April 22, 1941. W. F. ASTLEY 2,239,514

MACHINE AND METHOD OF WEAVING INSULATION

Filed June 23, 1938 7 Sheets-Sheet 1

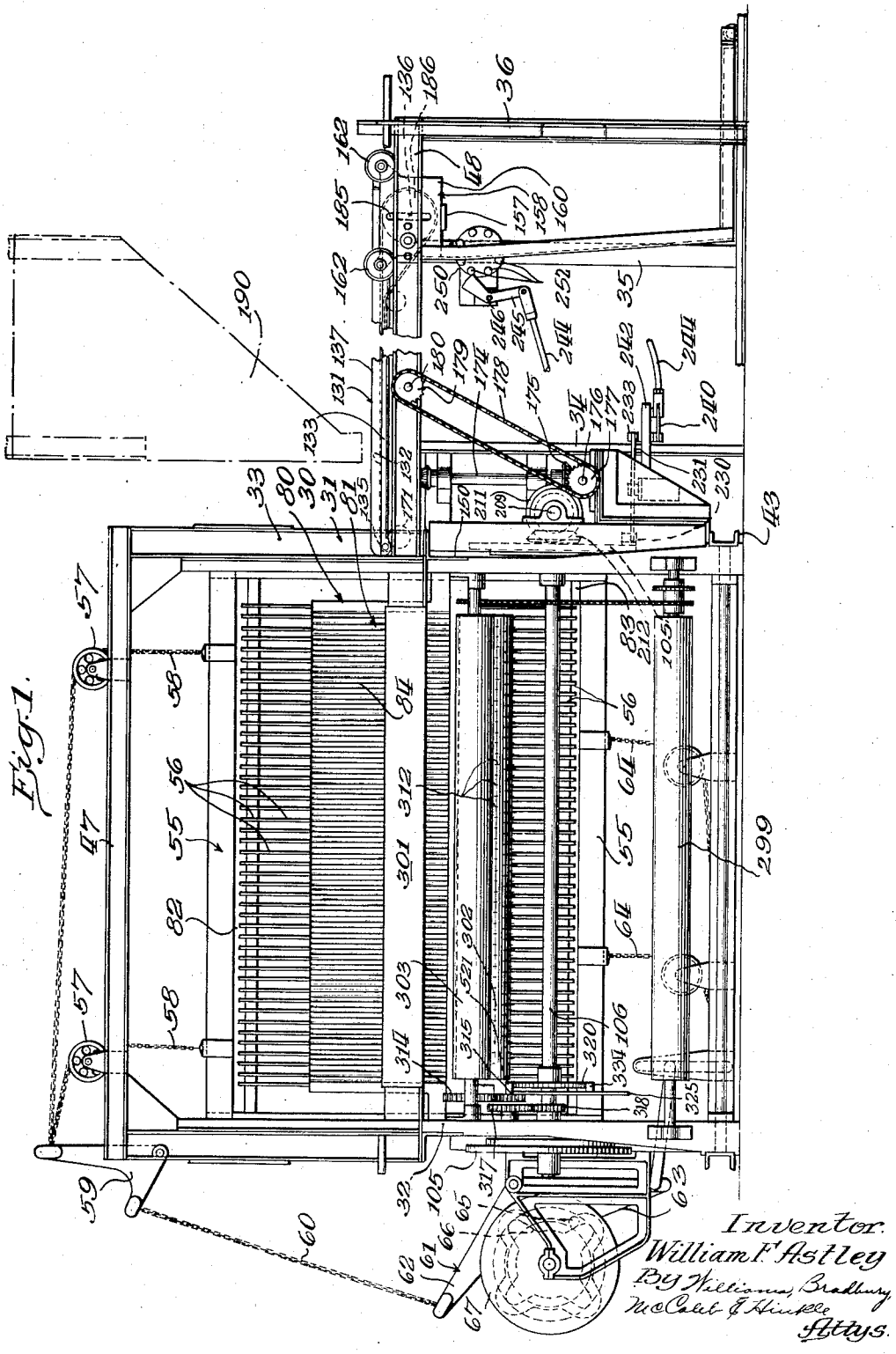


Fig-1.

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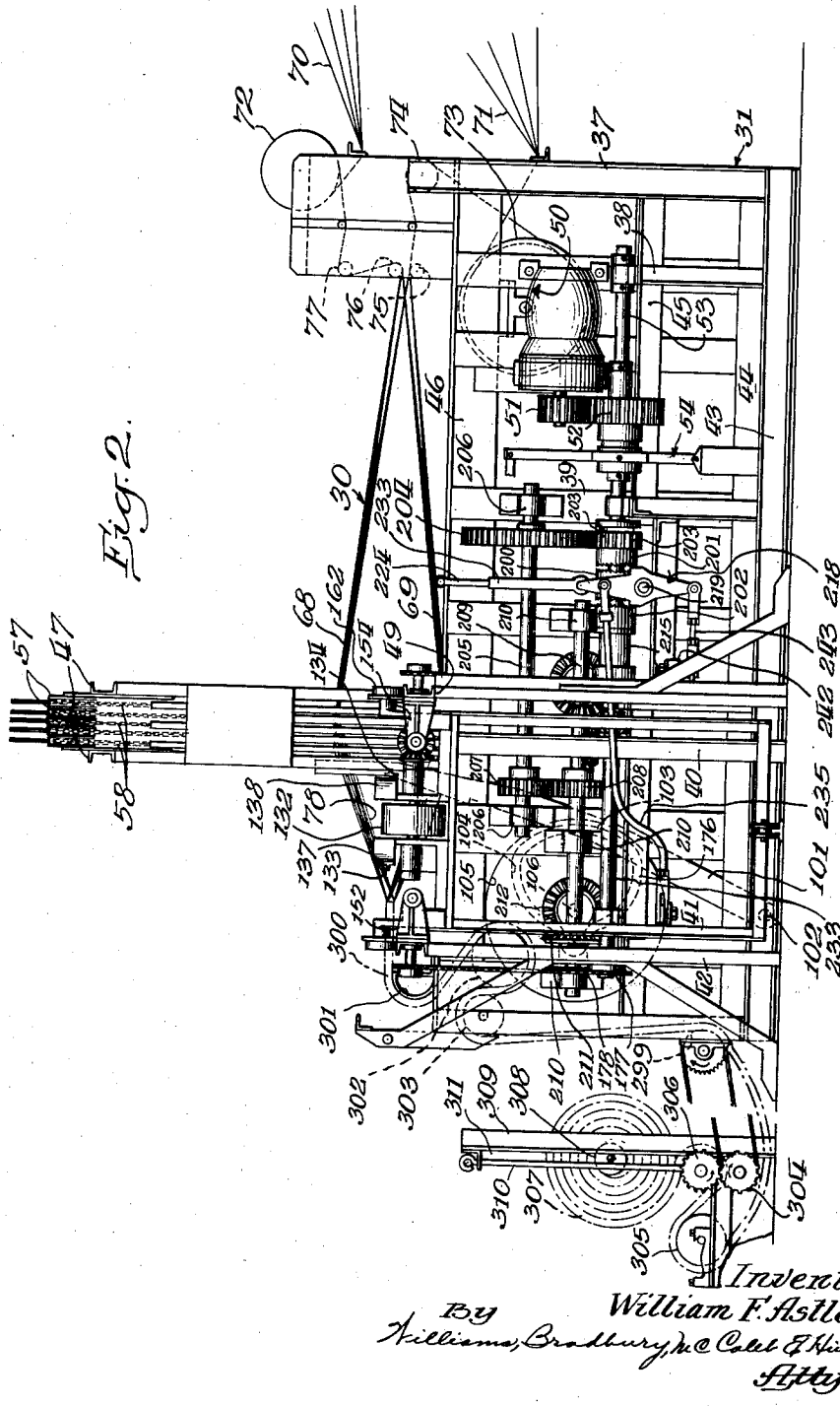
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MACHINE AND METHOD OF WEAVING INSULATION

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Fig. 2.



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MACHINE AND METHOD OF WEAVING INSULATION

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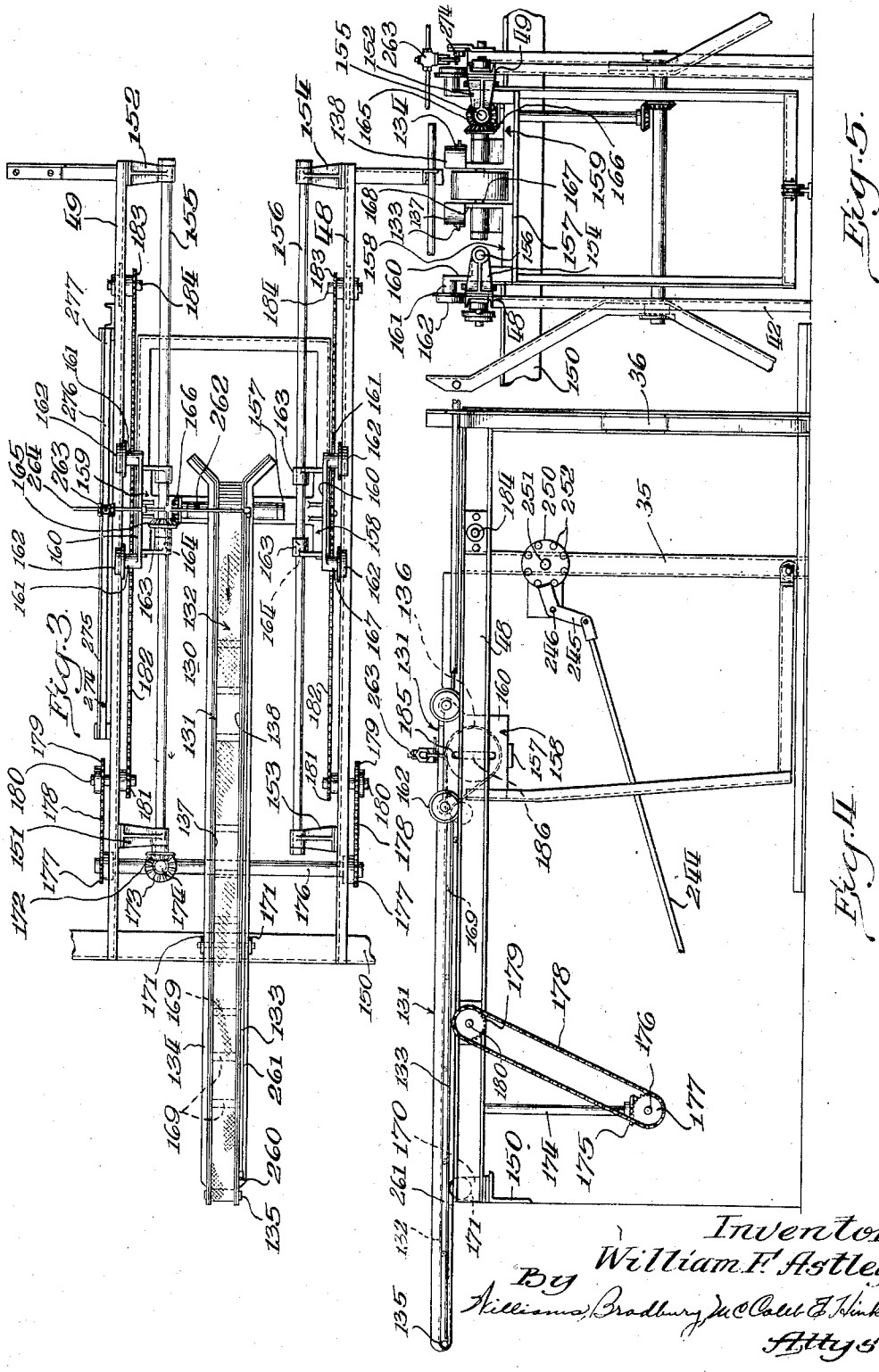


Fig. 5.

Fig. 3.

Fig. 4.

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MACHINE AND METHOD OF WEAVING INSULATION

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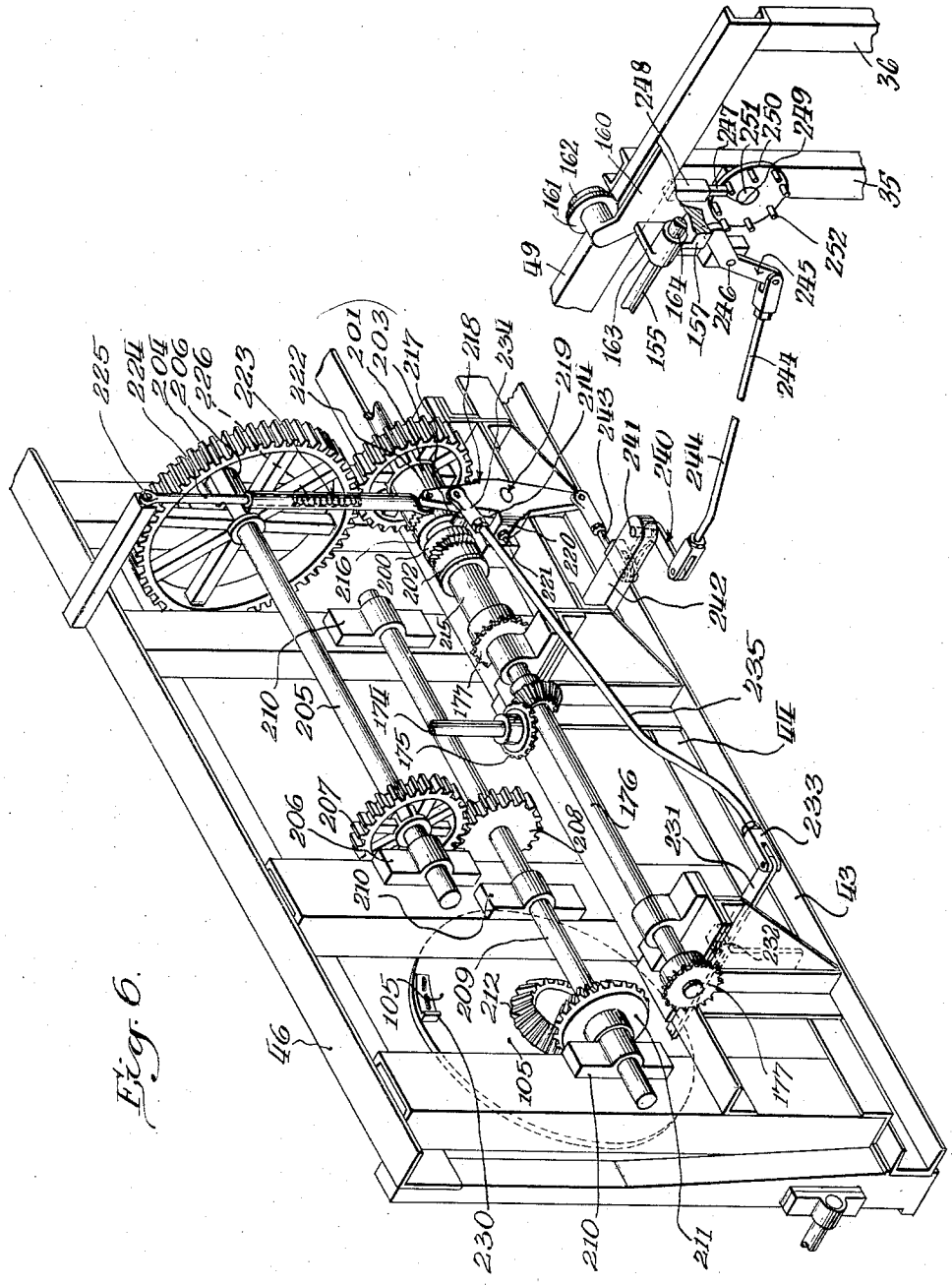


Fig. 6.

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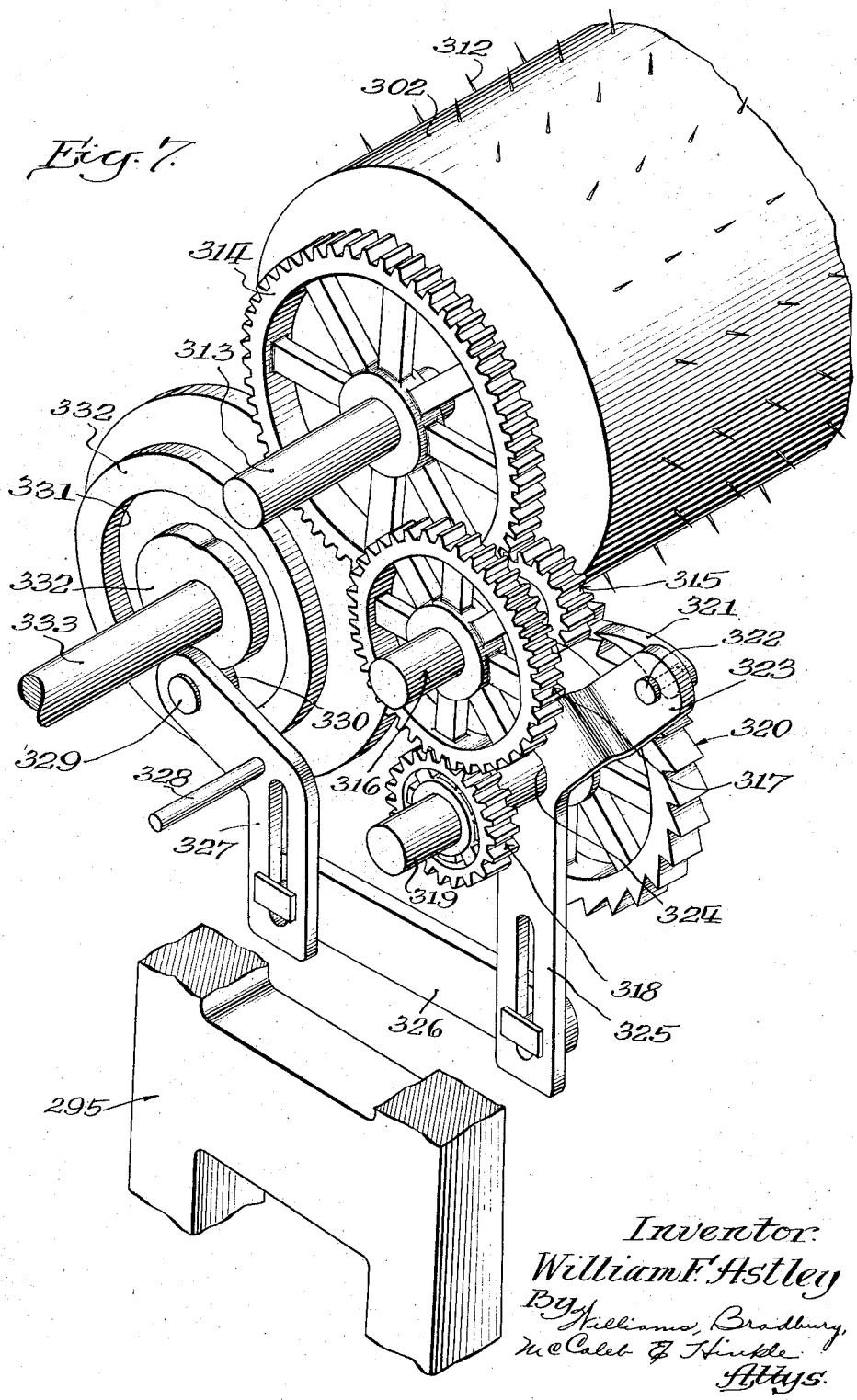
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MACHINE AND METHOD OF WEAVING INSULATION

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Fig. 7.



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MACHINE AND METHOD OF WEAVING INSULATION

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Fig. 9.

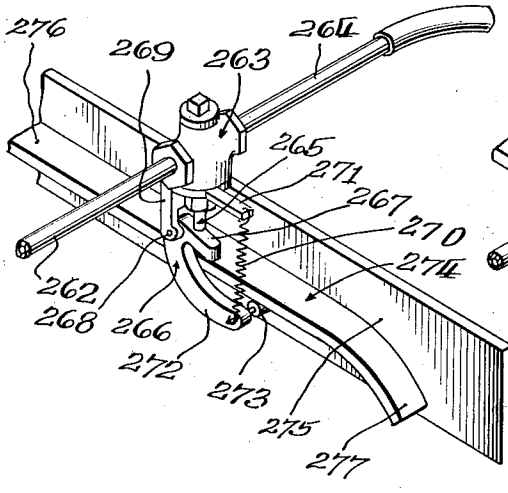


Fig. 10.

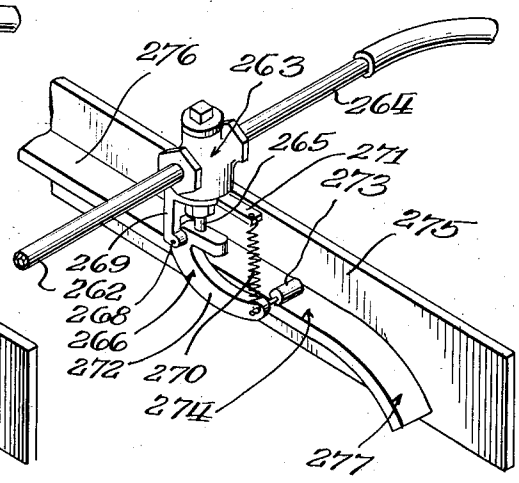
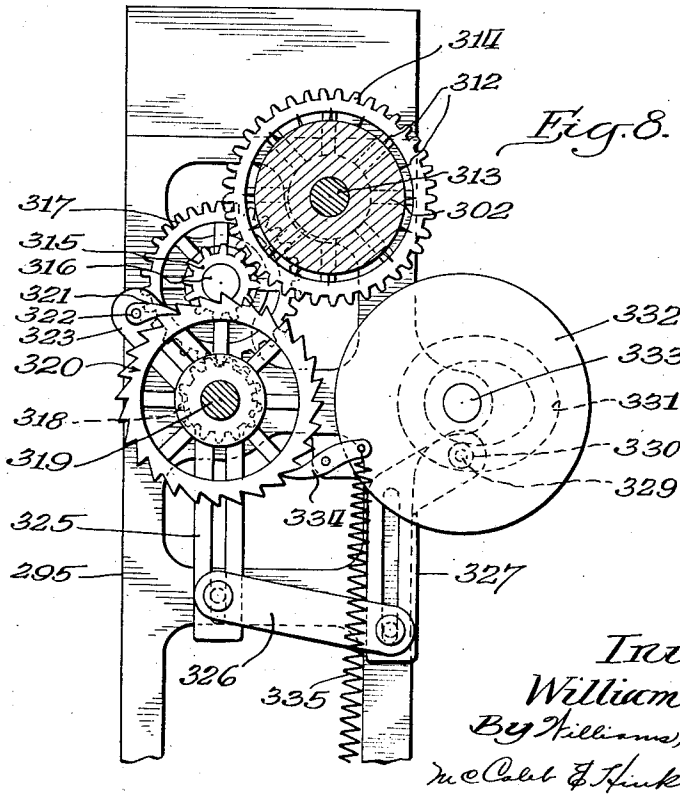


Fig. 8.



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MACHINE AND METHOD OF WEAVING INSULATION

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Fig. 12.

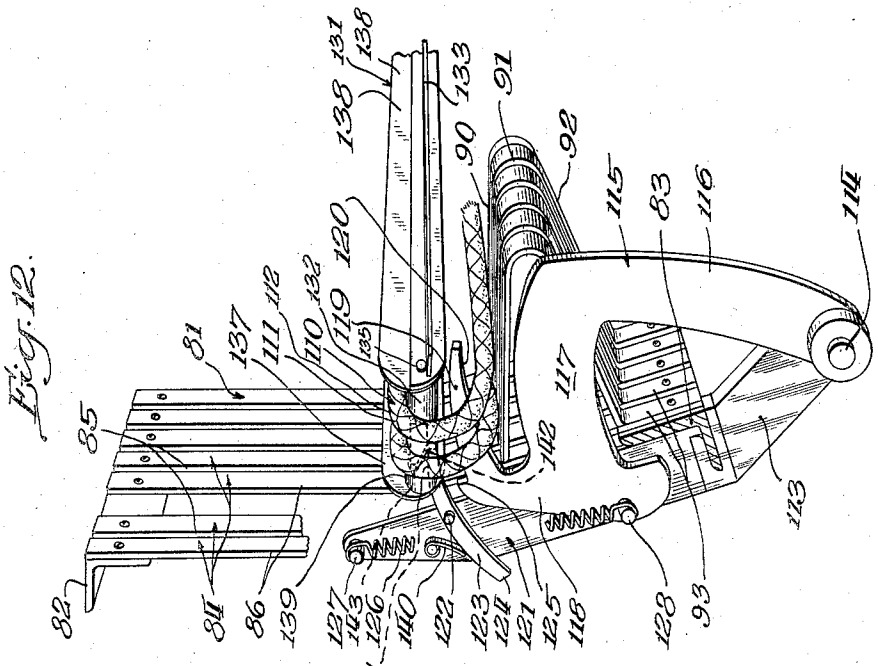
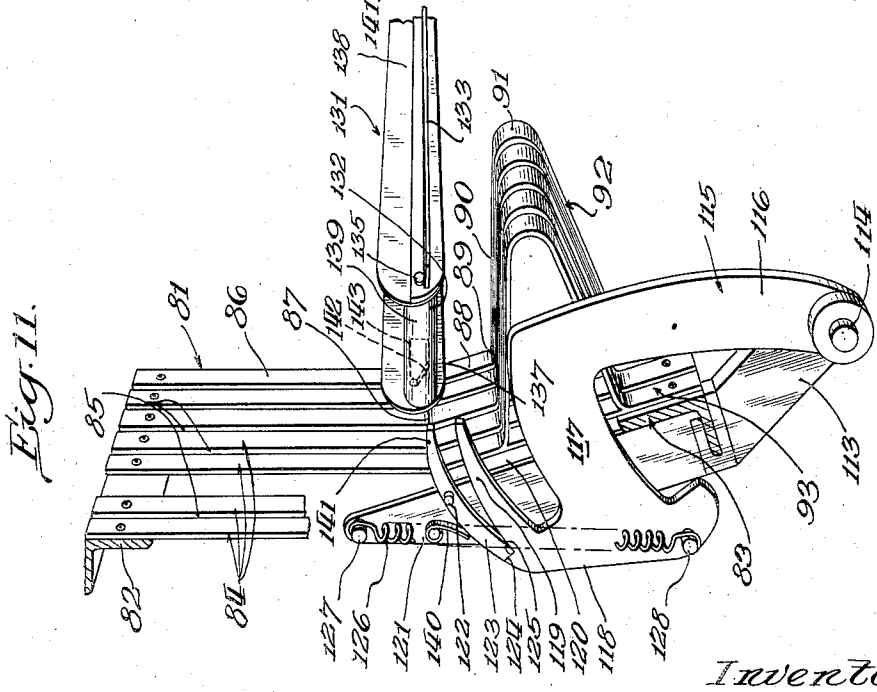


Fig. 11.



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UNITED STATES PATENT OFFICE

2,239,514

MACHINE AND METHOD OF WEAVING INSULATION

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

Application June 23, 1938, Serial No. 215,397

29 Claims. (Cl. 139—11)

The present invention relates to machines and methods for weaving insulation, and is particularly concerned with machines for the purpose of manufacturing insulation of the type covered by my prior application, Ser. No. 188,720, filed February 4, 1938, on Heat insulating materials.

One of the objects of the invention is the provision of an improved machine which is adapted to weave automatically an insulating blanket or cloth comprising warp threads and a weft which comprises material having solely bulk, and which is practically lacking in the tensile strength which is necessary to the weaving of cloth according to the methods of the prior art.

Another object is the provision of an improved machine which is adapted to weave insulating blankets of warp threads and bulk fibers which comprise the carded and open asbestos fibers in the form of sliver, the bulk having substantially no tensile strength.

Another object is the provision of an improved method of weaving an insulating blanket comprising carded and open asbestos fibers in the form of sliver and enclosing and binding warp threads for securing the asbestos fibers in the form of a blanket.

Another object is the provision of an improved machine of the class described in which all of the operations are automatic so that the machine does not require attention during its normal operation, but only for the purpose of assuring its supply of the raw materials and removal of the finished product.

Another object is the provision of an improved machine of the class described which is adapted to utilize insulating units constructed of opened and carded asbestos fiber in the form of sliver, loosely held together by spirally wound and incorporated threads of asbestos or other suitable fibers, described in my prior application, Ser. No. 195,117, filed March 10, 1938, on Methods and machines for making insulation, Patent No. 2,191,875, and which is also adapted to utilize various other kinds of known animal, vegetable or mineral fibers, irrespective of any tensile strength of the fibers.

Another object of the invention is the provision of an improved flexible and highly efficient insulating material which is capable of meeting special conditions, such as use at higher temperatures, as, for example, up to 750 degrees or 1,000 degrees F.

Another object of the invention is the provision of an improved insulating material adapted to be constructed of insulating fibers which are otherwise not adaptable for weaving according to ordinary methods and which possesses the characteristics of flexibility, strength, ease of application to flat or curved surfaces, resiliency, durability, and lightness, to a high degree.

Another object is the provision of an improved form of insulation which is built up of large, loose, soft bodies of special insulating fibers, such as, for example, Amosite fibers, which are thoroughly carded and opened to form a mass of high volume and low weight and in which the bodies of insulating units are bound together, but not confined nor shaped by the enclosing strands in such manner that the opened and carded fibers of one insulating unit may intermingle with the adjacent units to form a practically continuous felt body characterized by an absence of cracks and by a substantially homogeneous fibrous structure.

Another object is the provision of an improved insulating material which is not only adapted to be used for flat or curved surfaces, but may be made into flange covers and other odd sized covers, and covered with a jacket of asbestos cloth which is sewed in place or secured by lacing with asbestos twine.

Another object is the provision of an improved method of making insulating materials which have a high insulating efficiency, a low weight, and which are exceedingly durable, and which maintain their desirable characteristics through vibration or other deteriorating influences.

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 seven sheets of drawings accompanying the specification,

Fig. 1 is an end elevational view of a weaving machine constructed according to the invention, the view being taken from the output end of the machine;

Fig. 2 is a side elevational view of the weaving machine, taken from the right side of Fig. 1, showing further details of construction;

Fig. 3 is a fragmentary top plan view of the weft supporting and feeding conveyor, which appears at the right hand of Fig. 1;

Fig. 4 is a fragmentary side elevational view of the same conveyor, similar to that shown in Fig. 1, but showing greater detail;

Fig. 5 is a fragmentary end elevational view of the weft conveyor, taken from the right end of Figs. 3 and 4;

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Fig. 6 is a fragmentary view in perspective of the driving and reversing mechanism for the carriage and conveyor of Figs. 3–5;

Fig. 7 is a fragmentary view in perspective of the step-by-step take-up mechanism at the output end of the machine for winding the insulating blanket on a drum as it is woven;

Fig. 8 is a fragmentary elevational view of the same mechanism as shown in Fig. 7, and taken at the opposite end of the drum;

Fig. 9 is a fragmentary perspective view of a spray control valve and its actuating mechanism, by means of which the successive courses of the weft are sprayed with an adhesive solution for the purpose of causing them to cohere;

Fig. 10 is a similar view of the same mechanism in a different position;

Fig. 11 is a fragmentary view in perspective of a portion of the lay, including also improved forms of reeds, and showing the end of the weft carriage and conveyor, with automatic means for holding the weft in place after it has been laid in the shed, with the holding device in latched position;

Fig. 12 is a similar view of the weft holding device, after the latch has been tripped and the weft is secured in place at the left end of the machine of Fig. 1.

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 channelled 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 mechine, 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. 11, 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. 2, the lay **80** has its upper and lower angle irons **82**, **83** secured at their ends to the upwardly extending levers **100** and **101**. The levers **100**, **101** are pivoted on horizontal base members of the frame at the point **102**.

The levers **100**, **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

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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. 11 and 12, when the weaving machine is fed with weft material of the type disclosed in my prior application, Ser. No. 188,720 (Fig. 1), which is made by machines of my prior application, Ser. No. 195,117, filed March 10, 1938, 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. 11 and 12.

The weft material referred to is shown in Fig. 12 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, Ser. No. 195,117, and can again 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. 11 and 12, 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 is 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 backwardly 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. 12, 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. As shown in Fig. 11, the holding member 115 is latched in its other position. 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, as shown in Fig. 11. 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 ends, the hooks being engaged about the pin 127, carried by arm 121 and about pin 128 carried by holding member 115.

The spring 126, when in the position of Fig. 11, is tensioned and tends to pull the holding member 115 in a clockwise direction toward the position of Fig. 12; but the holding member 115 is latched, as shown in Fig. 11, 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. 1, and further details of which are disclosed in Figs. 3–5. This feeding mechanism is indicated in its entirety by the numeral 130, and 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. 4). 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. 12 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. 12.

The unlatching of the holding device 115 permits the spring 126 to move it clockwise from the position of Fig. 11 to that of Fig. 12, 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. 12 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 backward 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. 12) 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. 12 until the holding device reaches the relative position of Fig. 11, 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

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performs the latter function, the carriage 131 and conveyor 132 have receded from the position of Fig. 12 to that of Fig. 1, 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 Figs. 11 and 12 is merely required when the machine is to be operated wholly automatically, and the machine may be operated without the holding mechanism of Figs. 11 and 12 by employment of an operative who stands at the left side of the machine in Fig. 1 and holds the weft, as shown in Fig. 12, with his hand or some implement.

Referring to Figs. 1 and 3–5, I shall now describe the feeding mechanism for the weft, parts of which have been described in connection with the holding device of Figs. 11 and 12. 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 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. 3 and 4.

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 reeds 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. 6, parts of it being also shown in Figs. 1, 2, and 4.

The weft mechanism must be stopped during the interval of time when the lay and the heddles are actuated, and at that time the lay and

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heddles must be operated instead, in proper succession.

Referring again to Figs. 2 and 6, the shaft **53** 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 6, 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. 6) 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. 2, 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 extending 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. 6, where it is shown in the act 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, the completion of the movement of the lay to drive the weft into the shed and to recede, 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. 4 or in Fig. 6), 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. 6) 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. 6, 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. 5), 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.

Referring to Figs. 3 to 5 and 9 to 10, these figures show the action of the automatic controlling valve for the spraying solution. The valve 263 may be of the plunger type, being actuated by a valve stem 265, which is engaged by a lever 266 having a horizontal arm 267. Lever 266 is pivotally supported at 268 on a bracket 269 carried by the valve body 263, and it is urged into engagement with the plunger 265 by a tension spring 270, which has one end hooked in a bracket 271, and the opposite end hooked to the end of the actuating arm 272.

The actuating arm 272 has a roller 273, which extends laterally therefrom and is adapted to engage the top side or the bottom side of a cam track 274, which is fixedly secured by means of a longitudinal frame member 275 to the carriage track 49.

The cam track 274 has its main body portion 276 plane and substantially horizontal and parallel to the carriage track 49.

Thus the body portion 276 of the cam track 274 is adapted to maintain the roller 273 in substantially the same horizontal position over the major portion of the range of movement of the carriage.

At the right end of the cam track 274 it is provided with the downwardly bent portion 277, which is intended to engage beneath the roller 273 and cam the roller 273 upward until its rides upon the main body 276 of the cam track 274.

The valve 263 is preferably of the type which is spring pressed to closed position when the valve stem 265 is in its outermost position and the valve 263 is open when the valve stem is pressed inwardly to the position of Fig. 10.

Spring 270 is only strong enough to maintain the engagement of the lever 266 with the valve stem, and is not strong enough to actuate the valve 263 against the pressure of its internal spring.

The cam track 274 may be arranged in any desired manner to effect a spraying for any desired period of time, but is preferably so arranged that each weft is sprayed once during the time that the carriage moves forward to the left in Fig. 1. Thus the weft, which has been laid and interwoven by means of warp strands, will be sprayed prior to the action of the lay in forcing over the next weft against it, as the spraying action takes place while the carriage is laying the weft, comprising insulating units 110 on the shelf 90 of the reed.

This is accomplished by having the valve 263 moved to open position by the lever 266 when the roller 273 rides up the cam end 277 of the track 274.

The rolling of the roller 273 on the plane portion 276 of the cam track 274 keeps the valve open during the period of time when the carrage is progressing from the right hand toward the left hand in Fig. 1. When the roller 273 reaches the left end of the cam track 274 (Fig. 3), it rides off that end, and the internal compression spring in the valve 263 forces the valve shut and forces the plunger 265 outward, moving the lever 266 clockwise against the tension of spring 270 in the closing of the valve.

The valve is shown in Fig. 9 in the closed position, which is the position it assumes on the return stroke of the carriage 131, toward the right in Fig. 1. The carriage moves to such a position that the roller 273 passes under the inclined end 277 of the track and snaps upward, due to tension of spring 270, to such a position that it will engage above the cam track 274 on the return movement, toward the left in Fig. 1.

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.

Referring to Figs. 7 and 8, these are a view in perspective and a right end view of the take-up mechanism for the blanket, which is actuated step by step by means of a cam, so that each time the length of the blanket is increased by the amount of a weft unit the winding roll is moved forward a step farther, to take up the increased length of the blanket.

Beginning at the shed 78 (Fig. 2), 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 to extend horizontally to pass under roller 304 and roller 305, clockwise about roller 305, counterclockwise about a roller 306, until, 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 rod 310.

The roll 307 of the blanket rests loosely on the roller 306, and thus it rises as the roll becomes bigger. It is for this purpose that the mandrel

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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.

Referring to Figs. 7 and 8, it is the roller 302 which is shown in perspective in Fig. 7 and provided with the teeth 312 for engaging in the blanket and positively moving the blanket forward step by step from the loom.

The roller 302 (Fig. 7) is shown from the left end in perspective in Fig. 7 and from the right end in Fig. 8 in section. Both ends are identically driven, and therefore only one end need be described in detail. It is rotatably mounted upon a shaft or trunnions 313 at each end, the shaft being carried by bearings in the frame of the loom.

The shaft 313 bears the gear wheels 314 at each end of the roller or drum 302, and the gear 314 meshes with a pinion 315, carried by a stub shaft 316, which has another gear 317. A fragment of the frame is shown at 295.

The gear 317 meshes with a pinion 318 carried by stub shaft 319, and a stub shaft 319, which is rotatably mounted in the frame, carries a ratchet wheel 320, which is adapted to be actuated by a pivot pawl 321, pivotally mounted at 322 on an arm 323. The arm 323 is freely rotatable on the shaft 319, by means of the bearing 324, and it has a depending portion 325 which is pivotally connected by a connecting rod 326 to a pivoted lever 327.

The pivoted lever 327 is pivoted on the pin 328, and at its opposite end carries a stub shaft 329 with a roller 330, which is engaged in the cam groove 331 of a cam 332. Cam 332 is fixedly secured on the shaft 333.

The shaft 333 is driven in synchronism with the rest of the loom and is adapted to actuate the cam 332 and ratchet wheel 320 periodically, immediately after the lay has been moved forward to drive the weft into the shed.

A second spring pressed pawl 334 is actuated by spring 335, and is pivotally mounted on the frame so as to engage the teeth of the ratchet wheel 320 (Fig. 8) and hold that wheel and the drum 302 against backward movement while the pawl 321 is taking a new bite.

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.

The method of making the insulating material may be described as follows: The loosely carded fibers may be taken from the carding roll and deposited upon a conveyor which conveys the loosely carded fibers to a condensing funnel. I prefer to deposit in the loosely carded fibers one or more threads of insulating material, such as asbestos cords, which may be provided with reinforcing wires, if desired, for the purpose of increasing the tensile strength of the unit and causing the loose fibers to be carried along through the condensing funnel. As the loose fibers and embedded threads emerge from the condensing funnel, they are preferably wrapped spirally in one or both directions with a plurality of spiral threads of insulating material so that they are bound together, but the threads do not necessarily confine the loosely carded Amosite fibers or other fibers.

This provides an insulating unit which may be loosely coiled in a coil in the drum, and which has sufficient tensile strength to be lifted from the drum, but not sufficient to be handled like a weft in an ordinary weaving machine.

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 there 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 shed, 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

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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.

There is greater adherence between the insulating units than there is between the fibers of one insulating unit. Thus the blanket is made substantially uniform, without any possibility of cracks in the blanket.

It will thus be observed that I have invented an improved weaving machine which is adapted to weave into a blanket loose Amosite asbestos fibers, or any loose insulating fibers, in such manner as to provide an insulating blanket of the highest insulating quality. By means of special fibers the blanket may be made capable of resisting customary high temperatures, such as from 750 to 1,000 degrees F. The blanket also has improved characteristics over the insulating materials of the prior art, due to the fact that it has high flexibility and is adapted to be shaped to the surfaces to which the insulation is to be applied. It has the characteristics of flexibility, strength, ease of application to flat or curved surfaces, resiliency, durability, and lightness, to a high degree.

Its insulation is high because it is built up of loose fibers in their thoroughly carded and opened condition so that it forms a mass of high volume and low weight. The insulating material is characterized by the absence of cracks and by the presence of a substantially homogeneous fibrous structure. It has been found that the blankets may even be subjected to under-foot traffic without much deterioration, and that the blankets are capable of withstanding high vibration for a long period of time, without deterioration.

The present machine is adapted to carry out the operation of weaving such materials in a wholly automatic way, so as to require a minimum amount of attention and eliminate the necessity for any but a single operator for one or a plurality of machines.

The method may be practiced not only by the machine, but it may be carried out by hand, with suitable implements.

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. The method of weaving an insulating blanket of loose and open fibers which comprises forming a shed of warp threads, conveying into the shed the loose and opened fibers upon a supporting member, driving said loose fibers into the space between the warp threads, and causing the warp threads to cross, to confine the loose fibers between them, and spraying each successive weft unit with an adhesive solution for the purpose of causing greater adherence between the loose and projecting fibers of the successive weft units.

2. The method of weaving an insulating blanket of loose and open fibers which comprises forming a shed of warp threads, conveying into the shed the loose and opened fibers upon a supporting member, driving said loose fibers into the space between the warp threads, causing the warp threads to cross, to confine the loose fibers between them, said loose fibers being also loosely held together by a plurality of spirally extending threads which bind but do not confine the loose fibers, and spraying each successive weft unit with an adhesive solution for the purpose of causing greater adherence between the loose and projecting fibers of the successive weft units.

3. In a weaving machine, the combination of a supporting framework with a supporting member for carrying the woven blanket, heddles for controlling the warp threads, a lay having a comb which is provided with a substantially horizontally extending shelf, and means for depositing a weft unit on said shelf, said means comprising an elongated carriage having a supporting surface for supporting the weft unit to be deposited on said comb, said supporting surface being provided on a movable belt which is adapted to deposit the weft material as the carriage moves into the shed and as the carriage moves out of the shed.

4. In a weaving machine, the combination of a supporting framework with a supporting member for carrying the woven blanket, heddles for controlling the warp threads, a lay having a comb which is provided with a substantially horizontally extending shelf, and means for depositing a weft unit on said shelf, said means comprising an elongated carriage having a supporting surface for supporting the weft unit to be deposited on said comb, said supporting surface being provided on a movable belt which is adapted to deposit the weft material as the carriage moves into the shed and as the carriage moves out of the shed, and means for supplying loose insulating materials to said conveying belt for use in the weft of the blanket.

5. In a weaving machine, the combination of a supporting framework with a supporting member for carrying the woven blanket, heddles for controlling the warp threads, a lay having a comb which is provided with a substantially horizontally extending shelf, and means for depositing a weft unit on said shelf, said means comprising an elongated carriage having a supporting surface for supporting the weft unit to be deposited on said comb, said supporting surface being provided on a movable belt which is adapted to deposit the weft material as the carriage moves into the shed and as the carriage moves out of the shed, and automatic means for spraying the exposed edge of each weft member with an adhesive solution for engagement with the next adjacent member.

6. In a weft feeding mechanism for a weaving machine, the combination of a supporting frame with a pair of tracks and a carriage having supporting wheels on said tracks, said carriage also having guides for engaging a pair of longitudinally extending shafts carried by said frame, a conveyor frame carried by said carriage, and a conveyor belt mounted on said conveyor frame and adapted to project longitudinally of said track and beyond said track to place a weft member in the shed of a weaving machine.

7. In a weft feeding mechanism for a weaving machine, the combination of a supporting frame with a pair of tracks and a carriage having supporting wheels on said tracks, said carriage also having guides for engaging a pair of longitudinally extending shafts carried by said frame, a conveyor frame carried by said carriage, and a conveyor belt mounted on said con-

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veyor frame and adapted to project longitudinally of said track and beyond said track to place a weft member in the shed of a weaving machine, said conveyor belt being driven at a predetermined speed by one of said guide shafts and predetermined gears.

8. In a weft feeding mechanism for a weaving machine, the combination of a supporting frame with a pair of tracks and a carriage having supporting wheels on said tracks, said carriage also having guides for engaging a pair of longitudinally extending shafts carried by said frame, a conveyor frame carried by said carriage, a conveyor belt mounted on said conveyor frame and adapted to project longitudinally of said track and beyond said track to place a weft member in the shed of a weaving machine, and a spraying nozzle carried by said carriage at the projecting end thereof and connected to a source of liquid to be sprayed by a flexible conduit.

9. In a weft feeding mechanism for a weaving machine, the combination of a supporting frame with a pair of tracks and a carriage having supporting wheels on said tracks, said carriage also having guides for engaging a pair of longitudinally extending shafts carried by said frame, a conveyor frame carried by said carriage, a conveyor belt mounted on said conveyor frame and adapted to project longitudinally of said track and beyond said track to place a weft member in the shed of a weaving machine, a spraying nozzle carried by said carriage at the projecting end thereof and connected to a source of liquid to be sprayed by a flexible conduit, and valve means for controlling the supply of liquid to said nozzle, adapted to be actuated by the movement of said carriage to a predetermined point.

10. In a weaving machine, the combination of a weaving machine provided with means for supporting and controlling the warp threads, with a conveyor comprising a conveyor belt and means for supporting the same and for moving said conveyor belt into the shed, said conveyor belt being adapted to support loose fibers to be employed as the weft of a blanket and to be deposited in the shed between the warp threads.

11. In a weaving machine, the combination of a weaving machine provided with means for supporting and controlling the warp threads, with a conveyor comprising a conveyor belt and means for supporting the same and for moving said conveyor belt into the shed, said conveyor belt being adapted to support loose fibers to be employed as the weft of a blanket and to be deposited in the shed between the warp threads, said conveyor belt being carried by a carriage, and means controlled by the movement of said weaving machine for actuating said carriage at predetermined periods to move the conveyor belt into the shed and out of the shed.

12. The method of weaving an insulating blanket of loose and open fibers and warp threads, which comprises forming a shed of warp threads, carrying the loose and open fibers into the shed and spreading them substantially uniformly inside the shed the full width of the shed, driving the loose fibers into the space between the warp threads, and causing the warp threads to cross, to confine the loose fibers between them.

13. The method of weaving an insulating blanket of loose and open fibers and warp threads, which comprises forming a shed of warp threads, carrying the loose and open fibers into the shed and spreading them substantially uniformly inside the shed the full width of the shed, driving the loose fibers into the space between the warp threads, and causing the warp threads to cross, to confine the loose fibers between them, and spraying each successive filler of loose fibers with an adhesive solution for the purpose of causing greater adherence between the loose and projecting fibers of the successive weft units.

14. In a weaving machine, the combination of a supporting framework with a supporting member for carrying a woven blanket, heddles for controlling the warp threads, and a lay comprising a frame having upper and lower frame members and a comb carried by said frame members and comprising a plurality of metal members, each of said metal members having a downwardly extending portion, a forwardly bent horizontal portion, a downwardly and backwardly extending portion, and means for attaching each of the ends of said members to said upper and lower frame members, with said members in spaced relation to each other, forming slots for the warp threads.

15. In a weaving machine, the combination of a supporting framework with a supporting member for carrying a woven blanket, heddles for controlling the warp threads, and a lay, comprising a frame having upper and lower frame members, and a comb carried by said frame members and comprising a plurality of metal members, each of said metal members having a downwardly extending portion, a forwardly bent horizontal portion, a downwardly and backwardly extending portion, and means for attaching each of the ends of said members to said upper and lower frame members, with said members in spaced relation to each other, forming slots for the warp threads, and means for depositing loose and opened weft material on said portions of said members for support thereby, preliminary to the confinement of said fibers between said warp threads.

16. In a weaving machine, the combination of a supporting framework with a supporting member for carrying a woven blanket, heddles for controlling the warp threads, and a lay comprising a frame having upper and lower frame members, and a comb carried by said frame members and comprising a plurality of metal members, each of said metal members having a downwardly extending portion, a forwardly bent horizontal portion, a downwardly and backwardly extending portion, and means for attaching each of the ends of said members to said upper and lower frame members, with said members in spaced relation to each other, forming slots for the warp threads, and means for depositing loose and opened weft material on said portions of said members for support thereby, preliminary to the confinement of said fibers between said warp threads, said means comprising a movable framework and a conveyor belt on said framework, said conveyor belt moving in such direction that it discharges fibers from its end on said horizontally extending portions of said members.

17. In a weaving machine, the combination of a supporting framework with a supporting member for carrying a woven blanket, heddles for controlling the warp threads, and a lay comprising a frame having upper and lower frame members, and a comb carried by said frame members and comprising a plurality of metal members, each of said metal members having a downwardly extending portion, a forwardly bent horizontal portion, a downwardly and backwardly extending

portion, and means for attaching each of the ends of said members to said upper and lower frame members, with said members in spaced relation to each other, forming slots for the warp threads, and means for depositing loose and opened weft material on said portions of said members for support thereby, preliminary to the confinement of said fibers between said warp threads, said means comprising a movable framework and a conveyor belt on said framework, said conveyor belt moving in such direction that it discharges fibers from its end on said horizontally extending portions of said members, and said movable framework being reciprocable, whereby the discharge end of said conveyor belt is adapted to progress across said comb to deposit weft fibers over substantially the full width of said blanket.

18. In a weaving machine, the combination of a supporting framework with a supporting member for carrying the woven blanket, heddles for controlling the warp threads, a lay having a comb which is provided with a substantially horizontally extending shelf, and means for depositing a weft unit on said shelf, said means comprising an elongated carriage having a supporting surface for supporting the weft unit to be deposited on said comb, said supporting surface being provided on a movable belt which is adapted to deposit the weft material as the carriage moves into the shed.

19. In a weaving machine, the combination of a supporting framework with a movable lay and comb, means for supporting and controlling warp threads, a movable carriage having a conveyor belt thereon, adapted to convey and discharge a weft filler between the warp threads, and a mechanism for controlling the operation of said carriage comprising a driven shaft, a slidable drive collar carried by said shaft, said collar being mounted to rotate with said shaft, a gear having drive means rotatably mounted on said shaft and adapted to be engaged by said collar, and a second driving member having driving means adapted to be engaged by said collar, and snap mechanism for controlling the sliding motion of said collar, whereby either said gear or said driving member is adapted to be driven by said drive shaft to control the reciprocation of said carriage.

20. The method of weaving an insulating blanket of loose and open weft material, having fibers extending at random directions, and warp threads, which comprises forming a shed of warp threads, laying the loose and open material in the shed between the warp threads, the loose and open material being spread substantially uniformly inside the shed for the full width of the shed, driving the loose and open material into the space between the warp threads, and causing the warp threads to cross to confine the loose and open material between them by virtue of the engagement of the warp threads with the loose and open material.

21. The method of weaving an insulating blanket of loose and open weft material, having fibers extending at random directions, and warp threads, which comprises forming a shed of warp threads, laying the loose and open material in the shed between the warp threads, the loose and open material being spread substantially uniformly inside the shed for the full width of the shed, driving the loose and open material into the space between the warp threads, and causing the warp threads to cross to confine the loose and open material between them by virtue of the engagement of the warp threads with the loose and open material, and spraying the exposed edge of the predetermined weft members after they have been driven in between the warp threads with a limited amount of an adhesive solution to avoid impregnation and to reduce crack formation between successive weft members.

22. The method of manufacturing a blanket comprising arranging warp threads to form a shed, laying a layer of loose material, having elements extending in random directions in between the warp threads of said shed to form a layer therein, forming a weft member out of said layer within said shed by pressing the layer of loose material toward the junctures of the warp threads, and crossing the warp threads to confine the weft member so formed between said warp threads.

23. In a loom, a lay comprising upper and lower frame members extending horizontally and spaced vertically from each other, and a comb carried by said members, and comprising a plurality of relatively thin flat strips, each strip having its end carried by one of said frame members, and the strips being arranged edge to edge, but with their edges spaced from each other a distance which is a fraction of the width of said strips to form a space for passing warp threads, each of said strips being formed with a horizontally extending portion adapted to support loose material used for forming weft members on said support.

24. In a loom, a lay comprising upper and lower frame members extending horizontally and spaced vertically from each other, and a comb carried by said members, and comprising a plurality of relatively thin flat strips, each strip having its end carried by one of said frame members, and the strips being arranged edge to edge, but with their edges spaced from each other a distance which is a fraction of the width of said strips to form a space for passing warp threads, each of said strips being formed with a horizontally extending portion adapted to support loose material used for forming weft members on said support, and each of said strips having a downwardly and backwardly turned portion whereby the lower warp threads of the shed may be arranged wholly below the supporting surface of said comb and the loose material may be supported on said horizontally extending portion.

25. The method of weaving an insulating blanket of loose, open, unattached, and unspun fibers and warp threads which comprises forming a shed of warp threads, conveying the fibers into the shed in a layer of substantially uniform depth and thickness, depositing the fibers upon a support in said shed over the full width of the shed, driving the loose fibers into the space between the warp threads, and causing the warp threads to cross, to confine the loose fibers between them.

26. The method of weaving an insulating blanket of loose and opened fibers and warp threads, which comprises forming a weft member of opened and carded fibers by confining said fibers with spirally extending threads of insulating material, forming a shed of warp threads, carrying the loose and opened fibers in the form of such weft members into the shed and extending said weft member inside the shed over substantially the full width of the shed, driving the fibers into the space between the warp threads, and causing the warp threads to cross, to confine the fibers in the form of a weft member between them.

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27. The method of weaving an insulating blanket of loose and opened weft material, having fibers extending at random directions, and warp threads, which comprises forming the loose and opened fibers into a weft member, said fibers surrounding a core thread and having a plurality of spirally extending threads for holding the fibers together, forming a shed of warp threads, laying the loose and opened material in the form of a weft member in the shed between the warp threads, the weft member being spread substantially uniformly across the shed for the full width of the shed, driving the weft member into the space between the warp threads, and causing the warp threads to cross to confine the loose and opened material between them by virtue of the engagement of the warp threads with the loose and opened material.

28. The method of manufacturing a blanket comprising forming loose material into a weft member of sufficient tensile strength to be lifted from a coil, said weft member comprising a core thread surrounded by an assembly of loose and opened material and having a plurality of confining threads extending spirally in both directions about said loose material, arranging warp threads to form a shed, laying a layer of loose material in the form of a plurality of said weft members having elements extending in random directions in between the warp threads of said shed to form a layer therein, forming a weft element out of said layer within said shed by pressing the layer of loose material toward the junctures of the warp threads, and crossing the warp threads to confine the weft member so formed between said warp threads.

29. The method of weaving an insulating blanket of loose, opened, and unspun fibers and warp threads, which comprises assembling the loose and opened fibers with a plurality of core yarns, forming a shed of warp threads, conveying the fibers into the shed in a layer of substantially uniform depth and thickness, said fibers being carried on a support in said shed over the full width of the shed, driving the loose fibers into the space between the warp threads, and causing the warp threads to cross to confine the loose fibers between them.

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