United States Patent [19]

Jackson

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[54] **TUFTING MACHINE WITH POSITIVE POSITIONING MEANS FOR BACKING MATERIAL**

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[52] **U.S. Cl.** ..... **112/79 R,** 26/61 A

[51] **Int. Cl.** **D05c 15/14**

[58] **Field of Search** ..... 112/79 R, 79 A; 26/61 R, 26/61 A, 62 R, 62 C, 54 R; 38/143

[56] **References Cited**

UNITED STATES PATENTS

347,212	8/1886	Varney	26/61 A
459,235	9/1891	Windle	26/54
2,564,631	8/1951	Veitch	112/79 R
3,249,078	5/1966	Nowicki	112/79 R
3,396,687	8/1968	Nowicki	112/79 A

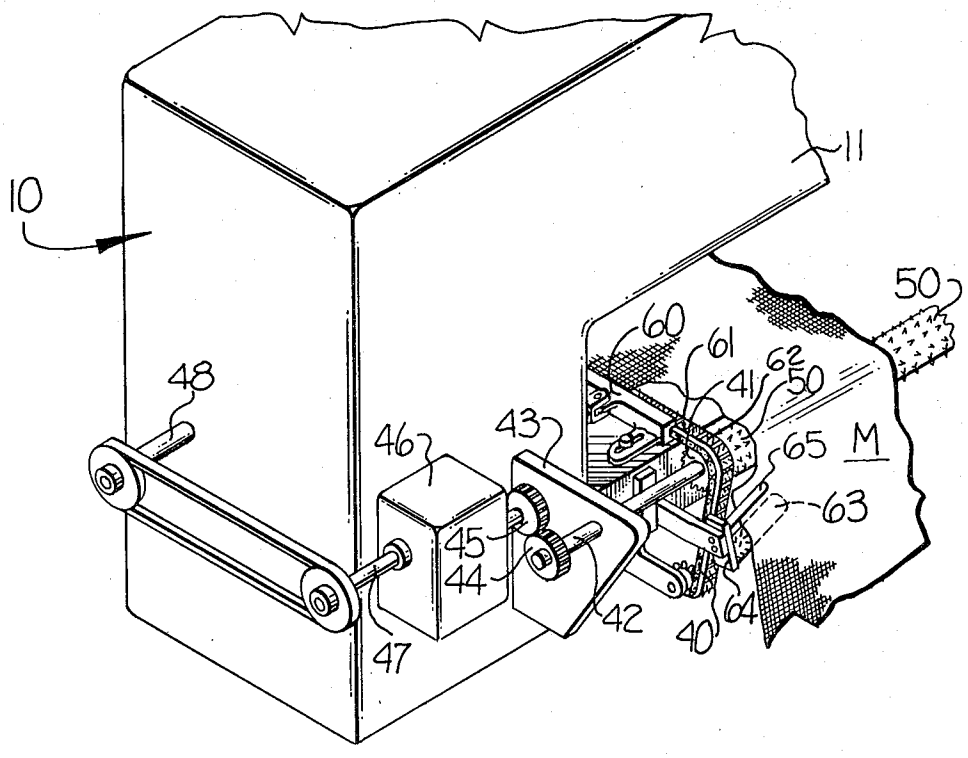
Primary Examiner—Werner H. Schroeder

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[57] **ABSTRACT**

The positive positioning means of the tufting machine of the present invention prevents lateral movement of the backing material as it passes beneath successive rows of tufting needles so that the rows of tufts are accurately positioned, relative to each other and to the backing material. This machine is particularly adapted for forming narrow or fine gauge pile fabrics, such as upholstery fabrics, carpet and the like wherein the rows of tufts are closely spaced. The positive positioning means includes a pair of endless chains having upper reaches supported for movement transversely of and adjacent opposite ends of the rows of tufting needles. Gripping means is carried by the chain for engaging the side edge portions of the backing material and for positively maintaining the lateral position of the backing material as it is moved beneath the successive rows of tufting needles.

8 Claims, 4 Drawing Figures



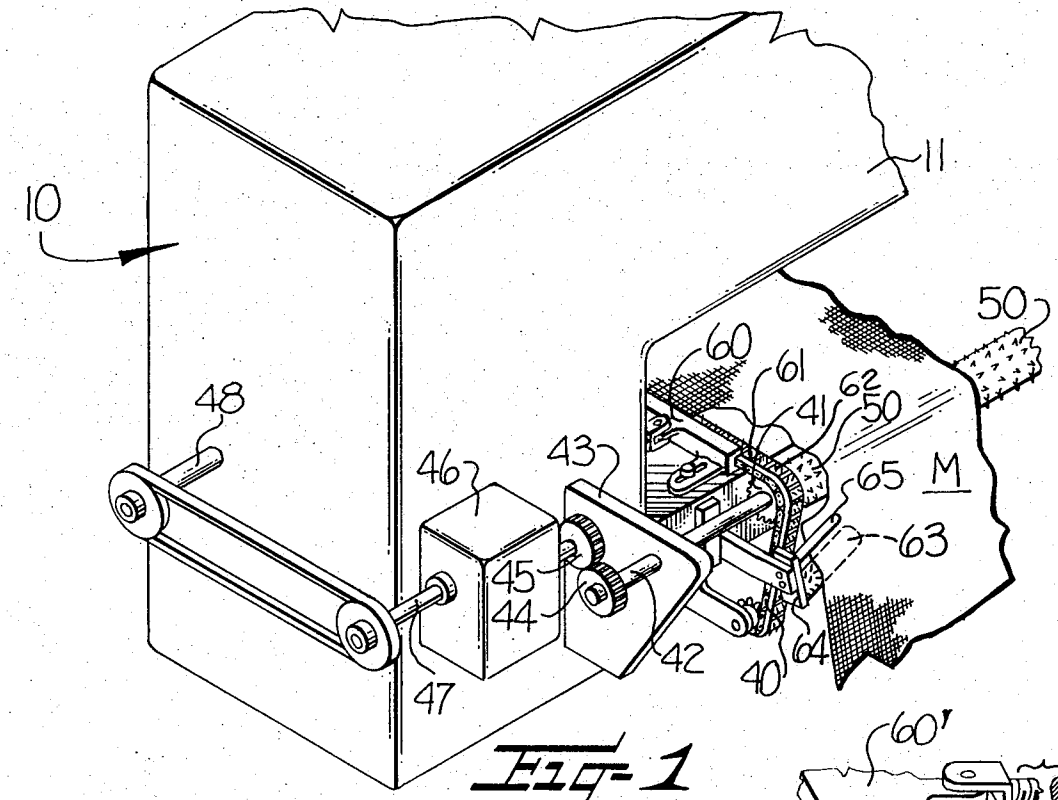


Fig-1

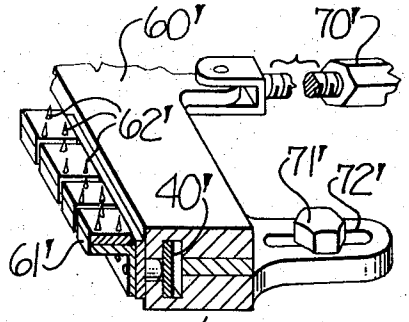


Fig-3

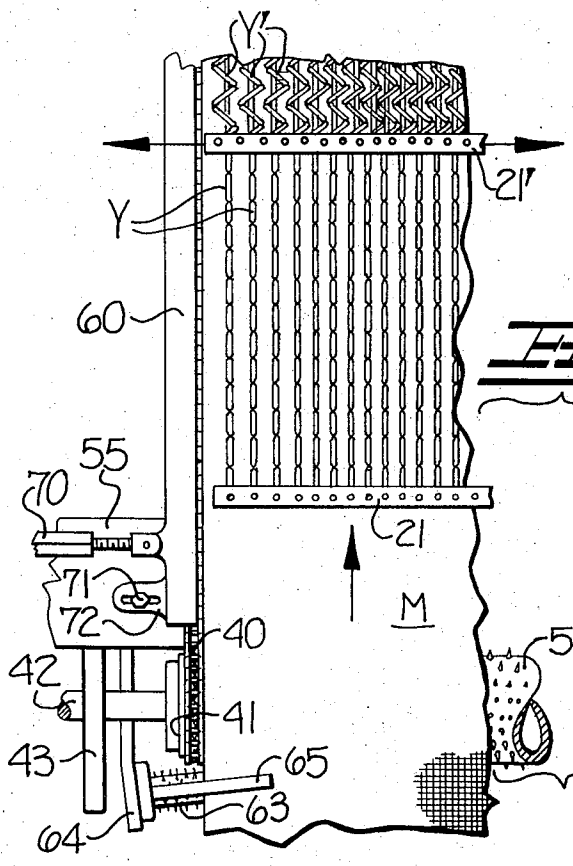
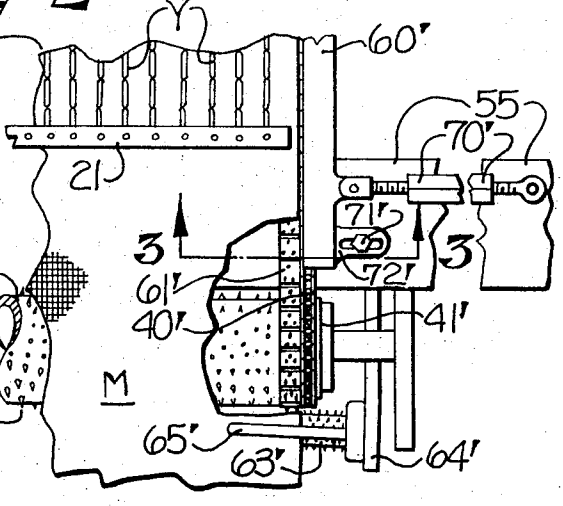


Fig-2



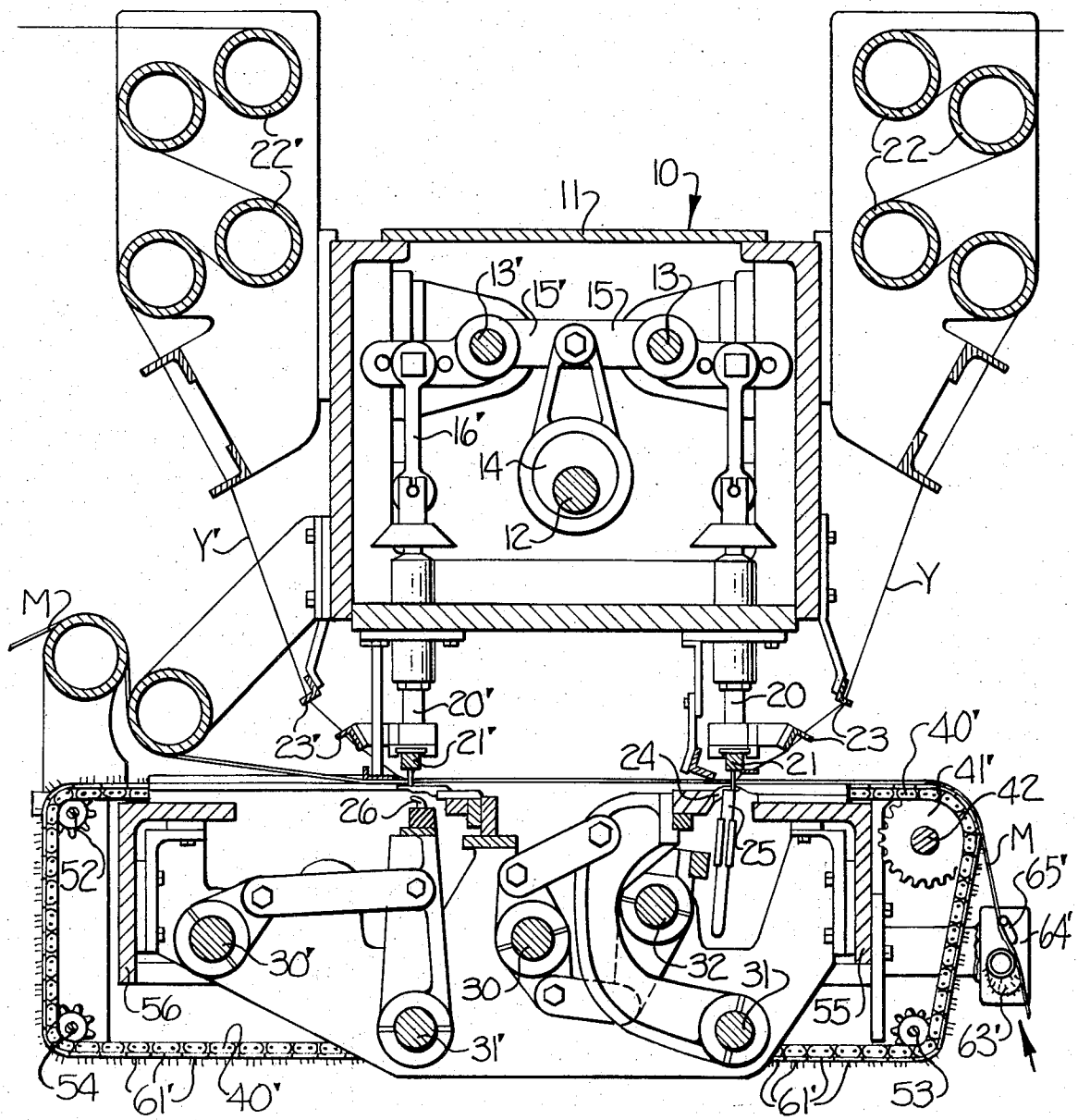

22'
22
11
10
13'
15'
15
13
16'
14
12
Y'
Y
M2
20'
20
23'
21'
24
21
23
40'
41'
42
26
25
M
65'
64'
52
30'
30
32
31
56
55
31'
63'
54
61'
40'
61'
53

Fig. 4

TUFTING MACHINE WITH POSITIVE POSITIONING MEANS FOR BACKING MATERIAL

This invention relates generally to tufting machines for forming narrow or fine gauge pile fabrics and more particularly to a tufting machine for forming such fabrics which includes a plurality of successive rows of tufting needles and positive positioning means to prevent lateral shifting of the backing material as its passes beneath successive rows of tufting needles.

The prior James T. Cobble, U.S. Pat. No. 3,585,948 issued June 22, 1971, discloses a tufting machine particularly adapted for forming narrow gauge pile carpeting and the like. This machine includes first and second spaced apart rows of tufting needles and tracking means disposed between the first and second rows of needles for guiding the backing material from the first row of needles to the second row of needles so that the rows of tufts formed by the first row of needles pass through the spaces between the needles of the second row of needles. The tracking means illustrated in this patent comprises first and second grooved tracking rolls supported for rotation between the first and second rows of tufting needles so that the rows of tufts formed by the first row of needles will be guided in a substantially straight line as the backing material is fed to the second row of needles. The tracking means also includes a grooved guide bar positioned beneath the backing material for aiding in maintaining the straight line path of travel of the backing material as it moves from the first row of needles to the second row of needles.

While the tufting machine illustrated in the prior Cobble patent operates satisfactorily in the formation of narrow gauge pile carpeting, the addition of the grooved guide rolls and grooved guide bar, with the associated mechanism for imparting longitudinal movement thereto, tends to complicate the tufting machine. Also, the guide rolls and guide bar of the tufting machine of the prior Cobble patent prevent lateral movement of the backing material only in the area between the first and second rows of tufting needles.

With the foregoing in mind, it is an object of the present invention to provide a tufting machine with positive positioning means to prevent lateral shifting of the backing material prior to and during the time it passes beneath the successive rows of tufting needles to insure proper positioning of the rows of tufts relative to the backing material and to insure proper positioning of the rows of tufts formed by one row of needles, relative to rows of tufts formed by a succeeding row of needles.

In accordance with the present invention, the positive positioning means includes a pair of endless chains having upper reaches supported for movement tranversely of and adjacent opposite ends of the rows of tufting needles. Gripping means is carried by the chains for engaging the side edge portions of the backing material and for positively maintaining the lateral position of the backing material as it is moved toward and beneath the successive rows of tufting needles by the chains. The gripping means is preferably formed by a series of plates carried by and extending inwardly from each of the chains with pins being carried by the plates and pointing upwardly along the upper reaches of the chains so that the opposite side edge portions of the backing material are penetrated by the pins and positively held in position as the backing material is fed through the tufting machine.

Other objects and advantages of the invention will appear as the description proceeds, when taken in connection with the accompanying drawings, in which:

FIG. 1 is an isometric view of a fragmentary portion of the tufting machine illustrating the backing material being guided into the machine;

FIG. 2 is a somewhat schematic sectional plan view with parts broken away and illustrating the manner in which the first and second row of tufting needles penetrate the backing material as it is guided through the tufting machine by the positive positioning means, in accordance with the present invention;

FIG. 3 is a fragmentary isometric view of one side of the guide track and chain, with parts in section and being taken substantially along the line 3—3 in FIG. 2;

FIG. 4 is a vertical sectional view through the tufting machine and illustrating the positive positioning means for feeding the backing material beneath the successive rows of tufting needles.

Many of the parts of the tufting machine of the present invention are identical to corresponding parts of the tufting machine illustrated in the prior Cobble U.S. Pat. No. 3,585,948 which is incorporated herewith by reference, and which may be referred to for any of the details not described in the present application. As had been indicated, the tufting machine of the present invention is particularly adapted for forming narrow or fine gauge pile fabrics, such as upholstery fabrics and, carpets and the like. These fabrics include an elongate backing material and yarns penetrating the backing material and forming closely spaced rows of tufts extending longitudinally of the backing material. As has been pointed out in the prior Cobble patent, it is necessary to utilize two or more successive rows of tufting needles in order to form the narrow or fine gauge pile fabric because the physical limitations imposed in the lateral spacing of the pile forming instrumentalities cooperating with the needles severely limit the close spacing of the pile needles.

Generally, the tufting machine of the present invention includes a frame or housing, broadly indicated at **10**, (FIG. 1) including a bridging support frame **11**. A main drive shaft **12** (FIG. 4) is suitably connected to the drive mechanism of the tufting machine housed in the end of the frame **10** in any suitable manner, not shown, and extends across the bridging frame **11**. The main drive shaft **12** is continuously driven by the conventional drive means and a pair of rocker shafts **13**, **13'** are also supported in the bridging frame **11**. Eccentric needle drive cams **14** are spaced along the main drive shaft **12** and are pivotally connected to needle rocker arms **15**, **15'** which are in turn connected to the rocker shafts **13**, **13'**. Drive links **16**, **16'** are connected at their upper ends to the rocker arms **15**, **15'** and their lower ends are connected to the upper ends of respective needle drive rods **20**, **20'** which are suitably supported for vertical movement in the bridging frame **11**. The lower ends of the drive rods **20**, **20'** are fixedly connected to first and second needle bars **21**, **21'** carrying respective first and second spaced apart rows of tufting needles mounted for reciprocation in a vertical direction transverse to the path of travel of the backing material, indicated at M, as it moved beneath the needles, in a manner to be presently described.

Each of the needles carried in the first and second needle bars **21, 21'** is continuously fed with respective yarns Y and Y' and by conventional tension and guide rolls **22, 22'** which draw the yarns from a suitable supply, not shown. The yarns are directed to the needles through suitable guide means, in the form of guide bars **23, 23'**. Pile forming means is disposed beneath the path of the backing material M and is operatively associated with each row of needles for forming rows of tufts on the lower face of the backing material. The pile forming means may be of any suitable type and is illustrated as including loopers **24** and knives **25** associated with the needle bar **21** and loopers **26** associated with the needle bar **21'**.

As best shown in FIG. **4**, looper and knife drive shafts **30, 30'** are supported for reciprocation in the lower portion of the frame of the machine. Looper pivot shafts **31, 31'** are also supported in the frame, along with a knife pivot shaft **32**. A suitable drive connection, not shown, is provided between the main drive shaft **12** and the shafts **30, 30'** for imparting oscillation thereto in synchronization with the rotation of the main drive shaft **12**. Thus, the vertical movement of the first and second needle bars **21, 21'** is synchronized with the movement of the loopers **24, 26** and the knives **25**.

As schematically illustrated in FIG. **2**, the first needle bar **21** moves in a vertical reciprocating manner to produce straight rows of the yarns Y while the second needle bar **21'** is shifted, first in one lateral direction and then in the opposite lateral direction to produce a zig-zag row of the yarns Y' and the needles in the second bar **21'** penetrate the backing material between the spaces between the rows of stitches formed by the yarns Y. However, it is to be understood that both of the needle bars could form straight rows of tufts. Also, if desired, both needle bars **21, 21'** may be shifted back and forth so that they each produce zig-zag rows of yarn. Also, the loop forming instrumentalities illustrated in cooperation with the first needle bar **21** are illustrated as forming a cut pile tuft while the instrumentalities associated with the needles carried by the second needle bar **21'** are illustrated as forming looped tufts, however, it is to be understood that cut tufts may be produced at each needle bar or looped tufts may be produced at each needle bar.

The positive positioning feed means of the tufting machine of the present invention includes a pair of endless chains **40, 40'** having upper reaches which are supported for movement transversely of and adjacent opposite ends of the first and second rows of tufting needles carried by the needle bars **21, 21'**. A first pair of sprockets **41, 41'** are supported on a shaft **42** which is suitably supported for rotation adjacent opposite ends in support brackets **43, 43'** (FIG. **2**). A drive pinion **44** is supported on one end of the shaft **42** (FIG. **1**) and is drivingly engaged by a gear **45** which is supported on the output shaft of the drive gear box **46**. An input shaft **47** of the gear box **46** is drivingly connected to a drive shaft **48** which is, in turn, drivingly connected to the tufting machine drive means, not shown, positioned inside of the housing **10**.

A picker roll **50** (FIG. **2**) having pins extending outwardly therefrom is supported between the first pair of sprockets **41, 41'** and engages the backing material as it is guided thereon in a manner to be presently described. A second pair of sprockets **52** is suitably supported for rotation adjacent the exit end of the tufting machine and supports the other end of the upper reaches of the chains **40, 40'**. Lower pairs of sprockets **53, 54** support the lower reaches of the endless chains **40, 40'** and are suitably supported for rotation on the lower frame of the tufting machine.

A front cross-frame **55** and a rear cross-frame **56** extend beneath the upper reaches of the chains **40, 40'** (FIG. **4**) and support the respective front and rear ends of chain guide tracks **60, 60'**. The guide tracks **60, 60'** are preferably made up of grooved upper and lower plates (FIG. **3**) for engaging the chains and maintaining the upper reaches thereof moving in straight line paths of travel as they pass the first and second rows of tufting needles, carried by the needle bars **21, 21'**.

Gripping means is provided on the chains **40, 40'** for engaging the side edge portions of the backing material M and for positively maintaining the lateral position of the backing material as it is moved beneath the first and second needle bars **21, 21'** by the chains **40** and **40'**. As illustrated in FIG. **3**, the gripping means includes a series of plates **61** which are carried by and fixed to the inner links of the chains **40** and **40'** and extend inwardly therefrom. Pins **62** are carried by the plates **61** and point upwardly along the upper reaches of the chain so that they penetrate the side edge portions of the backing material M as it is directed upwardly by the picker roll **50**.

Guide means is provided in advance of the picker roll **50** for spreading the outer edge portions of the backing material M in a lateral direction as it is guided onto the picker roll **50** to be engaged by the pins thereon. This guide means is illustrated in the form of guide rolls **63, 63'** supported for rotation on support brackets **64, 64'** and having pins extending outwardly therefrom. The guide rolls **63, 63'** are supported in angular relationship to cause a lateral spreading of the side edges of the backing materials as they pass thereover. Guide rods **65, 65'** are also supported on the brackets **64, 64'** and aid in maintaining the backing material in engagement with the pins on the guide rolls **63, 63'** as the opposite side edge portions of the backing material are guided thereover.

Thus, the positive positioning feed means for the backing material grips the opposite side edge portions of the backing material and positively guides it beneath the first and second needle bars **21, 21'** so that there can be no sideways or lateral movement of the backing material as it approaches the first needle bar **21** and as it moves from the needle bar **21** to the second bar **21'**. Therefore, the row of tufts formed by the needles of the second needle bar **21'** will be accurately positioned in the middle of the space between the row of tufts formed by the needles of the first needle bar.

In order to provide lateral adjustment of the path of movement of the backing material beneath the needle bars and to also provide adjustment of the lateral spacing between the conveying chains **40, 40'** , adjustment means is operatively associated with at least one of the guide tracks **60, 60'** for adjusting the position of one guide track relative to the other guide track. As illustrated in FIGS. **2** and **3**, this adjustment means is associated with both guide tracks **60, 60'** and comprises adjustment links **70, 70'** , the inner ends of which are fixedly secured to the outer extremities of the respective guide tracks **60, 60'** and the outer ends of which are suitably fixed to the upper surface of the front cross-frame **55**. The guide tracks **60, 60'** are main-

tained in adjusted position by screws **71, 71'** which are threadably imbedded in the cross-frame **55** and penetrate elongated slots in outwardly extending brackets **72, 72'**.

In the drawings and specification there has been set forth preferred embodiment of the invention, and although specific terms are employed, they are used in a generic and descriptive sense only and not for purposes of limitation, the scope of the invention being defined in the claims.

That which is claimed is:

1. A tufting machine for forming narrow gauge pile fabrics including an elongate backing material and yarns penetrating the backing material and forming rows of tufts extending longitudinally of the backing material, said machine comprising

a. a first row of spaced tufting needles mounted for reciprocation in a direction transverse to the backing material and arranged to carry yarns through the backing material to form spaced apart first rows of tufts therein,

b. a second row of spaced tufting needles mounted for reciprocation in a direction transverse to the backing material and arranged to carry yarns through the backing material, said second row of tufting needles being widely spaced from and offset relative to the needles of said first row to form second rows of tufts in the spaces between the first rows of tufts.

c. pile forming means disposed beneath the backing material for forming pile from the yarns carried by said needles, and

d. positive positioning means for feeding the elongate backing material beneath said first and second rows of spaced tufting needles and for preventing both lateral shifting and longitudinal sagging of the elongate backing material as it moves from said first to said second row of tufting needles, said positive positioning means comprising

1. a pair of endless chains having upper reaches supported for movement transversely of and adjacent opposite ends of said rows of tufting needles,

2. gripping means carried by said chains for engaging the side edge portions of said backing material and for positively maintaining the lateral position of said backing material as it is moved from said first row to said second row of tufting needles by said chains,

3. a rotatable picker roll supported on a fixed axis extending transversely between said chains and parallel to said rows of tufting needles, and including outwardly extending pins adapted to engage the backing material as the same is drawn over said picker roll, and

4. drive means for imparting movement to said chains, and for imparting rotation to said picker roll which is coordinated to the speed of movement of said chains.

2. A tufting machine according to claim **1** wherein said gripping means comprises a series of plates carried by and extending inwardly from each of said chains, and pins carried by said plates and extending upwardly along the upper reaches of said chains.

3. A tufting machine according to claim **2** including guide tracks supported along the upper reaches of each of said endless chains and engaging said chains to maintain said chains moving in straight-line paths of travel as they pass said first and second rows to tufting needles.

4. A tufting machine according to claim **3** including adjustment means operatively associated with at least one of said guide tracks for adjusting the distance between said tracks.

5. A tufting machine according to claim **3** including a first pair of sprockets supported adjacent the leading ends of said chain guide tracks, and a second pair of sprockets supported adjacent the trailing ends of said chain guide tracks, said sprockets supporting the upper reaches of said chains.

6. A tufting machine according to claim **5** including drive means for imparting reciprocation to said rows of tufting needles and wherein said drive means for said chains and picker roll is operatively connected to said needle drive means so that said chains and picker roll move the backing material beneath said rows of tufting needles in timed relationship to reciprocation of said tufting needles.

7. A tufting machine according to claim **6** wherein said picker roll is supported between said first pair of sprockets.

8. A tufting machine according to claim **7** including a pair of guide rolls engaging opposite side edge portions of the backing material prior to engagement with said picker roll, and pins extending outwardly from said guide rolls for spreading the outer edge portions of the backing material outwardly as it moves toward said picker roll and said pins carried by said chains.

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