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Blake

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[54] **FLEXIBLE TAPE FASTENER OR HINGE**

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[73] Assignee: **Norton Company**, Worcester, Mass.

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[52] **U.S. Cl.** ..... **16/150**; 220/339; 281/3 R

[51] **Int. Cl.**[2] **E05D 7/00**

[58] **Field of Search** ..... 220/339, 334, 336; 229/44 R; 248/205 A, 205 R; 281/37.5, 21, 40, 41, 22, 3 R; 16/150, 151

[56] **References Cited**

UNITED STATES PATENTS

3,851,353 12/1974 Wakeman 16/150

Primary Examiner—Geo. V. Larkin

Attorney, Agent, or Firm—Walter Fred

[57] **ABSTRACT**

A continuous longitudinal flexible tape has an X-like configuration transversely of its length providing four opposite side portions and quadrants of the X adapted to be adhesively secured to and join together a plurality of members intended to be either fixed relative to each other or hinged to permit articulation of the members about a longitudinal axis of the tape. The tape comprises a first perforated strip with a plurality of longitudinally spaced perforations in a central portion thereof situated between opposite side portions and forms one half of and first and second legs of the X. A second flexible slotted strip forming the second half and third and fourth legs of the X is intermeshed with the first strip and has an imperforate side portion adjoining a slotted side portion with a plurality of open ended elongated slots and elongated integral connecting portions extending transversely between the slots from the imperforate side portion. The first perforated and second slotted strips are assembled by inserting the elongated connecting portions through the perforations so they extend beyond the central portion of the first strip and are secured to at least one backing strip which together form a laminated side portion and fourth leg of the X. As a result the first and second strips are intermeshed, interlocked and hinged together by longitudinally spaced alternating connecting portions of the strips crossing and intersecting one another at the axis of the X-like configuration.

7 Claims, 6 Drawing Figures

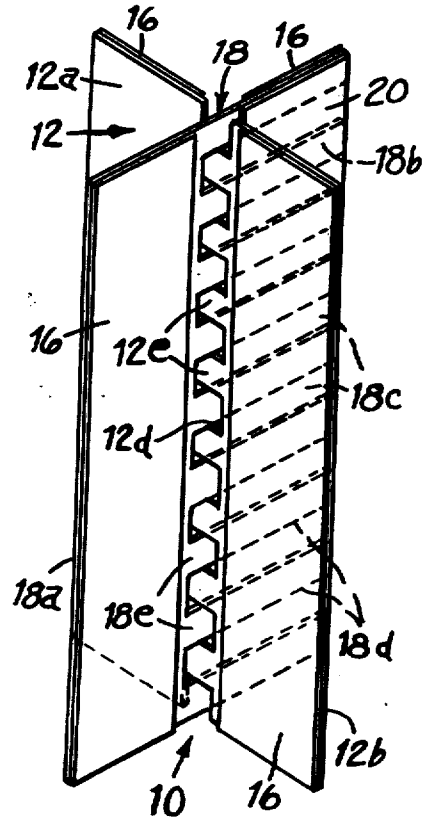


FIG. 1

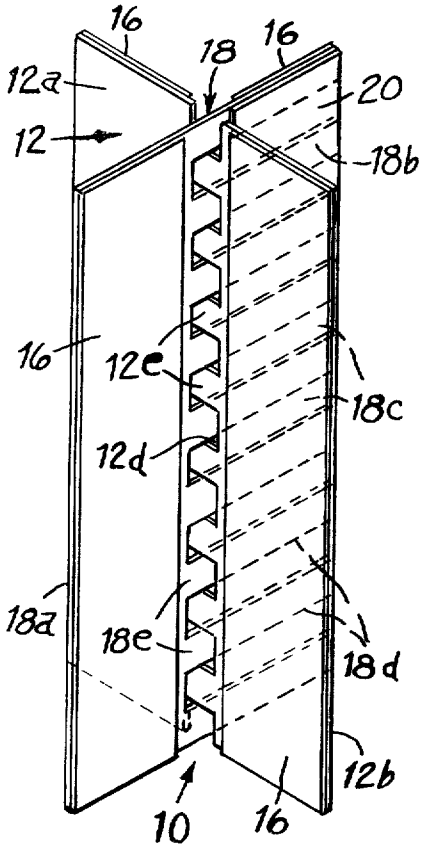


FIG. 2

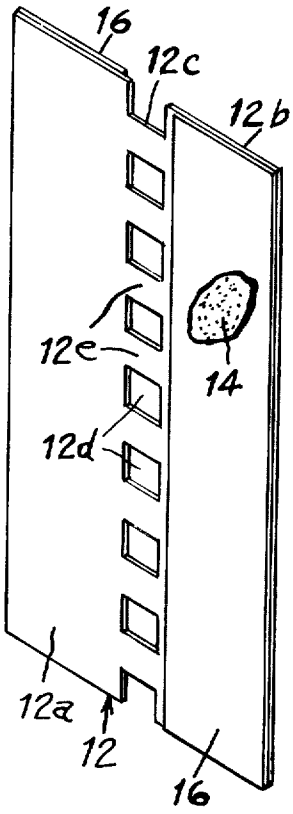
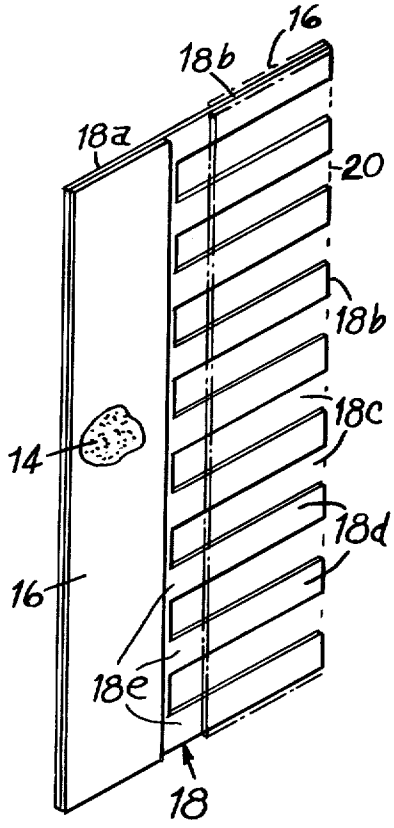


FIG. 3



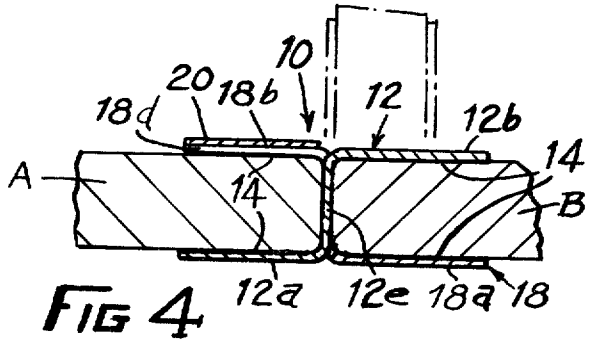
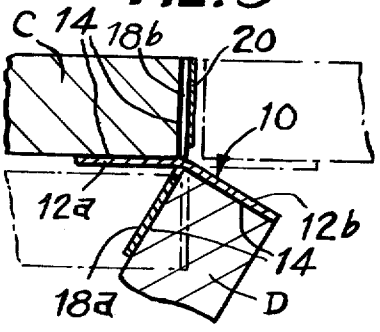


FIG 4

FIG. 5



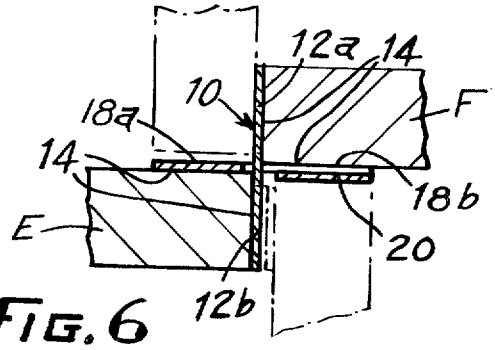


FIG. 6

FLEXIBLE TAPE FASTENER OR HINGE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to continuous length flexible tape structures adapted to be adhesively secured to and for either fixedly or hingedly connecting a plurality of adjacent members together and method of making the tape structure.

2. Description of the Prior Art

Heretofore, various tape structures for joining or hinging adjacent members together are disclosed and described in U.S. Pat. No. 3,751,760 granted to Wakeman and the various patents mentioned therein. The applicant's continuous tape construction is similar to but an improved form of the continuous tape structures disclosed by Wakeman in that it has fewer easily assembled integral formed elements and adhesive joints subjected to stress which reduces the assembly time and cost of constructing and which has greater resistance to and uniformly distributes the various forces encountered thereby. Applicant is also aware of the short individual X-like hinge structures disclosed in U.S. Pat. No. 792,460 granted June 13, 1902 to Richter et al., and in U.S. Pat. No. 3,442,415 granted May 6, 1969 to Glass. The hinges are not longitudinally continuous but a plurality of hinges, one of which is stitched together at the axis of the X, and the other made of two flexible members one inserted through a single aperture in the other.

SUMMARY OF THE INVENTION

The instant invention relates to a continuous flexible tape structure or fastener with an X-like cross sectional configuration which is cut to desired length and adhesively secured to edges and/or side surfaces of adjacent members to either fixedly fasten or hingedly connect them together. Elements of the tape structure comprise a first perforated flexible strip with a plurality of longitudinal spaced apertures and integral connector portions in a central portion between two opposite side portions adapted to be adhesively secured to the members to be joined. A second slotted flexible strip has a slotted side portion with a plurality of longitudinally spaced integral elongated connector portions extending transversely, between elongated slots, from an imperforate opposite side portion of the slotted strip through and beyond the spaced apertures or slots in the first perforated strip to a discontinuous opposite edge of the slotted strip interrupted by entrances to the elongated slots. At least one backing strip is adhesively secured to and maintains the spaced relationship of the elongated connectors and hingedly interconnects the first and second strips together. The backing strip extends a predetermined width inwardly from the entrances of and closes off the greater part of the elongated slots, to provide a laminated side portion adjacent the remaining openings of the elongated slots in the central portion of the second strip.

Preferably pressure sensitive adhesive is applied to the appropriate opposite side faces of the opposite side portions for securing them to the appropriate surfaces of members to be joined and protectively covered by removable release strips.

A method of constructing the tape structure having an X-like configuration comprises perforating a first continuous strip of flexible material to provide a plurality of longitudinally spaced apertures and integral connecting portions in the central portion extending between opposite side portions of the first strip; then, slotting a side portion of a second continuous strip of flexible material to provide a plurality longitudinally spaced elongated slots and integral elongated connectors spaced so they correspond to substantially the size and spacing of the apertures in the first strip and extend transversely between an entrance of the slots at one side edge to at least the center of and an opposite side portion of the second strip and thereafter, the elongated connector portion of the second strip is inserted and passed through and beyond the apertures in the first strip so they cross the connecting portions of the first strip at crossing points on the longitudinal axis of the X-like configured structure.

Lastly, at least one backing strip is adhesively secured to the protruding end portions of the elongated connecting portions extending beyond the first strip, of sufficient width to close off the greater part of the elongated slots and provide a laminated side portion hingedly connecting and interlocking the first and second strips together.

Therefore, it is the principal object of the invention to provide an easily applied continuous longitudinal hinge or joint tape structure having a minimum number of integral parts and adhesive joints subjected to the various loads, forces and stresses produced by the adjacent members joined by and to which the tape is adhesively secured and which has greater resistance to and uniformly distributes the various loads, stresses and forces produced.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of an assembled continuous length of the tape structure of the invention with an X-like configuration in cross-section.

FIG. 2 is a perspective view of a first continuous integral perforated strip forming one-half and the first and second legs of the X-tape structure with adhesive and protective release strips thereover as shown in FIG. 1.

FIG. 3 is a perspective view of a second slotted strip with adhesive and a protective release strip on a side portion thereof prior to being assembled and retained to the first strip by a backing strip adhesively secured thereto to form the remaining half and the third and fourth legs of the X-tape as shown in FIG. 1.

FIGS. 4, 5 and 6 are partial cross sectional views showing different arrangements of the tape of the invention attached to and joining two adjacent members together.

DESCRIPTION OF THE PREFERRED EMBODIMENT(S)

In FIG. 1 of the drawings there is shown the assembled continuous flexible tape structure 10 of the invention having an X-like configuration in cross section with a central longitudinally axis from which four quadrants and legs of the X extend radially outward. The tape structure comprises a first perforated flexible integral continuous strip 12 forming one half and opposed first and second legs of the X. The flexible strip 12, more clearly shown in FIG. 2, has opposite side edges, opposite side portions 12*a* and 12*b* adjacent the opposite side edges and a relatively narrow central portion 12*c* therebetween through which the longitudinal axis

of the X and tape **10** passes.

In the central portion **12***c* are a plurality of apertures **12***d* spaced longitudinally along the axis and which may be of various sizes, shapes and spacing. Preferably the apertures are of substantially identical size, of rectangular shape, equally spaced longitudinally and transversely of the axis. Connecting the opposite side portions or marginal web portions **12***a* and **12***b* are integral connection portions **12***e* equally spaced between and by the apertures **12***d* in the central portion **12***c*.

On each of the opposite side portions **12***a* and **12***b* are opposed side faces to at least one of which there is preferably applied a layer of pressure sensitive adhesive **14** protected by release strips or cover strips **16** which are removable for attachment to the members to be joined. However, the adhesive can be of any other suitable type and may be omitted and applied at the time the tape structure is attached to the member whereby the release strips **16** are not required. In the arrangement shown each of the covers or release strips **16** are applied to and held by the adhesive **14** to one side face, of each side portion and on opposite sides of the strip **12**.

Referring to FIGS. **1** and **3** there is shown a second continuous slotted flexible strip **18** forming the second half and opposed third and fourth legs of the X. The slotted strip **18** has opposite side edges and opposite side portions **18***a* and **18***b*, of which **18***a* is preferably a third substantially continuous or imperforate side portion and the other **18***b* a fourth or slotted side portion with a discontinuous side edge interrupted by the entrances to a plurality of substantially identical elongated slots **18***c*. The elongated slots **18***c* extend inwardly from the open ends or entrances at the interrupted edge transversely to the opposite side portion **18***a* and are preferably equally spaced longitudinally along the strip **18** to correspond with the spacing of the connecting portions **12***e* in the strip **12**.

Between the elongated slots **18***c* are a plurality of substantially identical equally spaced elongated projections, tongues or integral connecting portions **18***d* extending transversely from the side portion **18***a* to the interrupted edge of the opposite slotted side portion **18***b*. Preferably the transverse dimension or length of each of the elongated slots and connecting portions or tongues **18***d* is substantially identical and equal to the total transverse dimension or width of one of the opposite side portions **12***a* or **12***b* and perforations **12***d* in the central portion **12***c* of the first strip **12**. The longitudinal dimension or height or width of each of the slots **18***c* measured longitudinally of the strip **18** is substantially identical and preferably slightly greater than the longitudinal dimension or width of the connector portions **12***d* received therein. Likewise, the longitudinal dimension or height of each of the slots **12***d* measured longitudinal of the strip **12** is substantially identical and preferably slightly greater than the longitudinal dimension or height or width of the elongated connecting portions **18***d* inserted therein.

A layer of pressure sensitive adhesive **14** and another protective cover of release strip **16** is preferably applied to one side face of the side portion **18***a* for attachment to one of the members to be joined. However, as before the adhesive could be applied to either the members or the side portions at the time the tape structure **10** is used to join the members whereby the adhesive and release strips are not required before hand.

The tape structure **10** shown in FIG. **1** is assembled by inserting the protruding elongated tongues or connecting portions **18***d* of strip **18** through the apertures or openings **12***d*. Then, a continuous backing strip **20** of substantially the same longitudinal length and transverse width as the opposite side portion **18***a* is adhesively secured to a side face, of each of the elongated connecting portions **18***d*, preferably on the same side of the portion **18***b* and the strip **18** on which the release strip **16** is situated on the portion **18***a*, as shown by phantom lines in FIG. **3**. Hence, a plurality of portions **18***e* of the elongated connecting portion **18***d* and of the slots **18***c* remain uncovered between the backing strip **20** and the side portion **18***a*.

As a result of flexible first and second strips **12** and **18** are intermeshed, interlocked, free to move or pivot relative to each other about the longitudinal axis of the X-tape structure **10**, and prevented from moving axially any substantial amount relative to each other in the longitudinal direction.

After assembly a layer of adhesive and another cover or release strip **16** is applied to the opposite exposed side face of each of the elongated connection portions **18***d* and the completed or laminated side portion **18***b*, opposite the backing strip **20** for attaching to a member to be joined. The longitudinal axis of the X-tape structure **10** passes substantially through the points where the connecting portions **12***e* and **18***d* of the strips **12** and **18** cross one another. However, the crossing points and longitudinal axis may be located anywhere or shift to one or more positions between the opposite sides and within the transverse width of the openings or apertures **12***d*.

Referring to FIG. **4**, there is shown an enlarged cross sectional view of the tape **10** adhesively secured to opposite side portions of aligned and joined members A and B. The members A and B have edges situated close to one another and on opposite sides of the respective alternating connecting portions **12***e* and **18***d* of the first and second flexible strips **12** and **18** of the tape **10**.

Either one or both of the members may be fixed relative to the other. When both of the members A and B are fixed then the tape acts to maintain the edges together in a fixed relationship.

However, when one of the members A and B is fixed the other can be pivoted in either direction up to 180° relative to the fixed member and if desired fixed at the desired angular position. During the pivotable movement the connecting portions **12***e* and **18***d* of strip **12** and **18** cross one another and are free to bend and move relative to each other since they are not attached to the members joined.

In FIG. **4** there is shown in phantom lines the position of the member B after it has been pivoted or swung 90° from the aligned position shown. During the 90° movement the connecting portions **12***e* bend at the junction with the secured portions **12***b* and into alignment therewith while the adjacent unattached portions **18***e* of the elongated connecting portions of **18***d* bend at the junction with the attached side portions **18***b* and move within the apertures **12***d* into alignment with the side portion **18***b*.

In FIG. **5** there is shown the tape **10** with the side portions **12***a*, **12***b*, **18***a* and **18***b* attached to edges and adjacent side surfaces of the members C and D. Hence the members C and D are hingedly joined together and pivotal relative to one another to various positions indicated by phantom lines which by example only

show the extreme positions of the member D relative to member C.

FIG. **6** discloses another arrangement in which the side portions **12***a* and **12***b* are attached to the edges and the side portions **18***a* and **18***b* are attached to the adjacent side surfaces of the members E and F. This arrangement allows either member to pivot relative to each other to the positions shown in phantom lines whereby either right or left hand corners are formed. Also, one member can be hinged relative to the other so as to provide a hinged member or cover for a container or like structure.

The strips **12, 18** and **20** may be formed from any suitable type of flexible sheet material such as woven fabric of natural or synthetic fibers, leather, thin sheet metal, sheet plastic and paper. The sheet plastic material may be polypropylene, polyvinyl chloride, polyvinyl fluoride, cellulose acetate, cellulose triacetate polyamide and polyester at least 0.0005 of an inch (0.0127 mm) thick. Preferably the strips **12, 18** and **20** are made of high tensile strength polyester or polypropylene plastic sheet material or film 0.002 of an inch (0.0508 mm) thick and the protective peel or release strip may be made of any suitable sheet paper or plastic sheet material such as, polyvinyl fluoride 0.001 of an inch (0.0254 mm) thick having either a conventional release coating thereon or a smooth glossy surface to which the pressure sensitive adhesive does not permanently adhere to. The tape **10** is applied to the members to be joined in any well-known and obvious manner. For example, when the X-tape **10** is manufactured without adhesive and release strips the adhesive can be first applied to either the member or the side portions of the tape, which is then aligned with and pressed onto the members. When the tape has preapplied pressure sensitive adhesive and release strips then one end portion of the release strip is peeled away to expose a portion of the adhesively coated side portion which is aligned and pressed onto the member. Thereafter, the release strip is slowly removed while simultaneously aligning and pressing the remaining exposed adhesive coated side portion of the tape onto the desired edges or surfaces of the members. The tape structure can be applied to members made of wood, metal, solid or foamed plastic, glass, plywood, paper, particle board, corrugated board, fiber board, honeycomb, laminates, plaster board and any other known material.

A process of making the X-tape structure **10** may comprise providing a first roll of the desired size strip of flexible material for producing the perforate strip **12** and feeding the imperforated strip **12** through conventional rotary or straight flat cutting dies or punches adapted to perforate the central portion **12***c* of the strip **12** at equally spaced intervals with preferably identical square or rectangular shaped apertures or holes **12***d*.

If desired, a layer of the pressure sensitive adhesive **14** and a release strip **16** or cover, may be applied to one side face of each of the side portions **12***a* and **12***b* on opposite sides of the apertures **12***d* and on opposite sides of the strip **12.** This can be done by passing the strip over a first adhesive applicator roll positioned on one side of the strip and another applicator roll on the opposite side of the strip. Thereafter, the first strip **12** with the layers of adhesive can be partially dried by passing the strip through an oven or between a plurality of heat lamps and then applying the release strips or covers **16** thereover. The release strips or covers **16** are preferably in rolls and applied by feeding both the release strips and perforated strip simultaneously into the nip and between pressure rolls which press them tightly together.

Likewise, a second roll of similar continuous flexible strip material for producing the second slotted strip **18** can be fed through conventional rotary or straight cutting dies adapted to cut the equally longitudinally spaced elongated slots **18***c* of identical rectangular shape in one side portion **18***b* of the strip. The slots being of slightly greater longitudinal dimension, width, or height than the apertures **12***d* in the perforated strip but with the same spacing have entrances interrupting the adjacent edge of the strip and extend inwardly between elongated connecting portions **18***d* a transverse distance beyond the center of the strip to the imperforate opposite side portion **18***a* of the strip **18.** If desired a layer of the pressure sensitive adhesive **14** can be applied by an applicator roll to one side face of the imperforate side portion **18***a* which is then partially dried and onto which a continuous release strip or cover **16** is applied by simultaneously feeding them both into the nip and between pressure rolls as described above in making the perforate strip **12.**

The first perforated strip **12** and second slotted strip **18** are then brought together with the release strip **16** of the second slotted strip facing parallel to and offset from the release strip **16** on the first perforated strip **12** and in timed relation so that end portions and side edges of the elongated connecting portions **18***d* between the elongated slots **18***c* are automatically aligned with the perforation **12***d* and one side thereof in the central portion **12***c* of the first perforated strip **12.** Then the aligned strip can be passed either between a pair of rolls having spaced intermeshing shallow teeth and spaces of smaller size than but with the same spacing as the apertures **12***d* or over a toothed roll with similarly spaced teeth whereby the teeth insert or push the end portions of the elongated connecting portions **18***d* through the apertures **12***d*.

Thereafter, guides or edge rolls can be positioned to gradually and simultaneously separate, raise and move the offset second strip **18** toward the center of the first perforated strip **12** until the second strip **18** is perpendicular to the first strip whereby the elongated portions are pushed further into and beyond the apertures.

A pair of applicator rolls may be arranged to apply a layer of the adhesive **14** to both side faces of the protruding elongated portions **18***d* of the second strip **18** which is then partially dried.

A backing strip **20** and another release strip **16** from rolls can then be simultaneously applied to the adhesively coated opposite side faces of the slotted side portion **18***b* by passing between pressing rolls. The release strip **16** is applied to the side face situated on the opposite side of the strip from the first release strip applied thereto and the backing strip **20** permanently fixed by the adhesive to the opposite side face situated on the same side of the second strip **18** as the first applied release strip.

Lastly, the strips of the assembled tape are brought together and rolled upon a take up roll from which continuous lengths of the X-tape are cut for use.

What is claimed is:

1. A flexible tape having an X-like configuration, in cross section, a central axis and four legs providing a longitudinally continuous structure adapted to extend along, be secured to and join a plurality of adjacent members together so that the central axis of the X-like

configuration coincides generally with a juncture formed by the members to be joined, comprising:

a first flexible perforated strip of predetermined width forming a first half of the X having

opposite side edges,

opposite side portions adjacent the side edges forming first and second legs of the X and adapted to be fastened to the members to be joined,

a central portion between the opposite side portions and through which the central axis of the X passes,

a plurality of apertures in the central portion spaced longitudinally along the central axis, a plurality of longitudinally spaced connecting portions between the apertures in the central portion integral with and connecting the opposite side portions;

a second slotted flexible strip of predetermined width forming a second half of the X having

opposite side edges,

opposite side portions adjacent the side edges forming third and fourth legs of the X, and adapted to be fastened to the members to be joined,

a plurality of longitudinally spaced elongated slots in one of the opposite side portions of the second strip extending inwardly a predetermined distance from one of the side edges interrupted by entrances to the slots to the other one of the opposite side portions of the second strip,

a plurality of longitudinally spaced elongated integral connecting portions between the slots in a slotted one of the opposite side portions and extending from the other one of the opposite side portions through the apertures and beyond the central portion in the first perforated strip;

a continuous flexible elongated backing strip of a transverse width less than the length of the slots adhesively secured to at least one side face of the slotted side portion and elongated connecting portions therein,

whereby the first and second flexible strips are locked and hingedly connected together in an intermeshing and crossing relationship to form the continuous X-like tape structure.

2. A flexible tape according to claim **1** further comprising:

a layer of pressure sensitive adhesive on a side face, of each of the opposite side portions, situated on opposite side faces of each of the first and second strips; and

a removable release strip on and protectively covering the layer of adhesive on the side face of each of the opposite side portions.

3. A flexible tape according to claim **1** wherein the plurality of apertures in the central portion of the first perforated strip are substantially equally spaced, of substantially identical size, rectangular shape, and of substantially the longitudinal height of the elongated connecting portions of the second slotted strip within the apertures.

4. A flexible tape according to claim **1** wherein the first, second and backing strips are made of thin flexible sheet material selected from a group consisting of paper, natural and synthetic fabric, metal and plastic.

5. A flexible tape according to claim **2** wherein the release strips are made of thin sheet flexible material selected from a group consisting of paper and plastic and having a release coated surface to which the adhesive does not permanently adhere to.

6. A flexible tape according to claim **1** wherein the opposite side portions and the integral connecting portions in the central portion of the first strip are imperforate.

7. A flexible tape according to claim **6** wherein the backing strip, the other one of the opposite side portion adjacent the slotted side portion and the elongated integral connecting portions of the second strip are imperforate.

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