United States Patent

Buck

[15] **3,663,343**

[45] **May 16, 1972**

[54] COMPOSITE PRESSURE SENSITIVE ADHESIVE SHEET STRUCTURE AND PROCESS OF MAKING THE SAME

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[52] **U.S. Cl.** **161/39,** 161/406, 161/145, 161/167

[51] **Int. Cl.** **B32b 3/16,** B32b 7/06

[58] **Field of Search** 161/38, 39, 406, 145, 146, 161/147, 167

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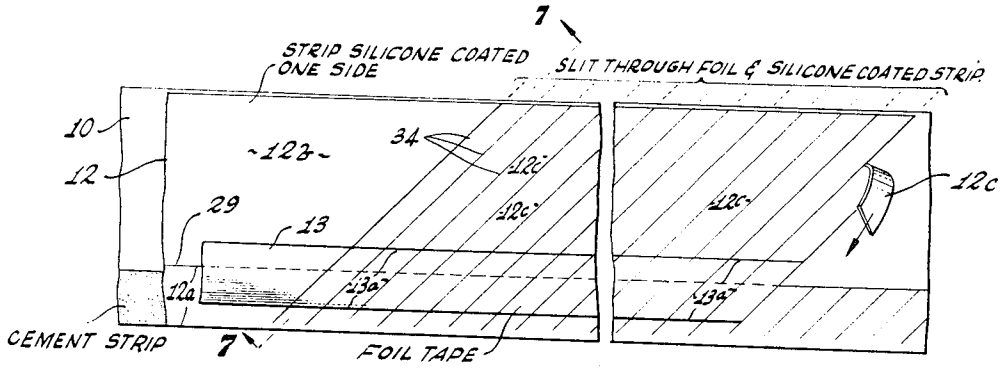
[57] **ABSTRACT**

A process in which a carrier strip has a release coated web marginally secured thereto, the latter releasably adherently mounting a longitudinally extending tape having a pressure sensitive adhesive on its underside. The release coated strip is longitudinally severed with the line of severance being spanned by the adhesive coated tape. Subsequently, the combined span of the tape and a marginal portion of the release coated stock that is freely superposed on the carrier strip, are transversely slit defining a plurality of discrete pressure sensitive adhesive backed sections of tape, each provided with a corresponding tab by means of which each discrete section of tape can be peeled from the composite structure for application to another article. The process produces a roll of individually dispensible, pressure sensitive adhesive tape sections, each with its corresponding tab being so angularly related to the length of the composite structure as to facilitate winding up of the product, in the process of manufacture, to protectively enclose the tabs between successive coils of the carrier strip. Upon unwinding of the roll through a specially adapted guide means of a dispensing apparatus, each tab is individually projected out of the plane of the carrier strip to provide clearance for grasping a free end of the tab stripping the associated adhesive backed sheet article from the roll. The carrier strip and tape may have different characteristics of light reflectivity, controlling an automatic feed system for the dispensing apparatus, cooperatively associated with a photoelectric light cell or the like.

16 Claims, 7 Drawing Figures



Patented May 16, 1972

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2 Sheets-Sheet 1

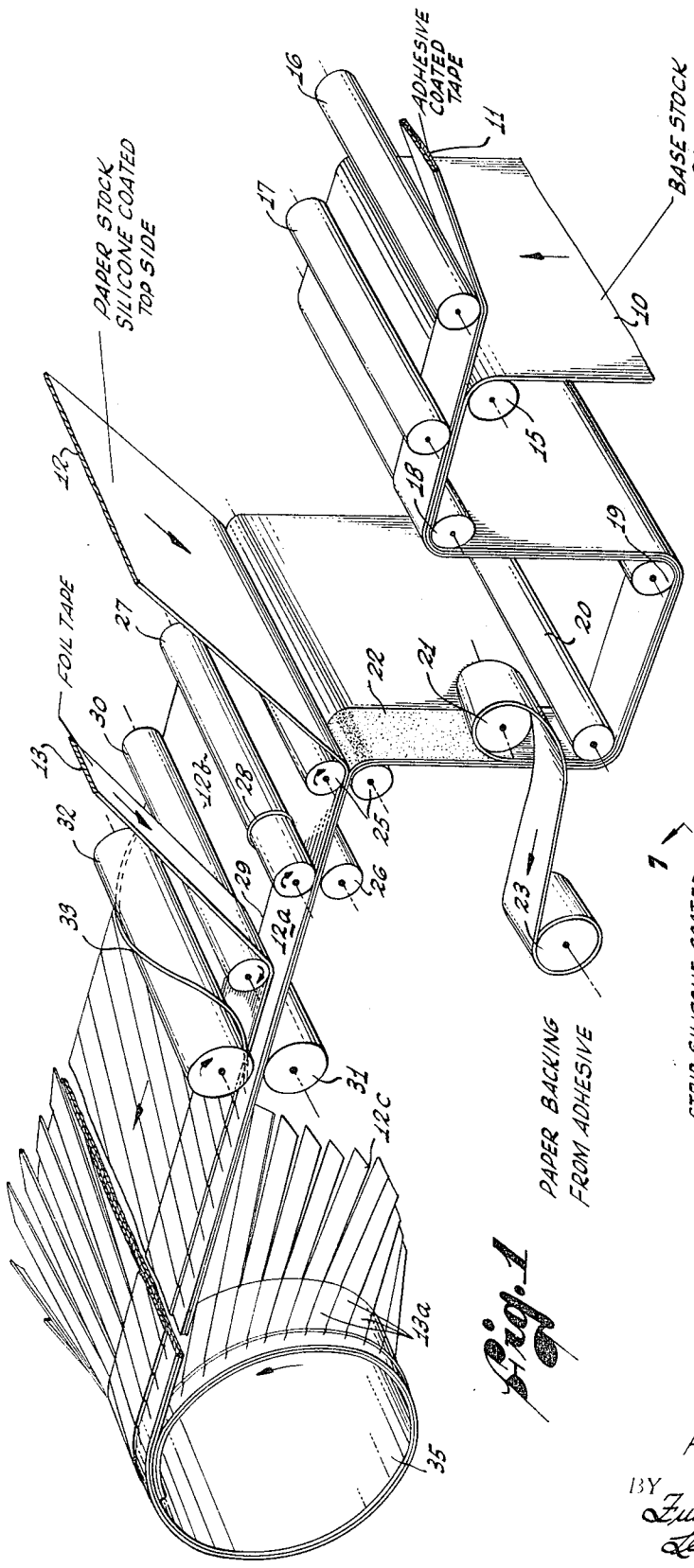

Fig. 1

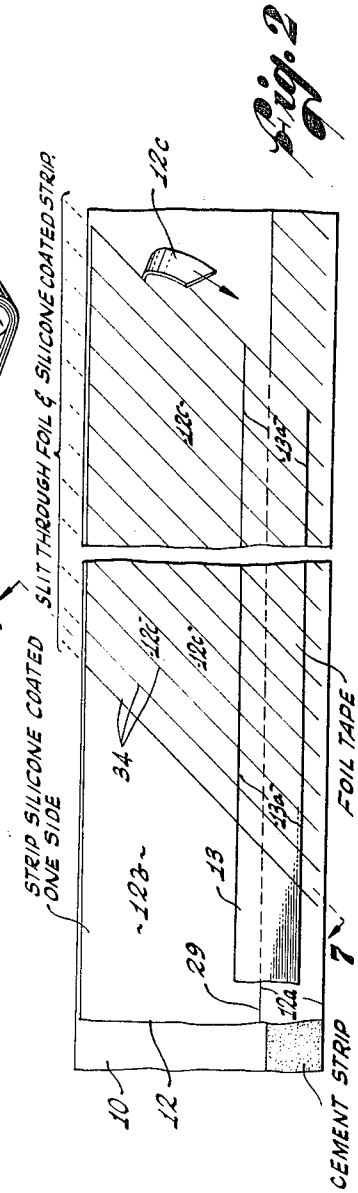

Fig. 2

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Patented May 16, 1972

3,663,343

2 Sheets-Sheet 2

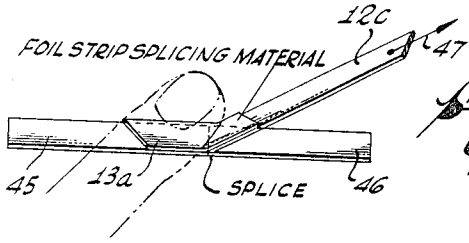

Fig. 3

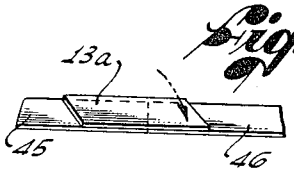

Fig. 4

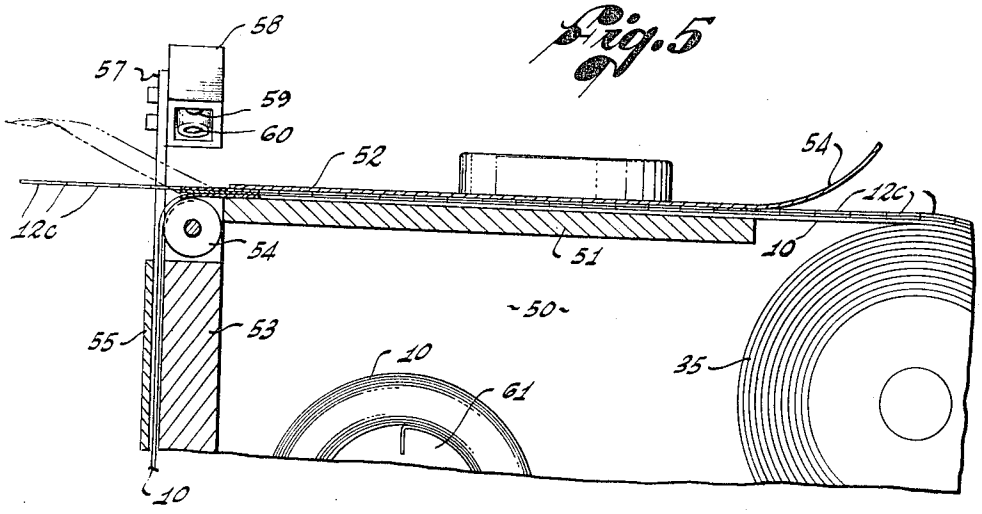

Fig. 5

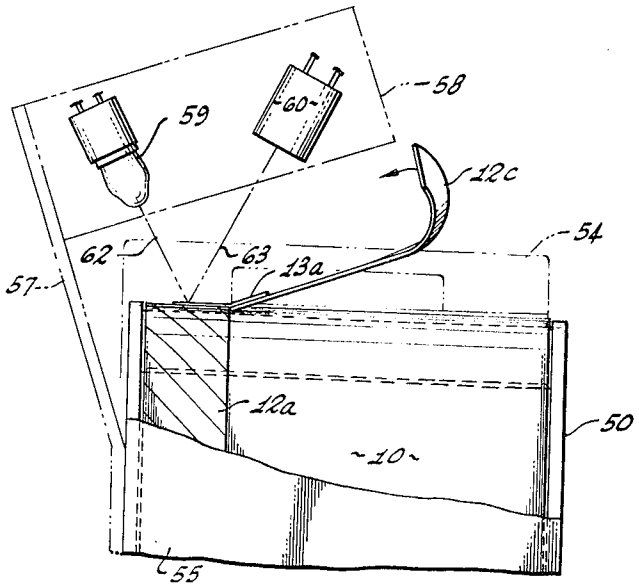

Fig. 6

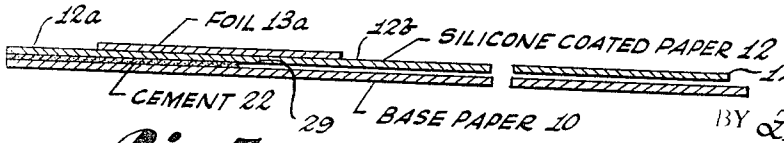

Fig. 7

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COMPOSITE PRESSURE SENSITIVE ADHESIVE SHEET STRUCTURE AND PROCESS OF MAKING THE SAME

BACKGROUND OF THE INVENTION

The present invention relates to a process of continuously manufacturing a roll of a composite strip structure providing a series of individually dispensable pressure sensitive adhesive backed sheet articles, the resulting product, and improvements in apparatus for dispensing the same.

SUMMARY OF THE INVENTION

The article of manufacture of this invention includes a base or carrier strip having a parallel strip or web mounted thereon in contacting superposition, the latter having a release coated top side on which a length of pressure sensitive adhesive backed sheet material is releaseably adherently mounted. One edge or marginal portion of the release coated stock is secured to the underlying corresponding marginal portion of the base stock, the remaining width of the release coated stock remaining in freely contacting superposition on the base stock. The release coated stock is longitudinally severed but the separate portions are held in contiguous abutment and against relative displacement by the pressure sensitive adhesive backed underside of a tape. Discrete sections of the tape are formed by a transverse slitting operating which simultaneously forms discrete areas of the free marginal portion of the release coated stock to provide tabs by means of which each separate label or the like can be peeled from the marginally secured portion of the release coated stock. The area of mutual contact of each discrete section of tape with its corresponding tab is so adjusted, taking into consideration the nature of the release coating and the tackiness of the pressure sensitive adhesive, that after the freed end of the tape section is placed in its finally intended position, the tab can be withdrawn from adherent contact with the underside of the article by laterally sliding the tab out of contact with the underside of the tape article, after which the then unadhered portion of the article can be pressed into adherent contact in its final position.

The process of this invention lends itself to high speed production of a longitudinal series of butt cut, contiguous, pressure sensitive adhesive backed sheet articles, each with its corresponding tab for removing each article from the assembly for ultimate application. The carrier or base stock, the release coated stock and an adhesive backed tape are fed at the same linear speed, continuously, to be sequentially brought into contacting superposition. An adhesive is first applied to an edge of the carrier strip after which the release coated stock is pressed thereonto, the two pieces of stock thereafter being adherently held against lateral displacement. Subsequently, the release coated stock is longitudinally severed adjacent the area of marginally applied adhesive to define first and second marginal portions of the release coated stock. The guide rolls and pressure rolls of the apparatus maintain the second marginal portion of the release coated stock in freely contacting superposition on the carrier stock until the adhesive backed tape is linearly applied across the line of severance of the release coated stock, the two marginal portions thereafter being tied against displacement by the tape. Subsequently, the second marginal portion of the release coated stock and the tape are transversely severed into discrete portions at intervals spaced longitudinally of the composite structure.

The lines of severance of the tape and second marginal portion of the release coated stock are preferably butt cuts and, preferably, disposed slant-wise, rather than along lines normal to a longitudinal edge of the composite structure. The lines of severance are so angularly related to the normal that during winding up into a roll of the completed product each discrete area of tape precedes its corresponding tab in entry into the roll. As a consequence, each coil of individual tabs is fed into the roll without deformation and is protectively enclosed between successive coils of the base stock or carrier strip.

The same preferred slant-wise severance of the tape and second marginal portion or tabs facilitates individual delivery of each section of tape and its corresponding tab, either manually or in an automatic dispenser. In unwinding from a roll of the composite product, each tab precedes its associated section of tape whereby the free end of the tape or tab can be grasped to peel the tape section from the first marginal portion of the release coated stock. As the tabs formed out of the second marginal portion of the release coated stock are merely in freely contacting superposition on the carrier strip, the latter may be deformed out of the plane of the tabs by an appropriate guide means, thus presenting each individual tab projecting forwardly in a position for easy pickup, with clearance, out of the plane of the base or carrier stock. By choosing a reflectivity of the base stock which differs from the reflectivity of the sheet article the composite strip assembly can be advanced incrementally through an automatically controllable dispenser apparatus by properly optically orienting a photoelectric cell system at the dispensing station of the apparatus.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a schematic perspective view illustrative of the process of carrying out the invention;

FIG. 2 is a top plan view of a longitudinal segment of the completed composite product, portions of successive layers being broken away to illustrate distinct stages in the process of manufacture;

FIG. 3 is a perspective view showing the means of application of a pressure sensitive adhesive backed sheet article made in accordance with the invention;

FIG. 4 is a view similar to FIG. 3 but showing the completed ultimate and use of the adhesive backed sheet article;

FIG. 5 is a somewhat schematic sectional view of an apparatus adapted for dispensing the individual pressure sensitive adhesive backed articles;

FIG. 6 is a front view of the apparatus of FIG. 5; and

FIG. 7 is a transverse sectional view on the line 7—7 of FIG. 2, on an enlarged scale, showing the relationship of the several parts of a single unit of the composite structure.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention is useful in the manufacture of a wide variety of pressure sensitive adhesive backed flexible sheet articles, for example labels, markers, tabs, bandages, film or tape splices, and other articles consisting of an essentially flexible segment of sheet material bearing a pressure sensitive adhesive on the underside thereof. For purposes of illustrating the process and resulting product of the invention, it will be described in conjunction with the manufacture of a metallic faced splicing tab of the type used in joining together adjacent ends of a sound recording tape.

Referring to FIG. 1, there are shown portions of strips of a carrier paper **10**, a transfer adhesive tape **11**, a release coated paper **12** and a pressure sensitive adhesive backed tape **13**. While not shown, it will be understood that each of these strips is fed from an appropriately located supply roll thereof, all being mounted on an apparatus for synchronously feeding the various strips through rolls and dies mounted on the apparatus at the same linear speed.

The carrier strip **10** is preferably made from a hard, die-cutting, calendered stock and is fed from its supply roll over a guide roller **15** whereon the transfer adhesive tape **11** comes into contacting superposition therewith, after having been trained over a guide roller **16**. The adhesive bearing tape **11** is one of a variety of commercially available products, typically a release coated paper bearing a stripable layer of adhesive. It will be observed that the supply roll of the transfer tape **11** is so aligned with the carrier strip **10** that the adhesive is laid along one margin or edge portion of the carrier strip, in a relatively narrow swath.

Thereafter, the layers **10** and **11** pass under a pressure roller **17**, adapted to firmly press the adhesive of the tape **11** onto the carrier strip **10**, and around a series of guide rollers **18**, **19** and **20**. A roller **21** takes the paper backing from the tape **11**, leaving a swath of adhesive **22** deposited on the upper surface of the carrier strip **10**. The paper backing of the tape **11** is spirally conducted away to be wound up on a waste roll **23**.

The strip or web **12**, on its upper side, is provided with a silicone release coating, which has relatively high release properties. As is shown in FIG. **1**, the strip **12** is brought into parallel contacting superposition with the adhesive bearing carrier strip **10** between a pair of rollers **25** resulting in the two strips being secured together against displacement, although the major portion of the width of the release coated strip **12** is merely in freely contacting superposition on the carrier strip, rather than being adhered thereto.

The marginally joined strips **10** and **12** are now passed over a roller **26**, positioned in opposition to a rotary die **27** that is formed adjacent one end with a circumferentially extending circular cutter **28**. It will be observed that the cutter **28** is offset from the adjacent edge of the carrier strip **10** a distance slightly greater than the width of the adhesive strip **22**, as best seen at the left hand end of FIG. **2**. The cutter **28** is adapted to slit only through the stock of the release coated strip **12**, thus severing the strip **12** into a first marginal portion **12*a*** and a wider, second marginal portion **12*b***, that remain in contiguous abutment along the line of severance **29** produced by the rotary die **27**. Thus, the first marginal portion **12*a*** is essentially permanently adhered to the carrier strip **10** while the second marginal portion **12*b*** remains in freely contacting superposition on the carrier strip.

The roll of tape **13** employed in this example comprises a strip of thin material coated with a pressure sensitive adhesive and covered with aluminum foil. The tape may be a polyester film, such as Mylar, having the aluminum foil laminated to one surface thereof, the resulting laminated tape **13** thus having a pressure sensitive adhesive coated underside. The tape **13** is relatively narrow, as compared to the strips **10** and **12**, and the supply roll thereof is disposed in alignment with the line of severance **29**. Accordingly, the tape **13** is fed onto the upper release coated side of the strip **12**, beneath a roller **30**, spanning the line of severance **29** to tie the portions **12*a*** and **12*b*** in contiguous abutment.

The composite of the strips **10** and **12** and tape **13** is next passed over a roller **31** in opposition to a rotary die **32** that is formed with at least one longitudinally extending cutting edge **33**. For simplicity of illustration, the rotary die **32** illustrated as being formed with but a single cutting edge **33**. It will however be appreciated that a plurality of such cutting edges may be formed on the die and may take the form of straight rather than helical cutting edges. In either event, the cutting edge **33** is adapted to slit the tape **13** and strip **12** transversely, without penetrating the carrier **10**, thus producing a plurality of butt cut slits **34** at intervals longitudinally of the composite strip. The slits **34** may, if desired, be along lines normal to the longitudinal edges of the strips **10** and **12**. However, it is preferred to form the rotary die **32** with helically extending cutting edges **33** whereby to produce slant-wise slits **34** extending transversely of the tape **13** and strip **12**, at angles other than normal to the longitudinal edges of the composite strip.

As a result of the slitting by the rotary die **32**, the tape **13** is divided into a series of discrete sections **13*a*** while the second marginal portion **12*b*** of the strip **12** is formed into discrete sections **12*c*** providing a pull tab for each section of the tape **13**.

Finally, the composite product is wound into a roll **35**. As the roll **35** is turned in the take-up direction, the successive coils of the carrier strip **10** receive the tabs **12*c*** therebetween to protectively enclose them. In this connection, the slant-wise orientation of the slits **34** is such that each tape section **13*a*** precedes its corresponding tab **12*c*** in entry into the roll **35**. As a result, the otherwise free tabs **12*c*** are successfully brought into the roll without deformation thereof and the roll **35** can be handled during transportation and in a dispenser without danger of deforming the tabs.

It will be seen that the process just described provides a roll of individually dispensable pressure sensitive adhesive backed sheet articles **13*a***. Referring to the right-hand end of FIG. **2**, it can be seen that each of the articles **13*a*** may be individually removed from a length of the roll **35** merely by grasping the free end of a tab **12*c*** to turn and pull it in a direction to peel the section **13a** from the release coated surface of the marginal portion **12*a***, the latter, of course, remaining glued to the carrier **10**.

In this connection, attention is drawn to the different areas of adhesive contact between the underside of the section **13*a*** and the marginal portion **12*a***, on the one hand, and the end of the corresponding tab **12*c***, on the other hand. Preferably, the greater area of contact is with the first marginal portion **12*a*** in order to insure peeling the section **13*a*** from the marginal portion **12*a***, rather than accidentally separating the tab **12*c*** from its associated section **13*a***. At the same time, it is desirable to determine the optimum area of contact between a tab **12*c*** and the underside of a tape section **13*a***, taking into consideration the tackiness of the particular adhesive involved and the qualities of the release coating on the upper surface of the tab, such that the tab **12*c*** may, in effect, be slid laterally from the section **13*a*** upon final application of the tape section.

It will be observed that a section **13*a*** of pressure sensitive backed adhesive sheet material is removed from the composite assembly merely by lifting and pulling on the tab **12*c***. The section **13*c*** can thus be removed without involving any contact of the fingers with the adhesive on the underside of the article **13*a*** or even with the edges thereof. Referring to FIGS. **3** and **4**, there are illustrated ends **45** and **46** of a recording tape to be spliced together by application of one of the sections **13*a***. It will be seen that the section may be brought into parallel alignment with the ends **45** and **46**, in position to span the abutting terminal end portions of the tapes and applied by manual pressure on top of the section **13*a***. The tab **12*c*** can thereafter be pulled laterally in the direction of the arrow **47**, in effect sliding the tab out of contact with the underside of the section **13*a***. Thereafter, as is illustrated in FIG. **4**, finger pressure may be applied to deflect the previously unadhered portion of the section **13** *a* into contact with the tape end **46**. Since manual contact with the adhesive on the underside of the tape section **13*a*** has been completely avoided, the integrity of the splice is greatly enhanced.

Referring to FIG. **2**, note should also be taken of the oblong parallelogram configuration of the tape section **13*a***, achieved by virtue of the slantwise slitting of the tape. In connection with the use of sheet articles **13*a*** intended for use in splicing sound recording tape and the like this parallelogram configuration is of particular utility both in attaining the proper alignment of the section **13*a*** with the tape ends and, also, in connection with inhibiting mechanical displacement of the section **13*a*** from the splice once it has been finally applied.

In FIGS. **5** and **6** there is illustrated an apparatus adapted for automatically dispensing the tape sections **13*a*** from a roll **35**. A housing **50** incorporates a top wall **51** over which a weighted guide plate **52** is superimposed. The top wall **51** and guide plate **52** thus define a channel therebetween through which the composite is channelled towards a forward wall **53** of the housing. At its rear end, the top plate **52** is formed with an upwardly and rearwardly projecting curved section **54** whereby individual tabs **12c** will be deflected downwardly onto the carrier strip **10**, into contacting superposition thereon, as the roll **35** turns in the unwinding direction.

The apparatus has a dispensing station at the junction of the forward wall **53** and the top wall **51** of the housing. This dispensing station includes a roller **54** mounted for rotation on a horizontal axis and over which the carrier strip **10** is turned to be deflected downwardly for passage through a clearance space provided between the front surface of the front wall **53** and a cover plate **55**. Also mounted at the dispensing station,

on an appropriate bracket **57**, is a housing **58** containing a prefocused light source **59** and photoelectric cell **60**.

The roll **53** may be provided with a leader comprising a blank portion of the carrier strip **10** that is initially passed through the guide means just described to have its end connected to a wind-up drum or spool **61**. A sufficient length of leader is provided whereby its end may be so connected to the wind-up drum and advanced sufficiently to bring the first tab **12***c* on the carrier strip **10** through the dispensing station, with the corresponding tape section **13**a at rest in a position to intercept a ray **62** focused by means (not shown) onto the section **13**a, to be reflected as a ray **63** directed into the photoelectric cell **60**.

The photoelectric cell **60** comprises a portion of a circuit (not shown) including a relay and adapted to start and stop a motor or the like drivingly engaged to the wind-up drum **61**. Thus, so long as a tape section **13***a* is in position to reflect light from the source **59** onto the cell **60** the motor drive circuit remains open and the wind-up drum **61** is deactivated. However, upon the foremost and forwardly projecting tab **12***c* being grasped and the corresponding tape section **13***a* being peeled from the first marginal portion **12***a*, the control circuit is closed, actuating the relay in order to turn the wind-up drum **61** through an arc sufficient to bring the next article **13***a*into the dispensing position. Thereupon, the light from the source **59** is again reflected from the upper surface of a section **13**a into the photoelectric cell **60**, deactivating the control system. In this connection, while the control system just described has been successfully employed with a metallic foil faced tape section **13***a*, it will be appreciated that it may also be employed with sections **13***a* not incorporating any metallic face. All that is required is a difference in reflectivity between the upper surface of the particular tape section **13***a* under consideration and that portion of the underlying first marginal portion **12***a* normally covered by the section **13***a*. For example, one of the surfaces may comprise a specular reflector while the other surface may comprise or have the characteristics of a diffuser, or both surfaces may be specular or diffuse, or may very in color or hue, but appropriate filters may be interposed in the line of the reflected ray **63** to discriminate between any differing characteristics of light reflected from two differently optically reflecting surfaces.

Referring to FIG. **5**, it will be seen that the guide means for the composite structure, at the dispensing station, is adapted to separate the individual tabs **12***c* from the normally underlying supporting strip **10**. Thus, as the composite tape is fed outwardly of the housing **50**, since the free end of each tab precedes the tape section **13***a* to which it is joined, a sufficient portion of the length of the tab is supported in the horizontal plane to project forwardly from the front wall of the housing while that portion of the carrier strip **10** originally disposed immediately thereunder has been turned downwardly into the channel defined between the forward wall **53** and the cover plate **55**.

Although the invention has been described in its preferred form with a certain degree of particularity, it is understood that the present disclosure of the preferred form has been made by way of example and that numerous changes in the details of construction and the combination and arrangement of parts may be resorted to without departing from the spirit and the scope of the invention.

I claim:

1. A pressure sensitive adhesive composite assembly comprising:

a carrier sheet;

a sheet of material in contacting superposition on said carrier sheet and having a release coating on its upper exposed face, said release coated sheet being severed into two abutting parts;

means securing one of said two parts of said release coated sheet to an edge portion of said carrier sheet to prevent relative lateral displacement therebetween;

a section of tape having an underside carrying a pressure sensitive adhesive coating in substantially continuously contacting adherence with said two parts of said release coated sheet across their contiguous abutting portions to hold said two parts of said release coated sheet in abutment; and

said section of tape having area and shape characteristics to leave exposed a marginal portion of the second of said two parts adapted to serve as a tab for peeling said section of tape from said one part of said release coated sheet.

2. A composite assembly as in claim **1** in which said coating on the exposed face of said superposed sheet has relatively high release properties.

3. A composite assembly as in claim **1** in which said section of tape has a greater portion of the area of its adhesive coated underside in contact with said first one of the two parts of said superposed sheet than is in contact with said second part.

4. A composite assembly as in claim **1** in which:

the area of mutual contact of the adhesive coated underside of said tape and said second, tab part of said superposed sheet is adapted to permit lateral separation of said second, tab portion from said tape in response to tension in said second, tab part when the balance of the area of adhesive coated underside of said section of tape is held against lateral displacement on a surface.

5. A composite assembly as in claim **1** in which:

said section of tape is of oblong parallelogram plan configuration and comprises a metallic foil,

said second tab part being arranged as a longitudinal extension of said section of tape.

6. A composite assembly as in claim **1** in which said two parts of said release coated sheet constitute but cut parts thereof.

7. An article of manufacturing comprising:

an elongated carrier strip;

an elongated strip of flexible sheet material, having an upwardly facing release coated surface, in parallel contacting superposition on said carrier strip;

an elongated flexible tape having a pressure sensitive adhesive on the underside thereof in parallel adherently contacting superposition on the upper surface of said release coated strip;

said release coated strip being longitudinally divided into discrete, contiguous first and second marginal portions along a line that is spanned by said tape whereby said discrete portions are adhesively held against relative lateral displacement;

longitudinally extending means securing said first marginal portion of said release coated strip to said carrier strip;

said tape having that longitudinal edge on said second marginal portion of said release coated strip spaced from the edge of said second marginal portion;

said tape and said release coated strip being divided into discrete areas along lines extending transversely thereof at intervals spaced longitudinally thereof to define a plurality of discrete sections of said tape and of said second marginal portions of said release coated strip;

each of said sections of tape being adhesively secured to a corresponding discrete section of said second marginal portion of said release coated strip with a tab area of the release coated strip defined between said edges of said tape and said second marginal portion;

each of said tab areas serving to peel the corresponding section of tape from adherent contact with said first marginal portion.

8. An article as in claim **7** in which:

said carrier strip has a width exceeding the width of and underlying said second marginal portion of said release coated strip;

said article being coiled with successive coils of said carrier strip protectively enclosing a coil of said discrete sections of said second marginal portion therebetween.

9. An article as in claim **7** in which said release coated strip is longitudinally butt cut to define said two marginal portions.

10. An article as in claim 7 in which said tape and said release coated strip are butt cut to define said discrete portions.

11. An article as in claim 7 in which said first marginal portion of said release coated strip is adhesively secured to said carrier strip.

12. An article as in claim 7 in which said lines along which said tape and said second marginal portion of said release coated strip are divided each have a length exceeding the combined span of said tape and said second marginal portion.

13. An article as in claim 12 in which said tape incorporates a lamination of metallic foil and is of uniform width whereby each discrete area of said tape has an oblong parallelogram planform.

14. An article as in claim 12 in which:

said carrier strip has a width exceeding the width of and underlying said second marginal portion of said release coated strip;

said article being coiled with successive coils of said carrier strip protectively enclosing a coil of said discrete sections of said second marginal portion therebetween;

said article being coiled in a take-up direction for inserting each of said discrete areas of tape into the coil in advance of the corresponding discrete area of said second marginal portion.

15. An article as in claim 7 in which each of said discrete areas of tape has a greater area of adhesive contact with said first marginal portion than with said second marginal portion.

16. An article as in claim 7 in which the area of mutual contact of the adhesive coated underside of said tape and said second marginal portion of said release coated strip is adapted to permit lateral separation of said discrete area of said second marginal portion from the corresponding discrete area of tape in response to tension in said tab area of said second marginal portion when the balance of the area of adhesive coated underside of the corresponding discrete area of tape is held against lateral displacement on a surface.

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