



US 20030137101A1

(19) **United States**
(12) **Patent Application Publication** (10) **Pub. No.: US 2003/0137101 A1**
Hendzel (43) **Pub. Date: Jul. 24, 2003**

(54) **AUTOMATICALLY
COMPLIANT/RELEASEABLE PINCH
ROLLER MOUNTING SYSTEM**

(57) **ABSTRACT**

(75) Inventor: **Louis J. Hendzel**, Owego, NY (US)

Correspondence Address:
**SCHWARTZ & WEINRIEB
CRYSTAL PLAZA ONE
SUITE 1109
2001 JEFF. DAVIS HWY.
ARLINGTON, VA 22202 (US)**

(73) Assignee: **LOCKHEED MARTIN CORPORA-
TION**

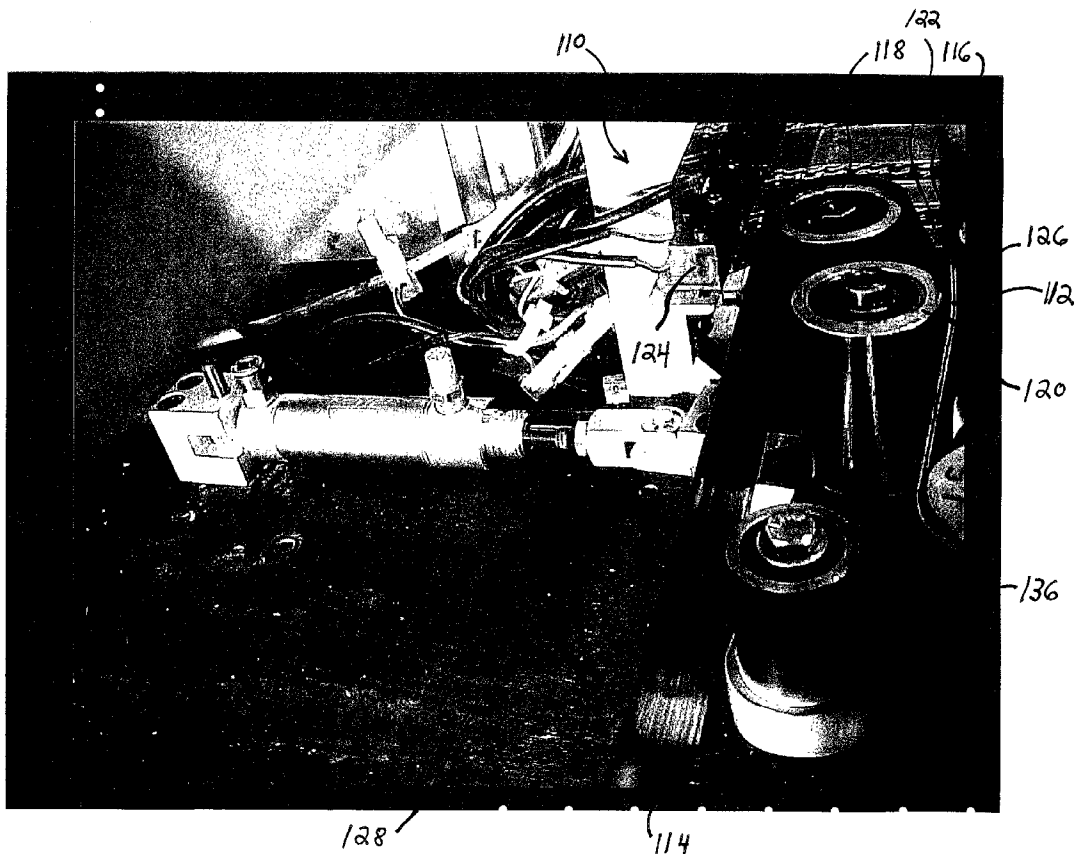
(21) Appl. No.: **10/059,424**

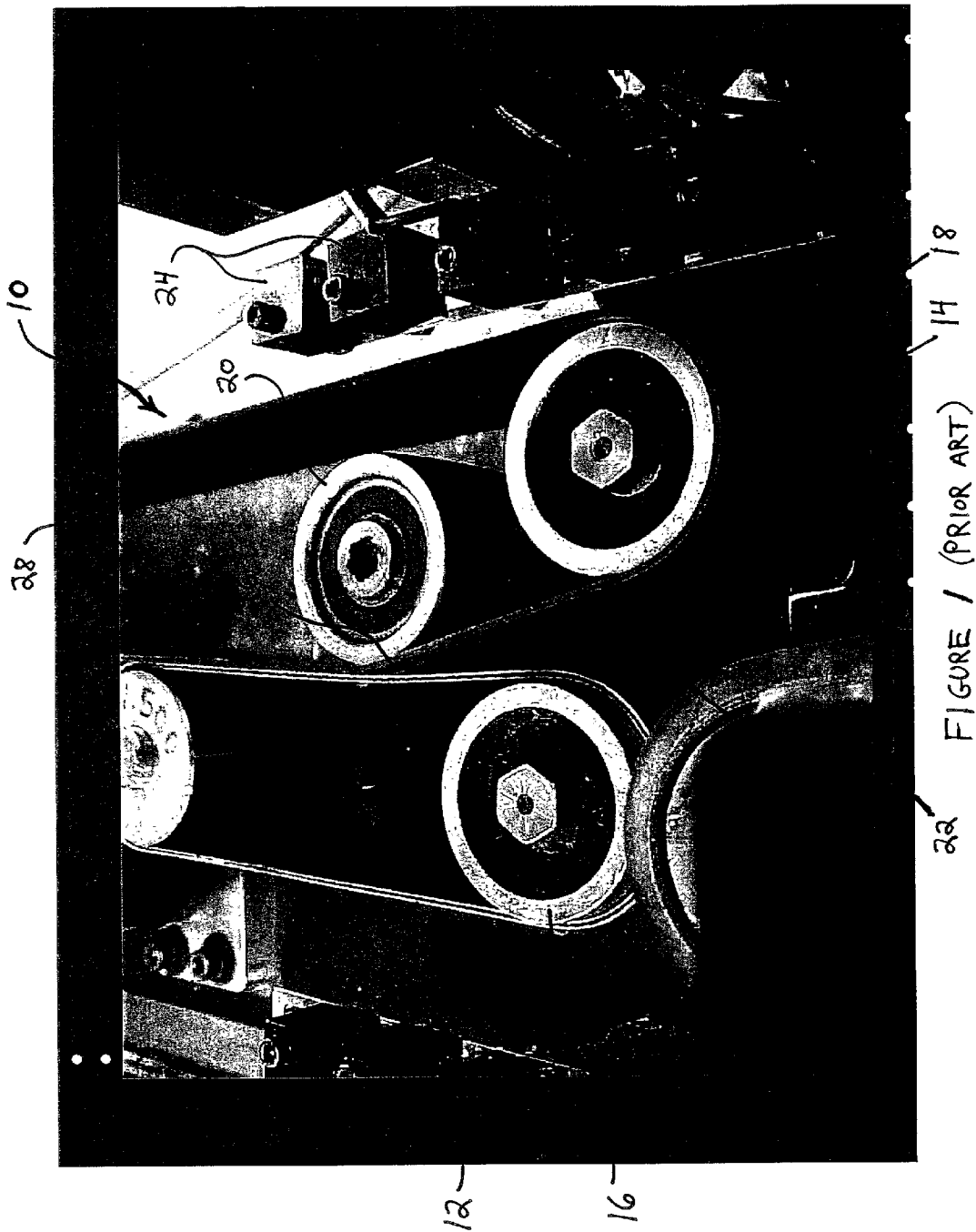
(22) Filed: **Jan. 31, 2002**

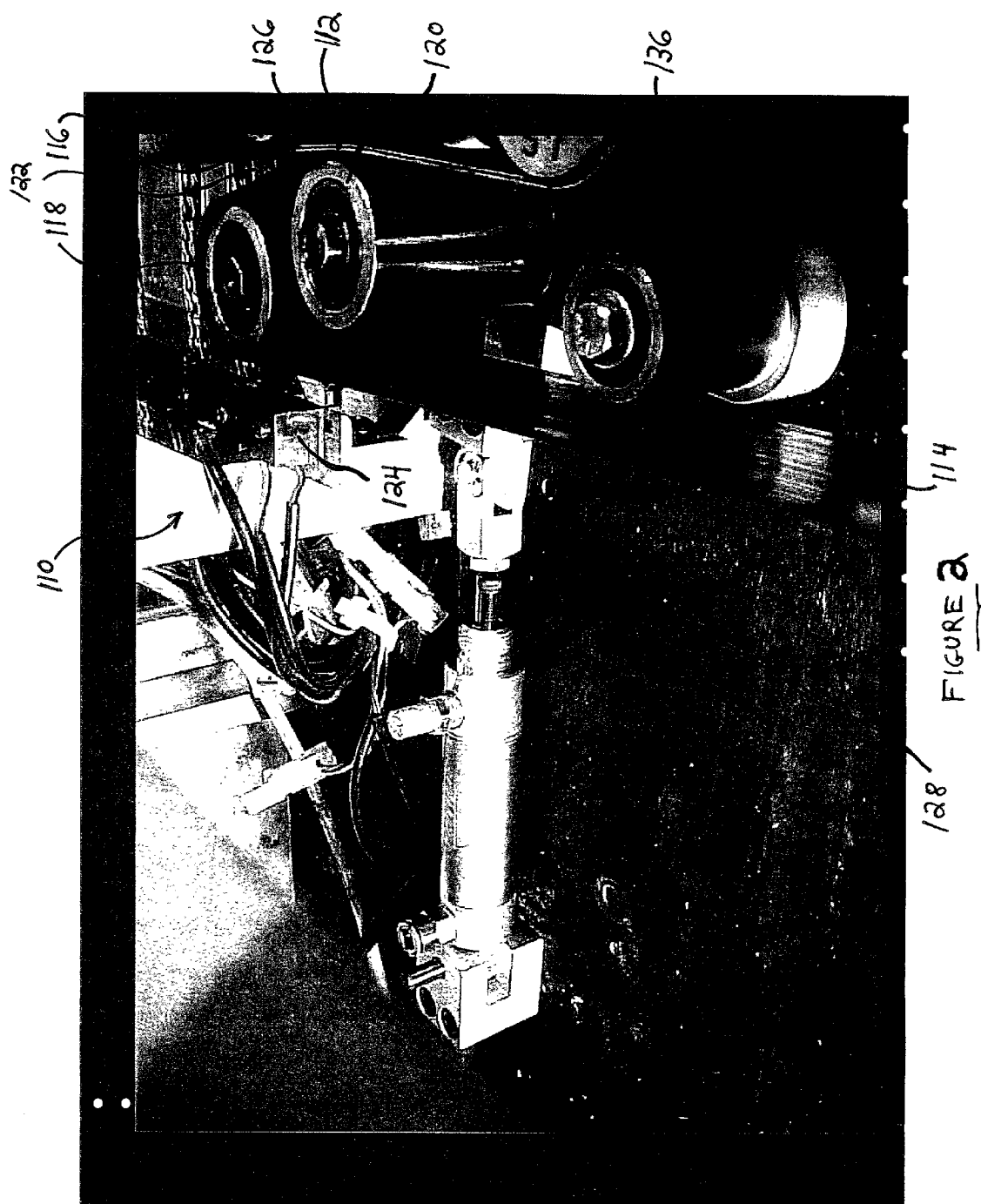
Publication Classification

(51) Int. Cl.⁷ **B65H 5/02**
(52) U.S. Cl. **271/272**

An article conveyor system for handling and conveying articles, pieces, or units of mail comprises first and second conveyor belts which are adapted to have a bite section formed therebetween by means of a pinch roller forcing a portion of the first conveyor belt toward a portion of the second conveyor belt. In order to accommodate different articles, pieces, or units of mail which have different thickness dimensions, the pinch roller is mounted upon a pivot arm, and the pivot arm is operatively connected to a pneumatic actuator. Consequently, as the different articles, pieces, or units of mail are transported through the bite section of the conveyor system, the pinch roller, through means of its pivotal mounting upon the pivot arm, is able to move in a substantially reciprocating fashion or floating manner against the constant bias of the pneumatic actuator so as to accommodate the different articles, pieces, or units of mail. The conveyor system can thus accommodate different articles, pieces, or units of mail having different thickness dimensions without experiencing any jamming, thus effectively eliminating operational downtime of the system.







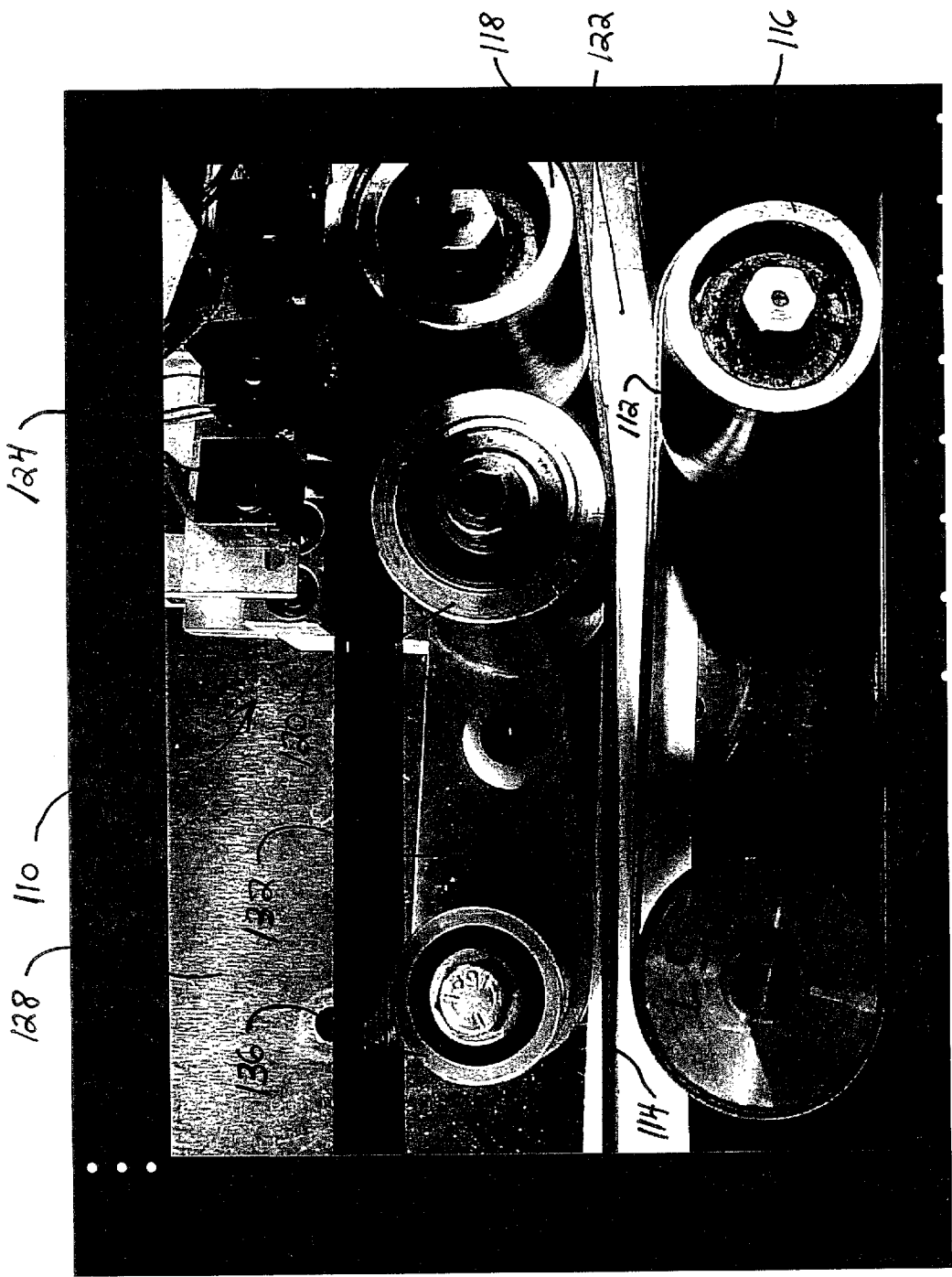


FIGURE 3

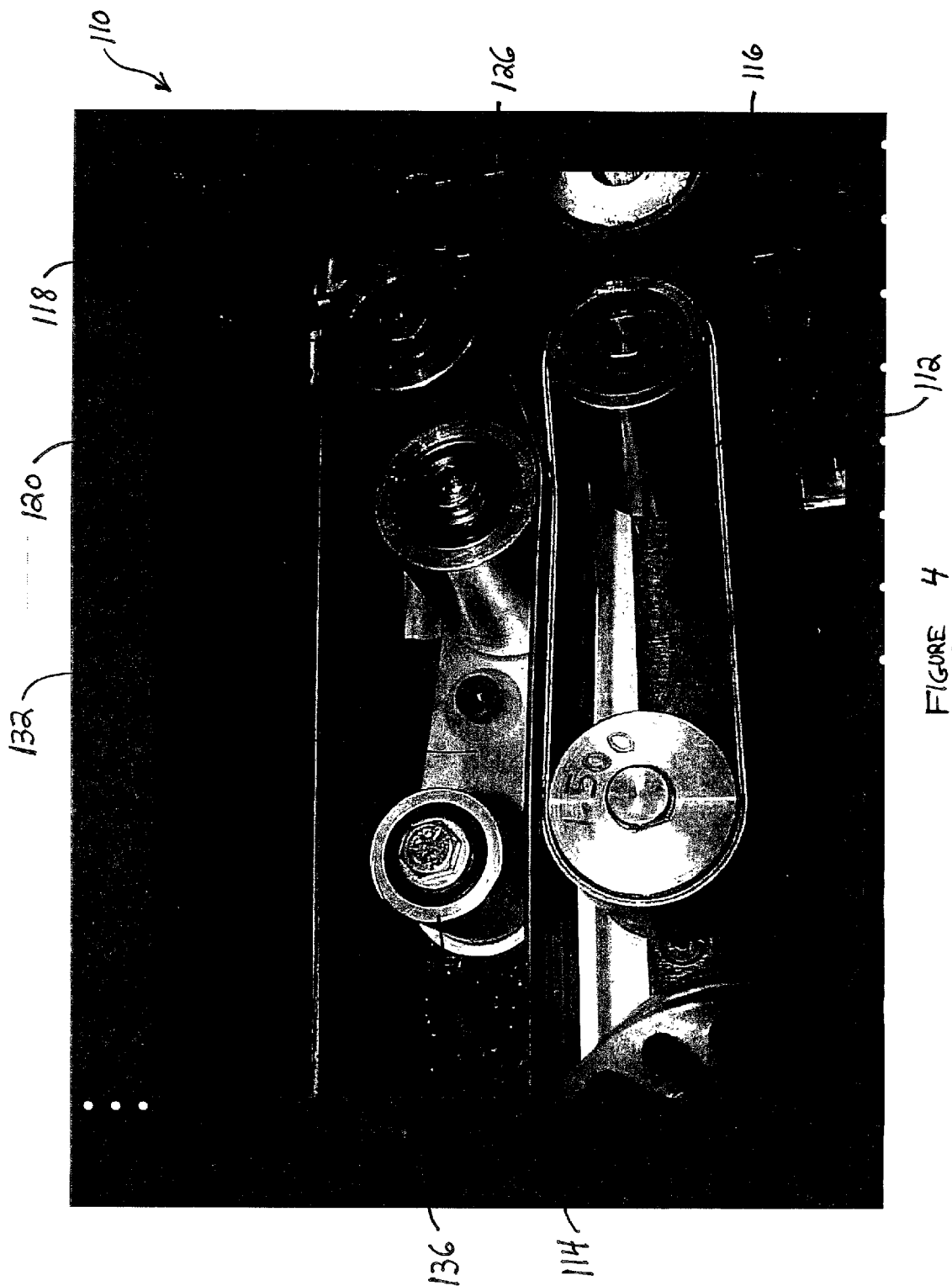


FIGURE 4

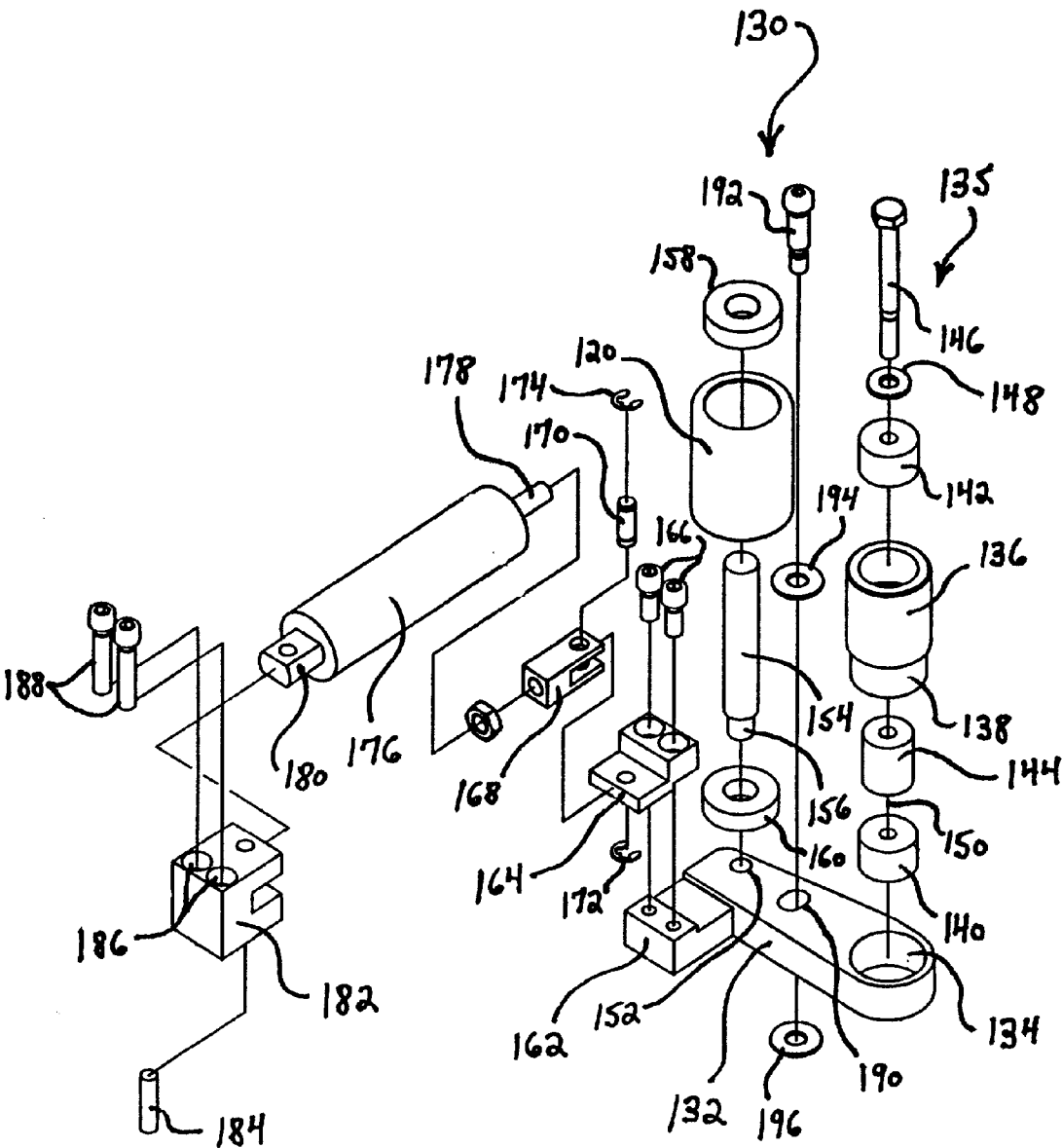
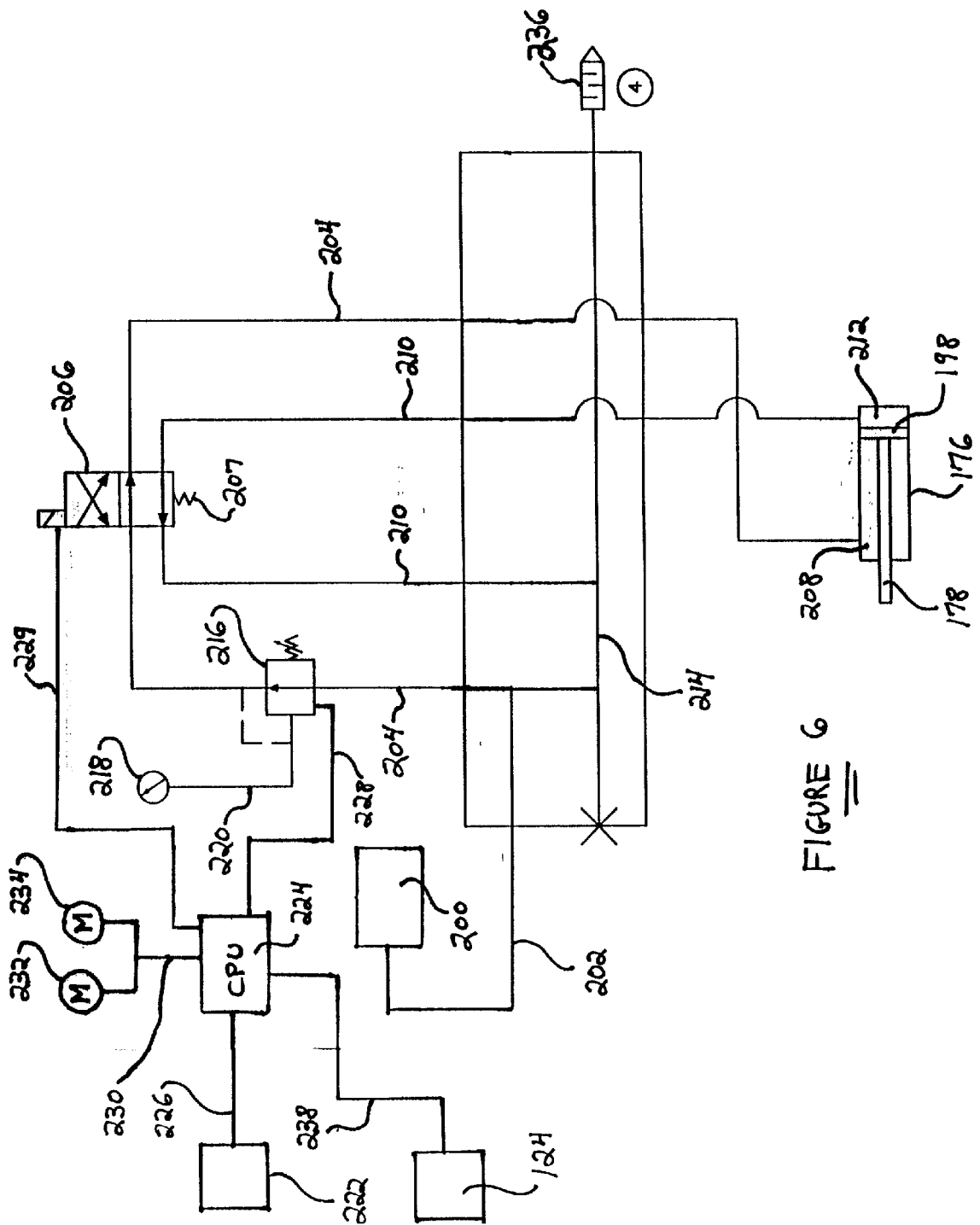


FIGURE 5



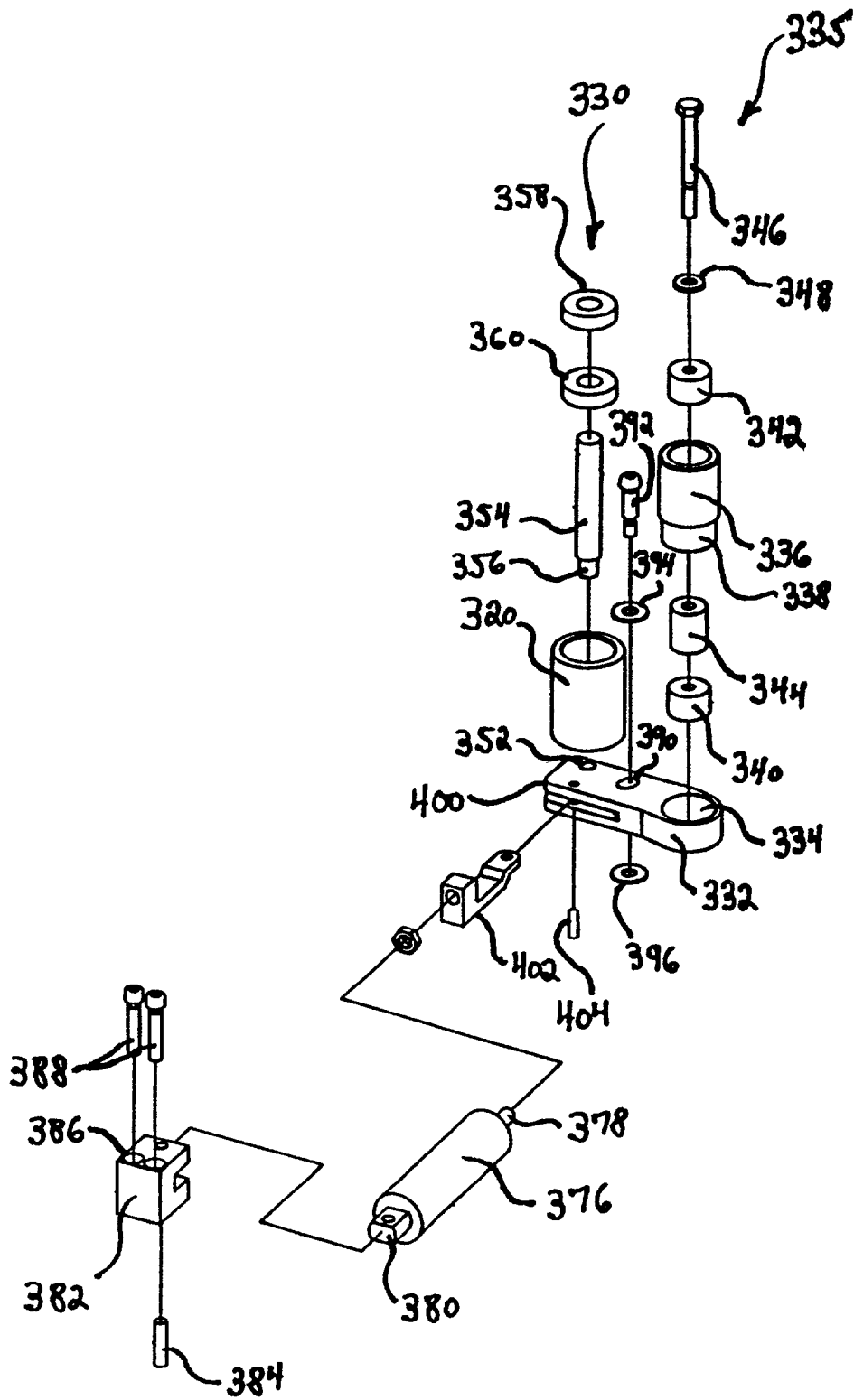


FIGURE 7

AUTOMATICALLY COMPLIANT/RELEASEABLE PINCH ROLLER MOUNTING SYSTEM

FIELD OF THE INVENTION

[0001] The present invention relates generally to article conveyor systems, and more particularly to a new and improved mail handling and conveyor system which is capable of handling mail articles, pieces, or units having different thickness dimensions without becoming jammed, or if a jam does in fact occur due to the presence of, for example, a particular article, piece, or unit of mail, which is characterized by means of a significantly oversized thickness dimension, within the conveyor system, then the jam can be readily and easily attended to and rectified without the system necessarily incurring substantial operational downtime.

BACKGROUND OF THE INVENTION

[0002] In connection with the conveyance of mail within automatic conveying, handling, sorting, and distribution systems, one of the first upstream stages or sections of the typical conveying, handling, sorting, and distribution system comprises, in effect, an infeed section or stage wherein the multitude of mail articles, pieces, or units, having different or varying thickness dimensions, are initially fed into the system for conveyance in a downstream direction toward the subsequent processing sections, stations, or stages at which the mail articles, pieces, or units will be, for example, scanned, sorted, and distributed. As shown, for example, within FIG. 1, which comprises a partial, overhead perspective view of a first stage or section of a conventional PRIOR ART conveyor system 10, it is seen that the system 10 comprises a first conveyor belt 12, and a second conveyor belt 14.

[0003] The first and second conveyor belts 12,14 are respectively routed around, for example, first and second drive rollers 16 and 18, and it is seen that the second conveyor belt 14 also has operatively associated therewith a pinch roller 20. The second drive roller 18 is laterally or transversely spaced or offset from the first drive roller 16, as considered in the longitudinal conveyance direction, and in this manner, an upstream gap 22 is defined between the first and second drive rollers 16,18 so as to permit the incoming mail articles, pieces, or units to be readily inserted between, and thereby accordingly driven by, the first and second conveyor belts 12,14. The pinch roller 20, however, is, in effect, transversely or laterally offset with respect to or spaced from the second drive roller 18 whereby the upstream portion of second conveyor belt 14, disposed downstream from the aforementioned upstream gap 22, is caused to approach, and thereby be disposed adjacent to or in contact with, the first conveyor belt 12 whereby the individual mail pieces, articles, or units can in effect be grasped between the first and second conveyor belts 12,14 and conveyed downstream thereby. Lastly, a serial array of photocell units 24 are disposed adjacent to and partially upstream and downstream of second drive roller 18 so as to monitor the travel or conveyance of the various different pieces, articles, or units of mail as they enter the gap 22 and the bite portion 26 of the conveyor system 10 as defined between the first and second conveyor belts 12,14. It is noted that the photocell units 24 are disposed at a predetermined elevational level which enables the same to monitor the

various different articles, units, or pieces of mail by detecting the upper edge portions of the articles, pieces, or units of mail which project or extend above first and second conveyor belts 12,14.

[0004] As has been noted hereinbefore, the first upstream or infeed stage or section of the overall automatic conveying, handling, sorting, and distribution system is adapted to handle and convey a multitude of mail articles, pieces, or units having different or varying thickness dimensions in preparation for further downstream processing of articles, pieces, or units of mail comprising, for example, scanning, sorting, and distribution stages. However, in view of the fact that the pinch roller 20 is disposed at its laterally or transversely offset position with respect to second drive roller 18 so as to cause the second conveyor belt 14 to operatively cooperate with the first conveyor belt 12 at the bite portion 26, and in view of the additional fact that the position of the axis of rotation of the pinch roller 20 is fixed upon the conveyor support surface, deck, or foundation 28, the conveyor system 10 can only accommodate articles, pieces, or units of mail having thickness dimensions which are less than a predetermined relatively small maximum value. Accordingly, if the thickness dimension of a particular piece, article, or unit of mail, which has been introduced into the conveyor system 10, exceeds the aforementioned maximum thickness dimension value, such article, unit, or piece of mail will not be able to be accommodated by the bite portion 26 of the conveyor system 10 and will therefore cause the conveyor system 10 to become jammed. When such jamming occurs, operation of the conveyor system 10 must necessarily be shut down and the cause of the jam accordingly rectified. In particular, the pinch roller 20 must be removed from the support, deck, or foundation 28, the jammed article, piece, or unit of mail retrieved or unjammed, and the pinch roller 20 replaced or remounted upon the support surface, deck, or foundation 28. Such a procedure, however, is quite tedious and time-consuming and accordingly results in substantial operational downtime of the conveyor system 10.

[0005] A need therefore exists in the art for a new and improved article conveyor system which will be particularly adapted for use in the conveyance of articles, pieces, or units of mail such that the articles, pieces, or units of mail can have a relatively wide diversity of thickness dimensions, wherein the articles, pieces, or units of mail having such a relatively wide diversity of thickness dimensions can be readily accommodated within the conveyor system without causing jamming of the conveyor system and a consequential operational shutdown thereof, and wherein further, should an operational jam occur within the system, as a result of a particular article, piece, or unit of mail having a thickness dimension which is significantly greater than the predetermined diverse range of thickness dimensions of the articles, pieces, or units of mail which can in fact be readily accommodated within the conveyor system, the jammed state can be easily and readily rectified without necessitating prolonged operational shutdowns of the conveyor system.

OBJECTS OF THE INVENTION

[0006] Accordingly, it is an object of the present invention to provide a new and improved conveyor system which is particularly adapted for use in connection with the conveyance of articles, pieces, or units of mail which have a relatively wide diversity of thickness dimensions.

[0007] Another object of the present invention is to provide a new and improved conveyor system which is particularly adapted for use in connection with the conveyance of articles, pieces, or units of mail which have a relatively wide diversity of thickness dimensions whereby articles, units, or pieces of mail, which have a relatively wide diversity of thickness dimensions, can be accommodated within the conveyor system without encountering or exhibiting the operational difficulties characteristic of PRIOR ART mail conveyor systems.

[0008] An additional object of the present invention is to provide a new and improved conveyor system which is particularly adapted for use in connection with the conveyance of articles, pieces, or units of mail which have a relatively wide diversity of thickness dimensions, wherein articles, units, or pieces of mail, which have a relatively wide diversity of thickness dimensions, can be accommodated within the conveyor system without encountering or exhibiting any jamming problems or difficulties.

[0009] A further object of the present invention is to provide a new and improved conveyor system which is particularly adapted for use in connection with the conveyance of articles, pieces, or units of mail which have a relatively wide diversity of thickness dimensions, wherein the pinch roller operatively associated with a first one of the conveyor belts of the conveyor system is movably mounted and pneumatically biased toward the other second one of the conveyor belts such that articles, units, or pieces of mail, which have a relatively wide diversity of thickness dimensions, can be accommodated within the conveyor system without encountering or exhibiting any jamming problems or difficulties.

[0010] A last object of the present invention is to provide a new and improved conveyor system which is particularly adapted for use in connection with the conveyance of articles, pieces, or units of mail which have a relatively wide diversity of thickness dimensions, wherein the pinch roller operatively associated with a first one of the conveyor belts of the conveyor system is movably mounted and pneumatically biased toward the other second one of the conveyor belts such that articles, units, or pieces of mail, which have a relatively wide diversity of thickness dimensions, can be accommodated within the conveyor system without encountering or exhibiting any jamming problems or difficulties, however, should a jamming situation nevertheless occur due to the attempted conveyance of a particular article, piece, or unit of mail having or exhibiting a substantially oversized thickness dimension, the jammed state can be readily, easily, and quickly rectified by retracting the pinch roller away from the other second one of the conveyor belts such that the conveyor system does not experience substantial operational downtime.

SUMMARY OF THE INVENTION

[0011] The foregoing and other objectives are achieved in accordance with the teachings and principles of the present invention through the provision of a new and improved conveyor system which is particularly adapted for use in connection with the conveyance of articles, pieces, or units of mail which have a relatively wide diversity of thickness dimensions, wherein the conveyor system comprises the incorporation therein of a pinch roller which is operatively

associated with a first one of the conveyor drive belts and which is mounted upon a pivotal arm so as to be reciprocally movable toward and away from the second one of the conveyor drive belts. The pinch roller is operatively connected to a double-acting pneumatically driven mechanism which controls the reciprocal movements of the pinch roller, and in this manner, when the piston rod of the pneumatic drive mechanism is extended, the pinch roller causes the first conveyor drive belt to be moved toward the other second one of the conveyor drive belts and define a conveyor system bite section therebetween, whereas when the piston rod of the pneumatic drive mechanism is retracted, the pinch roller permits the first conveyor drive belt to move away from the second conveyor drive belt. In this manner, the bite portion of the drive conveyor is effectively opened whereby a jammed article, piece, or unit of mail can be readily, easily, and quickly extracted and the operational cycle accordingly restarted so as to minimize operational downtime of the conveyor system.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] Various other objects, features, and attendant advantages of the present invention will be more fully appreciated from the following detailed description when considered in connection with the accompanying drawings in which like reference characters designate like or corresponding parts throughout the several views, and wherein:

[0013] FIG. 1 is a partial, overhead perspective view of a first stage or section of a conventional PRIOR ART conveyor system and showing the cooperative parts thereof wherein the pinch roller is fixedly mounted upon its support or foundation and with respect to the first and second conveyor drive belts such that the bite section defined between the first and second conveyor drive belts is predetermined and non-adjustable;

[0014] FIG. 2 is a partial perspective view, similar to that of FIG. 1 showing, however, the new and improved upstream, entry stage or section of the mail conveyor system constructed in accordance with the principles and teachings of the present invention wherein the pinch roller is mounted upon a movable arm and is operatively connected to a double-acting pneumatic actuator which moves the arm, and the pinch roller mounted thereon, to an extended position, as shown, at which the pinch roller causes its conveyor drive belt to form a conveyor belt bite section with the opposed conveyor drive belt in order to convey the articles, pieces, or units of mail;

[0015] FIG. 3 is a top plan view of the new and improved upstream entry stage or section of the mail conveyor system as shown in FIG. 2 wherein the pneumatic actuator has been activated so as to move the mounting arm, and the pinch roller mounted thereon, to the retracted position whereby a substantially large gap is defined between the conveyor drive belts such that articles, pieces, or units of mail are not able to be conveyed along the conveyor path;

[0016] FIG. 4 is a top plan view, similar to that of FIG. 3, of the new and improved upstream entry stage or section of the mail conveyor system, as also shown in FIG. 2, wherein the pneumatic actuator has been activated so as to move the mounting arm, and the pinch roller mounted thereon, to the extended position whereby the substantially large gap defined between the conveyor drive belts, as

shown in FIG. 3, has been closed and the conveyor belt bite section is defined between the conveyor drive belts such that articles, pieces, or units of mail are able to be conveyed along the conveyor path;

[0017] FIG. 5 is an exploded, perspective view of a first embodiment of a new and improved pinch roller-mounting arm-pneumatic actuator assembly which has been constructed in accordance with the principles and teachings of the present invention and which has been incorporated within the upstream, entry stage or section of the mail conveyor system as disclosed within FIG. 2;

[0018] FIG. 6 is a schematic drawing illustrating the pneumatic control system used in connection with the pneumatic actuator for controlling the extension and retraction movements of the pinch roller mounting arm upon which the pinch roller is mounted; and

[0019] FIG. 7 is an exploded, perspective view of a second embodiment of a new and improved pinch roller-mounting arm-pneumatic actuator assembly which has been constructed in accordance with the principles and teachings of the present invention and which may alternatively be incorporated within the upstream, entry stage or section of the mail conveyor system as disclosed within FIG. 2.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0020] Referring now to the drawings, and more particularly to FIGS. 2-5 thereof, a new and improved upstream, entry stage or section of a mail conveyor system, constructed in accordance with the principles and teachings of the present invention, is disclosed and is generally indicated by the reference character 110. It is to be noted that component parts of the new and improved upstream, entry stage or section of the mail conveyor system 110, as constructed in accordance with the principles and teachings of the present invention, which correspond to similar component parts of the PRIOR ART system disclosed within FIG. 1, will be designated by similar or corresponding reference numbers except that the reference numbers designating the component parts of the new and improved upstream, entry stage or section of the mail conveyor system 110, as constructed in accordance with the principles and teachings of the present invention, will be designated by reference numbers in the 100 series.

[0021] More particularly, as best seen in FIGS. 2-5, the new and improved upstream, entry stage or section of the mail conveyor system 110, as constructed in accordance with the principles and teachings of the present invention, is seen to comprise a first conveyor belt 112 and a second conveyor belt 114. The first and second conveyor belts 112,114 are respectively routed around, for example, first and second drive rollers 116 and 118, and it is seen that the second conveyor belt 114 also has operatively associated therewith a pinch roller 120. The second drive roller 118 is laterally or transversely spaced or offset from the first drive roller 116, as considered in the longitudinal conveyance direction, and in this manner, an upstream gap 122 is defined between the first and second drive rollers 116,118 so as to permit the incoming mail articles, pieces, or units to be readily inserted between, and thereby accordingly driven by, the first and second conveyor belts 112,114. The pinch roller 120, however, is, in effect, transversely or laterally offset

with respect to or spaced from the second drive roller 118 whereby the upstream portion of second conveyor belt 114, disposed downstream from the aforementioned upstream gap 122, is caused to approach, and thereby be disposed adjacent to or in contact with, the first conveyor belt 112 whereby the individual mail pieces, articles, or units can in effect be grasped between the first and second conveyor belts 112, 114 and conveyed downstream thereby. Lastly, a serial array of photocell units 124 are disposed adjacent to and partially upstream and downstream of second drive roller 118 so as to monitor the travel or conveyance of the various different pieces, articles, or units of mail as they enter the gap 122 and the bite portion 126 of the conveyor system 110 as defined between the first and second conveyor belts 112,114.

[0022] The first and second drive rollers 116,118 have their rotational axes fixed upon a support surface, foundation, or deck 128, however, unlike the fixed disposition of the conventional PRIOR ART pinch roller 20 of the conveyor system 10 upon the support surface, foundation, or deck 28, in accordance with the unique and novel teachings and principles of the present invention, the pinch roller 120 is rotatably mounted upon a first embodiment pinch roller subassembly 130, as best seen in FIG. 5, which is adapted to be movably mounted upon the deck, foundation, or support surface 128 so as to in turn adjustably position the pinch roller 120 with respect to the upstream portion of the second conveyor belt 114 as best seen or appreciated from FIGS. 2-4. More particularly, a pivot arm 132 is provided at a first longitudinal end thereof with a through-bore 134 within which a bearing assembly 135 is positioned or operatively disposed such that the pivot arm 132 is adapted to be pivotally mounted upon the foundation or deck 128. The bearing assembly 135 comprises a bearing sleeve 136, and the lower end portion of the bearing sleeve 136 has a reduced diametrical section 138 for disposition within the through-bore 134. A lower bearing member 140 is adapted to be disposed internally within the lower end portion 138 of the bearing sleeve 136, while an upper bearing member 142 is adapted to be disposed internally within the upper end portion of the bearing sleeve 136, with a spacer member 144 also being disposed internally within the bearing sleeve 136 and interposed between the upper and lower bearing members 140,142. A bolt fastener 146, along with a washer member 148, effectively secures the bearing assembly 135 components to the underlying foundation, support surface, or deck 128 such that the pivot arm 132 is pivotally movable around the vertical axis 150 of the bearing assembly 135.

[0023] The opposite end of the pivot arm 132 is provided with an aperture 152, the lower end portion of an idler stud 154 has a reduced diameter portion 156 for threaded disposition within the aperture 152, and the pinch roller 120 is rotatably mounted upon the idler stud 154 through means of upper and lower bearing members 158 and 160, respectively. The pivot arm 132 is further provided with an integral laterally projecting mounting block 162 upon which a mounting bracket 164 is fixedly secured by means of a pair of suitable fasteners 166. A first clevis 168 is pivotally mounted upon the mounting bracket 164 through means of a pivot pin 170 and a pair of C-clip fasteners 172,174, and a pneumatic cylinder or actuator 176 is adapted to be operatively connected to the pivot arm 132, through means of first clevis 168, mounting bracket 164, and mounting block 162, so that upon extension and retraction of the pneumatic cylinder piston rod 178, the pivot arm 132

undergoes desirably controlled pivotal movements so as to in turn move the pinch roller **120** toward and away from the first conveyor belt **112**.

[0024] More particularly, the free end portion of the piston rod **178** is operatively connected to the first clevis **168**, while a lug member **180** fixedly mounted upon the opposite end of the pneumatic cylinder or actuator **176** is adapted to be pivotally mounted within a second clevis **182** through means of a pivot pin or dowel **184**. Second clevis **182** is provided with a pair of threaded bores **186** for respectively accommodating a pair of screw fasteners **188** by means of which the second clevis **182** is fixedly mounted upon the foundation, support surface, or deck **128**. In order to limit the range or the stroke of the movement of the pivot arm **132** with respect to the first conveyor belt **112**, it is further noted that an intermediate portion of the pivot arm **132** is provided with an oblong or substantially elliptically shaped through-bore **190**, and a shoulder bolt **192**, having upper and lower washer members **194,196** operatively associated therewith, is adapted to be inserted therethrough and fixedly secured within the support surface, foundation, or deck **128**.

[0025] With reference now being made to FIG. 6, the pneumatic control circuit for the pneumatic cylinder or actuator **176** will be disclosed and described. The pneumatic cylinder or actuator **176** is disclosed in FIG. 6, and has its piston member **198** disposed therein which also comprises the piston rod **178** which has its free end portion operatively connected to the first clevis **168**. A source of compressed air **200** provides compressed air to the pneumatic control circuit along an input line **202** which is fluidically connected to a first upstream end of a first air line **204**, and a two-position control valve **206**, which is normally biased to the illustrated position by means of a suitable spring mechanism **207**, is operatively associated with the first air line **204**. A second downstream end of the first air line **204** is fluidically connected to the piston rod end or chamber **208** of the pneumatic cylinder or actuator **176**, while a second air line **210** is also operatively associated with the two-position control valve **206**. A first upstream end of the second air line **210** is fluidically connected to a piston head end or chamber **212** of the pneumatic cylinder or actuator **176**, while a second downstream end of the second air line **210** is fluidically connected to an exhaust line **214**. It is noted that the first upstream end of the first air line **204** is also fluidically connected to the exhaust line **214** for reasons that will be explained shortly, and a pressure regulator **216** is operatively disposed within the first upstream end of the first air line **204** so as to regulate the pressure of the incoming supply air to a predetermined pressure level. A pressure gauge **218** is operatively connected to the pressure regulator **216** by means of an air line **220** so as to readily permit the pressure within the pneumatic circuit to be readily determined or viewed by means of an operator.

[0026] In operation, when a mail handling, conveying, sorting, and distribution operation or cycle is to be commenced, an operator pushes a START button, not shown, located upon, for example, an operator console, also not shown, whereby the air regulator **216** and a first stage, infeed vacuum pickoff pump and conveyor belt, not shown, are activated. Accordingly, when articles, pieces, or units of mail are introduced into the first stage, infeed vacuum station, a vacuum sensor **222** emits a signal that mail is present within the system, and the mail-present signal is

transmitted to, for example, a central processing unit (CPU) **224** by means of a signal line **226**. The central processing unit (CPU) **224**, in turn, emits a first control signal which is transmitted by means of a signal line **228** to the air regulator **216**, and a second control signal which is transmitted by means of a signal line **229** to the two-position control valve **206** whereby the control valve **206** is moved from its normal first position, as illustrated within FIG. 6, to its second position. Consequently, air pressure at the pre-determinedly desired air pressure level is supplied to the head chamber **212** of the pneumatic cylinder or actuator **176** by means of the first upstream end of the first air line **204**, the two-position valve **206**, and the first upstream end of the second air line **210**. The piston-piston rod assembly **198,178** is thus moved within pneumatic cylinder **176** such that the piston rod **178** is extended outwardly from the cylinder **176**. The piston rod **178**, through means of the first clevis **168**, the mounting bracket **164**, and the pivot arm mounting block **162**, causes the pivot arm **132** to pivot in the clockwise direction, as viewed in FIG. 5, around axis **150** such that the pinch roller **120**, in turn, causes the second conveyor belt **114** to be moved toward the first conveyor belt **112** and thus define the bite portion **126** therebetween. In addition, after a predetermined time delay, such as, for example, 0.3 seconds, the central processing unit (CPU) also transmits appropriate signals by means of a signal line **230** to first and second drive motors **232,234** which are respectively operatively connected to the first and second conveyor belt drive rollers **116,118** so as to initiate drive movement of the first and second conveyor belts **112,114**.

[0027] Accordingly, articles, pieces, or units of mail are now introduced into the bite section **126** between the first and second conveyor belts **112,114** and are conveyed further downstream by means of the first and second conveyor belts **112,114** past the linear array of photocell assemblies **124** as can best be appreciated from FIGS. 2 and 3. As best seen in FIG. 6, the exhaust line **214** of the pneumatic control circuit also has fluidically associated therewith a one-way bleed orifice or mechanism **236** which will permit bleeding of air pressure from the pneumatic circuit should the air pressure within the pneumatic circuit exceed the predetermined pressure level set or established by means of the pressure regulator **216**. Accordingly, as the different articles, pieces, or units of mail are conveyed through the bite section **126** defined between the first and second conveyor belts **112,114**, the pressure regulator **216** serves to maintain a constant pressure level within the pneumatic circuit such that the pinch roller **120** is constantly biased toward first conveyor belt **112** by means of a constant pressure or force. In view of the fact that the different articles, units, or pieces of mail will have different thickness dimensions, then as each article, piece, or unit of mail enters the bite section **126** of the conveyor belt drive system, the pinch roller **120** will in effect be constantly forced away from the first conveyor belt **112** against the biasing force of the air pressure within the control circuit when a relatively thick article, unit, or piece of mail is being conveyed, and be forced toward the first conveyor belt **112** under the influence of the biasing force of the air pressure within the control circuit when a relatively thin article, piece, or unit of mail is being conveyed.

[0028] When the pinch roller **120** and the pivot arm **132** are moved away from the first conveyor belt **112** so as to accommodate a relatively thick article, piece, or unit of mail,

the piston rod 178 of the pneumatic cylinder 176 will be slightly retracted against the normal biasing force of the air pressure within head chamber 212 of the cylinder 176 and thereby effectively increase the air pressure upon the supply side of the piston 198 above the normal pressure value predetermined by means of the air regulator 216. Accordingly, such retractive movement of the piston 198, the piston rod 178, and the pivot arm 132 will be permitted as a result of the first upstream portion of the second air line 210, the two-position control valve 206, the first upstream portion of the first air line 204, and the exhaust line 214 being fluidically connected to the bleed valve mechanism 236. In a similar, but reverse manner, the pinch roller 120 and the pivot arm 132 will be moved toward the first conveyor belt 112 under the constant biasing force of the air pressure within the control circuit as predetermined by means of the air regulator 216 so as to accommodate a relatively thin article, piece, or unit of mail. Under such circumstances, the piston rod 178 of the pneumatic cylinder 176 will again be slightly projected or extended out of the pneumatic cylinder 176. Consequently, it can be readily appreciated that depending upon the particular thickness dimensions of the various articles, pieces, or units of mail being conveyed through the conveyor belt system, and more particularly, through the bite section 126 defined between the first and second conveyor belts 112,114, the mounting system for the pinch roller 120, comprising the pivot arm 132 and the piston rod 178, will undergo, in effect, reciprocating floating movements such that articles, pieces, or units of mail having varying thickness dimensions can always be readily accommodated without causing any jamming of the conveyor belt drive system.

[0029] Continuing further with the operation, if, in accordance with a first operational instance, the vacuum sensor 222 has not detected the presence of any additional pieces, articles, or units of mail within the system for a predetermined period of time which would normally permit the last previously detected article, piece, or unit of mail to have passed through the bite section 126 defined between the first and second conveyor belts 112,114, and in addition, all of the photocell units 124 have transmitted signals indicating that the articles, pieces, or units of mail which were previously detected by means of the vacuum sensor 222 have also passed by all of the photocell units 124, then the central processing unit (CPU) 224 will send appropriate signals to the two-position control valve 206 and the conveyor belt drive motors 232,234. As a result of the signal to the two-position control valve 206, the two-position control valve 206 will be moved back to its normal position as illustrated in FIG. 6 whereby the piston rod 178 of the pneumatic cylinder 176, and the pivot arm 132 operatively connected thereto, will be retracted in view of the fact that the first air line 204, which is fluidically connected to the air regulator 216 and the incoming air line 202 at its upstream end, is also fluidically connected to the piston rod chamber 208 of the pneumatic cylinder 176 at its downstream end, while the second air line 210 is fluidically connected to the piston head chamber 212 at its upstream end as well as being fluidically connected to the exhaust line 214 at its downstream end. As a result of the signal to the conveyor belt drive motors 232,234, the motor drive of the conveyor belts 112,114 by motors 232,234 will be terminated.

[0030] Accordingly, the pinch roller 120 and the second conveyor belt 114 will be moved away from the first

conveyor belt 112 such that the bite section 126 will no longer be defined between the conveyor belts 112,114, whereas the open gap 122 will in effect again be redefined between the conveyor belts 112, 114. In this manner, if there is no jam of any article, unit, or piece of mail within the system, then the pinch roller 120 is disposed in effect in an idle state so as not to constantly extend or stretch the second conveyor belt 114 whereby the service life of the belt is extended, and the drive motors 232,234 and conveyor belts 112,114 will likewise be disposed in respective idle states. Upon the subsequent detection of an article, piece or unit of mail by means of the vacuum sensor 222, the aforementioned operative cycling of the two-position control valve 206 and the conveyor belt drive motors 232,234 can again be initiated.

[0031] On the other hand, if in accordance with a second operational instance, the vacuum sensor 222 has not detected the presence of any additional pieces, articles, or units of mail within the system for a predetermined period of time which would normally permit the last previously detected unit, article, or piece of mail to have passed through the bite section 126 defined between the first and second conveyor belts 112,114, but all of the photocell units 124 have not transmitted signals indicating that the articles, pieces, or units of mail which were previously detected by means of the vacuum sensor 222 have also passed by all of the photocell units 124, then an article jam situation or state has occurred and is present, and again, the central processing unit (CPU) 224 will send appropriate signals to the two-position control valve 206 and the conveyor belt drive motors 232,234 so as to again cause retraction of the piston rod 178, and the pivot arm 132, as well as termination of the conveyor belt drive. It is to be noted that the size of the elongated aperture 190 defined within the central portion of the pivot arm 132, which in effect limits the stroke or range of movement of the pivot arm 132, is a primary factor in predetermining the thickness limit of articles, pieces, or units of mail which may be conveyed through the system 110. It is also to be noted that the size of the aperture 190 is also predetermined so as to limit the extent of movement of the pivot arm 132, and the pinch roller 120 mounted thereon, away from the first conveyor belt 112 and back toward the non-conveying loop portion of the second conveyor belt 114 as can best be appreciated, for example, from FIGS. 2-4 such that the pinch roller 120 does not overstress or overstretch the non-conveying loop portion of the second conveyor belt 114.

[0032] Accordingly, when the system experiences a jammed situation or state, the shoulder bolt 192 may be removed from the pivot arm 132 and its fixed disposition within the support surface, foundation, or deck 128, whereby the retraction movement of the pneumatic cylinder piston rod 178, the pivot arm 132, and the pinch roller 120 mounted upon the pivot arm 132, can proceed further so as to rectify the aforementioned jammed state or situation. Accordingly, if or when an article, piece, or unit of mail, having a thickness dimension which is inordinately large, causes a jam to occur within the bite section 126 defined between the conveyor belts 112,114, then the retracted movements of the piston rod 178, and the corresponding movements of the pivot arm 132 and the pinch roller 120, eliminating the bite section 126 and again establishing the gap region 122, readily permits an operator to remove the jammed article, piece, or unit of mail from between the conveyor belts

112,114 without incurring substantial operational downtime of the conveyor system **110**. During such jam-rectifying operation, the operator may also activate an OFF button or switch which terminates the operation of the air regulator **216**, whereupon subsequent rectification of the jammed state of the conveyor system **110**, the START button may again be depressed so as to again initiate the entire operational cycle.

[**0033**] With reference lastly being made to **FIG. 7**, a second embodiment of a new and improved pinch roller mounting arm subassembly is disclosed, and it is noted that since such subassembly comprises components which are similar to, but slightly different than, the corresponding components disclosed within the first embodiment of **FIG. 5**, the following discussion will be directed principally toward the structural differences comprising the different embodiments. Accordingly, the various components which are similar in both the first and second embodiments of **FIGS. 5 and 7** will be designated by corresponding reference numbers except that in connection with the components disclosed within the second embodiment of **FIG. 7**, the reference numbers will be within the 300 series. More particularly, it is seen that the principal differences between the first and second embodiments of **FIGS. 5 and 7** resides in the structure comprising the pivot arms **132** and **332**, and the structural means interconnecting the pivot arms **132,332** to their respective pneumatic cylinders or actuators **176,376**. It is firstly noted, for example, that the longitudinal extent or length of the pivot arm **332** is somewhat less than that of the pivot arm **132**, and that the laterally or transversely projecting mounting block **162** of pivot arm **132** has effectively been eliminated from the pivot arm **332**. As a result of the aforementioned structure of the pivot arm **332**, the latter can be utilized within spatially limited facilities that could otherwise not accommodate the pivot arm **132**. It is also noted that the mounting bracket **164** and the first clevis **168** have likewise been eliminated.

[**0034**] In view of the elimination of the aforementioned structure operatively associated with the pivot arm **132**, the end portion of the pivot arm **332**, which is disposed opposite the end portion of the pivot arm **332** within which the bearing aperture **334** is provided, is formed as a clevis member **400** within which a first end portion of a pneumatic cylinder mounting bracket **402** is rotatably secured by means of a pivot pin **404**. The opposite end of the pneumatic cylinder mounting bracket **402** is adapted to be fixedly connected to the pneumatic cylinder or actuator **376**, and the remainder of the structural assembly, as well as the operation thereof in accordance with the various operative cycles as have been described hereinbefore in connection with the embodiment of **FIG. 5** and in accordance with the pneumatic control circuit of **FIG. 6**, is substantially the same as that utilized in conjunction with the pivot arm **132**, and therefore further discussion will be omitted herefrom in the interest of brevity.

[**0035**] Thus, it may be seen that in accordance with the principles and teachings of the present invention, there has been provided a new and improved pinch roller mounting system for use within mail conveyor systems whereby as a result of the mounting of the pinch roller upon the positionally adjustable pivot arm, the pinch roller can constantly undergo pivotal or arcuate movements toward and away from the oppositely disposed or companioned conveyor belt so as to constantly adjust the bite section defined between the pair of conveyor belts. In this manner, different articles,

pieces, or units of mail, characterized by different thickness dimensions, can be readily accommodated by the conveyor system without causing jamming of the system. In the unlikely event that a jam does occur, the adjustable mounting of the pinch roller upon the pivotally movable pivot arm also permits an operator to readily, easily, and quickly rectify the jammed situation whereby substantial operational downtime of the conveyor system is not incurred.

[**0036**] Obviously, many variations and modifications of the present invention are possible in light of the above teachings. It is therefore to be understood that within the scope of the appended claims, the present invention may be practiced otherwise than as specifically described herein.

What is claimed as new and desired to be protected by Letters Patent of the United States of America, is:

1. An article conveyor system for conveying articles having different thickness dimensions, comprising:

a first conveyor belt;

first conveyor belt drive means for driving said first conveyor belt;

a second conveyor belt;

second conveyor belt drive means for driving said second conveyor belt such that said second driven conveyor belt operatively cooperates with said first driven conveyor belt so as to convey articles as a result of the articles being disposed between said first and second conveyor belts;

a pinch roller adapted to be disposed in contact with a portion of said second conveyor belt so as to effectively force said portion of said second conveyor belt toward a portion of said first conveyor belt in order to define a bite section, between said portions of said first and second conveyor belts, within which articles to be conveyed are effectively grasped so as to be conveyed by said first and second conveyor belts; and

means mounting said pinch roller for constantly adjusting the disposition of said pinch roller and said portion of said second conveyor belt with respect to said portion of said first conveyor belt so as to constantly adjust said bite section defined between said portions of said first and second conveyor belts in response to different articles, having different thickness dimensions, being conveyed through said bite section defined between said first and second conveyor belts such that said conveyor system can accommodate different articles having different thickness dimensions without experiencing jamming.

2. The system as set forth in claim 1, wherein said means mounting said pinch roller comprises:

a pivot arm upon which said pinch roller is rotatably mounted; and

actuating means for biasing said pivot arm toward said portion of said first conveyor belt, and for permitting said pinch roller to be moved away from said portion of said first conveyor belt, in response to different thickness dimensions of the different articles being conveyed through said bite section defined between said first and second conveyor belts.

3. The system as set forth in claim 2, wherein:

said actuating means comprises a pneumatic actuator.

4. The system as set forth in claim 3, wherein:

said pneumatic actuator comprises a pneumatic piston-cylinder assembly comprising a piston member having a piston head and a piston rod disposed within a cylinder,

wherein a free end portion of said piston rod is operatively connected to said pivot arm.

5. The system as set forth in claim 4, further comprising:

a source of air adapted to be fluidically connected to said piston-cylinder assembly by means of a pneumatic circuit;

a pressure regulator disposed within said pneumatic circuit so as to regulate incoming air from said source of air to a predetermined pressure value; and

a two-position control valve disposed within said pneumatic circuit for alternatively controlling regulated air pressure to piston head and piston rod chambers defined within said cylinder so as to cause extension and retraction of said piston member, and thereby cause extension and retraction of said pivot arm and said pinch roller mounted upon said pivot arm as a result of said pivot arm being operatively connected to said piston rod.

6. The system as set forth in claim 5, further comprising:

an exhaust line disposed within said pneumatic circuit and fluidically connected to said two-position control valve; and

a bleed orifice disposed within said exhaust line for bleeding excess air pressure from said exhaust line when said exhaust line is fluidically connected to said piston head chamber of said piston-cylinder assembly and when said piston member is forcibly retracted into said cylinder as a result of said pinch roller being forced away from said first conveyor belt in response to accommodating an article having a relatively large thickness dimension.

7. The system as set forth in claim 5, further comprising:

a vacuum sensor for detecting the presence of an article to be conveyed by said first and second conveyor belts and for generating an article-present signal; and

a plurality of photocells operatively disposed within the vicinity of said bite section defined between said first and second conveyor belts for determining the passage of an article, previously detected by said vacuum sensor, through said bite section defined between said first and second conveyor belts and for generating article-passage signals so as to ensure an article has not become jammed within said bite section defined between said first and second conveyor belts.

8. The system as set forth in claim 7, further comprising:

a central processing unit operatively connected to said vacuum sensor, said plurality of photocells, said first and second conveyor belt drive means, said pressure regulator, and said two-position control valve;

said central processing unit being adapted to receive said signals from said vacuum sensor and said plurality of

photocells and to generate first operational signals to said first and second conveyor belt drive means, said pressure regulator, and said two-position control valve, in response to said signals from said vacuum sensor and said plurality of photocells, so as to cause extension of said piston member of said piston-cylinder assembly and thereby movement of said pinch roller toward said portion of said first conveyor belt so as to establish said bite section defined between said first and second conveyor belts; and

said central processing unit being adapted to generate second operational signals to said first and second conveyor belt drive means so as to terminate operation of said first and second conveyor belt drive means and to said two-position control valve, in response to the absence of receiving any signals from said vacuum sensor and said plurality of photocells, so as to cause retraction of said piston member of said piston-cylinder assembly and thereby movement of said pinch roller away from said portion of said first conveyor belt so as to eliminate said bite section defined between said first and second conveyor belts and thereby place said system in an idle state.

9. The system as set forth in claim 7, further comprising:

a central processing unit operatively connected to said vacuum sensor, said plurality of photocells, said first and second conveyor belt drive means, said pressure regulator, and said two-position control valve;

said central processing unit being adapted to receive said signals from said vacuum sensor and said plurality of photocells and to generate first operational signals to said first and second conveyor belt drive means, said pressure regulator, and said two-position control valve, in response to said signals from said vacuum sensor and said plurality of photocells, so as to cause extension of said piston member of said piston-cylinder assembly and thereby movement of said pinch roller toward said portion of said first conveyor belt so as to establish said bite section defined between said first and second conveyor belts; and

said central processing unit being adapted to generate second operational signals to said first and second conveyor belt drive means so as to terminate operation of said first and second conveyor belt drive means and to said two-position control valve, in response to the presence of said signal from said vacuum sensor but in the absence of receiving all of said signals from said plurality of photocells thereby indicating a jammed mode within said system, so as to cause retraction of said piston member of said piston-cylinder assembly and thereby movement of said pinch roller away from said portion of said first conveyor belt so as to eliminate said bite section defined between said first and second conveyor belts and thereby facilitate extraction of a jammed article from said system.

10. An article conveyor system for conveying articles of mail having different thickness dimensions, comprising:

a first conveyor belt;

first conveyor belt drive means for driving said first conveyor belt;

a second conveyor belt;

second conveyor belt drive means for driving said second conveyor belt such that said second driven conveyor belt operatively cooperates with said first driven conveyor belt so as to convey mail articles as a result of the mail articles being disposed between said first and second conveyor belts;

a pinch roller adapted to be disposed in contact with a portion of said second conveyor belt so as to effectively force said portion of said second conveyor belt toward a portion of said first conveyor belt in order to define a bite section, between said portions of said first and second conveyor belts, within which mail articles to be conveyed are effectively grasped so as to be conveyed by said first and second conveyor belts; and

means mounting said pinch roller for constantly adjusting the disposition of said pinch roller and said portion of said second conveyor belt with respect to said portion of said first conveyor belt so as to constantly adjust said bite section defined between said portions of said first and second conveyor belts in response to different mail articles, having different thickness dimensions, being conveyed through said bite section defined between said first and second conveyor belts such that said conveyor system can accommodate different mail articles having different thickness dimensions without experiencing jamming.

11. The system as set forth in claim 10, wherein said means mounting said pinch roller comprises:

a pivot arm upon which said pinch roller is rotatably mounted; and

actuating means for biasing said pivot arm toward said portion of said first conveyor belt, and for permitting said pinch roller to be moved away from said portion of said first conveyor belt, in response to different thickness dimensions of the different mail articles being conveyed through said bite section defined between said first and second conveyor belts.

12. The system as set forth in claim 11, wherein:

said actuating means comprises a pneumatic actuator.

13. The system as set forth in claim 12, wherein:

said pneumatic actuator comprises a pneumatic piston-cylinder assembly comprising a piston member having a piston head and a piston rod disposed within a cylinder, wherein a free end portion of said piston rod is operatively connected to said pivot arm.

14. The system as set forth in claim 13, further comprising:

a source of air adapted to be fluidically connected to said piston-cylinder assembly by means of a pneumatic circuit;

a pressure regulator disposed within said pneumatic circuit so as to regulate incoming air from said source of air to a predetermined pressure value; and

a two-position control valve disposed within said pneumatic circuit for alternatively controlling regulated air pressure to piston head and piston rod chambers defined within said cylinder so as to cause extension and retraction of said piston member, and thereby cause extension and retraction of said pivot arm and said

pinch roller mounted upon said pivot arm as a result of said pivot arm being operatively connected to said piston rod.

15. The system as set forth in claim 14, further comprising:

an exhaust line disposed within said pneumatic circuit and fluidically connected to said two-position control valve; and

a bleed orifice disposed within said exhaust line for bleeding excess air pressure from said exhaust line when said exhaust line is fluidically connected to said piston head chamber of said piston-cylinder assembly and when said piston member is forcibly retracted into said cylinder as a result of said pinch roller being forced away from said first conveyor belt in response to accommodating a mail article having a relatively large thickness dimension.

16. The system as set forth in claim 15, further comprising:

a vacuum sensor for detecting the presence of a mail article to be conveyed by said first and second conveyor belts and for generating a mail-present signal; and

a plurality of photocells operatively disposed within the vicinity of said bite section defined between said first and second conveyor belts for determining the passage of a mail article, previously detected by said vacuum sensor, through said bite section defined between said first and second conveyor belts and for generating mail-passage signals so as to ensure a mail article has not become jammed within said bite section defined between said first and second conveyor belts.

17. The system as set forth in claim 16, further comprising:

a central processing unit operatively connected to said vacuum sensor, said plurality of photocells, said first and second conveyor belt drive means, said pressure regulator, and said two-position control valve;

said central processing unit being adapted to receive said signals from said vacuum sensor and said plurality of photocells and to generate first operational signals to said first and second conveyor belt drive means, said pressure regulator, and said two-position control valve, in response to said signals from said vacuum sensor and said plurality of photocells, so as to cause extension of said piston member of said piston-cylinder assembly and thereby movement of said pinch roller toward said portion of said first conveyor belt so as to establish said bite section defined between said first and second conveyor belts; and

said central processing unit being adapted to generate second operational signals to said first and second conveyor belt drive means so as to terminate operation of said first and second conveyor belt drive means and to said two-position control valve, in response to the absence of receiving any signals from said vacuum sensor and said plurality of photocells, so as to cause retraction of said piston member of said piston-cylinder assembly and thereby movement of said pinch roller away from said portion of said first conveyor belt so as to eliminate said bite section defined between said first and second conveyor belts and thereby place said system in an idle state.

18. The system as set forth in claim 16, further comprising:

- a central processing unit operatively connected to said vacuum sensor, said plurality of photocells, said first and second conveyor belt drive means, said pressure regulator, and said two-position control valve;

said central processing unit being adapted to receive said signals from said vacuum sensor and said plurality of photocells and to generate first operational signals to said first and second conveyor belt drive means, said pressure regulator, and said two-position control valve, in response to said signals from said vacuum sensor and said plurality of photocells, so as to cause extension of said piston member of said piston-cylinder assembly and thereby movement of said pinch roller toward said portion of said first conveyor belt so as to establish said bite section defined between said first and second conveyor belts; and

said central processing unit being adapted to generate second operational signals to said first and second conveyor belt drive means so as to terminate operation of said first and second conveyor belt drive means and to said two-position control valve, in response to the presence of said signal from said vacuum sensor but in the absence of receiving all of said signals from said plurality of photocells thereby indicating a jammed mode within said system, so as to cause retraction of said piston member of said piston-cylinder assembly and thereby movement of said pinch roller away from said portion of said first conveyor belt so as to eliminate said bite section defined between said first and second conveyor belts and thereby facilitate extraction of a jammed article from said system.

19. A mounting system for a pinch roller for use in connection with an article conveyor system, for conveying articles having different thickness dimensions, wherein the conveyor system includes a first conveyor belt, a first conveyor belt drive for driving the first conveyor belt, a second conveyor belt, and a second conveyor belt drive for driving the second conveyor belt such that the second driven conveyor belt operatively cooperates with the first driven conveyor belt so as to convey articles as a result of the articles being disposed between the first and second conveyor belts, comprising:

- a pinch roller adapted to be disposed in contact with a portion of the second conveyor belt so as to effectively force the portion of the second conveyor belt toward a portion of the first conveyor belt in order to define a bite section, between the portions of the first and second conveyor belts, within which articles to be conveyed are effectively grasped so as to be conveyed by the first and second conveyor belts; and

means mounting said pinch roller for constantly and automatically adjusting the disposition of said pinch roller and the portion of the second conveyor belt with respect to the portion of the first conveyor belt so as to constantly and automatically adjust the bite section defined between the portions of the first and second conveyor belts in response to different articles, having different thickness dimensions, being conveyed through the bite section defined between the first and second conveyor belts such that the conveyor system

can accommodate different articles having different thickness dimensions without experiencing jamming.

20. The system as set forth in claim 19, wherein said means mounting said pinch roller comprises:

- a pivot arm upon which said pinch roller is rotatably mounted; and

actuating means for biasing said pivot arm toward the portion of said first conveyor belt, and for permitting said pinch roller to be moved away from the portion of the first conveyor belt, in response to different thickness dimensions of the different articles being conveyed through the bite section defined between the first and second conveyor belts.

21. The system as set forth in claim 20, wherein:

said actuating means comprises a pneumatic actuator.

22. The system as set forth in claim 21, wherein:

said pneumatic actuator comprises a pneumatic piston-cylinder assembly comprising a piston member having a piston head and a piston rod disposed within a cylinder, wherein a free end portion of said piston rod is operatively connected to said pivot arm.

23. The system as set forth in claim 22, further comprising:

- a source of air adapted to be fluidically connected to said piston-cylinder assembly by means of a pneumatic circuit;

- a pressure regulator disposed within said pneumatic circuit so as to regulate incoming air from said source of air to a predetermined pressure value; and

- a two-position control valve disposed within said pneumatic circuit for alternatively controlling regulated air pressure to piston head and piston rod chambers defined within said cylinder so as to cause extension and retraction of said piston member, and thereby cause extension and retraction of said pivot arm and said pinch roller mounted upon said pivot arm as a result of said pivot arm being operatively connected to said piston rod.

24. The system as set forth in claim 23, further comprising:

- an exhaust line disposed within said pneumatic circuit and fluidically connected to said two-position control valve; and

- a bleed orifice disposed within said exhaust line for bleeding excess air pressure from said exhaust line when said exhaust line is fluidically connected to said piston head chamber of said piston-cylinder assembly and when said piston member is forcibly retracted into said cylinder as a result of said pinch roller being forced away from the first conveyor belt in response to accommodating an article having a relatively large thickness dimension.

25. The system as set forth in claim 23, further comprising:

- a vacuum sensor for detecting the presence of an article to be conveyed by the first and second conveyor belts and for generating an article-present signal; and

- a plurality of photocells operatively disposed within the vicinity of the bite section defined between the first and

second conveyor belts for determining the passage of an article, previously detected by said vacuum sensor, through the bite section defined between the first and second conveyor belts and for generating article-passage signals so as to ensure an article has not become jammed within the bite section defined between the first and second conveyor belts.

26. The system as set forth in claim 25, further comprising:

a central processing unit operatively connected to said vacuum sensor, said plurality of photocells, the first and second conveyor belt drives, said pressure regulator, and said two-position control valve;

said central processing unit being adapted to receive said signals from said vacuum sensor and said plurality of photocells and to generate first operational signals to the first and second conveyor belt drives, said pressure regulator, and said two-position control valve, in response to said signals from said vacuum sensor and said plurality of photocells, so as to cause extension of said piston member of said piston-cylinder assembly and thereby movement of said pinch roller toward the portion of the first conveyor belt so as to establish the bite section defined between the first and second conveyor belts; and

said central processing unit being adapted to generate second operational signals to the first and second conveyor belt drives so as to terminate operation of the first and second conveyor belt drives and to said two-position control valve, in response to the absence of receiving any signals from said vacuum sensor and said plurality of photocells, so as to cause retraction of said piston member of said piston-cylinder assembly and thereby movement of said pinch roller away from the portion of the first conveyor belt so as to eliminate the bite section defined between the first and second conveyor belts and thereby place the conveyor system in an idle state.

27. The system as set forth in claim 25, further comprising:

a central processing unit operatively connected to said vacuum sensor, said plurality of photocells, the first and second conveyor belt drives, said pressure regulator, and said two-position control valve;

said central processing unit being adapted to receive said signals from said vacuum sensor and said plurality of photocells and to generate first operational signals to the first and second conveyor belt drives, said pressure regulator, and said two-position control valve, in response to said signals from said vacuum sensor and said plurality of photocells, so as to cause extension of said piston member of said piston-cylinder assembly and thereby movement of said pinch roller toward the portion of the first conveyor belt so as to establish the bite section defined between the first and second conveyor belts; and

said central processing unit being adapted to generate second operational signals to the first and second conveyor belt drives so as to terminate operation of the first and second conveyor belt drives and to said two-position control valve, in response to the presence

of said signal from said vacuum sensor but in the absence of receiving all of said signals from said plurality of photocells thereby indicating a jammed mode within the conveyor system, so as to cause retraction of said piston member of said piston-cylinder assembly and thereby movement of said pinch roller away from the portion of the first conveyor belt so as to eliminate the bite section defined between the first and second conveyor belts and thereby facilitate extraction of a jammed article from the conveyor system.

28. A mounting system for a pinch roller for use in connection with a mail article conveyor system, for conveying mail articles having different thickness dimensions, wherein the conveyor system includes a first conveyor belt, a first conveyor belt drive for driving the first conveyor belt, a second conveyor belt, and a second conveyor belt drive for driving the second conveyor belt such that the second driven conveyor belt operatively cooperates with the first driven conveyor belt so as to convey mail articles as a result of the mail articles being disposed between the first and second conveyor belts, comprising:

a pinch roller adapted to be disposed in contact with a portion of the second conveyor belt so as to effectively force the portion of the second conveyor belt toward a portion of the first conveyor belt in order to define a bite section, between the portions of the first and second conveyor belts, within which mail articles to be conveyed are effectively grasped so as to be conveyed by the first and second conveyor belts; and

means mounting said pinch roller for constantly and automatically adjusting the disposition of said pinch roller and the portion of the second conveyor belt with respect to the portion of the first conveyor belt so as to constantly and automatically adjust the bite section defined between the portions of the first and second conveyor belts in response to different mail articles, having different thickness dimensions, being conveyed through the bite section defined between the first and second conveyor belts such that the conveyor system can accommodate different mail articles having different thickness dimensions without experiencing jamming.

29. The system as set forth in claim 28, wherein said means mounting said pinch roller comprises:

a pivot arm upon which said pinch roller is rotatably mounted; and

actuating means for biasing said pivot arm toward the portion of said first conveyor belt, and for permitting said pinch roller to be moved away from the portion of the first conveyor belt, in response to different thickness dimensions of the different mail articles being conveyed through the bite section defined between the first and second conveyor belts.

30. The system as set forth in claim 29, wherein:

said actuating means comprises a pneumatic actuator.

31. The system as set forth in claim 30, wherein:

said pneumatic actuator comprises a pneumatic piston-cylinder assembly comprising a piston member having a piston head and a piston rod disposed within a cylinder, wherein a free end portion of said piston rod is operatively connected to said pivot arm.

32. The system as set forth in claim 31, further comprising:

- a source of air adapted to be fluidically connected to said piston-cylinder assembly by means of a pneumatic circuit;
- a pressure regulator disposed within said pneumatic circuit so as to regulate incoming air from said source of air to a predetermined pressure value; and
- a two-position control valve disposed within said pneumatic circuit for alternatively controlling regulated air pressure to piston head and piston rod chambers defined within said cylinder so as to cause extension and retraction of said piston member, and thereby cause extension and retraction of said pivot arm and said pinch roller mounted upon said pivot arm as a result of said pivot arm being operatively connected to said piston rod.

33. The system as set forth in claim 32, further comprising:

- an exhaust line disposed within said pneumatic circuit and fluidically connected to said two-position control valve; and
- a bleed orifice disposed within said exhaust line for bleeding excess air pressure from said exhaust line when said exhaust line is fluidically connected to said piston head chamber of said piston-cylinder assembly and when said piston member is forcibly retracted into said cylinder as a result of said pinch roller being forced away from the first conveyor belt in response to accommodating a mail article having a relatively large thickness dimension.

34. The system as set forth in claim 32, further comprising:

- a vacuum sensor for detecting the presence of a mail article to be conveyed by the first and second conveyor belts and for generating a mail article-present signal; and
- a plurality of photocells operatively disposed within the vicinity of the bite section defined between the first and second conveyor belts for determining the passage of a mail article, previously detected by said vacuum sensor, through the bite section defined between the first and second conveyor belts and for generating mail article-passage signals so as to ensure a mail article has not become jammed within the bite section defined between the first and second conveyor belts.

35. The system as set forth in claim 34, further comprising:

- a central processing unit operatively connected to said vacuum sensor, said plurality of photocells, the first and second conveyor belt drives, said pressure regulator, and said two-position control valve;

said central processing unit being adapted to receive said signals from said vacuum sensor and said plurality of photocells and to generate first operational signals to

the first and second conveyor belt drives, said pressure regulator, and said two-position control valve, in response to said signals from said vacuum sensor and said plurality of photocells, so as to cause extension of said piston member of said piston-cylinder assembly and thereby movement of said pinch roller toward the portion of the first conveyor belt so as to establish the bite section defined between the first and second conveyor belts; and

said central processing unit being adapted to generate second operational signals to the first and second conveyor belt drives so as to terminate operation of the first and second conveyor belt drives and to said two-position control valve, in response to the absence of receiving any signals from said vacuum sensor and said plurality of photocells, so as to cause retraction of said piston member of said piston-cylinder assembly and thereby movement of said pinch roller away from the portion of the first conveyor belt so as to eliminate the bite section defined between the first and second conveyor belts and thereby place the conveyor system in an idle state.

36. The system as set forth in claim 34, further comprising:

- a central processing unit operatively connected to said vacuum sensor, said plurality of photocells, the first and second conveyor belt drives, said pressure regulator, and said two-position control valve;

said central processing unit being adapted to receive said signals from said vacuum sensor and said plurality of photocells and to generate first operational signals to the first and second conveyor belt drives, said pressure regulator, and said two-position control valve, in response to said signals from said vacuum sensor and said plurality of photocells, so as to cause extension of said piston member of said piston-cylinder assembly and thereby movement of said pinch roller toward the portion of the first conveyor belt so as to establish the bite section defined between the first and second conveyor belts; and

said central processing unit being adapted to generate second operational signals to the first and second conveyor belt drives so as to terminate operation of the first and second conveyor belt drives and to said two-position control valve, in response to the presence of said signal from said vacuum sensor but in the absence of receiving all of said signals from said plurality of photocells thereby indicating a jammed mode within the conveyor system, so as to cause retraction of said piston member of said piston-cylinder assembly and thereby movement of said pinch roller away from the portion of the first conveyor belt so as to eliminate the bite section defined between the first and second conveyor belts and thereby facilitate extraction of a jammed mail article from the conveyor system.

* * * * *