March 15, 1960 L. MISHCON ET AL 2,929,023

YARN SPEED METER

Filed Dec. 27, 1956

FIG. 1

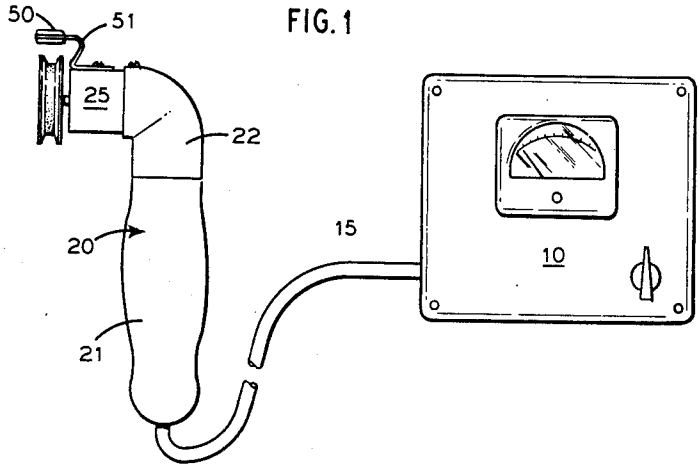


FIG. 2

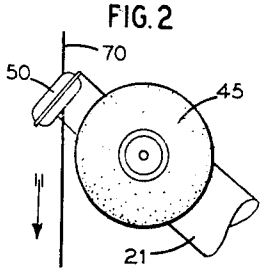


FIG. 3

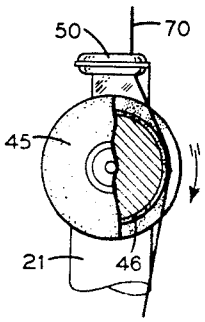


FIG. 5

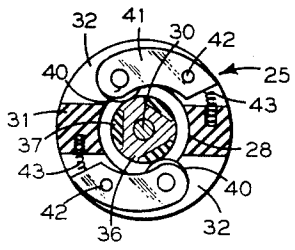


FIG. 4

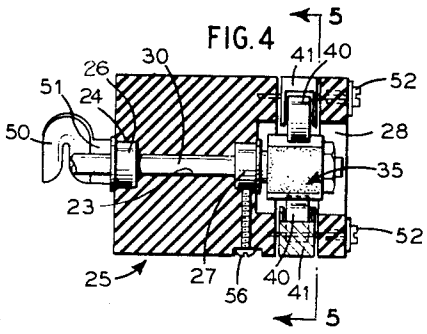
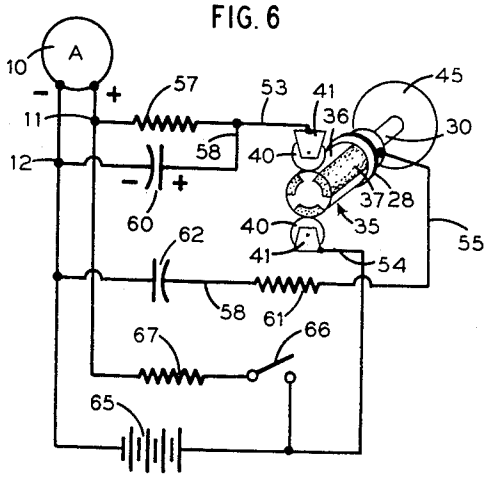


FIG. 6



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YARN SPEED METER

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Application December 27, 1956, Serial No. 630,972

9 Claims. (Cl. 324—70)

This invention relates to speed measuring devices and, more particularly, to an improved device for measuring the speed of yarn feeds in knitting apparatus.

In multi-feed knitting machines, such as a circular knitting machine, it is essential, to produce a fabric having a uniform surface, that all the yarn feeds be operating at substantially the same speed. The reason for this is that the uniformity of appearance is dependent upon the same amount of yarn being drawn for each course. In a knitting machine having multiple yarn feeds, successive courses are knit from successive yarn feeds in a repetitive sequence.

From examination of many fabrics, it has been found that differences of more than about 5% in yarn length per course can result in fabric of uneven appearance. This is particularly true in the case of plain fabrics knit from smooth uniform yarns. If the average yarn speed is 400 feet per minute, as in certain machines, a difference of 5% between the speeds of different yarn feeds is equal to a difference of 20 feet per minute.

The yarn feed speeds can be equalized by measuring the speed of each individual feed and then correspondingly adjusting the needle operating cams. When the length of yarn fed per course is measured by hand, a great deal of time and effort is required, resulting in an inefficient use of production time. An easier way is to measure the speed of each yarn feed while the machine is operating.

Such speed measurement is facilitated by the yarn speed meter assembly of the present invention. This assembly comprises a one-hand operated tachometer device for engaging each yarn feed in succession, and a speed meter supported on the user's person and connected by a flexible cable to the device.

The tachometer device comprises an elongated grip on the end of which is an elbow supporting a tachometer head. This head comprises a cylindrical body of dielectric material in which is rotatably mounted a shaft having a friction surface pulley secured on its outer end and engageable with a yarn. An open hook mounted on the head in radially spaced relation with the pulley serves to engage the yarn to assure wrapping of the yarn about an optimum arc of the pulley.

A commutator is formed on the inner end of the shaft and engaged by a pair of roller brushes mounted in the body and spring-biased against the commutator. Conductors connect each brush and the shaft into a pulsing circuit in a battery powered electric meter. The reading of the meter is dependent upon the pulse rate, and the pulse rate is dependent upon the speed of rotation of the pulley. Hence, the meter may be calibrated in yarn speed rates.

In using the device, the operator supports the meter on his person, by a belt or sling, and grips the tachometer handle in one hand. He then measures the speed of each yarn feed by engaging the hook with the yarn and then cocking the handle to engage the yarn around the pulley. The yarn speed may then be read from the meter, and the reading is used in adjusting the operating cams.

For an understanding of the invention principles, reference is made to the following description of a typical embodiment thereof as illustrated in the accompanying drawing. In the drawing:

Fig. 1 is a perspective view of a yarn speed meter assembly embodying the invention;

Fig. 2 and 3 are front elevation views of the tachometer device, illustrating its application to a yarn feed;

Fig. 4 is an axial sectional view of the tachometer head;

Fig. 5 is a diametric sectional view on the line 5—5 of Fig. 4; and

Fig. 6 is a schematic wiring diagram of the assembly.

Referring to Fig. 1, the assembly comprises a meter 10, which may be an ammeter or voltmeter calibrated in feet per minute, a tachometer-generator device 20, and a multi-conductor flexible cable 15 connecting meter 10 to device 20. The meter may be provided with a suitable sling or belt by means of which is supported on the operator's body.

Tachometer-generator device 20, as seen in Figs. 4 and 5, comprises a tubular grip or handle 21 having an elbow 22, of plastic composition material or the like, detachably engaged in its outer end. Elbow 22 has telescoped thereinto a cylindrical body 25, of dielectric material, having an axial passage 23 formed with an enlarged concentric recess 24 at its outer end. Recess 24 seats a metallic bearing 26 for a rotatable shaft 30 supported, intermediate its ends in a second metallic bearing 27 embedded in body 25 intermediate the ends of the latter and concentric with passage 23. Bearing 27 is seated at the inner end of a large diameter and relatively deep recess 28 at the inner end of body 25.

The inner end of shaft 30 has secured thereon a commutator 35 comprising, for example, three conductive "bars" 36 separated by insulation 37. The wall 31 bounding recess 28 has diametrically opposite slots 32 in which are mounted a pair of brushes. Each brush comprises an arcuate body 41, of electrically conductive material, such as copper or brass, having a forked free end mounting a roller 40 engaged with commutator 35. Brush bodies 41 are pivoted intermediate their ends on pins 42 extending across slots 32, and springs 43 seated between the ends of bodies 41 and the end surfaces of recesses 32 bias bodies 41 to maintain rollers 40 engaged with commutator 35.

The outer end of shaft 30 has secured thereto a V-belt pulley 45, which may be a two-piece pulley, and which has a cylindrical friction surface 46 for frictional engagement with the yarn. To assure adequate peripheral contact of the yarn with pulley 45, a yarn tensioning device is provided on head 25. As illustrated, this device comprises a U-shape guide 50 of porcelain or other hard smooth material. Guide 50 is mounted in a U-shape slot in a step bracket 51 secured to head 25 and supporting guide hook 50 in radially spaced relation to pulley 45.

Referring to Figs. 4–6, terminals 52 secured to pins 42 are connected to conductors 53 and 54. A third conductor 55 is connected to bearing 27, and thus to shaft 25, by a stud 56. The three conductors pass through elbow 22 and grip 21 into conductor 15.

The electrical circuit is illustrated in Fig. 6. Conductor 53 is connected through a series resistor 57 to one terminal 11 of meter 10. A conductor 58 branches from conductor 53 and is connected through a condenser 60 to the other terminal 12 of the meter. Conductor 55 is connected, through a resistor 61 and a condenser 62, to conductor 58 in parallel with condenser 60.

Conductor 54 is connected to one terminal of a battery

65 whose opposite terminal is connected to meter terminal 12. To test battery 65, a normally open switch 66 is connected between meter terminal 11 and conductor 54 in series with a resistor 67. When switch 66 is closed, the battery voltage may be computed from meter 10. This meter is preferably provided with a suitable scale calibrating and changing adjustment common in electric meters.

Referring to Figs. 2 and 3, the yarn speed is measured by first engaging guide hook 50 with yarn 70, as in Fig. 2, and then cocking handle 21 to engage pulley 45 with the yarn, as shown in Fig. 3. This wraps yarn 70 about a substantial arc of pulley 45 as determined by the cocking of handle 21. As pulley 45 is rotated by yarn 70, commutator 35 and brushes 40 pulse meter 10 at a rate dependent on the yarn speed, the pulsing circuit including the described resistors, condensers, and conductors. The rate the meter 10 is pulsed determines the meter reading, thus giving a direct measurement of each yarn speed. The obtained information is utilized to adjust the operating cams to substantially equalize the speeds of the several yarn feeds. The tachometer-generator, when in use, is gripped in one hand, thus leaving the other hand free.

While a specific embodiment of the invention has been shown and described in detail to illustrate the application of the invention principles, it will be understood that the invention may be embodied otherwise without departing from such principles.

What is claimed is:

1. A yarn speed meter, for measuring yarn feed speeds in a knitting machine, said meter comprising, in combination, a relatively elongated handle; a head extending laterally from an end of said handle; a shaft rotatably mounted to extend longitudinally of said head; a grooved pulley secured on the outer end of said shaft; a U-shape guide mounted on said head, lying in a plane parallel to said shaft, and positioned outwardly of said pulley; the opening in said guide being aligned with the groove of said pulley; interacting rotary switching means on said head and the inner end of said shaft operable by rotation of said shaft; electrically operable speed indicating meter means providing a speed indication corresponding to the angular velocity of said pulley; and a relatively elongated flexible cable interconnecting said handle and said meter means and including conductors electrically connecting said rotary switching means and said meter means.

2. A yarn speed meter as claimed in claim 1 in which said rotary switching means comprises a commutator on the inner end of said shaft; and brush means on said head engaged with said commutator.

3. A yarn speed meter as claimed in claim 1 in which said rotary switching means comprises a commutator on the inner end of said shaft and electrically connected thereto; and brush means on said head engaged with said commutator.

4. A yarn speed meter as claimed in claim 3 in which said brush means comprise brush holders oscillatably mounted in circumferential slots in said head; rollers rotatably mounted on said holders; and means biasing said holders to engage said rollers with said commutator.

5. A yarn speed meter as claimed in claim 1 in which said pulley has a friction surface at the base of its groove to engage the yarn.

6. A yarn speed meter as claimed in claim 1 in which said pulley comprises a pair of frusto-conical side members and a cylindrical friction surface element therebetween for engaging the yarn.

7. A yarn speed meter as claimed in claim 1 in which said head is a cylindrical member of dielectric material.

8. A yarn speed meter as claimed in claim 1 in which said head is a cylindrical member of dielectric material; and said guide is mounted in a stepped bracket on the outer end of said head.

9. A yarn speed meter as claimed in claim 8 in which said head has its inner end telescoped in a hollow elbow disengageably mounted on said one end of said handle.

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