Nov. 15, 1938. A. J. SIGNORET 2,136,828

PILE FABRIC MANUFACTURE

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Fig. 1

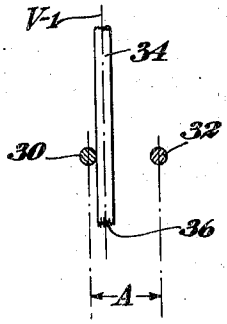


Fig. 2

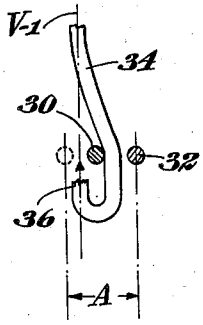


Fig. 3

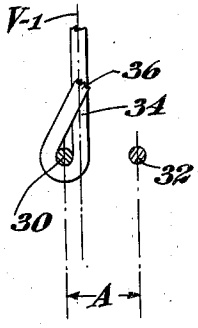


Fig. 4

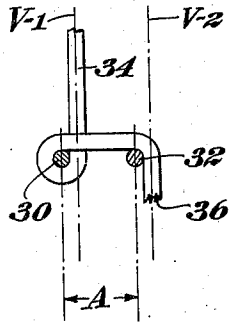


Fig. 5

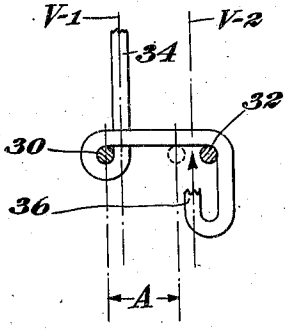


Fig. 6

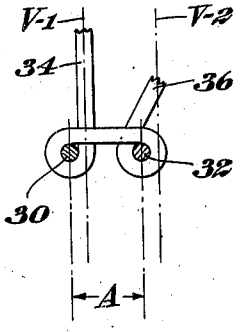


Fig. 7

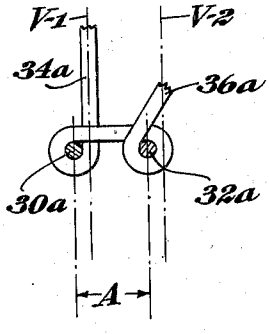


Fig. 8

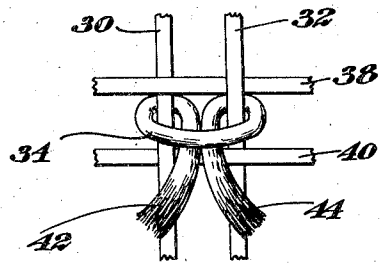
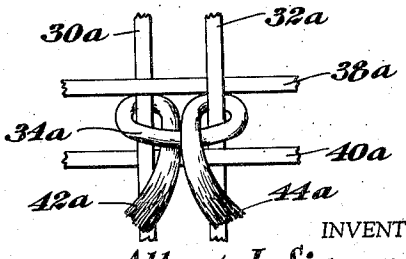


Fig. 9



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Fig.10

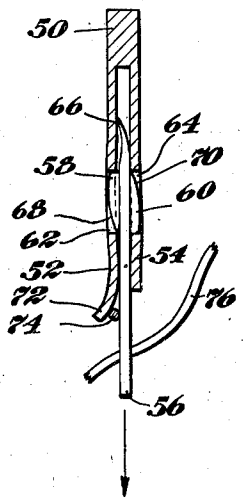


Fig.11

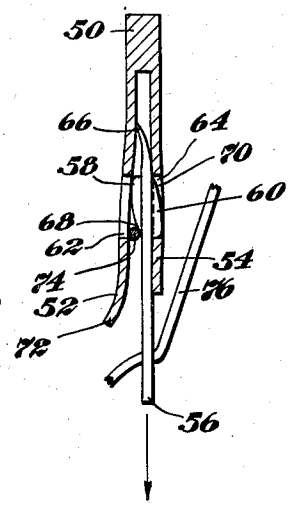


Fig.12

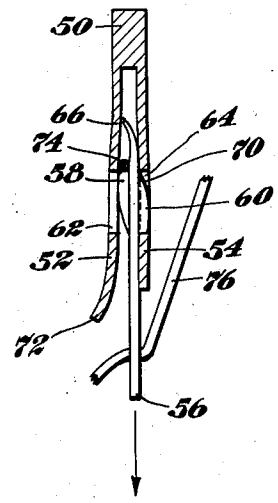


Fig.13

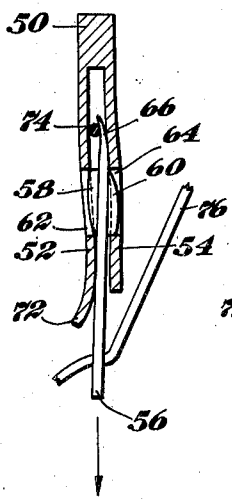


Fig.14

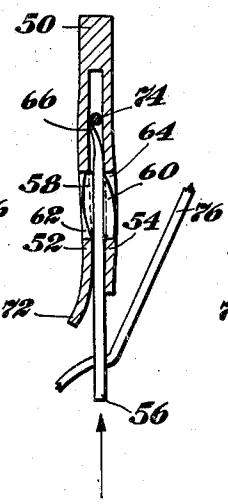


Fig.15

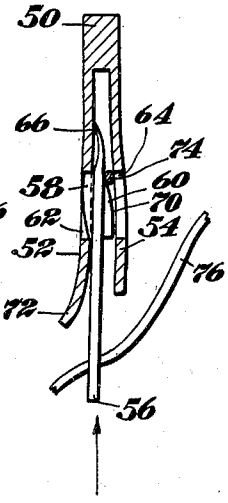
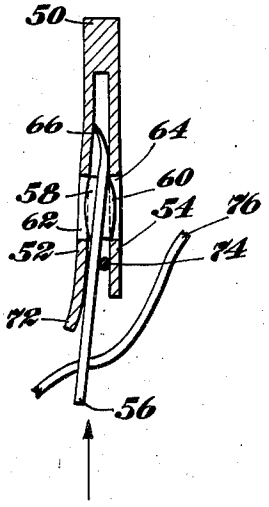


Fig.16



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PILE FABRIC MANUFACTURE

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Fig. 17

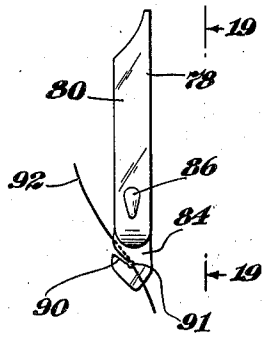


Fig. 18

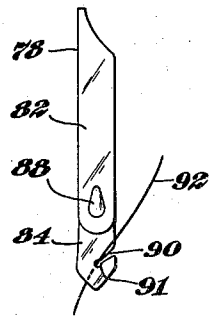


Fig. 19

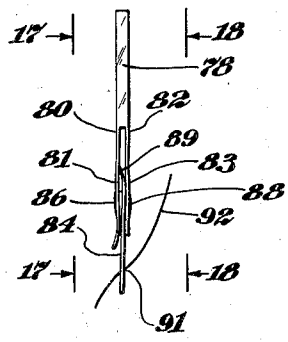


Fig. 20

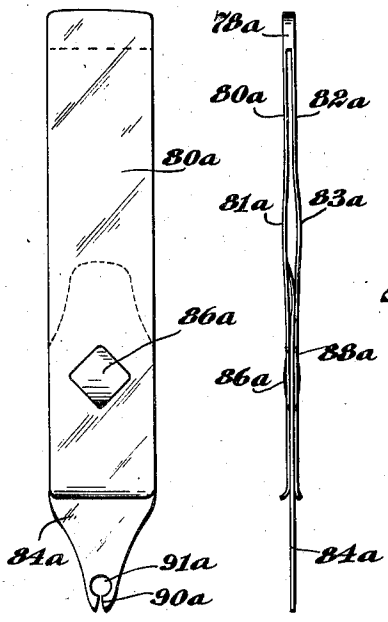
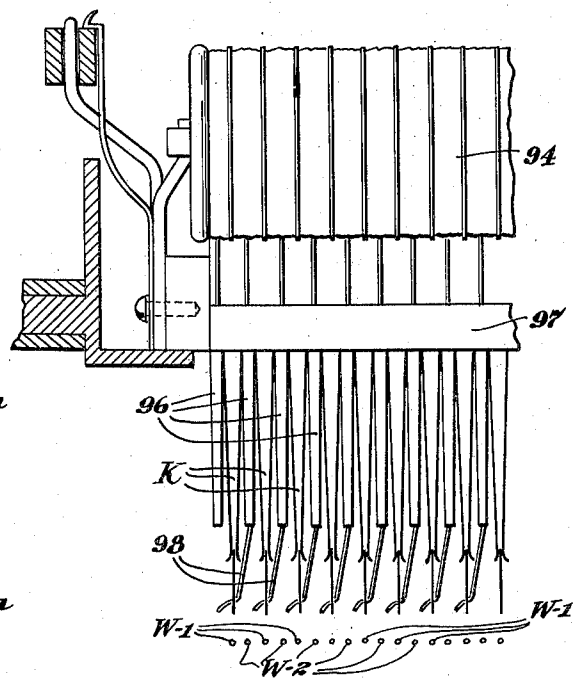


Fig. 21

Fig. 22



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Fig. 23

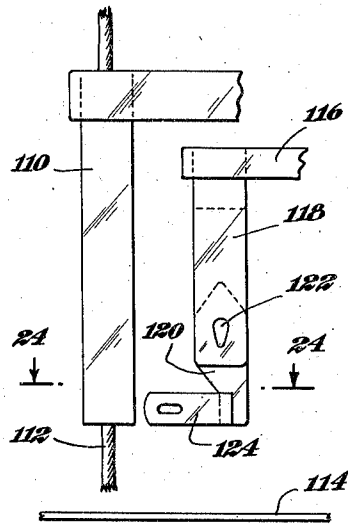


Fig. 25

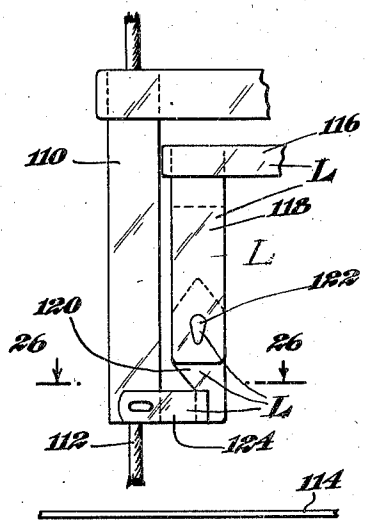


Fig. 24

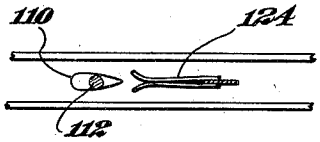


Fig. 26

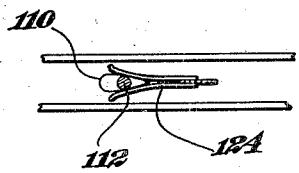


Fig. 27

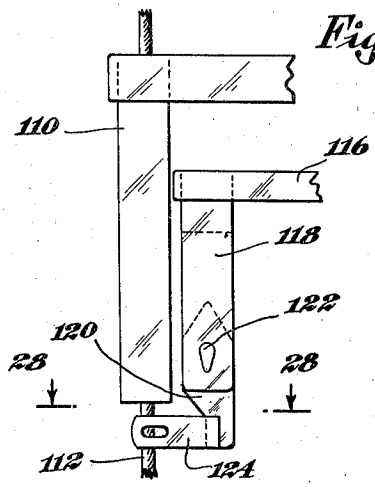
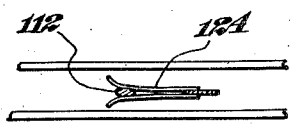


Fig. 28



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Patented Nov. 15, 1938

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UNITED STATES PATENT OFFICE

2,136,828

PILE FABRIC MANUFACTURE

Albert John Signoret, New York, N. Y., assignor to American Safety Razor Corporation, Brooklyn, N. Y., a corporation of Virginia

Application August 14, 1935, Serial No. 36,109

15 Claims. (Cl. 139—4)

This invention relates in general to the manufacture of pile fabrics, and in particular to a method of applying tufts to a pile fabric. Coordinately with such method it relates to mechanism for carrying out such method.

It is to be understood, however, that while it has been described in relation to pile fabrics, that as to certain phases thereof it may have other applications.

While the art of making pile fabrics is highly developed and a great variety of such fabrics have been developed very few of such machine made pile fabrics are equal to hand made Oriental rugs in regard to wear and artistic qualities. Such machine made pile fabrics as are at all comparable to the Oriental hand made product are so high in cost, that there is little to choose between the purchase of the machine made product and the hand made oriental product. The high cost of the product is due to the high cost of the machinery and the complicated processes used in the manufacture thereof.

One reason for the superiority of the hand made oriental rug is the use of short tufts to constitute the pile and the manner of incorporating the tufts with the foundation threads of the rug. The tufts are held in place by forming the tuft threads into loops about the warp threads of the fabric. In the Turkish or Ghiordes style of knot two loops are used. The tuft thread is laid transversely across two adjacent warp threads and looped around each one, and the two ends of the tuft pass outwardly between the two warp threads about which the tuft is looped.

In the Axminster type of carpet an approach to the oriental construction is made by the use of short tufts. These tufts, however, are not tied in any way, and the direction of the body thereof, that is to say the portion connecting the two upstanding tufts is parallel to the warp threads instead of transverse thereto. The only thing that holds the tuft threads in place is the pressure of the weft threads against the tuft threads that pass between them and the foundation.

I have found that the machines used in the Axminster carpet industry are capable by the use of my invention, of being readily modified so as to produce oriental rugs using the Turkish knot hereinabove described. However it will be understood that my invention may also be used in connection with other carpet weaving machines or in specially constructed machines.

The embodiments of my invention herein disclosed are particularly designed for use with Axminster looms, and thereby this machinery may be readily adapted, at relatively low cost, for weaving a machine made pile fabric that is at least equal to if not superior to the hand made oriental product.

It is the general object of my invention to provide a method of weaving pile fabrics by which a knot of the hand made Turkish type may be produced by machinery, and the provision of mechanism whereby such method may be practiced, and further the provision of mechanism whereby Axminster and other pile fabric looms may be readily adapted for the production of Turkish type pile fabrics.

For attainment of the aforementioned objects and such other objects as will hereinafter appear or be pointed out I have shown one manner of practicing my invention, and also several embodiments of mechanism for carrying out the practice of my invention, in the drawings, in which:

Figures 1 to 6 inclusive show several successive steps in the practice of my invention of weaving pile fabrics;

Figure 7 shows the knotted tuft construction that may be obtained by the practice of my invention as disclosed in Figures 1 to 6 as an alternative to the construction shown in Figure 6;

Figure 8 is a diagrammatic plan view of a knotted tuft similar to that shown in Figure 6, as it appears when applied to a pile fabric;

Figure 9 is a diagrammatic plan view of a knotted tuft similar to that shown in Figure 7 as it appears when applied to a pile fabric;

Figures 10 to 16 inclusive are diagrammatic showings of one embodiment of knot tying mechanism adapted for the practice of my invention and illustrate successive steps in the functioning thereof;

Figure 17 is a side elevation of one practical embodiment of my invention, the view being taken in the direction of the arrows 17 of Figure 19;

Figure 18 is an elevational view of the device of Figure 17 viewed from the opposite side, the view being taken in the direction of the arrows 18 of Figure 19;

Figure 19 is an end elevation, viewed in the direction of the arrows 19 of Figure 17;

Figure 20 is a side elevation of a second practical embodiment of my invention;

Figure 21 is an end elevation of the device of Figure 20;

Figure 22 is an elevational view of the tufting mechanism of an Axminster loom with my invention applied thereto;

Figures 23, 25 and 27 are side elevational views

of a further embodiment of my invention, showing consecutive positions in the operation thereof when used in conjunction with a tufting tube of an Axminster loom, and the various figures show several successive positions in the operation thereof; and

Figures 24, 26 and 28 are plan views corresponding respectively to Figures 23, 25 and 27.

With the aid of Figures 1 to 6 I will now endeavor to explain one method of practicing my invention. In these figures, **30** and **32** denote two adjacent warp threads, in cross-section, and **34** indicates a tuft thread that is to be looped around these warp threads.

In Figure 1, which illustrates the first step in my method, the tuft thread **34** is shown as having its tip **36** introduced between the warp threads **30** and **32**, the latter being in what may be termed their normal position, spaced from each other by the distance A. The tip **36** moves in the vertical line V—1.

In Figure 2, illustrating the second step, the warp thread **30** is shown as displaced toward the warp thread **32** and the tip **36** of the tuft thread **34** is shown as about to move upwardly on the outer side of thread **30**. Movement of tip **36**, either up or down is always along line V—1.

In Figure 3 the warp thread **30** is shown as having returned to its normal position at a distance A from warp thread **32**, and the tip **36** of the tuft thread **34** has been brought above the level of thread **30**, while the body of the tuft thread **34** is wrapped around thread **30**. The tip **36** has all this time remained in the vertical line V—1.

The next step, shown in Figure 4, consists in moving the end **36** laterally over the warp thread **32** and down on the outside thereof along the vertical line V—2, so that the tuft thread **34** now lies across both warp threads.

In Figure 5 the warp thread **32** is shown as having moved outward, away from thread **30**, while the tip **36** of the tuft **34** is commencing to move upward along the vertical line V—2.

The final knotting step is shown in Figure 6. It will be seen that the warp thread **32** has returned to its normal position while the tip **36** of the tuft thread which has moved upwardly along the vertical line V—2, has been brought completely around the warp thread **32** and above the plane of the warp thread. A length of tuft thread may now be severed from the main body thereof so as to produce a separate tuft thread having two upstanding tufts.

Figure 8 indicates diagrammatically the resulting tuft construction in place in a pile fabric, and shows that it is identical with the hand made Ghiordes or Turkish knot. **30** and **32** in this figure as before denote the warp threads, while a pair of weft threads are shown at **38** and **40**. **34** is the tuft thread shown as having two tufts **42** and **44**. It will be observed that the connecting portion of the tuft thread passes above the tufts **42** and **44** and that thereby the tufts **42**, **44** tend to lie down and to bend in the same direction.

It will be understood that the showing of Figure 8 is by way of illustration only, and that I do not limit myself to the application of my knotted tuft to the single shot pile fabric there shown. On the contrary it is to be understood that any arrangement of warp and weft threads may be used, the only requirement being the availability of a pair of parallel threads to which the tuft thread may be applied.

From the foregoing discussion the characteristics of my method of applying the tufts will be apparent. Whereas in the hand method the warp threads were disturbed as little as possible, and the looping was effected by moving the tuft thread vertically and laterally as required, in my method the tuft thread tip is led upward or downward along a vertical line and has no lateral motion, while, on the other hand, the warp thread is displaced laterally and has no vertical motion.

It will be understood that the words "vertical" and "vertically" in the foregoing discussion, are not intended to limit my method in that respect. They are used for convenience of description, and because that is a natural way of carrying out the method. However it is obvious that the method might be carried out with the warp threads **30** and **32** in a vertical, or any other position, and with the tuft thread tip **36** moved in a horizontal or any other direction appropriately related to the direction of the tuft threads.

It will further be understood that the position of the warp threads **30** and **32** will be appropriately controlled by the customary shedding operations as required, and no discussion of this phase is here attempted, because it is deemed unnecessary.

As to the tuft thread **34**, it is understood that it will be drawn from a bobbin or other source, under tension, in the customary manner.

Instead of the knot just described it may be found desirable to use the alternative manner of performing the final step of Figure 6, shown in Figure 7. It will be observed that in this figure the end **36***a* of the tuft thread **34***a* is carried in front of the portion of the tuft thread connecting the two loops, instead of to the rear thereof as shown in Figure 6. The result is a pair of projecting tuft ends arranged in relation to the pile fabric as shown in Figure 9, in which **30***a* and **32***a* again indicate a pair of adjacent warp threads, and **38***a* and **40***a* a pair of weft threads.

In Figures 10 to 16 inclusive I have indicated diagrammatically a mechanism adapted for performing the steps of the process indicated in Figures 1 to 6 inclusive.

The device shown in these figures comprises a body member **50** having two prongs or tines **52** and **54** projecting therefrom in substantially parallel relation. These tines are resilient and tend normally to move toward each other and to grip therebetween a guide piece **56** provided on opposite sides thereof with opposed projections **58** and **60**. These projections are adapted to fit respectively into openings **62** and **64** in the tines **52** and **54** and are so formed in relation to the openings that when either projection is in engagement with its opening it will serve to prevent lateral displacement thereof. It is therefore possible to pass a thread between either tine and the guide piece **56** without displacing the guide piece laterally in relation to the other tine, since the effect of so inserting a thread will serve to press the guide piece against said other tine. While the projections **58** and **60** prevent lateral displacement, tilting movement of the guide piece **56** relative to the tines is at all times possible, this tilting motion of course being accompanied by a corresponding yielding of the resilient tines. At its inner end the guide piece **56** is curved as shown at **66**, for a purpose to be explained hereinafter, and the lower end of projection **58** and the upper end of projection **60** are tapered off as shown at **68** and **70** respectively so as to afford a ramp-like construction serving as an approach to guide inserted threads from the surface

of the guide piece to the raised portion of the projection. It will further be observed that the tine **52** is provided with a portion **72** curved outwardly from the guide piece **56**, to serve as a guide to facilitate entry of threads between tine **52** and guide piece **56**.

Having explained the structure, the functioning of the device of Figures 10 to 16 will now be explained. Numeral **74** is intended to indicate a cross-section of a thread such as one of the warp threads **30** or **32** of Figure 1, and numeral **76** to indicate a thread such as the tuft thread **34** of Figure 1, which it is proposed to loop around the thread **74**. The knotting device of Figures 10 to 16, in the operation of looping the thread **76** about the thread **74**, is intended to move only in the direction of its length and with substantially no lateral motion. Any lateral motion that is required is imparted to the thread **74**, this being one of the characteristics of the method herein disclosed, as heretofore mentioned. In all of these figures the thread **74** is assumed to remain in the same horizontal plane and the knotting device to move vertically in relation thereto.

In Figure 10 the thread **74** is assumed to be in its normal position, that is, not displaced laterally, and the knotting device has been lowered so that the guide piece **56** contacts one side of the thread **74**, which is about to enter the knotting device between the curved guide **72** of tine **52** and the guide piece **56**.

In Figure 11 the knotting device has been lowered farther so that the thread **74**, which has not changed its position, has been forced into the device so that it has begun to ride up the inclined portion **68** of the projection **58**. In doing so it has spread the tines **52** and **54**, and at the same time has forced the guide piece **56** against the tine **54**.

In Figure 12 the knotting device has advanced still lower, so that the thread **74** has now completely passed the projection **58** and is about to tilt the guide piece **56** as the result of its passage between the tine **52** and the portion **66** of the guide piece. It will be observed that up to this point the guide piece **56** has been held against the tine **54** without tilting thereof.

In Figure 13 the knotting device has advanced still lower and the thread **74**, pressed against the curved portion **66** of the guide piece, has now begun to tilt the guide piece into the position shown in the figure, without however destroying the interlocking relation of the projections **58** and **60** with the tines. The knotting device continues its downward motion until the thread **74** clears the guide piece and thereafter it moves upward. If desired the portion **66** may be made flexible and resilient, so that the amount of tilting of the guide piece may be reduced or even eliminated. The same result might be accomplished by having the portion **66** made as a separate piece resiliently hinged to the body of the guide piece **56**.

Figure 14 shows the knotting device shortly after it has begun its upward movement. It will be observed that as soon as thread **74** clears the curved portion **66** of the guide piece, the tines **52** and **54** snap into a position of close contact with the guide piece, and the curved portion **66** engages the tine **52** thereby barring entrance of the thread **74** into the channel from which it emerged and at the same time guiding it into a channel between the opposite side of the guide piece and the tine **54**.

As the upward motion of the knotting device continues, the thread **74** is forced between the guide piece **56** and the tine **54**, and the guide piece is pushed and held against the tine **52**. The projection **58** interengaging with the opening **62** in the tine serves to hold the guide piece **56** against lateral disengagement from the knotting device. These positions are shown in Figure 15, in which the thread **74** is commencing to glide over the inclined surface **70** of the projection **60**.

Finally in Figure 16 the thread **74** is shown as having passed the projection **60** and as about to leave the device. After it has done so, and when the knotting device is again located above the thread **74** it will be observed that relative positions of thread **76** and **74** are those illustrated in Figure 3. It will also be observed that lateral motion of the thread **74** (such as shown for the thread **30** in Figure 2) has been effected by causing the thread **74** first to move on one side of the guide means **56** during the downward movement of the latter, and to move on the opposite side of the guide piece during the upward movement of the latter.

During this latter movement the warp thread is therefore displaced from its normal position by a distance equal to the combined thickness of the guide piece and the thickness of the thread.

It will further be observed that while the tip of the tuft thread is in adjacency to the warp thread, which occurs when the warp thread is passing on one side or the other of the exposed end of guide piece **56**, the said tip moves along a single vertical line, whether its motion be up or down. This is nevertheless true, even though the tuft thread tip, while the thread **74** is passing along the tines **52** and **54** is caused to move laterally to some extent, due to the tilting of the guide piece **56** and the lateral displacement of the tines.

The operation just described covers the loop formation of Figures 1, 2 and 3. If now it is desired to carry out the remaining steps of my method, as shown in Figures 4, 5 and 6, all that is necessary is to move the knotting device laterally to such a point that when it moves downward the left hand side of the guide piece **56** engages the next adjacent warp thread on its right hand side as shown in Figure 4, that is on the same side that it engaged the thread **74**, in the operation just described. The same cycle is then gone through, the knotting device dipping and then rising without moving laterally and displacing the warp thread to the right (see Figure 5), and on the completion of its rising motion the knot of either Figure 6 or 7 will have been obtained. Which one of these results is obtained is determined by the position of the tufting thread **76** and motion of the knotting device in a direction lengthwise of the warp thread. The final step comprises cutting the tufting thread by any suitable or preferred means, so as to sever the knotted portion from the main body of the thread.

It will of course be understood that the thickness of the thread **74** must be properly related to the various dimensions of the parts of the knotting device, so that the various parts remain in their proper relation. For instance with a thread that is too thick the tines may separate to such an extent that the guide piece **56** will drop or be forced out of its interlocking position with the tines.

One practical embodiment of my invention is shown in Figures 17, 18, and 19. Such practical embodiment is substantially identical in its main constructional features with the diagrammatic

showing of Figures 10–16 inclusive and it will be observed that it comprises a holder portion 78 provided with two downwardly extending tines or prongs 80 and 82 and an inner guide member 84. The guide piece 84 is provided with projections 86 and 88 and these project into complementarily shaped openings provided in the tines. These projections are shaped so as to prevent turning of the piece 84 in the tines and by way of example, I have shown them as ovally contoured. It will be observed that each projection is relatively pointed at one end thereof and that the direction of pointing is upwards for one projection and downward for the other one. The outer surface of each projection is sloped toward the point thereof, and it is at this point that the thread first engages the projection. At its inner end the guide piece 84 is provided with a curved portion 89 corresponding to the portion 66 of the diagrammatic showing, and this portion may also be made flexible. The outer exposed portion of the guide piece 84 is provided with a slot 90 terminating in a hole 91, serving for the reception of the tuft thread, which is indicated at 92. It will be observed that the tines 86 and 88 are shown as slightly bowed outwards at the points 81 and 83 respectively. I have found this construction advantageous in that it facilitates the passage of the thread, although it is not necessary to the proper functioning of the device.

A second practical embodiment of my invention is shown in Figures 20 and 21. Since this embodiment comprises only slight modifications of the form of Figures 17 to 19, corresponding parts have been denoted by the same numerals with the addition of the letter *a*, and it is unnecessary to describe them in detail.

The main points of difference between the two forms will now be briefly pointed out. The guide piece 84*a* is shown as provided with a thread receiving slot 90*a* that opens downwardly and as terminating in a hole 91*a*, whereby its action is symmetrical in relation to the direction in which it can pull the tuft thread, whereas in the form of Figures 17 to 19 the device would be adapted to pull the thread in one direction only. The projections 86*a* and 88*a* are shown as diamond shaped, and their surfaces are shown as tapering both upwardly and downwardly.

In the application of my knotting device to an Axminster loom, very little change is required in the loom, and such change is confined to the tufting mechanism and the mechanism determining its movements. An illustrative application is indicated in Figure 22, in which 94 denotes the standard tufting spool, moved in the customary way, and 96 indicates the tufting tubes carried by the tufting carriage or tube frame 97. Knotting devices K are shown on the tube frame, one device being positioned between each pair of tubes 96 and cooperating with one of these tubes, the tufting thread 98 of which is shown as having its end carried by the knotting device K. Warp threads W—1, W—2 are shown as ranged beneath the tufting mechanism, the lettering W—1, W—2 being intended to indicate that these are arranged in pairs, each comprising a thread W—1 and W—2, and each pair is positioned directly beneath mechanism comprising one knotting device K and its associated tube 96.

Owing to the fact that the knotting device mechanism serves first a warp thread W—1 and then a warp thread W—2, as hereinbefore explained in connection with Figures 1–6 inclusive, it is necessary to arrange the tube frame 97 so that it may move laterally for this purpose. and it will be understood that this tube frame is also arranged so that it may move vertically up and down, as is customary, except of course that the speed and range of this movement must be adapted for the purpose in view.

The arrangement just described has the disadvantage that the pitch of the tufts of the pile fabric is limited by the necessity of placing a knot tying device intermediate each pair of tubes, whereby the number of tufts that it is possible to apply is reduced approximately by one-half. An improvement that suggests itself is therefore that of placing the knot tying device either in front or in back of the tubes, the latter being arranged in an unbroken row. However it will be obvious that the devices of Figures 17 to 19 and 20, and 21 cannot be used in this manner and some modification is required.

A second disadvantage in the arrangement of Figure 22 is that one knot tying device is required for each tufting tube of each row of tufting tubes, and therefore the total number of knot tying devices needed will be equal to the number of tufts occurring in each repeat design of the pile fabric. For example, if the width of the design requires 100 tubes and its length requires 80 rows of tubes the number of knotting devices required is 8000. If therefore only a single row of knotting devices could be used in conjunction with all of the rows of tubes their number could be greatly reduced. In the example given, the number of knotting devices required would be reduced to the number of tubes in one row, namely, 100.

In Figures 23 to 28 inclusive I have shown the functioning of an arrangement whereby the aforementioned disadvantages may be overcome.

Figure 23 is a view looking toward the end of a row of tubes, the tube nearest the observer being denoted by 110, and the tuft thread 112 is shown as passing therethrough. 114 denotes the warp thread. A knotting device denoted as a whole by L, is shown to the right of the tube 110, that is, in the machine it would be positioned in back of the tube. It is to be understood that a whole row of these knotting devices is arranged in back of the row of tubes 110, one knotting device being positioned to the rear of each tube. The knotting devices are mounted on a carrier 116 adapted to move them simultaneously.

Each knotting device comprises a forked element 118 similar to that on the embodiments described hereinabove, and a central element 120 is carried between them and supported therein by projections 122, and this inner element functions in the manner already described in connection with the other embodiments. The point of departure from said other embodiments resides in the thread engaging member 124, which comprises a pair of opposed resilient members or jaws having their rear portions carried in fixed relation by the element 120, and adapted to have their forward portions separate for the purpose to be explained.

By referring to Figure 24, which is a plan view corresponding to Figure 23, it will be observed that the tubes 110 have an oval or streamlined cross-section tapered off toward the rear, and it is obvious that if the thread engaging member 124 is moved forward the tapered rear portion of the tubes 110 will engage and cause the separation of the jaws 124.

This action is shown in Figure 25 in which the carrier 116 for the knotting device has moved

away and the thread engaging members 124 have opened up. If now the carrier 116 is moved down, the thread engaging members 124 will move below the tube 110 and the jaws will close and grip the end of the thread 112 as shown in Figures 27 and 28. Thereafter the knotting operation may be carried on in the manner explained in Figures 1 to 6 inclusive. This is followed by a thread severing or shearing operation which separates the tuft from the main body of tuft thread and also from its connection with the jaws 124. The small piece of thread that remains in the jaws drops out on the next opening of the jaws as they are moved to engage the tubes 110.

The row of tubes may now be moved away and a fresh row substituted therefor without replacing the knotting device.

For effecting the desired movements of the carriers for the knotting mechanisms and the carriers for the tubes, or tube frames, the same may be actuated by combinations of mechanical elements such as gears, cams, levers and the like. Since the principles relating to the use of these elements for attaining any desired motions are well known, I have made no attempt to disclose any specific construction for moving the tube frames, as any such disclosure would not aid the understanding of my invention, but would only tend to obscure the same.

It will be understood that I have disclosed several ways of practicing my invention and several embodiments of mechanism for carrying out the methods disclosed by me, and that I have made no attempt to disclose all the various ways in which it might be practiced or all the various forms in which it might be embodied. It will be obvious to those skilled in the art that my invention may be practiced in many other ways and embodied in many other forms. The disclosure herein is not therefore to be construed in a limiting sense, but is illustrative merely, and it is to be understood that I do not limit myself in respect thereto in any way other than as called for by the prior art.

Having thus described my invention and illustrated its use, what I claim as new and desire to secure by Letters Patent, is:—

1. A knotting device for applying tuft threads to a pile fabric comprising a forked body member and a separate guide member having thread engaging means at its outer free end and a thread guiding portion at its inner end positioned within said forked body member and carried thereby, and complementary means on said guide member and said body member adapted when interengaged to maintain said guide member in place within said body member and yet when separated to permit the passage of a thread between said two members, and said complementary means constituting the sole means of support of said guide member.

2. In a knotting device for applying a tuft thread to a warp thread of a pile fabric, a body member having two parallel resilient tines, an elongated guide member having thread engaging means at its outer free end, and having its inner end deformed into a cammed guiding portion, positioned between said tines and carried thereby, cooperating means on said guide member and said tines adapted to effect engagement of said guide member and said body member at all times and yet to permit the passage of the thread between one of said tines and the guide member without disengagement of the guide member from the other tines, and said cooperating means constituting the sole means of support for said guide member.

3. In a knotting device for tying tuft threads to the warp thread of a pile fabric, a body member having two resilient tines projecting therefrom in closely spaced parallel relation, a narrow guide member having a thread engaging slot at its outer free end, and having a cammed guiding portion at its inner end, positioned between said tines, and cooperating means on said guide member and each of said tines adapted to prevent disengagement of said guide member from said body member and yet to permit the passage of the thread between said tines and the guide member.

4. A looping device for applying tuft threads to the warp thread of pile fabrics, comprising a body member having two resilient tines projecting therefrom in parallel relation, a guide member having thread carrying means at its outer free end, and having its inner end deformed into a relatively resilient cammed guiding portion, positioned between said tines, a pair of projections on opposite sides of said guide member, and an opening in each of said tines adapted to receive one of said projections and to prevent substantial displacement of said guide member in relation to said tines, except such as is due to the inward and outward movement of said projections in relation to said openings, and yet to permit the passage of the thread between one of said tines and the guide member.

5. A knotting device for applying tuft threads to a pile fabric comprising a forked body member and a guide member having thread engaging means at its outer free end and a thread guiding portion at its inner end positioned within said forked body member, and means on said guide member and body member adapted to maintain said guide member within said body member and yet to permit the passage of a thread between said two members, said thread engaging means comprising an opening in said guide member, and a slot leading from said opening to an edge of the guide member.

6. A knotting device for applying tuft threads to a pile fabric comprising a forked body member and a guide member having thread engaging means at its outer free end and a thread guiding portion at its inner end positioned within said forked body member, and means on said guide member and body member adapted to maintain said guide member within said body member and yet to permit the passage of a thread between said two members, said thread engaging means comprising an opening in said guide member, and a slot leading from said opening to a side edge of the guide member.

7. A knotting device for applying tuft threads to a pile fabric comprising a forked body member and a guide member having thread engaging means at its outer free end and a thread guiding portion at its inner end positioned within said forked body member, and means on said guide member and body member adapted to maintain said guide member within said body member and yet to permit the passage of a thread between said two members, said thread engaging means comprising an opening in said guide member, and a slot leading from said opening to the end of the guide member.

8. A knotting device for applying tuft threads to a pile fabric comprising a forked body member and a guide member having thread engaging means at its outer free end and a thread

guiding portion at its inner end positioned within said forked body member, and means on said guide member and body member adapted to maintain said guide member within said body member and yet to permit the passage of a thread between said two members, said thread engaging means comprising a pair of resilient jaws adapted to grip a tufting thread therebetween.

9. For use with an Axminster loom, a tufting mechanism comprising a tube frame having a row of tuft thread guiding tubes positioned transversely in relation to the warp threads of a fabric being made in the loom, knotting devices fixedly mounted on said tube frame, and each tuft thread guiding tube having a particular knotting device positioned in operative relation thereto, mechanism for translationally moving said knotting devices up and down and sideways in relation to the warp threads and into and out of contact with said warp threads and for preventing rotation thereof, and each of said knotting devices including as part thereof means movably supported solely by the other parts of said knotting device and adapted to receive the end of the tuft thread and to wrap it around said warp threads as the knotting device moves up and down and sideways and into and out of contact with said warp threads.

10. For use with an Axminster loom, a tufting mechanism comprising a tube frame having a row of tuft thread guiding tubes positioned thereon transversely in relation to the warp threads of a fabric being made in the loom, a knotting device associated with each tuft thread guiding tube and mounted on the tube frame, mechanism for translationally moving the body portion of said knotting devices up and down and sideways in relation to the warp threads and into and out of contact with said warp threads and for preventing rotation thereof, and each of said knotting devices including as part thereof means movably supported solely by the other parts of said knotting device and adapted to receive the end of the tuft thread and to be moved by contact with a warp thread to wrap it around said warp thread as the knotting device moves up and down and sideways and into and out of contact with said warp threads.

11. A tufting mechanism for Axminster looms comprising a carrier movable in relation to said loom, said carrier having a plurality of knotting devices fixedly mounted thereon a member carrying a plurality of tuft thread guiding devices adapted to be so positioned that each one of said devices is brought into operative proximity to a particular one of said knotting devices, each of said knotting devices being provided with means to receive the end of the tuft thread and to draw said thread out of its associated tube, mechanism for moving said member carrying said tuft thread guiding tubes into proximity with said knotting devices, and mechanism for moving said carrier of said knotting devices while said tubes are in said position in proximity to said knotting devices, so that the successive positions of said knotting devices are always parallel to each other and into and out of contact with said warp threads, first into a position so that each knotting device thereof is positioned above one of a pair of warp threads, and then dipping it so that the end of the tuft thread is brought below said warp thread, and then raising it so that the knotting device is brought above said warp thread, thereafter moving it laterally into a position above the other thread of said pair of warp threads, and repeating the dipping and raising of the knotting device in relation to said last mentioned warp thread, and no part of said knotting device receiving movement other than through said mechanism actuated member and contact of said knotting device with said warp threads.

12. In a machine for weaving pile fabrics, a tufting mechanism comprising a tube frame provided with a row of tufting tubes, each serving to guide a tufting thread having its end projecting therefrom, a knotting device carried by said machine in proximity to each of said tufting tubes and provided with means to draw the tufting thread therefrom and to loop it around the warp thread, means to hold said tufting tubes stationary during said looping operation and mechanism for moving each of said knotting devices translationally as a unit and without rotational movement thereof into and out of contact with said warp threads to effect the looping operation.

13. A tufting mechanism for use with Axminster looms, a carrier provided with a series of tuft thread guiding tubes mounted thereon and adapted to be positioned over the warp of a fabric being manufactured, each tuft thread guiding tube having a unitary knotting device mounted on said carrier in proximity thereto and adapted to grip and to draw the tufting thread from its associated tube as it makes contact with the warp threads, and means for moving each of said knotting devices as a unit into and out of contact with said warp threads vertically and horizontally in relation to the warp threads and said means also preventing rotational movement of each knotting device.

14. A tufting mechanism for Axminster looms, comprising tube frame, a series of tuft thread guiding tubes mounted on said tube frame, each tuft thread guiding tube having a unitary knotting device associated therewith and being adapted to receive and to draw the tufting thread from its associated tube and to tie it around a warp thread, and mechanism for moving each of said knotting devices during the operation as a unit into and out of contact with said warp threads vertically and also horizontally in transverse relation to the warp threads, and for limiting movements of said knotting devices to translational movement.

15. A unitary knotting device for applying tuft threads to a pile fabric comprising a body portion, and a tuft thread holding portion provided with means for grasping the tuft thread, and a by-passable connection for maintaining said tuft thread holding portion on said body portion, said mounting permitting the passage of a thread of the fabric between said body portion and said tuft thread holding portion and through said connection without separating the tuft thread holding portion from the body portion.

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