March 8, 1955 J. E. BOULWARE ET AL 2,703,771

METHOD OF MAKING REINFORCED STAY TAPE

Original Filed Aug. 2, 1949

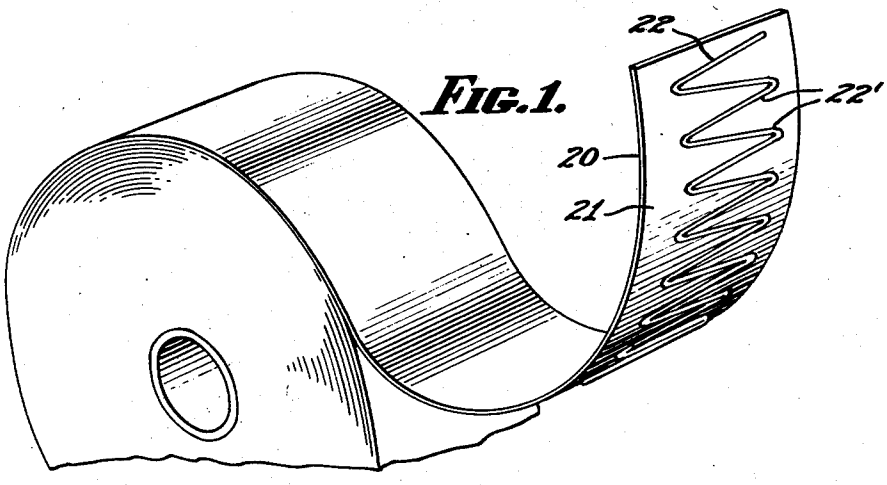


FIG. 1.

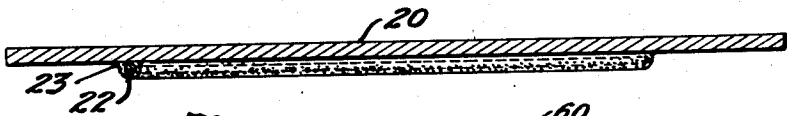


FIG. 2.

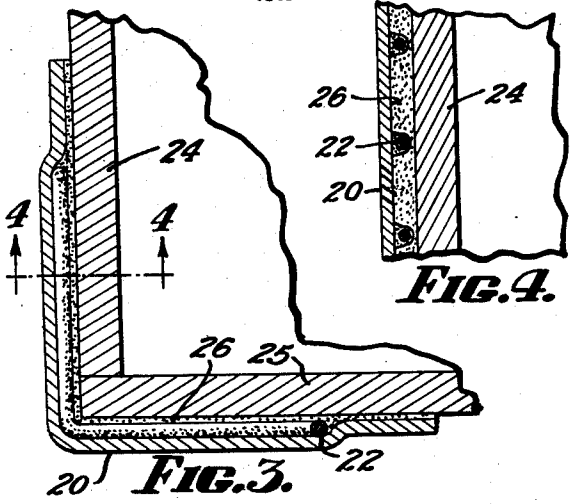


FIG. 3.

FIG. 4.

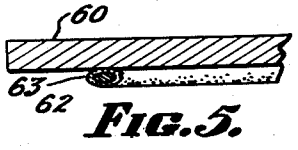


FIG. 5.

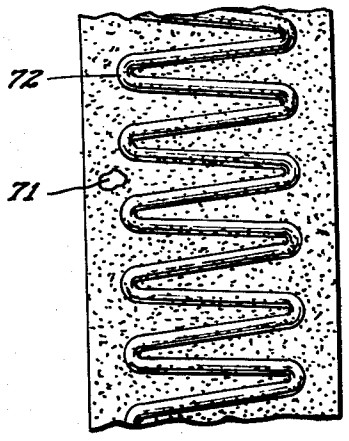


FIG. 6.

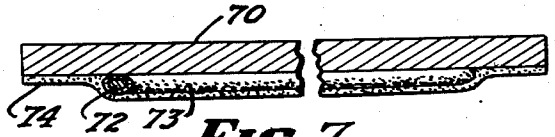


FIG. 7.



FIG. 8.

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METHOD OF MAKING REINFORCED STAY TAPE

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Original application August 2, 1949, Serial No. 108,188, now Patent No. 2,636,835, dated April 28, 1953. Divided and this application November 27, 1951, Serial No. 258,431

7 Claims. (Cl. 154—93)

This is a division of our application filed August 2, 1949, bearing Serial No. 108,188 and entitled Stay Tape, now Patent No. 2,636,835.

Our 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 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 with 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 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 surface 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 snythetic fibers are preferred because of their 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 employ 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:

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

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

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

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

Figure 5 is an enlarged fragmentary cross section of a stay tape wherein the reinforcing strands are relatively flat instead of round;

Figure 6 is an underface view of a section of stay tape according to still another form of the invention;

Figure 7 is a fragmentary enlarged cross section of the tape shown in Figure 6; and,

Figure 8 is a fragmentary enlarged longitudinal section corresponding to Figure 7.

The stay tape shown in Figures 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 **22** 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 reinforcing is convenient to manufacture. It is also contemplated to 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 Figure 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 Figures 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 surface 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 the 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 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.

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 Figure 5 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 Figure 1. It will be understood that thread **62** has lengths extending transversely of the tape at frequent longitudinal intervals and is preferably applied as a continuous length in zig zag form in the same arrangement as previously. The flattening of thread **62** has the advantage of presenting a greater surface area both for bonding to the tape and bonding to articles upon application of further adhesive in the form of a film on the undersurfaces of the tape.

The form of the invention shown in Figures 6 to 8 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 Figures 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 Figure 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.

Modifications may be made in our invention without departing from the spirit of it. Having thus described our invention in certain exemplary embodiments, what we claim as new and desire to secure by Letters Patent is:

1. A method of making reinforced stay tape which comprises providing a strip of tape and strand reinforcement in the form of a textile thread, coating said thread with adhesive, depositing the coated thread on said strip of tape in zigzag pattern, and while the adhesive coating on said thread is still in tacky condition, pressing said thread into contact with said tape to cause the thread to be bonded to the tape by means of the adhesive coating on the thread, and after the adhesive coating has dried, applying pressure to the tape to cause the thread to be flattened thereagainst.

2. A method of making reinforced stay tape which comprises providing a strip of tape and strand reinforcement in the form of a textile thread, coating said thread with a moisture-resistant adhesive, depositing the coated thread on said strip of tape in zig zag pattern, and while the adhesive coating on said thread is still in tacky condition pressing said thread into contact with said tape to cause the thread to be bonded to the tape by means of the adhesive coating thereon, permitting the adhesive coating on the thread to dry in contact with the strip of tape and thereafter applying pressure to the tape and the strand reinforcement thereon to flatten the strand reinforcement against the tape.

3. A method of making reinforced stay tape which comprises providing a strip of tape and strand reinforcement, coating said strand reinforcement with a moisture-resistant adhesive, depositing the coated strand reinforcement on said tape in zig zag pattern, and while the adhesive coating on said strand reinforcement is still in tacky condition, pressing the strand reinforcement into

contact with the tape to cause the strand reinforcement to be bonded to the tape, applying pressure to the tape and the strand reinforcement to cause the strand reinforcement to be flattened against the tape, and thereafter coating the tape and the strand reinforcement with a layer of moisture-sensitive adhesive constituting the glue line of the tape and serving to bond both the tape and the strand reinforcement directly to a supporting surface.

4. A method of making reinforced stay tape which comprises providing a strip of tape and a strand of textile thread, impregnating and coating the textile thread with a moisture-resistant adhesive, applying the impregnated and coated thread to one surface of the tape in zigzag pattern so as to cause said thread to be secured to said tape by said adhesive, and applying pressure to the tape and the reinforcement to cause the reinforcement to be flattened against the tape.

5. The method claimed in claim 4 wherein a strand of textile thread comprises a 420 denier nylon thread.

6. The method claimed in claim 4 wherein said strand comprises a double strand of two 210 denier nylon threads.

7. The method claimed in claim 4 including the step of applying a coating of moisture-softening adhesive over the tape surface and the flattened strand reinforcement thereon.

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