

March 4, 1952

R. M. BERGSTEIN

2,587,685

METHOD FOR THE MANUFACTURE OF ARTICULATED PANELS

Filed Feb. 7, 1947

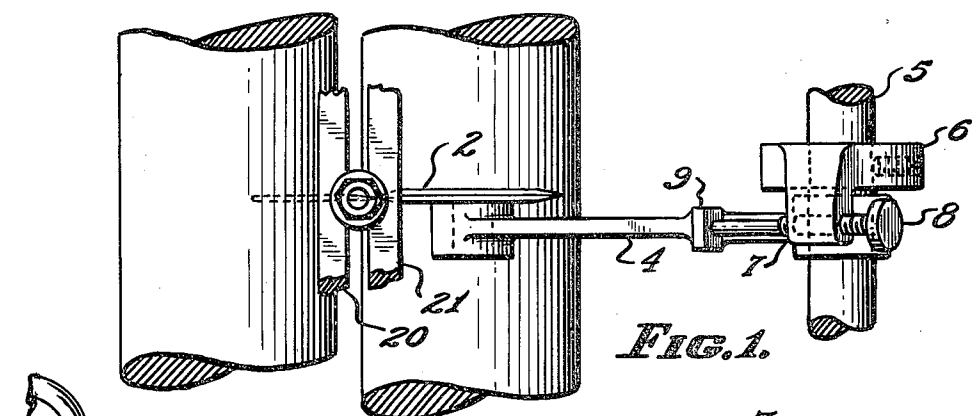


FIG. 1.

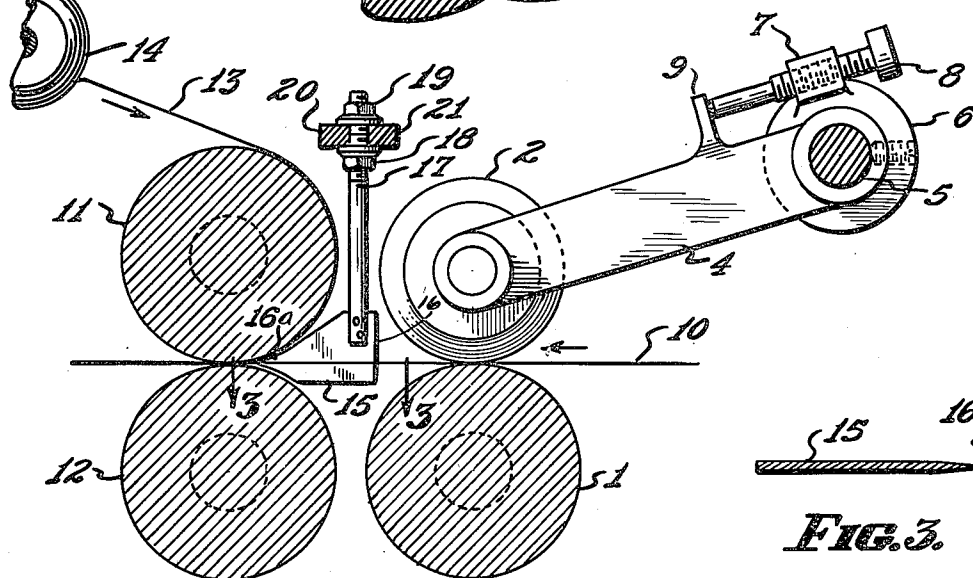
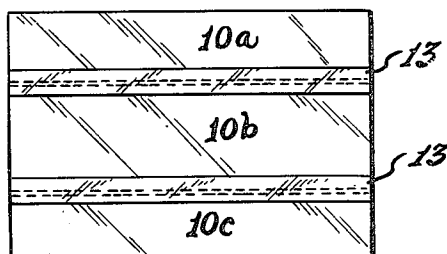


FIG. 2.

FIG. 4.



INVENTOR.

ROBERT MORRIS BERGSTEIN.

BY

Allen & Allen

ATTORNEYS.

UNITED STATES PATENT OFFICE

2,587,685

METHOD FOR THE MANUFACTURE OF
ARTICULATED PANELS

Robert Morris Bergstein, Cincinnati, Ohio

Application February 7, 1947, Serial No. 727,212

3 Claims. (Cl. 154—116)

1

2

In my copending applications, Serial No. 695,143, filed September 6, 1946, now Patent No. 2,551,090 and entitled Knocked Down or Folding Structure Made From Acetate Sheeting or the Like and Serial No. 720,497, filed January 6, 1947 and entitled Folding Boxes Employing Non-scorable Sheeting. I have shown the manufacture or articulated panel structures and knock-down or collapsible box structures made therefrom, where the panels are of non-scorable sheeting. By this is meant a material which, unlike boxboard, is incapable of being rendered less stiff along a line by the operation of scoring so that parts of the material adjacent the score line become in effect hinged together and can be folded and unfolded with respect to each other repeatedly. A non-limitative example of such a material is cellulose acetate sheeting of a thickness of .01 inches or over.

In the said copending applications articulated structures are made by continuously slitting a supply of the non-scorable sheeting, applying over the slit lines strips of a material thin and flexible enough to act as hinging means and adhesively securing these strips to the non-scorable material, then cutting the composite product transversely to provide structures in which discrete panels are articulated together. Such structures fold readily when the panels are moved toward each other with the strip within the apex of the angle formed by the folding. They can be folded in the opposite direction since there is sufficient give or stretchability in the material of the strips; but they offer a substantial resistance to folding in such a direction. It is advantageous both for strength and for appearance and feel to provide knock-down box structures in which the hinging strips lie at the outside of the lines of fold; and it is a principal object of this invention to teach a means and method whereby articulated panel structures may be manufactured which will fold as readily in one direction as in the other.

This and additional objects of the invention which will be set forth hereinafter or will be apparent to one skilled in the art upon reading these specifications, I accomplish by that method and means of which I shall now describe an exemplary embodiment. Reference is made to the accompanying drawings, wherein:

Figure 1 is a partial plan view of the exemplary for of my apparatus.

Figure 2 is a sectional view of the same parts.

Figure 3 is a sectional view of the spreader member taken along the line 3—3 of Figure 2.

Figure 4 is a perspective view of an articulated panel structure.

In the ordinary slitting of materials the severed edges come into complete abutment during the course of travel of the material. Thus when the hinge strips are applied there is no separa-

tion of the slit edges which would permit ready folding of the structure in the direction away from the hinge strips. While the articulated material can be forcibly folded in this direction, unless the lines of articulation are "pre-broken," resistance to folding will be encountered in erecting the box, which resistance will tend to warp the walls in the erected structure.

Pre-breaking, while feasible, is expensive and inconvenient.

I have found that if the slit edges of the sheeting can be separated a slight distance during the manufacture of the articulated panels, say a distance approximately equivalent to the thickness of the sheeting, and retained in that position, a structure will be obtained which will fold readily in either direction. I have further found that it is possible forcibly to separate the slit edges of the non-scorable sheeting during the operation of slitting it, by the insertion of a thin blade or spreader in the machine following the slitting device; but this presents the difficulty that if the slit material travels freely for any appreciable distance beyond the blade, the slit edges of the material will come together again and the desired effect will not be obtained.

I have discovered that if the flexible hinging material can be applied and affixed to the non-scorable sheeting while its slit edges remain or are maintained in a state of forcible separation, the final product will have the separation of panel edge portions which it is the object of this invention to produce. This object, in accordance with my invention, is most readily achieved by forcibly separating the slit edges and applying the flexible hinging material as close as possible to the place of separation, at which point I also utilize the holding effect of a pair of pressure combining rolls, as hereinafter described.

Referring to Figures 1 and 2, I have indicated at 1 the anvil roll or lower roll of a slitting combination employing an upper slitter knife 2. This knife is journaled on an arm 4 which in turn is journaled on a stationary non-rotatable shaft 5 extending across the machine. A collar 6 is fixed to this shaft and carries an ear 7 in which an adjusting screw 8 is threaded. The end of this screw bears against an abutment 9 welded or otherwise fixed to the arm 4 so that the slitter knife 2 may be brought to bear with adjustable pressure against the lower roll 1. This arrangement is exemplary of slitting devices which may be used, but is not limiting. It has the advantage that as many of the knives 2 may be employed as may be required to sever the panels in any particular structure; and, if the collars 6 are made adjustable along the shaft 5, the dimensional adjustment of the mechanism for panel structures of different numbers and sizes of panels is rendered easy. The non-scorable sheeting 10 passing through the slitting combination

is, of course, slit into two or more strips as desired.

I have shown a pair of draw or pull rolls at 11 and 12. These will be suitably mounted on the machine frame with provision for driving them and preferably with means for adjusting the pressure exerted by the rolls. These rolls not only serve to move the non-scorable sheeting 10, but also to combine therewith one or more of the hinging strips 13 which are withdrawn from rolls, one of which is indicated at 14.

The strip material is thin and flexible and, in the case of boxes made from cellulose acetate or other transparent sheeting, is preferably one of the transparent, non-felted films of commerce, such as an acetate film, cellophane or the like. These strips may be adhered to the sheeting in any way desired, as by the application of an adhesive or by the application of a solvent for the substance of the strips or the sheeting or both. Excellent results are obtained also by the use of strips pre-coated with a pressure sensitive adhesive.

At a suitable distance beyond the draw rolls 11 and 12, the treated sheeting will be cut apart transversely into articulated panel structures. This may be done by a fly knife (not shown) or in other ways.

To gain the effect of this invention, I make use of spreader blades such as shown at 15. These blades have a thickness which is a measure of the desired separation between the slit edges in the finished product. The blade end extending in the direction from which the sheeting approaches is tapered or beveled, as most clearly shown at 16 in Figure 3. The opposite end of the blade is preferably shaped as at 16a to extend as far as possible into the nip or bite of the rolls 11 and 12.

The blade may be supported by an upwardly extending rod 17 having a threaded end and provided with upper and lower nuts 18 and 19 by means of which it may be fastened to a suitable support extending transversely of the machine. The support may be in the form of a single rod or bar slotted for the adjustment of the blades, or a pair of rods 20 and 21 may be employed to permit universal transverse adjustment. The height of the blades may also be adjusted by the nuts 18 and 19.

When my apparatus as described is employed, separation of the slit edges is accomplished so close to the nip of the rolls 11 and 12 that these rolls maintain the separation of the slit edges during the combining of the strips 13 with the sheeting, and an article is produced capable of being readily folded along the hinging lines in either direction. An exemplary article of this type is shown in Figure 4 and comprises the three panels 10a, 10b and 10c hinged together by means of the strips 13. It will be understood that my articulated structures may have more or fewer panels as required for particular purposes, and that the teachings of this application may be applied as will be evident to the formation of tubular articulated structures as set forth in the applications referred to above. The articulated structures formed by the methods and on the apparatus of this invention may be employed, with or without scored boxboard members, in any of the ways set forth in the said applications.

Modifications may be made in my invention without departing from the spirit of it. Having thus described my invention in an exemplary

embodiment, what I claim as new and desire to secure by Letters Patent is:

1. A process of manufacturing articulated panels of non-scorable sheeting from a supply of sheeting material which comprises continuously moving the supply of sheeting, slitting said sheeting parallel to its direction of motion so as to divide it longitudinally into panel portions, forcibly separating the slit edges of the sheeting panels laterally a distance approximately equivalent to the thickness of the sheeting by means of a spreader blade, and immediately upon the passage of the laterally separated slit edges beyond the spreader blade, affixing to the sheeting panels over the laterally separated slit edges a flexible hinging material serving to hingedly articulate the panels to each other.

2. A process of manufacturing articulated panels of non-scorable sheeting material which comprises continuously moving the supply of sheeting, slitting said sheeting parallel to its direction of motion so as to divide it longitudinally into panel portions, forcibly separating the slit edges laterally by means of a spreader blade, and immediately upon the passage of the laterally separated slit edges beyond the spreader blade, causing the sheeting to pass between a pair of draw rolls acting to maintain the said laterally separated slit edges in a state of forcible separation, and simultaneously with the passage of the sheeting between the draw rolls, affixing flexible hinge material to the sheeting panels over the forcibly separated slit edges by causing the hinge material to pass around one of the draw rolls and into contact with the sheeting panels.

3. A process of manufacturing articulated panels of non-scorable sheeting from a supply of sheeting material which comprises continuously slitting the supply of sheeting so as to divide it longitudinally into panel portions, drawing the slit edge of the sheeting past a spreader blade to forcibly separate the slit edges of the sheeting laterally by a distance substantially equivalent to the thickness of the sheeting, and immediately upon the passage of the laterally separated slit edges of the sheeting beyond the spreader blade, affixing to the sheeting over the laterally separated slit edges a thin flexible hinge material while maintaining the laterally separated slit edges in a state of forcible separation.

ROBERT MORRIS BERGSTEIN.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
299,638	Hall	June 3, 1884
444,821	Feister	Jan. 20, 1891
1,101,928	Hawkins et al.	June 30, 1914
1,137,243	Terry	Apr. 27, 1915
1,203,616	Hawkins	Nov. 7, 1916
1,217,252	Williamson	Feb. 27, 1917
1,220,556	Reisbach	Mar. 27, 1917
1,382,208	Maranville	June 21, 1921
1,452,379	Haren	Apr. 17, 1923
1,627,812	Smith	May 10, 1927
1,716,991	Turner	June 11, 1929
1,924,523	Spring	Aug. 29, 1933
1,924,551	Higgins	Aug. 29, 1933
2,373,500	Pearce	Apr. 10, 1945
2,387,272	Klein et al.	Oct. 23, 1945
2,475,789	Kunz	July 12, 1949