Feb. 27, 1968 F. E. HILTON 3,370,328

TYING DEVICE AND METHOD OF AND APPARATUS FOR FORMING THE SAME

Filed Jan. 30, 1964 2 Sheets-Sheet 1

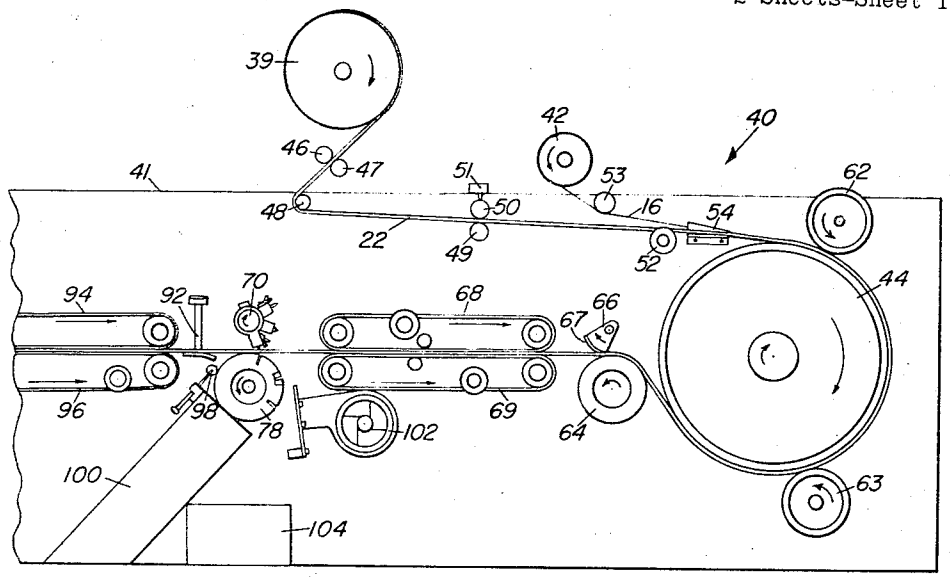

Fig. 1

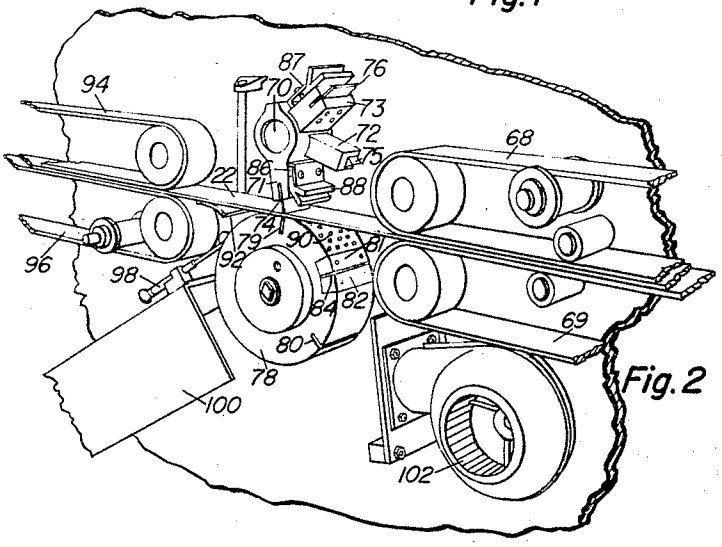

Fig. 2

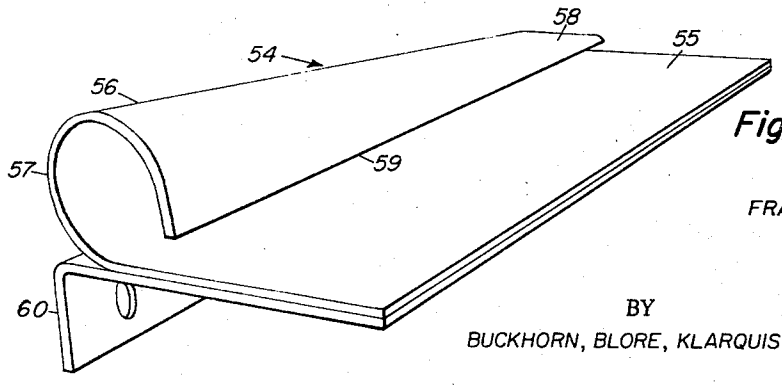

Fig. 3

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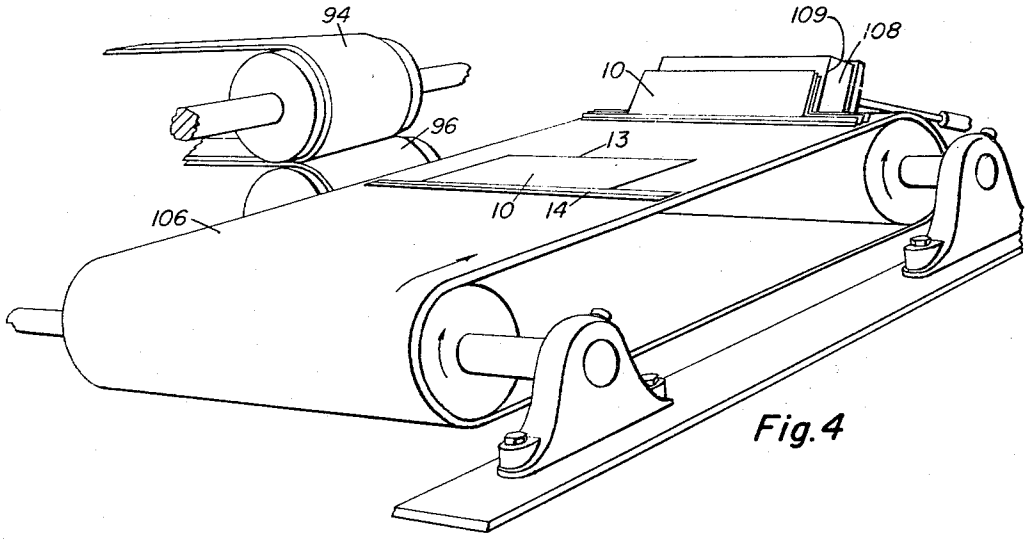

Fig.4

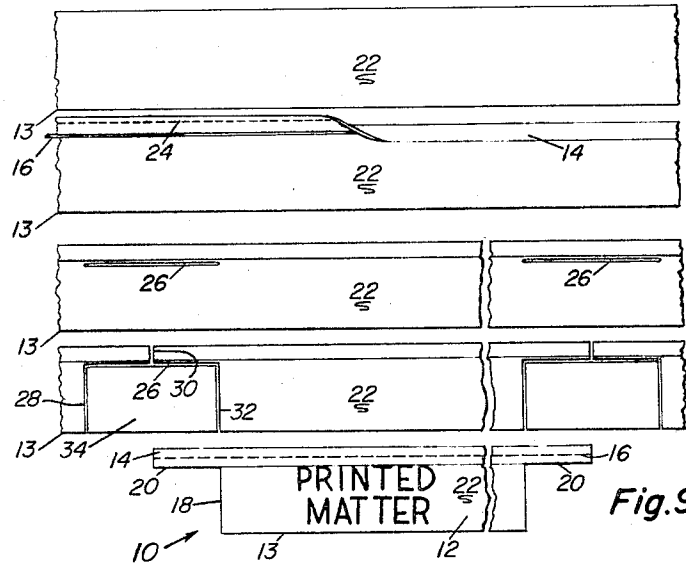

Fig.5

Fig.6

Fig.7

Fig.8

Fig.9

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TYING DEVICE AND METHOD OF AND APPARATUS FOR FORMING THE SAME

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Filed Jan. 30, 1964, Ser. No. 341,305
18 Claims. (Cl. 24—16)

ABSTRACT OF THE DISCLOSURE

This application discloses a method of making a wire-reinforced tying device having an advertising panel portion from a single continuously moving web of sheet material and a single continuous strand of wire. The method is performed in an apparatus having mounted thereon a roll of relatively wide paper web and a roll of wire both of which are unrolled and drawn through the apparatus in a continuously moving web and strand respectively. The apparatus includes means spaced along the conveyor path for performing in sequence various operations on the paper web, including imprinting the web with a legend, and then applying adhesive to a side edge surface portion of the web. Thereafter the wire and web are drawn together through a folding device wherein the adhesive-coated edge portion of the web is folded over the wire. The folded edge then passes between frictionally engaged pressure rolls which press the glued surfaces of the edge together to form a continuous wire-reinforced seam. Subsequently, a rotating slitter blade downstream from the pressure rolls periodically penetrates the passing web just inwardly of the seam to make a single longitudinal slit in the web. Downstream from the slitter, three spaced cutter blades on a single rotating cutter shaft make three successive transverse cuts in the passing web, each of which cuts is spaced to intersect the same longitudinal slit and sever a tying device in its final shape from the web upon each revolution of the cutter shaft. Thereafter, vacuum segregating means separates the finished tying devices from the resulting paper scrap, and collecting apparatus stacks the finished tying devices in neat piles.

The present invention relates to tying devices and to a method of and apparatus for forming such tying devices, particularly wire-reinforced paper tying strips having a relatively wide panel portion on which advertising matter can be imprinted.

Wire-reinforced paper tying devices for binding together packages and items of various sizes and shapes are common, but such devices have a uniformly narrow width and therefore provide a minimum surface area on which to imprint informational material.

Consequently, a primary object of the present invention is to provide a new and improved tying device having a relatively wide panel portion intermediate its narrower, opposite tying ends.

Another primary object of the invention is to provide a method of making a tying device having a wide panel portion intermediate its narrow tying ends from a continuous web of paper of uniform width and a continuous strand of wire.

Still another principal object of the invention is to provide new apparatus for performing the various steps of the aforementioned method.

A more specific object is to provide cutting and slitting means which cuts tying devices cleanly from a rapidly and continuously moving web of paper with a minimum of cutting strokes and without affecting upstream flow of the web through the apparatus.

Another specific object is to provide new and improved means for segregating tying devices from scrap material cut from a web of paper and means for collecting the segregated portions.

These and other objects and advantages of the invention will become more apparent hereinafter.

A more detailed description of the invention follows with reference to the accompanying drawings.

In the drawings:

FIG. 1 shows diagrammatically a side elevation of the major portion of an apparatus in accordance with the invention;

FIG. 2 is a perspective view on an enlarged scale showing the cutter means and related portions of the apparatus of FIG. 1;

FIG. 3 is a perspective view on an enlarged scale showing the edge-folding portion of the apparatus of FIG. 1;

FIG. 4 is a perspective view showing a collecting and stacking portion of the apparatus of FIG. 1;

FIGS. 5 through 8 illustrate in sequence various steps in a method for forming tying devices in accordance with the invention; and

FIG. 9 illustrates a tying device in accordance with the invention.

With reference to the drawings, FIG. 9 illustrates a tying device **10** with which the invention is concerned. The device is made from a web of sheet material, preferably paper, and includes a relatively wide rectangular panel portion **12** having an unseamed side edge **13** and an opposite, seamed side edge **14**. An easily deformable wire reinforcing strand **16** extends longitudinally of the device within the seam, the strand being retained therein by adhesive which binds the seam together. The wire-reinforced, seamed edge **14** projects beyond the opposite ends **18** of the rectangular panel portion **12** to define a pair of relatively narrow tie ends **20**. In binding a package together the panel portion **12** envelops the package and the tie ends **20** are twisted together to hold the panel in place. Because of the relatively great width of the panel portion, a large quantity of printed matter such as trademarks, advertising material, instructions and the like can be imprinted thereon, preferably during the making of such devices in the apparatus described hereinafter.

FIGS. 5 to 8 inclusive illustrate the sequential steps of the process by which the tying device **10** is made. In such process, a continuous strip or web **22** of paper having a width only slightly greater than the final width of the panel portion **12** is imprinted on one or both sides thereof as desired as the web is fed along a predetermined path. Thereafter, a narrow stripe **24** of adhesive is applied to one surface only of the web adjacent an edge thereof, the stripe being narrower than the fold width and centered with respect to the edge and the fold to be made. A continuous strand of wire **16**, FIG. 6, is then fed into engagement with the web and positioned on the opposite side of the fold line so as to be centered beneath the adhesive stripe when the edge is overfolded. The adhesive-coated edge portion of the web is then folded over the wire **16** and the facing surfaces pressed together to form the continuous wire-reinforced seam **14** as shown in the right-hand portion of FIG. 6. Thereafter, as it moves along its path, the web is slit at uniformly spaced intervals along its length just inwardly of the seam **14** to provide a series of uniformly spaced longitudinal slits **26** of predetermined, uniform length. Following the slitting operation, the web is cut perpendicular to its length in three places, at the location of each slit **26** so that each cut intersects the same slit **26**, as shown in FIG. 8. The three cuts include a first cut **28** extending from the unseamed side edge **13** of the web to one end of the slit **26**, a second cut **30** extending from the seamed

side edge **14** to the midportion of the slit **26** so as to sever the wire **16** and thus separate a finished tying device **10** from the web **22**, and a third cut **32** extending from the unseamed side edge **13** to the opposite end of the slit **26** to cut a rectangular piece of scrap **34** from the web and form one end of the next succeeding tying device **10**.

Referring now to FIG. 1, apparatus **40** is shown for performing the foregoing operations and producing tying devices in great quantity and in rapid succession. Such apparatus includes an upright panel portion **41** above which is suitably mounted a supply roll **39** of web paper **22** and a roll **42** of wire **16**. The web **22** and wire **16** are simultaneously pulled from their respective rolls at a substantially uniform rate of speed by a large driving wheel **44**. Proceeding along the conveying path of the apparatus as defined by the web **22**, and in the conveying direction, the web **22** first passes between printing rolls **46, 47** of any suitable kind and to which ink may be applied by any suitable means (not shown) and which print a desired legend on one or both surfaces of the web, as desired, each time the rolls rotate one revolution. Obviously the paper may also be preprinted.

From the printing rolls the web **22** passes about a tension roll **48** and thence over a positioning roll **49**. Means are provided to apply the adhesive stripe **24** and which means may comprise an adhesive-applying wheel **50** positioned above the roll **49** and engaging the upper surface of the web **22**. Adhesive is fed to the rim of the wheel **50** by suitable means such as a glue pot **51** above such wheel, and applied in the continuous stripe **24** to the paper web as it passes therebeneath. As the paper web proceeds downstream from the glue roll **50** and over a guide roll **52**, the wire **16** is drawn from its roll **42**, fed underneath a tension roll **53** and positioned just above the path of the web **22** such that the wire is laid upon the web parallel to the adhesive stripe **24**. The web **22** and wire **16** are then drawn together through a folding device, or cone **54**, and folded in the manner shown in FIG. 6, folding an edge portion of the web over itself and the wire **16** to form the seam **14**.

As shown most clearly in FIG. 3, the folding cone **54** includes a flat plate portion **55** over which the web **22** is drawn and a curled, generally conical lip portion **56** through which the adhesive-coated side edge of the web and the wire proceed as the web travels over the plate portion **55**. The curled lip portion **56** is formed generally in the shape of a cone with the large end **57** thereof being at the upstream end of the folding device. The interior cross section of the conical lip portion gradually diminishes in size toward the opposite, downstream end **58** thereof from which the folded edge of the web emerges. As the cone diminishes in size, its upper wall also becomes more flattened whereby the folded, outer side edge of the cone becomes gradually more abrupt, until at the downstream end **58**, a sharp crease is formed which will accordingly crease the folded edge of the web **22** drawn lengthwise therethrough. The downwardly directed extreme side edge **59** of the curled lip portion **56** is spaced above the upper surface of the flat plate portion **55** a sufficient distance so that the web **22** can pass freely beneath the edge **59** of the lip. The folding cone **54** is mounted on an angle bracket **60** for securing the device to the panel **41**.

After emerging from the folding cone **54**, the web **22** passes about the periphery, or rim, of the driving wheel **44**. While traveling about the rim, the folded edge of the web **22** passes between the rim and a pair of pressure rolls **62, 63** which pressurably engage the rim to press together the folded edge, thereby forming a continuous, wire-reinforced seam **14**.

Spaced downstream from the driving wheel **44** is a slitting means for cutting the longitudinal slits **26** in the web **22**. The slitting means includes a rotating slitter mandrel **64** over which the web **22** travels and a rotatable slitter segment **66** mounted on a driven shaft vertically

above the mandrel. The outer end of the segment **66** defines a single arcuate slitter blade **67** extending longitudinally of the conveyor path, the cutting edge of which is received within a circumferential groove (not shown) in the peripheral surface of the mandrel **64** as the blade rotates. Rotation of the segment **66** causes the blade **67** to have a periodic slitting stroke that defines an arcuate path intersecting the conveyor path of the web **22** and thus cutting a single longitudinal slit **26** in the strip once during each revolution of the slitter segment **66**. The slitter segment **66** and mandrel **64** rotate in opposite directions such that the slitter blade travels generally in the conveyor direction as the blade slits the web.

A web-stabilizing means is positioned downstream from the slitter means and includes a pair of elongate pinch conveyor belts **68, 69**, the facing surfaces of which engage one another and thus also the web **22** which passes therebetween. The belts **68, 69** have two functions, one being to remove the driving wheel-induced curvature from the web **22** after it emerges from the slitting means, and the other being to prevent the downstream cutting operations, to be described shortly, from interfering with the smooth flow of the web through the apparatus and thus the accuracy of the slitting operation just described.

Cutter means for severing finished tying devices **10** from the continuous web **22** is positioned just downstream along the conveyor path from the pinch belts **68, 69**. The cutter means includes a driven cutter shaft **70** mounted above the conveyor path and having three projecting clamp arms **71, 72** and **73** radiating therefrom, each of which grips a cutter blade **74, 75** and **76** respectively. All of the cutter blades extend transversely of the conveyor path and are adjusted to be at substantially equal distances from the axis of the shaft **70** such that the cutting stroke of each blade defines, as the shaft **70** rotates, an arcuate cutting path that intersects the conveyor path of the web **22** and thus cuts such web at the downward limit of the cutting stroke.

The leading cutter blade **74** and its supporting arm **71** is identical in construction to the trailing cutter blade **76** and arm **73**. The speed of rotation of the shaft **70** in a clockwise direction and the spacing of the blades **74, 75** and **76** are such that the leading blade **74** forms the transverse cut **28** in the web **22** from the unseamed edge **13** thereof to the leading end of a longitudinal slit **26**, whereas the trailing cutter blade **76** makes an identical transverse cut **32** from the same edge **13** to the trailing end of the same slit **26**. The intermediate cutter blade **75**, however, is shorter in length than the cutter blades **74** and **76** and offset toward the panel **41** from the latter so that the blade **75** cuts the web **22** at **30** from its seamed edge **14** to the midpoint of the slit **26**, thereby severing the wire **16** and cutting a completed tying device **10** from the web **22** upon each revolution of the shaft **70**.

A second, rotatable mandrel **78** is mounted vertically beneath the cutter shaft **70** in a position such that the web **22** passes over the upper peripheral surface thereof. The peripheral surface of the mandrel **78** has transversely extending, circumferentially spaced slots **79, 80** for receiving the cutter blades **74** and **76** respectively when such blades cut the web **22**. A pair of slightly spaced apart, hardened steel inserts **81, 82** define a third transversely extending slot **84** intermediate the slots **79** and **80** for receiving the wire-cutting blade **75**.

A hold-down foot **86** comprising a flexible strip of felt or the like split endwise to form a pair of laterally extending fingers **88** is mounted on the following side of the arm **71** just rearwardly of the leading cutter blade **74**, and an identical foot **87** is mounted in the same manner on the cutter arm **73**. The split fingers **88** extend downwardly to hold the cut web **22** against the surface of the mandrel **78** immediately after such web is cut and as the blades **74** and **76** are lifting from the web **22**, thereby preventing the blades from tearing the web or interrupting its forward movement as they recede therefrom.

Segregating means are provided in conjunction with the final cutting operation for separating finished tying devices **10** from the small patches of scrap **34** which result from such cutting. These means include a plurality of small suction holes **90** in the peripheral surface of the mandrel **78** between the leading transverse slot **79** and the insert **81**. The holes **90** communicate with a vacuum chamber (not shown) within the mandrel **78**, which chamber in turn is connected in any suitable manner to a vacuum source remote therefrom. Suction is applied as the rectangular scrap **34** is severed from the web, causing the scrap to adhere to the apertured surface of the mandrel **78** as such surface travels downwardly with the counterclockwise rotation of the mandrel. At the same time, the segregated tying device **10** continues in a horizontal path over a horizontally disposed guide member **92** mounted on the panel **41** and thence between a second pair of pinch conveyor belts **94, 96** which deliver the finished tying devices to collecting and stacking means described below.

A hold-down roller **98** is mounted on an inclined baffle structure **100** and is adjustable so as to frictionally engage the peripheral surface of the mandrel **78**. Thus, as scrap **34** is carried downwardly on the surface of the mandrel **78**, the roller **98** engages the scrap **34** to prevent it from sliding backward over the mandrel surface. A slightly downwardly directed blower **102** is mounted on the panel **41** opposite the baffle member **100** and in a position so as to direct a stream of air in a direction substantially tangential to the lowermost surface of the mandrel **78** and against the inner surface of the baffle **100**. Scrap **34** carried on the surface of the mandrel **78** to the underside thereof is thus separated from such surface by the airstream and deflected downward into a suitable receptacle **104**.

Collecting and stacking means for stacking the finished tying devices is located at the offbear end of the delivery belts **94, 96**. This apparatus comprises a driven conveyor belt structure **106**, shown in FIG. 4, which extends horizontally at right angles to and slightly below the conveyor path of the delivery belts **94, 96**. Accordingly, tying devices emerging from the offbear end of the pinch belts **94, 96** are deposited onto the upper surface of the conveyor **106**, with the unseamed edge **13** of the tying device directed downstream on such conveyor. An adjustable, inclined baffle member **108** is positioned at the offbear end of the conveyor **106**. As each tying device **10** arrives at the offbear end of the belt **106**, the leading, unseamed edge **13** thereof rides up onto the inclined surface **109** of the baffle member **108**. The wire-reinforced and therefore heavier, seamed edge **14** of the tying device **10** remains in abutment with the upper surface of the conveyor **106** despite the continuous movement of such surface, resulting in finished tying devices being stacked on edge in neat piles against the baffle member **108**, from which they may be easily removed at intervals as desired.

From the foregoing, it will be evident that tying devices as described can be made in the apparatus rapidly, continuously and completely automatically. The means for driving the various belts, wheels and cutters in timed relation can be any of many well-known mechanical arrangements, and accordingly such means are neither described nor shown herein.

Having illustrated and described a preferred embodiment of the invention, it should be apparent to those skilled in the art that the invention permits of modification and arrangement in detail. Intended as part of the invention are all such modifications as come within the true spirit and scope of the appended claims.

I claim:

1. A method of making from a continuous web of sheet material tying devices each having a relatively wide panel portion for containing printed matter and relatively narrow tie ends projecting beyond the opposite ends of said panel portion, said method comprising the steps:

(a) feeding a single web of sheet material continuously along a predetermined path,

(b) during the continuous feeding of said web slitting said web inwardly adjacent and parallel to one side edge of said web at uniformly spaced intervals along the length thereof to provide a series of uniformly spaced apart longitudinal slits of predetermined substantially equal length,

(c) and while continuing to feed said web cutting said web transversely of its length at three separate spaced positions along each slit so as to provide three cuts intersecting each said slit, including a first, long cut extending from the side edge opposite said one side edge to one end of said slit, a second, short cut extending from said one side edge to the midportion of said slit, and a third, long cut extending from said opposite side edge to the opposite end of said slit, thereby separating said web into a series of said tying devices of uniform length, width and configuration.

2. A method of making from a continuous web of paper or the like tying devices each having a relatively wide panel portion for containing printed matter and a wire-reinforced seamed edge projecting beyond the opposite ends of said panel portion to define tie ends, said method comprising the steps:

(a) feeding a single web of sheet material continuously along a predetermined path,

(b) applying a stripe of adhesive to one surface of a side edge portion of said web while continuously feeding said web,

(c) laying a strand of wire along said side edge portion adjacent said one surface while continuously feeding said web,

(d) folding said adhesive-coated side edge portion over said wire with said one adhesive coated surface facing inwardly toward said wire and said web while continuously feed said web,

(e) pressing the folded side edge portion together to form a continuous wire reinforced seam while continuously feeding said web,

(f) slitting said web inwardly adjacent and parallel to said seam at a first station along said web while continuously feeding said web to provide a series of uniformly spaced apart longitudinal slits of predetermined substantially equal length,

(g) and cutting said web transversely of its length three times at a second station along said web while continuously feeding said web and at the location of each longitudinal slit so as to provide three cuts intersecting each said slit, including a first long cut extending from the unseamed side edge of said web to one end of said slit, a second, short cut extending from the seamed side edge of said web to the midportion of said slit and severing said wire, and a third, long cut extending from said unseamed side edge to the opposite end of said slit, thereby separating said web into a series of said tying devices of uniform length, width and configuration.

3. A method of making from a continuous web of paper tying devices each having a rectangular panel portion for containing printed matter and a wire-reinforced seamed edge projecting beyond the opposite ends of said panel portion to define tie ends, said method comprising the sequential steps:

(a) feeding a continuous web of paper along a predetermined path and during the continuous feeding of said web,

(b) applying a continuous stripe of adhesive to one surface of a side edge portion of said web,

(c) continuously feeding a continuous strand of wire along and substantially parallel to said side edge portion adjacent said one surface,

(d) continuously folding said side edge portion substantially in half over said strand so that said one

surface is folded inwardly against itself and said adhesive stripe is positioned over said wire,

(e) pressing the folded said side edge portion together to form a continuous bonded reinforced seam,

(f) slitting the passing said web along its length just inwardly of said seam at periodic intervals using an arcuate slitting stroke to provide said web with a series of uniformly spaced apart longitudinal slits of substantially constant length,

(g) cutting the passing web transversely of the length thereof at the location of each said slit three times using each time an arcuate cutting stroke proceeding in the downstream direction of said web so as to provide three cuts each intersecting the same said slit, including making two cuts from the unseamed side edge of said web to the opposite ends of said slit and making a third, intermediate cut from the seamed side edge of said web to the midportion of said slit, whereby each series of three cuts severs a finished tying device and a piece of scrap from said web,

(h) then segregating the finished tying devices from said scrap by conveying said tying devices in a straight path in continuation of the path of said web while conveying said scrap in a path generally of the path of said web.

4. Apparatus for making tying devices from a continuous web of flexible sheet material of predetermined width, said tying devices including a rectangular panel portion and a pair of tie ends projecting in opposite directions beyond the opposite ends of said panel portion, said apparatus comprising:

(a) means for feeding a continuous web of flexible sheet material in a predetermined path through said apparatus,

(b) rotary slitter means adjacent said conveyor path having a slitting stroke operating in timed relation to said web feeding means for making a longitudinal slit of predetermined length in a side edge portion of said web at evenly spaced intervals therealong while said web moves continuously along said path,

(c) and rotary cutter means adjacent said conveyor path and spaced along said conveyor path from said slitter means operating in timed relation thereto for making a series of three successive cuts in said web transverse to the length thereof as said cutter means rotates in the general direction of downstream movement of said web, such that each series of three transverse cuts intersects a single one of said longitudinal slits to form a completed one of said tying devices and to sever the same from said strip.

5. Apparatus for making tying devices from a continuous web of flexible sheet material of predetermined width, said tying devices including a rectangular panel portion for containing printed matter and a pair of tie ends projecting in opposite directions beyond the opposite ends of said panel portion, said apparatus comprising:

(a) conveyor means for unrolling a roll of flexible sheet material in a continuous web at a substantially uniform rate of speed and conveying said web in a predetermined conveyor path through said apparatus,

(b) slitter means adjacent said conveyor path, including a movable slitter blade extending longitudinally of said conveyor path for making a single longitudinal slit in a side edge portion of said web,

(c) said slitter blade having a periodic slitting stroke operating in timed relation to said conveyor means and defining an arcuate slitting path intersecting said conveyor path,

(d) cutter means adjacent said conveyor path and spaced downstream from said slitter means,

(e) said cutter means including three movable cutter blades extending transversely of said conveyor path, each having a cutting stroke defining an arcuate cutting path intersecting said conveyor path for forming a series of three successive transverse cuts in said web,

(f) the directions of said cutting strokes being substantially the same as the downstream conveyor direction where said cutting paths intersect said conveyor path, and

(g) the timing of said cutting strokes being correlated with each other and the timing of said slitting stroke such that each of said three transverse cuts intersect the same one of said slits.

6. Apparatus according to claim 4 wherein said slitter means includes a rotatable slitter blade positioned on one side of said conveyor path defining an arcuate slitter path intersecting said conveyor path, and a rotatable mandrel positioned on the opposite side of and substantially tangential to said conveyor path for engaging the undersurface of said web, said mandrel having a circumferentially extending groove in the peripheral surface thereof for receiving said slitter blade.

7. Apparatus according to claim 4 wherein said cutter means includes a rotatable cutter shaft on one side of said conveyor path including means on said shaft fixedly supporting in spaced apart relationship three cutter blades substantially the same radial distance from the axis of said shaft, and a rotatable mandrel on the opposite side of said conveyor path from said cutter shaft, said mandrel having three spaced apart transversely extending grooves in the peripheral surface thereof, each for receiving one of said three cutter blades.

8. Apparatus according to claim 7 wherein said mandrel includes vacuum means in communication with a portion of the peripheral surface thereof for gripping sheet scrap severed from said web by said blades.

9. Apparatus according to claim 7 including flexible hold-down means on said cutter shaft rearwardly adjacent the first and third of said three cutter blades for holding said web against the peripheral surface of said mandrel during the cutting of said web by said blades and the subsequent withdrawal of said blades from said web.

10. Apparatus according to claim 9 wherein said hold-down means includes a pair of flexible hold-down feet, one positioned rearwardly adjacent the first and third of said three cutter blades, the radially outermost end portion of each of said hold-down feet being split in a direction transversely of said conveyor path to define a pair of web-holding fingers.

11. Apparatus for making tying devices from a continuous web of paper of predetermined width, said tying devices including a rectangular panel portion for containing printed matter and a pair of tie ends projecting in opposite directions beyond the opposite ends of said panel, said apparatus comprising:

(a) conveyor means for unrolling a roll of paper in a continuous web and conveying said web in a predetermined conveyor path through said apparatus,

(b) rotatable slitter means adjacent said conveyor path having a periodic slitting stroke for making a single longitudinal slit of predetermined length in a side edge portion of said web,

(c) rotatable cutter means spaced downstream from said slitter means including three transversely extending cutter blades for periodically making three successive cuts in said web each intersecting the same one of said slits,

(d) and web-stabilizing means along said conveyor path between said slitter means and said cutter means for straightening said web and stabilizing the flow of said web from said cutter means to said slitter means.

12. Apparatus for making tying devices from a continuous web of paper of predetermined width, said tying devices including a rectangular panel portion for containing printed matter and a pair of tie ends projecting

in opposite directions beyond the opposite ends of said panel, said apparatus comprising:

(a) conveyor means for unrolling a roll of paper in a continuous web at a substantially uniform rate of speed and conveying said web continuously at substantially the same said speed in a predetermined conveyor path through said apparatus,

(b) slitter means adjacent said conveyor path having a periodic slitting stroke for making a single longitudinal slit at intervals in a side edge portion of said web,

(c) cutter means positioned downstream from said slitter means, including a rotatable cutter shaft above said conveyor path having three cutter blades thereon for severing one of said tying devices and a piece of scrap from said web and simultaneously forming the leading end of the next succeeding tying device on said web during each revolution of said cutter shaft,

(d) a rotatable mandrel spaced vertically beneath said cutter shaft and having spaced grooves in the peripheral surface thereof for receiving said cutter blades,

(e) segregating means in association with said mandrel for segregating said tying devices from said scrap following the severing of each from said web,

(f) and means for rotating said mandrel and said cutter shaft in opposite directions so that said three cutter blades engage said web while moving in the downstream direction of said web.

13. Apparatus according to claim **12** wherein said segregating means includes vacuum means on said mandrel for holding said scrap against the peripheral surface of said mandrel, a guide member spaced downstream from said mandrel for guiding tying devices cut from said web in a horizontal path away from said mandrel, conveyor means adjacent said guide member for conveying tying devices away from said mandrel, roller means frictionally engaging the peripheral surface of said mandrel for retaining said scrap against said surface during the latter's downward rotation, and blower means adjacent said mandrel for directing a stream of air against the lowermost portion of said mandrel and thereby separating scrap therefrom.

14. Apparatus according to claim **12** wherein said segregating means includes vacuum means on said mandrel for holding scrap against the peripheral surface thereof, blower means laterally adjacent said mandrel for removing scrap therefrom when said scrap is conveyed to the underside of said mandrel, and inclined baffle means adjacent said mandrel for deflecting downwardly the air stream from said blower means.

15. Apparatus for making tying devices from a continuous web of paper of predetermined width, said tying devices including a rectangular panel portion and a pair of tie ends projecting in opposite directions beyond the opposite ends of said panel portion, said apparatus comprising:

(a) conveyor means for unrolling a roll of paper in a continuous web and conveying said web in a predetermined conveyor path through said apparatus,

(b) rotatable slitter means adjacent said conveyor path having a periodic slitting stroke for making a single longitudinal slit of predetermined length in a side edge portion of said web,

(c) rotatable cutter means adjacent said conveyor path and spaced along said conveyor path from said slitter means for periodically making a series of three successive cuts in said web transverse to said conveyor direction in timed relation to said slitting stroke and the speed of said conveyor means such that each series of three transverse cuts intersects a single one of said longitudinal slits to form a completed one of said tying devices and sever the same from said web,

(d) segregating means, including delivery conveyor means for conveying finished tying devices away from said cutter means,

(e) and collecting and stacking means for stacking said finished tying devices in neat piles, including receiver conveyor means at the offbear end of said delivery conveyor means for conveying finished tying devices in a direction generally transverse to the conveying direction of said delivery conveyor, and an inclined baffle member at the offbear end of said receiver conveyor means against which said tying devices are stacked on edge.

16. Apparatus for making tying devices from a continuous web of paper of predetermined width, said tying devices including a relatively wide rectangular panel portion and a pair of relatively narrow wire-reinforced tie ends extending beyond the opposite ends of said panel portion, said apparatus comprising:

(a) conveyor means, including a driving wheel for unrolling a roll of paper and a roll of wire in a continuous web and strand respectively along a predetermined conveyor path,

(b) adhesive applying means along said conveyor path for applying a stripe of adhesive to one surface of a side edge portion of said web,

(c) folding means downstream from said adhesive applying means for folding said adhesive-coated side edge portion over said strand,

(d) pressure rolls pressurably engaging said driving wheel for applying pressure against the folded side edge portion to form a continuous, wire-reinforced seam,

(e) slitter means downstream from said pressure rolls, including a rotatable slitter blade operable in timed relation to said driving wheel for periodically making a single longitudinal slit in said web adjacent said seam, and a slitter mandrel for receiving said slitter blade during the slitting stroke thereof,

(f) web-stabilizing means downstream from said slitter means, including pinch conveyor belt means for straightening said web and stabilizing the flow thereof,

(g) cutter means downstream from said stabilizing means, including three cutter blades mounted on a common rotatable shaft for making three successive transverse cuts in the passing web in timed relation to said slitter blade and said driving wheel, and thereby severing a finished tying device and a piece of scrap from said web, and a cutter mandrel beneath said cutter blades for receiving said cutter blades as they cut said web,

(h) and segregating means in association with said cutter mandrel for separating said scrap from said tying devices, including vacuum means on said mandrel, blower means laterally adjacent said mandrel, and delivery belt means downstream from said mandrel,

(i) and means for rotating said slitter blade and said cutter shaft in directions such that said slitter blade and said cutter blades all engage said web while moving in the downstream direction of said web.

17. A tying device made from a single strip of flexible sheet material comprising:

(a) a relatively wide panel portion of flexible sheet material of single sheet thickness,

(b) said panel portion having a relatively narrow folded over side edge portion of double sheet thickness,

(c) a deformable reinforcing strand extending lengthwise of said panel portion within the fold of said side edge portion,

(d) said side edge portion, including said reinforcing strand, extending beyond the opposite ends of said panel portion to define a pair of reinforced tie ends of double sheet thickness.

18. A tying device made from a web of single sheet material comprising:

(a) relatively wide, rectangular panel portion of single sheet thickness on which a legend can be imprinted,

(b) said panel portion having a relatively narrow over-folded side edge portion,

(c) said over-folded side edge portion being bound together by adhesive in a continuous seam,

(d) said seam extending beyond the opposite ends of said panel portion to define a pair of tie ends,

(e) a strand of deformable reinforcing material extending lengthwise of said side edge portion within and coextensive with said seam.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,370,328 February 27, 1968

Frank E. Hilton

It is certified that error appears in the above identified patent and that said Letters Patent are hereby corrected as shown below:

Column 6, line 37, for "feed" read -- feeding --; column 7, line 25, after "generally" insert -- laterally --; column 11, line 1, for "web of single" read -- single web of --.

Signed and sealed this 1st day of July 1969.

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents