

[54] ELIMINATE TAIL-ENDS OF YARN AND TO PICK UP THE END OF THE END OF THE WOUND YARN

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[30] Foreign Application Priority Data

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[51] Int. Cl..... B65h 67/08

[58] Field of Search 242/35.6 E, 35.6 R, 35.5 R, 242/35.5 A

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[57]

ABSTRACT

Apparatus for eliminating the tail-end winding on the base of a bobbin to thereby release the starting end of yarn of spinning cops. The tail-end winding is preferably wound on the base of the bobbin exposed above the main yarn winding and the bobbin base is formed with a negatively tapered surface for mating with a positively tapered socket of a plurality of mandrel means positioned at successive stations in the path of conveyor means for transferring said bobbins successively at a predetermined rate to said respective mandrel means for providing orientation and handling of the bobbins and elimination of the tail-end of yarn from the bobbin base by suitable means at each mandrel location without damage to the main yarn winding and to permit pick up of the released thread end of the cop winding to suitable readying mechanism of a spinning machine or the like.

18 Claims, 14 Drawing Figures

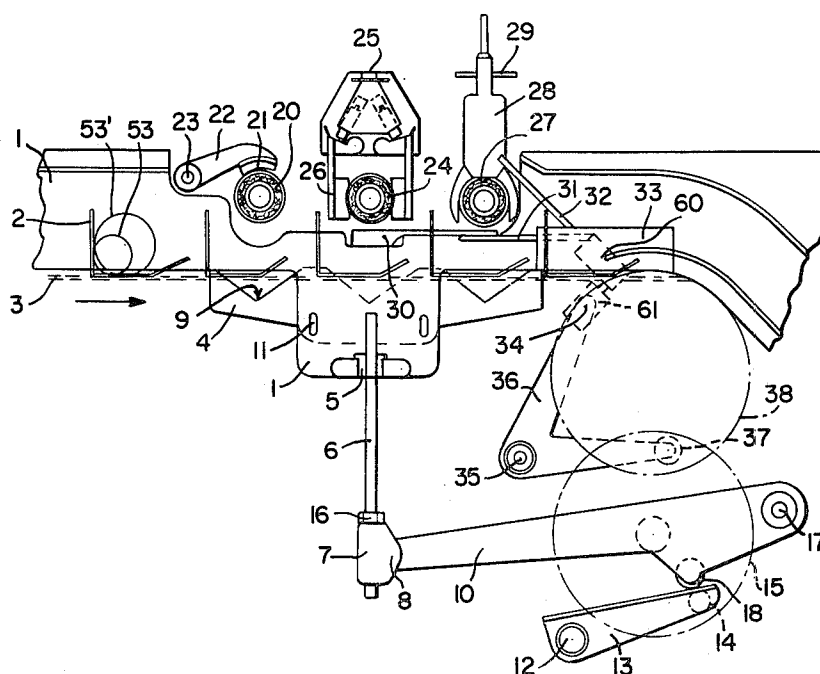


Fig. 1

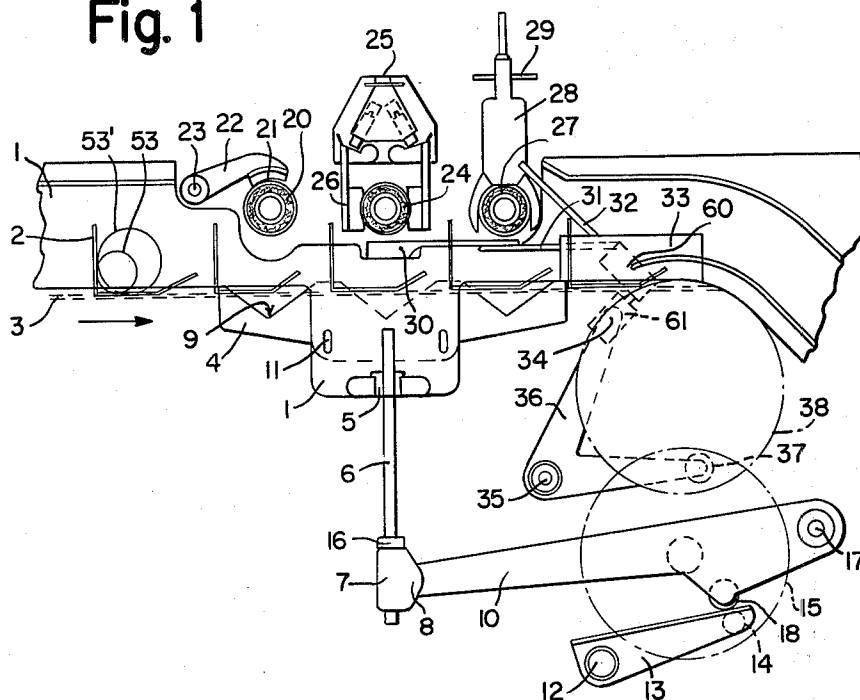
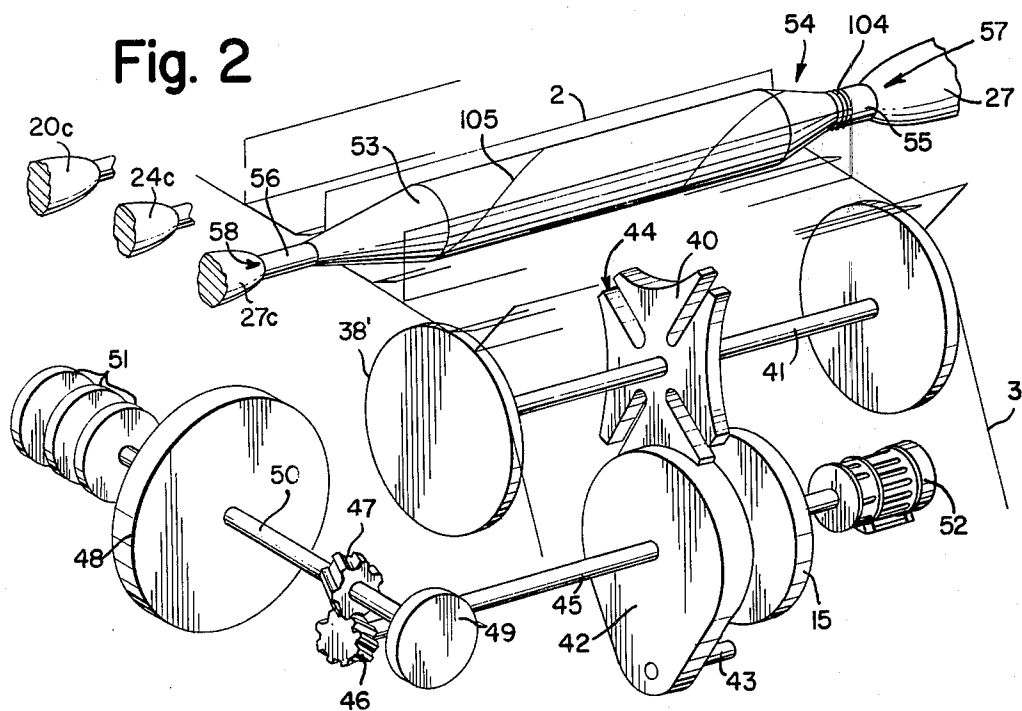


Fig. 2



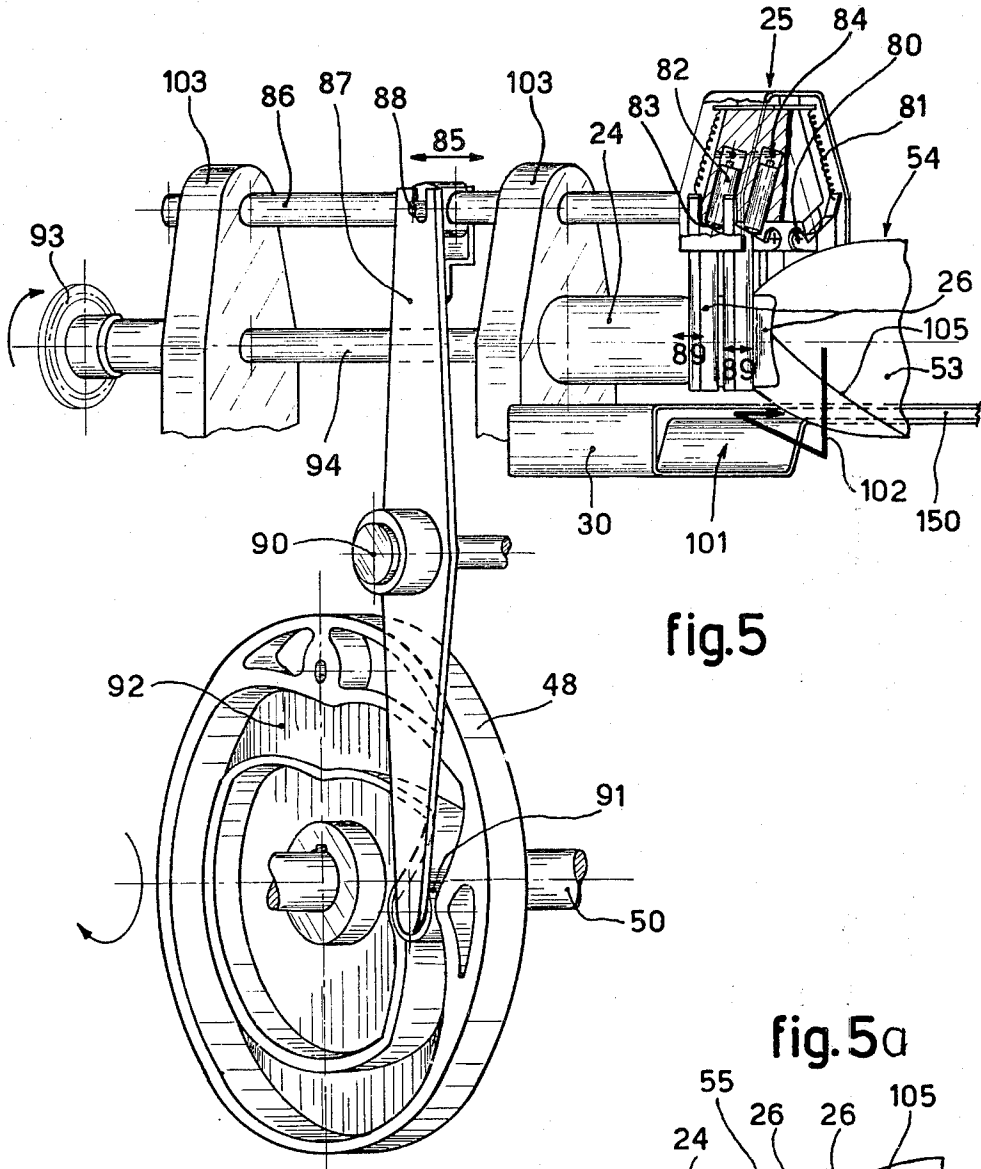


fig.5

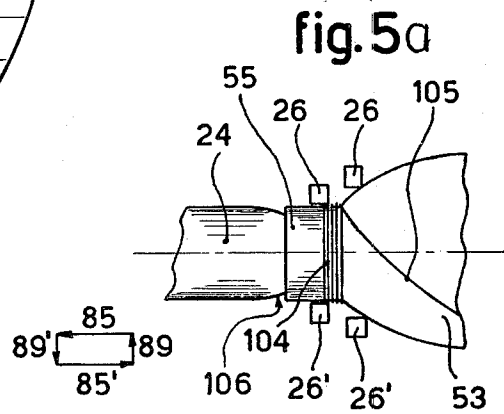


fig.5a

Fig. 6

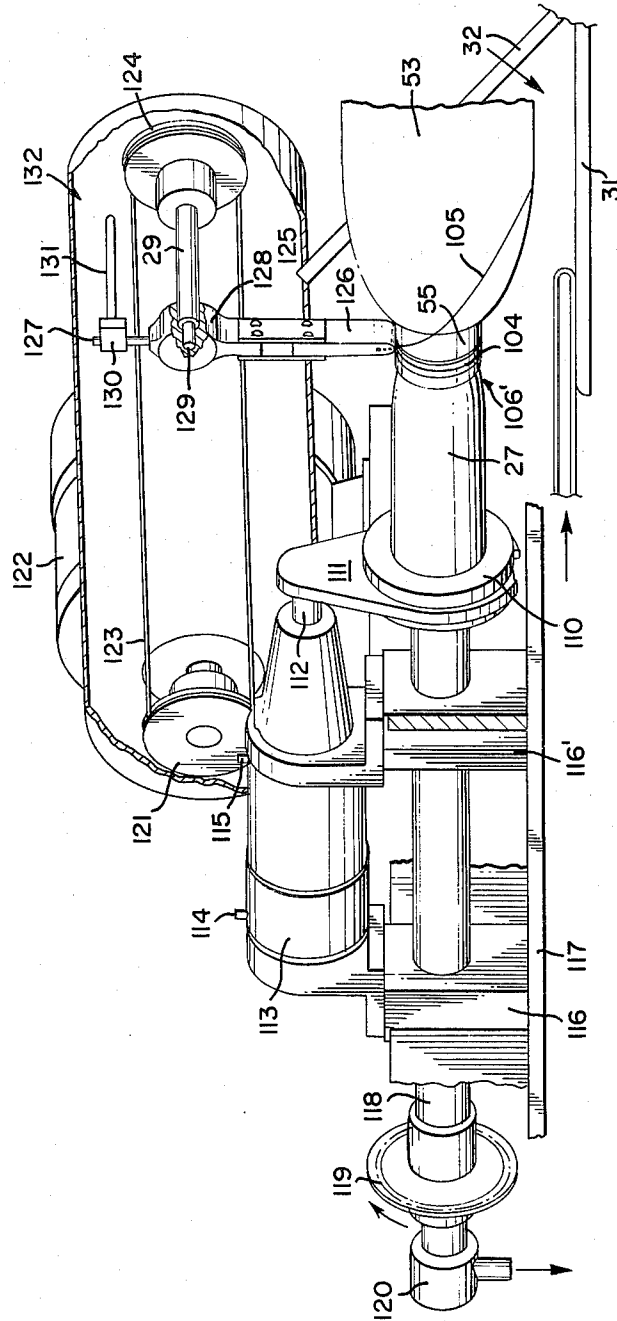
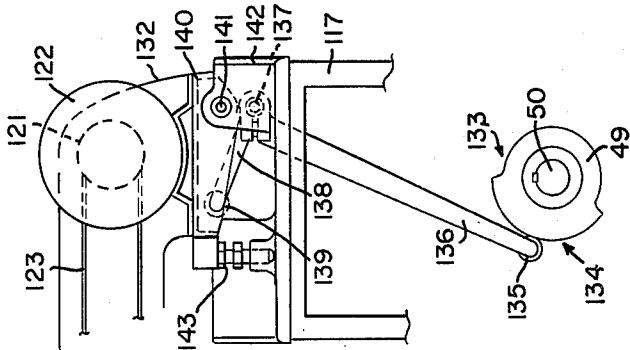
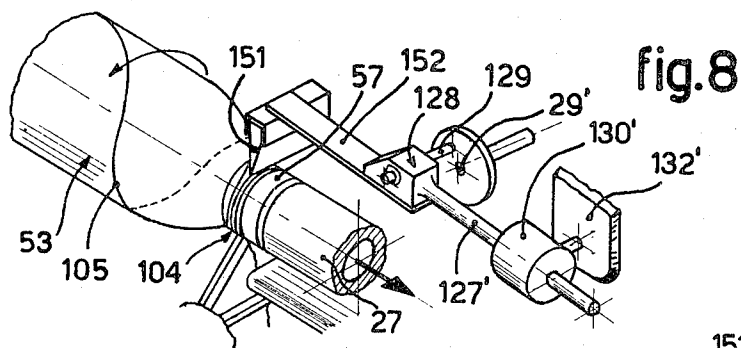
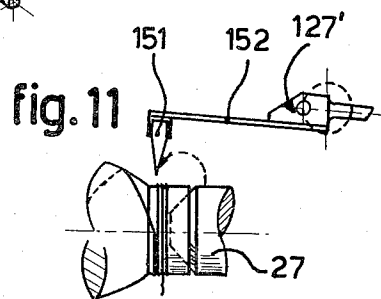
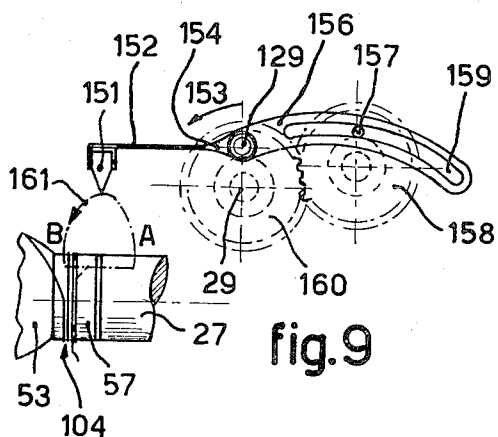
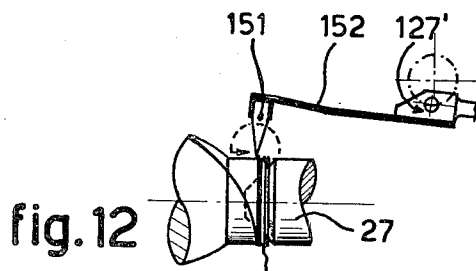
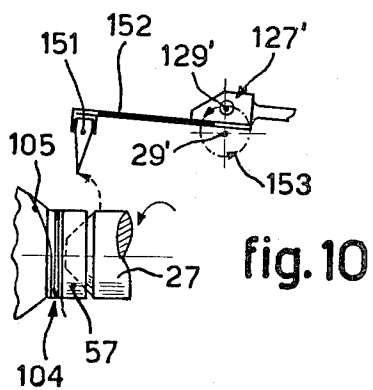
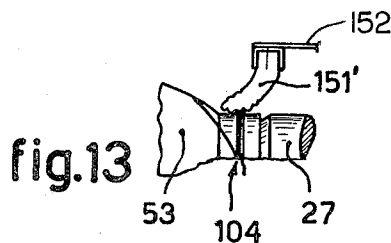


Fig. 2





ELIMINATE TAIL-ENDS OF YARN AND TO PICK UP THE END OF THE END OF THE WOUND YARN

This is a continuation of application Ser. No. 143,480 filed May 14, 1971 now abandoned.

BACKGROUND OF THE INVENTION

This invention refers to improvements in apparatus for eliminating the tail-ends of yarn, preferably at the base of the bobbin carrying the cop and for picking up the end of the thread so as to provide a cop already prepared, for example, for the step of automatical reel loading.

The tail-end of the yarn is formed at the end of the winding step when the traveller frame passes rapidly from its highest position, with respect to the base of the spindle, to the position where it is nearest to such base. Machines are known which arrange the tail-end above the part of the bobbin onto which the yarn has been wound, but under such conditions the tail-end can be eliminated much more easily. The following disclosure only deals with the case where the tail-end is positioned below the wound yarn, although the invention can be used to perform the same operations on cops where the tail-end is positioned above the wound yarn.

Accordingly, the terms "tail-end" and "turns below the wound yarn" are used interchangeably in the following disclosure.

During the downward movement some yarn is wound on and thus forms a fastening which is then fixed down by the tail-ends.

When the cop is used, the tail-end is eliminated, and at the same time the end of the yarn is picked up through removal of the fastening.

Mechanization of the elimination of the tail-end and of the picking up of the end of the yarn would be relatively simple if the base of the wound yarn were always positioned at the same distance from the end of the bobbin and if, as in the case in point where the tail-end is positioned below the wound yarn, the base of the bobbin were smooth and did not provide any possibility for the yarn to get caught while the tail-end is being eliminated, and if in addition the base of the bobbin were made slightly conical towards its end in the same manner as its top is made conical.

However, the distance between the bottom of the wound yarn and the base of the bobbin can vary considerably, and, for example, the average being about 10 mm., the free space at the base of the bobbin can vary from 15 mm. down only to 5 mm.

These variations are due to a number of reasons, of which the most usual are: an imperfect state of maintenance of the base of the bobbin, which thereby does not fit well onto its spindle and, therefore, the whole bobbin is not well positioned; irregular alignment of the travellers in their frame; and lastly imperfect alignment and/or positioning of the frame.

The mechanical operations must therefore provide for the possibility that the means for removing the tail-end, during part of their operation, may have to operate on the wound yarn itself, with undesirable consequences.

Besides this, because the bobbins are, for economical and practical reasons, made of treated board, the base of the bobbins can be found in two different conditions -- either with or without a reinforcing ring. Where there

is no reinforcing ring, the edge of the base deteriorates through usage and the material, of which the bobbin is made, tends to flake off and becomes a suitable place for the yarn to catch on while the tail-end is being pulled off.

On the other hand, if there is a reinforcing ring, it must of necessity involve a depression where it is fixed and it is just into this depression, which breaks the smoothness of the bobbin, that the tail-end or part of it can drop and render unavailing all efforts to extract it.

The above described problems make complex and difficult, if not totally ineffective, the action of known mechanical means, which amongst other things, as mentioned above must also take account of a certain negative tapering, whether residual or caused by wear, of the base of the bobbins themselves.

Therefore, the purpose of the invention is the elimination of the tail-end, preferably at the base of the bobbin, whether said base be in an excellent state of maintenance or be reinforced with a metallic ring or be damaged through usage or be cylindrical or with a negative tapering.

The systems known and most related to the invention can be divided into two classes according to the method used in eliminating the tail-end and in picking up the end of the yarn: systems which use pincers, and systems which use rotating brushes.

The most representative system using pincers is disclosed in British Pat. No. 1,068,415, French Pat. Nos. 474,479, No. 1,240,371 and No. 1,360,594 also disclose similar systems; in that system, pincers with two jaws are provided which move forward on the upper part of the bobbin and, being already in an open position, close onto the bobbin and attempt to pull off the tail-end. No system with pincers is known which eliminates tail ends positioned below the wound yarn.

Such a system can give good results so long as it is used to pull off tail-ends above the wound yarn, particularly so if the operation is repeated several times with consequent long operating periods; such positive results are also obtainable because the bobbin itself is tapered above the wound yarn and thus assists the removal. French Pat. No. 1,240,371 also uses pincers which, however, instead of eliminating the tail-end, endeavour to pick up the end of the yarn in the upper part of the wound yarn and ignore the tail-end.

These systems using pincers provide a sufficiently successful performance where the bobbin is tapered even slightly, thus helping the action of the pincers themselves; in fact, all the inventions which use pincers are concerned with eliminating picking up of the end of the yarn on the upper part of the cop.

Where, however, the surfaces are cylindrical and not tapered, the tail-end, being tightly wound, is difficult to extract unless it is sufficiently loosened beforehand.

Among the systems which use rotating brushes or other similar means, the most representative is disclosed in French Pat. No. 1,266,152, (French Pat. No. 1,208,308 and No. 1,283,466, besides British Pat. No. 1950 and U.S. Pat. No. 3,101,098 disclose similar systems).

The above patent, too, like all those cited for pincers systems, only solves the technical problem involved in eliminating the tail-end and in picking up the end of the yarn where the latter is positioned in the upper part of the wound yarn.

U.S. Pat. No. 3,406,920 alone is concerned with the elimination of the tail-end and the pick up of the end of the yarn in the lower part of the bobbin; that is below the wound yarn.

The arrangements of U.S. Pat. No. 3,406,920, however, have limitations as follows: the systems provided and, in particular, those shown in FIGS. 1 and 2 of that patent take no account of differences in the empty space remaining below the wound yarn; further, they operate with an abrasive movement either on the yarn itself or on the bobbin, thus reducing the working life of the bobbin; the other arrangement proposed in that patent, if the base of the bobbin has a metal collar with a depression caused by its fixture, will not solve the problem of eliminating the tail-ends in most cases, and even less so if such a collar is even slightly deformed through use.

OBJECTS AND SUMMARY OF IMPROVEMENTS

Accordingly, an object of the present invention is to solve the foregoing problems unsolved by the prior art and to provide a high conveyor feeding rate of the reels or bobbins, for example, one every three seconds with the certainty that in every case the tail-end positioned below the wound yarn on each bobbin is loosened and will be eliminated such as by cutting shears and pneumatic means and the end of the yarn from the main winding picked up the said reels or bobbins being oriented and positioned by a conveyor reel feeding system to respective successive tail-end elimination stations to free the yarn end for pick up by the readying means of the mechanism of suitable knitting apparatus.

In order to solve these difficulties and to allow a high rate of feedings of reels -- for example, one every three seconds -- with the certainty that in every case the tail-end positioned below the wound yarn will be eliminated and the end of the yarn picked up, the invention provides an apparatus including three operative stations performing respective steps, each one with a separate purpose to be carried out in turn in the direction in which the cop is moved.

The first step is for the prearrangement of the tail-end or thread below the wound yarn; the second step is for the elimination of the tail-end or for its movement to the edge of the bobbin, and the third step is a security operation to guarantee completely the elimination of the threaded below the wound yarn and the pick up of the end of the yarn in every case.

The improvements are, therefore, effected as follows:

Assuming that the cop of yarn is already oriented and positioned on a conveyor, which moves in steps and which in each step goes forward by an amount equal to the distance between the centers of the operative station used for the elimination of the tail-end and for the pick-up of the end of the yarn, then the means provided for carrying out these operations or steps which form the essence of the invention, are positioned on the side to which the base of the bobbin is turned and where the tail-end is placed.

The first step is an preliminary one and serves only to slacken off the turns of the thread which compose the tail-end at the base of the bobbin. This step is carried out by one or more pads, which press on the end of the bobbin, where the tail-end is positioned, and, as the cop and bobbin are rotating together, slow up the tail-end in relation to the bobbin and cause the turns of thread to slacken off.

The second step is the operation to eliminate the tail-end. This steps which fulfills its purpose in almost every single case.

Because the free part of the bobbin below the wound yarn varies considerably in length and because it can happen that the tail-end is positioned in among the wound yarn itself, this operation must try to eliminate the tail-end but must at the same time ensure that the action to eliminate the tail-end does not damage the wound yarn in some way; and, whenever it does not succeed in eliminating the tail-end, it must at least succeed in moving the tail-end itself to such an extent that, whenever the third and more forceful step has to be carried out, said step can act upon the tail-end alone without touching wound yarn.

Therefore, the second step which is also carried out with the cop and bobbin rotating together, must eliminate the tail-end, or whenever this cannot be done either because of the state of preservation of the end of the bobbin or because of a metal reinforcing collar, must at least move the tail-end clear of the wound yarn so that the third step can carry out an action sufficiently forceful to eliminate the tail-end in every case and so to make it possible to pick up the end of the yarn.

The third step is carried out by a system of brushes acting on the tail-end and has the purpose of eliminating the tail-end in every case; to complete this, in this step forceful action is carried out because such action will definitely never take place on top of the wound yarn but only on the tail-end, which has been moved clear of the wound yarn in the preceding phase.

Simultaneously with the last two steps, a suction system sucks up the tail-end, which has been eliminated from the bobbin, and places the end of the yarn under a shearing blade which cuts it and leaves a prearranged part of it on the wound yarn.

The means for carrying out the above steps including, according to the invention, a compartmented conveyor which moves in steps, each step having a length equal or a sub-multiple of the distance between the centers of fixed operative stations, each station having positioning means, means suited to start the bobbin/cop system rotating, and operational means.

In the second and third stations, a suction means sucks up the cut tail-end and thus pick up the end of the thread and moves it then to a lateral position (according to a preferred embodiment, to the side of and beyond the last station) which allows a mechanical shearing blade to cut the end of the thread at the position and length required.

In a preferred embodiment, such suction means can pass below (or above) the third station so as to draw up the end of the thread which has been picked up in such third station.

Instead of a separate suction means, according to a preferred embodiment of the invention, the two last operational mandrels may be hollow and have their centers exerting suction so that the tail-end is drawn up by them when it is released from the bobbin. In this case, not one shearing blade alone will be provided for both mandrels but one for each mandrel. In a further preferred development of the invention, which is described hereinafter, the central mandrel is fed by an auxiliary, separate system of suction and movement, downstream from the thread end, while the third and last mandrel has a suction intake in its center; the

shearing blade downstream from the third mandrel serves either for this mandrel or for occasions when the thread end has been picked up in the section station.

Preferred embodiments of the invention will now be described with reference to the accompanying drawings, wherein:

FIG. 1 is a diagrammatical partial side view of an apparatus for eliminating the tail-end winding on the base of a bobbin according to a preferred embodiment of the invention;

FIG. 2 is a partial perspective view of the apparatus of FIG. 1;

FIG. 3 is a partial perspective view of the first operative station of the present invention wherein the pad contacts the base of the bottom to remove the tail-end on the cop;

FIG. 4 is a partial end view of an alternative embodiment of first operative station for the apparatus of the invention;

FIG. 5 is a perspective view of a second operative station of the apparatus of FIG. 1 and 2;

FIG. 5a is a partial side view of the station of FIG. 5;

FIG. 6 is a partial perspective view of a third operative station of the apparatus of FIGS. 1 and 2;

FIG. 7 is an end view of the operative station of FIG. 6;

FIG. 8 is a partial perspective view of an alternative embodiment of the third operative station of the present invention acting horizontally;

FIG. 9 is an end view of a second alternative embodiment of the third operative station shown in FIG. 6;

FIGS. 10, 11 and 12 are end views of a part of the third operative station of FIG. 6, shown in different operative position of its members, to illustrate the operation of the system; and

FIG. 13 is a view similar to the views of FIGS. 10, 11 and 12, showing an alternative embodiment of a spatula used in the third operative station of one of FIGS. 6, 8 and 9.

Referring now to FIGS. 1 and 2, the apparatus according to the invention includes two lateral guideways of which only the left hand guideway 1 is shown, in the direction of movement of a conveyor 3, having compartments 2. The conveyor 3 is stepped by wheels 38, 38'. These are moved by a Malta Cross system 40, which is rigidly fixed onto an axle 41, as are the wheels 38, 38'. The Malta Cross 40, under the action of a crank 42 which is rigidly connected to a driving shaft 45, carries out, when a roller 43 centers a slit 44, a rotary movement of a quarter of a turn.

When the wheels 38, 38' rotate a quarter of a turn, the conveyor 3 moves by a step, equal to the distance between the centers of mandrels 20 and 24 or of mandrels 24 and 27, as the two distances are equal.

The distance between the centers of the compartments 2 is equal to the distance between the centers of the mandrels 20, 24 and 27. In front of each mandrel a respective countermandrel 20c, 24c, 27c is supported rotatably.

The shaft 45, which is driven by a motor 52, drives the shaft 41 in steps by means of the Malta Cross 40, and the shaft 50 continuously through gears 46 and 47.

On the shaft 45 is a mechanical drive cam 15, whilst on shaft 50 there are two mechanical drive cams 48 and 49 and cams 51 for programming, control and linkage for pneumatic, electrical or pneumoelectrical operations, as obvious for one skilled in the art.

Although the above arrangement includes two shafts 45 and 50, at right angles, because the mechanical nature of the main parts of the apparatus so requires, it will be understood that, whenever arrangements involving pneumatic and/or electrical control are adopted, all the programming cams could be positioned on the shaft 45, thus simplifying construction. In the specific case shown one turn of the shaft 45 corresponds to one operative step, or three turns are equal, for a cop, to the overall treatment including the three operations provided by the apparatus.

In the compartments 2, can be placed cops 53 of different lengths and measurements come in succession beneath the mandrels 20, 24, 27. They are raised and centered on the axis of the mandrels by the support 4 with V-shaped supports positioned on either side of compartments 2 (in FIG. 1 only the left hand one is shown). Transverse positioning is automatically carried out by the "V" shape of the movable support 4, whilst vertical centering is adjusted by means of a nut 16 which alters the reciprocal positions of the support 7 and the support 4.

The support 4 is raised by a rod 6, which is guided by a sleeve 5 rigidly fixed on the guideway 1, and slides along the slots 11.

The rod 6 is actuated by the support 7 which is hinged at 8 with a lever 10, pivoted at 17; the pivot 17 can also transmit motion to a further lever (not shown), on the right-hand side of the apparatus.

The lever 10 has a idle roller 18 running upon a lever 13, which is hinged at 12 and has an idle roller 14.

The roller 14 bears on one face of the double face cam 15. Although the roller 18 could be moved directly by the cam, two levers 10 and 13 are adopted, so that, where the shaft 17 is capable of moving axially, the roller 18 can always be actuated as it bears on the lever 13.

Axial displacement of the shaft 17 and, in consequence, of the support 4 is necessary so as to adjust the machine to various lengths of the bobbins.

When the cops 53 are positioned in front of the mandrels and are already oriented, with their upper end on the right and their lower end on the left, the mandrels 20 and 24 remain still while the counter-mandrels 20c, 24c move axially and, centering themselves at 58, push the cops towards the left until the mandrels 20 and 24 are centered on 57, the mandrel 27 centers at 57 and, moving axially, makes the counter-mandrel 27c center on 58.

The outward or axial movements of the mandrels to cause axial centering are preferred but can be modified within the principles of the invention.

The ends of the mandrels 20, 24, 27, which center themselves at 57, are tapered as also are the ends of the counter-mandrels which center themselves at 58; this makes the centering and the previous positioning simpler and easier to effect with larger tolerances. The tapering of the mandrels can be positive or negative according to the type of cop. Hereafter and in the Figures only positively tapered mandrels will be considered for convenience.

Once the cops are in position, the mandrels begin to rotate and carry out the steps of loosening the tail-end (mandrel 20), of eliminating the tail-end (mandrel 24) and of forcibly eliminating any tail-end which happens to remain (mandrel 27).

The means for carrying out these steps are better shown in the FIGS. after FIG. 1 but are diagrammatically illustrated in it, too. Such means include a pad 21 on an arm 22 which is hinged at 23; and pincers 26 which are actuated by a group 25; and a spatula 28, which is hinged at 29.

If both mandrels 24 and 27 have hollow suction spin-
dles, then each mandrel will be provided with shears to
cut the thread end; if, however, only the mandrel 27
has a suction apparatus, then a suction opening 30 ex-
tends from a point slightly at the left of the mandrel 24
to a point slightly at right of the mandrel 27, in the view
of FIG. 1.

In the example shown, only mandrel 27 has a suction
point so as to simplify construction and to eliminate
shears in between 24 and 27.

The suction opening 30 is here wider below mandrel
24 because it serves to draw up the tail-end which has
been pulled off from below the wound yarn; whilst
below mandrel 27, where the tail-end remaining is forc-
ibly eliminated and sucked up by the mandrel itself, as
described later, the opening has the purpose of bringing
the thread end within the field of action of the shears
and of placing it between the blades 31 and 32 of the
shears.

The shears are shown with one blade 31 fixed and the
other 32 hinged at 60 on the support 33 which also
holds the blade 31.

The end 61 of the movable blade 32 serves as a guide
for a roller 34 which transmit the control movements
of a lever 36.

In this way the blade system 31, 32 and the support
33 can be easily changed as they are subjected to con-
siderable wear in operation.

The lever 36 is hinged at 35 and has a roller 37 bear-
ing on the second face of the double face cam 15.

In FIG. 3 is shown the first operative station, com-
prising a positively tapered mandrel 20, which auto-
matically positions itself in a hole 57 of the base 55 of
the bobbin; the mandrel 20 is operated by a spindle 69,
which is turned by a gear 70 and is supported by sup-
ports 68 and 68'.

On the mandrel 20 there is rigidly supported a cam
66 with one or more projections 67; on the cam 66
bears an idle roller 64, biased by a spring 62. The spring
62 is anchored to the fixed point 63, which acts as a
support for the shaft 23.

The roller 64 transmits the lift caused by the cam 66
to the bracket 65 which is rigidly fixed to the shaft 23
which in turn is rigidly joined to the arm 22.

The up and down rotation of the arm 22 is trans-
formed into an alternating movement whereby the arm
acts at intervals by means of pad 21 on the tail-end 104
and loosens it.

The pad can be single or multiple or can have a single
support or multiple supports; and, where there are mul-
tiple supports, they can be elastic.

The pad 21 is made from a material suitable for brak-
ing the tail-end and is elastic or partly so; it preferably
consists of rubber or a similar material.

In order to increase the braking action, and there-
fore, to facilitate the loosening of the tail-end, in place
of one single pad 21 there could be provided two facing
pads or two pads such as those in FIG. 4, which are
controlled by a pneumatic means 71, hinged at 74 and
linked up to the drive coming from the cams 51. In the
case shown, the rod of the piston 71 has a support with

two pivots 72, to which are fixed the moving arms 22'
which are held in position by an elastic means 73.

By being raised and lowered, the pads 21, which can
also be staggered, fit onto the collar 55 of the bobbin
and by pressing on it carry out their braking action.
After a cyclic series of loosening actions on the tail-
end, the cop halts or is braked to a stop and drops into
the compartment below, which moves on by a step and
positions the cop below the second operative station.

FIGS. 5 and 5a show the second operative station
which, in the preferred solution illustrated, comprises
a mandrel 24, rotated by a gear 93 through a spindle 94
which is supported by a support 103.

The mandrel 24 is centered at 57 in the base 55 of the
bobbin. Below the mandrel 24 is the suction system 30
with an opening 101 and, on the side, a channel 150 for
positioning the thread end.

As the tail-end 104 is right at the bottom of the
wound yarn, the pincers 26 operate partly on top of the
wound yarn itself as well.

The pincers 26 are made of a resilient material such
as rubber, and carry out the movement 89', 85', 89 and
85.

The movements 89' and 89 are caused by assembly
25, whilst the movements 85 and 85' are induced by
the cam 48, which is moved by the shaft 50.

The assembly 25 is linked to cam 51, see FIG. 2. In
assembly 25 the arms of the pincers 26 are hinged at
80; said arms are kept open by elastic means 81, which
may be springs.

The cam 51 causes air to be pressurized into the
ducts 84 and therefore pressurizes the rear chambers
containing pistons 82, which bear on the surface 83 on
the arms. This closure action overcomes that of the
elastic means 81 and imparts a movement 89 to the pin-
cers 26.

The action of the pistons 82 lasts during the whole
return movement 85 and, when it ceases, the elastic
means make the pincers perform a movement 89'.

The cam 48, has a guide channel 92, engaging an idle
roller 91, attached to the arm 87, which is hinged at 90.

At the end of the arm 87 is a slit, engaging a pin 88,
which is rigidly fixed to the shaft 86, supporting the as-
sembly 25; the shaft 86 can turn through a certain angle
and allows the pincers 26 to level themselves on the
bobbin or on the wound yarn.

The shaft 86 can be used to pass the compressed air
through 84 into the chambers at the back of the cylin-
ders. The pincers 26' move along a path indicated by
the diagram 89', 85', 89, 85, while the pincers 26 move
along a similar path which is a mirror image of the for-
mer.

The part of the pincers 26 and 26', which is shown
in FIG. 5a as being square in contact with the wound
yarn, can be rounded or pointed, straight or concave,
smooth or with projections, as shown in FIG. 13. Their
working pressure can be adjusted by means of the air
pressure arriving in the back chambers containing pis-
tons 82. Therefore, for example, the pincers 26', which
move along a path mirroring the path of the pincers 26,
owing to the effect of the cam 48, complete the move-
ment 85.

According to the preferred cycle, the pistons 82
cause the pincers 26 and 26' to act on the wound yarn
and the tail-end 104 during movement 85.

The action of the pincers 26 moves the tail-end 104
from below the wound yarn on cop 53 towards the edge

of the base of the bobbin 55 until it pulls the tail-end off.

When pulled off, the tail-end lies at 106 and, as soon as the cop is freed from the mandrels and drops into the compartment 2 below, the tail-end is sucked up by 101, as indicated by arrow 102, and the thread end 105 is carried below the shears.

Whenever the action of the pincers 26 fails to pull off the tail-end 104, it will certainly move it away from the wound yarn on cop 53; this action is performed in a gentle manner so as not to damage the wound yarn. At the end of the step, after two or more cyclic repetitions of the passage of the spatulas 126 and 126' over the wound yarn and over the base of the bobbin 55, the cop 53 stops and drops into the compartment below, which positions it below the third operative station, generally shown in FIG. 1 as mandrel 27.

FIGS. 6 and 7 show the third operative station in accordance with a preferred solution, in it the mandrel 27 is the only one, according to the preferred system adopted as an example, to move forwards.

The movement, first forwards and then backwards, is imparted to the mandrel 27, by a pneumatic means 113, which presses with its stem 112 on a bracket 111. The bracket 111 joins on to a collar 110, which is rigidly fixed on the mandrel 27.

During the operative stop the piston 113 receives compressed air through connection 114 to press out the stem 112, whilst during the reverse step the drive is received through connection 115; the distribution of the fluid, such as air, is carried out by one of the cams 51 referred to in FIG. 2.

The piston 113 is held by the support 116 and 116' which also act as supports for a spindle 118, which is hollow and is driven by 119. The hollow spindle 118, is joined to the mandrel 27 and rotates the mandrel itself and, in consequence, the cop.

On the spindle 118 is a rotary coupling 120, through which the suction action reaches the hollow mandrel 27.

According to the arrangement in FIGS. 6 and 7, the spatula 126 acts forcefully on the tail-end 104, which has previously been separated from the wound yarn by the pincers 26.

The spatula 126 is connected to a body 128 by elastic blades 125.

The body 128 which is rotatably mounted on an eccentric pivot 129 on the shaft 29 receives a circular motion therefrom.

As the body 128, however, is held by the rod 127 which slides within the guide 130 moving on the pivot 131 the rotary movement applied to the body 128 changes into a fast rotary movement, which is transmitted to and amplified on the point of the spatula 126.

Such forceful movement, acting on the base 55 of the bobbin, moves the tail-end 104 in every case away from the base itself and places it in 106'. The movement of the spatula 126 takes the form of a stroking movement on the bobbin, as is shown in FIGS. 10, 11 and 12.

During the withdrawal step of the mandrel 27, the tail-end 104 is sucked up by the mandrel 27 itself, and the cop drops into the compartment 2, referred to in FIG. 1.

However, the thread end is cut by the blades 32 and 31 of the shears, the blade 32 passing in front of the withdrawn mandrel 27 and up to the positioning tube 30.

The rotary movement of the shaft 29 is induced by the pulley 124, which transmits to it, by means of belts 123, the movement received from a pulley 121, which is driven by the motor 122.

The apparatus is enclosed, in the case in question, by the casing 132. The positioning of the spatula 126 relative to the wound yarn is carried out by means of the eccentric spindle 141; this latter supports the base 140, in which the motor 122 and the casing 132 are placed.

The eccentric spindle 141 is held by the support 142, which is positioned on the frame of the machine 117, see FIG. 7.

In the support 142 another spindle 137 is an integral, fixed part of both the lever 136 and the lever 138.

At the ends of the two levers 136 and 138 there are two idle rollers 135 and 139.

The roller 135 bears on the cam 49, which is actuated by the spindle 50 and has two sections; one of these, 133, coincides with the working of the spatula 126 on the base 55 of the bobbin; the other, 134, coincides with the raising of the spatula and, therefore, with the period of discharge and charge of the cop at the station, in addition to the shearing of the thread end.

The pressure of the spatula 126 on the base 55 is adjusted by the system 142 which consists here of a screw and locknut and acts on the base 140, thus modifying its position relative to the base 142.

Instead of the spatula shown in FIG. 6, one of the spatulas shown in the following figures or one of the systems shown on the same Figures can be used.

In FIGS. 8 and 9, the spatulas shown and their associated systems differ from that shown in FIG. 6 as regards the means used to impart to the spatula the forceful movement required.

In FIG. 8, the spindle 29' carries an eccentric shaft 129, which is free to rotate in the support 128. The same Figure shows the elastic blade 152 which holds the spatula 151 and the shaft 127'.

The shaft 127' can run in the movable support 130' which is hinged to the support 132'.

The system is therefore similar to that of FIG. 6, but acts horizontally rather than vertically.

In FIG. 9, on the other hand, the movement of the spatula 151 is not circular, but as shown at 161, and thus allows a more continuous and precise action. The spatula 151 is carried on the flexible member 152, which is fixed at 154 and has at its rear the arm 156 with a slot 159.

The support 154 is hinged on a wheel 160 at 129; the wheel 160 is moved by the shaft 29 and transmits the motion to a wheel 158.

On the wheel 158 a pin 157 moves inside the slot 159.

The combination of movements and of links is translated in the case of the spatula 151, into a movement 161, as described.

In FIG. 13 is shown a preferred form of the spatula 151' provided with projections.

These projections, together with the fact that the spatula is made of a plastic or similar material, increase the effect of the spatula on the tail-end and improve its capability to remove it.

As is seen from the description and the drawings, the complete cycle is carried out as follows.

Assuming that a cop arrives below the first operative station below the mandrel 20, it will be lifted, positioned and rotated; its tail-end will be loosened, and

then the cop is placed back in its compartment in which it moves to below the second operative station.

Here the cop is raised, positioned and set in rotation, and it undergoes the gentle action of the pincers 26; it is then released so as to be able to return to its compartment 2. If the tail-end 104 has been pulled off, this latter is sucked up by 101, and the thread end is positioned below the shears, which cut it.

The cop is then brought below the third operative station and is placed on the mandrel 27, where it is set in rotation and it undergoes the forceful action of the spatula, which is generally illustrated by 28 in FIG. 1 and is illustrated in detail by 126 in FIG. 6 and by 151 in FIGS. 8 and 9. Then it is released to drop into its compartment.

From the moment when it has started to move so as to arrive below the mandrel 20 up to the moment when it starts to move away from below the mandrel 27, the shaft 45 has carried out three turns.

The embodiments of the invention disclosed above are to be understood as illustrative examples, as a person skilled in the art will easily devise modifications and alternative arrangements, within the scope of the appended claims.

I claim:

1. An apparatus for eliminating the tail-end winding at the base of a bobbin to thereby release the starting end of yarn in spinning cops, comprising:

- a. a first operative station having means for supporting and rotating a bobbin and means adapted to cooperate with the rotating bobbin for loosening the tail-end winding at the base of the bobbin;
- b. a second operative station having means for supporting and rotating a bobbin and means adapted to cooperate with the rotating bobbin for separating the tail-end from the cop;
- c. a third operative station having means for supporting and rotating a bobbin and means adapted to cooperate with the rotating bobbin for forcefully removing the tail-end from the cop;
- d. means for picking up the thread end from either of the second and third operative stations and means for cutting from either of the second and third operative stations the tail-end removed; and
- e. conveyor means in operative relationship to the operative stations, and driven in steps for positioning a bobbin in sequence in the first, second and third station.

2. The apparatus of claim 1, wherein the means for supporting and rotating a bobbin in the first, second and third station respectively each comprise a mandrel and a countermandrel.

3. The apparatus of claim 1, wherein the means for loosening the tail-end comprises an elastic pad and a support connected to the pad for moving the pad against the cop at intervals.

4. The apparatus of claim 3, wherein the means for loosening the tail-end include a pneumatic piston acting on the support.

5. The apparatus of claim 3, wherein the means for loosening the tail-end include at least one further pad.

6. The apparatus of claim 2, wherein the means for picking up the thread at the third station includes suction means adapted to apply suction in the area of the base of the bobbin supported in the third station.

7. The apparatus of claim 6, wherein the means for picking up the thread at the second station also in-

cludes suction means adapted to apply suction in the area of the base of a bobbin supported in the second station.

8. The apparatus of claim 6, wherein the suction means comprises an axial hole through the mandrel and a vacuum source connected to the axial hole.

9. The apparatus of claim 5, wherein the means for separating the tail-end in the second operative station comprise stroking means performing a stroking action with a controlled, adjustable pressure on the wound yarn and on the base where the tail-end is wound, means for effecting the controlled, adjustable pressure, means for pulling away the stroking means, means for supporting, orientating and holding the stroking means, and means for carrying out periodical, axial displacement of the stroking means on the rotating cop.

10. The apparatus of claim 9, wherein the means which carry out a periodically stroking action comprise multiple opposed pads, the part, which carries out the stroking, being of an elastic material, the pads also being held by an arm which is hinged in the support and orientation means, the arm having a raised plane for application of controlled pressure and also having anchorage means for the means which displace the stroking means for the cop.

11. The apparatus of claim 10, wherein the means for carrying out controlled pressure comprise, for each pad, pneumatic means which press on the raised plane on the pad-carrying arm outside the fulcrum of application, the pneumatic means comprise a small piston activated by compressed air.

12. The apparatus of claim 9, wherein said means for axial movement include a lever, adapted to actuate the support, orientation and holding means, said lever being worked by a cam.

13. The apparatus of claim 12, wherein the means for forcibly removing the tail-end on a cop rotating between two mandrels have scraper means capable of continual axial displacement.

14. The apparatus of claim 13, wherein the scraper means are held by elastic means, which are anchored to a support, to which a circular movement, is imparted, said support being connected to means creating a linkage, said means consisting of a sleeve, which moves perpendicularly at the hole within which the connecting shaft runs.

15. The apparatus of claim 14, wherein the scraper means include a spatula having projections.

16. The apparatus of claim 9, wherein the means for cutting the thread end comprises mechanical shears positioned downstream from the second and third stations, one blade being fixed whilst the other is capable of moving in front of the suction openings of the mandrels.

17. The apparatus of claim 9, further comprising lifting means cooperating with each operative station, and adapted to bring a bobbin from the conveyor means to a position where it can be engaged by the supporting means in the station.

18. The apparatus of claim 17, wherein the lifting means comprise two blades forming a V and placed axially to the stations, the blades being positioned at the sides of the conveyor and being simultaneously controlled, the vertical positioning of the blades being adjustable and the lifting and lowering control being carried out by a lever linked to a cam.

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