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APPARATUS FOR THE PRODUCTION OF YARN CHEESES

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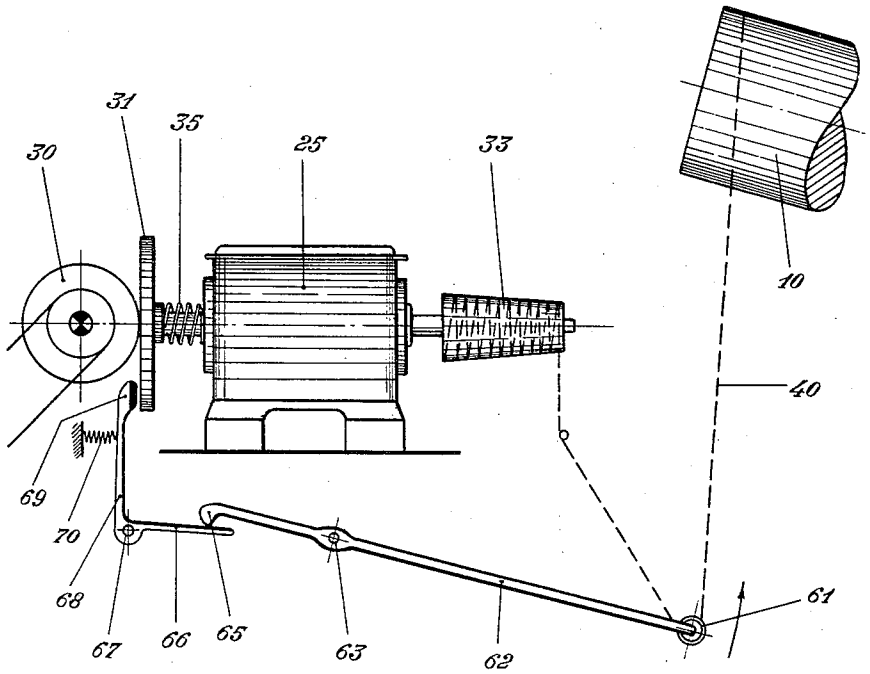

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APPARATUS FOR THE PRODUCTION OF YARN CHEESES

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1 Claim. (Cl. 242—45)

This invention relates to apparatus for the production of textile yarns, in particular in the form of cheeses of synthetic or artificial yarns.

In the case of viscose rayon, to which particular reference will be made both for illustration purposes and because it represents a preferred medium for carrying into effect this invention, the procedure requires only one manufacturing cycle, i. e. proceeding from the viscose solution to finished yarn wound on cheeses without any intermediate transfer manipulation, which is very advantageous, both from an economic viewpoint and from the point of view of yarn properties.

Thus, the invention relates principally to continuous spinning. Such a procedure, as applied to the case of viscose rayon, is carried into practice by causing the individual filaments formed in the coagulating bath to travel along a preferably spiral path by means of suitable storing and feeding devices and godet wheels, and processing the filaments during their movement in order that a finished yarn can be obtained. Such a processing includes various treatments in baths containing suitable solutions, such as washing, drying, and possibly cooling and conditioning cycles, which can be varied according to the finish required for the yarn. Some of such processing steps may be omitted, e. g. when rayon for tire fabrics is to be produced. At any rate, the yarn showing the required degree of finish, is wound onto bobbins by means of any suitable winding-up mechanism such as, for instance, a mechanism of the bell-type. Then the yarn is rewound, by means of separate equipment, on a conical cheese.

The apparatus according to this invention omits the latter re-winding operation, heretofore considered as essential, whereby a material saving of manipulation costs can be attained. Thus, this invention relates to apparatus for the continuous production of yarns wound on conical cheeses.

Another object of the invention is the provision of apparatus for the winding on cheeses of yarn delivered from a machine at a constant rate.

For a better understanding of the nature of this invention, it has been deemed convenient to describe briefly what occurs while the yarn is wound-up on cheeses in the winding frames heretofore known.

Should the cheese be built up by causing the spindle whereon it is fitted to rotate at a constant R. P. M., then the linear winding-up speed of yarn would vary at a rate governed by three factors. The first of such governing factors is the increase in size of the cheese due to the yarn being built-up thereon, the size increasing from zero up to a maximum value. Accordingly, should the R. P. M. be kept constant, the winding-up speed would tend to increase continuously. On the other hand, in the case of equally built-up yarn for each single layer of yarn, the diameter of cheese varies from a minimum to a maximum value, according to its taper. This makes for the second governing factor, and causes a pounding speed variation, i. e. a variation from a minimum up to

a maximum value, then again down to minimum and so on, which overlaps with the continuous variation caused by the first factor. Finally, it must be kept in mind that the winding-up speed of yarn is the resultant of a first component, the tangential speed of cheese as established by the R. P. M. thereof, and of a second component, a speed parallel to the bobbin axis, as determined by the motion of yarn guide. This makes for the third factor, which leads to pounding variations in the winding-up speed, and that overlaps with the already described variations.

Apart from the proper winding-up speed, the average speed over a relatively extended time, though very short if viewed from an absolute viewpoint, as for instance the time required for the building-up of at least one layer of yarn, could also be taken into consideration. Such an average speed is not interfered with by the second and third governing factors as previously described, and therefore it would continuously increase with the building-up of cheese. In the winding frames heretofore known, attempts have been made to keep such an average speed relatively constant, in order to obtain a good winding-up speed, a proper degree of zigzag motion and a smooth operation of winding frame; however in practice, such purposes are far from being wholly attained. One of means employed for the attainment of such ends consists in varying the R. P. M. inversely to the increase in the building-up of cheeses. Since in the winding frames heretofore used, the yarn is unwound from a freely revolving bobbin, a resistance must be applied at some point of the path travelled by the yarn if a compact building-up of cheeses is to be obtained.

When recourse is made to one of the already known winding frames to build up cheeses with a yarn delivered from a continuous spinning machine, then the operator is confronted with the practical impossibility of obtaining well compacted and regular cheeses. Such difficulty springs from the fact that the yarn, instead of being delivered by a bobbin which can be unwound at any time and at any required speed, is fed by a feeding device delivering at a pre-established speed, which can be considered as strictly constant, and that will be hereinafter called "feeding speed." The same condition would occur if the yarn could be delivered at a constant rate by a device that might even be independent from a continuous spinning machine. Such a difficulty has been efficiently overcome by the apparatus according to this invention, which winds the yarn delivered by a continuous spinning machine, or by a feeding device operated at a constant speed, directly on a conical cheese.

Thus, according to the invention, recourse can be made to winding frames of any suitable type, provided they are capable keeping the average winding-up speed of yarn nearly constant. Then a yarn compensating and tensioning device, capable of taking up and compensating the differences between the momentary winding-up speed of yarn, and the unwinding or delivery rate thereof, and at the same time keeping the tension of yarn within the preestablished limits, is inserted between the feeding device, which could be the spinning machine, and the winding frame.

For a better understanding of the invention, reference will be made in the following description to a preferred embodiment thereof, as shown in the accompanying drawing, in which all elements have been omitted which are not specifically intended for the formation of yarn and the processing thereof, and which shows an apparatus according to the invention in which the speed of the motor driving the cheese is controlled by means of a friction brake.

In the drawing, the device **10** represents a member of

a type capable of delivering the yarn at a constant linear speed. Such a device is diagrammatically shown in the form of a roller or drum; however, it could be a reel or a relay of the double cage type, or in general by any one of the many devices capable of delivering a yarn at a constant linear speed, and could form part of a continuous spinning machine.

According to the invention, the yarn coming from the member **10** is built up into cheeses by means of a winding frame **25**, the design of which is not specifically stated, as it could be of a type already known, provided that it be arranged to operate at a nearly constant average speed. It could be actuated, for instance, by means of a driving wheel **30** controlled by a suitable drive (not shown), through the driven wheel **31**. Said wheel **30** can be moved across the radius of wheel **31**, though remaining in frictional engagement therewith, in order to vary the transmission ratio.

Obviously, it is to be understood that the invention can be carried into practice even by having recourse to different devices of any known type. In particular, the average winding-up speed of yarn could be kept nearly constant by adjusting, through already known means, the R. P. M. of an electric motor, and in such a case the cheese could be fitted directly on the shaft thereof.

In fact, the type of winding frame used is not included within the scope of this invention, and therefore is not claimed as novel.

A compensating and tensioning member is interposed between the roller **10** and the winding frame. The hereinafter described embodiment thereof is based upon the following novel idea.

The motor and the drive for the winding frame are adjusted so that the average winding-up speed of the yarn is slightly higher than the speed with which the yarn is delivered by the continuous spinning machine or other feeding device. Under such conditions the compensating device will act essentially in the sense to deliver the yarn and, if the average winding-up speed is sufficiently high, it shall perform only said action. While such action of the compensating device may be automatically stopped at a given time, and then reversed, in the case in question it would be continued indefinitely, due to higher average winding-up speed.

Thus a device must be provided to cause the winding-up speed to drop, from time to time, to a value lower than the unwinding speed. This can be done by adjusting the average winding-up speed in such a manner that, in addition to the aforestated value, which might be called "normal value" or more strictly speaking "excess value," there will be one or more further well defined values or rates, at least one of which must be lower than the unwinding rate. Thus, the normal excess of winding-up speed is compensated for by periodically reducing the winding-up speed to a value lower than the unwinding speed.

Such a decrease in speed can be obtained by actuating the devices designed to cause it depending on the position attained by the movable components of the compensating device. The decreasing action could be developed either continuously or from time to time, i. e. when one or more pre-established positions have been attained by said components; in other words, depending upon the length of yarn stored in the compensating device, or when such length of stored yarn has attained one or more pre-established values, or depending on the tension of yarn, or after one or more pre-established values of such a tension have been attained. The components of compensating device are allowed to move freely, thus keeping the yarn tension constant, or at least within close limits, while suitable members designed to adjust or to change the winding-up speed are actuated by either continuously, or only when the device has reached one or more pre-established positions. When the control is intermittently actuated, and since the winding-up speed is initially higher than the unwinding speed, the length of yarn stored in the compensating device will at first decrease until a pre-established minimal value is attained, whereupon the aforesaid members shall enter into action whereby the winding up speed will be restored by means of suitable devices to its initial value. A similar condition will occur in the case in which more than two possible average winding-up speeds exist, or when the winding-up speed can be varied steplessly. In the case of a continuous control, the same results will be attained, however in a continuous manner. At any rate, a continuous control can be exerted between two pre-established end values of the stored length.

The simplest, and generally preferred device, allows the winding-up speed to return to its normal value as soon as the yarn tension has dropped under a given level, substantially corresponding to that which allows the compensating device to disengage itself from the braking or stopping member; all this can be attained by taking advantage of the action exerted by the components of the compensating appliance after they have come into contact with the aforestated members, to cause a decrease in the winding-up speed.

It will be apparent that a given effort is required to cause the winding-up speed varying devices to enter into action. Such an effort can be exerted directly or indirectly by the tension of yarn, or by an auxiliary source of power, that can be controlled by a very small effort exerted by the yarn. This procedure is particularly convenient when very fine yarns are being handled which could not withstand those even relatively moderate tensions which, through a train of levers and of differential pistons, would be usually sufficient to cause the adjusting elements to enter into action.

In the example shown, the yarn tension, acting through purely mechanical linkages, is utilized to vary the winding-up speed.

The yarn **40**, coming from roller **10**, is passed around a yarn guide **61** fitted on one end of a rod **62**, pivoted at **63**, and then is wound up on the cheese **33**. The opposite, suitably shaped end **65** of rod **62**, is kept in contact with one arm **66** of an L-shaped swing lever pivoted at **67**. Slippage means **69**, possibly lined with a suitable material and having a flat surface adjacent one face of driven disc **31**, is fitted on the end of the opposite arm **68** of said swing lever. A return spring **70** is designed to keep the slippage means **69** slightly spaced from the disc **31**, while all other component parts of the mechanism are kept in the positions as shown in the figure, the contact between the disc **31** and disc **30** being maintained by the spring **35**. Under such conditions, as the winding-up speed of winding frame is calculated in such a manner as to be slightly higher than the unwinding rate of yarn from roller **10**, the tension of yarn will tend to move the guide **61** in the direction shown by the arrow on said drawing. However, after the small clearance left between the slippage means **69** and the disc **31** has been taken-up, the yarn guide cannot be moved further, and therefore an increase in the yarn tension will occur, whereby the slippage means **69** is forced against the disc **31**. This results in a double action being exerted, i. e. on one hand said slippage means will exert a braking effect on the disc **31**, and thus on the rotary motion of cheese **33**, which is therefore slowed down, while on the other hand same slippage means will move the disc **31** away from disc **30**, thus compressing the spring **35**, whereby the braking action has to overcome only the inertia of winding frame and not the driving power too, and thus no undue friction occurs. When, due to slowing-down of rotary motion of cheese **33**, the linear winding-up of yarn thereon drops below the unwinding speed of roller **10**, the yarn tension drops and the return spring **70** will bring the mechanism again into its initial position, thus allowing a motion of yarn guide **61** in a direction opposite to that of the arrow, a releasing

of spring 35 and the bringing of disc 31 into contact with the driving disc 30.

It is thought that the invention and its advantages will be understood from the foregoing description and it is apparent that various changes may be made in the form, construction and arrangement of the parts without departing from the spirit and scope of the invention or sacrificing its material advantages, the form hereinbefore described and illustrated in the drawings being merely a preferred embodiment thereof.

What is claimed is:

In an apparatus for building-up yarn on cheeses carried by a spindle driven from a source of power, the yarn being delivered at a constant speed and the spindle being driven at a speed greater than the speed of delivery of the yarn, the combination of a drive connecting the source of power and the cheese spindle, said drive comprising a first disc rotated by the source of power adjacent the end of the spindle opposite the cheese, a second disc slidably mounted on said end of the spindle perpendicular to said first disc, spring means urging the surface of said second disc into engagement with the periphery of the first disc to form a friction drive connection between the discs, compensator means between the delivery of the yarn and the cheese, said means comprising an arm pivoted to the apparatus, a roller on the end thereof over which the yarn passes to the cheese, and means contacted by the compensator means to disconnect the drive

and brake the spindle, said means comprising an L-shaped lever pivoted at the elbow thereof to the apparatus, one arm of which is in contact with the free end of said compensator arm, the other arm of which has slippage means on the end thereof adjacent the periphery of said second disc, and spring means urging the other arm out of contact with said second disc, whereby when the tension in the arm increases, the compensator arm pivots and pivots the L-shaped lever to engage the slippage means with said second disc to disengage said second disc from said first disc against the action of said spring means and brake said second disc and said spindle.

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