

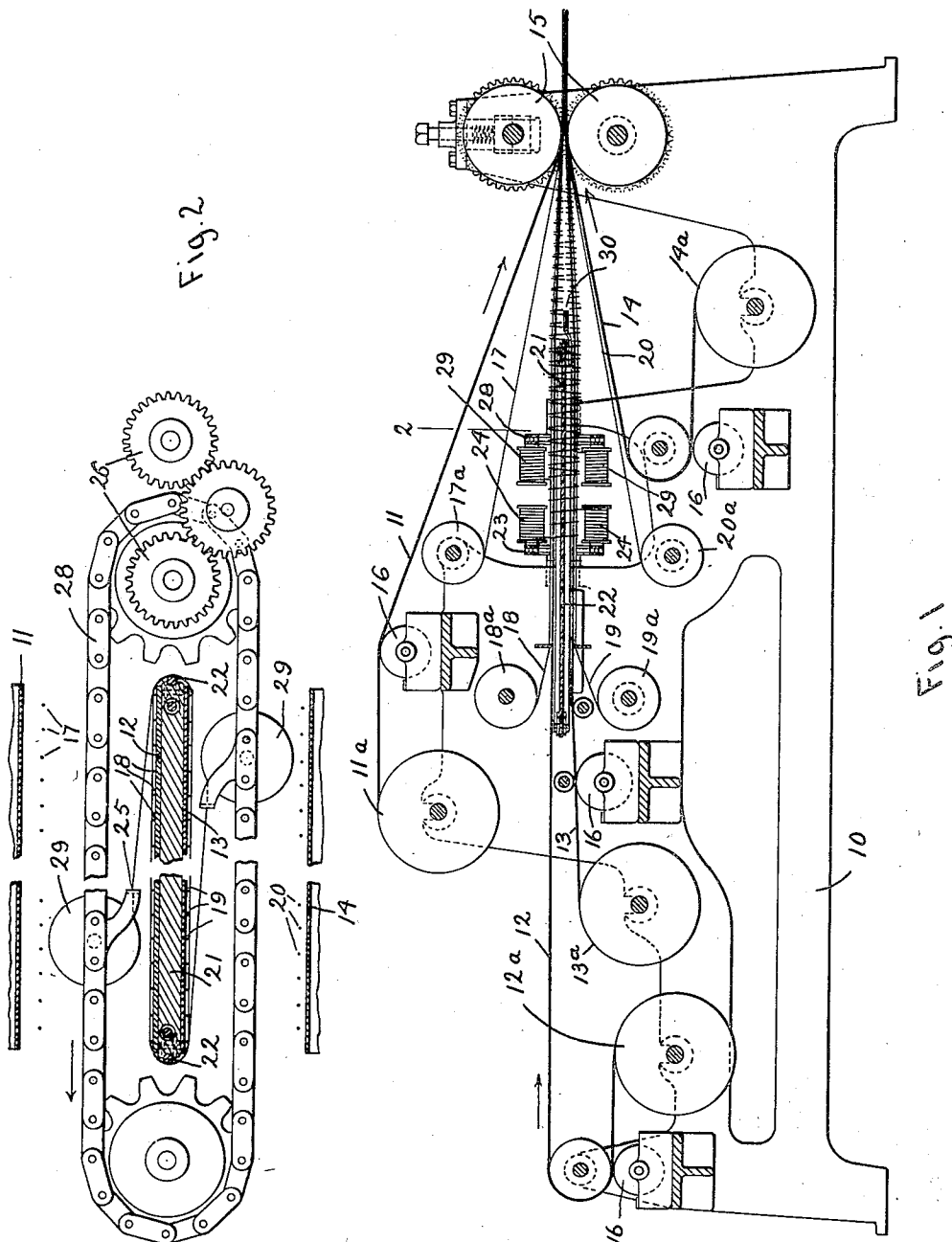
M. R. CARNEY (NOW BY MARRIAGE M. R. HARRISON.)
METHOD AND MACHINE FOR REINFORCING SHEET MATERIAL.

APPLICATION FILED FEB. 24, 1914. RENEWED MAY 11, 1915.

1,195,949.

Patented Aug. 22, 1916.

3 SHEETS—SHEET 1.



WITNESSES

Frederick W. Ande
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INVENTOR

Mary R. Carney
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Mary R. C. Harrison

by

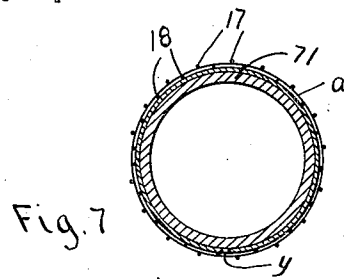
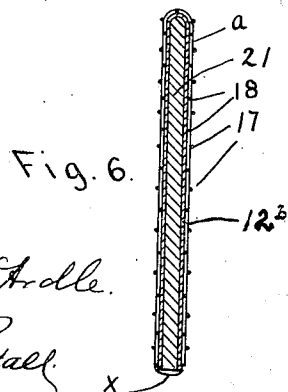
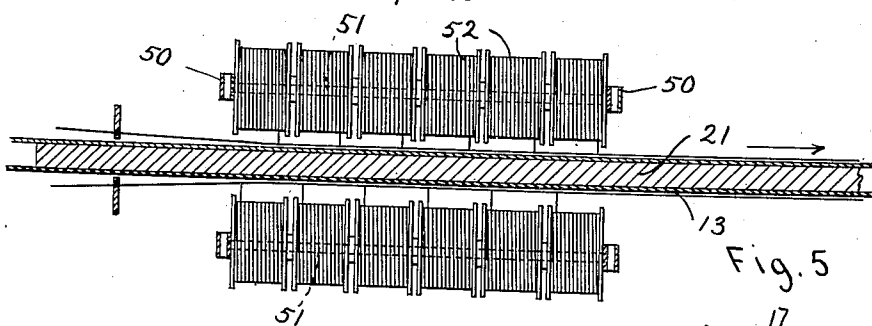
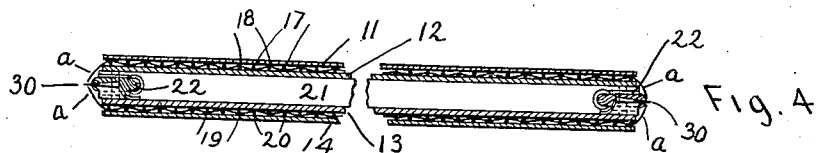
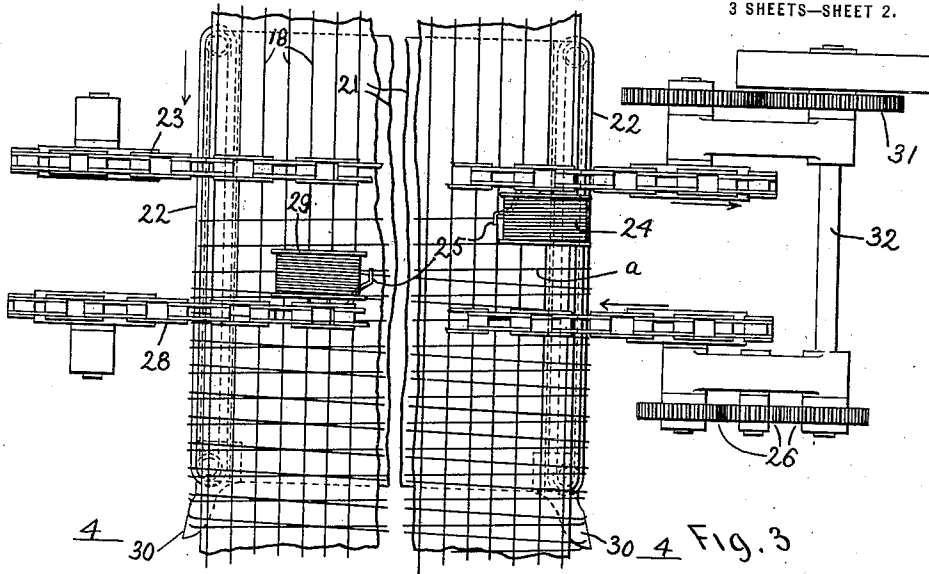
Atty.

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3 SHEETS—SHEET 2.



WITNESSES

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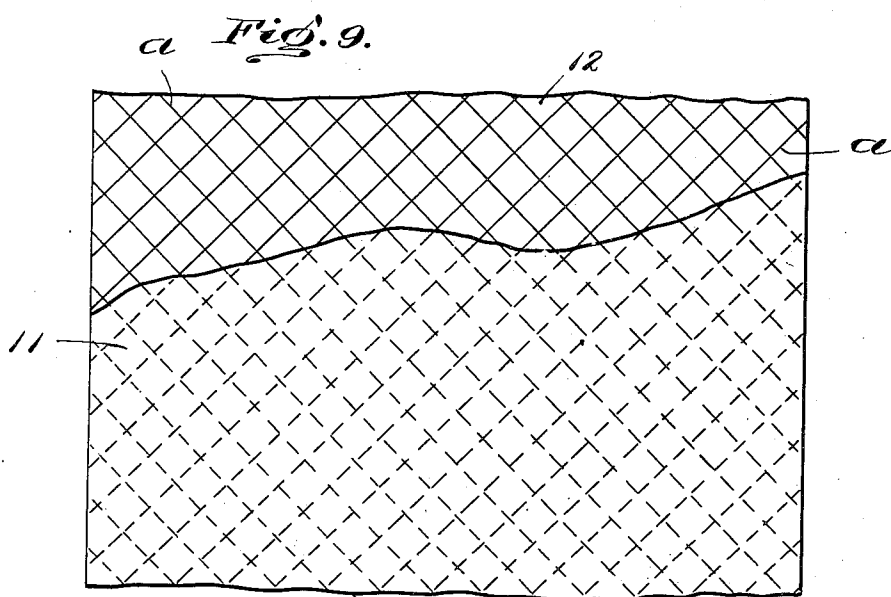
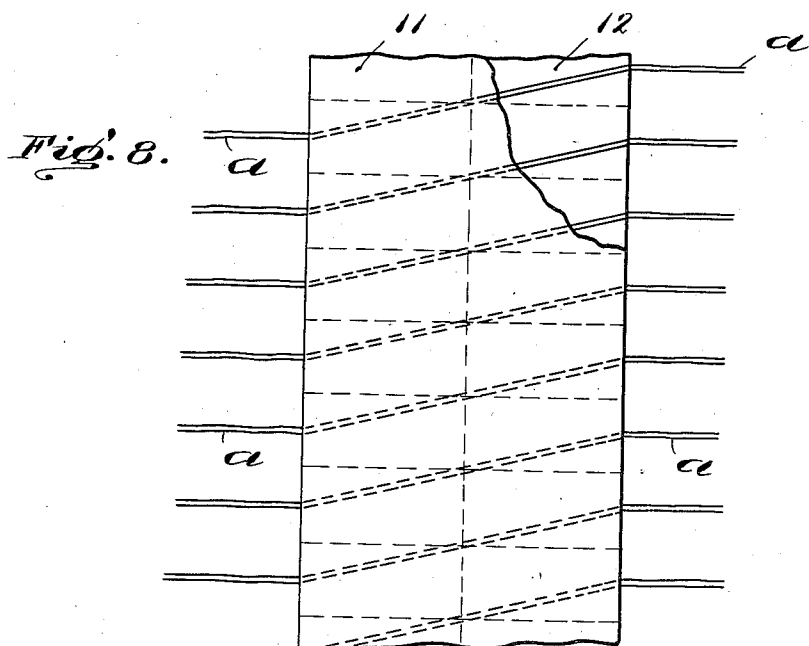
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3 SHEETS—SHEET 3.



Inventor:
Mary R. Carney
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UNITED STATES PATENT OFFICE.

MARY R. CARNEY, (NOW BY MARRIAGE MARY R. HARRISON,) OF WINTHROP,
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METHOD AND MACHINE FOR REINFORCING SHEET MATERIAL.

1,195,949.

Specification of Letters Patent.

Patented Aug. 22, 1916.

Application filed February 24, 1914, Serial No. 820,451. Renewed May 11, 1915. Serial No. 27,440.

To all whom it may concern:

Be it known that I, MARY R. CARNEY, (now by marriage MARY R. HARRISON,) of Winthrop, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Methods and Machines for Reinforcing Sheet Material, of which the following is a specification.

This invention relates to the manufacture of a strong sheet material, such as reinforced paper, for any and all uses to which such material can be put, the machine and its principle of operation being also such as to enable shipping tags to be rapidly and economically made.

One of the objects of my invention is to provide a simple, inexpensive and rapidly operating machine which enables strands, such as thread, string, cord, wire or tape, to be secured between two sheets cross-wise of the latter, either for the purpose of furnishing tags or to provide said material with reinforcement. For the latter purpose it is best also to lead in strands lengthwise of the material.

For convenience of description I shall hereinafter refer to the sheet material as paper, but it is to be understood that I do not limit myself to any specific sheet material.

The invention consists in the improvements which I shall now proceed to describe and claim.

Of the accompanying drawings Figure 1 is a side elevation, partly in section, of so much of a machine as is necessary to an understanding of my invention in one of its embodiments. Fig. 2 represents a transverse section on line 2—2 of Fig. 1, on a larger scale. Fig. 3 is a plan view of the mechanism shown in Fig. 2. Fig. 4 represents a section on line 4—4 of Fig. 3. Figs. 5, 6 and 7 are detail views representing modifications hereinafter referred to. Figs. 8 and 9 are views to illustrate two kinds of material which may be produced by the machine, if the machine is operated in certain ways as hereinafter described.

Referring to Figs. 1 and 2 a suitable framework is indicated at 10, four webs of paper 11, 12, 13 and 14 being indicated as passing through the machine from supply reels 11^a, 12^a, 13^a and 14^a respectively. The four webs and the reinforcing strands here-

inafter described are drawn through the machine by suitably driven rolls 15 which also serve to press the layers together. Of course any number of rolls 15 may be employed. Two or all four of the webs of paper are coated with a suitable adhesive supplied by means of rolls 16, in a well-known manner. To reinforce the webs of paper longitudinally, four series of strands 17, 18, 19 and 20 are led in from suitably mounted spools 17^a, 18^a, 19^a and 20^a, respectively. A thin, flat, supporting surface or table 21 is suitably supported by the frame of the machine in a position interposed between the webs 12 and 13, the side edges of said tables being provided with belts or chains 22 running freely in grooves in the edges of the table so that the transverse strands hereinafter described, and which are wrapped around the table and the webs 12 and 13, will not bind along the edges of the table so as to interfere with their being drawn off from the table by action of the rolls 15. A rotary strand carrier wraps one or more strands of reinforcing material around the table and portions of the webs 12 and 13 which are above and below said table, in a direction transverse of the webs so that the effect, due to the advancing movement of the webs in the direction of the arrows in Fig. 1, will result in the transverse strand or strands being wound spirally around said table and the two webs which are separated by said table. While this strand carrier might be in the form of a ring, I prefer to make it elongated, it comprising a belt or chain 23 as best shown in Fig. 2, the chain carrying one or more spindles for spools 24 of strand material, said spools being or course provided with suitable retarding devices to prevent too free unwinding of the strand material. Suitable guide-eyes 25 are provided for the strands leading from the spools. The strand carrier as illustrated in Figs. 2 and 3 may be driven by suitable gearing 31, the said strand carrier being mounted on sprockets 27. The material for the transverse strand is represented at *a* and in starting the operation one end of the strand is connected in any suitable way as by an adhesive to one of the webs 12 or 13 and then the rotation or travel of the strand carrier wraps the strand or strands *a* around the table and the two webs of paper. In Figs. 1 and 3 I have illustrated also a sup-

plemental strand carrier 28 similar to the strand carrier 23, and having spools 29, suitable gearing as indicated at 26 causing the driving-shaft 32 to operate the strand carriers 23 and 28 in opposite directions. This structure enables the transverse strands to be applied spirally in opposite directions so that they will cross each other more or less diagonally according to the speed of travel of the paper relatively to the speed of movement of the strand carriers. By means of suitable cutters such as knives 30 projecting forward from the delivery end of the table (Figs. 3 and 4) the strands *a* are divided, so that as the entire plurality of webs issue from the machine, two sheets of product will result. In other words, after the action of the cutters 30, the webs 11 and 12 with longitudinal strands and crossing transverse strands can be wound up on one reel while the webs 13 and 14 also having longitudinal and transverse reinforcing strands may be wound up on another reel.

A modified form of strand carrier is indicated in Fig. 5 the same comprising a pair of chains 50, 50, which are suitably driven in a manner similar to the carrier 23 or the carrier 29, said chains being connected by spindles 51 to support a plurality of spools 52 side by side. This form is especially adapted for the rapid production of reinforced fabric with the strands exceedingly close together.

Instead of employing two webs 12, 13 separate from each other, I may employ a single wider web 12^b which is folded over the table 21 as indicated in Fig. 6, the operation then being the same, a single cutter operating at the point X if desired. Or with this last-mentioned form the web 12^b need not be cut, but after leaving the table 21 may be guided back to flat or unfolded condition, cutting the strands, of course, at the other side of the table where the edges of the paper are adjacent to each other, and then a superimposed web similar to the web 11 in Fig. 1 may be fed upon and pressed to the web 12^b.

As shown in Fig. 7 the table instead of being flat may be in the shape of a cylindrical former 71, a web 12^c as it passes through the machine being guided so as to be wrapped or folded around the former 71. The transverse reinforcing strands are wound around this, and then at a farther point in the machine an outer web similar to the web 11 in Fig. 1 is wrapped over the web 12^c, after which transverse strands are cut along the point Y in Fig. 7 and the whole drawn through straightening or flattening rollers.

It will be readily understood that the number of spools employed for the longitudinal strands will control the lateral spacing of the latter, and the number of spools

employed for the transverse strands, or the relationship of the speed of travel of the paper webs and the strand carrier or carriers will control the spacing of the transverse strands.

If a 3-ply product is desired instead of a 2-ply product, one of the webs 12 or 13 in Fig. 1 may be omitted, the cutters 30 being then of course unnecessary.

Referring to Fig. 2 it will be understood that by employing paper for the webs considerably narrower than the table or former 21, then laying the transverse strands *a* in pairs, then cutting the paper after it passes through the machine longitudinally in the middle and cross-wise between the said pairs of transverse strands, the result will be the production of small pieces of reinforced paper with a pair of strings leading from one end, thus constituting suitable shipping tags. Such product is indicated in Fig. 8, the lines on which the paper will be cut being indicated by dotted lines. The pairs of strings *a* which project from the ends of the tags as the result of the operation described, form tying ends.

While the machine might be made in different sizes for different widths of product, it is not essential to do so, since one machine which will produce the greatest width of product ever needed will suffice, as the product may be cut longitudinally to any width, after it leaves the machine.

In connection with Fig. 3, I desire especially to refer to the fact that by means of two strand carriers, moving in opposite directions, and with the paper traveling at a relatively high rate of speed, the strands will be laid to cross each other at a right angle, as shown in Fig. 9, but diagonally to the paper thereby producing an arrangement of the strands similar to the warp and weft of bias-cut fabric. By a close arrangement of a multiplicity of spools of thread, the product is useful when gummed and cut to narrow width, as stay strips for paper boxes. For this purpose the longitudinal strands described need not be employed.

By reference to Fig. 2 it will be seen that the strands 17 and 18 of one pair, and the strands 19 and 20 of the other pair are not opposite each other. This leading in is controlled by the location of the guide-eyes for said strands. The result of this is that when the pairs of webs are brought together, the transverse strands will be alternately above and below the longitudinal strands in a manner similar to the passing of weft threads of woven fabric alternately above and below the warp threads. This arrangement is clearly illustrated in Fig. 4.

It is to be understood that I do not limit myself to the position of the knives or cutters as illustrated. Obviously they might be suitably mounted so as to operate after, in-

stead of before, the sheets are brought together. It is also to be understood that I do not limit myself to the particular form of table or mandrel illustrated. Obviously the middle portion of the table could be omitted since the paper is supported by its longitudinal tension and by the longitudinal strands. The edges of the table are the essential or operative portions, and said edges present parallel mandrels for the strands *a*. These edges of the table or parallel mandrels serve to prevent the tension of the strand *a* which is being wound transversely from laterally contracting the material.

I do not limit myself to loosely mounted belts 22 along the outer margins of the table or mandrel edges, as the same may be positively driven by any suitable mechanism at a speed the same as that of the speed of travel of the paper webs.

By overlapping the edges of the webs, especially when being reinforced in the manner illustrated in Figs. 6 and 7 and described in connection with those figures, and adhesively securing such overlapping edges, or by adhesively attaching a strip to connect said edges, a longitudinally and transversely reinforced tube will be made which can then be cut into the desired lengths. Such sections can be folded and glued at one end, thus making reinforced bags.

Having now described my invention in one or more of its embodiments without attempting to describe all possible modifications, what I claim is:

1. A machine of the character described comprising means for causing a plurality of strips of sheet material to travel in the direction of their length, a strand carrier movable around one of the strips to wrap a strand spirally about it, and means for adhesively connecting said strips at a point beyond the location of the strand carrier.

2. A machine of the character described, comprising means for causing a plurality of strips of sheet material to travel in the direction of their length, a strand carrier movable around one of the strips to wrap a strand spirally about it, means for leading other strands in the direction of the length of said strips, and means for adhesively connecting said strips at a point beyond the location of the strand carrier.

3. A machine of the character described, comprising means for causing a plurality of strips of sheet material to travel in the direction of their length, a strand carrier movable around one of the strips to wrap a strand spirally about it, means for leading other strands longitudinally, and alternately inside and outside of the path of movement of the strand carrier, and means for adhesively connecting said strips beyond the location of the strand carrier.

4. A machine of the character described,

comprising means for causing a plurality of strips of sheet material to travel in the direction of their length, a strand carrier movable around one of the strips to wrap a strand spirally about it, means for uniting said strips beyond the location of the strand carrier and means for cutting the wrapped strands.

5. A machine of the character described, comprising means for causing two pairs of strips of sheet material to travel in the direction of their length, a strand carrier movable around the adjacent strips of the two pairs, means for adhesively connecting said strips at a point beyond the location of the strand carrier, and means for cutting the transverse strands.

6. A machine of the character described comprising a table or former to support sheet material, means for causing sheet material to travel along said table or former, means for wrapping a strand spirally around said former and the sheet material supported thereby, and means for adhesively connecting other sheet material to the first-mentioned sheet material after the material passes beyond the strand carrier.

7. A machine of the character described comprising means for bringing the edges of sheet material together, means for winding a strand around the material, means for feeding the material along while the strand is being wound around it, means for securing the wound strand to the sheet material, and severing means for longitudinally dividing the strand-inclosed material.

8. A machine of the character described comprising means for bringing the edges of sheet material together, means for winding a strand around the material, means for feeding the material along while the strand is being wound around it, means for causing the strand and the material to adhere, and severing means for longitudinally dividing the strand-inclosed material.

9. A machine of the character described, comprising means for bringing the edges of sheet material together, means for winding a strand around the material, means for feeding the material along while the strand is being wound around it, means for adhesively applying sheet material to said strand-inclosed material, and means for longitudinally dividing the whole.

10. A machine of the character described comprising means for causing sheet material to travel in the direction of its length, a strand winder in position to apply one or more strands around the sheet material, means for adhesively applying sheet material to the strand-inclosed material, and means for longitudinally dividing the whole.

11. A machine of the character described, comprising means for causing two strips of sheet material to travel in the direction of

their length, means for applying an adhesive to the outwardly facing surfaces of said strips, a strand carrier movable around the strips to wrap a strand spirally about them and in contact with the said adhesive, and means for cutting the wrapped strands to disconnect the two strips.

12. A machine of the character described, comprising a carrier for imparting an orbital path of movement to strand material, means for feeding sheet material through said path, supporting means for preventing the sheet material from being collapsed by the strand material, and means for uniting the sheet material and strand material.

13. A machine of the character described comprising a support having a free end, means for feeding sheet material along said support, means for wrapping strand material around both the support and the sheet material, and means for adhesively uniting the sheet material and strand material.

14. A machine of the character described comprising a support having a free end, means for feeding sheet material along said support, means for wrapping strand material around both the support and the sheet material, flexible traveling means for preventing the strand material from binding on the support, and means for adhesively uniting the sheet material and strand material.

15. A machine of the character described comprising a support having a free end, means for feeding sheet material along said support, means for wrapping strand material around both the support and the sheet material, flexible traveling means mounted on said support, means for positively driving the flexible traveling means, and means for adhesively uniting the sheet material and strand material.

16. A machine of the character described comprising means for causing sheet material to travel in the direction of its length, a strand carrier movable around the sheet material to wrap a strand spirally about it, means for adhesively connecting the sheet material and strand material, and means for preventing the sheet material from being collapsed by the wrapping of the strand material about it.

17. The method of providing reinforced material, consisting in wrapping strand material around longitudinally moving other material, supporting the latter in line with the pull of the strand material to prevent lateral contraction of said sheet material and then uniting the whole.

18. The method of uniting transverse strands to sheet material, consisting in caus-

ing sheet material to travel, wrapping strand material transversely around the sheet material, then applying another layer of sheet material to confine the strand material, uniting the sheets of material, and severing the strand material.

19. The method of uniting transverse strands to sheet material, consisting in wrapping strand material simultaneously around a mandrel and a sheet of material moving longitudinally of said mandrel, uniting another sheet of material to the strand inclosed sheet, and severing said strand material.

20. The method of simultaneously producing two pieces of reinforced sheet material, consisting in causing four webs of sheet material to travel in the direction of their length, wrapping strand material around the two adjacent webs, severing the strands at the edges of said adjacent webs, and uniting each of said adjacent webs to one of the other webs.

21. The method of manufacturing reinforced sheet material which consists in spirally winding strand material around a mandrel and a web of sheet material moving relatively to said mandrel, and attaching to one face of the wound sheet another web of sheet material.

22. The method of manufacturing reinforced sheet material which consists in spirally winding strand material around a traveling web of sheet material transversely thereof and simultaneously attaching to one face of the wound web another web of sheet material.

23. The method of manufacturing reinforced sheet material which consists in spirally winding strand material around a traveling web of sheet material then attaching to one face of the wound sheet another web of sheet material and lastly removing the uncovered stretches of the winding from the wound web.

24. A machine of the character described comprising means for causing two strips of sheet material to travel in the direction of their length, means for applying an adhesive to the outwardly facing surfaces of said strips, and a strand carrier movable around the strips to wrap a strand spirally about them and in contact with the said adhesive.

In testimony whereof I have affixed my signature, in presence of two witnesses.

MARY R. CARNEY.

Witnesses:

A. W. HARRISON,
GEO. N. GODDARD.