July 9, 1968 KENJYU KATO 3,391,527

APPARATUS FOR FORMING CHEESES BY DIRECT WINDING OF FULL BOBBINS WITHOUT DOFFING OPERATION IN FIBER PROCESSING MACHINES

Filed Feb. 14, 1966 4 Sheets-Sheet 1

FIG. 1

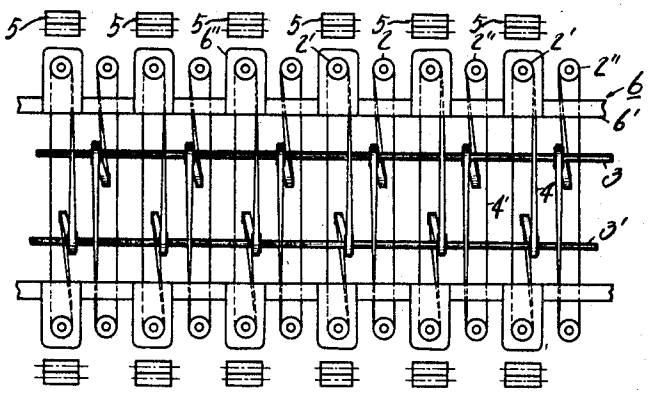


FIG. 2

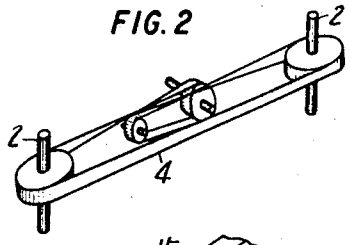


FIG. 4

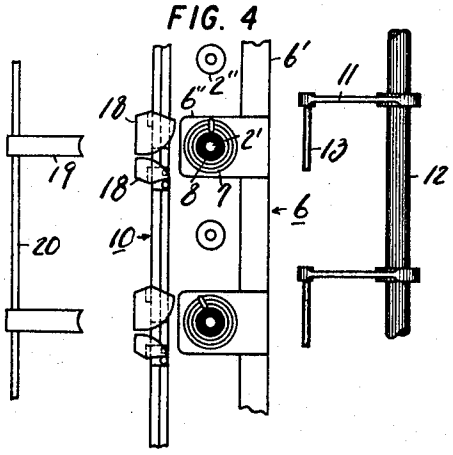


FIG. 6

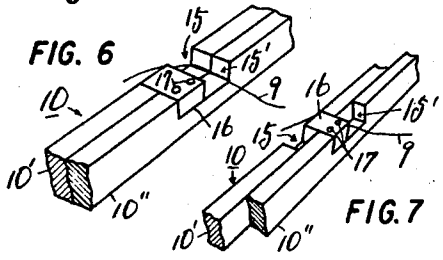


FIG. 7

FIG. 8

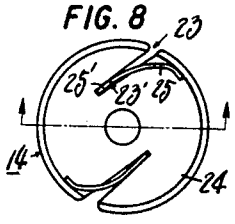
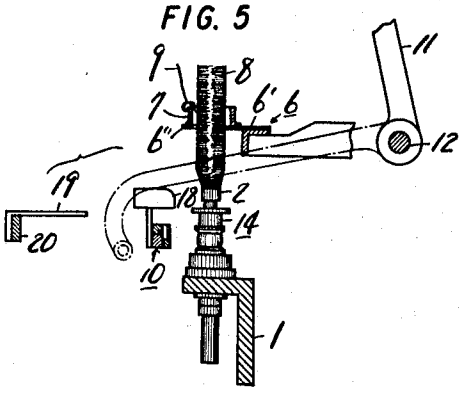


FIG. 5



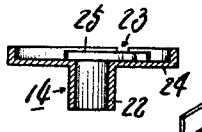


FIG. 9

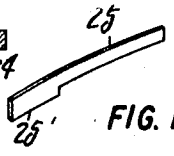


FIG. 10

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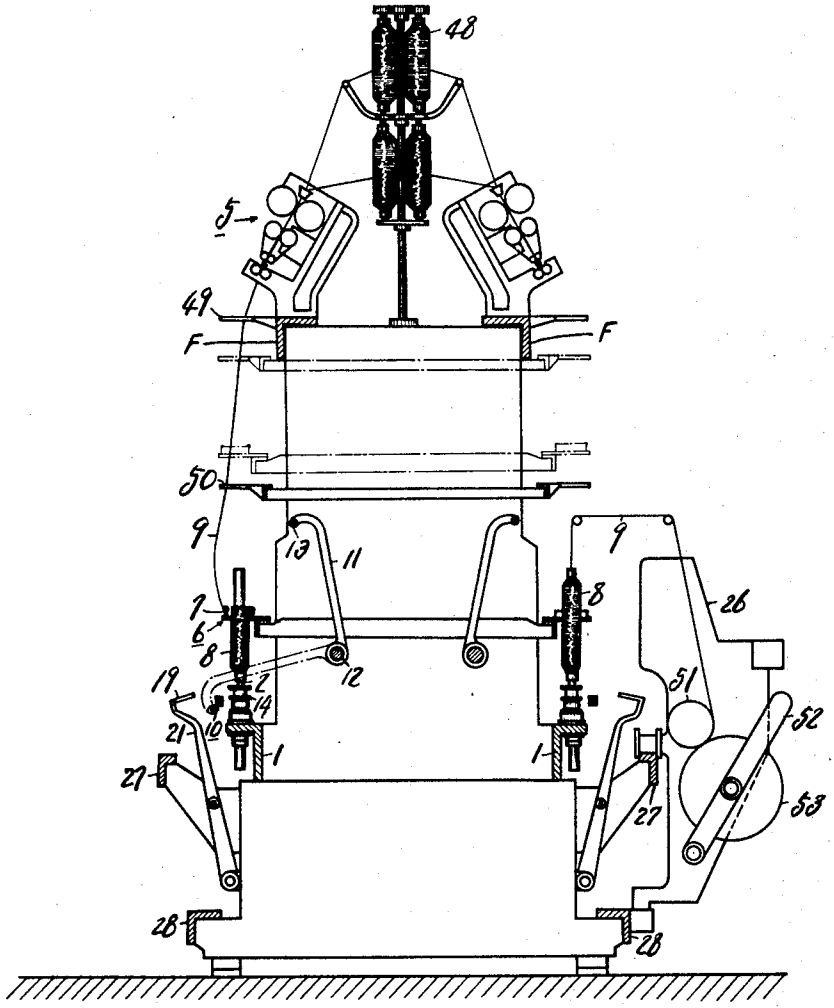
BY Hall & Houghton

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FIG. 3



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FIG. 11

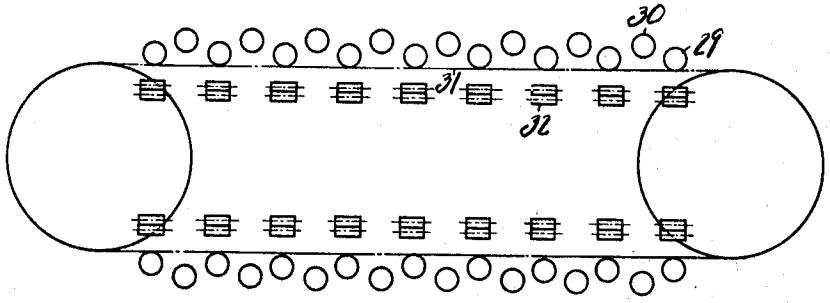


FIG. 13

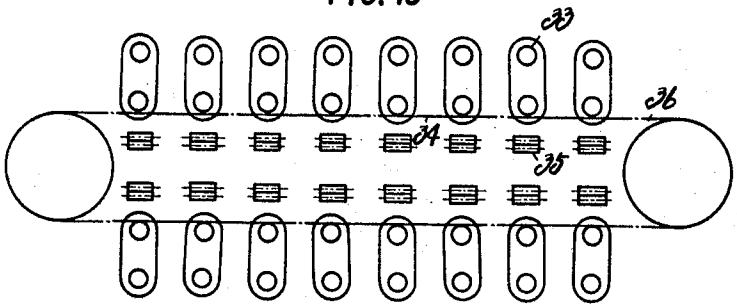


FIG. 15

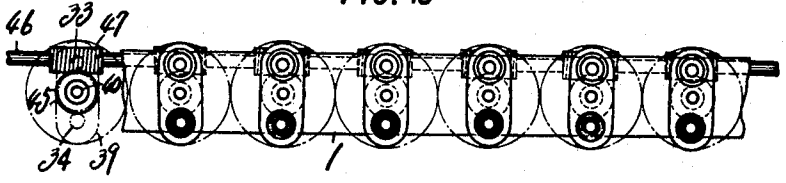
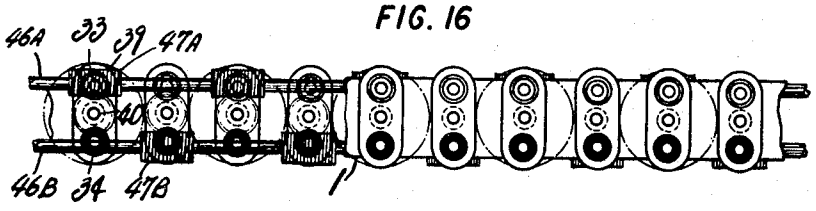


FIG. 16



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APPARATUS FOR FORMING CHEESES BY DIRECT WINDING OF FULL BOBBINS WITHOUT DOFFING OPERATION IN FIBER PROCESSING MACHINES

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FIG. 12

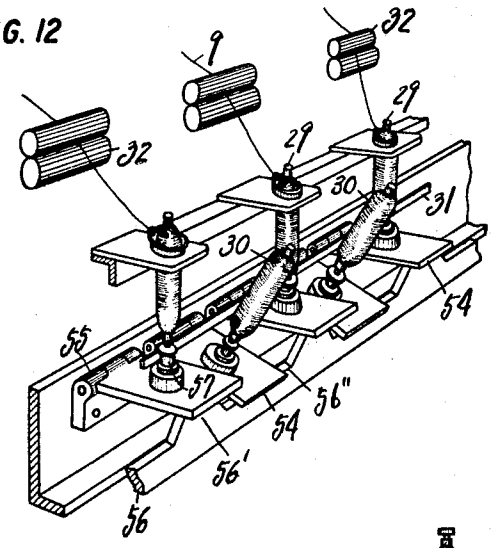
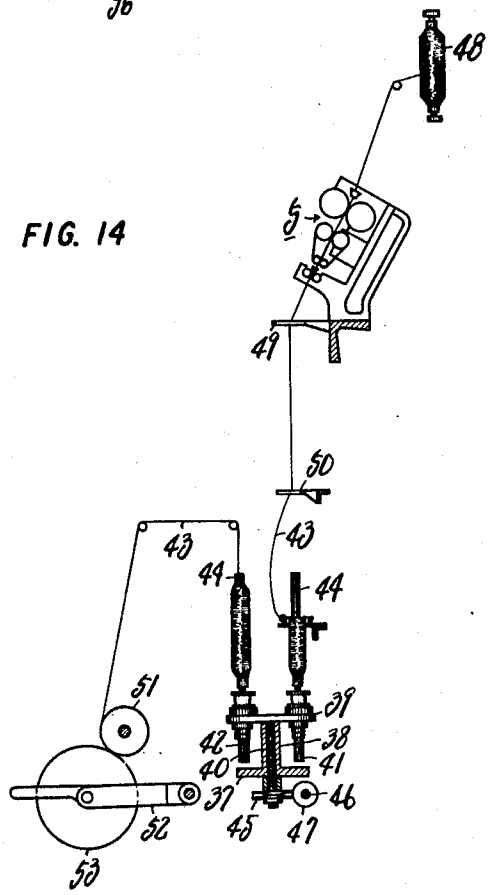


FIG. 14



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United States Patent Office

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3,391,527

APPARATUS FOR FORMING CHEESES BY DIRECT WINDING OF FULL BOBBINS WITHOUT DOFFING OPERATION IN FIBER PROCESSING MACHINES

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Claims priority, application Japan, Mar. 26, 1965, 40/11,204; Sept. 16, 1965, 40/56,910
8 Claims. (Cl. 57—34)

ABSTRACT OF THE DISCLOSURE

A combination spinning or twining and cheese winding fiber processing machine is provided. The spindles of the fiber processing machine are divided into two groups carried by spindle mounting means in the spinning apparatus. Those of one group lie in bobbin winding positions in the spinning apparatus while those of the other group lie in cheese winding positions of the combined machine. Means is provided for moving the cheese winding apparatus along the frame of the machine and for delivering to it to be wound into a cheese yarn drawn from the bobbins located in the cheese winding positions without removal of the bobbins from the spindles carried by the spindle mounting means of the spinning apparatus.

This invention relates to an apparatus for forming cheeses by the direct winding of full bobbins without doffing operation in fiber processing machines such as spinning frames and twisting machines.

Generally, in spinning frames or twisting machines (hereinafter referred to as fiber processing machines), full bobbins are first doffed from the spindles and then placed on an automatic winder (hereinafter referred to as automatic winding machine) for forming cheeses. Thus, much time and labor and required for this doffing operation. Further, in order to place full bobbins on the automatic doffing machine, it is required to transport the full bobbins to such machine. It is also required to insert the full bobbins one by one onto the spindles of the automatic winding machine, which requires further time and labor. Moreover, in the known system, fiber processing machines and automatic winding machines are separately installed, so that much space is required, with the increased cost of installation.

Another system recently developed is known wherein an automatic winding machine is arranged to be movable in front of and along a fiber processing machine, and besides the ring rails inherent to the fiber processing machine, exchange rails are additionally provided for inserting full bobbins thereinto, whereby yarns on the full bobbins on said exchange rails are wound into cheeses by the automatic winding machine moving along the fiber processing machine. However, this system only incorporates an automatic winding machine into a fiber processing machine with the view to decreasing the floor space required for installation of the automatic winding machine and the labor of transportation of full bobbins. Thus, full bobbins on the side of the spindle rails as produced by the twisting and winding operation of the fiber processing machine still have to be removed to the exchange rails either manually or by an expensive and complicated automatic bobbin exchanger. Thus, the problem of bobbin exchange is left unsettled, still requiring labor or troublesome automatic bobbin exchangers.

The present invention eliminates the aforesaid drawbacks and provides improvements wherein a large number of spindles mounted on the spindle rails on a fiber

processing machine are divided into two groups, each spindle group being in exchangeable relation to the other so as to be capable of being positioned either in the drafting, twisting and winding regions or twisting and winding regions or in the cheese winding regions of the fiber processing machine, the latter machine performing its drafting, twisting and winding operation or twisting and winding operation on the empty bobbins of the spindle group positioned in said drafting, twisting and winding or twisting and winding regions, the full bobbins of the other spindle group being treated, without being doffed, by an automatic winding machine travelling in front of and along the fiber processing machine for forming cheeses, it being so arranged that when the bobbins of one spindle group positioned in the drafting, twisting and winding regions or twisting and winding regions have become full, the yarns on the full bobbins of the other spindle group have also been completely wound into cheeses, whereupon the two spindle groups are exchanged at a time, the aforesaid operations being then repeated.

Since the invention is thus arranged, it is possible to omit the conventionally indispensable doffing operation and preclude the necessity of transporting full bobbins to automatic winding machines, hereby saving time and labor heretofore required for doffing operation, and eliminating the use of complicated automatic bobbin exchanger. Hence the invention can promote the efficiency of textile operation.

On the premise that yarn knotting operation can be automatically carried out if use is made of a full automatic winding machine and that the time required for said winding machine to wind the yarn of one full bobbin into a cheese is much less than the time required for completing one full bobbin, it is possible to set the treating power of the automatic winding machine, i.e., the number of the full bobbins which it can treat to form cheeses during the time required for completing one full bobbin, so that if the full automatic winding machine is allowed to run step by step so as to treat said set number of full bobbins in a predetermined time, cheeses can be continually produced one by one each time after either one group of spindles have completed the formation of full bobbins once or twice.

In order to decrease the number of doffing and donning operations and of operators, there has heretofore been a tendency to increase the amount of yarn per bobbin. According to the present invention, it is no longer necessary to take the trouble to produce such increased full bobbins, since no operator is required for doffing and donning operations. As a matter of course, the diameter of the rings of fiber processing machines can be decreased as well as the lift, so that by frequently repeating the formation of small full bobbins, it is possible to speed up fiber processing machines to promote the efficiency of textile operation.

Moreover, according to the invention the promotion of the efficiency of textile operation is further assisted by the fact that the drafting, twisting and winding operation effected by fiber processing machines and the cheese winding operation effected by automatic winding machines can be concurrently and repeatedly carried out.

Further, according to the invention, without the need of exchanging bobbins on the side of fiber processing machines and automatic winding machines, the same effect of bobbin exchange as before can be expected simply by exchanging the positions of two spindle groups at a predetermined time. Consequently, the troublesome bobbin exchange can be entirely avoided.

The invention will now be described with reference to the accompanying drawings. Although the following description is given with reference to an instance in which

the invention is applied to a spinning frame, a similar construction may be made in accordance with the invention in case of a twisting machine.

In the drawings:

FIG. 1 is a view explanatory of a spindle drive mechanism;

FIG. 2 is a perspective view of the entraining of a tape around a pair of spindles;

FIG. 3 is a side view of a spinning frame equipped with an apparatus according to the invention, the left half of the view showing a drafting and winding region while the right half showing a cheese winding region;

FIG. 4 is a partly enlarged plan view of a spindle part;

FIG. 5 is a side view of said spindle part;

FIGS. 6 and 7 are perspective views of a yarn gripper, FIG. 6 showing the gripper in yarn non-gripping position while FIG. 7 in yarn gripping position;

FIG. 8 is a plan view of the yarn gripper;

FIG. 9 is a longitudinal section of the yarn gripper;

FIG. 10 shows a plate spring provided in the yarn gripper;

FIG. 11 is a view explanatory of a second form of spindle drive mechanism;

FIG. 12 is a perspective view of a spindle rail part;

FIG. 13 is a view explanatory of a third form of spindle drive mechanism;

FIG. 14 is a longitudinal section of an arrangement incorporating said third form;

FIG. 15 is an enlarged plan view of FIG. 13, and

FIG. 16 is a view similar to FIG. 15, but showing a modification thereof.

Referring to the drawings, in FIG. 1 is shown a method of dividing a number of spindles into two groups and alternately positioning the thus grouped spindles in drafting and winding sections corresponding to draft roller mechanisms and in cheese winding sections operated by automatic winding machines. In other words, a number of spindles **2** laterally disposed on a frame **1** are divided into a first group of spindle **2'** in odd numbers and a second group of spindles **2''** in even numbers. The odd-numbered and even-numbered spindles **2'**, **2''** are separately driven by drive shafts **3**, **3'**, respectively, journalled in parallel to the frame. It will be noted that in such a kind of spinning frame, spindles are arranged correspondingly to each other on both sides of the frame **1**. Thus, spindles in odd or even numbers on one side are associated in pairs with those in odd or even numbers on the other side. Such pairs can be divided into two groups in connection with different power sources by drivingly associating them with respective drive shafts **3**, **3'** as by tapes **4**, **4'**, as shown in FIGS. 1 and 2. The draft roller mechanisms **5** of the spinning frame are of known construction, and are mounted on the spinning frame members F with twice the spindle pitch, i.e. as shown in FIG. 1 the draft rollers **5** are spaced twice as far apart as the adjacent spindles **2'** and **2''**. It is necessary that these draft roller mechanisms be so arranged on the frame F as to correspond to either the even-numbered or the odd-numbered spindle group carried by frame **1**. These two spindle groups **2'** and **2''**, their two drive shafts **3**, **3'**, and the clutches and power source to be later described are so constructed that they may be integrally moved a half the roller pitch either to the right or to the left at the predetermined time by movement of frame **1** on which they are mounted relative to frame members F on which the rollers **5** are mounted, by any suitable means (not shown). Further, these two drive shafts **3** and **3'** are connected to a single power source (not shown) through clutches for the change of drive (not shown). The change of drive is such that when one drive for a first spindle group which now confronts or corresponds to the draft roller mechanisms is being driven, the other drive shaft for the other or second spindle group which now confronts or corresponds to the cheese winding regions is in disengagement from the power source. Thus, the spindle group corresponding to the draft roller mechanisms is rotated at a high speed, thereby allowing the spindles to effect the usual drafting and spinning operation in cooperation with the draft roller mechanisms, while the other spindle group deviated from said draft roller mechanisms is in a stationary condition and hence the yarns on the full bobbins on these spindles are stationary so that they will be successively wound into cheeses by means of automatic winding machines travelling stepwise along the spinning frame.

In this spinning frame embodying the invention wherein spindles arranged in rows are divided into two groups by the relation of odd and even numbers, the object of simultaneously effecting the drafting and winding operation and the cheese winding operation requires the provision of a ring rail which is different from known one. That is to say, for drafting and winding, it is necessary to raise and lower spindle rails along bobbins. On the other hand, at the cheese winding regions adjacent the draft roller mechanisms, such ring rail constitutes an obstacle, which is required to be removed. Thus, the ring rails used herein should be of such a structure as to meet the above-mentioned conditions. One such statisfactory form of ring rail **6** is shown in FIGS. 1 and 4. As shown, it is composed of a ring rail base body **6'** disposed inside the spindle rows to extend along the full length of the frame and vertically movable, and ring support plates **6''** outwardly projecting therefrom to correspond to the draft roller mechanisms. The ring support plates **6''** are fitted with rings **7** including travellers. With the arrangement thus made, it is possible to effect the building motion of the ring rails at the draft roller mechanism and simultaneously effect the two distinct operations, i.e. a drafting, twisting and winding operation and a cheese winding operation, with the spindles of the two groups maintained in a row on either side.

In FIG. 3 the left half shows the drafting, twisting and winding regions operated by the roller draft mechanism while the right half shows the cheese winding regions operated by the automatic winding machines. In such drafting, twisting and winding regions it is required to provide means for separating yarns connected to full bobbins therefrom when the two spindle groups are to be exchanged and for winding the thus separated yarns extending from the draft roller mechanisms around their respective empty bobbins newly supplied to the drafting, twisting and winding regions.

The means will now be explained. As shown in FIGS. 3, 4 and 5, each drafting, twisting and winding region is provided with an arm body **11** adapted to press down a spun yarn **9** to press down a spun yarn **9** to cause the latter to cross a yarn gripper body **10**. Such arm bodies are secured to a common shaft **12** in such a manner that they may correspond to their respective drafting, twisting and winding regions and be positioned somewhat laterally of the spindles. A rod **13** is provided at the free end of each arm body so as to cross said spun yarn for pressing down the latter upon the falling-down of the arm body.

The yarn gripper **10**, which serves to temporarily grip the spun yarns pressed down by the arm bodies, is so mounted that it is positioned in front of the spindles and somewhat below yarn holder bodies **14** rigidly secured to the spindles. The yarn gripper body **10** is in the form of an elongated bar extending along the full length of the frame and is composed of fixed and movable rods **10'** and **10''**, respectively, contacted with each other at their side surfaces and adapted to be shiftable to change their relative position, as shown in FIGS. 6 and 7. Further, it is provided with recesses **15** and **15'** on the upper surfaces of both rods at the places thereof corresponding to the drafting, twisting and winding regions. Blocks **16** are fitted in said recesses to stride the latter, said blocks being

rigidly secured to the movable rod by means of bolts **17**. FIG. 6 shows a condition in which the spun yarn is not gripped, while FIG. 7 shows another condition in which it is gripped. Though not shown in FIGS. 6 and 7, guide plates **18**, **18** for spun yarns are rigidly secured to the fixed rod of the yarn gripper body **10**, on both sides of the recesses, as shown in FIGS. 4 and 5, in order that the spun yarns, when pressed down by the arm bodies, may be positively guided to cross the recesses of the yarn gripper body. Yarn transfer bodies **19** which serve to cause the spun yarns extending between the yarn gripper body and the draft roller mechanisms to be seized by empty bobbins are provided in front of the yarn gripper body. These yarn transfer bodies are mounted on a transverse rod **20** extending along the full length of the frame so as to correspond to the drafting, twisting and winding regions and are normally held in a condition shown in solid lines in FIGS. 3 and 4. The transverse rods are supported by and between two arm bodies **21** having their root portions pivoted to the frame. Thus, when the yarn gripper body **10** grips the spun yarns and new bobbins are supplied to the drafting, twisting and winding regions, the yarn transfer bodies are swung forwardly by the swing movement of the arm bodies **21**, thereby supplying the spun yarns connected between the yarn gripper body and the draft roller mechanisms to the yarn holder bodies **14** at the roots of the spindles. The structure of such yarn holder body rigidly secured to the root of a spindle is shown in FIGS. 8 and 9. It consists of a circular plate **24** having a hub sleeve **22** to be rigidly secured to the root of a spindle and two or three grooves **23** equispaced on the surface. These grooves are so arranged as to extend in the direction of the rotation of the circular plate, and receive therein the front ends **25'** of plate springs **25** as shown in FIGS. 10. The roots of the plate springs are rigidly secured to the peripheral upright edge of the circular plate. Thus, the spun yarn can be held between the front end **25'** of the plate spring and the inner wall **23'** of the grooves.

The operation of the present invention is as follows.

When the drafting, twisting and winding operation of one group of spindles is completed to provide full bobbins in a condition shown on the left-hand side of FIG. 3, the ring rails are lowered at a high speed to the lowermost level as shown in FIG. 5, and the spun yarns are wound two or three turns around the lower portions of the full bobbins, whereupon the group of spindles are simultaneously stopped. At this time, the cheese winding operation shown on the right-hand side of FIG. 3 has just been completed also. Thereafter, the ring rails are raised at a high speed to a position free from interfering with the successive operations, i.e., a position shown in dot and dash lines in FIG. 3. After the ring rails have been raised to the predetermined level, the arm bodies fall down to a position shown in dot and dash lines in FIGS. 3 and 5, thereby causing the spun yarns to cross the recess of the yarn gripper body. Simultaneously therewith, the yarn gripper body is actuated to grip the crossing portions of the spun yarns as shown in FIG. 7. In this condition the group of spindles carrying thereon full bobbins are simultaneously rotated one or two turns thereby cutting off the spun yarns between the yarn gripper body and spindles. In so doing, the arm bodies **11** are returned to the solid line position shown in FIG. 3. Upon the completion of the cutting of the spun yarns, the two spindle groups are simultaneously moved in a predetermined direction by ½ roller pitch, so that the full bobbin-carrying spindles are positioned in the adjacent cheese winding regions, while the empty bobbins which were positioned in the cheese winding regions are now positioned in the drafting, twisting and winding regions. That is to say, the two spindle groups exchange their positions. In this condition the yarn transfer bodies in front of the yarn gripper body advance towards the corresponding spindles thereby to press down the spun yarns connected between the yarn holder bodies and the draft roller mechanisms against the lower portions of the yarn holder bodies below the spindles, and then said group of spindles are simultaneously rotated one or two turns, whereupon the yarns are inserted into the grooves of the yarn holder bodies which, in turn, positively grip the spun yarns. At the same time, the spun yarns are released from the yarn gripper body, and then the ring rails are again lowered to the lowermost position, whereupon the group of spindles in the drafting, twisting and winding regions are simultaneously driven, so that the next drafting and spinning operation is started. Concurrently with the drafting, twisting and winding operation, the automatic winding machines associated with the frame begin cheese winding operation. In addition, on either side of the frame are provided rails **27** and **28** extending along the full length of the frame for the automatic winding machines **26**, as shown in FIG. 3.

Now, the reason why a series of drafting-winding and cheese winding can be smoothly effected by such concurrent operations, namely, drafting, twisting and winding operation effected by the spinning frame and cheese winding operation effected by the automatic cheese winding machine, will be described by showing an example. Supposing, for example, that the yarn delivery speed of the spinning frame is 30 m./min. and the winding speed of the automatic winding machines is 800 m./min., it suffices that one automatic cheese winding machine has charge of full bobbins, about 24 in number calculated as an approximate value of 800/30. On the other hand, the weight of a cheese is generally of the order of 1.8 pounds. Thus, if the amount of the yarn on a full bobbin is adjusted to about 0.037 pound, it is possible to produce one cheese from 48 full bobbins. That is to say, it is possible to produce one cheese by allowing an automatic winding machine to execute one reciprocation per 24 spindles. Therefore, it is seen that it suffices for this purpose to provide such automatic winding machines on either side of the frame with a ratio of one machine per 24 spindles. It is to be understood that the numerical values given above are only by way of example, and that other various combinations may be obtained as desired based upon the aforesaid principle by suitably determining the weight of one cheese and the amount of the yarn on one full bobbin.

FIG. 11 shows another embodiment of the invention, wherein two spindle groups **29** and **30** are adapted to be driven by a single tape **31**. Thus, of the spindles arranged in a row, those located at odd numbers form one group and those located at even numbers form the other group, the exchange of the positions of said spindle groups being effected in the same manner as the first embodiment by simultaneously shifting all spindles a half the roller pitch in one direction. Thereafter, the spindle group which is deviated from draft roller mechanisms **32** will be somewhat tilted outwardly away from the tape. This tilting mechanism will be described with reference to FIG. 12. Plates **54** each supporting a spindle are arranged on the frame, said support plates being hinged at **55** so that they may be tilted relative to the frame at a predetermined time. Fixedly positioned below the front end portions of these support plates is a cam plate **56** provided with raised portions **56'** at the places thereof confronting the draft roller mechanisms. Thus, those support plates which ride on said raised portions are in lifted position as shown in FIG. 12, so that the spindles supported thereby are in drafting, twisting and winding condition and the spindle wharves are, of course, in contact with the tape, which is supported for driving the spindles, as aforesaid, by any suitable tape supporting means (not shown) e.g. of the known form shown in DAS 1,066,112 published by the German Patent Office Sept. 24, 1959. On the other hand, the other support plates positioned in the cheese winding regions are forwardly tilted against the recesses **56''** of the cam plate, so that the corresponding spindle wharves are out of contact with the tape and

in stopped position. In this condition, cheese winding operation is carried out. It will be seen that if the base member on which are mounted these support plates is moved by ½ roller pitch, the as-raised and as-lowered support plates will be lowered and raised by the recesses and raised portions of the cam plate, all respectively. In short, the group of spindles confronting the draft roller mechanisms are contacted with the tape, are rotated at a high speed, and perform the intended drafting and spinning operation in cooperation with the draft roller mechanisms, while the other spindles are in stopped position so that the yarns on the full bobbins carried by these stopped spindles are wound into cheeses by the automatic winding machines. The other arrangements of this embodiment are the same as the first embodiment.

FIGS. 13 through 16 show a further embodiment, wherein spindles are arranged in two rows, front and rear, on each side of the frame, said front and rear rows each forming one group. After the lapse of the predetermined time, the pairs of spindles are simultaneously rotated through 180° whereby the positions of the two groups of spindles are exchanged. This will be described in more detail with reference to FIGS. 13 through 16. Spindles **33** and **34** are arranged in two rows on each side of the frame, the outer spindle group **33** being positioned on the cheese winding region side, the inner spindle group **34** being in a position to cooperate with the draft roller mechanism **35**, all the spindles of the group **34** being in contact with a single tape **36** and driven at a high speed. This will be further described with reference to FIG. 14. A spindle rail **37** is provided with as many bearing sleeves **38** as the spindles of one group vertically extending therefrom and arranged at fixed intervals. Shafts **40** for spindle support plates **39** are rotatably fitted in said bearing sleeves. The spindle support plates are in the form of elongated plates having said shafts secured to the middle portions of the lower surfaces thereof and are supported on the upper surfaces of the bearing sleeves. Pairs of bolsters **41, 42** are secured to the spindle support plates at their opposed end portions equidistant from the axes of the shafts **40**, each pair receiving therein a pair of spindles. The spindle support plates are so placed that these pairs of spindles may be positioned in front and rear relation as shown in the figure. That is to say, two spindle rows, front and rear, are provided on the spindle rail. In this condition the spinning frame is run to wind spun yarns **43** onto bobbins **44**. When the bobbins become full, the machine is stopped, whereupon the spindle support plates are turned through 180°, thereby effecting the positional exchange between the full bobbins in rear row and empty bobbins in front row. This means that the full bobbins assume the front row position and the empty bobbins assume the rear row position to cooperate with the draft roller mechanisms. In these conditions, spinning and winding operation is again effected at rear row and concurrently therewith the automatic winding machines provided in front of the spinning frame draw yarns from the full bobbins in front row and wind them into cheeses. Each of the shafts of the spindle support plates has a worm wheel **45** secured to the lower end thereof. These worm wheels mesh with corresponding worms **47** mounted on a common shaft **46**. Thus, by rotating the common shaft, all the spindle support plates are rotated through 180° to exchange the positions of the front and rear spindle rows at a time. In this case, if it is so arranged that all the spindle support plates are rotated at a time, it will be apparent from FIG. 15 that the distance between each pair of spindles must be relatively long. For the purpose of decreasing such distance, it may be so arranged that half the spindle support plates, positioned at every second place, are simultaneously rotated by like worms **47A** carried by a common shaft **46A**, followed by the next simultaneous rotation of the other by like worms **47B** carried by a common shaft **46B**, thereby completing the positional exchange of the front and rear rows at two times, as shown in FIG. **16**. With this arrangement, the spindle distance can be shortened. In addition, in effecting the positional exchange of the two groups, the above-mentioned third embodiment also must be provided with means for cutting the spun yarns off their full bobbins and winding the thus separated yarns around the empty bobbins supplied to the drafting, twisting and winding regions. Unlike the first embodiment, in this case the arm bodies for pressing down yarns are positioned in front of the spindles, while the yarn gripper body and yarn transfer bodies are positioned at the rear of the spindles. With this arrangement, it is possible to smoothly perform the procedures at the time of the bobbin exchange in the same manner as the first embodiment.

In addition, in the drawings, **48** designates a sliver bobbin; **49, 50** snail wires; **51** the dram of the automatic winding machine; **52** a cradle; and **53** a cheese.

What is claimed is:

1. A combination spinning and cheese winding machine comprising in combination:

(A) Spinning frame means having
  (1) a set of yarn draft roller mechanisms mounted along its length,
  (2) spindle mounting means mounted along its length and movable to first and second positions therein,
  (3) first and second spindles provided with bobbins and carried in pairs by said spindle mounting means for each of said draft roller mechanisms, and movable by movement of said mounting means to bobbin winding and cheese winding positions, respectively, and
  (4) means for rotating the spindles located in bobbin winding position and for winding yarns on the bobbins thereof,

(B) A cheese winding means, and

(C) Means for moving said cheese winding means along said spinning frame means and for delivering to it to be wound into a cheese yarn drawn from the bobbins located on said spindles in their cheese winding positions in said machine without removal of the bobbins from the spindles carried as aforesaid on the spindles mounting means of said machines.

2. A combination as claimed in claim **1** wherein:

(a) said bobbin winding positions are aligned with said draft roller mechanism along said spinning frame means,

(b) said cheese winding positions are located along said spinning frame means in alternation with said bobbin winding positions,

(c) said spindle mounting means is movable along said spinning frame means and

(d) said spindles are arranged in a row along said spindle mounting means, said first spindles being in odd numbered positions and said second spindles being in even numbered positions in said row and being spaced therealong to correspond to the spacings of said bobbin winding and cheese winding positions,

whereby shifting of said spindle mounting means along said frame effects the movement of said spindles to their bobbin winding and cheese winding positions, respectively.

3. A combination as claimed in claim **2**, wherein said means for rotating the spindles in their bobbin winding positions comprises first and second common drive shafts drivingly coupled to said first spindles and to said second spindles, respectively.

4. A combination as claimed in claim **1**, wherein the means for driving said spindles in their bobbin winding positions comprises a single continuous tape drive running along the length of the spinning frame means, and wherein the spindles shifted to bobbin winding position

are moved into driving contact with said tape drive while the spindles shifted to cheese winding position are moved out of contact with said tape drive.

5. A combination as claimed in claim 1 further comprising

(D) A yarn gripper body juxtaposed to each of said bobbin winding positions,

(E) Means for pressing into said yarn gripper bodies drafted yarn connected to filled spindles and for actuating said gripper bodies for gripping the same while said full and empty bobbined spindles are being interchanged.

(F) Means for supplying to the empty bobbins moved into the bobbin winding positions the spun yarns connected between the yarn gripper bodies and the draft roller mechanisms, and

(G) Means for positively holding the spun yarns connected to the draft roller mechanisms against the roots of the empty bobbins in the bobbin winding positions for allowing the next winding of drafted spun yarns thereon.

6. A combination as claimed in claim 1, wherein:

(a) said bobbin winding positions are aligned with said draft roller mechanisms along said spinning frame means in a first row,

(b) said cheese winding positions are aligned with said bobbin winding positions along said spinning frame means in a second row spaced forwardly of said first row,

(c) said pairs of first and second spindles are carried by rotatable members, the rotation of which through 180° interchanges the spindles of one row for those of the other row, and

(d) the means for driving said spindles in their bobbin winding positions comprises a tape drive contacted by the spindles in the first row but not contacted by the spindles in the second row.

7. A combination as claimed in claim 6, wherein said machine comprises a common operating means for simultaneously rotating all of said rotatable members through 180°, and wherein the spindles in said first and second rows are spaced apart sufficiently to permit such simultaneous rotation.

8. A combination as claimed in claim 6, wherein said machine comprises separately operable means one for simultaneously rotating alternate ones of said rotatable members, and the other for simultaneously rotating the remainder of said rotatable members 180°, and wherein the spindles in said first and second rows are spaced apart sufficiently to permit separate operations of said separately operable means, but not sufficiently to permit simultaneous operations of said separately operable means.

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