bobbin 40, marking a predetermined trailing end 47 with an invisible medium, severing this trailing length from succeeding sections of the composite strand, moving a sensing element longitudinally along bobbin 40 until an electronic indication of the presence of the trailing length is produced, and manually loosening the trailing length from the preceding turns of yarn on the bobbin. It will be appreciated that the step of moving a sensing element longitudinally along the bobbin, may be effected with a sensing head, e.g. in the form of a ring, that is carried manually by an operator.

Since certain changes may be made in the above disclosure without departing from the scope of the invention herein involved, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted in an illustrative and not in a limiting sense.

What is claimed is:

1. A device for detecting the trailing end of strand wound about a core, a length of said trailing end at least substantially as great as the length of the circumference of said core being provided with an invisible medium, said device comprising means for sensing the presence of said medium, means for moving said sensing means longitudinally in general parallelism with the axis of said core, means responsive to a signal from said sensing means for halting movement of said sensing means when said sensing means has detected said presence, and indicating means positionally synchronized with said sensing means to signal said presence.

2. A device for detecting the trailing end of strand wound about a core, a length of said trailing end at least substantially as great as the length of the circumference of an outer turn of strand on said core being provided with an invisible dye, said device comprising means for sensing the presence of said dye, means for moving said sensing means longitudinally in general parallelism with the axis of said core, means responsive to a signal from said sensing means for halting movement of said sensing means when said sensing means has detected said presence, and indicating means positionally synchronized with said sensing means for visible movement in order to signal said presence.

3. The device of claim 2 wherein said dye is radioactive and said sensing means is responsive to the presence of substantial radioactivity.

4. The device of claim 2 wherein said dye emits invisible electromagnetic radiation and said sensing means is responsive to said invisible electromagnetic radiation.

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