July 29, 1947. R. F. SMART 2,424,716

FOLDABLE CARDBOARD BOX

Filed June 20, 1945 3 Sheets-Sheet 1

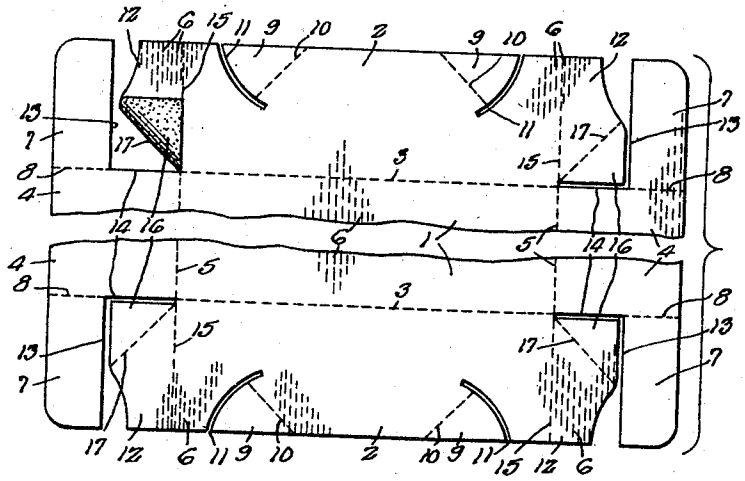


Fig. 1

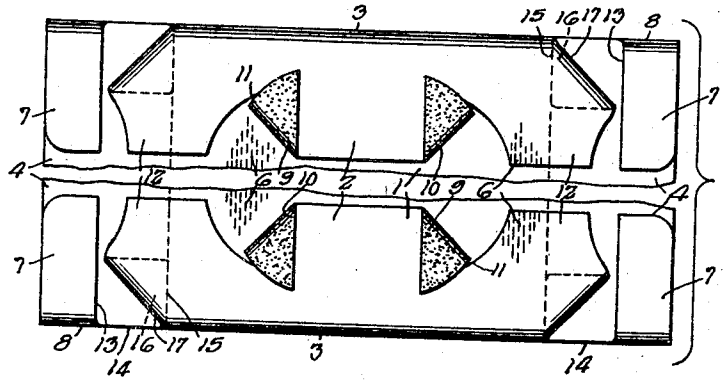


Fig. 2

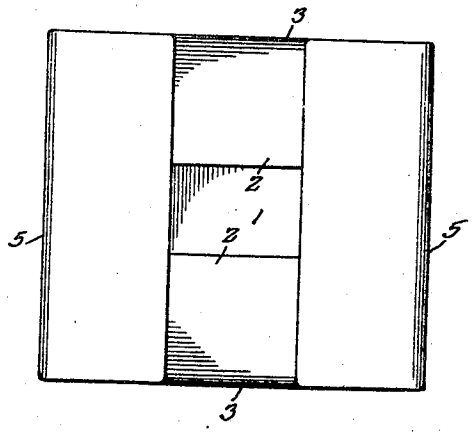


Fig. 3

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July 29, 1947. R. F. SMART 2,424,716

FOLDABLE CARDBOARD BOX

Filed June 20, 1945 3 Sheets-Sheet 2

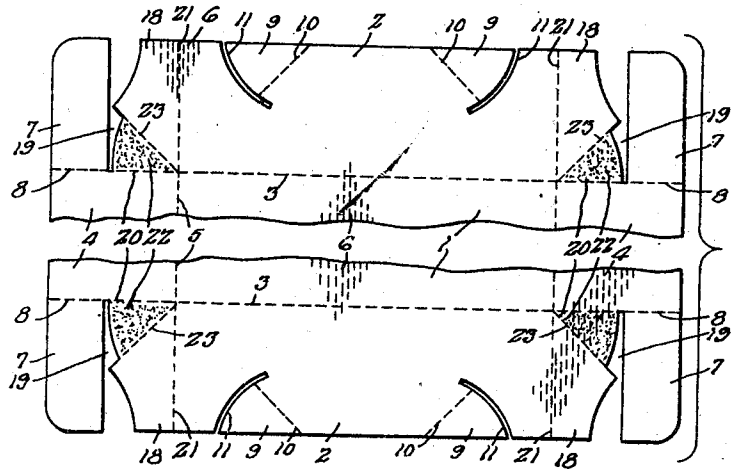


Fig. 4

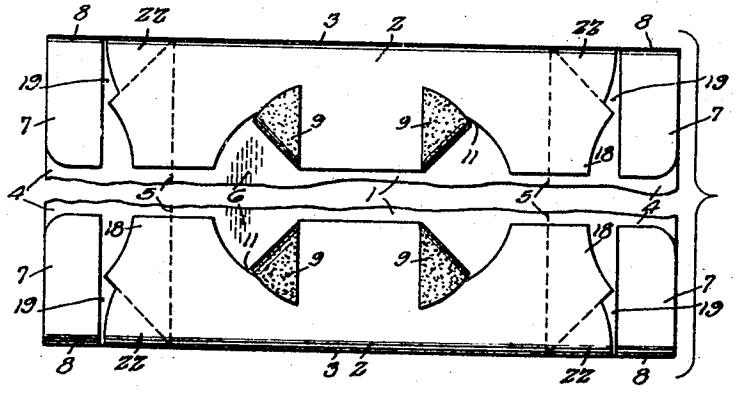


Fig. 5

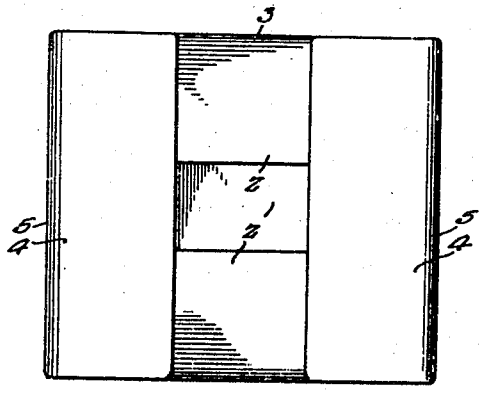


Fig. 6

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July 29, 1947. R. F. SMART 2,424,716

FOLDABLE CARDBOARD BOX

Filed June 20, 1945 3 Sheets-Sheet 3

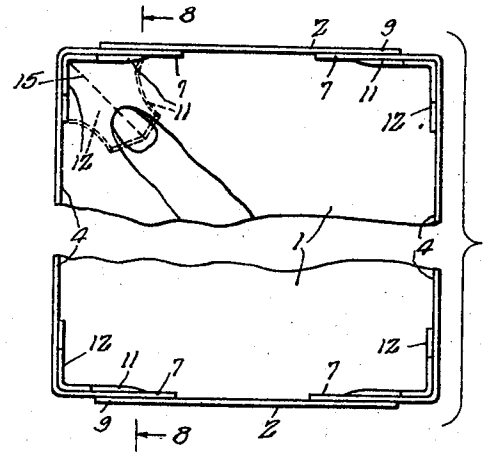


Fig. 7

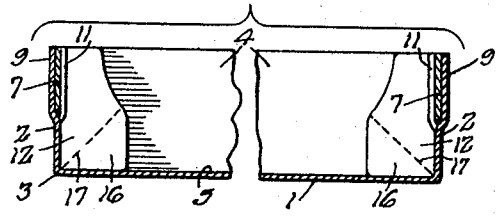


Fig. 8

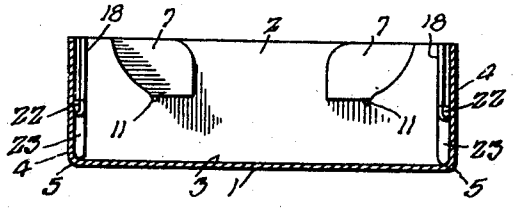


Fig. 9

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# UNITED STATES PATENT OFFICE

2,424,716

## FOLDABLE CARDBOARD BOX

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Application June 20, 1945, Serial No. 600,573

3 Claims. (Cl. 229—32)

1

This invention relates to foldable cardboard boxes.

An object of the invention is to provide an improved foldable cardboard box composed of a unitary and one-piece cardboard blank composed of a bottom and two complementary side walls and two complementary end walls hinged to said bottom for swinging movements, and hinges connecting the ends of said side walls with the ends of said end walls including parts integrally connected with said side walls and attached to the inner sides of said end walls, and also including parts integrally connected with the ends of said end walls and extending through slits in the upper portions of said side walls and securely attached to foldable tabs integral with said side walls inwardly beyond said slits, and means for utilizing the inherent resiliency of said hinges to hold the box open, while said hinges and said tabs are movable and foldable to permit said side walls and said end walls to be folded flatwise relatively upon that portion of the blank constituting the bottom of the box.

Another object of the invention is to provide an improved foldable cardboard box composed of a blank of the form and including the hinge structure and parts mentioned, in which said hinges operate in a novel and efficient manner to hold the box in open form and prevent accidental folding of the side and end walls upon the bottom, leaving said side and end walls foldable when said hinges are moved to inward positions in opposition to their inherent spring quality or resiliency.

Another object of the invention is to provide an improved foldable cardboard box composed of a blank including a bottom, side walls and end walls integrally hinged to said bottom, and hinge structure and parts assembled and attached in a novel and efficient manner to hold the box open and prevent accidental folding of the side and end walls upon the bottom, while leaving said side and end walls foldable when said hinges are moved to inward positions in opposition to their inherent spring quality and resiliency, said cardboard blank having the shreds forming the grain thereof extending longitudinally in a direction crosswise and parallel with said end walls for the attainment of this objective to obtain maximum resilient strength in said hinge structure and said parts.

Other objects of the invention will be apparent from the following description, reference being made to the annexed drawings, in which—

Fig. 1 is a plan view of an extended and unfolded cardboard blank for making a box in accordance with this invention.

2

Fig. 2 is a plan view showing the side walls and tabs of the blank as initially folded and superimposed upon adjacent portions of the blank with which said respective tabs have integral connection.

Fig. 3 is a plan view showing the side and end walls of the box completely folded after the tabs and flaps of the hinges have been permanently and integrally attached.

Fig. 4 is a plan view of an extended and unfolded blank of modified construction different from the blank of Fig. 1 in the particular that the hinges per se are integrally connected with both the side and end walls of the blank, whereas in the blank shown in Fig. 1, said hinges are separated from the end walls to which they are to be subsequently attached.

Fig. 5 is a plan view showing the tabs of the blank of Fig. 4 as initially folded and superimposed upon the walls to which they are integrally united.

Fig. 6 is a plan view showing one side of the completely folded box made from the blank of Figs. 4 and 5 after the tabs have been permanently and integrally attached.

Fig. 7 is a view showing the inside of the completely open box made from the blank of Fig. 1.

Fig. 8 is a transverse sectional view of the open box on the line 8—8 of Fig. 7, showing the hinge structure in a box made of the blank of Figs. 1 and 2.

Fig. 9 is a longitudinal sectional view on such a line as 9—9 of Fig. 7, showing the hinge structure in a box made of the blank of Figs. 4 and 5.

The unitary and one-piece cardboard blank in each modification of the invention shown in the drawings is composed of a bottom 1, two complementary side walls 2 integral with said bottom along parallel score and hinge lines 3, two complementary end walls 4 integrally united with said bottom 1 along parallel hinge score lines 5 extending at right angles from and intersecting the ends of said hinge score lines 3, and springy resilient hinges and parts connecting said side and end walls, as hereinafter described. For the attainment of one objective of the invention, it is preferable that the grain 6 of the cardboard extend transversely of the bottom 1, that is to say, approximately at right angles to the hinge score lines 3 and transversely across the side walls 2 to the edges of said side walls, and also continuously along the end walls 4 substantially parallel with the hinge score lines 5 and with the edges

of said end walls. This provides a cardboard box having greater springiness and resiliency in the hinges connecting the side and end walls than would be provided in a blank having the grain 6 extending in any other direction. This is because of the peculiar and novel arrangement of the resilient hinges and other parts pivotally attaching the side walls to the end walls for movement from open position in which said side and end walls extend vertically from the bottom 1 to folded position in which said side and end walls are superimposed upon the bottom 1, and vice versa.

Both modifications of the invention shown also comprise straps 7 extending beyond the ends of the end walls 4 and integrally connected therewith along hinge score lines 8 in approximate alinement with the respective hinge score lines 3 integrally uniting the bottom 1 and the side walls 2 for movement from said open position to said closed position, and vice versa. Each modification of the present invention also comprises two tabs 9 integrally connected with each side wall 2 along hinge score lines 10 extending from the upper edges of said side walls 2 toward the corners formed by intersection of the hinge score lines 3 and 5. It is preferable, but not indispensable, that the hinge score lines 10 incline towards said corners at angles of about 45° relative to the hinge score lines 3. Slits 11 through the side walls 2 extend angularly from the upper edges of said side walls 2 and across and beyond the lower ends of the hinge score lines 10 for receiving the straps 7. The said slits 11 extend downwardly far enough to receive the straps 7 when the boxes are opened, as in Figs. 7, 8 and 9.

In the modification of blank shown in Figs. 1 and 2, and the box made from said blank shown in Figs. 7 and 8, hinge tabs 12 are integrally connected with both ends of each side wall 2. The hinge tabs 12 are separated from the straps 7 by cutouts in the form of slits 13 and are separated from the ends of the end walls 4 by cutout slits 14. The slits 14 extend from the ends of the hinge score lines 3 to intersection with the slits 13 at the inner lower ends of the hinge score lines 8. The hinge tabs 12 are integrally connected with the respective ends of both side walls 2 by hinge score lines 15 extending from the outer edges of the side walls 2 to intersection with the ends of the hinge score lines 3 and the ends of the slits 14 at the ends of the hinge score lines 5. Triangular attaching portions 16 are integrally connected with the inner and lower ends of the hinge tabs 12 along hinge score lines 17 extending from the corners of intersection of the hinge score lines 15 with the slits 14 toward the corners of the blank. This provides an arrangement in which the hinge score lines 17 extend at angles of about 45° relative to the slits 14 and also relative to the adjacent hinge score lines 15.

In making a box from the blank of the modification shown in Figs. 1 and 2, the triangular attaching portions 16 are first folded along the hinge score lines 17 to superposed position upon the hinge tabs 12 and are then coated with some adhesive material if adhesive is to be used as the attaching medium. Other attaching devices may be used instead of adhesive. Then the side walls 2 and the straps 7 are folded inwardly toward each other, respectively, superimposing said side walls 2 upon the bottom 1, the straps 7 upon the inner surfaces of the end walls 4, and the hinge tabs 12—16 also upon the inner surfaces of said



end walls 4. Then the tabs 9 are folded along the hinge score lines 10 to superimposed positions upon the side walls 2 and are preferably coated with some adhesive attaching material, as shown in Fig. 2. Then the end walls 4 are folded inwardly toward each other to superimposed positions across the side walls 2, thereby placing the straps 7 directly upon the adhesively coated tabs 9. Pressure is then applied to cause the attaching portions 16 of the hinge tabs 12, and to cause the tabs 9, to adhere permanently and integrally to the end walls 4 and to the straps 7, respectively. Other devices may be used to attach the straps 7 to the tabs 9 instead of adhesive. The box is then in folded or collapsed position, as shown in Fig. 3. When the box is opened by raising the side walls 2 and end walls 4 vertically from the bottom 1, the parts assume the relative positions shown in Figs. 7 and 8, in which the hinge tabs 12 extend at right angles from the side walls 2 flatwise along the inner surfaces of the end walls 4 while the attaching portions 16 of said hinge tabs 12 also extend flatwise against and along the inner surfaces of said end walls 4. This arrangement is possible because of the existence of the slits 14 completely separating the hinge tabs 12—16 from integral connection with the ends of the end walls 4. The straps 7 extend through the slits 11, crossing from the outside to the inside of the side walls 2. The inherent springiness and resiliency of the cardboard holds the box securely in open position after said box has been opened, as shown in Fig. 7.

In the modification of box blank shown in Figs. 4 and 5, and the box made from said blank shown in Fig. 9, hinge tabs 18 are integrally connected with both ends of each side wall 2 and are separated from the straps 7 by cutouts in the form of slits 19 extending from the outer ends of said straps 7 to the hinge score lines 8. Hinge score lines 20 extend from the inner ends of the cutout slits 19 as extensions from the ends of both hinge score lines 3, leaving the hinge tabs 18 integrally connected with the side walls 2 and also with the end walls 4. The hinge tabs 18 are integrally connected with the respective ends of both side walls 2 by hinge score lines 21 extending from the outer edges of the side walls 2 to the corners formed by intersection of the ends of the hinge score lines 3 with the ends of the hinge score lines 5. Triangular attaching portions 22 are integrally connected with the inner, that is to say with the lower, ends of the hinge tabs 18 along hinge score lines 23 extending from the corners of intersection of the hinge score lines 20 and 21. This provides an arrangement in which the hinge score lines 23 extend at angles of about 45° relative to both of the hinge score lines 20 and 21 which intersect at right angles. The inner surfaces of the portions 22 are coated with glue.

In making a box from the modification shown in Figs. 4 and 5, the side walls 2 and the straps 7 are folded inwardly toward each other, respectively, superimposing said side walls 2 upon the bottom 1, the straps 7 upon the inner surfaces of the end walls 4, and the hinge tabs 18—22 also upon the inner surfaces of said end walls 4. Then the tabs 9 are folded along the hinge score lines 10 to superimpose said tabs 9 upon the side walls 2, and the exposed surfaces of said tabs 9 are preferably coated with some adhesive attaching material, as indicated in Fig. 5. Then the end walls 4 are folded inwardly toward each other to superimposed positions across the side walls 2

and separated therefrom by the interposed attaching tabs 18—22, thereby placing end portions of the straps 7 directly upon the adhesively coated tabs 9. Enough pressure is then applied to cause the tabs 9 to adhere permanently and integrally to the straps 7. The box thus made is in folded or collapsed position as shown in Fig. 6. When the box is opened by raising the side walls 2 and end walls 4 vertically from the bottom 1, the parts assume the relative positions shown in Fig. 9, in which the hinge tabs 18 extend at right angles from the side walls 2 against or close to the inner surfaces of the end walls 4, while the attaching portions 22 of said hinge tabs 18 extend flatwise between the end walls 4 and complementary lower portions of the hinge tabs 18. This arrangement and relationship of parts is effected because of the integral connection of the hinge tabs 18—22 with the ends of the end walls 4 along the hinge score lines 20. In this modification, the straps 7 extend through the slits 11, crossing from the outside to the inside of the side walls 2, just as in the first modification. The inherent springiness and resiliency of the cardboard holds the box securely in open position after said box has been opened as shown in Fig. 9.

In both modifications of the invention, the box may be folded to flat or collapsed position as shown in Figs. 3 and 6, or opened, as desired. To fold or collapse the box after it has been opened, it is only necessary to bend or move inwardly the four hinge tabs 12—16 and 18—22, bending said tabs along the hinge score lines 15 and 21, respectively. This is possible because the portions of the end walls between the slits 11 and the hinge score lines 12 and 22 are unattached to adjacent portions of the straps 7 and are freely flexible and bendable, as indicated by dotted lines in Fig. 7.

It is evident that my invention attains all of its intended advantages and functions economically and satisfactorily. There is practically no waste material. Rectangular or substantially rectangular box blanks may be cut to form boxes of any desired capacities. Limited variations other than the modifications described may be made without departure from the nature and principle of the invention as defined by the appended claims.

I claim:

1. A foldable cardboard box composed of a one-piece blank forming a box bottom, two spaced parallel side walls and two spaced parallel end walls having integral hinge connection with opposite side and end edges, respectively, of said bottom, hinge tabs having integral hinge connection with opposite ends of said respective side walls including attaching portions at the lower ends of said hinge tabs connected with the lower portions of said end walls and leaving said side and end walls movable from positions extending vertically from said bottom when said box is open to positions in which said side walls are folded inwardly flatwise upon said bottom and said end walls are folded inwardly flatwise upon the end portions of said side walls when said box is folded, tabs having hinge connection along their inner edges with said side walls and separated from said side walls along their outer edges by slits extending downwardly from the upper edges of said side walls toward said bottom to intersection with said hinge connection, and straps having integral hinge connection with the ends of said end walls, respectively, extending across the outer surfaces of the end portions of said side walls and thence through said respective slits and attached to the inner sides of said tabs.



2. A foldable cardboard box composed of a one-piece cardboard blank forming a bottom, two spaced parallel side walls and two spaced parallel end walls having integral hinge connection with opposite side and end edges, respectively, of said bottom and extending vertically therefrom, two tabs having their adjacent edges hinged to said side walls and their outer edges that are toward the ends of said side walls separated therefrom by slits extending downwardly toward said bottom from the upper edges of said side walls, hinge tabs having integral hinge connection with opposite ends of said respective side walls and including attaching portions at the lower ends of said tabs connected with the lower portion of the inner sides of said end walls, and straps having integral hinge connection with the ends of said end walls, respectively, extending across the outer surfaces of the end portions of said side walls and thence through said respective slits and attached to the inner sides of said tabs, leaving said side and end walls movable from said vertical positions to positions in which said side walls are folded inwardly flatwise upon said bottom and said end walls are folded inwardly flatwise upon the end portions of said side walls when said box is folded.

3. A foldable cardboard box made of a one-piece blank composed of fibrous material, said blank forming a box bottom, two spaced parallel side walls and two spaced parallel end walls having integral connection with opposite side and end edges, respectively of said bottom, hinge tabs having integral hinge connection with opposite ends of said respective side walls including attaching portions at the lower ends of said hinge tabs connected with the lower portions of the inner sides of said end walls, straps having integral hinge connection with the ends of said end walls, respectively, above the plane of said attaching portions extending across the outer end portions of said side walls and thence through slits in said side walls to the inner sides thereof, said slits being extended downwardly from the upper edges of said side walls, hinges extending downwardly from the upper edges of said side walls to intersections with said slits, respectively, thereby forming attaching tabs for said straps, and means attaching said straps to the inner surfaces of said tabs, leaving the remaining portions of said straps unattached to said side walls.

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