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Aaron et al.

[11] **3,773,594**

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[54] **MACHINERY AND PROCESS FOR ASSEMBLING A PRINTING MACHINE BELT**

[75] Inventors: **Charles Aaron**, West Caldwell; **Aimo K. Virta**, Warton, both of N.J.

[73] Assignee: **Midland-Ross Corporation**, Cleveland, Ohio

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[21] Appl. No.: **250,617**

[52] **U.S. Cl.**..... **156/299**, 156/302, 156/378, 156/386, 156/447, 156/471, 156/541, 156/552, 156/566, 101/DIG. 12

[51] **Int. Cl.**..... **B32b 3/10**, B41b 11/18

[58] **Field of Search**..... 156/299, 302, 370, 156/386, 391, 447, 471, 541, 566, 552; 101/382 R, 383, 384, 395, 415.1, 407 A, DIG. 12

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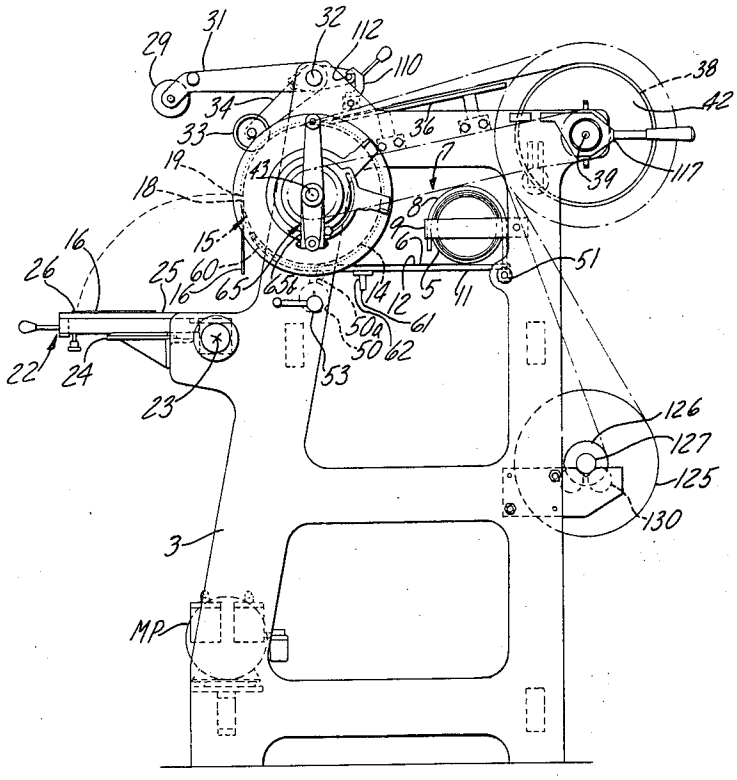
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Primary Examiner—Alfred L. Leavitt
Assistant Examiner—Frank Frisenda
Attorney—Woodrow W. Portz

[57] **ABSTRACT**

Machinery and process for attaching flexible printing plates to a flexible non-elastic base sheet under approximate conditions of deformation sustained by the printing belt of a belt-printing machine during operation. Provision is made for highly accurate locating and indexing of the plates relative to each other and the base sheet, and the attachment of such plates in successive groups wherein each group of plates is aligned transversely of the base and simultaneously attached thereto.

20 Claims, 9 Drawing Figures



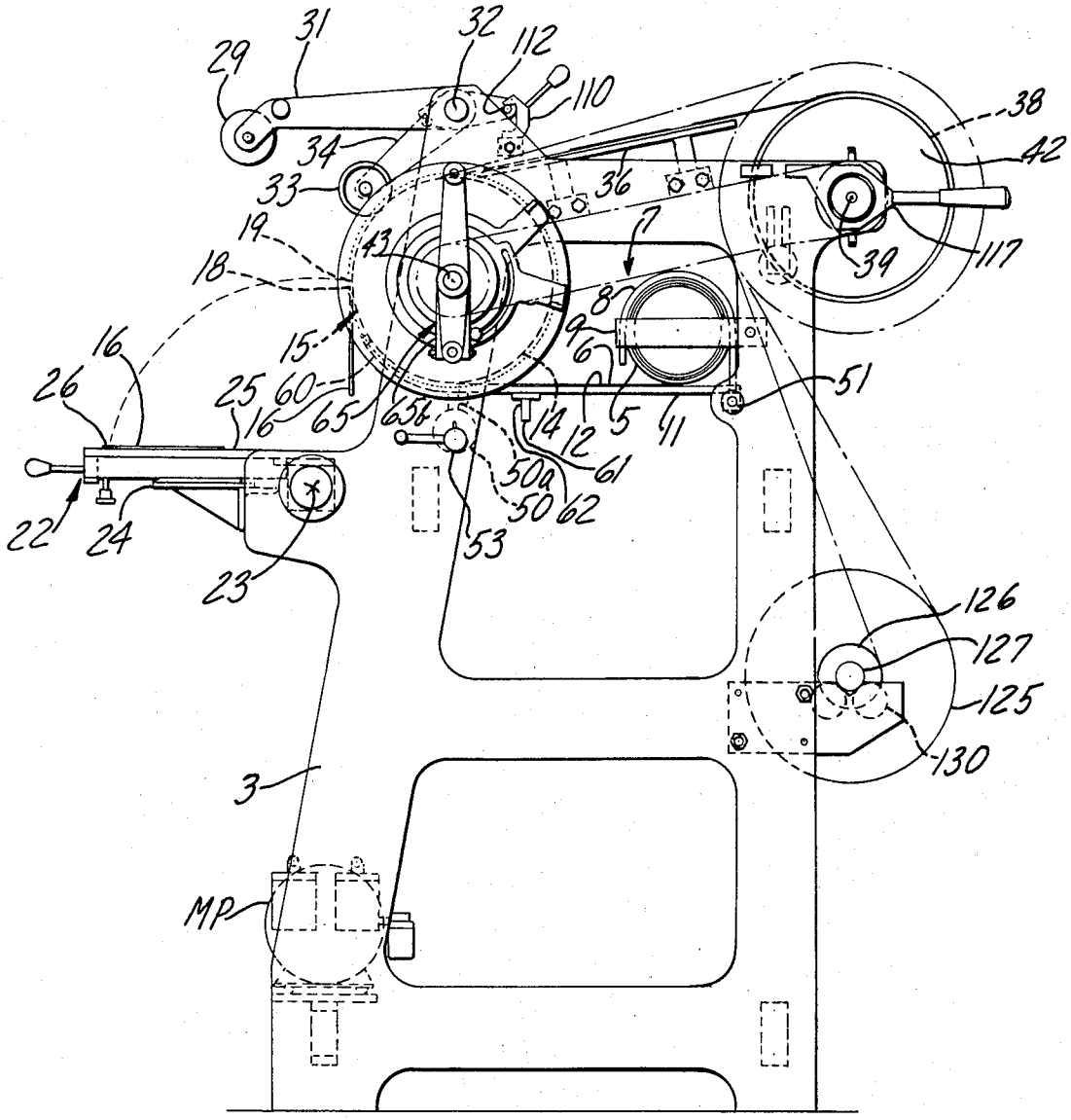

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65b
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FIG. 1

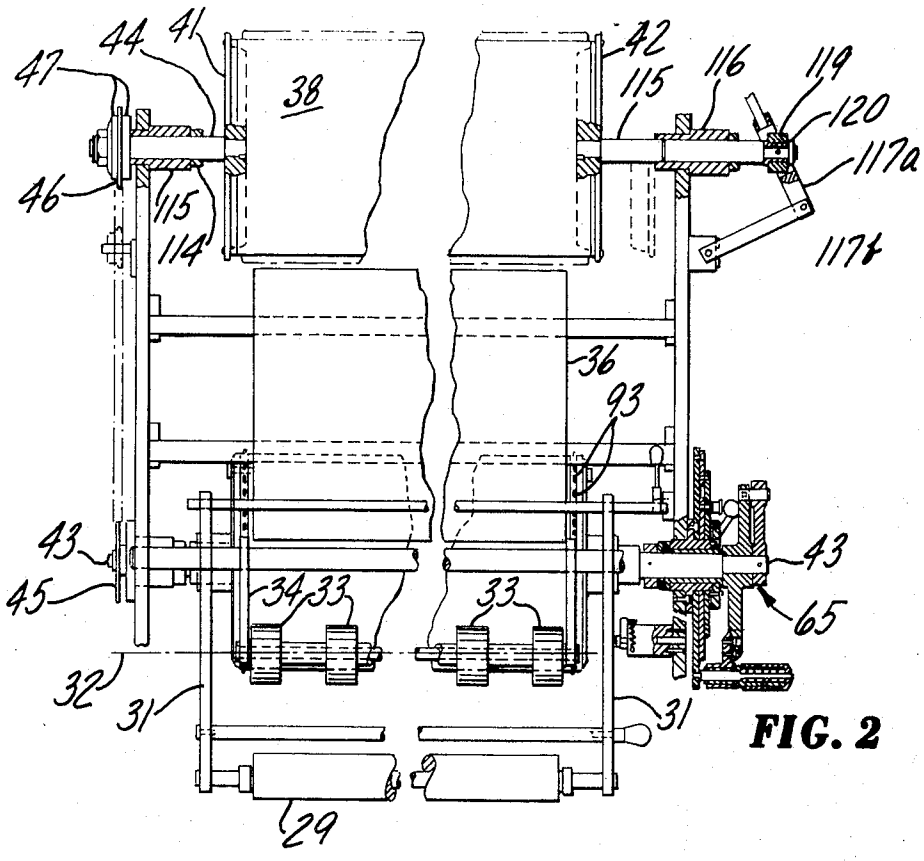

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117b
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FIG. 2

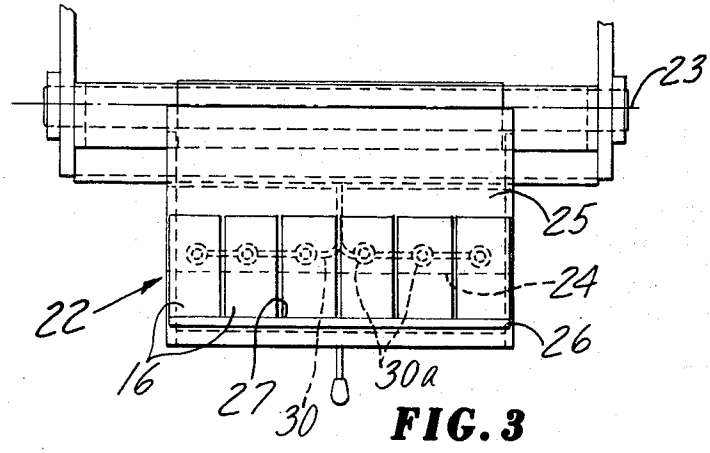

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FIG. 3

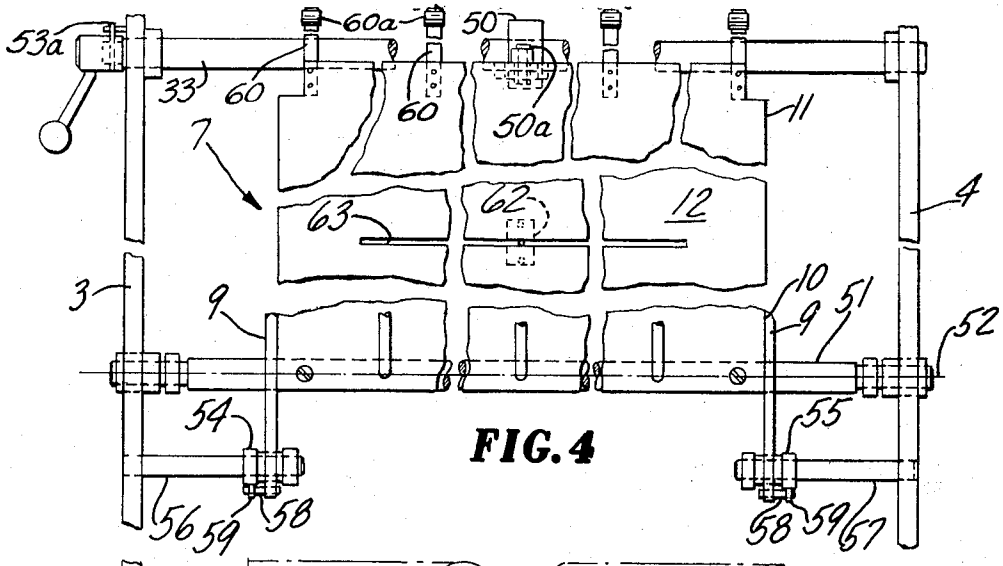


FIG. 4

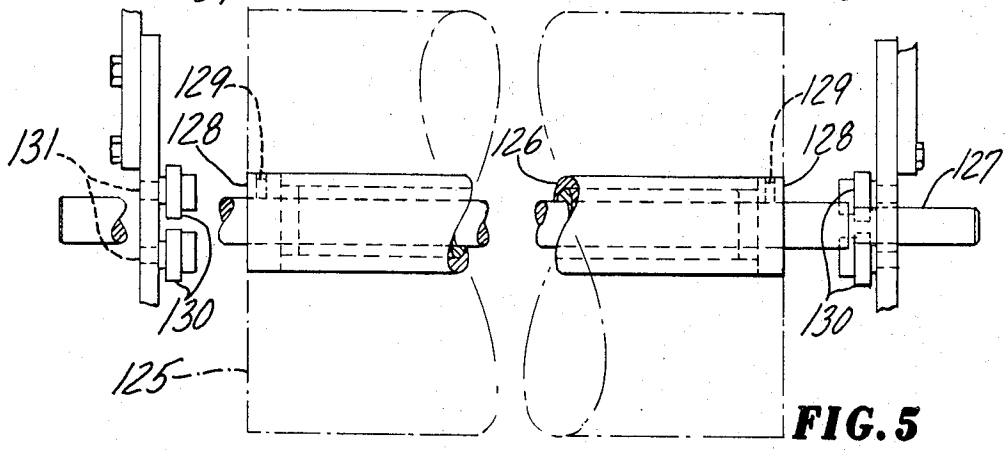


FIG. 5

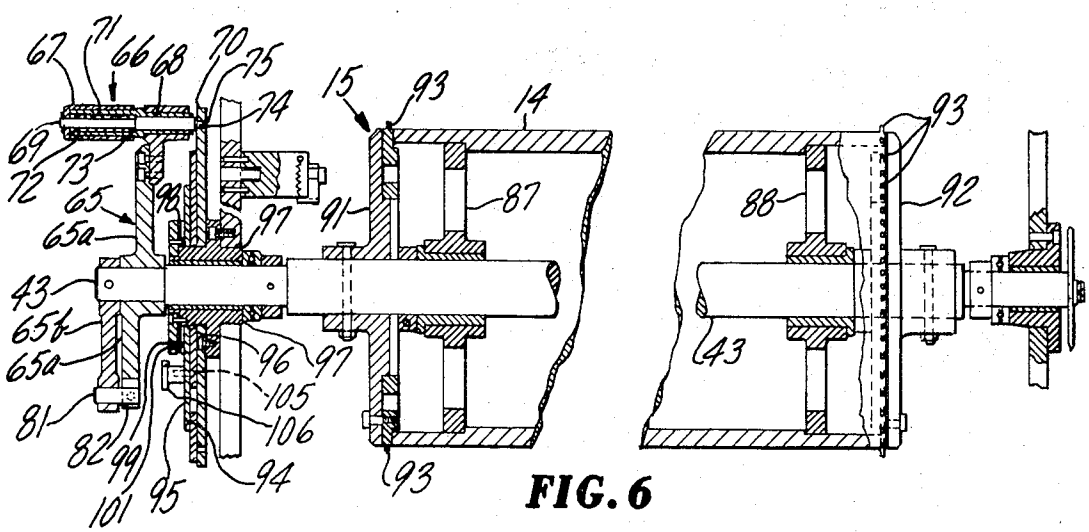


FIG. 6

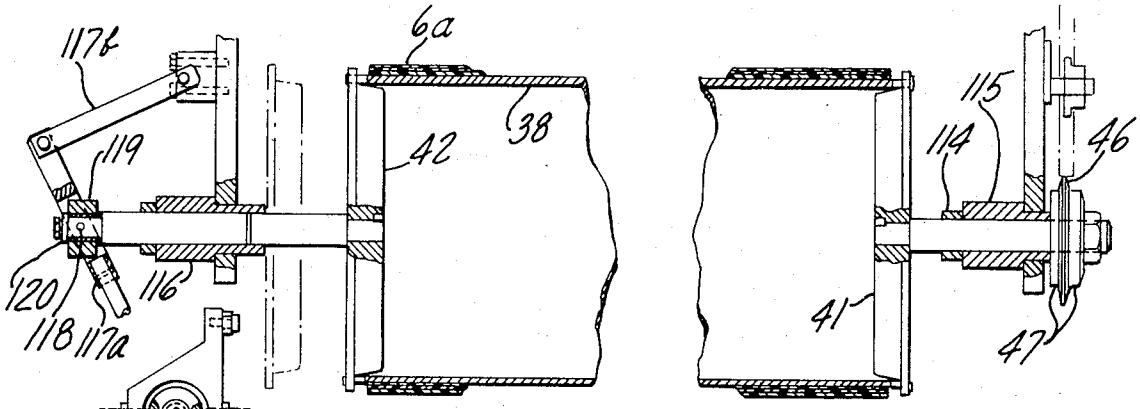


FIG. 7

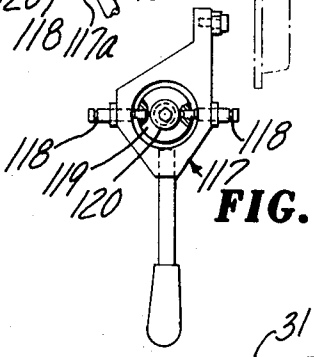


FIG. 8

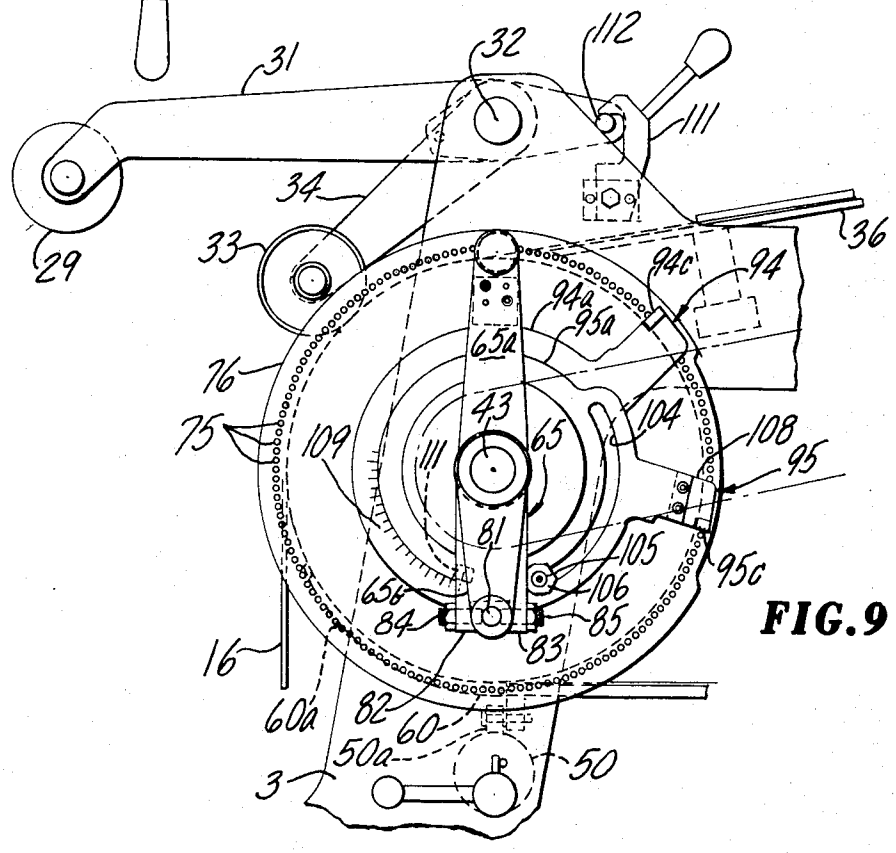


FIG. 9

MACHINERY AND PROCESS FOR ASSEMBLING A PRINTING MACHINE BELT

BACKGROUND OF THE INVENTION

The present invention arises out of the newly developing art of printing books by use of belt-printing machinery. In only very recent years has it been possible to operate belt-printers utilizing sprocket-driven, continuous flexible non-elastic sheet belts at high printing rates in the order of 1,000 feet per minute (f.p.m.). For a commercial printer to utilize such machines most effectively, it is desirable to be able to assemble many printing belts and maintain an inventory thereof for use as printing occasions arise. In the recent past, a great deal of time and labor has been expended in applying the printing plates which correspond to the various pages of the book to be printed to the belt base which may comprise, e.g., a polyester, such as a poly (ethylene terephthate) commercially known as Mylar. Such application, as assembly of the belt is normally accomplished, includes laying the base on a suitable flat surface and manually and very accurately positioning the plates on the base. Correction of position of any misplaced plate is difficult because of its strong adherence with the base. A common mode of rendering the plate adhesive is to apply a tape or film which has both sides coated with an adhesive to the backside of the plate.

Some disadvantages of present methods of assembling printing belts include a tendency for air bubbles to be captured between the plate and the base, distortion of the printing surface of the belt during printing, and the positioning inaccuracies and expense of correction entailed in a substantially manual procedure.

Hence, objects of the invention are to provide a process and apparatus which will avoid entrapment of air bubbles between the printing plates and the base sheet while assuring complete adhesion of the plates with the base; to reduce the cost of assembling printing belts; to increase accuracy of positioning the plates on the base; and to assemble the belt in a manner which will avoid distortion of the printing surfaces of the plates at the instant of printing.

SUMMARY OF THE INVENTION

The invention which accomplishes these and other objects resides in method and apparatus for assembling a printing belt, preferably within a single machine, in which flexible printing plates having adhesive back surfaces are fixed to a base sheet of flexible non-elastic material by (1) extending the base sheet around a lay-up cylinder in a taut condition; (2) pre-positioning and supporting one or more printing plates in a plane with the edges thereof which are leading with respect to the downstream direction or direction of movement of the belt in registry with a fixed registry line in its plane of support; (3) then maintaining the plates in the plane while moving them along a fixed path toward the cylinder to bring their leading edges into an initial contact of the plates with the cylinder along a stationary index line extending along the outer surface of the cylinder parallel to its axis; (4) cranking the cylinder with the belt base in positive driving or non-slip relation therewith to advance the belt base through angular movements which forward the belt through linear movement of one printing plate length; (5) controlling the magnitude of the incremental movements of the cylinder and the belt by angle-measuring indexing and stopping

mechanism acting between the machine frame and the adjacent end of the cylinder. As an important feature, the plates are progressively pressed against the cylinder by pressure applied to the plates along a continuous narrow area extending the full length of the index line in superimposed or immediate upstream relation therewith as the plates are advanced past the index line by rotation of the cylinder.

In a preferred practice, the belt is collected as assembling progresses in a coil wrapped onto a removable cylindrical core rotatably supported in the machine in drive relation with the lay-up cylinder. The printing plates are pre-positioned for attachment to the base sheet on a planate table supported in the machine to swing about one of its ends on an axis parallel to that of the cylinder to apply the leading edges of the plates to the belt base along the index line. The roll-down roll is supported on a frame also swingable on an axis parallel to the cylinder axis for movement into and out of contact with the cylinder adjacent said index line when the table is tilted out of a position of adjacency to the cylinder. To protect the plates wrapped within the coiled belt, the machine may also include structure for rotatably supporting a supply of film in a position wherein the film may be fed into the bite of the formed portion of the belt coil and that portion of the belt passing from the cylinder into the collected portion. Taut condition is maintained between the cylinder and the collection roll by a drive connection tending to drive the collection roll at a higher peripheral rate than the cylinder except for a slip-clutch mechanism. In the general arrangement of the machine, the working parts are located primarily between two spaced parallel planes with respect to various pivotal axes extending perpendicularly to the parallel planes.

In the drawing with respect to which the invention is described:

FIG. 1 is a side elevation of a plate lay-up machine in accordance with this invention;

FIG. 2 is a fragmentary laterally-shortened plan view of a portion of the machine of FIG. 1 including main frame portions, a lay-up cylinder, a belt collecting core and supporting structure, a plate roll-down roll and the frame therefor, hold-down wheels and the frame therefor, and a belt supporting stand;

FIG. 3 is a fragmentary plan view of the machine of FIG. 1 showing especially a pivoting-printing plate table and associated frame structure;

FIG. 4 is a fragmentary plan view of the machine of FIG. 1 showing its belt-base storage, a retarding platform, and a level adjuster for the platform;

FIG. 5 is a fragmentary plan view of a protecting film roll and storage structure therefor in the machine;

FIG. 6 is a fragmentary elevation and axial section of the lay-up cylinder and angle-measuring and indexing mechanism associated therewith;

FIG. 7 is a fragmentary view in axial section of a belt-collecting coil and supporting structure therefor including toggle lever core release mechanism;

FIG. 8 is a face view of the toggle lever mechanism shown in FIG. 7; and

FIG. 9 is an enlarged end elevation of the lay-up cylinder and the associated angle-measuring and indexing mechanism.

According to the complete arrangement of a lay-up machine of this invention as illustrated in FIG. 1, a coil 5 of continuous heavy gauge sheet 6 comprising a non-

elastic flexible material, e.g., a polyester, is stored in a cage 7 comprising a plurality of hooks 8, sideboards 9 and 10, and a sheet retarding platform 11 all located between parallel planate main frame members 3 and 4. The latter has an upper planate surface 12 which extends horizontally in substantially tangential relation with the coil-receiving region enclosed by the cage. The plane of the flat surface 12 is approximately tangential with a surface 14 of a lay-up cylinder 15 although the platform is not extended sufficiently far as to meet the surface 14.

The belt base 6 initially receives a transversely aligned plurality of plates, such as plate 16, along narrow area 18 having as its downstream boundary a stationary index line 19 which coincides with the downstream edges of the printing plates at the instant of application to the cylinder.

As one type of mechanism that may be used to apply the plates in the tangential manner just indicated, the pivoting-printing plate table 22, which pivots about an axis at 23 and normally rests in its horizontal position on a rest 24 receives the plates 16 with their adhesive faces facing upward on its top planate surface 25 against a rectilinear stop 26. The surface 25 is arranged with respect to axis 23 to assume a tangential relationship with the cylinder surface at index line 19 at which position the radially inward edge 27 of the stop becomes superimposed on the index line 19.

Underlying the plate which defines the surface 25 is suction means, such as a manifold 30 connected with a vacuum source (not shown) and terminating at a number of orifices 30*a* in the surface 25. Suction force is applied to the plates 16 through the manifold 30 to firmly hold them in position as the table is raised into tangency with the lay-up cylinder 15.

With the upper edges of a row of plates 16 adhered to area 18, vacuum is released in the manifold 30 and the table 22 is retracted to its horizontal position to leave the plates in tangential adhered relation with the cylinder 15. A rolldown roll 29, supported by a frame 31 for swinging with respect to a fixed axis 32 toward the cylinder surface 14 against a portion of the tangentially adhered plate 16 immediately adjacent the index line 19 is brought into position against the upper edges of the plates. The roll 29 comprises, e.g., a substantial outer layer of resilient material, such as soft rubber. The purpose of this rolldown roll is to progressively adhere the adhesive back or undersurface of the plate 16 to the surface of the belt base as the belt is advanced under the roll 29 by the clockwise motion of the cylinder 15. Progressive attachment of the plates such as just described accomplishes the highly desired result of avoiding entrapment of air bubbles between the belt and the plate.

To apply the next transverse row of plates to the belt, the rolldown roll 29 is retracted from the area 18 at the completion of such angular movement of the cylinder 15 as to cause the trailing edges of the row of plates being rolled down on the cylinder surface to clear the index line 19. In the practice of this invention such movement is a precise angular distance determined by angle-measuring and indexing mechanism shown on the foreground end of the cylinder in FIGS. 1 and 8.

As shown, holddown wheels 33 are mounted coaxially in a frame 34 pivoting independently of the frame 31 about the axis 32, capture the leading end of a belt base and thereafter hold succeeding portions of the belt into meshing relation with the sprocket teeth of the cylinder 15 and in alignment for passing over a belt supporting stand 36 fixedly mounted on the main frame. The latter is aligned tangentially with the peripheries of the cylinder 15 and a belt collecting core 38 suitably supported about an axis 39 by a pair of coaxial spaced core supports 41,42, bearing in the main frame for rotation about the axis 39. As shown in FIG. 2, the cylinder shaft 43 is connected to the stub shaft 44 of core support 42 by a sprocket drive consisting of a sprocket 45 fixed to the shaft 43, a sprocket 46 mounted on the stub shaft core support 41 in frictional drag relation with elements of a clutch 47 carried on the shaft 44. The drive arrangement is such as to drive the core at a greater peripheral speed than the cylinder except for speed equalizing action obtained by slippage of the sprocket 46 within the clutch 47. As shown, the belt supporting surfaces of the cylinder and the core have the same diameter. Hence, the sprocket 45 is slightly larger in diameter than the sprocket 46. The cylinder and core diameters may be varied with variation in the sprocket sizes as desired to maintain the drive potential for running the core at a higher peripheral speed than the cylinder.

Belt Base Storage and Transfer to the Lay-up Cylinder

FIG. 1 shows the belt base stored in a loose coil of sheet material within the cage 7, shown in more detail in FIG. 4, comprising a plurality of arcuately shaped hooks 8 fixed to a shaft 51 in rotatable bearing relation with the main frame of the machine along an axis 52 extending parallel to the axes of the various rotating and pivotal portions of the machine. As shown by FIG. 1, the inner radiuses of the hoops are centered at a distance approximately equal to the hoop radius from surface 12 of the platform 11 to complete a substantially cylindrical region for belt base storage.

The coil storage region is further defined by the sideboards 9 and 10, each of which is adjustable to a fixed position in respect to the horizontal transverse direction of the machine by fixing the positions of collars 54,55 on a stub shaft 56 or 57, respectively, fixed to the main frame along a common axis generally parallel to the other transverse axes of swinging or rotating parts of the machine. The angular movement of the sideboards 9, 10 about their common axis toward the platform 6 is limited by detent means comprising a pin 58 fixed in a hub portion of the sideboard and extending in the horizontal transverse direction of the machine. The elongate set screw 59 of the collar 54 in each case is positioned about the axis of the shaft 56,57 to engage the pins 58 at a desired operation of the sideboards. As shown, the detent means is arranged so that the sideboards extend in a horizontal longitudinal direction of the machine in substantially centered relation with the coil contained in the cage region. The coil 5 is insertable from a region laterally of the machine into the cage through an end thereof when one of the sideboards 9 or 10 is swung out of lateral proximity with the hoops 8. The sideboards are adjusted in a transverse direction of the machine to align the sheet being discharged from the coil 5 in good tracking relation of the belt base with its path over the lay-up cylinder 15.

A plurality of thin parallel arcuate leaf springs 60 are secured to the undersurface of the downstream end of the platform 11. The springs have felt pads 60*a* on the free end portions thereof which engage the outer surface of the belt base and force it against the surface 14

of the lay-up cylinder. The downstream end of the platform 11 is supported on a cam 50 through a smaller roller 50*a* rotatably attached to the platform so that the platform may automatically adjust laterally to a suitable tracking position for the belt base. The cam 50 is fixed to the shaft 53 which may be rotated out of stop position established by detent mechanism 53*a* to rotate the cam and lower the platform 11 and the springs 60 away from the cylinder periphery.

The sheet 6 is pulled from the sheet storage through rotation of the cylinder 15 under a condition of frictional drag intentionally imposed as the coil 5 unwinds while in contact with the inner periphery of the hoops 8 and establishes contact with the upper surface 12 of the platform. The sheet is dragged across the planate surface 12 to develop still more frictional drag. The drag is further increased through connection of a vacuum source, such as the motor-pump unit MP shown, with the inlet tube 61 of a manifold 62 having an elongate opening 63 in the surface 12. Such drag on the belt base in cooperation with the tension developed in the assembled portion of the belt proceeding from the cylinder to the core 38 maintains the belt base in a highly taut condition and good meshing relationship with the sprocket teeth of the cylinder in that portion of the belt base extending around the cylinder.

The Lay-up Cylinder and Angle-Measuring Mechanism

In practice, this taut condition of the belt base is maintained during motionless period of the cylinder since the basic propulsion unit of the machine, i.e., a crank lever 65, in fixed relation with the cylinder 15 is locked with the base frame of the machine. The crank comprises a handle 66 having its cylindrical grip 67 slidably mounted on a swaged tube 68. The grip is fixed to the end portion of a swaged concentric shaft 69 constantly urged toward a base plate 70 fixed to the main frame by a spring 71. This spring acts between a seat 72 fixed to the outer end of the tube 68 and a shoulder 72 of the shaft by a spring 71 to cause the shaft tip 74 to enter any one of a plurality of holes 75 located at quarter inch intervals along a circumference 76 of the stationary base plate 70 of the angle indexing mechanism.

The crank 65, considered in its entirety and comprising members 65*a* and 65*b*, is in fixed relation with the cylinder 15 by being fixed to the cylinder shaft 43 through the crank member 65*b* pinned thereto as shown. Member 65*b* is a simple radial arm provided with a crank pin 81 extending in the prevailing transverse axial direction of the machine into the region between fingers 82 and 83 of a radially projecting bifurcate portion of the crank member 65*a*. The diameter of the pin 81 is substantially less than the distance between the fingers 82 and 83. As the member 65*a* is freely rotatable upon the shaft 43, crank members 65*a* and 65*b* are relatively rotatable within the angular limits allowed by movement of the pin 81 between the fingers. Within this range of movement, a set screw 84 or 85 in each finger may be brought into engagement with the pin 81 to fix the relative angular positions of the crank members 65*a*,65*b*.

As shown especially in FIG. 6, the shaft 43 is fixed to the lay-up cylinder 15 supported in the main frame by substantial bearing structure providing against radial looseness and end play whereby the peripheral surface of the cylinder is supported against deviation from a desired path of revolution. As shown, the cylinder 15 is rigidly constructed with intermediate radial walls 87,88 and detachable end walls 91,92. The end walls have peripheral teeth 93 which are uniformly circumferentially spaced to mesh with corresponding apertures in edge margins of the belt base.

As FIGS. 6 and 8 show, the angle-measuring and indexing system for establishing precise movements of the cylinder 15 comprise a counterclockwise facing index arm member 94 and a clockwise facing index arm member 95. Each member has a hub portion 94*a* or 95*a*, respectively, in snugly rotatable relation with the cylindrical outer surface 96 of the shaft bearing 97 secured to the main frame. The index arm members are maintained in frictional relation with each other and with the stationary indexing plate 70 and a clutch facing 98 by an annular collar 99 secured to an end surface of the bearing 97. The clutch plate 98 is pressured against the axially outer index arm member 95 by a plurality of springs 101 located in axially opposite recesses of the clutch facing and the collar 99.

Thus, the index arms are movable together to any angle greater or less than 360° and are also relatively movable about the bearing 97. It is to be noted that member 95 has an arcuate slot 104 through which extends a stud 105 in anchored relation with the member 94; a pressure nut 106 is adjustable on the stud 105 to engage the outer surface of the member 95 to tighten the index members 94,95 together in a fixed relative adjustment. The member 95 has an outer arm element 108 bolted to its hub portion 95*a* to provide axial offset in the arm enabling element 108 to bear or ride against the index plate 70. A numerical scale 109 on member 94 and a radial indicia line 111 on member 95 is provided for the purpose of correlating the angular distance between arm edge 94*c* and arm edge 95*c* with the length of the book page to be printed or the length of the printing plate to be applied to the surface of the cylinder.

In the use of the arm members 94,95 they are relatively adjusted somewhat as shown to angular distances of edge 94*c* and 95*c* which correspond to an exact printing plate page length. As the printing plate page lengths are conventionally made up in lengths which are integer multiples of 1/4 inch increments, the edges 94*c* and 95*c* will always be adjusted into tangency with the adjacent holes 75 of, e.g., 5/32 inch in diameter. In initially applying plates to the cylinder, the tip 74 of the handle shaft 68 is entered into a hole which places a preselected point on the cylinder and the belt base carried thereon at the stationary index line 19. If there is slight mismatching of this point with the line 19, exact adjustment is obtained by adjustment of the set screws 84,85 to bring about a correction of angular relation between crank members 65*a*,65*b*. With the crank tip 74 so positioned, the index arms 94 and 95 secured together in relatively fixed relationship, are moved counterclockwise toward the now stationary crank until edge 94*c* engages the side of the tip 74.

The cylinder is now positioned for receiving plates from the table 22. The table 22 with plates thereon in registry against the indexing strip 26 is pivoted into tangency with the index line 19. Vacuum pressure used to hold the plate to the table is released and the table is returned to its horizontal position. The rolldown roll 29 is brought down into position on the plates now adhering to the cylinder along the area 18. The handle grip 67 is now pulled in a direction away from the plate 80

to pull the tip out of the hole **75** adjacent edge **94***c*. Then, the crank with the cylinder moving therewith is rotated while the arms **94,95** remain stationary to a position wherein the tip slides down the beveled edge **95***c* and into the adjacent hole **75.** During this movement the printing plates **16** have been rolled into complete adherence with the belt base **6** and the rolldown roll may be returned to its non-engaging raised position and secured therein by a latch **110** engaging a pin **112** protruding from the rolldown roll frame **31.** At this point the indexing arms locked together by the pressure nut **106** are rotated counterclockwise as viewed in FIGS. **1** and **8** to disengage the edge **95***c* from the tip **74** through perhaps a 330° angle or more until the edge **94***c* again engages the tip **74.** The machine is now ready to effect the next plate lay-up cycle.

Assembled Belt Takeup or Storage Mechanism

FIGS. **2** and **7** illustrate the construction of the belt-collecting core **38** and the supporting mechanism therefor. As the core and the collected belt **6**a wrapped thereon must be portable and easily removable from the machine, the core-supporting structure herein disclosed is of the type providing circular end supports **41** and **42** with support **41** being non-retractable by reason of a collar **114** fixed to its stud shaft **44** and in end bearing relation with the fixed shaft bearing **115.** Shaft **115** is axially adjustable relative to a bearing **116** fixed to the main frame through the use of a toggle lever **117***a* secured to the shaft by pins **118** in reentrant relation with a bearing **119** trapped on an end portion of the shaft by radially overlapping washer **120.** Another part of the toggle lever mechanism, link **117***b* connects the lever **117***a* to the end support **42.** As pointed out before, the core **38** is connected in drive relation with the cylinder **15** by a sprocket drive and clutch mechanism **47** tending to drive the core at a higher peripheral rate than the lay-up cylinder. When belt collection is completed, the toggle lever **117** is pulled outwardly to withdraw core support **42** and thus release the core and the belt wrapped thereon from the machine. Adhesive tape may be used to secure the ends of the assembled belt within the completed package comprising the core and the belt wrapped thereon.

Protecting Film and Storage Therefor

FIG. **5** illustrates structure for supporting a supply roll **125** of a protecting film which may be fed as a thin gauge sheet into the roll or assembled belt being collected on the core **38.** The film will ordinarily be supplied as a roll formed on a core **126** which must be taken in and out of the machine. As shown, a roll comprising a core **126** is supported on a free shaft **127** having collars **128** fixed thereto by set screws **129.** The collars **128** are removable from the shaft or adjustable therealong to position the roll if desired. The shaft is rotatably supported in the base frame by four rollers **130** rotatably mounted on suitable bearing and shaft structure **131** in turn mounted on opposite vertical walls of the main frame of the machine. The protective film unwraps from the core **126** and feeds upwardly into the bite of the core-supported wrappings of assembled belt and the portion of the belt feeding thereonto.

What is claimed is:

1. Apparatus for assembling a printing-machine belt comprising a base sheet and printing plates each having a printing face and an oppositely facing underside adhesively sensitive with respect to the outer plate-receiving side of said sheet, the apparatus being generally located between two spaced vertical planes and comprising:

sheet storage means for supplying a belt base sheet along a transverse plane perpendicular to said two planes;

a sheet-advancing cylinder located between said two planes on a fixed axis of rotation perpendicular to said planes with its periphery in tangential relation with said transverse plane, said cylinder and said base sheet being constructed to engage in positive drive relationship;

a plate-supporting platform having a planate plate-supporting surface adapted to accurately position one or more plates on said platform, and means for movably supporting the platform, said platform being movable by said supporting means to bring said surface into tangency with said cylinder with an edge of the surface in registry with a fixed index line extending lengthwise of the periphery of the cylinder;

pressing means for pressuring said plate into tight conformity with said belt along a rectilinearly continuous portion of said cylinder or a corresponding portion of the base sheet supported thereon in upstream parallel juxtaposition with said index line;

adjustable angle-measuring means comprising first indexing means on the cylinder and normally non-moving second indexing means supported adjacent the cylinder and cooperating with said first indexing means to indicate movements of said cylinder through a desired angle of rotation.

2. Apparatus for assembling a printing machine belt comprising a base sheet having rows of perforations along opposite edge portions adapting the belt to mesh with the teeth of spaced sprocket means and a plate-receiving surface between said rows, and printing plates having a printing face and an oppositely-facing underside adhesively sensitive with respect to the outer plate-receiving side of said sheet, the apparatus being generally located between two spaced vertical planes and comprising:

sheet storage means for supplying a belt base sheet along a transverse plane perpendicular to said two planes;

a sheet-advancing cylinder located between said two planes on a fixed axis of rotation perpendicular to said planes with its periphery in tangential relation with said transverse plane, said cylinder having sprocket teeth means at opposite ends spaced within the width of said sheet to mesh with said edge portions;

a plate-supporting platform located between said vertical planes and means for pivotally supporting the platform adjacent one edge thereof with respect to an axis perpendicular to said planes, said platform having a planate plate-supporting surface of which a radially outward portion is swingable into tangency with said cylinder along a fixed index line extending lengthwise of its periphery;

pressing means for pressuring said plate into tight conformity with said belt along a rectilinearly continuous portion of said cylinder or the portion of the base sheet supported thereon in upstream parallel juxtaposition with said index line; and

adjustable angle-measuring means comprising indexing means on the cylinder and normally non-moving indexing means supported adjacent the cyl-

inder for indicating movements of said cylinder through a desired angle of rotation.

3. The apparatus of claim 2 wherein:

said pressing means comprises a roll having a length at least as long as the width of said plate-receiving cylinder surface, and means for supporting the roll with its axis of rotation perpendicular to said vertical planes, said supporting means being operable to move the roll toward and away from the cylinder.

4. The apparatus of claim 3 wherein:

said roll comprises resilient peripheral material.

5. The apparatus of claim 1 wherein:

said sheet storage comprises coil-supporting, platform, and drag means arranged for unwrapping said sheet as said coil rotates and unwraps about a substantially fixed axis, said platform means defining said transverse plane and enabling said sheet to be passed thereover under a condition of frictional drag.

6. The apparatus of claim 5 wherein:

said drag means comprises recessed areas of said platform and vacuum means connected with said recessed areas.

7. The apparatus of claim 2 comprising:

coiling means in downstream spaced relation with said cylinder rotatable about an axis perpendicular to said planes for collecting assembled portions of said belt; and

said coiling means comprising a removable cylindrical core, axially-spaced stub shafts of which at least one is in drive relation with the cylinder, and annular end-capping core holders mounted coaxially on said stub shafts and being of a diameter to axially engageably overlap end portions of the core.

8. The apparatus of claim 2 comprising:

belt hold-down means and means movably supporting the hold-down means for movements into and out of contact with a peripheral portion of the cylinder or a belt portion supported thereon immediately downstream from said index line.

9. The apparatus of claim 8 wherein:

said hold-down means comprises a plurality of transversely spaced wheels in rolling contact with said cylinder or a belt portion supported thereon.

10. The apparatus of claim 2 wherein:

said pressing means comprises a roll of which its peripheral surface is formed of a resilient material; and

the apparatus further comprises a plurality of hold-down wheels mounted for rolling contact with a portion of the cylinder or a belt portion supported thereon in immediate downstream relation with said index line; and

separate frame and shaft means for said pressing roll and said hold-down wheels supported in said apparatus on a fixed common pivotal axis located in downstream relation with the hold-down wheels and in radial outward relation with the cylinder axis from said cylinder surface.

11. The apparatus of claim 2 wherein:

said angle-measuring means comprises a stationary endplate in lateral coaxial relation with said cylinder;

a first index arm pivotable about the cylinder axis and having a counterclockwise facing radial edge;

a second index arm pivotable with respect to the cylinder axis and having a counterclockwise facing radial edge located at the same radius as the first-named radial edge;

an arcuate slot on one of said arms with set screw means projecting through the slot attached to the other arm for fixing relative position of the arms;

frictional drag means in non-rotatable cooperating relation with the endplate for applying frictional drag to at least one of said index arms;

crank means for rotating the cylinder having a detent element reaching axially to engage said radial edges, said element being retractable to pass over said arms.

12. The apparatus of claim 11 wherein:

said plate has a circular row of equispaced apertures located along a full circle concentric to the cylinder axis, and detent means comprising a pin supported by the crank means in axial traversable relation therewith for entering any of said apertures not covered by said arms.

13. The apparatus of claim 11 wherein:

the apparatus comprises a shaft to which said cylinder and said crank means are coaxially fixed, and

said crank means comprises a crank lever in relatively rotatable relation with the shaft, and a radial arm fixed to the shaft extending into adjacent angularly movable relation with a portion of the lever radially spaced from the shaft, and adjustable means connecting the arm and the lever to change the relative angular positions thereof about the cylinder axis in small increments.

14. The apparatus of claim 2 comprising:

coiling means in downstream spaced relation with said cylinder rotatable about an axis perpendicular to said plane for collecting assembled portions of said belt;

drive means connecting the cylinder and coiling means in drive relationship, said drive means comprising slip clutch means and constructed for driving the coiling means at a higher peripherally linear rate than said cylinder.

15. The apparatus of claim 14 wherein:

said driving means comprises a sprocket chain drive system wherein the sprockets associated with the cylinder and the coiling means are related in diameter to the diameters of the cylinder and the coiling means to establish said peripheral linear rates.

16. The apparatus of claim 2 comprising:

coiling means in downstream spaced relation with said cylinder rotatable about an axis perpendicular to said planes for collecting assembled portions of said belt;

said coiling means comprising a removable core, axially spaced stub shafts of which one is in drive relation with said cylinder, annular end-capping core holders mounted coaxially on said stub shafts and being of a diameter to axially engageably overlap end portions of the core;

the other stub shaft being axially traversable relative to its operative position supporting said core to disengage the core holder mounted thereon from said core; and

toggle lever means including bearing means in fixed axial relation with said other stud shaft and connected with said main frame for traversing said other shaft and the associated core holder.

17. Apparatus for assembling a printing-machine belt comprising a base sheet and printing plates each having

a printing face and an oppositely facing underside adhesively sensitive with respect to the outer plate-receiving side of said sheet comprising:

a sheet-advancing cylinder located on a generally horizontal fixed axis of rotation;

sheet supply means for supplying a belt base sheet to the periphery of said cylinder in the direction of its rotation, said cylinder and said base sheet being constructed to engage in positive drive relationship;

a plate-supporting platform having a planate plate-supporting surface adapted to accurately position one or more plates on said platform, and means for movably supporting the platform, said platform being movable by said supporting means to bring said surface into tangency with said cylinder with an edge of said surface in registry with a fixed index line extending lengthwise of the periphery of the cylinder;

manifold means adapted for connection with a vacuum source and terminating in said platform in association with orifice means therein for retaining said plate by vacuum in fixed position on said platform during the movements of said platform effecting tangency of the plate with said cylinder.

18. A method of assembling a printing belt from a base sheet of flexible non-elastic material and printing plates having a printing face and an oppositely-facing underside which is adhesively sensitive with respect to the outer plate-receiving side of said sheet, comprising the steps of:

extending the base sheet around a lay-up cylinder in a taut condition;

pre-positioning and supporting one or more printing plates in a plane with the edges thereof which are leading with respect to the direction of movement of the base sheet within said machine in registry with a fixed line in its plane of support;

while maintaining the plates in said plane, moving them along a fixed path toward the cylinder to bring the leading edge of any of said plates into initial contact with the cylinder along a stationary index line extending along the outer surface of the cylinder parallel to its axis;

rotating the cylinder with the base sheet in non-slip relation therewith to advance the base sheet through an angular movement which forwards the base sheet for at least a distance of one printing plate length;

controlling the magnitude of such angular movement by angle-measuring indexing and stopping mechanism; and

progressively pressing the plates against the cylinder by continuous pressure along a continuous narrow area extending the full length of said index line as the cylinder and the base sheet are moved through said angular movement.

19. The method of claim **18** comprising:

subjecting the base sheet to a drag force tending to place the sheet in a taut condition as it advances onto said cylinder.

20. The method of claim **18** comprising:

withdrawing the assembled belt from such cylinder in a state of tension tending in cooperation with said drag force to maintain said sheet in positive driving relation with said cylinder.

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