March 27, 1951 J. H. ZIMMERMANN 2,546,809

BALE OF FIBROUS MATERIAL AND PROCESS OF FORMING SAME

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Fig. 1.

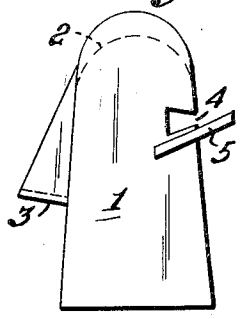


Fig. 2.

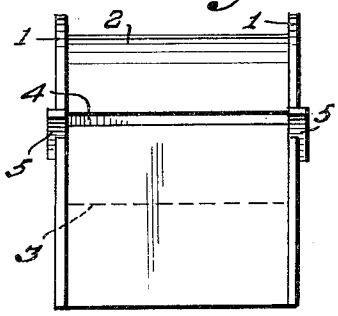


Fig. 3.

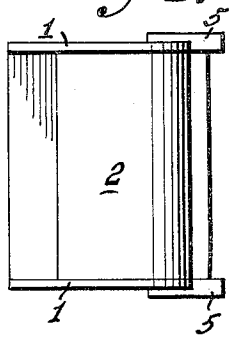


Fig. 4.

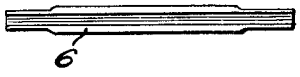


Fig. 5.

Fig. 6.

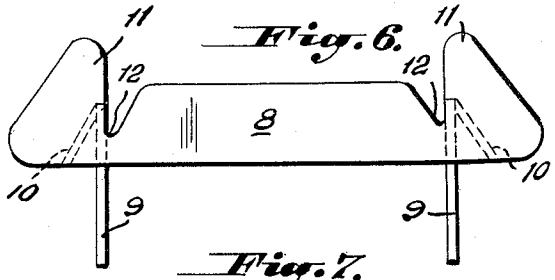


Fig. 7.

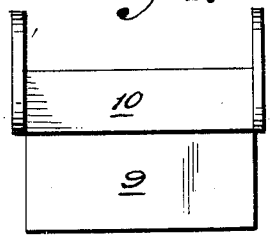
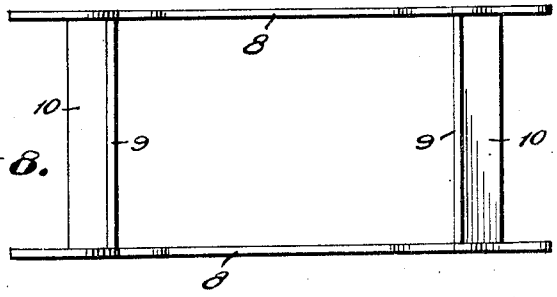


Fig. 8.



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March 27, 1951 J. H. ZIMMERMANN 2,546,809

BALE OF FIBROUS MATERIAL AND PROCESS OF FORMING SAME

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Fig. 9.

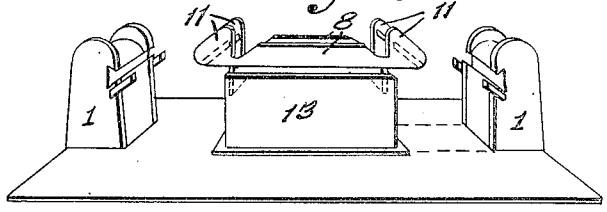

Fig. 10.

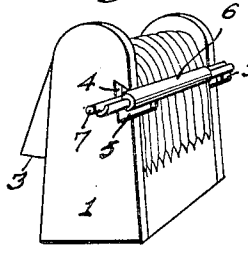

Fig. 11.

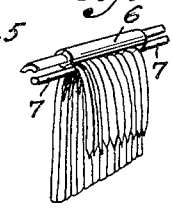

Fig. 12.

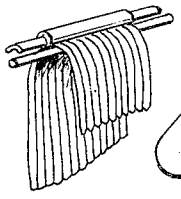

Fig. 13.

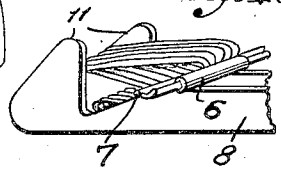

Fig. 14.

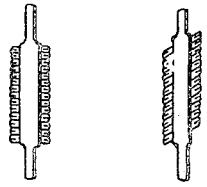

Fig. 15.

Fig. 16.

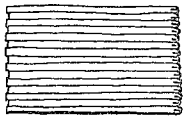

Fig. 18.

Fig. 19.

Fig. 20.

Fig. 21.

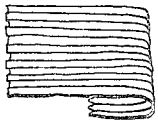

Fig. 17.

Fig. 24.

Fig. 22.

Fig. 36.

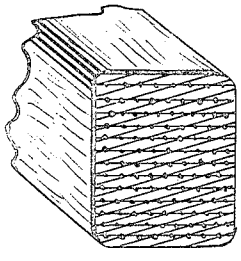

Fig. 37.

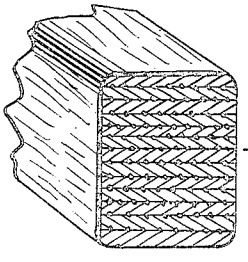

Fig. 23.

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BALE OF FIBROUS MATERIAL AND PROCESS OF FORMING SAME

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Fig. 25.

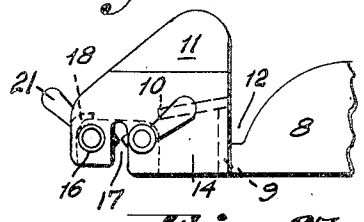

Fig. 26.

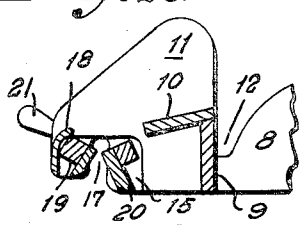

Fig. 27.

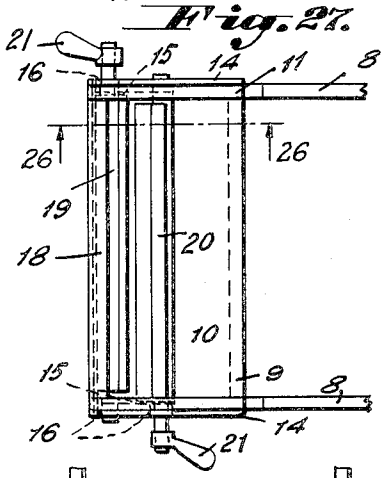

Fig. 28.

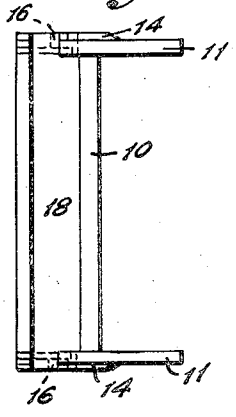

Fig. 29.

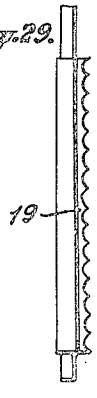

Fig. 30.

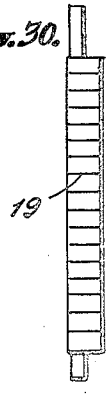

Fig. 31.

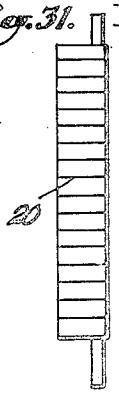

Fig. 32.

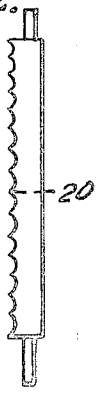

Fig. 33.

Fig. 34.

Fig. 35.

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Patented Mar. 27, 1951

2,546,809

UNITED STATES PATENT OFFICE

2,546,809

BALE OF FIBROUS MATERIAL AND PROCESS OF FORMING SAME

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Application July 29, 1946, Serial No. 686,900
In the Netherlands February 25, 1941

Section 1, Public Law 690, August 8, 1946
Patent expires February 25, 1961

6 Claims. (Cl. 100—14)

1

This invention relates to the baling of long industrial fibers and more specifically to a method of baling long industrial fibers in which a mass of fibers is arranged in a horizontal layer with the fibers running lengthwise of a baling box, the feet of the fibers being at one end and the fibers being folded backward upon themselves at the other end of the box, the fibers being so displaced that in the fold they slant obliquely, succeeding layers being pressed into said box on top of said first layer to form a bale, each of said layers at one end having a fold in which the fibers slant obliquely and the folds of successive layers being placed at opposite ends of said baling box. The invention also includes the bale produced by the above described process, said bale comprising a plurality of superimposed layers of fibers having their feet at one end of the bale and being folded obliquely back upon themselves at the opposite end of the bale, the folds and the feet of the fibers in successive layers being reversed with respect to adjacent layers, all as more fully and hereinafter set forth and disclosed.

An object of this invention is to form bales of long industrial fibers with the fibers folded in such a manner that the tendency of the fibers to break in the fold is eliminated.

A further object of the invention is to bale industrial fibers in such a manner that a greater weight of fibers can be compacted within the same cubic dimensions than in previous baling processes.

In the production of bales from long industrial fibers it is highly important that these bales be made very compact as the freight cost is determined by their cubic measure rather than by their weight. Prior to my invention it was difficult to form a compact bale because no method was known of folding the thin ends of the fibers so that they would not crack at the folds. According to prior methods of baling the ends were folded with the fiber running vertically in the fold. A fold of this type will crack under the pressure required to compact the bale, so that it has always been necessary to ship the fibers in bales so large that the freight charge was an appreciable part of the cost price.

I have discovered how the above and other objects can be accomplished and the difficulties overcome by a simple modification of the usual

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procedure used in the baling of industrial fibers. According to the method of my invention the fibers in the folds are displaced in such a manner that in the folds they slant obliquely so that the thin ends lie parallel with the main bodies of the fibers but are displaced in the horizontal direction whereas in the prior method the thin ends lay directly beneath the main bodies of the fibers. The required displacement can be accomplished in various ways either by hand or by clamping the fibers between two rods and displacing them in the described manner before pressing them in the baling or pressing box. In performing this latter method a baling box of greater width than that of the layers is used to allow for the displacement of the folded ends.

My invention can be explained in greater detail by reference to the accompanying drawings which show more or less diagrammatically how the fibers are arranged during my baling operation as compared with former processes. Two embodiments of bales that are formed by the process of my invention are also illustrated.

Fig. 1 is an end view of the trestle used in my invention,

Fig. 2 is an elevation of the trestle,

Fig. 3 is a plan view of the trestle,

Fig. 4 is an elevation of the clamping bar,

Fig. 5 is an elevation of the clamping rod,

Fig. 6 is an elevation of the filling frame,

Fig. 7 is an end view of the filling frame,

Fig. 8 is a plan view of the filling frame.

Fig. 9 is a perspective view of an assembly including two trestles, a baling box and a baling frame used in my process,

Fig. 10 is a perspective view of the trestle showing a layer of fibers lying across its top in position for transfer to the filling frame,

Fig. 11 is a perspective view of the layer of fibers, before displacement thereof, held by the gripping bars as removed from the trestle,

Fig. 12 is a similar view of the fibers after displacement and ready to be transferred to the filling frame,

Fig. 13 is a perspective view of one end of the filling frame showing the fibers being drawn over the end of the frame,

Fig. 14 is a plan view of the fibers held by the gripping bars as in Fig. 11 before displacement,

Fig. 15 is a similar view after the fibers have been displaced,

Fig. 16 is a plan view of the body portion of a layer of fibers formed in the baling process with the feet at one end and folded at the other end, as in the process of the prior art,

Fig. 17 is a side view of the layer of fibers of the prior art shown in Fig. 16,

Fig. 18 is an end view of the folded end of the layer of fibers of the prior art shown in Figs. 16 and 17 after pressing,

Fig. 19 is a similar view showing how the fibers of the prior art frequently become distorted in the fold on pressing,

Fig. 20 shows a fiber strand previously folded with the vertical fold of the prior art showing the undesirable cracking which results when the fibers are unfolded,

Fig. 21 is a plan view of a layer of fibers having the oblique fold of the present invention at one end,

Fig. 22 is a side view of the layer of fibers of Fig. 21 showing the manner in which the fibers are folded in the layer according to the method of my invention,

Fig. 23 is an end view of the folded end of the layer of fibers shown in Fig. 21, after pressing,

Fig. 24 shows the type of fiber used in this invention,

Fig. 25 is a partial elevation showing one end of a modified filling frame,

Fig. 26 is a vertical cross section through the end of the modified filling frame taken on the line 26—26 of Fig. 27,

Fig. 27 is a plan view of the end of the modified filling frame shown in Figs. 25 and 26,

Fig. 28 is an end view of the modified filling frame with the clamping lids removed, the view being taken in the horizontal plane,

Fig. 29 is an elevation of one of the cooperating clamping plates used in the modified filling frame,

Fig. 30 is a plan view of the clamping plate shown in Fig. 29,

Fig. 31 is a plan view of a cooperating clamping plate which cooperates with the plate shown in Figs. 29 and 30,

Fig. 32 is an elevation of the plate of Fig. 31,

Fig. 33 is an end view of the clamping plate shown in Fig. 29,

Fig. 34 is an end view of a clamping plate showing the handle used for operating the same,

Fig. 35 is an end view of the clamping plate shown in Fig. 32,

Fig. 36 is an end view of a bale having oblique folds in which the fibers all slant in the same direction, while

Fig. 37 is an end view of a bale having oblique folds in which the folds of successively superimposed layers are folded obliquely in opposite directions to give a herringbone pattern.

In the various figures like parts are designated by like reference numerals.

As shown in Figs. 1 to 3 the trestle used in my process comprises two ends 1 connected by a cylindrical top 2 over which fibers are spread. Extending from one side in a horizontal direction is a plank 3 and on the opposite side is a gutter or indentation 4. Mounted directly below the gutter and protruding beyond the edges of the ends are arms 5. The width of the trestle corresponds to the width of the baling box and accordingly to the width of the finished bale. As shown in Figs. 4 and 5 the clamping device, employed for removing fibers from the trestle and for transferring them to the filling frame, consists of a bar 6 having a longitudinal recess on one side which is adapted to receive the rod 7 with a layer of fibers in between. Figures 6, 7 and 8 show a filling frame comprising two longitudinal sides 8 supported by the vertical ends 9. The sides 8 are connected at each end by a slanting board 10. Each of the two longitudinal sides has an elevation 11 and a notch 12 at both ends.

In operation a layer of fibers is spread evenly across the trestle with their thick ends resting on the plank 3 and their thin ends extending slightly below the gutter 4. The bar 6 is placed in the gutter 4 behind the layer of fibers and the layer is gripped between the bar 6 and the rod 7 at a distance from the feet of the fibers equal to the length of the baling box as shown in Fig. 10. The layer of fibers is then transported to the filling frame as shown in Fig. 13.

In Fig. 25 is shown a filling frame modification comprising reinforcing plates 14, a space 15, holes 16, gates 17 and ribbed clamping plates 19 and 20, the plates having handles 21 and mounted with their ribbed faces together and with their rounded ends protruding through the holes 16 in such manner that they can be displaced longitudinally with respect to each other in order to displace the fibers in the fold, as described below.

In baling long industrial fibers of the type shown in Fig. 24 having a thick or foot end and a thin end it is conventional practice to arrange a mass of fibers in a horizontal layer with the thin ends folded back upon the bodies of the fibers as shown in Figs. 16, 17 and 18 before pressing them into a baling box 13. When these layers are placed in the baling box the feet and folded ends are reversed in successive layers. The width of the horizontal layer of fibers corresponds to the width of the baling box and the folded thin ends lie directly beneath the main bodies of the fibers as shown in the drawing. Folding the fibers is advantageous since a great deal of waste is prevented which would otherwise result if the thin ends were cut to form fibers of uniform length. The layers arranged in this manner are compressed in the baling box and as explained above it is advantageous to compress the layers into as small a cubic content as possible to save freight charges. The use of high pressures during pressing has not been possible owing to the fact that the fibers when folded vertically, as shown in Fig. 18 are likely to crack when straightened as shown in Fig. 20.

In my improved process the folded thin ends of the fibers lie parallel with but are displaced in a horizontal direction with respect to the main bodies of the fibers as shown in Fig. 21. This causes the fibers in the fold to slant obliquely as shown in Fig. 23. When folded in this manner the pressure applied during baling results in a further oblique displacement of the fibers in the bend—a twist rather than a sharp bend. I have found that bales made of layers folded in this manner are compressed to a smaller cubic content than bales made of layers folded according to prior methods, when using the same pressure.

Various methods may be used for producing the required displacement of the fibers in the folds before or after placing the layers of fiber in the baling box. For example a mass of fibers can be arranged in a layer in the baling box with their feet at one end and the thin ends at the other end of the box and the thin ends can be folded

backward underneath the layer of fibers and simultaneously being pulled to one side so that they are displaced in the horizontal direction with respect to the main bodies of the fibers.

A second more advantageous method consists in arranging a mass of fibers in a layer across a support, such as a trestle (Figs. 1 to 3 and 6 to 8) with their feet hanging on one side, as in Fig. 10 and their thin ends on the other side. The so-arranged fibers are then picked up with a pair of gripping bars (Figs. 4, 5, 11 and 12) at the point where they are to be folded, that is, at a point which is a distance from the feet corresponding to the length of the baling box. Two workmen are required, one at each end of the gripping bars. The gripping bars preferably consist of a rod 7 which is placed in the bight of the fold and a bar 6 having a longitudinal recess on one side which is adapted to receive the rod with the layers of fibers in between. While the layer of fibers is held between the gripping bars, the latter being grasped by the workmen in one hand, one of the workmen pulls the thin ends of the fibers toward himself and the other the thick ends while both relax their grip on the gripping bars. This causes the fibers to slant obliquely in the fold. The layer of fibers held by the gripping bars in the manner described is then transferred to the baling box, as in Fig. 13. The baling box which is equipped with a ram may also be equipped with a baling frame (Fig. 6) which comprises a slanting board 10 at either end across which the fibers may be dragged as they are introduced into the box. The slanting board tends to spread out the fibers into a layer of uniform thickness. The gripping bars are released when the folded ends of the fibers have been pulled into the filling frame on top of the baling box, thus laying on the previously dropped layer. The same two workmen equipped with gripping bars and another trestle stationed at the other end of the baling box introduce another layer of fibers into the baling box with the feet and folded ends in reverse position to the first described layer. This procedure is continued with operation of the ram to compress the added layers until the baling box is full and the bale completed.

If desired the required oblique displacement of the fibers in the fold can be accomplished with the aid of a pair of fluted bars 19 and 20 in the following manner. These fluted bars with the fluted sides facing each other are placed in a support such as the filling frame as in Figs. 25 to 28 in such a manner that they can be moved longitudinally with respect to each other. The above described gripping bars with the fiber held between them are then clamped between the fluted bars and the latter are then moved longitudinally with respect to each other. The pressure on the clamping bars is released during this movement so that as a result of the operation the fibers are given the desired oblique displacement.

While I have described what I believe to be the most advantageous embodiment of my invention it is evident of course that various modifications can be made in the specific procedures described without departing from the purview of my invention. As stated previously my method can be performed by hand or by means of a trestle and loading form. The displacement of the fibers in the fold can be accomplished at any time before the pressing operation and either before or after laying the fibers in the baling box. The bales may be made of any convenient size depending upon the length of the fiber as will be understood by those skilled in the art. Other modifications of my invention which fall within the scope of the following claims will be immediately evident to those skilled in the art.

What I claim is:

1. In the baling of long industrial fibers, the process which comprises arranging a mass of fibers in a horizontal layer with the fibers running lengthwise of a baling box, the feet of the fibers being at one end and the fibers being folded backward upon themselves at the other end of the box, pressing succeeding layers of fibers into said box on top of said first layer to form a bale, each of said layers at one end having a fold and the folds of successive layers being placed at opposite ends of said baling box, and prior to the pressing step displacing the folded ends of the fibers with respect to the remaining portions so that in the fold the fibers slant obliquely, whereby cracking of the fibers in the fold is prevented.

2. In the baling of long industrial fibers, the process which comprises arranging a mass of fibers in a horizontal layer with the fibers running lengthwise of a baling box, the feet of the fibers being at one end and the fibers being folded backward upon themselves at the other end of the box, displacing the fibers so that in the fold they slant obliquely, arranging a second layer of fibers on top of said first layer with a similar fold at the first mentioned end and the feet of the fibers at the opposite end of the box, the fibers in said fold also being displaced so that they slant obliquely, placing a third layer of fibers on top of said second layer with the fibers running and folded as in said first layer, the fibers in the fold being slanted in the same direction as in said first fold, continuing the described procedure and pressing the successive layers of fibers into the baling box to form a bale with superposed folds of fibers interspersed with fiber feet at the opposite ends thereof, the fibers in said folds at each end of the bale slanting obliquely whereby cracking of the fibers in the folds is prevented.

3. In the baling of long industrial fibers, the process which comprises arranging a mass of fibers in a horizontal layer in a baling box with the fibers running longitudinally, the feet of the fibers being at one end and the fibers being folded backward upon themselves at the other end of the box, displacing the fibers so that in the fold they slant obliquely, arranging a second layer of fibers on top of said first layer but with the fold and the feet of the fibers being reversed relative to the first layer, arranging a third layer of fibers on top of said second layer with the fold and the feet of the fibers again being reversed, the fibers in the fold of said third layer being displaced so that they slant obliquely in a direction opposite to that of the fibers in the fold of said first layer, adding additional layers of fibers to the box with the folds and feet of the fibers being reversed in position in successive layers and pressing the layers of fibers into the box to form a bale having superposed folds of fibers in layers interspersed with layers of feet at the opposite ends thereof, the folded fibers at each end slanting obliquely in a herringbone pattern whereby cracking of the fibers in the folds is prevented.

4. A bale of long industrial fibers comprising a plurality of superposed layers of fibers having their feet at one end of the bale and being folded back upon themselves at the opposite end of the bale, the folds and the feet of the fibers in successive layers being reversed with respect to ad-

jacent layers, the fibers in said folds slanting obliquely whereby cracking of the fibers in the folds is prevented, the said layers of fibers being compressed together.

5. The bale of claim 4 wherein the fibers in the folds at either end of the bale all slant obliquely in the same diagonal direction.

6. The bale of claim 4 wherein the fibers in each of the superposed folds at the ends of the bale slant obliquely in a direction opposite to that of the fibers in adjacent folds thereby producing a herringbone pattern.

JAN HENDRIK ZIMMERMANN.

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