Jan. 15, 1935. T. VOLLENBROICH 1,988,060

APPARATUS FOR TWISTING YARN AND WINDING ON CONICAL CROSS WOUND BOBBINS

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Fig. 1

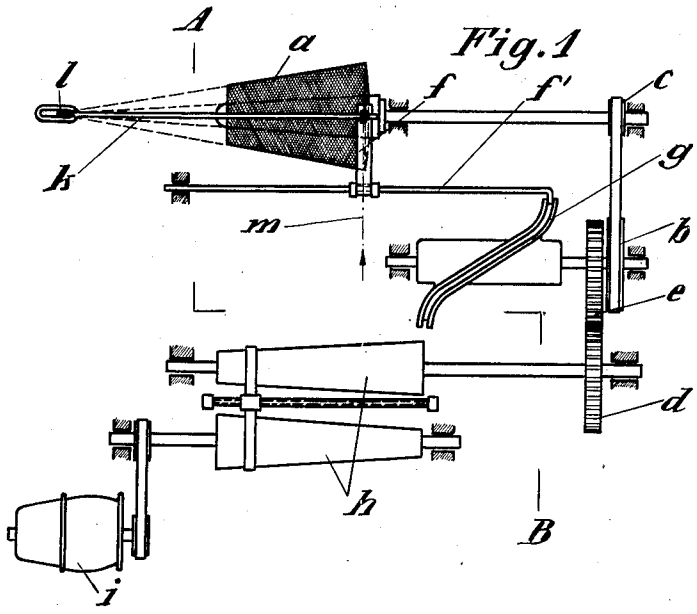
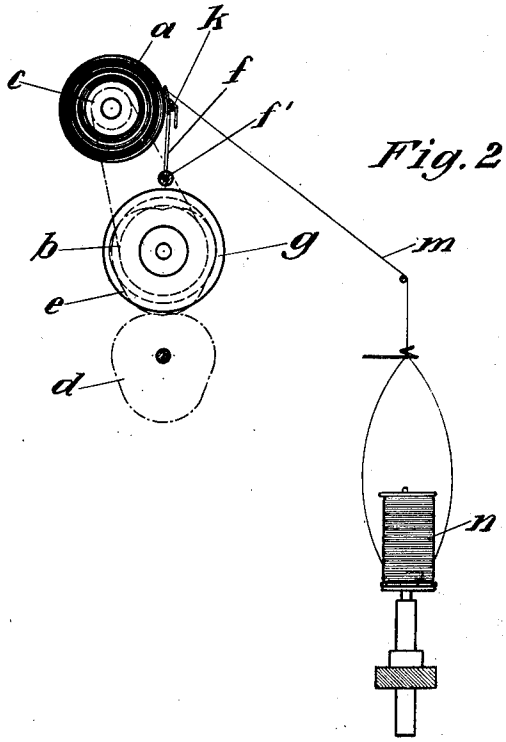


Fig. 2



Inventor:
Theodor Vollenbroich
by Paul P. Heinemann
Attorney

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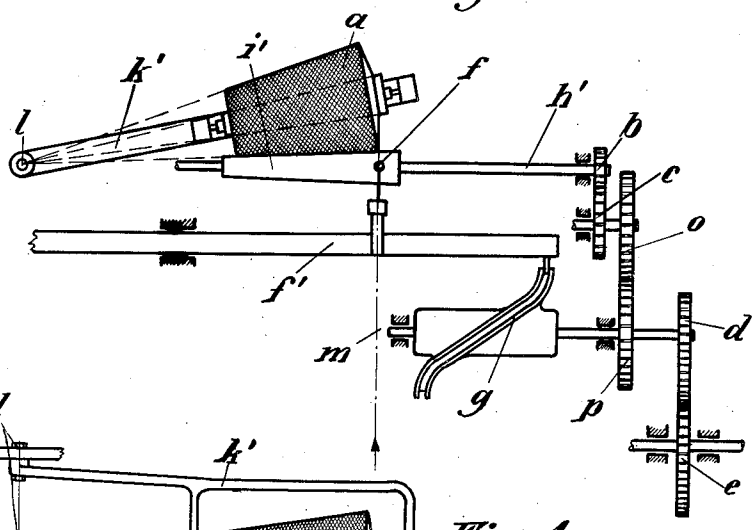
Fig. 3



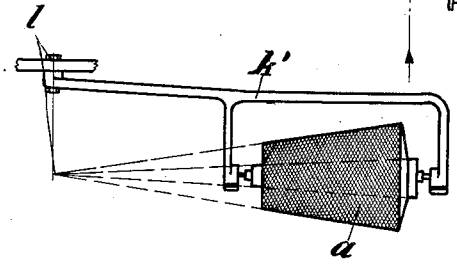


Fig. 4

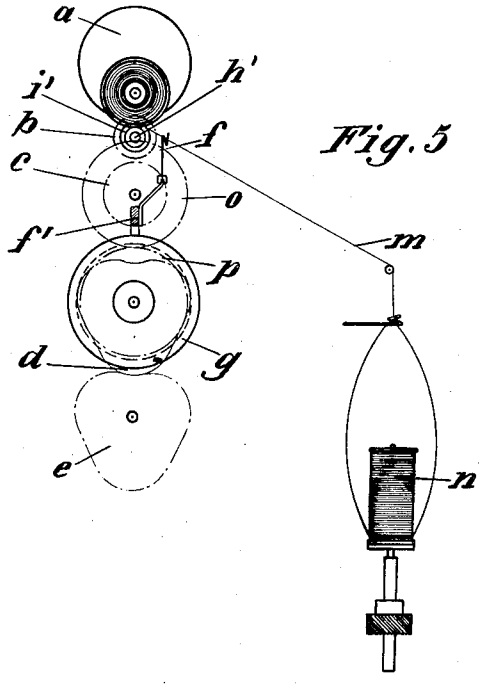


Fig. 5

Inventor;
Theodor Vollenbroich
by Paul E. Felsing
Attorney.

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APPARATUS FOR TWISTING YARN AND WINDING ON CONICAL CROSS WOUND BOBBINS

Theodor Vollenbroich, Barmen, Germany, assignor to the firm Barmer-Maschinenfabrik A.-G., Barmen-Rittershausen, Germany

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In Germany January 31, 1929

12 Claims. (Cl. 117—26)

It has hitherto been usual to avoid a direct drive when winding conical cross wound bobbins, because the circumferential velocity changes according to the varying circumference of the conical bobbin, and consequently the taking up speed also changes between a minimum and maximum. But in the case where such cross wound bobbins have been used in conjunction with a doubling or twisting machine wherein the thread is drawn off over the head of a cop or bobbin revolving at high speed, the use of such cross wound conical bobbins has been out of the question, as a change in the twist occurs in conjunction with the varying speed of taking up, and this of course also caused a change or variation in the yarn number or titre.

This invention relates essentially to a process for the direct winding, twisting or doubling of a thread, especially of artificial silk, in the shape of a conical bobbin with cross wound layers, the thread being wound on a cross wound bobbin, the speed of rotation of which varies. This variation of the speed of revolution is in each case adapted to the circumference of the cross wound bobbin. That is to say, when the larger circumference of the cross wound bobbin is being wound, then the bobbin revolves at a lesser speed, and vice versa, and consequently a practically uniform peripheral velocity and consequently a uniform thread tension results therefrom. If it is desirable that the taking up speed of the bobbin be absolutely uniform at each moment of the winding, then of course it becomes necessary to carry out the winding operation in a particular manner; that is to say it must be effected in such a manner, that the conical winding surfaces of the bobbin shall always converge towards one and the same point—hereinafter called the apex of the cone. This particular type of winding is produced by the fact that less winding turns occur at the pointed end than the base or larger extremity of the bobbin, by reason of imparting an especial acceleration to the thread guide when feeding thread at the smaller end of the cone.

Another object of the invention is to produce a novel and efficient device for carrying out the process above mentioned.

In the accompanying drawings, two constructional forms of the device according to the invention are shown, and,

Fig. 1 is a front view of an arrangement with a driven bobbin spindle.

Fig. 2 is a lateral elevation of a doubling or twisting device, using the winding device shown in Fig. 1.

Fig. 3 is a front view of an arrangement, wherein the conical bobbin is not positively driven, but is driven by means of a driving cone contacting therewith.

Fig. 4 is a detail view of the bobbin holder seen from above.

Fig. 5 is a side view of a doubling or twisting device making use of the winding device shown in Figs. 3 and 4.

On the doubling or twisting frame the twisting or doubling bobbin (*n*) shown in Fig. 2 is for instance arranged on a bobbin frame; the bobbin (*n*) revolves at a high speed, and the thread (*m*) is guided to the winding bobbin (*a*) over the head of the doubling bobbin through an eyelet of the thread guide and by means of a guide rod. This winding bobbin (*a*) is connected by means of a belt drive (*b*, *c*) with the shaft of the guiding cam (*g*) for the thread guiding rod (*f'*) and with the thread guide (*f*) and is driven in conjunction with the guiding cam by means of heart shaped gear wheels (*d*, *e*). The form of these gear wheels is such, that the resulting speed of revolution corresponds to the conicity of the winding bobbin, so that the product of the number of revolutions and the circumference of the bobbin, which is being wound at the time is in the main constant. If the winding of the cross wound bobbin (*a*) is not desired to be effected in parallel layers, but in such a manner that the peripheral bobbin surfaces converge at all stages of the winding process on one and the same cone-apex, then the guiding cam for the thread guide (*f*) is shaped in such a manner that the inclination of the thread becomes less at the base end of the cone than at the small end thereof. It will be seen that the thread guide (*f*) is arranged to oscillate between a pair of collars on the rod (*f'*) and that a rod (*k*) is fixed at (*l*) to lie parallel to the surface of the cone (*a*) and engages the thread guide adjacent its free end to cause it to travel parallel to the cone or cop.

The cam shaped gear wheels (*d*, *e*) are driven from the motor (*i*) through the intermediary of the cone pulleys (*h*) so that the average number of revolutions is, for the purpose of maintaining an equal average taking up speed, decreased in a measure corresponding to the increasing winding on the bobbin (*a*).

In the case of the device shown in Fig. 3, the conical bobbin (*a*) is arranged to pivot around the point (*l*) on a holder (*k'*) and rests on a conical mandrel (*i'*) the cone apex of which coincides with the pivotal centre (*l*) of the bobbin holder. The mandrel (*i'*) is extended as a shaft or spindle (*h'*) and is driven by means of gear wheels (*b*, *c*, *o*, *p*) and the cam shaped gear wheels (*d*, *e*). The guiding cam (*g*) is operatively connected with the gear wheel (*d*). The thread guiding rod (*f'*) with the individual thread guides (*f*) is moved to and fro by means of the above mentioned guide cam. The guiding cam (*g*) may, as in the device according to Figs.

1 and 2 be designed in such a manner that the thread guide movement is accelerated when moving towards the smaller end of the bobbin (*a*) which acceleration is adapted to the decreased circumference in such a way that all winding surfaces converge towards one and the same cone apex, that is to say the point (*l*).

By reason of the arrangement of the cam shaped gear wheels (*d*, *e*) the conical mandrel (*i'*) is driven at a varying speed of rotation adapted in each case to the circumference on which the thread is being wound. This movement is transmitted to the conical bobbin (*a*) resting on the mandrel.

By this means a uniform peripheral velocity and consequently a uniform taking up of the thread is ensured, as the effective velocity is due to the mandrel (*i'*) the circumferential surface of which does not alter during the winding process, and the number of revolutions of which varies between a maximum and minimum value, according to the position of the thread guide. In the case of this device a cone pulley drive for equalizing purposes is superfluous, as the average taking up speed does not alter.

The examples shown, illustrate the application of the invention to doubling or twisting frames, but this does not in any way limit the invention to this special machine, it may just as well, and with very considerable advantages be adapted to winding frames.

The term "unison" as hereinafter used is to be understood as falling within the definition given by Webster's dictionary which defines that term as, among other things, "harmony".

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed I declare that what I claim is:—

1. A device for forming cross wound cops including a frusto-conical winding bobbin, a frusto-conical friction driving roller bearing against the material wound on said bobbin, means to rotate the roller alternately at gradually increasing and gradually decreasing speeds of revolution, a thread guide mounted for movement along said bobbin, and means acting in timed relation to the roller rotating means to reciprocate the thread guide at a constant acceleration in its movement toward the smaller end of the bobbin and at a constant deceleration in the opposite direction.

2. A device for forming cross wound cops including a frusto-conical winding bobbin, a frusto-conical friction driving roller extending along and in frictional engagement with material on the bobbin, a thread guide mounted to reciprocate longitudinally of the roller, a rotatable cam, an operative connection between the cam and thread guide, said cam being formed to reciprocate the thread at a constantly accelerated speed towards the smaller end of the bobbin and at a constantly decelerated speed towards the larger end thereof, and gearing driving said cam and friction roller and arranged to drive the friction roller at alternate gradually increasing and gradually decreasing speeds of revolution.

3. A device for forming cross wound cops including a frusto-conical winding bobbin, a frusto-conical friction driving roller bearing against the material wound on said bobbin, means to rotate the roller alternately at gradually increasing and gradually decreasing speeds of revolution, a thread guide mounted for movement along said bobbin, means acting in timed relation to the roller rotating means to reciprocate the thread guide at a constant acceleration in its movement toward the smaller end of the bobbin and at a constant deceleration in the opposite direction, and means for pivotally supporting said bobbin to swing about an axis at the apex of the cone of which the bobbin is a frustum.

4. A device for forming cross wound cops including a frusto-conical winding bobbin, a frusto-conical friction driving roller extending along and in frictional engagement with material on the bobbin, a thread guide mounted to reciprocate longitudinally of the roller, a rotatable cam, an operative connection between the cam and thread guide, said cam being formed to reciprocate the thread at a constantly accelerated speed towards the smaller end of the bobbin and at a constantly decelerated speed towards the larger end thereof, gearing driving said cam and friction roller and arranged to drive the friction roller at alternate gradually increasing and gradually decreasing speeds of revolution, and means for pivotally supporting said bobbin to swing about an axis at the apex of the cone of which the bobbin is a frustum.

5. A device for building up a cross wound frusto-conical cop of a uniformly twisted thread comprising a delivery bobbin forming an uptwister rotating at a constant speed, a conical winding bobbin, means to rotate the winding bobbin at alternate gradually increasing and gradually decreasing peripheral speeds, a thread guide movable along the winding bobbin, means acting in timed relation to the last means to reciprocate the thread guide between the larger and smaller ends of the winding bobbin at a constant acceleration in its movement toward the smaller end and a constant deceleration in its opposite movement, and means adapted to decrease the average rotating speed of the winding bobbin in conformity with the increase in periphery of the windings thereon.

6. A device for building up a cross wound frusto-conical cop of a uniformly twisted thread comprising a delivery bobbin forming an uptwister rotating at a constant speed, a conical winding bobbin, means to rotate the winding bobbin at alternate gradually increasing and gradually decreasing speeds, a thread guide movable along the winding bobbin, means acting in timed relation to the last means to reciprocate the thread guide between the larger and smaller ends of the winding bobbin at a constant acceleration in its movement toward the smaller end and a constant deceleration in its opposite movement means to rotate the delivery bobbin at a constant and high speed, and means adapted to compensate the increasing periphery of the winding bobbin by a deceleration of the average rotating speed of the winding bobbin.

7. A device for building up a frusto-conical cross wound cop of uniformly twisted thread comprising a delivery bobbin forming an uptwister rotating at a constant speed, a conical winding bobbin, a thread guide guided for movement along the winding bobbin, a rotating cam, an operative connection between the cam and thread guide, and cam gearing driving said cam and winding bobbin, said cam and cam gearing being arranged to drive the winding bobbin at alternate constantly increasing and constantly decreasing speeds of revolution and to recipro-

cate the thread guide and cause accelerated motion thereof toward the smaller end of the bobbin and decelerated motion thereof toward the larger end of the bobbin.

8. A device for building up a frusto-conical cross wound cop of uniformly twisted thread comprising a delivery bobbin forming an uptwister rotating at a constant speed, a conical winding bobbin, a thread guide guided for movement along the winding bobbin, a rotating cam, an operative connection between the cam and thread guide, and cam gearing driving said cam and winding bobbin, said cam and cam gearing being arranged to drive the winding bobbin at alternate constantly increasing and constantly decreasing speeds of revolution and to reciprocate the thread guide and cause accelerated motion thereof toward the smaller end of the bobbin and decelerated motion thereof toward the larger end of the bobbin, said cam having a spiral cam groove increasing in pitch toward the smaller end of the winding bobbin.

9. A device for building up a frusto-conical cross wound cop of uniformly twisted thread comprising a delivery bobbin forming an uptwister rotating at a constant speed, a conical winding bobbin, a thread guide mounted for movement along the winding bobbin, a cam cylinder having its axis parallel to the winding bobbin and provided with a continuous spiral cam groove, an operative connection between the thread guide and the cam groove, cam gearing for driving said cam and arranged to produce alternate accelerated and decelerated rotation thereof, and means to connect said cam cylinder and the winding bobbin to cause the latter to rotate in unison with the cam cylinder.

10. A device for building up a frusto-conical cross wound cop of uniformly twisted thread comprising a delivery bobbin forming an uptwister rotating at a constant speed, a conical winding bobbin, a thread guide mounted for movement along the winding bobbin, a guide rod fixed at the apex of the winding bobbin cone and engaging the thread guide to cause the latter to travel parallel to the surface of the cop in its formation, a cam cylinder having its axis parallel to the winding bobbin and provided with a continuous spiral cam groove, an operative connection between the thread guide and the cam groove, cam gearing for driving said cam and arranged to produce alternate accelerated and decelerated rotation thereof, and means to connect said cam cylinder and the winding bobbin to cause the latter to rotate in unison with the cam cylinder.

It will thus be seen that by merely varying the

11. A device for building up a frusto-conical cross wound cop of uniformly twisted thread comprising a delivery bobbin forming an uptwister rotating at a constant speed, a conical winding bobbin, a thread guide mounted for movement along the winding bobbin, a cam cylinder having its axis parallel to the winding bobbin and provided with a continuous spiral cam groove, an operative connection between the thread guide and the cam groove, cam gearing for driving said cam and arranged to produce alternate accelerated and decelerated rotation thereof, means to connect said cam cylinder and the winding bobbin to cause the latter to rotate in unison with the cam cylinder, and a cone pulley drive for said cam gearing arranged to gradually decrease the speed of revolution of the cop during winding and thereby maintain the mean peripheral speed of the cop uniform throughout its formation.

12. A device for building up a frusto-conical cross wound cop of uniformly twisted thread comprising a delivery bobbin forming an uptwister rotating at a constant speed, a conical winding bobbin, a thread guide mounted for movement along the winding bobbin, a guide rod fixed at the apex of the winding bobbin cone and engaging the thread guide to cause the latter to travel parallel to the surface of the cop in its formation, a cam cylinder having its axis parallel to the winding bobbin and provided with a continuous spiral cam groove, an operative connection between the thread guide and the cam groove, cam gearing for driving said cam and arranged to produce alternate accelerated and decelerated rotation thereof, means to connect said cam cylinder and the winding bobbin to cause the latter to rotate in unison with the cam cylinder, and a cone pulley drive for said cam gearing arranged to gradually decrease the speed of revolution of the cop during winding and thereby maintain the mean peripheral speed of the cop uniform throughout its formation.

THEODOR VOLLENBROICH.