Dec. 12, 1961 R. A. PIM 3,012,327

METHOD OF PRODUCING ROVINGS PACKAGES OF UNIFORM LENGTHS

Filed April 10, 1957 2 Sheets-Sheet 1

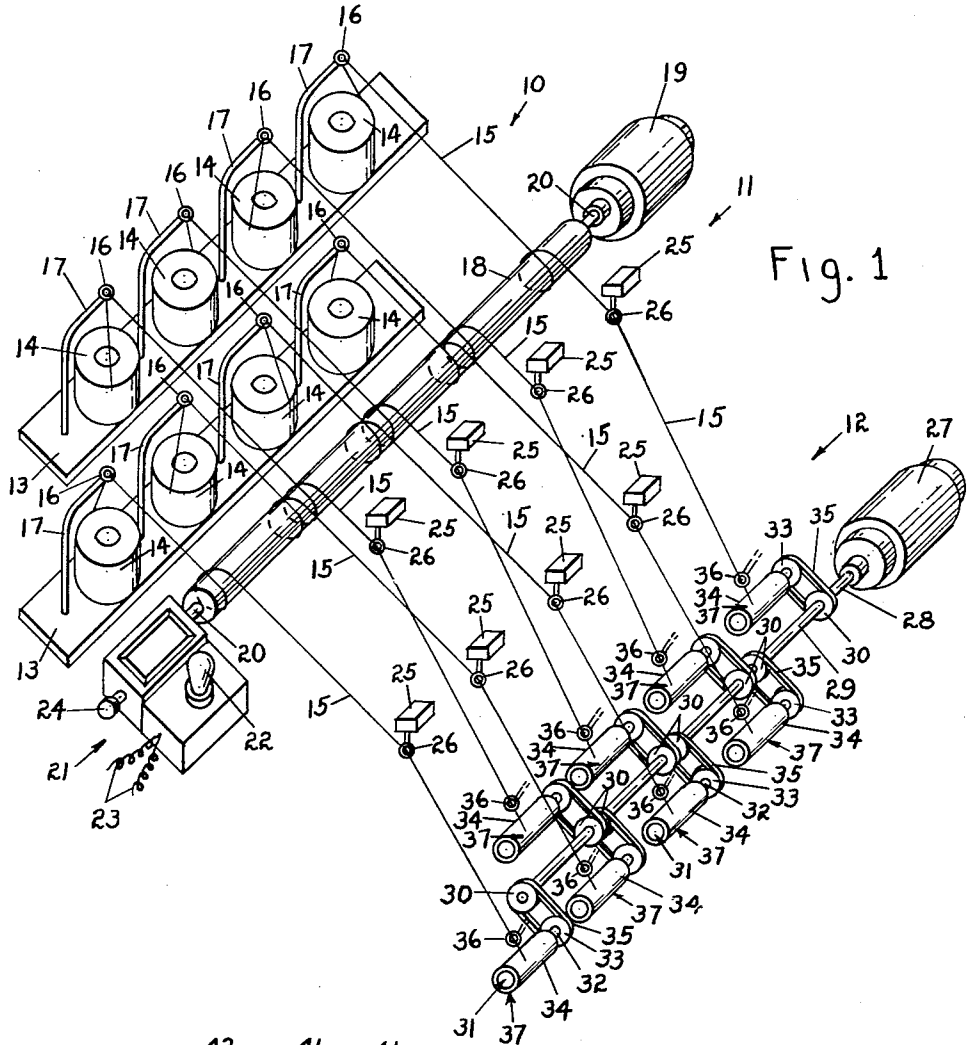


Fig. 1

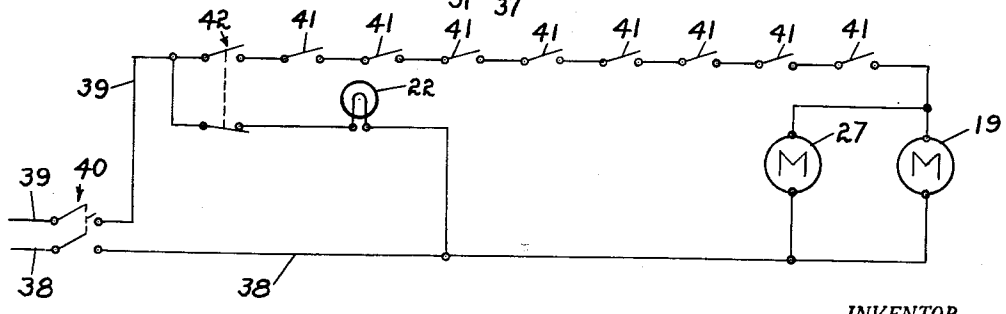


Fig. 2

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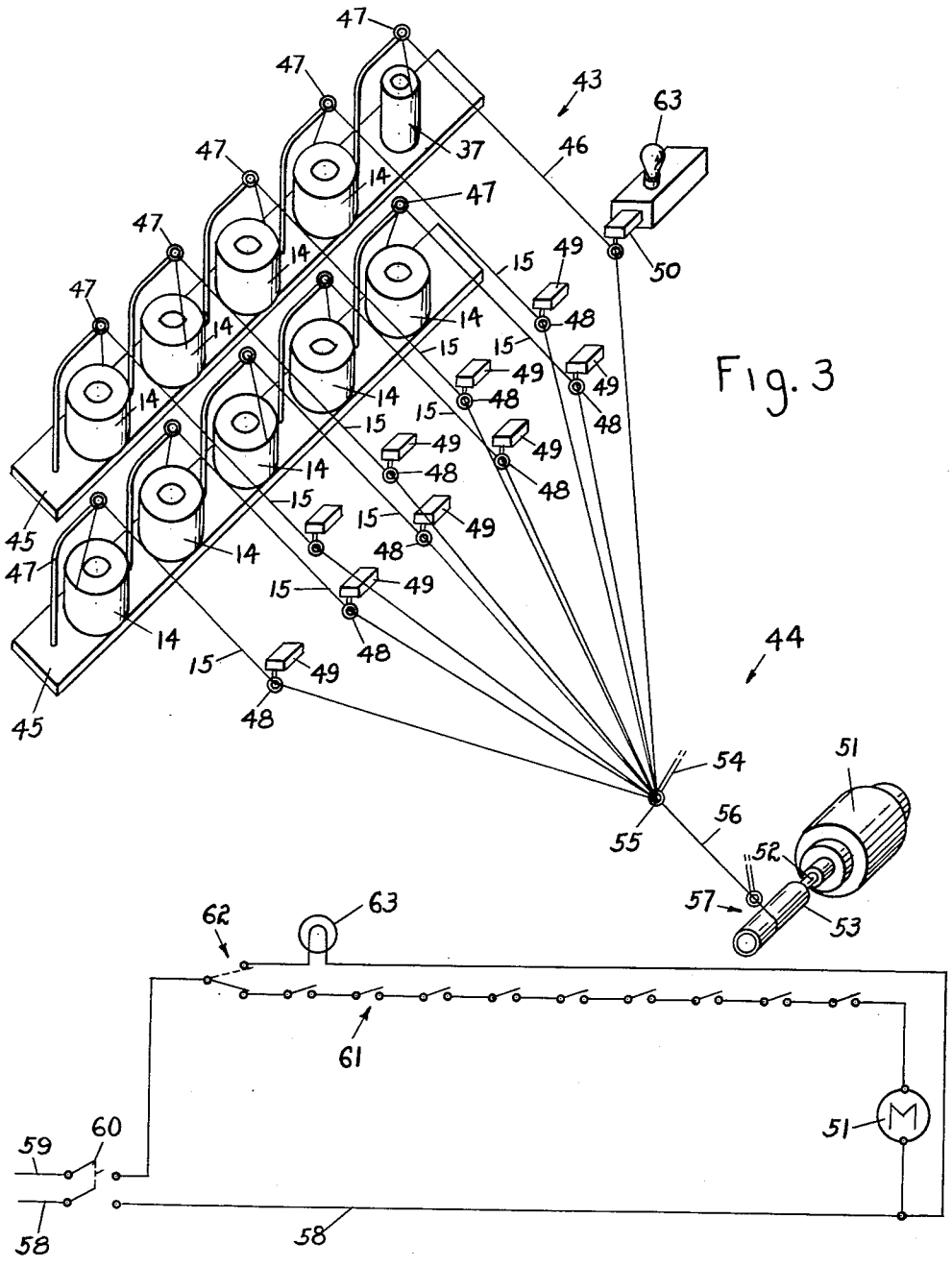


Fig. 3

Fig. 4

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METHOD OF PRODUCING ROVINGS PACKAGES OF UNIFORM LENGTHS

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5 Claims. (Cl. 33—136)

This invention relates to the production of roving packages of uniform length, and more particularly to a method for producing roving packages which are of uniform length within close limits.

A roving as defined in the glass fiber art comprises a plurality of untwisted continuous glass strands, each containing a multiplicity of continuous glass fibers, wherein the strands are arranged in parallel contacting relationship as a single large strand.

Prior methods of producing roving packages have included control of package length or yardage by either weight or diameter of the finished package. However, with the tolerances permitted in previous forming operations on the fiber, and the tolerances permitted in the winding of the roving packages, the yardage varied as much as 20 to 25% from one package to another.

It is therefore an important object of the present invention to produce roving packages of uniform yardage within extremely close tolerances.

It is another object to provide a method for winding roving packages of uniform yardage employing a master control strand.

Another object is to provide a method for producing roving packages of uniform yardage employing as the master, a strand of precise length.

A further object is to provide a method for winding roving packages of uniform length within close tolerances wherein a master package containing a single strand previously wound to a precise length, is employed to control the roving package length within extremely narrow limits.

Other objects and advantages of the invention will become more apparent during the course of the following description when taken in connection with the accompanying drawings.

In the drawings wherein like numerals are employed to designate like parts throughout the same:

FIG. 1 is a perspective view of apparatus for winding master packages of strand of precise length;

FIG. 2 is a schematic diagram of the electrical circuit employed in the device of FIG. 1;

FIG. 3 is a perspective view of apparatus for winding roving packages of uniform yardage within extremely clear tolerances; and

FIG. 4 is a schematic diagram of the electric circuit employed in the apparatus of FIG. 3.

As shown in FIG. 1, an apparatus is provided upon which the present method can be practiced for winding a single strand of desired roving specification into a package of precise length. The apparatus includes a strand supply section **10**, a strand measuring section **11** and a strand winding section **12**. The strand supply section **10** includes suitable support members **13** upon which a plurality of packages **14** of continuous glass fiber strand **15** are adapted to be positioned. Associated with each package **14** is a guide eye **16**, positioned upon a suitable support element **17**, secured to the package support member **13**.

The strand measuring section **11** includes a metering roll **18** which is adapted to be powered by connection to a suitable motor **19**. The metering roll **18** is mounted on a long shaft **20** to which a counting device **21** is connected for determining the number of revolutions thereof. The counter **21** is adapted to be set to actuate an electrical switch upon completion of counting of a selected number of yards of the strand **15** as determined by revolution of the metering roll **18**. The counter **21** contains a signal lamp **22**, in circuit with the switch, which is adapted to be lighted upon actuation of the switch. The switch and lamp **22** are connected in a circuit through a pair of conductive lines **23**. The counter **21** is also provided with a set handle **24**. Positioned between the strand measuring section **11** and the strand winding section **12** are a plurality of knock off devices **25** having guide eyes **26** corresponding in number to the number of strands **15** to be wound.

The strand winding section **12** includes a power source, such as a motor **27**, the shaft **28** of which is connected to a main power shaft **29**. The main power shaft **29** is provided with a plurality of pulleys **30**. Spaced in parallel relation with respect to the main power shaft **29** are a plurality of winding spindles **31**. Each of the winding spindles includes a rotatable shaft member **32** provided at one end with a power receiving pulley **33** and upon which shaft is adapted to be mounted a suitable spool in the form of tube **34** for receiving strand **15** thereon. The pulleys **33** of the winding spindles **31** are operably connected by belts **35** to appropriate pulleys **30** on the power shaft **29** for receiving power therefrom and are thereby adapted to be rotated. It is to be noted that the winding spindles **31** correspond in number to the individual strands **15** adapted to be wound from the strand supply section **10**. Associated with each winding spindle **31** is a suitable traversing device **36** for moving the strand **15** in a to-and-fro manner across the peripheral surface of the winding tube **34** in forming a master package **37**.

The strands **15** from the strand supply section **10** are passed through the guide eyes **16** and looped about the metering roll **18** and passed through the guide eyes **26** of their respective knock offs **25**. Thence the strands **15** are directed through the traversing devices **36** to their respective winding spindles **31** where they are wound into a plurality of master packages **37** of precisely the same length.

By referring to the electrical circuit diagram of FIG. 2, the operation of the machine can be better described. It will be seen that power is supplied to the circuit through a pair of supply lines **38** and **39**, through a main switch **40**. Line **38** leads to one side of the motor **27** powering the winding spindles **31** and of the motor **19** driving the metering roll **18**. The other supply line **39** leads to and through switches **41** of each of the knock off devices **25**, connected in series, and thence to the other side of the motors just described. The circuit also includes a two-position switch **42**, forming a part of the counting device **21**. This two-way switch **42** is normally closed and thus in series with the knock-off switches **41**. However, when the winding operation has proceeded to a desired point as determined by the counting device **21** the two-position switch **42** is opened, thus stopping the winding operation. Concomitantly with the changes in position of the two position switch **42** the signal lamp **22** forming a part of the counting device **21** is actuated thus signaling an operator that the winding operation is completed.

In the event of breakage of any one of the plurality of strands **15**, it will be seen that the knock off device **25** associated therewith is effective to stop the entire operation. This permits the strand **15** to be spliced and the operation again set in motion and completed. It will thus be seen that a plurality of master packages **37** of identical length, each produced under precisely the same conditions of manufacture, will be formed.

A master package, prepared by the aforedescribed method, is then utilized in the apparatus of FIG. 3 for

producing a roving package of accurate length. As shown in FIG. 3 the apparatus includes a strand supply section 43 and a roving winding section 44. The strand supply section 43 includes a support comprising a pair of shelves 45 upon which are placed a set of packages 14 of strand 15. The position of one of the packages 14 is occupied by a master package 37 of strand 46 prepared as previously described. The other master packages 37 are utilized with other sets of packages 14. At each strand package station, a guide unit 47 is provided to direct the strand 15 from the package 14 to the guide eye 48 of a knock off unit 49. The strand 46 from the master package 37 is directed to a knock-off unit 50. The knock-off units 49 and 50 are effective to stop the winding operation in the event of strand breakage. This a precautionary measure to assure that the roving contains the specified number of strands. The roving winding section 44 includes a motor 51, provided with a rotatable shaft or mandrel 52, upon which a tube 53 is adapted to be mounted. The roving winding section 44 also includes a traverser 54 provided with a guide eye 55. The separate strands 15 including the master strand 46 are gathered by the guide eye 55 of the traverser unit 54 into a roving 56 and thence are directed onto the tube 53 of the winding mandrel 52 to form a roving package 57.

The electrical circuit for the apparatus of FIG. 3 is shown in FIG. 4 and includes a pair of power supply lines 58 and 59 leading to a master switch 60. Line 58 continues from the master switch 60 to the motor 51. The other line 59 also continues to the motor 51, being connected to the other side thereof through a plurality of switches 61 and 62. The switches include a two-way switch 62 comprising a part of the knock off 50 of the master strand 46 and a plurality of switches 61 comprising a part of the knock offs 49 of the strands 15, corresponding in number thereto. In case one of these switches is opened by a strand break, current to the motor 51 is cut off and the winding operation is stopped. The stoppage allows the broken strand to be spliced after which winding is continued. The circuit of FIG. 4 also includes a signal lamp 63 forming part of the knock off 50 of the master strand 46 and is connected to lines 58 and 59 through the two position switch 62.

The winding operation is effected by first positioning the packages 14 and 37 upon the shelves 45 in their proper locations and threading the strands 15 through the guides 48 of their respective knock offs 49, thence through the guide eye 55 of the traverser 54. The main switch 60 of FIG. 4 is then closed and the operation is started. The strand 46 from the master package 37 determines when the operation is completed and when the end of such strand passes through its knock off device 50, winding is stopped and the rovings package 57 is complete. Passage of the master strand 46 through the knock off 50 causes the two position switch 62 forming a part thereof to be moved into circuit with the signal lamp 63 which is thereby lighted to inform the operator visually of completion of the winding operation.

With regard to the apparatus shown in FIG. 3, the knock offs 49 associated with the strands 15 may be omitted if desired, since commercial specifications for rovings allow a variation of one to two strands. Thus without the knock offs 49, the machine operator observes the machine visually and in the event of breakage of a strand 15, splices and rethreads the broken strand after having observed the break. The knock off 50 associated with the master strand 46 is retained, of course, to provide the precise length of the rovings package as previously described by virtue of the precise length of the master strand.

It will thus be seen that the present invention provides a method for producing roving packages of closely controlled length within narrow tolerances limits. In accordance with the present method an error as low as

0.01% can be retained in roving packages of a nominal length of 7000 yards. The present method provides a number of advantages including uniformity of product, that is uniformity of package lengths so that manufacturers who use roving packages produced by this method no longer need be concerned with the problem of varying yardage as heretofore encountered. The use of automatic controls provides means for attaining absolute uniformity of product. Such controls also enable one operator to tend a plurality of machines without danger of packages of non-uniform quality being produced.

It is to be understood that the form of the invention herewith shown and described is to be taken as a preferred embodiment of the same, but that various changes in the shape, size and arrangement of parts may be resorted to without departing from the spirit of the invention or the scope of the subjoined claims.

I claim:

1. The method of winding a roving package which includes the steps of, providing a master strand of continuous and predetermined length, providing a plurality of continuous strands of undetermined but greater length than said master strand, associating said plural strands and said master strand into a roving, winding said roving into a package, and automatically controlling the winding operation by the length of said master strand.

2. The method of winding a roving package which includes the steps of, providing a continuous strand of undetermined length, measuring said strand to a selected length to provide a master strand, providing a plurality of continuous strands of undetermined but greater length than said master strand, associating said strands with said master strand into a roving, winding said roving into a package, and controlling the winding operation by said master strand length.

3. The method of winding roving packages of highly uniform length including the steps of, providing a plurality of continuous strands of undetermined length, measuring each of said strands to a selected exact length into master strands by means of a common measuring device, providing a plurality of sets of continuous strands of undetermined but greater length than one of said master strands, associating each of said sets of strands with one of said master strands into a roving, winding said rovings into separate packages, and controlling the winding operation by the lengths of said master strands.

4. The method of winding a roving package which comprises: providing a master strand of continuous and predetermined length; providing a plurality of other strands; associating said plurality of other strands with said master strand to form a roving equal in length to said master strand; winding said roving into a package; and interrupting the winding operation in response to a signal initiated by the approach of the master strand end.

5. The method of winding a plurality of roving packages, which comprises: providing a source of strand; measuring a plurality of lengths of said strand to form master strands of predetermined and equal lengths; subsequently associating a master strand with a plurality of strands of indeterminate length to form a roving; winding said roving into a package; discontinuing the winding operation in response to a signal initiated by the approach of the master strand end; duplicating the preceding three steps with each of the remaining master strands to form a plurality of packages, corresponding to the number of master strands formed, of substantially uniform length.

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