United States Patent [19]

Wootten

[11] **3,793,928**

[45] **Feb. 26, 1974**

[54] **PAPER BOARD CONNECTING METHOD**

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[22] Filed: **Sept. 7, 1971**

[21] Appl. No.: **178,183**

[52] **U.S. Cl.** **93/1.1,** 156/253, 156/298, 161/111

[51] **Int. Cl.** **B31f 5/02**

[58] **Field of Search** .... 161/110, 115, 111; 156/252, 156/253, 298; 93/1.1, 1 R, 1 W Z

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[57] **ABSTRACT**

The combining of two flat fiber or paper board panels with partial perforations is effected by the employment of similarly perforated auxiliary sheets or tapes, the partial perforation areas or tabs of which are deflected or bent into the perforations of two or more panels to make a connection between them.

12 Claims, 11 Drawing Figures

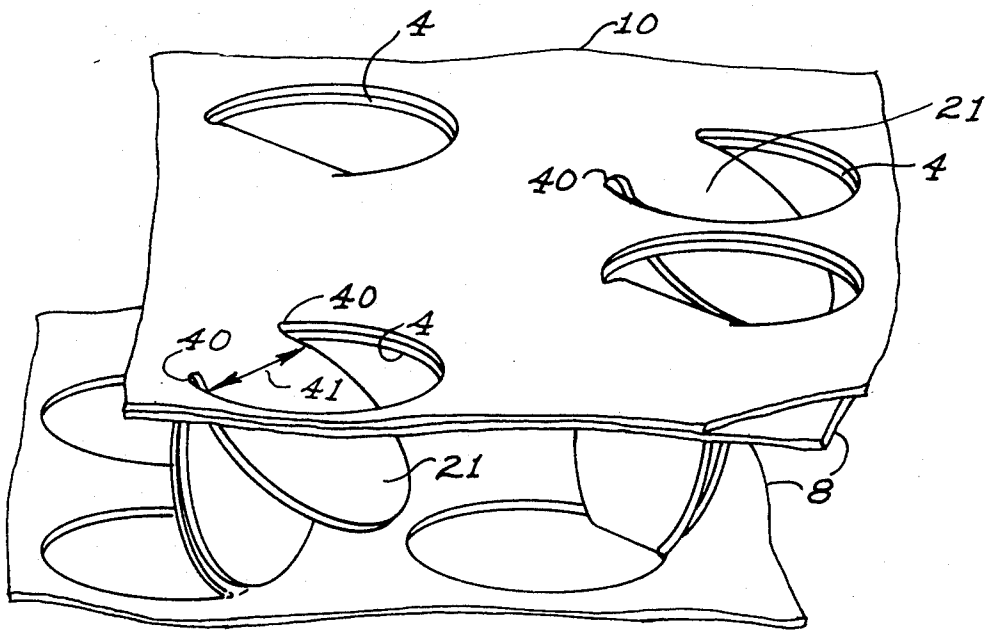


Fig. 1

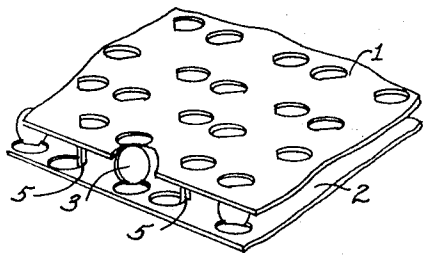


Fig. 2

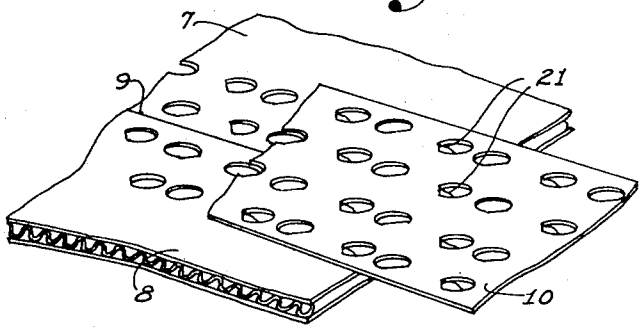


Fig. 3

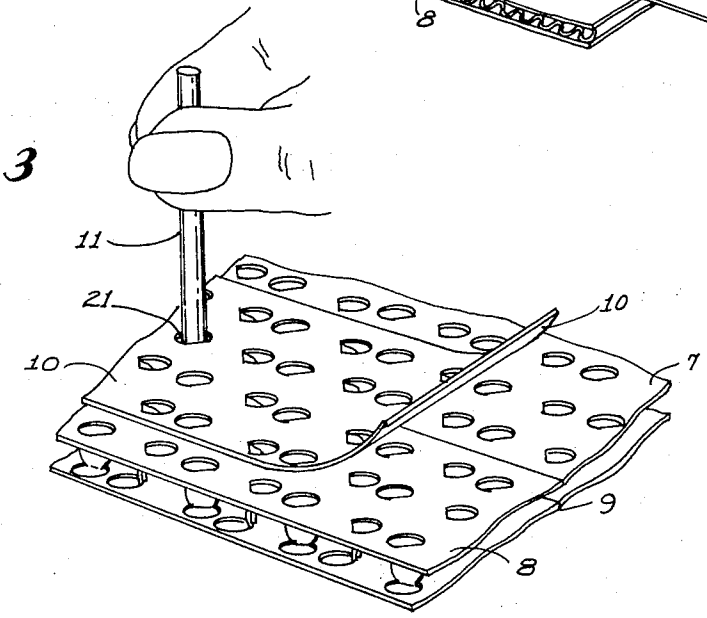
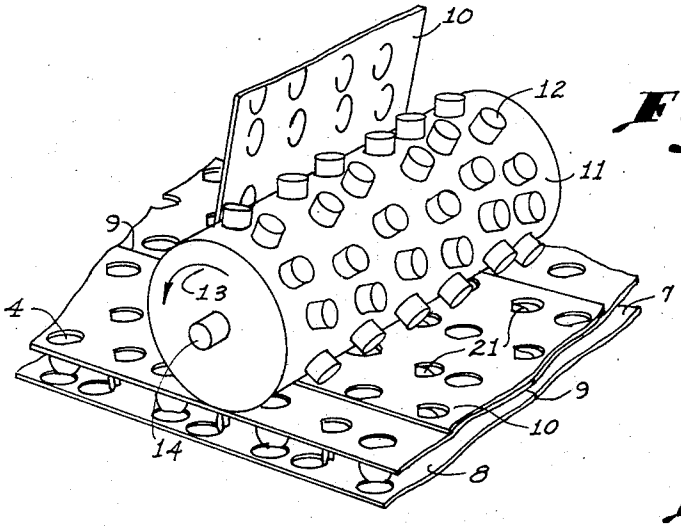


Fig. 4



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Fig. 5

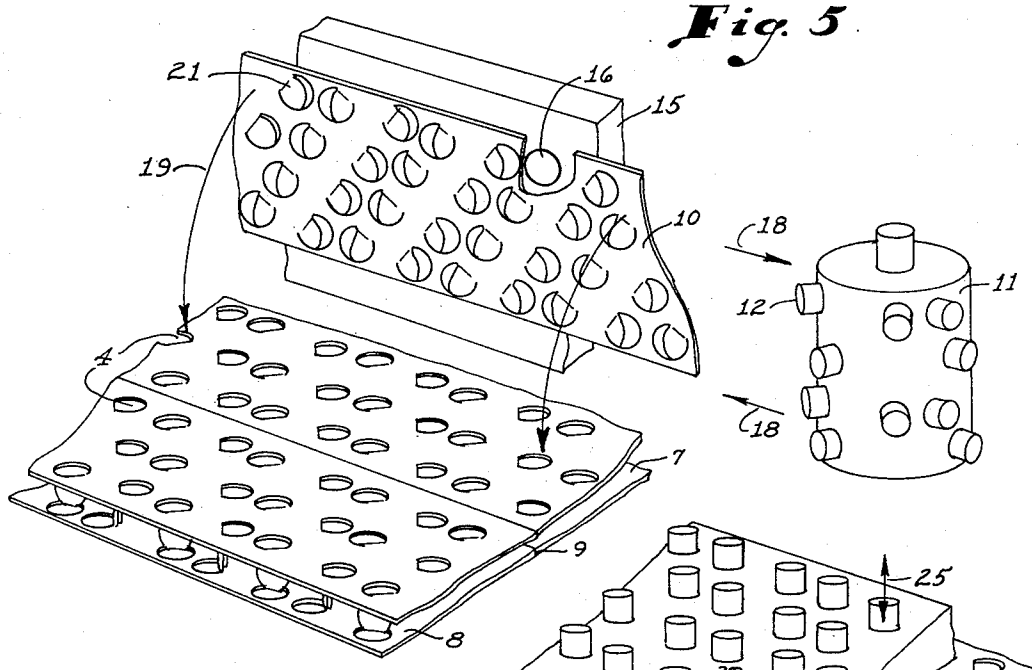


Fig. 5a

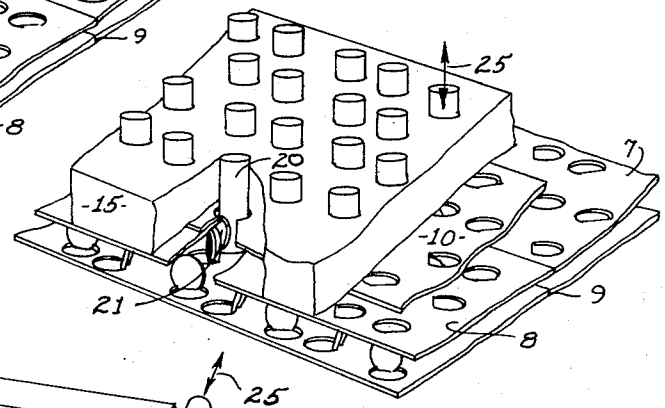
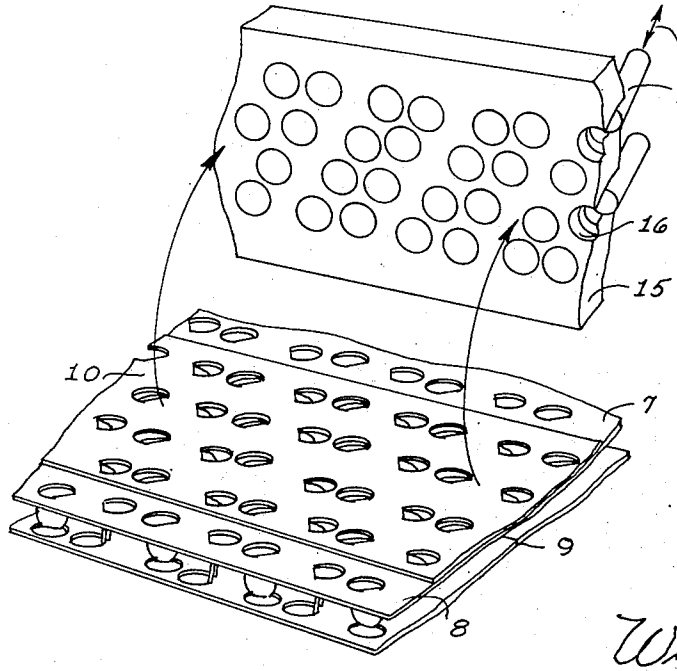


Fig. 5b



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Fig. 6

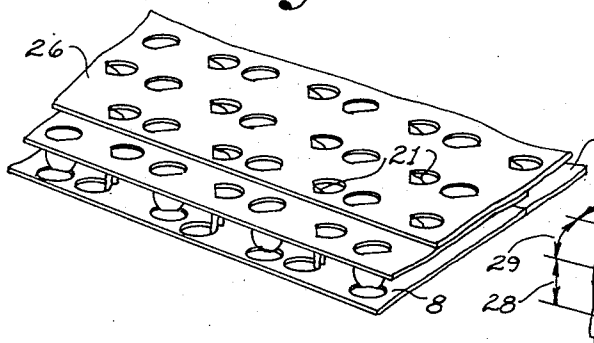


Fig. 7

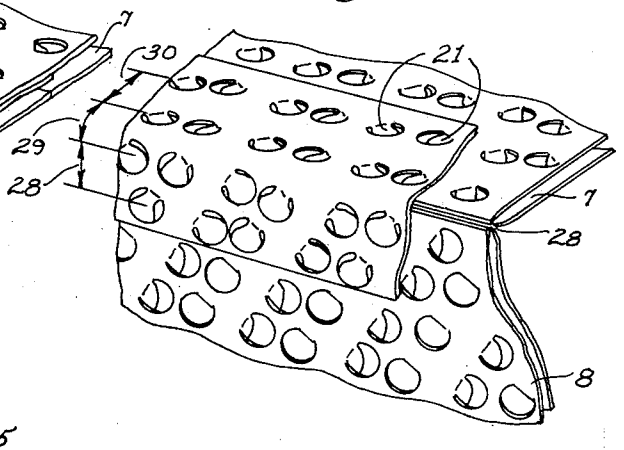


Fig. 8

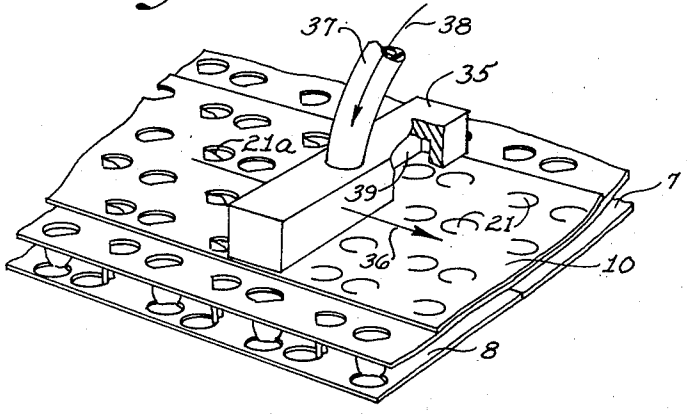
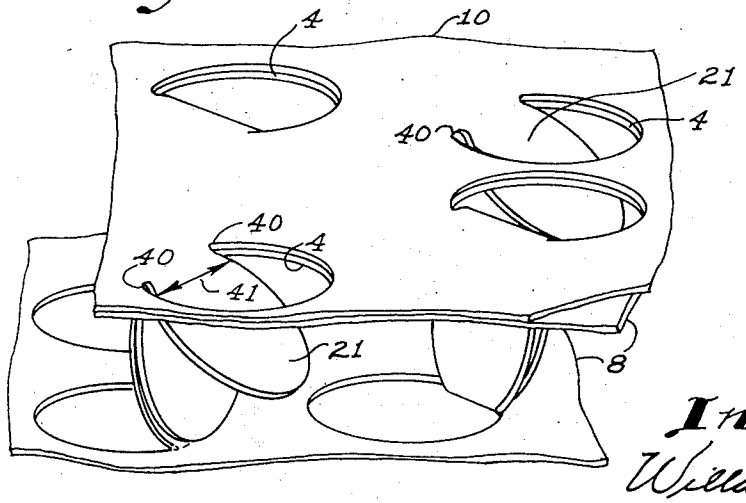


Fig. 9



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PAPER BOARD CONNECTING METHOD

CROSS REFERENCE TO RELATED APPLICATION

Wootten application Ser. No. 170,120 filed Aug. 9, 1971, for "Method and Apparatus for Forming a Fiber or Paper Board Structure".

BACKGROUND OF THE INVENTION

The present invention relates generally to a method for the mechanical connecting of fiber board paper or board panels that have a perforated surface and, because of said perforations, afford an area or plane which can be "connected" to a similarly patterned and perforated fiber or paper board tape or a sheet so the two such panels can be connected. The application of such a connection primarily applies to packaging or the containment of smaller packages and containers utilized for enclosing articles of commerce.

There are at present several generally accepted methods for the joining of paper or fiber board box sections together to form a container. These are usually related to adhesive procedures in which glue is applied directly to a box or a glued tape is employed, although in some instances boxes are stapled or stitched together with mechanical apparatus that applies wire stitches to the sections that require connection.

This invention contemplates effecting a connection between a pair of panels, having perforated surfaces, by means of a tape or sheet that has been partially perforated in a pattern like that employed in a paper board surface material of said panels. The connection between the panels is accomplished by the alignment and placement of said tape or sheet against and in a common plane with the paper board being joined, with the perforations aligned; and the tabs of the tape or sheet are then deflected or bent into the open perforations of the paper board panel surfaces thereby producing a very tight connection. Strength equal to that of the tape is exhibited when tension is applied in a direction parallel to the plane of the sheet and not perpendicular to its plane. When applied perpendicularly, the tape or sheet is easily peeled away.

The production of the partially perforated sheet is accomplished by applying force to a punch with a specific shape and placement to accomplish a pattern of perforations only a portion of which are cut away. The remaining segment of the punched openings remain to form a hinge or a connection with the tape or sheet.

In general usage, the connecting sheet or tape may be employed in much the same manner as an adhesive tape, either of the pressure sensitive variety or water activated glue type. The connecting tapes are roll mounted and are applied to the cartons employed by the use of a pin wheel which operates to bend the partial perforations or tabs and force them into the panel perforations. Such apparatus can be applied to the tapes and cartons by hand or aligned and applied with machinery.

Tapes can be wrapped around a carton and secured at both ends or at one point in a complete 360° wrap to securely and effectively hold a package without the need of adhesives.

In general usage, containers of the type anticipated for use with this procedure are constructed of corrugated material and are employed as shipping boxes or tertiary units primarily associated with the function of transportation. However, in certain instances, specialized packages can readily be employed with this system of connection provided the corrugated material is perforated or replaced by the material described in my aforementioned co-pending application Ser. No. 170,120.

The containers formed in the particular configuration described in my co-pending application Ser. No. 170,120 are assembled from two or three sheets of material having perforated surface patterns forming tabs which are bent at right angles to each sheet, with the tabs extending from one sheet being fastened to corresponding tabs extending from an opposing sheet to form a structural board configuration with a thickness dimension greater than the combined thickness of the paper board panels employed in the make-up of said board. When only two sheets are used to form this board, the resulting product, and any package formed therefrom, has its entire inner and outer surface perforated, and consequently is ventilated, to enclose produce items and other articles that require such ventilation. If desired, the perforated surfaces can be covered by an additional sheet of material to increase the structural strength of the board and to effectively seal the contents of a package fabricated from said board. Such enclosure by additional sheets can be partial, affording an exposed area of perforations which cooperates with the latching or connecting tape of the present invention.

An object of this invention is to provide a method of connecting paper board components through the use of a tape or sheet of paper or board having a partially perforated a pattern and adapted to be employed as a connecting means in the assembly of perforated or partially perforated board components.

It is another object of this invention to provide a preperforated board cooperating with a partially perforated tape for the purpose of forming a box adapted to enclose articles of commerce.

It is a further object of this invention to provide a novel pin roller type apparatus for the bending and deflection of the area tabs or partial perforations of a perforated tape to force said tabs into corresponding perforations in the surfaces of panels being joined.

It is a further object of this invention to provide a mechanical novel die configuration in which the tape or sheet tabs are retained within openings in said die which is subsequently aligned with the panels being joined in a second operation at which time pins within the openings in said die are moved in a reciprocating manner to transfer or deflect the tabs to a position within the perforations of the panels, accomplishing the connection of this invention.

It is a further object of this invention to provide a a method employing compressed air to force area tabs formed in the surface of a perforated tape into perforations defined by the surfaces of panels being joined. This result is achieved by the passage of a suitable plenum, connected to a pressurized air source, across the surface of the tape while the tape is held in contact with the surface of the panels being joined.

It is another object of this invention to produce a tight mechanical connection between two perforated panel members by the application of a tape or sheet that affords great strength in a direction parallel to the plane of the sheet, but which tape can be drawn away from the surfaces in a perpendicular fashion to afford easy removal in a "peel-off" type of function.

An additional object of this invention is to provide a tape or sheet material, employed for the connecting of paper board panels, having perforations of slightly larger area than the perforations of said panels, to achieve a tighter connection due to tab distortion when each tab of the sheet is deflected or bent into a cooperating perforation of the panel.

SUMMARY OF THE INVENTION

These and the objects of the present invention are achieved by the application of partially perforated tapes or sheets to the plane of perforated panels for the connection of said panels.

The connection is formed by the deflection or bending of the partial perforation tabs or extensions into the perforations within the plane surface of the panels being joined. These tabs are the same size as the panel perforations or slightly larger and, when bent from the plane of the sheet, the tab portion of the perforation is made to extend in an angular fashion into the perforation of the panel with the result that the shoulder or hinging section tends to lock within this space holding the plane of the sheet in tight surface connection to the plane of the perforated paper board. With angular placement of the partial perforation in a variety of positions, this interlock of tape or sheet tabs with the perforations, in the surface of the paper board panel, is effective in all directions.

The preferred cutting procedure is most effective when the tabs are arranged to bend so the plane of one is directed at the edge of another in a pattern that affords maximum resistance to the deflection of the tab when the pull is in any direction parallel to its plane.

The pattern arrangements of the partial perforations in the bending of the tabs from the plane of the sheet is planned to coincide with similar perforations in a previously prepared paper board material. It is possible to augment this connection by the application or use of adhesives, but this is unnecessary except at one or two points or at the terminus of the tape or sheet to maintain a tight "wrap" condition holding the plane of the tape or sheet tightly against the plane of the paper board being connected.

The tools involved for the combining or connecting of paper board, employing a pre-perforated tape or sheet, can be in several forms.

EXAMPLE I

The combining of a tape or sheet to the surface of two or more paper board panels for their connection can be accomplished by a simple sprocket wheel unit with the tape directed and maintained in a wrap over the pins of such a wheel so it is always engaged by said pins. Two or more rows of pins beyond the edge of the tape can be employed to effectively engage, register, align or synchronize the perforations in the panel boards being assembled so that the pins of the roller deflect or bend the tabs of the tape forcing them into the perforations of the paper board.

In a similar function, a lead pin or guide roller can be geared to and synchronized with the tape application pin roller so the perforations are registered between the tape and box board surface.

EXAMPLE II

In certain applications, the technique of applying tape or sheets to large panels to achieve connection can be more effectively done with intermittent functions. Under these circumstances, a special receiver device in the form of a perforated plate can receive the tape by the deflection of partial perforations into a pattern of openings in its surface with application of tape to this surface being accomplished using pin roller means comparable or similar to those associated with the roller systems described in Example I. In this type of application, the receiver plate has, within each of its hole openings, a reciprocating pin unit that is retracted when the tape partial-perforations are deflected within the plate openings, but when brought into conjunction and registered with the perforated area of the two panels being joined, the pins are moved forward at once in a common function to deliver, by deflection in the opposite direction, the area tabs of the tape forcing them into the perforations of the panel, thus at once making a connection across the entire area of the plane of the two panels being joined.

EXAMPLE III

In certain applications, because of very high speed and continuous connection needs, the seam of this invention can be made by moving carton elements past an air device. The utilization of compressed air is employed by holding the tape in aligned registry with the perforations of the panels being joined, and a suitable pressurized air plenum chamber is held in contact with the tape surface. Air can only escape by the deflection of the tabs within the tape, forcing said tabs into the perforations of the panels being joined and making the connection of this invention.

Various other configurations and methods are possible, and will be apparent to those versed in the art, to effect the deflection of tape or sheet partial perforations into the perforated openings of the panels, thus achieving connection between two or more board elements using the method of this invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a partially cut-away perspective illustration of a paper board that can be joined by the method of this invention.

FIG. 2 is a partially cut-away perspective illustration showing the connection of this invention in joining two sheets of corrugated paper board.

FIG. 3 illustrates a hand method for the deflection of area tabs of a tape-connecting element to join two paper board components.

FIG. 4 is a partially cut-away perspective illustration showing mechanical means for rapidly deflecting the area tabs of a tape connecting element to join two paper board sections.

FIG. 5 is a partially cut-away perspective illustration schematically illustrating the mechanics of applying a perforated tape or sheet to a plate or platen, also perforated, which is subsequently applied in registry to two paper board elements.

FIG. 5A is a partially cut-away perspective illustration showing the platen of FIG. 5 in a position for the simultaneous deflection of area tabs by the actuation of pin elements within the platen.

FIG. 5B illustrates two paper board elements joined by the connection of this invention, and with the perforated platen element returned to its original position as in FIG. 5.

FIG. 6 illustrates a partially cut-away perspective illustration of two perforated paper board elements joined by an overlapping section or extension of one sheet of the paper board combination, the area tabs of which have been connected to the second member to make the connection of this invention.

FIG. 7 is a corner attachment or connection in perspective, partially cut-away, showing two perforated paper board panel elements adjoined to form a corner using the connection of this invention.

FIG. 8 is a partially cut-away perspective illustration showing schematically a pressurized air chamber or plenum, the air pressure within which forces deflection of the area tabs of a tape into perforations of a board element to adjoin two paper board panels.

FIG. 9 is an enlarged perspective view of several perforations in an assembled panel board with a partially perforated tape overlayed in contact and with the deflection of area tabs within that sheet to accomplish the connection of this invention.

DESCRIPTION OF A PREFERRED EMBODIMENT

Referring now to the drawings, there is shown at FIG. 1, in perspective, a board structure of the type described in my aforementioned prior application Ser. No. 170,120. The board comprises two paper panels (1) and (2) joined to one another by tabs (3) formed by partially perforating openings, in panels (1) and (2) in like patterns, bending the tabs at right angles to the panels in directions extending toward one another, and then connecting pairs of tabs, extending from the two panels respectively, to one another, as illustrated at (5), in a back to back relationship by adhesive or other bonding means to achieve a board configuration having a thickness dimension greater than the sum of the thicknesses of the two panels being connected. As described in my said prior application the planes of the tab (3), extending from each panel, are angularly disposed to one another to give the final board substantially uniform strength in all directions. As is apparent from FIG. 1, the final board has patterns of perforations in its opposing surfaces; and these perforations can be used, in accordance with the present invention, to join plural such board sections to one another.

FIG. 2 illustrates two panel board members (7) and (8) in a butted adjoinment (9). Each board member has a form and geometry like that described in reference to FIG. 1. A tape component (10) provided with perforations therein in a pattern and form corresponding to the pattern of perforations in the outer sheets of board members (7) and (8), has been placed in alignment with the perforations of members (7) and (8); and the area tabs (21) of said tape have been deflected into the perforations of members (7) and (8) in their various angular hinging positions to achieve a connection between said members.

FIG. 3 illustrates a hand method for effecting the tape tab deflection referred to in reference to FIG. 2. A pin (11) is used to apply force to the area tabs (21) of tape (10) to transfer or deflect area tabs (21) into the perforations of the panels (7) and (8) to accomplish the connection of this invention.

FIG. 4 illustrates, in perspective, an alternative method for effecting the tape tab deflection referred to above. The panels (7) and (8) are again disposed in butt alignment (9) with one another, and a tape (1) is placed over the butt joint with the tape perforations in registry with those of panels (7) and (8). A cylinder (11), having peripheral pins (12) in a pattern equivalent to that of the perforations in tape (10) and panels (7) and (8), engages the assembled components and is moved in the direction of arrow (13) about axis (14) to cause deflection of the area tabs (21) from the plane of tape (10) into the perforated areas (4) in the panel elements (7) and (8) being joined.

FIG. 5 is the first of a series of three schematic illustrations which, together, illustrate a still further method and apparatus for effecting the aforementioned tape tab deflection. This further technique employs a perforated platen (15) having perforations (as shown in cut-away) (16). The area tabs (21) are initially deflected into these platen perforations (16) by means of the pins (12) mounted on a roller (11) which passes in an excursion as indicated by arrow (18), and which functions in a manner similar to that described in reference to FIG. 4. As a result platen (15) retains a section of tape or a sheet having partial perforations therein, permitting the platen (15) to then be moved in the direction of arrow (19) and thereby bring the perforated tape or sheet into registry with the perforated areas (4) of panels (7) and (8).

FIG. 5A illustrates the platen (15) in its closed position, described above, with the tape (10) located beneath the platen and substantially coplanar with the surface of butt aligned panels (7) and (8). The platen includes pin unit (20), shown in cut-away, which functions to deflect each area tab (21) when all the pins similarly located in the platen (15) are actuated in the directions of arrows (25). This operation achieves simultaneous deflection of area tabs (21) in tape (10) to cause said tabs to pass through the perforations of panels (7) and (8) making the connection of this invention.

FIG. 5B illustrates the retraction next step in the procedure, i.e., the or the return to the position of FIG. 5, of platen (15). As best shown in this Figure, in cut-away, there is a relief within the perforated openings (16) of the platen through which a smaller diameter pin (20) reciprocates in the directions of arrows (25). The finished connection is also shown, with panels (7) and (8) abutted at (9), with tape (10) in contact with the surface of these panels, and with area tabs (21) of tape (10) deflected to connect the panels (7) and (8).

FIG. 6 is a cut-away perspective view showing a variation in the invention which eliminates use of a separate tape or sheet for joining two panels together. One sheet, forming an integral portion of the paper board panel (7) is extended or permitted to overhang as at (26) the paper board panel (8). The area tabs (21) within this overhanging section have been deflected to connect with the perforated areas of panel (8), thus achieving the connection of this invention.

FIG. 7 is a perspective illustration showing a corner configuration in which the panels (7) and (8) are adjoined at a 90° angle. The tape (10) is wrapped around the corner, and the corner is cut at abutment (28) to produce a hole spacing between lines (29) and (30) which is equivalent dimensionally to the hole spacing between lines (28) and (29). The deflection of area tabs (21) from the plane of tape (10) into the perforations of panels (7) and (8) produces a connection, having the illustrated angle or corner geometry, in exactly the same manner as is accomplished when the two panels are in a common plane.

FIG. 8 illustrates still another method and apparatus for effecting the tape tab deflection described above. The panels (7) and (8) with tape (10) placed in surface contact therewith, and with the perforated areas of the tape and panels aligned, corresponds to the arrangement already described. The area tabs (21), previously cut in the tape, are not yet deflected. An air plenum (35) is placed in contact with the surface of tape (10) and moved in the direction of arrow (36). Air pressure applied through hose (37) in the direction of arrow (38) exceeds that of the atmosphere surrounding the assembly. The pressure within chamber (39) is such that the area tabs (21) are deflected, as shown at (21*a*) to pass into the perforated openings in panels (7) and (8) thereby achieving the connection of this method.

FIG. 9 is an enlarged view depicting the manner in which the connections of the present invention are achieved. Several perforations in a paper board panel, is shown in cross-section at (8), are joined to a tape or sheet shown partially at (10). Area tabs (21), deflected from the plane of the tape (10), pass through the perforations (4) of panel (8) and, in doing so, cause a latch or connection between the edge of the tab (21) and a perforated opening (4) as shown at (40). This latching action results from the angular placement of the tab (21), and from the fact that the distance across its surface on segment line (41) is greater than the opening in perforation (40) on the same line in the same segment.

I claim:

1. The method of connecting a pair of sheets, each of which has a plurality of perforations in at least one surface thereof, comprising the steps of positioning said sheets in side-by-side relationship to one another with an edge of each sheet being disposed in facing relationship to an edge of the other sheet, partially perforating a unitary flat joinder element to define a plurality of tab areas therein deflectable out of the plane of said joinder element, said partial perforating step comprising cutting a plurality of planar tab areas into said element while leaving, for each tab area, an uncut portion defining a hinge line about which said tab area may be bent, said hinge lines being angularly disposed relative to one another whereby said tab area, when deflected, extend from said joinder element in planes disposed at a plurality of different angles to one another, placing said partially perforated joinder element with sapced portions thereof being in surface engagement with the perforated surfaces of both of said sheets respectively, said joinder element being positioned in overlying relationship to the facing edges of said sheets and with the tab areas of said joinder element overlying perforations in each of said perforated sheet surfaces, and applying a force to each tab area to deflect said tab areas out of the plane of said joinder element and into perforations in said sheet surfaces to join each of said sheets to said joinder element thereby to connect said sheets to one another via said joinder element.

2. The method of claim 1 wherein each of said sheets is flat, said positioning step comprising placing said flat sheets in substantially coplanar edge-to-edge engagement with one another.

3. The method of claim 1 wherein said partial perforating step forms tab areas of such shape, in relation to the shapes of the perforations in each sheet, that the shape of each tab area is distorted as it is deflected into a sheet perforation.

4. The method of claim 1 wherein said force applying step comprises rotating a roller, having a plurality of pins extending from the surface thereof, over said joinder element to cause said pins to engage and deflect said tab areas successively.

5. The method of claim 1 wherein said force applying step comprises positioning a platen, having a plurality of reciprocable pins therein, over said joinder element with said pins in alignment with said tab areas, and moving said pins reciprocably to effect simultaneous deflection of a plurality of said tab areas.

6. The method of claim 1 wherein said partial perforating step comprises cutting said joinder element to form tab areas defined by a plurality of partial, substantially circular lines, each of which is associated with an uncut portion of said element defining the hinge line about which said tab area may be bent relative to the plane of said joinder element.

7. The method of claim 1 wherein each of said sheets comprises a board structure having a pair of opposed panels held in fixedly spaced relation to one another by an intervening structure, said plurality of perforations being formed in at least one of said opposed panels in each of said board structures.

8. The method of forming a structural element comprising the steps of perforating a pair of panels, said panel perforating step forming a pattern of spaced perforations in each panel comprising plural perforations disposed in each of a plurality of rows in each panel, positioning said perforated panels at an angle to one another with an edge of each panel being disposed closely adjacent an edge of the other panel whereby said pair of panels extend at an angle to one another from a common line, partially perforating a flat joinder element to define a plurality of tab areas therein delfectable out of the plane of said joinder element with said tab areas being spaced from one another in patterns which correspond to the pattern of perforations in each of said panels, bending said joinder element about a line to form two joinder element sections which are disposed at an angle to one another with each said section containing one of said patterns of tab areas, positioning said joinder element with its bending line disposed along said common panel line and with said two joinder element sections in surface engagement with said pair of panels respectively to place said tab areas in overlying relation to perforations in a plurality of rows in each of said panels, and thereafter applying a force to said tab areas to deflect said tab areas out of the plane of said joinder element toward and into the underlying perforations in each of said panels thereby to affix said joinder element to each of said panels.

9. The method of connecting a pair of flat sheets, each of which has a plurality of perforations in at least one surface thereof, comprising the steps of positioning said sheets in side-by-side relationship to one another with an edge of each sheet being disposed in facing relationship to an edge of the other sheet, said positioning step comprising placing said flat sheets at an angle of one another to form a corner configuration, partially perforating a unitary flat joinder element to define a plurality of tab areas therein deflectable out of the plane of said joinder element, placing said partially perforated joinder element with spaced portions thereof being in surface engagement with the perforated surfaces of both of said sheets respectively, said joinder element being positioned in overlying relationship to

the facing edges of said sheet and with the tab areas of said joinder element overlying perforations in each of said perforated sheet surfaces, said flat joinder element being bent along a line extending parallel to the facing edges of said sheets so that said spaced portions of said joinder element are at an angle to one another corresponding to the angle between said flat sheets, and applying a force to each tab area to deflect said tab areas out of the plane of said joinder element and into perforations in said sheet surfaces to join each of said sheets to said joinder element thereby to connect said sheets to one another via said joinder element.

10. The method of connecting a pair of sheets, each of which has a plurality of perforations in at least one surface thereof, comprising the steps of positioning said sheets in side-by-side relationship to one another with an edge of each sheet being disposed in facing relationship to an edge of the other sheet, partially perforating an elongated tape to define a plurality of tab areas therein deflectable out of the plane of said tape, placing said partially perforated tape with spaced portions thereof being in surface engagement with the perforated surfaces of both of said sheets respectively, said tape being positioned in overlying relationship to the facing edges of said sheets and with the tab areas of said tape overlying perforations in each of said perforated sheet surfaces, and applying a force to each tab area to deflect said tab areas out of the plane of said tape and into perforations in said sheet surface to join each of said sheets to said tape thereby to connect said sheets to one another via said tape.

11. The method of connecting a pair of boards, each of which has a pair of opposed panels held in fixedly spaced relation to one another by an intervening structure, and each of which has a plurality of perforations in at least one of its panels, comprising the steps of positioning said boards in side-by-side relationship to one another with an edge of each board being disposed in facing relationship to an edge of the other board, at least one of the panels in one of said boards being formed to extend beyond a boundary edge of said board and being positioned in overlapping relation to a perforated one of the panels in the other of said boards to provide a unitary flat joinder element, partially perforating said joinder element to define a plurality of tab areas therein deflectable out of the plane of said joinder element, placing said partially perforated joinder element in surface engagement with a perforated panel of the other of said boards and with the tab areas of said joinder element overlyng the perforations in said perforated panel, and applying a force to each tab area to deflect said tab areas out of the plane of said joinder element and into perforations in said perforated panel to join the other of said boards to said joinder element thereby to connect said boards to one another via said joinder element.

12. The method of connecting a pair of sheets, each of which has a plurality of perforations in at least one surface thereof, comprising the steps of positioning said sheets in side-by-side relationship to one another with an edge of each sheet being disposed in facing relationship to an edge of the other sheet, partially perforating a unitary flat joinder element to define a plurality of tab areas therein deflectable out of the plane of said joinder element, placing said partially perforated joinder element with spaced portions thereof being in surface engagement with the perforated surfaces of both of said sheets respectively, said joinder element being positioning in overlying relationship to the facing edges of said sheets and with tab areas of said joinder element overlying perforations in each of said perforated sheet surfaces, and applying air under pressure to each of said tab areas to deflect said tab areas out of the plane of said joinder element and into perforations in said sheet surfaces to join each of said sheets to said joinder element thereby to connect said sheets to one another via said joinder element.

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