

Sept. 24, 1968

C. E. PALMER

3,402,875

CONTAINERS

Filed Nov. 8, 1966

3 Sheets-Sheet 1

Fig. 1.

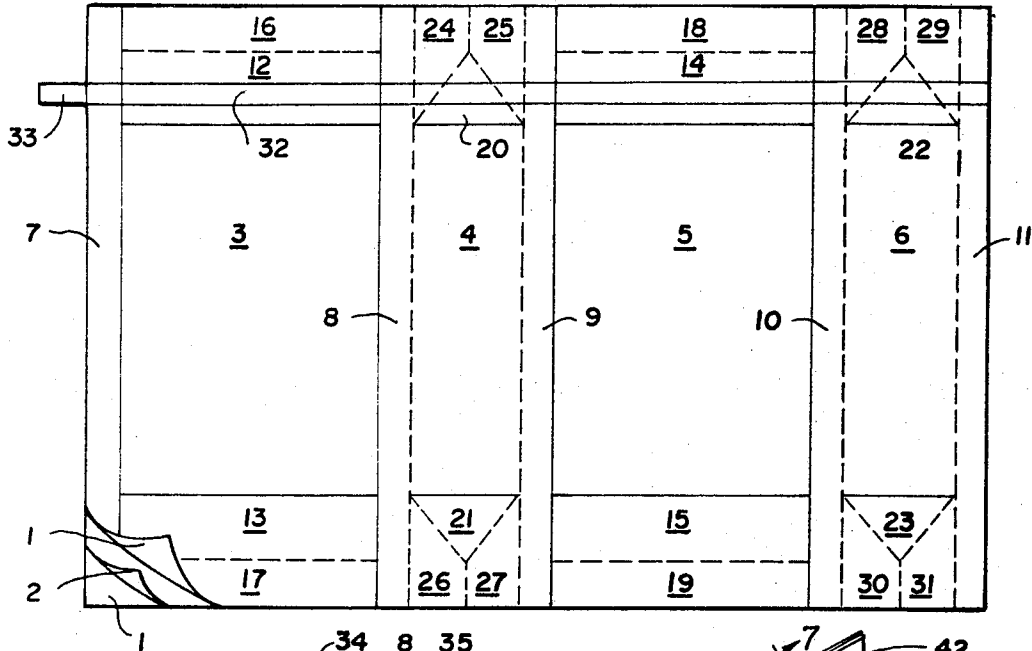


Fig. 4.

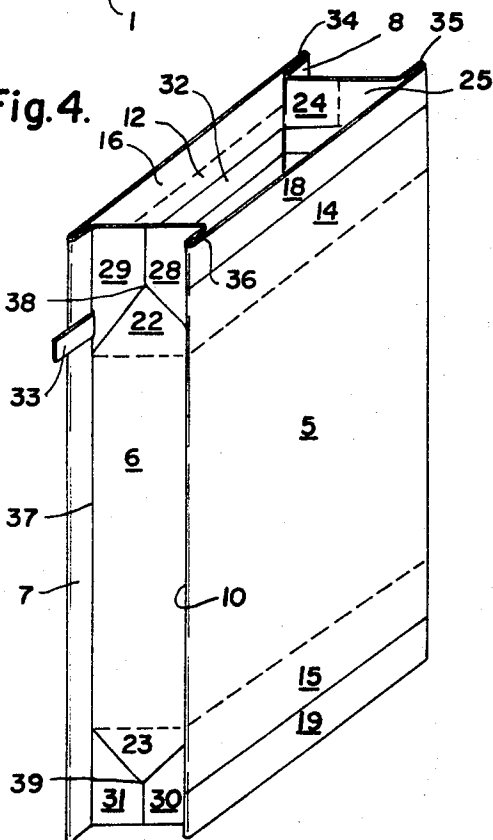
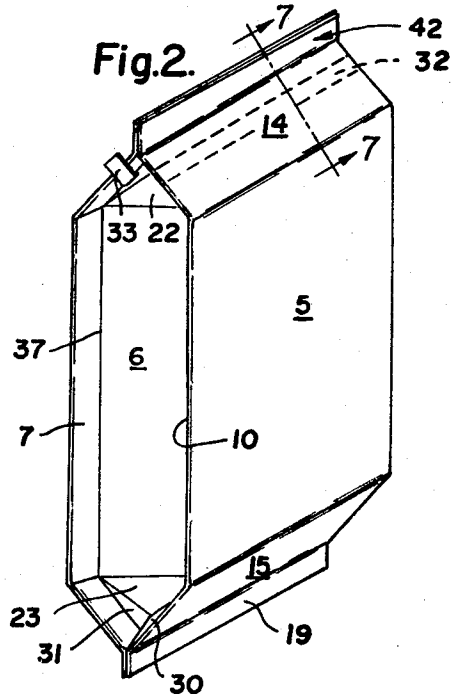


Fig. 2.



INVENTOR.
CHARLES E. PALMER

BY

JA Zaluski

his AGENT

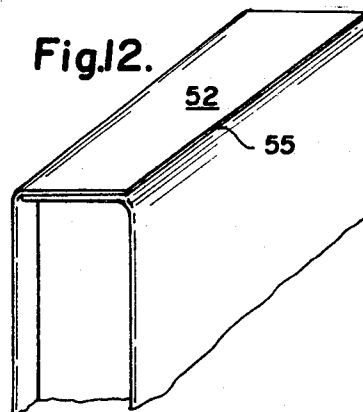
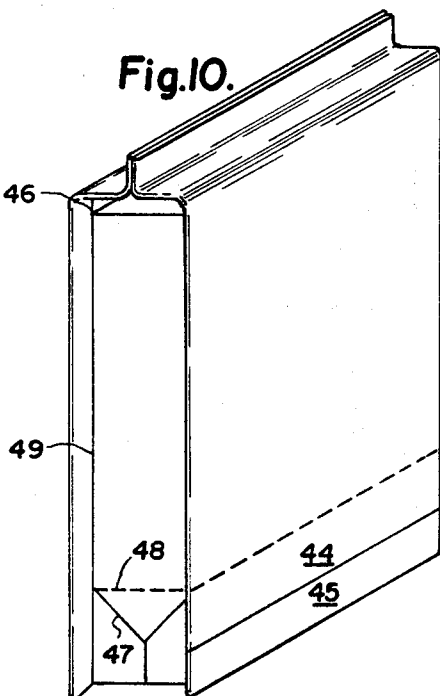
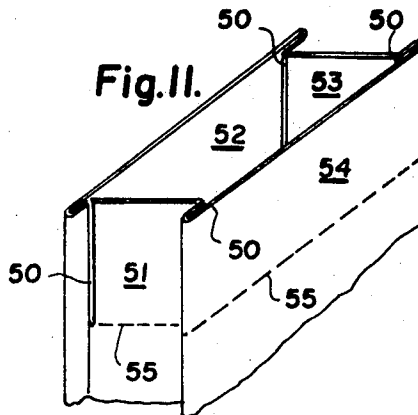
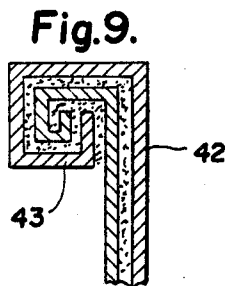
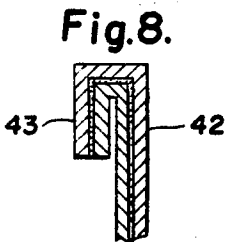
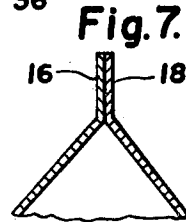
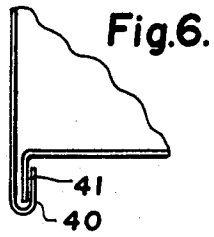
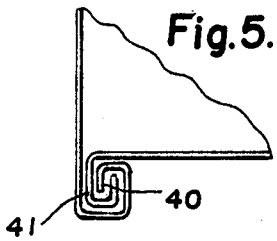
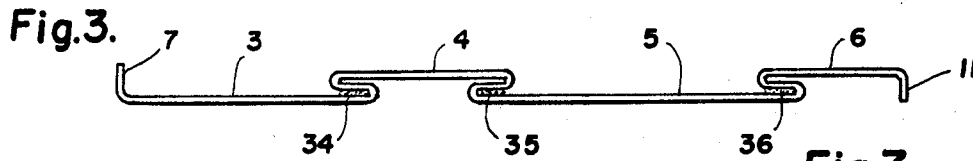
Sept. 24, 1968

C. E. PALMER
CONTAINERS

3,402,875

Filed Nov. 8, 1966

3 Sheets-Sheet 2



INVENTOR.
CHARLES E. PALMER

BY

JA Zaluski

his AGENT

Sept. 24, 1968

C. E. PALMER
CONTAINERS

3,402,875

Filed Nov. 2, 1966

3 Sheets-Sheet 3

Fig.13.

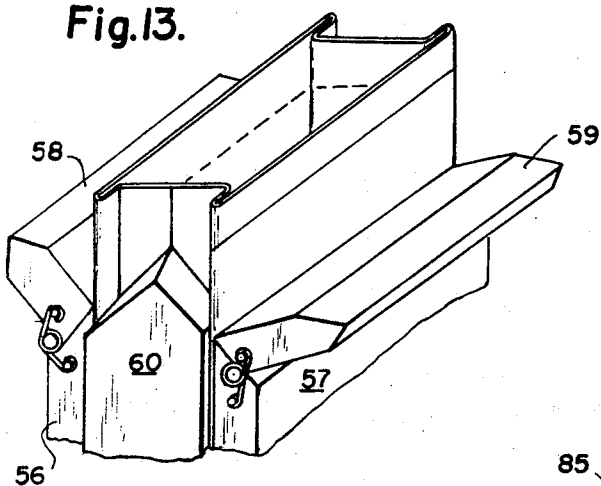


Fig.14.

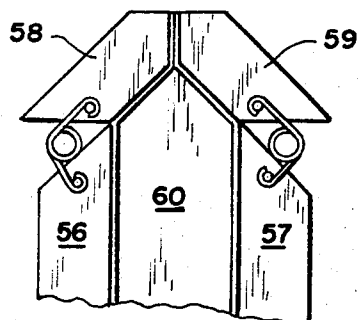


Fig.16.

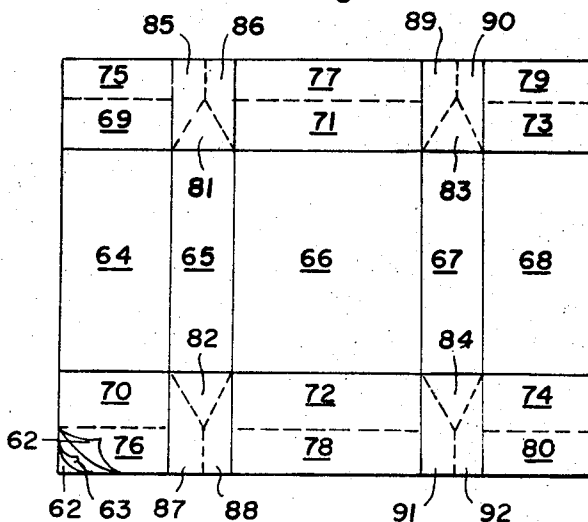
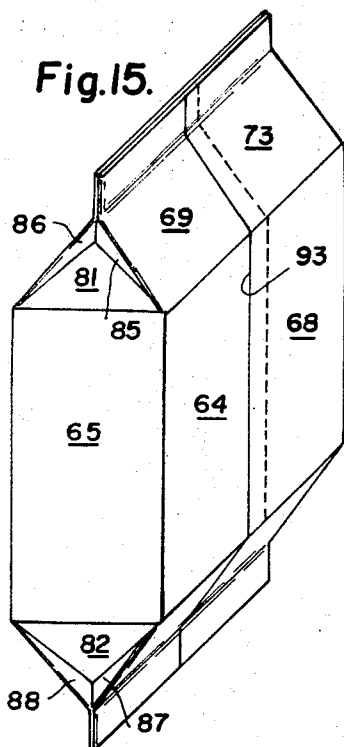


Fig.15.



INVENTOR.
CHARLES E. PALMER

BY

J. A. Zelenka

his AGENT

1

3,402,875

CONTAINERS

Charles E. Palmer, Somers, Conn., assignor to Jones & Laughlin Steel Corporation, Pittsburgh, Pa., a corporation of Pennsylvania

Filed Nov. 8, 1966, Ser. No. 592,855

10 Claims. (Cl. 229—51)

ABSTRACT OF THE DISCLOSURE

The present invention provides containers constructed of steel foil and steel foil-paper laminates. The containers are constructed so as to take full advantage of the highest strength afforded by the use of steel foil.

This invention relates generally to containers and more particularly to containers formed from steel foil.

Treated paperboard, cardboard, sheet plastic, and similar materials as well as metal foils such as aluminum foil or aluminum alloy foils, have found applicability in the packaging art as container forming materials. Inexpensive containers constructed from such materials often prove to be unsatisfactory, however, because they lack the necessary strength and rigidity to withstand shock without rupturing and because often they are unable to maintain their shape under the weight and pressure of the material which they contain.

Steel foil has a greater tensile strength and is more abrasion resistant than the above mentioned materials. The strongest and most abrasive-resistant steel foil, however, is rather low in ductility. Therefore, a container of this foil constructed so as to have corners formed by the intersection of three or more fold lines at right angles to one another, as would be the case with a flat end wall container, is susceptible to being ruptured by a blow at those corners. Certain embodiments of my invention are not subject to this problem because they possess no such corners. Other embodiments of my invention are constructed so that weak corners are recessed within the outer extremities of the container and so are protected from sharp blows. The containers of my invention therefore take advantage of the highest strength afforded by steel foil.

In addition to being strong because they are constructed of the strongest steel foil, the containers of my invention are of increased strength. Increased strength is imparted to certain embodiments of my invention by forming the container ends into triangular or peak-type structures. Certain other embodiments of my invention are constructed of steel foil which has been laminated to a pliable material such as paper or paperboard. The paper or paperboard lamina, besides contributing to the strength of the container by decreasing the frequency of rupturing of the container along a seam, in addition increases the radius of the folds required so that the material is not bent as sharply as it would be in the absence of such laminae. This is advantageous since sharply folded high strength steel foil is susceptible to cracking along the fold. Still another method I employ to give increased strength to steel foil containers is to provide the containers with liners or pouches, as distinguished from laminates. Containers which possess liners or pouches are not as likely to rupture under impact along seams or folds as are containers not having such liners. These and other techniques used to provide high strength containers are more fully discussed below.

2

The containers of my invention possess characteristics which make them especially applicable to the packaging art in addition to the characteristics of high strength briefly noted above. Thus according to one embodiment of my invention the container has one parallel pair of its side walls recessed within another parallel pair of side walls. The recessed side walls provide a working area wherein outside mandrels can be positioned so that the container end structures can be completed about the outside mandrels. Thus there is no need for inside mandrels and consequently no problem as to closing of the container ends arises when the container is filled prior to the completion of the end structures.

A characteristic of the recessed side wall container constructed from steel foil-paper laminate material which is of singular advantage in the packaging art is the ability of the container in its semifinished condition, i.e. prior to the completion of the end structures, to be flattened and then opened to a filling position with relative ease. This enables the container to be partially assembled, flattened so as to reduce its bulk, and shipped to a distant filling station where it can be readily opened, filled and completed by formation of the end structures.

A further characteristic of the containers of my invention is that they are formed from an integral substantially rectangular blank and thereby include the advantages, such as absence of waste, attendant in using such a blank. By using an integral blank and by employing face to face folds in the construction of the container, a completely sealed one piece container is formed.

I have as an object of my invention to provide high strength containers constructed from steel foil.

Another object of my invention is to provide high strength containers constructed from steel foil-paper laminates.

Yet another object of my invention is to provide steel foil containers having no weak corners.

Still another object of my invention is to provide steel foil containers wherein any weak corners formed in the container are recessed within the exterior limits of the container.

A further object of my invention is to provide steel foil containers having high end strength characteristics.

Another object of my invention is to provide steel foil containers having liners or pouches for adding strength to the containers.

Still another object of my invention is to construct steel foil containers which include an outside working area for mandrels, thus eliminating the need for inside mandrels for completing the container end structures.

Yet another object of my invention is to provide steel foil containers which in the semifinished form can be readily collapsed from an open condition and readily opened from a collapsed condition.

A further object of my invention is to construct steel foil containers from an integral blank.

Another object of my invention is to provide completely sealed one piece containers.

Yet another object of my invention is to provide containers having one pair of substantially parallel walls recessed within another pair of substantially parallel walls.

Various other objects and advantages will appear from the following description of my invention with reference to the accompanying drawings where presently preferred embodiments of the invention are depicted. The novel features of my invention will be particularly pointed out hereinafter in connection with the appended claims.

In the drawings:

FIGURE 1 is a plan view, in part developed, of a steel foil-paper laminate blank scored in a manner for forming a recessed side wall container. FIGURE 2 is a perspective view of a recessed side wall container formed from the blank of FIGURE 1. FIGURE 3 is an end view of the blank of FIGURE 1 after having undergone the first folding operation. FIGURE 4 is a perspective view of the semifinished recessed side wall container formed from the folded blank of FIGURE 3 prior to forming of the container end structures.

FIGURE 5 is a fragmentary top view of a semifinished container illustrating a modified side seam. FIGURE 6 shows the side seam of FIGURE 5 as it appears after the initial folding operation.

FIGURE 7 is a fragmentary transverse vertical sectional view taken on line 7—7 of FIGURE 2 showing the end seal.

FIGURE 8 is a fragmentary sectional view like that of FIGURE 7 illustrating a first modified end seal.

FIGURE 9 is a fragmentary sectional view like that of FIGURE 7 illustrating a second modified end seal.

FIGURE 10 is a perspective view of a partially completed container formed from a blank like that of FIGURE 1 and having a modified end structure.

FIGURE 11 is a fragmentary perspective view of a semifinished recessed side wall container prepared for forming a flat end structure. FIGURE 12 is a fragmentary perspective view of the completed flat end structure formed from the body of FIGURE 11.

FIGURE 13 is a fragmentary perspective view of a semifinished recessed side wall container illustrating a particular form of apparatus used in forming the end structures of the container.

FIGURE 14 is an end view of the end structure formed by the apparatus of FIGURE 13.

FIGURE 15 is a perspective view of a container formed according to a second embodiment of my invention. FIGURE 16 is a plan view, in part developed, of a steel foil blank scored in a manner for forming the container of FIGURE 15.

The steel foil used in constructing containers according to my invention is of less than about .006 inch thickness and is preferably of about .001 to about .004 inch thickness. Also the steel foil most generally used in making the containers of my invention is "full hard" steel foil, that is, steel foil which is not annealed after being worked to gauge. While steel foil of different tempers is also used, the containers made from full hard steel foil possess a greater strength generally than those made from steel foil of other tempers.

Referring to the drawings, FIGURE 2 illustrates the container which is constructed from the blank shown in FIGURE 1 and FIGURES 3 and 4 depict various stages in the formation of the container from that blank. As shown in FIGURE 1, the blank includes three laminae, the two outside laminae 1—1 comprising kraft paper and the middle lamina 2 comprising steel foil of .002 inch thickness. The paper laminae are secured to either side of the steel foil by means of an asphaltic adhesive. As illustrated in FIGURE 1, the upward facing side of the blank forms the inside of the container and the various solid lines shown thereon are score lines made on that side while the dotted lines are score lines made on the downward facing side of the blank.

The blank includes a first pair of rectangular panels 3 and 5 which form the parallel exterior walls of the completed container and a second pair of rectangular panels 4 and 6 which form the parallel interior or recessed walls of the completed container. The interior walls are recessed within the extremities of the exterior walls. Adjoining the four panels are strips 7, 8, 9, and 10, which comprise the folded over edges of the exterior walls of the completed container. The folded over edges serve to join the recessed walls to the exterior walls. Strip 11 forms a

salient portion on the completed container and is fastened to strip 7 in a face to face manner by an adhesive. The exterior walls and the folded over edges form four double thickness margins or marginal extensions about the completed container.

Integral with panels 3 and 5 are end panels 12, 13, and 14, 15, respectively, which form the sloping sides of the end structures of the completed container. Further integral with the latter four panels are the end sealing panels 16, 17, 18, and 19. The end sealing panels provide the means by which the container ends are sealed. The container is sealed and completed by sealing panel 16 to panel 18 and panel 17 to panel 19 in a face to face relationship.

Contiguous with panels 4 and 6 are triangular panels 20, 21, 22, and 23, and immediately adjacent these triangular panels are panels 24 through 31. The triangular panels in the completed container form gusset folds which extend inwardly and away from the recessed walls towards the sealed ends of the container. The panels 24 through 31 act as flaps by which the gusset folds are made continuous with the sloping sides 12 through 15 of the container end structures and with the end sealing panels 16 through 19.

Securely attached to blank across its lateral extent over panels 12, 24, 20, 25, 14, 28, 22, and 29 is a narrow strip of steel foil 32. The strip is one-fourth inch wide and .003 inch thick and in the completed container provides a tear strip whereby the container may be opened. The portion of the tear strip which extends beyond the end of the blank, 33, protrudes from the completed container as illustrated in FIGURE 2 and provides a pull tab for initiating opening of the container.

In forming the container of FIGURE 2, the blank is first double parallel folded along those longitudinal score lines which define strips 8, 9, and 10, and is then single folded along the score lines which define strips 7 and 11. An end view of the blank so folded is shown in FIGURE 3 wherein the top surface of the folded blank forms the inside of the container. An adhesive is placed between the folds formed by the panels 8, 9, and 10, and adjacent panels 3 and 5 as is shown at 34, 35, and 36 of FIGURE 3. The adhesive in addition to maintaining the integrity of the folds provides added strength thereat so that the marginal extensions formed by the exterior walls 3 and 5 and the folded over edges 7, 8, 9, 10, and 11 cannot be readily ruptured by a sharp blow.

The semifinished container of FIGURE 4 is completed by bringing panels 11 and 7 into overlapping relationship and sealing the panels together by means of an adhesive thereby producing seam 37. I have found that by positioning the seam within one of the marginal extensions of the container a stronger container is produced than is the case when the seam is positioned along one of the exterior walls. The portion 33 of the tear strip which extends beyond the edge of the blank extends outside the container at the seam 37 so as to provide a pull tab for initiating opening of the container. The semifinished container of FIGURE 4 being generally rectangular in cross section is readily collapsible as can be understood. For many applications the semifinished container is constructed at a particular location and is then transported to a second distant location where it is filled and closed and because the semifinished container is collapsible, it can be transported in a collapsed condition which is of great advantage. To open the collapsed body for filling, it is necessary only to grasp the two cater-cornered marginal extensions of the collapsed container which are closest to one another and pull the extensions in opposite directions. The ability of the semifinished container to be readily collapsed and to be readily opened is, as can be appreciated, a function of the flexibility of the folds and I have found that the folds made in a container formed of a laminated structure as described are a great deal more flexible than those made in a container formed of steel foil alone.

The container end structures are completed by pushing inwardly at points 38 and 39 and at similar points on recessed side wall 4. At the same time end sealing panels 16 and 18 are brought together in a face to face relationship and sealed together by means of an adhesive placed on the panels to produce fin 42. Panels 17 and 19 are similarly sealed together. One end of the container is of course sealed before the container is filled.

When it is desired to dispense the contents of the container, the pull tab 33 is grasped and pulled about the perimeter of the container so as to tear it open. To facilitate this method of opening the container the strip 7 can be slit slightly at those points where the tear strip extends outwardly of the seam 37. Under some conditions when the container holds liquid or loose material, I prefer to provide a tear strip across only one gusset fold and not around the entire container. Then after opening the container by means of the tear strip the gusset fold can be pulled outwardly to provide a spout whereby the dispensing of the liquid or loose material can be accomplished with a great degree of control.

High strength steel foil when it is severely folded is quite likely to crack and split along the fold lines. In the embodiment of my invention just described I greatly reduce such a possibility by providing the steel foil with kraft paper laminae. Thus when the blank is folded, the steel foil is always folded about a thickness of kraft paper. The radius of the fold is thereby increased over what it would be if steel foil alone were being folded and the severity of the fold in terms of susceptibility to splitting and cracking is thus reduced. This feature of course contributes to the overall strength of the container. In addition the paper laminae add to the overall strength of the container in and of themselves by virtue of their tight bond with the steel foil by means of the asphaltic adhesive. In this regard I have noted that containers made from steel foil having a paper lamina on only one side while stronger than containers made from steel foil having no paper laminae are not as strong as containers made from steel foil having paper laminae on both sides. Thus in standard drop weight tests wherein the containers were filled with a uniform quantity of sand and were dropped a uniform distance, containers having a single paper lamina were capable of being dropped a greater number of times before rupturing occurred at the seam than were the containers having no laminae. Containers having laminae on both sides could be dropped an even greater number of times before rupturing at the seam resulted. The superior performance of the laminated containers is so significant that it cannot be explained as resulting solely from the sum of the strengths of the individual materials. I have also found that the performance of each of these types of containers, i.e. with no paper lamina, with a paper lamina on only one side and with paper laminae on both sides can be improved by providing the container with a liner or pouch. For example, a sheet of kraft paper is secured to a blank like that shown in FIGURE 1 either before or after the blank is scored. The sheet of kraft paper has the same lateral and longitudinal dimensions as does the blank and the paper is secured to the blank only around the perimeter of the blank and is not laminated thereto. So secured the paper acts as a liner or pouch in the completed container. While I am not certain why containers having such a pouch or liner do not rupture at the seam as readily as do containers not having a liner, I believe that the presence of the liner allows the shock of impact to be distributed more evenly over the entire container and not be concentrated at the seam as is the case when no liner is used. The liner can be installed if it is desired only after the container has reached the stage of completion shown in FIGURE 4. In this instance a sheet of kraft paper is formed into a liner having the shape of an open ended parallelepiped with outer dimensions corresponding to the inside dimensions of the semifinished

container. The liner is simply inserted into the semifinished container and secured thereto only to an extent to keep it from slipping from the container. The container is then filled and completed in the normal manner. The liner rather than being open ended can be closed on one end and thus be more in the nature of a pouch when inserted and attached to the semifinished container. Materials other than kraft paper can be used for liners. Plastics for example can be employed. Of special interest are those plastics which can be sealed by the application of heat since besides acting as a liner material the plastic can be used to form the end seals on the container. Thus when the end panels 16, 18, and 17, 19, are brought together for sealing of the container after insertion of the plastic liner, no adhesive need be applied since by applying a heating tool to the end panels the portion of the plastic liner which overlays these panels will act to seal the ends.

As indicated above, the positioning of the container side seam within a marginal extension improves the performance of the container in a drop weight test as compared to the case where the side seam is formed along one of the exterior walls. Additional strength can be imparted to the container side seam by providing a double folded side seam. Such a seam is illustrated in FIGURE 5 which is a fragmentary top view of a semifinished container in a stage of completion like that of FIGURE 4. In forming a double folded seam a terminal portion 40 of an exterior wall is folded about the end of a salient portion 41 of a recessed side wall as shown in FIGURE 6. An adhesive is applied to those faces which are adjacent one another so as to provide a strong bond therebetween. Thereafter the folded structure is folded upon itself to produce the double fold illustrated in FIGURE 5. Again, adhesive is applied to the adjacent faces of the fold to secure the seam.

FIGURE 7 is a sectional view of the upper end of the container shown in FIGURE 2 and illustrates the manner in which the container ends are sealed. As has been described an adhesive is applied to the end sealing panels 16 and 18, after which they are brought together in a face to face relation and the container end thereby sealed. A modification of this end seal is shown in FIGURE 8 wherein a portion of the fin produced upon joining of the end sealing panels together is folded over and the folded over portion 43 is fastened to the upstanding portion of the fin by means of an adhesive. A further modification of the end seal is the double folded end seal shown in FIGURE 9 wherein a folded over portion as illustrated in FIGURE 8 is folded upon itself and the refolded portion secured to the upstanding portion of the fin.

In describing the construction of the end seals and side seams, reference has been made to the use of adhesives. Both cold and hot type adhesive are used. Taping, stitching and stapling methods are also used to close the ends of the containers.

Constructing the containers so as to provide peak-type end structures thereon as has been described is preferred because such end structures being triangular provide end strength characteristics to the container. This of course is particularly important when considering the possibility of the container rupturing upon handling and shipping. Another feature of peak-type end structures is that no weak corners are formed on the container. That is to say that no corners are formed on the container by the intersection of three fold lines all at right angles to one another as would be the case in a flat-end container. Containers are, however, for some applications constructed so as to have one or more flat end structures. One such type end structure is shown in the container of FIGURE 10. The container is constructed from a blank like that of FIGURE 1 except that the end panel 44 and the other end panels are of such a length that in order to bring the end sealing panels as represented by 45 into a face to face relationship, the end wall panels must be folded to an extent so as to be substantially perpendicular to the con-

tainer side walls. The manner in which the end seal panels are finally sealed may comprise any of the methods discussed above. Although in this type of end structure weak corners are formed at 46 and at similar points about the container by the intersection at substantially right angles of fold 49 and the folds formed along lines 47 and 48, these corners are recessed within the outer extremities of the exterior walls. Therefore, they are not likely to receive a sharp blow and consequently are not as subject to being ruptured as they would be if they were not recessed.

The formation of a second type of flat end structure is illustrated in FIGURES 11 and 12. In this embodiment the recessed side walls are slit at those locations 50 where they are joined to the various salient portions which extend to the exterior walls. Four flaps 51, 52, 53, and 54 are thereby provided, which flaps are hinged about score line 55. These flaps are successively folded downwardly towards the body of the container until they are perpendicular to the side walls of the container and the flaps are then sealed to one another by means of an adhesive.

As indicated, advantages derived by constructing steel foil containers with recessed side walls are the protection of weak corners in the end folds formed in flat end containers by recessing the corners within the exterior walls and the providing of marginal extensions as gripping surfaces whereby the semifinished container in the flattened condition can be readily grasped and pulled open. A further advantage is that the recessed side walls provide a working area for outside mandrels around which the container end structures are formed. Although the mandrels are used with containers formed from either steel foil-paper laminates or from steel foil alone, they have greater applicability to the latter type of container because of the greater relative degree of difficulty in folding steel foil alone as compared to steel foil-paper laminates. FIGURES 13 and 14 illustrate the use of such mandrels in forming the container end structures. The semifinished container is supported between supports 56 and 57 upon which are hinged pressure members 58 and 59. Mandrel 60 and an identical mandrel, not shown, are positioned within the recesses formed by the exterior walls and the side walls. The mandrels include a peak portion about which the peak-type end structures are formed. The pressure members are pivoted about the supports 56 and 57 so that in forming the end structures they are rotated inwardly so as to fold the end panels inwardly about mandrels and bring the end seal panels into face to face engagement as shown in FIGURE 14. Thus no inside mandrels are required to complete the end structures and both ends of the container can be completed after the container has been filled if desired.

Another type of steel foil container constructed according to my invention is that of FIGURE 15. This container does not have recessed side walls and thus does not possess the advantages peculiar to such containers but is quite satisfactory for many applications. The container is formed from the blank of FIGURE 16 which blank comprises three laminae 62—62, and 63 of the type used in making the recessed side wall container described above. The blank shown in FIGURE 16 includes a series of solid lines which are made on the upward facing side of the blank and a series of broken lines made on the downward facing side. The upward facing side forms the inside of the container.

Rectangular panels 65 and 67 on the blank form the side walls of the container and panel 66 forms the back wall while panels 64 and 68 combine to form the back wall. Panels 69 through 74 of the blank form the sloping sides of the container end structures while end sealing panels 75 through 80 which are integral with panels 69 through 74 provide the means by which the container ends are sealed.

Adjacent panels 65 and 67 are triangular panels 81, 82, and 83, 84, respectively, and immediately adjacent the

triangular panels are panels 85 through 92. The triangular panels in the completed container form gusset folds which are attached to the sloping sides of the container ends by means of panels 85 through 92 in a manner like that of the recessed side wall container.

The container is constructed by folding the blank along the score lines which define panels 64 through 68. Panels 64 and 68 are then brought into overlapping relation and the overlapping portions sealed by means of an adhesive to produce seam 93. The end structures are then completed in a manner like that described in conjunction with the description of the construction of the recessed side wall container without the use of outside mandrels. The peak-type end structures of these containers add strength to the containers because of their triangular configuration. Also, no weak corners are formed with this type of end structure since no corners are formed by the intersection of three or more fold lines all at right angles to one another as would be the case with flat end containers.

Liners or pouches are also used in conjunction with this type of container with the attendant advantages of such liners.

Although I have disclosed my invention in relation to embodiments wherein the containers are of oblong cross section, containers are also constructed of square cross section.

In those instances where containers are made from steel foil alone or steel foil having a paper laminate on only one side, the steel foil can be coated with organic materials such as micro-crystalline waxes, plastics, rubbers, lacquers and the like as well as with inorganic materials such as tin, zinc, aluminum and the like.

It will be understood that various changes in the details, materials, steps, and arrangement of parts which have been herein described and illustrated in order to explain the nature of the invention may be made by those skilled in the art within the principle and scope of the invention as expressed in the appended claims.

I claim:

1. A folded container formed from an integral substantially rectangular sheet of steel foil comprising a first pair of opposed substantially parallel walls spaced from each other by a second pair of opposed substantially parallel walls, the second pair of walls being recessed within the folded edges of the first pair so as to form outwardly extending double thickness margins therealong and a pair of opposed end structures closing off the ends of the container.

2. The container of claim 1 wherein the sheet of steel foil has a sheet of kraft paper laminated to at least one of its sides.

3. The container of claim 2 wherein the steel foil is full hard.

4. The container of claim 1 in which at least one end structure comprises a peak-type structure.

5. The container of claim 3 including a liner supported within the container, said liner being free of substantial attachment to the container.

6. The container of claim 5 including a tear strip positioned on the container.

7. A container formed from a substantially rectangular steel foil-paper laminate blank, said container including four walls and being rectangular in cross section, two peak-type end structures closing off opposite ends of the container and a liner supported within the container, said liner being free of substantial attachment to the container.

8. The container of claim 3 wherein said container includes a side seam positioned within the extremity of one of the outwardly extending margins and adjacent one of the side walls.

9. The container of claim 6 wherein said container includes a side seam positioned within the extremity of one of the outwardly extending margins and adjacent one of the side walls.

10. The container of claim 3 wherein at least one end

structure comprises a peak-type structure having a pair of sloping sides joined to a first pair of walls, a pair of gusset folds extending inwardly and away from the recessed pair of walls and two pairs of flap members, each of said pairs of flap members joining a respective one of the gusset folds with each of the sloping sides, and a tear-strip positioned across one of said gusset folds and associated pair of flap members whereby upon opening of the container by means of the tear-strip the gusset fold can be pulled outwardly to provide a spout.

5

10

References Cited

UNITED STATES PATENTS

2,141,252	12/1938	Prindel	229—51
3,124,294	3/1964	Zerlin	229—17
3,237,838	3/1966	Elias	229—23
3,297,225	1/1967	Bransten	229—3.5
3,300,118	1/1967	Owens	229—4.5 X

DAVID M. BOCKENEK, *Primary Examiner.*