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(54) METHOD AND DEVICE FOR JOINING A THREAD

(71) We, W. REINERS VERWALTUNGS-GESELLSCHAFT MIT BESCHRÄNKTER HAFTUNG, a Germany Body Corporate, of 143/145 Blumenberger Strasse, Mönchengladbach, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to a method and device for joining a thread in a bobbin winding apparatus comprising an open-end spinning rotor, a thread take-off device including a clamping roller and a driven roller for taking off thread from the spinning rotor, means for supporting and driving the bobbin in a thread winding direction and a thread guide for guiding the thread from the take-off device to the bobbin during winding.

In the prior art, for the purpose of joining the thread, a thread joining device is provided, which comprises a special thread take-off device. The thread is deflected and pulled back from a normal direction of travel in such a way that it is guided around an auxiliary thread take-off roller and this thread-joining device and is returned from there to the take-off tube of the spinning rotor. After the thread joining operation, the take-off device is switched from backward motion to forward motion. Subsequently, the thread is pulled off at a constant normal take-off speed. If the thread is now to be transferred to the normal thread running position, an additional thread length is released. Trouble arises during this process. Either the thread has to be taken over by the main thread take-off device after having left the auxiliary take-off device or the thread is indeed taken over very quickly by the main thread take-off device but the bobbin is not in a position to take up so rapidly the additional released thread length. In the first case, the thread is spun more thickly, because it is temporarily pulled from the spinning rotor at a reduced speed; in the second case, it is loosely wound on the take-up bobbin without tension. These loose windings later hinder the withdrawal of the thread from the bobbin.

The present invention may bring about the joining of a thread returned into the spinning rotor without the formation of any thick places, with an even thread tension and without any trouble during the winding operation.

According to the present invention there is provided a bobbin winding apparatus comprising an open-end spinning rotor, a thread take-off device including a clamping roller and a driven roller for taking off thread from the spinning rotor, means for supporting and driving a bobbin in a thread winding direction and a thread guide for guiding the thread from the take-off device to the bobbin during winding, a method of joining a thread comprising the steps of:

lifting the clamping roller away from the driven roller;

taking a thread end from a bobbin;

driving an auxiliary thread take-off device in one direction to feed the thread from the bobbin between the clamping roller and the driven roller to the spinning rotor;

subsequently driving the auxiliary thread take-off device in the opposite direction to take off joined thread from the spinning rotor;

subsequently returning the clamping roller to the driven roller when the speed of the auxiliary take-off device corresponds to the speed of the driven roller;

returning the joined thread under tension to the thread guide; and

releasing the joined thread from the auxiliary take-off device.

Also, according to the invention there is provided a bobbin winding apparatus comprising an open-end spinning rotor, a thread take-off device including a clamping roller and a driven roller for taking off thread from the spinning rotor, means for supporting and driving a bobbin in a thread winding direction; a thread guide for guiding the thread from the take-off device

to the bobbin during winding and a thread joining device comprising:

means for lifting the clamping roller away from the driven roller;

means for taking a thread end from a bobbin;

an auxiliary thread take-off device drivable in one direction to feed the thread from the bobbin between the clamping roller and the driven roller to the spinning rotor and drivable in the opposite direction to take off joined thread from the spinning rotor; and

means for returning the joined thread under tension to the thread guide.

Preferably, the apparatus further comprises means for driving the bobbin at a greater speed in the thread winding direction while the joined thread is returned under tension to the thread guide. Advantageously, the winding speed of the take-up bobbin is restored to a normal value as soon as the joined thread has been returned to the thread guide.

The means for returning the joined thread under tension to the thread guide may include means for laterally guiding the thread beneath an end of the bobbin. The apparatus may also be provided with a thread feeder for feeding the thread taken from the bobbin to the auxiliary thread device, the thread feeder including a thread lifter, the movement of which is controlled by movmement of the thread feeder, the thread lifter serving to guide the thread from the auxiliary thread take-off device, when the latter is driven in said one direction, between the clamping roller and the driven roller.

The invention is particularly advantageous if the bobbin winding apparatus comprises a plurality of winding stations each having its associated spinning rotor, thread take-off device, means for supporting and driving a bobbin and a thread guide, and a movable thread joining device serving a number of said winding stations.

The advantages achieved with the aid of the invention consist, in particular, in that a trouble-free winding of the joined thread can be performed after the thread joining operation. This has a particularly advantageous effect on winding means for conical bobbins because during the thread transfer, the thread stores provided for the compensation of different winding speeds are not capable of working and the thread joining device of an apparatus according to the invention is able to assume the task of a thread store in this case.

An exemplified embodiment of the invention is shown in the drawings. The invention will be explained and described in more detail in the following text with reference to this exemplified embodiment.

In the drawing:—

Fig. 1 shows a spinning station and a thread joining means in a side view,

Figs. 2 to 4 show the same spinning station and the same thread joining means at different times of the thread joining operation,

Fig. 5 shows a partial view, from the top, of the spinning station and the thread joining means,

Fig. 6 shows a movement or control diagram.

As can be seen particularly clearly in Fig. 1, the spinning station 1 comprises a rotor spinning means 1a provided with a spinning rotor 1b. In a normal operation, the spun thread 2 is guided through a thread take-off device consisting of a take-off roller 3 and a clamping roller 4. The thread 2 is drawn at a constant speed from the rotor spinning means 1a by the thread take-off device. The thread 2 passes from the take-off roller 3 over a deflecting rod 5, through a thread guide 6 and via a winding roller 7 onto a take-up bobbin 8. The take-up roller 8 is driven by the winding roller 7 by means of friction at a constant speed. The take-up bobbin 8 is mounted in a bobbin holder 9.

A thread joining means 10, which is movable on rails 10c, 10d by means of rollers 10a, 10b, can be seen in front of the spinning station 1. It comprises a drive arm 11 which is rotatable about a rotary joint 11a. The drive roller 12, which is rotatably mounted at the end of the drive arm and is driven by a chain drive 11b, can be swung along the circular arc 12a. The drive roller 12 can be driven in both directions of rotation by means of the chain drive 11b.

One discerns furthermore on the thread joining means 10 another thread take-off device consisting of a take-off roller 13 and a clamping roller 15. The clamping roller 15 sits at the end of a lever 15a, which can be pivoted around the fulcrum 15b. The drive roller 12 and the take-off roller 13 can be synchronously driven at the same circumferential speed.

A suction tube 14 is rotatably suspended on the pivot point 14a, so that its suction nozzle 14b can be swung along the circular arc 14c. A thread puller 16 is swingable about the centre of rotation 16a. Its thread gripper 16b describes a circular arc 16c when the thread puller 16 is swivelled.

A grinding wheel 20 serves for the separation and preparation of the thread to be returned, as will still be explained in detail later. One discerns furthermore a thread feeder 17, which can be swivelled around the rotary joint 17a and to which a thread lifter 18 is rotatably fastened at 18a. The thread lifter 18 is controllable by a hingedly fastened connecting rod 19. The connecting rod 19 is hingedly connected to

the housing of the thread joining means 10 in the centre of rotation 19a. The clamp 17b of the thread feeder 17 can be swung along the circular arc 17c.

Beneath the take-off roller 13, one discerns a dropper 21, which can be shifted vertically to the projection plane. The dropper 21 serves for dropping at the appropriate time a thread disposed on the take-off roller 13 onto the roller 23 of a thread transferrer 22 (Seee also Fig. 5). The thread transfer 22 can be swung about the rotary joint 22a. It comprises a lever 22b, on which one end of a pull-back spring 24 is suspended. The other end of the pull-back spring 24 is hingedly fastened to an adjusting screw 25. The adjusting screw 25 enables the spring force to be set. The roller 23 of the thread transferrer 22 can be swung along the circular arc 23a. When the thread transferrer 22 swings to the other end position, the line of action of the spring 24 crosses the rotary joint 22a, so that the action exercised by the pull-back spring 24 on the thread transferrer 22 is reduced. As soon as the thread transferrer reaches its other end position, its further lever 22c actuates a switch 26.

A stop pin 26a prevents the thread transferrer 22 from swinging back to an inadmissibly far extent under the action exercised by the pull-back spring 24. One discerns from Fig. 5 that the rotary joint 22a is in an oblique position, so that the roller 23 can swing in the direction of the arrow 23b beneath the end 8a of the take-up bobbin 8.

A thread joining operation will be explained in more detail with reference to the movement or control diagram shown in Fig. 6 and to the drawings Figs. 1 to 5. In Fig. 6, there is plotted on the abscissa the time t and on the ordinate the movement or control of the parts 4, 11 to 17, 21 and 22 to be controlled, for example, according to a sequential control plan.

Fig. 1 shows the arrangement of all the parts during a normal spinning operation. Roving 2b is fed from a can 2a to the rotor spinning means 1a. In the rotor 1b there is formed the thread 2 which is passed through the take-off tube 28 and is taken off by the take-off device 3, 4 at a constant speed. A lifter 27, which can be swung about shaft 27a and serves for lifting the clamping roller 4, which is secured to a lever 4a and can be swung about a centre of rotation 4b, is in its position of rest. When the spinning operation is interrupted, which necessitates a renewed thread joining, the same situation exists with the difference that the thread 2 is missing and the thread end has run onto the take-up bobbin 8. The supply of the roving 2b is still blocked.

In response to a start command for thread joining given, according to Fig. 6, at the time A, the drive arm 11 swings against the take-up bobbin 8. Thereafter, at the time B, the suction arm 14 also begins to swing in the direction of the take-up bobbin 8. As soon as the drive arm 11 has reached the take-up bobbin at the time C, its drive roller 2 starts to rotate backwards. During the process, it lifts take-up bobbin 8 from the winding roller 7 and rotates it against the direction of winding. At the same moment, the take-off roller 13 is also switched to a rearward motion rotation so as to withdraw thread from the take-up bobbin 8. At the time D, the suction arm 14 has approached the take-up bobbin 8 to such an extent that the suction nozzle 14b is very close to the bobbin surface. Up to the time E, the thread is now located on the bobbin surface and is sucked in by the suction nozzle 14b. When this has happened, the suction arm 14 swings back up to the time F, taking along the thread 2, as shown in Fig. 2. At the same moment, the drive roller 12 and the take-off roller 13 are switched off. The take-off roller 13 has not so far been in contact with the thread and only ran because it is switched on and off synchronously with the driver roller 12.

From the time F to the time G, the thread puller 16 swings upwards, seizes the thread 2, swings back up to the time H and pulls out the thread loop shown in Fig. 3. The thread 2 now extends from the take-up bobbin 8 between the clamping roller 15 and the take-off roller 13 of the thread take-off device to the thread gripper 16b. From there, the thread end 2b extends into the suction nozzle 14b. At the time H, the clamping roller 15 is swung against the take-off roller 13 and the thread feeder 17 is set in motion. Simultaneously, the clamping roller 4 is lifted from the take-off roller 3 by the actuation of the lifter 27, as shown in Fig. 3. At the time I, the thread 2 is clamped between the still stationary take-off roller 13 and the clamping roller 15. The thread take-off device 3, 4 of the spinning station is now completely opened. The thread feeder 17 has in the meantime swung downwards by a small amount, namely to such an extent that the clamp 17b lies in front of the grinding wheel 20. The grinding wheel 20 separates the thread and prepares the new thread end for thread joining by unravelling and tapering it. The old thread end 2a is sucked in and removed by the suction nozzle 14b.

At the time J, the driving roller 12 and the take-off roller 13 are switched to a slow backward motion. Simultaneously, the thread feeder 17 commences to swing further downwards on the circular path 17c. At the time K, this swivel movement is completed, as can be seen in Fig. 4. The clamp 17b of the thread feeder 17 is now

disposed in front of the aperture of the take-off tube 28 of the rotor spinning means 1a. Controlled by the connecting rod 19, the thread lifter 18 has in the meantime assumed a crosswire position in relation to the thread feeder 17 and, in doing so, has placed the thread 2 into the opened spinning station thread take-off device 3, 4. At the time K, the clamp 17b opens. Simultaneously, the thread end is sucked into the take-off tube 28. At the same moment, the drive roller 12 and the take-off roller 13 are switched to a somewhat faster backward motion.

At the time L, the thread end has almost reached the rotor groove of the spinning rotor 1b. The drive roller 12 and the take-off roller 13 are stopped between the times L and M and directly thereafter, between the times M and N, feed back in a rapid backward motion the thread into the spinning rotor 1b, the actual thread joining being effected during this process. At the time N, the direction of rotation of the drive roller 12 and the take-off roller 13 is reversed and is subsequently increased to a predetermined thread take-off operating speed in a rapid run-up. At the time 0, the thread feeder 17 begins to swing back. This movement is completed at the time P. At the same time the thread take-off operating speed has also been reached, that is to say the take-off rollers 3 and 13 have the same circumferential speed. The take-off roller 3 constantly rotates at the normal thread take-off speed.

Between the times P and Q, the lifter 27 is taken back again, so that the clamping roller 4 is placed against the take-off roller 3.

Now the thread 2 can be transferred to the thread guide 6. To this end, at the time Q, first the clamping roller 15 is lifted from the take-off roller 13 and the dropper 21 is activated. The dropper 21 presses the thread 2 laterally downwards from the take-off roller 13, so that it slides onto the roller 23 of the thread transferrer 22. When this has happened at the time R, the thread transferrer 22 begins to swing obliquely in the direction of the spinning station 1. This movement is completed at the time S. Between the times R and S, the drive roller 12 and the take-off roller 13 are switched to a rapid forward motion. This is necessary so as to enable the take-up bobbin 8 to take up the additional length of thread released by the swivel movement of the thread transferrer 22, with an unchanged or slightly increased thread tension. The take-off roller 13 in fact has no longer any function; it only co-rotates in an empty state because, for simplicity's sake, it is switched synchronously with the drive roller 12. In the present case, the swivel movement carried out by the thread transferrer 22 takes place under the effect of the thread tension against force of the adjustable pull-back spring 24. The pull-back spring 24 is suspended in such a way that the force component acting in the direction of deflection is reduced as the deflection of the thread transferrer 22 increases. This is advantageous because the thread looping angle, and thus also the active component of the force of the thread tension, is also reduced as the deflection increases. In the end position of the thread transferrer 22, the lever 22c actuates the switch 26 at the time S. The switch 26 switches the drive roller 12 and the take-off roller 13 back to the normal thread take-off speed. Since the thread transferrer 22 deflects the thread 2 obliquely beneath the bobbin end 8a (Fig. 5), it first slides laterally from the drive roller 12 and is grasped by the thread guide 6 at the time S and is laterally pulled from the roller 23 of the thread transferrer 22.

After the completion of the thread transfer, the thread transferrer 22 swings back to its starting position under the action exercised by the pull-back spring 24. When this has happened at the time T, the drive arm 11 also begins to swing back. During the swivel movement of the drive arm 11, the take-up bobbin 8 resting again on the winding roller 7, the drive roller 12 and the take-off roller 13 are switched off. As soon as the drive arm 11 has reached its position of rest shown in Fig. 1 at the time V, the control programme is completed.

The programme switching mechanism is included in the spinning means 10 and is not shown in detail. It may be, for example, a conventional electromechanical programme switching mechanism operating with cam plates.

WHAT WE CLAIM IS:—

1. In a bobbin winding apparatus comprising an open-end spinning rotor, a thread take-off device including a clamping roller and a driven roller for taking off thread from the spinning rotor, means for supporting and driving a bobbin in a thread winding direction and a thread guide for guiding the thread from the take-off device to the bobbin during winding, a method of joining a thread comprising the steps of:

lifting the clamping roller away from the driven roller;

taking a thread end from a bobbin;

driving an auxiliary thread take-off device in one direction to feed the thread from the bobbin between the clamping roller and the driven roller and the spinning rotor;

subsequently driving the auxiliary thread take-off device in the opposite direction to take off joined thread from the spinning rotor;

subsequently returning the clamping roller to the driven roller when the speed of the auxiliary take-off device corresponds to the speed of the driven roller;

returning the joined thread under tension to the thread guide; and

releasing the joined thread from the auxiliary take-off device.

2. A bobbin winding apparatus comprising an open-end spinning rotor, a thread take-off device including a clamping roller and a driven roller for taking off thread from the spinning rotor, means for supporting and driving a bobbin in a thread winding direction; a thread guide for guiding the thread from the take-off device to the bobbin during winding and a thread joining device comprising:

means for lifting the clamping roller away from the driven roller;

means for taking a thread end from a bobbin;

an auxiliary thread take-off device drivable in one direction to feed the thread from the bobbin between the clamping roller and the driven roller to the spinning rotor and drivable in the opposite direction to take off joined thread from the spinning rotor; and

means for returning the joined thread under tension to the thread guide.

3. An apparatus as claimed in Claim 2, further comprising means for driving the bobbin at a greater speed in the thread winding direction while the joined thread is returned under tension to the thread guide.

4. An apparatus as claimed in Claim 2 or 3, wherein the means for returning the joined thread under tension to the thread guide includes means for laterally guiding the thread beneath an end of the bobbin.

5. An apparatus as claimed in Claim 2, 3 or 4, further comprising a thread feeder for feeding the thread taken from the bobbin to the auxiliary thread device, the thread feeder including a thread lifter, the movement of which is controlled by movmeent of the thread feeder, the thread lifter serving to guide the thread from the auxiliary thread take-off device, when the latter is driven in said one direction, between the clamping roller and the driven roller.

6. An apparatus as claimed in Claim 1, wherein the bobbin winding aparatus comprises a plurality of winding stations each having its associated spinning rotor, thread take-off device, means for supporting and driving a bobbin and a thread guide, and a movable thread joining device serving a number of said winding stations.

7. A method as claimed in Claim 1, substantially as hereinbefore described.

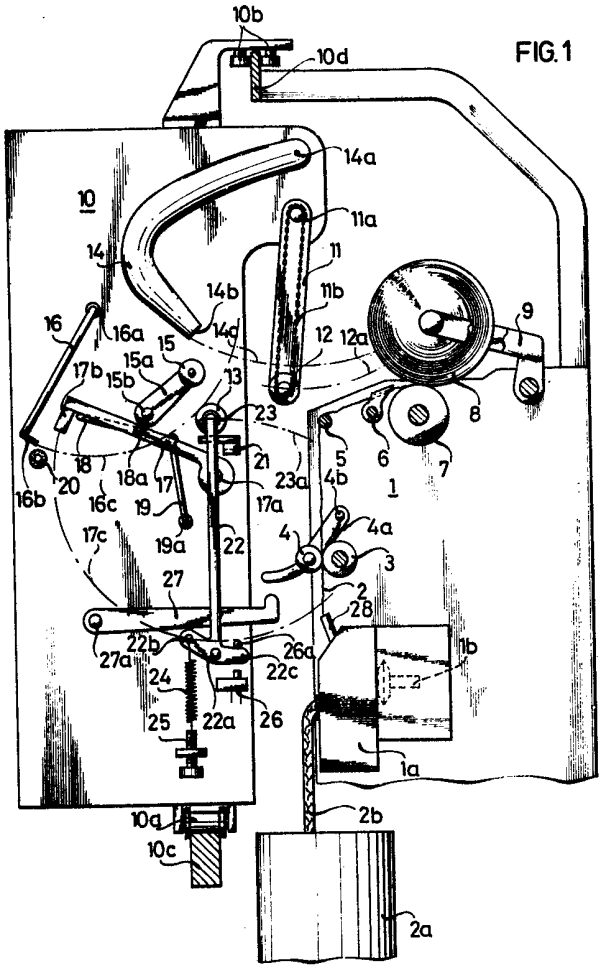
8. A bobbin winding apparatus, substantially as hereinbefore described, with reference to, and as illustrated in the accompanying drawings.

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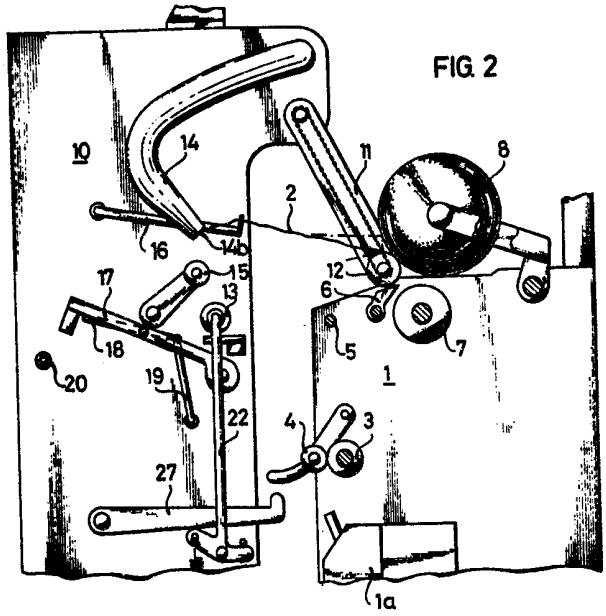
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5 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 1

FIG. 1



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FIG. 2



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Sheet 3

FIG. 3

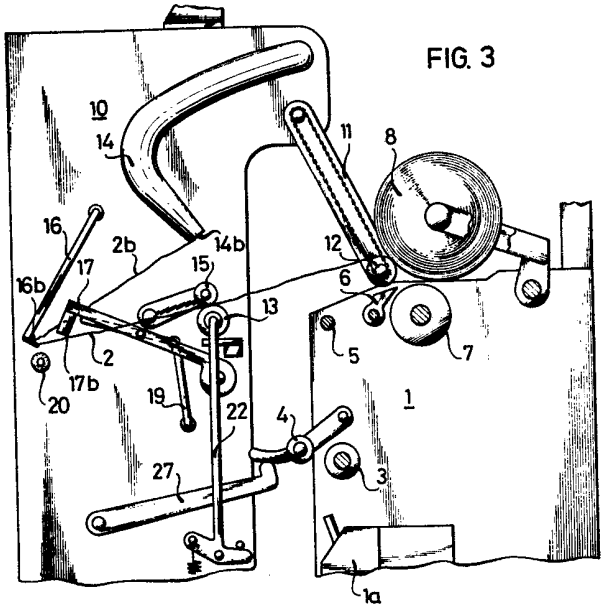


FIG. 4

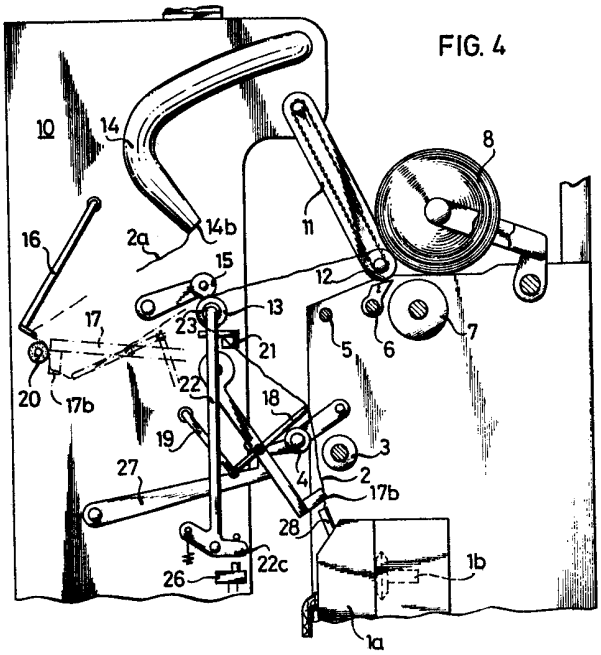

10
14
8
16
2a
14b
11
15
12
17
23
13
21
5
6
7
20
17b
22
18
19
3
27
4
2
17b
28
22c
1b
26
1a

FIG. 5

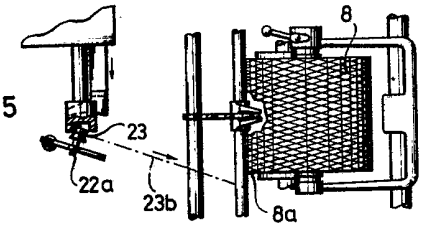

8
23
22a
23b
8a

FIG. 6

