Dec. 9, 1952 E. F. HATHAWAY ET AL 2,620,545

MACHINE FOR TRIMMING THE TUFT YARNS OF TUBE FRAMES

Filed Nov. 14, 1950 4 Sheets-Sheet 1

FIG. 1

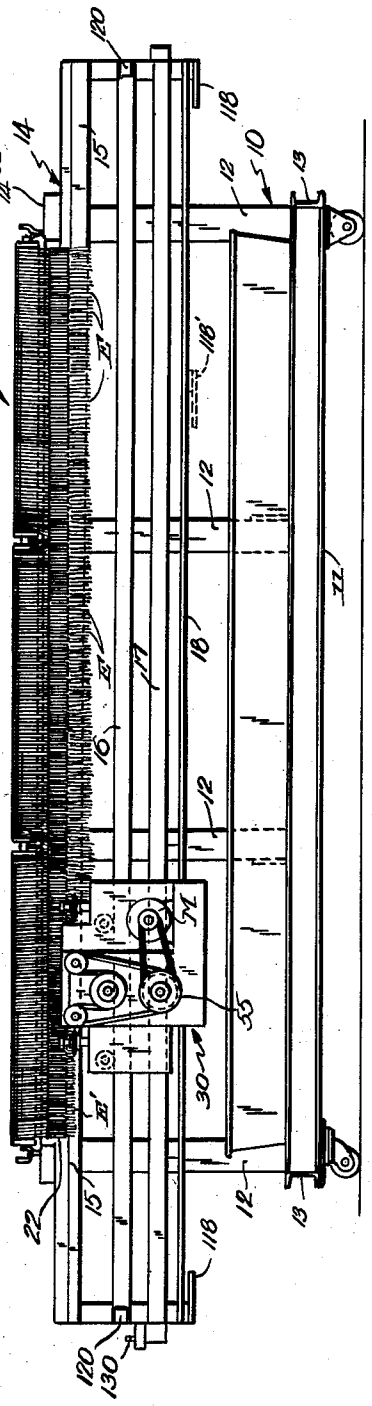

FIG. 7

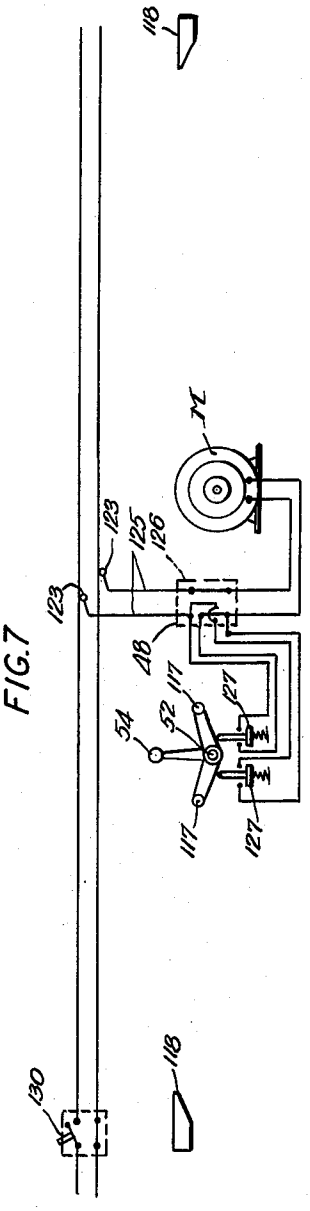

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FIG.5

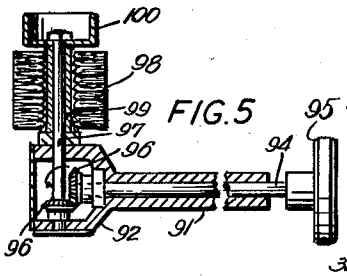


FIG.2

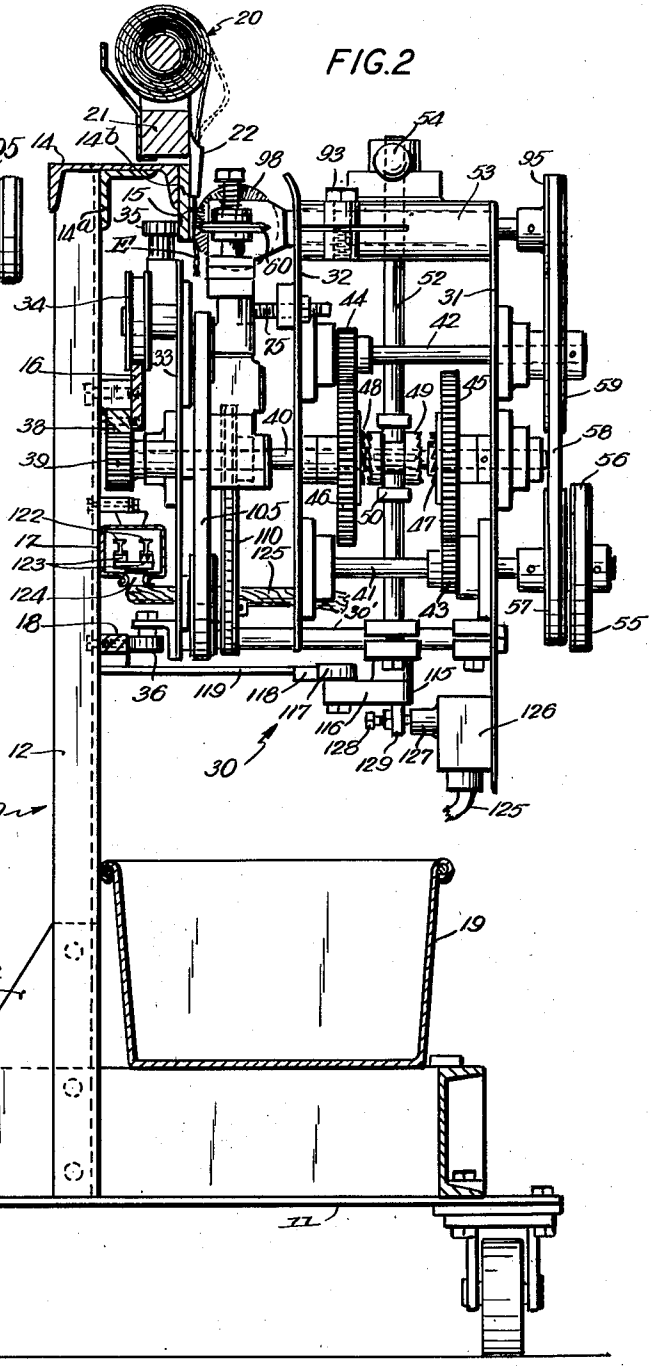
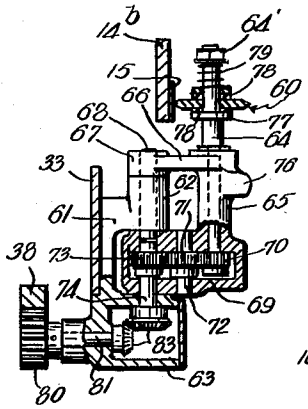


FIG.6



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MACHINE FOR TRIMMING THE TUFT YARNS OF TUBE FRAMES

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FIG. 3

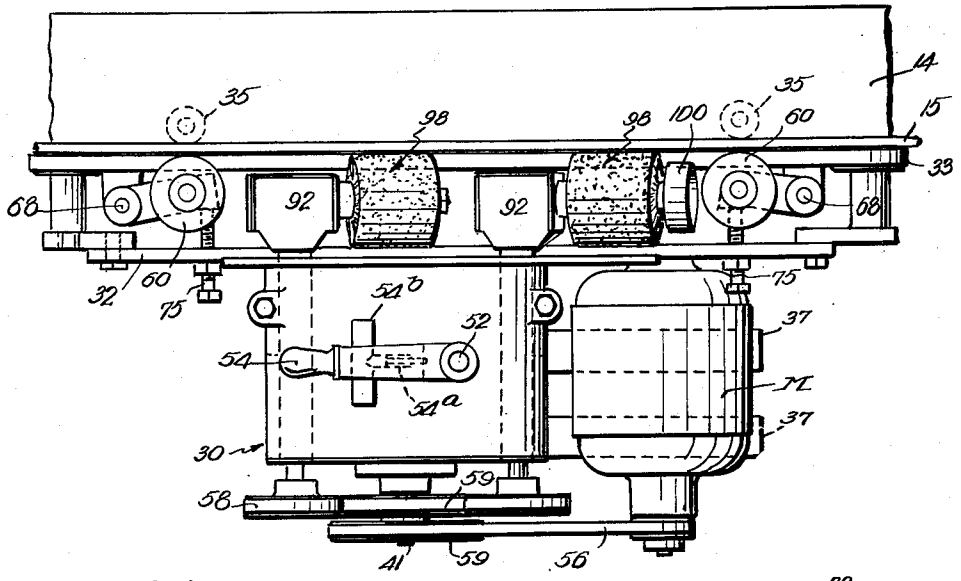
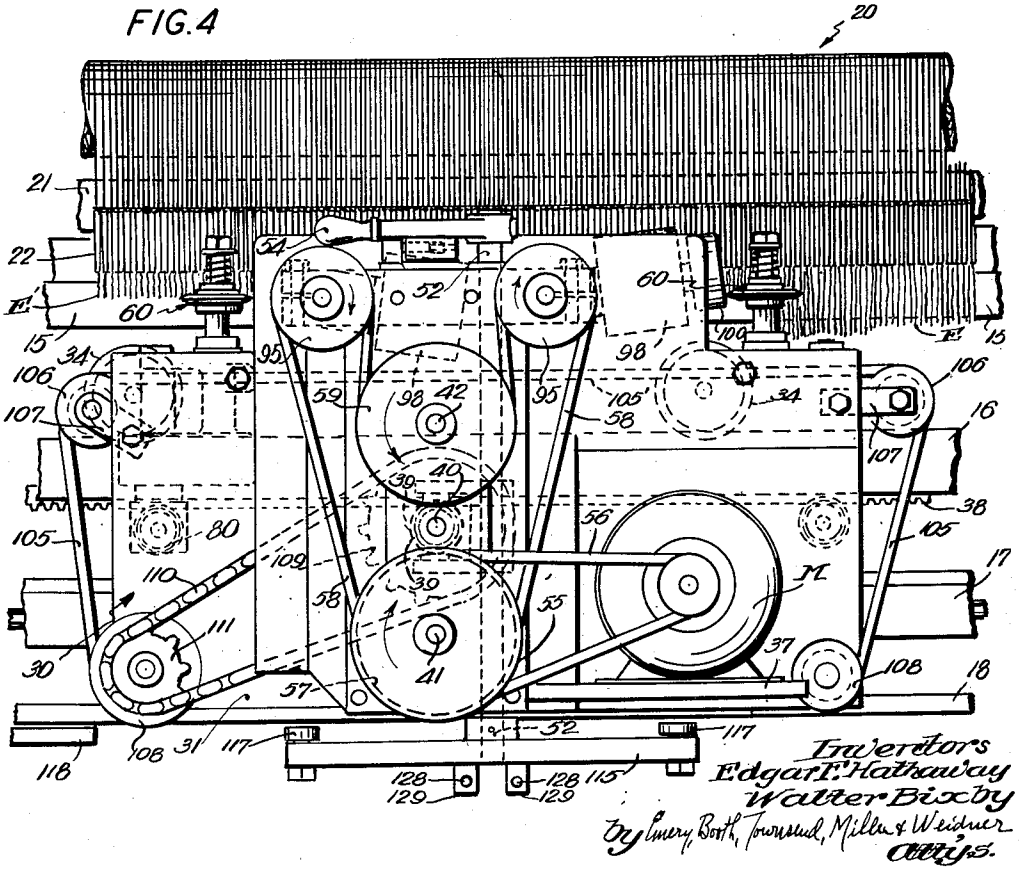


FIG. 4



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MACHINE FOR TRIMMING THE TUFT YARNS OF TUBE FRAMES

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FIG. 8

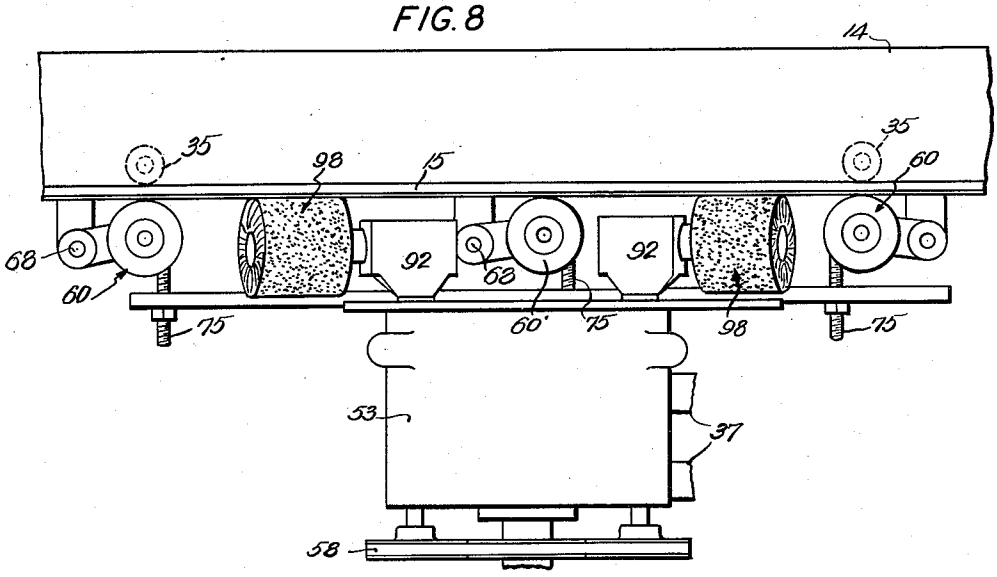
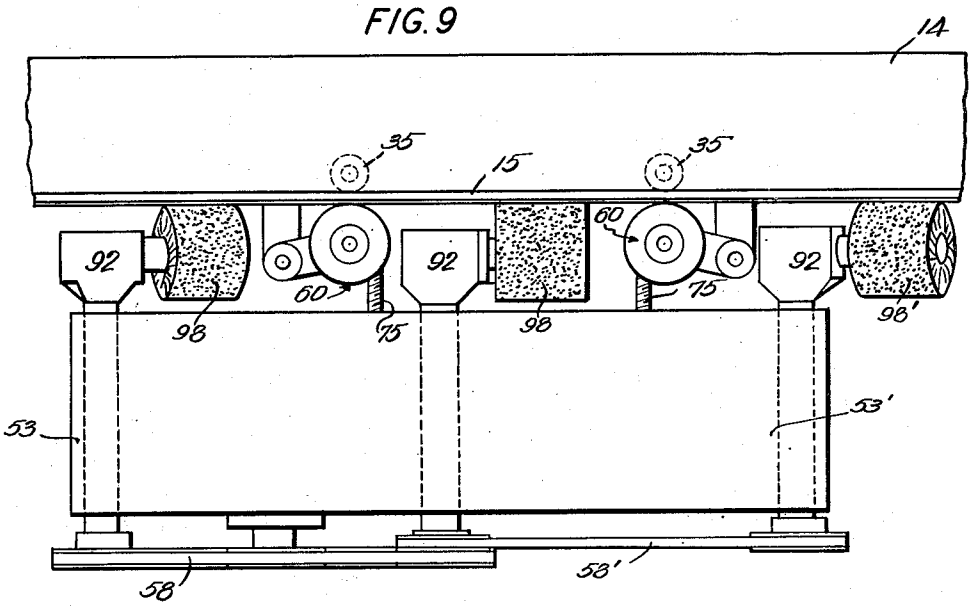


FIG. 9



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UNITED STATES PATENT OFFICE

2,620,545

MACHINE FOR TRIMMING THE TUFT YARNS OF TUBE FRAMES

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Application November 14, 1950, Serial No. 195,646

21 Claims. (Cl. 28—1)

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This invention relates to a yarn trimmer and more particularly to a machine for evening the ends of tuft yarns projecting through the tubes of a yarn carrier or tube-frame, in preparation for weaving Axminster rugs and similar pile fabrics.

The invention will be more fully understood from the following description taken in connection with the accompanying drawings illustrating by way of example certain embodiments and in which:

Fig. 1 is a front elevation of the machine, showing a tube-frame in position for trimming and the cutter carriage advancing to the right;

Fig. 2 is a sectional view transversely of the machine of Fig. 1, on a larger scale and showing the carriage largely in end elevation;

Fig. 3 is a top plan view of the carriage and a portion of the tube-frame support, without a tube-frame installed and for clarity omitting underlying carriage and cutter drive mechanism;

Fig. 4 is a front view of the carriage, shown advancing to the right;

Fig. 5 is a horizontal sectional detail view of a brush assembly, as at the upper portion of Fig. 2;

Fig. 6 is a detail view mainly in vertical section of a cutter and drive unit as at the upper left portion of Fig. 2;

Fig. 7, on the sheet with Fig. 1, is a diagram of the electrical circuit for the carriage-advancing motor; and

Figs. 8 and 9 are top plan views corresponding to Fig. 3, showing alternative arrangements of the cutter and brush assemblies.

In weaving Axminster rugs and other pile fabrics the pile-forming or tuft yarns are drawn from supplies thereof on spools mounted on tube-frames. In preparation for weaving, the yarns of the color and order appropriate for the fabric or rug are wound on the spools, the leading ends of the yarns are placed in the presenting tubes of a tube-frame or yarn carrier, and the spools, generally an axially aligned plurality thereof, are installed in supporting bearings therefor on the frame or carrier.

Before the spool-holding tube-frames are ready for installing on the carrier chains of the loom, the yarn ends projecting from the tubes should be brought into line lengthwise of the carrying frame by trimming them, in order that uniform yarn lengths shall be presented in the weaving operation. It has been the general practice heretofore to trim by hand, a tedious operation presenting various difficulties hindering the

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obtaining of an even trim. Consequently the first rug woven from a given set of frames has frequently contained imperfections necessitating that it be sold as a "second," with corresponding loss to the manufacturer.

By the present invention automatic power-actuated means is provided subject to operator control and whereby a uniform trim of the yarn ends is afforded while speeding the manufacturing process and eliminating the costly hand operation.

The trimmer as a whole will be seen to comprise a support or frame designated generally at 10 for a tube-frame 20 and for a cutter carriage generally indicated at 30. The carriage 30 has a reciprocating travel lengthwise of the support. The apparatus as a whole may be incorporated in a threading machine, as exemplified in United States Patent No. 1,597,971 granted August 31, 1926 to Edgar F. Hathaway and Walter Bixby. It may be fixedly or permanently mounted, or it may be portable as in the embodiment described herein.

Referring now more particularly to Fig. 1, the support means or machine frame 10 comprises a wheeled base 11, having fixed along the rear thereof, at the left in Fig. 2, a plurality of uprights 12. The vertical frame defined by the uprights 12 further includes along the top thereof a platform or work-table shown as a horizontally disposed inverted U-beam 14 providing positioning support for a tube-frame 20 at a convenient working level. This frame-positioning beam is rigidly held as on a longitudinal angle bracket 14a along the upper front of the several uprights 12.

As seen in Figs. 1, 2 and 4, the carrier bar 21 of a tube-frame 20 to be worked on is installed with the spool or spools uppermost, and with the yarn tubes 22 disposed vertically, exit ends downward. Thus the entire series of yarn ends E from the one, two, three or more spools of the particular frame is presented for trimming in vertical down-hanging position. In order that the tube-frame to be trimmed will be held similarly as when in the loom the respective end portions of the platform 14 have seating blocks 14x adjustably spaced to receive the ends of the particular tube-frame bar 21, whereby the intermediate portion of the bar may be spaced somewhat above the top face of the platform 14, see Fig. 2. The tube-frame, which in the case of wide work may run as long as 24-quarter (18 feet) or more, thus is permitted to assume whatever sag, if any, it will have when in the loom.

The tube-frame 20 is further located in the direction from front to rear of the machine by aligning the bank of tubes 22 against the upper portion of a vertical face-plate 14b fixed at the front edge of the platform 14 and extending the full length thereof. This face-plate 14b extends down beyond the tubes 22 and beyond the level at which the yarn ends E are to be trimmed, so as to provide a longitudinal trimming zone defined by a backer strip or surface as at 15, adapted to support the rotary cutting action. Such yarn-backing zone or abutment strip 15 along the lower portion of the face-plate 14b and across which the yarn ends E hang down presents behind the yarns a surface having a smooth hard finish. This may be formed integrally with the plate 14b or may be constituted as a renewable trimmer strip or tape of a hard material such as steel or a steel alloy. Such longitudinal zone of hardness or trimming zone 15 in cooperation with the rotary cutter elements to be traversed along and in cutting relation to it is adapted to effect a clean cutting action on the yarn ends.

The tube-frame platform 14 and associated trimmer strip or zone 15 are of a length to receive the longest tube-frame to be handled and to extend beyond the ends thereof enough to permit travel of the yarn aligning and cutter means past the endmost yarns of the series, as evident in Fig. 1.

For supporting and guiding the traveling cutter carriage 30 as a whole in its traversing movements along the particular tube-frame, the uprights 12 of the machine frame further carry longitudinal ways and track elements, below and paralleling the tube-frame platform 14. As seen in front elevation in Fig. 1 and in section in Fig. 2 these include a main supporting and guiding track 16 horizontally disposed along and laterally spaced from the uprights 12. The lower rear face of the previously mentioned face-plate 14b provides an upper longitudinal guide-way restraining the carriage against forward tilting. Further guiding and restraint against opposite rearward tilting is provided by a lower guide bar 18 also carried by the frame uprights 12. Also on the uprights 12 is a tubular housing 17 for a pair of electrical contact bars substantially coextensive with the tracks and through which power is supplied to the motor M on the carriage 30 in a trolley means 123, 124 later referred to. The entire assembly which traverses across the machine in one and the opposite directions, including the trolley means through which actuating power is received may sometimes be referred to hereinafter as the trolley carriage or cutter carriage.

From the foregoing in connection with the drawings it will be apparent that the machine of the invention provides supporting means on which a tube-frame may be installed with the yarns E hanging from the tubes in a general vertical plane, a vertical trimming face or zone such as 15 across which the yarn ends depend, and a track system whereby a carriage with yarn aligning and trimming elements to be described may be moved along the tube-frame in operative relation to the series of yarns, in one and the opposite directions. As seen at the central right portions of the tube-frame in Fig. 1 the yarns before trimming vary in length and hang unevenly, as contrasted with projection to a uniform level when trimmed, as at the left in said figure. The yarn end trimmings as will be explained are carried off from the cutting point and are deposited in a trough or pan 19 removably placed below the cutting path, as on the machine base 11.

Turning now to the traveling assembly or trolley carriage designated generally at 30, this comprises as best seen in Fig. 2 a carriage frame formed by front, intermediate and rear vertical plates 31, 32, 33. These are rigidly interconnected and held in fore and aft spaced relation as by tie rods 30', one of which is seen in Fig. 2. This carriage frame and the mechanism thereon is afforded accurately guided travel along the machine by the track and guide means described. For this purpose the carriage has two or more flanged wheels 34 rotatably mounted as on studs, at the back of the rear plate 33 and riding on and guided by the main track 16 mentioned. The carriage rear frame plate 33 also carries a plurality of upper guide rollers 35 turning on vertical axes in engagement with the adjacent rear face of the face-plate 14b on the machine frame and a corresponding lower plurality of guide rollers 36 bearing against the forwardly directed face of the lower guide bar 18 also on the machine frame. These upper and lower rollers 35 and 36 maintain the carriage accurately in the vertical plane, against forward or rearward tilting respectively.

Thus the carriage is mounted for reciprocating movement longitudinally of the support in a path paralleling the trimmer strip 15, over an operative range at least equal to the length of the longest tube-frame for which the particular machine is designed. In accordance with the invention means is provided for driving the carriage in one and the opposite directions along the presented bank of yarn ends and for automatically halting it at the end of a traverse. Starting control, for either direction of travel, is at the will of the operator.

Power for traversing the carriage, and for the yarns straightening, tensioning and trimming means, is supplied by the electric motor M supported on the carriage frame, Figs. 1, 3, 4 and 7, as on brackets 37 thereon. A positive and accurately controllable drive is had herein by means of a stationary rack 38. Figs. 2 and 4, of a length appropriate for the maximum travel desired for the carriage. As shown the rack parallels and is mounted with the track 16.

Meshing with the rack 38 is a carriage drive pinion 39 fast at the adjacent rear end of a drive shaft 40 extending through and having bearings on the carriage frame plates 31—33. The shaft 40 is driven in one and the opposite direction through a pair of counter shafts 41, 42 and associated clutch and gear means. These shafts have fast thereon pinions 43 and 44 respectively meshing with relatively large reduction gears 45 and 46. These latter are loosely positioned in spaced relation on the drive shaft 40 and have at their opposed inner faces each a clutch element 47, 48 for alternative engagement with a clutch collar 49 slidably splined on the drive shaft 40.

As positioned in Fig. 4 the clutch collar 49 is in neutral, out of engagement with either of the gears 45 or 46, the carriage 30 accordingly being at rest. A clutch yoke 50 straddles and is engaged in the central annular groove of the clutch collar 49 and is fixed on a vertical clutch and control shaft 52 by turning of which the clutch collar may be appropriately shifted to selectively engage either of the gears 45, 46 or to disengage both of them. The clutch shaft 52 is supported for rocking about its axis by means of a suitable

bearing at the upper end disposed on a top housing member 53 mounted on and spanning between the upper portions of the front and intermediate plates 31 and 32. A hand lever 54 at the upper end of the clutch shaft provides for manual operation, as in starting the carriage drive in one or the opposite directions. Other means to be described, herein at the lower end of the clutch shaft, provides for automatic disengagement of the carriage drive at either end of its run.

The lower and upper counter shafts 41, 42 are driven by the motor M as by V-belt and pulley connections. A first and herein outer or front pulley 55 fast on the lower counter shaft 41 is directly driven from the motor M by a belt 56. A second pulley 57, Fig. 2, fast on the lower counter shaft 41 receives a belt 58 which passes around brush drive pulleys 95 to be described and about a pulley 59 fast at the outer end of the upper counter shaft 42. The same belt 58 also furnishes the drive for certain yarn aligning and tensioning brush elements to be described. As indicated by the arrows on Fig. 4 the first or lower pulley 55 and the lower counter shaft 41 are driven in the clockwise direction while the upper pulley 59 and counter shaft 42 are oppositely rotated, counterclockwise. Accordingly when the clutch collar 49 is shifted toward the right in Fig. 2 to engage the gear 45 driven from the lower counter shaft 41, by pulling the manual control lever 54 in the same direction, that is, toward the front of the machine, Figs. 3 and 4, the drive shaft 40 and the rack-engaging drive pinion 39 thereon will be turned counterclockwise and by reaction with the stationary rack 38 will cause travel of the carriage toward the right of the machine, noting Figs. 1 and 4. Conversely, shifting of the clutch collar 49 to the left in Fig. 2 to apply drive to the shaft 40 from the upper counter shaft 42 will drive the pinion 39 clockwise and so traverse the carriage toward the left of the machine.

The described carriage provides for accurate traversing of the rotary cutter elements now to be described across the full length of the particular tube-frame 20 and along a line paralleling the exit ends of the bank of yarn tubes 22. One of the cutter assemblies is shown separately in Fig. 6 partly in vertical section. While in some instances, as for relatively short frames, a single cutter may be employed, preferably a plurality of at least two are provided. In the embodiment of Figs. 1 to 6 two rotary cutters 60 are shown, see particularly Figs. 3 and 4, adjacent opposite end portions of the carriage. The cutter unit adjacent the left of the carriage is seen also in Fig. 2. Since the cutter assemblies are similar they are given similar reference numerals and a description of one will suffice.

Each cutter assembly comprises a yoke-like bracket and bearing member 61 fixed on the rear carriage plate 33. This bracket 61 has at the upper portion a collar 62 and spaced vertically below it a gear chamber 63. In order to provide for adjustment of the cutter disc 60 toward and from the trimmer strip 15 the cutter shaft 64 is rotatably mounted in an offset yoke-like bearing and housing element 65 having at its upper end a lateral arm 66 with a bearing collar 67 received on a short stud shaft 68 in the previously mentioned collar 62. At the lower end of the cutter shaft housing 65 is a chambered lateral extension 69 received between the upper and lower portions 62, 63 of the bracket 61. The cutter shaft 64 extends down into the chamber of the extension 69 and there has fixed on it a pinion 70 meshing with an intermediate pinion 71 on a bearing stud 72 and in turn meshing with a like pinion 73 on a short vertical shaft 74 axially in line with the bearing stud 68 referred to.

Said stud shaft 68 and the separate lower shaft 74 disposed in prolongation of each other define a vertical axis about which the cutter shaft housing 65 is adjustable, as by means of a thrust screw 75, Figs. 2 and 3, threaded through a boss on the intermediate carriage frame plate 32 and taking against a lateral ear 76, Fig. 6, on the cutter shaft housing. In this manner the cutting relation or pressing contact of the cutter discs 60 with respect to the trimmer strip 15 may be set to afford the desired clean trimming action and to compensate for wear of the contacting parts.

Further in this connection it is noted that each cutter disc 60 is yieldably clutched upon its supporting shaft 64. The latter for this purpose has a radial flange 77, Fig. 6, supporting the cutter disc 60 between upper and lower friction washers 78. A coil spring 79 surrounding the upper end of the cutter shaft 64 urges the cutter disc and washers into gripping relation under a pressure adjustable by the nut 64'. While thus rotatably driven from its shaft 64 the cutter disc is adapted to slip rotatably in the event of malfunctioning and may also yield in the axial direction. Also by interchanging washers beneath the disc 60 its operative position lengthwise of the shaft may be adjusted vertically, to present it at different path levels upon the trimmer strip 15.

The drive for the cutter shaft, referring still to Fig. 6, also Fig. 4, is had by means of a cutter drive pinion 80 fast at the rear end of a short horizontal shaft 81 projecting from and having bearing in the lower portion 63 of the main cutter bracket 61, said pinion 80 meshing with the previously mentioned stationary rack 38 on the machine frame. Thus travel of the carriage 30 imparts rotation to the pinion 80 and its shaft 81 at a speed proportionate to the rate of carriage travel. The shaft 81 is operatively connected as by bevel pinions 83 to the lower end of the short vertical shaft 74 described.

Referring now more particularly to Fig. 4, also Figs. 2 and 3, the yarn ends E prior to trimming hang down to unequal lengths and in random alignment, as previously explained. There may be more or less overlapping of the yarn ends and various of them may have worked or been drawn back in the yarn tubes 22 into some such slack position as indicated by the dotted lines in Fig. 2. Therefore unless prepared for the trimming operation by downwardly extending, aligning and tensioning them, especially at the time just before and during the trimming action, accurate evening of all the yarn ends of the series is unlikely to result.

To take care of this problem there is herein provided in cooperative association with the cutter elements rotary means for pulling out, straightening and tensioning the yarn ends. Such means comprises one or more rotary brushes, preferably one in operative association with each cutter, turning about axes extending in the general direction of the carriage travel but at least in some instances a determined inclination relative thereto, see particularly Fig. 4. The angle of such axial inclination is calculated with respect to the speed of travel of the carriage so that the tendency of the brush to move the yarn ends in the direction of the carriage travel is compensated and the yarn ends are brushed out in parallelism, laying them substantially vertical

and normal to the path of travel of the carriage and the plane of rotation of the cutters.

One of the yarn end tensioning and aligning assemblies is shown separately in generally horizontal section in Fig. 5. These are adjustably mounted on the top housing member 53 of the carriage frame. Each such assembly comprises a supporting element including a bearing sleeve 91 having at the rear end a chambered head 92. This supporting element 91, 92 is angularly adjustably clamped in the carriage top housing member 53 as by means of threaded studs 93 extending through split portions of the housing. The sleeve 91 provides bearing support for a horizontal shaft 94 extending through it and having at the outer forward end a relatively small pulley 95 about which the V-belt 58 providing the drive for the upper countershaft 42 is passed, as previously mentioned. The shaft 94 thus driven is connected at the inner end as by bevel pinions 96 to a brush shaft 97 journalled in the chambered head 92 of the supporting element, at right angles to the shaft 94, so as to extend in the general direction of carriage travel.

The brush element proper 98 comprises a cylindrical body of radial strands or bristles projecting from a hub 99 fixed on the projecting end of the shaft 97. For purposes to be described the rotary yarn preparing means may further comprise a relaying cup 100 mounted on the brush carrier shaft 97 beyond the brush 98, between the latter and the adjacent cutter disc 60.

From a comparison of Fig. 5 with Figs. 2 and 4 it will be seen that the appropriate angle of tilt for the brushes, such for example as in Fig. 4 may be had by loosening the clamp stud 93, Fig. 2, and turning the entire sleeve-like housing support 91, 92 in the upper frame member 53, about the axis of the shaft 94.

To prevent the severed ends or trimmings of the yarns from lodging and accumulating in the mechanism of the carriage, means desirably is provided for catching and carrying them off to one or the other end of the carriage from which they may spill freely into the collecting pan 19 mentioned. For this purpose there is provided, noting Figs. 2 and 4, a conveyor belt 105 having an upper horizontal run 105' closely below and in vertical line with the active path of the cutters. This trimming conveyor belt is guided at the upper portion over idler pulleys 106, 106 on brackets 107 at the offset ends of the carriage. It extends endlessly around a pair of lower pulleys 108 on the carriage frame near the respective ends thereof but somewhat less spaced longitudinally than the upper pulleys 106, so that the vertical runs of the belt 105 incline inward and downwardly to promote free fall of the trimmings into the collecting pan. This trimmings take-off belt 105 is driven in one or the opposite direction, and oppositely to the direction of carriage travel, so as to carry the trimmings to and dump them at the then trailing end of the carriage. This is accomplished herein by means of a relatively large sprocket 109 fixed on the carriage drive shaft 60 and connected as by a chain 110 to a smaller sprocket 111 on the shaft of one of the pulleys, herein than at the lower left, Fig. 4.

As previously mentioned provision desirably is made for automatically halting the carriage 30 at the end of a single run in either direction, so that the operator is relieved of attention in this regard. Referring particularly to Fig. 4, also Fig. 2, for this purpose the clutch shaft 52 is suitably extended below the carriage and has fixed on the lower end a two-arm knock-off lever 115 rockable in the horizontal plane and adapted to turn the clutch shaft 52 in one or the opposite direction. At each end of the knock-off lever 115 a rearwardly projecting finger 116 rotatably carries a cam roll 117. These are respectively engageable with knock-off cams 118 on arms 119 on and projecting forwardly from a stationary part of the machine frame, such as the lower guide bar 18.

The knock-off cams 118 are adjusted lengthwise of the carriage track, near the opposite ends of the trimming path, to engage and trip the knock-off lever 115 and thereby shift the clutch collar 49 to the neutral stopping position of Fig. 2 attendant on completion of a trimming traverse of the carriage in one or the opposite direction. The clutch shaft 52 is turned oppositely under this release action at the respective ends of the traverse, to effect disengaging movement of the clutch collar 49 either to the right or to the left in Fig. 2 as appropriate to take it to neutral position. Upon disengagement of the clutch the carriage comes quickly to rest, the rate of travel afforded by the described drive being such that the momentum is kept low. Buffering stops such as 120, Fig. 1, are mounted on the machine frame near the respective ends, as on the main track 16, defining travel limits for the carriage. The knock-off cams 118 are set sufficiently in advance of the carriage stops 120 so that positive drive of the carriage is terminated ahead of engagement of the carriage with the buffering stops, bringing it easily to rest. The stops 120 as well as the knock-off cams 118 may be longitudinally adjusted relative to the machine and to each other as appropriate for tube-frames 20 of different lengths. For the shorter tube-frames, the cams 118 may be appropriately set in from the ends of the track, or auxiliary cams swingable out of operative position may be provided as for example indicated in dotted line at 118' to the right of the center of Fig. 1.

Preferably the motor M is shut off between successive trimming operations, the time required for a trimming run of the carriage being relatively brief as compared with that for the removal of a trimmed tube-frame and the installation of another one. Such cut-off of the motor is in the illustrated example effected substantially simultaneously with the unclutching of the carriage drive and herein through the medium of the same knock-off lever 115.

As earlier stated, current for the motor M is supplied preferably independently of the machine frame and any metal portions thereof, as through a pair of electrical conductor bars 122 carried in and insulated from the tubular housing 17 paralleling the carriage track. There are continuously engaged by trolley means comprising rider contacts 123 on an insulating shoe 124 moving along and guided in a slot at the underface of the housing 17 and coextensive with the maximum trimming path. The two individually insulated contact riders 123 are respectively electrically connected to the conductors of a two-wire cable 125 leading to a junction box 126, Figs. 2 and 7, herein at the lower portion of the carriage front frame plate 31. The housing 17 for the conductors and trolley means, being entirely closed save for the narrow trolley-receiving slot at the relatively protected bottom face, shields the trolley system against interference by yarn trimmings, fibre fly or other dirt. At the rear of the junction box 126 are a pair of microswitches 127.

one adjacent each of the opposite end portions of the knock-off lever 115 in position to be actuated by adjustable studs 128, Figs. 2 and 4, on downward projections 129 on the respective portions of the knock-off lever 115.

As readily seen in connection with the wiring diagram Fig. 7 the two motor-controlling switches 127 are respectively placed in parallel circuits leading through the junction box and each including the motor M and the cable 125 leading from the contact riders 123 engaging the conductor bars 122. In Figs. 2 and 7, the knock-off lever 115 is in the neutral disengaged position of the clutch collar 49, and both motor switches 127 are open. The operator's manual control lever 54, Figs. 2, 3 and 4, is equipped with a spring-pressed detent 54a releasably engageable with appropriate notches in a locking block 54b whereby the control handle, the clutch and the motor switches are yieldably held in said neutral position as in Fig. 3. The handle 54 also is held in either clutch-engaging position, toward the rear or toward the front of the machine, that is toward the top or bottom as seen in top plan in Fig. 3 and to the left or right in Fig. 2, for cutting traverse by the carriage toward the left or toward the right of the machine respectively.

By reference again to Fig. 7 as well as Figs. 2 to 4, it will be noted that turning of the clutch shaft 52 in one or the opposite direction will hold open one of the switches 127 while permitting closure of the other switch to start a carriage traverse. This same starting motion by the handle 54 also moves the corresponding knock off cam roll 117, the one adjacent the closed switch 127, into position to engage the stationary cam 118 at the corresponding end of the track. Thus at the end of a carriage traverse the engageably positioned roll 117 and its arm of the knock-off lever 115 will be returned sufficiently to open the previously closed switch 127, simultaneously disengaging the clutch collar 49 and also through the opposite arm of the knock-off lever 115 maintaining the other switch 127 open. Thus the parts are restored to the neutral position of Figs. 2, 3 and 7, in readiness for the next trimming run in the opposite direction at the will of the operator.

It will be understood that the motor switch and clutch control parts operate similarly but reversely for carriage travel in the opposite direction from the first assumed. The stopping of the motor coincident with the completion of a trimming run and during the succeeding tube-frame removal and installation interval additionally insures that the carriage shall be at rest while the tube-frames are being handled by the operator. In the illustrated embodiments the cutters and brushes are driven from the same motor on and which propels the trolley carriage. Hence during rest periods of the carriage, when the motor is stopped, the drive of the cutters and brushes also is halted. Desirably a master line switch 130, Figs. 1 and 7, is provided on the machine at a convenient point, for shutting it down when desired.

The manner of operation of the machine will be apparent from the foregoing description in connection with the drawings. The untrimmed tube-frame 20 is installed on the support 14 with the ends of the tube-frame bar set in the end seats 14x and with the untrimmed yarn ends E hanging freely down over the cutting zone at the vertical face of the trimmer strip 15. As previously noted the tube-frame 20 as thus installed for treatment receives mainly end support, in the similar manner as when on the carrier chains of a loom. Thus any sag tendency of the longer frames is duplicated in the trimming position. Hence by now trimming the entire series of yarn ends along a horizontal line by the cutter means of the invention they will be correctly presented when the tube-frame is later end-suspended in the loom, with all ends terminating at the same level.

In Figs. 1 and 4 the carriage 30 is represented as having started a traverse from the left end of the machine and is assumed as moving toward the right. A number of evenly trimmed yarn ends E' are seen at the left, Fig. 1, while to the right of and in advance of the carriage the untrimmed yarn ends E hang irregularly. To start such traverse toward the right, the carriage initially being at rest at the left end of the machine, the operator has pulled the hand lever 54 toward the front of the machine. The entire cutting operation is thereafter carried out automatically. The clutch will be released and the motor shut off as the carriage completes the trimming operation adjacent the right end of the machine, through engagement of the knock-out lever 115 with the right cam 118, with the control parts restored to neutral position in full readiness for the next trimming operation, in the direction from right to left.

In accordance with the invention the brush and cutter assemblies such as those of Figs. 5 and 6 may be variously arranged in the direction lengthwise of the carriage travel, whether in pairs or alternately, or with either the cutters or the brushes nearer the ends of the carriage. Different arrangements are suitable for different use circumstances, determining factors being the length of the tube-frame and the composition of the yarns. The arrangement found appropriate for the majority of cases and in general preferred is that as represented in Figs. 1 to 6 wherein, noting particularly Figs. 3 and 4, the series of yarn engaging instrumentalities comprises a cutter disc 60 in leading and in trailing position on the carriage with brush elements 98 interposed between them; that is, the cutters are mounted outwardly of the brushes. As seen in Figs. 3 and 4 the rotational axes of the two brushes 98 are oppositely tilted. The direction of rotation for both brushes is the same, being such that the peripheral portions adjacent and engageable with the yarns E move downward, in the yarn extending direction.

Viewing Fig. 4 wherein the carriage is in course of travel toward the right, the leading cutter disc 60, at the right in said figure, makes an initial cut, severing the long yarn ends. The closely succeeding brush 98 at this time serves mainly to sweep the cutting down onto the conveyor 105. Its rotational axis is shown tilted upward at the leading end so that the downward sweeping action is angularly forward, tending to throw them in the direction of advance of the carriage so they will be deposited on a relatively clear portion of the upper run 105 of the take-off conveyor which at this time is traveling to the left, oppositely to the carriage. The trimmings thus are dumped behind the carriage, with minimum interference with the mechanism.

The next following brush 98, preceding the trailing cutter 60, is tilted downward at the leading end so that the sweeping action is toward the rear with reference to the direction of carriage travel. It will be apparent that the bodily move-

ment of the brushes with the carriage tends to drag the yarns in the direction of carriage travel. To counteract this the second brush 98, Figs. 3 and 4, next preceding the second or trailing cutter 60, at the left in said figures, is tilted in the manner shown to give a rearward sweep or back-kicking action calculated with reference to the speed of carriage travel so as to leave the yarn ends accurately tensioned and aligned vertically and normal to the cutter path. The trailing cutter 60 then makes the final cut, accurately evening the yarn ends along a straight horizontal line. As explained, the angle of tilt for the brushes may be regulated and correlated with the carriage speed and with the rotational speed of the brushes to afford the stated accurate alignment.

This cutter and brush arrangement of Figs. 3 and 4 has the advantage of severing the long yarns before engagement by the brushes, thus reducing tendency for the yarns to be pulled away from the trimming surface and engaged or wound on the brush under electrostatic or other action. It will be seen that for a trimming action in the opposite direction, that is from right to left of the machine, the cutters and brushes similarly function in reverse order. The cutter 60 at the left, Fig. 4, becomes the leading severing element for removing the main excess of yarn length, the closely following brush 98 serves as the clearer, and the other brush 98, at the right in Fig. 4, then serves as tensioner and aligner, sweeping rearwardly toward the right and opposite to the direction of carriage travel, presenting the ends in accurate alignment for the final severance by the trailing cutter 60, that at the right in Fig. 4.

Where a brush may be located relatively close to a following cutter, as for example the right-hand brush 98 of Fig. 4 during a cutting traverse toward the left, the strands may be given a final laying action just prior to engagement by the cutter disc, further counteracting any tendency of the yarns to be lifted away from the trimming surface 15. This is effected by the rotary laying wheel 100 described, this having a smooth surface and being of a material non-productive of electrostatic action. Such rotary re-laying element 100, which may be provided in association with any of the brushes, is disposed coaxially with the related brush so as to have the same axial tilt as the latter. These re-laying elements 100 preferably are of somewhat less diameter than the brushes, so as to be spaced from the trimming surface 15 by approximately the thickness of the yarns. Thus they have minimum frictional contact with the yarns and effect a final smoothing and accurate vertical and normal presentation of the yarns beneath the following cutter.

Figs. 8 and 9 illustrate modified arrangements of the series of cutters and brushes. In Fig. 8 the machine as a whole is generally similar to that of the preceding views. It additionally includes a central cutter unit with rotary cutter disc 60' mounted and driven in similar manner as the assembly shown in Fig. 6. This central cutter is here disposed between the brushes 98, 98. In this construction two successive cutting-brushing phases are had ahead of the final trim, the second brushing being accurately vertical by reason of the described tilt of the brush and back-sweep action proportioned to the carriage motion, followed by a final accurate straight-line severance by the trailing cutter 60.

In some instances it is found desirable to employ an initial brushing, to clear the trimming surface and prepare the yarns for the first more or less rough cutting action, and to provide for a final brushing after the last cutting stage so as to leave the trimming strip entirely free of severed pieces. This may be accomplished by the arrangement as illustrated in Fig. 9 wherein a cutter disc 60 is interposed between each two succeeding brushes 98, there being a brush at both the leading and trailing ends of the series. As compared with Fig. 4 the brush and cutter units at the left in Fig. 9 are in effect reversed in order and an additional brush 98' is provided at the right, including a drive and supporting housing therefor substantially as in Fig. 5. In this connection the top housing 53 of the carriage frame is extended as at 53' to support the central brush assembly, and drive therefor is provided by the supplemental V-belt 56' drivingly connecting the shaft of the intermediate brush 98 with the right-hand brush 98'. In the embodiment of Fig. 9 the outer brushes may be mounted at a somewhat lower level than the cutters and the central brush thereby in effect serving the function of the yarn-laying wheels 100 such as described in connection with Figs. 1 to 6.

Our invention either as to apparatus or method is not limited to the particular embodiments thereof illustrated and described herein, and we set forth its scope in our following claims.

We claim:

1. A machine for trimming the ends of tuft yarns of a tube-frame comprising, in combination, a tube-frame support having a cutting strip across which the yarns may be extended, a carriage movable longitudinally of the support and strip, a rotary cutter on the carriage in yarn trimming relation to the cutting strip, drive means for the carriage, and positive gearing means to rotate the cutter during movement of the carriage along the support.

2. A tuft yarn trimming machine according to claim 1 having in further combination a rotary yarn-laying brush on and moving with the carriage and connected to be driven with the drive means of the latter.

3. In a tuft yarn trimmer, the combination of a tube-frame support including a longitudinal element presenting a zone of cut-supporting hardness receiving the yarn ends transversely across it, a carriage traversable along said zone, a rotary disc cutter on the carriage and movable with it to trim the yarns in a straight path along said zone, a rotary brush on the carriage for positioning the yarns during travel of the carriage, and drive means for the carriage, the cutter and the brush mounted on the carriage, said drive means on the carriage comprising a motor, a drive pinion engageable with a rack along the tube-frame support, drive connections between the motor and pinion including means to rotate the pinion in one and the opposite directions, and a manually operable clutch and associated motor switch for selecting and starting the drive in the desired direction.

4. A tuft yarn trimmer according to claim 3 including automatic means for disengaging the clutch on completion of a carriage traverse in either direction along the cutting zone and simultaneously stopping the motor.

5. In a machine for trimming tuft yarns of a tube-frame, the combination of a tube-frame support, an abutment strip fixed with the support and extending along a supported tube-frame in backing relation to the yarns thereof, a track on the support paralleling said strip, a pair of conductor elements along the track in insulated re-

lation to all machine parts and having a shielding housing, a carriage traversable along the track, a motor on the carriage for driving the same, and a trolley movable along the conductor elements and connected to supply current therefrom to the motor.

6. A yarn trimming machine according to claim 5 wherein the carriage drive includes reversible gearing driven from the motor, a clutch to render the gearing inoperative or operative to traverse the carriage in either direction, a manual throw-in control for the clutch, a motor switch subject to said manual control, and automatic means to release the clutch and open the switch at the end of each carriage traverse.

7. In a tuft yarn trimming device, the combination of a support for a tuft yarn tube frame, an abutment strip backing the yarns and extending the length of the support to define a trimming zone, a trimmer mounted for reciprocating movement along said zone in trimming relation to the yarns backed by said strip thereat, a conveyor for collecting and carrying off the trimmed yarn ends for deposit out of the trimming zone, and means to drive the trimmer selectively in one and the opposite directions along the trimming zone, said means connected also to drive the conveyor.

8. Apparatus for trimming the ends of tuft yarns projecting from the tubes of a tube-frame, comprising a support for the frame, an abutment strip along the supported frame and presenting a vertical trimming surface behind the yarn ends, a track and a trolley carriage mounted for movement therealong in a path paralleling the abutment strip, yarn tensioning and straightening means rotatably mounted on the carriage so as to lay the yarns across the strip, rotary cutter means on the carriage and coacting with the abutment strip to trim the yarns at a uniform horizontal level along it, endless belt means having a generally horizontal run adjacently below the abutment strip to receive, carry off and deposit the yarn end trimmings, and means for driving the carriage, the cutter means and said belt means.

9. Mechanism for trimming the ends of tube-frame tufting yarns, comprising a support for the tube-frame, longitudinal means fixed along the support to provide an abutment surface against which the yarn ends may be trimmed, a carriage mounted for travel lengthwise of the support, a plurality of disc cutters mounted in longitudinally spaced relation on the carriage for rotary trimming action upon the yarns along said surface, rotating brush means on the carriage between the cutters for tensioning and aligning engagement with the yarns at the trimming surface, the brush means having the axis of rotation at such angle of tilt with respect to carriage travel path that the brushing action at the location next ahead of one cutter, in either direction of carriage travel, is calculated to lay the yarn ends normal to said travel path, and means for driving the carrier, the cutters and the brushes.

10. Tuft yarn trimming mechanism according to claim 9 wherein a plurality of rotary brushes are disposed between a spaced plurality of cutter discs.

11. Tuft yarn trimming mechanism according to claim 9 wherein the cutter discs and the rotary brushes are disposed in alternation along the carriage, with cutter discs at the ends of the series.

12. Tuft yarn trimming mechanism according to claim 9 wherein the cutter discs and the rotary brushes are disposed in alternation along the carriage, with brushes at the ends of the series.

13. Mechanism for trimming the ends of tufting yarns of a tube-frame, comprising a support for the tube-frame including a hard-faced element extending lengthwise thereof to present a trimming surface behind the yarn ends of a supported tube-frame, a carriage mounted for travel in a path paralleling said element, means on the carriage to trim the yarns against said surface, a set of rotary brushes mounted on said carriage for laying the ends across the trimming surface, a set of cutters spaced alternately with and intermediate the brushes, the brush preceding the foremost cutter tilted to brush diagonally of the surface whereby the ends are laid normal to the path of carriage travel, the trailing brush functioning to sweep the severed ends from the trimming surface, and means for driving the carriage, brushes and cutters.

14. In tuft yarn trimming, a carriage movably mounted on a horizontal support to traverse along the yarn series, a disc cutter assembly on the carriage and a trim strip on the support along the cutter path, the cutter assembly comprising a cutter shaft normal to the cutter path, a shaft housing, a bearing bracket on the carriage pivotally supporting the shaft housing for bodily movement about a pivot axis paralleling the cutter shaft thereby to adjust the cutter relative to the trim strip, and means to hold the shaft housing with the cutter in adjusted position.

15. In tuft yarn trimming, a carriage movably mounted on a horizontal support to traverse along the yarn series, a disc cutter assembly on the carriage and a trim strip on the support along the cutter path, the cutter assembly comprising a cutter shaft normal to the cutter path, a shaft housing and means to mount it on the carriage, and spring-loaded friction clutch means between the shaft and cutter for drivingly connecting the latter subject to slippage about its axis in the event of obstruction.

16. The structure according to claim 15 wherein the clutch connection for the cutter affords the latter capacity for variable positioning axially.

17. In tuft yarn trimming, a carriage movably mounted on a horizontal support to traverse along the yarn series, a yarn sweeping and laying assembly on the carriage, and an abutment strip on the support along the carriage path for backing yarn ends extended transversely of the strip, said assembly comprising a cylindrical brush having an axial shaft, a shaft supporting housing with means thereon to drive the shaft, and means to mount the housing on the carriage with capacity for angular adjustment to set the brush and its shaft in selected variable inclination to or alignment with the carriage path.

18. In tuft yarn trimming, a carriage movably mounted on a horizontal support to traverse along the yarn series, a yarn sweeping and laying assembly on the carriage, and an abutment strip on the support along the carriage path for backing yarn ends extended transversely of the strip, said assembly comprising a cylindrical brush having an axial shaft, bearing support on the carriage for the brush shaft, and means whereby the brush axis may be angularly varied relative to the abutment strip and the carriage path as between general parallelism therewith and inclination thereto at an angle calculated with respect to the carriage travel so as to compensate

therefor and to cause the brush to tension and lay the yarns normally across the abutment strip.

19. In tuft yarn trimming, a carriage movably mounted on a horizontal support to traverse along the yarn series, a yarn sweeping and laying assembly on the carriage, and an abutment strip on the support along the carriage path for backing yarn ends extended transversely of the strip, said assembly comprising a cylindrical brush having an axial shaft, bearing means for the shaft, and a relatively smooth-faced wheel on the shaft at one end of the brush for light re-laying coaction with the yarns.

20. In tufting yarn trimming apparatus for yarn-spool-carrying tube-frames, a support to present such frame in position similarly as for weaving, with the tubes directed vertically downward and the yarn ends pendant therefrom, an abutment strip along the frame support and having a yarn-backing trimming surface in the vertical plane of the pendant yarn ends, a cutter disc rotatable on a vertical axis and in edgewise tangential yarn-severing relation to the trimming surface when moved horizontally along it, and traversing carriage means for the cutter disc to move it horizontally in longitudinal parallelism with said trimming surface and at an adjusted level therealong to sever the yarn ends at a uniform vertical distance below the lower ends of the tubes of the supported frame.

21. In tufting yarn trimming apparatus for yarn-spool-carrying tube-frames, a support to present such frame in position similarly as for

weaving, with the tubes directed vertically downward and the yarn ends pendant therefrom, an abutment strip along the frame support and having a yarn-backing trimming surface in the vertical plane of the pendant yarn ends, a cutter disc rotatable on a vertical axis and in edgewise tangential yarn-severing relation to the trimming surface when moved horizontally along it, traversing carriage means for the cutter disc to move it horizontally in longitudinal parallelism with said trimming surface and at an adjusted level therealong to severe the yarn ends at a uniform vertical distance below the lower ends of the tubes of the supported frame, and rotary brush means bodily movable with the cutter horizontally along the trimming surface in tangential relation thereto to tension and vertically align the pendant yarn ends by a downward brushing action thereon.

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