June 9, 1942. W. F. ASTLEY 2,285,385

LOOM CONTROLLING MECHANISM

Original Filed June 23, 1938 5 Sheets-Sheet 1

Fig. 9.

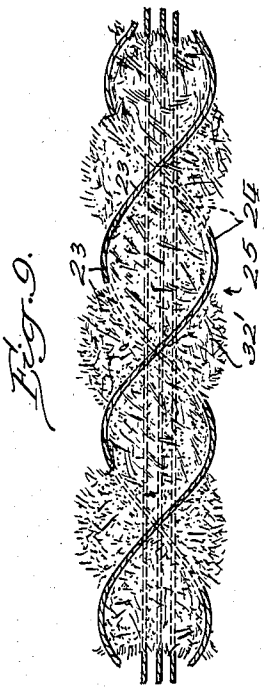


Fig. 1.

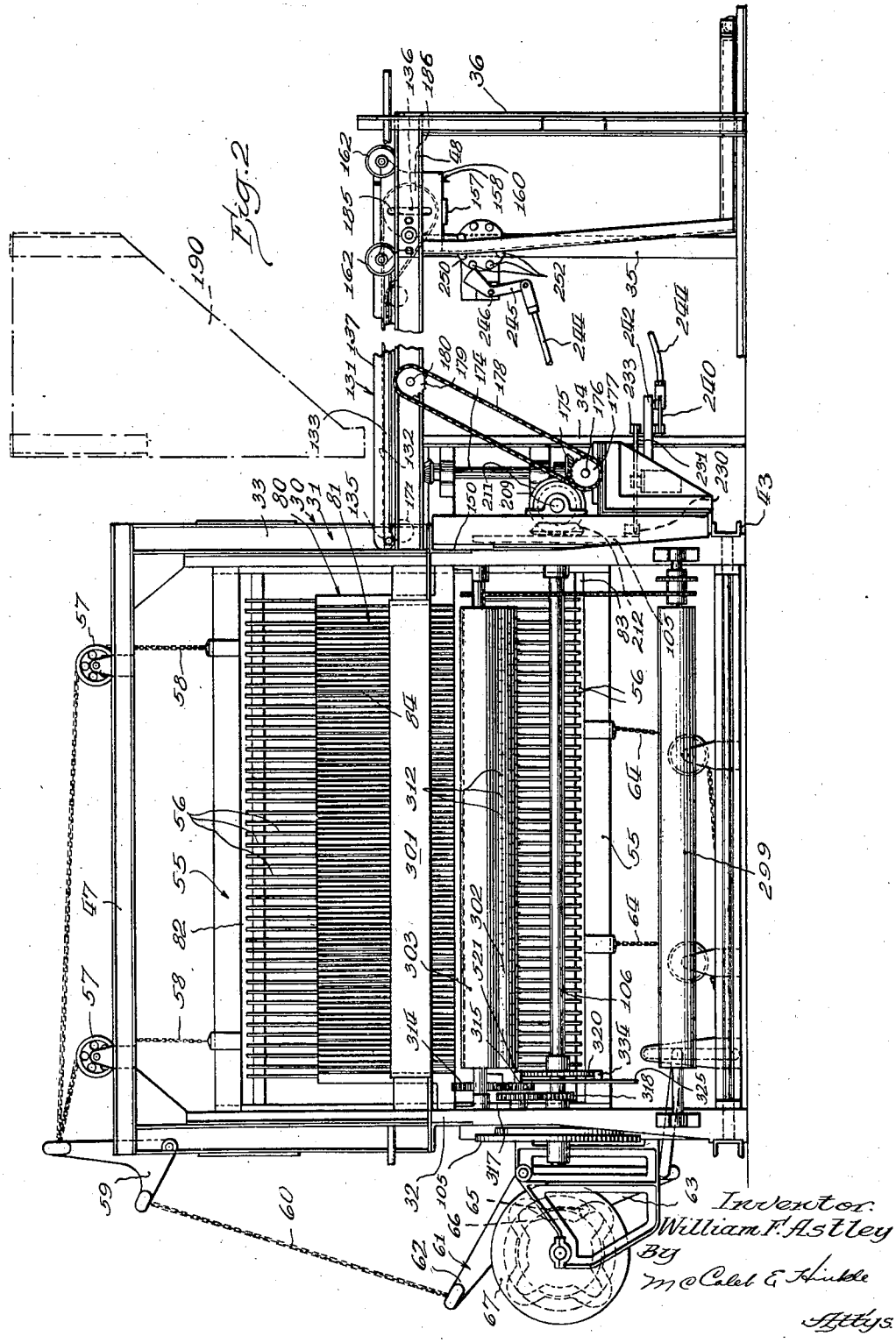
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Fig. 2



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LOOM CONTROLLING MECHANISM

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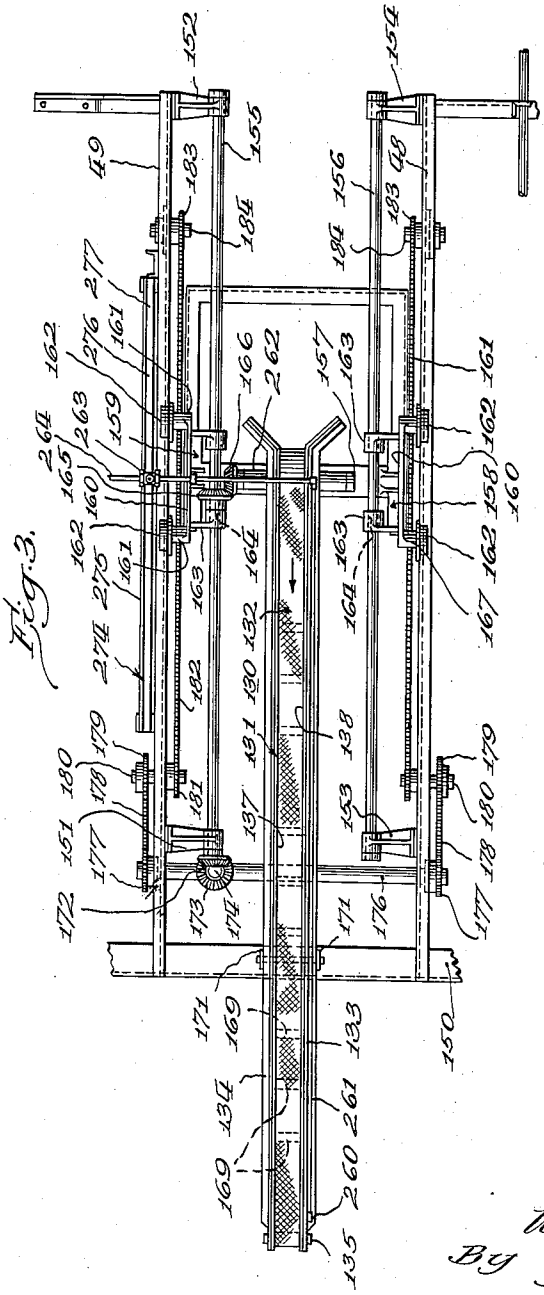


Fig. 3.

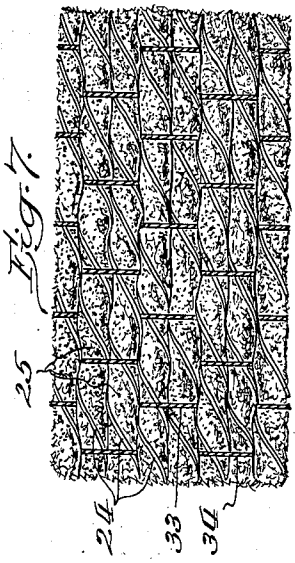


Fig. 7.

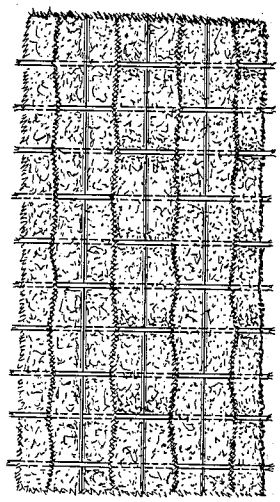


Fig. 8.

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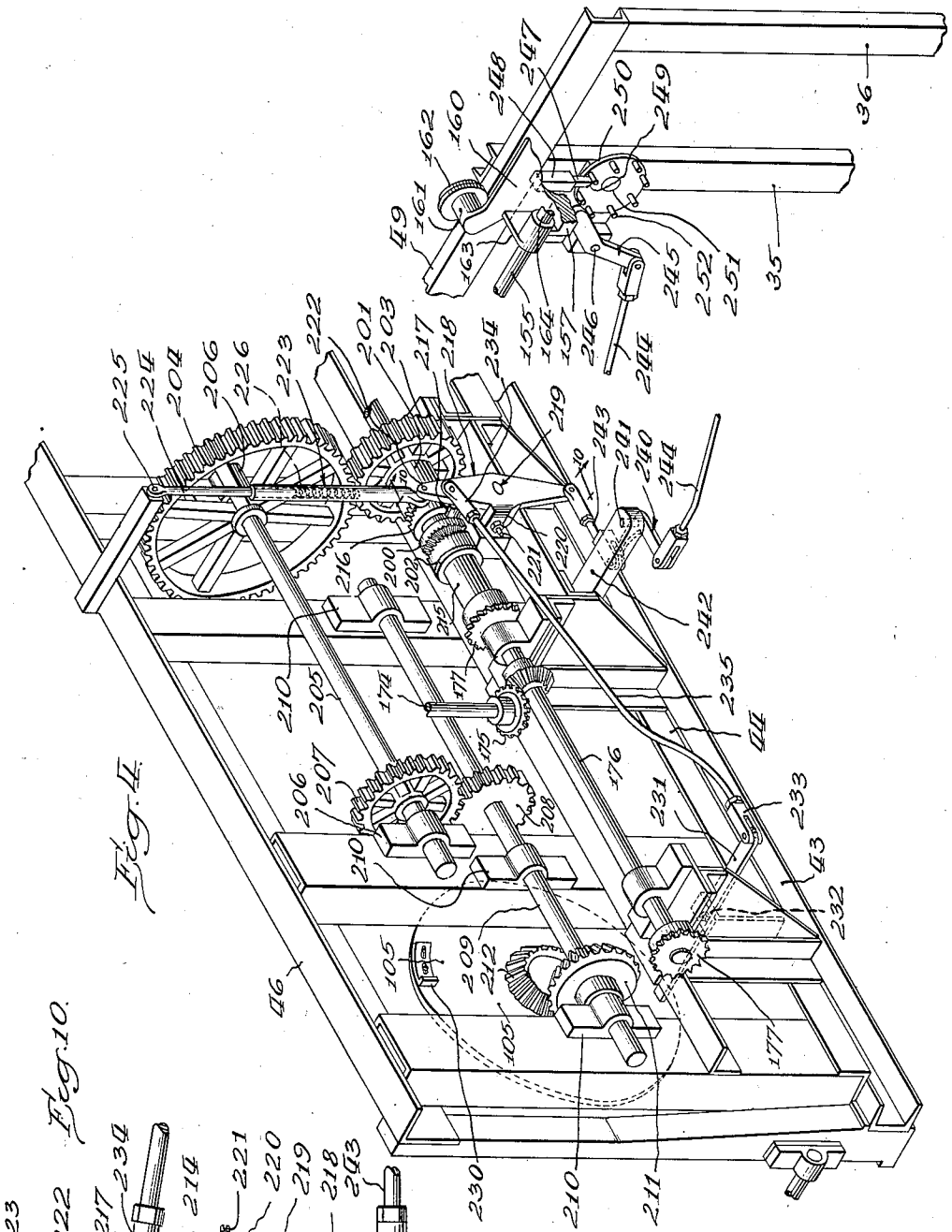


Fig. 4.

Fig. 10.

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Fig. 6.

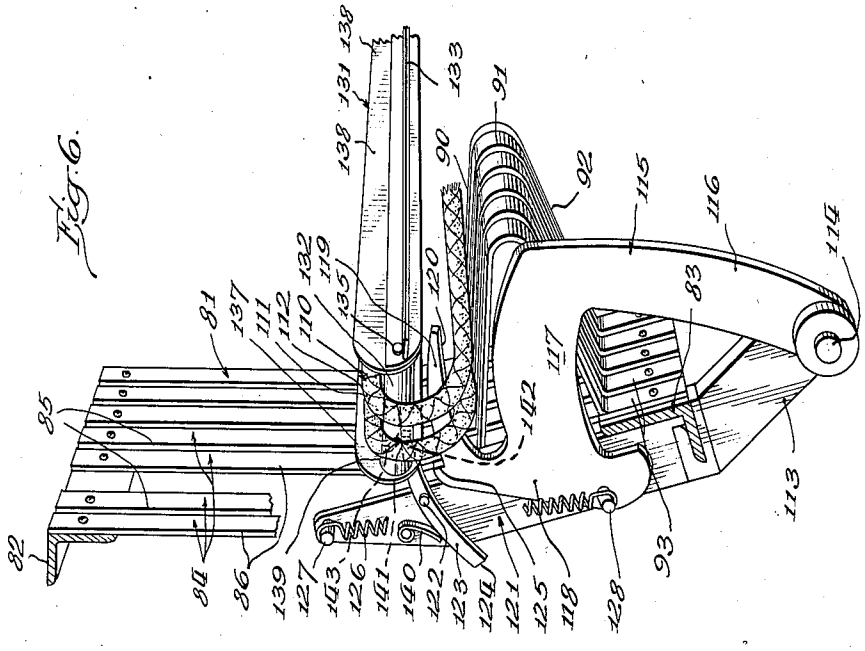
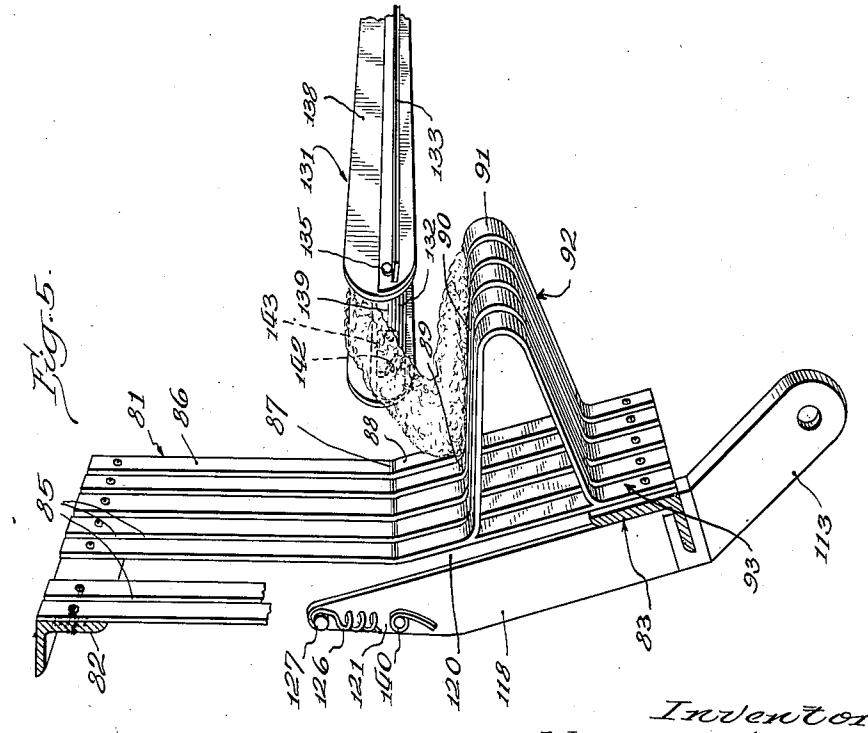


Fig. 5.



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Patented June 9, 1942

2,285,385

UNITED STATES PATENT OFFICE

2,285,385

LOOM CONTROLLING MECHANISM

William F. Astley, Cicero, Ill., assignor to Union Asbestos & Rubber Company, Chicago, Ill., a corporation of Illinois

Original application June 23, 1938, Serial No. 215,397. Divided and this application February 21, 1941, Serial No. 379,931

13 Claims. (Cl. 139—1)

The present invention relates to loom controlling mechanism and is a division of my prior application Serial No. 215,397 filed June 23, 1938, on Machines and methods of weaving insulation, United States Patent No. 2,239,514 issued April 22, 1941.

The loom which forms the subject-matter of my prior application is adapted to weave insulating blankets of warp threads and bulk fibers or weft members which comprise the carded and open asbestos or other fibers in the form of sliver, the bulk having substantially no tensile strength.

Therefore, the machine of my prior application is of a type provided with the usual heddles forming a shed, but the loom has a special comb provided with a shelf adapted to support the fibers until they are driven into the shed. In addition to this, it is provided with means for conveying the loose fibers into the shed. It is one of the primary requirements of such a machine that the conveying means be removed from within the shed at the time that the lay is actuated to drive the fibers into the shed. The conveyor would otherwise interfere with the operation of the loom.

It is also a requirement that the loom shall be effectively stopped or shall hesitate in its action until the conveyor has an opportunity to move into the shed for the purpose of depositing the fibers on the comb. If the loom were not stopped, there would be inevitable interference between the elements of the loom and the conveyor.

One of the objects of the present invention is the provision of an improved controlling mechanism for a loom by means of which the lay and the conveyor may be operated alternately so that the conveyor may be removed from the shed when the lay is to be actuated and the loom may be stopped in its ordinary operation while the conveyor is depositing fibers in the shed on the comb.

Another object of the invention is the provision of a controlling mechanism of the class described which is certain and positive in its action and which is adapted to be used for a long period of time without necessity for repair or replacement.

Another object of the invention is the provision of an improved controlling mechanism of the class described which has a snap action by means of which its controlling clutch is positively moved and positively held in either of the controlling positions so that there is no possibility of slow action or the driving of both of the mechanisms at the same time which are to be controlled.

Other objects and advantages of the invention will be apparent from the following description and the accompanying drawings, in which similar characters of reference indicate similar parts throughout the several views.

Referring to the drawings, of which there are five sheets,

Fig. 1 is an end elevational view of a loom embodying the invention;

Fig. 2 is a front elevational view of a loom embodying the invention;

Fig. 3 is a fragmentary top plan view of the conveyor for conveying the loose fibers into the shed;

Fig. 4 is a view in perspective of the main parts of the loom controlling mechanism which forms the subject of the present application;

Fig. 5 is a fragmentary view in perspective of parts of the comb and conveyor with the conveyor in the act of depositing loose fibers on the comb;

Fig. 6 is a similar view with the conveyor in the act of depositing yarns or rovings of loose asbestos fibers wrapped with spiral threads upon the same comb;

Fig. 7 is a fragmentary plan view of a blanket adapted to be woven by the present machine;

Fig. 8 is a similar fragmentary view with the warp members shown in dotted lines and the weft composed of loose unspun fibers;

Fig. 9 is a fragmentary elevational view of a yarn or roving member of the type of which the weft of the blanket in Fig. 7 is composed; and

Fig. 10 is a fragmentary sectional view taken on the plane of the line 10—10 of Fig. 4 showing the lost motion arrangement by means of which the automatically reversible clutch is adapted to be actuated.

Referring to Figs. 1 and 2, the weaving machine 30, elevations of which are shown in these figures, comprises a frame, which may be indicated in its entirety by the numeral 31, consisting of a plurality of vertical and transverse channeled members of steel or other suitable material, such as, for example, the vertical frame members 32, 33, 34, 35, 36, 37, 38, 39, 40, 41 and 42, and the horizontal frame members 43, 44, 45, 46, 47, 48, 49, etc. Such suitable frame members may thus be provided and suitably located to support the bearings, shafts, and other elements of the machinery at the points shown, and the

framework may be varied considerably without changing the operation of the machine.

The mechanism may be driven by a suitable electric motor 50, the drive shaft of which carries a pinion 51, meshing with the gear 52 carried by the drive shaft 53. The direction of rotation of the drive shaft 53 may, for example, be clockwise, looking at the right end of the shaft 53. The element indicated by the numeral 54 is a standard Johnson clutch, which is used for stopping and starting the machine.

Before describing the rest of the gearing and actuating mechanism, various important functional parts of the machine will be indicated with suitable numerals. The vertical frame members 33 and horizontal frame member 47 comprise the supports for the heddle frames 55, having the usual type of heddles 56 for controlling the action of the warp threads.

The heddles 56 and heddle frames 55 are moved upward and downward in the usual manner by a mechanism which comprises the pulleys 57, chains 58, bellcranks 59, and chains 60, which are secured to the bellcrank 61.

The bellcrank 61 has two arms 62 and 63, the lower one of which is suitably connected to means for actuating the chains 64, which are connected to the lower part of the heddle frames 55. Bellcrank 61 is actuated by a roller 65, which is mounted within the track 66 of a cam 67. By means of this mechanism the heddles are so operated, and by means of the heddles the warp threads 68, 69, which form the shed 78, are so manipulated that they are alternately crossed about the weft after the weft has been suitably laid in the shed and driven forward into tight engagement with the warp threads by the lay.

The operation of the heddle frames is, of course, synchronized with the rest of the machine, as will be described hereinafter. The warp threads 68 and 69, which form the shed 78, come from suitable spindles, the separate threads being indicated at the right of the machine by the numerals 70 and 71. 72 and 73 comprise friction rollers; that is, rollers covered with friction material, such as a soft rubber covering about which the warp threads 70 and 71 are wrapped, and the rollers 74, 75, 76, 77 are merely guide rollers for guiding the warp threads in the proper direction. From the last guide rollers 75, 76, the warp threads 68, 69 extend to heddles.

The friction drums 72, 73 maintain a suitable tension on the warp threads, and the tension may be varied to change the characteristics of the blanket of insulation to be woven.

The present weaving machine is provided with an improved form of lay 80, comprising the reeds 81, which are of particular shape for accomplishing a new function. The reeds 81 of the lay 80 are adapted not only to maintain the alignment of the warp threads and to force the weft up closely between the warp threads of the shed, but the reeds 81 are also adapted to support the weft in proper position, although the weft may be of such character that it has no tensile strength whatever, so that it cannot be supported merely at each end of the weft, as is the case where the weft is a member having tensile strength.

Referring to Fig. 5, reed 81 comprises an upper angle iron 82 and a lower angle iron 83, to which are secured a multiplicity of straps or bands of steel 84 of suitable material, the bands being separated by the slots 85 of sufficient width to pass the warp threads.

The bands 84, comprising the reed 81 and the downwardly extending flat portion 86, are provided with an obtuse angle at 87. They also have a diagonally downwardly extending flat portion 88 and are provided with a bend at 89, which is slightly less than ninety degrees so that the flat portion 90 of the bands 84 extends in substantially horizontal direction. Thereafter the bands 84 are bent back at 91 and provided with a flat portion 92 which extends downwardly and backwardly in a diagonal direction toward an attaching flange 93, which is at substantially right angles to the portion 92.

The ends of the flat portions 86 and 93 are secured to the angle irons 82, 83 by screws or other fastening means passing through the bands and threaded into the angle irons. Thus the reed 81 is provided with a flat shelf which may be designated by the portion 90, upon which the warp material may be supported and the weft may be of such material that it has no tensile strength, since it is supported over practically the full length of the weft, that is, the width of the fabric or blanket.

Referring to Fig. 1, the lay 80 has its upper and lower angle irons 82, 83 secured at their ends to the upwardly extending levers 101. The levers 100, 101 are pivoted on horizontal base members of the frame at the point 102.

The levers 101 are each provided with a suitable roller or pin 103, which is adapted to move in the eccentrically located groove 104 of a cam member 105, which is carried by shaft 106. The shape of the cam groove 104 is such that as the cam disc 105 rotates the roller 103 follows the groove 104 and the lay levers 100, 101 are pivoted back and forth from the position of Fig. 2 to a position in which the lay 80 drives the weft over tightly between the warp threads 68 and 69 of the shed 78. Of course, this action is taken only at the proper time, as the action of the lay is synchronized with the other mechanism of the weaving machine, as will be described later.

Referring again to Figs. 5 and 6, when the weaving machine is fed with weft material of the type disclosed in my prior application, Serial No. 188,720 (Fig. 1), which is made by machines of my prior application, Serial No. 195,117, filed March 10, 1938, No. 2,191,875 issued February 7, 1940, the weaving machine is preferably provided with a means for catching the weft and holding it in proper position at the sides of the lay, as shown in Figs. 5 and 6.

The weft material referred to is shown in Fig. 6 and indicated by 110, and comprises opened and carded asbestos fibers, such as Amosite, which have been slightly confined by the spirally extending asbestos threads 111, 112, which may be wrapped spirally about the loose fibers in opposite directions.

Such insulating units used as the weft have sufficient tensile strength so that they can be deposited in a barrel or other container in coils, as disclosed in my prior application, Serial No. 195,117, and can be withdrawn from the barrel by the weft feeding mechanism of this weaving machine.

The weft unit 110 also has sufficient tensile strength so that it can be caught at the side of the lay by the mechanism disclosed in Figs. 5 and 6, the operation and structure of which will now be described.

The angle iron 83 at the lower part of the lay supports a downwardly extending arm 113, which is fixedly secured thereto, and which is provided

with a pivot bolt 114 for pivotally supporting a holding lever 115. The holding lever 115 has an upwardly extending arm 116 and a backwardly extending arm 117, which are located below the shelf 90 of the lay, the purpose of these arms being to keep these parts of the lever 115 out of the way of the shed so that there will be no interference between this mechanism and the warp threads.

The lever 115 has an upwardly extending arm 118 and a forwardly extending hook 119, the hook 119 being of sufficient length and the space 120 between the hook 119 and arm 117 being large enough so that the hook 119 can embrace the weft 110, whether it consists of one or two or more strands or units.

As shown in Fig. 6, the hook or arm 119 is engaged by the weft units 110, and is in position to hold them at that side of the lay. For this purpose the arm 113 has an upwardly extending portion 121, which is provided with a pivot 122 for supporting a latch 123. The latch 123 has a shoulder 124 which engages the shoulder 125 on the holding member 115. The arm 121 and holding member 115 are also connected by means of the tension spring 126, which may consist of the helical spring having hooks at its end, the hooks being engaged about the pin 127, carried by arm 121 and about pin 128 and carried by holding member 115.

The spring 126 tends to pull the holding member 115 in a clockwise direction toward the position of Fig. 6; but the holding member 115 is latched until a predetermined point is reached in the cycle of weaving.

For the purpose of describing the action of this mechanism, reference must also be had to the feeding mechanism for the weft, which is shown at the right of Fig. 2. This feeding mechanism includes a carriage 131, which has a conveyor belt 132 that is carried by the carriage 131 and supported upon an elongated laterally projecting pair of arms or angle irons 133, 134, having a roller 135 at the left end (Fig. 3) and a drive roller 136 at the right end (Fig. 2). The angle irons 133, 134 also support the side plates 137, 138, which confine the loose weft material to the top area of the conveyor belt 132.

It will be evident from Fig. 3 that the left end of the carriage, including the conveyor belt 132, is adapted to be projected a considerable distance toward the left of the feeding mechanism of Fig. 3. In fact, the conveyor belt and supporting mechanism for it are of sufficient length so that the discharge end 139 of the conveyor belt 132, which is an endless belt, is adapted to traverse the reed and lay above the shelf 90 to carry the weft over said shelf and deposit it on the shelf 90.

Fig. 6 shows a part of the weft material just after the conveyor 132 has carried it over to the left side of the weaving machine of Fig. 1, and it has been caught by the holding device 115. The latch 123 is urged into latching position by a leaf spring 140, but it has an upwardly projecting end 141 which is adapted to be engaged by a beveled camming surface 142 carried by a block 143, which is located on the side of the plate 137. Thus the holding device 115 is adapted to be unlatched by the engagement of the camming surface 142 with the end 141 of the latch when the conveyor 132 reaches the position of Fig. 6.

The unlatching of the holding device 115 permits the spring 126 to move it to the position of Fig. 6, and the hooked end 119 passes over the weft units 110, which are lying upon the shelf 90, and is adapted to hold these weft units 110 during the period of time when the carriage 131 and conveyor 132 recede from the position of Fig. 6 to the position of Fig. 1. During this receding motion another length of the continuous weft units 110 is laid on the shelf 90, extending from the holding device 115 at the left side of the lay to the right side of the lay. No holding device is required at the right side of the machine for the reason that in the interim after the completion of the laying of a weft between the shed, the warp threads are crossed about the weft by the heddles, and the warp threads at the right side of the blanket hold the weft when the weft feeding mechanism again moves toward the left in Fig. 1 and lays the strand of weft again on the shelf 90.

The holding device 115 is again latched when the lay is moved forward in a counterclockwise direction on the lever 101 (Fig. 1) by the cam 104 as the forward movement of the lay causes it to pass beyond the position of the holding device 115 of Fig. 6 until the holding device reaches a position where it is latched.

The holding device may be forced backward to that position by engagement of the lever 115 with an appropriate stop or by its engagement with the weft when the lay forces the weft down tightly between the warp threads of the shed.

It should be noted that at the time the lay performs the latter function, the carriage 131 and conveyor 132 have receded from the position of Fig. 6 to that of Fig. 2, so that there is no interference between the end of the latch 123, which is carried by the lay, and the side plate 137 of the carriage 131.

Of course, the mechanism of Fig. 6 is merely required when the machine is to be operated wholly automatically, and the machine may be operated without the holding mechanism of Fig. 6 by employment of an operator who stands at the left side of the machine in Fig. 2 and holds the weft, as shown in Fig. 6, with his hand or some implement.

Referring to Figs. 1 to 3, I shall now describe the feeding mechanism for the weft, parts of which have been described in connection with the holding device of Fig. 6. This feeding mechanism is provided with a framework, including the frame members 34, 35, 36 and horizontal frame members 48, 49, together with additional frame members for holding them together in the relation shown in the figures mentioned. The framework of the feeding mechanism is attached to that of the weaving machine at the horizontal angle iron 150 (Fig. 1), which is secured to the horizontal channels 48, 49.

Each channel 48, 49 supports adjacent its ends an inwardly extending angle 151—154. These are provided with cylindrical bearing apertures for receiving the shafts 155, 156, which also may serve as guides.

The shaft 156 may be fixed, and merely serves as a guide; but the shaft 155 is also adapted to rotate for the purpose of driving certain mechanism. The carriage 131 may comprise a framework, such as a horizontal frame member 157, which carries the members 158, 159, which are of similar shape. Each of the members 158, 159 is provided with an upwardly extending flange 160, having a pair of laterally extending wheel trunnions 161 for rotatably supporting flanged wheels 162.

The flanged wheels 162 are so located that the

flanges are inside of the channels 48, 49, and the tread of each wheel rests on top of the uppermost flange of the channels 48, 49, which provides tracks for the carriage. The members 158, 159 are also provided with inwardly extending guide arms 163, having cylindrical bores 164 for slidably engaging the shafts 155, 156. That is, the carriage is guided not only by the flanged wheels, but it is held against over-balancing by the extended arm of the conveyor 132, by the guide rods or shafts 155, 156, which retain the carriage on its track.

In addition to this, the shaft 155 supports the beveled gear 165, which engages the beveled gear 166, carried by a laterally extending shaft 167, which is mounted in the upwardly extending arms 168 of the members 158, 159.

The arms 168 also support the frame members 133, 134 and the side plates 137, 138, which extend longitudinally of the track 48, 49 and support and enclose the conveyor belt 132. At spaced intervals the frame members 133, 134 and side plates 137, 138 support a plurality of rollers 169 which engage and support the lower side of the upper part of the endless belt 132. Additional transverse frame members are provided as required for maintaining the frame members 133, 134 in parallelism, and the conveyor belt 132 is driven by the roller 136, which in turn is driven by shaft 167 and bevel gears 165, 166.

Conveyor belt 132 continuously moves its uppermost portion, that is, the part visible in Fig. 3, toward the left, so as to feed the weft material toward the weaving machine. The transverse frame member 150 may be provided with a pair of bearing brackets 170 for rotatably supporting a pair of rollers 171 which are adapted to engage under the horizontally extending flange of the frame members 134, 133 to give additional support to the laterally projecting conveyor 131.

The shaft 155 is driven by bevel gear 172, which is engaged by bevel gear 173, carried by shaft 174. The shaft 174 carries a bevel gear 175, meshing with a similar gear on the shaft 176, which also has a pair of sprockets 177, one at each end, for driving the carriage.

The sprockets 177 are connected by chains 178 to sprockets 179, carried by a stub shaft 180, journaled in the channeled frame members 48 and 49. Stub shaft 180 carries another sprocket 181 engaged by a chain 182, which extends parallel to the tracks 48, 49, and is carried at the other end of the frame by a sprocket 183 on the stub shaft 184.

The chains 182 each carry a laterally projecting lug 185, which is adapted to engage in the slot 186, formed in the frame member 160 of the carriage so that as the lugs 185 on the chains 182 move longitudinally of the frame they carry with them the carriage 131, which is reciprocated from left to right and from right to left in Figs. 2 and 3.

The shaft 176 is thus adapted not only to cause the conveyor belt 132 to feed weft material continuously off the discharge end 139 of the conveyor, but it is adapted to cause the carriage to move back and forth and to lay that material in a continuous layer on the shelf 90 of the lay or reed as the carriage moves over from right to left, and again as the carriage moves back from left to right. Thus the weft material is actually conveyed or carried into the space between the warp threads; that is, into the shed 70, after which the lay is actuated to drive the weft tightly between the warp threads. Thereafter the heddles cause the warp threads to cross, confining the weft between them.

It will be evident that it is unnecessary for the weft material to have any tensile strength, as loose fibers can be conveyed by the feeding mechanism to the proper place. Such loose fibers may be placed upon the conveyor belt 132 by means of a hopper 190, which may be provided with conventional agitating and feeding means, so that the fibers will be continuously deposited in a layer, uniformly on the conveyor belt 132.

In other embodiments of the invention, when the weft units 110 are employed, these strands or units of loose and carded fibers, confined by spiral threads, can be continuously withdrawn from coiled form in the barrel, by the action of the conveyor belt 132, frictionally engaging the lower side of the weft units.

When a hopper 190 is employed, it is of course located sufficiently close to the left end of the feeding mechanism of Fig. 3 so that it is always above a part of the conveyor belt 132.

The weft feeding mechanism is synchronized with the other mechanism of the weaving machine and is adapted to be actuated automatically and periodically by means of the mechanism which is illustrated in Fig. 4, parts of it being also shown in Figs. 1, 2, and 3.

The weft feeding mechanism must be stopped during the interval of time when the lay and the heddles are actuated, and at that time the lay and heddles must be operated instead, in proper succession.

Referring again to Figs. 1 and 4, the shaft is driven through the intermediary of the clutch 54 by the motor 50, and shaft 53 may be provided with an automatic clutch collar 200, both ends of which are toothed, as shown in Figs. 2 and 4, for driving one or the other of the right hand and left hand clutch elements 201, 202, which are adjacent to it, but loosely mounted on the shaft 53 for rotation.

The clutch element 201 is secured to a pinion 203, which drives a gear 204, carried by shaft 205, at a reduced speed. Shaft 205 is rotatably mounted in bearings 206 and carries a pinion 207, engaging gear 208, carried by shaft 209.

Shaft 209 has its bearings indicated at 210, and it is provided with a beveled pinion 211, which engages the beveled pinion 212 that is secured to the cam disc 105, having the groove 104. This is the cam which actuates the lay, and the intermediate gears are for the purpose of actuating this cam and the lay at proper speed.

When the right hand clutch element 201 is engaged by the clutch collar 200, gear 203 is actuated to drive shaft 205 and shaft 209 and to actuate the cam 104, which controls the movement of the lay. The other clutch member 202 (Fig. 4) is connected by a sleeve 215 with the sprocket 177, carried by shaft 176, previously mentioned as being the drive shaft for the conveyor belt and carriage of the weft feeding mechanism.

When the clutch collar 200 is moved toward the left in Fig. 1, the weft feeding mechanism is actuated, and when the clutch collar 200 is moved toward the right, the lay is actuated. In order that the clutch collar 200 may be automatically actuated, its parts are arranged as follows:

The collar is provided with a groove 216 for engaging a roller 217 on a loosely pivoted arm 214, which is pivoted at 219. The clutch arm 218 is pivoted on the frame at the point 219, and comprises a member with a pair of inwardly extend-

ing arms 220, having adjustable set screws 221 with lock nuts.

The arm 214, which carries the roller 217, has a limited degree of lost motion between the set screws 221, carried by arm 218, which set screws engage the arm 214. The lever 218 is pivoted at its upper end by a screw bolt 222 to a tubular rod 223, within which slides another rod 224 that is pivotally mounted on the frame at 225.

A compression spring 226 is located in the tubular rod 223 and is engaged by the end of the rod 224. Thus the compression spring 226 and its associated mechanism constitute a snap mechanism for the clutch collar 200, and the collar 200 is forced by the spring 226 into engagement with one or the other of the clutch members 201, 202, and ordinarily does not come to rest in the position shown in Fig. 4, where it is shown in a position of transition from one clutch member to the other. The additional lost motion, which is provided by this mechanism and by the loosely pivoted lever 214, permits the actuation of this clutch by two different controlling devices, one of which is controlled by the position of the carriage, and the other of which is controlled by the position of the cam disc 105.

The cam disc 105 is provided with a cam 230 for engaging the end of a lever 231, which is pivoted on the frame at 232. The lever 231 is connected by a pair of yokes 233, 234 and a connecting rod 235 to the lever 218 in such manner that when the cam 230 reaches a predetermined position and actuates the lever 231, the clutch collar 200 is moved over into engagement with the clutch member 202.

Thus, during the cycle of the movement of the cam disc 105, when the cam disc reaches a predetermined position, that is, upon the completion of the backward movement of the lay after driving the weft up to the fell, the control cam 230 actuates the clutch to shut off movement of the gear 203, which drives the cam 105, and the lay is then still until the clutch is again actuated by the controlling mechanism that is actuated by the carriage.

The latter mechanism is described as follows: A bellcrank 240 is pivotally mounted at 241 on a part of the frame 242. One arm of the bellcrank is pivotally connected by an adjustable connecting rod 243 to the lower end of the clutch lever 213. The other arm of the bellcrank is pivotally connected by a long adjustable connecting rod 244 to a trip lever 245, which is pivotally mounted on the frame of the feed mechanism at the point 246 adjacent the path of the carriage.

The carriage 131 has a reciprocable spring pressed plunger 247, mounted in a socket member 248, which is carried by the carriage, and the plunger member 247 has its rear side provided with a beveled surface 249.

The feed mechanism frame has a toothed wheel 250 mounted for rotation about the stub shaft 251, and provided with regularly spaced, laterally projecting teeth 252. The size of the wheel 250 and the space between the pins 252 are such that each time the carriage 131 moves toward the right (in Fig. 1 or in Fig. 3), the spring pressed plunger 247 engages one of the pins 252 and rotates the wheel 250 one step in a clockwise direction. The second pin behind the pin so actuated in a clockwise direction is in engagement with the bellcrank 245 and is adapted at this same time to rotate that bellcrank in a counterclockwise direction. This produces a pull on the connecting rod 244, and through the bellcrank 240, a pull on the connecting rod 243, which actuates the clutch lever 218 in a clockwise direction, moving the clutch member 200 toward the right (in Fig. 4) to engage and actuate the pinion 203.

Thus, at the end of each movement of the carriage toward the right (in Fig. 1), the clutch 200 is so actuated that gear 203, and through it the lay cam 105, are caused to start into motion.

As previously stated, this motion of the lay cam continues until the lay has performed its function, and through the controlling mechanism 230 to 235 the clutch collar 200 is pulled in the opposite direction to shut off the motion of the lay cam.

It should be noted that as the carriage 131 moves toward the left, in Fig. 4, the spring pressed plunger 247 has its beveled side 249 engage the adjacent pins 252, which causes the plunger 247 to recede against pressure of its pin, and snap over the pin instead of actuating the wheel 250.

Thus the clutch is actuated only upon the right hand motion of the lay at the end of the range of movement of the carriage, so that the lay is actuated only when the conveyor 132 has been withdrawn from between the shed 78.

In order to make the blanket of insulation which is thus woven still more uniform in thickness, and to eliminate joints between successive insulating units 110, which have the loose fibers protruding from the spiral thread wrappings 111 and 112, I prefer to spray the successive insulating units with an adhesive solution such as a solution of sodium silicate, which causes the protruding and intermingling fibers of adjacent insulating units of the type disclosed in my prior application, Serial No. 188,720, to adhere together and form a continuous blanket of the loose fibers, in spite of the crossing of the warp threads between the insulating units.

This spraying may be carried on by hand by means of a nozzle, but is preferably accomplished automatically by means of a laterally directed nozzle 260 carried by the end of a pipe 261, which extends longitudinally of the carriage 131 and is carried thereby.

The pipe 261 has an elbow and is connected to a laterally extending pipe joint 262 at the right end of the carriage 131, and is provided with an automatic valve 263 (Fig. 3), carried by the carriage and adapted to be actuated when the carriage reaches a predetermined position. The continuation 264 of the pipe to the source of supply of the spraying solution is made of flexible hose of sufficient length to permit movement of the carriage without interfering with the tank.

The pipe 264 is, of course, supplied with a supply of the silicate solution, or other suitable solution, under pressure, so that it is only necessary to open the valve to accomplish the spraying by means of the nozzle, which is directed toward the unfinished edge of the blanket inside the shed. Thus the successive weft members are adapted to be sprayed so that the intermingling loose fibers will not only be brought into contact with each other, but will be caused to adhere to each other, to prevent any segregation of the weft units or forming of cracks in the blanket, even when the blanket is bent about a body to be insulated. The bending of the blanket and the tensioning of the outer layer of the weft only results in the separation of the loose fibers within the insulating units and does not result in separation at the cracks between the insulating units of the weft.

The loom is of course provided with a suitable

take-up mechanism as described in my prior application Serial No. 215,397, mentioned above.

This take-up is described briefly as follows: The woven blanket 300 of insulating material is carried over a curved fixed apron 301, thence to a pair of idling rolls 302, 303, and down to a roller 299, about which it passes in a clockwise direction. The blanket then extends horizontally, passing under the roller 304 and over roller 305 in a clockwise direction and counterclockwise about the roller 306. Then, with a backward turn, it is wound upon the roll 307 which is carried by the mandrel 308, loosely mounted for rotating and sliding movement between the standard 309 and the rod 310. The roll 307 of the blanket rests loosely upon the roller 306, and thus it raises as the roll becomes bigger. It is for this purpose that the mandrel 308 is mounted for rotating and sliding movement in the slot 311. The rollers 299, 304, and 306 may be geared together and driven by means of chains, and the blanket itself passes between the rollers 304 and 306, so that it is positively fed to form the roll 307. The roller 302 is provided with teeth for engaging the blanket and positively moving the blanket forward step by step from the loom.

The operation of the complete loom will be evident to those skilled in the art from the preceding description of the operations of the respective parts thereof. Therefore, it is sufficient to say that in the present loom the carriage 131 is adapted to support and convey the weft material in the form of loose fibers into the space of the shed at periodic intervals so that these loose fibers can be bound by means of the warp and compacted by means of the lay into a compact blanket.

In addition to loose fibers of Amosite asbestos, which have merely been carded and opened, practically any type of mineral, animal, or vegetable fiber may be woven, such as processed mineral fibers, rock wool in its customary forms, or any form of asbestos fibers. It is also possible to use fur, feathers, cotton, wool, linen, or any other known animal, vegetable, or mineral fiber. By means of mineral wool, blankets may be woven which may be used at temperatures from 750 to 1,000 degrees F.

Where loose fibers are employed, the hopper 190 would be used for distributing the fibers on the conveyor belt; but where the fibers have been previously bound into insulating units of the type shown in Fig. 1 of my prior application, Ser. No. 188,720, filed February 4, 1938, it is sufficient to permit the conveyor belt 132 to draw such insulating unit out of a coil in a barrel and convey it to the machine to be used as the weft.

In the weaving of the blanket such insulating units may be employed, or the method may be modified, as follows: Loosely carded insulating fibers of any of the materials listed may be placed in a hopper and deposited from the hopper in an even layer on a conveying belt, which is moved at a uniform rate of speed. As the conveying belt moves, it is uniformly covered, and when covered to a sufficient extent the belt or other supporting surface may be conveyed to the space between the warp threads, that is, inside the shed, and fibers deposited upon a comb of such shape as to have a supporting surface for the fibers.

The comb or lay is then moved forward to drive these fibers tightly into the fell, and after the lay recedes the warp threads may be crossed. This can be done by hand, the fibers being driven into the shed by means of a long block, or it can be done by means of the structure of the machine described herein.

After one weft is woven into the fabric, the fabric, which is wound upon a drum, is caused to progress one step forward so as to be ready for the next weft. Thus the loose fibers are woven into a blanket.

When the insulating units of the type shown in my prior application, Ser. No. 188,720, Fig. 1, are employed, they are carried in the form of one or two units or more on the conveying belt in exactly the same manner as just described for loose fibers. The only difference is that the operation may be carried on by machine or by hand, more quickly and conveniently than can be done with loose fibers.

The weft is then caught at the opposite side of the fabric and held either by hand or by a holding device, and the weft unit is strung not only across, but backward from that point, before the weft is bound into the blanket by the warp threads. In other respects the operation is exactly the same as in making a blanket of entirely loose fibers.

In addition to holding the fibers together by warp threads, the edges of each successive weft unit are preferably sprayed with the adhesive solution previously described, which causes the loose fibers of one insulating unit to adhere to the fibers of the next adjacent ones, and totally eliminates any possibility of any cracks between insulating units.

It will thus be observed that it is an absolute necessity for the operation of the machine that the loom be stopped when conveying mechanism is being operated and vice-versa. This is accomplished and the loom is controlled automatically by the mechanism, the principal parts of which are illustrated in Fig. 4. The operation of this mechanism has already been described in connection with the description of its parts.

The clutch element 200 is adapted to be moved to the left or the right, depending upon the position in which the conveyor is located, or the position in which the lay is located. When the clutch collar 200 is moved toward the left in Fig. 4, the weft feeding mechanism, that is, the conveyor of Fig. 3, is actuated. When the clutch collar 200 is moved toward the right, the lay is actuated and the loom operates to secure one weft assembly between the warp threads in the usual way.

The clutch collar 200 is actuated by a snap mechanism so that it is positively held in one or the other of its positions and there is no possibility that the two conflicting parts of the machine may be driven at the same time.

It will thus be observed that I have invented an improved controlling mechanism for the parts of this special loom by means of which the loom, including its heddles and lay, may be stopped automatically and the parts held in predetermined position while the conveyor mechanism is moved into the shed to deposit loose fibers or a special yarn on the comb in the shed. The lay cannot be actuated again until this conveyor has moved out of the shed and the weft is properly laid in the shed after which the conveyor is automatically stopped and the loom automatically started to drive the weft into the shed and cross the warp threads to form a new shed.

While I have illustrated a preferred embodiment of my invention, many modifications may be made without departing from the spirit of

the invention, and I do not wish to be limited to the precise details of construction set forth, but desire to avail myself of all changes within the scope of the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States, is:

1. In a controlling mechanism for a loom having two driven elements adapted to be driven alternately and a driving member adapted to be driven continuously with a controlling mechanism interposed between said driving member and said driven members comprising a clutch member having two positions on a driven shaft and adapted to connect the driving member with one or the other of said driven members alternately, said clutch member having an annular groove therein and a movable lever having a lug engaged in said groove, spring means adapted to be compressed by the movement of said lever when said clutch member moves from either of its engaging positions through a neutral position, and means engaging said lever and actuated by one of said driven members to move said lever and said clutch from one of its driving positions to the other of its driving positions.

2. In a controlling mechanism for a loom, the combination of a support with means for rotatably supporting a cam disc and a driving shaft, said driving shaft being provided with a movable clutch element, one driven member on said shaft at one side of said clutch element and another driven member on said shaft on the other side of said clutch element, and means actuated by said cam disc for urging said clutch element into predetermined position.

3. In a controlling mechanism for a loom, the combination of a support with means for rotatably supporting a cam disc and a driving shaft, said driving shaft being provided with a movable clutch element, one driven member on said shaft at one side of said clutch element and another driven member on said shaft on the other side of said clutch element, means actuated by said cam disc for urging said clutch element into predetermined position, and means operatively connecting one of said driven elements with said cam disc whereby said cam disc is driven at a predetermined rate of speed.

4. In a controlling mechanism for a loom, the combination of a support with means for rotatably supporting a cam disc and with a driving shaft, said driving shaft being provided with a movable clutch element, one driven member on said shaft at one side of said clutch element and another driven member on said shaft on the other side of said clutch element, means actuated by said cam disc for urging said clutch element into predetermined position, means operatively connecting one of said driving elements with said cam disc whereby said cam disc is driven at a predetermined rate of speed, and means connected operatively with said other driven element and a loom element whereby the loom element is driven by said other driven element.

5. In a controlling mechanism for a loom, the combination of a support with means for rotatably supporting a cam disc and a driving shaft, said driving shaft being provided with a movable clutch element, one driven member on said shaft at one side of said clutch element and another driven member on said shaft on the other side of said clutch element, means actuated by said cam disc for urging said clutch element into predetermined position, means operatively connecting one of said driving elements with said cam disc whereby said cam disc is driven at a predetermined rate of speed, means connected operatively with said other driven element and a loom element whereby the loom element is driven by said other driven element, and means actuated by said loom element for moving the clutch in the opposite direction to its actuation by said cam disc.

6. In a controlling mechanism for a loom, the combination of a support with a driving shaft, said shaft having a pinion thereon with a clutch face, a clutch element splined to said driving shaft and slidably mounted thereon, a tubular shaft rotatably mounted on said driving shaft and having a clutch face arranged for engagement with said clutch element, said clutch element having a pair of annular shoulders formed thereon, a freely pivoted lever having a roller engaging said annular shoulders for actuating said clutch into either of two positions engaging said clutch faces, and an actuating lever mounted on said support and having shoulders for lost motion engagement with said freely pivoted lever.

7. In a controlling mechanism for a loom, the combination of a support with a driving shaft, said shaft having a pinion thereon with a clutch face, a clutch element splined to said driving shaft and slidably mounted thereon, a tubular shaft rotatably mounted on said driving shaft and having a clutch face arranged for engagement with said clutch element, said clutch element having a pair of annular shoulders formed thereon, a freely pivoted lever having a roller engaging said annular shoulders for actuating said clutch into either of two positions engaging said clutch faces, an actuating lever mounted on said support and having shoulders for lost motion engagement with said freely pivoted lever, and a spring-pressed plunger having one of its ends pivotally mounted on said support and having the other end engaging a spring in a tubular guide member, said guide member having its opposite end pivoted to said actuating lever whereby the clutch may be urged from one position to the other with a snap action.

8. In a controlling mechanism for a loom having a cam disc for controlling a loom element, the combination of a support with a driving shaft, said shaft having a pinion thereon with a clutch face, a clutch element splined to said driving shaft and slidably mounted thereon, a tubular shaft rotatably mounted on said driving shaft and having a clutch face arranged for engagement with said clutch element, said clutch element having a pair of annular shoulders formed thereon, a freely pivoted lever having a roller engaging said annular shoulders for actuating said clutch into either of two positions engaging said clutch faces, an actuating lever mounted on said support and having shoulders for lost motion engagement with said freely pivoted lever, a spring-pressed plunger having one of its ends pivotally mounted on said support and having the other end engaging a spring in a tubular guide member, said guide member having its opposite end pivoted to said actuating lever whereby the clutch may be urged from one position to the other with a snap action, a connecting rod connected to said actuating lever and connected to a lever having its end in proximity to the cam disc of the loom, and means on said cam disc for engaging said end of said latter lever to exert a force on said actuating lever and move said clutch from one position to the other, the lost

motion between said actuating lever and freely pivoted lever permitting the spring-pressed plunger to pass dead center before actuating said clutch.

9. In a controlling mechanism for a loom, the combination of a support with a driving shaft, said shaft having a pinion thereon with a clutch face, a clutch element splined to said driving shaft and slidably mounted thereon, a tubular shaft rotatably mounted on said driving shaft and having a clutch face arranged for engagement with said clutch element, said tubular shaft being arranged to drive a loom element, said clutch element having a pair of annular shoulders formed thereon, a freely pivoted lever having a roller engaging said annular shoulders for actuating said clutch into either of two positions engaging said clutch faces, an actuating lever mounted on said support and having shoulders for lost motion engagement with said freely pivoted lever, and a spring-pressed plunger having one of its ends pivotally mounted on said support and having the other end engaging a spring in a tubular guide member, said guide member having its opposite end pivoted to said actuating lever whereby the clutch may be urged from one position to the other with a snap action, a lever pivoted on said support adjacent the loom element and means carried by the loom element for actuating said lever in a predetermined direction when the loom element reaches a limit of its movement, and means connecting said latter lever with said actuating lever whereby the clutch may be moved in a predetermined direction when the loom element reaches a limit of its movement.

10. In a controlling mechanism for a loom or the like, the combination of a supporting framework with a driving shaft and bearings carried by said framework for rotatably supporting said shaft, said shaft having a pinion thereon and said pinion carrying a clutch face, said pinion being freely mounted on said shaft, a clutch member splined to said shaft and slidably mounted thereon adjacent said clutch face, and a tubular shaft carried by said driving shaft on the other side of said clutch member and having a clutch face on its end, said clutch member having an annular groove formed therein and a lever pivoted on said support having a roller in said groove, a second lever pivoted on said support and having shoulders provided with adjustable threaded members for engaging said first-mentioned lever, whereby a predetermined lost motion may be provided between said levers, a snap mechanism connected to the second of said levers comprising a plunger and a tubular housing, and a compression spring interposed between the end of the plunger and the closed end of said housing, said plunger and housing having one end pivotally mounted on said support and the other pivotally secured to said lever with the spring compressed.

11. In a controlling mechanism for a loom or the like, the combination of a supporting framework with a driving shaft and bearings carried by said framework for rotatably supporting said shaft, said shaft having a pinion thereon and said pinion carrying a clutch face, said pinion being freely mounted on said shaft, a clutch member splined to said shaft and slidably mounted thereon adjacent said clutch face, and a tubular shaft carried by said driving shaft on the other side of said clutch member and having a clutch face on its end, said clutch having an annular groove formed therein and a lever pivoted on said support having a roller in said groove, a second lever pivoted on said support and having shoulders provided with adjustable threaded members for engaging said first-mentioned lever, whereby a predetermined lost motion may be provided between said levers, a snap mechanism connected to the second of said levers comprising a plunger and a tubular housing, a compression spring interposed between the end of the plunger and the closed end of said housing, said plunger and housing having one end pivotally mounted on said support and the other pivotally secured to said lever with the spring compressed, a connecting rod connected to said second lever and having its end pivotally connected to a third lever carried by said support, said third lever having its opposite end adjacent a shoulder carried by a cam disc driven by said pinion whereby when the cam disc reaches a predetermined position, the third lever is actuated to actuate said second lever through said connecting rod, and after lost motion, to actuate said freely pivoted lever and drive said clutch into position of disengagement from the clutch face on said pinion to stop said cam disc.

12. In a controlling mechanism for a loom or the like, the combination of a supporting framework with a driving shaft and bearings carried by said framework for rotatably supporting said shaft, said shaft having a pinion thereon and said pinion carrying a clutch face, said pinion being freely mounted on said shaft, a clutch member splined to said shaft and slidably mounted thereon adjacent said clutch face, and a tubular shaft carried by said driving shaft on the other side of said clutch member and having a clutch face on its end, said clutch having an annular groove formed therein and a lever pivoted on said support having a roller in said groove, a second lever pivoted on said support and having shoulders provided with adjustable threaded members for engaging said first-mentioned lever, whereby a predetermined lost motion may be provided between said levers, a snap mechanism connected to the second of said levers comprising a plunger and a tubular housing, a compression spring interposed between the end of the plunger and the closed end of said housing, said plunger and housing having one end pivotally mounted on said support and the other pivotally secured to said lever with the spring compressed, a disc carried by said support having a plurality of pins projecting therefrom and arranged in a circle, a spring-pressed beveled pawl carried by a controlled element driven from said tubular shaft, said pawl being located to engage one of said pins when said controlled element reaches a predetermined position, a lever engaged by another of said pins when said disc is rotated by engagement with said pawl, and means connecting said latter lever with the second lever whereby the clutch is actuated to such a position that the clutch is disengaged from the clutch face on the tubular shaft when the controlled element moves into said predetermined position.

13. In a controlling mechanism for a machine having two driven elements adapted to be driven alternately, the combination of a pair of driven elements with a driving member adapted to be driven continuously and a clutch member interposed between said driving member and said driven members, said clutch member being located between said driven members and being adapted to engage one or the other of said driven members, resilient snap means for actuating said

clutch member after it passes dead center of said resilient snap means, and a controlling element actuated by one of the driven members for moving said snap means from one of the clutching positions of said clutch to a point past dead center, and an actuating member interposed between the clutch and said controlling element and having a lost-motion connection with the controlling element whereby the controlling element may be moved to a point past dead center of said spring snap means before the driven element is stopped so that the driven element may itself actuate the clutch in conjunction with said spring snap means into a position to stop the drive of said driven element.

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