May 28, 1963 K. HAMILTON 3,091,075

PAPER YARN APPARATUS

Filed Jan. 22, 1962

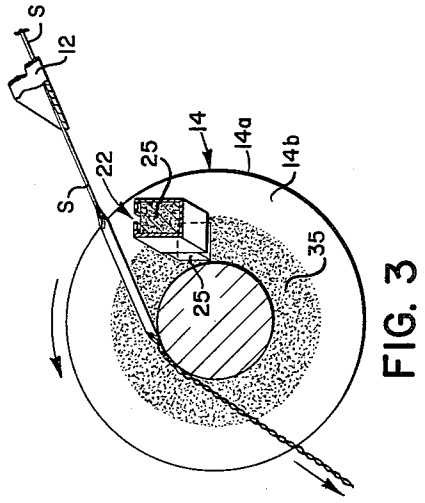


FIG. 3

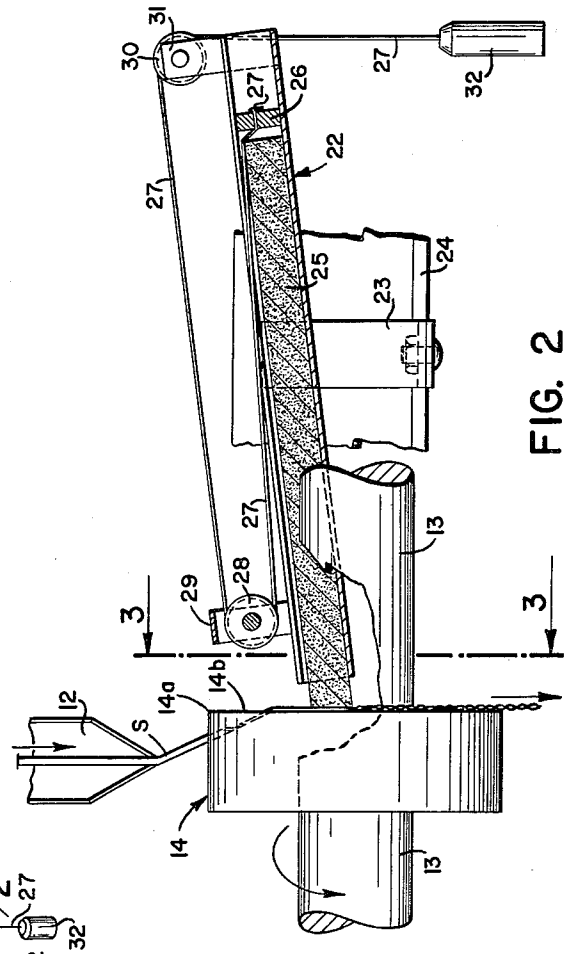


FIG. 2

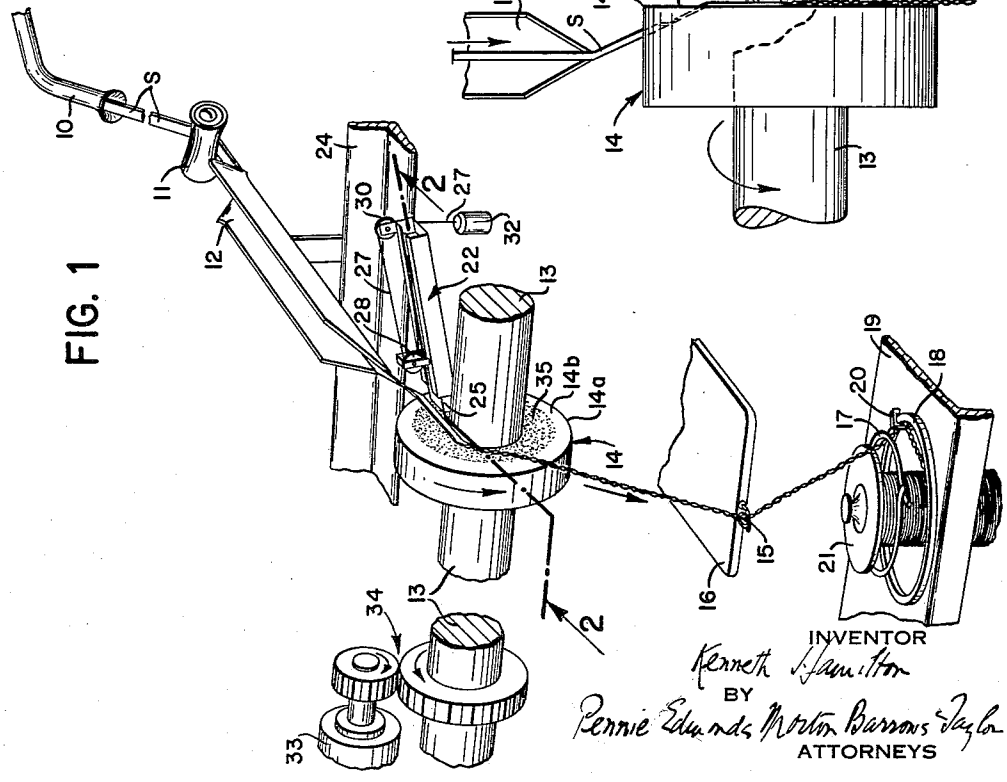


FIG. 1

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PAPER YARN APPARATUS

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This invention relates to the production of paper yarn formed by twisting a narrow strip of paper about its longitudinal axis. More particularly, the invention is concerned with a novel means for applying a compound to the strip before it is twisted, the compound serving to keep the yarn flexible, so that it can be used without difficulty in weaving and knitting operations.

In the production of paper yarn by the usual methods, a web of paper drawn from a roll is slitted into a plurality of strips of a width appropriate for the formation of the desired yarn. The strips are separated and individually twisted into yarns, as they advance, and the respective yarns are then wound into packages. In order that the strips may be twisted tightly, it is customary to moisten the paper and this is done by applying moisture either to the web before it reaches the slitting means or to the strips before they are twisted. While paper yarn contains moisture so applied to the paper, it is flexible and can be readily manipulated in weaving and knitting operations, but, if the yarn dries out, it becomes stiff and unmanageable in such operations. The development of stiffness in paper yarn can be avoided by applying a small amount of a suitable compound to the paper, and a compound, which may be advantageously used, is a mixture of paraffin and Japan wax of a melting point substantially below 212° F.

The present invention is directed to the provision of means for applying to a strip of paper, which is to be twisted to form a yarn, a thin coating of a compound, which will keep the yarn soft and flexible during its fabrication by weaving and knitting operations. The new applicator device is simple in construction, effective in use, and capable of being controlled, so that it will apply the compound in varying amounts as required for different yarns.

For a better understanding of the invention, reference may be made to the accompanying drawing, in which

FIG. 1 is a view in perspective showing the applicator device of the invention together with associated parts of a paper yarn machine, on which it is used;

FIG. 2 is a sectional view on the line 2—2 of FIG. 1; and

FIG. 3 is a sectional view on the line 3—3 of FIG. 2.

In the drawing, the applicator device is illustrated as incorporated in the paper yarn machine disclosed in the Shuttleworth and Hamilton Patent 3,012,393, issued December 12, 1961. In the patented machine, the web of paper drawn from a supply roll is moistened and slitted into strips which then pass through individual guide tubes **10** to twisting and winding mechanisms arranged in rows along opposite sides of the machine.

The strip S issuing from each tube **10** passes beneath a guide **11**, which may be a waisted porcelain roller, and then travels through a guide trough **12** of V-shape. A shaft **13** extends lengthwise of the machine on each side and it carries a disk **14** aligned with each of the guides **12**. The strip issuing from each guide **12** is led so that it travels across an end of the disk and, as the disk is of substantial thickness, the strip is diverted from its rectilinear path through the guide and passes over the sharp edge **14***a* of the disk. The contact of the strip with the edge **14***b* tends to hold the strip flat and the strip advances with one of its faces in contact with the end surface **14***b* and with its lower edge in contact with the surface of the shaft.

Beyond the disk **14**, the strip passes through the usual pigtail guide **15** on a plate **16** hinged to the frame of the paper yarn machine and then travels through an anti-ballooning ring **17** mounted concentrically with a spinning ring **18** on a ring rail **19** extending along the side of the machine. The ring is provided with the usual traveler **20** through which the twisted strip or yarn passes on its way to the bobbin **21**, on which the yarn is wound. In the operation of the machine, the rotation of the spindle carrying the bobbin and the drag of the traveler cause the strip to be twisted and the twist runs back through the guide **15** to the disk **14** and across the face of the disk to a point near the top of the shaft **13**.

A casing **22** is supported adjacent each disk **14** by a bracket **23** attached to a frame member **24** of the yarn machine and the casing lies substantially at right angles to the plane of rotation of the disk and has one end close to the surface **14***b* of the disk. The casing is slotted longitudinally at its top and it receives a stick **25** of a coating compound. A follower plate **26** is mounted in the casing to bear against the outer end of the stick and it is attached to a cord **27** which extends through the slot and passes around a grooved pulley **28** carried in a bracket **29** attached to the casing. The cord extends around the pulley and is then led outwardly to pass around a grooved pulley **30** on a standard **31** attached to the casing near its outer end. The cord extends downward from the pulley **30** and carries a weight **32** which acts through the cord and follower to urge the stick of compound out of the casing and into contact with the end surface **14***b* of the disk. The casing is so disposed that the stick of the compound bears against the surface of the disk close to the shaft **13**.

A motor **33** mounted on the frame of the yarn machine is connected through gearing **34** to each of the shafts **13** and, in the operation of the machine, the shafts are driven to rotate the disks. As each disk turns, it receives a coating of the compound on an annular area **35** encircling and close to the shaft **13** and the shafts **13** are driven at such a rate that the surface speed of all parts of the annular area **35** on each disk is different from the surface speed of the paper strip traveling across the disk. Preferably, the surface speed of the annular area is greater than that of the strip and, because of the difference in surface speeds, the strip makes a rubbing contact with the annular area, which causes a coating of the compound applied to the annular area to be taken up by one face of the strip.

A compound, which has been found to be satisfactory for the purpose, is a mixture of five parts of paraffin and one part of Japan wax. The paraffin employed is such that the mixture has a melting point of 140° F., although, during the summer months, it is preferable to use a compound having a melting point between 160° F. and 170° F. Such a compound adheres to the paper and remains in the yarn to keep the latter flexible during fabricating operations. If the yarn is used in the production of a product, which is subjected to a drying operation at a temperature of about 212° F., the coating compound will be driven from the product, after which the yarn, upon becoming completely dry, will be relatively stiff. An example of such a product is a tufted carpet, in which the backing sheet is made of paper yarn or in which a scrim woven or knitted of paper yarn is applied to the under surface of the carpet after a coating of latex has been applied to the under surface of the backing sheet to lock the tufts in position. When such a carpet is passed through the usual dryer, the coating compound applied to the paper yarn is expelled and, upon completion of the drying operation, the yarn becomes stiff so as to add to the stiffness of the carpet.

In the operation of the applicator, the amount of the coating applied to a paper strip may be varied by varying

the difference between the surface speed of the strip and the surface speed of the coated annular area on the disk, from which the strip takes up the coated material. As the speed of the strip depends on the spindle speed, which is keep constant, the difference in surface speeds mentioned may be effected by varying the speed of rotation of the shaft 13 carrying the disk.

I claim:

1. In a machine for making paper yarn, the combination of a rotary element, means for applying a coating of a solid compound to the surface of the element, means for advancing a strip of paper by twisting the strip into yarn and winding the yarn into a package, means for guiding the strip to cause it to travel with one face in contact with the coated surface of the element, and means for rotating the element at a rate such that its coated surface in contact with the strip travels at a surface speed different from that of the strip to transfer coating material to the strip by a rubbing action.

2. In a machine for making paper yarn, the combination of claim 1, in which the rotary element is a disk and the applying means applies the coating to an annular area on a flat surface of the disk, the area being concentric with the axis of rotation of the disk.

3. In a machine for making paper yarn, the combination of claim 2, in which the disk is mounted on a rotary shaft and the applying means applies the coating to an annular area on a flat surface of the disk, the area encircling and lying adjacent to the shaft.

4. In a machine for making paper yarn, the combination of claim 2, in which the applying means comprises a support mounted adjacent to the disk for holding a body of the compound in contact with a flat surface of the disk and means for pressing the body against the flat surface.

5. In a machine for making paper yarn, the combination of claim 4, in which the support is a longitudinally slotted casing for holding a stick of the compound with one end bearing against the flat surface of the disk, a follower is disposed within the casing, a cord is connected at one end to the follower and passes through the slot in the casing, and a weight attached to the other end of the cord causes the follower to urge the stick of compound against the disk.

6. In a machine for making paper yarn, the combination of claim 1, in which the rotating means rotates the element at such a rate that its coated surface in contact with the strip travels at a higher surface speed than that of the sttrip.

7. In a machine for making paper yarn, the combination of a rotary element, means for holding a body of a solid material against a surface of the element, means for urging the body against the surface to cause the body to form a coating of the material on the surface, means for advancing a strip of paper and guiding it to travel with one face in contact with the coated surface of the element, and means for rotating the element at a rate such that its coated surface in contact with the strip travels at a surface speed different from that of the strip to transfer coating material to the strip by a rubbing action.

8. In a machine for making paper yarn, the combination of claim 7, in which the rotating means rotates the element at such a rate that its coated surface in contact with the strip travels at a higher surface speed than that of the strip.

References Cited in the file of this patent

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3,012,393	Shuttleworth et al.	Dec. 12, 1961