Feb. 15, 1966 M. A. SCHWARTZ 3,234,705

METHOD OF MAKING A PACKAGE

Original Filed Aug. 31, 1960 4 Sheets-Sheet 1

Fig. 1.

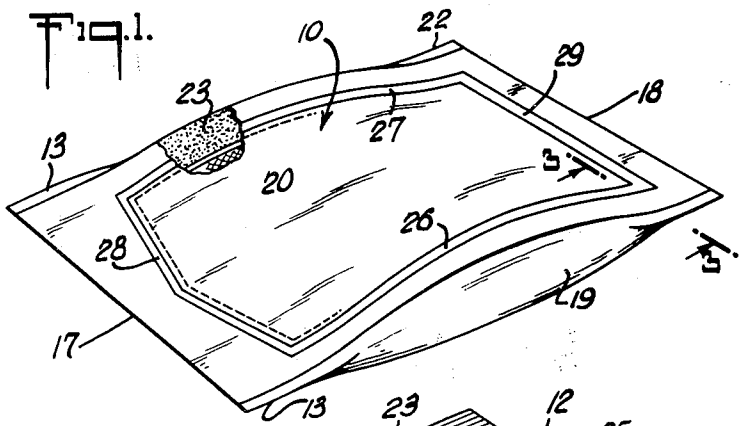


Fig. 2.

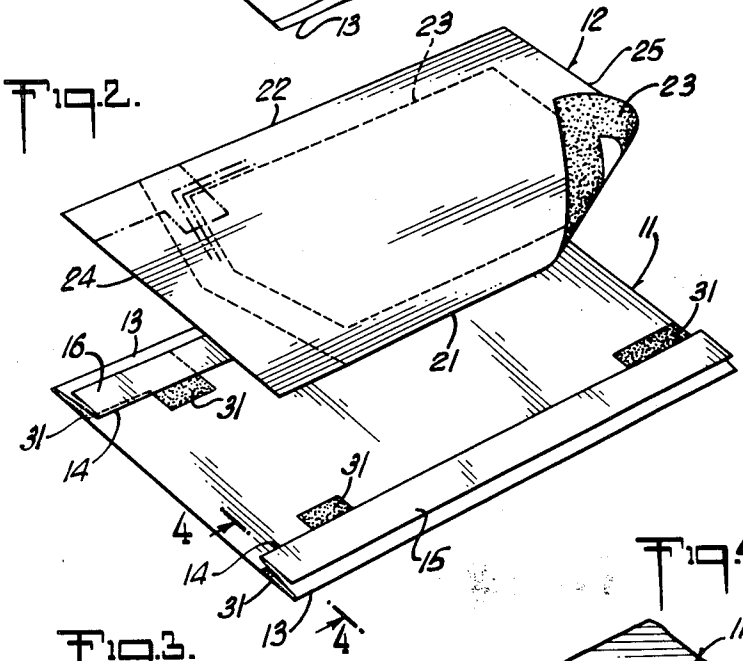


Fig. 3.

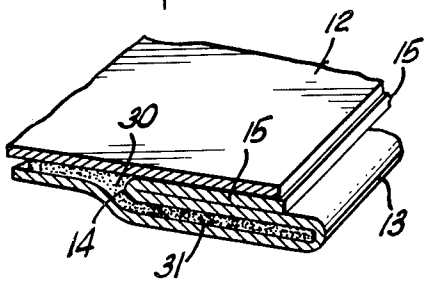
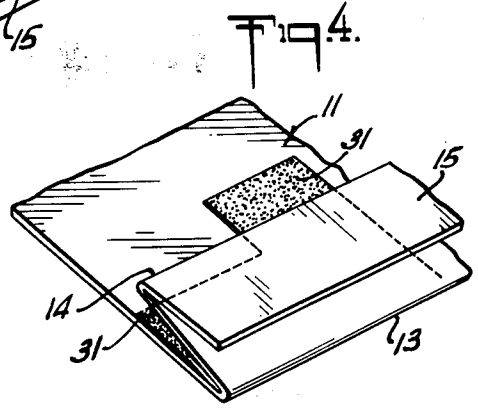


Fig. 4.



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Fig. 5.

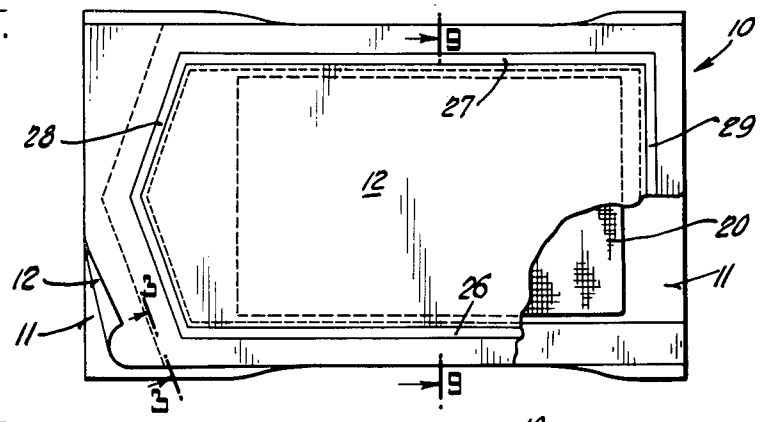


Fig. 6.

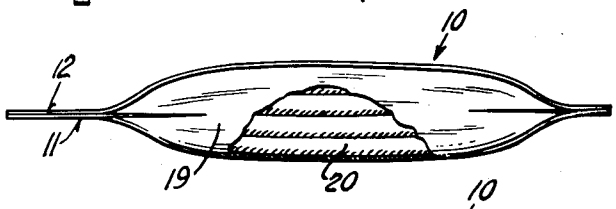


Fig. 7.

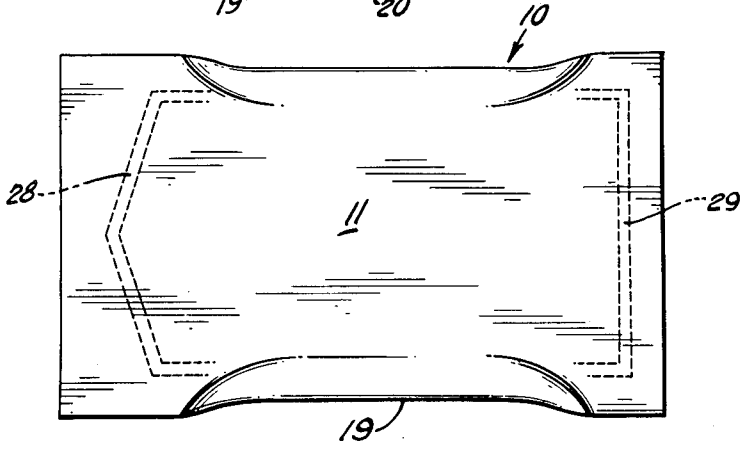


Fig. 8.

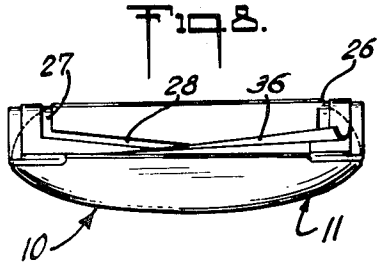
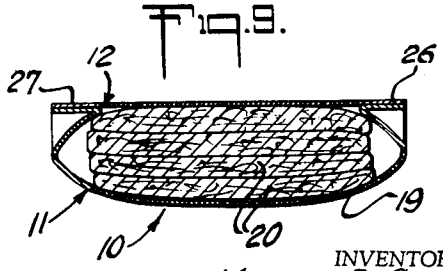


Fig. 9.



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METHOD OF MAKING A PACKAGE

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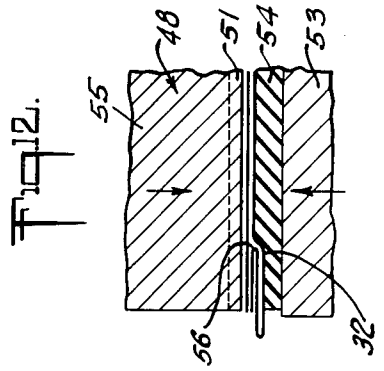


Fig. 12.

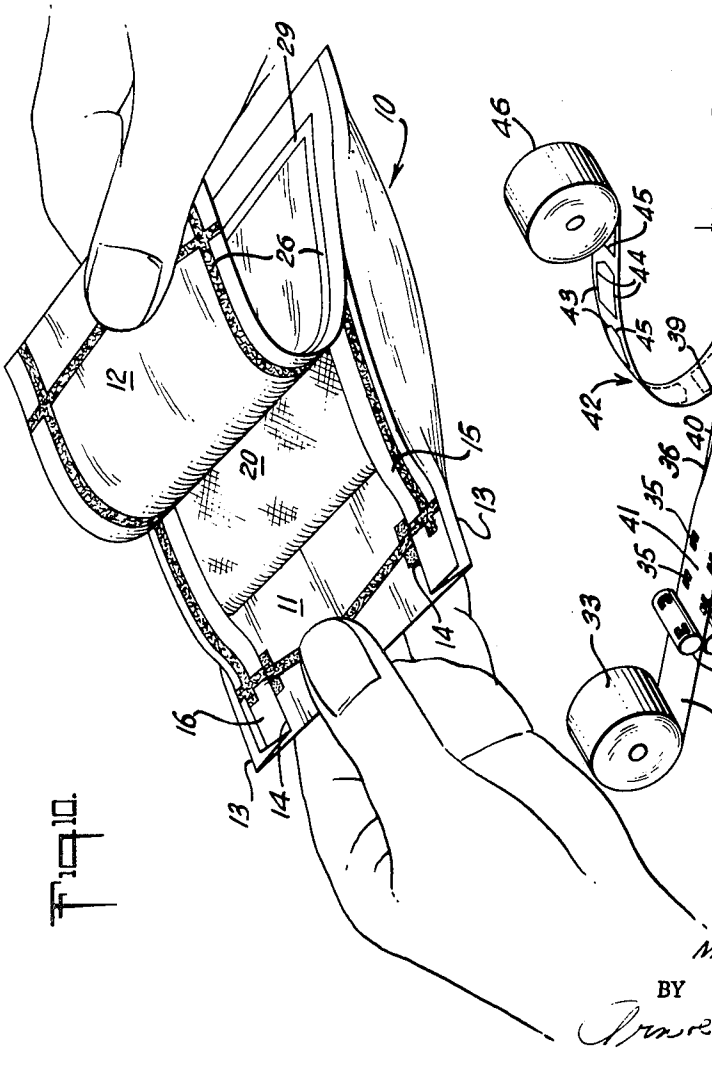


Fig. 10.

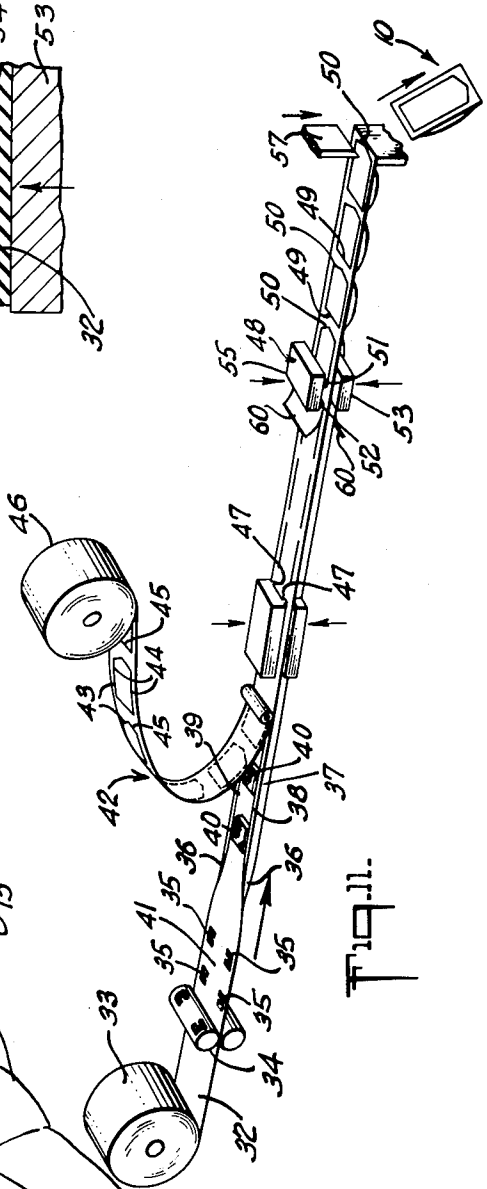


Fig. 11.

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METHOD OF MAKING A PACKAGE

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Fig. 13.

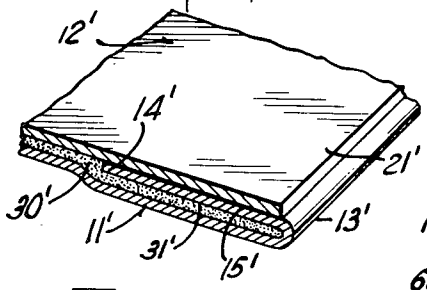


Fig. 14.

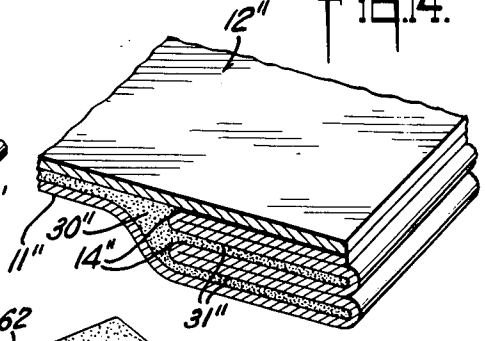


Fig. 15.

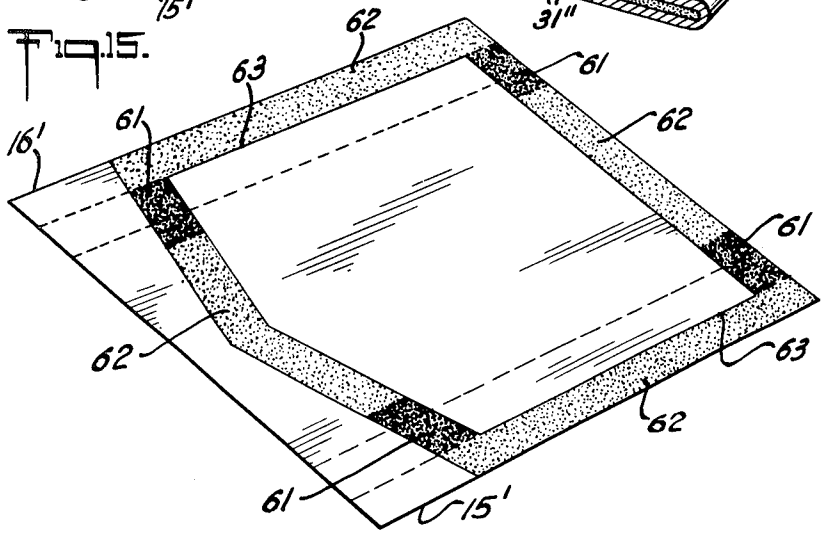
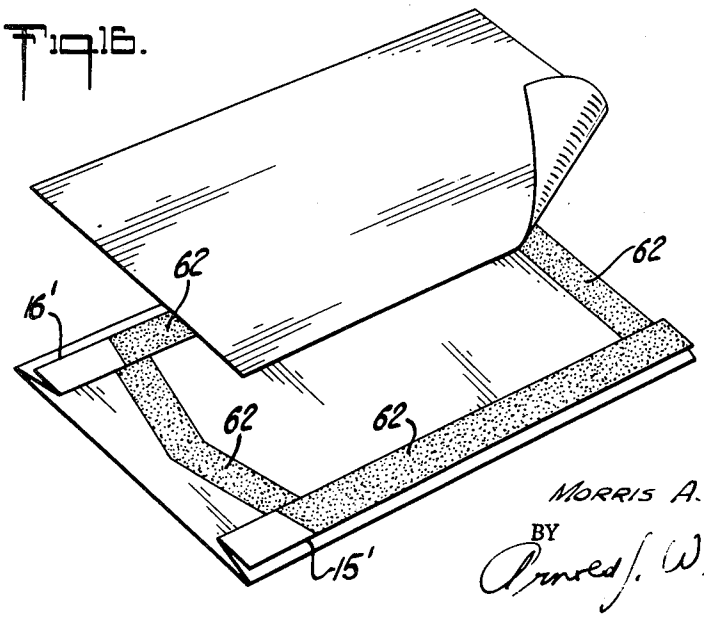


Fig. 16.



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United States Patent Office 3,234,705 Patented Feb. 15, 1966

3,234,705

METHOD OF MAKING A PACKAGE

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Original application Aug. 31, 1960, Ser. No. 53,194, now Patent No. 3,070,225, dated Dec. 25, 1962. Divided and this application Nov. 6, 1961, Ser. No. 178,517

8 Claims. (Cl. 53—28)

This application is a division of application Serial No. 53,194, filed August 31, 1960, and now Patent No. 3,070,225.

The present invention is drawn to packages formed of flexible sheet material and more particularly to packages for relatively bulky objects which are suitable for packaging sterile articles and to the method of making the same.

Relatively thin dressings or other objects have heretofore been packaged by placing the same between two sheets of paper, permeable to air, but impervious to airborne bacteria, and then bonding around the peripheral edge with thermoplastic or other adhesive to protect the enclosed contents. However, where it is desired to package relatively bulky articles, the paper will not conform around the article without wrinkling of the edges, thus preventing obtaining a good seal.

It is accordingly an object of the present invention to form a package from flexible sheet material, which package is suitable for relatively bulky objects and is completely sealed, the seal being impervious to air-borne bacteria. It is a further object to form a flexible package of flexible sheet material that contains folds which provide for expansion of the package for enclosing bulky articles, the package being completely sealed. Also, an object is to prepare a package for sterile articles from which the sterile article can be readily removed without danger of contamination by contact with unsterile package edges during removal. A still further object is a process for making expansible packages of flexible sheet material and sealing the same.

Other objects and advantages will become apparent from the following description taken in connection with the accompanying drawings wherein are set forth by way of illustration and example certain embodiments of this invention.

Referring to the drawings:

FIG. 1 is a perspective view of a package of the present invention;

FIG. 2 is an exploded view showing the relationship of the sheets from which the package of FIG. 1 is formed and details thereof;

FIG. 3 is a detail taken along line **3**—**3** of FIG. 1;

FIG. 4 is a detail taken along line **4**—**4** of FIG. 2;

FIG. 5 is a top plan view of the package of FIG. 1 with a portion broken away to show the packaged article;

FIG. 6 is a side view of the package of FIG. 1 with a portion broken away to show the packaged article;

FIG. 7 is a bottom view of the package of FIG. 1;

FIG. 8 is a front perspective view of the package of FIG. 1;

FIG. 9 is a view taken along line **9**—**9** of FIG. 5;

FIG. 10 is a view illustrating the opening of the package of FIG. 1;

FIG. 11 is a schematic view illustrating the method of forming the package of FIG. 1 in a continuous operation;

FIG. 12 is a detail view of the cross-sealing step of FIG. 11;

FIG. 13 is a detail view similar to that of FIG. 3 but taken on a package having a single fold;

FIG. 14 is a detail view similar to that of FIG. 3 but illustrating the cross-seal of a package having multiple folds;

FIG. 15 is a perspective view of the bottom sheet of the package with a different pattern of adhesive coating thereon; and

FIG. 16 is an exploded view similar to FIG. 2 showing the manner in which the adhesive-coated sheet of FIG. 15 is used.

Referring to the drawings, the outer wrap of the package **10** of FIG. 1 is formed from a bottom sheet **11** and a top sheet **12**. The longitudinal side edges of the bottom sheet **11** are folded inwardly and then outwardly again to form an outer fold **13** and an inner fold **14** on each side of the bottom sheet **11**. The outward folding of the edge of bottom sheet **11** along fold **14** forms flanges **15** and **16** extending respectively along each side of bottom sheet **11** along the length thereof. Although the two ends of the package, front end **17** and back end **18**, are flat, the center portion of the package **19**, which surrounds the packaged contents **20**, will be noted to bulge substantially so that the packaged article **20** can be readily contained. This bulging or expanding of the package in the area where it surrounds the packaged article **20** is enabled by the outer folds **13** which provide for expansion in the main body area of the bottom sheet **11**.

The top sheet **12** is cemented along its side edges **21** and **22** to the flanges **15** and **16** of the bottom sheet by adhesive **23** and across its front end **24** and back end **25** to completely seal the package.

Where the package is designed for the packaging of sterile articles, it is particularly important that the seal lines **26** and **27** extending along the sides of the package as well as seal lines **28** and **29** extending respectively across the front and back ends of the package be impervious to airborne bacteria; otherwise, the contents of the package will become contaminated. This is particularly important where the package is of a flexible nature, as where the walls are formed of flexible sheet material, since as the package is flexed air would be drawn into and expelled out of the package through any channel that may exist. Unless special precautions are taken in sealing across the inner folds **14**, small channels will be formed in the area **30** which is not completely sealed. As a result, air-borne bacteria can readily pass into the package with resulting contamination of package contents. For sterile packages, it is therefore imperative that this area and any channels existing therein be completely sealed to prevent possible contamination of any packaged article **20**. In accordance with the present invention, this sealing is accomplished in the manner hereinafter more fully described by placing a thermoplastic calking adhesive **31** along the contacting surfaces formed by the outer folds **13** in the areas of the end seals **28** and **29**, this adhesive being adapted to flow during the sealing operation to completely fill or calk the area **30** and plug any channel that otherwise might exist along the edge of inner folds **14**. This is best illustrated in FIGS. 3 and 4.

In preparing the packages of the present invention, the bottom sheet **11** is preferably first coated, as illustrated in FIG. 2, near its four corners with an adhesive **31** that will flow under heat and pressure. The adhesive is preferably spaced from the edge of the bottom sheet so not to cover the flange portions **15** and **16**. This is best illustrated in FIG. 4 where the adhesive will be observed to coat the inner contacting side of the folded edge of the bottom sheet **11** but not to extend over the flange area **15**.

The side edges of the bottom sheet **11** are then folded to form the flanges **15** and **16** and the article to be packaged placed on the bottom sheet **11** between the flanges. The

top second sheet **12** is then adhesively secured along its edges **21** and **22** to the respective underlying flanges **15** and **16** of the bottom sheet **11**. The respective ends of the top sheet **12** and the bottom sheet **11** are then brought together and adhesively secured to give transverse front and back seals **28** and **29**. Heat and pressure are also applied along the front and back seals to cause the thermoplastic calking adhesive **31** to flow into the area **30** and fill any channels existing along folds **14**. In the preferred practice, the top cover sheet **12** is coated with a thermoplastic adhesive which may be the same as the calking adhesive **31**. The side seals **26** and **27** are still preferably first formed so as to seal the side edges of the top sheet **12** to the flanges **15** and **16** of the bottom sheet **11**. Where the adhesive **23**, used for sealing together the top sheet **12** and the bottom sheet **11**, is a thermoplastic adhesive, sealing is done throughout by heat and pressure. However, the side seals **26** and **27** are still first formed, the ends of the sheets **11** and **12** then brought together and the end seals **28** and **29** then formed by heat and pressure which, besides sealing the ends simultaneously, causes flow of the calking adhesive **31** which, besides sealing together the contacting surface of sheet **11** resulting from folds **13**, also fills the area **30** to assure filling of channels that would otherwise exist along the edges of folds **14**.

Although the top cover sheet **12** may, if desired, be completely coated on its inner surface with a thermoplastic adhesive, it is preferred, in order to save on adhesive and to prevent adherence to the packaged article if later subjected to high temperature sterilization, to coat only the portion of the cover sheet **12** along which the transverse and longitudinal seal lines **26**, **27**, **28** and **29** will be formed, as illustrated in FIG. 2.

In the particular embodiment illustrated in FIGS. 1–9, the flanges **15** and **16** are formed on the bottom sheet **11** by first folding the side edges in and then out to form an outer fold **13** and an inner fold **14**. A similar package can be prepared, however, although less expansible in its center, by having only a single fold, as illustrated in FIG. 13. With such a construction, the outer surface of the lower sheet **11'** would form the upper surface of the flange **15'** to which the edge **21'** of the top cover sheet **12'** is bonded. A package of this type formed with a single fold **13'** would be suitable for articles somewhat less bulky than those that could be placed in the package of FIG. 1.

Where the article to be packaged is quite bulky and substantially more depth is required in the center portion **19** of the package, this can be obtained by forming the package with the side edges of the lower sheet **11''** being folded back and forth on itself several times, as illustrated in FIG. 14. A structure of this type provides substantially more paper for the bottom sheet in the central portion **19** of the resulting package and provides a package which can contain articles of even greater bulk than those which can be contained in the package of FIG. 1. In the structures of both FIGS. 13 and 14, the thermoplastic calking cement **31'** and **31''** is still used between the inner meeting faces of the folded portion of the bottom sheets **11'** or **11''** to bond these surfaces together at the transverse end seams and to provide adhesive for flowing into the areas **30'** and **30''** to fill channels which would otherwise exist along the inner edge **14'**, as illustrated in FIG. 13, or along the inner folds **14''**, as illustrated in FIG. 14. It is apparent that as the thickness of the fold increases the larger will be the channel formed and the more important that the same be filled through the flow of the calking thermoplastic adhesive **31**.

One of the many advantageous features of the package of the present invention is the manner of its opening. By folding the bottom sheet **11** in the manner indicated and then applying the cover sheet over the resulting flanges **15** and **16**, as described, the package can in essence be considered as consisting of a bottom tray covered with a flexible cover that can readily be peeled therefrom. An advantage to this construction is that the top cover **12** can be peeled back leaving the sterile article contained in the tray portion formed by the folded edges of the bottom sheet **11**, as illustrated in FIG. 10. As a result, there is no contamination of the packaged article by contact with any unsterile edge as the package is being opened. After the cover sheet **12** is peeled back, the sterile packaged article **20** can then readily be removed by sterile forceps from its tray-like container without any danger of contamination. This is an important feature when it is considered that maintaining an article sterile in the package is of little value if the article, such for example, a sterile sponge, is contaminated on its removal from the package through contact with an unsterile outer edge.

A further advantage of the package of the present invention is that it can be made automatically in a continuous process in strip form, wherein a plurality of individual packages are all connected together. If separate packages are desired, these may then be severed to give separate packages, such as that shown in FIG. 1. In describing the preferred process for continuous manufacture of packages of the present invention, reference is made to FIG. 11 which schematically illustrates operation for carrying out such a process.

Referring to FIG. 11, a strip of paper **32** impermeable to air-borne bacteria is drawn from a roll **33** and passed under a coating roll **34** where it is coated in spaced areas **35** with a thermoplastic adhesive (the calking adhesive **31** of FIGS. 3, 4, 12, 13 and 14). The spaced areas **35** containing the thermoplastic calking adhesive **31** coincide with the transverse seals of the finished package. These spaced areas are large enough to cover the back end transverse seal of one package and the front end transverse seal of an adjacent package so that at each transverse sealing operation the back transverse seal and the forward transverse seal of two adjacent packages are formed simultaneously. After the spaced areas **35** have been coated with adhesive, the side edges of the paper strip **32** are turned upward, as illustrated at **36** of FIG. 11, and then outward to provide a U-shaped channel having a center U-shaped body with sides **37** and flanges **38** and **39**. After the paper strip has thus been formed, surgical sponges or other articles **40** to be packaged are then dropped in spaced relation as the folded strip **32** passes a package depositing station, not shown. The articles may, if desired, be placed on the U-formed moving strip by hand. The articles **40** are dropped in timed relation to the travel of the strip **32** so as to be placed in the area **41** between the adhesive-coated areas **35**.

A second, top strip **42** of paper similar to that of the bottom strip of paper **32** is then placed over the U-formed bottom strip **32** so as to rest on the flanges **38** and **39** and cover the articles **40**. The top paper strip **42** has thermoplastic adhesive **43** coated thereon in a predetermined pattern providing side adhesive-coated lines **44** and transverse adhesive-coated lines **45** on its under surface. Top strip **42** is fed from a roll **46** in timed relation to the movement of the lower strip **32** and superimposed on the lower strip **32** so that the side coated areas **44** lie directly over the flanges **38** and **39** of the bottom strip **32** and the transverse adhesive-coated areas or transverse adhesive lines **45** come directly over the coated spaced areas **35** on the bottom sheet **32**. The two sheets with the article **40** to be packaged are moved together in timed relationship and passed under heated longitudinally extending sealing bars **47** which are synchronized with the movement of the two paper webs to close on the flange portion directly over the longitudinally extending adhesive-coated portion **44** of the top paper strip **42** to seal the same, through the application of heat and pressure, to the underlying side flanges **38** and **39**. This sealing step may be done intermittently, with the movement of the paper strips **32** and **42** stopping during the sealing operation, or the mechanism can be so designed that the sealing bars **47** are adapted to travel with the webs during the sealing operation

and, after the seal is completed, then move back to again grasp the flanges **38** and **39** opposite the packaged article and along the adhesive-coated edges of the top sheet to seal the sides of the next package.

After passing the sealing means for preparing the side flange seals, the two webs **32** and **42** and contained article **40** are moved between spring-urged plates **60** which urge the bottom and top paper strips **32** and **42** together in the areas between the articles **40** from where the paper strips pass to transverse sealing means **48** which, through heat and pressure, simultaneously forms two transverse seals, one seal **49** across the lower end of the forward package and the other seal **50** across the front end of the following package. This is preferably done by providing the transverse sealing means with two raised sealing surfaces **51** and **52**, the front sealing surface being in the form of a straight line extending directly across the moving strips **32** and **42** for making the back seal **49** and the other having a V-shaped configuration for making a V-shaped seal **50** at the front end of the package.

In the preferred operation, the lower plate or jaw **53** of the transverse sealing mechanism **48** is covered with a resilient surface **54**, such for example as a heat-resistant rubber, so that when the jaws **53** and **55** come together to form the seals **49** and **50** the lower sheet **32** is forced up around the inner fold **56**, as illustrated in FIG. 12, to help further in sealing any channel that might otherwise exist. By using a lower resilient surface to press in the paper around fold **56**, as illustrated in FIG. 12, not only is there a force exerted to help further to flow the adhesive in areas **35** into any channel that might otherwise exist, but less calking adhesive, which is the adhesive coated in areas **35**, is required since the paper itself is caused to bend partially around the fold to decrease the area needed to be calked by adhesive.

After the ends have been sealed by the transverse seals **49** and **50**, the package is completed. Where the packages are relatively small, it may be desirable to keep them in strip form, numerous packages being joined together in a single strip. However, where the packages are somewhat larger or even when small, where individual packages are desired, the strip of packages is severed between transverse seals **49** and **50** by a severing knife **57** or other means to provide individual packages **10**.

In severing the strip into separate packages, care should be taken to leave sufficient paper between the front end of the package and the front transverse seal **51** to permit grasping, as illustrated in FIG. 10, for peeling off the cover sheet **42**. By forming the front seal in a V configuration, the cover can be more readily peeled since the initial pull for separation occurs along a specific point of the seal rather than occurring simultaneously along the whole seal line. This enables the package to be opened more readily than would be the case if a straight transverse seal were used, although a straight seal may be used if desired.

Although it is presently preferred to make the packages of the present invention by placing an adhesive on the cover sheet **12** (top paper strip **42** of FIG. 11) and then freshly applying the calking adhesive to the bottom sheet **11** (bottom paper strip **32** of FIG. 11) just prior to forming the package, all of the adhesive may be applied to the bottom sheet, as illustrated in FIGS. 15 and 16, the portion **61** which comes under the folds in forming flanges **15'** and **16'** preferably being somewhat heavier than the adhesive coating **62** which is on top of the flange areas **15'** and **16'** and across the front and back of the package. This is to assure sufficient adhesive in the area under the fold to obtain ready flow and proper calking along the fold to fill channels while permitting ready separation of the cover **12** from the flanges as the cover **12** is peeled back on opening the package. Where the bottom sheet **11** contains all of the adhesive, the adhesive should perferably not extend on the side past the flange fold lines **63** so as to avoid contact with the packaged articles. The thermoplastic adhesive is preferably applied fresh shortly prior to forming the package to assure proper flow during the sealing operation.

In practicing the invention, any thermoplastic adhesive may be used which can be caused to flow under heat and pressure as the calking adhesive **31**. For securing the top cover sheet to the flanges and across the front and back ends of the package, any suitable adhesive may be used and it is not necessary to use a thermoplastic adhesive. However, for packages which are to be steam sterilized, the adhesive used should be one that will maintain its hold under the steam sterilization conditions. In the preferred practice, however, a thermoplastic adhesive is used which may, if desired, be the same as the calking adhesive **31**. Although a thermoplastic adhesive which has been found to be highly suitable as the calking adhesive in the present packages is a liquid suspension of lightly plasticized polyvinyl acetate, any adhesive flowable under pressure or heat and pressure is believed to be suitable.

The invention is susceptible to many modifications within its spirit and accordingly is to be limited only by the scope of the appended claims.

Having thus described my invention, I claim:

1. The method of packaging articles which includes coating adhesive on one face and in given areas spaced along and near the opposite edges of a first strip of flexible packaging material of uniform width and indeterminate length, folding said strip of material throughout its length inwardly along first lines spaced given distances from said opposite edges and outwardly along second lines spaced lesser distances from said opposite edges respectively, whereby to present sections of strip material between said first and second lines of fold associated with the respective opposite edges which, in said areas of adhesive, are adapted for adhesive engagement facewise with underlying sections of said strip material, and which between said areas of adhesive and lengthwise of the strip are adapted for extension from said second lines of fold to form with the strip material between said first lines of fold, a trough to accommodate an article, and whereby also to form flanges extending outwardly from said second lines of fold presenting exposed surfaces, locating articles in said troughs, positioning a second strip of flexible packaging material of indeterminate length face to face longitudinally with respect to said first strip of packaging material, along the exposed surfaces presented by such flanges and transversely across exposed surfaces extending between said flanges in the vicinity of said adhesive coated areas, with an adhesive interposed where said strips are positioned face to face, and activating said interposed adhesive and said coated adhesive to bond lengthwise and crosswise said sheets of packaging material and seal all around the packaged article, to seal across those portions of the coated first sheet which are in facewise engagement between said first and second lines of fold, and to seal completely such channels as exist between the opposed strips of packaging material adjacent said second line of fold, whereby to produce packaged articles completely closed against ingress of contamination.

2. The method of claim **1** in which the individually packaged products are severed one from the other in the region of the crosswise bonding.

3. The method of claim **1** in which the cross-bonding between adjacently spaced articles is in the form of two separate cross bond lines spaced longitudinally along the strips, the strips being adapted for severance between said lines to provide individual packages.

4. The method of claim **3** in which said individual packages are separated by severing across said first and second strips between said packaged articles and cross-bonded areas to provide separate individual packages.

5. The method of claim 1 wherein the interposed adhesive is a coating on said second sheet which is limited to the approximate area of seal between said first sheet and second sheet.

6. The method of claim 1 in which the adhesive coating on the first strip is a thermoplastic which is activated by heat and pressure.

7. The method of claim 1 in which the adhesive coated on the first strip and the adhesive interposed between the strips are thermoplastic and are activated by heat and pressure.

8. The method of packaging articles which includes coating adhesive on one face and in given areas spaced along and near the opposite edges of a first strip of flexible packaging material of uniform width and indeterminate length, folding said strip of material throughout its length inwardly along first lines spaced given distances from said opposite edges and outwardly along second lines spaced lesser distances from said opposite edges respectively, whereby to present sections of strip material between said first and second lines of fold which, in said areas of adhesive, are adapted for engagement facewise with underlying sections of said strip material, and which between said areas of adhesive and lengthwise of the strip are adapted for extension from said second lines of fold to form with the strip material between said first lines of fold, a trough to accommodate an article, and whereby also to form flanges extending outwardly from said second lines of fold presenting exposed surfaces, locating articles in said troughs, positioning a second strip of flexible packaging material of indeterminate length face to face longitudinally with respect to said first strip of packaging material, along the exposed surfaces presented by such flanges and transversely across exposed surfaces extending between said flanges in the vicinity of said adhesive coated areas, with an interposed adhesive

along said flanges and an interposed adhesive in the form of a pair of cross bond lines spaced longitudinally along the strips extending transversely of the strips between adjacently spaced articles, activating said interposed adhesive and said coated adhesive to bond said sheets of packaging material together and seal the same around the packaged article, across those portions of the coated sheet which are in facewise engagement between said first and second lines of fold, and to seal completely such channels as exist between the opposed strips of packaging material adjacent said second line of fold, and transversely severing the first and second strips between a pair of cross bond lines in a position spaced from at least one cross bond line thereof whereby to produce separated packages each with a cross bond line spaced from the line of severance to provide tabs for gripping and peeling said sheets apart to facilitate opening said package.

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