

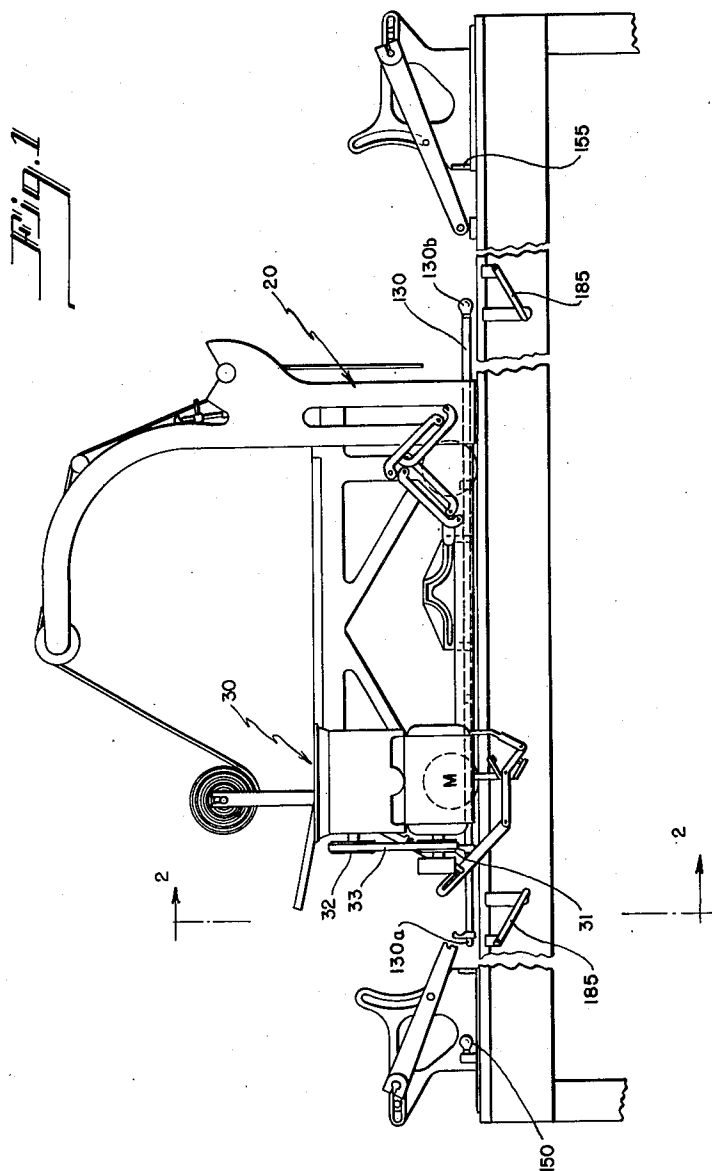
March 17, 1953

H. W. GILBERT ET AL
RECIPROCATING CARRIAGE DRIVE

2,631,457

Filed July 11, 1947

5 Sheets-Sheet 1



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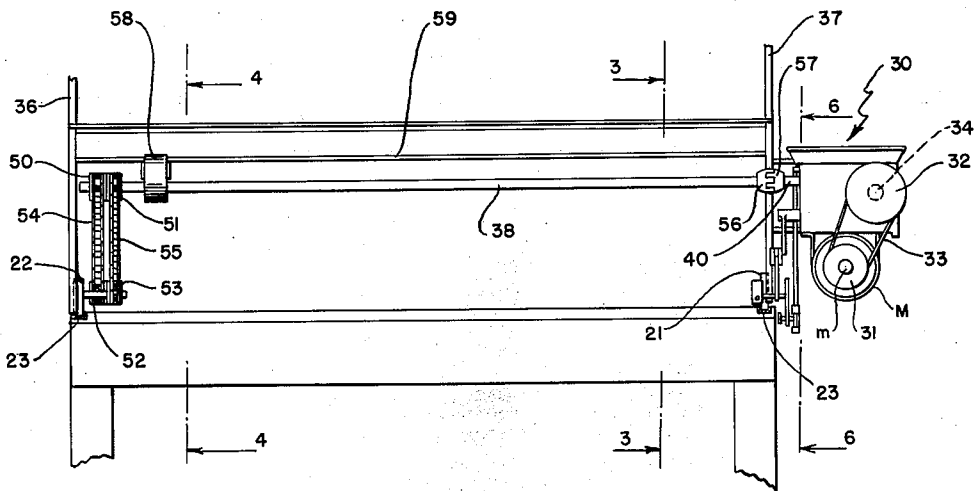
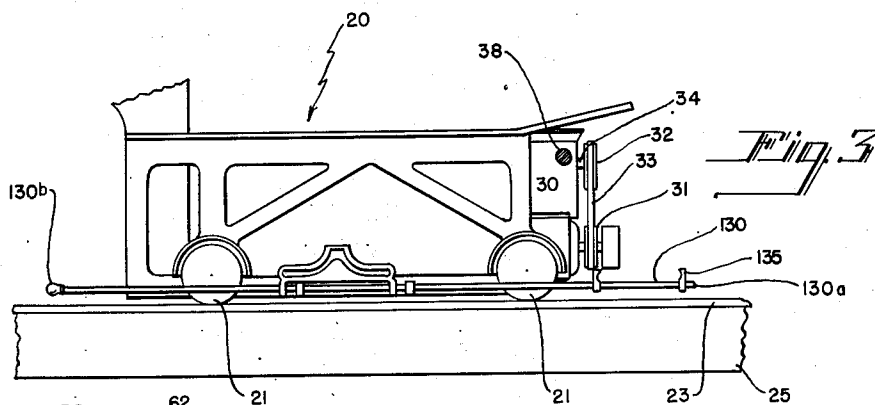
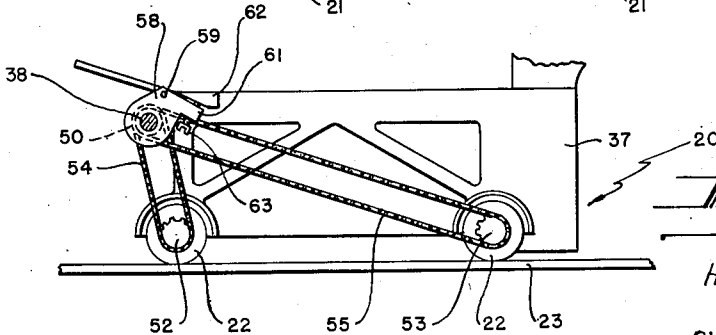
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Fig. 2



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RECIPROCATING CARRIAGE DRIVE

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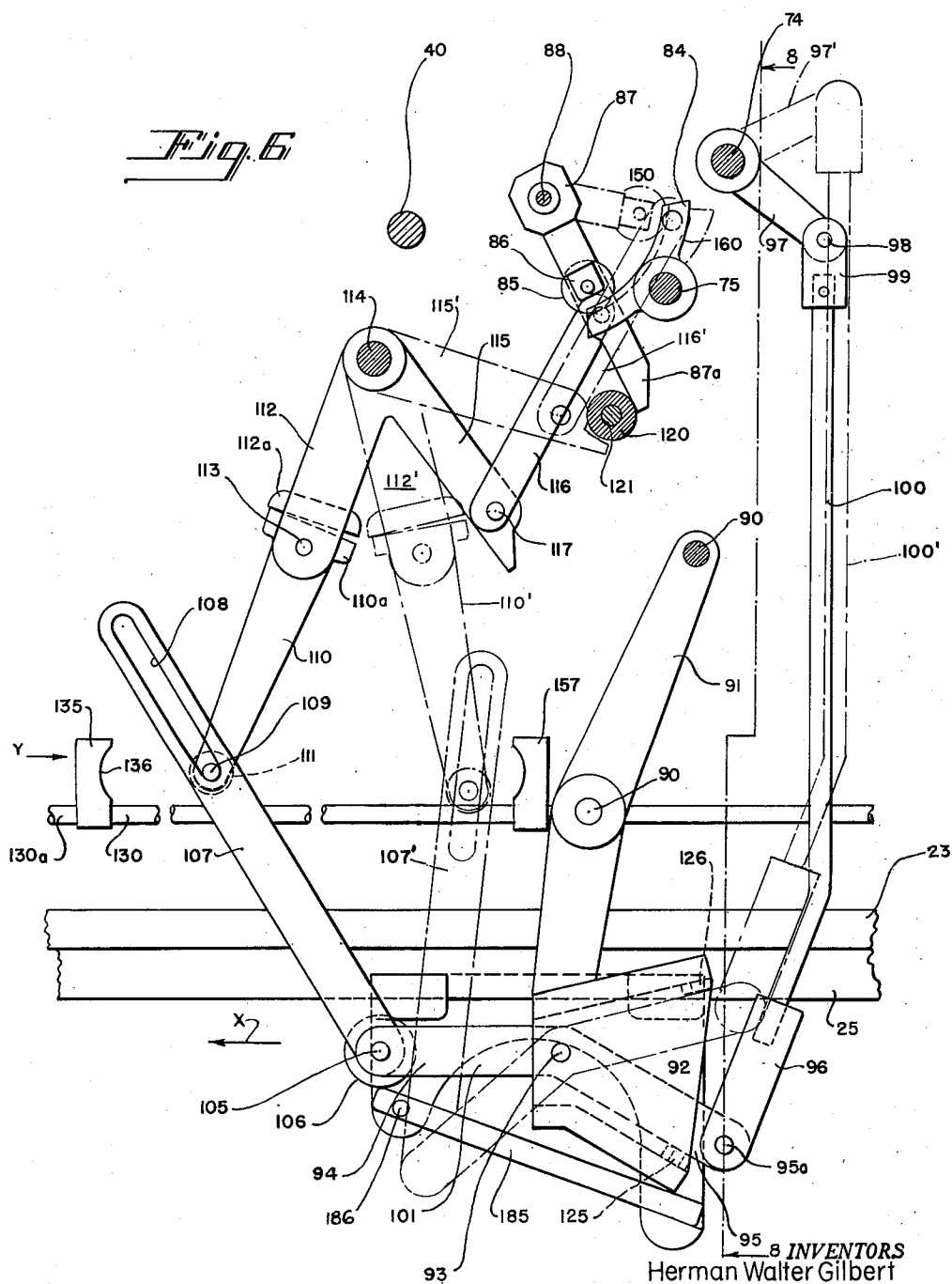
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H. W. GILBERT ET AL
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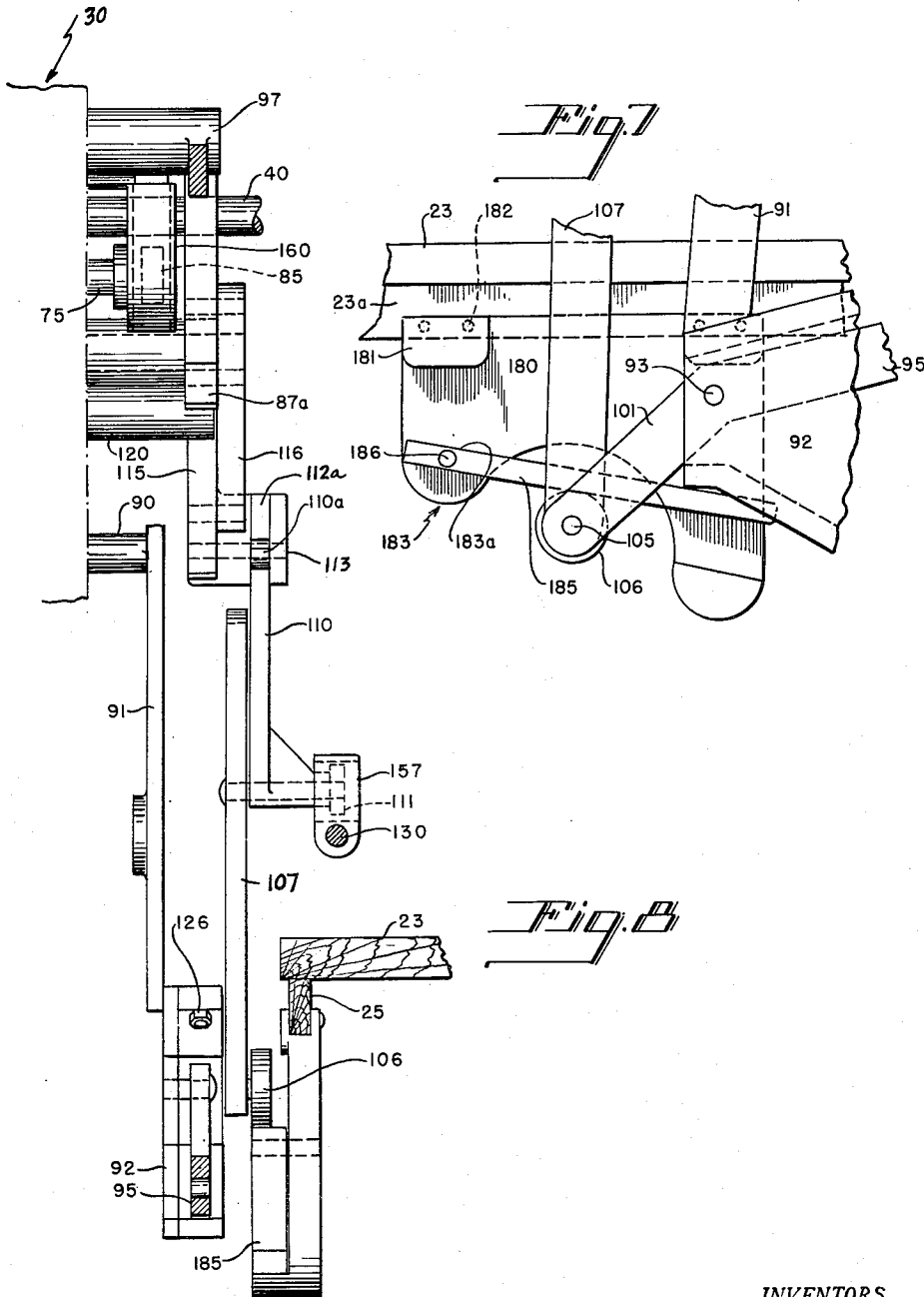
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5 Sheets-Sheet 5



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UNITED STATES PATENT OFFICE

2,631,457

RECIPROCATING CARRIAGE DRIVE

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Application July 11, 1947, Serial No. 760,388

8 Claims. (Cl. 74—27)

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This invention relates to cloth laying-up machines of the type which operate automatically and has for one of its objects the provision of a cloth laying-up machine of the character described having certain novel constructional features representing an improvement over that shown and described in U. S. Patent No. 2,360,869, dated October 24, 1944, for Automatic Cloth Laying-Up Machine and which render the operation of the said machine more efficient.

Another object of our invention is to provide in a cloth laying-up machine of the character described novel means whereby the change of speed of travel of the carriage and the reversal of the direction thereof are automatically and substantially simultaneously rendered effective.

Still another object of our invention is to provide in a cloth laying-up machine of the character described novel and improved mechanism and arrangements thereof for driving the carriage from a source of electrical power.

A still further object of our invention is to provide in a cloth laying-up machine of the class described, a gear box and motor unit for driving and controlling the speed and direction of movement of the carriage which shall be characterized by its compactness and which shall consist of certain constructional arrangements representing general improvements in the art.

Other objects of our invention will become apparent from the description to follow or will hereinafter be more fully pointed out.

In the accompanying drawings,

Fig. 1 is a side elevational view of a cloth laying-up machine constructed and arranged in accordance with our invention;

Fig. 2 is a cross-sectional view taken substantially along the line 2—2 of Fig. 1;

Figs. 3 and 4 are cross-sectional views taken substantially along the lines 3—3 and 4—4, respectively, of Fig. 2;

Fig. 5 is an enlarged schematic perspective view of the driving and controlling mechanism contained in the gear box unit carried by the reciprocating carriage in association with the motor, as shown in Figs. 1, 2 and 3;

Fig. 6 is an enlarged cross-sectional view taken substantially along the line 6—6 of Fig. 2;

Fig. 7 is an enlarged fragmentary view of a portion of the apparatus shown in Fig. 6, but illustrating a further step in the operation thereof; and

Fig. 8 is a cross-sectional view taken substantially along the line 8—8 of Fig. 6.

Referring now in detail to the drawings we

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have illustrated therein a cloth laying-up machine of the type described in the said Patent No. 2,360,869 and adapted for use in cutting rooms of manufacturers of ready to wear garments in automatically laying-up or arranging in superposed layers cloth from a bolt or from any other suitable supply source for the purpose of ultimately cutting the same into component garment parts.

Such cloth laying machines generally comprise a carriage which is caused to travel back and forth on a long table during the course of which the cloth is arranged in superposed layers.

In Figs. 1 to 4 we have shown a carriage generally designated by the numeral 20 having pairs of side wheels 21 and 22 designed to ride on tracks 23 adjacent opposite longitudinal edges of a long table 25. The goods to be arranged in layers is carried by the carriage 20 and guided and fed out to the table in any suitable manner known to the art, such as, for example, the arrangement shown and described in the copending application, Serial No. 370,784 of Messrs. Gilbert, Dexter and Deichmann, filed December 19, 1940.

Mounted on the side frame of the carriage 20 for movement therewith is an electric motor M, of sufficient power to cause the carriage 20 to be driven back and forth along the table through the mechanism and in a manner soon to be described. The motor M is connected to a suitable source of electric power by any well known electrical connecting means, not shown.

Also mounted on the frame of the carriage 20 in close proximity to the motor M, is a casing 30 housing a control unit for controlling the speed and direction of movement of the carriage. The said control unit comprises a transmission system including change of speed clutches and change of direction clutches which represent an improvement over the change of speed and direction clutches shown and described in the said prior U. S. Patent No. 2,360,869 and which will hereinafter be more fully described.

The motor M is provided with a pulley 31 mounted on the motor shaft M which is interconnected to a pulley 32 by a suitable belt 33, the said pulley 32 being mounted on a shaft 34 journaled in opposite side walls of the casing 30. Through suitable transmission mechanism within the casing 30, which will be described hereinafter in detail, the rotation of the shaft 34 by the operation of the motor M will cause a shaft 40 to rotate, the said shaft 40 being rotatably supported in the back wall of the casing 30. Transversely suitably mounted across a pair of

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spaced side frames 36 and 37 of the carriage 20 is a suitably rotatably mounted driving shaft 38. At a point adjacent the frame 36 the shaft 38 is provided with a pair of sprocket wheels 50 and 51 simultaneously rotatable therewith. Fixed to the axle, supporting one of the rear wheels 22, for rotation therewith is a sprocket wheel 52 (see Fig. 4). Similarly a sprocket wheel 53 is fixed to the axle supporting the other rear wheel 22, for rotation therewith. A relatively short sprocket chain 54 interconnects the sprocket wheels 50 and 52 and a relatively long sprocket chain 55 interconnects the sprocket wheels 51 and 53. The shafts 38 and 40 are in alignment and suitably interconnected for simultaneous rotation by a pair of cooperating clutch members 56 and 57 (see Fig. 2).

It is thus seen from the above described construction that when the shaft 40 is caused to rotate, the shaft 38 will rotate therewith to cause simultaneous positive drive rotation of the rear wheels 22 and of the traction wheels 21 to cause movement of the carriage along the table for effectively laying up the cloth in the well known manner. It is noted that the direction of movement of the carriage will depend upon the direction of rotation of the shaft 40.

In accordance with my invention, as shown in Figs. 2 and 4, the drive shaft 38 is journaled in a bearing member 58 which in turn is pivotally supported on a rod 59 carried by the frames 36 and 37 of the carriage. The bearing member 58 is provided with a projecting lug 61 which is designed to abut a fixed abutment 62 on the frame to limit the counter-clockwise rotational rotation of the said bearing member 58.

The above described construction is designed to adjustably simultaneously take up the slack of the chains 54 and 55. A set screw 63 threadedly passing through the lug portion 61 of the bearing member 58 and engaging the abutment member 62 serves to adjust the desired tension of the chains 54 and 55.

It is particularly noted that the position of pivot point 59 is such that an adjustment of the set screw 63 will swing the bearing member 58 on its pivot 59 to tighten or loosen the relatively long chain 55 a greater amount than the relatively short chain 54 so that there will be an equal automatic and simultaneous taking up or providing slack of the two unequal length chains.

The means for causing rotational movement of the shaft 40 to drive the carriage in one direction along the table and then automatically reversing the direction of movement at a predetermined point will now be described:

Fig. 5 of the drawings illustrates in detail the mechanism of the control unit and represents a lower level area A of the control unit and an upper level area B, the latter being positioned slightly to one side of the former for the sake of clarity, it being understood that in actual construction the part B is directly above the part A.

The upper shaft 34, carrying the driven pulley 32 is journaled longitudinally of the casing 30, in the end wall thereof. On this shaft 34 there is mounted for rotation therewith a pinion 50. Journaled in opposite end walls of the casing 30 is a second upper longitudinal shaft 51 parallel to the shaft 34. Mounted on the shaft 51 for rotation therewith is a gear 52 in mesh with the pinion 50. Also mounted on the same shaft 51 for rotation therewith and spaced from the gear 52 is a pinion 53. Journaled in the end walls of the casing 30 is a first lower longitudinal shaft

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54 having normally idly mounted thereon a gear 55 in mesh with the gear 52 and a gear 56 normally independent of rotation with the shaft 54 and fixed to a standard type clutch cup 57 which in turn may be selectively made to engage or disengage the said shaft 54 for rotation therewith. The gear 55 is also normally independent of rotation with the shaft 54 and is fixed to a standard type clutch cup 58 which may be made to engage or disengage the shaft 54. Fixed to the shaft 54 for rotation therewith are the gears 59 and 60.

A second lower longitudinal shaft 61 parallel to the shaft 54 is also journaled in the end casing walls. This shaft 61 carries gears 62 and 63 normally independent of rotation with the said shaft 61 but which are fixed to clutch cups 64 and 65 respectively, means such as is shown in Patent No. 2,360,869 being provided to selectively engage and disengage the clutch cups 64 and 65 with the shaft 61. Also mounted on the shaft 61 for rotation therewith is a small spiral gear 66. Mounted on the shaft 40 for rotation therewith and in direct mesh with the spiral gear 66 on shaft 61 is a large spiral gear 67.

It is thus seen from the above described construction that when the clutch cups 65 and 58 are caused to engage the shafts 61 and 54 respectively in the manner which will hereinafter be described, while at the same time leaving the clutch cups 64 and 57 disengaged, the shaft 40 will be made to rotate in one direction to cause movement of the carriage in one direction through the drive shaft 38, as follows:

When the shaft 34 is rotated by the driven pulley 32, the pinion 50 will cause rotation of the shaft 51 through the gear 52. The shaft 54 will then be rotated by the meshing of the gear 52 with the pinion 55, to cause simultaneous rotation of the pinion 60. The pinion 60 will in turn transmit rotational movement to the shaft 61 by means of an idler gear 70 freely mounted on the shaft 51, which meshes with the gear 60 and also at the same time meshes with the gear 63 fixed to the clutch cup 65. The spiral gear 66 on the shaft 61 will cause rotation of the shaft 40 through the spiral gear 67.

To reverse the direction of movement of the shaft 40 and consequently the direction of travel of the carriage, the clutch cups 65 and 58 are disengaged from the shafts 61 and 54 respectively and at the same time the clutch cups 64 and 57 are made to engage the said shafts 61 and 54 respectively. In such instance it is noted that when the pinion 50 causes rotation of the shaft 51 through the gear 52, the pinion 53 will mesh with the gear 56 which will rotate the shaft 54 through the engagement of the clutch cup 57. The gear 59 being fixed to the shaft 54 will rotate therewith and since the said gear 59 is in mesh with the gear 62, it will cause rotation of the shaft 61 carrying the spiral gear 66 and thence through the spiral gear 67 the shaft 40 will be rotated in the opposite direction to that previously described.

In accordance with this invention the following arrangement and design is provided so that with the change of direction of movement of the carriage as just described there will be a substantially simultaneous change of speed. The purpose of this is so that, as the carriage travels along a high speed for effective operation, when it reaches a certain point near the end of its run in one direction, the speed is automatically slowed down, to cause the carriage to travel for

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a short distance at low speed to avoid too great a shock of stopping and then when the change of direction of movement occurs there will be a simultaneous change from low to high speed for effective speedy operation of the carriage in the opposite direction, and so on at each end of the table.

Referring again to Fig. 5 of the drawings it is noted that if the clutch cup 58 engages the shaft 54, then as hereinbefore described the gear 52 driven by pinion 50 will drive the shaft 54 through the gear 55, and the shaft 61 will be driven through the gears 59 and 62 which are in mesh and fixed to their respective shafts. It is noted that in this instance high speed will result because of the fact that the relatively large gear 52 will drive the relatively small gear 55 (the ratio in the casing being 2 to 1), the gears 59 and 62 being in 1 to 1 ratio. It is noted at this point that when a change of direction occurs, because of the fact that the clutch 65 engages the shaft 61 as hereinbefore explained, the carriage will still be driven at high speed because, instead of the effective meshing operation of the 1 to 1 gears 59 and 62, there will be the 1 to 1 ratio of speed between shafts 54 and 61 through the gears 60, 63 and 70.

For low speed movement of the carriage it is necessary for the clutch cup 57 to engage the shaft 54 (which, in accordance with the present arrangement will automatically disengage the clutch cup 58). Slow speed will result because of the fact that the pinion 53 on shaft 51, caused to rotate because of the pinion 50 and gear 52, will mesh with the gear 56 to turn the shaft 54. As previously explained the rotation of shaft 54 will cause simultaneous rotation of the shaft 61 on a 1 to 1 ratio basis through the gears 59 and 62. The low speed drive will be due to the fact that the ratio between the said meshing gears 53 and 56 will be 1 to 2.

To operate the pairs of clutch cups 64, 65 and 57, 58 for engaging or disengaging the shafts 61 and 54 the following mechanism is provided:

As shown in Fig. 5 there is journaled in the front and rear walls of the casing an upper transverse shaft 74 and a lower transverse shaft 75. Fixed to the shaft 74 for rotation therewith is a collar 76 having a depending portion 77 in which is slidably mounted a spring pressed plunger 78 having a roller 79 fixed at the free end thereof. Freely rotatably supported on the lower shaft 75 is a fork member 80, the legs of which straddle the shaft 54 and disposed between the clutch cups 57 and 58, and having an arcuate track portion 81 uppermost. The roller 79 is designed to ride in the track 81.

Also fixed to the shaft 75 for rotation therewith is a fork member 82, the legs of which straddle the shaft 61 between the clutch cups 64 and 65. Instead of providing the member 82 with an arcuate track portion, similar to the track portion 81 of the member 80, we mount a separate arcuate track member 84 (see Fig. 6) similar in purpose and function to the arcuate track 81, directly on the shaft 75 for rotation therewith. Cooperating with said track 84 to ride therein is a roller 85 carried by a spring pressed slidable plunger 86 housed in a member 87 which in turn is pivotally mounted on a fixed pivot shaft 88 the said pivot shaft 88 being supported by the rear wall of the casing 30.

It is thus seen from the above described construction that when the shaft 74 is rotated, in a clockwise direction, as viewed from Fig. 5, the

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roller 79 will ride on the track 81 and cause the fork member 80 to rotate freely about the shaft 75 in a counter-clockwise direction to cause the legs thereof to slidably move the clutch cup 57 to actuate the same to engage the shaft 54, simultaneously disengaging the clutch cup 58 therefrom. Similarly, it is seen that rotational movement of the roller 85 in the track 84 in a counter-clockwise direction as viewed from Fig. 6, will cause rotation of the shaft 75 in a clockwise direction. The fork member 82 being fixed to the shaft 75 will also rotate in a clockwise direction to cause the clutch cup 65 to engage the shaft 61 and simultaneously therewith to cause disengagement of the clutch cup 64 with the said shaft 61.

It is further noted that rotational movement of the shafts 74 and 75 in opposite directions from that just described will correspondingly reverse the operation of the fork members 80 and 82 to cause engagement and disengagement of opposing sets of clutch cups 58 and 65 respectively.

For reasons which will soon become apparent the track 84 (shown in Fig. 6) and cooperating roller 85 and member 87 are located outside of the rear wall of the casing 30.

In accordance with this invention the following control means are provided for cooperative action with the above described mechanism so that when the carriage travels along the table in one direction and reaches a predetermined point along the table the speed will be automatically changed from high to low and after proceeding for a predetermined relatively short distance at such low speed the direction of movement of the carriage will be reversed and substantially simultaneously therewith the speed will be changed back from low to high. The same cycle of operation will be repeated at the end of the run in the opposite direction and so on continuously. The time in which the operation of the cloth laying apparatus is in low speed is thus greatly reduced.

As shown, generally, in Figs. 1, 6, 7 and 8 of the drawings, at a predetermined distance from each end of the table there are provided a left hand cam unit and a right hand cam unit both similar in function and design. For convenience in description the left hand cam unit only will be described. As clearly shown in Figs. 6 and 7, this cam unit comprises a relatively flat rigid body member 180, provided at its upper end with lugs 181 having longitudinal slots adapted to receive therein the vertical portions 23a of the track 23 located at the front longitudinal edge of the table. Set screws 182 are provided to maintain the cam unit in a position depending from the table top. The main body portion 180 is provided with a pair of downward integral extensions 183 and 184, the extension 184 being lower than the extension 183, the purpose of which will soon become apparent.

At the bottom of each extension there are provided outwardly disposed lugs 183a and 184a. A cam bar 185 is pivotally mounted at one end to the lug 183 by means of the pivot 186 and is so arranged that the free end 185a of the bar 185 freely rests upon the lug 184a which serves as a shoulder therefor.

As shown in Fig. 6 there is fixedly attached to the frame of the carriage by means of bolts 90 a supporting bracket arm 91 having rigidly attached thereto at the lower end thereof a block member 92. It is noted that the block member

is positioned below the table so as to clear the track 23. Rotatably mounted on the block member 92 by means of a pivot shaft 93 is a rocker arm comprising the arms 94 and 95. Pivotaly attached to the free end of the arm 95 by the pivot 95a is a bar 96. Fixed to the shaft 74 for rotation therewith is a link 97. Pivotaly attached to the free end of the link 97 by means of the pivot 98 is a bar 99. A rigid rod 100 interconnects the bars 96 and 99. It is thus seen from the above described construction that when the rocker arm 94, 95 is rotated in a clockwise direction about the fixed pivot 93, the link 97 will move from its dotted line position 97¹ (Fig. 6) to the full line position 97 to cause clockwise rotational movement of the shaft 74. This, in turn, as previously explained will actuate the fork member 80 to cause the clutch cup 57 to engage the shaft 54 and simultaneously disengage the clutch cup 58 from the said shaft 54, resulting in the change of speed of the carriage from high to low speed.

Pivotaly attached to the free end of the rocker arm part 94, by means of the pivot 105 is a roller 106, adapted to ride on the inclined bar 185 by movement of the carriage in the direction of the arrow X (Fig. 6) to cause rotation of the rocker arm 94, 95 about the pivot 93 in a clockwise direction to automatically change the speed of movement of the carriage from high to low, as above described.

The following means are employed for automatically changing the direction of movement of the carriage while it is traveling at low speed.

Pivotaly attached at one end thereof to the arm 94 by means of the pivot 105 is a lever 107. The said lever 107 is provided with a slotted opening 108 at the opposite end thereof which slidably and pivotaly receives therein a pin 109, the said pin 109 being fixed to a link 110. A roller 111 mounted on the pin 109 and disposed on the opposite side of the lever 107 from that of the link 110, serves to hold the pin 109 captive in the slot 108. The link 110 is pivotaly connected to a part 112 of a rocker arm by a pivot 113 which, in turn, is rotatably mounted on a pivot shaft 114 fixed to the casing 30. The other part 115 of the rocker arm is pivotaly connected to one end of a link 116 by the pivot 117, the opposite end of the said link 116 being pivotaly attached to an extending bar portion 87a of the member 87.

It is thus seen from the above description that when the roller 106 rides up on the cam bar 185, the pin 109 will strike the bottom wall of the slot 108 and cause rotational movement of the rocker arm 112, 115 about the pivot 114 in a clockwise direction. This action will cause the link 116 to rotate the member 87 in a clockwise direction. In the full line position of the above described parts, when the roller 106 has reached the highest point on the bar 85, the action will have caused the shaft 75 to rotate in a counter-clockwise direction, through the track 84 and roller 85. An abutment member 120 fixed to a shaft 121 which in turn is fixed to the casing wall 30 limits the clockwise rotational travel of the member 87 so that the roller 85 will not leave its track 84. The abutment member 120 is so positioned as to be in the path of movement of the extension 87a. An abutment lug 125 fixed to the member 92 limits the rotational movement of the rocker arm 94, 95 in a clockwise direction and an abutment lug 126 limits the rotational movement of the rocker arm 94, 95 in a counter-clockwise direction.

It is noted that the links 110 and 112 are provided with adjacently disposed flange abutments 110a and 112a, respectively. The said abutments 110a and 112a are slightly spaced from each other to permit a limited amount of relative rotational movement between the links 110 and 112 to provide a slightly delayed action for the rocker arm 112, 115 and links 116 and 87 and prevent too sudden a jar on the mechanism when the direction of movement is reversed, as will now be explained.

After the roller 106 has reached the position shown in Fig. 6 of the drawings the speed of the carriage has been lessened as above described and continues to ride at such slower speed in the same direction until at the end of its run and by the following means the direction of movement is reversed and simultaneously therewith the speed is restored to high so that the carriage begins its travel and effective cloth laying operation without loss of time.

Suitably mounted on the frame of the carriage for axial sliding movement with respect thereto is a bar 130 (see Fig. 6). Fixed to the bar 130 adjacent one end thereof and for movement therewith is an upwardly projecting abutment member 135 having a concaved inner surface 136. It is noted that the bar 130 and the concaved surface 136 are so positioned that when the roller 106 is in the position at the top of the cam bar 185, as shown in Fig. 6, the said surface 136 of the member 135 will be in axial alignment with the roller 111 on the link 110. It is also noted that the length of the bar 130 is such that when the roller 106 is in the position shown in Fig. 6 the end 130a will strike up against a bumper member 150 (see Fig. 1) in axial alignment with the rod 130 and suitably fixed to the table 23. As the carriage continues to travel in the same direction, after the rod end 130a strikes the bumper 150, the rod 130 will be slidably moved in the direction of the arrow Y in Fig. 6 with respect to the movement of the carriage. This will cause the surface 136 of the member 135 to engage the roller 111 and to carry the same along in the direction of the arrow Y. When this happens the lever 107 will be caused to rotate in a clockwise direction about the pivot 105 to be swung over to the dotted line position 107¹. The above described action will swing the levers 110, 112, the arm 115 and the link 116 to their dotted line positions 110¹, 112¹, 115¹ and 116¹, respectively, to in turn swing the member 87 to its dotted line position 87¹ and thereby cause rotational movement of the shaft 75 in a counter-clockwise direction to reverse the direction of movement of the carriage as hereinbefore explained. At the same time, it is noted that the rocker arm 94, 95 has been caused to rotate in a counter-clockwise direction to raise the rod 100 to its dotted line position 100¹ to cause counter-clockwise rotational movement of the shaft 74 and thereby restore the movement of the carriage to high speed as hereinbefore explained.

As shown in Fig. 7 of the drawings, when the carriage has started to travel in the reverse direction, that is, in the direction opposite that of the arrow Y (Fig. 6) the roller 106 will ride underneath the cam bar 185 to raise the same on its pivot 106 and freely pass above the bar support 184 to continue on its way.

When the carriage has reached near the end of its run in the direction opposite that of the arrow Y (Fig. 6) the roller 106 will ride upon another cam bar 185, in the right hand end cam

unit to lessen the speed of travel in the same manner as just described. The rod 130 is provided with an enlarged abutment end 130b which is designed to strike an abutment 155 fixed to the table 23 to cause the said rod 130 to slidably move in the opposite direction. A second up-
standing abutment member 157 similar in design and function to the member 135 engages the roller 111 and pushes the lever 107 back to change the direction of movement of the carriage and simultaneously therewith to change the speed from low to high.

It is thus seen that the carriage will reciprocate continuously on the table to lay the cloth and will automatically near the end of its run in one direction slacken its speed and then after a predetermined period thereafter reverse its direction and simultaneously with the change in direction also change to high speed.

It is noted that the detailed construction of the pairs of clutch cups 57, 58 and 64, 65 are not shown in the drawings since it is intended that any suitable type of well known clutch means may be employed in practicing this invention.

Also it is noted that in accordance with our invention we have been able to obtain an improved construction wherein two-directional movement of the carriage is obtained by a one-directional running motor, and we have been able to alter the speed of travel of the carriage without changing the speed of the running motor. In this latter connection it is pointed out that when the speed of travel of the carriage is changed from high to low speed, its inertia will drive the shaft 34 through the gear chain at a speed of approximately three times greater than the normal speed of the motor shaft. To prevent this motion from being transmitted to the motor, which would cause the motor to act as a brake and thereby cause a jar in the operation of the carriage, an overrun clutch mechanism is employed. This over-run clutch mechanism is of any well known standard type, such as, for example, that known as free wheeling, and is incorporated in the pulley 32 in any suitable well known manner.

This arrangement of over-running clutch in the pulley 32 thus constitutes an important element in our invention.

Having described our invention, what we claim and desire to secure by U. S. Letters Patent is:

1. In a cloth laying machine, a table, a carriage, traction wheels supporting said carriage upon said table for traversing the same, a motor carried by said carriage and adapted to be actuated from a power source, driven sprocket wheels rotatable with said traction wheels, driving sprocket wheels, sprocket chains coupling said driven and driving sprocket wheels, a drive shaft journaled in said carriage, and carrying said driving sprocket wheels for rotation therewith, a power output shaft axially aligned with said drive shaft, clutch means releasably coupling said driving and power output shafts for rotation together, and means acting between said motor and said power output shaft for propelling said carriage at any predetermined speed and according to a preselected pattern of direction and operation.

2. The construction according to claim 1, characterized further in that said last mentioned means comprises a housing carried by said carriage, said power output shaft being journaled in the housing, a power input shaft journaled in said housing, means coupling said motor and

power input shaft to drive the power input shaft, and gear means acting between said power input shaft and said power output shaft for driving said power output shaft in a predetermined direction and speed.

3. In a cloth laying machine of the character described, the combination of a carriage having wheels adapted to ride on a traction surface, a support for said traction surface, a motor carried by said carriage and adapted to be actuated from a power source, a drive shaft journaled in said carriage, means for driving said wheels from said drive shaft, means for rotating said drive shaft from said motor for propelling said carriage at predetermined rates of speed and according to a preselected pattern of direction and operation while said motor runs at substantially constant speed and in one direction, said last named means comprising a housing carried by said carriage, a power output shaft cooperatively interconnected with said drive shaft, said power output shaft being journaled in said housing, a power input shaft journaled in said housing, belt means coupling said motor shaft and said power input shaft to drive the power input shaft, a seventh gear mounted on said power input shaft for rotation therewith, a sixth shaft journaled in said housing, a pair of high and low speed driving gears mounted on said sixth shaft for rotation therewith, said high speed gear being in mesh with said seventh gear whereby the sixth shaft is driven, a fourth shaft journaled in said housing, a pair of high and low speed driven gears mounted on said fourth shaft and intermeshing respectively with said high and low speed driving gears and normally free to rotate thereon, normally disengaged high and low speed clutches carried respectively by said high and low speed driven gears for selectively engaging either of said high or low speed driven gears with said fourth shaft to drive the same at either high or low speed, a fifth shaft journaled in said housing, gear means intercoupling said fifth shaft with said power output shaft to drive the latter, reverse and direct drive driven gears mounted on said fifth shaft and free to rotate thereon, reverse and direct drive normally disengaged clutches carried by said fifth shaft driven gears for selectively engaging them with said fifth shaft to drive the latter, reverse and direct drive driving gears mounted on said fourth shaft for rotation therewith, said direct drive driven and driving gears meshing with each other, an idler reverse gear rotatable in said housing and intermeshing between said driving and driven reverse gears, eighth means disposed for engaging and actuating selectively either of said reverse and direct drive clutches, and ninth means disposed for engaging and actuating selectively either of said high and low speed clutches, whereby the speed and direction of movement of said carriage may be automatically regulated according to a predetermined pattern, characterized further in that said eighth and ninth means are so constructed and arranged that the carriage moves longitudinally along the table at high speed with the high speed clutch engaged to rotate the fourth shaft at high speed, tenth cam means carried jointly by said carriage and said table and adapted when brought into action to disengage said high speed clutch and to thereupon engage said low speed clutch to cause the carriage to move thereafter at low speed, the table carried portion of said tenth cam means being disposed at a predetermined location on the table near

the end of the table toward which the carriage is traveling, and eleventh cam means carried jointly by the carriage and the table at the end thereof and adapted when brought into action to disengage said low speed clutch and re-engage said high speed clutch, and twelfth cam means adapted to simultaneously disengage said direct drive clutch and to engage said reverse drive clutch with said fifth shaft, whereupon the carriage immediately commences high speed travel in the reverse direction across the table while the motor continues to rotate in the same direction as originally.

4. In a cloth laying machine of the character described, the combination of a carriage having wheels adapted to ride on a traction surface, a support for said traction surface, a motor carried by said carriage and adapted to be actuated from a power source, a drive shaft journaled in said carriage, means for driving said wheels from said drive shaft, means for rotating said drive shaft from said motor for propelling said carriage at predetermined rates of speed and according to a preselected pattern of direction and operation while said motor runs at substantially constant speed and in one direction; said last named means comprising a housing carried by said carriage, a power output shaft cooperatively interconnected with said drive shaft, said power output shaft being journaled in said housing, a power input shaft journaled in said housing, belt means coupling said motor shaft and said power input shaft to drive the power input shaft, a seventh gear mounted on said power input shaft for rotation therewith, a sixth shaft journaled in said housing, a pair of high and low speed driving gears mounted on said sixth shaft for rotation therewith, said high speed gear being in mesh with said seventh gear whereby the sixth shaft is driven, a fourth shaft journaled in said housing, a pair of high and low speed driven gears mounted on said fourth shaft and intermeshing respectively with said high and low speed driving gears and normally free to rotate thereon, normally disengaged high and low speed clutches carried respectively by said high and low speed driven gears for selectively engaging either of said high or low speed driven gears with said fourth shaft to drive the same at either high or low speed, a fifth shaft journaled in said housing, gear means intercoupling said fifth shaft with said power output shaft to drive the latter, reverse and direct drive driven gears mounted on said fifth shaft and free to rotate thereon, reverse and direct drive normally disengaged clutches carried by said fifth shaft driven gears for selectively engaging them with said fifth shaft to drive the latter, reverse and direct drive driving gears mounted on said fourth shaft for rotation therewith, said direct drive driven and driving gears meshing with each other, an idler reverse gear rotatable in said housing and intermeshing between said driving and driven reverse gears, eighth means disposed for engaging and actuating selectively either of said reverse and direct drive clutches, and ninth means disposed for engaging and actuating selectively either of said high and low speed clutches, whereby the speed and direction of movement of said carriage may be automatically regulated according to a predetermined pattern, characterized further in that thirteenth and fourteenth cam actuating means are disposed on the table near and at, respectively, the ends of said table, and means brought into action upon contact of said carriage with

said thirteenth cam actuating means for actuating said ninth means to disengage said high speed clutch and to thereupon engage said low speed clutch, to thereafter cause the carriage to move toward the table and at low speed, and so arranged that when the carriage contacts the said fourteenth cam actuating means, said ninth means is actuated to disengage said low speed clutch and to re-engage said high speed clutch, and further arranged that upon contact with said fourteenth cam actuating means, said eighth means is actuated to simultaneously disengage said direct drive clutch and to engage said reverse drive clutch, whereupon the carriage is caused thereafter to move across the table in the opposite direction to its approach, and at immediate high speed.

5. In a cloth laying machine of the character described, the combination of a carriage having wheels adapted to ride on a traction surface, a support for said traction surface, a motor carried by said carriage and adapted to be actuated from a power source, a drive shaft journaled in said carriage, means for driving said wheels from said drive shaft, means for rotating said drive shaft from said motor for propelling said carriage at predetermined rates of speed and according to a preselected pattern of direction and operation while said motor runs at substantially constant speed and in one direction, said last named means comprising a housing carried by said carriage, a power output shaft cooperatively interconnected with said drive shaft, said power output shaft being journaled in said housing, a power input shaft journaled in said housing, belt means coupling said motor shaft and said power input shaft to drive the power input shaft, a seventh gear mounted on said power input shaft for rotation therewith, a sixth shaft journaled in said housing, a pair of high and low speed driving gears mounted on said sixth shaft for rotation therewith, said high speed gear being in mesh with said seventh gear whereby the sixth shaft is driven, a fourth shaft journaled in said housing, a pair of high and low speed driven gears mounted on said fourth shaft and intermeshing respectively with said high and low speed driving gears and normally free to rotate thereon, normally disengaged high and low speed clutches carried respectively by said high and low speed driven gears for selectively engaging either of said high or low speed driven gears with said fourth shaft to drive the same at either high or low speed, a fifth shaft journaled in said housing, gear means intercoupling said fifth shaft with said power output shaft to drive the latter, reverse and direct drive driven gears mounted on said fifth shaft and free to rotate thereon, reverse and direct drive normally disengaged clutches carried by said fifth shaft driven gears for selectively engaging them with said fifth shaft to drive the latter, reverse and direct drive driving gears mounted on said fourth shaft for rotation therewith, said direct drive driven and driving gears meshing with each other, an idler reverse gear rotatable in said housing and intermeshing between said driving and driven reverse gears, eighth means disposed for engaging and actuating selectively either of said reverse and direct drive clutches, and ninth means disposed for engaging and actuating selectively either of said high and low speed clutches, whereby the speed and direction of movement of said carriage may be automatically regulated according to a pre-

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determined pattern, characterized further in that thirteenth and fourteenth cam actuating means are disposed on the table near and at, respectively, the ends of said table, the mechanism being so arranged that during the travel of said carriage opposite thirteenth cam actuating means said eighth and ninth means maintain said high speed clutch in engagement, and either the direct or reverse drive clutch in engagement depending upon the direction of movement of the carriage, thirteenth cam and lever linkage means acting between said cam actuating means and said eighth and ninth means respectively, whereby when the carriage reaches the said thirteenth cam actuating means said thirteenth cam and lever linkage is brought into action to disengage said high speed clutch and to engage said low speed clutch to cause the carriage to continue its movement in the same direction but at reduced speed, and whereby, when the carriage reaches the table end, said fourteenth cam actuating means is engaged with said thirteenth cam and lever linkage to bring it into action to cause said eighth and ninth means to disengage said low speed clutch and to re-engage said high speed clutch, and to simultaneously disengage said direct drive clutch and to engage said reverse drive clutch, whereupon with the motor continuing to run in its original direction, the carriage is caused to reverse its direction of motion on the table, and simultaneously to move away from the adjacent table end immediately at high speed, this process being repeated similarly as the carriage approaches the opposite table end.

6. In a cloth laying machine of the character described, the combination of a carriage adapted to ride on a traction surface, motive power mounted on said carriage for movement therewith, a main driving shaft on said carriage for causing said carriage to travel, means for causing said driving shaft to be driven from said motive power, to cause said carriage to travel in one direction at a relatively high rate of speed, means automatically rendered effective after said carriage has travelled a predetermined distance at such high speed for changing the rate of travel of said carriage to a relatively slower speed, means automatically rendered effective after a

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predetermined distance of travel of said carriage at said slower speed to reverse the direction of travel of said carriage and means substantially simultaneously automatically rendered effective with said last named means for restoring the speed of travel of said carriage to its original relatively high rate of speed.

7. In a cloth laying machine of the character described, the combination of a carriage adapted to ride on a traction surface, a support for said traction surface, a first cam device mounted on said support, a second cam device mounted on said support and spaced from said first cam device, means for driving said carriage, in one direction at a relatively high rate of speed, means on said carriage cooperating with said first cam device for automatically lessening the speed of travel of said carriage up to a given point beyond said first cam device, means automatically rendered effective at said given point for reversing the direction of travel of said carriage and automatic means substantially simultaneously rendered effective with said last named means for restoring the rate of travel of said carriage to its original high rate of speed past said first cam device without being effected thereby and continuing at such high rate of speed until reaching said second cam device.

8. In a cloth laying machine, the combination according to claim 1, in which means are provided on said carriage for adjustably taking up slack in said sprocket chains.

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