Dec. 28, 1943. W. S. RAINFORD ET AL 2,337,726

METHOD OF AND APPARATUS FOR FELTING FIBROUS MATERIAL

Filed Feb. 12, 1942

FIG. 1.

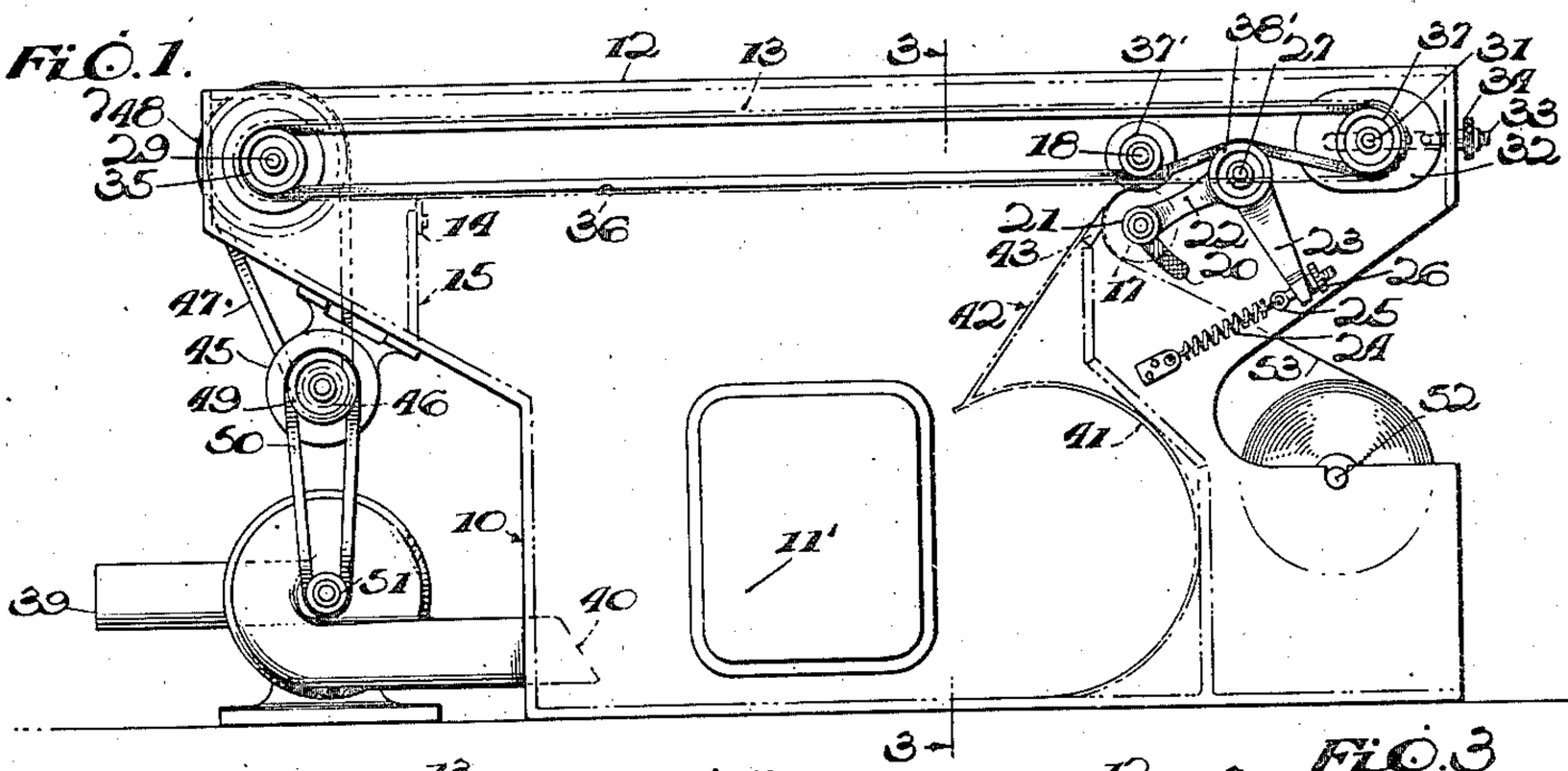


FIG. 2.

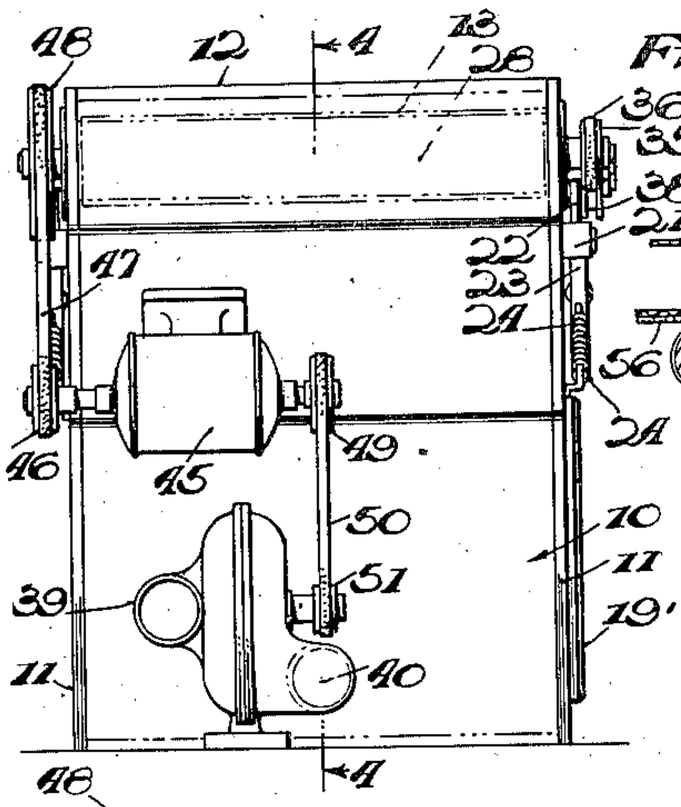


FIG. 5.

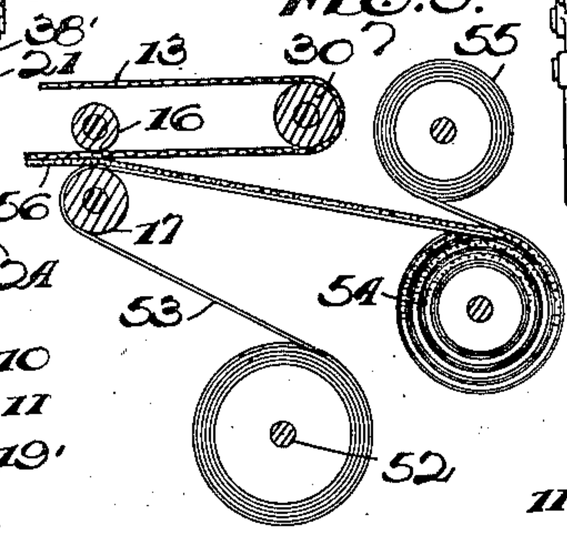
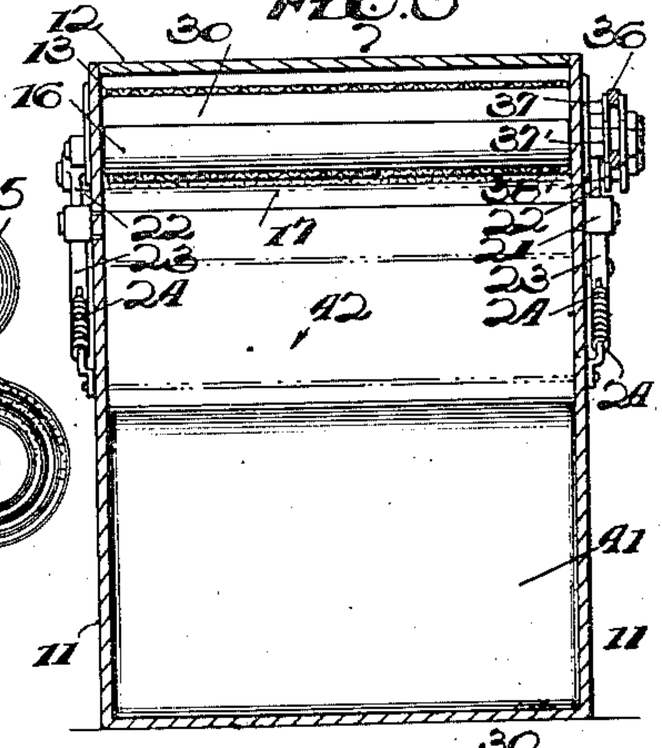


FIG. 3



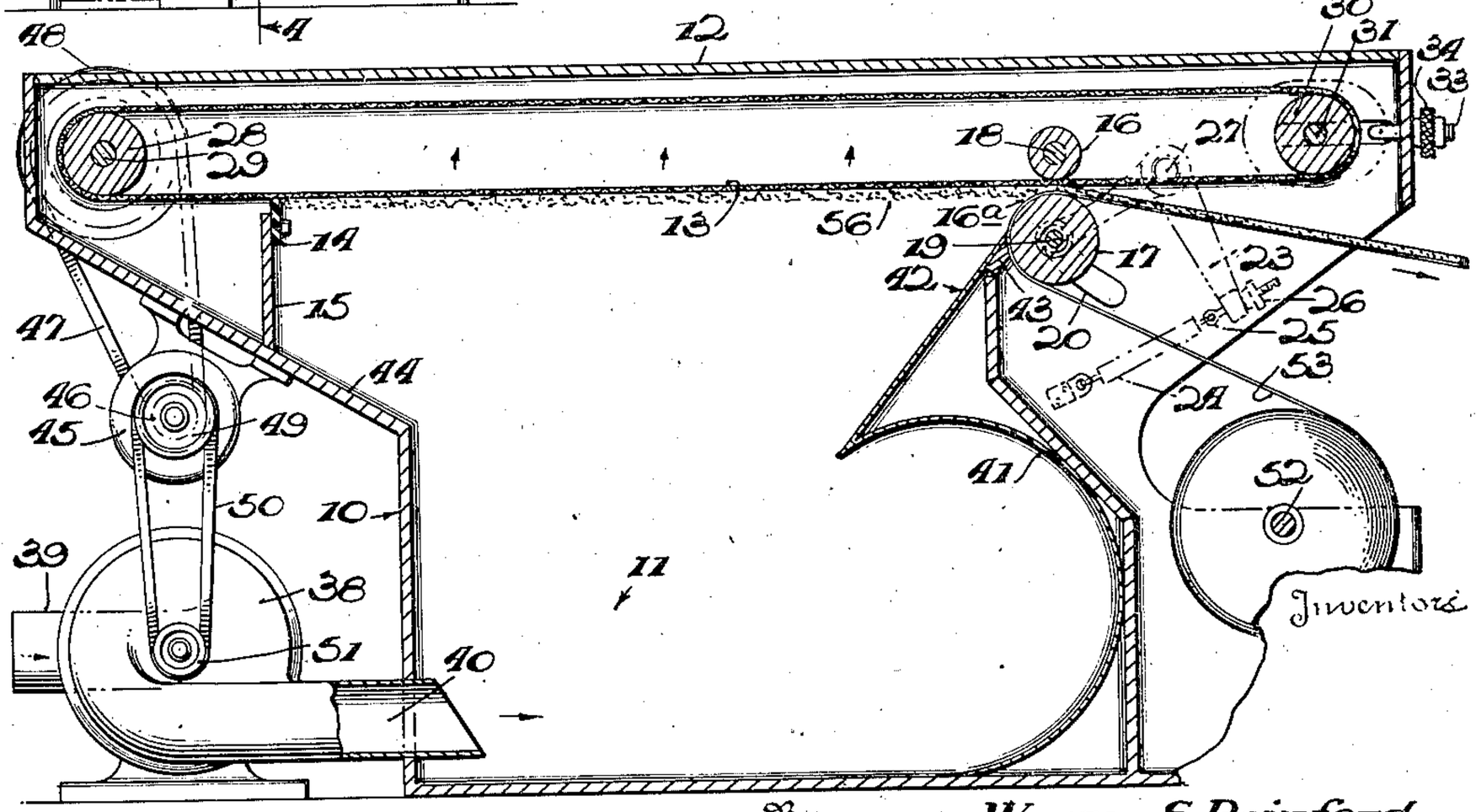


FIG. 4.

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METHOD OF AND APPARATUS FOR FELTING FIBROUS MATERIAL

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Application February 12, 1942, Serial No. 430,652

11 Claims. (Cl. 19—156)

The present invention relates to a method of and apparatus for felting fibrous material and thereby producing a batting.

An important object of the invention is to provide means whereby the fibrous material is introduced into a felting chamber by air pressure so that the fibrous material is deposited upon a foraminous carrier and the pressure within the felting chamber is maintained above atmospheric pressure so that the increased pressure aids in the feeding of the felted material from the felting chamber.

A further object of the invention is to provide means to impart to the fibrous material a whirling action within the felting chamber so that the fibrous material is uniformly deposited upon the foraminous carrier.

A further object of the invention is to provide means whereby the felt is transferred to a traveling backing strip, immediately upon its discharge from the felting chamber.

A further object of the invention is to provide means whereby the pressure above the upper surface of the foraminous carrier is greater than the pressure beneath the carrier, exteriorly of the felting chamber so that the felt will readily separate from the foraminous carrier.

A further object of the invention is to provide apparatus of the above-mentioned character which is of simplified construction.

Other objects and advantages of the invention will be apparent during the course of the following description.

In the accompanying drawing forming a part of this application and in which like numerals are employed to designate like parts throughout the same,

Figure 1 is a side elevation of a felting machine embodying our invention,

Figure 2 is a front end elevation of the same,

Figure 3 is a vertical transverse section taken on line 3—3 of Figure 1,

Figure 4 is a vertical longitudinal section taken on line 4—4 of Figure 2, and

Figure 5 is a partly diagrammatic view, showing the feeding and guiding means for the flexible sheet and associated elements.

In the drawing, wherein for the purpose of illustration is shown a preferred embodiment of our invention, the numeral 10 designates a casing. This casing includes a lower felting chamber 11, which is closed at its sides, ends and bottom. The chamber 11 has its top open to form a main air discharge opening. This chamber also has a window 11' covered by glass or the like. The casing 10 has its top closed by a cover 12 and beneath this cover is a traveling foraminous carrier 13, in the form of an endless belt of screening material, such as wire gauze of 18 gauge. The lower run of this foraminous endless belt covers the open top of the felting chamber 11 and is engaged by a flexible sealing strip 14, preferably formed of rubber, and which is carried by a wall 15, as shown. The sealing strip 14 is positioned at the intake end of the felting chamber 11 and the endless belt 13 extends outwardly beyond the same. At the outlet end of the felting chamber 11 is a batt discharge opening 16a and a pair of rolls 16 and 17, which also constitute an air seal for the felting chamber. The roll 16 is disposed above the lower run of the belt 13 and is mounted upon a shaft 18 which is journaled within stationary bearings, while the roll 17 is disposed within the opening 16a and is mounted upon a shaft 19, operating within upstanding segmental slots 20. The shaft 19 is journaled in bearings 21 formed upon the arms 22 of bell-crank levers, having arms 23, drawn inwardly by retractile coil springs 24, adjustably connected with the arms 23 by eye-bolts 25 carrying nuts 26. The bell-crank levers are mounted upon fixed pivots 27 and are turned upon these pivots by the springs 24 to move the roll 17 toward the roll 16. The springs 24 serve to draw the rolls 16 and 17 together. The roll 17 operates within the opening 16a and forms an air seal, compresses the belt, and guides the sheet 53.

The endless belt 13 extends outwardly beyond the rolls 16 and 17, and the casing, outwardly of the felting chamber 11, is open to the atmosphere, as shown.

The endless belt 13 has its rear end passed about a transverse roll 28, mounted upon a shaft 29, journaled in stationary bearings. The rear or discharge end of the endless belt 13 is passed about a roll 30 carried by a shaft 31 journaled in bearings 32, which are longitudinally adjustably mounted upon the casing 10 and are adjusted by rods 33 connected therewith and carrying nuts 34. The shaft 29 carries a grooved pulley 35 engaged by a belt 36, engaging a grooved pulley 37, mounted upon the shaft 31. The rolls 28 and 30 therefore turn in unison. 37' is a belt guide pulley, rotatable upon the shaft 18 and 38' is a belt guide pulley rotatable upon the pivot 27.

The fibrous material is introduced into the felting chamber under pressure from a rotary blower 38, having an intake pipe 39 and an outlet pipe 40, discharging into the intake or rear end of the felting chamber 11, adjacent to its bottom.

Disposed opposite the outlet pipe 40 is a current rotating plate or sheet 41, having its axis of rotation horizontal. This sheet is circularly curved in cross-section and is substantially semi-cylindrical with its open side disposed inwardly and opposite the outlet pipe 40. The plate or sheet 41 is disposed at the outlet end of the felting chamber adjacent to its bottom. The plate or sheet 41 is connected at its upper free end with an inclined plate 42, extending upwardly and terminating in close relation to the roll 17. This sheet is resilient and urges a pivoted strip 43 toward the roll 17, to form therewith a substantially air tight joint.

Arranged at the intake end of the casing 10 beneath the inclined wall 44 is a motor 45, which may be rigidly mounted upon the wall 44. This motor drives a grooved pulley 46, driving a belt 47 in turn driving a grooved pulley 48 which is mounted on the shaft 29. The motor also drives a grooved pulley 49, driving a belt 50 which drives a grooved pulley 51 which in turn drives the rotary fan 38.

The numeral 52 designates a shaft or roll which is rotatably supported near the discharge end of the chamber 11 and outwardly of the same. This roll carries a roll of flexible sheet material 53, such as cloth, paper, or the like. This continuous sheet 53 passes about the roll 17 upon the side thereof next to the discharge outlet of the felting chamber 11 and then passes over the roll 17 in an outward direction. This sheet is fed longitudinally by being wound upon a take-up roll 54. An upper sheet 55 may be applied to the upper surface of the batt, if desired.

The longitudinal edges of the endless belt 13 travel in substantial contacting relation with the sides of the casing 10, for forming a substantially air tight fit therewith. If desired, suitable packing may be arranged between these edges of the belt 13 and the sides of the casing to effect a further air tight fit.

In the practice of the method, the operation of the apparatus is as follows:

The fibrous material employed may be cotton, china cotton, down, reused wool, repossessed wool, kapok, hair, feathers, linters, jute, and other like material. The fibrous material is divided by passing the same through a shredding process. This divided fibrous material is then fed into the intake pipe 39 of the blower 38, in suitable amounts, from a hopper or the like. The rotary blower is set into action and draws the fibrous material in through the pipe 39 and discharges the same through the pipe 40, in an air current, within which the fibrous material is suspended. This air current having the fibrous material suspended therein is projected against the curved current rotating plate 41, whereby the current with the fibrous material suspended therein is subjected to a whirling or cyclonic action. This whirling action causes the fibrous material to be uniformly distributed in the air within which it is suspended. This air having the fibrous material uniformly suspended therein throughout its entire mass, rises within the felting chamber 11, and passes through the lower run of the foraminous endless belt 13, at the top of the felting chamber. The suspended fibrous material is deposited upon the lower face of this lower run and produces the batt 56. The lower run of the foraminous belt 13 with the batt applied thereto now passes outwardly of the felting chamber 11 between the rolls 16 and 17, with the flexible sheet or backing 53 which is passed beneath the batt. The rolls 16 and 17 are driven by frictional engagement with the belt 13 and sheet 53 respectively. The longitudinal travel of the sheet 53 may be effected by any suitable means, as by being wound upon a roll 54. The air blown into the felting chamber 11 and having the fibrous material suspended therein is under pressure above atmospheric pressure. This pressure beneath the lower run of the endless belt 13 tends to aid in feeding the batt 56 outwardly between the rolls 16 and 17. The air under pressure passing into and through the endless belt 13 discharges to the atmosphere at the discharge end of the chamber 11, exteriorly of this chamber. Some of this air is passing downwardly and outwardly through the lower run of the endless belt 13 upon the outer sides of the rolls 16 and 17. It is therefore apparent that the instant that the batt passes upon the outer portions or sides of the rolls 16 and 17, it is subjected to the downward or outward action of the air escaping through the lower run of the endless belt, which aids in causing the maximum amount of the batting being transferred to the traveling sheet 53. When the sheet and batting pass outwardly beyond the casing 10, an upper sheet may be applied to the batting, if desired.

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

Having thus described our invention, what we claim is:

1. In apparatus for producing a batt, a felting chamber having an outlet opening at its top, a foraminous traveling carrier extending across the outlet opening, a blower having an inlet for receiving air and fibrous material and an outlet discharging into the felting chamber beneath the carrier, the blower serving to force a stream of air and fibrous material into the felting chamber and create a pressure therein above atmospheric pressure and cause the suspended fibrous material to move upwardly within the filling chamber and contact with the lower face of the carrier, the arrangement of the foraminous carrier being such that a batt is formed on the lower face of the carrier within the felting chamber, and means to transfer the batt from the foraminous traveling carrier to a flexible sheet, said means including an element to support the sheet as it is traveling upwardly toward and in contact with the batt within the felting chamber, said means serving to guide the contacting batt and felting sheet to the exterior of the chamber, said means also serving as an air seal.

2. In apparatus for producing a batt, a felting chamber having a main air outlet opening near its top and a batt discharge opening arranged near the end of the felting chamber and adjacent to the outlet opening, a foraminous traveling carrier extending across the main air outlet opening and extending through to the batt discharge opening outwardly beyond the interior of the felting chamber, means to transfer the batt from the foraminous traveling carrier to a flexible sheet including a roll operating within the batt discharge opening, means to guide a flexible sheet to the lower portion of the roll so that the sheet

passes upwardly about the roll and next to the felting chamber, the felt being deposited upon the upper face of the sheet, means to move the upper portion of the sheet from the discharge opening, and means coacting with the roll to produce an air seal, and a blower having its discharge end discharging into the chamber, the arrangement being such that the batt is applied to the flexible sheet before the batt passes to the exterior of the felting chamber.

3. In apparatus for producing a batt, a felting chamber having a main air outlet opening near its top and a batt discharge opening near its end, a foraminous traveling carrier arranged adjacent to and extending across the main air outlet opening and extending adjacent to the batt discharge opening outwardly beyond the interior of the felting chamber, means to transfer the batt from the foraminous traveling carrier to a flexible sheet including a roll operating within the batt discharge opening to engage with the batt formed upon the foraminous traveling carrier, means to guide a flexible sheet about the roll upon the side thereof next to the felting chamber, means coacting with the roll to form an air seal, a blower discharging into the felting chamber beneath the carrier, and means to impart a whirling motion to the air stream from the blower.

4. In apparatus for producing a batt, a felting chamber having its top open and provided with a batt discharge opening, a foraminous endless belt having its lower run extending across the open top of the chamber, the lower run extending through the batt discharge opening and passing to the exterior of the chamber, means to transfer the batt from the foraminous endless belt to a flexible sheet including a flexible sheet carrying roll operating within the batt discharge opening and disposed beneath the lower run the inner side of the roll turning upwardly toward the lower run so that the sheet passes upwardly toward and in contact with the batt within the felting chamber, a coacting roll disposed above the lower run, yielding means to draw the rolls together to provide an air seal, and a blower discharging into the chamber to introduce air and fibrous material into the chamber and create a pressure therein above atmospheric pressure.

5. The method of producing a batt, comprising providing a stream of air having fibrous material suspended therein, subjecting the suspended material to a pressure above atmospheric pressure, acting upon the suspended material while in the pressure above atmospheric pressure to deposit the same in a layer, moving the deposited layer in a predetermined path, moving a flexible sheet into contact with the deposited layer of fibrous material while such fibrous material is subjected to the pressure above atmospheric pressure to apply the layer to the sheet, feeding the contacting deposited layer of fibrous material and the sheet from the presence of the pressure above atmospheric pressure and causing the pressure above atmospheric pressure to act upon the fibrous material in the direction of such feeding, moving the flexible sheet in the direction from the path of the deposited layer, and causing a portion of the pressure above atmospheric pressure to act upon the deposited layer to force the same against the sheet.

6. The method of producing a batt, comprising providing a stream of air having fibrous material suspended therein, subjecting the suspended material to a pressure above atmospheric pressure, acting upon the suspended material while in the pressure above atmospheric pressure to deposit the same in a layer, moving the deposited layer in a predetermined longitudinal path, moving a flexible sheet into contact with the deposited layer of fibrous material while such layer of fibrous material is subjected to the pressure above atmospheric pressure to apply the layer to the sheet, feeding the contacting deposited layer of fibrous material and the sheet from the presence of the pressure above atmospheric pressure, moving the flexible sheet exteriorly of the pressure above atmospheric pressure laterally from the longitudinal path of the deposited layer, and causing a portion of the pressure above atmospheric pressure to act upon the deposited layer to force the same against the sheet.

7. In apparatus for producing a batt, a felting chamber having its top open and provided with a batt discharge opening, a generally horizontal foraminous endless belt having its lower run extending across the top of the chamber and through the batt discharge opening and outwardly beyond the batt discharge opening, means to transfer the batt from the lower run of the foraminous endless belt to a flexible sheet including a flexible sheet carrying roll operating within the batt discharge opening and disposed beneath the lower run, the inner side of the roll turning upwardly toward the lower run so that the sheet passes upwardly toward and in contact with the batt within the felting chamber, a coacting roll disposed above the lower run, yielding means to draw the rolls together to provide an air seal, feeding means for the flexible sheet passed about the lower sheet carrying roll and guiding the upper portion of the flexible sheet so it is spaced downwardly from the lower run of the foraminous endless belt, and a blower discharging into the felting chamber for supplying air under pressure above atmospheric pressure and having fibrous material suspended therein into the felting chamber.

8. In apparatus for producing a batt, a felting chamber having a main air outlet opening at its top and a batt discharge opening near one end, a substantially horizontal foraminous traveling carrier extending across the main air outlet opening and passing through the batt discharge opening, means to drive the carrier so that the felt deposited thereon passes through the batt discharge opening, means for forming an air seal at the batt discharge opening including a roll arranged within the batt discharge opening, paying out and taking up rolls arranged near and exteriorly of the batt discharge opening, the last named rolls carrying a flexible sheet which is passed about the face of the first named roll next to the felting chamber, means to drive the taking up roll so that the upper run of the flexible sheet passes from the batt discharge opening, and a blower discharging air under pressure and fibrous material into the felting chamber beneath the carrier to produce a pressure in the felting chamber about atmospheric pressure.

9. In apparatus for producing a batt, a felting chamber having its top open and provided near one end with a batt discharge opening, a foraminous endless belt having its lower run extending across the open top of the chamber, the discharge end of the endless belt extending through the batt discharge opening and passing exteriorly of the felting chamber, means to transfer the batt from

the lower run of the foraminous endless belt to a flexible sheet including a flexible sheet carrying roll having its inner side operating within the batt discharge opening beneath the lower run, the inner side of the roll turning upwardly toward the lower run so that the sheet passes upwardly toward and in contact with the batt within the felting chamber, means coacting with the roll to form an air seal, and a blower discharging into the felting chamber beneath said lower run and introducing air and fibrous material into the felting chamber and serving to create a pressure within the felting chamber above atmospheric pressure.

10. In apparatus for producing a batt, a felting chamber having its top open and providing near one end with a batt discharge opening, a foraminous endless belt having its lower run extending across the open top of the chamber, the discharge end of the endless belt extending through the batt discharge opening and passing exteriorly of the felting chamber, means to transfer the batt from the lower run of the foraminous endless belt to a flexible sheet including a flexible sheet carrying roll having its inner side operating within the batt discharge opening beneath the lower run, the inner side of the roll turning upwardly toward the lower run so that the sheet passes upwardly toward and in contact with the batt within the felting chamber, means coacting with the roll to form an air seal, a blower having its outlet leading into one end of the felting chamber beneath said lower run for supplying air and fibrous material into the felting chamber and serving to create a pressure within the felting chamber above atmospheric pressure, and a vertically curved plate arranged within the felting chamber adjacent to the opposite end of the felting chamber and arranged opposite the outlet of the blower.

11. The method of producing a batt, comprising providing a stream of air having fibrous material suspended therein, subjecting the suspended material to a pressure above atmospheric pressure, moving upwardly the suspended material while in the presence of the pressure above atmospheric pressure and depositing the same in an upward direction in a substantially horizontal layer, moving the deposited layer longitudinally, moving a flexible sheet upwardly into contact with the lower face of the deposited layer of the fibrous material while such fibrous material is subjected to the pressure above atmospheric pressure and applying the layer to the upper face of the sheet, forming an air seal and placing the air seal in communication with the pressure above atmospheric pressure, feeding the contacting deposited layer of the fibrous material and sheet from the presence of the pressure above atmospheric pressure by passing the same through the air seal, and causing the pressure above atmospheric pressure to act upon the fibrous material in the direction of its feeding movement.

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