June 9, 1959 W. WACKER ET AL 2,889,583

METHOD AND DEVICE FOR SUPERPOSING OF FIBRE-FLEECES

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Fig. 1

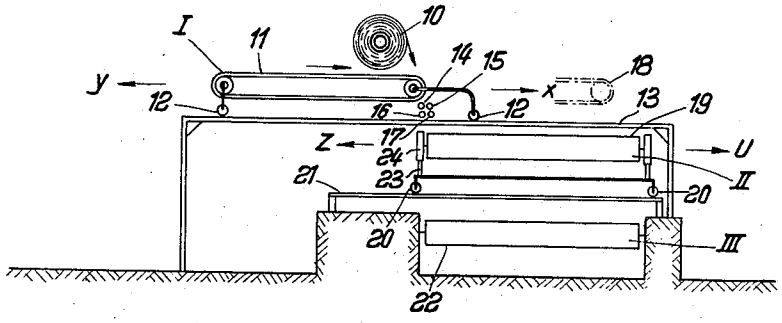


Fig. 2

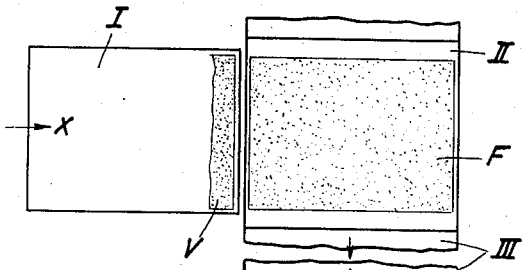


Fig. 3

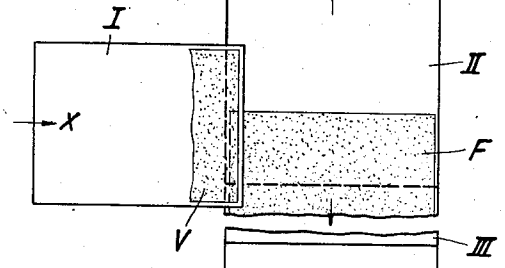
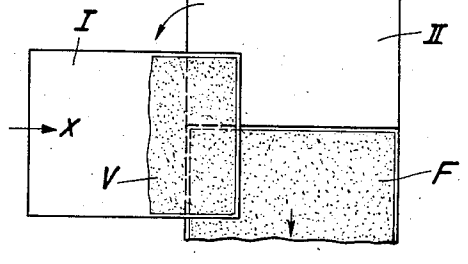


Fig. 4



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METHOD AND DEVICE FOR SUPERPOSING OF FIBRE-FLEECES

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Fig. 5

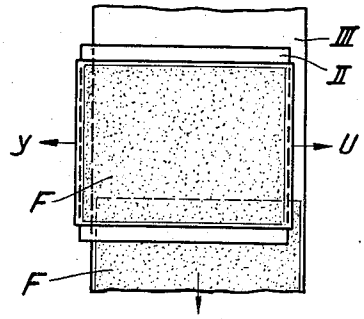


Fig. 6

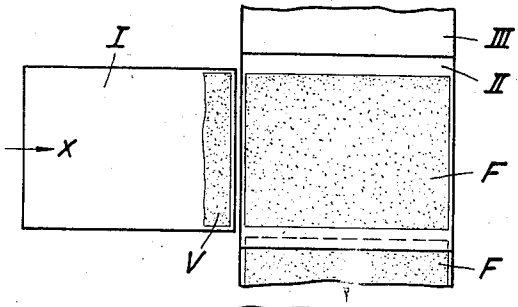


Fig. 7

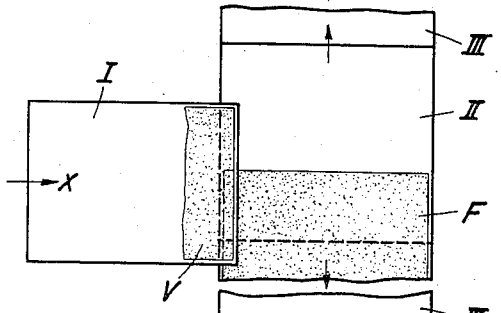
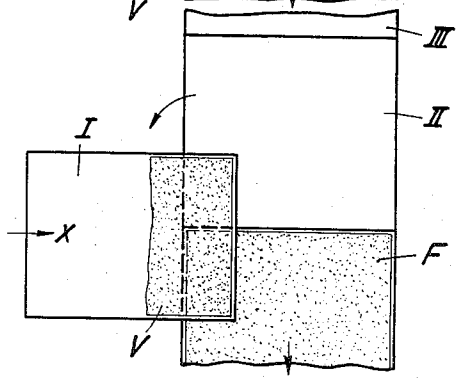


Fig. 8



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METHOD AND DEVICE FOR SUPERPOSING OF FIBRE-FLEECES

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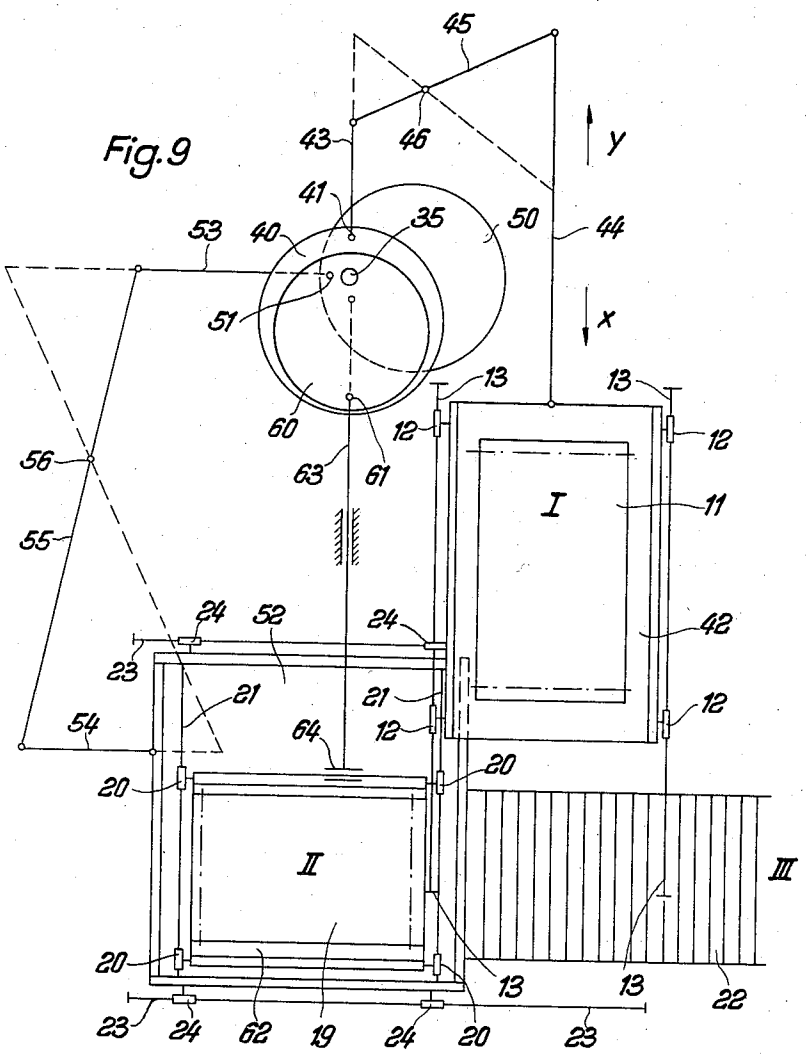
Fig. 9



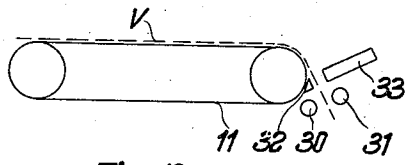


Fig. 10

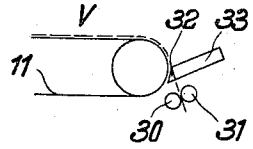


Fig. 11

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United States Patent Office 2,889,583 Patented June 9, 1959

2,889,583

METHOD AND DEVICE FOR SUPERPOSING OF FIBRE-FLEECES

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Application December 30, 1953, Serial No. 401,332
Claims priority, application Germany June 3, 1952
5 Claims. (Cl. 19—161)

For the production of multiple fibre-fleeces of natural or artificial fibres it is known to wind up single carding-fleeces on bobbin-cylinders and to unwind them again, whereby any number of fleeces may be superposed. To increase the transversal resistance of such fleeces different devices are known for transversal superposing. These are composed of tables with cross-laying arms, wherein also conveyor belts may be used.

With all these devices the single carding fleeces are superposed in such a way that either the angular folded fleeces at their turning edges or the edges of the single fleece sections partly overlap. Dependent on that the thickness of the fleece becomes irregular, which is disturbing and therefore undesired. The thickened parts, for instance, prove more absorbent when being impregnated and when passing through couch-rolls they receive irregular pressure, whereby the elasticity of the multiple fleece becomes irregular too.

Therefore the invention relates to a method for superposing of fibre-fleeces in which conveyor belts are used in such a way that the delivery of the breadth of fleece is performed by means of a feed-conveyor belt which rotates horizontally and can be moved in the direction of its progress. By corresponding movements the said feed-conveyor belt delivers one section of a breadth after another transverse to the main direction of conveyance to a guiding-belt arranged below. From this guiding-belt the single sections are again delivered to a breadth of fleece that continuously passes by below and on which they are arranged contiguously.

The arrangement of contiguous fleece sections is performed transverse to the main direction of conveyance and the sections are superposed on a continuously running breadth of fleece by means of oscillating movements of the feed- and guiding-belt carriages on which the belts provided thereon move during a part of the movement of the carriages.

To accomplish this method according to the invention devices of different kind may be used, wherein the systems of drive and control of the cooperating conveyor-belts are essential.

An example of a device for the accomplishment of the method according to the invention is schematically shown in the drawings.

Fig. 1 is a side view of the means of conveyance according to the invention, whilst

Figs. 2–8 illustrate the movements of conveyance of the fibre-fleece, respectively of one fleece section.

Fig. 9 explains schematically a central control for the means of conveyance for the fleeces.

Fig. 10 shows a special arrangement of a cutting-off device in opened and

Fig. 11 in closed position.

The sequence of the phases of movement can be seen in Figs. 2–8, wherein the fibre-fleeces are signified by dotted areas whilst the conveyor-belts or the like show the same reference numbers as Fig. 1. The continuously

conveyed fleece is designated V, the cut-off sections are marked F.

The fleece which has to be superposed in sections is continuously taken from a bobbin cylinder **10**, respectively a carding machine, and delivered to the endless conveyor belt **11** of the conveyor-belt unit I which at the beginning of the operation is to be found in the position shown in Figs. 1, 2, and 6. In the following the conveyor-belt unit I will be called feed-conveyor belt unit. The endless conveyor belt **11** of the feed-conveyor belt unit I is at first stationary and during the delivery of the fibre fleece V onto the belt **11** the unit I is laterally displaced in the direction of arrow X, and by means of the travelling rollers **12** it is gradually guided on the track **13** above the guiding-belt unit II. On the conveyor belt unit I are mounted four clamping cylinders **14**, **15**, **16** and **17** which are arranged in pairs as best seen in Fig. 1 adjacent and slightly below the right roller over which the conveyor belt **11** of the conveyor unit **1** is guided. The clamping cylinders **14–17** are mounted on the unit I for movement therewith in the directions of the arrows *x* and *y*, respectively, and the cylinders are adapted to rotate about their own axis for the purpose as will be described later on. The fleece V taken from the cylinder **10** is passed between the pairs of clamping cylinders **14–17**.

The feed-conveyor belt unit I moves into its end position **18** (shown in dash-dotted lines Figs. 1–5). After this end position **18** is reached, the direction of movement of the feed-conveyor belt unit I is reversed, it moves back in the direction of arrow Y, and during this back movement of the unit I whereby the rotating movement of the endless conveyor belt **11** is provoked by any known means, not forming part of the present invention. The conveyor belt **11** is thereby moved with such a speed and in a direction that the upper strand of the belt moves the fibre-fleece V supported thereon in the direction of the arrow *x* with the same speed and in the same direction as during the movement of the unit I in the direction of the arrow *x*, whereby that part of the breadth of fleece which has passed between the clamping cylinders **14–17** is superposed on the endless conveyor belt **19** of the guiding-belt unit II, whose direction of movement is normal to that of the feed-conveyor belt unit I. The whole guiding-belt unit II is arranged on travelling rollers **20** in such a way that it can be laterally displaced on the track **21**. As soon as the feed-conveyor belt unit I has reached its starting position shown in Fig. 1, that part of the breadth of fleece V which has been superposed on the conveyor belt **19** of the guiding-belt unit II is cut off by means of the clamping cylinders **14–17**, and the feed-conveyor belt unit I anew begins its explained movement in the direction of arrow X (Fig. 6). During the movement of the belt conveyor unit I towards the left, as viewed in Fig. 1, in the direction of the arrows *y*, the pairs of clamping cylinders **14**, **15** and **16**, **17** are preferably rotated towards each other to help placing the fleece taken up from the cylinder **10** onto the belt of the second belt conveyor unit II. When the unit I reaches its starting position as shown in Fig. 1 in full lines, the fleece taken from the cylinder **10** is cut off as mentioned above in a well known manner by means of the clamping cylinders **14–17**. This cut off is performed by clamping the pair of upper clamping cylinders **14** and **15** tightly against the fleece to hold the same stationary, whereas the pair of lower clamping cylinders **16** and **17** are rotated with fast speed towards each other, so that the fleece is cut or torn off along a substantial straight line between the two pairs of clamping cylinders. The drive of these clamping cylinders and the control of the movement thereof may be performed in any well known manner, not forming part of the present invention. The cylinders may be

driven individually by small electrical motors and the clamping movement controlled by solenoids and the motors and solenoids in turn be controlled by proper switches arranged along the track as well known in the art.

The cut off fleece section F placed on the top run of the belt **19** of the belt conveyor unit II in the manner as described above is then transferred onto the fleece located on the top run of the endless belt **22** of the conveyor belt unit III located below the unit II as shown in Fig. 1. The belt **22** of the conveyor unit III is located at right angles to the path of reciprocation of the unit I and this belt is slowly driven in the direction of the arrow shown in Fig. 2. To transfer the cut-off fleece section F from the top run of the belt **19** of the conveyor unit II onto the fleece located on the top run of the conveyor belt of the feed unit III, the conveyor belt unit II is moved by means of the rollers **24** on the track **23** at relatively great speed in a direction opposite to the direction of movement of the conveyor belt **22** of the unit III. During this movement of the conveyor belt unit II the rollers on which the belt **19** is mounted are rotated in such a way that the top run of the belt moves in the direction of progress of the conveyor belt **22** of the unit III. In this way the cut off fleece section F is transferred from the top run of the belt **19** of the conveyor unit II to the fleece located on the top run of the conveyor belt **22** of the unit III, while this latter fleece is continuously and slowly moved in a direction opposite to the direction of movement of the conveyor unit II.

After its delivery movement the guiding-belt unit II moves back on the track **23** in its starting position and is simultaneously displaced on the track **21** in the direction of arrow Z by means of the travelling rollers **20**. It is mentioned that the movement of the unit II in the direction of the arrow Z is not absolutely necessary for the proper working of the machine and the track **21** and rollers **20** of the unit II and the reciprocation of the unit II in the directions of the arrows Z and U, respectively, may also be omitted. However, it will be evident that if the unit II is moved in the direction of the arrow Z while the unit I is moved in the direction of the arrow X, the superposition of the two units I and II may be performed much faster so that the transfer of the fleece V from the belt **11** of the unit I onto the belt **19** of the unit II can start sooner than in a machine in which the unit II would not be reciprocated in a direction opposite to the direction of the movement of the unit I.

Meanwhile the feed-conveyor belt carriage I has reached again its position **18** as shown in Fig. 1 and delivers another section of the breadth of fleece V to the conveyor belt **19** of the guiding-belt unit II which is in its end position beneath unit I as shown in Fig. 5. Now the guiding-belt unit II moves in the direction of arrow U until it is superimposed over unit III, so that the conveyor-units I and II move contrary to each other, whereby the endless belt **19** of the guiding-belt unit II is stationary, whilst the endless belt **11** of the feed-conveyor belt unit I is circulating. As soon as the width of the endless cloth **19** is covered with fleece V another section F is cut off by means of the clamping cylinders **14–17**, after which this section is superposed on the conveyor belt **22** of the conveyor-belt unit III in the explained way (Figs. 6, 7, 8).

Due to the corresponding speed of the conveyor-belts **11**, **19** and **22** a contiguous arrangement of the single sections of the fleece is guaranteed. In the arrangement according to the invention the conveyor-belt **22** is driven continuously so that the delivery of upper- and lower-fleeces may be performed. This makes it possible to put the single sections of the fleece, which are delivered in transversal direction, between two breadths of fleeces running in longitudinal direction.

To make it possible to work up very thin breadths of fleeces preferably the conveyor-belts **11**, **19** and **22** are provided with devices which guarantee a safe delivery of the single sections of the fleece. For this purpose especially pressure cylinders are suitable and the guiding-belt may be arranged with a slight declination to the feed-conveyor belt.

For the cutting-off of the single sections of the fleece known devices may be used as well. Especially suitable, however, is the cutting-off device shown in Figs. 10 and 11, which is arranged at the end of the feed-conveyor belt I similar to the cylinders **14**, **15**, **16**, **17**. The said device is provided with two cylinders **30** and **31**, of which at least one has to be driven, and with an abutment **32** and a counterpressure bar **33**. During the delivery of the fleece the elements of the cutting-off device are separated two by two so that the breadth of fleece V does not touch them anywhere, but is able to pass unhindered (Fig. 10). At the very moment of separation the counter-pressure bar **33** is pressed against the abutment **32** and the cylinder **31** against the cylinder **30**, so that the section of the fleece is cut off instantly (Fig. 11). Since the cutting-off device is closed only for a moment, the continuously running fleece does not bulge. To avoid disturbing eddies of air it proves useful to increase the speed of rotation of the driven cylinder **31** to the necessary cut-off speed only immediately before it is touching the fleece.

Especially suitable for the device according to the invention are sprocket chain drives, wherein the chains can be blocked periodically in order to separate the single phases of conveyance. So stopping periods are attained which are adapted by suitable means as well to the length of the single sections of the fleece as to the working speed. For said control known technical means may be used. Especially suitable are reciprocating or oscillating systems which are electrically and mechanically controlled.

Fig. 9 shows schematically moving means for the device according to the invention shown in Fig. 1. The moving means consists of three cam discs **40**, **50**, **60** which are fixed to the shaft **35** for movement therewith. The three eccentrically revolving cam discs **40**, **50**, **60** are provided with cam grooves (not shown in the drawing) in which follower pins **41**, **51**, **61** are guided to derive the movements for the carriage **42**, **52**, **62** which carry the conveyor-belts I and II. When the cam discs are in rotation the pins **41**, **51**, **61** are reciprocated radially to the shaft **35**. By means of the disc **40** via the push and tension rods **43**, **44** and the double armed lever **45**, fixed at a pivot **46** and articulated to said rods, the carriage **42** receives an oscillating movement in the direction of the arrows X, Y. In the same way the carriage **52** is articulated to the pin **51** by means of the push and tension rods **53**, **54** and the double armed lever **55** connected with the said rods and fixed at a pivot **56**. The movement of the carriage **62** is transmitted by the push rod **63** provided with the sliding guide **64**.

The dashed lines in Fig. 9 show the opposite end positions of the said levers, which are reached after half a revolution of the shaft **35**. In this opposite end position the feed-conveyor belt I is above the now stationary guiding-belt II as already explained in connection with Fig. 1.

The two carriages **42** and **62** always move in opposite directions and thereby compensate the intervals of stopping and cutting-off.

The advantage attained by the device according to the invention is the possibility of producing a multiple fibre-fleece which shows a complete regular thickness and in which the fibres of the single carding fleeces are exactly cross like superposed. This exact cross like superposition guarantees an equal tensile strength in all directions. These advantages are due to the contiguous arrangement of the single sections of the carding fleece. The regular thickness is attained by the mastering of the movements of conveyance with suitable controlling means, which

make it possible to arrange the transverse delivered sections of the fleece contiguously.

Another advantage is the possibility of a very high working speed, which allows to take the fibre fleece V directly from a carding machine.

What is claimed as the invention is:

1. A method of making a multi-layer cross-laid fibrous web comprising the steps of continuously drawing a first fibrous web in a first direction; laying said web on a first supporting surface while said supporting surface moves in said first direction; transferring said web from said first supporting surface across a second supporting surface located below said first supporting surface while withdrawing said first supporting surface in a direction opposite to said first direction; cutting the portion of said web laid across said second supporting surface from said web; and transferring said cut-off web portion onto a second fibrous web continuously moving in a plane located below said second supporting surface and in a second direction inclined to said first direction while moving said second supporting surface in a direction opposite to said second direction with such a speed that the cut-off portions of said first web will be superimposed on said second web adjacent each other and with their longitudinal edges in abutting relationship.

2. A method of making a multi-layer cross-laid fibrous web comprising the steps of continuously drawing a first fibrous web in a first direction; laying said web on a first supporting surface while said supporting surface moves in said first direction; transferring said web from said first supporting surface across a second supporting surface located below said first supporting surface while withdrawing said first supporting surface in a direction opposite to said first direction; cutting the portion of said web laid across said second supporting surface from said web; and transferring said cut-off web portion onto a second fibrous web continuously moving in a plane located below said second supporting surface and in a second direction normal to said first direction while moving said second supporting surface in a direction opposite to said second direction with such a speed that the cut-off portions of said first web will be superimposed on said second web adjacent each other and with their longitudinal edges in abutting relationship.

3. A device for making a multi-layer fibrous web comprising, in combination, a support; means for continuously conveying a first web at substantially uniform speed in direction of its length; first support means for supporting said web in a first plane and being mounted on said support for reciprocating motion in said direction; second support means for supporting said web in a second plane below said first plane and being mounted on said support for reciprocating movement in a second direction inclined to said first direction, said second support means having an edge substantially parallel to said second direction, said first support means receiving a portion of said web as it is moved in one direction and transferring said portion of said web across said second support means during the movement of said first support means in a direction opposite to said one direction; cutting means for cutting said first web along said edge of said second support means; and means for continuously conveying a second web at substantially uniform speed in a plane below said second plane and in direction of its length along said second direction, and said second support means transferring the cut portions of said first web onto said second web in abutting relationship during the movement of said second support means in a direction opposite to said direction in which said second web is continuously fed.

4. A device for making a multi-layer fibrous web comprising, in combination, a support; means for continuously conveying a first web at substantially uniform speed in direction of its length; first support means for supporting said web in a first plane and being mounted on said support for reciprocating motion in said direction; second support means for supporting said web in a second plane below said first plane and being mounted on said support for reciprocating movement in a second direction normal to said first direction, said second support means having an edge substantially parallel to said second direction, said first support means receiving a portion of said web as it is moved in one direction and transferring said portion of said web across said second support means during the movement of said first support means in a direction opposite to said one direction; cutting means for cutting said first web along said edge of said second support means; and means for continuously conveying a second web at substantially uniform speed in a plane below said second plane and in direction of its length along said second direction, and said second support means transferring the cut portions of said first web onto said second web in abutting relationship during the movement of said second support means in a direction opposite to said direction in which said second web is continuously fed.

5. A device for making a multi-layer fibrous web comprising, in combination, a support; means for continuously conveying a first web at substantially uniform speed in direction of its length; a first conveyor belt unit mounted on said support for reciprocating motion in said direction and including an endless conveyor belt for receiving and supporting said first web as it is continuously conveyed from said means; a second conveyor belt unit mounted on said support for reciprocating motion in a second direction normal to said direction in which said first web is fed and including an endless belt located below said belt of said first conveyor belt unit; transfer and cutting means on said first conveyor belt unit for transferring the first web from the conveyor belt of the first conveyor belt means across the conveyor belt of the second conveyor belt unit and for cutting said first web into portions having a length equal to the width of the conveyor belt of the second conveyor belt unit; means for supporting and continuously conveying a second web at substantially uniform speed in direction of its length along said second direction and in a plane below said second conveyor belt unit; first moving means for alternately moving said first conveyor unit in the direction in which said first web is conveyed without moving the endless belt conveyor thereof relative to said unit and in a direction opposite to said direction in which said first web is conveyed while moving the conveyor belt thereof in the direction in which said first web is conveyed; and second moving means fore moving said second conveyor belt unit in a direction opposite to the direction in which said second web is fed while moving the conveyor belt thereof in said direction in which said second belt is fed.

References Cited in the file of this patent

UNITED STATES PATENTS

33,426	Butler	Oct. 8, 1861
65,456	Waite	June 4, 1867
2,434,887	Repass et al.	Jan. 20, 1948
2,710,992	Goldman	June 21, 1955

FOREIGN PATENTS

925,338	Germany	Mar. 17, 1955