Feb. 28, 1933. A. L. CLEMENTS 1,899,260

MATERIAL HANDLING APPARATUS

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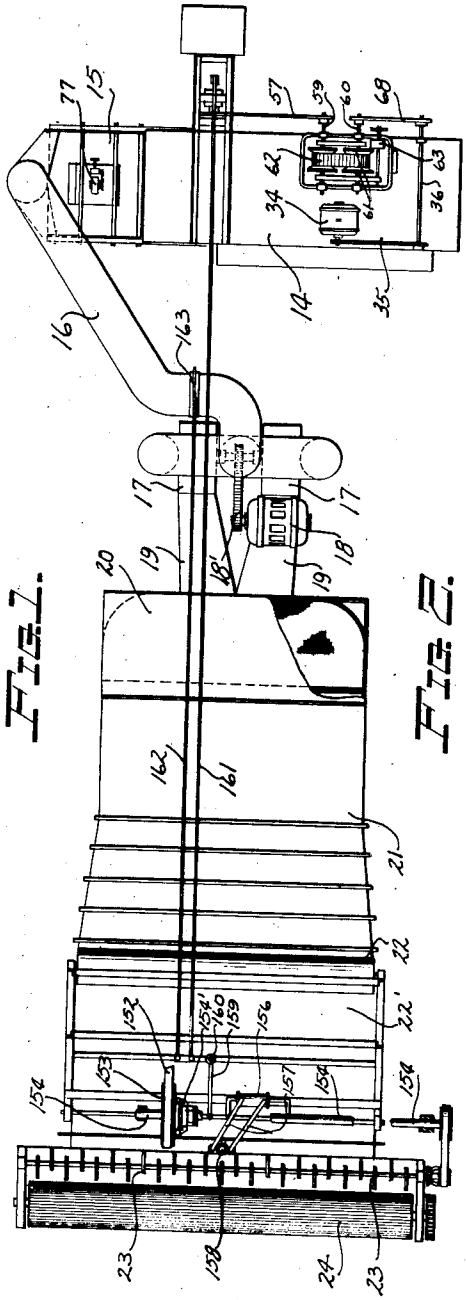


Fig. 1.

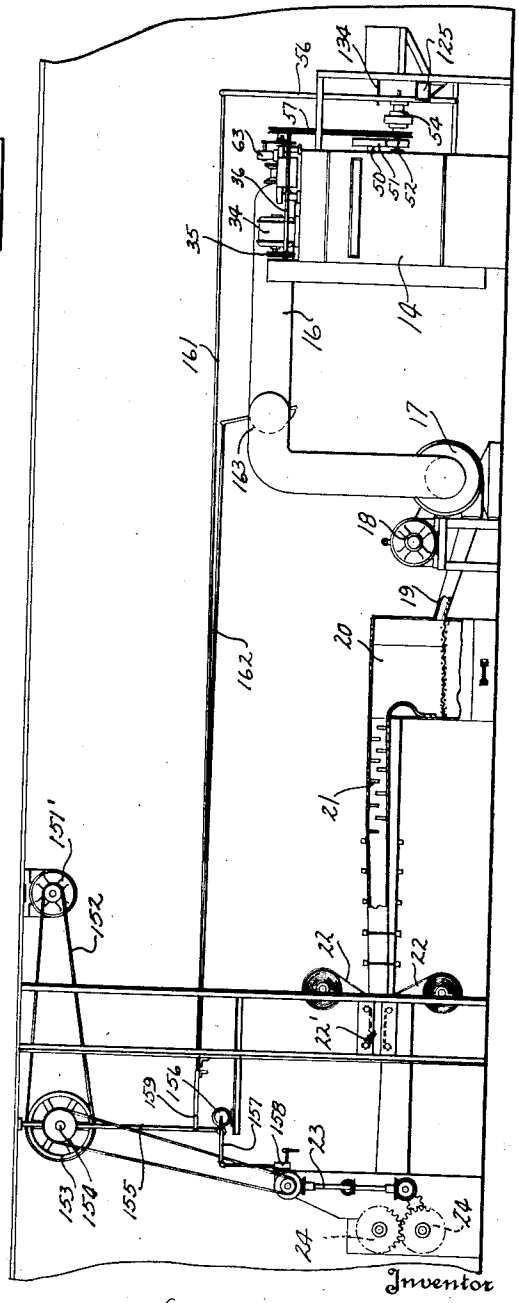


Fig. 2.

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MATERIAL HANDLING APPARATUS

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Fig. 4.

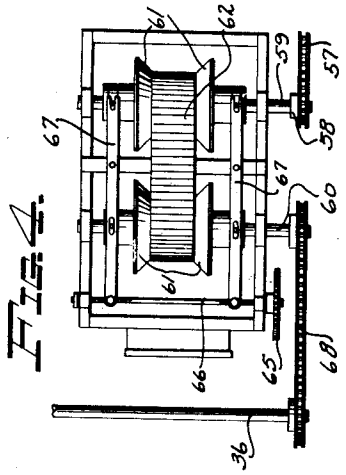


Fig. 3.

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MATERIAL HANDLING APPARATUS

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Fig. 5.

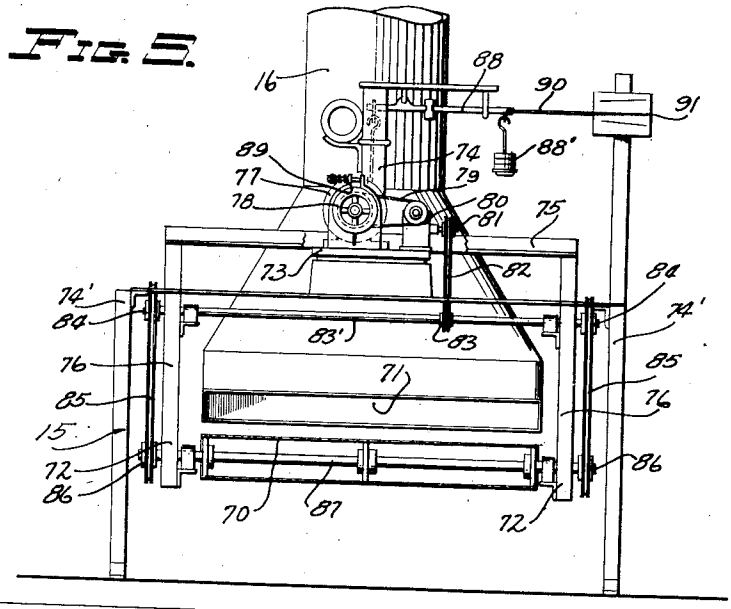
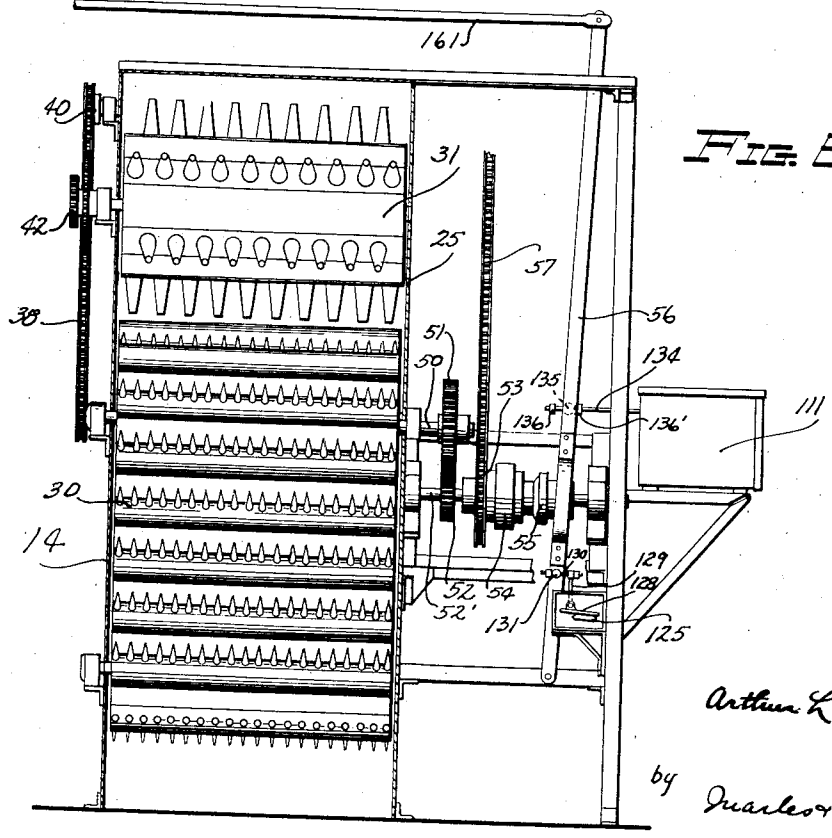


Fig. 6.



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FIG. 7.

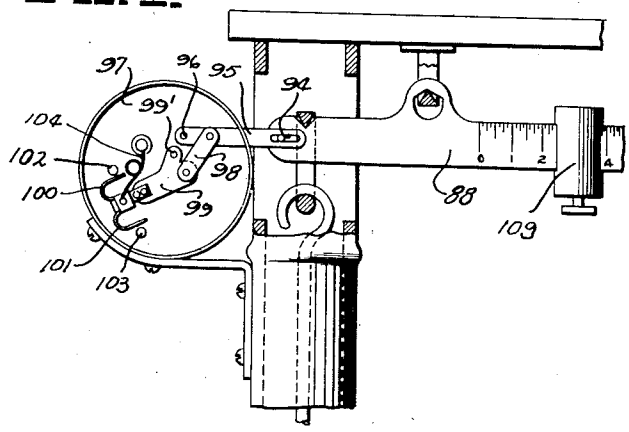
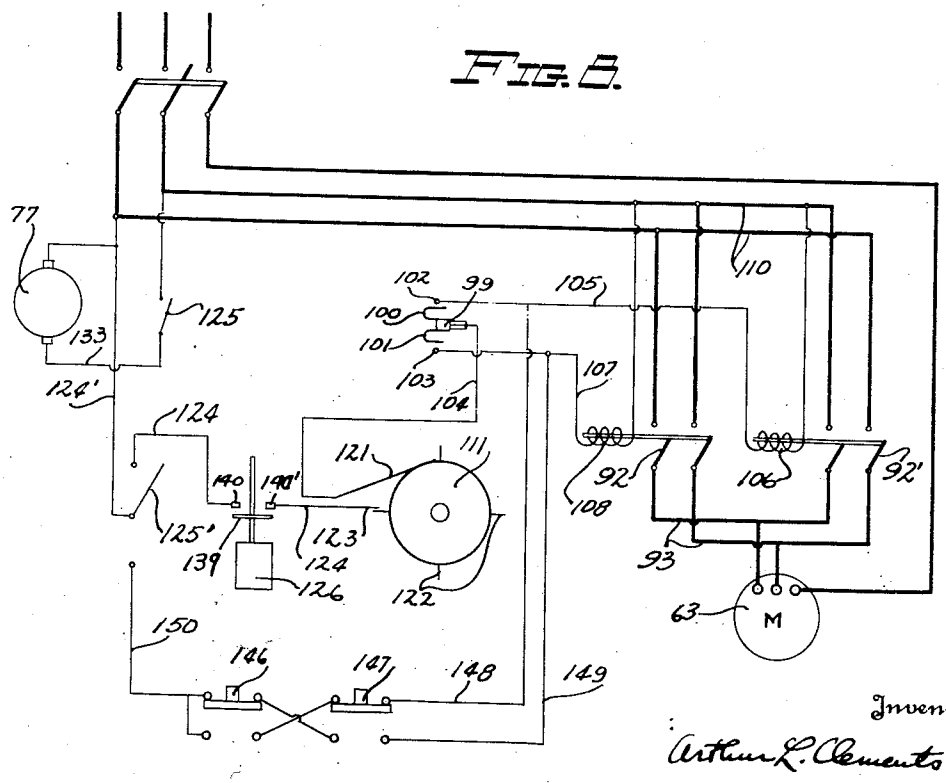


FIG. 8.



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FIG. 9.

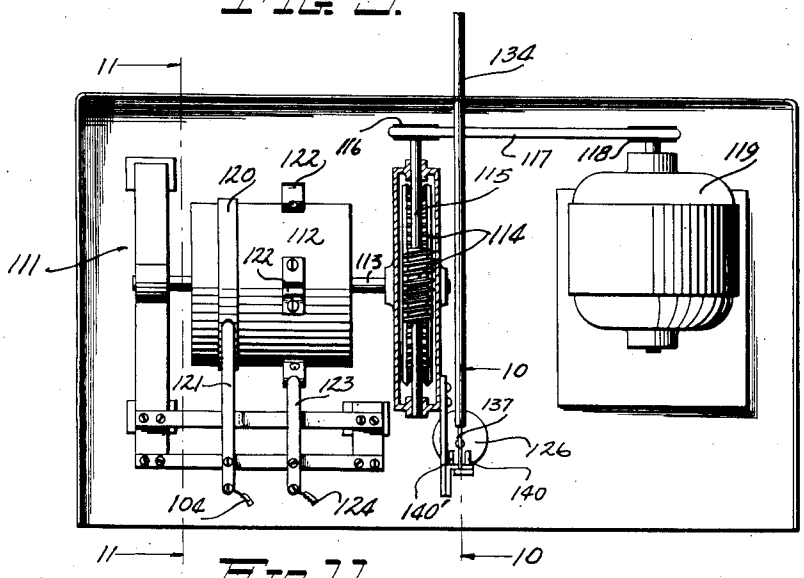


FIG. 11.

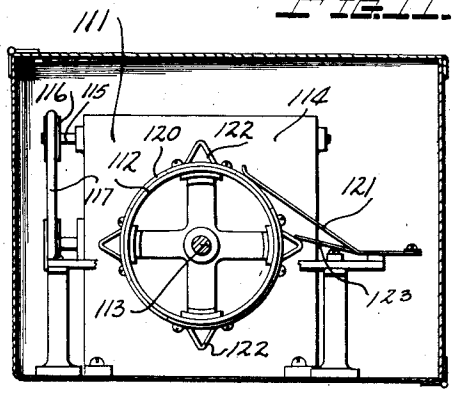


FIG. 10.

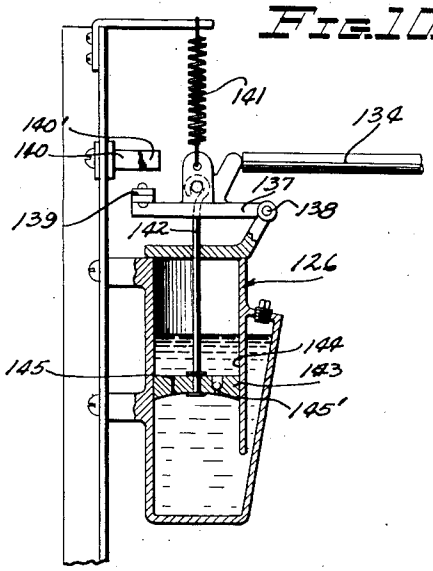
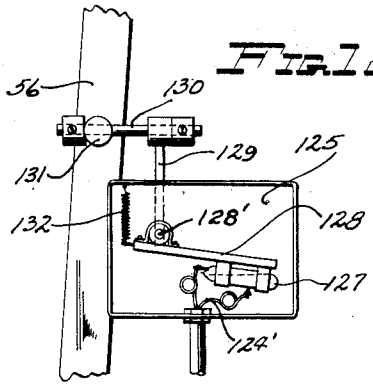


FIG. 12.



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UNITED STATES PATENT OFFICE

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MATERIAL-HANDLING APPARATUS

Application filed March 20, 1930. Serial No. 437,474.

The invention relates to material-handling apparatus and more particularly to an apparatus for controlling the quantity or volume of material received from a source of supply.

One of the objects of the invention is to provide an apparatus for moving material in a substantially constant flow, by weight, wherein the operation of the feeding mechanism is controlled by the true net weight of the material being handled. In accordance with the present invention, the weight of said material preferably acts to control the action of the electric motor which drives a positively operating, mechanical, variable speed drive for the feeding mechanism, the net weight control also preferably being operated only intermittently in order to overcome the momentum or lag of the feeding devices.

The invention has been particularly shown and described in connection with the manufacture of fibrous material from separate fibres and by its control produces a more uniform product than heretofore known and results in a saving of material and hence a decrease in the cost of the product which, however, because of its uniformity is superior to the old products.

Another object of the invention is to provide certain improvements in the apparatus for producing bodies formed of separate fibres over that disclosed in United States Letters Patent No. 1,584,386, dated May 11, 1926, to Harvey B. Lindsay.

In the accompanying drawings, which show the apparatus embodying the invention, Fig. 1 is a plan view of such apparatus;

Fig. 2 is a side elevation view of such apparatus, parts being broken away and parts being shown in section;

Fig. 3 is a vertical, sectional view through the bale opener and a side elevation view of the weighing apparatus;

Fig. 4 is a detail plan view of the variable speed drive mechanism;

Fig. 5 is a detail sectional view taken on the line 5—5 of Fig. 3;

Fig. 6 is a detail vertical, sectional view through the bale opener, taken on the line 6—6 of Fig. 3;

Fig. 7 is a detail elevation view of the scale-beam-operated switch mechanism, parts being broken away and parts being shown in section;

Fig. 8 is a wiring diagram showing circuit control connections;

Fig. 9 is a plan view of circuit control mechanism used in the apparatus, parts being shown in section;

Fig. 10 is a detail sectional view taken on the line 10—10 of Fig. 9;

Fig. 11 is a detail sectional view taken on the line 11—11 of Fig. 9;

Fig. 12 is a detail view of a cut-out switch used in the control circuit.

The invention is particularly described in connection with the manufacture of fibrous material, but it will be understood that the automatic weighing mechanism hereinafter described may be used for other materials.

Considering first the general arrangement of parts forming the apparatus and their operation and function, and referring particularly to Figs. 1 and 2, the numeral 14 designates the bale breaker or opener, 15 the weighing apparatus receiving the separated fibres from the opener and delivering them to a feed stack 16, which by means of a pair of suction fans located in the housings 17 and driven by chain 18′ from an electric motor 18 carries said fibres up through the stack 16 and blows them through spaced channels 19 to a collecting and sediment-separating chamber 20 from which they proceed through the fibre-laying apparatus or grainer 21, generally similar to the aforementioned patent and from which the laid fibre, in the form of a bat, is enclosed between coverings of fabric 22 at the section designated 22′, as in the aforesaid patent, and thereafter this covered material is subjected to the action of a series of stitchers 23 past which it is drawn by the drag rolls 24 to form the completed blanket material.

Referring more particularly to Figs. 3 and 6, the bale opener consists of a housing 25 having an entrance door 26 hinged at 27 and through which the fibrous material, in wads from the bale, is pushed from a platform 28 onto an endless conveyor 29 which carries it

into the path of another conveyor and breaker device 30 that cooperates with a rotary beater 31 to separate the bunched fibres into separate fibres. A rotary beater device 32 cooperates with conveyor 30 and a similar beater device 33 cooperates with the beater 31. The massed or compressed wads of baled fibres are separated by the action of the beater devices thereon in known manner. Unlike the usual bale opener, all these parts are positively driven. The beaters 31, 32 and 33 are positively driven at constant speed by an electric motor 34 connected by a chain and sprocket drive 35 with a countershaft 36 carrying a sprocket 37 connected by chain 38 with sprocket 39 on the shaft of beater 32, idler sprocket 40 and a sprocket 41 on the shaft of the beater 31 which is connected by sprocket 42 and chain 43 to a sprocket 44 on the shaft of beater 33. The conveyors 29 and 30 are positively driven together by a chain 45 connecting the sprockets 46 and 47 on the shafts of the rollers 48 and 49 of said conveyors 29 and 30. The shaft 50 for the other roller of the conveyor 30 carries a gear 51 meshing with a gear 52 on a shaft 52′ adapted to be connected to a sprocket 53 by a clutch 54 whose shiftable element 55 is suitably connected with a shifting lever 56. The sprocket 53 is connected by a chain 57 to a sprocket 58 on a variable speed drive shaft 59, see Fig. 4. Thus the beaters are driven at constant speed and the conveyors supplying the fibrous material to them are driven at variable speeds, depending upon the control hereinafter described.

Referring to Figs. 3 and 4, the shaft 59 constitutes a part of a variable speed drive whose construction and operation is well known, it being noted that such drive includes the shaft 59 and a companion shaft 60, each carrying spaced sets of cone pulleys 61 over which a drive belt 62 passes, said pulleys of each set being movable toward and away from each other. In the present instance this drive is under the control of a speed-change electric motor 63 whose drive shaft carries a gear 64 meshing with a gear 65 on a shaft 66 operatively connected by the usual feed screw connections to the pulley-shifting levers 67, the shaft 60 being driven from the countershaft 36, driven by motor 34, by a chain and sprocket connection 68 therewith.

The material to be weighed, such as the separated fibres, is delivered from the feed means, instanced here as the bale opener, through a discharge opening 69 in its housing onto an endless conveyor 70 that carries these fibres to a position to be picked up by the suction of air through the entrance end 71 of the stack 16.

The conveyor 70 constitutes a weighing platform for the fibres or other material to be weighed and for this purpose its frame 72 is hung from the platform 73 of a weighing scale 74, mounted on a frame 74′ by cross frame members 75 and upright frame members 76, Figs. 3 and 5.

The conveyor is continuously driven at constant speed by a constant speed electric motor 77 mounted on the platform 73 and whose drive pulley 78 drives through the belt 79, a speed-reduction gear unit 80, connected by sprocket 81 and chain 82 to a sprocket 83 on the conveyor support, the shaft 83′ for said sprocket 83 carrying other sprockets 84 connected by chains 85 on each side of the conveyor to sprockets 86 on the shaft 87 of one of the rotating supports for conveyor 70. To quickly check the speed of the motor 77 when the current thereto is shut off, a suitable brake 89 is associated with the drive pulley 78 of said motor.

The scale beam 88 of the scale 74 is provided with a pointer 90 cooperating with an indicator member 91 which is used for adjusting the feed under the manual control of the operator, Fig. 5. The scale beam and its weight is used to register the net weight, the weight of the conveyor, its frame, the motor and the drive connections and other mechanism being counterbalanced by a weight 88′.

The scale beam 88 also, as shown in Fig. 7, is operatively connected with circuit control switch mechanism controlling magnetic reversing switches 92, 92′ for reversing the circuit connections 93 to the speed change motor 63, Fig. 8. For this purpose the beam 88 has a pin and slot connection 94 with a lever 95 pivoted at 96 on a base member 97, said lever being connected by a link 98 with switch lever 99 pivoted at 99′ and carrying contacts 100 and 101 adapted to respectively engage fixed contacts 102 and 103, the current coming in through a conductor 104 to said switch arm, the contact 100 being in circuit through contact 102 and conductor 105 with energizing coil 106 of the magnetic switch 92′ and the contact 101 being in circuit through contact 103 and conductor 107 with the energizing coil 108 of the other of said magnetic switches, 92, as shown in Fig. 8.

With this construction, when the net weight of the load of fibres or other material passing along on the conveyor 70 balances the weight 109 on the scale beam 88, which has been set at a predetermined figure, the switch arm 99 is in mid position, out of contact with either of the contacts 102 and 103 and consequently the magnetic switches 92, 92′ are open and no current can flow from the supply circuit connections 110 to either set of conductors 93 for the motor 63 and consequently said motor is at rest and the belt 62 is being driven by shaft 60 from motor 34 and driving shaft 59, and consequently the feed conveyors 29 and 30, at the desired speed to supply the conveyor 70 with substantially the right amount of material, such as separate fibres, to produce a blanket material of the desired

density. Any tendency of the weight of the fibres on the conveyor 70 changing is reflected in the movement of the scale beam 88 which, if too small an amount of total weight of fibres or other material is being supplied, drops, thus shifting the lever 99 to bring the contact 101 into engagement with the contact 103, whereupon current passes from conductor 104, through conductor 107 and coil 108 to throw in the switch 92 and thus start the motor 63 turning in such a direction as to cause the pulleys 61 of the speed-change device to move outwardly and thus speed up the drive of the shaft 59, or which, if too large an amount or total weight of fibres or other materials is being supplied, rises, thus shifting the lever 99 to bring the contact 100 into engagement with the contact 102, whereupon current passes from the conductor 104 through conductor 105, through coil 106 to throw in the switch 92′ and thus start the motor 63 turning in the opposite direction to cause the pulleys 61 to move toward each other and thus decrease the speed of the belt 62 and consequently the shaft 59 which, as previously explained, drives the feed conveyors 29 and 30.

In order to prevent "hunting" or continual speeding up and down of the change-speed drive, current is intermittently supplied to the conductor 104 through a switch mechanism 111 of the flasher type, which is shown in detail in Figs. 9 and 10. This device comprises a drum 112 of insulating material mounted on a shaft 113 driven through a worm and worm wheel reduction gearing 114, shaft 115, pulley 116, belt 117, pulley 118, from a constant speed electric motor 119, said drum carrying a conductor ring 120 engaged by a spring contact 121 and a plurality of radially spaced contacts 122 intermittently engaged by a spring contact 123.

The speed of the switch mechanism 111 is so timed that when contact is made by the arm 123 with one of the contacts 122 the motor 63 is given power enough to slightly speed up or slow down the speed of the aprons in the opener. The next contact is not made until time enough has elapsed for the change of speed to show its results on the weighing conveyor or apron 70. If the amount of material deposited is not enough the power is again applied and so on until the desired weight is on the scale, at which time the scale beam will return to its neutral position and the scale switch will be open.

The spring contact 121 is connected to conductor 104 while the contact 123 is connected to a conductor 124 which also has included therein a double pole cut-out switch 125′ and a dash-pot-controlled switch 126 and is connected by a conductor 124′ to the supply line 110. A switch 125, shown in Figs. 6 and 8, and in detail in Fig. 12, is a mercury switch wherein mercury in a bulb 127 mounted on a lever 128 serves in one position of said bulb to complete the circuit through adjacent sections of the conductor 133 and in another position to break said circuit. The operation of said switch 125 is under the control of the clutch lever 56 by its connection with the lever 128 through the lever arm 129 connected at one end to the pivot shaft 128′ of the lever 128 and at its other end by a sliding connection with the pull link 130, which is slidably mounted in a pivot pin 131 on the lever 56. Thus as the lever 56 is swung toward the left, as viewed in Fig. 6, to throw in the clutch 53, the lever 128, through link 130 and lever arm 129, is swung upwardly to a horizontal position to close the mercury switch and when said lever 56 is moved to throw out the clutch the lever 128 is swung downwardly to the position shown in Fig. 12 by a spring 132 connected at one end to said lever and fixed at its other end, the sliding connections between link 130 and levers 56 and 129 permitting this movement to open the mercury switch.

This mercury switch 125 controls the flow of current to the constant speed motor 77 on the scale platform 73 through circuit connections 133 while the motors 119 and 34 are controlled by separate hand-operated switches (not shown).

In order to give the parts time to get up to speed and the scale beam to attain a position of equilibrium before the speed-changing motor control becomes operative, the dash-pot-controlled switch 126 is placed in series with the switch 111 and is under the control of the clutch lever 56. As shown in Fig. 6 and in detail in Figs. 9 and 10, the clutch lever has a rod 134 mounted for limited sliding movement in a boss 135 thereon, the movement of said rod relative to said lever being limited by stops 136 and 136′, the free end of said rod being engageable with a switch arm 137 pivoted at 138 and carrying a bridging contact 139 engageable in raised position with the spaced contacts 140 and 140′ of adjacent sections of the conductor 124. This switch arm is normally urged upwardly to close the circuit by a spring 141 and its movement to closing position is slowed up by the dash-pot mechanism which includes a rod 142 pivoted to the arm 137 and connected to a piston 143 slidably mounted in the oil cylinder 144, said piston having the bleed orifice 145 therein for the slow transfer of oil from one side of the piston to the other as the switch is raised to closed position and the check-valve-controlled port 145′ for the faster flow of oil from one side of the piston to the other as the switch is opened by pressure exerted by the rod 134 upon the switch arm 137, when the stop 136 is engaged by the boss 135 as the lever 56 moves to clutch release position.

In some instances, as in starting the machine for a continuous run, when sizes are be-

ing changed and at times when the speed of the motor 63 is manually controlled by the operator, who is guided in his control by observing the position of the scale pointer 90 with reference to the high and low marks 91′ on the indicator 91, either the decreasing or increasing of the speed of the motor 63 to secure the desired speed of the conveyors 29 and 30 is accomplished by the operation of manual reversing switches 146 and 147, having circuit connections 148 and 149 with the conductors 105 and 107 and a circuit connection 150 with the conductor 124′, through the double pole switch 125′. Thus, with the switch 125′ connecting conductors 124′ and 150, when the operator moves switch 146 from the position shown in Fig. 8 to its other position, current passes from the conductor 124′, 150 through switch 146 in its new position to switch 147, conductor 148 to conductor 105, thus energizing the coil 106 and closing switch 92′ so that motor 63 operates to decrease the speed of the belt 62 and consequently the conveyors 29 and 30, and when the operator moves switch 147 from the position shown in Fig. 8 to its other position, current from the conductor 124′, 150 through switch 146 in its original position to switch 147 in its new position, conductor 149 to conductor 107, thus energizing the coil 108 and closing switch 92 so that motor 63 operates to increase the speed of the belt 62 and consequently the conveyors 29 and 30.

The clutch lever 56 is under the control of an operator at the front of the apparatus adjacent the stitching mechanism 23 and is operated on the actuation of the clutch 154′ which controls the drive to the stitching mechanism. As shown in Figs. 1 and 2, an electric motor 151′ is connected by belt 152 with a pulley 153 loose on the stitcher drive shaft 154, but adapted to be connected to drive the same by the clutch 154′. While this clutch may be manually operated, it is preferred to operate the same by power and in the present instance the clutch-shifting lever 155 is operated by a piston working in an air cylinder 156, the introduction and release of compressed air into said cylinder through pipes 157 being controlled by a suitable hand-control valve 158. Connected with the clutch-shifting lever 155 is an arm of a bell-crank lever 159 pivoted at 160 and whose other arm is operatively connected by a link 161 with the upper end of the lever 56. Thus, when the operator starts the stitcher drive the drive to the conveyors 29 and 30 is thrown in by the shifting of clutch element 55 to driving position to permit the variable speed drive acting through the chain 57 to drive said conveyors. At the same time this action occurs, a link 162, operatively connecting the lever 159 with a damper or valve 163 in the stack 16, permits the passage of the separated fibres through said stack, the motor 18 having been previously started to drive the fans in the casing 17.

The speed of the weighing apron or conveyor 70 is synchronized with the speed of the blanket material and by computing the amount of fibre desired in one lineal foot of blanket, multiplied by its width in feet, the weight is arrived at, at which the scale 74 is set to balance when the correct amount of fibre is on the apron.

From the foregoing description it will be noted that the weight of material upon the weighing apron 70 is made to bear a definite relationship to the density or amount of fibre in one lineal foot of finished material, and that by the present method the volume of the fibre to be treated is controlled by the weight control mechanism which controls the output of fibre from the opener by controlling its speed of delivery of material upon the weighing apron 70.

I desire it to be understood that this invention is not to be limited to any particular form or arrangement of parts of the apparatus except insofar as such limitations are specified in the claims.

What I claim as my invention is:

1. In an automatic weighing apparatus. the combination of a weighing device, a conveyor and drive means therefor mounted on said weighing device, said weighing device registering the net weight of the material on the conveyor, means for feeding material to said conveyor, and means for automatically controlling the feeding means by said weighing device.

2. In an automatic weighing apparatus, the combination of a weighing device, a conveyor and means for driving the conveyor at substantially constant speed mounted on the weighing device, said weighing device registering the net weight of the material on the conveyor, means for feeding material to the conveyor, a variable speed drive mechanism for said feeding means, and means for automatically controlling said variable speed drive by said weighing device.

3. In an automatic weighing apparatus, the combination of a weighing device, a conveyor and drive means therefor mounted on said weighing device, said weighing device registering the net weight of the material on the conveyor, means for feeding material to said conveyor, electrically controlled means controlled by said weighing device for automatically controlling the feeding means, and means for causing said electrically-controlled means to operate only at intermittent intervals.

4. In an automatic weighing apparatus, the combination of a weighing device, material-carrying means associated with said weighing device whereby said weighing device registers the net weight of the material in transit, means for feeding material to said

carrying means including a mechanically variable speed drive mechanism, an electric motor for changing the speed of said change-speed mechanism, a control circuit for said electric motor, a switch associated with the scale beam of said weighing device for controlling said circuit, and switch mechanism also in said circuit for automatically interrupting the same to prevent hunting due to the momentum or lag of said feeding means.

5. In an automatic weighing apparatus, the combination of weight-controlled apparatus comprising a scale, a weighing conveyor associated with said scale, means for driving said conveyor, means for feeding material to said conveyor, variable speed drive mechanism for said feeding means, a clutch for connecting said drive mechanism with said feeding means, clutch-shifting means, an electric motor for controlling said variable speed drive mechanism, a control circuit for said motor including control switch mechanism controlled by said scale, and a delayed action switch in said circuit controlled by said clutch-shifting means.

6. In an automatic weighing apparatus, the combination of weight-controlled apparatus comprising a scale, a weighing conveyor associated with said scale, means for driving said conveyor, means for feeding material to said conveyor, variable speed drive mechanism for said feeding means, a clutch for connecting said drive mechanism with said feeding means, clutch-shifting means, an electric motor for controlling said variable speed drive mechanism, a control circuit for said motor including control switch mechanism controlled by said scale, a delayed action switch controlled by said clutch-shifting means, and means for intermittently supplying current to said control circuit.

7. In an automatic weighing apparatus, the combination of a weighing device, a conveyor and constant speed drive means therefor mounted on said weighing device, said weighing device registering the net weight of material in transit on said conveyor, means for feeding material to said conveyor, a mechanically variable speed drive mechanism for said feeding means, a reversible electric motor for changing the speed of said drive mechanism, electrically-controlled reversing switches for said motor, a control circuit for said switches, and a switch associated with the scale beam of said weighing device for controlling said control circuit.

8. In an automatic weighing apparatus, the combination of a weighing device, a conveyor and constant speed drive means therefor mounted on said weighing device, said weighing device registering the net weight of material in transit on said conveyor, means for feeding material to said conveyor, a mechanically variable speed drive mechanism for said feeding means, a reversible electric motor for changing the speed of said drive mechanism, electrically-controlled reversing switches for said motor, a control circuit for said switches, a switch associated with the scale beam of said weighing device for controlling said control circuit, and switch mechanism also in said circuit for automatically interrupting the same to prevent hunting due to the momentum or lag of said feeding means.

In testimony whereof, I affix my signature.

ARTHUR L. CLEMENTS.