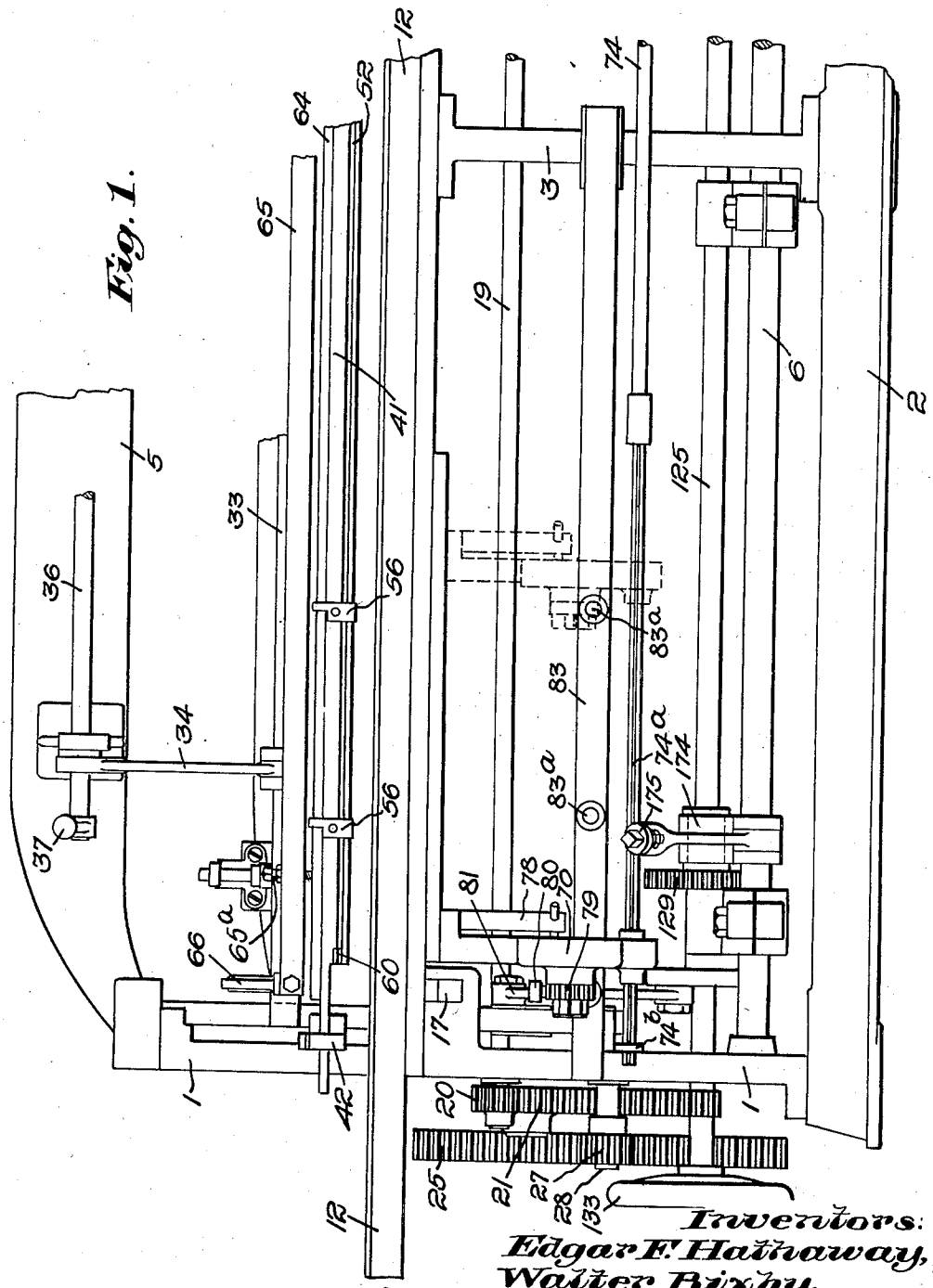
Dec. 3, 1935. E. F. HATHAWAY ET AL 2,022,858

MACHINE FOR AND METHOD OF PLACING TUFT YARNS

Filed Jan. 21, 1932 10 Sheets-Sheet 1

Fig. 1.



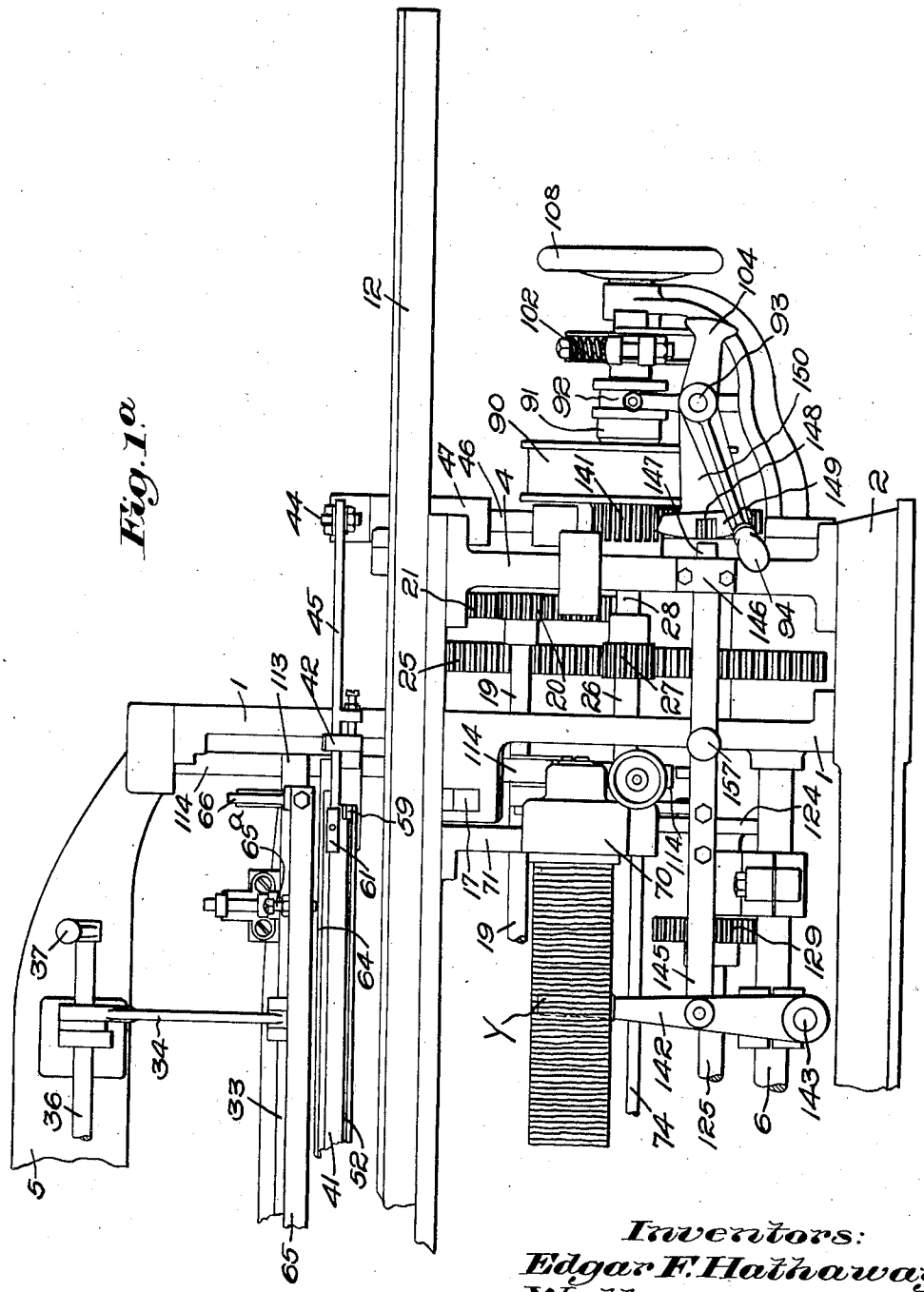
Inventors:
Edgar F. Hathaway,
Walter Bixby,
by Emery, Booth, Varney & Townsend Attys

Dec. 3, 1935. E. F. HATHAWAY ET AL 2,022,858

MACHINE FOR AND METHOD OF PLACING TUFT YARNS

Filed Jan. 21, 1932 10 Sheets-Sheet 2

Fig. 1a.



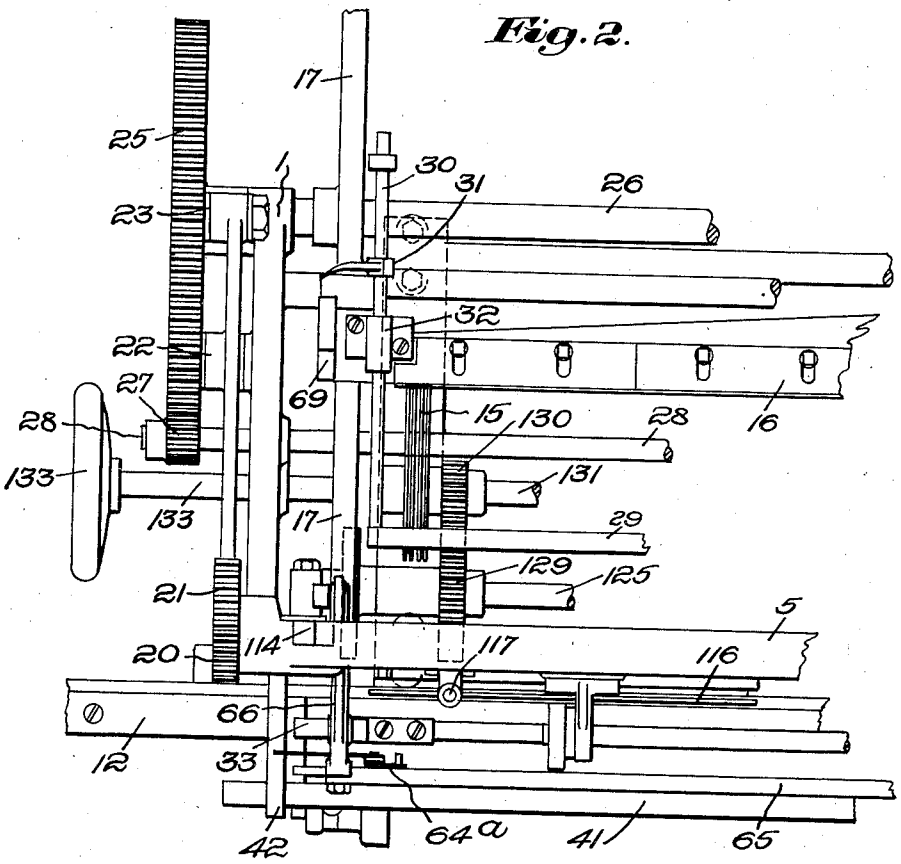
Inventors:
Edgar F. Hathaway,
Walter Bixby,
by Emery, Booth, Varney & Townsend
Attys

Dec. 3, 1935. E. F. HATHAWAY ET AL 2,022,858

MACHINE FOR AND METHOD OF PLACING TUFT YARNS

Filed Jan. 21, 1932 10 Sheets-Sheet 3

Fig. 2.



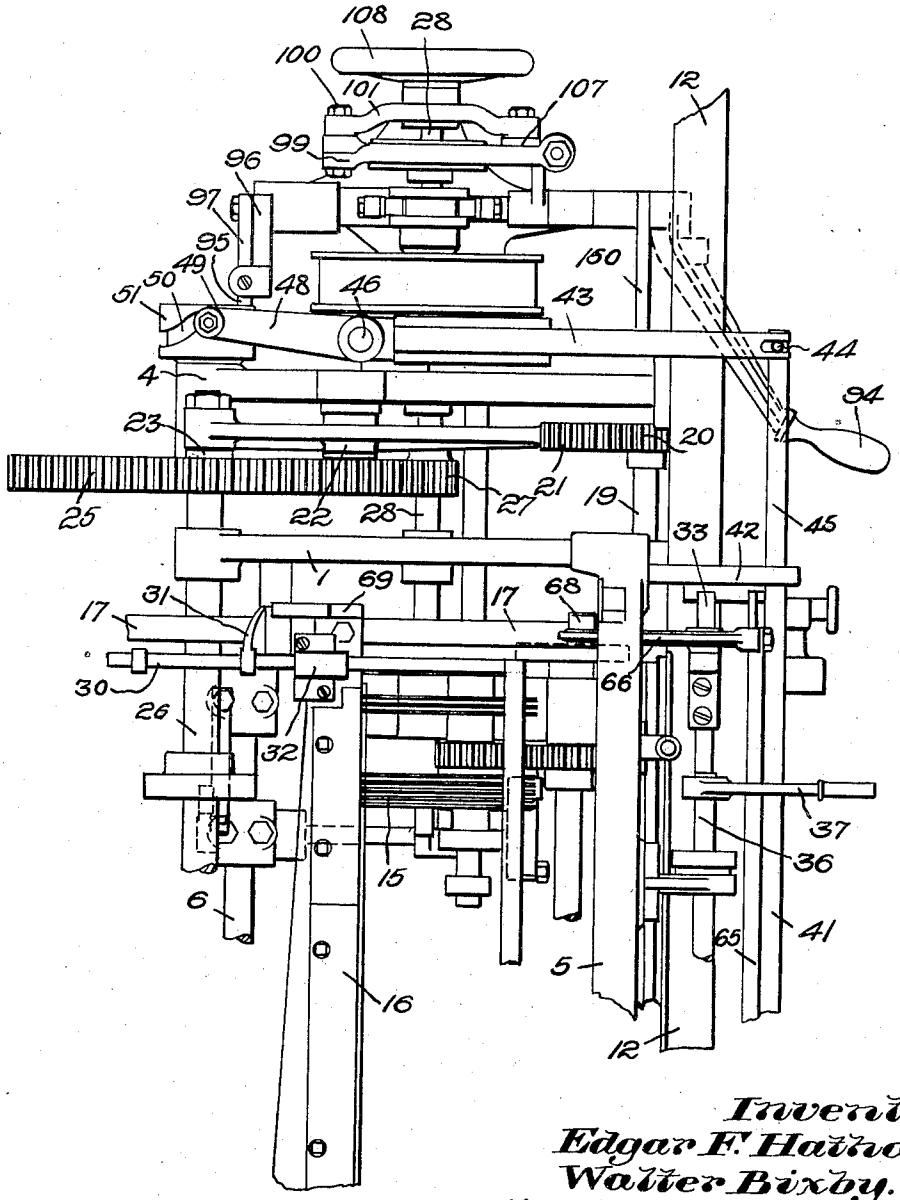
Inventors:
Edgar F. Hathaway,
Walter Bixby,
by Emery, Booth, Varney & Townsend
Attys

Dec. 3, 1935. E. F. HATHAWAY ET AL 2,022,858

MACHINE FOR AND METHOD OF PLACING TUFT YARNS

Filed Jan. 21, 1932 10 Sheets-Sheet 4

Fig. 2a



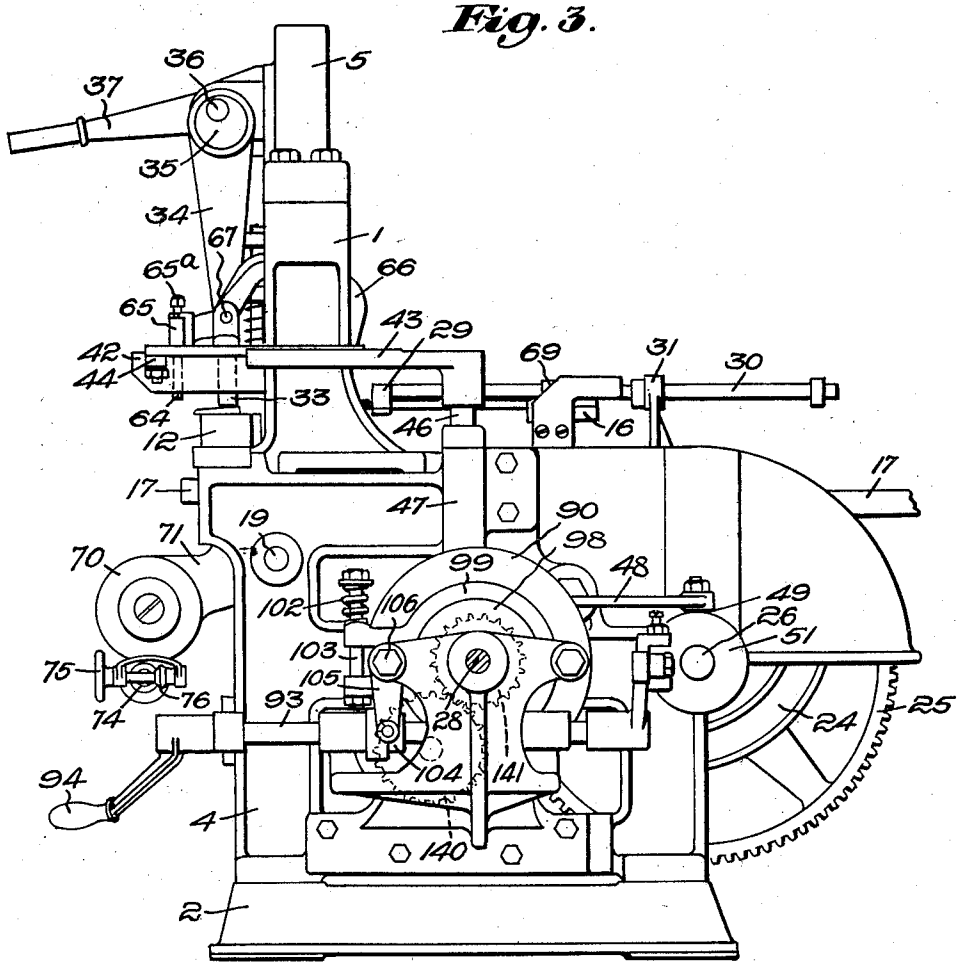
Inventors:
Edgar F. Hathaway.
Walter Bixby.
by Emery, Booth, Varney & Townsend
Attys

Dec. 3, 1935. E. F. HATHAWAY ET AL 2,022,858

MACHINE FOR AND METHOD OF PLACING TUFT YARNS

Filed Jan. 21, 1932 10 Sheets-Sheet 5

Fig. 3.



Inventors:
Edgar F. Hathaway,
Walter Bixby
by Emery, Booth, Varney & Townsend
Attys

Dec. 3, 1935. E. F. HATHAWAY ET AL 2,022,858

MACHINE FOR AND METHOD OF PLACING TUFT YARNS

Filed Jan. 21, 1932 10 Sheets-Sheet 6

Fig. 4.

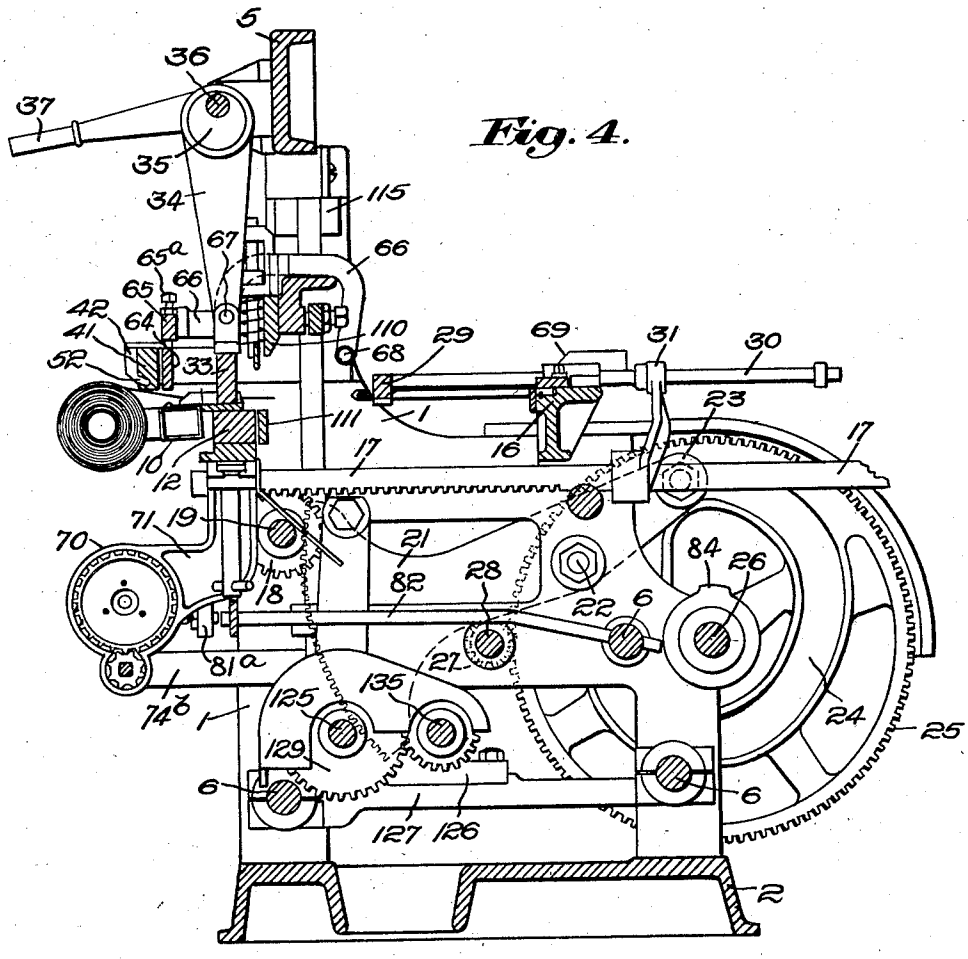
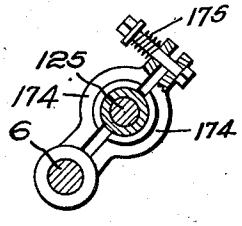


Fig. 4a.



Inventors:
Edgar F. Hathaway,
Walter Bixby,
by Emery, Booth, Varney & Townsend
Attys.

Dec. 3, 1935. E. F. HATHAWAY ET AL 2,022,858

MACHINE FOR AND METHOD OF PLACING TUFT YARNS

Filed Jan. 21, 1932 10 Sheets-Sheet 7

Fig. 5.

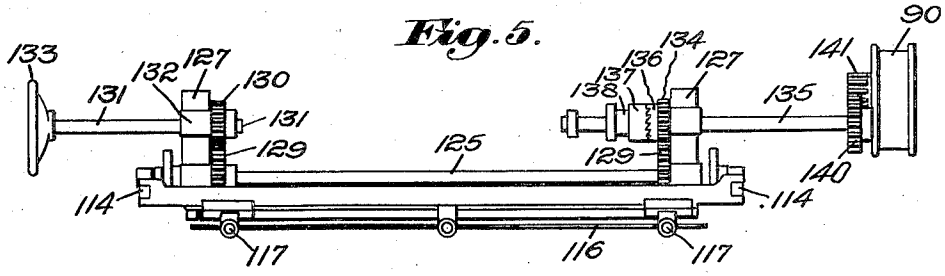


Fig. 6.

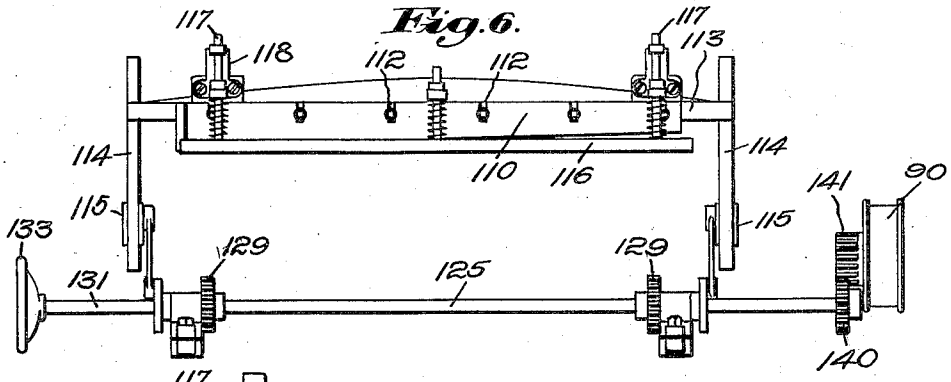


Fig. 7.

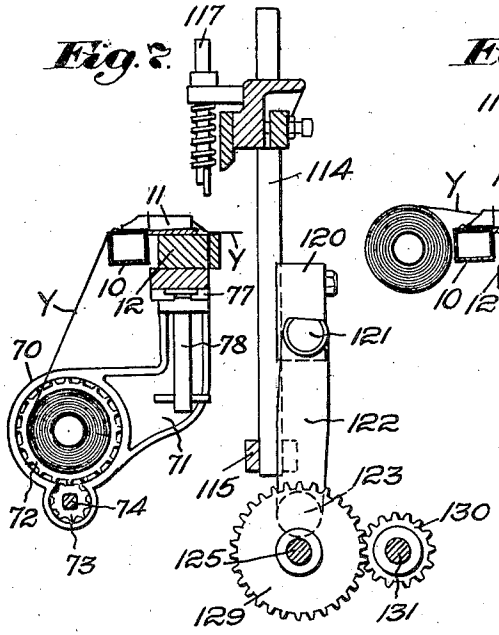


Fig. 8.

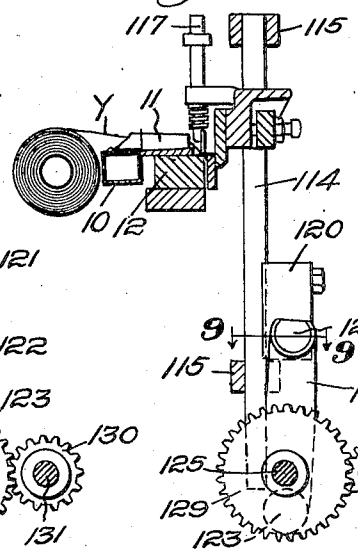
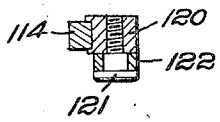


Fig. 9.



Inventors:
Edgar F. Hathaway,
Walter Bixby,
by Emery, Booth, Varney & Townsend
Attys.

Dec. 3, 1935. E. F. HATHAWAY ET AL 2,022,858

MACHINE FOR AND METHOD OF PLACING TUFT YARNS

Filed Jan. 21, 1932 10 Sheets-Sheet 8

Fig. 10.

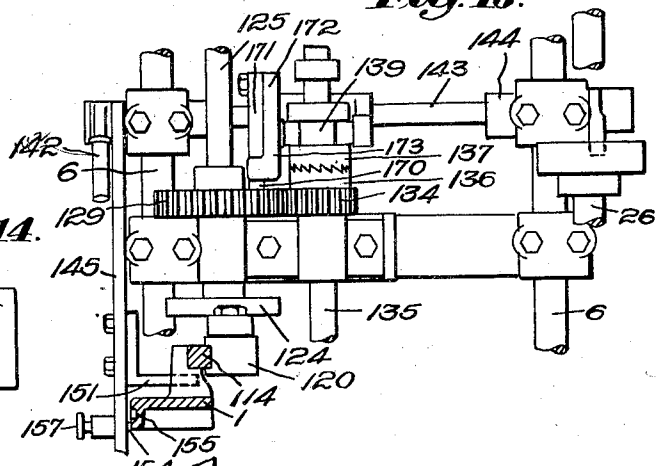


Fig. 13.

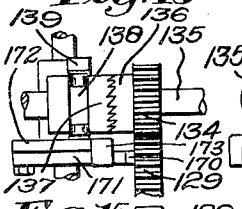


Fig. 14.

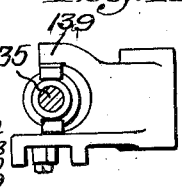


Fig. 15.

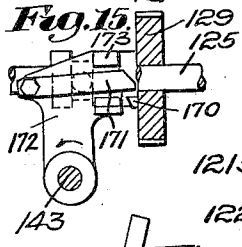


Fig. 12.

Fig. 11.

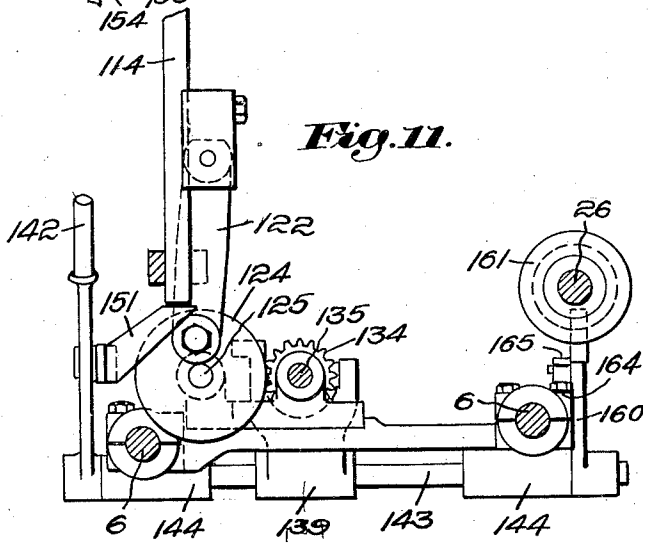


Fig. 16.

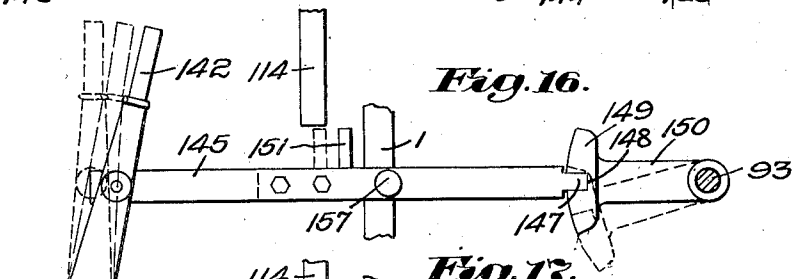
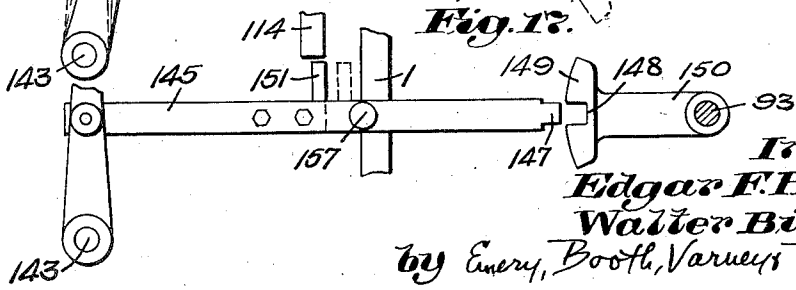


Fig. 17.



Inventors:
Edgar F. Hathaway,
Walter Bixby,
by Emery, Booth, Varney & Townsend Attys

MACHINE FOR AND METHOD OF PLACING TUFT YARNS

Filed Jan. 21, 1932 10 Sheets-Sheet 9

Fig. 21.

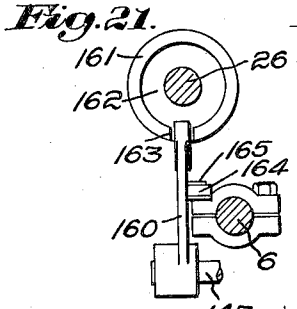


Fig. 22.

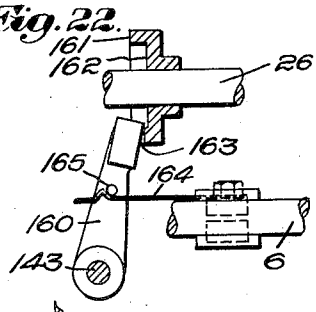


Fig. 18.

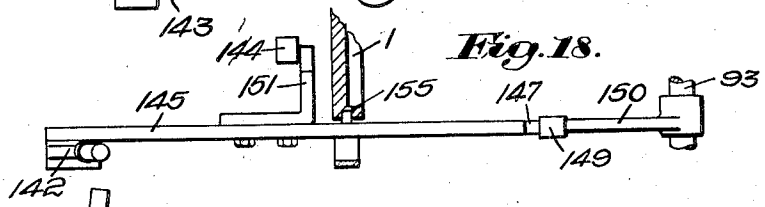


Fig. 19.

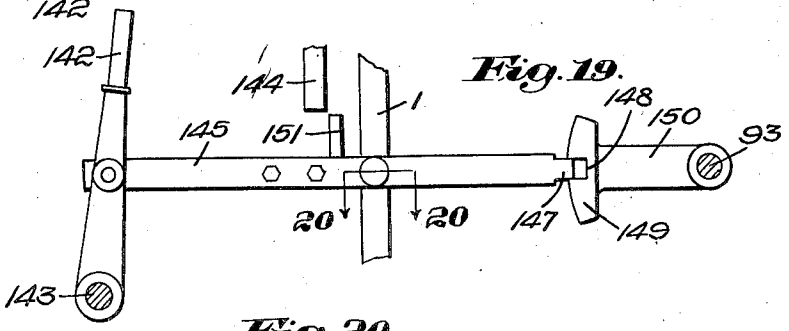
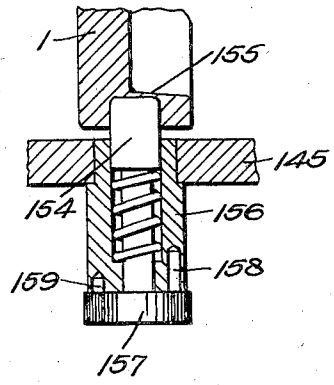


Fig. 20.



Inventors:
Edgar F. Hathaway,
Walter Bixby,
by Emery, Booth, Varney & Townsend
Attys

Dec. 3, 1935. E. F. HATHAWAY ET AL 2,022,858

MACHINE FOR AND METHOD OF PLACING TUFT YARNS

Filed Jan. 21, 1932 10 Sheets-Sheet 10

Fig. 23.

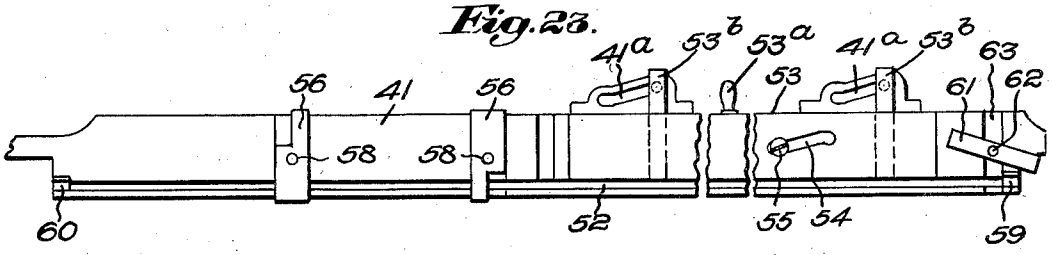


Fig. 24.

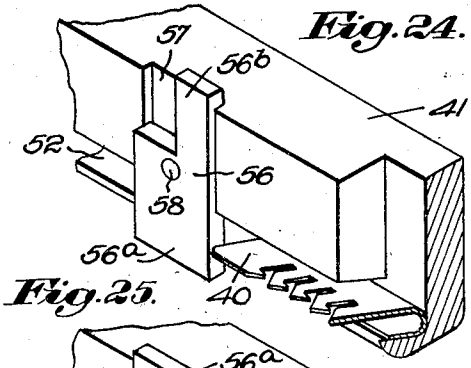
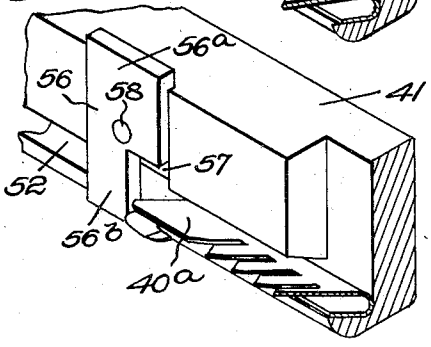


Fig. 25.



Inventors:
Edgar F. Hathaway,
Walter Bixby,
by Emery, Booth, Varney and Townsend
Attys

Patented Dec. 3, 1935

2,022,858

UNITED STATES PATENT OFFICE

2,022,858

MACHINE FOR AND METHOD OF PLACING TUFT YARNS

Edgar F. Hathaway, Wellesley, and Walter Bixby, Dorchester, Mass.

Application January 21, 1932, Serial No. 587,906

22 Claims. (Cl. 28—56)

Our present invention relates to the preparation of yarns, particularly tufting yarns, for use in Axminster and other looms, and aims to provide improved mechanism for and methods of placing the yarns or yarn units of a series in yarn carriers or so-called tube frames for such looms. In various respects our present invention constitutes an improvement upon prior methods and machines for the purpose stated, such, for example, as disclosed and claimed in our prior Patent No. 1,512,928, dated October 28, 1924.

In the drawings, illustrating by way of example one embodiment of the invention,

Fig. 1 is a front elevation of the left portion of the machine;

Fig. 1ª is a similar view of the right end of the machine;

Figs. 2 and 2ª are plan views of the left end and right end respectively of the machine of Figs. 1 and 1ª;

Fig. 3 is a right side or end view;

Fig. 4 is a vertical section substantially centrally through the machine of the preceding figures;

Fig. 4ª is an elevation of a brake for the yarn trimming mechanism;

Fig. 5 is a skeleton view upon a smaller scale, in plan, of the yarn cutting means and its drive;

Fig. 6 is a front elevation corresponding to Fig. 5;

Figs. 7 and 8 are vertical sections, with parts omitted, and upon a larger scale, of a portion of the cutting mechanism, in two different positions;

Fig. 9 is a section on the line 9—9 of Fig. 8 looking in the direction of the arrows;

Figs. 10, 11 and 12 are respectively a plan, an end view with parts in vertical section, and a front elevation of the drive for the yarn trimming means, together with certain interlocking devices therefor;

Figs. 13, 14 and 15 respectively are a plan, a vertical transverse section, and a vertical longitudinal section of a portion of the drive for the yarn trimming means as shown in Figs. 10 to 12;

Figs. 16, 17, 18 and 19 are views illustrating the clutch lever for the yarn trimming means, together with certain interlocking or safety devices, showing three different positions of the parts, Figs. 16, 17 and 19 being front elevations (compare Fig. 1ª), and Fig. 18 being a plan view corresponding to Fig. 19;

Fig. 20 is an enlarged detail sectional view substantially on the line 20—20 of Fig. 19;

Figs. 21 and 22 are respectively a vertical transverse section, looking from the left, and a longitudinal section, of a portion of the locking mechanism seen at the upper right part of Fig. 10;

Fig. 23 is a front elevation of the holder for the yarn end clamps or transfer combs; and

Figs. 24 and 25 are perspective views of a portion of the holder of Fig. 23, showing it as positioned for use with different types of clamps or combs.

Referring first to Figs. 1 to 4, the various parts are assembled upon a suitable frame, herein including the side frames 1, 1, the base 2, an intermediate upright 3, Fig. 1, and a supplemental end upright 4, Fig. 1ª. The side frames are connected by the top arch 5 and by suitable tie rods 6, 6, 6.

For the purposes of illustration, the invention is shown in connection with a yarn placing or "tubing" machine adapted to place or thread at one time the yarns of but a single spool, of any length up to the maximum. Various features of the invention, however, are also applicable to the threading of the yarns of a plurality of spools simultaneously, for example, as in our prior Patent No. 1,522,778, dated January 13, 1925. The apparatus and methods as herein disclosed are also useful for threading or placing yarns in the receiving spaces of yarn carriers or tube frames of various types, whether of the continuous-walled or true tube variety, or of the barrier or comb-like type, or of other form. In Figs. 7 and 8 we have shown a yarn carrier or tube frame 10 having a series of yarn receiving passages or tubes 11, such carrier or tube frame, however, being illustrated merely by way of example.

Referring again to Figs. 1 to 4, the machine has along its front portion an elongated support or platform 12, of a length to receive the longest yarn carrier or tube frame, for example, one capable of holding a series of three or more spools as employed for "wide" work. The yarn carrier to be threaded is adapted to be shifted along this support 12 to present various sections thereof for threading.

Suitable instrumentalities for placing the yarns are provided, in this instance including a bank of reciprocable needles 15, several of which are seen in Figs. 2 and 2ª, at the opposite ends of the series. The general construction and arrangement of these needles may be similar to that of our said prior Patent 1,512,928. They are preferably individually removably mounted at their rear ends upon a needle bar 16, Figs. 3

and 4, carried at its opposite ends on rack bars 17. These rack bars are adapted to be moved forwardly and rearwardly to advance and retract the needles for engagement and placing the series of yarns.

The needle drive mechanism herein includes the gears, 18, Fig. 4, respectively meshing with the rack bars 17, and fast on the shaft 19. On the same shaft are pinions 20, each engaged by a segment lever 21, best seen in Fig. 4, supported for rocking movement as at 22 upon the adjacent frame. These segment levers have cam rolls 23 at their rear ends running in the cam paths 24, Figs. 3 and 4, of large cam gears 25 on the needle cam shaft 26. Each cam gear 25 is driven by a pinion 27 on the needle drive shaft 28.

The needles are preferably provided with a traveling guide 29 to keep their front ends in proper line during approach toward and withdrawal from the supported yarn carrier. This guide is carried by guide rods 30 slidably supported in stands 31 on the rack bar 17 and in guides 32 on the needle bar, in a manner permitting it to move with the needles during the first part of their advance but allowing the needles then to travel beyond and relatively to it, for example, as in our said Patent 1,512,928.

A yarn carrier to be threaded is positioned upon its support 12, as seen in Fig. 4 and also in Figs. 7 and 8. It is releasably held in this threading position by suitable means, herein including a carrier clamp bar 33 having a notched lower edge adapted to seat down over the yarn spacing members or tubes of the carrier. This carrier clamp is attached to the lower ends of clamp arms 34 having their upper ends received on adjustable eccentrics 35 on a shaft 36 rockably supported in suitable bearings on the top arch 5. By turning the shaft 36, as by means of one of the hand levers 37 at its ends or at any convenient intermediate point, the arms 34 are moved to raise or lower the carrier clamp 33, to clamp or release a carrier. As seen in Figs. 2 and 2a, the ends in the forwardly extending brackets 42 are referred to below.

Preparatory to the threading or tubing operations to be performed by the machine of our present invention, the yarns are wound upon each spool in a suitable spooling machine or so-called set-frame. In connection with the winding, the free ends of yarns are positioned in a transfer comb or yarn-end clamp, two different forms of which, numbered 40 and 40a respectively, are seen in Figs. 24 and 25. The clamp 40 of Fig. 24 is of a barbed tooth type which retains the yarns without applying a cap or other retainer, while the clamp 40a of Fig. 25 is of a straight tooth type, with which a cap (not shown) is employed to hold yarns against displacement in the direction of the teeth.

Means is provided on the machine, in accordance with our invention, for supporting these yarn end clamps or combs, of different types, to align the series of yarns with the passages of the yarn carrier and to present them in proper spaced relation for engagement by the needles. For this purpose we herein employ a comb or clamp holder 41, one end of which is seen in Fig. 3 and which appears in section in Fig. 4 and in detail in front elevation in Fig. 23. This holder is supported for longitudinal sliding movement in brackets 42 extending forwardly from the side frames 1. Any suitable means may be provided for shifting this holder lengthwise to lay the yarn across the needles after they have been advanced through the tubes or other passages of the carrier. As seen at the right in Fig. 1a, and also in Figs. 2a and 3, said means includes an adjustable-length arm 43 pivoted at its front end, as at 44, Fig. 1a, to an extension 45 of the clamp holder. Said arm 43 is fast upon a short vertical shaft 46, Figs. 1a, 2a and 3, having a bearing on the adjacent side frame 1 as at 47. A cam lever 48 is secured to the lower end of said vertical shaft 46 and carries at its rear end a follower 49 received in the cam path 50 of a drum cam 51 on the needle cam shaft 26 previously mentioned.

As stated, the clamp or comb holder 41, in accordance with our present invention, is adapted to cooperate with combs or clamps of various types, two of which are shown in Figs. 24 and 25. Moreover, this holder is also formed to receive the combs or clamps for spools of different lengths, for example, so-called three-quarter, four-quarter, six-quarter or other spools, the term "quarter" referring to quarters of yards. The holder accordingly is provided with a groove or seat 52 in its front face, see also Fig. 4, of a length to receive a comb or clamp of maximum length. The comb is set into this seat with its teeth extending forwardly, substantially as seen in Figs. 24 and 25. A comb is held in position in this seat as by means of a sliding lock bar 53 at the front face of the holder 41 and vertically movable thereon as by means of inclined cam slots one of which is seen at 54, Fig. 23, engaging with studs 55 on the holder. When the lock bar 53 is moved lengthwise, to the left in Fig. 23, as by the hand lever 53a attached to it, the cam slots lift it, to permit insertion of a yarn clamp, of whatever length or type. Reverse movement of the lock bar causes it to descend into holding relation with an inserted clamp. Other guides or stops 53b may be provided, which are vertically movable in slots at the back of the lock bar 53 and are caused to move vertically reversely to the latter by engagement with cam slots 41a on the clamp holder 41.

From a comparison of the clamps or transfer combs 40 and 40a of Figs. 24 and 25, it will be noted that the nontoothed end portion of the clamp 40 is longer than the corresponding portion of the clamp 40a. It is important, however, that either clamp be so positioned as to bring the spaces between its teeth into line with the series of needles. Accordingly we have provided adjustable stops or positioners, each herein comprising a block 56 received in a slot 57 at the front face of the clamp holder 41 and variably held on it, as by means of a removable pin or spring plunger 58, so that the block may be drawn out of its slot 57 and inverted, to position it with its wide portion 56a at the bottom, as in Fig. 24, or with its narrow portion 56b in said position, as in Fig. 25.

As seen in Fig. 23, one such adjustable positioner 56 is provided for the left end of a three-quarter clamp, whether of the barbed or straight toothed type, and a similar adjustable positioner is provided for the left end of a four-quarter clamp. The right end of either a three-quarter or a four-quarter clamp, of either type, is accurately positioned against a fixed stop 59, at the right end of the holder. Thus the latter accommodates either three-quarter or four-quarter clamps, both of the barbed and of the straight-toothed type, and automatically aligns their spaces with the needles. If the clamp is of the barbed-tooth type as in Fig. 24, the appropriate adjustable stop 56 is disposed as in said figure, with its

wider portion 56a down. If the clamp, whether of three-quarter or four-quarter length, is of the straight-toothed type as in Fig. 25, the appropriate adjustable positioner 56 is correspondingly disposed, with its narrower end 56b in down position, as in Fig. 25.

For a maximum length or six-quarter clamp we provide the fixed stop 60 for its left end, Fig. 23, which is so spaced from the fixed stop 59 at the right end of the holder as to receive and properly align a straight-toothed type of clamp of that length. For a six-quarter clamp of the barbed-toothed type we employ a special positioner 61 supported as at 62 in a similar manner as the previously decribed positioners 56, said stop 61 adapted to be received in a slot 63. When said positioner 61 is disposed in its slot the holder is arranged for proper positioning reception of a maximum length or six-quarter clamp of the straight-toothed type, which will then be located in the desired alignment, between said positioner 61 and the left-hand fixed stop 60. It will be understood that the clamp lengths referred to are given as examples, and that various other lengths might be similarly handled. The described clamp holder 41, seat 52 and holding bar 53, together with the positioners 56, also provide for supporting any of the clamps mentioned either with their teeth up, as in Figs. 24 and 25, or with the clamps inverted, so that the teeth are down, as may be desirable in connection with reversing the pattern arrangement of the yarns.

Referring again to Figs. 1 to 4 and particularly Fig. 4, the needles desirably are guided as they emerge forwardly through the spacers or tubes of a positioned yarn carrier, between the outer ends of the latter and the supported series of yarns. Herein we have shown for this purpose a front needle-guide bar 64 having its lower end notched to provide guide passages for the needles. It is normally held up by suitable spring means 64a, Fig. 2, and is vertically movable in guides in the brackets 42 at its opposite ends. At the proper time it is depressed to bring it down into guiding relation with the advancing needles, as by means of a rocker bar 65 carrying adjustable studs 65a for down engagement with the guide bar 64 and itself fixed on rocker levers 66 pivoted as at 67 on the carrier clamp 33 already described. These rocker levers have cam rolls 68, Figs. 2, 2a and 4 at their rear ends for engagement by cams 69 on the needle bar 16. As the needles move forward said cams 69 elevate the rear ends of the rocker arms causing them to depress the front needle guide bar 64 into the path of the needles for guiding relation with them as they advance through the sheet or series of yarns whose ends are held in the transfer comb or clamp then in the clamp holder 41.

Prior to and during the threading or laying-in operation the spool on which the yarns are wound is rotatably supported in suitable spool holders upon the machine, the yarn ends to be engaged by the needles then extending upwardly to the transfer comb or clamp held in the clamp holder 41 as described. In Fig. 7 a yarn spool is seen in said position in the spool holders of the machine, but in said figure the yarns have been drawn into the tubes or guide passages of the yarn carrier 10. After a threading operation the needles automatically come to rest in their retracted position, and the spool is taken from the spool holders of the machine and placed in the spool brackets directly upon the yarn carrier or tube frame 10, in the position as in Fig. 8, to be referred to later in connection with the yarn trimming means.

The spool holding means of the machine include oppositely disposed holders 70 for the respective ends of a spool whose yarns are to be threaded. In order to accommodate spools of different lengths, one or both of these spool holders may be adjustably mounted upon the machine. The construction of these holders may be generally similar to those of our prior Patent 1,512,928. Each is supported by a bracket 71 depending from the yarn carrier platform 12. The end of a spool is received in a gear-toothed cup 72 rotatable in each holder, see Figs. 4 and 7, suitable means being provided for holding the spool against rotation with respect to the cup. The cups of the two holders are retained in the same angular position with respect to each other, and may be turned in unison, as by means of the pinions 73 on a shaft 74 extending the length of the machine. At one end of said shaft, herein the right, see Fig. 3, is a hand wheel 75 connected to the shaft as by the miter gears 76, whereby a supported spool may be turned manually to take up or let off the yarns.

In the present instance the spool holder at the left of the machine, see Fig. 1, is variably positionable lengthwise the machine to accommodate the spools of different lengths. In said figure this left-end holder is set for a spool of substantially maximum length, for example a six-quarter spool, as indicated in full lines, while one position for cooperation with a shorter length spool is shown in dotted lines. The upper end of its supporting bracket 71 is slidably associated with the yarn carrier support 12, see Figs. 4 and 7, as by means of a gib 77 and a binder screw 78 for securing it in various adjusted positions. The left portion of the spool holder shaft 74 has a groove 74a for a key on the pinion 73 of the left spool holder, accommodating the pinion to the various adjusted positions of the holder. The shaft 74 has bearing support at its left end in an arm 74b extending forwardly from the adjacent side frame 1.

In association with one or the other of the spool holders, herein that at the left of the machine, we provide means for normally holding the spool supporting cups against rotation but adapted to release them so that the yarns may be drawn off by the needles at the proper time. As herein illustrated, see particularly Fig. 1, this means includes a ratchet wheel 79 coaxial and fast with the spool cup of this left holder and cooperating with a pawl 80 on the forward arm of a bell crank 81 on the holder. The lower end of the rear arm of said bell crank is seen at 81a in Fig. 4. For automatically releasing the pawl, to allow the yarns to unwind as the needles retract, we provide a push rod 82, Fig. 4, the front end of which is slidably supported in a bar 83 extending across the front of the machine between the left side frame 1 and the intermediate upright 3. At its rear end this push rod is movably supported as by the adjacent tie rod 6, with its end in the path of a cam 84 on the needle cam shaft 26. This cam is timed to move the push rod 82 forwardly to release the pawl 80 when the needles move back, taking the yarns with them. The cam 84 is adjustable along said cam shaft, or a series of similar cams may be provided at the proper points, to cooperate with the various adjusted positions of the left spool holder 70, and the push rod bearing bar 83 is formed with a series of bearings 83a

for a like purpose, as is also the tie rod 6 at the rear of the push rod.

Referring now to Figs. 1a, 2a and 3, power is applied to the needle drive shaft 28 as by means of a drive pulley 90 which may be of the expanding clutch type substantially as in our previous patent referred to. A suitable expanding member 91 slides on the shaft adjacent the pulley, for clutching or releasing the latter. This expanding member is movable lengthwise the shaft by the yoke 92 connected to a rockable shipper shaft 93 having a shipper lever 94 at its front end, by which the application of power to the drive shaft 28 may be manually controlled.

Upon completion of each drawing-in operation the needles are automatically halted, preferably in their fully retracted or rear position, after having placed and dropped the yarn ends. This is herein effected by means of a stop 95, Fig. 2a projecting laterally from the adjacent face of the cam 51. On the rear end of the shipper shaft 93 is an arm 96 carrying an adjustable catch 97 which, when the shipper handle is moved to throw in the needle clutch, is brought into the path of the stop 95. The stop is so positioned and timed with respect to the other parts that as the needles come back to their rear position, it engages and lifts the catch 97 and the arm 96, thus rocking the shipper shaft reversely and releasing the clutch.

To insure that the parts are brought quickly to rest without over-running, the drive shaft 28 is provided with a brake drum encircled by a pair of brake shoes 99 pivotally supported for movement toward and away from each other as at 100 upon a bracket 101 mounted on the adjacent end upright 4. A spring 102, Figs. 1a and 3, on a post 103 attached to the lower brake shoe tends to bring the shoes together, into braking relation with the drum 98. The brake shoes are spread to release the brake, when the shipper lever 94 is moved to throw in the clutch, by a brake cam 104, Figs. 1a and 3, on the shipper shaft cooperable with a finger 105 pivoted as at 106 upon the brake shoe bracket 101. Said finger carries an expander block 107, Fig. 2a, lying between the front portions of the brake shoes. Turning of the expander block spreads the shoes, or releases them for application of the brake under action of the spring 102. Thus the brake is released when the shipper lever is moved to throw in the clutch, and is automatically applied when the clutch is subsequently thrown out, whether by action of the stop 95 or manually. The drive shaft desirably is provided with a hand wheel 108, Figs. 1a and 2a, whereby the needle mechanism may be operated manually.

The mechanism so far described includes the threading instrumentalities or needles and their operating means, the provisions for holding the transfer comb and yarns in position for engagement by the needles, and the spool holders upon the machine. If the yarn carrier or tube frame to be threaded is arranged to carry more than one spool, it is understood that such carrier is positioned upon its support 12 on the machine, aligning with the needles that section of the yarn passages or tubes which is to be threaded. The carrier is held in that position by lowering the carrier clamp 33, controlled by the hand levers 37. The transfer comb or yarn-end clamp, of whatever type or length, is properly positioned in the comb holder 41, and the spool itself is placed in the spool holders 70. The machine is then started by throwing the shipper lever 94, causing the needles to advance through the supported series of yarns, which are then engaged with the needles by the automatic shifting of the comb holder 41 lengthwise the machine, whereupon the needles retract, drawing the yarns into and leaving them in the passages or tubes of the yarn carrier, as seen in Fig. 7. The needles herein preferably continue to retract, until they are completely disengaged from the yarns and reach their full rear or rest position, whereupon the machine is automatically stopped. The yarn spool is then taken out of the spool holders of the machine and set up onto the carrier or tube frame, into the position indicated in Fig. 8. The actual threading or laying-in of the yarn is now complete, but it remains to even or trim the yarn ends so that all project equally.

In accordance with our invention and the method thereof we provide for trimming the yarn ends while the yarn carrier remains upon the machine but as a distinct and separately controllable operation and which may be effected either by power or manually, at the will of the operator, and which may be repeated any number of times desired, without moving the needles between each such trimming operation. Further, the arrangement as illustrated is such that the yarns of each spool may be trimmed following their threading, the carrier then shifted and another spool threaded and its yarns trimmed, also as a separately controllable operation, and so on for the entire series of three or more spools, whereupon the carrier may be shifted along its support and any of the yarn ends can be retrimmed, the needles remaining at rest. Such retrimming may include some of the yarns of one spool and others of the next adjacent spool. To this end we have provided novel trimming mechanism and actuating means therefor, independently controllable, and either manually or power operable, at the will of the operator, together with interlocking and safety mechanism intermediate the trimming means and the needle mechanism previously described.

Referring particularly to Fig. 4, the trimming mechanism includes an adjustably mounted movable shear blade or knife 110, seen in section in said figure and adapted to cooperate with a fixed element or bar 111 to sever the entire series of yarns. As best seen in Fig. 6, the knife 110 is adjustably mounted as by the slot and bolt connections 112 upon a knife bar 113 carried at its opposite ends by vertical slides 114 having upper and lower bearings 115 on the adjacent side frames 1. By the means to be described the slides are reciprocated vertically to operate the knife 110 at the desired time.

Associated with the knife bar is a clamping bar 116, in advance of the knife and which is adapted to be brought down onto the series of yarns, between the yarn carrier and the blade, to hold the yarn ends while they are being severed. This clamping bar is attached to studs 117 guided in brackets 118 on the knife bar. Springs 119 between the clamping bar and the brackets yieldably urge it downwardly. As the knife bar descends the clamping bar 116 first comes into holding engagement with the yarns, but the described yieldable mounting of the clamping bar allows the knife to continue downwardly to complete the cutting operation.

As herein illustrated, each knife slide 114 has adjustably secured to it a block 120, see particularly Figs. 7, 8 and 9, to which is pivoted, as at 121, the upper end of a link 122 the lower end of

which is pivoted on a stud 123 upon a crank plate 124; see also Fig. 10. Similar crank plates are provided for the two knife slides, each being fixed on a crank shaft 125 extending lengthwise the machine and journaled in bearing blocks 126 supported on hangers 127, 127 extending across between the front and rear lower tie rods 6; see Fig. 4.

The crank shaft 125 has fast upon it, near its respective ends, the gears 129. The gear 129 at the left of the machine, see Fig. 5, meshes with a pinion 130 on a short shaft 131 journaled on the adjacent hanger 127, as at 132, and extending outwardly beyond the side frame, where it is provided with the hand wheel 133 for operating the knife manually.

The gear 129 at the other end of this crank shaft 125 meshes with a gear 134 loose on a clutch shaft 135 having a bearing on the block 126 of the adjacent hanger 127. The gear 134, see also Figs. 10–14, has secured to its inner face one element 136 of a clutch, the other element 137 of which is slidably splined on said clutch shaft and has an annular recess 138 receiving a yoke 139 by means of which the clutch may be moved into and out of clutching relation.

The clutch shaft 135 extends outwardly, to the right, beyond the right end frame 1 and the supplemental end upright 4, and carries at its outer end a gear 140, Figs. 5 and 6, meshing with a relatively large gear 141 on the hub of the drive pulley 90.

It will be seen that the clutch shaft 135 is continuously driven but that the knife mechanism will be operated only when the clutch elements 136, 137 are interengaged, since otherwise the gear 134 remains at rest. The clutch 136, 137 is controlled by a hand lever or knife clutch lever 142, Figs. 1ª and 16 to 20, which is fast on the front end of a control shaft 143 supported for rocking movement in bearings 144, Fig. 11, hung on the front and rear tie rods 6. The clutch yoke 139 is connected to said control shaft 143 so that by rocking the latter the clutch element 137 may be shifted to throw in or to release the knife clutch.

From the foregoing it will be seen that the threading means and its drive connections constitute in effect one operative unit and that the knife or severing means and its drive are in effect a second operating unit, independently controllable. Moreover, this second unit, namely the knife mechanism, may be operated either manually or by power, as the threading means also may be, and each unit may be operated through one cycle or any desired number of successive cycles, without disturbing the other. Further in accordance with our invention the control of these units is so interrelated that during operation of the threading means or whenever the needles are out of their normal rearward or rest position, the cutting means is locked against actuation and in non-interfering relation. Also the construction and arrangement herein are such that, conversely, during power operation of the cutting means the threading unit is locked and can subsequently be operated only upon completion of the cutting operation and return of the knife and its operating parts to their normal or rest position. In addition provision is also desirably made to prevent application of power either to the cutting unit or the threading unit when the knife is being operated by hand, together with other safety provisions which will be apparent from the following description. In other words, the machine, with its selectively operable yarn placing and yarn trimming means, is rendered substantially fool-proof.

With these objects in mind, it will be noted first, by reference to Figs. 1*a* and 11, that the knife clutch lever 142 lies behind a spool when the latter is mounted in the spool holder 70 of the machine. Hence it is substantially impracticable for the operator to reach the knife clutch lever 142 to apply power to the knife operating mechanism so long as there is a spool in the holders. It is desirable that, after threading, the spool be removed from the holders 70 and placed in the spool brackets of the yarn carrier, the slack taken up and the spool clamped, for if the yarns were to be trimmed before so transferring the spool, the evenness of the yarn ends would very likely be disturbed. Accordingly the described position and arranngement of the knife clutch lever 142 at the level of and behind a spool in the holders 70 substantially make it necessary to complete this transfer of the spool before power can be applied to the knife.

The knife clutch lever 142 has pivotally attached to it, see Figs. 1*a* and 12 to 20, a locking bar 145, the other end of which is slidably supported as at 146 upon the supplemental end frame 4. At the end of the lock bar is a finger 147 which is adapted to be moved into or out of engagement with a notch 148 in the face of a segment 149 in an arm 150 fast on the shipper shaft 93 for the needle mechanism. In Fig. 1ª the various parts are in their rest position, both the needle clutch and the knife clutch being released. If now the shipper handle 94 is depressed to throw in the needle clutch, the arm 150 and its segment 149 will similarly be moved down, carrying the notch 148 out of alignment with the lock bar 145 and bringing the head of the arm 150 into the path of the latter. It is then impossible to move the knife clutch lever 142 to throw in the knife clutch, and it cannot be so moved until the needle clutch has again been released. Conversely, if the knife clutch lever 142 has been swung to the right to operate the knife, which can take place only when the arm 150 is positioned as in Fig. 1ª, the shipper handle cannot be moved to throw in the needle clutch bcause the finger 147 of the locking bar 145 is then in the notch 148, holding the arm 150 and the shipper shaft against movement. Such position of the parts is illustrated in Fig. 16.

As a further safety and precautionary feature, the lock bar 145 has projecting rearwardly and upwardly from it, see particularly Fig. 11 and also Figs. 1ª and 16 to 19, a foot 151. In the inoperative position of the knife, and with the knife clutch lever 142 in normal out position, as in Figs. 1ª, 11 and 17, this foot lies immediately below and in vertical alignment with the adjacent knife slide 114, positively holding the latter up. So long as the knife clutch lever remains in said position it is therefore impossible to operate the knife by hand, and it has already been pointed out that the clutch lever must be in said releasing, left hand or vertical position during operation of the threading mechanism. Hence, the knife also cannot be manually operated during threading. Said foot also positively locks the knife against down movement to any extent during threading, under the influence of jarring or vibration.

The finger 147 at the end of the lock bar 145 and the cooperating notch 148 of the arm 150 on the shipper shaft are so disposed that they are interengaged whenever the foot 151 is out of line

with the knife slide 114, and such interengagement takes place before the knife clutch lever 142 is moved sufficiently to the right in Fig. 1a to throw in the knife clutch. The knife clutch lever thus has three distinct functional positions. First, the straight upright position shown in Figs. 1a and 17 wherein both the knife clutch and the needle clutch are released but the knife is locked against hand actuation, by the foot 151; second, an intermediate position, seen in full line in Fig. 18 and dotted in Fig. 19, wherein the foot 151 is moved out from below the knife slide, so that the knife can be hand operated, but the finger 147 has been moved over into the slot 148 part way, preventing needle operation; and, third, a right hand position as in Fig. 16 in which the knife clutch is thrown in but the needle mechanism is still locked, by further interengagement of the finger 147 and the notch 148 of the shipper shaft arm 150.

In addition to the interlocking devices already described means is desirably provided for positively holding the knife clutch lever and locking bar 145 in the intermediate position of the clutch lever, so that the needle mechanism is locked and the knife clutch is positively held out, preliminary to hand operation of the knife. Such means as herein illustrated comprises a spring pressed plunger 154, seen in detail in Fig. 20 and also in Figs. 1a and 16 to 19, mounted on the locking bar 145 in position to come opposite a recess 155 in the adjacent side frame 1, in the intermediate or hand-trimming position of the knife clutch lever. When this plunger is engaged in said recess, as automatically happens when the clutch lever is brought to intermediate position, the knife clutch cannot be thrown in and the shipper lever is likewise positively locked against movement into needle operating position. The plunger 154 as seen in Fig. 20 is rotatable as well as slidable in a housing 156 on the locking bar and has a head 157 on which is a pin 158 which seats in a relatively deep aperture in the housing when the plunger is in, as in Figs. 18 and 20. To hold the plunger out, at other times, it is manually withdrawn and its head 157 turned to bring the pin 158 opposite a second and shallower holding aperture 159.

It will be apparent that by the described means the needles could not be operated if the knife should be left in partly down position after operating it manually. In such circumstance the shipper shaft would be locked by the bar 145, and the latter could not be moved to unlocked position, with the knife still partly down, as the foot 151 would strike the knife slide 114 and prevent movement of said bar and hence of the needle shipper shaft.

As a still further safety feature, means may be provided for insuring that the needles are in fully retracted position before the knife can be power-operated, and whereby the knife cannot be brought into play in the event that the needles stop short of their full rear position for any reason or should overrun and come forward again to any appreciable extent. For this purpose we have shown in Figs. 10, 11, 21 and 22 an arm 160 fast on the knife clutch shaft 143, the upper end of which lies against the rim 161 of a plate 162 fast on the needle cam shaft 26. At one point in said rim 161 is a notch 163, disposed to come opposite the arm 160 only when the needles are fully retracted. At any other time the arm engages against the rim 161 and thus prevents the knife clutch lever from being moved to throw in the clutch. A spring finger 164, conveniently supported as upon the adjacent tie rod 6, cooperates with a pin 165 on the arm 160 to hold the latter in engaged or disengaged position respectively relative to the notched plate 162.

Desirably we include means for stopping the knife mechanism when it has completed one cycle or severing operation, during which the blade 110 descends to trim the yarns and returns to its normal or up position. As best seen in Figs. 13 to 15, we have herein provided for the purpose a stop 170 on one face of the right hand gear 129 on the knife shaft 125. The outer end of a trip 171 lies in the path of this stop, for actuation thereby after each revolution of the gear 129, corresponding to one knife cycle. The trip 171 is pivoted on an arm 172 fast on the knife clutch shaft 143 and lies under a lug 173 on said arm. When the trip is lifted by engagement of the stop 170 therewith it contacts the lug 173 and rocks the knife clutch shaft 143 in a direction to release the knife clutch.

If desired suitable brake means may be employed to bring the knife promptly to rest and prevent over-running. As herein illustrated, see particularly Figs. 1 and 4a, this means comprises a pair of opposed brake shoes 174 supported on the adjacent tie rod 6 for movement toward and away from each other. These shoes enclose the hub of one gear 129 on the knife shaft 125 and are yieldably urged into clutching relation therewith as by the spring and bolt means 175. Similar brake means may be employed at both ends of said shaft or at any other suitable point.

It will be understood that our invention, either as to means or method, is not limited to the exemplary embodiment or steps hereein illustrated and/or described, its scope being set forth in the following claims.

We claim:

1. In a machine of the class described, a yarn carrier support, a series of yarn engaging needles and actuating means therefor, yarn-end trimming means, operating mechanism for said yarn-end trimming means, said operating mechanism being power-operable independently of the actuating means for said needles, and means preventing interferent operation or positioning of the needles and the trimming means.

2. In a machine of the class described, a yarn carrier support, a series of yarn engaging needles and actuating means therefor, yarn-end trimming means, power-actuated operating mechanism for said trimming means, and other means for operating said trimming means manually.

3. In a machine of the class described, a yarn carrier support, a series of yarn placing devices and actuating means therefor, yarn-end trimming means, power-actuated operating mechanism for said trimming means, other means for operating said trimming means manually, and locking devices prohibiting power operation either of the trimming means or the yarn placing devices during manual operation of the trimming means.

4. That method of placing tufting yarns upon a yarn carrier of the plural-spool type, for use in looms, which comprises supporting the yarn carrier in given position, rotatably positioning a yarn spool separately from the carrier, aligning the yarns of said spool with a given section of yarn passages of the carrier, engaging and placing the yarn ends through said section of carrier passages, installing the spool upon the carrier, trimming the yarn ends in an independently

controllable cyclar operation repeatable at the will of the operator and while retaining the carrier in its position as when placing the yarn ends therein, shifting the yarn carrier longitudinally to present another section of passages, repeating the foregoing steps with a second yarn spool, again shifting the yarn carrier and repeating said steps for any further spool or spools receivable thereon, and permissibly thereafter shifting the carrier and retrimming any desired yarn ends optionally manually or by power.

5. In a yarn placing machine of the class described, holding means upon the machine for a transfer comb or yarn-end clamp of maximum length, a series of yarn placing devices, and adjustable positioning elements associated with said holding means in a plurality of selective positions for positioning and holding combs or clamps both of different lengths in a given type and also of different types in operative alignment with said placing devices.

6. In a yarn placing machine of the class described, holding means upon the machine for a transfer comb or yarn-end clamp of maximum length, a series of yarn placing devices, a fixed positioning element for one end of a minimum length or an intermediate length comb, and selective positioners for the other ends of said combs respectively, to present one or the other of such combs in cooperative relation to the placing devices.

7. In a yarn placing machine of the class described, holding means upon the machine for a transfer comb or yarn-end clamp of maximum length, a series of yarn placing devices, a fixed positioning element for one end of a minimum length or an intermediate length comb, and selective positioners for the other ends of said combs respectively, to present one or the other of such combs in cooperative relation to the placing devices, each of said selective positioners being adjustable for cooperation with combs of different types.

8. In a yarn placing machine of the class described, holding means upon the machine for a transfer comb or yarn-end clamp of maximum length, a series of yarn placing devices, a fixed positioning element for one end of a minimum length or an intermediate length comb, and selective positioners for the other ends of said combs respectively, to present one or the other of such combs in cooperative relation to the placing devices, and other means for similarly positioning a comb of still greater length.

9. In a yarn placing machine of the class described, a support for a yarn carrier of the plural-spool type for use in "wide" work, spool holding means upon the machine adjacent said support, including opposed holders each carrying a rotatable cup for receiving one end of a spool, gear means interconnecting said cups for turning as a unit, at least one of said holders and its supported parts being adjustable into a plurality of positions for cooperation with spools of different lengths, and said gear means being similarly adapted for drivingly interconnecting the cups in different relative positions of the latter.

10. In a yarn placing machine of the class described, a support for a yarn carrier of the plural-spool type for use in "wide" work, spool holding means upon the machine adjacent said support, including opposed holders each carrying a rotatable cup for receiving one end of a spool, gear means interconnecting said cups for turning as a unit, pawl and ratchet means normally holding the cups against turning, a pawl-release device and cam means for operating said device, at least one of said holders and its supported parts being adjustable into a plurality of positions for cooperation with spools of different lengths, the pawl-release and cam means for said adjustable holder being constructed and arranged for cooperation therewith in the several adjusted positions of the latter.

11. In a yarn placing machine of the class described, a support for a yarn carrier of the plural-spool type for use in "wide" work, spool holding means upon the machine adjacent said support, including opposed holders each carrying a rotatable cup for receiving one end of a spool, gear means interconnecting said cups for turning as a unit, pawl and ratchet means normally holding the cups against turning, a pawl-release device and cam means for operating said device, at least one of said holders and its supported parts being adjustable into a plurality of positions for cooperation with spools of different lengths, the pawl-release and cam means and the gear means interconnecting the rotary cups being constructed and arranged for cooperation therewith in the several adjusted positions of the latter.

12. In a yarn placing machine having a series of yarn laying devices and operating means therefor, a movable knife for trimming the ends of a plurality of yarns, slide bars movably supporting the knife, means independent of the yarn laying devices and their operating means, for actuating the slide bars, and clutch means to render said actuating means operative or inoperative.

13. In a yarn placing machine having a series of yarn laying devices and operating means therefor, a movable knife for trimming the ends of a plurality of yarns, slide bars movably supporting the knife, a drive shaft, operative connections between the drive shaft and the slide bars, a clutch to render said connections operative or inoperative, and automatic means to throw out the clutch at the end of an operating cycle of the knife.

14. In a yarn placing machine having a series of yarn laying devices and clutch-controlled operating means therefor, a movable knife for trimming the ends of a plurality of yarns, slide bars movably supporting the knife, a drive shaft, operative connections between the drive shaft and the slide bars, a separate knife-clutch mechanism to render said connections operative or inoperative, and brake mechanism acting to bring the knife to rest.

15. In a yarn placing machine having a series of yarn laying devices and operating means therefor including a drive shaft, a movable knife for trimming the ends of a plurality of yarns, slide bars movably supporting the knife, a knife drive shaft, separately controllable power-applying means for each drive shaft, operative connections between the knife drive shaft and the slide bars, including a crank plate and gearing to drive it, and a pivoted link connecting the crank plate and a knife slide bar.

16. In a yarn placing machine, in combination with a series of power-driven yarn placing devices, a support for a yarn carrier of the spool-carrying type, yarn trimming means, spool holders on the machine for holding a spool during the yarn placing operation, a clutch to control the yarn trimming means, and a manual operating member for said clutch, the construction and arrangement being such that said manual member

is relatively inaccessible when a spool is in said spool holders.

17. In a yarn placing machine, in combination with a series of power-driven yarn placing devices, a support for a yarn carrier of the spool-carrying type, yarn trimming means, spool holders on the machine for holding a spool during the yarn placing operation, a clutch to control the yarn trimming means, and a clutch lever disposed intermediate and to the rear of the spool holders, to lie behind a spool supported therein but becoming readily accessible upon removal of the spool for positioning upon the supported yarn carrier.

18. In a machine of the class described, yarn placing devices, a clutch and drive means therefor, a yarn trimming element and driving means therefor operable independently of the yarn placing devices, including a control clutch, and intermediary means preventing operative engagement of either clutch while the other is engaged.

19. In a machine of the class described, yarn placing devices, a clutch and drive means therefor, a yarn trimming element and driving means therefor operable independently of the yarn placing devices, including a control clutch, said trimming element also having means for operating it manually, and means to lock the drive means both for the yarn placing devices and the trimming element against operation during manual operation of the latter.

20. In a machine of the class described, yarn placing devices, a clutch and drive means therefor, a yarn trimming element and driving means therefor operable independently of the yarn placing devices, including a control clutch, separate hand levers for said clutches, and interlocking means effective during engagement of one clutch to prevent movement of the hand lever of the other clutch to operative position.

21. In a yarn placing machine, a series of reciprocable yarn placing devices, means to drive them to engage and place the yarns, a movable knife to trim the ends of the emplaced yarns, actuating means therefor and means other than said actuating means positively locking the knife and its actuating means against movement during operation of the yarn placing devices.

22. In a yarn placing machine, a series of reciprocable yarn placing devices, means to drive them to engage and place the yarns, a movable knife to trim the ends of the emplaced yarns, independent driving means therefor, and mechanism to prevent operation of said knife driving means except when the yarn placing devices are in non-interfering inoperative position.

EDGAR F. HATHAWAY.
WALTER BIXBY.