Feb. 16, 1932. H. MASON 1,845,614

PILE FABRIC LOOM

Filed May 19, 1931 3 Sheets-Sheet 1

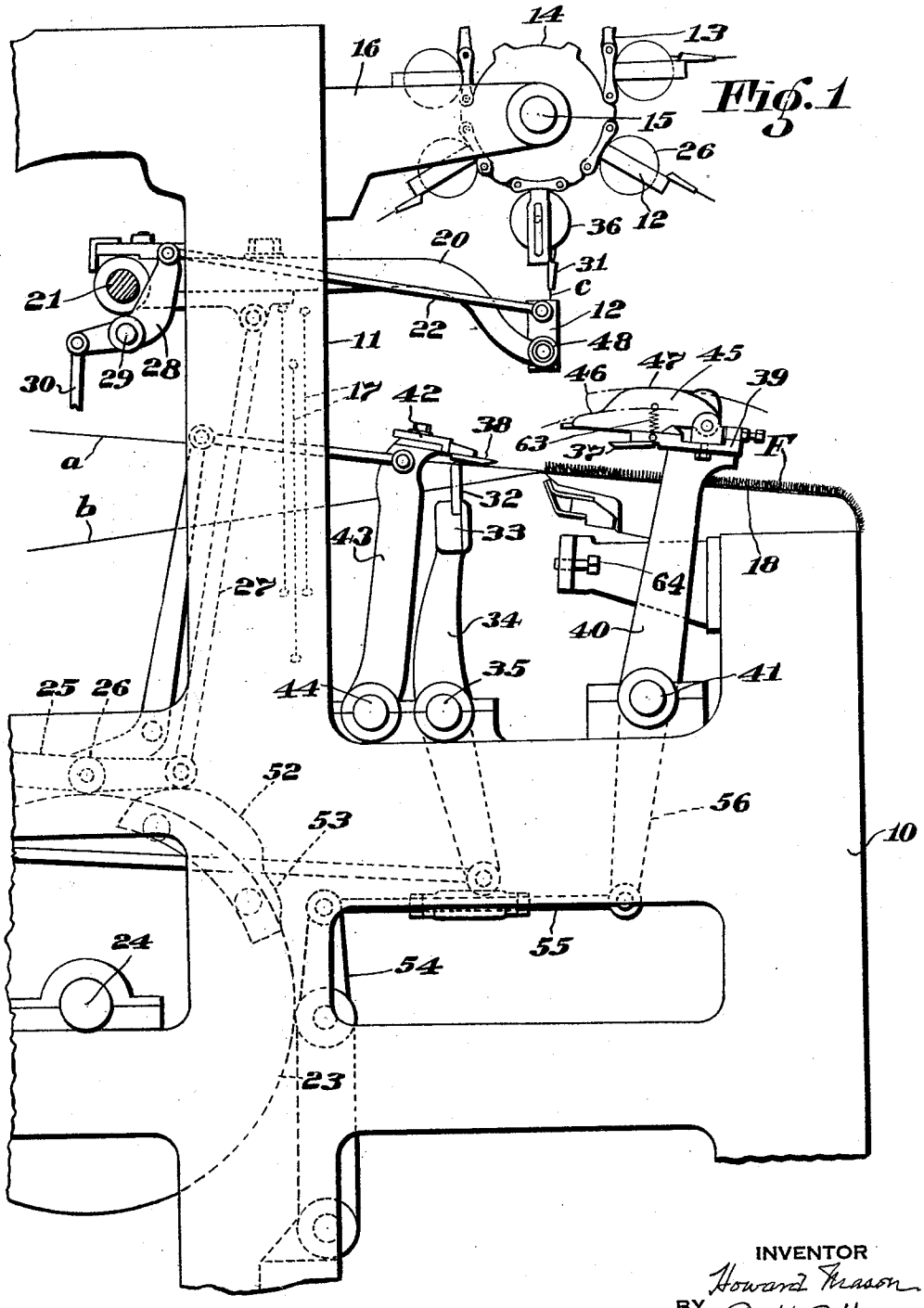


Fig. 1

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Fig. 2

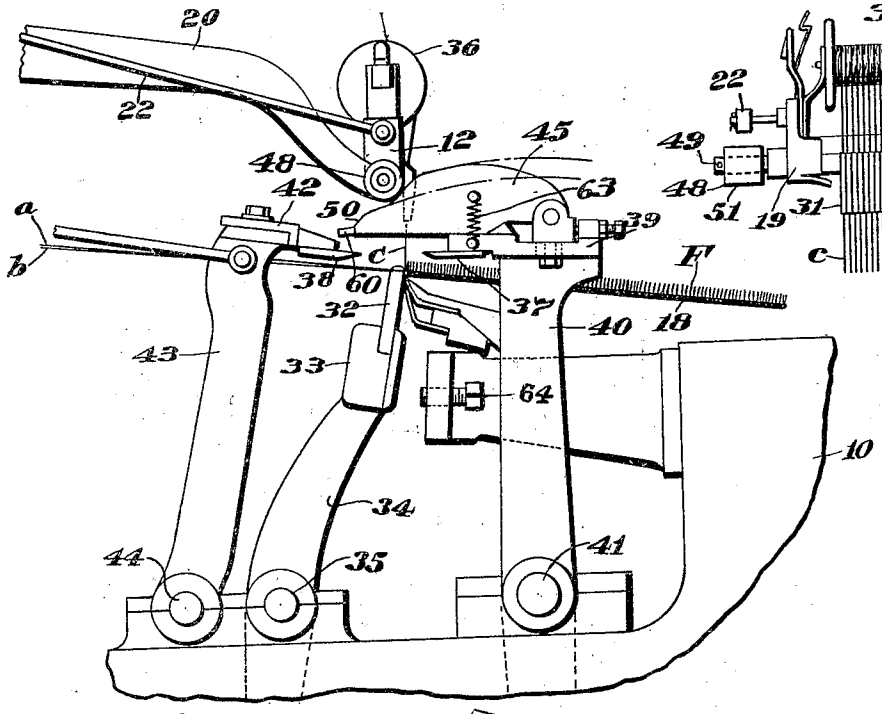
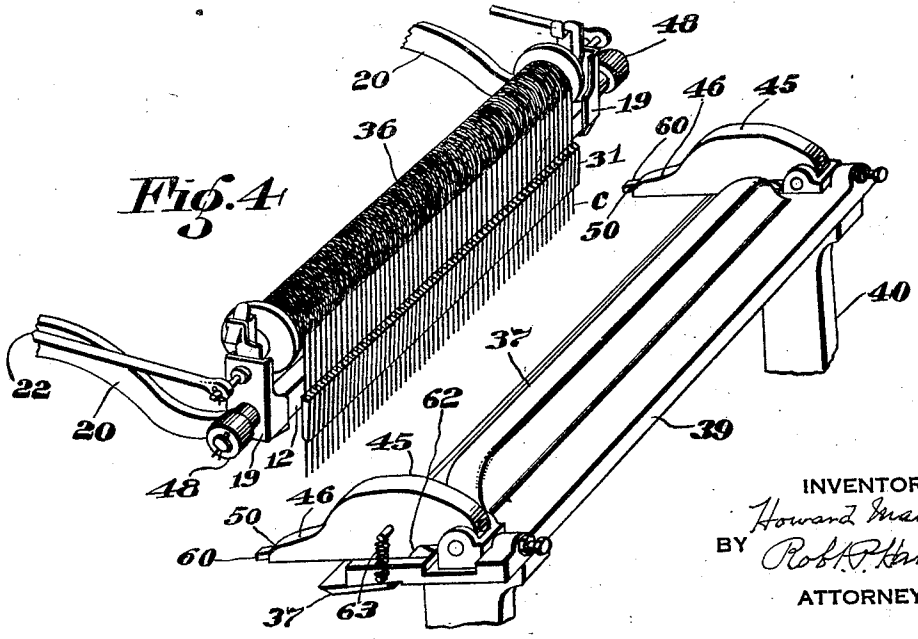


Fig. 3

Fig. 4



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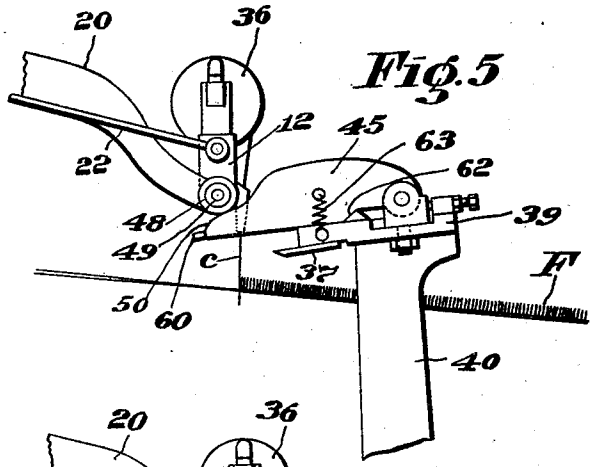


Fig. 5

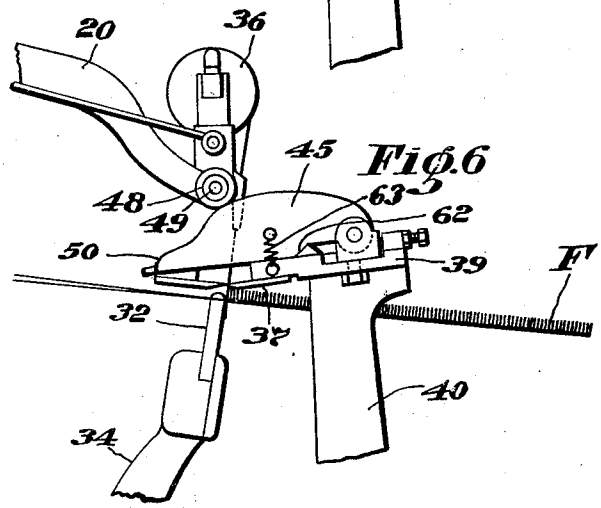


Fig. 6

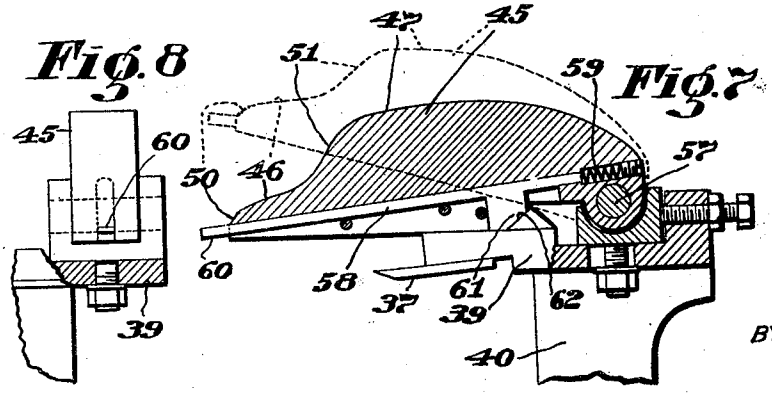


Fig. 8

Fig. 7

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UNITED STATES PATENT OFFICE

HOWARD MASON, OF SAXONVILLE, MASSACHUSETTS

PILE FABRIC LOOM

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This invention relates to pile fabric looms of the Axminster type employing tube frames, and more particularly to novel means for accurately positioning each tube frame relative to the fabric during the tuft inserting operation.

In the Axminster or tube frame type of loom a large number of tube frames are employed to present different colored tuft yarns to the fabric in accordance with the requirements of the pattern being woven, and the tube frames are usually supported above the loom and are advanced in the proper order towards the weaving position by a conveyor or chains. As each tube frame is carried to a predetermined position above the weaving point, clutches supported by power operated arms are engaged with the opposite ends of the tube frame, in a well known manner, to lower the frame so as to introduce the tuft yarns carried by the frame tubes between the warps.

In performing the tuft inserting operations the tube frame is commonly given what is called the dipping or wiping-in motion to carry the ends of the tuft yarns downwardly between the warps. The tube frame is then lifted to a position which will cause the ends of the yarns to extend downwardly from the lower face of the fabric far enough to form the desired length of tufts. A shot of filling is then inserted and beaten up by the reed, the reed being held against the fell of the cloth long enough to hold the tuft yarn firmly in place while the tube frame is lifted to effect what is known as the drawing-off operation, employed to draw from the tube frame the length of yarns needed to form the next row of tufts. The tuft yarns are then severed above the fabric to form pile of the desired length and the tube frame is returned to its conveying chains.

If tuft yarns are to be introduced in the fabric so as to produce pile of the desired length without waste, due to shearing, it is important that the position of the tube frame be accurately controlled; (1) at the time the first binder shot is being bound in; and (2) while the cutting operation takes place.

Heretofore it has been difficult to control accurately the first position just mentioned and practically impossible to control accurately the second position, and as a result the rows of tuft yarns extending from the different tube frames have not been cut accurately to the same length. The lack of uniformity in severing the rows of yarns of the different tube frames is readily understood when it is appreciated that a loom carries several hundred tube frames, and each frame is supplied with its own tension device, the braking action of which necessarily varies more or less from that of the tension devices of the other tube frames, so that the lifting force it is necessary to exert upon a tube frame to unwind the yarns therefrom will vary for each tube frame. This variation in the force required to unwind the yarns from the spools of the tube frames is sufficient to vary somewhat the springing action of the clutch arms that lift the tube frames and to modify the action of the arm operating means, with the result that the distance between the tube frames and the cutting knife at the time the row of tuft yarns is cut may easily vary from $\frac{1}{16}$th to $\frac{1}{8}$th of an inch for different tube frames, depending whether the spools supplying the yarns turn hard or easy.

In order to allow for this variation in cutting the length of the tuft yarns, it has been the practice heretofore to insert longer pile forming yarns between the warps than desired in the finished pile and then shear the yarns to the required length. This practice, however, involves a large waste of pile forming yarn, for if the waste per tube frame averages $\frac{1}{16}$th of an inch for each cut and there are approximately three hundred cuts to the tube frame this constitutes a loss of nearly 20 inches per tube frame. The waste of yarn from this source is considerable and is further objectionable in that it causes some spools to become exhausted ahead of others, so that even in the case of the spools where the waste due to shearing is small the spools of the different tube frames will become exhausted at different times, thus causing a loss on all spools.

Having in mind the foregoing the present

invention contemplates an extremely simple and practical construction for moving each tube frame accurately to a fixed predetermined distance from the yarn shearing mechanism before the row of tuft yarns is cut, so that all tube frames will have their yarns cut accurately to the desired length irrespective of the adjustment of the spool tension devices. As a result of the present construction whereby the length of yarns introduced between the warps may be accurately controlled, it is no longer necessary to supply longer tuft yarns to the fabric than are needed in the finished pile, thus avoiding the wasteful practice employed heretofore.

A further feature of the invention resides in means for accurately positioning the tube frame relative to the fabric while the first binder shot is being bound in, and in means for accurately positioning the tube frame while the cutting operation takes place.

A more specific feature of the present invention resides in means mounted on a knife carrying frame and operable to engage the tube frame supporting heads to lift the heads and their tube frame to a definite predetermined distance from the cutter blade, so that every tube frame will have its yarns sheared at the same distance from the end of the tubes.

Still a further feature of the invention resides in safety mechanism adapted to be operated by an abnormally positioned tube frame to move the means for accurately positioning the tube frame to an inactive position.

The above and other features of the invention and novel combination of parts will be hereinafter described in connection with the accompanying drawings which illustrate one good practical form of the invention.

In the drawings:—

Fig. 1 is a side elevation with parts in section of an Axminster loom provided with the novel features of the present invention;

Fig. 2 on an enlarged scale is a similar view of portions of the loom of Fig. 1;

Fig. 3 is a front view of a head and associated parts for supporting one end of a tube frame;

Fig. 4 is a perspective view of a tube frame shown supported in spaced relation to the front knife carrying frame;

Fig. 5 is a side view showing a tube frame supported in one position adjacent the fabric by the novel means of the present invention;

Fig. 6 is a similar view showing the tube frame supported in a second position;

Fig. 7 is a vertical sectional view through the tube frame positioning means of the present invention; and

Fig. 8 is an end view of the construction of Fig. 7 with parts in section.

The features of the present invention may be employed in connection with any Axminster loom where tube frames are used in the weaving process as distinguished from the nipper type of loom, and the loom illustrated in the drawings is for the most part well known and operates in a well understood manner.

In the construction shown the operating parts are supported by the spaced side frames 10, only one of which is shown, and each side frame is provided with the upright columns 11 adapted to support the mechanism for handling the tube frames 12 which are advanced by the carrier chains or conveyor 13 towards the weaving position in a well known manner. The chains 13 pass downwardly from overhead supporting structure, not shown, and about the sprockets 14 which may be rigidly secured to and driven by the shaft 15 rotatably supported by the brackets 16 mounted upon the columns 11.

The warp threads *a*, *b*, may be supplied from the usual let-off beams in a well known manner, and are controlled by the harnesses 17, as usual, and the woven pile fabric F is advanced as woven towards the front of the loom over the fabric supporting mechanism 18 to the take-up roll, not shown.

As each tube frame 12 is advanced by the chains 13 to a position directly below the shaft 15 its opposite ends are engaged in a well known manner by the clutches or heads 19 carried by the clutch arms 20 which are pivotally supported by the shaft 21, the arrangement being such that the arms 20 may be rocked slightly in a horizontal plane to move the clutches 19 into and out of engagement with the ends of a tube frame 12 and may be and are rocked in a vertical plane to convey a tube frame towards and from the tuft inserting position. The auxiliary levers 22 are provided to impart the desired tilting movement to a tube frame while it is in the tuft yarn inserting position. Various means have been provided heretofore for imparting the desired movements to the arms 20 and levers 22 and in the construction shown the vertical movement of the clutch arms 20 is controlled by the cams 23 secured to the operating shaft 24 and having cooperating therewith the pivoted levers 25, each of which has a cam engaging roller 26 and the outer end of each lever 25 is connected by a link 27 to an arm 20. Each head tilting lever 22 is operatively connected to a bell crank lever 28 which is pivoted at 29 and has the operating link 30.

The operation of the mechanism for handling the tube frames is such that a tube frame is carried by the clutch arms 20 downwardly to insert the tubes 31 between the warp threads so as to introduce the tuft yarns *c* therebetween, a dipping or wiping-in motion being imparted to the tube frame at this time by the levers 22 to facilitate the insertion of the yarns *c* downwardly between the warps. A shot of weft or filling is then inserted and beaten up against the fell of the cloth by the

reed 32, supported by the reed holder or lay 33 carried by the levers 34 pivotally supported at 35, and while the lower ends of the tuft yarns *c* are held by the reed, as shown in Fig. 2, the clutch arms 20 are raised to lift the tube frame so as to unwind from the spool or spools 36 sufficient yarn to supply the tufts for the next yarn inserting operation of this tube frame.

The mechanism so far described operates in a well known manner, but as above pointed out, it is practically impossible to so operate the described mechanism as to cut the rows of yarn *c* at the same distance from the ends of the tubes 31 upon the different tube frames. This is due to the fact that the force required to lift the tube frames to unwind the yarn from the spools will vary for the different tube frames, thus placing a varying strain upon the tube frame lifting arms 20 and parts that operate these arms, with the result that the height to which a tube frame is lifted from the fabric at the time the yarns *c* extending therefrom are sheared may vary, say, from $\frac{1}{16}$th to $\frac{1}{8}$th of an inch. This produces an objectionable variation in the length of the yarn *c* projecting from the different tube frames, and in order to meet this difficulty it has been the general practice heretofore to so present the tube frames 12 to the fabric that the portions of yarns bent upwardly around the binding weft will extend upwardly to a greater distance than desired in the finished pile so that these ends of the tuft yarns will be sheared to a uniform length by the shearing knives 37 and 38, which operate in a well known manner to shear the yarns *c* extending from the tube frame to the fabric, as shown in Fig. 2. The front knife 37 in the construction shown is supported by the frame 39 secured to the upper ends of the operating levers 40, pivotally mounted at 41, and the rear knife 38 is secured to the frame 42 carried by the arms 43, pivoted at 44. When it is desired to shear a row of yarns *c*, the front and rear knives are advanced to the position in which they are shown in Fig. 6, in a well known manner.

In order to overcome the difficulties experienced heretofore in supporting the tube frames accurately in the desired position during the tuft inserting and shearing operations, the present invention contemplates means conveniently carried by the front knife supporting frame and adapted to control accurately the position of the tube frame relative to the fabric during the yarn cutting operation, and which may also serve to control accurately the position of the tube frame while the first binder shot is being bound in place. As a result of these features of the invention each tube frame will be accurately positioned before the yarns are cut, irrespective of whether the yarns are easy or hard to pull through the tubes 31.

While various constructions may be employed in carrying out the features of the present invention excellent results are secured by providing upon the knife carrying frame 39 the blocks 45, each having the stepped surfaces 46 and 47 for supporting a tube frame. These surfaces preferably are formed as arcs of circles swung about the knife supporting shaft 41 as a centre, as indicated in Figs. 1 and 2, and the radial distance between the arcs of the surfaces 46 and 47 equals the length of the tuft yarns it is desired to cut from the tube frames.

The arcuate surfaces 46 and 47, at each side of the loom, are adapted to cooperate with a roller 48 journaled upon a boss or stub shaft 49 rigidly secured to a tube frame supporting head 19, as shown in Fig. 3, and the operation of the loom parts are so timed that upon completion of the dipping or wiping-in motion of the tube frame, above mentioned, the front knife supporting frame 39 will be advanced towards the yarns to be sheared to the position in which the parts are shown in Fig. 5. This will cause an inclined or cam portion 50 at the nose of each arcuate surface 46 to facilitate the passage of the arcuate surface 46 under the roller 48, so as to support the tube frame carried by the clutches 19 at an accurate predetermined distance from the fabric F to thereby determine the length of the tuft yarns *c* extending downwardly below the woven fabric, as will be apparent from Fig. 5.

After the first binding shot has been inserted and beaten up by the reed 32 and the tube frame has been lifted by the arms 20 part of the distance required by the drawing-off operation, the front cutter may be moved to the position in which it is shown in Fig. 6. This will cause the inclined or cam portions 51 to raise the rollers 48 so that they will rest upon the arcuate surface 47. In this manner the tube frame is lifted the radial distance between the surfaces 46 and 47 to thereby draw off from the tube frame the exact length of tuft yarns required for the next tuft inserting operation of this tube frame. The rear knife 38 is then advanced to sever the yarns *c*, whereupon the tube frame is carried upwardly by the arms 20 to the chains 13.

It is desirable that the front knife shall dwell momentarily in the position of Fig. 5 before it is moved to the cutting position of Fig. 6, and this is accomplished by providing the cam which operates the front cutter with the stepped portions 52 and 53 adapted to actuate the connections 54, 55 and 56 to advance the cutter first to the position of Fig. 5 and then to the position of Fig. 6.

Should a tube frame, through some defect, occupy a position abnormally close to the fabric at the time the front knife 37 is moved towards the cutting position, the parts might

be damaged by the nose 50 of the block 45 striking squarely against the roller 48, and in order to prevent damage to the parts from this cause, the blocks 45 may be pivotally secured to the frame 39 by the adjustably supported pivot pins 57, so that the blocks may be swung upwardly to the dotted line position of Fig. 7. It is desirable to provide means for throwing the blocks 45 upwardly in case the tube frame occupies a position that is abnormally low, and to this end in the construction shown, each block 45 has a longitudinally extending slot formed in its lower face adapted to receive the slide 58 which is normally held by a spring 59 in position to cause its end 60 to strike an improperly positioned roller 48. The slide 58 has the inclined surface 61 adapted to engage and ride upwardly upon the fixed inclined surface 62. The arrangement is such that if the end 60 of the slide 58 should strike a roller 48 the slide will be pushed frontwardly and this will serve to throw the block 45 upwardly out of the way to the dotted line position of Fig. 5, as a result of the inclined surface 61 riding up upon the fixed surface 62. A spring 63 may be provided to hold the block 45 down against the supporting frame 39. The movement of the front knife 37 towards the yarns may be arrested in the desired position by the adjustable bolts 64.

It will be seen from the foregoing that the tube frame positioning means of the present invention serves to position each tube frame accurately with respect to the fabric, so as to insure; (1) accurate positioning of the tube frame while the first binder shot is being bound in place; and (2) accurate positioning of the tube frame during the cutting operation. As a result all tube frames presented to the yarn inserting position will have their tuft yarns accurately positioned in the fabric and cut at the proper distance from the tube frame so that the tufts bound in the fabric will have just the right length and will not require shearing. In this manner the large waste of tuft yarns caused heretofore by the inaccurate positioning of the tube frames is entirely avoided.

What is claimed is:—

1. In a pile fabric loom provided with tube frames, in combination, shed forming mechanism, weft inserting mechanism, a tube frame conveyor, means for presenting the tube frames advanced by the conveyor to the tuft inserting position to supply tuft yarns to the fabric, tuft yarn cutting mechanism including a knife carrying frame movable towards and from the row of inserted yarns, and means having stepped camming surfaces mounted on the knife carrying frame and adapted to lift the tube frame adjacent the fabric to one accurate predetermined position before the row of yarns are secured in the fabric by a binder weft and to a second and slightly higher position after said yarns are secured in the fabric.

2. In a pile fabric loom provided with tube frames, in combination, shed forming mechanism, weft inserting mechanism, a tube frame conveyor, means for presenting the tube frames advanced by the conveyor to the tuft inserting position including heads engageable with the ends of a tube frame and power actuated arms for supporting and shifting the heads, a roller upon each head, tuft yarn cutting mechanism including a knife carrying frame movable towards and from the row of inserted yarns, and blocks having stepped camming surfaces associated with the knife carrying frame and engageable with said rollers to lift the tube frame to one accurate predetermined position relative to the fabric before the yarns extending therefrom are secured in the fabric by a binder weft and to a second and slightly higher position after said yarns are secured in the fabric.

3. In a pile fabric loom provided with tube frames, in combination, shed forming mechanism, weft inserting mechanism, a tube frame conveyor, means for carrying the tube frames advanced by the conveyor to and from the tuft inserting position including heads engageable with the ends of a tube frame and power actuated arms for supporting and shifting the heads, tuft yarn cutting mechanism, and power actuated means supported near the front of the loom and operable independently of said arms to lift the tube frame while the yarns extending therefrom engage the fabric to one predetermined position before the binding weft is forced against these yarns and to a second predetermined position before these yarns are severed by the cutting mechanism.

4. In a pile fabric loom provided with tube frames, in combination, shed forming mechanism, weft inserting mechanism, a tube frame conveyor, means for carrying the tube frames advanced by the conveyor to and from the tuft inserting position including heads engageable with the ends of a tube frame and power actuated arms for supporting and shifting the heads, tuft yarn cutting mechanism, and power actuated means supported near the front of the loom and including stepped surfaces operable independently of said arms to lift the lowered tube frame to one position preparatory to beating up a binding weft against the yarns supported by the tube frame, and operable to lift the tube frame to a second position to draw off the proper length of yarns from the tube frame.

5. In a pile fabric loom provided with tube frames, in combination, shed forming mechanism, weft inserting mechanism, a tube frame conveyor, means for presenting the tube frames advanced by the conveyor to the tuft inserting position to supply tuft yarns to the

fabric, tuft yarn cutting mechanism including a knife carrying frame movable towards and from the row of inserted yarns, means including stepped surfaces mounted on the knife carrying frame and adapted to lift the tube frame adjacent the fabric to one position to determine the length of the yarns extending from the tube frame below the fabric and to a second position to draw off the proper length of yarns from the tube frame.

6. In a pile fabric loom provided with tube frames, in combination, shed forming mechanism, weft inserting mechanism, a tube frame conveyor, means for presenting the tube frames advanced by the conveyor to the tuft inserting position to supply tuft yarns to the fabric, tuft yarn cutting mechanism including a knife carrying frame movable towards and from the row of inserted yarns, means mounted on the knife carrying frame and adapted to lift the tube frame adjacent the fabric to an accurate predetermined position while the yarns extending from the tube frame engage the fabric, and mechanism operable by an improperly positioned tube frame to render said last mentioned means inoperative.

7. In a pile fabric loom provided with tube frames, in combination, shed forming mechanism, weft inserting mechanism, a tube frame conveyor, means for presenting the tube frames advanced by the conveyor to the tuft inserting position to supply tuft yarns to the fabric, tuft yarn cutting mechanism including a knife carrying frame movable towards and from the row of inserted yarns, means mounted on the knife carrying frame and adapted to lift the tube frame adjacent the fabric to an accurate predetermined position while the yarns extending from the tube frame engage the fabric, and mechanism operable by an improperly positioned tube frame to effect the movement of the last mentioned means to an inactive position.

In testimony whereof, I have signed my name to this specification.

HOWARD MASON.