June 9, 1959 H. BUDDECKE 2,889,610

METHOD AND MEANS FOR REELING OF YARN

Filed April 18, 1956 2 Sheets-Sheet 1

FIG. 1

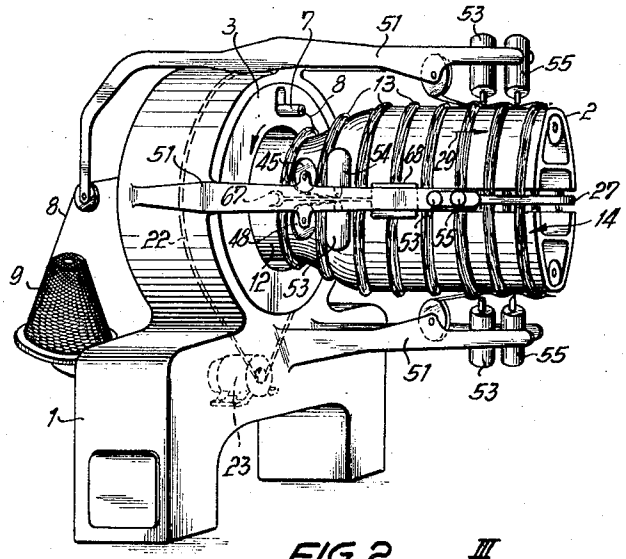
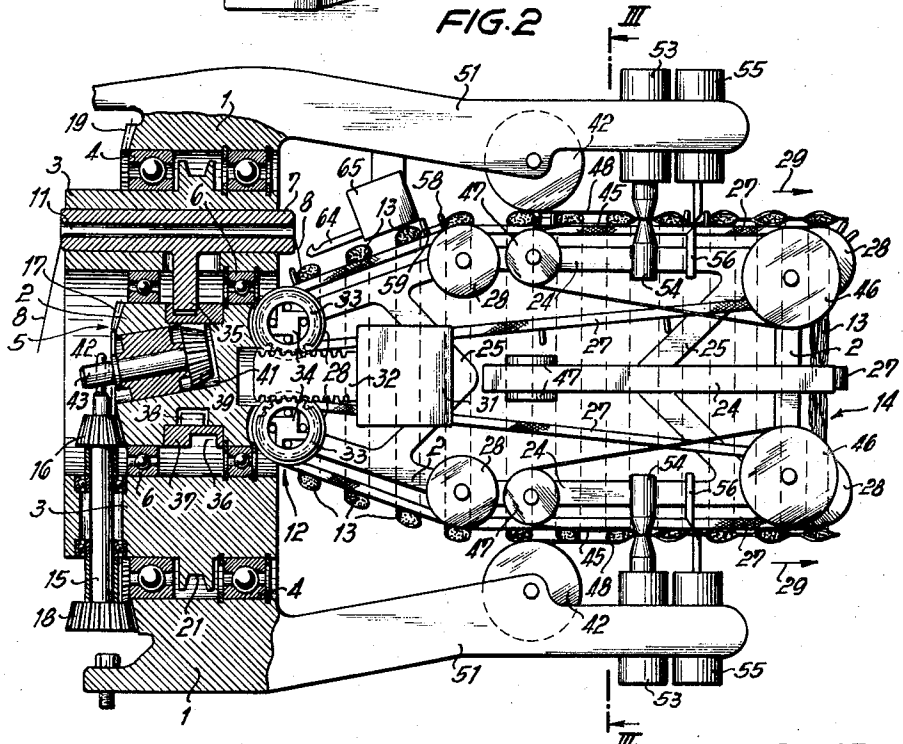


FIG. 2



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FIG. 3

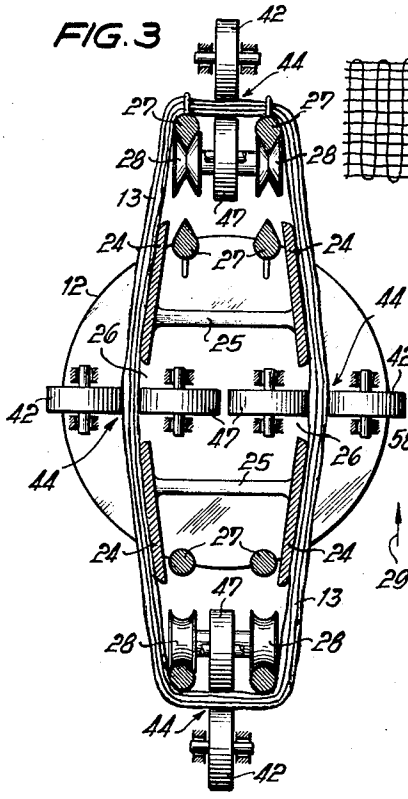


FIG. 4

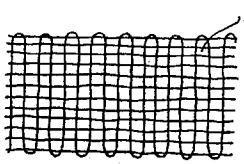


FIG. 5

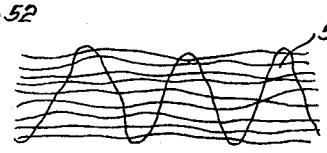


FIG. 7

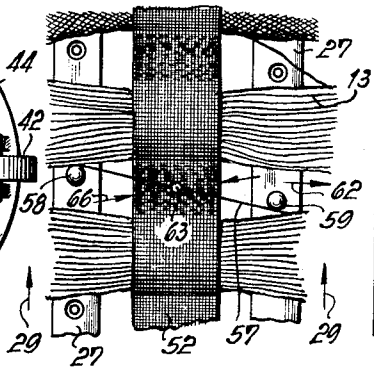


FIG. 6

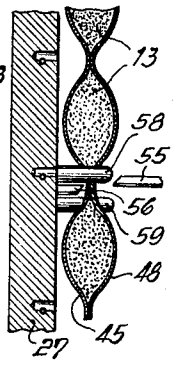


FIG. 9

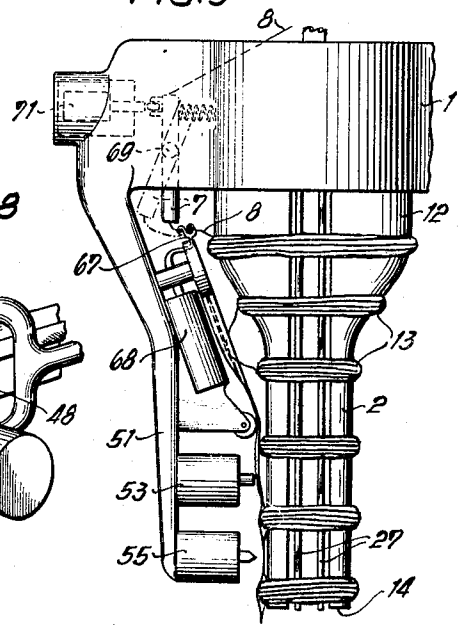
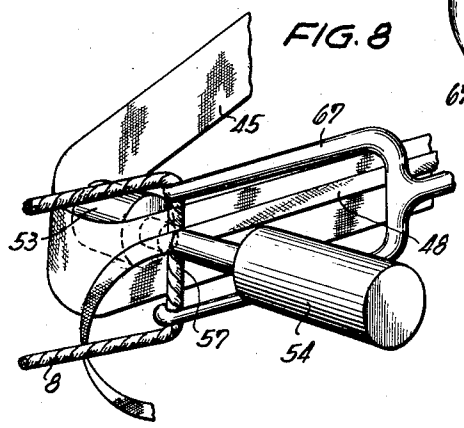


FIG. 8



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United States Patent Office 2,889,610 Patented June 9, 1959

2,889,610

METHOD AND MEANS FOR REELING OF YARN

Heinrich Buddecke, Goppingen, Wurttemberg, Germany

Application April 18, 1956, Serial No. 579,085

Claims priority, application Germany April 27, 1955

25 Claims. (Cl. 28—21)

The invention relates to a method and means for reeling of yarns or threads whereby the spun or twisted yarn wound upon bobbins and the like is to be wound to simple hanks or hanks which are divided into bunches in order that the yarn will be treated uniformly by the colouring fluid during the following dyeing process, in particular that the yarn may be moved at will in the colouring fluid and that it can be dried uniformly after dyeing.

The circumferential length of the hanks is made between 40 to 80" corresponding to the circumference of the reel drums. The hanks are manufactured in weights between 25–500 grammes. They may be divided into several, for instance five bunches and the yarn windings are loosely bound at least at two points of their circumference by means of crossing threads in order to avoid entanglement of the diverse windings or of the bunches when the bunches are moved in the colouring fluid or during further treatment and manipulation. The known reel drums usually form an hexagonal prism consisting of metal crosses and corresponding longitudinal bars.

Such a reel drum has a length of about 140" to 160". It is rotatably mounted only on the two journals at the ends of its shaft. Parallely to the longitudinal bars of the reel drum a thread-guiding bar is moved to and fro on which are mounted the equally spaced thread guides. The yarn wound up in the form of bobbins or the like is drawn through a thread guide to the reel drum where it is clamped to a longitudinal bar by means of clamping springs. The reel drum, upon rotation, will be wound round with hanks whereby between the bunches of the hanks small spaces are left.

After this the reel drum will be stopped and the hanks or bunches will be bound with crossing binding threads by hand and the different hanks will be separated from the bobbins or the like by cutting the running yarn threads. By displacing of some longitudinal bars the circumference of the reel drum will be reduced and the operator now draws the loosely hanging hanks with his arm from the remaining longitudinal bars and, what is more, along the whole length of the reel drum up to the discharge wheel, putting them in a recess of the discharge wheel, turning it by hand about 360° in order to free the finished hanks from the reel drum.

After applying new yarn the reel drum can be rotated again in order to produce a new set of hanks. The duration of the idleness of the reel drum or the machine, respectively, is essentially greater than the duration of its rotation, so that the work done by such a reel is comparatively small and the costs of production are comparatively high in consequence of the necessity of the service by hand of binding the hanks or bunches, separating the hanks from the bobbins, taking off the hanks, applying the threads for a new set of hanks, sticking up new bobbins and the like.

The method of reeling, according to the invention, is performed in such a manner that the yarn is wound up continuously on the one end of a reel drum in the form

of hanks spaced from each other and the hanks are shifted onto the other end whereby they are bound into separate bunches by binding means and then they are separated from each other and the finished hanks will be discharged at the other end of the reel drum.

The new reeling device, accordingly, consists of a reel drum and a winding up device by which the yarn is wound up continuously in the form of hanks and bunches separated from each other on the one end of the reel drum, a feeding device, shifting the wound up hanks or bunches onto the other end, discharging them after the hanks are separated from each other by a severing device.

By these measures it is attained that the reel drum can be continuously rotated without idleness and all manipulations by hand hitherto absolutely necessary for binding, separating, taking off the hanks, applying again the threads and so on fall away. The effect on production of such a device is a multiple of that of the hitherto reels and substantial salary being saved.

The transport of the wound hanks or bunches from the one end of the reel drum to the other one may be performed by different means, for instance by bars which are provided with pins, or by wheels or bands engaging the hanks. During winding of each bunch the reel drum may be shifted to and fro by the width of a bunch.

According to the invention, after each winding of a bunch this will be, together with the previously wound bunches, suitably shifted by one width of a bunch enlarged by the space between two adjacent bunches by means of endless supporting bands located in the reel drum. The finished bunches then remain in rest until the next bunch is wound.

The actuating of the supporting bands is effected by means of an electro-magnet which is connected with idler rollers of the supporting bands through a rack and a free wheel gear mechanism as will be more fully explained later.

The winding up end of the reel drum of circular section changes into an oblong section formed by gliding plates or gliding ribs. Longitudinal spaces are arranged between the gliding plates in which the devices for binding and the hankwise separation of the bunches are located in pairs in one or more than one axial planes of the reel. The thread guide of the reel drum for conveying the yarn to the reel drum is axially shiftable. It may be further rockable in an axial plane. The thread guide is, as is known with winders for yarn bundles, located in a rotor rotatably mounted in a stator. The rotor serves as a bearing for the reel drum. Means are provided for by which the reel drum will be retained stationary with respect to the stator.

Reel drum and stator are connected with each other by a planet gear in which the planet wheels engage a gear ring of the reel drum and a gear ring of the stator. The planet wheels are rotatably mounted in the rotor. Their ratio of gear corresponds to the ratio of the diameter of the two gear rings so that the reel drum is held unrotatably with respect to the stator.

The actuation of the devices located in the reel drum is effected either by electro-magnetic means or mechanically dependently on the relative movement between the rotor and the reel drum.

For binding up the bunches crossing binding means are used running in and outside of the bunches and being fed according to the shifting of the bunches. These binding means are connected with each other between adjacent bunches and they will be severed only between the adjacent bunches at the ends of neighbouring hanks. The connection of the two crossing binding means in form of threads or the like may be brought about with stitches similar to the connection of the upper and under thread of a sewing-machine, or in that the binding means

consists in part or wholly of weldable plastic strips which are welded together between the bunches by pressing them together by means of stamps which may be heated. In order to avoid the forming of drops of colouring fluid on such means consisting of plastic after the dyeing whereby blurs in the yarn may arise, the means consist of loosely woven strips of fine plastic threads, which are temporarily stiffened for their manipulation and the binding by a stiffening means which dissolves in the colouring fluid. A binding and a severing device is provided for each of two, four or more binding means distributed round the circumference of the reel drum at distinct points which are supported by projecting arms of the stator, by which the bunches are bound and the hanks are severed from each other, respectively.

At the separating point of one of the bindings the connecting thread between neighbouring hanks too, is to be cut. Particular devices are necessary for this purpose by which the said connecting thread is brought into the reach of the severing device.

In order to secure the beginning and the end of the yarn of each hank the connecting thread between two adjacent hanks will be secured to the binding means for instance by welding or by knotting in such a way that upon cutting of the corresponding binding point the connecting thread will be retained securely at the severed ends of the binding means. Particular devices are necessary to guide the connecting thread through the cutting spot of the binding means in question.

Further features of the invention will be apparent from the following description of an embodiment of the invention which is described simply by way of example, with reference to the accompanying diagrammatic drawings, in which:

Fig. 1 is a perspective view of the device the means for advancing the skeins being omitted.

Fig. 2 shows a vertical middle section through a machine according to the invention partly deviating from the construction of Figure 1.

Fig. 3 shows a section of a somewhat modified machine similar to the section taken along the line III—III of Fig. 2.

Figs. 4 and 5 are embodiments of the binding members.

Fig. 6 is a section through bound bunches following one after the other with the severing device.

Fig. 7 is a top plane appertaining thereto.

Fig. 8 is a perspective view of a device for bringing the connecting thread into the cutting point.

Fig. 9 is a top elevation of the reel drum.

The reel comprises a stator **1** (Figs. 1 and 2) which is formed as a casing for a reel drum **2** being held unrotatably, and a rotor **3** arranged between the stator and the reel drum. The rotor **3** is rotatably mounted in the stator **1** by means of two ball bearings **4** (Fig. 2). In the rotor the reel drum **2** is rotatably mounted at its bearing end **5** by means of ball-bearings **6**. On the rotor **3** a thread guide **7** is mounted. The thread **8** is brought to the thread guide from a bobbin **9** or the like which is mounted on a supporting member connected with the stator **1**. The thread **8** runs through a bore **11** of the thread guide **7**. On rotation of the rotor **3** the thread is wound up on the winding zone **12** of the reel drum **2**. After each winding up of a bunch **13** a shifting of all wound up bunches takes place towards the discharge end **14** of the reel drum.

For holding the reel drum **2** stationary with respect to the stator **1**, different means may be used, for instance magnetic forces. Preferably said holding of the reel drum **2** is brought about mechanically by a planet wheel gear which, in the embodiment represented in Fig. 2, consists of a shaft **15** mounted rotatably on the rotor in radial direction which at its inner end engages a bevel gear ring **17** of the reel drum by means of a bevel gear **16**, and at its outer end engages a bevel gear ring **19** of the stator by means of a bevel gear **18**.

When the ratio of the diameters of the bevel gears **16** and **18** is equal to the ratio of the diameters of the bevel gear rings **17** and **19** the bevel gears roll on their bevel gear rings with the same angular velocity so that a mutual rotation between the stator and the reel drum does not take place and the latter thereby will be held stationary with respect to the stator. For the same purpose other planet wheel gears, for instance, spur gears with the same ratio of gear may be used.

The drive of the rotor **3** is introduced through a pulley **21** which is mounted on the circumference of the rotor **3** between the ball bearings **4** by means of a wedge-shaped belt **22** (Fig. 1) and a motor **23** which is mounted in or on the stator **1**.

At the winding up zone, the reel drum **2** has a circular cross section so that upon uniform rotation of the drum the velocity of the thread always remains the same and by this way the highest winding up velocity can be attained.

Towards the discharge end **14** the circular cross section changes into an oblong cross section, care being taken that the length of the circumference of the drum remains the same in all radial sections in order to hold the bunches stretched during their wandering along the reel drum. In order to facilitate the movement of the bunches towards the discharge end the circumferential length of the drum can be decreased towards the discharge end by a little amount.

As is apparent from Fig. 3 the drum is formed in the oblong part of its section by longitudinal gliding plates **24** which are secured to the bearing head **5** of the drum and stiffened to each other by cross arms **25**. Between the gliding plates free spaces **26** (Fig. 3) are formed which serve for the location of the means described below for binding, cutting and transporting of the bunches towards the discharge end **14**.

The movement of the bunches towards the discharge end is performed by supporting bands **27** (Fig. 2), which run over rollers **28**, limiting with their outer parts the circumference of the drum as is apparent from Fig. 2, in such a way, that in the winding zone **12** of the real drum the bunches are wound directly on the supporting bands.

When the supporting bands are moved in the direction of the arrow **29** (Fig. 2) all of the bunches are taken towards the discharge end **14**. The drive of the supporting bands is performed step by step corresponding to the width of the bunches and the width of the space between neighbouring bunches. To this end a gear may be used which is arranged in the bearing end **5** of the drum and which will be actuated by the rotation of the rotor **3**. In the embodiment represented in Fig. 2 the drive of the supporting bands **27** will be brought about by an electro-magnet **31** (Fig. 2) which is located in the reel drum, the solenoid of which shifts a rack **32** being in mesh with gear wheels **33**, which turn supporting rollers **28** journalled in the bearing head **5** of the reel drum over a free wheel gear **34**. During the return movement of the gear rack **32** actuated by spring force these parts remain uninfluenced by virtue of the free wheel gear. The energization of the electro-magnet **31** in appropriate moments every time a new bunch has been wound up may be effected in any of the numerous manners which will be apparent to those skilled in the art. For instance the magnet may be connected to a source of voltage through appropriate switch means by hand or automatically by cam means dependently on the rotation of the rotor in such a manner that after a certain number of revolutions of the rotor the switch means will be actuated. For instance, the ring **37** (Fig. 2) may be connected by means of toothed wheels with a member rotatably mounted in the reel drum **2**, in such a way, that it closes the circuit of the electro-magnet **31** each time when the

rotor 3 has performed a certain number of revolutions.

Upon the winding up of each bunch or hank the thread to be wound up must be moved to and fro within the bunch width or hank width in the direction of the drum axis. This may be enabled by a corresponding to and fro movement of the supporting bands 27 or the whole reel drum respectively. With the represented embodiment (Fig. 2), for this purpose, the thread guide 7 is mounted longitudinally movably in the rotor 3. It engages, by means of a projection 35, a cam notch 36 of a ring 37 which is rotatably mounted about the bearing head 5 of the reel drum. The ring 37 is provided at the inside with a gear ring 38 engaging a gear wheel 39 rotatably mounted in a bore 41 of the bearing head 5 and the shaft journal of which being connected for rotation with the rotor 3 in suitable manner. This connection is performed in such a manner that an extension 40 of the shaft 15 engages a slot 43 of the shaft of the gear wheel 39. When the rotor is rotated the gear wheel 39 will be rotated with it whereby owing to the cam notch 36 the thread guide 7 will be moved to and fro.

The automatic binding of the bunches 13 will be effected by devices 44 (Fig. 3) which are arranged at the spaces 26 between the gliding plates 24 of the circumference of the reel drum. At least two of such oppositely arranged devices 44 are to be provided for. It is however advantageous to use more than two devices in order to avoid the entanglement of the windings of the bunches or hanks, respectively, as far as possible. Fig. 3 shows an arrangement with which in the middle portion of the broad side and in the middle portion of the narrow-side of the reel-drum binding devices are provided, taken altogether, four binding devices.

With these binding devices, appropriately, an inner and an outer binding member in the form of a thread, a strip or the like is used, which may be stitched or knotted with each other in the manner of the lower and upper yarn of a sewing machine. The inner binding members 45 (Fig. 2) run from supply drums 46 mounted in the reel drum and are directed to the inner circumference of the bunches by means of direction changing rollers 47. The outer binding members 48 run from supply drums 42 which are mounted on projecting arms 51 of the stator 1 extending along a part of the length of the reel drum. Here, direction changing rollers 47 are not necessary. The direction changing rollers 47 for the inside binding members enable the supply drums 46 to be arranged at the front end of the reel drum, in order that they can be more easily filled up or changed.

With the represented embodiment of the invention the lower and upper binding members are connected between the bunches by welding. To this end they consist wholly or in part of a cold or warm weldable plastic and the welding will be performed by pressing stamps, which may be heated in an appropriate manner. The binding members 45, 48 have the form of narrow strips 52 (Fig. 7). In order to avoid a forming or a sticking to of drops of the colouring fluid upon or after the dyeing they are, as shown in Figs. 4 and 5, woven loosely of thin plastic threads. This loose web will be provided with a stiffening means, for instance with starch or the like, which on bringing the bound hanks into the colouring fluid dissolves in same so that the formation of drops after taking the hanks out of the colouring fluid cannot take place.

By the stiffening it is attained that the binding members can be precisely and surely fed and manipulated in the reel devices.

The welding is brought about by means of stamps 53 (Fig. 2) mounted on the projecting arms 51, which stamps cooperate with counter members 54 in the reel drum and are actuated in the suitable moment mechanically or electro-magnetically. The stamps may be electrically heated. After each step of movement of the supporting hands by means of the rack 32, pressing of the stamps 53 onto the counter members 54 takes place between two adjacent bunches whereby the inner binding members 45 are welded with the outer binding members 48 so that the bunches will become bound up (see Fig. 6).

In order to discharge the bunches only connected to hanks from the reel drum, knives 55 (Figs. 1 and 2) are provided for in the reach of each binding strip 52 consisting of the binding members 45, 48. Said knives 55 are mounted on projecting arms 51 and cooperate with counter knives 56 (Fig. 2) mounted in the reel drum. During the pressing movement of the welding stamps 53 the knives 55 may be actuated at the same time. During the following movement of the supporting bands the severed hanks will be automatically discharged.

In addition to the binding strip 52 in one of the cutting places for the hanks the connecting thread 57 (Fig. 7) between the two adjacent bunches must be cut. When the cutting device for this purpose is located at a distinct place on the circumference of the reel drum it is to be taken care that the connecting thread has attained this place in the moment of the knife movement. Further, it is desirable to secure the cut ends of the connecting thread to their hanks in a suitable manner in order that they do not loosely hang at their hanks. The last mentioned problem is solved in that the connecting thread is connected with one of the binding strips at the connecting or welding spot disposed as place for the separation of the binding strip between consecutive hanks. In particular, the connecting thread will be welded in between the two binding members 45, 48 so that upon the severing of the welding spot the ends of the connecting thread remain in the ends of the binding strip made by the cut. This proceeding can be brought about in a different manner.

With the embodiment represented in Figs. 2, 6 and 7 the two supporting bands 27 (Fig. 7) moving adjacent the concerning binding strip 52 are provided with projecting pins 58, 59 spaced from each other according to the width of the hanks. The oppositely arranged pins 58, 59 have a distance, seen in the direction of movement of the bands (arrow 29), from each other corresponding to the space between two bunches 13. Upon the winding up of the yarn on the reel drum according to the arrow 62 (Fig. 7) by means of the yarn guide the thread must at first arrive before the pin 58 of the one supporting band and then behind the pin 59 of the other supporting band, so that the connecting thread 57 is located precisely at the spot 63 disposed for the cutting of the binding strip. In order to correspondingly guide the connecting thread 57 a movable needle-hook 64 (Fig. 2) is provided in the reach of the winding up zone of the reel drum on the upper projecting arm 51. The needle-hook 64 will be moved by an electro-magnet 65 in such manner that it seizes the thread immeriately after the passing of the thread guide 7 at the pin 58, whereby the thread in the sense of the arrow 29 (Fig. 7) will be put before the pin 58. After seizing the thread will be returned oppositely to the direction of movement 29 so far that during the further movement of the thread guide it arrives behind the pin 59.

As is obvious by these means, the connecting thread is directed in such a manner that it crosses the spot 63 of the corresponding binding strip 52 disposed for the cutting separation of the hanks from each other. In this position the connecting thread 57 will be carried in the described manner by the supporting bands in the direction of the arrow 29 up to the appertaining welding stamps 53 for this binding strip 52 and will be welded and then carried up to the corresponding cutting device 55, 56 (Fig. 2) which is arranged in the direction of the line 66 (Fig. 7), so that upon cutting the corresponding binding strip the connecting thread will be cut too, leaving its two ends secured to the ends of their binding strip 52.

For the same purpose the device represented in Figs. 1 and 9 may be used. Pins at the supporting bands are not necessary here. The thread 8 coming forth

from the thread guide 7 will be seized after passing the thread guide 7 by a two pronged catching fork 67 in the manner shown in Fig. 8 whereby the thread 8 will be formed to a loop having a cross piece 57 (Fig. 8) representing the connecting thread later to be cut. The catching fork 67 is shiftably mounted on one of the projecting arms 51 and is influenced by an electro-magnet 68 (Fig. 1) which moves it according to the wandering of the wound up bunches in the direction of the arrow 29 (Fig. 7). Thereby the cross piece 57 (Fig. 2) will be brought between the arriving inner and outer binding members 45, 48 and between the appertaining welding stamps 53, 54 (Fig. 2). By the latter the connecting thread 57 will be welded in between the two binding members 45, 48. Thereafter the catching fork 67 can be freed by return movement from the thread 8 (Fig. 9). If then upon the further movement of the bunches in the direction of the arrow 29 the corresponding welding spot reaches the appertaining cutting device 55 (Fig. 9) it will be likewise cut in the manner indicated in Fig. 7, so that also the connecting thread 57 is cut, the ends of which will remain fixed to the ends of the cut up binding strip 52.

The movements of the needle-hook 64 or the catching-fork 67, respectively, which are necessary in order to take up the arriving yarn thread 8 can be avoided in that the thread guide 7, as indicated in Fig. 9, is mounted rockably about an axis 69 and is influenced by an electro-magnet 71. Upon passing the needle-hook or the catching fork, respectively, the thread guide 7 will be rocked counterclockwise whereby the thread is put on the needle-hook or the catching fork 67, respectively. The needle-hook or the catching-fork, respectively, then only has still the task to move the thread forwards or back in the described manner.

What I claim is:

1. In a method for reeling yarn continuously winding up the yarn to hanks consisting of one or more than one bunch around the one end of a reel drum, shifting each new wound up bunch together with the previously wound up bunches towards the other end of the reel drum, binding up and connecting with each other the bunches by means of continuously fed crossing binding means, separating the hanks from each other by cutting up the binding means and the connecting yarn thread between adjacent hanks, and discharging the finished hanks one after the other from the other end of the reel drum.

2. In a method according to claim 1, said shifting of the bunches taking place after each winding up of a bunch by a distance corresponding to the width of one bunch together with the intermediate space between adjacent bunches, said binding up being performed after each shifting movement, the separating of the adjacent hanks from each other taking place after a number of shifting movements corresponding to the number of bunches forming one hank.

3. In a method according to claim 1, said binding means comprising an inner binding member running within the bunches and an outer binding member running outside of the bunches, the inner and the outer binding member being connected with each other between adjacent bunches.

4. In a method according to claim 1, said binding means comprising an inner binding member running within the bunches, and an outer binding member running outside of the bunches, said binding members being fed stepwise accordingly to and by means of the stepwise shifting movements of the bunches, said two binding members being connected, with each other between adjacent bunches by press-welding.

5. In an apparatus for reeling yarn, a reel drum, winding up means adapted to continuously wind up the yarn into hanks consisting of one or more than one bunch about the supported end of the reel drum opposite the free end, a binding device for binding up the bunches and connecting them with each other by means of crossing binding means, a separating device for separating the bunches forming one hank from the bunches forming the following hank, and a shifting device adapted to shift the wound up bunches after being bound up along the reel drum and discharging the hanks separately from each other from the other end of the reel drum.

6. In an apparatus according to claim 5, said shiftng device comprising means for shifting the wound up bunches step by step along the reel drum each time the winding up of a bunch is finished by a distance corresponding to the width of a bunch together with the intermediate space between adjacent bunches.

7. In an apparatus according to claim 5, said shifting device comprising endless supporting bands arranged in axial planes of the reel drum flushing with their outer runs with the circumference of the reel drum and receiving the bunches being wound up around the one end of the reel drum, means for moving the bands step by step whereby the wound up bunches are shifted step by step towards the other end of the reel drum and are discharged there.

8. In an apparatus according to claim 5, said shifting device comprising endless supporting bands arranged in axial planes of the reel drum, flushing with their outer runs with the circumference of the reel drum and receiving the wound up bunches, moving them step by step along the reel drum, means for driving said bands comprising an electro-magnet and a rack actuated by said electro-magnet, supporting rollers for the supporting bands, free wheel gears connecting said rack with said supporting rollers, whereby the supporting bands are moved in one direction by the to and fro movement of the rack.

9. In an apparatus according to claim 5, said reel drum being mounted on bearings at the supported end, a winding up zone of the reel drum near this end, the free end serving as discharge end for the finished hanks, said winding up zone having circular section changing in an oblong section of the other portion of the reel drum without alteration of the peripherical length, the circumference of the oblong sectional part being formed by gliding plates separated from each other by longitudinal spaces, in which said supporting bands, binding up devices and separated device are located.

10. In an apparatus according to claim 5, said winding up means comprising a thread guide, means for rotating said thread guide around the reel drum and means for moving the thread guide to and fro in longitudinal direction of the reel drum by a distance corresponding to the width of a bunch.

11. In an apparatus according to claim 5, said winding up means comprising a thread guide, a stator, a rotor bearing said thread guide and being rotatably mounted in said stator, said reel drum being mounted for rotation with one end on the rotor, means for retaining the reel drum stationary with respect to the stator when the rotor is being rotated whereby the thread guide is rotated about the reel drum.

12. In an apparatus according to claim 5, said winding up means comprising a rotor bearing said reel drum, a stator rotatably bearing said rotor, a tooth ring at the reel drum, a tooth ring at the stator, two planet gear wheels connected with each other and rotatably mounted in the rotor, one of them meshing with the tooth ring of the stator, the other one meshing with the tooth ring of the reel drum, the ratio of gear of the planet wheels corresponding to the ratio of gear of the tooth rings, whereby on rotating the rotor the reel drum will be retained stationary with respect to the stator.

13. In an apparatus according to claim 5, said winding up means comprising a rotor bearing said reel drum, a stator, two ball bearings in the stator bearing said rotor, a motor mounted at the stator, connecting means

between the motor and the rotor engaging the rotor between said two ball-bearings.

14. In an apparatus according to claim 5, said winding up means comprising a rotor bearing said reel drum, a stator bearing said rotor, means for retaining said reel drum stationary with respect to the stator when said rotor rotates, working devices located in said reel drum, and connecting means between said working devices and said rotor, whereby said working devices are actuated on rotation of the rotor.

15. In an apparatus according to claim 5, said winding up means comprising a rotor bearing said reel drum, a stator bearing said rotor, means for retaining said reel drum stationary with respect to the stator, a thread guide mounted in said rotor, a tooth wheel mounted in the reel drum, a cam disc connected thereto, a follower engaging said cam disc and being connected with said thread guide, a taking with member on said rotor cooperating with said tooth wheel whereby on rotating said rotor the thread guide will be moved to and fro in order to wind up the thread along the width of a bunch.

16. In an apparatus according to claim 5, said binding means consisting of an inner binding member running within the bunches and an outer binding member running outside of the bunches, means adapted for connecting the two binding members between adjacent bunches and a supply drum for each binding member, whereby on shifting the bunches along the reel drum the binding members will be taken along.

17. In an apparatus according to claim 5, said binding means consisting of an inner and an outer binding member, said separating device comprising means for cutting of the binding members and the connecting thread between adjacent hanks and means adapted for connecting the cut up ends of the connecting thread with the cut up ends of the binding members.

18. In an apparatus according to claim 5, said binding means consisting of an inner binding member running within the bunches and an outer binding member, running outside of the bunches, means adapted for connecting the two binding members between adjacent bunches, a supply drum for each binding member, the supply drum for the inner binding member being located within the front part of the reel drum, a guide roller guiding the inner binding member at first oppositely to the shifting movement of the bunches, a stator, a rotor bearing the reel drum and being journaled on the stator, and a projecting arm secured to the stator supporting the supply drum for the outer binding member.

19. In an apparatus according to claim 5, said binding means consisting of an inner and an outer plastic strip running inside or outside, respectively, of the bunches, a stator, a rotor bearing the reel drum and being journalled on the stator, a projecting arm secured to the stator, welding stamps supported by said projecting arm, counter stamps cooperating therewith being located within the reel drum.

20. In an apparatus according to claim 5, said binding means consisting of two weldable plastic strips, the one running inside, the other one running outside of the bunches, said binding up device comprising a welding stamp and a counter stamp adapted to press and weld together the two plastic strips, means for cutting up the binding strips between adjacent hanks, means for carrying the connecting thread between adjacent hanks to a spot of the binding strips to be welded between the inner and outer binding strips, whereby the connecting thread is welded in and cut up upon welding and cutting up the binding strips.

21. In an apparatus according to claim 5, said binding up means consisting of two weldable binding strips, means for welding together the binding strips between adjacent bunches, said separating device comprising a cutting device for cutting up the welded together spots of the binding strips, means for carrying the connecting thread between adjacent hanks to one of said spots to be welded and cut up, whereby on cutting up the binding strips the connecting thread will be cut too, its ends remaining connected to the cut ends of the binding strips.

22. In an apparatus according to claim 5, said binding means consisting of two binding members, means for welding together said binding members between adjacent bunches, means adapted to cut up the binding members welded to each other between adjacent hanks, said shifting means for the bunches being formed as supporting bands, two of said supporting bands being located each on one side of the binding strip, a pin on each of said two supporting bands, said means for placing the connecting thread between adjacent hanks before the one and behind the other of the two pins comprising a needle-hook electro-magnetically actuated, whereby the connecting thread is placed across the welding and cutting spot of the binding members.

23. In an apparatus according to claim 5, said binding means consisting of two binding members, means for welding together the binding members between adjacent bunches, means adapted to cut up the binding means between adjacent hanks, a two pronged catching fork adapted for seizing the connecting thread between adjacent hanks, said connecting thread being stretched between the two prongs, means for moving the catching fork so as to carry the connecting thread to the spot of the binding members to be welding and cut up.

24. In an apparatus according to claim 5, said binding means consisting of two weldable binding strips, means for welding together said binding strips between adjacent bunches, means adapted to cut up the binding strips between adjacent hanks, said winding up device comprising a thread guide, a stator, a rotor mounted on the stator and bearing said reel drum, said thread guide being mounted movably on the rotor, a seizing device adapted to seize the connecting thread between adjacent hanks and to carry it to the spot of the binding strips to be welded and cut up, and means for moving the thread guide in such a way that the connecting thread is brought into engagement with said seizing device.

25. Binding means for binding up bunches, consisting of strips which are woven from weldable plastic threads and impregnated with a stiffening means adapted to be dissolved in a colouring fluid, thereby allowing two strips, one running inside of the bunches and the other one running outside of the bunches, to be connected with each other by welding during the binding up process and on the other hand allowing free access of the colouring fluid during the dyeing process.

References Cited in the file of this patent

UNITED STATES PATENTS

2,379,935	Seiferth et al.	July 10, 1945
2,445,109	Ferguson	July 13, 1948