

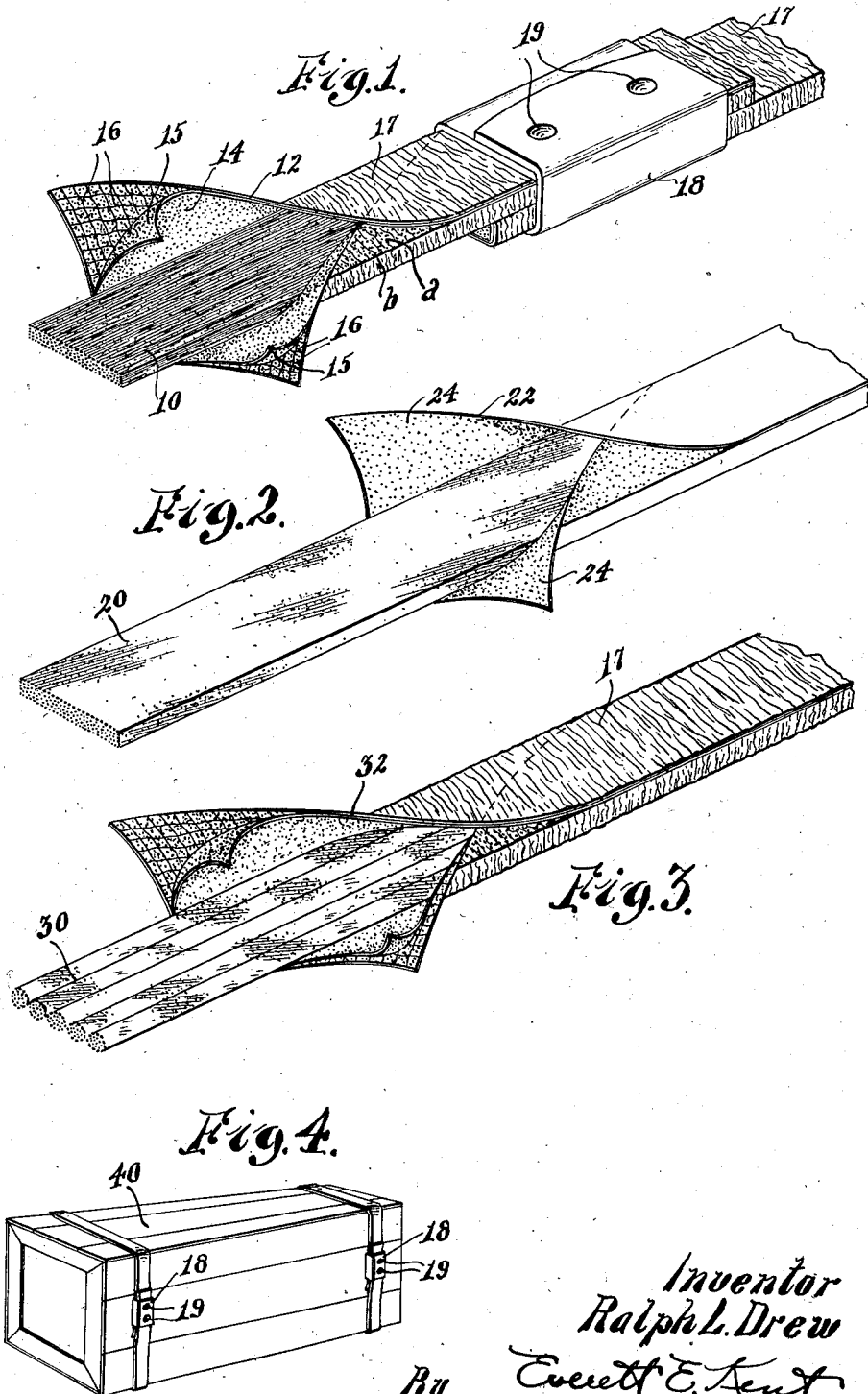
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TIE FOR BOXES, BALES, AND THE LIKE.

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TIE FOR BOXES, BALES, AND THE LIKE

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This invention provides a construction by which long vegetable fibre becomes available as a tensile element comparable with steel for the encircling, tying, and strengthening of boxes, crates, bundles, bales and the like.

Specifically it provides for utilizing the strength of the long staple fibre which is abundantly and at low cost derived from bast or leaf portions of numerous plants—illustrations of which are manila, sisal, java, and other long and strong fibres well known for making ropes and other cordage. Fibres of this type, when made up as cordage, cannot serve the functions of steel straps as reinforcements for boxes. The outstanding diameter of the rope prevents its being bent closely around angles of a box; the twist of the rope reduces the available strength of the fibre to resist tension longitudinal of the rope; the ridges and valleys of its contines make it difficult to draw a rope tight around the angles of a box; and experience has shown that if by any means a rope has once been made tight around a wooden box or crate, that rope will often change its tightness from day to day, soon becoming impracticably loose.

In the best form of the invention, preferred where the requirements are most severe, all of these objections are overcome. Long staple fibres, usually each several feet in length, are assembled in approximate parallelism, unspun, in a mass which is thin and broad, herein called strapform; and this fibre-mass is held in that thin, broad cross-sectional shape by a flexible cellulosic sheath, adhering around the mass and having the quality of preventing the vaporous passing of humidity between the fibre and the atmosphere. The said cellulosic material may be a sheet of paper, preferably strong, as kraft paper, or may be a sheet of regenerated cellulose, as Cellophane. In either case it preferably is creped so that it is slightly extensible without breach. The barrier to humidity may be incorporated in the sheet material, as, asphalt impregnated into paper; or it may be mixed or embodied in the adhesive substance surrounding the fibre mass. In the form at present thought likely to go most extensively into industrial use the waterproofing of the sheath is asphalt or the like impregnated into kraft paper; and latex, surrounding the fibre, is employed as a tacky adhesive rather than for any waterproofing qualities which it may have.

As compared with ties made of steel or iron, flat or round, the strap of the invention is, like them, useful for binding boxes and crates, for

hoops, for baling cotton, wool and other fibres, for bundling lumber, shingles, slate and other flat or laminated articles, and, in general, for the industrial and commercial packaging and shipping of merchandise, manufactured goods or waste products. But it is more flexible than metal; it is superior in tensile strength to many types of steel strapping of equal width; and per pound of weight it affords greater length than steel; so that its use would still make a substantial saving in shipping costs even if the price per pound were higher for the new strap than for steel. In addition, as compared with steel, and because of its cellulosic interior and exterior the tie of the invention is not subject to corrosion; has no sharp or hard edges to cut or scratch the floor or bench or anything over which it is dragged; affords a small degree of padding; and does not have so great a danger of cutting into the material of the package or merchandise around which it is drawn, as steel does; and, because of its easy and sharp flexibility, can slip past corners when being drawn taut on its package, better than steel can without cutting into the corner. Also it cannot cause injury to person or property, as the rough edges of steel or iron may, when it is loose and is being handled, or is released.

When used as a box, bale or bundle tie the strap of the invention will ordinarily encircle its package and have its ends secured together by any suitable variety of sheet metal fastener, clutch, clasp or buckle, various kinds that are already in use for steel being capable also of use with the strap of the present invention.

The invention thus described in general terms may be embodied in various forms, using various materials, some of which are suggested in the text which follows. These, however, are to be considered as illustrating some of the possibilities of the invention, and not as limitations, except as may be expressly indicated in the claims.

It is intended that the patent shall cover, by suitable expression in the claims, whatever features of patentable novelty exist in the invention disclosed.

In the accompanying drawing:

Figure 1 is an isometric view of a tie strap embodying features of the invention, portions of the wrapper being unlaidd and its plies separated, for clearness;

Figure 2 is a view similar to Figure 1, but showing a single-ply wrapper around a mass of fibres which are laid together in parallelism with a slight twist of the whole mass;

Figure 3 is a view similar to the others but showing a different organization of the body fibres, and having a wrapper reenforced with fibre; and

Figure 4 is a perspective showing the tie of the invention as it may be applied to a wooden box.

The tie as a whole, and the structure of a package in which it is embodied, are indicated by Figure 4, where the tie is an exterior tensile reinforcement strap encircling a wooden shipping box 40. The ends of the strap are gripped together by a metal jaw piece 18 clamped upon those ends and clenched by the indentations 19 in the metal which, by their indenting, grip the enveloped fibre mass.

The particular fibre best suited for the practice of the invention is some variety having very long staple, many varieties of which are known and among which the class known industrially as long, hard, vegetable fibre includes manila, sisal, java and many others. Guiding qualities in selecting the variety of fibre would be its inherent strength, flexibility and durability.

The organization of the assemblage of individual fibres into a unitary tensile element may take several forms, three of which are illustrated in the drawing, at 10, 20 and 30 in Figures 1, 2 and 3. In each the assemblage is organized into form so as to lie flat on the surface of its package, with square, firm edges and neat aspect, except that in Figure 3 the edges of the fibre mass are not square, although the edge of the strap as a whole may be so approximately.

In Figure 1 the organization of fibres is into mutual parallelism; an adhesive substance 14, indicated by the stippling, preferably does not pervade but lies only on the surface of the mass of fibres, between it and the sheet cover 12. The sheet cover may be of various materials, and the materials may be variously combined, and therefore advantage is taken of the three views in the drawing to show three different covers. All, as it happens, are of paper, this being the material which is preferred because of low cost and which has been combined successfully, but other materials may be used. The cover 12 in Figure 1 is two-ply of kraft paper, having an intervening layer of asphalt in which are strewn longitudinal and transverse fibres of reinforcement, which may be long hard vegetable fibres, introduced according to methods already known for the making of reinforced paper sheets. These reinforcing fibres in the paper are marked 16; the asphalt in which they are embedded and which adheres to the paper is 15; and the paper sheets themselves are in each ply possessed of minute wrinkles 17, extending with their crests and troughs of wave formation running transversely of the longitudinal direction of the strap. Paper of this characteristic is already known. The reinforcing fibres 16 include cross fibres which extend around the mass of fibre whether or not there be a ply of paper between them and the mass of fibre. Where only a single ply of cellulosic sheet is employed the reinforcing fibres will be adhering on its inner surface. In either case the inner or the outer surface may carry a coating of the water-proofing material, instead of its being impregnated into the sheet. The combining of these features with the other elements in the making of the strap of the present invention makes it possible for paper to stretch with fibre when the strap is drawn taut, and for the strap to bend around a sharp corner of a box

without breaking the paper on the outside of the bend, and also makes it possible for the fibre to move slightly within the paper, although that is not ordinarily to be expected, without breaking the paper—so that the strap will preserve the finished surface aspect, notwithstanding extreme distortion of the strap from the shape in which it was when its manufacture was completed. Kraft paper is suitable for this purpose, duly creped or crinkled.

Another feature is the overcoming of the natural tendency of long staple fibre to shrink and to elongate, from time to time, for which, in cordage industry, an allowance of ten per cent of the length of a rope is customarily made. This is achieved in the present invention by providing a barrier to the passing of humidity in either direction between fibre and atmosphere, thus rendering the fibre stable as to its content of humidity. Stability of humidity-content being attained, the tie is found to be permanently unchanging in length—except as it may be stretched by tension.

For the developing of the full strength of the tie, each fibre must come into service and be drawn taut. The rendering of each fibre adhesive to its neighbors, which might be done by dipping them all in a liquid adhesive, is ordinarily not advisable. The initial setting for the developing of full strength is provided best by the arrangement of fibres in parallelism, shown in Figure 1, or in Figure 2 which is nearly the same in effect. In the making of the strap it is important to have the fibres go into the organization under equality of tension, so that when in use they will accept tension equally and the full strength of resistance will be developed. Yet there will inevitably be some differences as regards initial tautness of individual fibres—or of cords in Figure 3. If the form of Figure 3 be employed, which is sufficient for many purposes, the stress ultimately attainable before breaking will be somewhat less because of the twist of the fibres in the individual cords, which results in the stress having a shearing component. By leaving the fibres and cords free of strong attachment to each other each fibre and cord will be individually free to adjust its position by straightening laterally into spaces and slipping longitudinally alongside its neighbors, if necessary, until they all become taut so as each to carry a share of the tensile load.

Also it is desirable that there be possibility of some slight slip between the fibres and their sheet covering, to prevent breach of the sheet by the strain resulting when tension is applied for tightening the tie, and/or resutling from the greater length requisite for the outer surface to go around angles. The slip of some fibres over others is only enough for all to become taut, and the only slip likely to occur thereafter is between the mass as a whole and the envelope, in case the mass of fibre stretches more than the paper does under the tightening of the tie about the package. All of these requirements are best met by assembling the fibre mass with merely a tacky attachment to its sheath leaving the fibres and cords and spaces between them free from impregnation or filling with any adhesive except such little as may result from the applying of a liquid adhesive to the inner face of the sheet cover. For this, at present an aqueous latex is preferred, of a consistency which quickly dries to a tacky state. This latex may be applied by blowing it upon the strip of paper or other cellu-

losic wrapper, which may then be folded around the mass. Where the sheet overlaps itself latex may also be used as an adhesive, but it is preferred that a quick drying latex be used here, for holding the sheath more firmly closed upon itself.

The extreme degree of protection of the fibre, indicated in Figure 1, is not necessary for some purposes; and Figure 2 shows the fibre protected by a single-ply wrapping of kraft paper, without the asphalt or the fibre reinforcement. This is marked 22, and preferably is moistureproof, and is interiorly coated with adhesive for attaching it to the surface of the fibre mass, as indicated by the stippling 24. The organization of fibre 20 in Figure 2 is that the whole mass of fibre has a small degree of twist—a long pitch—which has been flattened into the oblong cross-section after being spun. In this case the fibres tend to bind themselves together, because of the slight twisting; and this degree of twisting increases the frictional resistance, when all are taut, to a slippage of any one fibre with respect to its neighbors.

In Figure 2 the fibre arrangement is exaggerated, as to angle of fibres to the longitudinal axis. This angle should ordinarily be as slight as is feasible, because when tension is experienced all of the fibres tend to approach parallelism, and, if there be any twist, tend to approach the axis, and this will result in considerable stretch of the mass as its rectangularity changes toward circularity which will tend to occur unless the fibres are unable to change their mutual relations because of being bound together by impregnation with a cement or glue. The type of Figure 2 is therefore better suited to uses where the tension will not be great, and is preferably made with longer pitch and with a thickness of mass more nearly equaling the breadth of the mass, in order to have the advantages of empty interfibrous spaces and to avoid the cost and difficulty of introducing glue and the stiffness which results when it is dry—Figure 2 and Figure 1 illustrate the remoteness of long staple fibre, whose fibres are so long that a mass of them, laid in parallel and bound together, can constitute a strong tensile element, as for a box or bale tie, without the fibres being twisted together—from a fibre, such as cotton, of which this is not true.

In Figure 3 the fibres are organized with shorter pitch, and are separated into groups, five of which make a width of strap which may, for example, be assumed to be three-eighths of an inch. In this case the twist of each long fibre about its neighbors in its own group tends to inhibit the slipping of any one past the others. The steeper helical arrangement of the fibres reduces somewhat the ultimate tensile breaking strength of the strap, but the available strength is so great that in many cases this will be found to be no objection. The sheet cover 32 here represented is of two-ply kraft crepe paper, which can stretch with the fibre when the strap is drawn taut, with the interior reinforcement shown in Figure 1, and having the moistureproof characteristic and the adhesion to the fibres.

A silver or roving of the manila or other fibres which are to be used having been prepared by processes which are known in the cordage industry, this which is to become the tensile element of the strap may be drawn through a tube of the desired oblong or other shape, which it fills, and may have the paper or other material which is to constitute the cover wrapped about it as it issues from the tube, the paper being first

wiped or sprayed with the adhesive. As various apparatus already known for the making of stays may be employed for this folding of paper, it is sufficient to mention one: the tube of oblong cross-section through which the fibre is being drawn may have a firm extension with successive sections in which one side after another of the oblong tube, in rotation around the tube, is open, to receive the feed and permit the enwrapping of the cover by guides which apply and fold the paper about the mass of fibre. Thus, for example, a strip of paper, suitably adhesive, may be guided so as to have its edge portion *a* laid upon the top of a mass of fibre at a place where the top of the tube is open, and be pressed down thereon by a wheel into the top; and may then come to a place where the top of the tube is again closed, but its right hand edge is open, where the next section *b* crosswise of the paper may be made to adhere to this edge of the mass of fibre by a similar device; following which, at a section of the tube where the top and two edges are closed, the paper may be guided, bent and pressed against the open bottom of the mass of fibre; and so on around at the left hand edge, and over the top again.

The width of the completed strap gives it advantage over a wire tie because it avoids tendency to cut into its package; the softness of curvature at the corners of the strap gives it advantage over the sharp raw edges of a steel strap in the same respects, and, if in any case this be particularly important, the more rounded edge afforded by the style of Figure 3 can be used, or the fibres of Figures 1 or 2 can be molded in the round-edge shape of Figure 3. The thinness gives it advantage over rope for sharp bending. The material selected for constituting the wrapped cover may be any thin and tough material having the qualities which are desired.

In applying the strap to a bale or bundle or box, the strap is to be laid around the package and drawn taut by any one of suitable mechanism, called baling or strapping tools, which holds its ends frictionally and pulls the strap; and then a clasp or permanent fastening is bent around where the strap ends overlap, and is to be made secure by any suitable means, of which the indentations 19 are one example, strapping appliances and strap fastenings being already known. The metallic fastener which completes the tie by joining ends of the strap, illustrated in Figure 1, is a band of stout sheet metal bent closely around the strap, the metal being marked 18 and this metal being indented as at 19 into the body of the fibres, so as to make a secure engagement. It is a particular feature of the invention to employ a clamp of a type which coacts with the unit constituted by the strap-form mass of fibre and its envelope by being stiffly, bluntly and compressively indented into opposite sides of the overlapped portion. One embodiment of such is illustrated. As the indentation ordinarily does not penetrate the enveloping skin the fibre and its integument retain undiminished strength, and the joint holds strongly by friction.

The length of the tie may be expected to remain unchanged by atmospheric humidity. Its resistance to tensile stresses is adequately provided by the choice of kind of fibre and cross-sectional area of its mass. The nature of that mass is such that it is soft, as compared with a metallic edge, and is non-abrasive; and the thick body of fibres in the long direction of its

cross-section is so deep that the tie is extremely resistant to any external force applied in that direction.

Surface abrasion of the strap will not ordinarily be harmful when used as a box or bale tie. If the strap is to be put to a use where surface abrasion is expected, a material suited to withstand the abrasion can be used in place of the paper or added to it, by adhesion or by enwrapping, surface coating, or otherwise. It is preferred that the surface coating, or cover, should be continuously secured to the fibre. This coordinates these two elements and prevents the cover from being skinned off in case any break occurs to the cover to interrupt its own continuity. Adhesive substances useful for securing fibres to the cover, include asphalt, rubber cement, latex, casein. It is not necessary to impregnate the mass of fibres with any of these colloidal bodies nor to vulcanize them. Asphalt has the advantage of affording low cost, quick setting, and easy thinning to desired fluidity, solidifying by cooling. Latex, being a colloidal suspension in water, holds its tackiness when enclosed within a waterproof cover. In rubber cement the vehicle is an organic solvent which escapes more easily. All of these are more flexible than casein.

The adhesive may be the element which inhibits the passing of humidity to and from the fibre.

The protection of the fibre against change of its contained humidity may be effected by a layer of asphalt or other substance between the two plies of paper; or by an impregnating treatment or coating of the paper or other cellulosic sheet, as with asphalt, resin, rubber or suitable proteids, colloidal materials being especially suitable. The cellulosic sheet may be wrapped helically about the mass of fibre, instead of being folded transversely as illustrated in Figures 1, 2 and 3; and when so wrapped in a flat smooth fashion it constitutes a binder enhancing the friction between fibres, holding them in shape, and making the covering more resistant to becoming accidentally peeled by external contacts. Peeling can be reduced or prevented also by bending a thin metallic fastener tightly around the paper and fibre at intervals, or around the fibre alone without the paper, pinching it together at intervals.

The tie thus completed can lie close around the package, bending sharply at angles, and can be drawn taut easily. It is a feature that one exterior side of the cellulosic envelope may be coated with a liquid adhesive, and that the tie still can be drawn taut, and that when the adhesive has set, it will be secure and firm on the surface—which is not true either of steel or of cordage—a feature especially useful to prevent side slip of contents of certain bundles. Or, one exterior side of the cellulosic sheet can be coated with casein glue or dried glue of other variety. The tie can then be applied to a cardboard carton, water being added, and the tie will stick to the carton, the outside of which is paper. Thus the invention affords an extraordinarily strong and secure tie for cartons containing heavy articles.

The tie thus described may, for example, have a cross-section which is substantially oblong, three or five or more eighths of an inch wide and one or two sixteenths of an inch thick, for making a strap as herein described, which would

be serviceable as above indicated, and would approximately have the advantages above stated as compared with a steel strap of the same width.

This application is a continuation in part of my application for Patent Serial 25,522 filed June 7, 1935.

I claim as my invention:

1. A tie for bales, boxes, and the like comprising a strip-form mass of fibres, each of which fibres lies approximately longitudinally of the strip, and a sheath extending along and enveloping the strip; wherein the sheath comprises a cellulosic sheet carrying waterproofing material and wherein other fibres adhering to the sheath, extend, at intervals from each other, laterally in direction around the strip-form mass of fibres, whereby the strip-form mass of fibres is further bound against lateral separation.

2. A tie for boxes, bales and the like comprising a main tension element of long-staple fibre of bast or leaf origin arranged in a flat-sided strap-form mass which has substantial thickness and has breadth exceeding its thickness, combined with a flexible waterproof casing surrounding the mass and adhesively engaged with fibres of the said mass at surface regions of that mass, there being a substantial body of fibre comprising a portion of said mass located inward from the surface fibres of the mass, in which inward body the individual fibres are free from attachment together by any intermediary substance and are free from such attachment to said surface fibres, whereby said inward fibres are combined in strap form and yet, subject only to friction, are free to slip relative to each other and relative to the surface fibres.

3. A tie for boxes, bales and the like, comprising long-staple fibre of bast or leaf origin arranged in a flat-sided strap-form mass which has substantial thickness and has breadth exceeding its thickness, combined with a sheet enveloping the mass of fibres, and an adhesive substance between the mass of fibres and the sheet, the location of said adhesive substance in said mass being only at the interface between sheet and mass, and in the interstices between superficial fibres of the mass, there being a substantial body of fibre comprising a portion of said mass located inward from the surface fibres of the mass, in which inward body the individual fibres are free from attachment together by any intermediary substance and are free from such attachment to said surface fibres, whereby said inward fibres are confined in strap-form and yet, subject only to friction, are free to slip relative to each other and relative to the surface fibres.

4. A tie for boxes, bales and the like comprising a main tension element of long-staple fibre of bast or leaf origin arranged in a flat-sided strap-form mass, which has substantial thickness and has breadth exceeding its thickness, combined with a flexible sheathing embracing and maintaining the strap form of the mass of fibres, and adhesive means interiorly of the sheathing securing the sheathing to fibres at surface regions of the mass, there being a substantial body of fibre, comprising a portion of said mass located inward from the surface fibres of the mass, in which inward body the individual fibres are free from attachment together by any intermediary substance and are free from such attachment to said surface fibres, whereby said inward fibres are combined in strap-form and yet, subject only to friction, are free to slip relative to each other and relative to the surface fibres.

5. A tie for boxes, bales and the like as in claim 4, wherein the said sheathing is of cellulosic material, and said adhesive means is a substance impervious to humidity.

6. A tie for boxes, bales and the like as in claim 4, wherein the said sheathing is of cellulosic material, and said adhesive means is an asphaltic substance constituting a barrier to the passing of humidity.

7. A tie for boxes, bales and the like as in claim 4, wherein the said sheathing is of kraft paper, and said adhesive means is a waterproof substance adhering thereto.

8. A tie for boxes, bales and the like comprising an assemblage of long-staple fibre of bast or leaf origin, combined with a flexible casing surrounding the assemblage, the whole constituting a flat-sided strap-form tie, in which fibres are associated closely together in a body which has substantial thickness and has breadth exceeding its thickness, said casing being adhesively secured to portions of fibres which are located at surface regions of said thick body, the thickness of this body of fibres being greater than the depth of the said adhesive securement, and there being other portions of fibres, at regions inward of said body, apart from said surface regions of adhesive securement, which are free from adhesive securement to neighboring portions of other fibres at said inward location, whereby these inward fibre portions can slip relative to each other.

9. A tie for boxes, bales and the like comprising an assemblage of long-staple fibre of bast or leaf origin, combined with a flexible extensible

casing surrounding the assemblage, the whole constituting a flat-sided strap-form tie, in which fibres are associated closely together in a body which has substantial thickness and has breadth exceeding its thickness, said casing being adhesively secured to fibres at surface regions of said thick body, the thickness of this body of fibres being greater than the depth of the said adhesive securement, and there being, at regions inward of said body, apart from said surface regions of adhesive securement, portions of fibres which are free from adhesive securement to neighboring portions of other fibres at said inward location.

10. A tie for boxes, bales and the like comprising an assemblage of long-staple fibre of bast or leaf origin, combined with a flexible casing surrounding the assemblage, the whole constituting a flat-sided strap-form tie, in which fibres are associated closely together in a body which has substantial thickness and has breadth exceeding its thickness, said casing being adhesively secured to fibres at surface regions of said thick body, the thickness of this body of fibres being greater than the depth of the said adhesive securement, and there being, at regions inward of said body, apart from said surface regions of adhesive securement, portions of fibres which are free from adhesive securement to neighboring portions of other fibres at said inward location; and the said casing being a sheet having minute wrinkles whose crests and troughs run transversely of the strap.

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