

April 28, 1953

J. E. BOULWARE ET AL

2,636,835

STAY TAPE

Filed Aug. 2, 1949

3 Sheets-Sheet 1

Fig. 1.

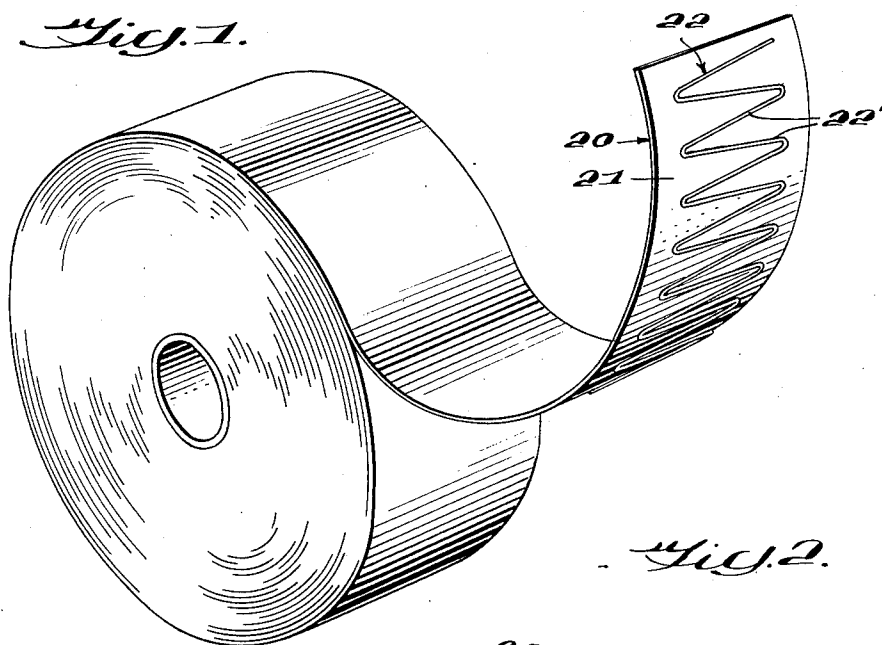


Fig. 2.

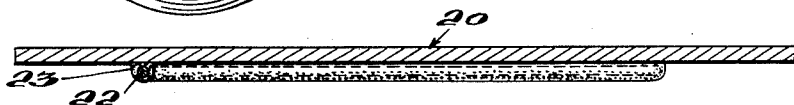


Fig. 3.

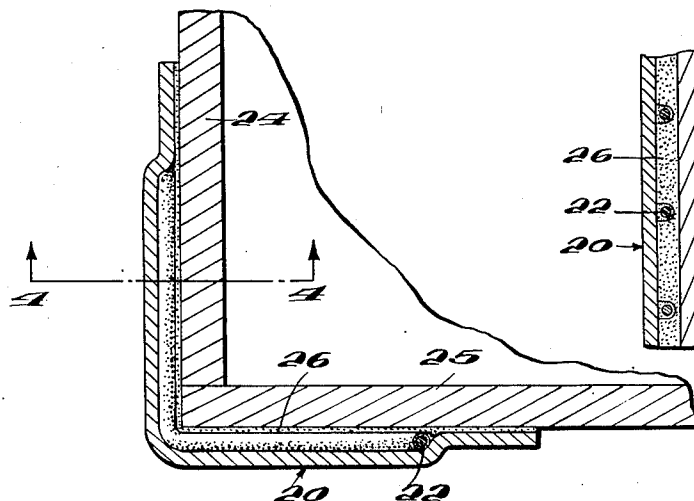
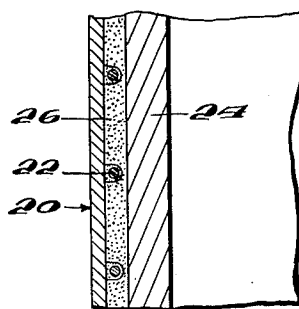


Fig. 4.



INVENTORS
JAMES E. BOULWARE,
WILLIAM H. CANNARD,
BY

Parry & Miller
ATTORNEYS

April 28, 1953

J. E. BOULWARE ET AL

2,636,835

STAY TAPE

Filed Aug. 2, 1949

3 Sheets-Sheet 2

Fig. 5.

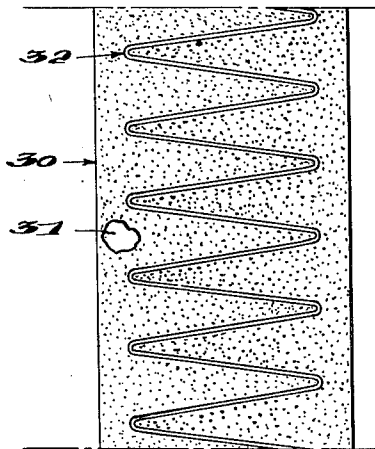


Fig. 9.

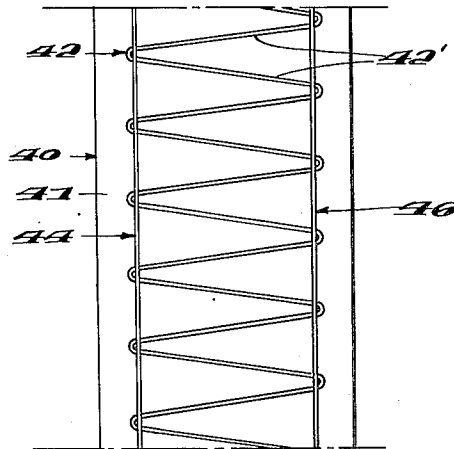


Fig. 6.

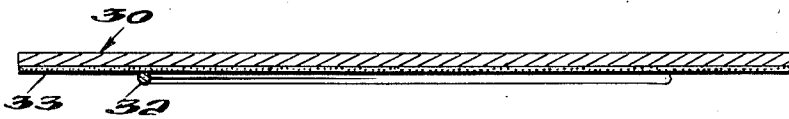


Fig. 10.

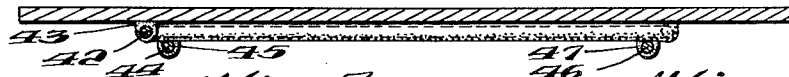
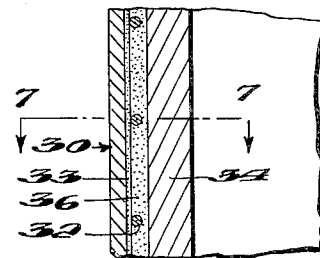
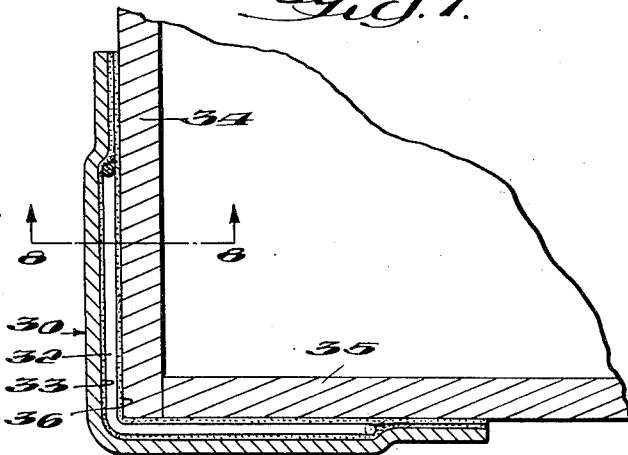


Fig. 7.

Fig. 8.



INVENTORS

JAMES E. BOULWARE,
WILLIAM H. CANNARD,

BY

Parry & Miller
ATTORNEYS

April 28, 1953

J. E. BOULWARE ET AL

2,636,835

STAY TAPE

Filed Aug. 2, 1949

3 Sheets-Sheet 3

Fig. 11.

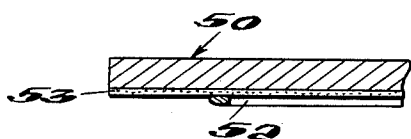


Fig. 12.

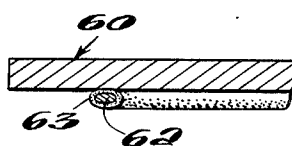


Fig. 13.

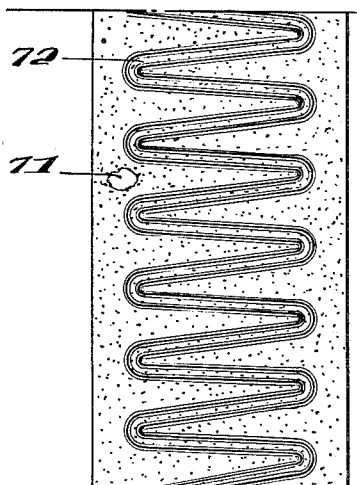


Fig. 14.

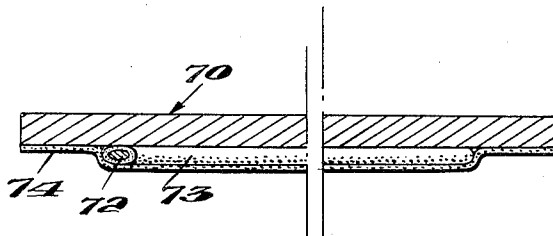
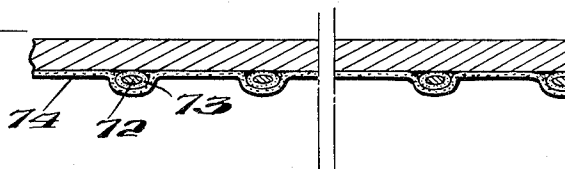


Fig. 15.



INVENTORS
JAMES E. BOULWARE,
WILLIAM H. CANNARD,
BY

Perry & Miller
ATTORNEYS

UNITED STATES PATENT OFFICE

2,636,835

STAY TAPE

James E. Boulware, Attleboro Falls, and William H. Cannard, Attleboro, Mass., assignors to The Gummed Products Company, Troy, Ohio, a corporation of Ohio

Application August 2, 1949, Serial No. 108,188

3 Claims. (Cl. 154—53.5)

1

This invention relates to paper stay tape and is particularly directed to such a tape having reinforcing giving tensile strength in a transverse direction.

The general object of the invention is to provide a stay tape of high transverse tensile strength.

A further important object of the invention is to provide a stay tape with reinforcing giving added transverse tensile strength with the reinforcing so located as to directly strengthen articles to which the tape is applied.

A further object of the invention is to provide a stay tape having reinforcing giving additional tensile strength both transversely and longitudinally.

Paper stay tapes are commonly used for securing the corners of cardboard boxes, and in such use are known as box stays. The present invention is designed to provide a stay tape ideally suited as a box stay. However, stay tapes have many other applications and the present invention is adapted for general usage.

Transversely reinforcing paper box stay tapes have heretofore been made in laminated form with strand reinforcing embedded in asphalt adhesive between two paper plies so arranged as to give added transverse tensile strength to the tape. Usually such laminated tape has the exposed face of the paper underply gummed with a moisture-sensitive animal glue adapted on wetting to adhesively secure the tape to box corners. Such tapes can be provided without pre-gumming for the application of adhesive at the time the tape is to be applied to a box corner. Such laminated tapes are subject to two objections. First, the moisture present at the time the tape is adhesively applied to a box corner is absorbed on the paper underply and cannot evaporate off due to the presence of the asphalt adhesive which bonds the two paper plies together. Such moisture may remain indefinitely, particularly under refrigeration, and so weakens the underply that the same is likely to tear away from a box corner. Such a failure also occurs under conditions where cardboard cartons are stored under conditions of relatively high humidity. The underply of a laminated tape usually fails by rupturing into two strata, one of which remains bonded to the tape by the asphalt adhesive and the other of which remains bonded to the box through the adhesive applied to the underface.

The second objection referred to with reinforced laminated box stay tapes is that the strand reinforcing does not directly strengthen the box corner. Its strengthening action is dependent

2

upon the ability of the paper underply to resist strata rupture and it further depends upon the bonding strength of both the adhesive through which the tape is bonded to a box corner and to the strength of the asphalt adhesive which embeds the reinforcing between the plies of the tape.

The present invention is designed to avoid objections to prior laminated box stay tapes of the type described and at the same time to provide a tape of simple construction. For box stay purposes and likewise for other purposes the strand reinforcing is so arranged on the tape that it directly reinforces a box or other article independently of the strength of the paper tape and independently of the strength of its bond with the tape.

The characterizing feature of the invention is that strand reinforcing is transversely arranged at frequent longitudinal intervals on the underface of a paper stay tape so as to be adapted to be directly bonded to article surfaces. Use of laminated paper tape is possible but a single ply paper tape is preferred. The strand reinforcing is bonded to the tape by suitable adhesive. The adhesive which is to secure the tape to an article may be omitted from the tape as supplied and applied as a liquid at the time the tape is to be secured to an article. Again, a suitable article bonding adhesive may be applied to the tape in the course of manufacture in the form of a dry film capable of being softened to an adhering state at the time of use. In the latter case it is important that adequate adhesive film be obtained on the surfaces of the strand reinforcing to insure a proper bond thereof with an article. To this end the strand reinforcing should be non-absorbent at the time the adhesive film is applied. This condition can be obtained by having the strand reinforcing impregnated with the adhesive by which it is bonded to the tape. Such tape bonding adhesive provides a rough surface coating on the strand reinforcing and we find that after setting an adequate amount of the article bonding adhesive film will adhere thereto.

For the strand reinforcing textile threads of nylon or other synthetic fibers are preferred because of their long length fiber character and great tensile strength. Cotton or other vegetable fiber threads may also be employed. The size of the thread may vary considerably depending upon the increased degree of transverse tensile strength required for the tape on the basis of its usage and also upon the individual tensile strength of the thread. For a box stay we have found that a 420 denier nylon thread is very satisfactory. For equivalent strength we may em-

ploy a double strand of two 210 denier nylon threads. We have also had quite satisfactory results with box stays employing only a single strand 210 denier nylon yarn. As indicated, however, the denier and the tensile strength of the thread employed is subject to considerable variation and is not a critical feature of the invention.

The strand reinforcing is firmly bonded to the reinforcing tape by a suitable adhesive. Animal glue and other moisture-sensitive adhesives can be employed but are not preferred because they are likely to soften and loosen the bond between the strand reinforcing and the tape when the article bonding adhesive is applied. Heat setting synthetic resin adhesives can be employed for bonding the strand reinforcing to the tape, likewise latex emulsion adhesives, both of which are moisture-resistant after setting. We have secured best results, however, with synthetic resin emulsion type adhesives, which have extremely strong bonding properties and when set are moisture-resistant and permanently flexible. Pressure sensitive adhesives are unsuitable because they remain permanently moist and have inadequate bonding strength for present purposes.

The invention will be more fully understood from the illustrative embodiments thereof in the accompanying drawings and the description thereof to follow.

In such drawings:

Fig. 1 is a perspective view of a roll of stay tape embodying a preferred form of the invention;

Fig. 2 is a greatly enlarged cross section of the tape shown in Fig. 1;

Fig. 3 is a fragmentary cross section of a box with the stay tape of Fig. 1 applied to the corner thereof;

Fig. 4 is a fragmentary section taken on line 4—4 of Fig. 3;

Fig. 5 is an underface view of a section of stay tape according to another form of the invention;

Fig. 6 is an enlarged cross section of the tape shown in Fig. 5;

Fig. 7 is a fragmentary cross section of a box showing the tape of Fig. 5 applied to the corner and being taken on line 7—7 of Fig. 8;

Fig. 8 is a fragmentary section at line 8—8 of Fig. 7;

Fig. 9 is an underface view of a section of stay tape employing a modification of the construction of tape shown in Fig. 1;

Fig. 10 is an enlarged cross section of the tape shown in Fig. 9;

Figs. 11 and 12 are enlarged fragmentary cross sections of stay tape wherein the reinforcing strands are relatively flat instead of round;

Fig. 13 is an underface view of a section of stay tape according to still another form of the invention;

Fig. 14 is a fragmentary enlarged cross section of the tape shown in Fig. 13; and

Fig. 15 is a fragmentary enlarged longitudinal section corresponding to Fig. 14.

The stay tape shown in Figs. 1 and 2 comprise a single ply of paper tape 20, preferably smooth kraft paper. Creped paper can also be employed. To the underface 21 of the tape is bonded strand reinforcing of textile thread arranged as a series of transversely extending lengths 22' at frequent longitudinal intervals. In the form shown transverse lengths 22' are formed of a continuous thread with the ends of adjacent lengths joined along lines somewhat inwardly of the side edges of the tape. Such formation of the strand rein-

forcing is convenient to manufacture. It is also contemplated to employ recurrent transverse lengths of thread which are unconnected at their ends. By laying a continuous strand of thread with the same zig-zag formation as in Fig. 1 on wide paper and then severing such paper into a multiple of narrower strips it will be evident that such a discontinuous transverse strand arrangement would result.

Reinforcing thread 22 is permanently bonded to paper tape 20 by an adhesive 23. The thread is preliminarily thoroughly impregnated and coated with the adhesive 23 by immersion and then applied to the tape. Pressure is applied when the adhesive is partially set to insure a strong bond. Because of the applied pressure the adhesive coating at the surface of the paper is flattened and spread. As before stated, it is preferred to use a resin emulsion type of adhesive. In the emulsion state the adhesive is of course a liquid and may contain approximately 50% solids suspended in water. After evaporation of the water when the adhesive sets and hardens a water resistant bond is obtained between the thread and the tape.

Because textile threads composed of a multiplicity of filaments are absorbent impregnation thereof as above explained is desirable so that adequate adhesive be present as a coating on the thread surface to insure proper bonding with the tape. It is also found that impregnation materially increases the thread tensile strength, the adhesive bonding the thread filaments to one another.

It should also be pointed out that the presence of the tape adhering adhesive on the threads is important when further adhesive is applied to bond the tape to an article. The latter adhesive is prevented from absorbing into the threads and an adequate amount in the form of a coating or film will be obtained on the threads to insure their proper bonding with an article. It is found that the tape bonding adhesive coating on the threads has a somewhat rough surface, due at least in part to the manipulation of the thread in applying it to the tape while such adhesive coating is soft in a partially set state. Such rough surface assists in adhering adequate article bonding adhesive to the threads through cohesive action.

The advantage of having the reinforcing thread located on the exposed underface of the stay tape will become apparent from Figs. 3 and 4. Therein a strip of the stay tape is applied to a corrugated cardboard box corner to secure box sides 24 and 25. Preparatory to applying the tape to the box a coating of adhesive 26 is applied to the underface of the tape and the reinforcing thread and such coating adheres the reinforcing tape to the box. It will be apparent that the reinforcing thread is directly bonded to the surfaces of the box by adhesive coating 26. Thus the transverse lengths of the thread directly reinforce the box corner, of course the tape is also bonded to the box by adhesive 26 so that a strong composite structure is provided. However, the tensile strength of the thread ordinarily exceeds that of the paper and the thread is the more important factor in securing the box.

Since the undersurface 21 of tape 20, as supplied, is uncoated it is capable of absorbing moisture. This is advantageous in that when adhesive 26 is applied at the time of installation of the tape on a box or other article the water

5

or other liquid can absorb into the paper and evaporate off of the outer surface. The adhesive can dry more quickly. It is preferable that the same type of adhesive be employed to secure the tape to the box as that which bonds the thread 22 to the tape. A resin type emulsion adhesive is recommended. However where such adhesive is employed to bond the thread to the tape, or any other adhesive which when set is moisture resistant, any liquid cement having strong bonding characteristics may be used to secure the tape to a box or other article.

Paper tape 30 shown in Figs. 5 through 8 is similar to that previously described. In this case the undersurface 31 of the tape has reinforcing thread 32 bonded thereto by an adhesive 33. Such adhesive is preliminarily applied to the tape as a film and the thread is then applied after such film has partially set. The thread is not itself preliminarily impregnated with adhesive as in the previous embodiment.

As before, adhesive 33 when set should be moisture-resistant. It is not intended as the adhesive for securing the tape to an article since it does not coat the major surface of thread 32. It is important, according to the invention, that the thread be bonded to the article as well as the tape. It is further desirable, although not entirely essential, that dislocation of the thread relative to the thread should be avoided during application to an article and this might occur if adhesive 33 was of the character subject to softening when further adhesive to secure the tape to an article is applied.

Figs. 7 and 8 show tape 30 applied to the outer surfaces of sides 34 and 35 of a box corner. Bonding is effected by applying an adhesive layer 36 which coats thread 32 and forms a second adhesive film on top of adhesive film 33. Since film 33 prevents absorption of moisture through tape 30 film 36 will not set as quickly as the article adhering adhesive film 26 shown in Figs. 3 and 4. It is preferred that film 36 be of the same type adhesive as film 33, such as an emulsion type of resin, but any strong bonding adhesive may be employed.

Stay tape 40 shown in Figs. 9 and 10 is similar to that of Figs. 1 and 2. The undersurface 41 thereof is uncoated and reinforcing thread 42 is preliminarily impregnated with adhesive 43 and applied to such surface after the adhesive has partially set. The thread is applied as before in zig-zag arrangement to provide recurrent transversely extending lengths 22'. Whereas for box stay purposes longitudinal reinforcement of the tape is unnecessary there are many other uses where longitudinal as well as transverse reinforcement is desirable. In the present embodiment longitudinal reinforcement is provided by longitudinal threads 44 and 46. As in the case of thread 42 such threads are preliminarily impregnated with adhesive. Thread 44 is bonded by adhesive 45 to the tape somewhat inwardly of one edge thereof and also crosses and is bonded to lengths 42' of thread 42 near the ends thereof. Longitudinal thread 46 is provided with adhesive 47 which bonds the same to the tape somewhat inwardly of the opposite edge and to the end portions of thread lengths 42'. At the time tape 40 is to be applied to an article a suitable adhesive will preliminarily be applied thereto in the same manner as in the embodiment of Figs. 1 and 2. The arrangement of reinforcing threads on tape 40 will give the same

6

exceedingly high tensile strength both transversely and longitudinally.

The reinforcing threads may be flattened out of their usual round form. This may be accomplished after the threads have been applied to the tape and the adhesive has partially set by applying relatively heavy pressure to the tape, as by means of a highly polished metal roll. In the embodiment of Fig. 11 paper stay tape 50 has reinforcing thread 52 adhered thereto by an adhesive film 53. In Fig. 12 tape 60 has thread 62 adhered thereto by an adhesive coating 63. Such adhesive is preliminarily applied to the thread as in the embodiment of Fig. 1. It will be understood that threads 52 and 62 have lengths extending transversely of the tapes at frequent longitudinal intervals and are preferably applied as a continuous length in zig-zag form in the same arrangement as previously. The flattening of threads 52 and 62 has the advantage of presenting a greater surface area both for bonding to the tapes and bonding to articles upon application of further adhesive in the form of a film on the undersurface of the tapes.

The form of the invention shown in Figs. 13 to 15 includes a dried film of a softenable adhesive for bonding the tape to a box or other article. The paper tape 70 has bonded to its underface 71 transverse lengths of thread 72. This is accomplished by preliminarily thoroughly impregnating and coating the thread with an adhesive and applying it to the tape while still soft through adhesive coating 73, all as in the embodiment of Figs. 1 and 2. Such adhesive is preferably a resin emulsion or other moisture-resistant type, although animal glues have been found satisfactory under some conditions. After such tape bonding adhesive has dried, a film 74 of adhesive is applied to the coated thread 72 and entire underface of the tape and allowed to dry. Moisture-softening adhesives such as animal glue have been found to produce a good bond of both the thread and tape to boxes and other articles which moistened at the time of use. As already pointed out the non-absorbent and rough surface provided on the thread by the tape bonding adhesive 73 insures adequate article bonding adhesive film 74 on the threads to provide a strong bond between the thread and article.

It will be apparent that the invention provides extremely simple reinforcing paper stay tape with greatly increased transverse tensile strength. As before stated, the main advantage of the invention is that reinforcing thread is bonded directly to the article so as to function as a reinforcement therefor. The tape may be supplied in rolls as shown in Fig. 1 without danger of the adjacent convolutions adhering to one another. The tape may be transported and handled under conditions of high humidity without difficulty. The tape may be made up in a variety of forms using paper of different types and weight, likewise with textile reinforcing threads of various kinds and sizes. The scope of the invention is to be determined according to the appended claims.

We claim:

1. A stay tape for securing and directly reinforcing the edges of shipping containers consisting of a strip of tape having strand reinforcement bonded to one surface of said tape and extending transversely over said tape surface in zig zag pattern, said strand reinforcement being impregnated with moisture resistant adhesive and bonded to said tape surface in flattened condi-

7

tion by said moisture resistant adhesive, and a coating of moisture sensitive adhesive covering said tape surface and said strand reinforcement for bonding both directly to a shipping container, said strand reinforcement being buried in said moisture sensitive adhesive and adapted when bonded to a shipping container to directly reinforce the container independently of said tape.

2. The structure claimed in claim 1 wherein said strand reinforcement comprises nylon filaments.

3. A stay tape for securing and reinforcing the edges of shipping containers consisting of a strip of tape and strand reinforcement bonded to one surface of said tape by a moisture resistant adhesive, said strand reinforcement extending transversely over said tape surface in zig zag pattern, and a coating of moisture sensitive adhesive

8

constituting the glue line of said tape covering said strand reinforcement to bond both directly to a shipping container.

JAMES E. BOULWARE.
WILLIAM H. CANNARD.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,195,430	Angier -----	Aug. 22, 1916
1,197,315	Wendler -----	Sept. 5, 1916
1,910,501	Schindler -----	May 23, 1933
2,000,475	O'Donnell -----	May 7, 1935
2,024,224	Humphner -----	Dec. 17, 1935
2,070,624	Schlegel -----	Feb. 16, 1937
2,098,909	Angier -----	Nov. 9, 1937
2,311,572	Reynolds -----	Feb. 16, 1943