Jan. 4, 1966 F. A. DEPUY 3,227,384

WINDING MACHINE

Filed Aug. 20, 1963 3 Sheets-Sheet 1

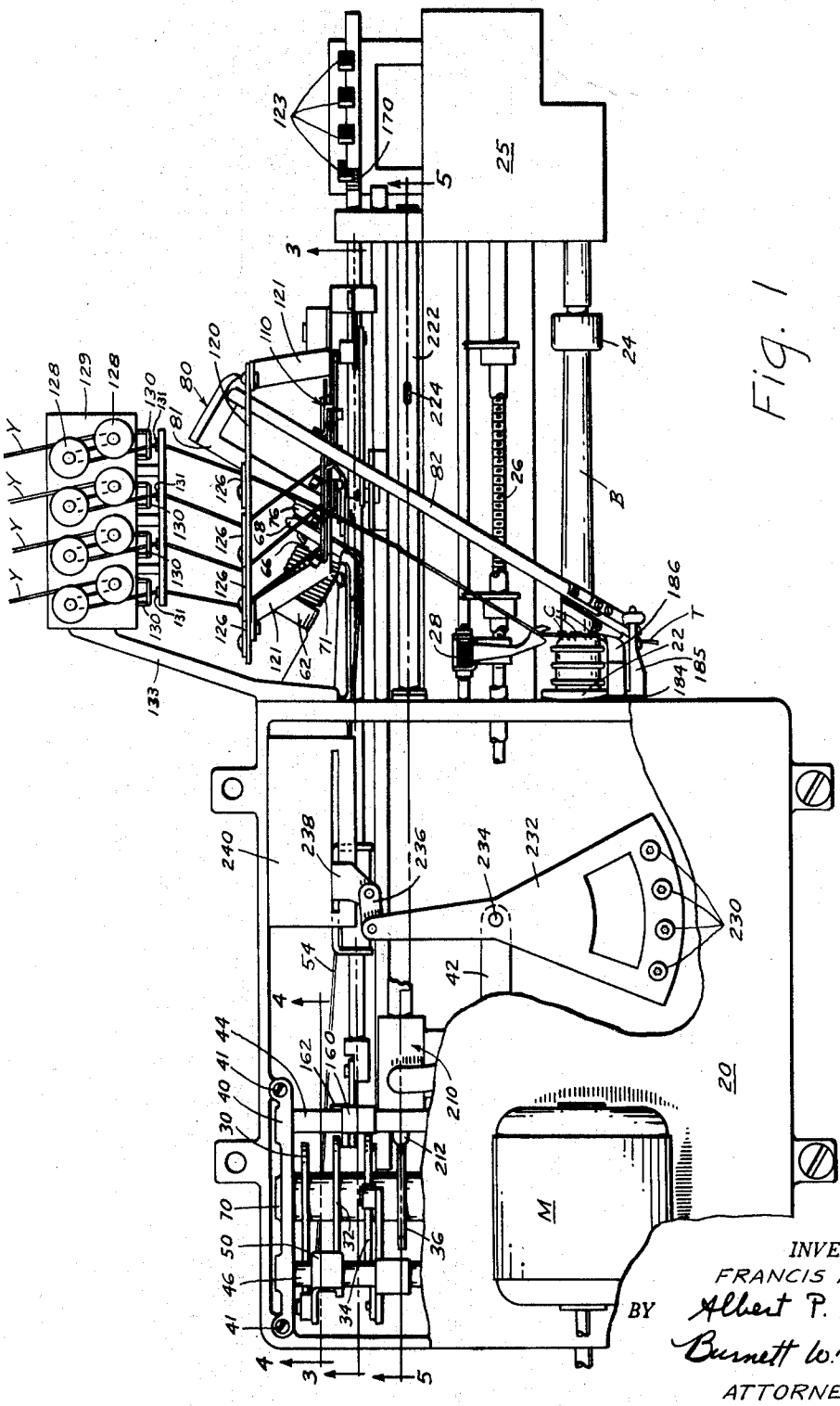


Fig. 1

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WINDING MACHINE

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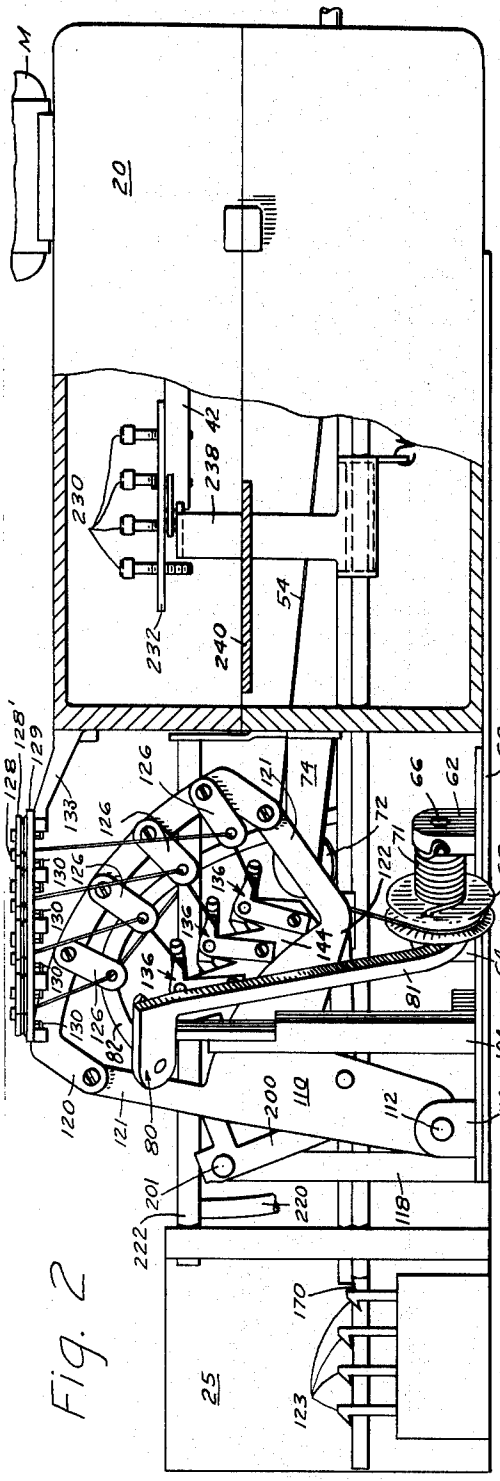


Fig. 2

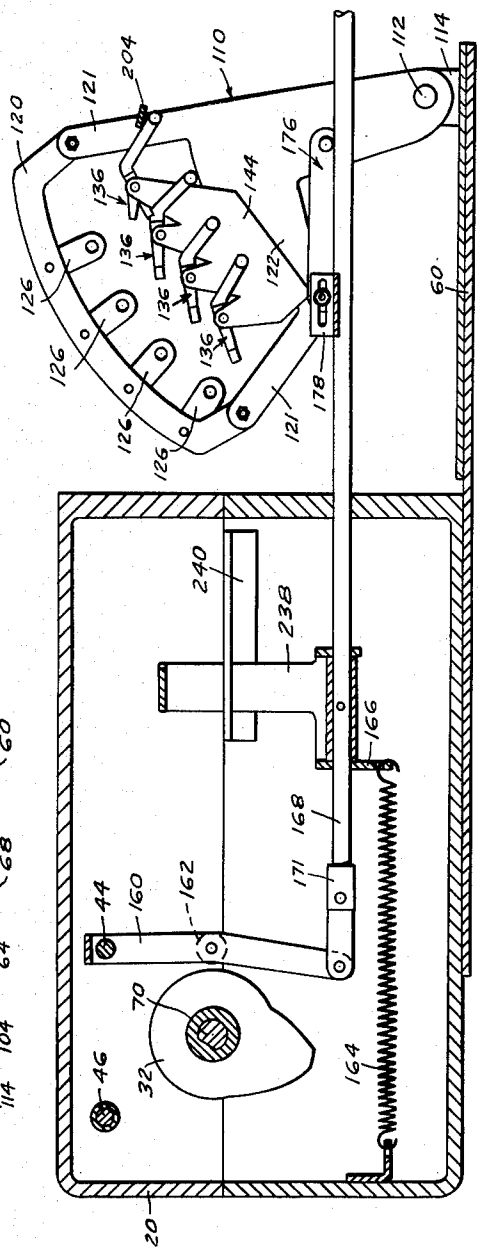


Fig. 3

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WINDING MACHINE

Filed Aug. 20, 1963 3 Sheets-Sheet 3

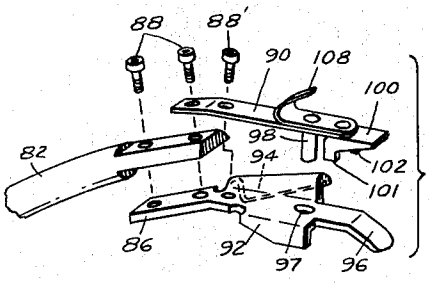
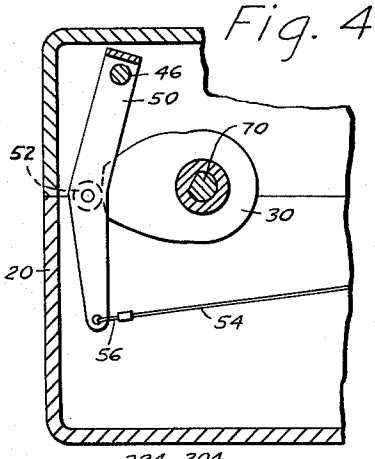


Fig. 6

Fig. 4



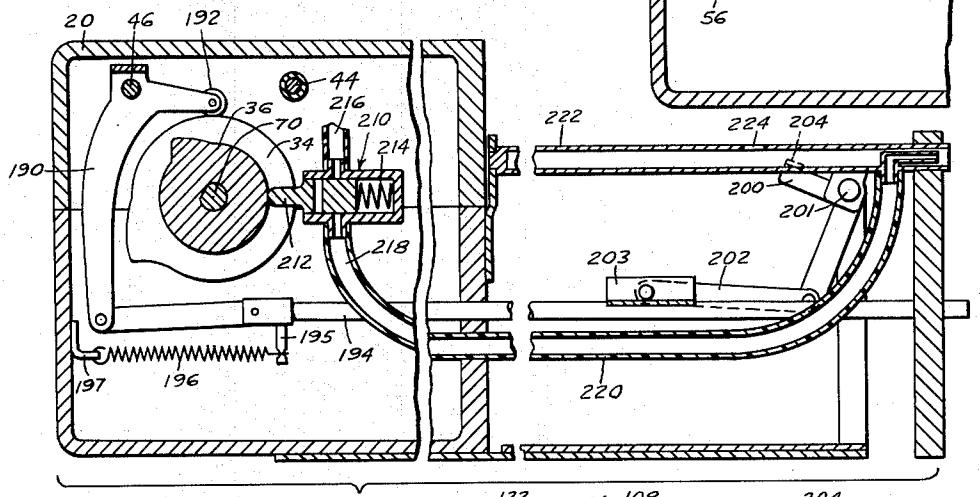


Fig. 5

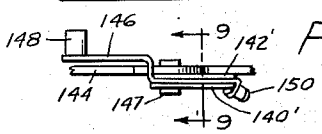


Fig. 8

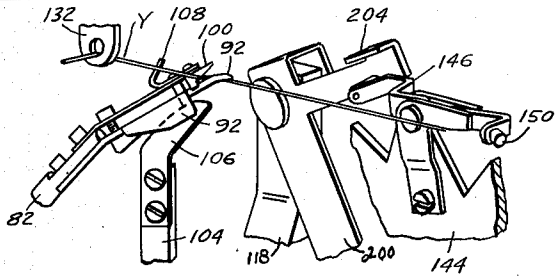


Fig. 10

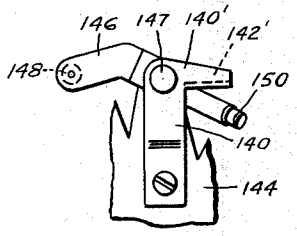
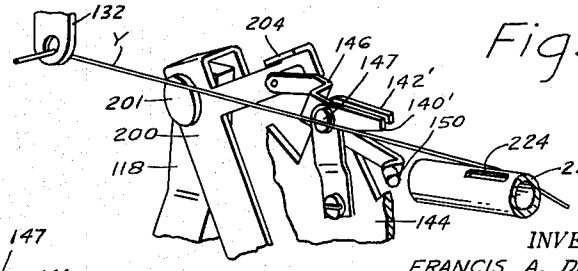


Fig. 7



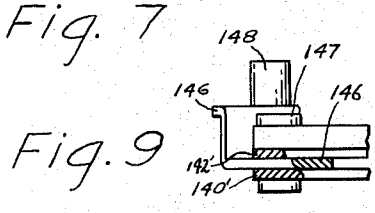


Fig. 9

Fig. 11

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United States Patent Office 3,227,384 Patented Jan. 4, 1966

3,227,384

WINDING MACHINE

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Filed Aug. 20, 1963, Ser. No. 303,378
22 Claims. (Cl. 242—27)

The present invention relates to automatic bobbin winding mechanisms such as exemplified in U.S. Patents Nos. 2,638,936 of May 19, 1953 and 2,763,443 of September 18, 1956, both to William V. Goodhue et al. More particularly, the invention is concerned with improvements in the yarn carrier means of U.S. patent application Ser. No. 231,390 for utilization with the apparatuses exemplified in the two cited U.S. patents.

The copending application of Francis A. Depuy et al., Serial No. 231,390, filed October 18, 1962, for "Winding Machine," discloses and claims improvements in the mechanisms of the above patents for selectively presenting different yarns, one by one, to the bobbin of a winding machine, winding the selected yarn onto the bobbin, and subsequently delivering the wound bobbin to a magazine. The yarn carriers disclosed in that application are constituted as a plurality of arcuate arms supported on a movable slide or carriage. The arms are adapted to rotate individually whereby each, upon an appropriate signal, may present a particular type of yarn to the bobbin to be wound. In practice with the invention disclosed in said application Serial No. 231,390 it is necessary that there be an individual yarn carrier arm for each different yarn to be wound into a supply bobbin for the associated magazine. Moreover, the arms are necessarily supported on a movable slide or carriage so that each arm may be slid to a suitable position with its given type of yarn in order to deliver the yarn to the bobbin.

It has now been found possible to place the delivery of the several supply yarns to be separately wound by the bobbin winding mechanism under the control of a single non-sliding yarn carrier arm thereby achieving savings in the space consumed by the winding mechanism as well as economy in the power consumption thereof. These advantages, in turn, contribute to greater overall efficiency of the apparatus.

Therefore, one object of the present invention is to provide improved means for automatically delivering a selected supply yarn to the bobbin of an automatic bobbin winding mechanism.

Another object of the present invention is to provide improved yarn carrier means for delivering a selected supply yarn to a bobbin of an automatic bobbin winding mechanism, said carrier means having a single arm for transporting the supply yarn.

Yet, a further object of the present invention is to provide improved yarn carrier means having a cooperative yarn holding means whereby a plurality of supply yarns maintained in said holding means may be received, one by one, by said carrier means for delivery to a bobbin of an automatic bobbin winding mechanism.

An additional object of the present invention is to provide improved yarn carrier means which may be incorporated readily into existing automatic bobbin winding mechanisms.

Another object of the present invention is to provide improved yarn carrier means which is compact in size and durable and reliable in use.

Other objects of the present invention will, in part, be obvious and will, in part, appear hereinafter.

The invention accordingly comprises the apparatus possessing the construction, combination of elements and arrangement of parts which are exemplified in the following

detailed disclosure, and the scope of the application of which will be indicated in the claims.

For a fuller understanding of the nature and objects of the invention reference should be had to the following detailed description taken in connection with the accompanying drawing wherein:

FIG. 1 is a plan view of the yarn carrier means of the present invention in association with an automatic bobbin winding machine of U.S. patent application Ser. No. 231,390, the components of the invention being shown in their active positions, the top of the machine housing being broken away to illustrate certain of the operative elements therein;

FIG. 2 is a rear elevational view of the apparatus of FIG. 1;

FIGS. 3, 4 and 5 are views taken along lines III—III; IV—IV; and V—V respectively of FIG. 1;

FIG. 6 is an exploded view of the yarn gripping means of the present invention;

FIG. 7 is an enlarged fragmentary view of one of the yarn clamping and severing members;

FIG. 8 is a top plan view of the member of FIG. 7;

FIG. 9 is a view taken along lines IX—IX of FIG. 8;

FIG. 10 is an enlarged perspective view illustrating the yarn carrier in position to engage a supply yarn disposed in the clamping means of the present invention; and

FIG. 11 is a view similar to FIG. 10 illustrating the position of the supply yarn at the end of a winding cycle.

The present invention has particular utility in practicing the invention of the commonly U.S. patent application, Serial No. 231,390. However, it will be obvious to those skilled in the art that the present invention will have many other applications and it is not intended to limit the invention to use with the apparatus of the above patent application.

Briefly, the present invention includes a single arcuate arm or yarn carrier which is fixed so as to prevent lateral movement thereof with respect to the winder frame on which it is supported. However, the yarn carrier is arranged for rotary movement whereby a fixed jaw or yarn clamp on the forward end of the arm is moved from an inactive position rearwardly of a yarn supporting bracket to an advanced position extending forwardly of a bobbin supported for rotation in the winder. The yarn supporting bracket is constituted as a fan-like member, pivoted at its lower end for rocking movement and provided in its upper part with a plurality of yarn guides, and a plurality of yarn clamp-shear members aligned with and spaced apart from the yarn guides. The various supply yarns are positioned between the yarn guides and clamp-shear members. In operation the yarn supporting bracket is indexed or rocked to present a selected supply yarn into the lineal path of yarn carrier. Upon actuation the yarn carrier is projected forwardly whereby its forward jaw or clamp seizes the supply yarn for delivery to the bobbin. The yarn is engaged for winding on the bobbin whereupon the carrier retreats to its inactive position while the bobbin is wound. Thereafter, means are actuated to sever the yarn adjacent the yarn supporting bracket to position in readiness for a succeeding cycle. Additional means are present to carry away as waste yarn end severed between the bobbins and the clamp shear unit if such waste end should be present.

Since the improvements of the present invention are directed essentially to the yarn carrier system of the aforesaid patent application they are illustrated in connection therewith. As the parts of that apparatus not shown form no part of the instant invention the details thereof will not be further referred to herein except insofar as the inclusion thereof will contribute to a clear understanding of this invention. It will be understood that the parts of

the apparatus of the cited patent application which are absent from this description and the accompanying drawing will ordinarily be present in a complete working machine and may be the same as shown and described in that patent application.

Turning now to a detailed description of the drawing with initial reference to FIG. 1, the numeral 20 designates a box-like casing enclosing the means for automatically controlling the winding cycle and the automatic donning, winding, and doffing means of the winding apparatus as fully described in U.S. Patent 2,763,443, the apparatus of this same patent forming the context in which the invention described in the cited patent application is shown. The top of casing 20 serves to mount a motor M constituting the main power drive for the winding mechanism in the manner set forth in the said patent application. Further, the winding mechanism includes a pair of axially aligned chucks 22 and 24 between which a bobbin B is supported, the chuck 22 being disposed in casing 20 and chuck 24 being supported from tail stock bracket 25.

As in the patent application above mentioned a traverse rod 26 is provided for reciprocating a yarn guide 28, so that yarn engaged in the yarn guide may be laid on bobbin B from the butt end to the apical end in the manner of a "filling wind," the chucks 22 and 24 being arranged for rotation as in the manner discussed in the patent application for the winding of yarn on the bobbin B. After winding the bobbin is automatically doffed, a fresh empty bobbin donned between the chucks and the winding of yarn thereon automatically reinstituted. For a more detailed description of the foregoing elements reference is made to the disclosure of the patent just mentioned considered in connection with the improvements and modifications of the cited patent application Serial No. 231,390.

In the instant invention a cross-shaft, or cycling cam shaft 70 is provided, corresponding generally to the cycling cam shaft of the apparatus of the patent application referred to. However, in accordance with the present invention cycling cam shaft 70 is elongated rearwardly to accommodate four plate cams 30, 32, 34 and 36, each of which is affixed to shaft 70 for rotation therewith as shown in FIG. 1. A relatively heavy bracket 40 is fastened firmly to bosses within casing 20 by bolts 41. The bracket 40 extends upwardly above shaft 70 to provide a support for a pair of parallel spaced rods 44, 46. Moreover, bracket 40 acts as a bearing for the rear end of shaft 70, as seen in FIG. 1. A similar bracket 42 is positioned toward the front of casing 20, or opposite to bracket 40, for supporting the distal ends of rods 44, 46, as well as the forward end of shaft 70.

It will be seen in FIG. 1 that rods 44, 46 provide the means for rotatably supporting several cam follower arms, each of these arms being aligned for coaction with a given cam. Thus, a follower arm 50 is mounted for rotation on rod 46 adjacent to cam 30, the upper section of this arm being folded over in the manner of an inverted U-shape to afford a bearing support for the arm. The mid-portion of arm 50 is provided with a cam follower roller 52 positioned to ride on the periphery of plate cam 30, see FIG. 4. Thus, as shaft 70 is rotated, the follower roller 52 will ride on the edge of cam 30 and cause arm 50 to rock about rod 46. The lowermost end of arm 50 has an elongated cable 54 attached thereto through a clevis 56, the cable extending through the side wall of casing 20 and connected outside of the casing with elements yet to be described. Hence, it will be apparent that the rocking motion of arm 50 imparted by cam 30 creates generally rectilinear movement to cable 54.

With continuing reference to FIGS. 1 and 2 it will be seen that a heavy mounting plate 60 is affixed to the base of casing 20 and is cantilevered outwardly therefrom toward tail stock bracket 25. A pair of spaced, upright hubs 62, 64 are rigidly connected to the upper surface of the mounting plate 60, these hubs being so located that the axis of a shaft 66, which is rotatably supported therebetween, lies at an acute angle to the axis of bobbin B. One end of shaft 66 has a sheave or pulley 68 connected therewith. A relatively heavy torsion spring 71 surrounds shaft 66, one end of this spring being hooked in the side of pulley 68 and the distal end of the spring being secured in the side of hub 62.

It has been stated that cable 54 extends outwardly from within casing 20. The outermost end of this cable is attached in the groove of pulley 68 so that, as the cam follower arm 50 is rocked by cam 30 shaft 66, in turn, is rotated, by virtue of its connection with the pulley. In order that cable 54 may move freely an intermediate guide pulley 72 is supported on an arm 74 extending laterally from the side of casing 20 and positioned to engage with the cable between arm 50 and pulley 68.

As best seen in FIG. 1 pulley 68 has a hub 76 formed integrally therewith. This hub serves as the mount for a rotatable yarn carrier 80. Viewing FIG. 2 it will be seen that yarn carrier 80 includes a radially projecting portion 81, one end of which is affixed to the hub 76. The remote end of portion 81 constitutes the support for an arcuately shaped arm 82, the curvature of the arcuate arm being concentric to the axis of its rotary movement, i.e., shaft 66.

The upper or forward end of yarn carrier arm 82 is provided with a yarn gripping means. To this end, with particular reference now to FIG. 6, an elongated stiff plate 86 is attached to the lower side of arm 82 by screws 88 and projects beyond the forward end of the arm. These same screws act to hold a member 90 of spring steel on the upper side of the forward end of arm 82 and juxtaposed to and generally coterminous with plate 86. Desirably, member 90 is bent slightly downwardly to cause it to bear firmly on the upper side of plate 86. Further, an adjusting screw 88' passes through member 90 and threadedly engages with plate 86 to adjustably urge these elements together.

Referring now particularly to plate 86, a side plate 92 and a cam 94 are folded downwardly from the opposite edges thereof. Additionally, the forward edge of the plate is curved downwardly into a bill at 96 for encouraging the reception of yarn therealong. An aperture 97 is pierced through the mid-portion of plate 86 for the free reception of a guide pin 98 depending from member 90.

In order that a supply yarn may be securely gripped for cooperative movement with yarn carrier 80 the lead end of member 90 has a U-shaped clamp 100 affixed on its forward end. A pair of depending ears 101, 102 formed on the opposite margins of clamp 100, limit the rearward movement of a strand of yarn engaged between plate 86 and clamp 100.

A standard 104 is firmly connected to plate 60 the upper end of which supports a cam 105 aligned with pin 98. Cam 105 has an inclined top profile rising from rear to front. Thus, as yarn carrier 80 rotates through its projecting path pin 98 rides up cam 106 thereby opening clamp 100 for the reception of the supply yarn, as illustrated in FIG. 10.

A U-shaped hook 108 is fastened on the top of member 90 and serves cooperatively with means to be described hereafter for opening clamp 100 from plate 86 in order to release the yarn from the clamp as the yarn is delivered onto the bobbin.

It has already been stated that yarn carrier 80 is movable in a rotary path about shaft 66. The extremes of this movement are controlled by cable 54 so that the gripping means on the forward end constituted generally as plate 86 and clamp 100 move from a position rearwardly and somewhat below a supply yarn (see FIG. 2) to a projected position where the supply yarn may be engaged to winding on a rotating bobbin. Advantageously, the present invention includes a yarn supporting

bracket for holding different supplies of yarn and for presenting a given one of the supply yarns for reception by the yarn carrier for delivery to the bobbin. Thus, referring to FIGS. 1 and 2, a generally fan-shaped yarn supporting bracket **110** is rockable about a shaft **112** which is, in turn, supported at one end in a hub **114**, the opposite end of the shaft being journalled in the lower end of a standard **118**. The upper portion of yarn supporting bracket **110** has a generally horizontal bar **120** connected by vertical legs **121** to a further bar or web **122** extending parallel to bar **120**. Viewing FIG. 1 it will be seen that legs **121** are bent somewhat backwardly to situate bar **120** in a plane rearwardly of its companion web **122**. The bar **120** has a plurality of spaced yarn guides **126**, depending therefrom, here illustrated as four in number, each yarn guide serving to handle a different supply yarn being conducted from a suitable supply source. In advancing to the yarn guides **126** each supply yarn strand is conducted from its supply source through tandem disk-type tension elements **128, 128'** supported on a member **129**, through a rockable drop-wire tension element **130** and through a further yarn guide **131**, all as illustrated in FIG. 1. A bracket **133** affixed to casing **20** at one of its ends, is employed to mount the member **129** on its distal end.

In order that each supply yarn may be suitably positioned for reception by the yarn carrier **80** each yarn is caused to span the space between bar **120** and bar **122** under tension imparted by disc-tension elements **128, 128'** and drop-wire tension element **130**. The lead end of each supply strand is held in a clamp-shear unit, generally referenced by numeral **136**, mounted on bar **122**, it being understood that one such unit **136** is provided for each separate supply strand and each clamp-shear unit being horizontally aligned with a yarn guide **126**. With particular reference now to FIGS. 7, 8 and 9 each clamp-shear unit comprises a pair of right-angle fingers **140, 142** securely connected to a plate **144** which is bolted to bar **122**. As seen in FIG. 7 the angular portion or "clamp portion" **140'** of finger **140** is somewhat wider than the corresponding "shear portion" **142'** of finger **142**, the dotted lines of that view serving to illustrate the variation. Moreover, and for reasons to become apparent hereafter, the lower edge of clamp portion **140'** is preferably formed with a radius while, in contrast thereto, the bottom edge of shear portion **142'** is sharpened to a knife edge, see FIG. 9.

An arm **146** is medially fulcrumed between fingers **140** and **142**, on a pin **147**, the rear section of this arm being provided with a cam roller **148**, and the forward portion thereof extending snugly between portions **140'** and **142'** terminating outwardly thereof so as to mount a further cam roller **150**. In practice with the instant invention the various supply yarns are each held by the clamp-shear unit **136** for retrieval by yarn carrier **80** with each of the strand pinched or nipped between forward portion of arm **146** and finger clamp portion **140'**.

As related earlier the yarn carrier **80** moves through a rotary path to engage a supply yarn in yarn supporting bracket **110**. In operation cam **94** of the yarn carrier moves in a path to communicate with cam roller **150**. As will be seen in FIG. 6 cam **94** inclines downwardly from its front to its rear end so that, as it communicates with roller **150**, it forces the roller downward, or clockwise as viewed in FIG. 8, thereby opening the clamp-shear unit to release the supply yarn therefrom. At this time the supply yarn will have become engaged between plate **86** and clamp **100** and pin **98** will have ridden off cam **106** to secure the yarn firmly under the clamp. Since the yarn is engaged under clamp **100** before it is released from clamp-shear unit **136** the yarn carrier will commence to withdraw yarn from the supply source before the forward free end of the yarn moves. Thus, there is produced a slight tail of yarn T hanging off the bill **96** when cam **94** strikes roller **150**. This is the yarn between clamp **100** and clamp-shear unit **136**, see FIGS. 1 and 10. Advantageously, this tail T is subsequently utilized to insure engagement of the supply yarn with the bobbin.

It has already been stated that yarn supporting bracket **110** is rockable about shaft **112**. In this fashion each of the different supply yarns supported therein may be indexed or rotated into the path of yarn carrier **80** whereby the yarn carrier may intercept a given one of these supply yarns for delivery to the bobbin B. In this connection it will be recalled that cycling cam shaft **70** has already been described as mounting a cam **32** thereon for rotation therewith. Referring now to FIGS. 1 and 3 rod **44** mounts a cam follower arm **160** thereon, the top of this arm being folded into a U-shaped section to provide a bearing for the rod. The intermediate portion of this arm carries a roller **162** positioned to ride on the edge of cam **32**. A coil spring **164** extended between a wall of casing **20** and a collar **166** fast on a connecting rod **168** acts to bias roller **162** against cam **32**. Connecting rod **168** is joined to the lower end of arm **160** through a ball joint **171**, the opposite end of this connecting rod projecting outside of casing **20** and extending generally the full length of the winding mechanism. The outermost end of connecting rod **168** is notched as at **170**. A plurality of serially positioned stops, here referenced as **123** in accordance with the referencing of like stops in the earlier cited U.S. Patent Application S.N. 231,390, are positioned to engage with notch **170**. The construction and operation of stops **123** in conjunction with the bobbin magazine is fully set forth in that patent application and reference is made thereto for the details thereof. Suffice here to state that as connecting rod **168** is traversed axially by cam **32** notch **170** is moved beneath stops **123**. In accordance with the operation of these stops as set forth in the said patent application, an appropriate signal from a bobbin magazine chamber will depress a stop for engagement with notch **170**. With the suitable stop **123** engaged in notch **170** the connecting rod **168** will be held against moving until a further recycling, i.e., another revolution of cycling cam shaft **70**, is made.

As best seen in FIG. 3 connecting rod **168** is joined with yarn supporting bracket **110** through a link **176** attached thereto and to a tab **178** fast on rod **168**. Advantageously, tab **178** has an elongated slot therein to afford adjustment of the rocking path of bracket **110** relative to the motion of rod **168**. By means of this linkage, then, connecting rod **168** will be determinative of the position of yarn supporting bracket **110**. Moreover, the ultimate location of this bracket about its pivot on shaft **112** will be controlled by the stops **123** so as to govern the type of yarn to be picked up by yarn carrier **80** for winding on bobbin B.

It has now been recited that the given or selected yarn to be delivered to bobbin B by yarn carrier **80** is regulated by rocking motion of yarn supporting bracket **110** so as to dispose that given yarn in the path of the yarn carrier. The projected path of the yarn carrier **80** is illustrated in FIG. 1. Further, and with continuing reference to that view, it will be seen that bobbin B has a plurality of cleats C disposed around the butt end thereof, the cleats projecting outwardly to engage the supply yarn and commence its winding on the bobbin. The supply yarn, as it is gripped between plate **86** and clamp **100** is carried over bobbin B in a path to become engaged in yarn guide **28** and on cleats C. It has been found desirable at the end of the forward projection of yarn carrier **80** to free the yarn from its rather firm grip under clamp **100** and transfer its retention to a relatively lighter holding force in order that the yarn will continue to be tensioned for ready engagement with cleats C, yet permitting the yarn to be freely withdrawn from this lighter holding force when the yarn is securely engaged on the bobbin. To this end an angular bracket **184** is attached to the side of casing **20** forwardly of chuck **22** so as to present a finger **185** projecting outwardly therefrom and coacting with hook **108**

earlier described as carried on the top surface of clamp 100. Bracket 134 serves the further purpose of supporting a horizontal flap 136 of resilient frictional material such as rubber intermediate the bracket and bobbin B. Thus, as yarn carrier 80 projects the supply yarn over the bobbin, hook 108 engages with finger 185 causing clamp 100 to separate from plate 86 to release the supply yarn therebetween. However, in the normal course of forward movement of the yarn carrier the supply yarn is caused to lay against side plate 92. In consequence thereof, as the yarn carrier 80 approaches the forwardmost extent of its projection, flap 186 bears against side plate 92 to yieldably compress the yarn therebetween. Hence, upon the opening of clamp 100 from plate 86 the yarn continues to have tension therein as a result of the gripping force exerted by flap 186 and side plate 92. Yarn carrier 80 dwells briefly in its forward position while rotation of bobbin B commences and the yarn is accordingly withdrawn from its frictional grip between the flap and side plate. The yarn tail serves advantageously as a loose yarn portion for wrapping on cleats C. At this time the yarn carrier 80 is returned to its start or inactive position under the force of spring 71 while the bobbin is wound.

During the deposition of yarn on the rotating bobbin the supply strand gradually moves from the butt end of the bobbin to the apical end thereof. In so doing the supply yarn, in its expanse between the bobbin and yarn guide 126, is caused to shift from a position passing generally along the outer ends of finger portions 140', 142' to a position well within the confines of the V-notch formed by these two finger portions, see FIG. 11. This positioning of the yarn advantageously presents the supply yarn for cutting at the completion of the winding of the bobbin and permits the free yarn end to be clamped. Turning now to FIGS. 1 and 5 plate cam 34 has already been said to be mounted on cycling cam shaft 70. A cam follower arm 190 is rockably supported on rod 46, the upper angular section thereof having a roller 192 thereon positioned to engage with the periphery of cam 34. The lower end of arm 190 has an elongated bar 194 flexibly coupled thereto which projects through an opening in casing 20 terminating closely adjacent standard 118. Bar 194 is arranged with a pin 195 depending therefrom within casing 20. A spring 196 has one of its ends connected to this pin and has its opposite end attached to a post 197 embedded in the side of casing 20. Spring 196 acts to urge bar 194 rearwardly to maintain roller 192 in engagement with cam 34.

An angular arm 200 (FIG. 5) is rockably mounted on standard 118 by a pin 201 which passes through a pair of folded-over ears of the arm and through the standard. A short link 202 is loosely connected at one of its ends for rotation to a pad 203 attached along the mid-section of bar 194, and is connected at its other end in a similar manner to the lower end of arm 200. Thus, it will be apparent that motion transmitted through bar 194 will produce a rocking motion to arm 200 about its pivot point at 201.

The end of arm 200 remote from its connection with link 202 is bent to form an anvil or lug 204 which normally lies in a plane slightly above roller 148 of the earlier described clamp-shear unit. Lug 204 is arranged to rock downwardly in response to counterclockwise motion of arm 200 (FIG. 5) to strike roller 148, thereby rocking arm 146 in between portions 140', 142' (FIG. 7) of fingers 140, 142. It will be recalled that the yarn has been said to pass into the notch defined by the finger portions as the supply strand is traversed toward the apical end of the bobbin. Thus, upon lug 204 striking roller 148 the yarn is first clamped between arm 146 and the broader clamp portion 140'. Continued counterclockwise motion of arm 146 causes the yarn to be sheared between the arm and shear portion 142'. Thereafter the supply yarn continues to be clamped by portion 140' in cooperation with arm 146 until the arm is once again rocked clockwise, as viewed in FIG. 10.

It will be appreciated that, while each unit may employ a plurality of clamp-shear units supported on yarn supporting bracket 110, yet but one lug 204 is required to operate each of those units. This results from the motion of the bracket 110 being rocked to present a given supply yarn to the yarn carrier. As a concomitant to this movement the roller 148 of the clamp-shear unit holding the given supply yarn is positioned in alignment with the lug 204.

Advantageously, the present invention includes a yarn clearer system for removing a waste end of yarn between the bobbin and the clamp-shear unit. By way of example, the commonly assigned U.S. patent application Serial No. 297,594 filed July 25, 1963, discloses and claims means for severing the yarn at the bobbin. It follows that when the yarn is severed at the bobbin and is also cut at the clamp-shear unit a waste end is produced therebetween. It is desirable that this end be removed. Alternatively, it may be desired to simply hold the end of yarn attached to the bobbin away from the main body of yarn windings for readily locating this end.

Thus, with further reference to FIGS. 1 and 5 the cam 36 which is rotatable with cycling cam shaft 70 has a valve aligned therewith, this valve being suitably mounted within casing 20 as by a bracket affixed to the floor thereof, such mounting not being illustrated herein. Valve 210 includes a stem 212 situated to ride on the edge of plate cam 36. A spring 214 biases the stem 212 against the cam and thereby acts to maintain the valve in a normally closed state. One side of valve 210 is connected to a suitable pressure source through tube 216. The other side or "downstream" side of the valve is provided with a flexible coupling 218 connected with a rigid tube 220 leading outside of casing 20. Tube 220 connects into a port in a further tube 222 having an aperture therein at 224 in alignment with the path of the supply yarn as its winding onto bobbin B is completed. The aperture 224 (FIGS. 1, 5 and 11) is rearwardly of the connecting port so that a negative pressure is produced in the operative zone of the aperture when air pressure is applied through tube 220. At the end of the winding cycle shaft 70 is rotated to cause cam 36 to momentarily depress stem 212 thereby providing air pressure through tubes 220 and 222. At this time the supply yarn is cut at the clamp-shear unit and, possibly, at the bobbin. The free yarn end therebetween or the end attached to the bobbin is drawn into aperture 224 by virtue of the negative pressure produced thereat and this yarn is carried into tube 222. Obviously, the operation of aperture 224 can be inactivated if desired as by shutting off the air supply to valve 210.

In the patent application referred to there is fully disclosed automatic increment feed mechanism. It is also described in that application the desirability of automatically positioning the increment feed means for each given supply yarn in cooperation with the selection of a given supply yarn to be wound. The present invention incorporates improved mechanism for automatically setting the increment feed. Viewing FIGS. 1 and 2 the increment feed adjusting screws 230 are threaded at spaced intervals, through a mounting plate 232. It will be appreciated that these adjusting screws operated with increment feed lever means in the same fashion as described in the apparatus of the patent application. Plate 232 is rotatably supported in its mid-section on a pivot 234 embedded in bracket 42. The distal or rear end of plate 232 is connected with a rotatable link 236, the remote end of this link being rotatable on a stud passing through the upper end of an upright lever 238. In turn, lever 238 is securely attached at its lower end to connecting rod 168. A guide plate 240 extends outwardly from the inner rear wall of casing 20 and is suitably slotted to accommodate lever 238. It will be appreciated that as connecting rod 168 is actuated by cam 32 as hereinbefore described lever 238

will swing plate **232** about pivot **234** to properly locate the appropriate screw **230** in operative position for coaction with the increment lever means.

The manner of operation of the structure of the invention will be reasonably apparent from the detailed description thus far given. However, a brief general description of the over-all operation of the apparatus will now be given.

Preliminary to winding bobbins from the various supply yarns these supply yarns are drawn from suitable supply sources and each is individually threaded through tension discs **128** and **128'**, beneath drop wire tension element **130**, through yarn guides **131** and **126**, to be clamped between its respective clamp arm **146** and clamp portion **140'**.

Now, as in the case of the mechanism of the patent application referred to a fresh denuded bobbin is positioned between chucks **22** and **24** in response to rotation of cycling cam shaft **70**, through means of a one revolution clutch, the bobbin lying at rest or in a state of non-rotation at this time. Generally simultaneously therewith cam **32** coacts with roller **162** to push connecting rod **168** to the right, FIG. 3, causing yarn supporting bracket **110** to pivot clockwise about shaft **112**, when also viewed in FIG. 3. Such rightward motion causes notch **170** to be traversed below the several stops **123**, passing outwardly beyond all of the stops. As roller **162** rides down the lobe of cam **32** connecting rod **168** shifts to the left, FIG. 3, until one of the stops, depressed in response to a signal from the bobbin magazine as set forth in cited patent application, engages in notch **170**. This arrests the movement of connecting rod **168** and yarn supporting bracket **110** in such a position that the preselected yarn for the given bobbin compartment which set up the signal will be delivered by yarn carrier **80** to bobbin B for winding. Concurrently therewith, plate **232** is pivoted to locate the proper screw **230** to control the increment feed of the selected yarn.

The positioning of the given type of yarn, of course, takes place by virtue of these several yarns spanning the zone between their respective yarn guides **126** and clamp-shear units **136** on yarn supporting bracket **110**, and by reason of the movement of said yarn supporting bracket to dispose a selected one of these supply yarns in the path of yarn carrier **80**. It will be appreciated that the aforedescribed movement of yarn supporting bracket **110** may withdraw yarn from the source of the supply yarns. However, the individual drop wires **130** are free to rock downwardly on these yarns, thereby keeping the strands tensioned in the supporting bracket.

Continued rotation of cycling cam shaft **70** causes cam **30** to actuate cam follower arm **50** rearwardly, or clockwise (FIG. 4), about rod **46** thereby rotating shaft **66** through cable **54** to commence projecting yarn carrier **80** forwardly to deliver the selected supply yarn Y to the bobbin. In consequence thereof the supply yarn Y spanned between yarn guide **126** and shear clamp **136** and in the path of the yarn carrier slides up bill **96**. At the same time pin **98**, coacting with cam **106**, forces clamp **100** open so that the yarn Y slides thereunder. Pin **98** thereafter falls off the edge of cam **106** causing clamp to bear on the supply yarn. Sequentially thereafter, cam **94** depresses roller **150** to release the end of yarn gripped in the shear-clamp **136**. Yarn carrier **80** continues its forward rotary movement, the supply yarn Y being pulled along and lying against side plate **92**, yarn tail T representing the free portion between clamp **100** and shear-clamp unit **136** hanging freely from the carrier.

As the yarn carrier advances it lays the supply yarn in yarn guide **28** as in the case of the apparatus of the patent application, the yarn carrier thereafter passing over bobbin B whereupon the supply yarn is lead into cleat C thereon. At the end of the projecting stroke of the yarn carrier side plate **92** communicates with flap **186**, a portion of the supply yarn laying therebetween. As a further incident of the attainment of the end of the projecting stroke of yarn carrier hook **108** engages with finger **185** to open clamp **100** and release the yarn therefrom. However, it will be understood that coacting flap **186** and side plate **92** will suffice to yieldably hold the yarn end. Further, it will be understood that the free yarn tail T will hang loosely beyond the flap and side plate as seen in FIG. 1, the yarn carrier dwelling in its forward position momentarily to keep these last mentioned elements in contact. At this time cycling cam shaft **70** completes its movement and the parts are engaged to rotate bobbin B as with the mechanism of the patent application referred to. The supply yarn end is withdrawn from between flap **186** side plate **92** and is engaged by the cleat C of the bobbin, the free yarn tail serving to entwine with the cleats to insure engagement of the supply yarn thereon since the tensioned yarn alone may pull out from under the cleats. Yarn carrier **80** thereupon retreats to its inactive position under the force of spring **71**, the rotation of the cycling cam shaft **70** ceases, and yarn is wound onto the bobbin.

At the end of the winding cycle, cycling cam shaft is once again rotated in the manner as earlier related. In response thereto arm **146** which, it will be recalled, was rocked clockwise as shown in FIG. 7, to an open position is closed, the supply yarn now having migrated into the notch between the arm **146** and portions **140'**, **142'** as the yarn traversed toward the apical end of the bobbin during winding, as illustrated in FIG. 11. This closing action takes place in the first few degrees of rotation of shaft **70** as cam **34** is rotated to cause its lobe to swing follower arm counterclockwise about rod **46**, FIG. 5, and thereby thrust bar **194** to the right as seen in said FIG. 5. This causes lug **204** to strike roller **148**, swinging arm **146** counterclockwise, FIG. 7, first clamping yarn between arm **146** and the broader clamp portion **140'** and successively shearing the yarn between the arm and shear portion **142'**. Simultaneously therewith, valve **210** is operated to introduce pressurized air into tube **222** to suck the waste end, if there be one, or the end of yarn attached to the bobbin, in aperture **224**. The mechanism is thereupon ready for a further cycle upon receiving a signal from a bobbin compartment to actuate a stop **123**.

It will be appreciated that, in the event all the bobbin compartments of an associated magazine are full means are energized as in the apparatus of the patent application previously referred to for discontinuing the rotation of cycling cam shaft **70** until there is a vacancy in one of the compartments.

Since certain changes may be made in the above apparatus without departing from the scope of the invention herein involved, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative only, and not in a limiting sense.

What is claimed is:

1. In a machine for winding yarn onto a bobbin,

spindle means for rotatably supporting said bobbin,

a yarn carrier for delivering yarn to said bobbin for winding,

a yarn supporting bracket for holding a plurality of supply yarns in normal spaced relationship to said yarn carrier,

said carrier and said bracket being arranged for relative movement,

means for effecting said relative movement to selectively present a given one of said supply yarns held by said bracket for reception by said yarn carrier, and

means for operating said yarn carrier to deliver said given yarn to the bobbin for winding thereon.

2. Apparatus as set forth in claim 1 wherein said carrier includes a gripping member operable to engage the given supply yarn for delivery to said bobbin.

3. Apparatus as set forth in claim 2 wherein said means for operating said yarn carrier for delivering the given supply yarn to said bobbin includes a cam.

4. Apparatus as set forth in claim 3 wherein said cam is operable to advance said yarn carrier from a retracted position to a projected position proximate to said bobbin for delivering said given supply yarn thereon, and means for releasing said yarn from said gripping member at said projected position.

5. Apparatus as set forth in claim 4 wherein said cam includes a portion to permit said gripping member to dwell in said projected position until the given yarn is engaged with said bobbin for winding thereon.

6. Apparatus as set forth in claim 4 including a yarn engaging member located adjacent said yarn releasing means to yieldably hold said supply yarn released from said gripping member against said yarn carrier until the yarn is secured on said bobbin.

7. Apparatus as set forth in claim 4 including means for traversing yarn onto said bobbin, said given yarn being disposed in said traversing means as said yarn carrier advances to its projected position with the given yarn.

8. In a machine for winding yarn onto a bobbin,

spindle means for rotatably supporting said bobbin,

a yarn carrier for delivering yarn to said bobbin for winding,

a yarn scpporting bracket for holding a plurality of supply yarns in normal spaced relationship to said yarn carrier,

means for actuating said bracket to selectively present a given one of said supply yarns held thereby for reception by said yarn carrier, and

means for operating the yarn carrier to deliver said given yarn to the bobbin for winding thereon.

9. Apparatus as set forth in claim 8 wherein said carrier includes a gripping member operable to engage the given supply yarn for delivery to said bobbin.

10. Apparatus as set forth in claim 8 wherein said means for operating said yarn carrier includes a cam.

11. Apparatus as set forth in claim 10 wherein said cam is operable to advance said yarn carrier from a retracted position to a projected position proximate to said bobbin for delivering said given supply yarn thereon, and means for releasing said yarn from said gripping member at said projected position.

12. Apparatus as set forth in claim 11 wherein said cam includes a portion to permit said gripping member to dwell in said projected position until the given yarn is engaged with said bobbin for winding thereon.

13. Apparatus as set forth in claim 11 including a yarn engaging member located adjacent said yarn releasing means to yieldably hold said supply yarn released from said gripping member against said yarn carrier until the yarn is secured on said bobbin.

14. Apparatus as set forth in claim 11 including means for traversing yarn onto said bobbin, said given yarn being disposed in said traversing means as said yarn carrier advances to its projected position with the given yarn.

15. In a machine for winding yarn onto a bobbin,

a yarn carrier for delivering yarn to said bobbin for winding thereon,

a bracket for supporting different supply yarns in normal spaced relationship to said yarn carrier,

yarn clamping means associated with said bracket for holding the free end of each of said supply yarns,

means for actuating said bracket to selectively present a given one of said supply yarns supported thereby for reception by said yarn carrier,

means for operating said yarn carrier to deliver the given yarn to said bobbin for winding, and

means for operating said clamping means to release the given yarn held thereby after said yarn has been received by said yarn carrier.

16. Apparatus as set forth in claim 15 wherein said means for operating the clamping means includes a hook and a finger engageable therewith.

17. Apparatus as set forth in claim 15 wherein said clamping means includes severing means for cutting the given supply yarn after said bobbin has been wound.

18. Apparatus as set forth in claim 15 wherein said bracket includes yarn guide means spaced apart from said clamping means, said supply yarns when in said bracket being extended between the guide means and the clamping means to present a gripping portion therebetween, said yarn carrier being operable to receive the gripping portion of the given supply yarn for delivery to said bobbin.

19. Apparatus as set forth in claim 17 including suction means for collecting the yarn end between said severing means and said bobbin after the supply yarn has been cut.

20. Apparatus as set forth in claim 18 wherein said yarn carrier moves in a predetermined path to receive said given supply yarn intermediate said guide means and clamping means to thereby provide a free yarn tail at the forward end of the given supply yarn, means for releasing said yarn from said carrier proximate to said bobbin, and a yarn engaging member to engage and yieldably hold said supply yarn whereby said yarn tail may be engaged with said bobbin to commence winding of arm thereon.

21. Apparatus as set forth in claim 20 wherein said yarn carrier is operated by a cam, said cam including a portion to permit the gripping member to dwell proximate to said bobbin until said yarn is engaged thereon.

22. Apparatus as set forth in claim 20 including means for traversing yarn into said bobbin, said given yarn being disposed in said traversing means as said yarn carrier advances to its projected position with the given yarn.

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