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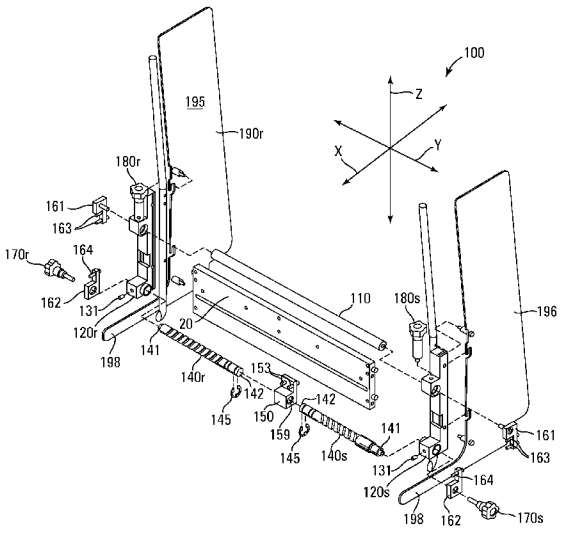
(54) **Title:** LATERALLY ADJUSTABLE SIDE GUIDE ASSEMBLY FOR USE WITH FRICTION SHEET FEEDING MACHINES



(57) **Abstract:** A laterally repositionable side guide assembly for use with a friction sheet feeding machine. The side guide assembly includes (i) a support member, (ii) a carriage, (iii) a side guide, and (iv) a worm screw. The support member is configured and arranged for attachment to a friction sheet feeding machine. The carriage is repositionably mounted on the support member for selective lateral repositioning relative to the support member. The side guide is configured and arranged for laterally guiding sheets through a friction sheet feeding machine. The side guide is attached to the carriage for lateral repositioning with the carriage. The worm screw is in threaded communication with the carriage for effecting linear movement of the carriage along the length of the worm screw upon rotation of the worm screw.

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LATERALLY ADJUSTABLE SIDE GUIDE ASSEMBLY FOR USE WITH FRICTION SHEET FEEDING MACHINES

[0001] This application claims the benefit of United States Provisional Application No. 60/784,121, filed March 20, 2006.

BACKGROUND OF THE INVENTION

[0002] A wide variety of friction sheet feeding machines are available for feeding individual sheets from the bottom of an essentially vertical stack of sheets. Exemplary friction sheet feeding machines are shown and described in United States Patents Nos. 4,991,831, 5,143,365, 5,244,198, 5,642,877, 5,772,199 and 6,932,338.

[0003] These machines typically include (i) a tray for holding a stack of sheets in an essentially vertical position, (ii) a nip for feeding a lowermost sheet from the stack, (iii) a driven friction roller or feed belt for contacting the downward facing major surface of the lowermost sheet in the stack and pulling the lowermost sheet from underneath the sheet stack towards the nip, and (iv) a friction retard surface positioned above the driven friction roller for contacting the leading edge(s) and any exposed upward facing major surface(s) of the sheet(s) positioned directly above the lowermost sheet for retarding advancement of the sheet(s) directly above the lowermost sheet and thereby facilitating separation of the lowermost sheet from the immediately overlying sheet prior to introduction of the lowermost sheet into the feed nip.

[0004] Side guides are commonly employed on friction sheet feeding machines for providing lateral support to a sheet stack loaded onto the tray, and providing lateral guidance to sheets as they are pulled from the stack by the driven friction roller or feed belt(s) and introduced into the nip area. These side guides are commonly mounted on a laterally repositionable carriage to permit quick and easy repositioning of the side guides in order to accommodate sheets of different widths. However, because the side guides typically extend below the upper conveying surface of the feed belts in order to prevent sheets from slipping under the side guide, the feed belts often interfere with lateral repositioning of the side

guides. Hence, the side guides need to be detached from the carriage prior to repositioning of the subassembly and reattached after the carriage has been repositioned.

[0005] While generally effective for facilitating lateral repositioning of the side guides, the repositioning process tends to be an awkward, cumbersome, time consuming and potentially dangerous as it involves detachment and reattachment of the side guides.

[0006] Accordingly, a need exists for laterally repositionable side guides capable of being quickly, easily and safely repositioned without requiring the use of a tool or requiring detachment of the side guides.

SUMMARY OF THE INVENTION

[0007] A first aspect of the invention is a laterally repositionable side guide assembly for use with a friction sheet feeding machine. The side guide assembly includes (i) a support member, (ii) a carriage, (iii) a side guide, and (iv) a worm screw. The support member is configured and arranged for attachment to a friction sheet feeding machine. The carriage is repositionably mounted on the support member for selective lateral repositioning relative to the support member. The side guide is configured and arranged for laterally guiding sheets through a friction sheet feeding machine. The side guide is attached to the carriage for lateral repositioning with the carriage. The worm screw is in threaded communication with the carriage for effecting linear movement of the carriage along the length of the worm screw upon rotation of the worm screw.

[0008] The side guide assembly preferably includes a pair of laterally spaced and laterally repositionable carriages, each with an associated side guide and a corresponding worm screw.

[0009] A second aspect of the invention is a method of laterally repositioning a side guide on a friction sheet feeding machine. The method includes the steps of (i) obtaining a friction sheet feeding machine equipped with a repositionable side guide assembly wherein the side guide assembly includes at least (A) a support member attached to the friction sheet feeding machine, (B) a pair of laterally spaced carriage, each repositionably mounted on the support member for selective lateral repositioning relative to the support member, (C) a pair of

laterally spaced side guides, each configured and arranged for laterally guiding sheets through the friction sheet feeding machine, and each attached to one of the carriages for lateral repositioning with the carriage, and (D) a pair of laterally spaced worm screws, each in threaded communication with one of the carriages for effecting linear movement of the corresponding carriage along the length of the worm screw upon rotation of the worm screw, (ii) rotating one of the worm screws to laterally reposition the corresponding carriage and attached side guide along the support member without lateral movement of the one worm screw, and (iii) rotating the other worm screw to laterally reposition the corresponding carriage and attached side guide along the support member without lateral movement of the other worm screw.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] Figure 1 is an exploded perspective view of one embodiment of the invention.

[0011] Figure 2 is an enlarged perspective view of one of the carriages and associated side guide shown in FIG. 1.

[0012] Figure 3 is a cross-sectional side view of the carriage shown in FIG. 2 taken along line 3-3 with the catch pins inserted into the carriage and the corresponding side guide shown attached to the carriage in the lower position.

[0013] Figure 4 is a perspective view of the invention shown in FIG. 1 attached to a friction sheet feeding machine with the side guide in the lower position.

DETAILED DESCRIPTION OF THE INVENTION

Nomenclature

10 Friction Sheet Feeding Machine

20 Cross Member

30 Drive Assembly

31 Friction Feed Roller
32 Idler Roller
35 Friction Feed Belts
100 Side Guide Assembly
110 Support Rod
120 Carriages (120r and 120s)
120r Right Carriage
120s Left Carriage
121 Top of Carriage
122 Bottom of Carriage
123 Front of Carriage
124 Back of Carriage
127 Lateral Channel Across Front of Carriage
128 Transverse Channel Along Back of Carriage
129a First Lateral Bore Through Carriage
129b Second Lateral Bore Through Carriage
131 Follower Pin
132 Catch Pins
140 Worm Screws (140r and 140s)
140r Right Worm Screw
140s Left Worm Screw
141 Proximal End of Worm Screw
142 Distal End of Worm Screw
145 E-Clip
150 Center Support Block
153 Machine Screws
161 First Mounting Blocks
162 Second Mounting Blocks
163 Machine Screws
164 Machine Screws
170 Repositioning Knobs
170r Right Repositioning Knob
170s Left Repositioning Knob
180 Locking Knobs (180r and 180s)

180r Right Locking Knob

180s Left Locking Knob

190 Side Guides (190r and 190s)

190r Right Side Guide

190s Left Side Guide

191 Top of Side Guide

192 Bottom of Side Guide

193 Front or Forward Edge of Side Guide

194 Back or Rearward Edge of Side Guide

195 Inward Facing Major Surface of Side Guide

196 Outward Facing Major Surface of Side Guide

198 Forward Projecting Finger

199 Slots (199a and 199b)

199a First L-shaped Slot in Forward Edge of Side Guide

199b Second L-shaped Slot in Forward Edge of Side Guide

x Longitudinal Direction

y Lateral Direction

z Transverse Direction

Construction

[0014] Friction sheet feeding machines **10** generally include a frame (not shown), a tray assembly (not shown), a gating assembly (not shown) and a drive assembly **30**. The machines **10** are capable of serially feeding individual sheets (not shown) in a longitudinal direction **x** from the bottom (not shown) of a generally vertical stack of sheets (not shown) retained within the tray assembly (not shown).

[0015] **A** typical configuration of the frame (unnumbered) is a generally rectangular frame (not shown) having (i) a generally horizontal base plate (not shown), (ii) a right side panel (not shown) extending upward from the base plate (not shown), (iii) a left side panel (not shown) also extending upward from the base plate (not shown), (iv) a rear end plate (not shown) extending upward from the base plate (not shown) and laterally interconnecting the side panels (not shown), (v) at least one lateral cross member, such as cross member **20**, transversely spaced above the base plate (not shown) and interconnecting the side panels (not

shown) for supporting the gating assembly (not shown), and (vi) a plurality of laterally extending support rods (not shown) extending between and interconnecting the side panels (not shown). Other frame configurations may also be employed, such as a cross-beam construction rather than a plate construction. Exemplary frames suitable for use are shown and described in United States Patents Nos. 4,991,831, 5,143,365, 5,244,198, 5,642,877, 5,772,199 and 6,932,338.

[0016] The tray assembly (not shown) is effective for holding a stack of individual sheets (not shown) in a substantially vertical position with a slight biasing of at least the lower portion (unnumbered) of the stack (not shown) towards the gating assembly (not shown) and the drive assembly **30**.

[0017] One means for achieving the desired biasing of the stack (not shown), is to incline the floor (not shown) of the tray assembly (not shown) towards the gating assembly (not shown) and the drive assembly **30**. Other means are known and may also be employed, such as a transversely extending strip (not shown) positioned within the tray assembly (not shown) for supporting the trailing edges (not shown) of the sheets (not shown) in the stack (not shown) wherein the lower portion (unnumbered) of the support strip (not shown) is curved towards the gating assembly (not shown) and the drive assembly **30**. Suitable tray types, styles and configurations are shown and described in United States Patents Nos. 4,991,831, 5,143,365, 5,244,198, 5,642,877, 5,772,199 and 6,932,338.

[0018] A typical gating assembly (not shown) includes a friction retard roller (not shown) driven by an auxiliary electric motor (not shown) for contacting the upward facing major surface (not shown) of sheets (not shown) as they approach the friction feed belts **35** for assisting in separation of a lowermost sheet (not shown) from the immediately overlying sheet (not shown) and preventing the simultaneous feeding of multiple sheets (not shown). Typical gating assemblies are shown and described in United States Patents Nos. 4,991,831, 5,143,365, 5,244,198, 5,642,877, 5,772,199 and 6,932,338.

[0019] Generally, the drive assembly **30** includes a primary drive motor (not shown) and a friction feed roller **31** driven by the primary drive motor (not shown). The friction feed roller **31** drives friction feed belts **35** which contact the sheets (not shown).

[0020] The drive assembly **30** on friction sheet feeding machines **10** typically includes a conveyor system (not shown) downstream from the friction feed belts **35** for receiving individual sheets (not shown) fed from the sheet stack (not shown) by the friction feed belts **35** and conveying the fed sheets (not shown) to the desired location, typically a conveyor belt (not shown) timed to receive and collate sheets (not shown) fed from several aligned friction sheet feeding machines **10**.

[0021] Referring generally to FIG 4, one embodiment of a suitable drive assembly **30** includes a primary drive motor (not shown), and a plurality of laterally **y** aligned and spaced friction feed belts **35**, each mounted onto a driven friction feed roller **31** and an idler roller **32**. The friction feed roller **31** is rotatably attached to side panels (not shown). Similarly, the idler roller **32** extends parallel with the friction feed roller **31** and is rotatably attached to the side panels (not shown). The friction feed roller **31** is driven by the primary drive motor (not shown) via drive belt (not shown).

[0022] Referring generally to FIGs 1 and 4, the invention is a side guide assembly **100** configured and arranged for operable attachment to a friction sheet feeding machine **10** to provided lateral **y** support to a sheet stack (not shown) loaded onto the machine **10** and lateral guidance to individual sheets (not shown) as they are fed through the machine **10**.

[0023] The side guide assembly **100** includes a support rod **110**, right and left carriages **120r** and **120s** (collectively carriages **120**), and right and left side guides **190r** and **190s** (collectively side guides **190**).

[0024] The support rod **110** is positioned just above the cross member **20** with the lateral ends (unnumbered) of the support rod **110** attached to the lateral **y** ends (unnumbered) of the cross member **20** by first mounting blocks **161** and machine screws **163**.

[0025] The carriages **120** are slidably supported on the support rod **110** via a first lateral **y** bore **129a** through each carriage **120**. The carriages **120** are also slidably supported on the cross member **20** via a lateral **y** channel **127** in the front **123** of each carriage **120**.

[0026] The right and left side guides **190r** and **190s** are mounted onto the right and left carriages **120r** and **120s** respectively. The side guides **190** are configured and arranged to cooperatively support a stack of sheets (not shown) therebetween.

[0027] The carriages **120** each have a second lateral bore **129b** extending through the carriage **120**. A right worm screw **140r** extends through the second lateral bore **129b** in the right carriage **120r** and a left worm screw **140s** extends through the second lateral bore **129b** in the left carriage **120s**. The worm screws **140r** and **140s** (collectively **140**) are spirally threaded for cooperatively engaging a follower pin **131** extending into the second lateral bore **129b** in each carriage **120**, whereby rotation of the worm screw **140** causes the corresponding carriage **120** to travel along the length of the rotated worm screw **140**.

[0028] The distal ends **142** of the worm screws **140** are rotatably supported by a center support block **150** attached to the cross member **20** by machine screws **153**.

[0029] The proximal ends **141** of each worm screw **140r** and **140s** is attached to a repositioning knob **170r** and **170s** respectively (collectively repositioning knobs **170**) for effecting independent manual rotation of the attached worm screw **140**. The repositioning knobs **170** are rotatably supported by second mounting blocks **162** attached to the cross member **20** by machine screws **164**.

[0030] A locking knob **180r** and **180s** (collectively **180**) is provided on each carriage **120r** and **120s** respectively, for selectively engaging and disengaging the support rod **110** to prevent further lateral repositioning of the corresponding carriage **120** when the locking knob **180** is rotated into locking engagement with the support member **110**, and permitting repositioning of the corresponding carriage **120** when the locking knob **180** is rotated away from the support member **110**.

[0031] Bearings (unnumbered) are preferably provided at each end (unnumbered) of the first bores **129a** through each carriage **120** to facilitate lateral **y** sliding of the carriages **120** along the support rod **110**. Bearings (unnumbered) are also preferably provided at each end (unnumbered) of the second bores **129b** through each carriage **120** to facilitate rotation and lateral **y** sliding of the worm screws **140** relative to the carriages **120**.

[0032] An e-clip **145** can be provided on each worm screw **140** proximate the distal end **142** of the worm screw **140** for serving as a stop to continued inward travel of the carriages **120** along the length of the corresponding worm screw **140**. Other mechanical stops are well known to those of routine skill in the art and may be substituted for the e-clip stop **145** shown and described.

[0033] Referring to FIG 2, each of the side guides **190** has a top **191**, a bottom **192**, a forward edge **193**, a rearward edge **194**, an inward facing major surface **195**, and an outward facing major surface **196**. The side guides **190** preferably include a forward projecting finger **198** extending from proximate the bottom **192** of the side guide **190** for projecting underneath the cross member **20** and thereby providing lateral **y** guidance to sheets (not shown) as they are fed through the gating assembly (not shown) and drive assembly **30**.

[0034] The side guides **190** are mounted to a corresponding carriage **120** so that they travel laterally **y** with the corresponding carriage **120**, and a capable of being transversely **z** lifted relative to the carriage **120** during repositioning of the side guide **190** without being detached from the carriage **120**.

[0035] One mechanism for achieving the desired attachment is depicted in FIG 3. The forward edge **193** of each side guide **190** is retained within a transversely **z** extending channel **128** in the back **124** of the corresponding carriage **120** which extends from the top **121** of the carriage **120** to the bottom **122** of the carriage **120**. L-shaped slots **199a** and **199b** (collectively slots **199**) are cut in the forward edge **193** of each side guide **190** for cooperatively engaging corresponding catch pins **132** positioned within the transverse **z** channel **128**. The side guides **190** are biased downward onto "locking" engagement with the catch pins **132** by gravity (*i.e.*, the catch pins **132** are normally biased into the upper portion of the L-shaped slots **199** as depicted in FIG 3). The transversely **z** extending leg (unnumbered) of the L-shaped slots **199** is elongated to permit the side guide **190** to be lifted relative to the corresponding carriage **120** so as to slide the side guide **190** along the transverse z length of the transverse channel **128** without removing the catch pins **132** from within the slots **199**. Generally, a lift distance of about 0.5 cm to 2 cm is sufficient to lift the bottom **192** of the side guide **190** above the friction feed belts **35** and thereby permit unimpeded lateral **y** repositioning of the side guide **190**.

[0036] Other attachment mechanisms capable of coupling the side guide **190** to a corresponding carriage **120** with the necessary and desired upward sliding or pivoting of the side guide **190** relative to the corresponding carriage **120** without detaching the side guide **190** from the carriage **120**, are known and within the scope of this invention. One such example is to replace the catch pins **132** on the carriage **120** with an L-shaped slot **199** and replace the slots **199** on the side guide **190** with trunnions (not shown).

[0037] Biasing means other than gravity are known and may be employed to bias the side guides **190** into the lower "locked" position on the corresponding carriage **120**. Such biasing means include springs, elastic bands, pneumatic cylinders, etc.

Use

[0038] The side guide assembly **100** of the present invention permits quick and easy repositioning of the side guides **190** as necessary for accommodating sheets (not shown) of different width by (i) rotating the locking knob **180** to allow the carriage **120** to slide along the support rod **120**, (ii) pulling up on the side guide **190** to position the side guide **190** into the upper position and thereby lift the bottom **192** of the side guide **190** above the friction feed belts **35**, (iii) rotating the repositioning knob **170** as necessary and appropriate to move the carriage **120** and attached side guide **190** into supporting engagement with sheets (not shown) loaded onto the friction sheet feeding machine **10** with the side guide held in the lifted position, (iv) releasing the side guide **190** so as to allow the side guide **190** to return to its lower biased position, (v) rotating the locking knob **180** to again lock the carriage **120** against the support rod **110** and prevent any further lateral **y** movement of the carriage **120** and the corresponding side guide **190** relative to the friction sheet feeding machine **10**, and (vi) repeating steps (i) through (v) for the other side guide **190**.

We claim:

1. A laterally repositionable side guide assembly for use with a friction sheet feeding machine capable of feeding individual sheets from a stack of sheets in a longitudinal direction, comprising:

(a) a support member configured and arranged for attachment to a friction sheet feeding machine,

(b) a carriage repositionably mounted on the support member for selective lateral repositioning relative to the support member,

(c) a side guide configured and arranged for laterally guiding sheets through a friction sheet feeding machine, the side guide attached to the carriage for lateral repositioning with the carriage, and

(d) a worm screw in threaded communication with the carriage for effecting linear movement of the carriage along the length of the worm screw upon rotation of the worm screw.

2. The side guide assembly of claim 1 wherein (i) the support member is rigidly attached to a friction sheet feeding machine, (ii) the machine has a right side and a left side, (iii) safety panels are mounted on the right and left sides of the machine for limiting side access into to the machine, and (iv) an interface device for effecting manual rotation of the worm screw is located on the outside of one of the safety panels.

3. The side guide assembly of claim 2 wherein the interface device is a manually rotatable knob.

4. A laterally repositionable side guide assembly for use with a friction sheet feeding machine capable of feeding individual sheets from a stack of sheets in a longitudinal direction, comprising:

(a) a support member configured and arranged for attachment to a friction sheet feeding machine,

(b) a pair of laterally spaced carriages, each repositionably mounted on the support member for selective lateral repositioning relative to the support member,

(c) a pair of laterally spaced side guides, each configured and arranged for laterally guiding sheets through a friction sheet feeding machine, and each attached to one of the carriages for lateral repositioning with the carriage, and

(d) a pair of laterally spaced worm screws, each in threaded communication with one of the carriages for effecting linear movement of the corresponding carriage along the length of the worm screw upon rotation of the worm screw.

5. The side guide assembly of claim 3 wherein (i) the support member is rigidly attached to a friction sheet feeding machine, (ii) the machine has a right side and a left side, (iii) safety panels are mounted on the right and left sides of the machine for limiting side access into to the machine, (iv) an interface device for effecting manual rotation of the one worm screw is located on the outside of one of the safety panels, and (v) an interface device for effecting manual rotation of the other worm screw is located on the outside of the other safety panel.

6. The side guide assembly of claim 5 wherein the interface device is a manually rotatable knob.

7. The side guide assembly of claim 3 wherein each carriage and attached side guide are independently repositionable.

8. A method of laterally repositioning side guides on a friction sheet feeding machine, comprising the steps of:

(a) obtaining a friction sheet feeding machine equipped with a repositionable side guide assembly wherein the side guide assembly includes at least:

(i) a support member attached to a friction sheet feeding machine,

(ii) a pair of laterally spaced carriages, each repositionably mounted on the support member for selective lateral repositioning relative to the support member,

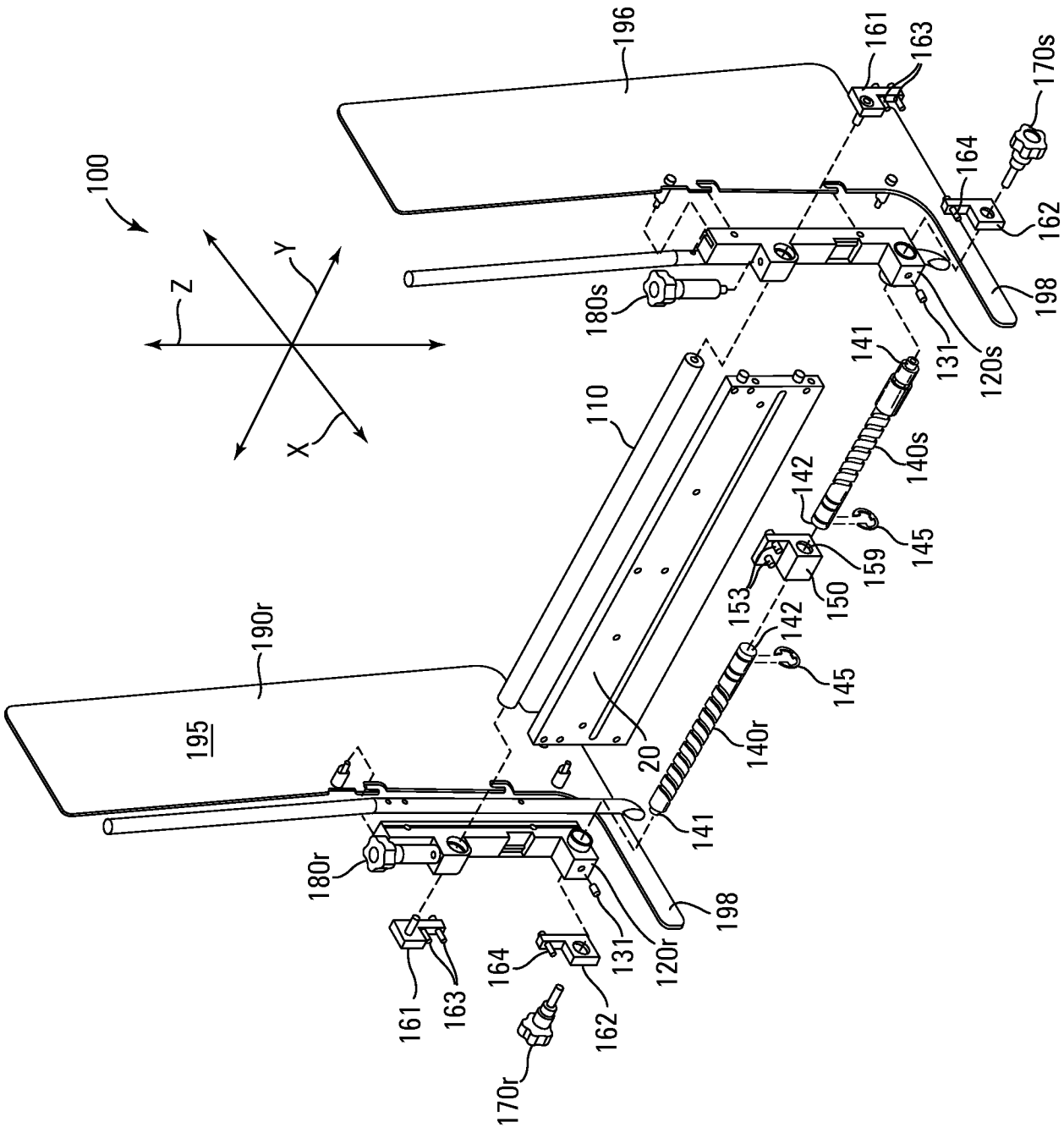
(iii) a pair of laterally spaced side guides, each configured and arranged for laterally guiding sheets through a friction sheet feeding machine, and each attached to one of the carriages for lateral repositioning with the carriage, and

(iv) a pair of laterally spaced worm screws, each in threaded communication with one of the carriages for effecting linear movement of the corresponding carriage along the length of the worm screw upon rotation of the worm screw,

(b) rotating one of the worm screws to laterally reposition the corresponding carriage and attached side guide along the support member without lateral movement of the one worm screw, and

(c) rotating the other worm screw to laterally reposition the corresponding carriage and attached side guide along the support member without lateral movement of the other worm screw.

FIG. 1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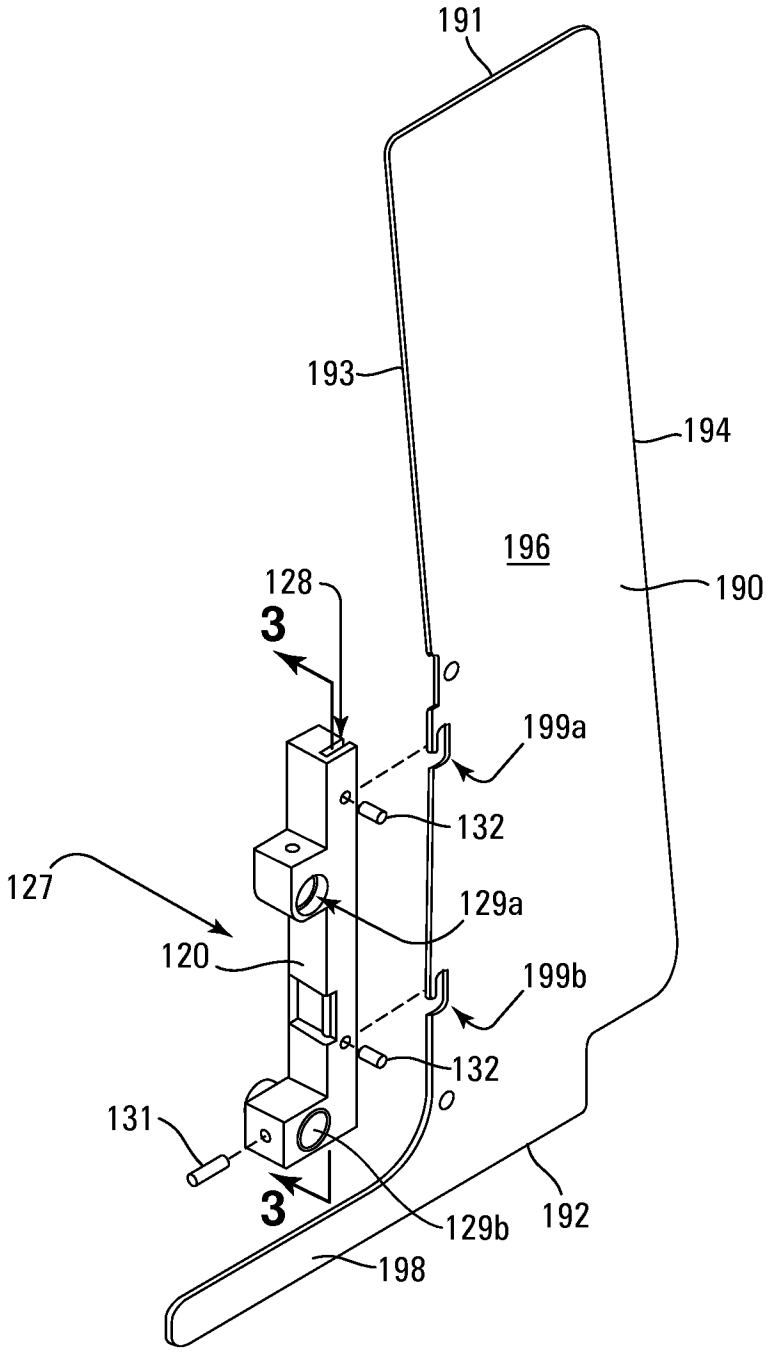
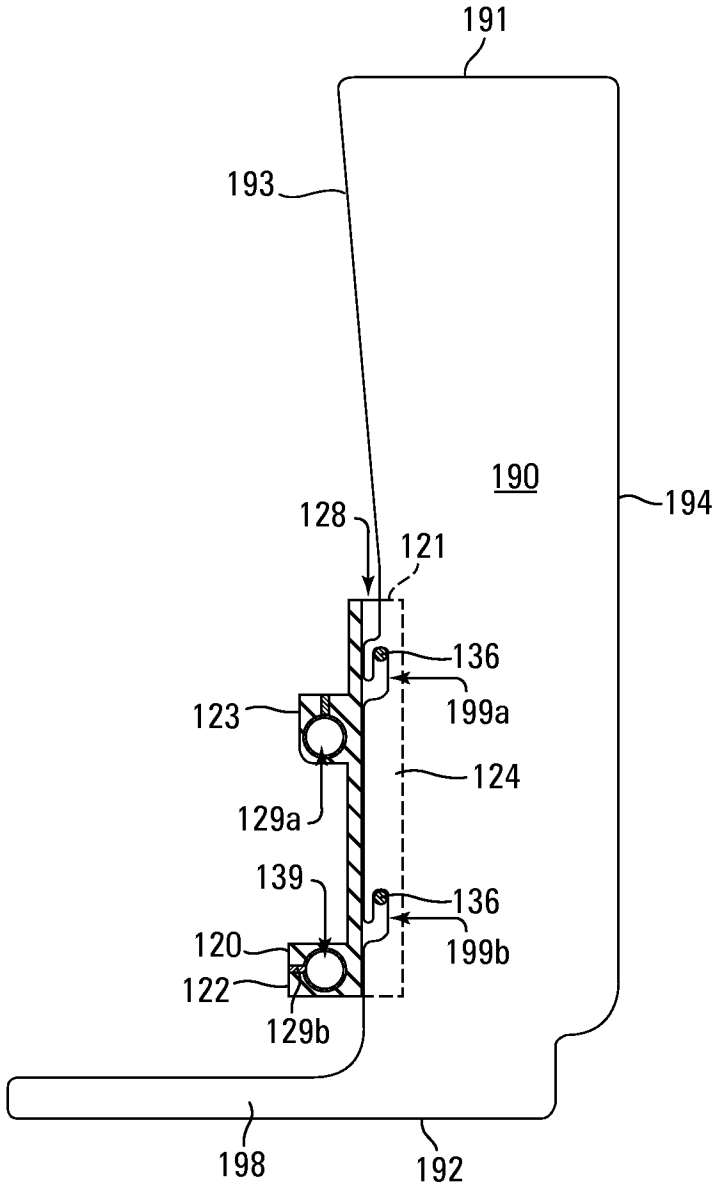

191
193
194
196
190
128
3
199a
132
127
129a
120
199b
132
131
3
129b
192
198

FIG. 2


191
193
190
194
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199a
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129a
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120
122
129b
198
192

FIG. 3

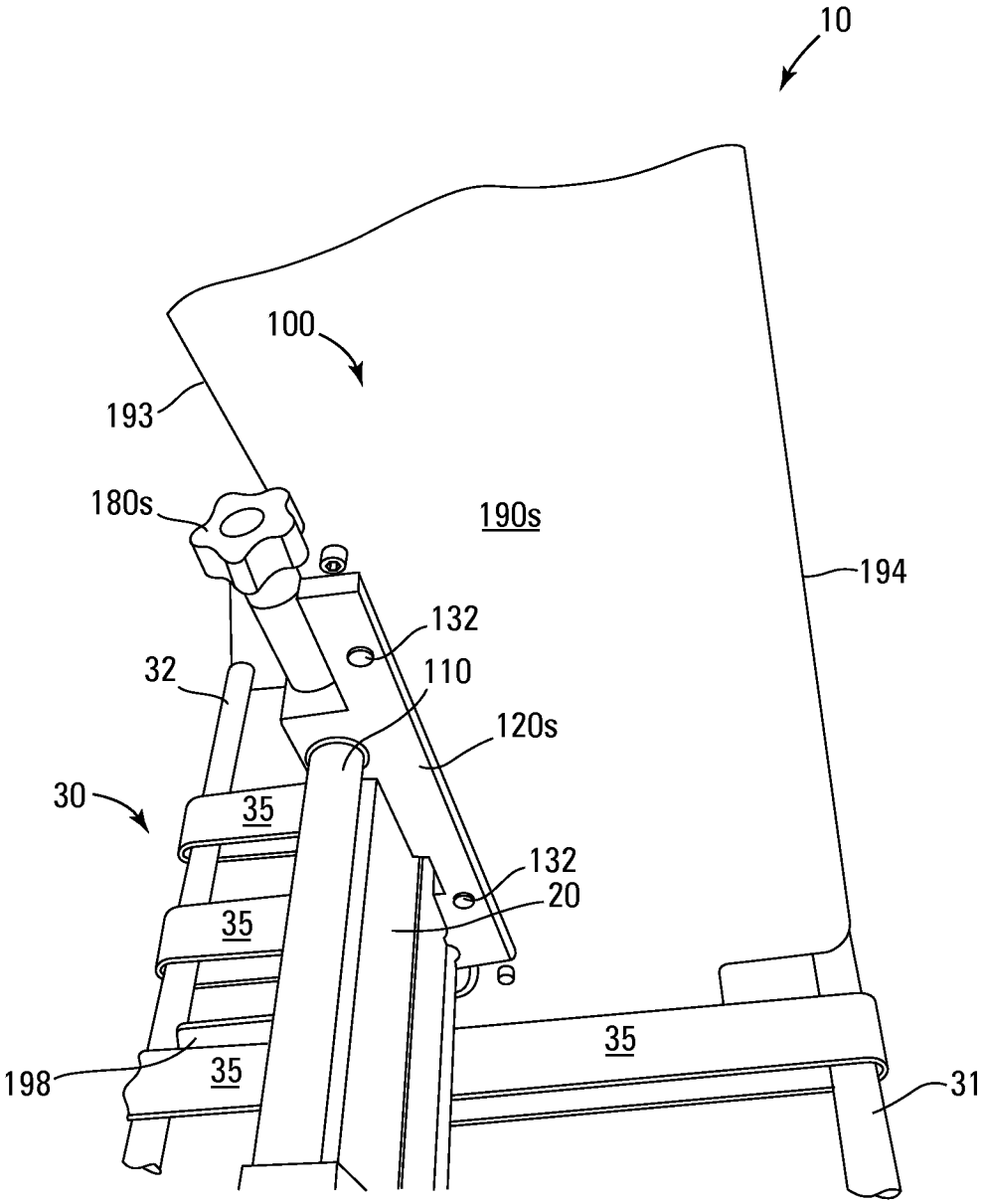
10
100
193
180s
190s
194
132
32
110
120s
30
35
132
20
35
35
198
35
31

FIG. 4