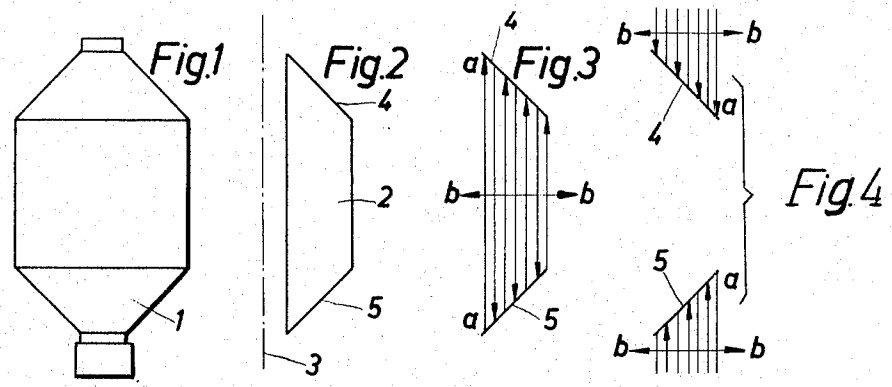
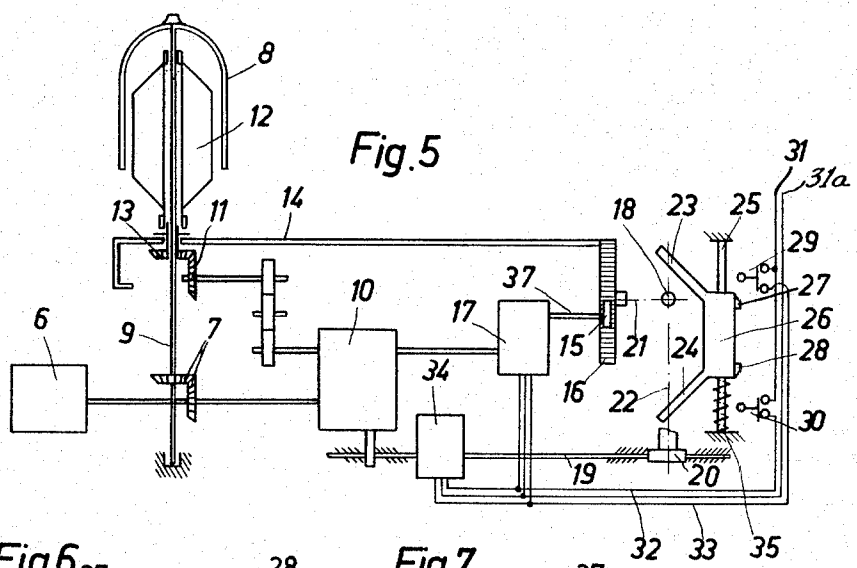
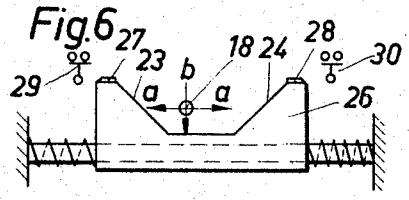
Feb. 7, 1967 W. PFEIFER 3,302,381

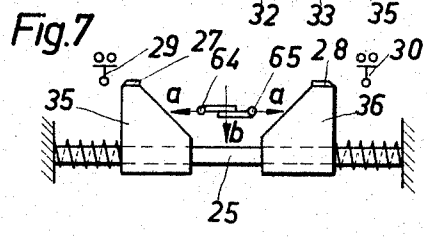
APPARATUS FOR CONTROLLING THE COP FORMATION ON ROVING FRAMES

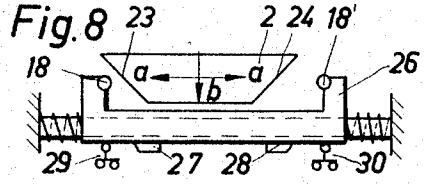
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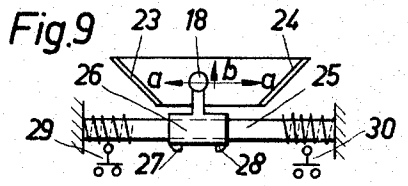










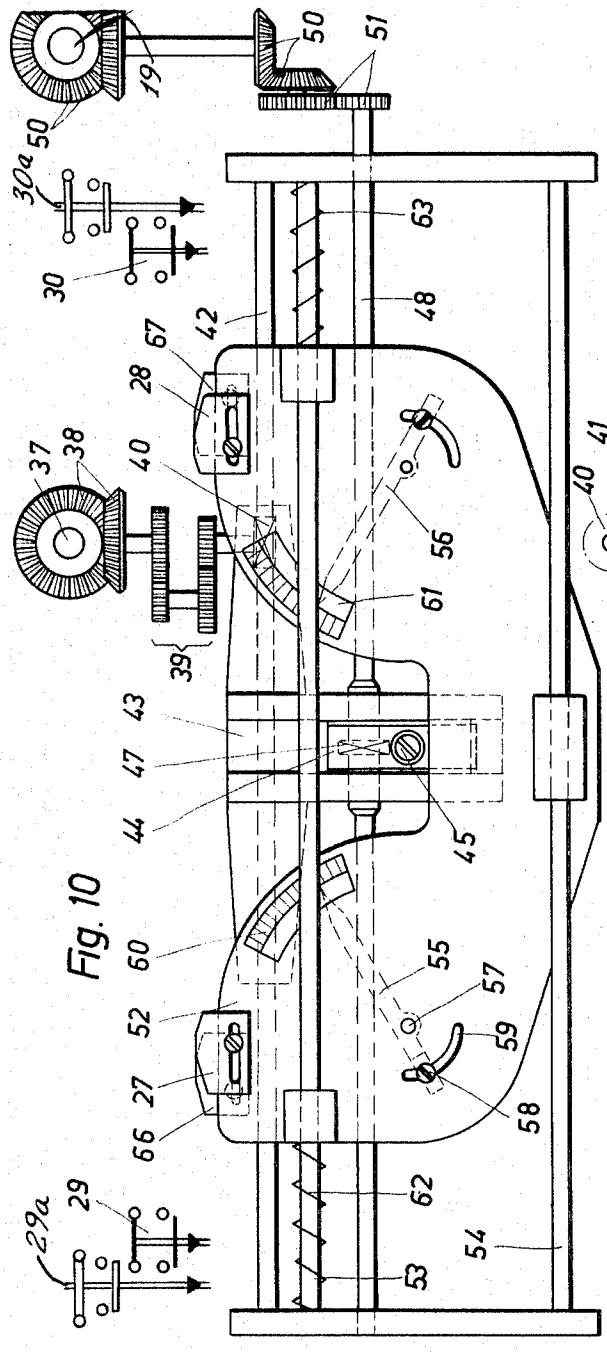


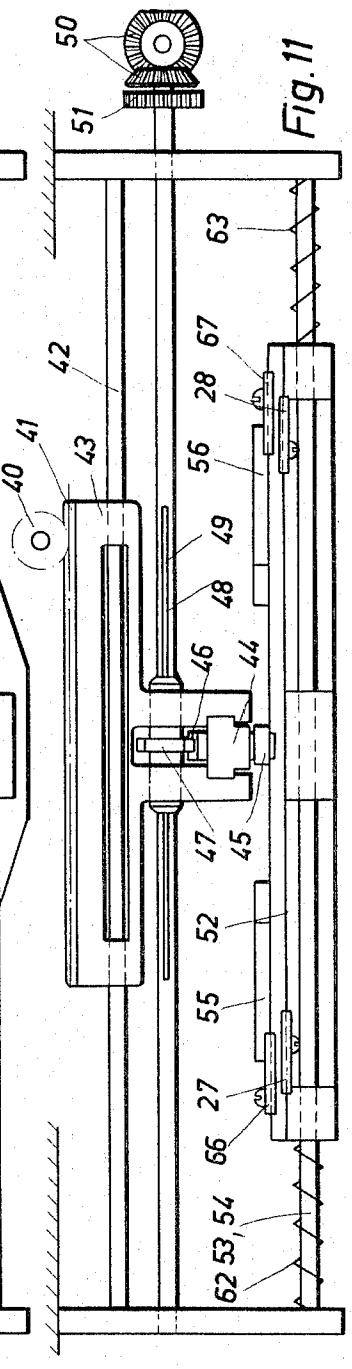
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APPARATUS FOR CONTROLLING THE COP FORMATION ON ROVING FRAMES

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APPARATUS FOR CONTROLLING THE COP FORMATION ON ROVING FRAMES

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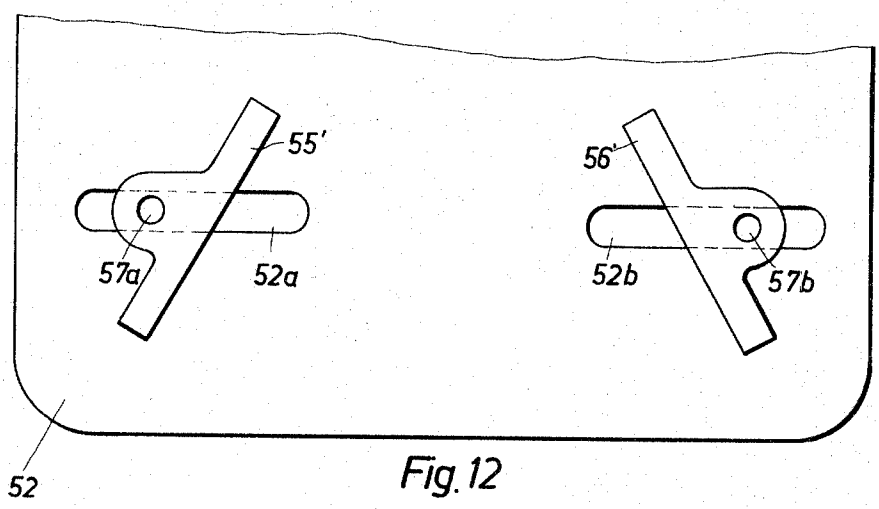


Fig. 12

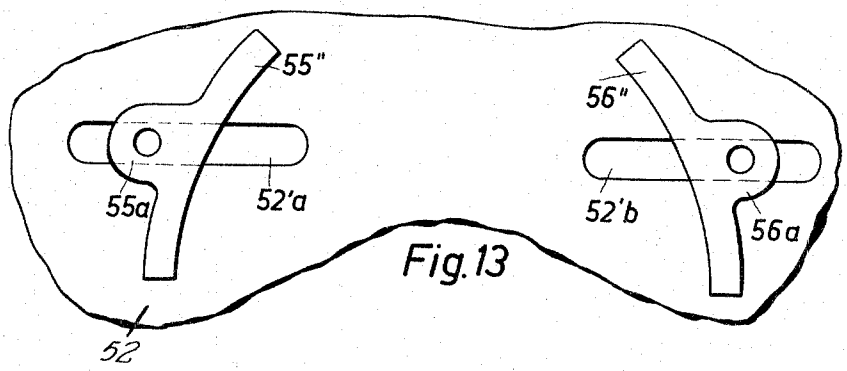


Fig. 13

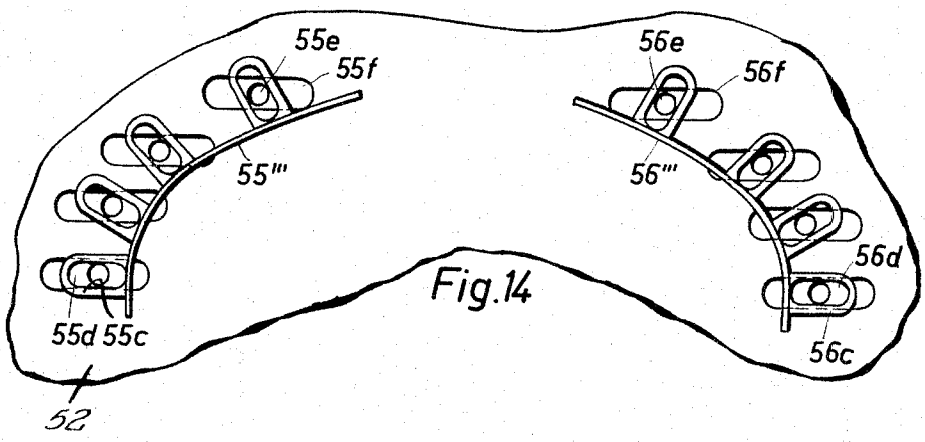


Fig. 14

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APPARATUS FOR CONTROLLING THE COP FORMATION ON ROVING FRAMES

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Claims priority, application Germany, July 19, 1963, Z 10,239
13 Claims. (Cl. 57—98)

The present invention relates to an apparatus for controlling the building up of a cop on speed frames. More specifically, the present invention concerns a control mechanism for speed frames by means of which the contour of a predetermined cop or bobbin shape is in the form of a control program conveyed to a reversing gear transmission for reversing the direction of movement of the balling carriage and the infinitely variable transmission for changing the speed of the bobbins and for changing the speed of the balling carriage.

These control operations, have with heretofore known speed frames, been carried out by the so-called switch. This switch primarily comprises a rotatably journalled rocker which by means of the upwardly and downwardly moved balling carriage is subjected to an alternate weight load. The pawls which arrest said rocker in its respective end positions are lifted out by means of adjustable abutments arranged at another rocker moved by said carriage by linkage means. In this way, the rocker is released, tilted, and thereby reverses the reversing transmission through the intervention of linkage means.

Simultaneously with the actuation of said rocker, two pawls are shifted over which thereby permit an index gear which is under the load of a weight to turn by half a tooth pitch. This index gear will then, in view of its turning movement through a suitable transmission, displace the cone belt bar and the link system actuating the rocker.

The form of the bobbin winding or of the cop and, more specifically, the height and the conical angle thereof are determined by the adjustment of the abutments of the rocker actuated by the balling carriage, and furthermore by the teeth of the indexing wheel and the length of the link member at the start and the end of the withdrawal operation. The adjustable abutments on the rocker actuated by the balling carriage determine the level of the winding.

The mutual influence and interdependence of these adjusting elements make it rather difficult to obtain a certain desired bobbin shape, and for all practical purposes, this is possible only by a rather time-consuming trial-and-error method.

It is, therefore, an object of the present invention to provide a simple and more positive method which will overcome the above-mentioned drawbacks.

It is another object of the present invention to provide an apparatus of the type involved which will make it possible to cause the speed frame truly to reproduce a desired bobbin shape in conformity with a predetermined geometrical contour.

These and other objects and advantages of the invention will appear more clearly from the following specification in connection with the accompanying drawings, in which:

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FIGURES 1 to 4 illustrate the development of the control template;

FIGURE 5 represents a diagram for explaining the essence of the present invention;

FIGURES 6 to 9 respectively illustrate various embodiments of a control template according to the invention;

FIGURES 10 and 11 respectively illustrate a particularly advantageous embodiment of the present invention in side view and top view;

FIGURE 12 diagrammatically illustrates an arrangement for adjusting rulers in scanning or feeling direction in connection with the present invention;

FIGURE 13 shows an arrangement similar to that of FIGURE 12 but with circularly curved, rigid rulers;

FIGURE 14 shows an arrangement similar to that of FIGURE 13 but with variable curvature.

The problem underlying the present invention has been solved by reversing the lifting movement which brings about the building up of the bobbin, in conformity with a template which is geometrically similar to the generatrix of the winding trapezoid of the bobbin, said template having two legs which are scanned by feelers gradually displaced in a direction transverse to their feeling direction.

In order to realize the method according to the present invention, it is suggested, in conformity with the present invention, on a switching apparatus with stationary switching elements which by reversing a reversing transmission reverse the lifting movement of the winding-up station and by actuating a stepping mechanism, through a control to adjust the infinitely variable transmission in the drive of the bobbin and the lifting movement. Furthermore, the invention provides a feeler which is moved back and forth synchronously with the lifting movement of the winding-up station of the rover, and by a stepping mechanism is, within the course of the withdrawal gradually displaced in a direction perpendicular to said first-mentioned direction of movement. According to the invention, there is furthermore provided a carriage with two rulers which are engaged by the feeler whereby the carriage is displaced until one of its control cams actuates one of the two switching elements which reverse the reversing transmission.

According to another embodiment of the invention, the switching apparatus has a template with two rulers which are, synchronously with the lifting movement of the winding-up station of the roving, moved back and forth and in the course of a withdrawal are gradually displaced in a direction perpendicular to said first-mentioned direction of movement. There is also provided a carriage with one or two feelers engaged by the rulers whereby the carriage is displaced until one of its control cams actuates one of the shifting elements which reverse the reversing transmission. Each shifting element may have associated therewith a carriage.

The adjustment of the winding level is in conformity with the present invention to be effected either by adjusting the distance of the rulers in the carriage in the direction of movement of the carriage by adjusting the starting position of the feelers at the start of the withdrawal in a direction transverse to its lifting movement, or by changing the width of the feeler which width is effective in the direction of movement of the carriage. For adjusting the winding height, it is also possible to vary

one of the variable transmissions which may be inserted in the power train for conveying the lifting movement from the winding-up station to the feeler, and by displacing the switching elements in the direction of movement of the carriage.

The adjustment of the opening angle of the winding cone may be effected by adjusting the inclination of the rulers with regard to the direction of movement of the carriage or by varying a variable transmission which is inserted in the power train for conveying the stepping movement from the control shaft to the feeler.

In order to increase the lifting strokes of the abutment and of the carriage, or advantageously to reduce the same, it is possible to interpose a variable lift step-up or step-down transmission into the power train for conveying the lifting movement from the winding-up station to the feeler.

According to a preferred realization of the invention, the feeler is designed in the form of a roller. However, it may also be designed in the form of two feelers which are adjustable relative to each other in the direction of movement of the carriage.

Finally, the carriage may carry a plurality of adjustable control cams each having associated therewith a switching or shifting element.

Referring now to the drawings in detail, FIG. 1 illustrates the normal shape of a roving bobbin of a speed frame the winding body **1** of which is built up in the customary manner, i.e. in the form of a so-called parallel winding. The winding body of the bobbin may be viewed as a trapezoid of rotation, in other words, as a body which has been generated by rotating an isosceles trapezoid **2** about the bobbin axis **3** (FIG. 2). This isosceles trapezoid **2** represents a template which is determined by the distance between and the inclination of its legs **4** and **5** and the height and opening angle of the winding body to be built up. The final diameter of the bobbin is determined by the length of the wound-up roving and by the number of the winding layers.

The principle of the invention consists in that a template of this type serves as control program for the actuation of the control transmission of the speed frame and is gradually scanned by feelers in the course of the withdrawal. By means of the thus created control impulses, those parts of the speed frame are controlled which determine the build-up of the winding. The scanning of the template may, in conformity with FIG. 3, be effected from the inside or, in conformity with FIG. 4, be effected from the outside while template and feeler are moved relative to each other in two directions *aa* and *bb*. In this connection, *aa* always represents a reciprocatory movement, whereas *bb* indicates a stepping movement in one direction only. The sense of direction, however, depends on whether the feeler or the template is being moved.

The operation of an arrangement according to the present invention will now be described in connection with FIG. 5 and pertaining to a speed frame of the customary construction. It is, however, to be understood that the present invention is, by no means, limited to speed frames of this type.

Referring now to FIG. 5, the main motor **6** through a pair of bevel gears **7** drives the spindle **9** carrying the flyer **8** and also drives the drafting mechanism of the speed frame (not illustrated). By means of an infinitely variable transmission **10** and bevel gears **11**, the bobbin pinions **13** meshing with gears **11** and carrying the bobbins **12** will be driven. In order to simplify the illustration, FIG. 5 shows only one of a plurality of spindles of the speed frame. The bobbin pinions **13** are rotatably journalled in the balling carriage or bobbin rail **14**, which is vertically movable and is driven through the intervention of a pinion **15** and gear rack **16** by an infinitely variable transmission **10** and an interposed reversing transmission **17**.

A feeler **18** is, for instance by means of a coulisse system arranged on bobbin rail **14** in such a way that it takes part in the lifting movement *aa* of the bobbin rail but is displaceable *bb* transversely to the direction of movement of the bobbin rail. This displacement is effected, for instance, through the intervention of a threaded member **20** which is guided on a control shaft **19** designed as a threaded spindle and in which the feeler **18** is, in its turn, guided for instance, by means of a second coulisse system. The auxiliary lines **21** and **22** indicate the central lines of the two coulisse systems which coulisse systems are perpendicular to each other and guide the feeler **18**. These coulisse systems connect the feeler **18** with the bobbin rail **14** and also with the control shaft **19**. During the upward and downward movement of the bobbin rail **14**, the feeler **18** alternately abuts one of the two legs **23**, **24** of the carriage **26** which is slidably guided on guiding means **25**. Carriage **26** is displaceable to such an extent that it is able by means of its control cams **27** and **28** to actuate the two switches **29** and **30**. The feeding line to switches **29**, **30** is designated with the reference numeral **31**. Through lines **32** and **33**, the control impulses of switches **29**, **30** are conveyed to the reversing transmission **17** and to a stepping mechanism **34** which rotates the control shaft **19** and thereby adjusts the infinitely variable transmission **10** and the feeler **18**. Line **31***a* is the other side of the electric power supply of which line **31** is a part. A spring **35** balances the weight of the carriage **26**.

The operation of the device is as follows: When the bobbin rail **14** moves downwardly, also feeler **18** is moved downwardly. During this downward movement feeler **18** hits leg **24** of carriage **26** and moves the latter downwardly until carriage **26**, by means of its control cam **28** hits switch **30**. As a result thereof, switch **30** closes a contact and through line **32**, an impulse is conveyed to the reversing transmission **17** which in this way is reversed and reverses the direction of movement of the bobbin rail **14**. The same impulse also actuates the stepping mechanism **34** which, consequently turns the control shaft **19** by an adjustable angle and adjusts the infinitely variable transmission **10** as well as displaces the feeler **18** in a direction transverse to its lifting movement with the bobbin rail. More specifically, this displacement corresponds to the increase in diameter for the new winding layer.

During the upward movement, the just-described cycle is repeated with the only difference that the reversing transmission **17** is again moved into its other end position, whereas the stepping mechanism **34** is advanced by one step. In this connection, feeler **18** is adjusted in the direction of the decreasing distance of legs **23** and **24** of the carriage, so that at the next stroke it will hit the respective leg somewhat earlier whereby the control impulse by carriage **26** is released at an earlier stage and the lifting height of the bobbin rail **14** is reduced correspondingly.

Various designs are possible for the template and the feeler, FIGS. 6 to 9 illustrating one of these possible embodiments.

FIG. 6 corresponds to the arrangement of FIG. 5. The reciprocatory movement of feeler **18** in the direction *aa* is effected synchronously with the movement of the bobbin rail, *b* indicating the direction of the stepwise advance of feeler **18**.

According to the embodiment of FIG. 7, the carriage is divided into two independent carriages **35** and **36**, of which one carriage actuates switch **29** by means of control cam **27**, whereas the other carriage actuates switch **30** by means of control cam **28**. As has been illustrated diagrammatically in FIGS. 8 and 9, it is also possible to move the template **2** and to arrange the feelers **18** and **18'** on carriage **26**. The movement of template **2** is effected in the same manner in the direction *aa* and *b* as described above in connection with feeler **18**.

Whereas according to FIG. 8, the moved template is scanned from the outside, according to FIG. 9 the scan-

ning is effected from the inside. In the following figures, *b* indicates the direction of the stepwise advance.

FIGS. 10 and 11 illustrate an embodiment of the invention in greater detail. The reference numeral **37** designates the shaft, rotation of which causes the described movement of the bobbin rail. Shaft **37** may be designated "lifting shaft." The lifting movement of the bobbin rail is, through the pair of bevel gears **38**, the gear transmission **39** which is preferably equipped with a variable step-up and step-down transmission, and pinion **40**, conveyed to gear rack **41** which latter is mounted on a supporting member **43** which is displaceable on a guiding bar **42**. Guided in supporting member **43** is a slide **44**, and a roller **45** is rotatably journalled on said slide **44**. Slide **44** is displaceable transversely to the direction of movement of the supporting member **43** and is provided with teeth **46** meshing with a pinion **47**. Pinion **47** is rotatably journalled in supporting member **43** and is axially displaceable on a shaft **48** but rotatably connected thereto by means of a key **49** and groove. The reference numeral **19** designates a control shaft the rotative movement of which is by means of a pair of bevel gears **50**, if desired, by a step-up or step-down transmission **51** conveyed to shaft **48**.

In contrast to the automatically moved parts, viz. supporting member **43** and slide **44** with roller **45**, slide **52** is freely displaceable on the guiding bars **53** and **54**. At both wings of slide **52**, there is arranged rulers **55** and **56** each of which is tiltable about a bolt **57** and by means of a clamping screw **58** is adjustable in slide **59**. The inclination of rulers **55** and **56**, which in this way is variable, may be read at the scales **60** and **61**. Instead of the illustrated straight rulers which will produce straight winding cones, it is also possible, as control edges of the template, to employ curved rulers which will, for instance, form convex winding cones.

Slide **52** carries two control cams **27** and **28** which, during a displacement of the slide will actuate switches **29** and **30**. If it appears advantageous to carry out the two control steps, viz. the reversing of the reversing transmission **17** and the advancing of the control shaft **19** not at the same time but at a slightly adjustable time interval, each of the two sides of slide **52** may be equipped with two control cams **27**, **66** and **28**, **67**, which are independently adjustable on the slide in the direction of movement *aa* of the slide. For effecting said adjustment, each cam has a slot extending in the direction of adjustment thereof and a clamp screw extending through the slot and threaded into the slide. These adjustable control cams each are adapted to act upon separate control elements **29**, **29***a* at one side, and **30**, **30***a* at the other side. Springs **62** and **63** always return slide **52** to its intermediate position.

During the upward movement of the bobbin rail by means of the lifter shaft **37**, through the intervention of transmission **39**, pinion **40** and gear rack **41**, also the supporting member **43** and together with the latter slide **44** and roller **45** are moved, for instance, toward the left. During this movement, the feeler roller **45** abuts the ruler **55** and thereby takes along slide **52** until the latter, by means of its control cam **27** actuates switch **29**. As a result thereof, in the manner described above, the direction of movement of the bobbin rail is reversed, and control shaft **19** is rotated by one step, while through the intervention of pinions **50** and **51** and shaft **48**, slide **44**, and with the latter, roller **45** are displaced somewhat further upwardly so that during the next stroke, roller **45** will hit the ruler **55** earlier whereby slide **52** is carried along earlier and switch **29** is actuated earlier with the result that the stroke of the bobbin rail will be reduced. The same operation will occur at the lower reversing point of the lifting movement and will be brought about by means of the parts arranged on the other half of slide **52**.

After the withdrawal has been completed, control shaft **19** and the stepless transmission **10** and feeler roller **45** are returned to their starting positions. The adjustment of the desired bobbin shape with regard to the winding cone may, as mentioned before, be effected by adjusting the inclination of the rulers **55** and **56**. A further possibility consists in changing the transmission ratio of movement between the bobbin rail and the feeler on transmission **39**. This engagement also affects the height of the winding bobbin, which may be corrected by other steps.

With regard to the winding height, the bobbin shape may, in addition to the already mentioned change in the transmission ratio of the movement between bobbin rail and feeler roller, be changed also by changing the distance of the rulers **55** and **56** with regard to each other. This may be effected in a simple manner in conformity with the illustration of FIG. 12 by an adjustable arrangement of rulers **55'** and **56'** in the feeling direction. The rulers **55'** and **56'** are adjustable in the oblong holes **52***a*, **52***b* of slide **52** and are rotatable about bolts **57***a* and **57***b*. The said bolts, when tightened, clamp the rulers in any adjusted position.

The same effect may also be obtained as indicated diagrammatically in FIG. 7 by providing two feeler rollers **64** and **65** the distance apart of which is adjustable. A greater distance between rollers **64** and **65** corresponds to a lower height of the winding. A similar arrangement consists in selecting the starting position of roller **45** in direction *b* in such a way that in this starting position, the lifting height of the bobbin rail corresponds to the desired winding height. Finally, it is also possible to adjust switches **29** and **30** in conformity with the desired winding height. The rollers **64** and **65** could be adapted to the system of FIG. 5 by replacing roller **18** by the two rollers **64** and **65** with each thereof having its own support member, the two support members being adjustably connected together and being connected as a unit to the support for roller **18**.

FIG. 13 illustrates an arrangement in which circularly curved rigid rulers **55''** and **56''** are provided. These rulers are each provided with an eye **55***a* and **56***a* by means of which through the intervention of clamping screws, the rulers can be clamped in oblong holes **52'***a* and **52'***b* in slide **52**, while it is possible to vary their distance apart as well as their inclination.

FIG. 14 illustrates rulers **55'''** and **56'''** which are adjustable as to their curvature. These rulers consist of flexible band-shaped bodies of metal or synthetic material which protrude from the drawing plane and which are provided with angled-off members **55***c*, **56***c*. At these members, which are expediently provided with oblong holes **55***d*, **56***d*, said rulers are likewise arrestable by means of screws **55***e*, **56***e* in oblong holes **55***f*, **56***f* in slide **52**. In the particular illustration of FIG. 14, said rulers follow the shape of a parabulum or hyperbulum.

In view of the exchangeability of the rulers, which are simple and inexpensive, a device according to the present invention excels by its great flexibility with regard to the shape of the cone flanks. This advantage is particularly great when the rulers are flexible.

It is, of course, to be understood that the present invention is, by no means, limited to the particular constructions shown in the drawings, but also comprises any modifications within the scope of the appended claims.

What is claimed is:

1. An apparatus for winding a cop on a bobbin comprising: a constant speed source of power, a flyer connected to said source of power, a bobbin, an infinitely variable transmission connecting said source of power to said bobbin, a lifting mechanism to reciprocate said bobbin and flyer relatively in the direction of the length of the bobbin, a reversing transmission connecting said variable transmission to the lifting mechanism, a template comprising spaced end members inclined to the same angle as the ends of the cop, a feeler for engagement with

said end members, drive means connecting one of said template and feeler to the lifting mechanism for effecting reversible relative movement between the feeler and template in one direction corresponding to the length of the cop, carriage means supporting the other of said template and feeler for reversible movement thereof in said one direction in response to interengagement of said feeler and one of said end members as brought about by relative movement therebetween caused by said drive means, resilient means biasing said carriage in said one direction toward an intermediate position, adjusting means for adjusting said feeler and template relatively in a second direction at right angles to said one direction, and control means operated in response to movement of the carriage means caused by inter-engagement of said feeler and end members for reversing said reversible transmission and actuating said adjusting device and adjusting said infinitely variable transmission.

2. An apparatus according to claim 1 in which the feeler is connected to the lifting device to be moved therewith and the template is supported by said carriage means.

3. An apparatus according to claim 1 in which the template is connected to the lifting device to be moved therewith and the feeler is supported by said carriage means.

4. An apparatus for winding a cop on a bobbin comprising: a constant speed source of power, a flyer connected to said source of power, a bobbin, an infinitely variable transmission connecting said source of power to said bobbin, a lifting mechanism to reciprocate said bobbin and flyer relatively in the direction of the length of the bobbin, a reversing transmission connecting said variable transmission to the lifting mechanism, a template comprising spaced end members inclined to the same angle as the ends of the cop, a feeler for engagement with said end members, drive means connecting said feeler to the lifting mechanism for effecting reversible relative movement between the feeler and template in one direction corresponding to the length of the cop, carriage means supporting said template for reversible movement thereof in said one direction in response to interengagement of said feeler and one of said end members as brought about by relative movement therebetween caused by said drive means, resilient means biasing said carriage in said one direction toward an intermediate position, adjusting means for adjusting said feeler and template relatively in a second direction at right angles to said one direction, and control means operated in response to the movement of the said carriage means caused by inter-engagement of said feeler and end members for reversing said reversible transmission and actuating said adjusting means and adjusting said variable transmission, said carriage means comprising a pair of independently moveable carriages each supporting a respective one of said end members, and said control means including control element means under the control of each carriage.

5. An apparatus for winding a cop on a bobbin comprising: a constant speed source of power, a flyer connected to said source of power, a bobbin, an infinitely variable transmission connecting said source of power to said bobbin, a lifting mechanism to reciprocate said bobbin and flyer relatively in the direction of the length of the bobbin, a reversing transmission connecting said variable transmission to the lifting mechanism, a template comprising spaced end members inclined to the same angle as the ends of the cop, a feeler for engagement with said end members, drive means connecting one of said template and feeler to the lifting mechanism for effecting reversible relative movement between the feeler and template in one direction corresponding to the length of the cop, carriage means supporting the other of said template and feeler for reversible movement thereof in said one direction in response to interengagement of said feeler and one of said end members as brought about by relative movement therebetween caused by said drive means, resilient means biasing said carriage in said one direction toward an intermediate position, adjusting means for adjusting said feeler and template relatively in a second direction at right angles to said one direction, and control means operated in response to movement of the said carriage means caused by inter-engagement of said feeler and end members for reversing said reversible transmission and actuating said adjusting means and adjusting said variable transmission, and means for adjusting the amount of movement of said bobbin by said lifting mechanism during the interval from the time said feeler engages one said end member until it engages the other thereof.

6. An apparatus for winding a cop on a bobbin comprising: a constant speed source of power, a flyer connected to said source of power, a bobbin, an infinitely variable transmission connecting said source of power to said bobbin, a lifting mechanism to reciprocate said bobbin and flyer relatively in the direction of the length of the bobbin, a reversing transmission connecting said variable transmission to the lifting mechanism, a template comprising spaced end members inclined to the same angle as the ends of the cop, a feeler for engagement with said end members, drive means connecting one of said template and feeler to the lifting mechanism for effecting reversible relative movement between the feeler and template in one direction corresponding to the length of the cop, carriage means supporting the other of said template and feeler for reversible movement thereof in said one direction in response to interengagement of said feeler and one of said end members as brought about by relative movement therebetween caused by said drive means, resilient means biasing said carriage in said one direction toward an intermediate position, adjusting means for adjusting said feeler and template relatively in a second direction at right angles to said one direction, and control means operated in response to movement of the said carriage means caused by inter-engagement of said feeler and end members for reversing said reversible transmission and actuating said adjusting means and adjusting said variable transmission, said end members of said template comprising end rail portions to engage the feeler and inclined at the same angle as the ends of the cop, and means for adjusting said rails angularly and toward and away from each other.

7. An apparatus for winding a cop on a bobbin comprising: a constant speed source of power, a flyer connected to said source of power, a bobbin, an infinitely variable transmission connecting said source of power to said bobbin, a lifting mechanism to reciprocate said bobbin and flyer relatively in the direction of the length of the bobbin, a reversing transmission connecting said variable transmission to the lifting mechanism, a template comprising spaced end members inclined to the same angle as the ends of the cop, a feeler for engagement with said end members, drive means connecting one of said template and feeler to the lifting mechanism for effecting reversible relative movement between the feeler and template in one direction corresponding to the length of the cop, carriage means supporting the other of said template and feeler for reversible movement thereof in said one direction in response to interengagement of said feeler and one of said end members as brought about by relative movement therebetween caused by said drive means, resilient means biasing said carriage in said one direction toward an intermediate position, adjusting means for adjusting said feeler and template relatively in a second direction at right angles to said one direction, and control means operated in response to movement of the said carriage means caused by inter-engagement of said feeler and end members for reversing said reversible transmission and actuating said adjusting means and adjusting said variable transmission, said drive means including speed changing means for adjusting the height of a cop made

under the control of any given feeler and template arrangement.

8. An apparatus for winding a cop on a bobbin comprising: a constant speed source of power, a flyer connected to said source of power, a bobbin, an infinitely variable transmission connecting said source of power to said bobbin, a lifting mechanism to reciprocate said bobbin and flyer relatively in the direction of the length of the bobbin, a reversing transmission connecting said variable transmission to the lifting mechanism, a template comprising spaced end members inclined to the same angle as the ends of the cop, a feeler for engagement with said end members, drive means connecting one of said template and feeler to the lifting mechanism for effecting reversible relative movement between the feeler and template in one direction corresponding to the length of the cop, carriage means supporting the other of said template and feeler for reversible movement thereof in said one direction in response to interengagement of said feeler and one of said end members as brought about by relative movement therebetween caused by said drive means, resilient means biasing said carriage in said one direction toward an intermediate position, adjusting means for adjusting said feeler and template relatively in a second direction at right angles to said one direction, and control means operated in response to movement of the said carriage means caused by inter-engagement of said feeler and end members for reversing said reversible transmission and actuating said adjusting means and adjusting said variable transmission, said control means including switch elements and switch actuating elements for actuating the switch elements, one of said elements being mounted on the carriage means for movement therewith and the other of said elements being stationarily supported in the path of said one element, and means for adjusting one of said elements to adjust the amount of relative movement of said carriage means from said intermediate position thereof to effect actuation of said control means thereby to control the height of the cop.

9. An apparatus for winding a cop on a bobbin comprising: a constant speed source of power, a flyer connected to said source of power, a bobbin, an infinitely variable transmission connecting said source of power to said bobbin, a lifting mechanism to reciprocate said bobbin and flyer relatively in the direction of the length of the bobbin, a reversing transmission connecting said variable transmission to the lifting mechanism, a template comprising spaced end members inclined to the same angle as the ends of the cop, a feeler for engagement with said end members, drive means connecting one of said template and feeler to the lifting mechanism for effecting reversible relative movement between the feeler and template in one direction corresponding to the length of the cop, carriage means supporting the other of said template and feeler for reversible movement thereof in said one direction in response to interengagement of said feeler and one of said end members as brought about by relative movement therebetween caused by said drive means, resilient means biasing said carriage in said one direction toward an intermediate position, adjusting means for adjusting said feeler and template relatively in a second direction at right angles to said one direction, and control means operated in response to movement of the said carriage means caused by inter-engagement of said feeler and end members for reversing said reversible transmission and actuating said adjusting means and adjusting said variable transmission, said end members of said template comprising end rail portions to engage the feeler inclined at the same angle as the ends of the cop, and said rails being angularly adjustable to control the inclination of the ends of the cop.

10. An apparatus for winding a cop on a bobbin comprising: a constant speed source of power, a flyer connected to said source of power, a bobbin, an infinitely variable transmission connecting said source of power to said bobbin, a lifting mechanism to reciprocate said bobbin and flyer relatively in the direction of the length of the bobbin, a reversing transmission connecting said variable transmission to the lifting mechanism, a template comprising spaced end members inclined to the same angle as the ends of the cop, a feeler for engagement with said end members, drive means connecting one of said template and feeler to the lifting mechanism for effecting reversible relative movement between the feeler and template in one direction corresponding to the length of the cop, carriage means supporting the other of said template and feeler for reversible movement thereof in said one direction in response to interengagement of said feeler and one of said end members as brought about by relative movement therebetween caused by said drive means, resilient means biasing said carriage in said one direction toward an intermediate position, adjusting means for adjusting said feeler and template relatively in a second direction at right angles to said one direction, and control means operated in response to movement of the carriage means caused by inter-engagement of said feeler and end members for reversing said reversible transmission and actuating said adjusting means and adjusting said variable transmission, said feeler comprising a roller.

11. An apparatus for winding a cop on a bobbin comprising: a constant speed source of power, a flyer connected to said source of power, a bobbin, an infinitely variable transmission connecting said source of power to said bobbin, a lifting mechanism to reciprocate said bobbin and flyer relatively in the direction of the length of the bobbin, a reversing transmission connecting said variable transmission to the lifting mechanism, a template comprising spaced end members inclined to the same angle as the ends of the cop, a feeler for engagement with said end members, drive means connecting one of said template and feeler to the lifting mechanism for effecting reversible relative movement between the feeler and template in one direction corresponding to the length of the cop, carriage means supporting the other of said template and feeler for reversible movement thereof in said one direction in response to interengagement of said feeler and one of said end members as brought about by relative movement therebetween caused by said drive means, resilient means biasing said carriage in said one direction toward an intermediate position, adjusting means for adjusting said feeler and template relatively in a second direction at right angles to said one direction, and control means operated in response to movement of the said carriage means caused by inter-engagement of said feeler and end members for reversing said reversible transmission and actuating said adjusting means and adjusting said variable transmission, said feeler comprising a pair of feeler elements adjustable relative to each other in said one direction to effect adjustment of the height of the cop.

12. An apparatus for winding a cop on a bobbin comprising: a constant speed source of power, a flyer connected to said source of power, a bobbin, an infinitely variable transmission connecting said source of power to said bobbin, a lifting mechanism to reciprocate said bobbin and flyer relatively in the direction of the length of the bobbin, a reversing transmission connecting said variable transmission to the lifting mechanism, a template comprising spaced end members inclined to the same angle as the ends of the cop, a feeler for engagement with said end members, drive means connecting one of said template and feeler to the lifting mechanism for effecting reversible relative movement between the feeler and template in one direction corresponding to the length of the cop, carriage means supporting the other of said template and feeler for reversible movement thereof in said one direction in response to interengagement of said feeler and one of said end members as brought about by relative movement therebetween caused by said drive means, resilient means biasing said carriage in said one

direction toward an intermediate position, adjusting means for adjusting said feeler and template relatively in a second direction at right angles to said one direction, and control means operated in response to movement of the said carriage means caused by inter-engagement of said feeler and end members for reversing said reversible transmission and actuating said adjusting means and adjusting said variable transmission, said control means including a plurality of control elements adjacent said carriage means, and a control cam on said carriage means for each of said control elements operable for actuating the pertaining control element in response to movement of the carriage means.

13. An apparatus according to claim 12 in which at least one of said control elements and control cams are adjustable in the direction of movement of the carriage means.

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