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Middleton

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[54] **TRANSVERSING MECHANISM FOR ADHESIVE APPLICATION**

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[52] **U.S. Cl.**.....**118/315,** 118/323

[51] **Int. Cl.**.....**B05c 5/00**

[58] **Field of Search**.....118/315, 323, 411, 412; 83/300, 303

[56] **References Cited**

UNITED STATES PATENTS

1,835,402	12/1931	Juers	118/323
1,929,896	10/1933	Merritt et al.	118/323
3,516,849	6/1970	Shank et al.	118/323
3,620,188	11/1971	Schmitzer	118/323

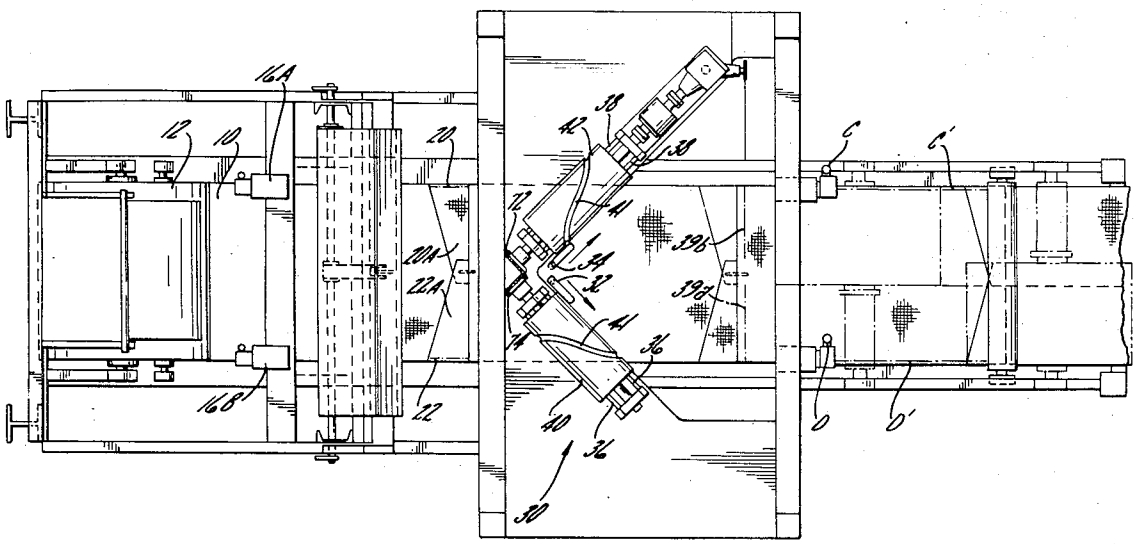
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[57] **ABSTRACT**

An automatic adhesive applicator for applying successive transverse adhesive strips on a continuously moving web. An adhesive dispenser is mounted for reciprocating movement along a predetermined path extending transversely of the continuously moving web. The dispenser includes a rotatable cam follower adapted to engage cam surfaces located in the outer surface of a rotatable cylinder which operates to drive the dispenser back and forth along the predetermined path. The cam surfaces operably drive the dispenser at a constant speed along that portion of the path during which adhesive is dispensed, and return the dispenser at a constant speed along the same portion of the path. At each end of the path, the cam surfaces reverse the direction of the cam follower and therefore the dispenser with harmonic motion to permit reliable high speed operation with minimum stress and wear on the equipment.

9 Claims, 8 Drawing Figures



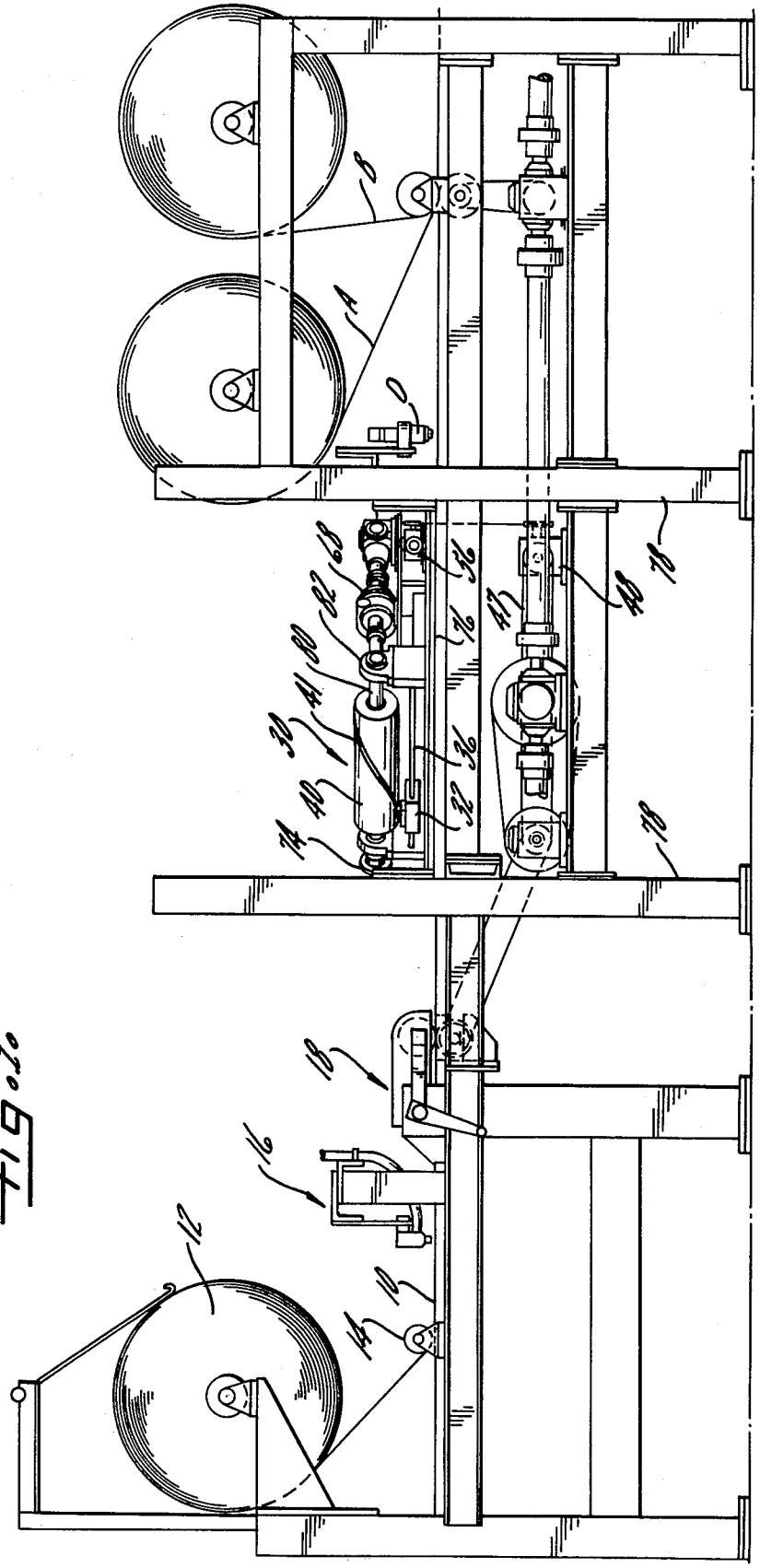


Fig. 1

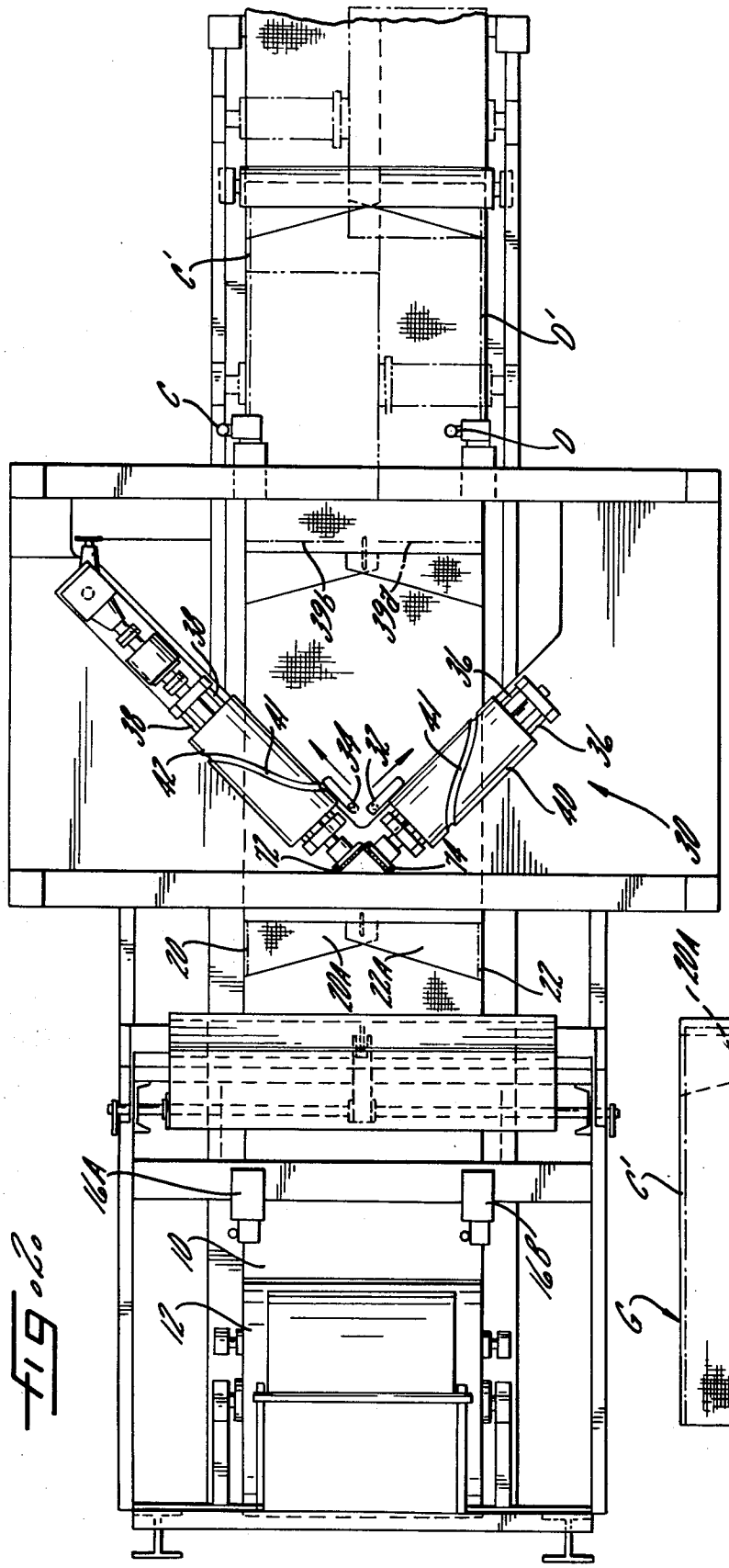

C'
D'
C
D
38
38a
38a
36
38
44
44
42
34
36
40
30
12
14
20
20A
22A
22
16A
16B
10
12

FIG. 2a

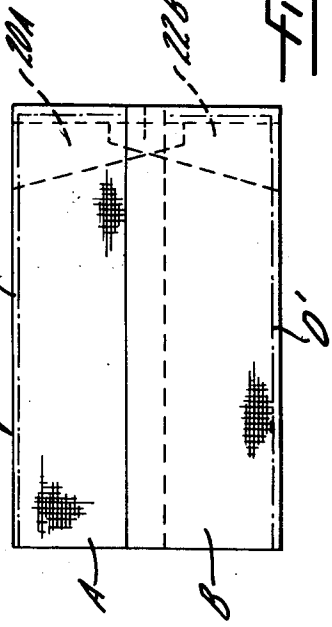

20A
22B
C'
D'
G
A
B

FIG. 3a

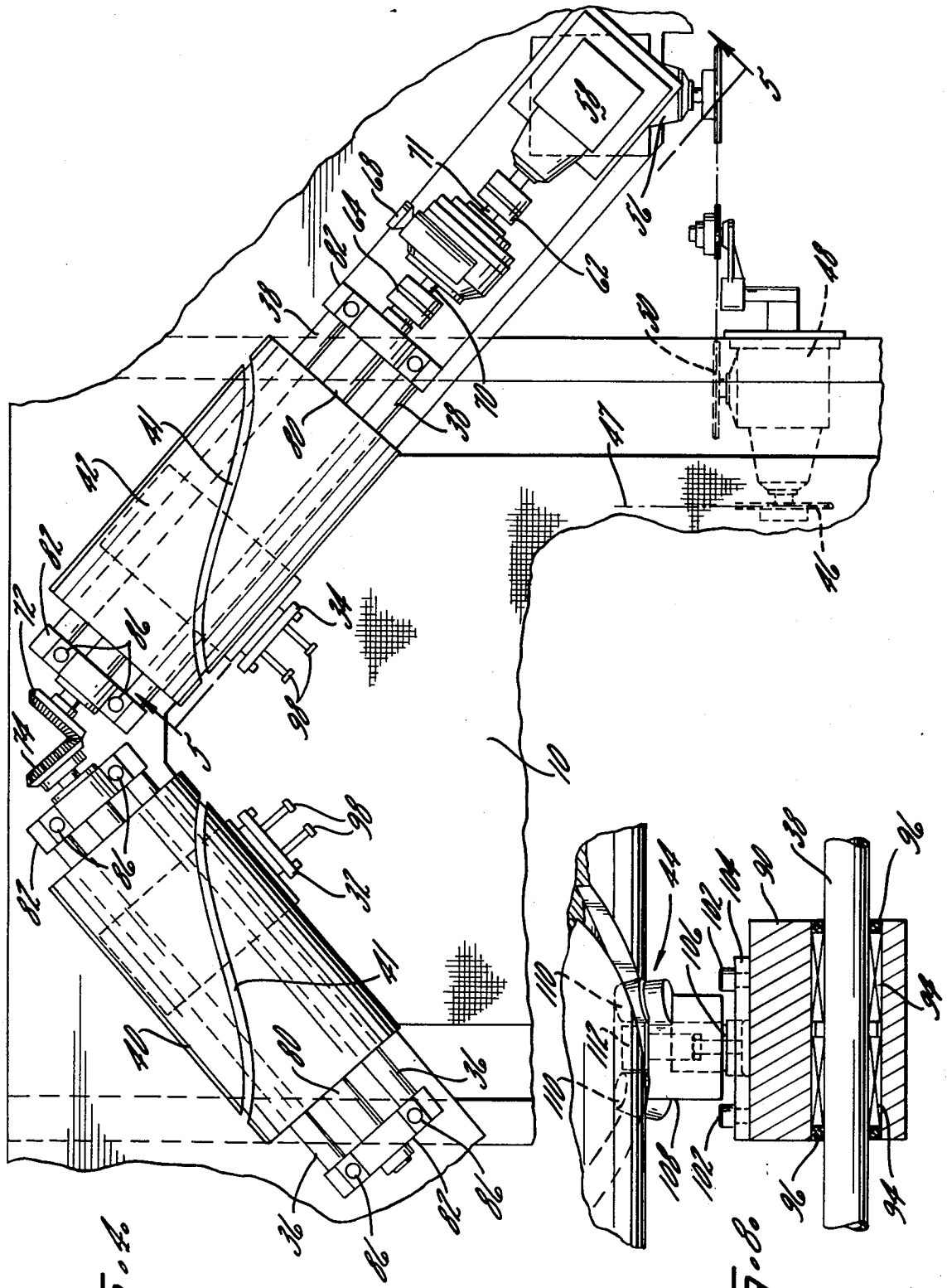


Fig. 4a

Fig. 6a

Fig. 5

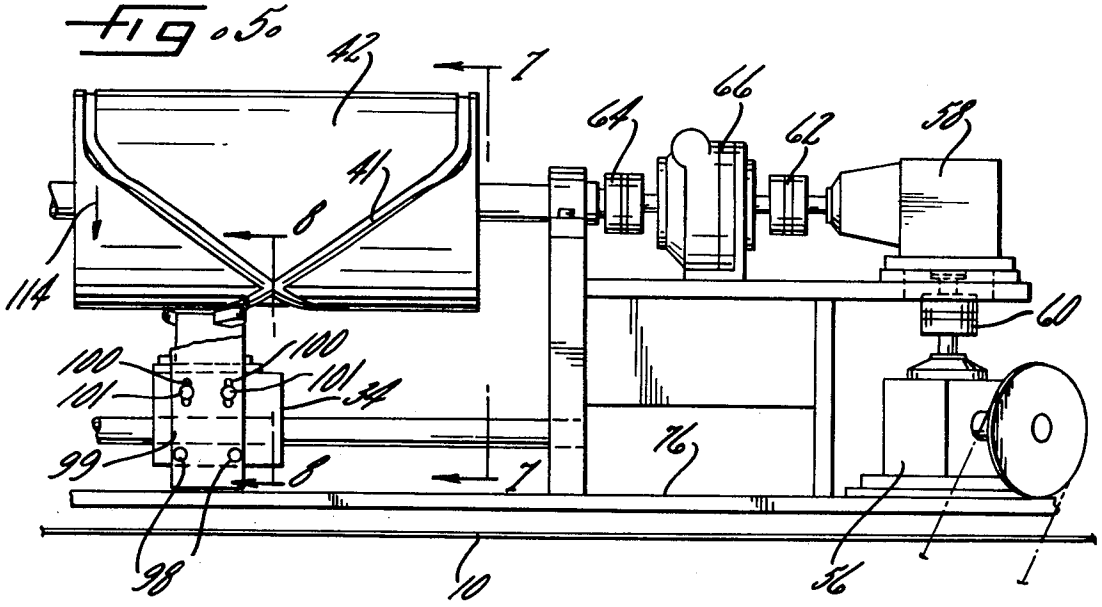


Fig. 6

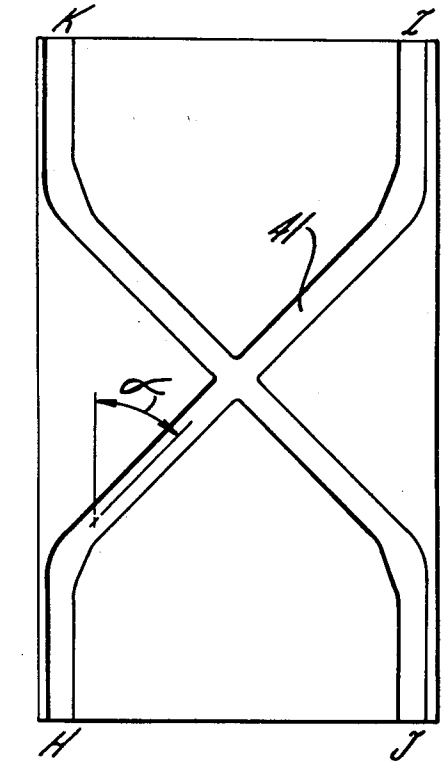
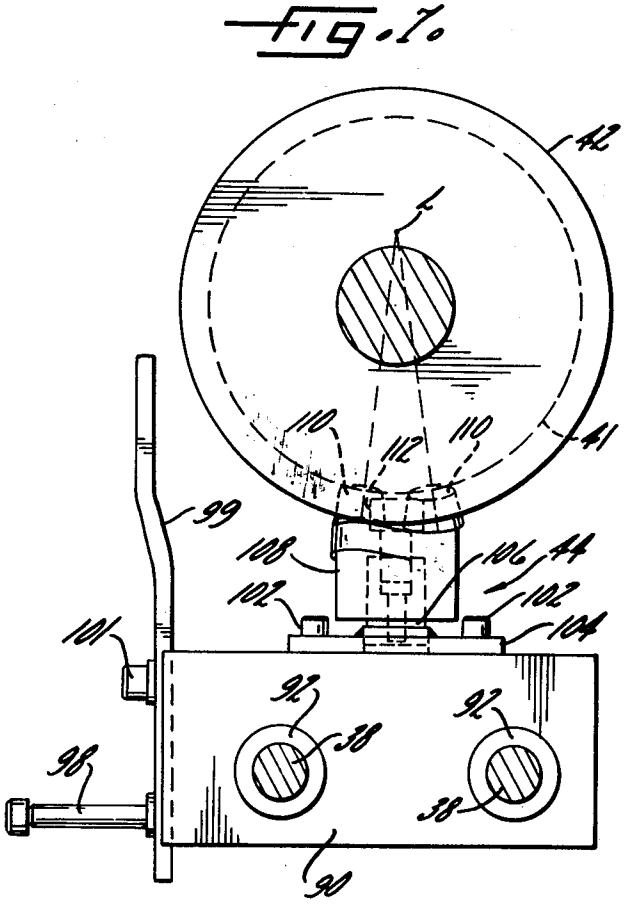


Fig. 7



TRANSVERSING MECHANISM FOR ADHESIVE APPLICATION

DESCRIPTION OF THE INVENTION

The present invention relates generally to automatic adhesive applicators, and, more particularly, to an improved automatic adhesive applicator for applying successive transverse adhesive strips on a continuously moving web.

It is a primary object of the present invention to provide an improved automatic adhesive applicator which is particularly adapted to apply successive transverse adhesive strips to a continuously moving web at high speeds and with accuracy, so that the web to which the adhesive strips are applied can also be advanced at correspondingly high speeds without sacrificing the quality of the adhesive strips being applied.

It is another object of the present invention to provide an improved automatic adhesive applicator of the foregoing type which provides reliably reproducable speeds over a large number of traverses of the adhesive applicator to provide successive uniform transverse adhesive strips along the length of the web or even a number of successive webs.

A further object of the present invention is to provide an improved automatic adhesive applicator wherein the dispenser is driven back and forth along a path of predetermined length and in which the dispenser includes a cam follower mechanism cooperating with a cylinder means having a pair of cam surfaces which, when the cylinder is rotated, drives the dispenser back and forth along the path.

Yet another object of the present invention is to provide an improved automatic adhesive applicator of the foregoing type, wherein the cylinder means is easily removable, thereby permitting the interchange of other cylinder means having different cam surface patterns so that the resulting transverse adhesive strips may be angularly varied or curved on the webs to which they are applied.

Still a further object of the invention is to provide an improved automatic adhesive applicator which reduces wear on all moving parts to provide reliable operation and a long operating life with minimum downtime.

Other objects and advantages of the invention will be apparent from the following detailed description taken in conjunction with the accompanying drawings in which:

FIG. **1** is a side elevation of an automated garment production line including a transverse adhesive applicator embodying the present invention;

FIG. **2** is a top plan view of the production line illustrated in FIG. **1**;

FIG. **3** is a plan view of a typical garment produced by the production line of FIGS. **1** and **2**;

FIG. **4** is a top plan view of a portion of the applicator of the present invention;

FIG. **5** is a plan view of a portion of the applicator of the present invention and is taken generally in the direction of the line **5—5** in FIG. **4**;

FIG. **6** is a plan view of an exemplary cam track path for the rotating cylinder that is useful in the applicator of the present invention;

FIG. **7** is a sectional view of a portion of the applicator illustrated in FIG. **5** and is taken generally along the line **7—7** in FIG. **5**; and,

FIG. **8** is a sectional view of a portion of the applicator illustrated in FIG. **5** and is taken generally along the line **8—8** in FIG. **5**.

While the invention is susceptible to various modifications and alternative forms, certain specific embodiments have been shown by way of example in the drawings which will be described in detail herein. It should be understood however, that it is not intended to limit the invention to the particular forms disclosed but, to the contrary, the invention is to cover all modifications, equivalents, and alternatives falling within the spirit and scope of the invention.

Turning now to the drawings, there is shown in FIG. **1** an automated garment production line including an automatic transverse adhesive applicator embodying the present invention. While the automatic transverse adhesive applicator provided by this invention is particularly useful in an illustrative application, it will be understood that the applicator can be used in a wide variety of different applications. In the illustrative production line, the transverse adhesive strips are applied to a continuously moving web **10** of disposable garment material unwound from a roll **12**. The web **10** is typically used to form the back panel of a gown G such as that illustrated in FIG. **3**. As the web is withdrawn from the roll **12**, it is passed under a guide roll **14** (FIG. **1**) and on through adhesive application and slitting stages designated by the reference numerals **16** and **18**, respectively. More particularly, longitudinal strips of adhesive **20** and **22** (FIG. **2**) are applied to the longitudinal edges of the web **10** by a pair of adhesive dispensers **16A** and **16B**; these longitudinal adhesive strips are spaced along the length of the web **10** for the purpose of bonding a pair of sleeve members **20A** and **20B** (FIGS. **2** and **3**) to the top surface of the web **10**. After application of the adhesive strips **20** and **22** the web **10** is passed through the slitting stage **18** for forming successive neck opening slits at regular intervals along the length of the web **10**. The sleeves **20A** and **22A** are then deposited on the web, by apparatus (not shown) in the positions illustrated in FIGS. **2** and **3**, after which the web is passed through the transverse adhesive application stage **30** to be described in detail below.

In the illustrative arrangement, the transverse adhesive applicator **30** deposits successive pairs of transverse adhesive strips on the web **10** for the purpose of forming shoulder seams between the web **10** and a pair of continuous secondary webs A and B unwound from rolls A′ and B′ and deposited on top of the primary web **10**. A pair of stationary adhesive dispensers C and D deposit continuous strips of adhesive C′ and D′ on the longitudinal edges of the web **10** and the overlying sleeves **20A** and **22A** so that the webs A and B are bonded to the web **10** along the longitudinal edges thereof as well as along the shoulder seams defined by the transverse adhesive strips. The continuous webs are subsequently cut transversely at regular intervals to form a plurality of simple disposable gowns G as shown in FIG. **3**, with the web **10** forming the front panel of the gown, and the webs A and B forming a pair of back panels. The gowns G in effect are manufactured inside-out which facilitates protection of the exterior surfaces of the gown in the event their sterilization is required, as in the case of hospital gowns for example.

In accordance with the present invention, the transverse adhesive applicator includes an adhesive dispensing means mounted for reciprocating movement along a predetermined path extending transversely to the continuously moving web, and adhesive is automatically dispensed from the dispensing means during a pre-selected portion of each traversing cycle. The dispensing means in the illustrated embodiment is driven at a constant speed during that portion of the advancing stroke of each traversing cycle when the adhesive is dispensed and during the corresponding portion of the return stroke during each cycle, and is reversed with harmonic motion at the end of each advancing and returned stroke. Thus, in the illustrative arrangement, a pair of adhesive dispensers **32** and **34** are mounted for reciprocating movement along a predetermined path, defined by a pair of fixed round way bars **36** and **38** as shown in FIGS. **1**, **2**, **4** and **5**. Because the mounting and drive arrangement for the two dispensers **32** and **34** are substantially identical, only one of the assemblies has been shown in detail in FIGS. **5**, **7** and **8**, namely, the assembly carrying the adhesive dispenser **34**. It should be understood, however, that the description thereof is equally applicable to the driving and mounting arrangement for the other dispenser **32**. It should also be appreciated that the term "transverse" as used herein refers to any path or line which intersects the longitudinal path of the continuously moving web **12**, whether it be a straight line at a definite angular orientation relative to the web or a curved line crossing the longitudinal path of the moving web. In the particular arrangement illustrated in the drawings, the transverse adhesive applicator assemblies are oriented so that the dispensers **32** and **34** traverse the path of the continuously moving web **10** at an angle of about 41.5°, and the speeds of the transversing dispensers **32**, **34** and the continuously moving web are adjusted so that the adhesive strips deposited on the web by the dispensers **32**, **34** extend at right angles to the longitudinal axis of the web **10**. This is clearly illustrated in FIG. **2** for example, where it can be seen that adhesive strips **39***a* and **39***b* deposited on the web **10** by the respective dispensers **32** and **34** extend across the web **10** at right angles relative to the longitudinal edges of the moving web for the purpose of forming the shoulder seams in the illustrative garment. However, it is to be understood that transverse adhesive strips of practically any desired angular orientation, even curved strips, may be applied to the web **10** by varying the relative speeds of the web **10** and the adhesive dispensers **32** and **34**.

In keeping with the invention, the traversing movement of the adhesive dispensers **32** and **34** along predetermined paths fixed by the way bars **36** and **38** are controlled by cam mechanisms that include a slot or groove **41** forming a pair of opposed cam surfaces which are cut or otherwise formed in the surface of each of a pair of elongated cylinders **40** and **42**, which are rotatably journaled substantially parallel to, but above the respective way bars **36** and **38**. The dispenser **34**, which is substantially similar to the adhesive dispenser **32**, includes a cam follower, indicated generally at **44**, engaging the cam surfaces of the cylinder such that rotation of the cylinder drives the cam follower and therefore the adhesive dispenser back and forth along the predetermined path, as is shown in FIGS. **1**, **2**, **5**, **7** and **8**.

In accordance with a further aspect of the present invention, the drive train for the cylinders and therefore the adhesive dispensers is synchronized with the movement of the continuous web **10** to which adhesive is applied. Thus, for the purpose of rotating the cylinders **40**, **42**, and referring to FIGS. **4** and **5**, a sprocket wheel **46** is connected by a chain **47** that is connected to another component of the production line. Rotation of the sprocket **46** drivingly rotates the cylinder **42** via a right angle gear box **48** and sprocket **50** which is, in turn, connected to an angular gear box **56** which drives the right angle gear box **58** through a flexible coupling **60**. To drive the cylinder **42** the gear box **58** is connected thereto through flexible couplings **62**, **64** positioned on opposite sides of a line phase shifting differential **66**. To adjust the position of the transverse adhesive strips being applied to the web relative to the web, the phase shifting differential **66** has a knob **68** which enables a variation of the angular position of output shaft **70** relative to input shaft **71** and thereby enables the accurate placement of the strips of adhesive relative to reference points on the web during production running. Cylinder **40** is connected to cylinder **42** through a pair of intermeshing bevel gears **72** and **74** having suitable press angles to accommodate the angle between the axes of the two cylinders.

The gear boxes **48**, **56**, **58** as well as the differential **66** are suitably bolted to a frame which includes a lower plate **76** extending across the width of the web **10** as well as a support frame **78** of the production line. The lower surface of the plate **76** is spaced sufficiently above the upper surface of the web to provide adequate clearance, say 1½ inch, but is also relatively close to the web to allow the dispensers to be spaced a distance of approximately one-fourth to one-half inch to permit the application of an accurate precise strip of fluid adhesive.

In accordance with another feature of the invention, provision is made for the cylinders **40**, **42** to be easily removed and replaced in the event differently configured garments are to be made which require variation in the spacing between successive adhesive strips, alteration of the angular orientation of the strips relative to the web, or the inclusion of a curved transverse strip. Such changes may be readily made by placing other cylinders having differently configured cam surfaces and, proper design of the cam surfaces enables a wide variety of differently configured adhesive strips to be applied to the web.

In keeping with the provision of the invention enabling the removal of the cylinders **40**, **42**, the cylinders are preferably fabricated to include integral shafts **80** journaled in bearing blocks **82** by means of thrust resisting bearings **84**. The bearing blocks are adapted to be mounted on the frame by bolts **86** as shown. Thus, it should be seen that each of the cylinders **40**, **42** can be easily removed for repair or replacement by removing four bolts **86** that secure the two bearing blocks associated with each of the cylinders.

In accordance with an important aspect of the present invention, the adhesive dispensing means **34** (which is substantially identical to the dispensing means **32**) includes a block **90** having a pair of apertures **92** which are adapted to receive sliding bushings **94** together with seals **96** positioned near the outer surface. The block is fitted on the way bars **38** and is

adapted to easily slide back and forth thereon. A pair of fluid adhesive dispensing guns **98** are mounted to a vertically adjustable bracket **99** having parallel vertical slots **100** through which set screws **101** are placed into suitable apertures within the block. The guns are connected to an adhesive supply by flexible tubing or the like (not shown). The guns are suitably controlled by a synchronized rotating cam limit switch (not shown) which is electrically connected to solenoid valves (not shown) that control the adhesive guns **98**. As previously mentioned, it is advantageous to have the guns closely spaced from the surface of the web, say approximately one-fourth to one-half inch, to insure that the strips of fluid adhesive are precisely applied and which have uniform width and distinct ends—that is, no adhesive drippings extending beyond the end of the adhesive strip when the guns are shut off. It should be realized that in the adhesive strip application being described, the placing of erratic or inaccurate strips of adhesive may result in a gown G having shoulder seams that are of inferior quality.

In keeping with yet another important aspect of the present invention, the adhesive dispenser **34** carries the cam follower assembly **44** which is securely bolted to the block **90** by bolts **102**. The cam follower assembly **44** includes a base plate **104** through which the bolts **102** are passed and also includes a shaft **106** that is perpendicularly mounted to the base plate **104**. Rotatably journaled on the shaft **106** is a cam follower block **108** that includes a pair of rotatable bearings **110** positioned on opposite sides of a third rotatable bearing **112**. All of the bearings **110, 112** are generally in line. Referring to FIG. **6**, an exemplary cam surface pattern of the groove **41** for the cylinders **40, 42** is illustrated. The adhesive dispenser is driven back and forth on the way bars by rotation of the cylinders, with the bearings **110, 112** of the cam follower being disposed between the cam surfaces of the cylinder. Referring to FIGS. **5** and **6**, rotation of the cylinder continually drives the cam follower back and forth along the predetermined path, the follower moving between points H-I-J-K-H for each two revolutions of the cylinder **42** rotating in the direction of the arrow **114** shown in FIG. **5**. During tracking -- that is, when the cam follower is moving transversely to the direction of the web, it is important that the pressure angle (the angle between the direction of the cam surfaces relative to a plane passing through the cylinder perpendicular to the axis thereof; shown as the angle α in FIG. **6**) should be within acceptable limits, for example, less than 45°, to minimize wear on the bearings **110, 112**. Thus, it may be required to vary the size of the roll in addition to the number of revolutions of the cylinder for a given repeat cycle of the dispenser reciprocating back and forth along the path to maintain the cam follower pressure angle within acceptable limits. It should be realized from FIG. **6** that the pattern of the cam surfaces is such that two revolutions of the cylinder drives the cam follower through a full reciprocal cycle along the path.

The portions of the cam surfaces that track the cam follower back and forth along the track are shown in the pattern of FIG. **6** to be straight lines. This results in the dispensers moving at a constant speed transverse to the web, assuming that the rotational velocity of the drum is constant. It should also be realized that varying the angular orientation of the cam surfaces during tracking will vary the transverse speed of the cam follower **44** and depending upon the particular results that are desired, a curved pair of cam surfaces during the tracking will produce a curved strip of adhesive on the moving web **10**.

Because the three bearings **110, 112** on the cam follower block **108** follow the curved surface of the cylinder **42**, the upper surface of the cam follower block adjacent the surface of the cylinder **42** is curved to generally correspond with the curvature of the cylinder. The outer pair of bearings **110** are generally disposed such that their axes point to the axis of the cylinder or slightly above it. The third inner roller **112** axis is in line with the axis of the shaft on the cam follower assembly piece plate and therefore always passes through the axis of the cylinder. Because the cam follower block rotates while the three bearings **110, 112** follow the cam surfaces, the outer pair of rollers **110** are angularly disposed such that their axes point directly to the axis of the cylinder during tracking. However, due to their angular orientation, when the cam follower is not tracking while the cylinder is rotating, the axis of the pair of rollers **110** will point to a position above the axis of the cylinder in the approximate area shown at L in FIG. **7**. Because of the changing of the angular orientation of the axes of the outer pair of bearings **110** relative to the axis of the cylinder, coupled with the fact that it is desirable to have the cam surfaces substantially perpendicular to a plane tangent to the surface of the cylinder at any given point, requires that the outer bearings **110** be tapered, having a smaller diameter at the end opposite the cam follower block **108**. Such tapering enables a relatively tight fit between the cam follower bearings and the cam surfaces which permits accurate tracking of the cam follower and thus precise placement of the strips of adhesive upon the relatively moving web.

As can be seen from the foregoing detailed description this invention provides an improved automatic adhesive applicator which is capable of applying successive transverse adhesive strips to a continuously moving web at high speeds, so that the web itself can be advanced at correspondingly high speeds. The dimensions of the other characteristics of the transverse adhesive strips may be controlled by a number of variables, such as the velocity of the transverse adhesive dispensers, which is controlled by the pattern of the cam surfaces as well as the rotational velocity of the cylinders and the speed of the web. The particular applicator provided by this invention provided reliably reproducable speeds over extended production periods, and insures successive formation of uniform adhesive strips. Furthermore, the applicator can be easily adjusted to vary the placement of successive adhesive strips relative to a given point on the moving web through the use of the phase shifting differential **66**. Moreover, the applicator can be efficiently manufactured from available and relatively inexpensive parts, and is adapted for relatively easy changeover to alter the shape of the transverse adhesive strips that may be necessary in the event the production line is utilized to produce differing products.

I claim as my invention:

1. An improved automatic adhesive applicator for applying successive transverse adhesive strips on a continuously moving web, said applicator comprising:

guide means extending transversely of at least a part of said web at an angle relative to the direction of the web;

an adhesive dispensing means mounted on said guide means for reciprocal movement along a path of predetermined length, said adhesive dispensing means being closely spaced from said web and adapted to apply a strip of adhesive to said web while transversing a preselected portion of said path;

drive means including a rotatable cylinder means positioned generally parallel to said guide means and operable to drive said dispensing means back and forth along said predetermined path when said cylinder means is rotated, the combination of movement of said dispensing means and the continuous movement of the web relative to said dispensing means being operable to apply adhesive to said web along a transverse path differnet from the path traversed by said dispensing means.

2. An improved automatic adhesive applicator as set forth in claim 1 wherein said drive means is continuously synchronized with the movement of said continuously moving web.

3. An improved automatic adhesive applicator as set forth in claim 1 wherein said dispensing means is in close proximity to the surface of said web such that precisely applied strips of adhesive having a uniform width and distinct ends are applied to said web.

4. An improved adhesive applicator as set forth in claim 1 wherein said rotatable cylinder includes a pair of cam surfaces extending substantially continuously around said cylinder means and between opposite end portions thereof.

5. An improved automatic adhesive applicator as set forth in claim 4 wherein said adhesive dispenser includes a cam follower assembly disposed between said cam surfaces of said cylinder means whereby rotation of said cylinder means causes said dispensing means to be driven back and forth along said path.

6. An improved automatic adhesive applicator as set forth in claim 5 wherein said cam follower assembly is positioned above said guide means and includes a pair of rotatable bearings positioned on opposite sides of a third bearing, said bearings being disposed between said cam surfaces mounted upon a rotatable cam follower block such that rotation of said cylinder means causes said bearings and cam follower block to rotate while said dispensing means transverses back and forth along said path.

7. An improved adhesive applicator as set forth in claim 6 wherein said third roller is directed toward the axis of said cylinder menas, and each of said pair of rollers are generally directed toward said axis, each of said pair of rollers being tapered in a direction toward said cylinder means.

8. An improved adhesive applicator as set forth in claim 4 wherein said cylinder means includes bearing blocks having bearings therein at each end thereof, said blocks being removably mounted to said applicator, such that removal of said cylinder means is easily facilitated.

9. An improved automatic adhesive applicator as set forth in claim 1 where said drive means includes a rotatable drive train for rotating said cylinder means, and said drive train includes a phase shifting means for shifting the location of said strip of adhesive in the web direction.

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