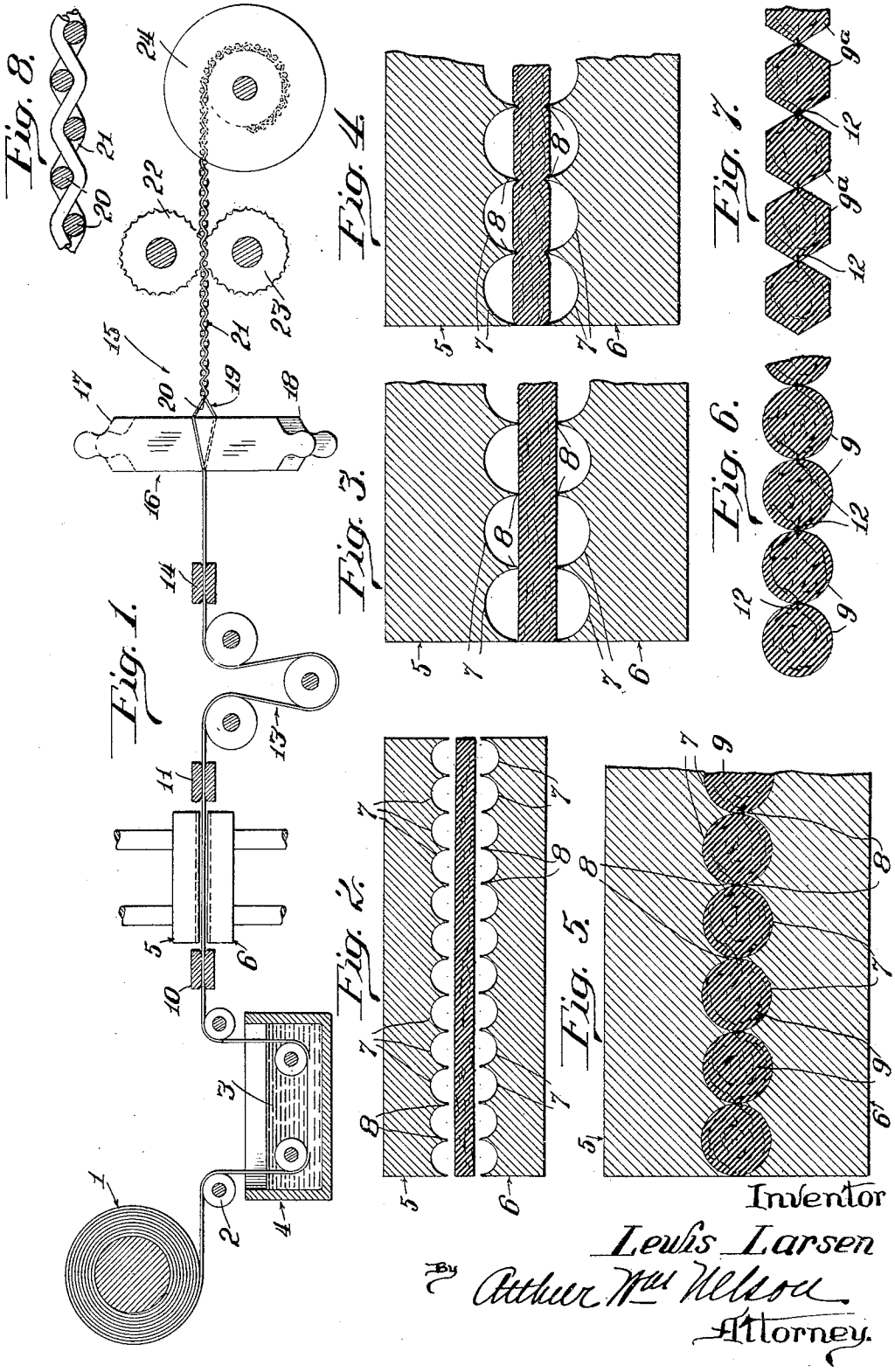
June 14, 1932. L. LARSEN 1,862,687

METHOD OF MAKING A FIBER FABRIC

Filed Aug. 4, 1930



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Patented June 14, 1932 1,862,687

UNITED STATES PATENT OFFICE

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METHOD OF MAKING A FIBER FABRIC

Application filed August 4, 1930. Serial No. 472,862.

This invention relates to improvements in methods of making a fibre fabric such for example as a stake and strand fabric, and it consists in the matters hereinafter described and more particularly pointed out in the appended claims.

The fibre fabric with which the invention is particularly concerned, comprises long strands of fibre now known as "artificial reed" and which constitutes the "warp" of the fabric, and interwoven or otherwise engaged cross strands which constitutes the weft of the fabric. In some instances the strands are interwoven with the heavier strands termed "stakes" which fabric is termed a "stake and strand" fabric and is extensively used in the furniture industry as the covering for the frames of many different articles.

Heretofore, many operations and machines, as well as a great amount of floor space were required to produce the fabric and the strands from which they were made and this, of course, increased the cost of the finished fabric in proportion. The strands were made individually and the first step was to make paper pulp into a wide strip of paper of a relatively thin cross section of about .0035" in thickness. This paper was then wound in roll form.

The paper from such a roll was next cut to provide a plurality of rolls of paper ribbons each about 1⅜" wide. Thereafter each paper ribbon was withdrawn from its roll and run through a machine that included a sizing bath and was then twisted or spun into a strand having a cylindrical cross section. The diameter of a typical strand is about .068". The formed strand was then passed around heated rolls whereby it was dried and thereafter the finished strand was wound upon a reel ready for storage for future use or for immediate use in a loom or otherwise. Whether the use was future or immediate, each strand was wound upon an individual reel.

When such strands were used in a loom as the closely adjacent warp of the fabric to be woven, a fabric 24" wide required about 360 warps, fabrics of greater or less widths requiring a proportionate number of warps. With each strand requiring its own reel, the large number of such reels is apparent. These reels were all mounted on a suitable frame work at the rear of the loom and occupied floor space much greater than the loom itself. Such a frame work had to be indeed strong to hold the large number of reels and all of this imposed a heavy floor load. Again, only skilled artisans were capable of leading off and properly threading each strand through a loom without entanglement. Again, as all strands might not feed off their individual reels in the same manner, some strands would have a tension different from that of the others. As each strand was fed off its reel by the pulling action of the fabric setting and take-up roll of the loom, a vast amount of power was absorbed by the pulling action on said strands with the result that the loom could not run at its maximum speed and production was slowed down and especially so as the breakage of an individual strand required repair that in most cases necessitated a stoppage of the loom.

In the winding of the finished strand upon its reel, the strand took an irregular lateral movement which reduces the maximum capacity thereof so that frequent changes in both the reeling and weaving operations were required.

From the above, it is apparent that from the time the pulp is operated upon to produce paper, to the time that the finished strand is incorporated in a fabric, much space as well as many machines and operations were employed in order to produce fabric under the prior practice, all of which matters materially increased the cost of such fabric.

The primary object of the invention is to provide a method whereby many of the heretofore necessary steps in producing fabric from strands of this kind are eliminated so that the cost of the fabric is thereby reduced.

Another object of the invention is to provide a method of this kind whereby it is possible to make fabric direct from a strip of pulp or fibrous material without the necessity of making, sizing and twisting a paper ribbon

into strand form prior to incorporating the same in a fabric.

A further object of the invention is to provide a method which is continuous from the time the pulp strip is fed from its associated roll until it is incorporated in a fabric, the steps and sequence of the same being such that it is possible to coordinate them in proper relation in a single apparatus so that the use of much floor space, as well as machines and hand and other operations are eliminated.

These objects of the invention, as well as others, together with the many advantages thereof, will more fully appear as I proceed with my specification.

In the drawing:—

Fig. 1 is a diagrammatic view illustrating an apparatus capable of carrying out the steps of the invention relating to forming a fibre fabric.

Fig. 2 is a view illustrating a transverse section through the fibre pulp strip and end elevation of associated strand forming dies, after the dies have been relatively separated to permit the feed of a new area of said such strip to said dies.

Fig. 3 is a detail transverse sectional view on an enlarged scale through a portion of the dies of Fig. 2 as they approach the pulp strip between them.

Fig. 4 is a view similar to Fig. 3 with the dies approaching each other and partially slitting and forming the pulp strip into strands.

Fig. 5 is a view similar to Fig. 4 after the dies have completed their relative movement toward each other to form the desired web of strands.

Fig. 6 is a transverse vertical section through a web of finished strands before the same is operated upon by a loom and illustrates the side by side arrangement of the strands in said web and the attenuated connections, if any, between adjacent strands.

Fig. 7 is a view similar to Fig. 6 illustrating strands of a different cross sectional shape, and

Fig. 8 is a detail longitudinal section through a piece of fabric made in accordance with one embodiment of the invention.

In general, my improved method consists in first providing a long strip of fibre pulp. In order to make such a strip easy for handling and still retain its integrity as a strip, it is necessary that it be thoroughly dried and preferably in roll form. For the purpose of making strands for general use in the furniture industry, that is to make a fibre reed fabric, the pulp strip should have an approximate thickness of about .038″. This strip is led through a liquid bath (preferably sizing) which is readily absorbed so that the strip swells to substantially twice its thickness or to about .072″.

From the sizing bath the strip passes between coacting dies with which suitable strippers are preferably associated to prevent adherence of the strands to the dies in their relative movements away from each other. The said dies are so formed as to provide aligned or registering grooves, each defined by sharp knife blade-like edges that sever or substantially sever the sized and now damp or moistened pulp strip into ribbons. The said grooves are of such cross sectional shape that the ribbons at the time of the slitting thereof are compressed laterally inward to fill up such grooves whereby the strands thus produced take on the cross sectional shape of the coacting grooves. I find that after these operations, the strands have a diameter of about .068″. The formed strands as they leave or issue from the coacting dies, while all being arranged in close intimate side by side relation, may or may not have lateral connection. If such a connection be present, it is purely an attenuated one, which upon any relative movement of the strands, quickly disintegrates to dissipate any bonding action between the strands.

After the strands leave the die as a web of closely adjacent and associated moistened compressed strands, they pass in operative relation with respect to drying means whereby the strands are dried and without in any way of breaking the continuity of the strands, they are passed through suitable guides on a loom and then through the shedding mechanism of said loom. In this mechanism the desired strands are operated upon to form sheds through which "wefts" sometimes referred to as "stakes" are inserted as such sheds are formed and as each weft is locked in place by the formation of the succeeding shed, the fabric is formed from that point onward. The formed fabric thereafter passes between longitudinally fluted fabric shape setting and feed rolls and is thereafter wound upon the take-up roll of the loom, ready for such use as it is desired to make of the finished fabric.

Referring now in detail to that embodiment of the invention illustrated in Fig. 1, 1 indicates as a whole, a roll of fibre pulp in strip form as the same will come from the pulp mill. Such a strip, for the purpose of making a strand of approximately .068″ should be about .038″ in thickness and is quite compact and dense in character. It also has a considerable affinity for water or other liquid. Said strip is passed over and under suitable rolls 2 arranged to guide a portion of the strip into and out of a sizing bath 3 in a container 4 whereby both sides of the strip are fully exposed to the sizing which is readily absorbed or taken up thereby. As the strip leaves the sizing bath, due to the quantity of sizing it absorbs, it swells in thickness to about .072″ and is quite damp or moist.

From the sizing bath the damp, sized strip is led between suitable coacting dies 5 and 6 respectively. As shown herein, said dies are capable of a relative reciprocating movement toward and away from each other, but as is apparent, a pair of coacting roller dies will serve as well.

The coacting surfaces of said dies are formed to provide closely adjacent parallel grooves 7, preferably of a semi-cylindrical cross section, of approximately 180° in length, separated by relatively sharp knife edge ridges 8, with the ridges of one die in register with those of the other die. I find that such grooves, having a radius of about .034″ produce good results as this gives a spacing of about .068″ between the knife edge ridges which corresponds to the diameter of the finished fibre strand to be made.

Reciprocating movement of said dies may be accomplished in any suitable manner and when said dies have moved away from each other to their limit, they must be, at that time, separated to such an extent that the strip of fibre pulp can freely pass between them.

When said dies have approached each other, to their limit of relative movement in this direction, the knife edge ridges of one die engage those of the other with but little, if any, pressure contact as substantial pressure contact would unduly dull said edges. It is apparent that in the case of reciprocating dies, as described, the feeding movement of the strip therebetween will necessarily be intermittent but with roller dies, as before mentioned, the feeding movement of the strip would be continuous.

With a portion of the strip disposed between said dies, as said dies approach each other, the knife edge-like ridges first engage the opposite surfaces of the strip and will cut thereinto and will start a lateral inward compression of those portions of the strip in line with the coacting grooves. As the said dies approach the final limit of movement toward each other, this further cutting action on the strip from opposite surfaces thereof, is increased and the material of the strip in line with said grooves is crowded into said grooves with a compressing action so that strands 9 are formed from the strip that take on the cross sectional shape of the coacting grooves which, in this instance, is cylindrical. This forming of the strands into cross sectional shape of different form from that of the sheet, is greatly facilitated by the moist character of the sheet.

As before stated, when the dies have reached the limit of movement toward each other, the knife edge ridges of one die do not engage with great pressure contact with those of the other, so that there may possibly be a lateral connection left between the strands, but such a connection would be indeed an attenuated one, which could be readily broken upon any relative movement between the strands. I find that in most instances a complete severance is had between the strands and such connection or bonds as may exist between the strands occur at irregular longitudinal spacings so that such a severance may be considered entire and complete.

As the strands thus formed are under compression in the grooves, I provide at each end of the dies, strippers 10 and 11 respectively whereby when the dies move away from each other, the newly formed strands are held against following either die so that they are cleanly stripped therefrom.

In Fig. 6, I have illustrated a portion of a web of strands arranged in intimate side by side relation and all in the same plane and for the sake of clearness, I have shown short lines 12 disposed in said plane between adjacent strands to indicate such attenuated connections or bonds that may so happen to exist along the length of the strands. By the compression action before referred to, whereby the desired cross sectional shape is imparted to said strands, another advantage flows therefrom in that such action forces all projecting fibres back into the strands and packs them thereinto to provide a smooth, hard, calendered, exterior surface finish. Instead of the strands being cylindrical in cross sections, other cross sectional shapes may be imparted thereto and in Fig. 7, I have shown the strands 9^a as of a hexagonal shape. Such a shape readily lends itself to formation in accordance with the teachings of the invention thus far described.

After the web of closely adjacent strands 9 leave the stripper 11, said web passes in operative relation with respect to suitable drying means 13 and then, it is fed through a strand guide 14 of a loom indicated as a whole as at 15 and the various strands are then threaded through the shedding mechanism 16 of said loom. Such shedding mechanism may consist of coacting pairs of top and bottom reciprocating heddle bars or plates 17 and 18 respectively. When the desired pairs of heddle plates move in one direction and the other desired pairs of heddle plates move in the opposite direction, a shed 19 of the strands 9 is formed into which a weft or stake 20 is inserted. It is pointed out that the plane of the weft is disposed in substantially the plane of the guide 14 and in the reciprocation of the heddle bars, the strands actuated thereby are moved by said bars to one side and then to the other side of said plane so that any lateral connection of the strands (which at most is but an attenuated one, as before described) is readily broken, whereby the individuality of the strands is assured before the strands are interwoven with the wefts to produce the finished fabric.

After the heddles change their relation to

form the next shed, the weft is locked in the previously formed shed and another weft is inserted in the new shed to thus form the fabric 21.

In Fig. 8 is illustrated a longitudinal section through a fragment of conventional stake and strand fabric, wherein the strands 9 form the warp of the same and the wefts 20 form the so-called stakes.

The fabric thus formed passes between a pair of coacting, longitudinally fluted rolls 22 and 23 respectively which have a step by step rotative movement and act to set the formation of the fabric as well as to provide the feed for the loom. After the fabric leaves these rolls it is wound upon a take-up roll 24 ready for such use as is desired.

My improved method of making fabric has many advantages. Under such a method it is not necessary to first make thin paper, which must be slit into narrow ribbons or bands and thereafter sized and twisted into individual strands. All of these steps are omitted as well as the steps of reeling the strands so that the method is continuous from the time the pulp strip is unwound from its roll until the finished fabric is wound upon the take-up roll of the loom. All of this greatly reduces the cost of fabric because many machines and the heretofore necessary handlings between said machines are eliminated and the floor space they occupied is made available for other purposes.

The mechanism described is such that the fabric is formed as fast as the strands are made because the rolls 22 and 23 together with the take-up roll constitute the feed of the strands and also determine the speed of the weaving, as well as the formation of the strands from the strip of pulp in the roll 1.

By the arrangement described, it is possible to correlate the various steps from making the strands to those of weaving them into fabric so that no surplus of strands develop over and above that which the loom can conveniently handle in its weaving operations.

While in describing the invention, I have referred in detail to the several steps as well as to the sequence thereof, together with mechanism whereby the same may be carried out, these should be considered merely as illustrative of one embodiment of the invention and therefore, I do not wish to be limited thereto except as may be specifically set forth in the appended claims.

I claim as my invention:—

1. The method of making fibre fabric which consists in providing a relatively wide strip of fibrous material, operating upon the strip to slit the same into portions which are compressed inwardly to produce a plurality of strands therefrom, shedding the strands thus produced and inserting wefts into the shedded strands to form the fabric.

2. The method of making fibre fabric which consists in providing a relatively wide strip of fibrous material, operating upon the strip to slit the same into portions which are compressed inwardly to produce a plurality of strands therefrom, shedding the strands thus produced and inserting wefts into the shedded strands to form the fabric, the strands being sized previously to the shedding thereof.

3. The method of making fibre fabric which consists in providing a relatively wide strip of fibrous material, sizing the same, operating upon the sized strip to slit the same into portions and at the same time compress them inwardly to produce a plurality of strands therefrom, shedding the strands thus produced and inserting wefts into the shedded strands to form the fabric.

4. The method of making fibre fabric which consists in providing a relatively wide strip of fibrous material, sizing the same, slitting the sized strip into portions and at the same time compressing them inwardly to produce a plurality of strands therefrom, drying the strands, shedding the dried strands and inserting wefts in the shedded strands to form the fabric.

5. The method of making fibre fabric which consists in providing a relatively thick strip of pulp material, operating upon said strip to form a plurality of strands which are compressed inwardly to have a cross sectional thickness greater than that of the strip from which they are formed, shedding said strands and inserting wefts into said sheds to form the fabric.

6. The method of making fibre fabric which consists in providing a relatively thick strip of moistened pulp material, operating upon the moistened strip to form a plurality of strands therefrom which are compressed inwardly to shape the same, shedding said strands and inserting wefts into said sheds to form the fabric.

7. The method of making fibre fabric which consists in providing a relatively thick strip of moistened pulp material, operating upon the moistened strip to form a plurality of strands therefrom, which are compressed inwardly to shape the same into a cross sectional thickness less than that of the moistened strip from which they are formed, shedding said strands and inserting wefts into said sheds to form the fabric.

8. The method of making fibre fabric which consists in providing a relatively thick strip of pulp material, moistening the same and thereby increasing its thickness, operating upon the moistened strip to form a plurality of strands therefrom which are compressed inwardly into a thickness less than that of the strip after the same has been moistened, shedding said strands and inserting wefts in said sheds to form the fabric.

9. The method of making fibre fabric which consists in providing a relatively thick strip of size moistened pulp material, operating upon the same to slit it into portions which are compressed inwardly to form a plurality of strands therefrom, shedding said strands and inserting wefts into said sheds to form the fabric.

10. The method of making fibre fabric which consists in providing a relatively thick strip of moistened pulp material, operating upon the same to simultaneously slit and inwardly compress longitudinal portions thereof to form a plurality of strands therefrom, shedding said strands and inserting wefts into said sheds to form the fabric.

11. The method of making fibre fabric which consists in providing a relatively thick strip of pulp material, moistening the same with a sizing to increase its original thickness, slitting the same longitudinally and imparting a laterally inward compression to each portion of the strip between the slits to change the cross sectional shape of each portion into a strand of a thickness less than that of the size moistened strip, shedding said strands and inserting wefts into said sheds to form the fabric.

12. The method of making fibre fabric which consists in providing a relatively thick strip of pulp material, moistening the same with a sizing to increase its original thickness, simultaneously slitting the strip and imparting a laterally inward compression to the portions of the strip between said slits to form a plurality of compressed strands thereof of a thickness less than that of the size moistened strip, shedding said strands and inserting wefts into said sheds to form the fabric.

13. The method of making fibre fabric which consists in providing a relatively thick strip of moistened pulp material, operating upon the same to simultaneously slit and inwardly compress longitudinal portions of the strip to form a plurality of strands therefor, drying the strands, shedding dried strands and inserting wefts into said sheds to form the fabric.

14. The method of making fibre fabric which consists in providing a relatively thick strip of moistened pulp material, operating upon the same to simultaneously slit and inwardly compress longitudinal portions of the strip to form a plurality of strands therefrom of a thickness less than that of the sized strip, passing said strands about heated rolls to dry the same, shedding the dried strands and inserting wefts into the sheds to form the fabric.

15. The method of making fibre fabric which consists in providing a relatively thick strip of moistened pulp material, operating upon the same to form a web of closely associated side by side strands therefrom which have been compressed inwardly to a thickness less than that of the moistened strip of pulp material, shedding said strands and then inserting stakes into said sheds to form the fabric.

16. The method of making fibre fabric which consists in providing a relatively thick strip of moistened pulp material, operating upon the same to form a web of closely associated side by side strands therefrom, which have been compressed inwardly to a thickness less than that of the moistened strip of pulp material, drying the web of strands thus formed, shedding said strands and then inserting stakes into said sheds to form the fabric.

17. The method of making fibre fabric which consists in providing a relatively thick strip of pulp material, moistening the same and thereby increasing its thickness, operating upon the moistened strip of pulp material by means of coacting dies to form a plurality of side by side strands therefrom, each compressed to a thickness less than that of the moistened strip, shedding said strands and then inserting stakes into said sheds to form the fabric.

18. The method of making fibre fabric which consists in providing a relatively thick strip of pulp material, moistening the same and thereby increasing its thickness, operating upon the moistened strip of pulp material by means of coacting dies to simultaneously slit and compress inwardly, longitudinal portions of the strip to form a plurality of compressed strands therefrom, each of a thickness less than that of the moistened strip, shedding the strands and then inserting wefts into said sheds to form the fabric.

19. The method of making fibre fabric which consists in providing a relatively thick strip of pulp material, moistening the same and thereby increasing its thickness, operating upon the moistened strip of pulp material by means of coacting dies to form a plurality of side by side strands therefrom, each compressed to a thickness less than that of the moistened strip, drying the strands in their compressed condition, shedding the strands and then inserting wefts into the sheds to form the finished fabric.

20. The method of making fibre fabric which consists in providing a relatively thick strip of pulp material, moistening the same and thereby increasing its thickness, operating upon the moistened strip of pulp material by means of coacting dies to simultaneously slit and compress inwardly, longitudinal portions of the strip to form a plurality of compressed strands therefrom, each of a thickness less than that of the moistened strip, drying the strands in their compressed condition, shedding the strands and then inserting wefts into the sheds to form the finished fabric.

21. The method of making fibre fabric which consists in providing a moistened strip of pulp material, operating upon the same to slit the same longitudinally into a plurality of flat ribbons and then compressing the sides of each ribbon to displace the same inwardly to form a strand having a cross sectional shape different from the ribbon from which it was made, shedding the strands and then inserting wefts into the sheds to form the finished fabric.

22. The method of making fibre fabric which consists in providing a moistened strip of pulp material, operating upon the same to slit the same longitudinally into a plurality of flat ribbons, compressing the sides of each ribbon to displace the same inwardly to form a strand having a cross sectional shape different from the ribbon from which it was made, drying the strands, shedding the strands and then inserting wefts into the sheds to form the finished fabric.

In testimony whereof, I have hereunto set my hand, this 18th day of July, 1930.

LEWIS LARSEN.