July 5, 1960 H. E. ERICKSON ET AL 2,943,365

FELTING APPARATUS

Filed Dec. 3, 1956 7 Sheets-Sheet 1

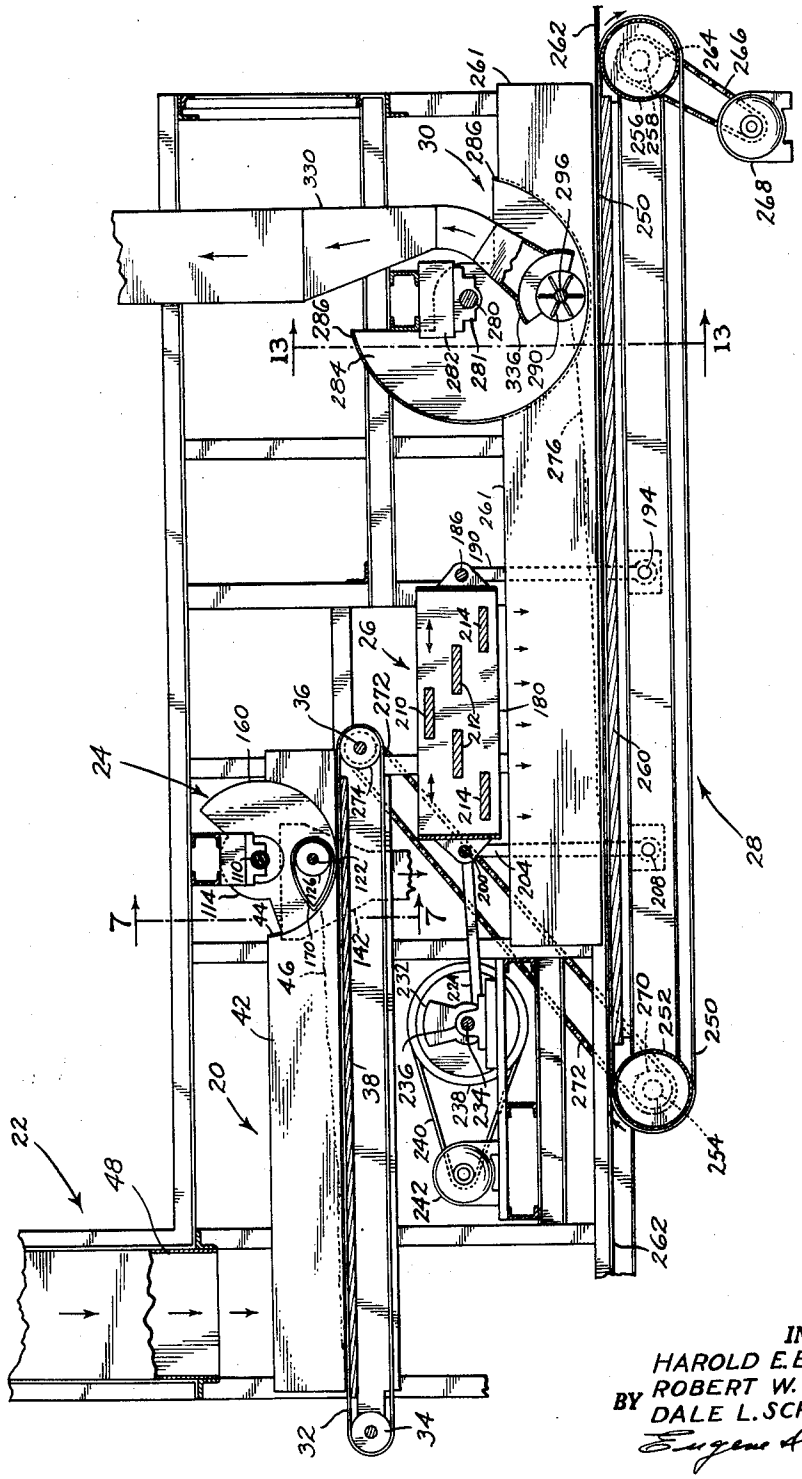

Fig. 1.

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FELTING APPARATUS

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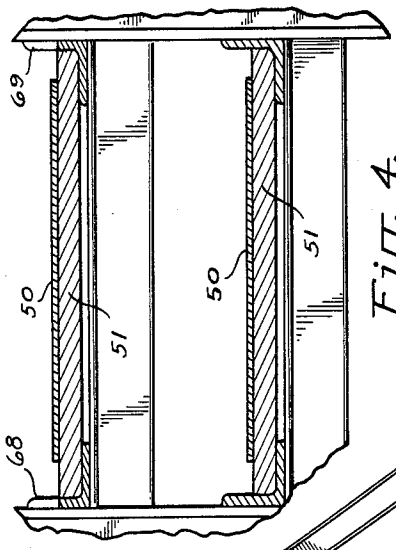

Fig. 4.

Fig. 2.

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FELTING APPARATUS

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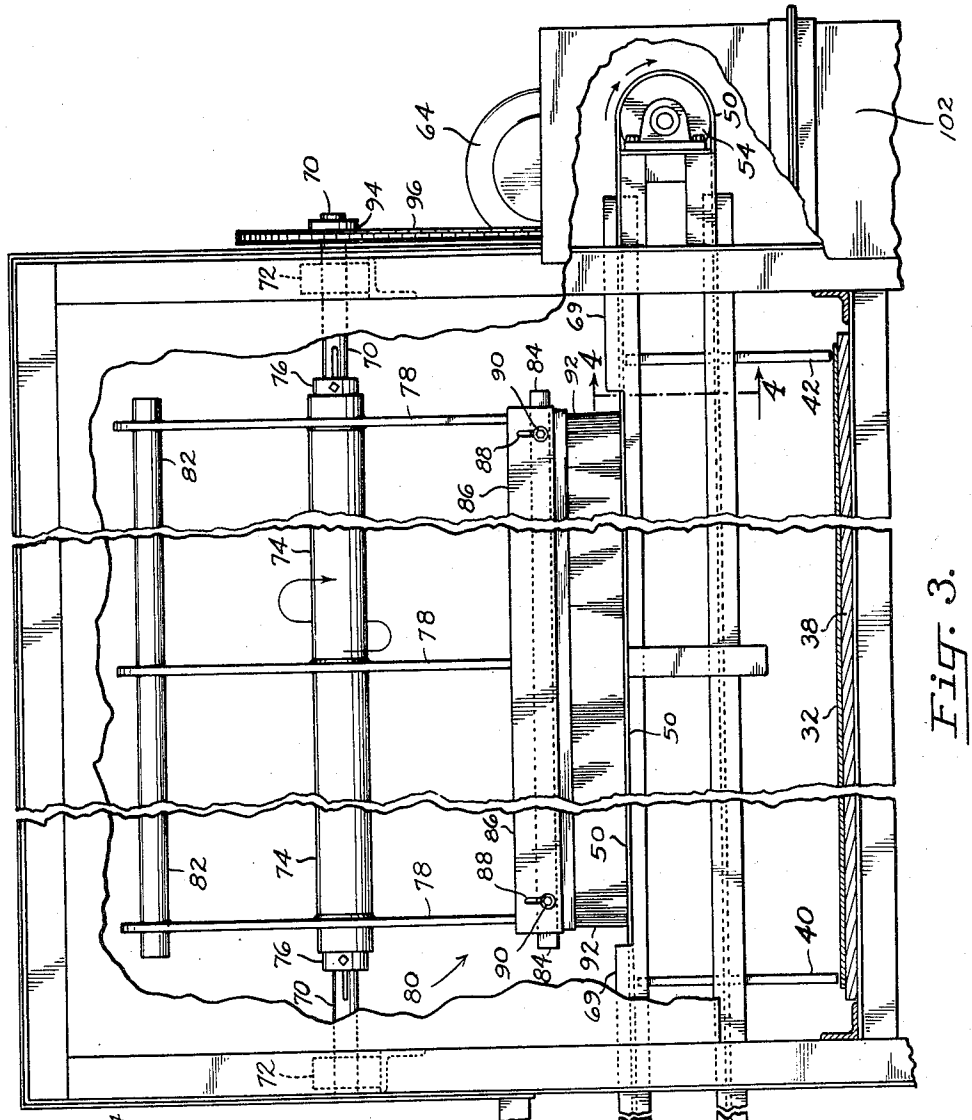

Fig. 3.

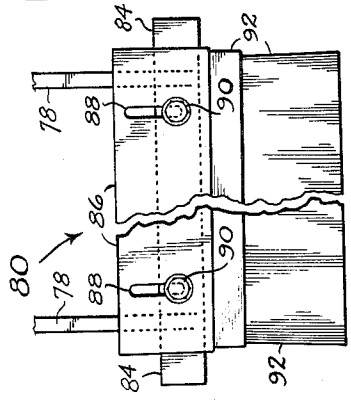

Fig. 5.

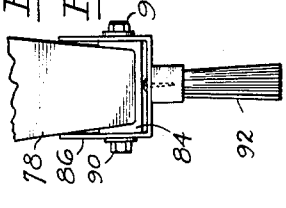

Fig. 6.

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FELTING APPARATUS

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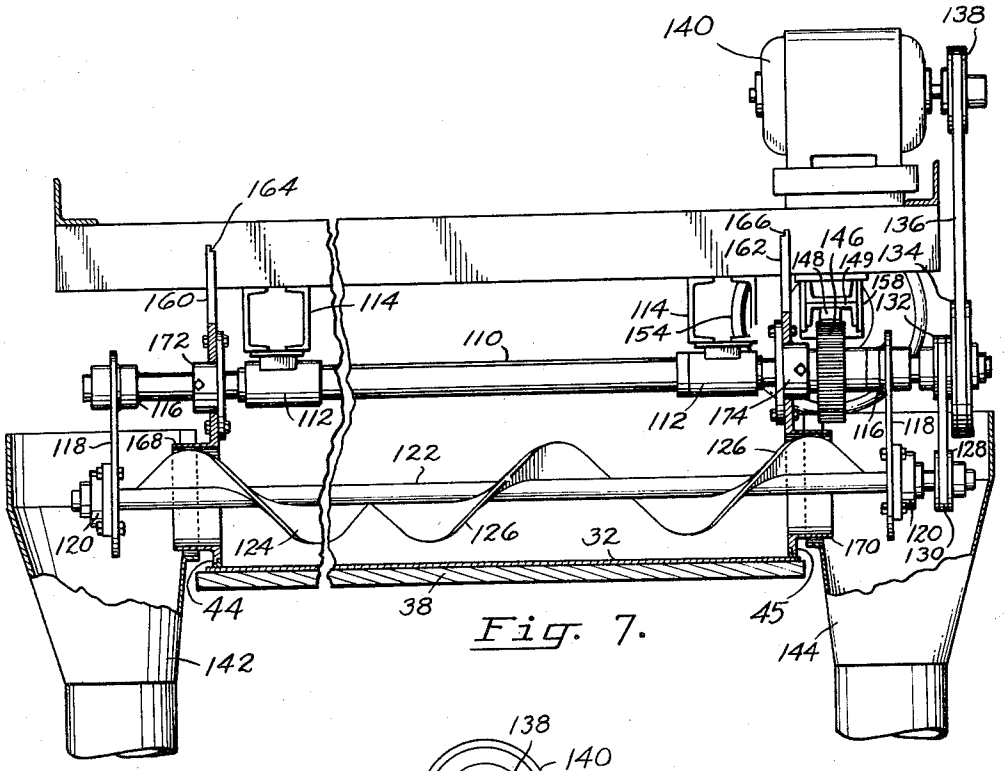

Fig. 7.

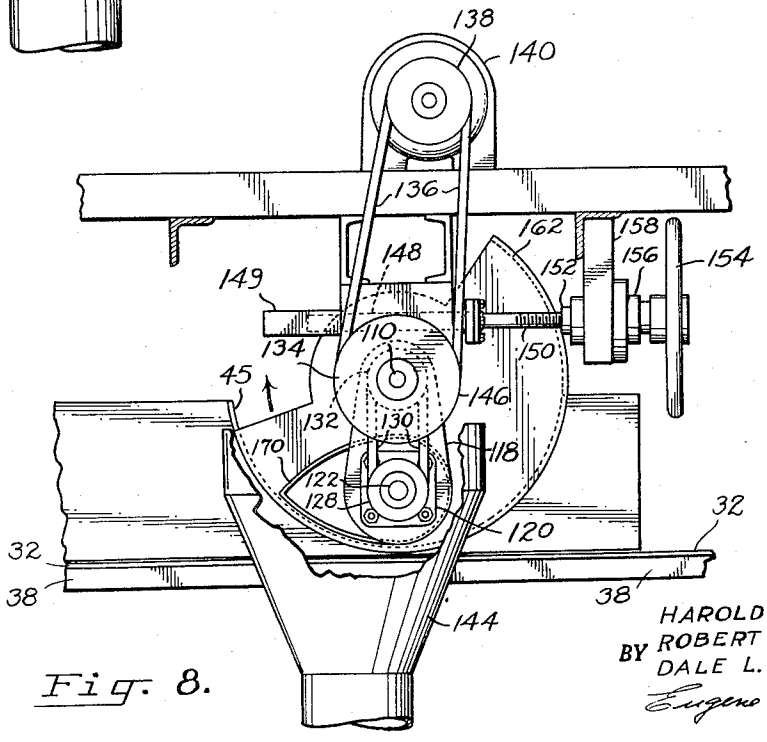

Fig. 8.

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FELTING APPARATUS

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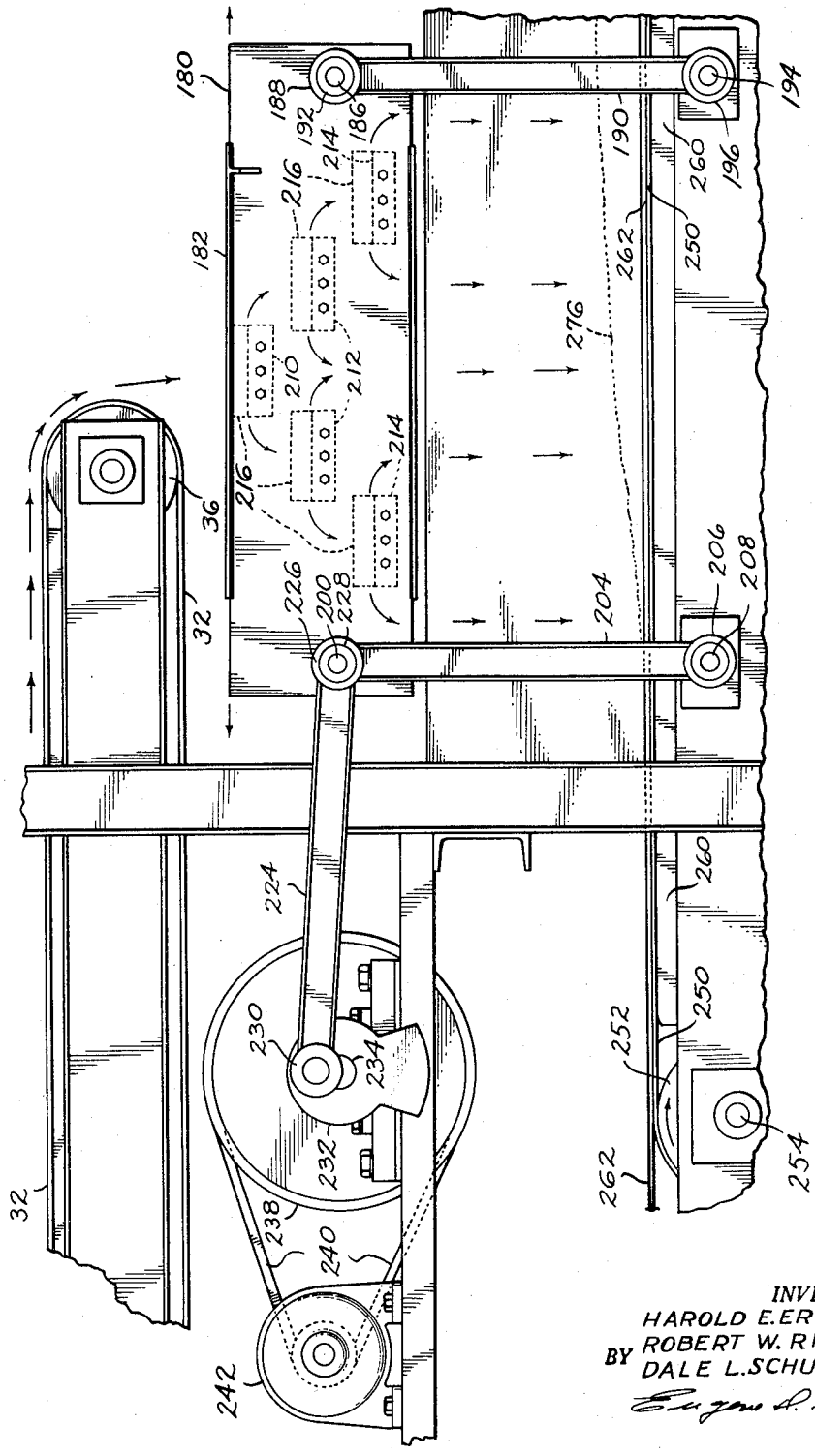

Fig. 9.

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FELTING APPARATUS

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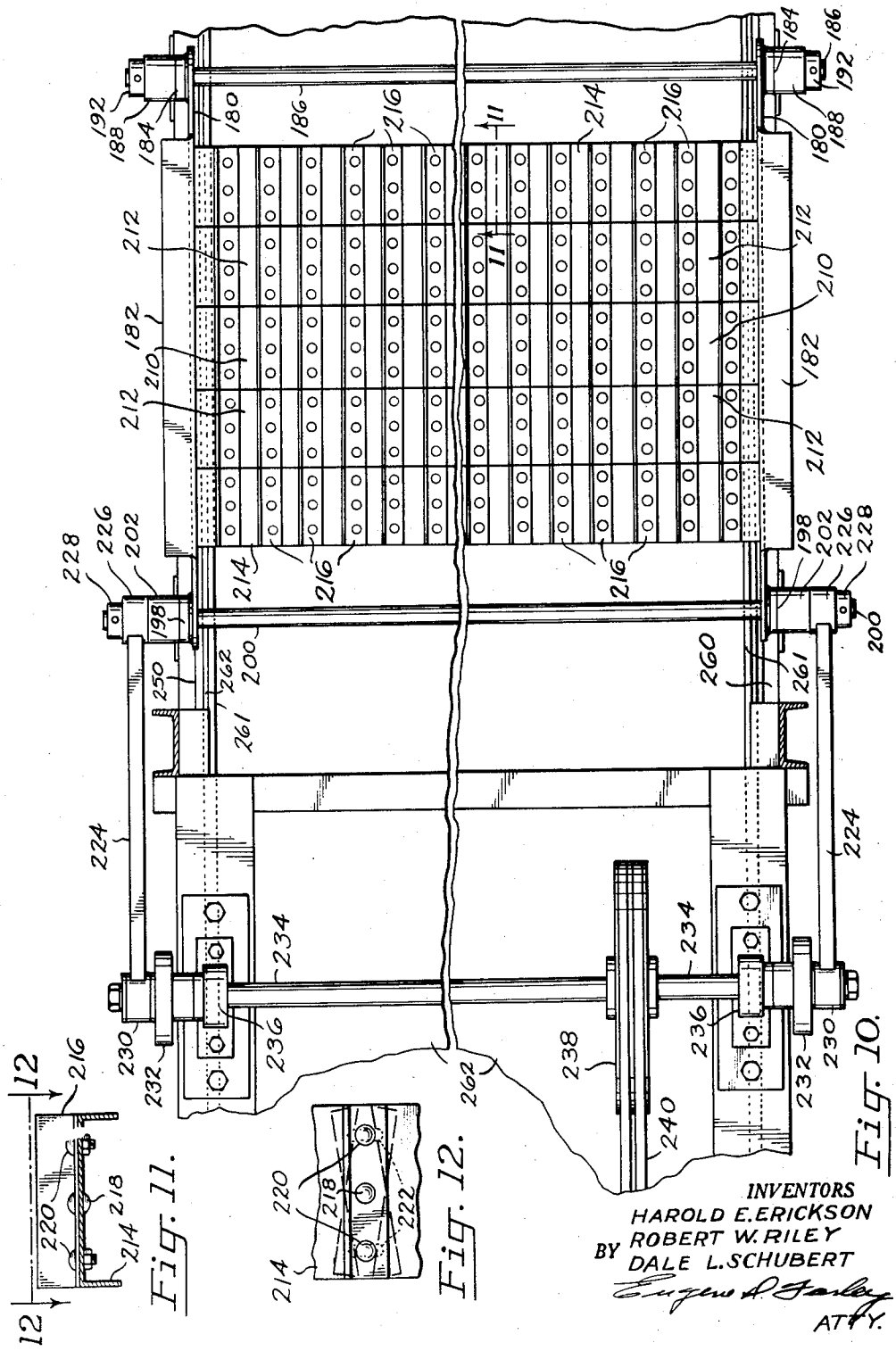

Fig. 10.

Fig. 11.

Fig. 12.

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FELTING APPARATUS

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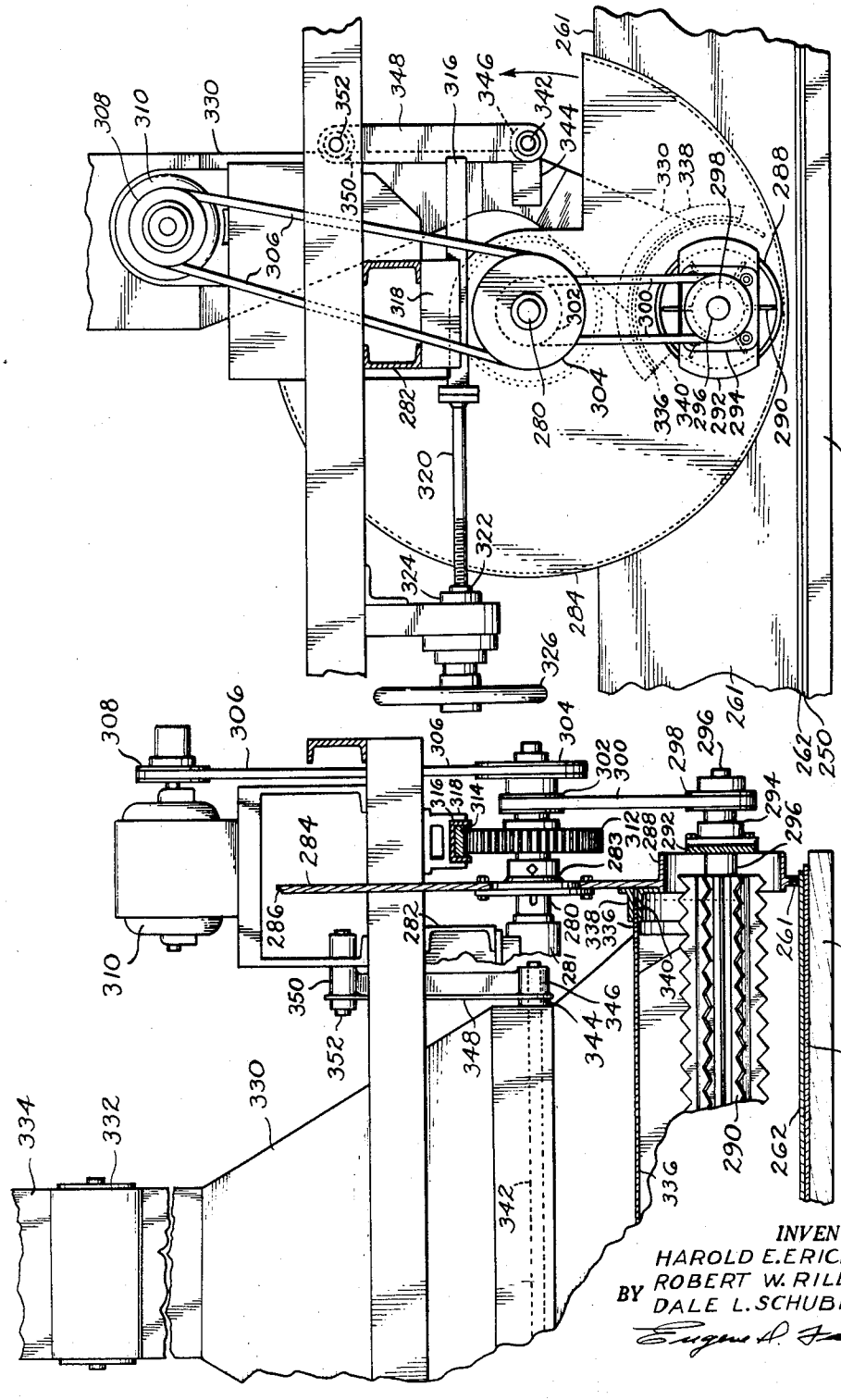

Fig. 14

Fig. 13.

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2,943,365

FELTING APPARATUS

Harold E. Erickson, Auburn, Robert W. Riley, Milton, and Dale L. Schubert, Tacoma, Wash.; said Erickson and said Riley assignors, by direct and mesne assignments, of one-sixth to said Schubert and three-sixths to Industrial Development Co., Tacoma, Wash., a corporation of Washington

Filed Dec. 3, 1956, Ser. No. 625,671

11 Claims. (Cl. 19—155)

This invention relates to felting apparatus for forming moist or dry fibrous material into a felt preliminary to pressing the felt into a consolidated product.

The herein described apparatus is applicable to the felting of a variety of fibrous materials, but is particularly applicable to the felting of particles of lignocellulose and is described herein with particular reference to that application although no limitation thereby is intended.

In making consolidated fibrous products such as composition boards, it is conventional practice to reduce wood and other lignocellulose to the form of small pieces, to mix the pieces with a resinous binder and size, and to form them into a felt. The latter then is consolidated to the desired density by the application of heat and pressure.

The properties of the felt prepared by the foregoing sequence of operations are of critical significance in determining the properties of the final consolidated product. If the felt is non-uniform in composition, thickness or density, this non-uniformity is reflected in the finished product. Control of felt uniformity is difficult of accomplishment when pieces of lignocellulose are felted, however, because of the irregularity in size and shape of the pieces, and their tendency to aggregate into clumps or flocs.

Accordingly, it is the general object of this invention to provide apparatus for forming small pieces of solid material into felts which are uniform in thickness and density and free from voids and which accordingly may be pressed into consolidated products of uniform properties.

Other objects of the present invention are the provision of felting apparatus which:

(1) Is readily adaptable for use in felting pieces of various shapes and sizes, particularly hard to felt, bulky pieces;

(2) May be used to felt pieces of material characterized by pronounced tendency to form clumps;

(3) May be applied to the production of felts of a wide range of predetermined thicknesses;

(4) Is provided with an accurate running adjustment for control of felt thickness;

(5) Forms a felt wherein the pieces are interlocked and interfelted with consequent high strength of the felt and the consolidated product made therefrom;

(6) Can be operated with a minimum of spillage;

(7) Produces a felt having a uniform, smooth surface.

The manner in which the foregoing and other objects of this invention are accomplished will be apparent from the accompanying specification and claims considered together with the drawings; wherein:

Fig. 1 is a general view in side elevation of the presently described felting apparatus;

Fig. 2 is a detail view in side elevation of the particle distributing component of the apparatus of Fig. 1 which is applied to the formation of a preliminary mat or felt;

Fig. 3 is a view in front elevation of the particle distributing apparatus of Fig. 2;

Fig. 4 is a detail view taken along line 4—4 of Fig. 3;

Fig. 5 is a fragmentary view in elevation illustrating a brush assembly which may be used in the particle distributing apparatus of Figs. 2–4;

Fig. 6 is a fragmentary view in side elevation further illustrating the construction of the brush assembly shown in Fig. 5;

Fig. 7 is a sectional elevation view taken along line 7—7 of Fig. 1 and illustrating a leveling unit employed for leveling the primary mat formed by the distributing unit of Figs. 2–6;

Fig. 8 is a fragmentary view further illustrating the leveling apparatus of Fig. 7;

Fig. 9 is a view in side elevation of a felting unit employed in building up a second felt from the leveled felt built up by the units of the preceding figures;

Fig. 10 is a plan view of the felting unit of Fig. 9;

Fig. 11 is a detail sectional view taken along line 11—11 of Fig. 10 and illustrating the construction of one of the particle distributing units of the felting unit of Figs. 9 and 10;

Fig. 12 is a view looking along line 12—12 of Fig. 11 and further illustrating the construction of the particle distributing element of that figure;

Fig. 13 is a sectional view in elevation taken along line 13—13 of Fig. 1 and showing the construction of a leveling unit employed for leveling the felt laid down by the felting unit of Figs. 9–12; and

Fig. 14 is a view in side elevation of the leveling unit of Fig. 13.

Generally stated, the felting apparatus of our invention comprises first conveyor means, distributing means positioned for distributing small pieces of fibrous material on the first conveyor means, felting means positioned adjacent the first conveyor means for receiving pieces discharged therefrom, and second conveyor means positioned adjacent the felting means for receiving pieces discharged therefrom, thereby building a felt of the pieces on the second conveyor means.

In the foregoing general combination, the two conveying means may be synchronized to operate at the same speed so that the deposits of pieces formed thereon are built up to substantially the same thickness. Also, leveling means are preferably associated with both the first and second conveyor means for leveling the deposited pieces thereon.

Considering the foregoing in greater detail and with particular reference to the drawings:

Fig. 1 illustrates the general arrangement of the presently described felting apparatus. A first or upper conveying unit is indicated generally at **20**. Distributing means for distributing pieces of solid material on the conveying means is indicated generally at **22**. Leveling means for leveling the material deposited on the conveying means is indicated at **24**.

The numeral **26** indicates generally a felting unit positioned for receiving the leveled material discharged from conveying unit **20**. The felting unit forms a felt of the pieces on a second conveyor situated immediately below and indicated generally at **28**. This felt is leveled by means of a leveling unit **30**. These various units of the assembly are considered in sequence below.

First conveyor

The first conveying unit indicated generally at **20** in Fig. 1 includes an endless belt **32** mounted on an idler pulley **34** and a driven pulley **36**. The upper or working stretch of the belt is supported by plate **38**. Deckel plates **40**, **42** are stationed one on each side of the belt extending longitudinally thereof for retaining material

deposited on the belt. As indicated at 44, 45 of Figs. 1 and 8, a section of each deckel plate is cut away and rabbeted for a purpose which will appear hereinafter.

Distributing unit

Means are provided for distributing pieces of lignocellulosic or other material on belt 32 for forming a preliminary mat 46 thereon. Various types of distributing units may be employed for this purpose. In the embodiment illustrated in Fig. 1, the distributing means comprises a spout 48 which may swing back and forth across the width of belt 32, distributing material across the surface thereof.

Preferred distributing means are illustrated in Figs. 2–6 inclusive. This distributing unit may be mounted across belt 32 in the same position as is occupied by oscillating spout 48 of Fig. 1. It comprises an endless belt 50 suitably supported on bed plates 51 and mounted on idler pulley 52 and a driven pulley 54. Pulley 54 is connected through coupling 56 (Fig. 2) to one shaft 57 of a conventional bevel gear box 58. The gear box in turn is coupled through coupling 60 to gear reducer 62 and this in turn is connected to a suitable motor 64.

Suitable means also are provided for delivering small pieces of material such as wood chips, shavings, fiber, or granules to the infeed end of belt 50. Such means may comprise, for example, a chute or hopper 66 through which the pieces are fed at the desired rate. After having been delivered to the belt, the pieces are moved toward the outfeed end, being confined between the notched longitudinal side plates 68, 69.

As the pieces reach the central portion of the belt, opposite the notched or cut-away portions of side plates 68, 69 they are acted upon by means for sweeping them off belt 50 and distributing them on belt 32 of conveying unit 20, described above. The sweeping or brushing unit is keyed to a central shaft 70 mounted in bearings 72. It comprises a sleeve 74 confined by means of collars 76 and carrying a plurality of spokes 78.

A brushing assembly 80 is mounted on one end of the spokes. A counter weight bar 82 which balances the brushing assembly is mounted at the other end of the spokes.

The brush assembly is vertically adjustable to compensate for wear and other factors and accordingly includes a first channel iron 84 which is welded to the spokes and a second channel member 86 dimensioned to telescope over the first channel iron. Channel 86 is provided with spaced vertical slots 88. Bolts 90 work in the slots and are threaded into channel 84. Accordingly the relative position of the outer channel member 86 may be set as desired.

The brush assembly is completed by means of the elongated brush 92 which extends substantially the entire length of channel 86 and is suitably affixed to the central segment thereof. It will be noted that the brush is substantially as long as belt 32 is wide and that it is positioned directly over the belt 32, so that material swept from belt 50 by the brush will fall downwardly onto belt 32, being distributed across its entire width between deckels 40, 42.

Coupled to the brushing assembly is motor means synchronized with the drive belt 50 so that the belt will be driven a distance equal to the length of brush 92 during the time that the brush makes one complete revolution. A suitable arrangement for achieving this synchronization is illustrated in Fig. 2. Thus shaft 70 carries a sprocket 94 which is connected through chain 96 to a sprocket 98 carried by shaft 100 of bevel gear box 58. Accordingly both belt 50 and the brush assembly are driven synchronously from a common motor 64.

Although the major proportion of material is swept from belt 50 by brush 92, any surplus not removed by the brush is carried by the belt into a chute 102. From the chute it is recirculated to the feeding source and may again be deposited on belt 50 through chute 66.

First leveling unit

As has been indicated above, the material which has been deposited on belt 32 forms a loose felt 46 thereon. This felt is next leveled to provide a primary felt of uniform thickness which is suitable for introduction into the felting unit of the assembly in order to supply a uniform feed thereto. The leveling means employed are indicated generally at 24 in Fig. 1 and function not only to level the mat but also to shave it off to any desired thickness while still confining it between deckel plates. The construction of this unit is illustrated particularly in Figs. 7 and 8.

Stationed above the outfeed end of belt 32 is a torsion rod 110 journaled in bearings 112 which are mounted on frame members 114. Collars 116 are rigid to rod 110 and mount rigidly connecting links 118. The latter in turn are fastened to bearings 120 in which is journaled a shaft 122. This shaft carries an auger, the two halves 124, 126 of which work respectively toward opposite sides of belt 32.

The auger shaft is powered through a linkage including pulley 128 keyed to the shaft, belt 130, pulleys 132 and 134 which are keyed together and rotate freely on the end of torsion rod 110, belt 136 and pulley 138 on motor 140.

It will be apparent that as the auger is rotated at the desired speed, it will shave off the top pieces from the mat on belt 32 and carry them toward the sides of the belt. There they are deposited in chutes 142, 144, which may return them to the feed source for recirculating through the apparatus.

The construction described above makes possible a facile, vertical, running adjustment of the auger to enable the production of mats of any desired thickness on belt 32. The elements included in the adjusting assembly comprise the pinion gear 146 splined to the torsion rod 110, a rack 148 guided in guideway 149 engaging the pinion gear, a screw 150 coupled to the rack, an internally threaded sleeve 152 into which screw 150 is threaded, and a wheel 154 coupled to sleeve 152, and rotatably mounted in bearing 156 supported on bracket 158.

Accordingly, rotation of hand wheel 154 extends or retracts rack 148 which rotates torsion rod 110 in either a clockwise or a counterclockwise direction as viewed in Figure 8. This in turn moves connecting links 118 angularly and raises or lowers auger shaft 122 to the desired position.

Not only can the auger assembly be raised or lowered expeditiously while the apparatus is running, but the adjustment may be made without losing continuity of deckel. To make this possible, there are provided deckel sections 160, 162, which cooperate with deckels 40, 42, respectively. The deckel sections are provided with rabbeted edges 164, 166, which register with the rabbeted edges 44, 45 of the deckels. Also, they carry tear-shaped, open, stub conduits 168, 170 through which auger segments 124, 126, respectively, extend. The deckel section assemblies are fastened to and supported by hubs 172, 174. These in turn are keyed to torsion rod 110 in such a manner that they may be set at variable spacings from each other as required to form mats of predetermined widths on belt 32.

Hence it will be evident that as the torsion bar turns in one direction or the other, it carries with it not only the auger assembly but also the deckel sections so that a continuity of deckel is maintained while still permitting discharge of the scalped material through stub conduit 168, 170 into chutes 142, 144.

The felting unit

The leveled mat of the desired thickness which has been formed on belt 32 is discharged over the outfeed

end thereof onto the felting unit indicated generally at **26** in Fig. 1. The construction of this unit is illustrated in greater detail in Figs. 9–12 inclusive.

Thus the felting unit may comprise a pair of spaced longitudinally arranged side plates **180** formed with horizontal stiffening flanges **182**. The side plates are mounted through bearings **184** on a first transverse rod **186**. This rod in turn is journaled in bearings **188** mounted on the ends of arms **190** and retained by collars **192**. Arms **190** in turn are pivotally mounted at the base of the unit on shaft **194** journaled in bearings **196** carried by the lower ends of arms **190**.

The other ends of side plates **180** are fixed to bearings **198** in which a shaft **200** is journaled. The outer ends of this shaft extend through bearings **202** carried by the upper end of arms **204**. The lower ends of these arms carry bearings **206** in which shaft **208** is journaled. The reciprocatable frame thus provided supports a plurality of substantially horizontal transverse plates **210**, **212**, **214** offset from each other, both horizontally and vertically, in a stepped, pyramidal arrangement, and affixed in a suitable manner to side plates **180**.

The upper surfaces of plates **210**, **212**, **214** may carry a plurality of spaced baffles **216**. These baffles preferably are mounted for angular adjustment in the manner illustrated in Figs. 11 and 12. Thus the base of each baffle is pivoted centrally on a pin **218**. A pair of bolts **220** penetrate the respective ends of the baffle and also slots **222** in the portion of the horizontal base plate immediately beneath. Hence by loosening the bolts, the baffles may be placed in any selected angular position and secured there by tightening the bolts.

Means are provided for reciprocating the felting unit rapidly. In the illustrated embodiment such means comprise a drive including connecting rods **224**, having on their respective forward ends bearings **226** in which shaft **200** is journaled, and collars **228** securing the bearings on the shaft. The other ends of connecting rods **224** carry bearings **230**, in which the shafts of eccentrics **232** are journaled. The eccentrics in turn are keyed to a drive shaft **234** mounted in bearings **236** and driven by a pulley **238** keyed to the shaft and connected through belt **240** to motor **242**.

Thus when the felting unit is reciprocated rapidly by motor **242**, the plates and baffles thereon in aggregate form a cascade down both sides of which the pieces tumble after being introduced onto the top plate from belt **36**. As the pieces tumble over and between the plates, they are separated from each other and distributed uniformly. Accordingly, they fall in a uniform flow in felting relationship onto a second conveying unit.

Second conveying unit

The second conveying unit is stationed below felting unit **26** and is indicated generally at **28** in Fig. 1. It includes an endless belt **250** reeved about pulley **252** keyed to shaft **254** and pulley **256** keyed to shaft **258**. The upper or working stretch of belt **250** is supported by a bed plate **260**. A plurality of cauls **262** may be carried on top of the belt.

Belt **250** is driven through a sprocket **264** keyed to shaft **258** and connected through chain **266** to drive motor **268**.

Belt **250** may be synchronized with belt **32**. To this end a sprocket **270** is keyed to shaft **254** and connected through chain **272** to sprocket **274** on the shaft of pulley **36** by means of which belt **32** is driven. In this manner the rates of travel of belts **32** and **250** may be maintained at any desired ratio to each other, so that the thickness of the felts deposited upon the belts can be maintained at the desired levels.

The action of felting unit **26** builds up on caul plates **262** carried by belt **250** of conveyor unit **28** a felt **276**, the raw freshly-formed edge of which is inclined upwardly in the direction of travel of the belt, as is indicated in Fig. 1. It is an important attribute of the herein described felting assembly that the felt can be formed in this manner since it avoids caving of the raw felt edge and the formation of voids in the caved portion. This in turn produces a uniform felt which leads to the production of a uniform pressed product.

The surface of felt **276**, however, is somewhat uneven and accordingly the felt is passed through a second leveling unit.

Second leveling unit

The second leveling unit employed in the presently described felting assembly is indicated generally at **30** in Fig. 1 and has for its function producing a felt of the desired thickness having a smooth, uniform surface. The construction and mode of operation of this leveling unit is indicated in Figs. 13 and 14.

From inspection of these figures, it will be observed that the construction of leveling unit **30** is similar in some respects to that of unit **24**. It differs however in the use of a toothed roll instead of an auger, and in the provision of a vacuum hood for removal of the material which has been scalped from the top of the felt by the leveling roll.

However, as in the case of unit **24**, leveling unit **30** includes a torsion bar **280** which extends entirely across the unit and is rotatably mounted in bearings **281** fixed to frame member **282**, it being kept in mind that the construction of the unit is substantially symmetrical, so that the left-hand side, broken away in Fig. 13, is identical with that of the right-hand side which is illustrated.

Keyed to torsion bar **280** are hubs **283** on which are mounted the deckel sections **284**. These correspond in general to deckel sections **162** of unit **24**, and like them may be set at predetermined distances apart from each other as required to define mats of predetermined widths. Also, they are provided with marginal tracks **286** adapted to cooperate with complementary tracks in the cutaway portions of deckels **261**. The lower portions of deckel sections **284** are provided with openings in which are mounted tubes **288**.

Deckel sections **284** support a toothed shaving roll **290** in the following manner: plates **292** are bolted across the open end of tubes **288**, it being noted, however, that the plates are of restricted size and do not completely close off the opening. Bearings **294** are mounted on the plates and mount in turn the shaft **296** of roll **290**.

The roll is driven by a drive including pulley **298** keyed to the end of shaft **296**, and belt **300** connecting pulley **298** to pulley **302**. The latter pulley is keyed to pulley **304**, both of these pulleys floating on the end of torsion rod **280**. Pulley **304** is connected through belt **306** to pulley **308** of motor **310**. Accordingly, it is rotated at a speed determined by the speed of the motor.

To elevate the shaving roll a predetermined distance above belt **250**, a pinion gear **312** is keyed to the torsion bar. This gear meshes with a rack **314** contained in a guideway **316** mounted on structural member **318**.

Rack **314** is coupled to a threaded shaft **320** which lies in threaded engagement with a sleeve **322**. The latter is rotatably mounted in a bearing **324** and connected to a handwheel **326**. Hence rotation of the handwheel secures longitudinal reciprocation of the rack **314** and rotation of pinion gear **312**. This in turn rotates torsion bar **280**, and, through the coupling action of deckel section **284**, swings toothed roll **290** in an arc, thereby raising or lowering it in respect to belt **250**, as the case may be.

The material removed from the surface of felt **276** by the action of roll **290** is carried away by a vacuum hood **330** which is connected through a telescopic joint **332** to a conduit **334**. The latter communicates with a fan for inducing a vacuum in the hood.

The lower open end of the hood is flared and directed toward toothed roll **290**. It is provided with a flange **336** which moves in a track formed by spaced track members **338, 340**.

The entire hood assembly is supported by a rod **342** which penetrates brackets **344** welded to the sides of the hood and is journaled in bearings **346** which are present on the lower end of arms **348**. The upper ends of these arms are provided with bearings **350** in which pins **352** are journaled. Accordingly, when torsion bar **280** is actuated and deckel sections **284** move angularly, hood **330** follows along because of the impelling action of track members **338, 340** on hood flange **336**. During this motion, the flange slips between the track members as required to relieve any induced stress. Also, supporting arms **348** move in the manner of a pantograph, the sides of the parallelogram being formed by supports **348** as the links on one side and the deckel sections **284** as the links on the other side.

This adjustment can be made readily while belt **250** and felt **276** thereon are in motion. Since the open mouth of hood **330** remains always immediately adjacent scalping roll **290**, material removed from the felt is sucked up by the air stream passing through the openings between sleeve members **288** and plates **292**, through hood **330** and through conduit **334**. The solid particles then may be separated from the air stream in a cyclone or otherwise and returned to the feed for recycling to the infeed side of the apparatus.

Operation

The operation of the herein described felting apparatus is as follows:

Small pieces of material such as wood granules, chips or shavings are fed continuously on belt **50** from chute **66**. The material on the belt is swept off onto belt **32** immediately below by rotary brush **92**, the speed of rotation of the brush being correlated with the linear movement of the belt so that a fresh charge of material is conveyed beneath the brush while the latter is making one revolution.

Thus the material is distributed on belt **32** between deckels **40–42**. It next is leveled off by means of leveling unit **24**, the worm members **124, 126** of which are adjustable vertically by means of torsion rod **110** to which they are connected, so that a mat of any desired thickness may be formed. During vertical adjustment of the worm members, the continuity of the deckels is maintained by the action of deckel sections **160, 162**.

The leveled mat accordingly affords a uniform feed source to be supplied to felting unit **26**. As it falls downwardly on top of plate **210** thereof, it cascades over and between the succession of horizontally and vertically spaced plates immediately below, being dispersed by this action as well as by the action of the angularly disposed plates **216** thereon.

As a consequence, a continuous and uniform flow of material falls downwardly from the felting unit onto the second conveying unit **28** which carries a succession of caul plates **262**. There is built up on the caul plates a felt **276** of the particles, the freshly-formed edge of the felt having a gradual slope to prevent caving and void formation.

This felt may be trimmed to any desired thickness by leveling unit **30**, the operation of which is somewhat similar to that of unit **24**. Toothed roll **290** of this unit shaves from the mat the surplus material which then is carried away by vacuum hood **330**. Vertical adjustment of the toothed roll is secured by means of torsion bar **280** which, acting through deckel sections **284**, moves the roll and associated hood in an arc until the desired elevation has been attained. During this sequence, deckel continuity is again maintained by the action of the deckel sections.

Accordingly, at the outfeed end of the apparatus, there are discharged uniform, smooth-surfaced felts carried on caul plates **262**. The felts on the caul plates then may be transferred to a press in the usual manner and consolidated to form the finished product.

It is to be understood that the form of our invention herein shown and described is to be taken as a preferred example of the same and that various changes in the shape, size and arrangement of parts may be resorted to without departing from the spirit of our invention or the scope of the subjoined claims.

Having thus described our invention, we claim:

1. Felt leveling apparatus comprising conveyor means adapted to convey a felt, a torsion bar mounted above the conveyor means transversely thereof, a motor driven leveling roll supported by the torsion bar substantially parallel thereto and a spaced distance toward the felt therefrom, and means for rotating the torsion bar by amounts predetermined to adjust the space between the leveling roll and the surface of the felt by desired increments.

2. Felt leveling apparatus comprising a conveyor adapted to convey a felt, a pair of deckel plates mounted one on each side of the conveyor, each deckel plate including a section which is relatively movable with respect to the balance of the plate in the plane thereof, a torsion bar interconnecting the deckel plate sections, a motor driven leveling roll supported by the torsion bar substantially parallel thereto and a spaced distance therefrom in the direction of the conveyor, and means for rotating the torsion bar by amounts predetermined to adjust the space between the leveling roll and the surface of the felt by desired increments, the deckel plate sections moving arcuately during such adjustment.

3. Felt leveling apparatus comprising a conveyor adapted to convey a felt, a torsion bar rotatably mounted transversely of the felt, a motor driven leveling roll supported by the torsion bar substantially parallel thereto and a spaced distance below the same, means for rotating the torsion bar by an amount predetermined to adjust the space between the leveling roll and the felt by desired increments, and vacuum hood means coupled to the leveling roll for conveying away material removed from the felt by the same.

4. Felt leveling apparatus comprising a conveyor adapted to convey a felt, a pair of deckle plates positioned one on each side of the conveyor, means mounting the deckle plates for adjustment toward and away from each other, each deckle plate including a section which is relatively rotatable with respect to the balance of the plate in the plane thereof, a torsion bar interconnecting the deckle plate sections, a motor driven leveling roll supported by the torsion bar substantially parallel thereto and a spaced distance therefrom in the direction of the conveyor, the deckle plate sections having openings therein for receiving the ends of the leveling roll therethrough for adjusting the spacing between the deckle plates, and means for rotating the torsion bar by amounts predetermined to adjust the space between the leveling roll and the surface of the felt by desired increments, the deckle plate sections moving arcuately during such adjustment.

5. The apparatus of claim 4 including vacuum hood means positioned adjacent the leveling roll for conveying away material removed from the felt by the same, and coupling means slidably interconnecting the vacuum hood means and the rotatable deckle sections.

6. Felting apparatus comprising conveyor means, an oscillating shaker above the conveyor means and comprising a plurality of spaced substantially horizontal plates offset from each other vertically and horizontally, and feed means above the shaker for feeding small pieces of fibrous material to the latter, the pieces discharged onto the shaker cascading downwardly over the plates, thereby being separated and disbursed onto the conveyor means.

7. Felting apparatus comprising conveyor means, feed means for feeding fibrous material to the conveyor means, leveling means comprising a torsion bar mounted transversely of the conveyor means, a leveling roll supported by the bars substantially parallel thereto a spaced distance therefrom in the direction of the conveyor means,

and means for rotating the torsion bar by amounts predetermined to adjust the space between the leveling roll and the surface of the fibrous material by a desired increment.

8. Felting apparatus comprising conveyor means, feed means for feeding small pieces of fibrous material to the conveyor means, and a combination deckle and adjustable leveling means for retaining the pieces of material on the conveyor means and leveling the surface of the same, the deckle including a movable section connected to the adjustable leveling means and movable during adjustment of the leveling means to maintain continuity of deckle.

9. Felting apparatus comprising conveyor means, feed means for feeding small pieces of fibrous material to the conveyor means, and a combination deckle and adjustable leveling means comprising a pair of deckle plates mounted one on each side of the conveyor means, each deckle plate including a section which is relatively movable with respect to the balance of the plate in the plane of the plate, a torsion bar interconnecting the two sections, a motor driven leveling roll supported by the torsion bar substantially parallel thereto a spaced distance therefrom in the direction of the conveyor means, and means for adjusting the torsion bar by amounts predetermined to vary the space between the leveling roll and the surface of the material on the conveyor means by a desired increment, the deckle plate sections moving arcuately during such adjustment.

10. Felting apparatus comprising conveyor means, feed means for feeding fibrous material to the conveyor means, leveling means comprising a torsion bar mounted transversely of the conveyor means, a motor driven felt leveling roll supported by the torsion bar substantially parallel thereto at a spaced distance below the same, means for rotating the torsion bar by an amount predetermined to adjust the space between the leveling means and the felt by a desired increment, and vacuum hood means coupled to the leveling roll for conveying away material removed from the felt.

11. Felting apparatus comprising first conveyor means, distribution means positioned for distributing small pieces of fibrous material on the first conveyor means, felting means positioned adjacent the first conveyor means for receiving pieces discharged therefrom, second conveyor means positioned adjacent the felting means for receiving pieces discharged therefrom, thereby forming a felt of the pieces on the second conveyor means, and a combination adjustable deckle and leveling means associated with at least one of said conveyor means for retaining the pieces of material thereon and leveling the surface of the same.

References Cited in the file of this patent

UNITED STATES PATENTS

648,001	Thurber	Apr. 24, 1900
2,014,947	McCulloch et al.	Sept. 17, 1935
2,165,280	Lannan	July 11, 1939
2,373,183	Hawthorne	Apr. 10, 1945
2,459,924	Culhane et al.	Jan. 25, 1949
2,462,276	Mueller	Feb. 22, 1949
2,589,008	Lannan	Mar. 11, 1952
2,635,301	Schubert et al.	Apr. 21, 1953
2,653,416	Slayter	Sept. 29, 1953
2,693,619	Goss	Nov. 9, 1954
2,737,997	Himmelheber et al.	Mar. 13, 1956
2,743,758	Uschmann	May 1, 1956
2,780,341	Smallegan	Feb. 5, 1957