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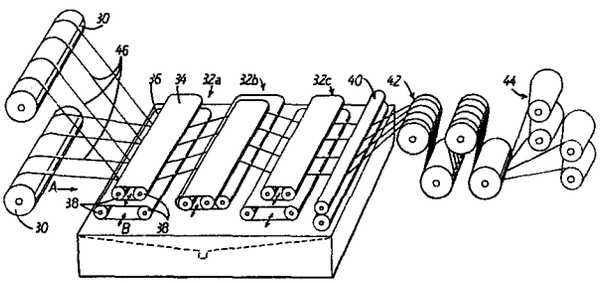
(54) Method and apparatus for textile yarn production.

(57) A method and apparatus for producing a felted rope or roving wherein rovings or slubbings of wool or blends of wool with other fibres are subjected to an oscillatory rubbing movement.

In order to produce a felted rope or roving of a quality which enables it to be used as a substitute for conventional spun yarns the oscillatory rubbing movement is carried out in the presence of water. The oscillatory rubbing movement is carried out at several stations using several pairs of rubbers 32. Water heated to a predetermined temperature is fed to each of the rubbers. Excess water is removed using a pair of squeeze rollers 40 and the felted rope or roving is further dried using heated drums 42. The speed of forword movement, the rate of oscillation and stroke of the rubbers is controlled to give the desired degree of felting.



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DESCRIPTION

"METHOD AND APPARATUS FOR TEXTILE YARNS PRODUCTION"

The present invention relates to the production of textile yarns and in particular to a method of producing a felted rope or roving and to an apparatus for carrying out the method.

It is an aim of the present invention to provide a method and apparatus for producing a felted rope or roving which can substitute for conventional yarns of the spun, or spun and doubled, type normally used in weaving, tufting or knitting processes.

British Patent No. 1351043 describes a method and apparatus for production of non-twist yarn from ribbons as they are delivered from a carding machine. The ribbons enter dry into the first rubbing leathers and are then damped with hot water prior to entry to further rubbing leathers. The resulting yarn is relatively weak and is considered unsatisfactory since it is not felted sufficiently. One factor leading to the unsatisfactory nature of the yarn produced according to this known process is that the material is not subjected to the rubbing action for a sufficient time.

It is an aim of the present invention to produce a felted rope or roving which is different to that produced by the known method and apparatus.

According to one aspect of the present invention then there is provided a method of continuously felting rovings or slubbings of wool or blends of wool with other fibres to produce a felted rope or roving, comprising subjecting the rovings or slubbings to an oscillating rubbing movement in the presence of water.

According to another aspect of the invention there is provided a machine for continuously felting

rovings or slubbings of wool or blends of wool with other fibres to produce a felted rope or roving, comprising a series of conveying devices adapted to subject the rovings or slubbings carried thereby to an oscillating rubbing movement and means for supplying water to at least some of the said conveying devices.

The rovings pass through a series of aprons where they are subjected to the oscillatory rubbing movement. The water is hot typically 55°C and, advantageously contains a felting agent. Preferably, six sets of rubbers or aprons are employed. Each rubber or apron subjects the rovings or slubbings to a two dimensional movement comprising an oscillatory transverse movement and a forward movement. The degree of two dimensional oscillating rubbing movement performed on the rovings or slubbings at each apron is not necessarily the same. In the preferred method scouring takes place at the first apron in the presence of hot water and a scouring agent, and the scoured rovings or slubbings are then passed between squeeze rollers, where soiled, coloured water is removed, after which the rovings or slubbings pass to the felting zone, comprising four aprons disposed one after the other. Migration and consolidation of the fibres within the slubbings takes place at this stage. The degree of felting is controlled by the amount of energy input to the slubbings or rovings and this is dependent on the combination of time, oscillatory speed, stroke, forward speed and temperature.

The yarn or felted rope then proceeds through a final apron where heated clean water is applied to clean away residue or foreign matter present within the yarn. At this stage the felted, yarn or rope, is saturated and holds a water content of approximately 320%. The felted

rope is passed through a set of squeeze rollers to extract the water to a level of approximately 100% water content before passing to a drying zone. Drying is preferably achieved by passing the felted rope around a plurality of electrically heated drums or rollers. The felted rope or yarn is dried to a moisture content of 15% and then wound onto suitable storage packages.

The rovings or slubbings may be subjected to a pounding movement at the same time as they are subjected to the oscillatory rubbing movement.

The present invention will now be described further by way of example only, with reference to the accompanying drawings, in which:-

Figure 1 is a diagrammatic side elevation of one embodiment of a machine in accordance with the present invention;

Figure 2 is a diagrammatic perspective view of a second embodiment of a machine in accordance with the present invention, and

Figure 3 is a diagrammatic side elevation showing the position of aprons for self feeding.

Referring firstly to the embodiment of Figure 1. Material is unwound from a plurality of supply packages 10, which might be conventional condenser bobbins or sliver cans or other such commonly used container vehicles.

Each resulting roving 12 is then passed between a series of continuous aprons 14. Water at a predetermined temperature , containing a felting agent, is also applied to the continuous aprons via pipework 16. The aprons 14a,14b,14c deliver the rovings longitudinally, and at the same time impart a transverse oscillatory rubbing movement (in a plane generally parallel to the conveying surface of the

aprons) to the rovings. A pounding movement (in a plane generally perpendicular to the conveying surface of the aprons) may also be imparted to the rovings by the aprons. The pounding movement can be achieved by arranging for the aprons to flap against the material as it is passing through.

After passing through a plurality (14a,14b,14c) of such aprons 14, whose number depends upon the degree of felting required, the material passes through another set of oscillating aprons 20 before being finally wound on to hank reels 22.

Variable speeds are incorporated in the machine to control the speed of the material through the machine, the amount of rub imparted to the roving and, where present, the amount of pounding also given to the roving. A metering device is also incorporated to control the flow of water to the several felting zones. The water is collected, filtered, re-heated and then re-cycled.

Stainless steel is used where metal is likely to come in contact with the water.

The machine is so designed that a multiple number of slivers or rovings 12 are processed through the machine at the same time.

Referring now to Figures 2 and 3 there is shown a preferred embodiment of the invention in which the machine takes a more linear form.

Material to be felted in the form of rovings or slubbings are unwound from a plurality of supply packages 30. Typically these packages would be conventional condenser bobbins having wound thereon the slubbings to be felted. Two such bobbins are illustrated in Figure 2.

The main bulk of the machine comprises a plurality of aprons 32. For simplicity only three sets of aprons are illustrated but it will be appreciated that any convenient number may be employed. Six aprons are employed in the preferred machine. Each apron 32 comprises a pair of endless bands 34,36 which are entrained around rollers 38. The bands are driven by drive means in the direction of forward motion of the slubbings through the machine, indicated by arrow A. Thus, band 34 rotates anti-clockwise and band 36 rotates clockwise as viewed in Figure 1. The bands 34 and 36 are also oscillated in a direction transverse to the direction of forward motion of the slubbings indicated by arrow B. The bands 34 and 36 are oscillated simultaneously in opposite directions. The speed of forward motion, the rate of oscillation and the stroke are all variable and in use, are adjusted to give a desired amount of felting.

As will be seen from Figures 2 and 3 the two bands are placed adjacent to one another one above the other, but are slightly spaced apart so that the lower run of band 34 does not actually contact the upper run of band 36. The distance by which the bands are spaced apart is adjustable to cater for different thicknesses of material to be felted. As will be seen, the transverse width of the aprons is considerably greater than the band run, and the width is dictated by the number of slubbings which are to be felted.

Means are provided for applying hot liquid to the material to be felted and this is conveniently achieved by providing pipe work which feeds liquid onto each of the aprons. Excess liquid is collected, filtered, re-heated and then re-cycled. Water is

employed with appropriate additives as determined by the operation performed at each of the aprons. The water is heated to at least 55°C and is preferably maintained between 55°C and 60°C.

The machine also comprises squeeze rollers 40 located downstream of the felting zone. These rollers serve to reduce the water content of the felted material prior to drying. The felted yarn or rope is dryed using a plurality of heated rollers 42. The felted yarn passes around the circumference of the rollers. Preferably, the rollers have a plurality of transversely spaced circumferential grooves, and each groove receives and guides an individual felted yarn. As shown in Figure 2 the felted yarn contacts the heated drums only once. In a more preferable arrangement a double pass is employed wherein the yarn is fed back from the fourth drum dryer to the first to pass through the dryer again before emerging to be wound onto bobbin 44 or other suitable storage containers. Thus the number of grooves in the drying drums is twice the number of felted yarns emerging from the machine. Typically twenty four felted yarns are produced.

In operations, the slubbings are fed to the first apron 32a where scouring takes place in the presence of water heated to 55°C and containing a scouring agent. The motion of the apron subjects the slubbings to the oscillating rubbing movement and to forward movement. Soiled and coloured water is removed from the slubbings by passing them between a pair of squeeze rollers (not illustrated). This water goes to waste. It will be seen that a slubbing 46 from each of the two bobbins 30 is brought together prior to feeding them into the machine. The combination of two slubbings is to be preferred, but is by no

means essential. The number of slubbings which are combined is determined by the size of felted yarn required. In certain circumstances no combination may be necessary.

On leaving the scouring zone the slubbings are fed to the felting zone proper. In the preferred method four sets of aprons are used in the felting zone - only one 32b is illustrated in Figure 2. Water containing a felting agent is fed to each of the four aprons at a temperature of between 55°C and 60°C and the material is subjected to the oscillatory rubbing motion and to forward motion by the aprons. The water is fed onto the upper band 34 and runs down onto lower band 36.

The oscillatory motion of the two bands of each apron causes the slubbings to roll about their own axis and is accompanied by a rubbing action. The forward motion of the bands contributes to the rubbing imparted to the slubbings. The speed of forward motion of the band 34 is preferably different to the speed of forward motion of the band 36. Conveniently, it is driven at half the forward speed of band 36. Migration and consolidation of the fibres within the slubbing takes place in the felting zone. Each of the successive aprons is preferably driven at a higher forward speed to achieve elongation of the slubbing, if the slubbing needs to be attenuated.

On emerging from the fourth apron in the felting zone the yarn proceeds through to the last apron 32c where heated clean water is applied to clean residue or foreign matter present within the yarn.

At this stage the yarn is now saturated and holds a water content of approximately 320%. The water content

is reduced by passing the yarn through squeeze rollers where the water content is reduced to 100%. The yarn is subsequently passed to a drying zone where it contacts the surface of a plurality of electrically heated drums. The moisture content is reduced to approximately 15% before the felted rope or yarn is wound onto bobbins 44 or other suitable storage containers.

The machine features self feeding whereby a slubbing 46 is fed into the first apron 32a automatically feeds through the subsequent aprons. The wet slubbings will not feed between aprons which are in the same plane but spaced apart. This problem does not usually arise with dry slubbings. Self feeding is achieved by arranging for the aprons to overlap with one another. This is illustrated by way of example in Figure 3 where it will be seen that the band 36 of apron 32b is disposed at a level below that of the band 36 of apron 32a. Similarly band 36 of apron 32c is disposed at a level below that of band 36 of apron 32b. The fore and aft ends of the bands 36 of aprons 32a and 32b and aprons 32b and 23c overlap one another in the direction of movement of the slubbings. Thus, an end of a slubbing as it emerges from the apron 32a is automatically carried into apron 32b because there is no gap between the aprons. This is the case for all the aprons. Without this provision the machine would have to be stopped whilst the slubbing is threaded into the machine. Alternatively, considerable risk may have to be taken in threading manually whilst the machine is still running. Clearly, the latter is to be avoided in view of the risks involved whilst the former is to be avoided because it slows down production.

The endless bands 34,36 of the aprons 32 are made of a flexible rubber-like material and preferably have a contoured surface. This may consist of a plurality of circumferential ridges and hollows placed alternately side by side across the transverse width of the apron. Alternatively, the band may have a criss-cross pattern formed thereon. A transverse stroke of the order of two inches has been found particularly suitable.

The successful operations of the system is dependent on the accurate re-cycling of the water through the filters and the calculated inflow against ouflow, plus yarn to take up. The pH standard of 9 is achieved by an injection of felting agent at specified times of production to avoid neutrality. A stainless steel tank is employed for collecting the liquor used in felting and by means of filtration the liquor is re-cycled. Thermostatically controlled heaters are employed to maintain a water temperature at the aprons of 55°C. The liquor is pumped to the aprons by way of feed pipes 48.

The components employed which are in contact with the liquor are either made of corrosion resistant materials or are treated so as to be resistant to corrosion for example by galvinising.

Felting is achieved by the combined effects of, the rate of oscillation; the stroke; and the setting distance between the bands of the apron; and the presence of the hot water. The differential speed between the upper and lower bands also contributes to good felting performance.

CLAIMS

1. A method of continuously felting rovings or slubbings of wool or blends of wool with other fibres to produce a felted rope or roving, characterised by subjecting the rovings or slubbings to an oscillatory rubbing movement in the presence of water.

2. A method as claimed in claim 1, in which the oscillatory rubbing movement is obtained by passing the rovings or slubbings between two adjacent endless bands which move continuously in the direction of forward movement of the rovings or slubbings through the machine and which oscillate in a direction transverse to said direction of forward movement.

3. A method as claimed in claim 1 or 2, in which the material to be felted is subjected to the oscillatory rubbing movement at a plurality of stations in the presence of water heated to at least 55°C.

4. A method as claimed in claim 3, in which heated water containing a scouring agent, is introduced at a first station where the material to be felted is scoured, heated water containing a felting agent is introduced at a second station, and clean heated water is introduced at a further station where washing occurs.

5. A method as claimed in claims 1, 2, 3 or 4, in which the felted rope or roving is passed through squeeze rollers to extract excess water is subsequently passed around heated rollers to further reduce the water content of the felted rope or roving prior to being wound onto storage containers.

6. A machine for continuously felting rovings or slubbings of wool or blends of wool with other fibres to produce a felted rope or roving, characterised by a series of conveying devices 32 adapted to subject the

rovings or slubbings carried thereby to an oscillatory rubbing movement and means for supplying water to at least some of said conveying devices.

7. A machine as claimed in claim 6, in which the oscillatory rubbing movement is imparted by a series of aprons 32a, 32b, 32c each of which comprises a pair of endless bands 34,36 which are mounted adjacent to one another and between which the slubbings or rovings are carried, each of the bands being driven continuously in the direction of forward movement of the rovings or slubbings through the machine and being reciprocated in a direction transverse to said direction of forward movement.

8. A machine as claimed in claim 7, in which the two bands of said pair are driven at different speeds to one another.

9. A machine as claimed in claims 7 or 8, in which the series of aprons are arranged in a stepped sequence one after the other with the terminal end of one band of one apron over lapping with and disposed above the front end of one band of the next apron, whereby the rovings or slubbings self-feed from one apron to the next.

10. A machine as claimed in any of claims 6 to 9, in which a pair of squeeze rollers 40 is disposed downstream of the conveying devices 32 for removing excess water, and downstream of the squeeze rollers is a drying zone comprising a plurality of heated drums 42 around which the felted rope or roving is passed to reduce the moisture content.

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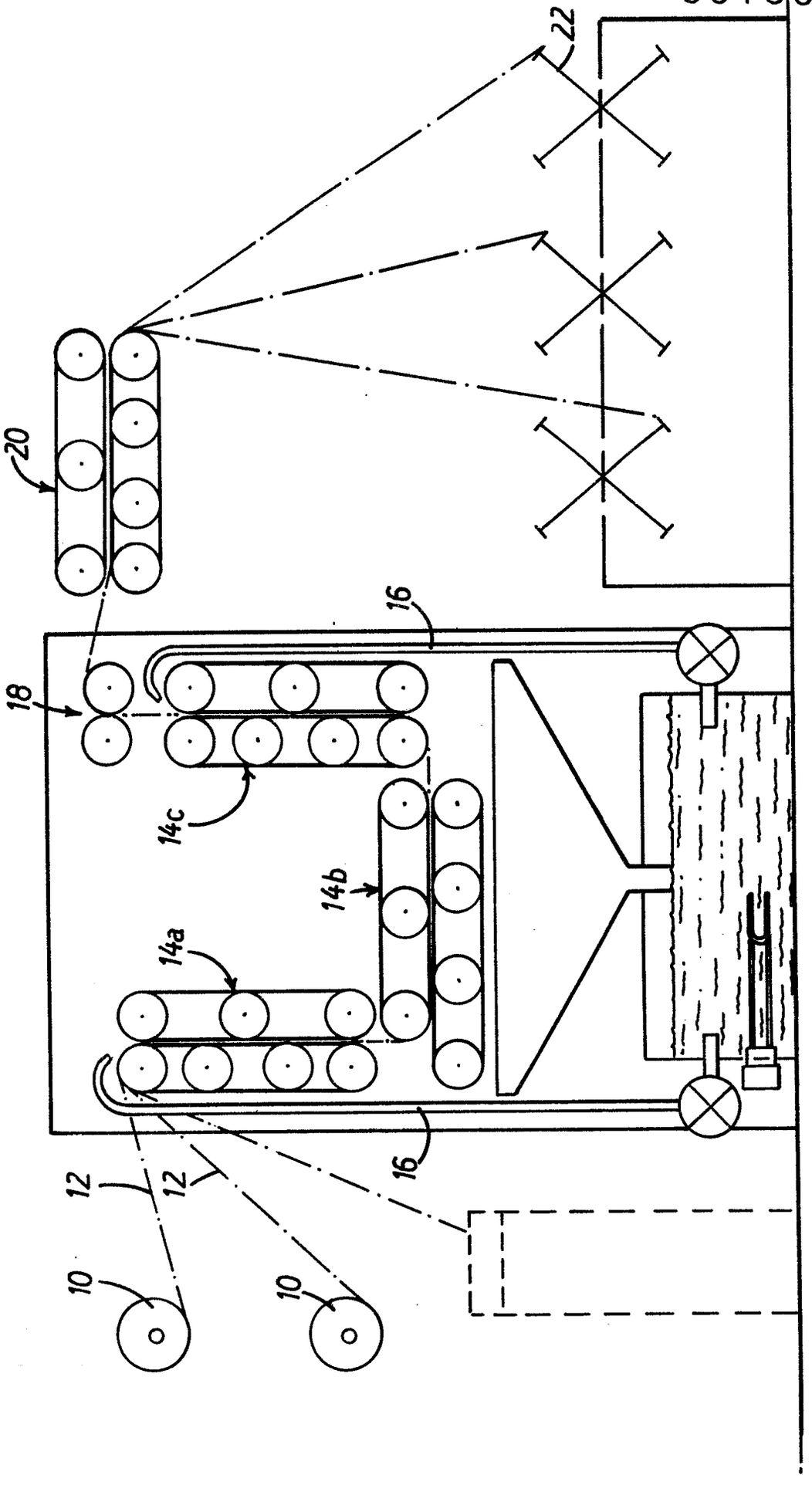

Fig.1

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Fig 3.

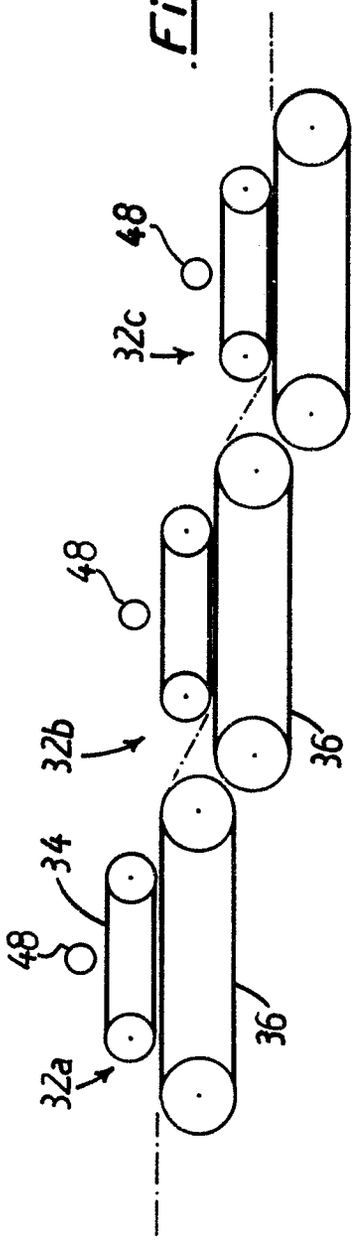

Fig 2.