United States Patent [19]

Stevens

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[54] **MACHINE AND METHOD FOR WRAPPING THREE DIMENSIONAL RECTANGULAR OBJECTS**

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[51] **Int. Cl.**... **B65b 11/12,** B65b 49/00, B65b 49/08

[58] **Field of Search**..... 53/32, 209, 218

[56] **References Cited**

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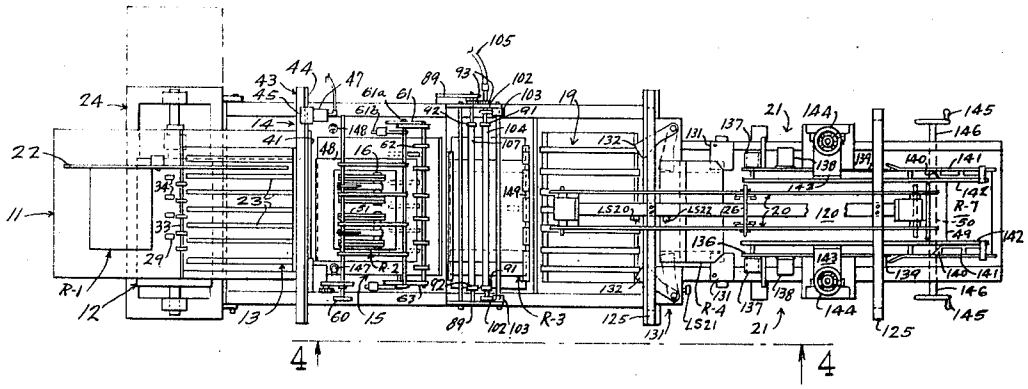
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[57] **ABSTRACT**

A machine and method for wrapping a three-dimensional, rectangular object, such as a ream or stack of paper sheets. The object to be wrapped is delivered onto a table at one end of the machine. The machine feeds a length of wrapper material off of a supply roll and beneath the object, feeds the wrapper material and the object along the machine, cuts off a proper length of wrapper material to form a wrapper of sufficient size to properly enclose the object and spreads a glue line on the wrapper along one edge thereof. The machine then folds the wrapper around the object to overlap the ends of the wrapper and seals the overlapped ends together to form a girth seam that extends transversely to the direction of movement of the wrapper and object along the machine. After the girth seam is closed, the object and wrapper are then fed in the same direction and between means which apply glue to and then tuck in, fold, and seal, the lateral margins around the sides of the object. The machine and method are particularly adapted for overwrapping stacks of sheets of paper of various sizes and quantities.

16 Claims, 8 Drawing Figures



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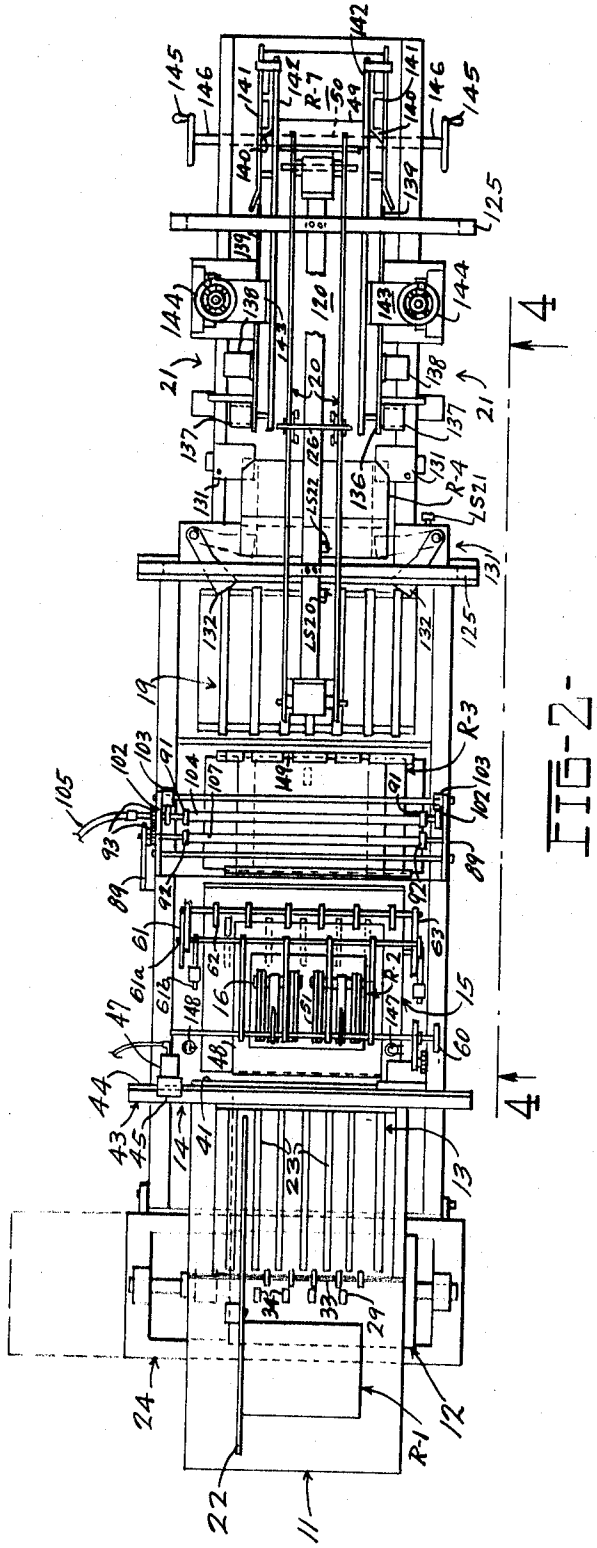


FIG-2-

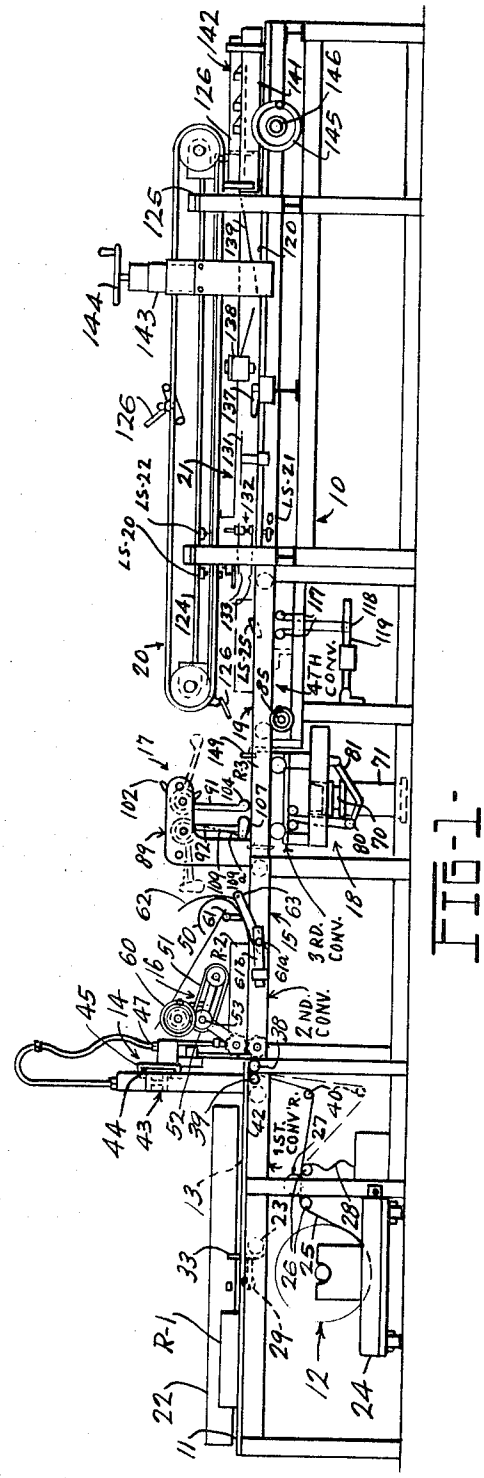


FIG-1-

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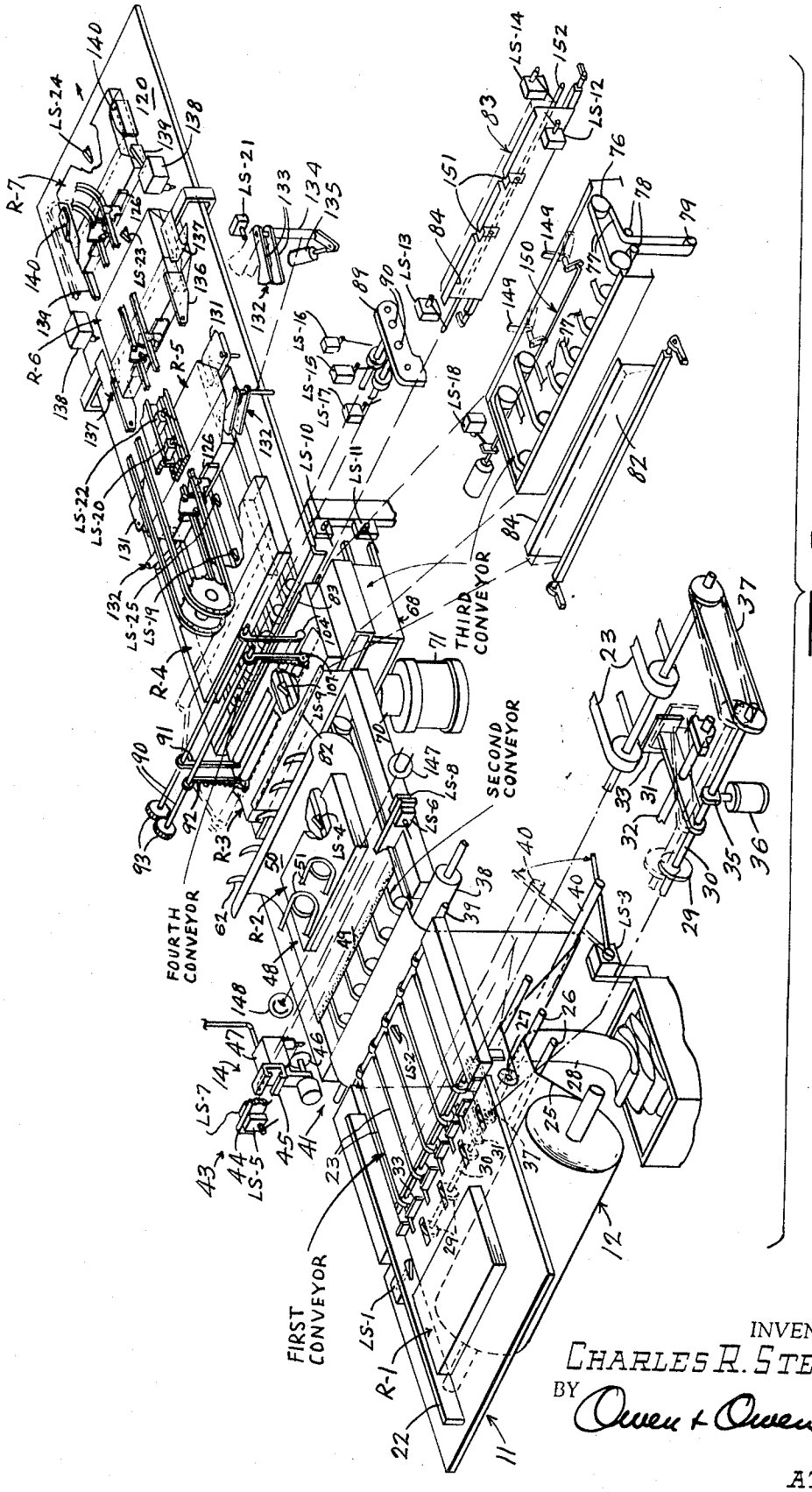


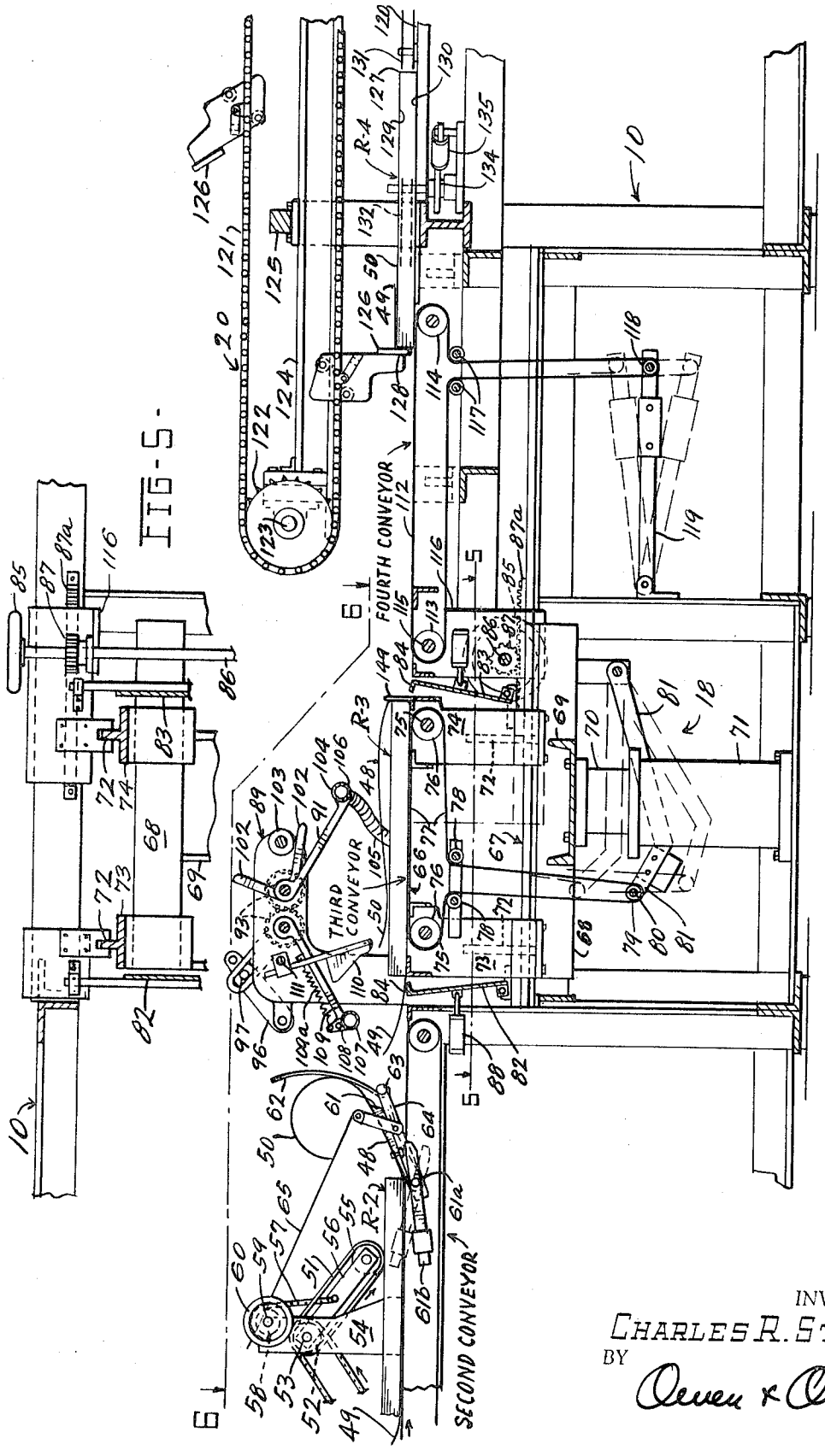
FIG. 2.

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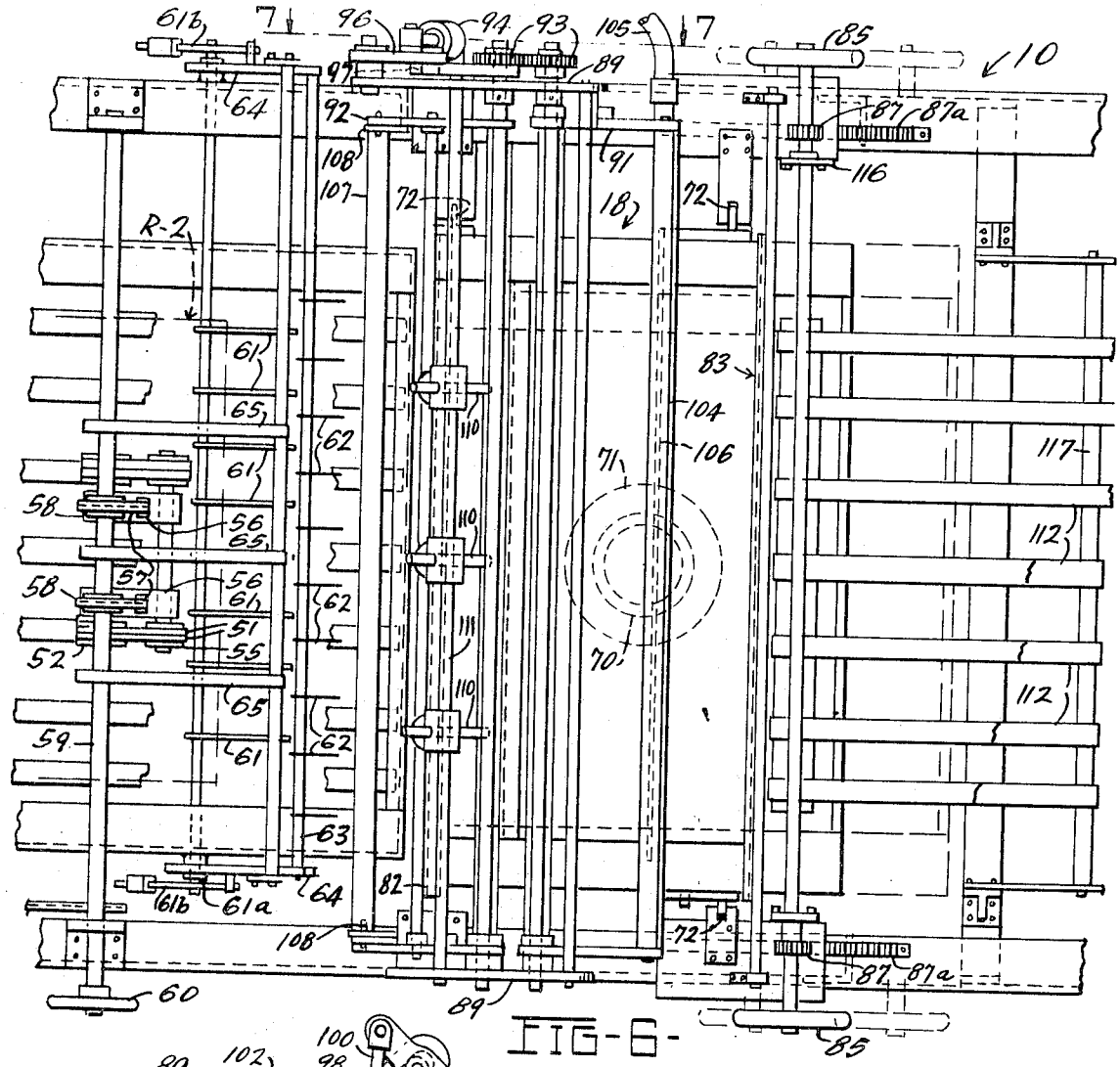


FIG-6-

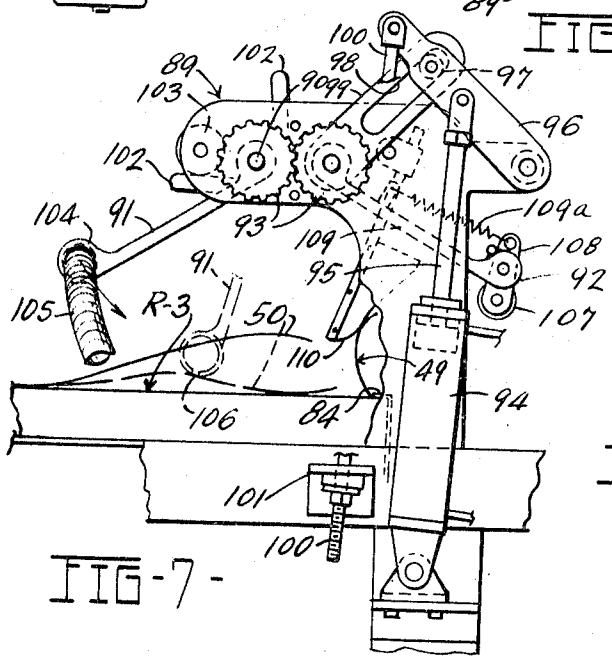


FIG-7-

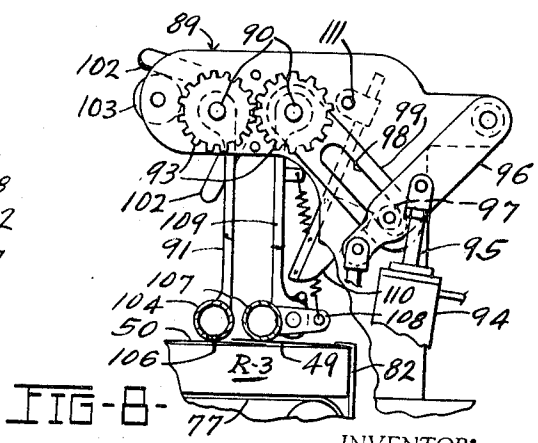


FIG-8-

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MACHINE AND METHOD FOR WRAPPING THREE DIMENSIONAL RECTANGULAR OBJECTS

BACKGROUND OF THE INVENTION

It is conventional in paper mills to cut the paper into sheets of varying sizes such as those which are used for printing books, pamphlets, leaflets and miscellaneous other uses and to package the cut sheets of paper in packages, each package containing a pre-determined number of sheets. For example, the conventional "ream" of 500 sheets of paper usually is packaged in an outer moisture-proof wrapper in order to protect the sheets from damage. The wrapper must be folded around the girth of the ream and sealed with a girth seal and then the sides of the wrapper must be tucked and folded together and sealed. While a conventional "ream" usually consists of 500 sheets, in this specification the words "ream" or "stack" of sheets will be used to mean any number of sheets of the same size which are to be packaged on the machine embodying the invention and according to the method of the invention. Such a stack of sheets may number as few as 25 or as many as 1,000 for example.

Various machines have been designed for the purpose of overwrapping reams or stacks of sheets of paper, many of them requiring that the ream or stack be moved in one direction for making the initial girth wrap and then turned 90 degrees to the first conveyor in order to make the side seals. Some machines have been designed which fold the wrapper down around the ream of paper and seal it beneath the ream. Other machines have been designed which move the wrapper material vertically, move the ream of sheets against the wrapper material while it is in vertical position and then fold the wrapper material around the ream completing the girth wrap with a grith seam either on the top of the package or the bottom of the package.

It is the principal object of the instant invention to provide a machine for wrapping rectangular objects such as a ream or stack of sheets in which the direction of movement of the ream to the girth wrap station and from the girth wrap station through the mechanisms which tuck and fold the end seals, is in a straight line.

It is yet another object of the instant invention to provide a machine which will automatically feed lengths of wrapper material in response to the arrival of a ream of sheets to be wrapped, will correctly position the ream on the wrapper material, will cut off the wrapper material to form an individual wrapper of the proper length and width, will girth wrap the material around the ream with a girth-seam extending transversely to the direction of movement of the ream and wrapper and will then tuck and fold the end flaps or margins of the wrapper to form the side seals.

It is yet another important object of the instant invention to provide a method for wrapping various three-dimensional objects such as a ream or stack of sheets of paper by moving the object onto the upwardly facing inner surface of a length of wrapper material, moving the object and the wrapper material together along a longitudinal path, cutting off the wrapper material to form a wrapper of pre-determined length slightly in excess of the girth of the object, snugly fold the wrapper over the top of the object to form an overlapped girth seam on top of the object and that extends transversely to the direction of movement of the ream and wrapper and then to continue to move the girth wrapped object in the same direction while tucking in, folding and sealing the wrapper at and over the sides of the object.

Other and more specific objects and advantages of the machine and method embodying the invention will be better understood from the specification which follows and from the drawings in which:

FIG. 1 is a side view in elevation shown on a very small scale, of a machine embodying the invention and upon which the method of the invention can be carried out for wrapping reams or stacks of paper sheets;

FIG. 2 is a plan view of the machine illustrated in FIG. 1 and shown on the same scale as FIG. 1;

FIG. 3 is a diagrammatic, exploded view with parts broken away illustrating the sequence of operations of the machine and the steps of the method according to the invention for the feeding, girth wrapping, and end wrapping and sealing of a stack of paper sheets;

FIG. 4 is a fragmentary view in side elevation with parts broken away taken from the position indicated by the line 4—4 of FIG. 2 and shown on a greatly enlarged scale;

FIG. 5 is a fragmentary, horizontal sectional view taken along the line 5—5 of FIG. 4;

FIG. 6 is a fragmentary plan view taken from the position indicated by the line 6—6 of FIG. 4;

FIG. 7 is a fragmentary view in elevation, with parts broken away, taken from the position indicated by the line 7—7 of FIG. 6; and

FIG. 8 is a view similar to FIG. 7 but showing the parts in a different relative position.

DESCRIPTION OF A PREFERRED EMBODIMENT OF THE MACHINE

Although a machine embodying the invention and the method of the invention both are capable of wrapping any rectangular three-dimensional object with a sealed overwrap, throughout the description of a particular embodiment of the invention, it will be illustrated and described as designed and employed for the purpose of wrapping stacks of sheets of paper, herein called "reams." In a particular machine embodying the invention, the spacing between fences, guides, etc. is adjustable to accept a wide range of sheet sizes and a wide range of thicknesses of the reams or stacks. For example, in a machine embodying the invention, adjustments are built in to allow the handling of stacks of sheets from 16 inches by 20 inches to as large as 35 inches by 50 inches. Similarly, vertical movements and adjustments are provided so that stacks of sheets varying in height from a minimum of three-quarters inch to 4 inches may be automatically handled.

A machine for wrapping rectangular three-dimensional objects such as the reams or stacks of paper has a longitudinally extending frame generally indicated in FIGS. 1 and 2 by the reference number 10. The major operating sub-assemblies of the machine are mounted in spaced positions along the frame 10 and comprise: a receiving table 11, a wrapper material supply roll 12, a first conveyor 13, a cut-off mechanism generally indicated by the reference number 14, a second conveyor 15, an overhead feeding means 16, a girth wrap station 17 which includes a third conveyor that is mounted upon an elevator 18, a fourth conveyor 19, an overhead paddle conveyor 20 and a series of co-operating tuckers and shoes which co-operate in a side sealing section 21.

The article receiving table 11 has a fence 22 extending longitudinally of the machine which is adjustably mounted for positioning at selected positions, transversely relative to the table 11, to accept reams or stacks of paper sheets such as the ream shown in Position R-1 in FIG. 2.

The fence 22 extends across the back of the article receiving table 11 parallel to belts 23 of the first conveyor 13 which leads from the "off-side" of the table 11 toward the cut-off mechanism 14 and the remaining portions of the machine. The wrapper supply roll 12 is mounted in a carriage 24 so that it can be moved into position beneath the table 11. The carriage 24 also carries a motor (not shown) for rotating the wrapper supply roll 12 when desired. Wrapper material 25 is lead from the wrapper supply roll 12 over a pair of guide bars or rollers 26 which extend across beneath the table 11 and the wrapper material 25 is engaged by a pair of powered slitters 27 which are operated to trim off-side edges 28 of the wrapper material 25 in order to trim the wrapper material 25 to the proper width for the particular ream or other object to be wrapped. The slitters 27 are mounted on transverse support members so they can be moved toward and away from each other, as desired, to cut off wide or narrower edges, or no edges at all, depending upon the particular width needed.

A plurality of ream feeding rollers 29 are mounted on a cross shaft 30 (see FIG. 3) which is journaled in a pair of rockers 31 pivotally carried by a bar 32 that is located beneath the receiving table 11. The rockers 31 are connected at their front ends to a slotted ream stop 33 which extends across the front of the table 11. The ream feeding rollers 29 are located in slots 34 in the table 11. The cross shaft 30 is connected by a yoke 35 to an actuating cylinder 36. The cross shaft 30 is driven by a belt 37 or similar means in synchronism with and with their peripheries moving at the same lineal speed, as the belts 23 of the first conveyor 13.

A limit switch LS-1 is located in the fence 22 with its actuator protruding through the fence in such position that when an operator pushes a ream onto the table 11, squares it up against the fence 22 and moves it forwardly on the machine into engagement with the ream stop 33, the limit switch LS-1 is closed to energize the rocker cylinder 36 which lowers the ream stops 33 and swings the ream feeding rollers 29 upwardly through the slots 34 into engagement with the bottom sheet of the ream.

A wrapper feeding roller 38 is suitably journaled in the frame 10 and extends across the frame between the front end of the first conveyor 13 and the rear end of the second conveyor 15 and has a resiliently urged nip roller 39. The wrapper material 25 is led over the guide bars 26 and then downwardly beneath a vertically movable dancer roll 40, thence upwardly through a slot 41 which extends across the table 10, between the nip roller 39 and the wrapper feeding roller 38, and into contact with the upper surface of belts 42 of the second conveyor 15.

A bridge, generally indicated by the reference number 43, extends across the frame 10 above the near end of the second conveyor 15 and has a guide bar 44, or the like, on which a traveling carriage 45 is movably mounted, suitable drive mechanism, such as a loop of power driven chains or belts (not shown) are supported on the bridge 43 for moving the carriage 45 back and forth across the machine. The carriage 45 supports a rotary cutter 46 and a glue applicator 47. A traverse of the carriage 45 in one direction across the guide bar 44 cuts off a wrapper 48 of suitable length to girth wrap the particular ream being wrapped, for example the ream shown at Position R-2 in FIG. 3. At the same time, the glue applicator 47 spreads a thin line of adhesive across a trailing margin 49 of the wrapper 48 near its rear edge.

As will later be described under the operation of the machine, the timing of the actuation of the necessary controls and the speeds of the various conveyors and feeding rollers so far described is such that, in moving the ream from position R-1 to Position R-2 (FIG. 3) the ream is fed onto the upper surface of the wrapper 48 with a leading margin 50 extending in front of the ream and the trailing margin 49 extending behind the ream. As the ream moves off of the first conveyor 13 and onto the wrapper 48 on the second conveyor 15, its upper surface is engaged by the outer peripheral surfaces of belts 51 (FIG. 4) of the overhead feeding means 16. The belts 51 run in drive pulleys 52 which are pinned on a cross shaft 53 extending between two uprights 54. Each of the belts 51 is also engaged with an idler pulley 55 that is rotatably mounted at the lower forward end of a tilting arm 56. The arms 56 are pivotal on the axis of the cross shaft 53 and drive pulleys 52 and are movable angularly vertically to accommodate reams or stacks of paper of different thicknesses. Their adjustment is accomplished by means support chains 57 which are engaged over sprockets 58 that are in turn pinned upon an adjustment shaft 59. A hand wheel 60 on the end of the adjustment shaft 59 may be rotated to pull upwardly on the chains 57 to raise the arms 56 and the idler pulleys 55 or to lower the idler pulleys 55 by reversing the rotation of the hand wheel 60. As can best be seen in FIG. 4, the tilting arms 56 are positioned so that the lowermost surfaces of the belts 51 on the idler pulleys 55 frictionally engage the top sheet of the ream as it passes the overhead feeding means 16 while moving into and out of Position R-2.

A series of upwardly extending, depressible guide fingers 61 (FIGS. 4 and 6) protrudes upwardly between the belts 42 of the second conveyor 15 at a point slightly in advance of the overhead feeding means 16. The guide fingers 61 are mounted on a cross shaft 61*a* which also carries weighted arms 61b. The arms 61*b* urge the fingers 61 upwardly with sufficient force so that the weight of the leading margin 50 of the wrapper 48 will not depress the fingers 61. The leading margin 50 strikes the fingers 61 and is lifted up off the belts 52 of the second conveyor 15 and into engagement with the lower ends of several upwardly curved stationary guides 62. The guides 62 are mounted on a support bar 63 which, in turn, is carried by a pair of support arms 64. The arms 64 can be adjusted vertically to raise and lower the support bar 63 relative to the top surfaces of the belts 42 to provide a sufficient space therebetween for the passage of a ream beneath the support bar 63. As the belts 42 move the wrapper 48 and the ream, the leading margin 50 of the wrapper 48 is curled over and backward by the curved guides 62 and its edge falls on the upper surfaces of a series of backwardly inclined supports 65.

A limit switch LS-4 is positioned between the belts 42 of the second conveyor 15 to be engaged by the leading edge of the ream and, as will be described below, this

actuates the mechanism for traversing the carriage **45** in order to sever the wrapper **48** from the wrapper material **25**.

The girth wrap station **17** is illustrated in FIGS. **4–8** and comprises, among its many other parts, a third conveyor **66** which is mounted upon an adjustable support frame generally indicated by the reference number **67** that is located on the upper side of the elevator **18**. The elevator **18** has an open main frame **68** that is carried by a cross beam **69**. The cross beam **69** is mounted on the top of a heavy piston **70** of an elevator cylinder **71**. The main frame **68** is guided for vertical movement by ways **72** rigidly erected in the main frame **10**. The support frame **67** for the third conveyor **66** is formed by two transversely extending arches **73** and **74**. Transverse pulley shafts **75** extend across between the uprights of the respective arches **73** and **74** and each of the shafts **75** mounts a series of pulleys **76** with which belts **77** of the third conveyor **66** are engaged. Each of the belts **77** also passes over a pair of fixed position idler rollers **78** and downwardly beneath a take-up roller **79**. The take-up rollers **79** are journalled on a cross shaft **80** which extends between a pair of weighted bars **81**. The bars **81** are pivoted at their front ends and can swing downwardly to maintain the belts **77** taut as the front arch **74** is moved horizontally toward or away from the rear arch **73**, thus shortening or lengthening the distance between the belt pulleys **76** and, correspondingly, the length of the spans of the belts **77** across the third conveyor **66**.

Two folding wings **82** and **83** (see also FIG. **3**) are mounted on transverse pivot axes and are carried by the main frame **68** of the elevator **18**, extending across the table, the wing **82** at the back side of the girth wrap station **17** and the wing **83** at the front side of the girth wrap station **17**. The front wing **83** is mounted with the front arch **74** which is slidable on the main frame **68** as mentioned above. Each of the folding wings **82** and **83** has an inwardly directed lip **84** at its upper end.

The front arch **74** and the pulleys **76** carried thereby as well as the front folding wing **83** may be slid toward and away from the rear arch **73** by rotation of either of a pair of hand wheels **85** which are secured on the outer ends of a shaft **86** which also carries two pinions **87**. The pinions **87** are in turn engaged with a pair of racks **87a** secured on the main frame **10**. By rotating either of the hand wheels **85**, the pinions **87** are rotated to run along the respective racks **88** to move the front bridge **74** and front folding wing **83** as well as the pulleys **76** carried thereby toward or away from the rear wing **82**. When one of the hand wheels **85** is rotated, for example, in a counterclockwise direction (FIG. **4**) the front bridge **74** is moved farther away from the rear bridge **73** which applies tension to the belts **77** of the third conveyor **66** and pulls upwardly on the take-up roller **79** lifting the weighted bars **81** to maintain tension on the belts **77**. The folding wings **82** and **83** are moved toward or away from each other by actuating cylinders **88** as will be described below.

Two brackets **89** are erected on opposite sides of the machine and support bearings for two parallel shafts **90** (see also FIGS. **7** and **8**) for front and rear sweep arms **91** and **92**. Meshed sprockets **93** are secured on the ends of the shafts **90** to insure that the two shafts **90** rotate in opposite directions when the sweep arms are actuated.

Mechanism for actuating the sweep arms **91** and **92** is illustrated in detail in FIGS. **7** and **8** and comprises a cylinder **94**, the piston rod **95** of which is yoked to an actuating lever **96**. The actuating lever **96** carries a roller **97** that is engaged in a slot **98** in a rocker arm **99** also pinned on the shaft **90** for the rear sweep arm **92**. A stroke limit rod **100** is yoked to the end of the actuating lever **96** and passes through a stop **101** attached to the frame **10**. When the cylinder **94** is actuated and pulls downwardly on its rod **95**, the mechanism just described sweeps the two sweep arms **91** and **92** rearwardly and forwardly, respectively. The limits of rotational movement of the front sweep arm **91** are determined by a pair of stop fingers **102** which rotate with the shaft **90** for the front sweep arm **91** and impact against the upper and lower surfaces respectively, of a cushion **103**. The front and rear sweep arms **91** and **92** extend across above the third conveyor **66** and thus above a ream and wrapper located in Position R-3 for the purpose of sweeping the leading margin **50** and trailing margin **49**, respectively, over the top of the ream for girth sealing the same as will be described below.

The front sweep arm **91** comprises a tube **104**. The tube **104** (See FIG. **8**) of the front sweep arm **91** is connected by a hose **105** to a vacuum source and has a series of perforations **106** through its wall extending along a line that is substantially tangential to the surface of the leading margin **50** of the wrapper **48**.

The rear sweep arm **92** comprises a rod **107** that is carried by a pair of rockers **108** which are pivotally mounted on the ends of two struts **109** secured to its shaft **90**. Springs **109*a*** extend between the rockers **108** and the struts **109** to urge the rod **107** away from the shaft **90**. As can best be seen in FIG. **8**, this presses the overlapped edges of the margins **50** and **49** to form the girth seal, as will be described below.

Temporary catches **110** (see FIGS. **4**, **6**, **7**) are mounted on a rod **111** which extends between the brackets **89**. The lower ends of the catches **110** extend downwardly a distance sufficient to catch the glued edge of the trailing margin **49** of the wrapper **48** (FIG. **7**) after the rear folding wing **82** has swung inwardly and folded the wrapper **48**. This prevents the glued edge from dropping over onto the top sheet of the ream or the edge of the leading margin **50** until after the front sweep arm **91** has swept the leading margin **50** down into place. The trailing margin **49** is pulled off the catches **110** by the rear sweep arm **92** as it moves from the position shown in FIG. **7** to the position shown in FIG. **8**.

The fourth conveyor **19** is located just beyond the girth wrap station **17** to receive the girth wrapped reams or "packages" as they are discharged from the third conveyor **66** of the girth wrap station **17**. The fourth conveyor **19** has a plurality of parallel belts **112** which run over pulleys **113** and **114**. The pulleys **113** are all mounted on a driving shaft **115** which extends across between the upper ends of a pair of side plates **116** which also support the shaft **86** for the length adjusting hand wheels **85**. The side plates **116** are mounted to move with the front arch **74** and the front folding wing **83** when the hand wheel **85** is rotated to lengthen or shorten the distance between the folding wings **82** and **83** to accommodate reams of different lengths. When the hand wheel **85** is rotated to increase the distance between the folding wings **82** and **83**, the

side plates **116** of the fourth conveyor **19** are moved away from the girth wrap station **17** (to the right in FIG. 4). The belts **112** of the fourth conveyor **19** are led downwardly between pairs of idler pulleys **117** and around take-up pulleys **118** which are rotatable on a cross shaft at the ends of weighted levers **119.** The weighted levers **119** apply tension to the belts **112** to hold them taut when the pulleys **113** and **114** are moved toward and away from each other to decrease or increase the length of the fourth conveyor **19** compensatorily to the lengthening or shortening of the third conveyor **66** of the girth wrap station **17.**

A girth wrapped ream or package moving from Position R-3 to Position R-4 (FIG. 3) travels on the fourth conveyor **19** and is slid onto an elongated flat tabel **120** which extends from the fourth conveyor **19** to the end of the machine.

The overhead paddle conveyor **20** (FIG. 4) consists of a pair of parallel, endless chains **121** which run on two pairs of sprockets **122** which are mounted on the opposite ends of stub shafts **123** at the rear and front end, respectively, of a longitudinally extending support beam **124** of the overhead conveyor **20.** The beam **124** is supported above the table **120** by two heavy bridges **125** which are erected on the main frame **10** and span the table **120.** The overhead conveyor chains **121** carry a plurality of ream moving paddles **126** which depend from the lower spans of the chains **121** down to a level just above the top of the table **120** and are adapted to engage the rear ends of girth wrapped reams when they reach approximately the position shown as Position R-4. The enerization and timing of the operation of the overhead paddle conveyor **20** will be explained below when the operation of the machine is described.

After leaving the girth wrap station **17,** the ream or stack of papers is wrapped and sealed with the transverse girth seam and the edge margins of the wrapper **48** extend beyond the sides of the paper sheets in the ream, forming front and back vertical webs **127** and **128,** respectively, and upper and lower horizontal webs **129** and **130,** respectively.

At a short distance down the table **120** from the "off" end of the fourth conveyor **19,** and positioned at opposite sides of the table **120,** are a pair of front web tucker plates **131** and rear web tucker plates **132.** The front web tucker plates **131** have beveled inside corners and are positioned slightly above the level of the table **120,** approximately at the mid line of reams of average height. The front web tucker plates **131** are first engaged by the front vertical webs **127** at each side of a package or girth wrapped ream being moved by the paddle conveyor **20.** The front vertical webs **127** are bent backwardly against the sides of the sheets of paper in the ream as can be seen by reference to Position R-5 in FIG. 3. During the folding in of the front vertical webs **127,** the upper and lower horizontal webs **129** and **130** are also folded in angularly.

The rear web tucker plates **132** are located closer to the end of the fourth conveyor **19** at a point at which the rear side of the reams stop in Position R-5. It will be appreciated that if the stack of papers is longer from front to back than, for example, the ream shown in Position R-5, the front web tucker plates **131** will have already tucked in the front vertical webs **127** of the package before the package reaches Position R-5. The rear web tucker plates **132** have two flat, vertically spaced horizontal elements **133** (FIG. 3) mounted on a vertical rocker **134** that is connected to an actuating cylinder **135.** Actuation of cylinder **135** rotates the rocker **134** and swings the rear web tucker plates **132** from their outer positions (FIG. 2) to their inner positions (FIG. 3). The swinging movement of the rear web tucker plates **132** tucks in the rear vertical webs **128** of the package as is shown in FIG. **3.**

At a point farther down the table **120** from the front tucker plates **131,** there are positioned two vertical shoes **136,** one on each side of the table **120** and spaced from each other across the tabel a distance such that the package moves snugly between them while it is traveling from Position R-5 to Position R-6. Because the rear ends of the shoes **136** are beveled, the shoes **136** fold down the upper horizontal marginal webs **129** of the package tightly over the sides of the packages sharply creasing the wrapper **48** at the upper side edges of the ream sheets and bending it over horizontally at the lower edges of the sides of the package of sheets where it overlies the lower horizontal marginal webs **130.**

Pressure plates **137** are positioned beyond the shoes **136,** one at each side of the table **120** to flatten the folds in the upper and lower marginal webs **129** and **130** of the package after they have been tucked and folded as described.

Side flap glue applicators **138** are mounted on the table **120** at positions just beyond the pressure plates **137.** The side flap glue applicators **138** function to spread a line of glue near the edges of the partially folded lower horizontal webs **130** of the wrapper **48.**

A pair of upwardly inclined shoes **139** are located just beyond the glue applicators for folding the lower horizontal webs **130** and the ends of the upper horizontal web **129** tightly up against the sides of the sheets in the ream. Immediately after the upward folding of these marginal webs **129** and **130,** the package comprising the ream and the wrapper **48** moves into Position R-7 with its sides passing beneath overlapping shoes **140** which fold the ends of the lower horizontal web **130** over and on top of the girth sealed leading and trailing margins **49** and **50.**

Guide fences **141** (see FIGS. 1 and 2) are not shown in FIG. 3 for purposes of clarity. The fences **141** extend along the table **120** to provide a longitudinal path leading between the tucking and folding mechanisms just described. The fences **141** are supported by longitudinally extending, parallel presser bars **142** which are, in turn, mounted by vertically movable slides **143.** The presser bars **142** are located inwardly of the fences **141** so that the bars **142** press on the upper surfaces of the packages and the sealed over flaps of the lower horizontal webs **130.** The slides **143** may be raised and lowered by hand wheels **144** to raise and lower the presser bars **142** to accommodate reams of different thicknesses.

Similarly, the fences **141** may be moved toward and away from each other to accommodate reams of different widths, by the rotation of hand wheels **145** which rotate a shaft **146** having right and left-hand threaded sections engaged with similarly threaded nuts (not shown) on the fence structure.

OPERATION

When a machine designed according to the invention for wrapping stacks of paper (see particularly FIG. 3), herein generally called reams, is first energized, the

belts 23 of the first conveyor 13 are started and they operate continuously during wrapping operations.

The operator places a ream to be wrapped on the receiving table 11 against the table fence 22. The ream is then slid along the fence 22 to Position R-1 where it engages the ream stop 33 and the actuator of the limit switch LS-1 which protrudes through the fence 22. This correctly positions the ream to be fed onto the first conveyor 13.

Actuation of the limit switch LS-1 which initiates a cycle by energizing the cylinder 36 causes the ream feeding rollers 29 to be moved upwardly through the slots 34 in the receiving table 11 and lowers the ream stop 33. Engagement of the ream feeding rollers 29 with the under side of the ream moves it forwardly until it engages the belts 23 of the first conveyor 13 which carries the ream along over the top of the frame portion where the first conveyor 13 is located. The rollers 29 rotate so that their peripheral speed is the same as the lineal speed of the belts 23. The ream depresses a trigger of a wrapper feeding switch LS-2 which protrudes upwardly between the belts 23 of the first conveyor 13. Actuation of the limit switch LS-2 engages the shaft which drives the feeding roller 38 to feed wrapper material 25 upwardly through the slot 41 located between the belts 23 of the first conveyor 13 and the feeding roller 38. Rotation of the feeding roller 38 pulls on the wrapper material 25 and elevates the dancer roll 40 from its lowermost position. This actuates a limit switch LS-3 to energize the motor for the wrapper supply roll 12 to supply wrapper material 25 as needed.

Because the dancer roll 40 is free to move up and down in its guide, the only tension applied to the wrapper material 25 and which must be overcome by the feeding roller 38 is the gravitational force exerted on the wrapper material 25 by the dancer roller weight. Because the dancer roll 40 is lifted immediately upon actuation of the feeding roller 38, the limit switch LS-3 starts the motor for the wrapper supply roll 12 and the dancer roll 40 "floats" or "dances" at a level slightly above the bottom of its path.

This eliminates the otherwise considerable force which would be necessary to be exerted at the feeding roller 38 in order to supply sufficient tension to the wrapper material 25 to unwind it from the heavy wrapper supply roll 12. Furthermore, it compensates for the changing diameter of the wrapper supply roll 12 as wrapper material is unrolled therefrom.

When the limit switch LS-3 is closed to actuate the drive motor for the wrapper supply roll 12, it also applies energy to the slitters 27 which are located in the path of the travel of the wrapper material 25 from the wrapper supply roll 12 and over guide bars 26 too the dancer roll 40. The slitters 27 are movable transversely of the machine in order to trim off the edges of the wrapper material 25 to the proper size for the particular object or ream or stack of sheets being wrapped. The trimmed edges 28 of the wrapper material 25 are gathered in suitable receptacles located beneath the table 11.

The wrapper supply roll motor (not shown) continues to rotate the wrapper supply roll 12 until the dancer roll 40 moves to the bottom of its path of travel where it again actuates the limit switch LS-3 which stops the wrapper supply roll motor.

Simultaneously, because of the continued movement of the belts 23 of the first conveyor 13, the ream has also been moved forwardly and, as the wrapper material 25 is fed along on the belts 42 of the second conveyor 15, the timing is such that the leading margin 50 of the wrapper material 25 is fed ahead of the ream. The ream and the wrapper material 25 are fed together on the belts 42 of the second conveyor 15, a sufficient distance so that the trailing margin 49 of the wrapper material 25 extends backwardly from the ream.

In addition to the automatic wrapper material feeding mechanism just described, which functions during normal operation of the machine for the continuous wrapping of a plurality of objects of the same size, a machine embodying the invention also has an electrical circuit for the manually controlled feeding of the wrapper material 25. When the machine is initially being set up with a new wrapper supply roll 12 or if some malfunction or other event has caused the wrapper material 25 to be torn or to jam prior to its being fed out between the wrapper feeding roller 38 and the nip roller 39, it is necessary to establish or to re-establish the wrapper in position for automatic feeding. The machine controls (not shown) include manually actuatable switches which over-control the automatic switches so that the wrapper supply roll 12 can be rotated simultaneously with the wrapper feeding roller 38 independently of the operation of the dancer roll 40 and the limit switch LS-3. In addition, each of the motors (not shown) or drive clutches (not shown) for the wrapper supply roll 12 and the wrapper feeding roller 38 may be independently energized to rotate these items independently of each other. Again, and for similar purposes, the motors which rotate the slitters 27 may or may not be energized during such an initial feeding of the wrapper material 25 into the machine or during a reestablishment after some untoward event has occurred.

When almost the full length for wrapper material 25 has been fed, as described above, the leading corner of the ream strikes the trigger of a limit switch LS-4 which protrudes upwardly between the belts 42 of the second conveyor 15. The leading margin 50 of the wrapper material 25 is not heavy to depress the trigger. When the limit switch LS-4 is closed it establishes an electrical circuit to respond to the reestablishment of a light beam from a lamp 147 located on one side of the machine (FIG. 3) which strikes a photocell 148 located on the other side of the machine. When the rear edge of the ream passes the light path and the photocell 148 is re-activated; a suitable relay is tripped to stop the movement of the belts 42 of the second conveyor and to energize the mechanism for causing the cutter carriage 45 to traverse the table to cut off the wrapper material 25 leaving its trailing margin 49 at the back. A separate wrapper 48 has now been formed and the wrapper and ream are in Position R-2.

The cutter 46 travels with the carriage 45 back and forth across the table of the machine making a traverse in one direction for the separation of each individual wrapper 48. A pair of limit switches LS-5 and LS-6 are adjustably positioned on the guide bar 44 to stop the movement of the cutter carriage 45 on the respective sides of the machine. The girth seam glue applicator 47 is also mounted on the carriage 45 adjacent to the cutter 46 so that it travels across the machine with the cutter 46 and applies a thin line of glue near the edge of the top surface of the trailing margin 49. Because the nozzle of the glue applicator 47 must be opened and

closed at the start and end of its travel, respectively, and because the length of the line of glue spread thereby on the wrapper **48** may not extend for the complete width of the wrapper **48** and may need to be adjusted, two limit switches LS-7 and LS-8 are positioned on the forward side of the guide bar **44** to open the nozzle of the glue applicator **47** upon departure from one edge of the wrapper **48** and to close the nozzle of the glue applicator **47** upon arrival at the other edge of the wrapper **48.**

A short time prior to the actuation of the carriage **45** for the cutter **46** and the glue applicator **47,** the front end of the leading margin **50** of the wrapper **48** has engaged depressible guide fingers **61** (see FIGS. **1** and **4**) and has been lifted above and off of the belts **42** of the second conveyor **15.** The edge of the leading margin **50** then immediately engages the upwardly curved guides **62** and the leading margin **50** of the wrapper **48** is loosely folded back against the support bars **65** above the ream.

At about the same time that the leading edge of the leading margin **50** strikes the depressible fingers **61,** the uppermost sheet of the ream is engaged by the exposed spans of the two belts **51** of the overhead feeding means **16** which are moved at the same lineal speed as the ream on the belts **42** of the second conveyor **13.** This engagement continues while the ream is moving into Position R-2 on the second conveyor **15** and during the initiation of movement of the ream and wrapper **48** away from that position. The belts **51** of the overhead feeding means **16** are actuated concomitantly with the belts **42** of the second conveyor **13** and stopped when those belts are stopped.

Upon completion of the cutoff, when the cutter **46** reaches the respective one of the limit switches LS-5 or LS-6, not only is the movement of the carriage **45** stopped, but also power is fed to the shaft for moving the belts **42** of the second conveyor **15** and the belts **51** of the overhead feeding means **16.** The wrapper **48** and the ream are then fed through the space beneath the crossbar **63** of the curved guides **62,** depressing the fingers **61** and moving from the second conveyor **15** onto the belts **77** of the third conveyor **66** which is mounted on the elevator **18.** The belts **77** of the third conveyor **66** and the belts **42** of the second conveyor **15** move at the same lineal speed.

The ream and its wrapper **48** move forward until the leading edge of the ream engages a trigger of a limit switch LS-9 which is positioned between the belts **77** of the third or elevator conveyor **66.** The trigger of the limit switch LS-9 is so located relative to the far end of the third conveyor **66** that the ream and wrapper **48** come up against a pair of horizontally yieldable package stops **149** (FIG. **3**) when the third conveyor **66** stops. Because the package stops **149** are yieldable, this absorbs whatever energy may remain in the package when the conveyor **66** stops. The package stops **149** are mounted to be swung over sideways.

Actuation of the limit switch LS-9 also shifts the controls to feed air to the down-side of the elevator cylinder **71** to pull the elevator **18** and the third conveyor **66,** and the ream and wrapper **48** downwardly below the general level of the conveyors a distance in excess of the thickness of the ream so that the upper corners of the ream will be below the level of the lips **84** of the folding wings **82** and **83.**

When the elevator **18** moves downwardly, a limit switch LS-10 is actuated. This energizes a mechanism **150** to swing the package stops **149** over (FIG. **3**). When the elevator **18** reaches the bottom of its travel, a limit switch LS-11 is actuated to turn off the air moving the elevator **18** downwardly and the cylinders **88** are actuated to swing the folding wings **82** and **83** from their outwardly angular positions toward each other into parallel vertical positions. The folding wings **82** and **83** swing in against the front and back ends of the ream tightly folding the wrapper **48** around the lower corners of the front and back of the edges of the ream and sweeping the wrapper **48** upwardly along the front and back edges of the ream, also "squaring up" the sheets in the ream if any displacement has occurred.

Upon completion of the inward movement of the folding wings **82** and **83,** a limit switch LS-12 is actuated by the folding wing **83.** This shifts the valving to the cylinder **71** to apply air to the "up" side thereof. As the elevator cylinder **71** moves the elevator **18** upwardly, the wrapper **48** is sharply folded inwardly by the lips **84** at the upper ends of the folding wings **82** and **83.** As these upper corners of the front and back ends of the ream move upwardly into contact with the undersides of the lips **84** they also lift two triggers **151** which lift a cross bar **152** to actuate a pair of limit switches LS-13 and LS-14, one at each side of the machine.

Actuation of the limit switches LS-13 and LS-14 cuts off the air then being fed to the "up" side of the elevator cylinder **71** and feeds air to the actuating cylinder **94** for the sweep-arms **91** and **92.**

As can best be seen in FIG. **7,** when the two folding wings **82** and **83** come in, and the elevator **18** moves up to tightly fold the wrapper **48** at the upper front and back conrers of the ends of the stack or ream, the leading margin **50** of the wrapper **48** lies down loosely on the upper surface of the ream but the end of the trailing margin **49** is caught on the temporary catch **110** in order to prevent the glue spread across its now undersurface near its edge, from contacting the upper sheet of paper in the ream.

When the front sweep-arm **91** swings downwardly, to sweep the leading margin **50** of the wrapper **48** tightly over the top sheet of the ream, vacuum is applied to the front sweep-arm **91** and the leading margin **50** of the wrapper **48** is snugly swept over the top of the ream. The rear sweep-arm **92** follows immediately and sweeps the trailing margin **49** downwardly and forwardly sliding it off of the temporary catches **110** and pressing it over the now rearwardly extending edge of the leading margin **50** of the wrapper **48.** The wrapper and ream are now in Position R-3. The rear sweep-arm **92** is resiliently urged against the edge of the trailing margin **49** by the springs **109***a* to seal the glue line.

When the rear sweep-arm **92** reaches its lowermost position, it actuates a limit switch LS-15 which opens a holding circuit to release the valves for cylinders **153** (FIG. **4**) which actuate the folding wings **82** and **83.** These valves are biased toward "open" so they then feed air to the cylinders **153** and the two folding wings **82** and **83** are swung out. The sweep-arms **91** and **92,** respectively, actuate two additional limit switches LS-16 and LS-17 which cause the valves to feed "up" air to the cylinder **71** to raise the elevator **18** and the third conveyor **66** to its uppermost position, restoring the upper level of the belts **77** of the third conveyor **66**

to the main level of the machine. When the elevator **18** reaches the uppermost position, the upper elevator limit switch LS-**10** starts the third conveyor **66** to feed the now girth-wrapped package off of the elevator **18**.

When the ream and wrapper **48** first were moved onto the third conveyor **66**, and up against the movable package stops **149**, the edge of the ream extended over the stops **149** to hold the stops **149** down. They cannot be swung up until the third conveyor **66** moves the wrapped package off of the elevator **18**. The linkage leading to the package stops **149** is so arranged that a limit switch LS-**18** is maintained in position to hold in the circuit which allows the elevator upper limit switch LS-**10** to initiate the movement of the belts **77** of the third conveyor **66**. If, for some reason, the girth-wrapped package had been shifted backwardly so that the package stops **149** were swung up by their biasing springs (not shown) the safety limit switch LS-**18** would have disabled the circuit through the limit switch LS-**10** so that when the elevator **18** reached its uppermost position and actuated the upper limit switch LS-**10**, the belts **77** of the third conveyor **66** on the elevator **18** would not start. The circuit is also such that the mechanism **150** which actuates the package stops **149** is held in electrically until the now girth-wrapped package has moved far enough off of the third conveyor **66** to release the trigger of the limit switch LS-**9**. After the girth-wrapped package passes the trigger of the limit switch LS-**9**, and the package releases the package stops **149** which swing upwardly. The circuit thus controlled allows the limit switch LS-**9** to start the third conveyor **66**. Conversely, of course, if the package stops **149** were up, the fact that the package would still be holding the limit switch LS-**18** in its closed position would prevent the third conveyor **66** from starting.

Assuming that the girth-wrapped package is fed off of the third conveyor **66** as described above, it moves on to the belts **112** the fourth conveyor **19**. The fourth conveyor **19** runs continuously while the machine is energized unless it is deliberately de-energized, as will be described below. As the girth-wrapped package moves along on the belts **112** of the fourth conveyor **19**, it moves in under the end of the overhead paddle conveyor **20**. The package reaches Position R-**4** and its leading edge strikes a trigger of a limit switch LS-**19** that is located between the belts **112** of the fourth conveyor **19**. Closing the limit switch LS-**19** applies power to the paddle conveyor **20** and one of the paddles **126** moves in behind the particular package to slide the package along the table **120** between the tuckers **131** and **132** and the shoes **136, 139, 140.**

The particular paddle **126** moves the package along between the guides **141** (see FIG. 1) and the front tucker plates **131** tuck in the front vertical webs **127** of the side margins of the wrapper **48**. The package continues to move until the paddle **126** engages a limit switch LS-**20** which stops the paddle conveyor **20** and the package, with the rear end of the package aligned with the double-bladed rear tuckers **132.**

Actuation of the limit switch LS-**20** also applies air to the tucker plate cylinders **135** which swing in the rear tucker plates **132** to tuck in the rear vertical webs **128** of the side margins of the wrapper **48.** When the rear tucker plates **132** complete their inward movement (illustrated as Position R-**5** in FIG. **3**) one of their blades **133** actuates a limit switch LS-**21** which reverses the air to the tucker plate cylinders **135** to move the rear tucker plates **132** outwardly and also reenergizes the overhead conveyor **20.** The paddle **126** moves the package from Position R-**5** a distance sufficient to clear the tucker zone and until the paddle **126** engages a limit switch LS-**22** which again stops the overhead conveyor.

During the movement of a particular package from Position R-**3** on the elevator conveyor **66** through Positions R-**4** on the fourth conveyor **19** and R-**5** for tucking, each intermittent movement of the overhead conveyor **20** has picked up a subsequent package with a subsequent paddle **126.**

Upon the next movement of the overhead conveyor **20,** the package at Position R-**5** is moved between the shoes **136** which fold down the upper horizontal webs **129** of the side margins of the wrapper **48.** The package then moves through Position R-**6** and the side margins of the wrapper **48** pass beneath the pressure plates **137** which press the margins flat. As the package moves on, its leading edge engages a trigger of a limit switch LS-**23.**

The limit switch LS-**23** energizes nozzle control solenoids of the glue applicators **138** to open their nozzles to spread lines of glue along near the outside edges of the lower horizontal webs **130** of the side margins of the wrapper **48.** As the package is moved past the glue applicators **138** its front edge engages the trigger of a limit switch LS-**24** which de-energizes the glue nozzle solenoids to shut off the glue.

The next cycle of the overhead conveyor **20** moves the package to Position R-**7** between shoes **139** which fold the lower horizontal webs **130** of the side margins of the wrapper **48** up against the sides of the package and then fold them over the top and press them down to seal the flaps.

The next movement discharges the package from the machine.

If a girth wrapped package, in moving from Position R-**4** toward Position R-**5** should be cocked sideways, it would jam between the elongated guides **141.** In such event continued pressure of a paddle **126** on the rear of the package causes the package to buckle sufficiently to depress a trigger of a limit switch LS-**25** which protrudes upwardly through the table **120** but which is not actuated when a package slides over its trigger in normal operation. Actuation of the limit switch LS-**25,** has two effects:

1. The circuit to LS-**19** is disabled which prevents the overhead conveyor **20** from starting again when LS-**19** is actuated by the next package.

2. The circuit to LS-**10** iis disabled so the third, or elevator, conveyor **66** does not start when a subsequent package is brought up to table level and the elevator actuates LS-**10.** When such a jam occurs, the operator de-energizes the fourth conveyor **19.** With the third and fourth conveyors **66** and **19** and the overhead paddle conveyor **20** all stopped, the jammed package may be removed.

What I claim is:

1. In a machine for wrapping rectangular objects, in combination,

a. a longitudinally extending machine frame,

b. an object receiver at one end of said frame,

c. object feeding means supported on said frame for moving objects away from said receiver,

d. cycle initiating mechanism responsive to the arrival of an object at a predetermined location on

said object receiver for energizing said object feeding means.

e. a wrapper supply roll and means for feeding wrapper material from said roll and beneath the object,

f. first conveyor means for feeding the object and the wrapper material together along said frame with the wrapper material on said conveyor means and the object positioned on the wrapper material at a place to provide a leading margin of wrapper material extending ahead of the object,

g. a cutter for cutting off the wrapper material along a line spaced from the rear end of the object for forming a trailing margin of wrapper material, the total length of the cut off wrapper material being selected to provide a wrapper for a particular object,

h. first control means responsive to the arrival of the object and the wrapper material at a selected position,

i. said first control means functioning for stopping said first conveyor means and for actuating said cutter,

j. means for applying a line of glue along the upper surface of one margin of the wrapper near the edge thereof,

k. upwardly inclined wrapper guides engaged by the leading margin of the wrapper prior to the actuation of said first control means, for lifting the leading margin of the wrapper off of said conveyor means,

l. an overhead feeding means engageable with the top surface of the object and means for driving said overhead feeding means at the same lineal speed as said belt means, said overhead feeding means being actuated concommitantly with said conveyor means,

m. second control means actuated by said cutter upon completion of a cutting action of said cutter for re-energizing said conveyor means and said top feeding means,

n. a wrapper girth-seal station on said frame,

o. additional conveyor means energized by said second control means for feeding the wrapper and object to said station,

p. means actuated by arrival of the object at said staion for folding the leading and trailing margins of the wrapper up and around the forward and rear ends of the object, respectively,

q. and means for sequentially sweeping the leading margin of the wrapper and the trailing margin of the wrapper on and over the top surface of the object with the glued edge of said one margin of the wrapper overlying the edge of said other margin of the wrapper.

2. A machine according to claim **1** in which the object receiver is a horizontal table adjacent the onside of the first conveyor means.

3. A machine according to claim **1** in which the means for applying a line of glue is adjacent the cutter and the glue line is applied across the surface of the trailing margin.

4. A machine according to claim **1** in which the cutter is mounted on a carriage and track means for guiding said carriage and said cutter along a path extending perpendicularly across said frame.

5. A machine according to claim **2** in which the object feeding means includes rollers mounted to move into and out of engagement with the underside of the object for feeding the object off of said table when engaged therewith.

6. A machine according to claim **1** in which said means for feeding a wrapper material from the supply roll comprises a feeding roller and a nip roller adjacent the first conveyor means for feeding the wrapper material upwardly and forwardly with and under the object, a motor for rotating said supply roll and signal means located between said feeding roller and said supply roll for controlling said motor to unwind a length of wrapper off of said supply roll.

7. A machine according to claim **6** in which the signal means comprises a vertically movable dancer roll that is engaged with the upper surface of the wrapper material and limit switch means effective at the lower end of the path of vertical movement of said dancer roll for energizing the wrapper roll motor when said dancer roll is lifted by the feeding of the wrapper material by said feeding roller and de-energizing said wrapper roll motor when said dancer roll is lowered by the feeding of wrapper material off of said wrapper roll.

8. A machine according to claim **7** and a manually actuated control circuit for energizing said wrapper supply roll motor and said wrapper feeding roller for feeding wrapper off of said wrapper supply roll independently of said cycle initiating mechanism and said limit switch means.

9. A machine according to claim **1** in which the glue applying means is mounted on the carriage and travels with said cutter across the frame for applying the glue line adjacent the trailing edge of the trailing margin of the wrapper.

10. In a machine according to claim **1**, wrapper slitters for trimming the edges of the wrapper material to a width selected for the width of the object being wrapped, said slitters being mounted for simultaneous opposite adjustable movement laterally relative to said machine frame.

11. A girth seal station for a wrapping machine, said machine having preceding means and mechanisms for positioning an object on a wrapper in a position whereby the wrapper has a leading margin extending ahead of the object, a main portion underlying the object and a trailing margin extending backwards from the object, the wrapper having a total length equal to the girth of the object plus a quantity for overlapping the ends of the wrapper, and the machine has means for applying a glue line along the edge of one margin of the wrapper; said station comprising in combination,

a. an elevator frame,

b. belts having webs extending longitudinally along the top of said frame,

c. means for driving said belts for moving the wrapper and object onto said frame,

d. means for stopping the object at a predetermined position on said frame with the leading margin of the wrapper bent loosely up along the front end of the object,

e. means responsive to the arrival of the object at such position for lowering said frame,

f. folding wings extending across the front and back of said frame and spaced from each other a distance to embrace the front and back ends of the object, said wings having inwardly extending lips at their upper ends,

g. means for swinging said wings toward each other for folding the wrapper around the lower edges of the front and back ends of the object,
h. means for moving said frame unwardly until the upper edges of the ends of the object engage the under sides of said lips on said wings for folding the wrapper tightly around said upper edges,
i. a transversely extending front sweep bar mounted for movement from an elevated position downwardly and rearwardly over and in sweeping contact with the leading margin of the wrapper for spreading the leading margin rearwardly over the top of the object,
j. a rear sweep bar similarly mounted for movement from an elevated position downwardly and forwardly into sweeping contact with the trailing margin of the wrapper for spreading the trailing margin forwardly over the top of the object, the edges of said margins being overlapped, and pressing the overlapped edges together for sealing the same,
k. mechanism for sequentially moving said front and rear sweep bars,
l. and means for moving said sweep bars back to their elevated positions, raising said frame and moving said belts for discharging the girth wrapped object from said station.

12. A mechanism according to claim **11** in which the front sweep bar is a tube having a plurality of orifices along its length at approximately the line of tangency to the wrapper when the wrapper is spread over the object, and a vacuum line connected to said tube.

13. A machine according to claim **12** in which the elevator frame has spaced front and back cross members, and support pulleys rotatably mounted on the respective cross members for the belts which extend therebetween and in which the respective one of the folding wings and the adjacent cross member are adjustably movable toward and away from the other of said cross members and wings longitudinally of said machine for selectively spacing said folding wings from each other for accepting objects of different lengths.

14. In a machine according to claim **11**, the improvement consisting of a temporary catch means positioned above the elevator frame for catching and holding that margin of the wrapper on which the glue line has been spread above the object, after the wrapper has been folded around the upper edges of the ream.

15. A method for wrapping a stack of paper sheets which consists in the steps of:
a. feeding a wrapper that is wider than the stack, thereby providing end seal portions, and that is longer than the girth of the stack, whereby the ends thereof may be overlapped to form a transverse girth seam, from beneath the front end of the stack to extend a leading margin of wrapper ahead of the stack,
b. feeding the stack onto and with the wrapper until the stack and wrapper are moved a distance to provide a trailing margin of wrapper behind the stack,
c. cutting off the wrapper at the rear edge of the trailing margin,
d. applying a line of glue across one of said margins adjacent the edge thereof,
e. loosely folding the leading margin of the wrapper up around the leading end of the stack and backwardly over the top thereof,
f. tightly folding the wrapper at and around the top and bottom edges of the front and back ends of the stack,
g. sweeping the other one of said margins of the wrapper over the top of the stack while holding the glued edge of the said one margin above the stack,
h. moving a transversely extending perforated tube along the surface of said one margin of the wrapper while drawing a vacuum in the tube for increasing the sweeping friction against the wrapper, for sweeping the said one margin of the wrapper over the top of the stack and over the end of the other one of the said margins of wrapper for overlapping the ends of the margins of the wrapper with the glue line lying therebetween and leaving the end seal portions of the wrapper extending beyond the stack as two vertical and two horizontal webs and
i. sequentially folding in the vertical webs of the end seal portions of the wrapper, folding down and up, respectively, the horizontal webs of the end seal portions of the wrapper while spreading a glue line on one of said horizontal webs and overlapping said horizontal webs with the glue line therebetween for sealing the ends of the wrapper.

16. A machine for wrapping reams of paper sheets, said machine comprising, in combination,
a. a longitudinally extending frame,
b. a wrapper supply roll journalled in said frame,
c. means for unrolling and cutting off a measured length of wrapper,
d. a girth seam station on said frame,
e. means for feeding such length of wrapper and a ream of paper sheets resting thereon with margins of the wrapper extending outwardly from the edges of the ream on all sides, along said frame and to said girth seam station.
f. means for loosely laying the front margin of the wrapper back over the front end and top of the ream of sheets,
g. means actuated upon arrival of said ream at said station for tightly folding the front and rear margins of the wrapper at the upper and lower edges of the front and rear ends of the ream along parallel fold lines extending across said frame,
h. means actuated immediately thereafter for sequentially sweeping the front margin of the wrapper over the top sheet of the ream and for sweeping the rear margin of the wrapper forwardly over the top sheet of the ream and overlapping the edge of the front margin of the wrapper along a girth seam extending across said frame,
i. tuckers and folding shoes mounted on said frame at opposite sides of said frame,
j. conveyor means energized by completion of said girth seam for moving the girth wrapped object away from said station and along a path between said tuckers and folding shoes for sequentially tucking in the margins of the wrapper at the top and bottom of the sides of the object.

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