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C. Y. CHITTICK
FLEXIBLE CORRUGATED SHEET MATERIAL AND
METHOD OF FABRICATING SAME
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2,642,372

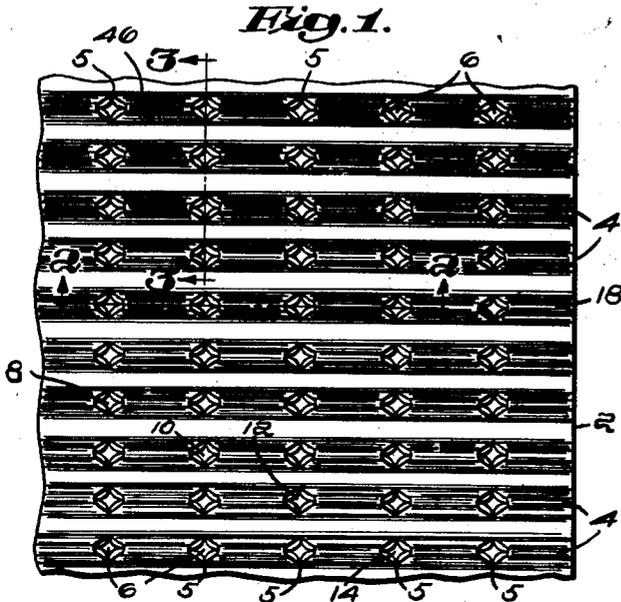


Fig. 3.

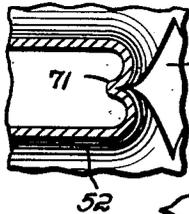
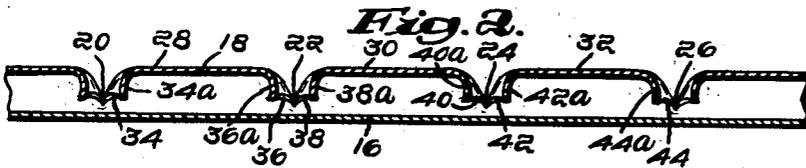
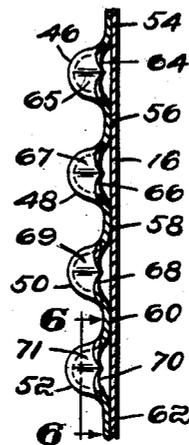


Fig. 4.

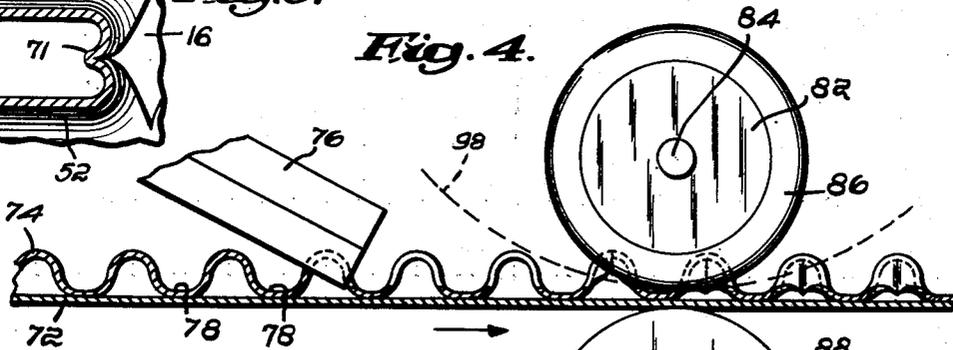
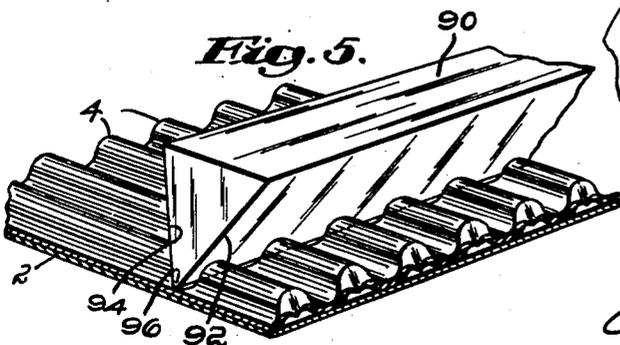


Fig. 5.



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FLEXIBLE CORRUGATED SHEET MATERIAL AND METHOD OF FABRICATING SAME

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11 Claims. (Cl. 154—55)

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This invention relates to corrugated paper board of the type now in ordinary commercial use.

Corrugated paper board is made in single face and double face. In the single faced type, there is a plain smooth backing ply to which is affixed by adhesive a corrugated ply forming parallel, raised ribs or flutes with corresponding grooves therebetween. Double faced corrugated board differs from the single faced board in that a second smooth ply is applied to the other surface of the corrugations.

This invention, however, is particularly concerned with single faced corrugated paper board. The purpose of the invention is to enable the board to be folded not only transversely along the lines of the corrugations, but also at right angles and diagonally thereto.

Up to the present it has not been possible to provide a single faced corrugated board having substantially all of the normal cushioning qualities, which could also be folded in various directions. To accomplish this desirable result, the present invention contemplates treating ordinary single faced board in such manner that each transverse corrugation or flute will be divided into a plurality of truncated members of controllable length. These truncated members will be longitudinally aligned so that the board can be folded along lines at right angles to or diagonally of the corrugations and defined by the junctions of the truncated members.

In the practice of the present invention, none of the material forming the corrugations is removed or destroyed. The corrugations are merely cut crosswise along longitudinal lines which cuts form a series of interruptions in each corrugation. Then the cut ends of the individual sections formed by the cutting are folded downwardly and inwardly under the ends of each short section thereby to form the individual truncated knob like sections or members heretofore referred to.

The invention includes both the product so formed and the method used in producing the product. The invention will be more particularly understood as the description proceeds with the aid of the accompanying drawings in which

Fig. 1 is a plan view of a section of single faced corrugated board made according to the present invention.

Fig. 2 is an enlarged section on the line 2—2 of Fig. 1.

Fig. 3 is an enlarged section on the line 3—3 of Fig. 1.

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Fig. 4 is a schematic showing of means for carrying out the method of the invention to form the finished product.

Fig. 5 shows an alternative means for practicing the method.

Fig. 6 is a section on the line 6—6 of Fig. 3.

Referring to Fig. 1 which shows a plan view of a section of single faced corrugated board made according to the invention, it will be seen that the sheet indicated generally at 2 comprises a plurality of corrugations 4 of conventional construction. These corrugations, however, have been cut transversely along the lines 5 and have had the ends of the cut sections folded into form in each transverse corrugation a plurality of openings 6, a few of which have been numbered. The openings 6 are arranged in longitudinal rows by virtue of their uniform spacing. It will also be noted that they form uniformly spaced straight diagonal rows. It is believed apparent from this construction that a piece of single faced corrugated board so treated may be folded longitudinally along one or more of the rows of openings 6 as may be desired. Similarly the board may be folded diagonally along any selected diagonal row of openings, as for example, the diagonal row of openings numbered 8, 10, 12 and 14.

Greater detail of the construction is shown in Figs. 2 and 3.

Fig. 2 is an enlarged section on the line 2—2 of Fig. 1, and shows the smooth backing sheet 16 and one of the transverse ribs 18 that forms one of the corrugations. The rib 18 is shown in section at its highest point. It has been slit crosswise at 20, 22, 24, and 26 to form individual sections 28, 30 and 32. The end portion of each of the individual sections has been folded down and inwardly under the ends of each section as at 34, 36, 38, 40, 42 and 44. The folded material on the line 2—2 of Fig. 1 and as shown at 34a, 36a, 38a, 40a, 42a, and 44a has been buckled into a reverse curve. This is obviously necessary in view of the normal convex curvature of the two sloping folded edges that run from the crest to the foot of each fluted section.

This construction is shown from another point of view in Fig. 3, which is a section on the line 3—3 of Fig. 1. Here the backing sheet 16 has affixed to it a plurality of transverse ribs or corrugations 46, 48, 50 and 52, which have been affixed by adhesive to the backing sheet as at 54, 56, 58, 60 and 62. This construction, of course, is representative of the construction used throughout the corrugated sheet. The ends of the sections 46, 48, 50 and 52 have been turned

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down, in and under the ends of the several sections as at 64, 66, 68 and 70 with the buckled portions indicated by the lines 65, 67, 69 and 71.

Thus it will be seen that the ends of each truncated section terminate in a folded portion of the rib, in which each cut edge is turned inwardly a sufficient distance to provide a smoothly finished, smartly appearing sloping end without necessitating the removal of any of the corrugated material. The turned in end portions add materially to the inherent strength of the individual corrugated rib sections because the end of each section now has a doubled and folded edge along the top and both sides thereof. As is well known, folded paper has considerable compressive strength in the direction of the fold line which without the fold, is entirely lacking.

Accordingly, the corrugated board disclosed herein, is materially stronger than when the corrugations are untreated or have been cut away in the manner disclosed for example in the patent to Amy No. 1,782,399 as shown in Fig. 8 thereof.

Different mechanical equipment may be used to practice the method required to produce this construction. One convenient mechanism is shown schematically in Fig. 4 where the single faced corrugated board having a backing sheet 72 and corrugations 74 is fed continuously past a gang of knives, one of which is shown at 76, the knives being spaced apart according to the desired length of the individual truncated sections to be formed. The board, of course, will be supported under the knives at the proper level by a table, not shown.

As the knives 76 pass through the corrugations 74, the latter are slit through substantially all of the raised portions. The bottom portions or valleys 78 which are glued to the backing sheet are preferably not cut, thereby maintaining transverse strength.

After the corrugated board has passed through the gang of knives it is fed to a gang of forming rollers 82 mounted for free or driven rotation on shaft 84. The outer edges 86 will present V-shaped faces to exert a downward spreading pressure on the cut edges of the sections. This pressure will automatically cause the edges of the sections to be progressively folded downwardly and, as the folded edge widens as faces 86 enter further, the bent down portions will be turned inwardly under the ends of the sections with the crest portion buckled to form the construction illustrated in Figs. 2 and 3.

In practice the diameter of the forming roller 82 and the V-shaped angularity at the edge, as at 86, will be subject to some variation as determined by the size and quality of the material of which the corrugated side of the board is formed. The proper size and angularity of the forming rollers may readily be determined in any given case. Roller 88 acts to support the corrugated board as it is passing under the gang of forming rollers 82.

Another method which may be utilized to form the product is shown in Fig. 5. After the corrugations have been slit longitudinally by a suitable gang of knives or slit by application of a single knife successively applied to the corrugations across the width of the board, the folded in ends may be simultaneously formed over a length of board by the downward application of a V-shaped forming tool 90 having its sides 92 and 94 set at a proper angle. When the leading edge 96 engages the tops of the corrugations directly along the slit that defines the adjacent

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sections, the top cut edges of the sections will be folded downwardly with the folding continuing progressively downwardly along the sloping sides of the facing sections to turn the ends of the sections continuously inwardly to produce the construction shown in Figs. 2 and 3.

The size of the forming roller 82 shown in Fig. 4 is much smaller in diameter than the roller would actually be in practice. The showing in Fig. 4 is for explanatory purposes only. It will be understood that if the advancing edges 86 engage the ends of the sections at an angle that is too much toward the horizontal the ends of the sections will merely be pushed in the direction of the advancing roller rather than turned in in the desired manner. Accordingly, it is essential that the forming roller 82 be of such diameter that the initial and subsequent direction of the engagement of the edges 86 with the cut edges of the sections will be more in a vertical direction than horizontal. The dotted line 98 is indicative of a roller that would apply pressure to the ends of the sections in very nearly a vertical direction.

While a specific form of the invention has been disclosed and preferred methods of making the product have been explained, it will be understood that the invention is not to be limited thereby, but only by the appended claims.

I claim:

1. The method of fabricating flexible corrugated sheet material which includes the steps of slitting the corrugations transversely thereof and turning inwardly the slit edges of the corrugations.
2. The method of fabricating flexible corrugated sheet material which includes the steps of slitting the corrugations transversely and turning inwardly the slit edges of the corrugations sufficiently to form a V-shaped notch therebetween.
3. The method of fabricating flexible corrugated sheet material which includes the steps of slitting the corrugations transversely and then progressively folding each slit edge inwardly with the greatest amount of folded material being at top portion of the corrugated section.
4. The method of fabricating corrugated sheet material which includes the steps of simultaneously slitting said corrugations along a plurality of lines at right angles to said corrugations to form a plurality of sections in each corrugation with cut ends and then simultaneously folding opposed cut ends of said sections inwardly each within its own section.
5. The method of fabricating flexible corrugated sheet material which includes the steps of slitting the corrugations transversely to form sections in each corrugation and then folding the ends of the sections inwardly of the sections and simultaneously causing a reverse curvature to be produced in that part of each folded end that prior to folding was along the crest of said corrugation.
6. Flexible corrugated single faced sheet material having a flexible backing ply and a corrugated ply adhesively secured thereto, the raised unsecured portions of the flutes of the corrugated ply being cut in at least some areas of the sheet along a series of substantially parallel lines intersecting the corrugations at right angles with negligible diminution in volume of the cut portions of said flutes, the top and side walls of the said cut portions of the flutes terminating at inwardly folded edges and defining voids in the

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said flutes and forming in each flute a plurality of truncated sections with strengthened end edges, each said truncated sections being secured to said backing ply along two parallel sides only, with the secured sides being continuous with the secured sides of the next adjacent truncated section.

7. Flexible corrugated sheet material having a flexible backing ply and a corrugated ply adhesively secured thereto, the raised unsecured portions only of the flutes of the corrugated ply being cut along a plurality of parallel lines extending at right angles to said corrugations with negligible diminution in volume of the cut portions of said flutes, said cuts forming a plurality of sections in each flute, the ends of the sections being turned inwardly to form rows of V-shaped notches, the said turned in end portions of said sections forming non-cut ends to said sections and providing reinforcement against crushing.

8. Flexible corrugated sheet material having a flexible backing ply and a corrugated ply adhesively secured thereto, the unsecured portions only of the flutes of the corrugated ply being cut along a plurality of parallel lines extending at right angles to said corrugations, said cuts forming a plurality of fluted sections in each flute with negligible diminution in volume of the material forming said corrugated flutes, the ends of the sections formed by the cuts being folded inwardly of the fluted sections and being unconnected with said backing ply.

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9. Flexible corrugated sheet material having a flexible backing ply and a corrugated ply adhesively secured thereto, the unsecured portions only of the flutes of the corrugated ply being cut along a plurality of parallel lines extending at right angles to said corrugations with negligible diminution in volume of the cut portions of said flutes, said cuts forming a plurality of fluted sections in each flute, the ends of the sections formed by the cuts being folded inwardly of the fluted sections and being unconnected with said backing ply.

10. Flexible corrugated sheet material as set forth in claim 9, in which the greatest length of folded material of the section is that which prior to folding was along the crest of the flute.

11. Flexible corrugated sheet material as set forth in claim 9 and that part of the folded material which prior to folding was on the crest of the flute at the end of the section being folded to a reverse curvature along the longitudinal axis of the flute.

CHARLES YARDLEY CHITTICK.

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