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Maughan

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[45] **Dec. 30, 1975**

[54] **MOISTURE RESISTANT CORNER POST**

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[73] Assignee: **Westvaco Corporation,** New York, N.Y.

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[21] Appl. No.: **461,922**

Related U.S. Application Data

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[52] **U.S. Cl.** ..... **156/85;** 156/87; 156/213; 156/216; 156/251; 156/286; 156/299; 156/306; 229/3.1; 229/DIG. 1; 264/230; 264/342 R

[51] **Int. Cl.**[2] **B24C 27/26;** B29C 27/18

[58] **Field of Search** ..... 156/84, 85, 86, 213, 216, 156/383, 70, 198, 212, 215, 251, 285, 286, 299; 229/14 C, 3.1, 3.5 R, DIG. 1; 206/45.33, 46 FR, 46 FN; 264/230, 342 R

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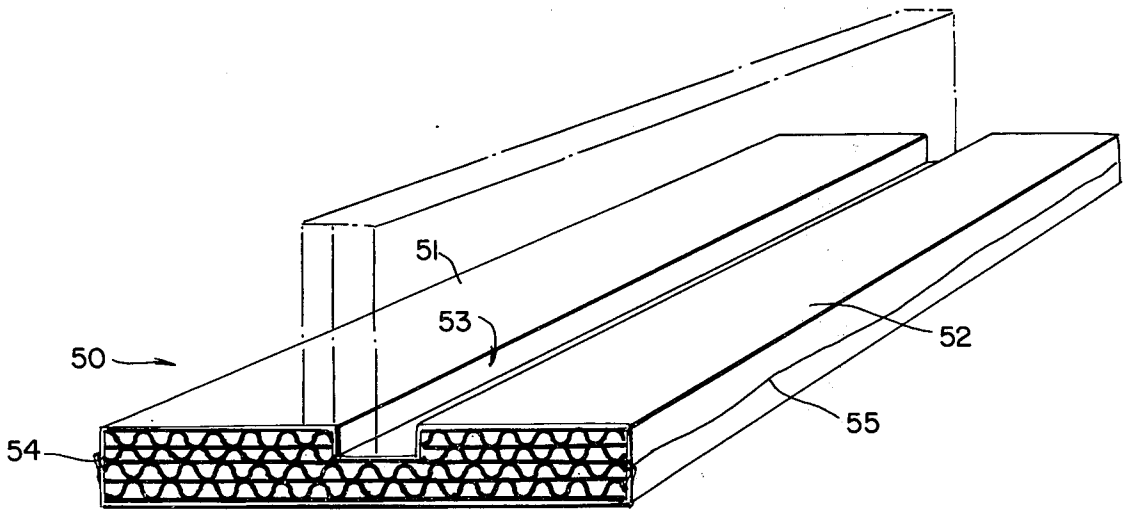
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Primary Examiner—Edward G. Whitby

[57] **ABSTRACT**

A corner post made of corrugated paperboard is enclosed in a film of plastic or the like and sealed on all sides to protect the corner post from contact with water vapor and thereby retain a high percentage of its dry strength when exposed to high humidity conditions. The plastic film may be selected from the classes consisting of polyethylenes, polyvinyl chlorides or other plastic materials, and the post may be sealed in the plastic enclosure with the aid of a heat shrinking operation, a skin packaging operation, a gluing operation or any combination of the above.

2 Claims, 8 Drawing Figures



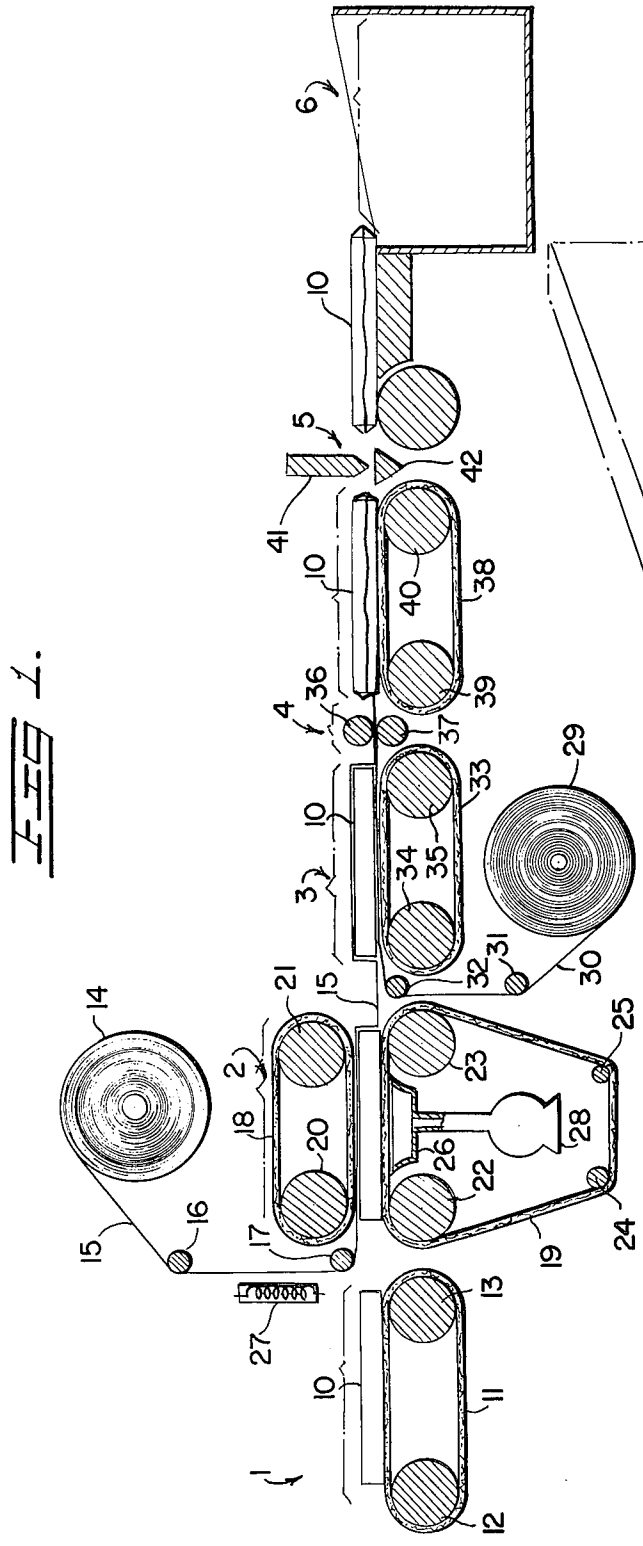


FIG 1.

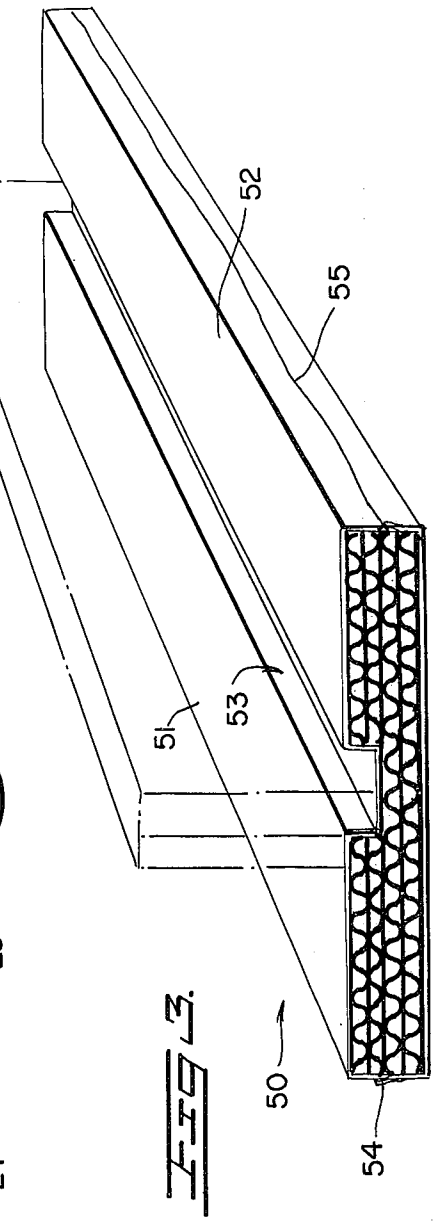
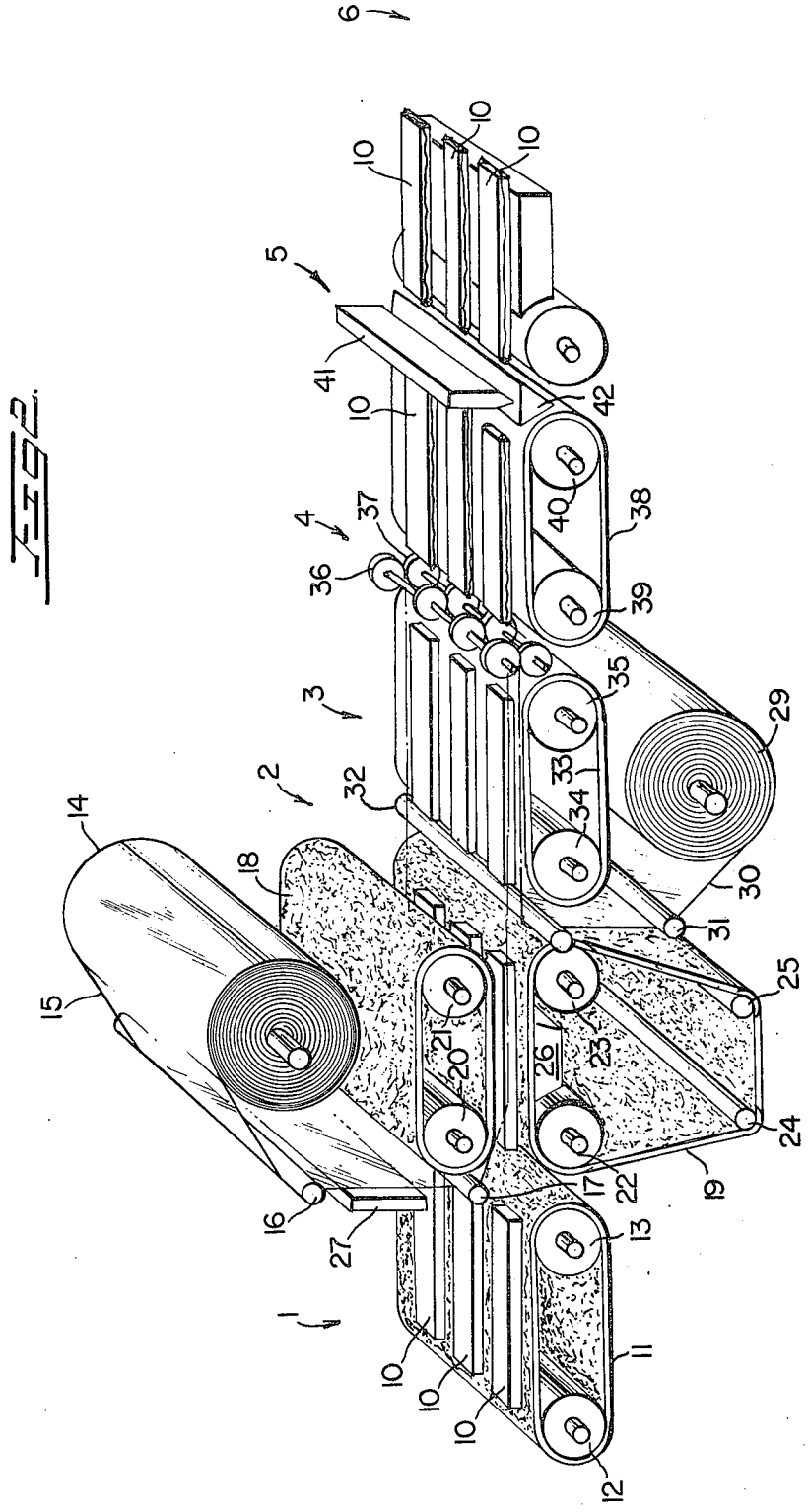


FIG 3.

FIG 2.


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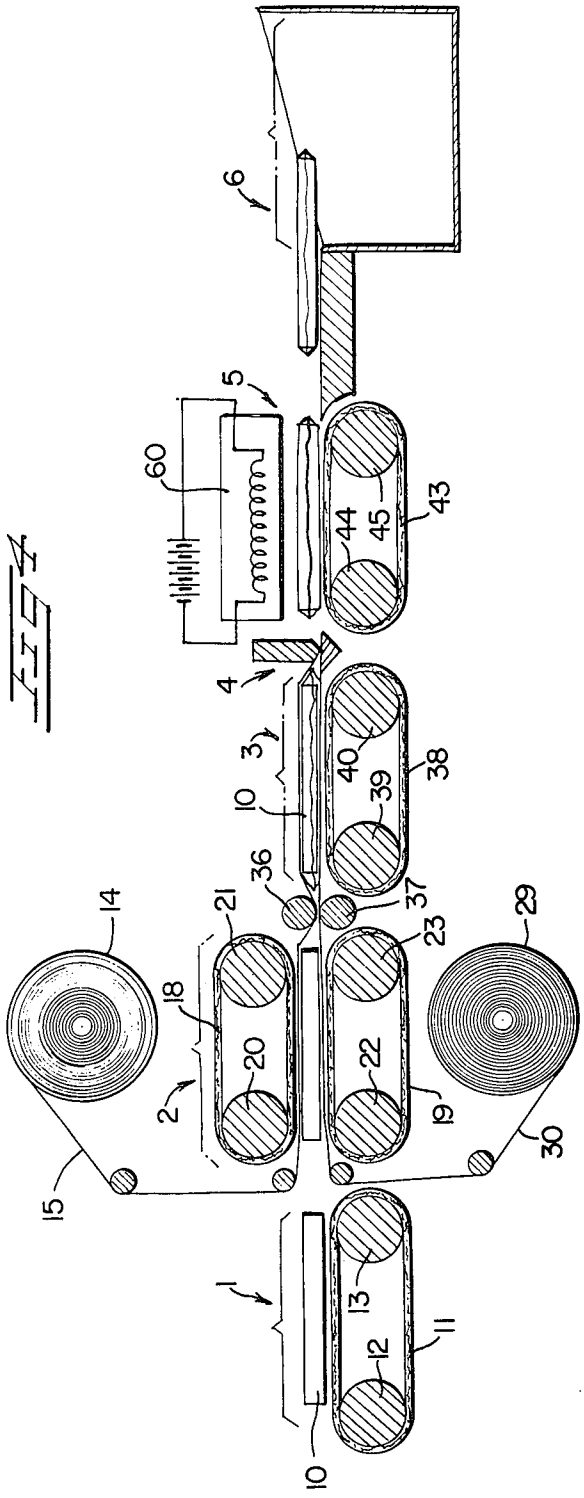


Fig. 4

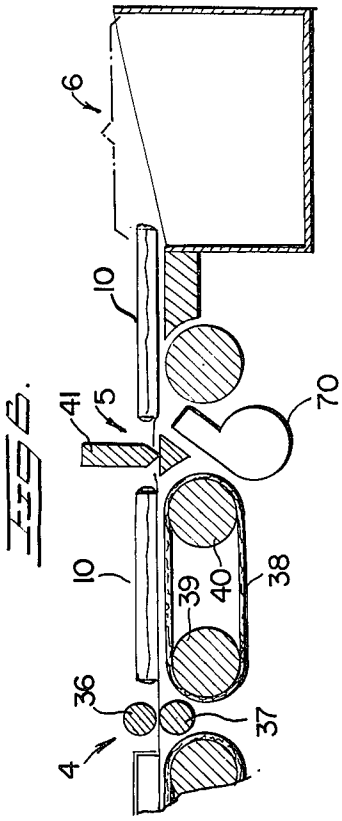


Fig. 3.

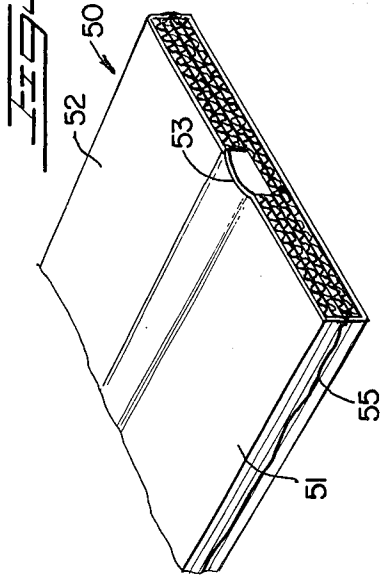


Fig. 5.

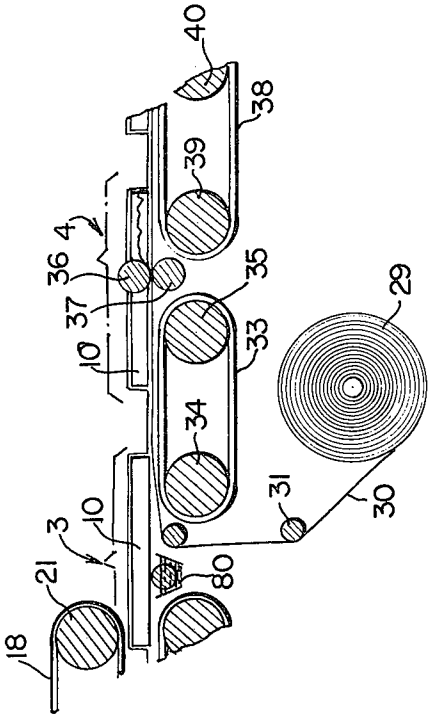

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FIG 7.

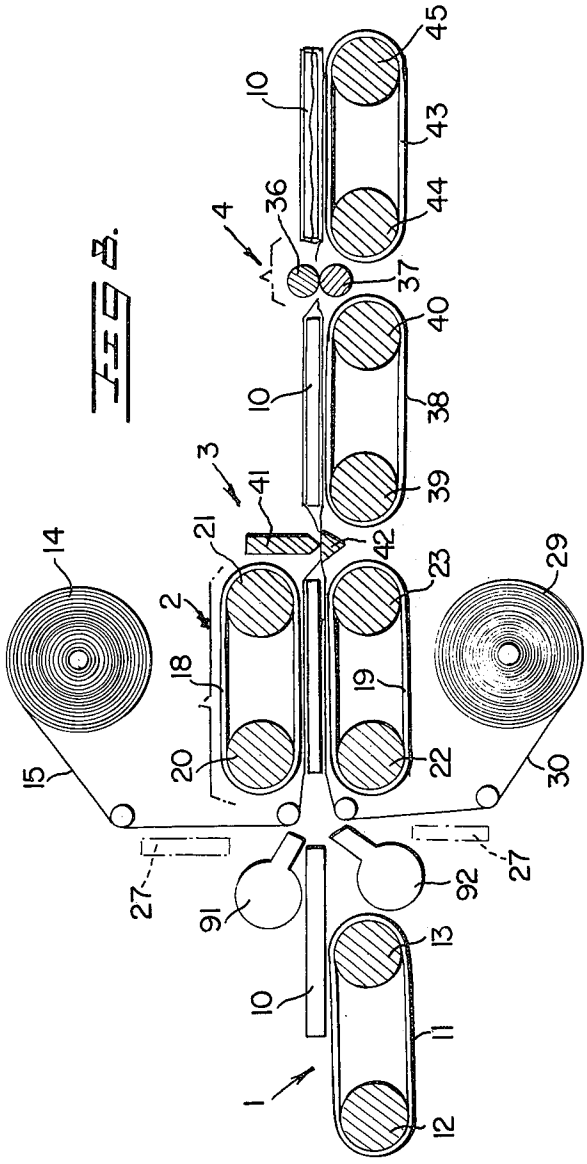

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FIG 8.

MOISTURE RESISTANT CORNER POST

This application is a division of the copending application Ser. No. 252,048, filed May 10, 1972.

SUMMARY OF INVENTION

The present invention relates generally to a novel corner post construction for use in conjunction with containers to provide a relatively high and unexpected compressive strength and/or cushioning protection for articles packaged in the containers. More specifically, the present invention relates to a corner post constructed from corrugated paperboard which is particularly useful under conditions of high relative humidity which are found both during storage and transit in the humid summer months, or in normally humid climates.

Corner posts constructed from paper based materials and similarly containers manufactured from paper based materials lose a high percentage of their dry strength (40–65%) when subjected to ambient conditions of high relatively humidity. Such conditions of 75 to 100% RH may be found during storage or transit during the humid summer months or in normally humid climates.

One method presently used to protect corner posts from the deteriorating effects of high humidity is to wax saturate the post (45–55% wax) for increased dry and humid strength. Curtain coating of corner posts is one method of wax saturation although dipping and other coating techniques have also been employed. In addition, moisture barriers applied directly to the container have also been used, but none of these treatments have been found to be completely successful, and all of these prior art treatments have been found to be excessively expensive.

Furthermore, present interior packing elements used in the container industry seriously lack consistency, economy and quality. Also, interior packing elements such as corner posts are manufactured and set up with slow and unwieldly techniques. Accordingly, it is one object of the present invention to provide a corner post and a method of manufacturing the corner post that is of a simple, economical and consistently highly effective construction.

It is another object of the invention to provide a corner post which not only locates the packaged article in the container, but also protectively cushions the packed article in spaced relationship from the container walls, and also serves as a reinforcement for the container thereby strengthening the corners thereof against deforming impact and compressive forces.

Moreover, since it is readily apparent that corner posts as used in containers are angular in cross-section, it is highly desirable that the corner posts be storable and shippable in a flattened condition. Therefore, it is another object of this invention to provide a novel blank structure for a corner post which is normally flat, but which is readily foldable to the useable generally L-shaped configuration.

However, the primary objective of the present invention is to provide a corner post and method of manufacture which achieves all of the above noted objectives and still performs under conditions of high relative humidity.

DESCRIPTION OF DRAWING

FIG. 2 shows schematically one method for manufacturing the corner post in accordance with the present invention;

FIG. 2 is a perspective view of the apparatus employed in FIG. 1;

FIG. 3 is a partial cross-section in perspective showing the corner post construction produced using the manufacturing process shown in FIGS. 1 and 2;

FIG. 4 shows schematically a second method for manufacturing the corner post in accordance with the present invention;

FIG. 5 is a partial cross-section in perspective showing the corner post construction produced using the manufacturing process shown in FIG. 4;

FIG. 6 shows schematically a partial view of an additional step that may be used in manufacturing the corner posts in accordance with the present invention;

FIG. 7 shows schematically a partial view of an additional step that may be used in manufacturing the corner post; and,

FIG. 8 shows schematically a partial view of a third method for manufacturing the corner post in accordance with the present invention.

DETAILED DESCRIPTION

A corner post, completely enclosed in a plastic film and sealed on all sides, is protected from moisture penetration outside the range of its water vapor transmission rate (WTVR) properties. In one instance, a set of four corner posts constructed from corrugated paperboard, and enclosed in separate films of plastic to seal the corner posts from contact with water vapor, demonstrated in a retention of their dry strength in excess of 95% after being subjected to high humidity conditions (90°F. and 90% RH) for 48 hours. In this test, the corner posts were wrapped in 1¼ mil polyethylene, the seams were sealed and the polyethylene enclosure was heat shrunk into intimate contact with the corner posts. However, for the purpose of carrying out the present invention, the plastic film may be from ½ to 5 mils in thickness and any desirable plastic film may be employed depending upon the type of manufacturing method desired.

For instance, it is possible that the corner post could be completely sealed in the plastic film, and then used directly without additional treatments such as heat shrinking. Moreover, the corner post could be enclosed in a plastic film or enclosure using a twin film skin packaging technique wherein the two films would be drawn around the post when the air was evacuated from the enclosure. In addition, a modified skin packaging operation could be used to apply a sheet of the plastic film to one side of the corner post and then a second sheet of the plastic film could be sealed to the first sheet (and the corner post) by using a heat treatment, or a gluing operation or an ultrasonic sealing step to completely enclose the corner post.

The plastic enclosed corner post could be made on continuous operating or batch type equipment. The continuous operation would utilize one or more sheets of plastic film that would be folded around the corner post and then the ends of the film would be sealed and cut in assembly line fashion. Of course, separate other steps could be added to the corner post manufacture as set forth including vacuum skin packaging, gluing or heat shrinking. Some attendant advantages of the plas-

tic enclosed corner post would be a lack of paper dust from the corrugated paperboard, no sharp edges to cut handlers, and the lack of the presence of wax or other non-abrasive coating materials which would of necessity be transferred to the packaged articles. Of course, the major advantage obtained with the plastic enclosed corner posts as described herein is the excellent waterproof and moisture barrier properties achieved. However, in addition, the plastic enclosed post presents an excellent non-abrasive surface, a more pleasing physical appearance than conventional or even wax coated corner posts and finally, by removing the plastic enclosure, the corner posts of the present invention could be disposed of with regular corrugated materials, or even by recycled if desired without presenting recovery problems. Thus in accordance with the present invention, a corner post fabricated from corrugated paperboard is made to perform under exceptional humidity conditions while achieving many other desirable advantages not heretofore realized.

The corner posts described herein are preferably fabricated from a corrugated paperboard blank which is constructed from layers of linerboard and corrugating medium of any desired thickness. The corrugated paperboard blanks are then slit-scored on their backsides to form two side panels, thus permitting the side panels of the blank material to be folded around and glued to the front face of the blank at each side edge thereof. The corner post thus formed is illustrated in FIGS. 3 and 5, and as shown reveals a centrally located gap between the inner edges of the two side panels of the blank. This gap is necessary to permit the corner posts to be folded into their L-shaped configuration for use. Accordingly, for the purpose of describing the corner post constructions herein, grade designations such as (42-33-42-33-42) or (26-26-26-26-26) may be used, and in each case, the numbers represent basis weight of the paper materials used for either the liner board or the corrugating medium. Further, it should be understood that in each case, the corner post blanks are slit scored as described above and then the side panels are folded over and adhesively or otherwise secured to the front face of the main part of the blank so as to leave the gap between the side panels previously mentioned.

Referring now to the drawing, it will be noted that FIG. 1 discloses schematically one method for manufacturing the novel corner posts described. The apparatus intended in the schematic disclosure of FIG. 1 may be of any well known type, and no particular significance should be attached to the elements as shown. However, the arrangement of the different elements shown was particularly chosen to carry out the desired steps necessary to the manufacture of the corner posts described. For this purpose, station 1 of FIG. 1 shows a corner post supply and feeding mechanism wherein one or more pre-formed corner posts 10 are shown as being deposited on a felt or other type of conveyor belt 11 which passes around a pair of elongated rollers 12, 13. It should be appreciated however that the illustrated corner post feeding mechanism could in fact be of any other desired form as long as the other form served to convey the pre-formed corner posts to the second, or vacuum forming station shown.

At station 2 of the illustrated apparatus (FIGS. 1 and 2) a first roll of plastic film material 14 is shown which supplies the upper sheet 15 of plastic film to the corner posts 10. In this regard, the sheet of plastic film 15 is passed around a pair of rolls 16, 17 and brought into nip engagement with the top surface of the travelling corner posts 10 by means of two sets of felts 18 and 19. In each case, the felts 18 and 19 are preferably of a porous material and each is passed, respectively, around suitable roller elements 20, 21 and 22, 23, 24 and 25, to achieve the desired purpose of laying the top film sheet in intimate contact with the posts 10 to permit the vacuum forming element 26 to shrink and thereby mold the upper film sheet to the relief pattern provided by the corner posts 10. To accomplish this result, the film element 15 is pre-heated either by a heater box indicated at 27 or by other means located within the conveyor felt 18, and the then pliable film 15 is sucked down and into contact with the blanks 10 by the vacuum forming element 26 which is connected to a source of vacuum 28.

Subsequently, the posts 10 with the continuous upper film element 15 adhered to the upper surface thereof are passed to station 3 of the manufacturing process where the lower film element is brought into contact with the posts. At station 3, a second roll of plastic film material 29 is fed in continuous sheet form 30 around a pair of guide rollers 21, 32 into nip engagement between the felt 33 and the bottom portion of the posts 10. The felt 33 is shown as being passed around a pair of elongated rollers 34, 35 and serves to convey the posts 10 from station 3 to the next stage in the manufacturing process.

At station 4 (FIG. 1) the posts which are at that time sandwiched between the shrink wrapped upper film 15 and the lower film 30, encounter pairs of heated sealing discs 36, 37 which serve to form sealed seams between the two films at each side of the respective corner posts, which are then separated from one another and encased in a plastic enclosure except for the final end closure step. Again, another felt 38 is illustrated which passes around a pair of elongated rollers 39, 40 and this felt 38 serves to convey the encased posts 10 from station 4 to the end sealing station 5.

At station 5, the end seal and preferably a cutting or separating function is carried out by means of a programmed action involving a suitable heating and cutting device 41 and a base element 42. Thus, as the encased posts 10 progress through the different manufacturing steps, the end seal apparatus at station 5 acts intermittently to seal and cut the ends of the upper and lower films 15, 30 in order to completely enclose the posts in their plastic and moisture resistant enclosures. Finally, at station 6 (FIG. 1), the final product is collected where the completely sealed corner posts, if not already separated from one another, may then be separated from one another along their longitudinal heat sealed seams and prepared for shipment to the ultimate user.

FIG. 2 shows a perspective view of the apparatus described above and illustrates an operation where three corner posts are simultaneously wrapped. In this view, four sets of upper and lower sealing discs 36, 37 are shown which form longitudinal seams at each side of the three respective corner posts. Thus it should be clear that one or more corner posts may be continuously enclosed in a plastic enclosure with the apparatus described schematically in conjunction with FIGS. 1 and 2. In each instance, the number of corner posts that may be simultaneously enclosed in a plastic-like material would depend on the width of the film material available and the number of longitudinal seam sealing

stations permissable on a given piece of equipment. Moreover, it should be apparent that other and different equipment from that shown could be utilized to perform the same steps carried out by the illustrated apparatus to produce the same or an equivalent result.

FIG. 3 illustrates a cross-sectional view of the corner post as formed with the apparatus described in FIGS. 1 and 2. It may be seen that the corner post 50 includes the two side panels 51, 52 which are folded over so as to leave the centrally located gap 53 mentioned hereinbefore. The film enclosure 54 is adhered directly to and follows the contours of the upper face of the corner post as a result of the skin packaging step performed at station 2 of the manufacturing apparatus. In addition, one of the side seams 55 is shown which serves to join together the upper film sheet 15 and the lower film sheet 30. It may be appreciated that when the heat seal is performed at the two sides of the corner post, the film in that particular region tends to shrink slightly and thereby cling to the sides of the corner post more closely than would be expected.

For the purpose of demonstrating the dramatic increase in strength retention under adverse humidity conditions of a wrapped or plastic enclosed corner post as described above, as compared with a conventional (unwrapped) corner post and a wax coated corner post, a compression test was conducted on a series of 4-post sets of the corner posts described. For this purpose, the compressive strength of the respective corner posts was measured under standard or ambient atmospheric conditions and then under adverse or tropic atmospheric conditions. The test was performed using different samples which were applied with loads under compression until total failure occurred. The results of the test are set forth in the following Table.

TABLE

Post	Compression Tests - Pounds Std. Conditions 73 deg. F-50% RH	Tropic Conditions-72 hrs. 90 deg. F-90%RH	% Retention
(42-33-42-33-42) plastic wrapped	2750	2633	95.7
(38-33-26-33-38) plastic wrapped	2818	2720	96.5
(38-26-38-26-38) plastic wrapped	2502	2470	98.7
(26-26-26-26-26) wax coated	2955	2110	71.4
(42-33-42-33-42) conventional	2750	1375	50.0

It will be noted from the above results that the plastic enclosed corner posts each retained in excess of 95% of their strength even when exposed to the tropic conditions. The wax coated corner post was prepared in a Cascade waxer and absorbed between 45 and 55% of the wax applied. This absorption increased the dry strength of the waxed post, however, the strength retention under tropic conditions was only around 71%. Of course, the untreated corner post only retained 50% of its original strength when exposed to the tropic conditions. Accordingly, the results show the superior performance achieved by encasing the corner post in a plastic enclosure as described herein. The increased dry strength of the waxed post is not really significant when one considers the attendant disadvantages obtained by applying wax to the corner post. Initially, the waxing operation is already costly and the costs are increasing. On the other hand, the costs of plastic films are going down and the mechanical elements required to heat seal, shrink wrap or skin package are considerably less expensive than a wax applicator. Moreover, the waxed corner post ends to transfer some of its wax to the packaged item during transit and storage. And, of course, the was on a waxed corner post ends to soften and cause a reduction in strength of the corner post under very hot (100°–140°F.) storage and transit conditions.

In addition, although the plastic enclosed corner post does not obtain any increased dry strength, tests have demonstrated a side effect of the hot wax application which is not experienced by the plastic wrapping operation. When the hot wax is applied to the corner post, the high temperature of the wax tends to drive some of the moisture out of the corner post material and cause some total shrinkage of the length and width of the corner post. Thus with the waxed post, accurate reproduction of corner posts having a specified length is almost impossible. Of course, with the plastic enclosed post, there is no change in length and uniform reproduction is easily achieved with the added bonus of better high humidity strength performance. It is believed therefore, that the corner post construction and method of manufacture described herein clearly achieves a level of performance not obtained with the corner posts described in the prior art.

With reference to FIG. 4, a second means is illustrated for manufacturing the corner post described herein. In this embodiment, the corner post is simultaneously encased in upper and lower films, side seams are formed, end closure is effected and the entire post is passed through a heated zone which shrink wraps the plastic film around the corner post. For this purpose, station 1 shows a corner post supply and feeding mechanism comprising a felt 11 passed around a pair of elongated rolls 12, 13. Station 2 includes two rolls of plastic film material 14, 29 including an upper sheet 15 and a lower sheet 30. The sheet of plastic film 15 is passed around a pair of guide rolls 16, 17 and the sheet of film 30 passes around a pair of guide rolls 31, 32. The two films 15, 30 are then brought into nip engagement with the travelling corner post by a pair of upper and lower felts 18 and 19. Each of the felts 18 and 19 respectively are passed around a pair of elongated rolls 20, 21 and 22, 23.

Subsequently, the corner post which is now sandwiched between the upper film 15 and the lower film 30 is passed through the longitudinal edge sealing station 3 where the paired heat sealing discs 36, 37 are encountered. At this point, the heat sealing discs form the longitudinal side seams which completely encase the corner post in its plastic enclosure except for the end sealing operation at station 4. Again, another felt 38 is shown, passing around the rollers 39, 40, which

serves to convey the then completely enclosed posts to the heat shrinking station **5.** At station **5,** the heated element **60** radiates or otherwise projects heat to the enclosed corner post to adhere the film evenly to the corner post structure. If necessary, additional heat could be applied from beneath the corner post by arranging a second heat source in the area enclosed by the final felt system **43** passing around the rollers **44, 45.** Finally, at station **6,** the final product is collected where the completely sealed and heat shrink corner posts are prepared for shipment to the ultimate user.

FIG. **5** shows a cross-sectional view of the corner post as manufactured on the apparatus illustrated schematically in FIG. **4.** The film tends to hub very closely to the surface of the corner post but not follow the intimate contours of the corner post precisely as obtained with the skin packaging technique employed in FIGS. **1** and **2.**

FIG. **6** shows schematically an additional step that could be added to the corner post manufacture first shown in FIGS. **1** and **2.** If it was desired for instance to assure that the lower film **30** was more precisely shrunk around and more closely in contact with the corner post **10,** an additional heat source **70** could be added after the end cutting station **5** to perform much like the heating step included in the FIG. **4** embodiment.

As an alternative to the heat source shown in FIG. **6,** a bottom glue roll installation **80** could be added at station **3** of the embodiment shown in FIGS. **1** and **2** to accomplish the same purpose of more closely adhering the bottom film **30** to the bottom of the corner post **10.** This alternative embodiment is shown schematically in FIG. **7.** In addition, and if desired, it should be appreciated that even the top film **15** could be adhesively secured to the top surface of the corner post. For this purpose, it would only be necessary to add a top glue application installation to the apparatus shown just prior to bringing the top film **15** into contact with the corner post.

Finally, as another alternative to the different manufacturing schemes disclosed herein, the corner post could be enclosed in plastic using a twin film skin packaging technique as shown schematically in FIG. **8.** In this latter embodiment, the two films **15, 30** would be drawn around and brought into contact with the corner post when the air was evacuated from the partially closed plastic enclosure. For this purpose, directly after the corner post feeding and supply station **1,** a pair of evacuating devices **91, 92** could be added to immediately evacuate the air from between the two film applications **15** and **30** just prior to the corner post entering the nip formed by the two felts **18, 19** at station **2.** Subsequently, the ends of the two films **15, 30** would be sealed at station **3** while the area around the corner post remained evacuated. Finally, heated sealing discs **36, 37** would then be encountered to form the hereinbefore mentioned longitudinal side seams to completely enclose the corner post.

Thus it will be seen from the above detailed description that a rapid, economical, unique and simple method of manufacturing moisture resistant corner posts has been achieved. Moreover, the corner posts manufactured are believed to be novel since in each case the final product achieved solves a problem that heretofore was not solved by the prior art constructions.

It will be understood, however, that the different schematic illustrations included herein are purely diagrammatic and that the invention is capable of many refinements which would readily occur to those skilled in the art. Accordingly, what is desired to be protected by Letters Patent is set forth in the appended claims.

I claim:

1. A method of manufacturing moisture resistant corner posts constructed from corrugated paperboard or the like which are protected from moisture penetration and contact with water vapor to thereby permit the corner posts to retain a high percentage of their dry strength when exposed to high humidity conditions comprising the steps of:

1. applying a top sheet of heat shrinkable plastic film of a width that is greater than the width of said corner posts to the upper face of said corner posts;
2. vacuum sealing said top sheet to the upper face of said corner posts;
3. applying a layer of adhesive to the bottom of said corner posts;
4. applying a bottom sheet of heat shrinkable plastic film of a width that is greater than the width of said corner posts to the lower face of said corner posts;
5. simultaneously adhering the top and bottom sheets of plastic film longitudinally to one another at each side of said corner posts;
6. adhering the top and bottom sheets of plastic film transversely to one another at each end of said corner posts; and,
7. collecting the completely film enclosed corner posts sealed on all sides.

2. A method of manufacturing moisture resistant corner posts constructed from corrugated paperboard or the like comprises the steps of:

1. simultaneously applying both a top and bottom sheet of plastic film each of a width that is greater than the width of said corner posts to the upper and lower faces of said corner posts and in the presence of a vacuum to vacuum seal the two sheets of plastic film to said corner posts;
2. adhering the top and bottom sheets of plastic film transversely to one another at each end of said corner posts;
3. simultaneously adhering the top and bottom sheets of plastic film longitudinally to one another at each side of said corner posts; and,
4. collecting the completely film enclosed corner posts sealed on all sides.

* * * * *