United States Patent [19]

Kirby, Jr.

[11] **3,880,548**

[45] **Apr. 29, 1975**

[54] **INK PUMP**

[76] Inventor: **Raymond L. Kirby, Jr.**, 527 Damian St., Vandalia, Ohio 45377

[22] Filed: **July 5, 1973**

[21] Appl. No.: **376,668**

Related U.S. Application Data

[62] Division of Ser. No. 215,783, Jan. 6, 1972.

[52] **U.S. Cl.** **415/73**; 416/177; 198/213

[51] **Int. Cl.** **F04d 29/38**; B65g 33/00

[58] **Field of Search** 415/72, 73, 74; 198/213; 416/176, 177

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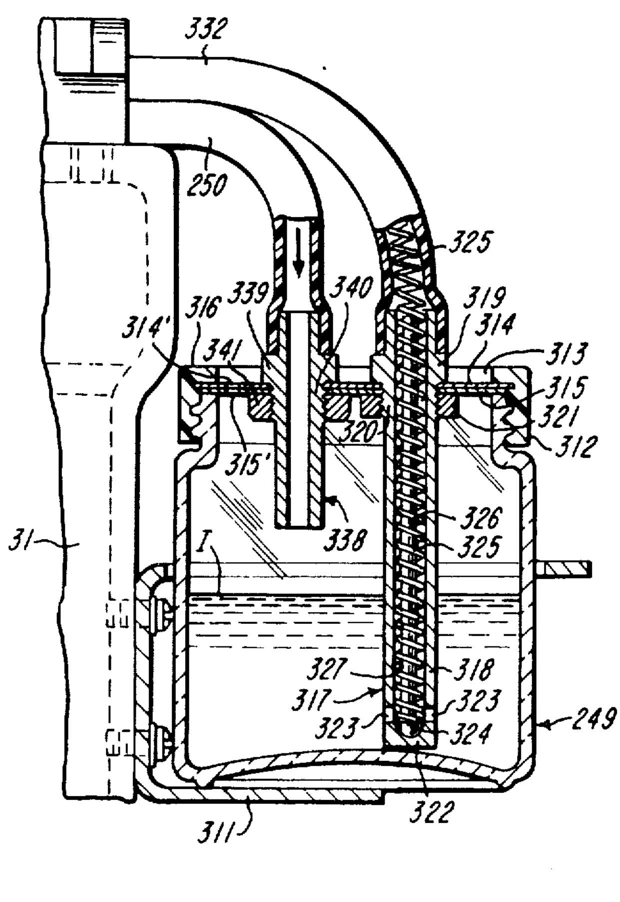
Primary Examiner—C. J. Husar
Assistant Examiner—Louis T. Casaregola
Attorney, Agent, or Firm—Joseph J. Grass

[57] **ABSTRACT**

There is disclosed a printing, feeding and severing method and apparatus for carrying out the method. The apparatus includes a print head assembly and a platen assembly movable relatively toward and away from each other into and out of printing cooperation, mechanism for inking the print head assembly, mechanism for feeding a web of record members to between the print head assembly and the platen assembly, the web being in roll form and there being means to assist the gradual unwinding of the roll with gradual paying out of web material from the roll to the feeding mechanism, an idler contacting the web and disposed at a slight angle to the direction of feed of the web to cause the web to follow a feed edge, record severing means disposed downstream of the print head assembly and the platen assembly, and a modular support assembly of a print head of the print head assembly. The inking mechanism includes an improved ink pump.

2 Claims, 35 Drawing Figures



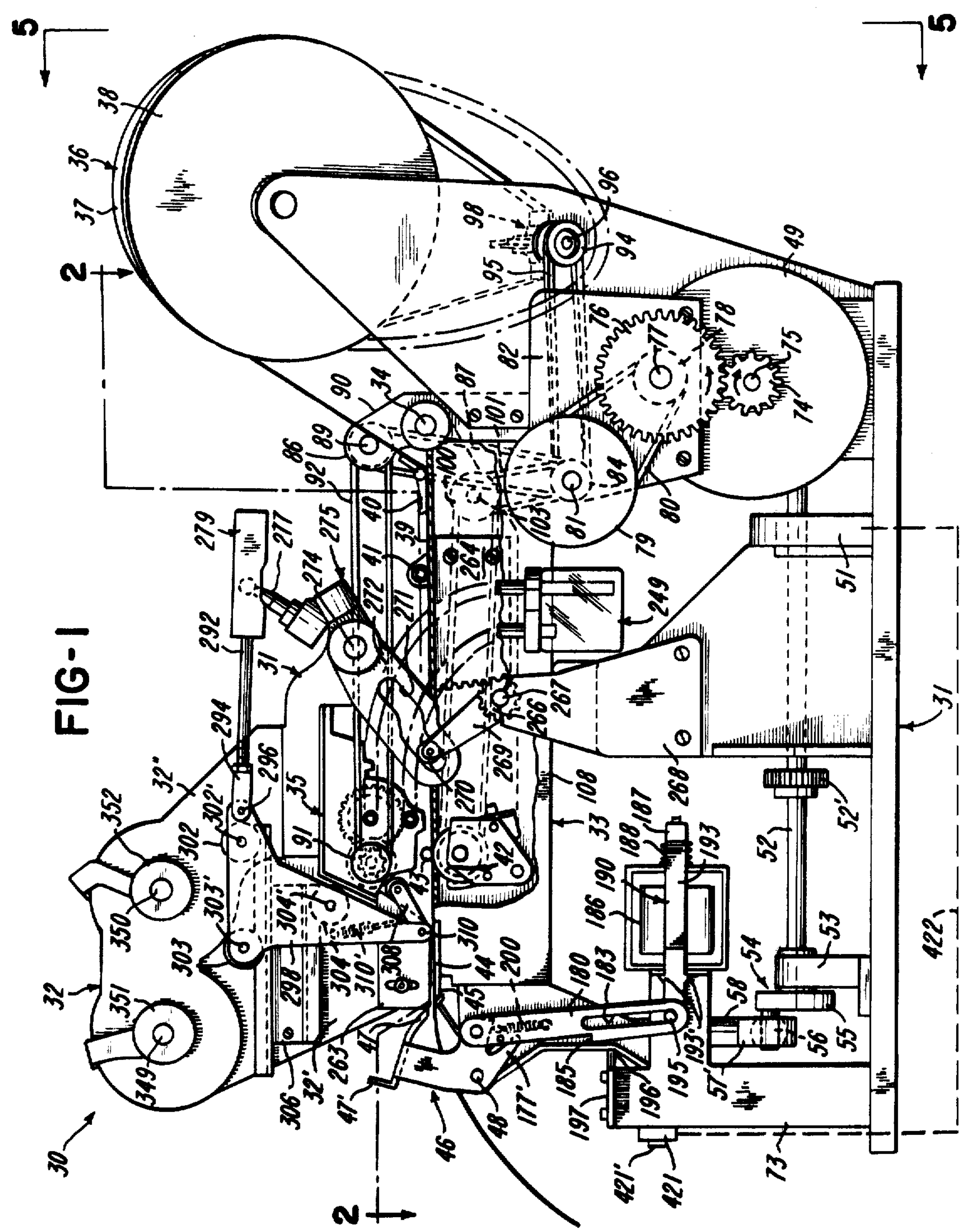
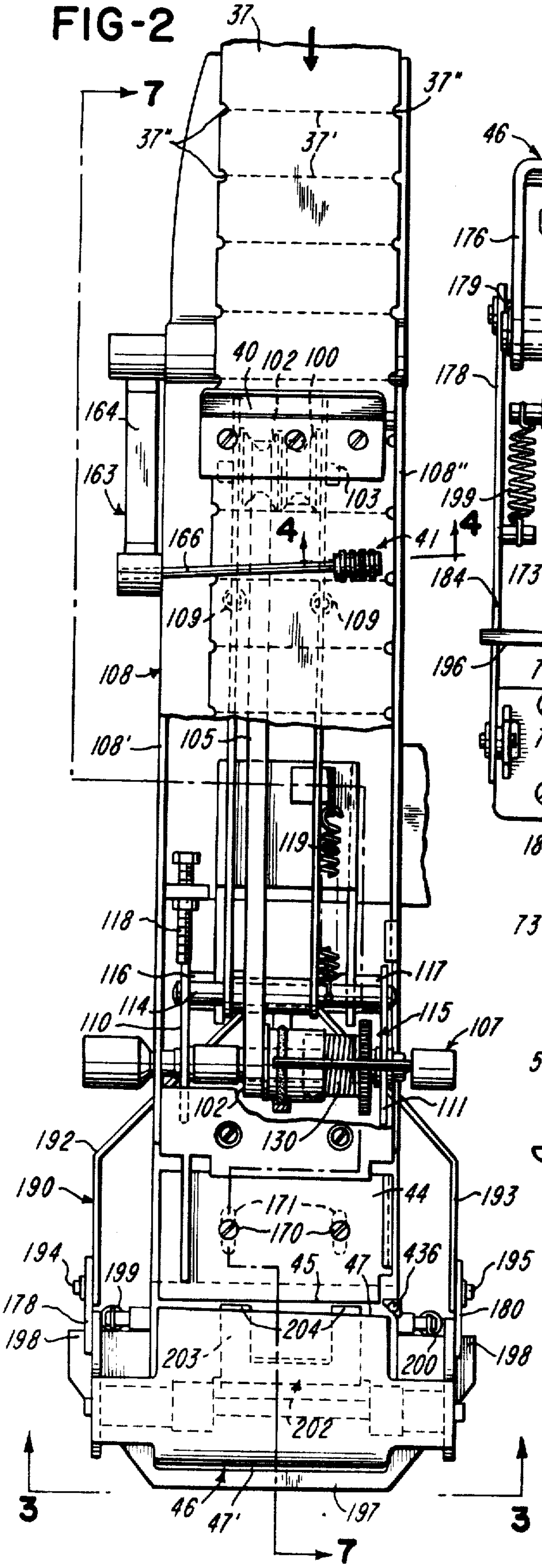


FIG-1

FIG-2



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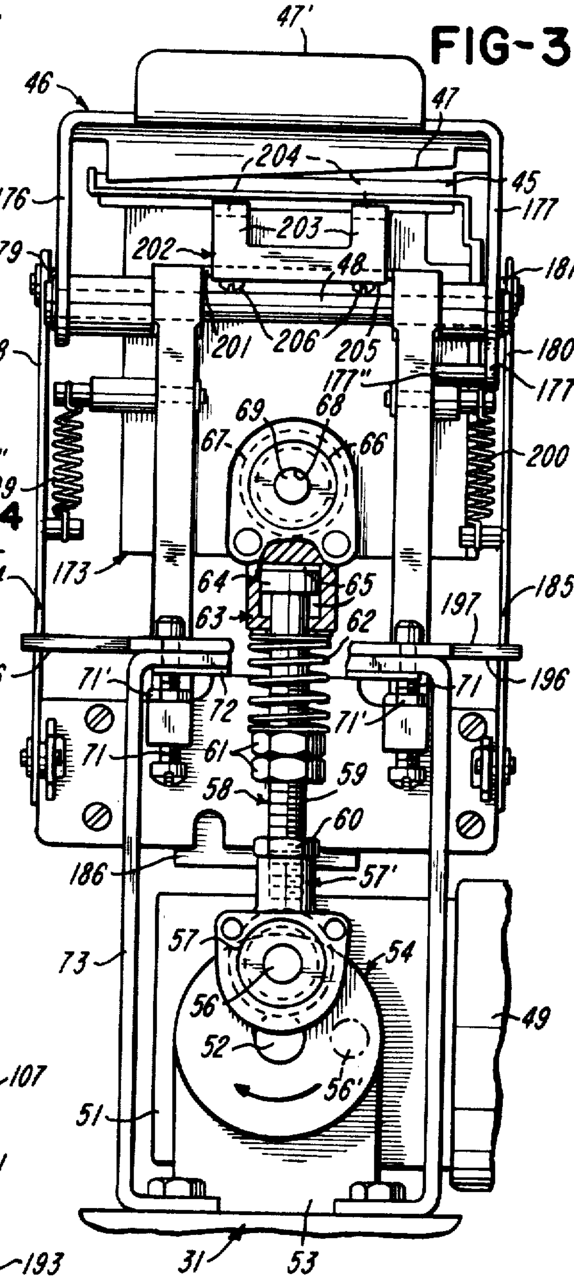

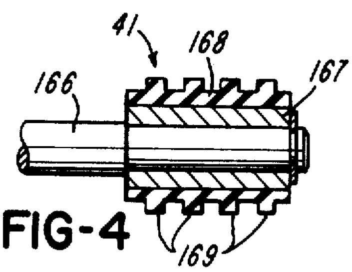

FIG-4

FIG-6

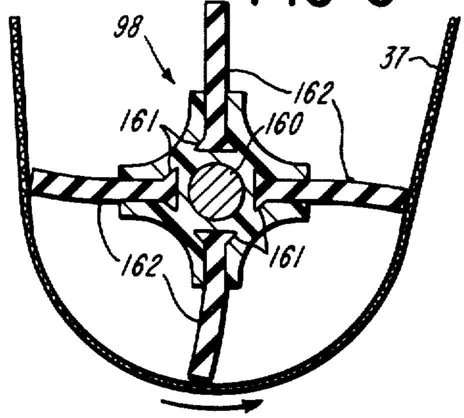
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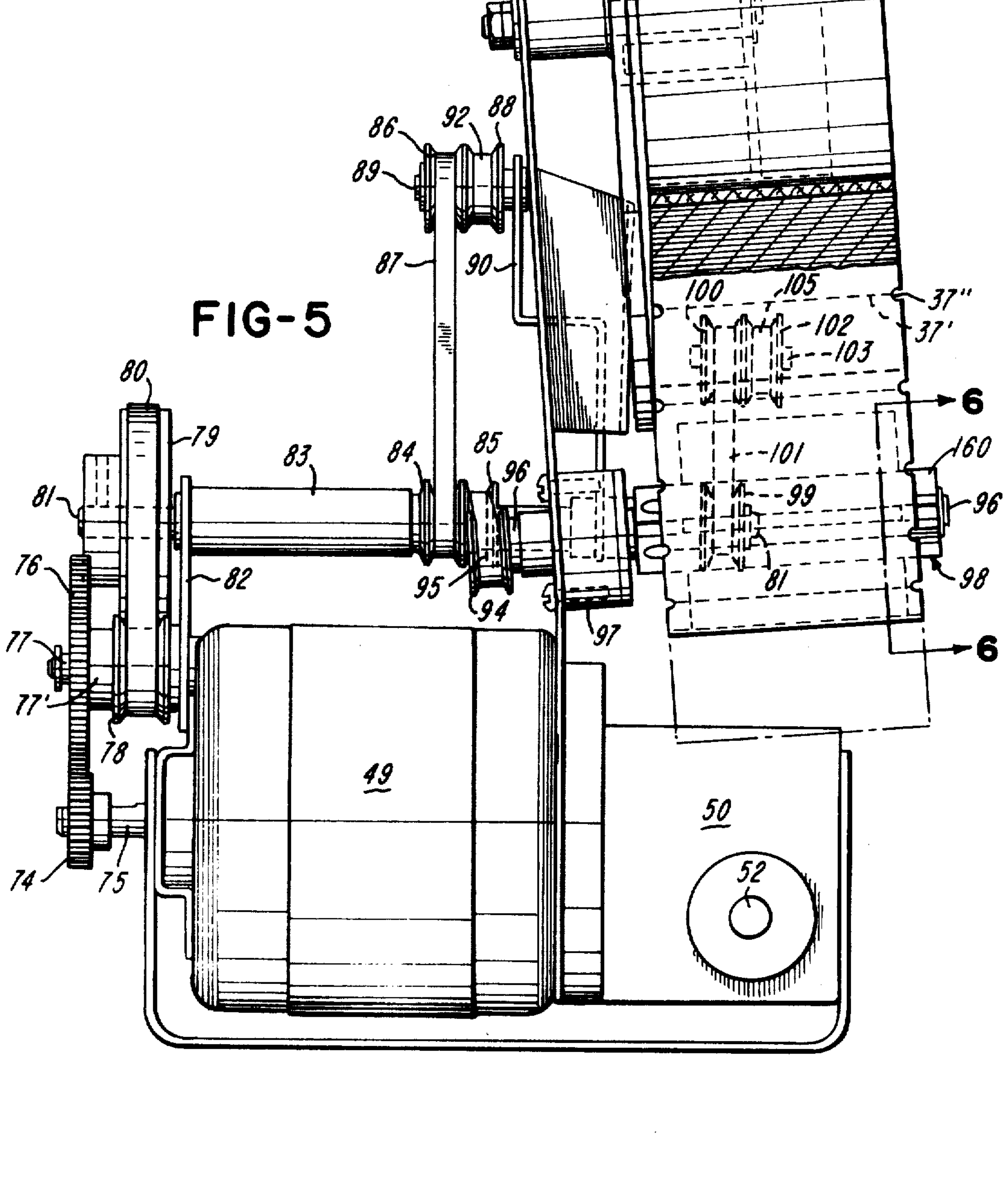
FIG-5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84
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96
101
160
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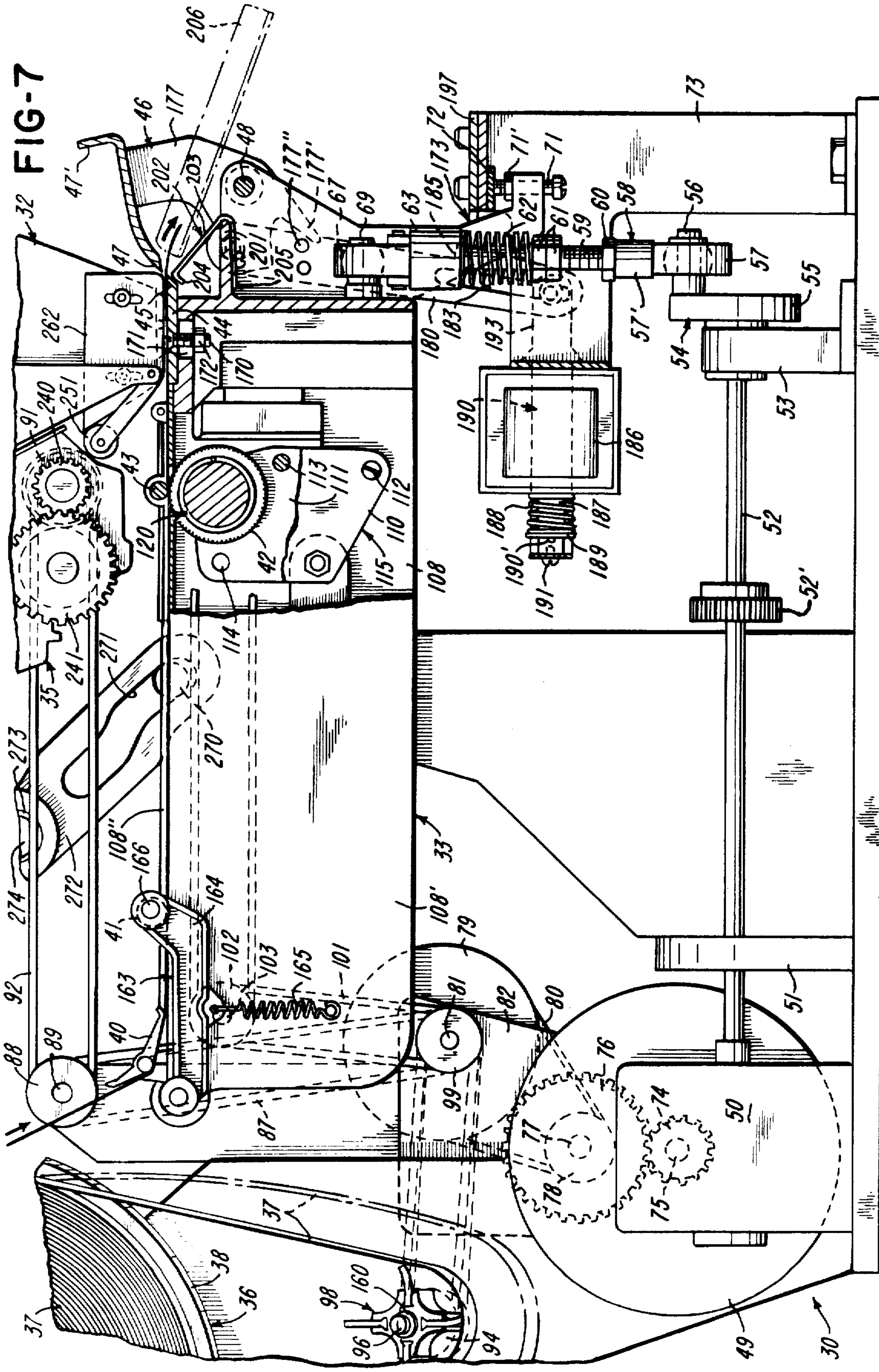
74
75
52

FIG-7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61
60
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56
59
57
57'
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54
53
32
47
201
205
204
262
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171
44
172
170
180
183
193
190
186
188
187
190'
189
191
52
52'
240
251
91
43
120
42
113
111
112
110
115
108
114
35
241
271
270
273
274
272
108''
166
33
108'
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31
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49
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FIG-8

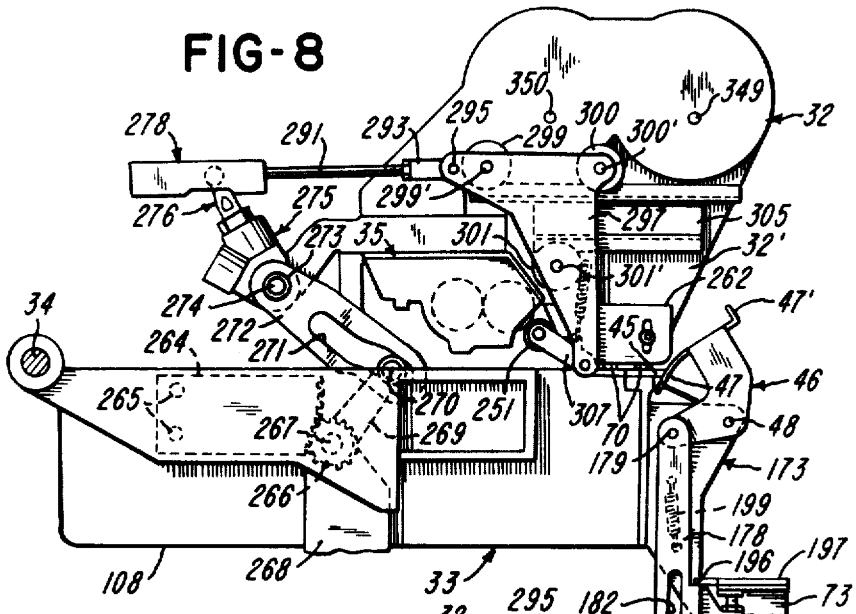
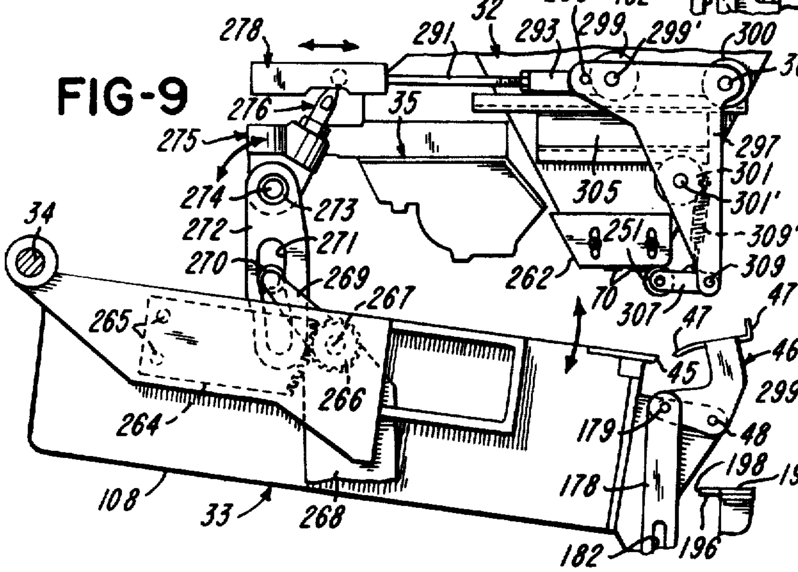


FIG-9



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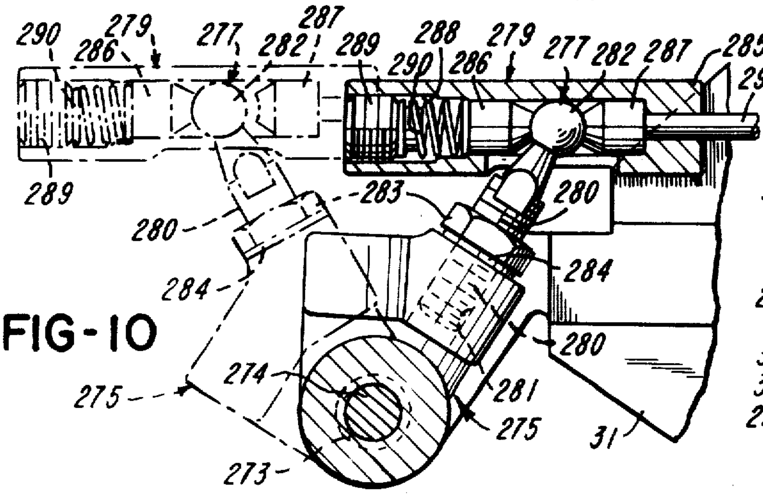

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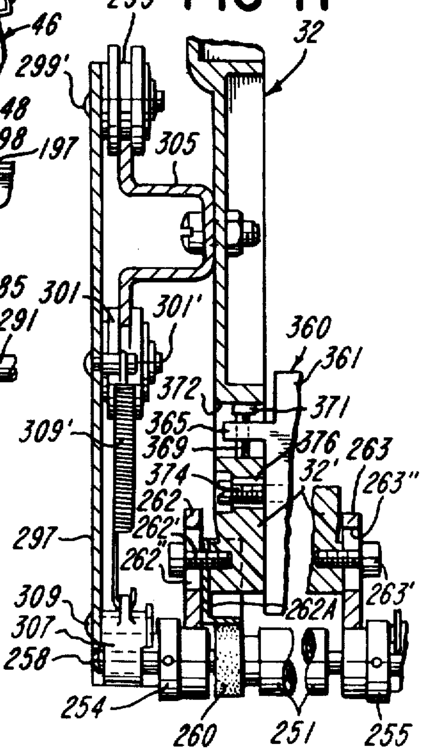

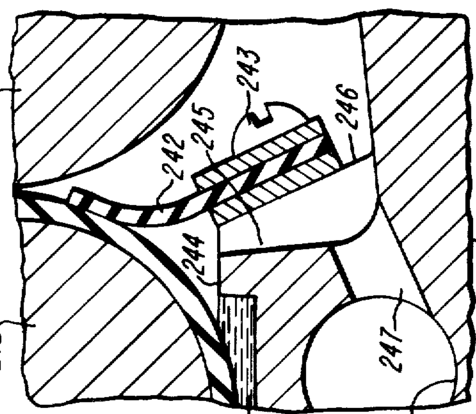

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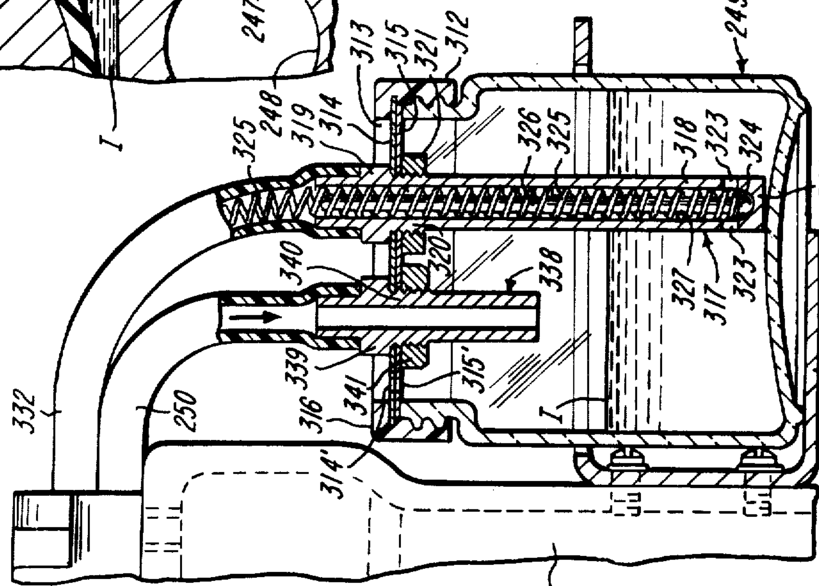

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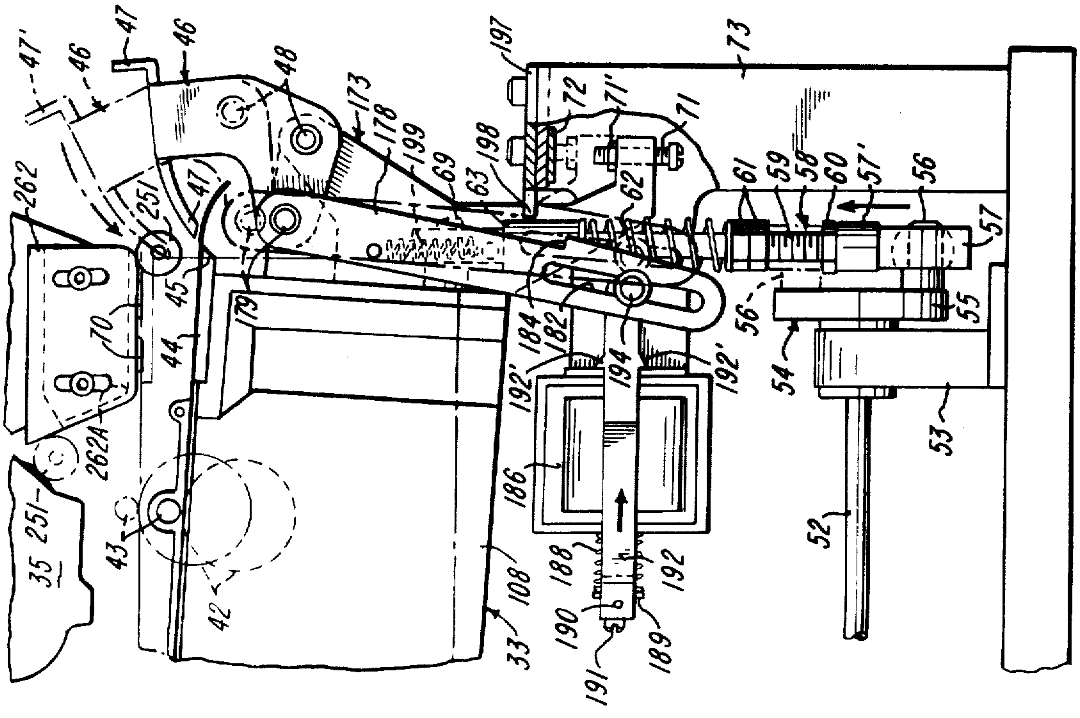
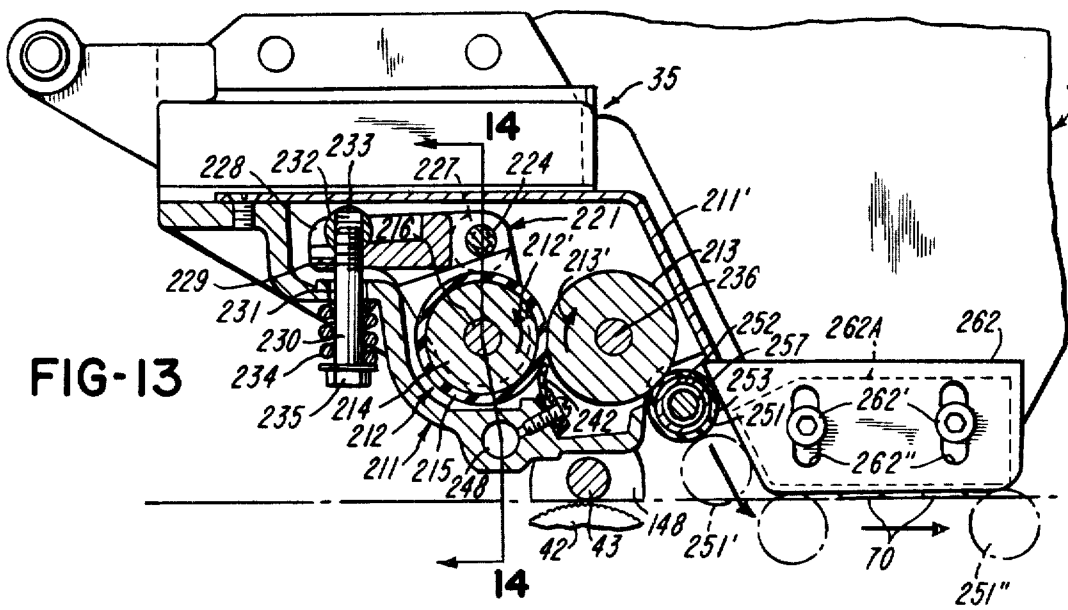


FIG-12



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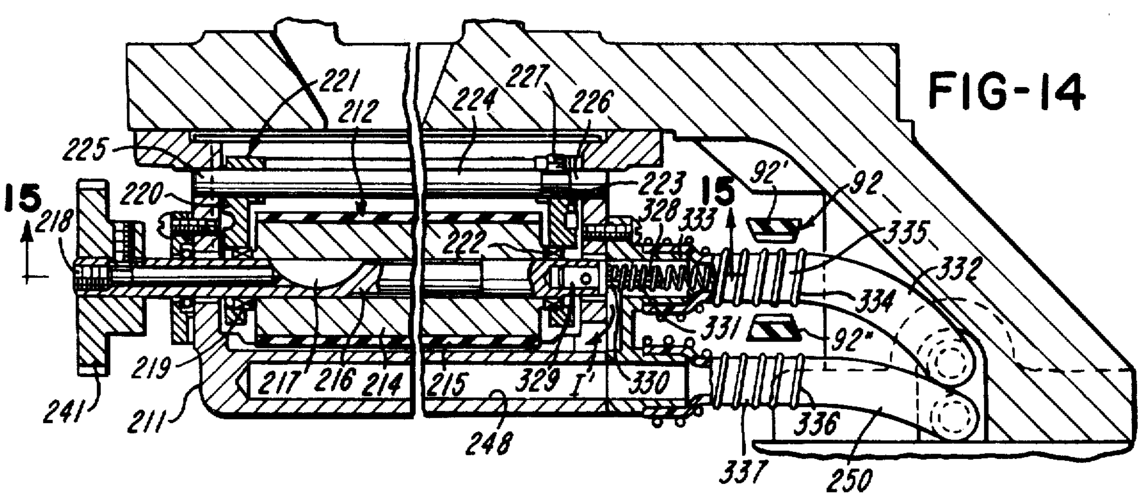

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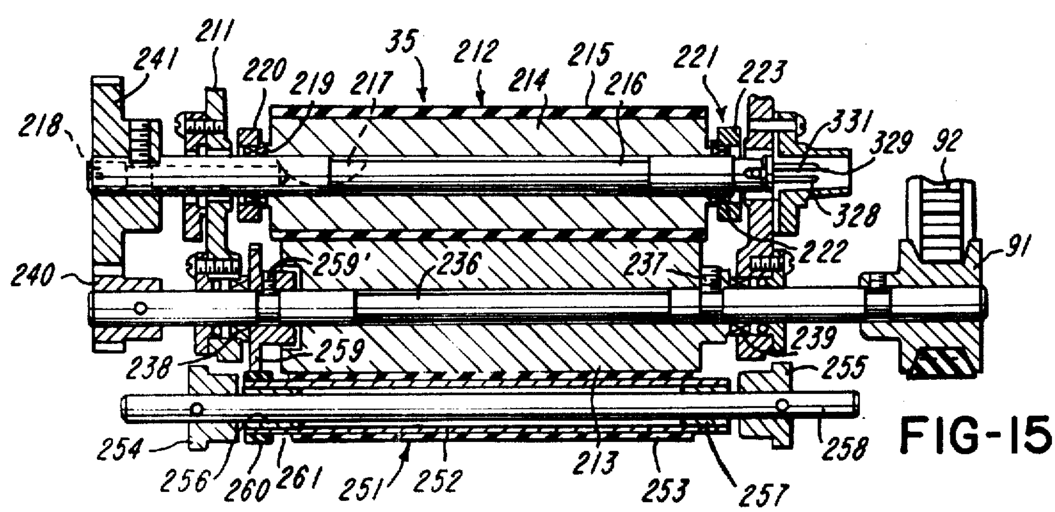
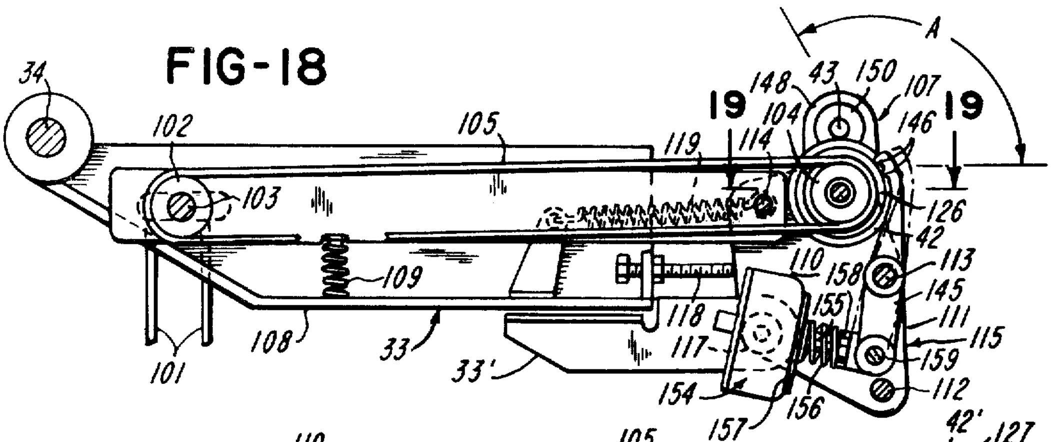


FIG-15

FIG-18



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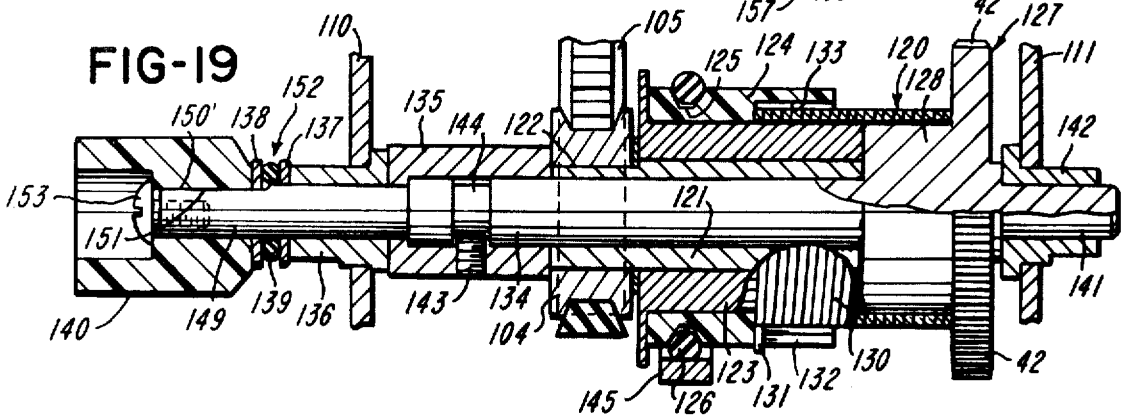

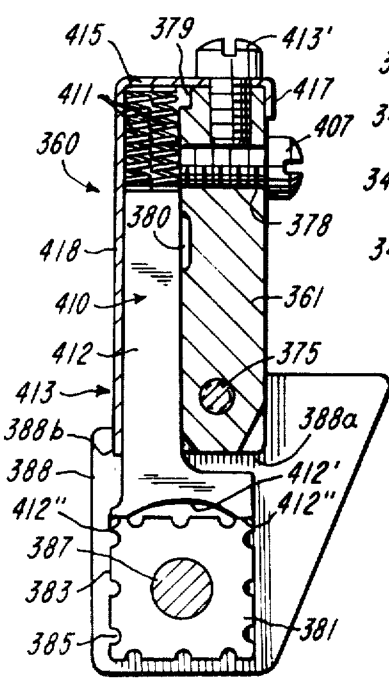

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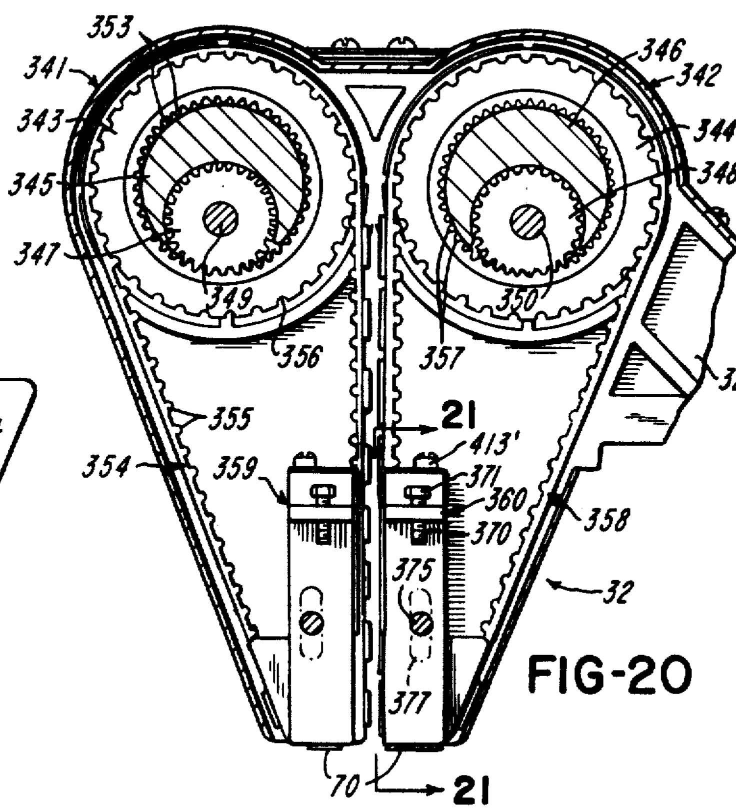
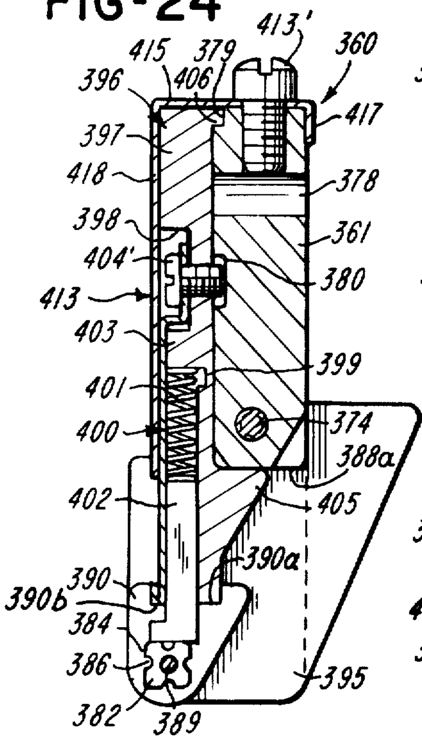


FIG-20

FIG-24



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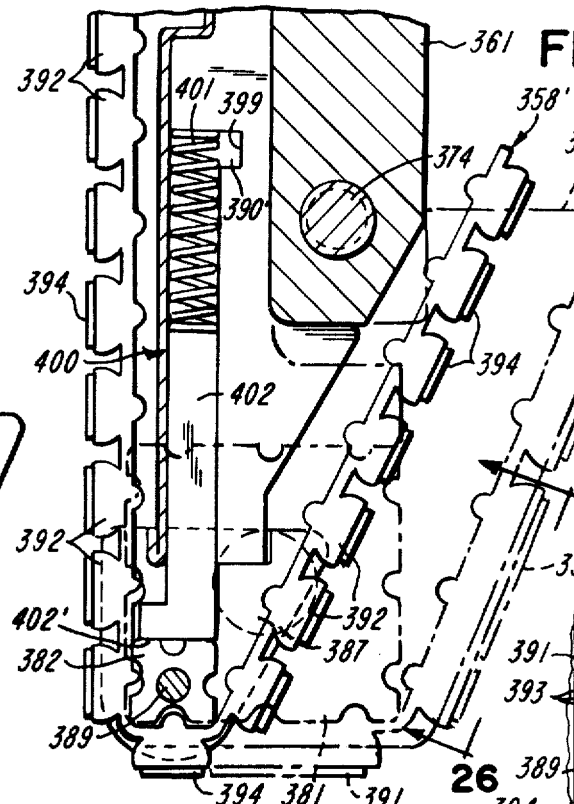

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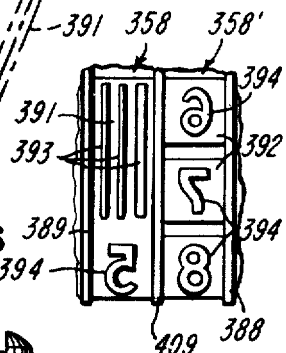

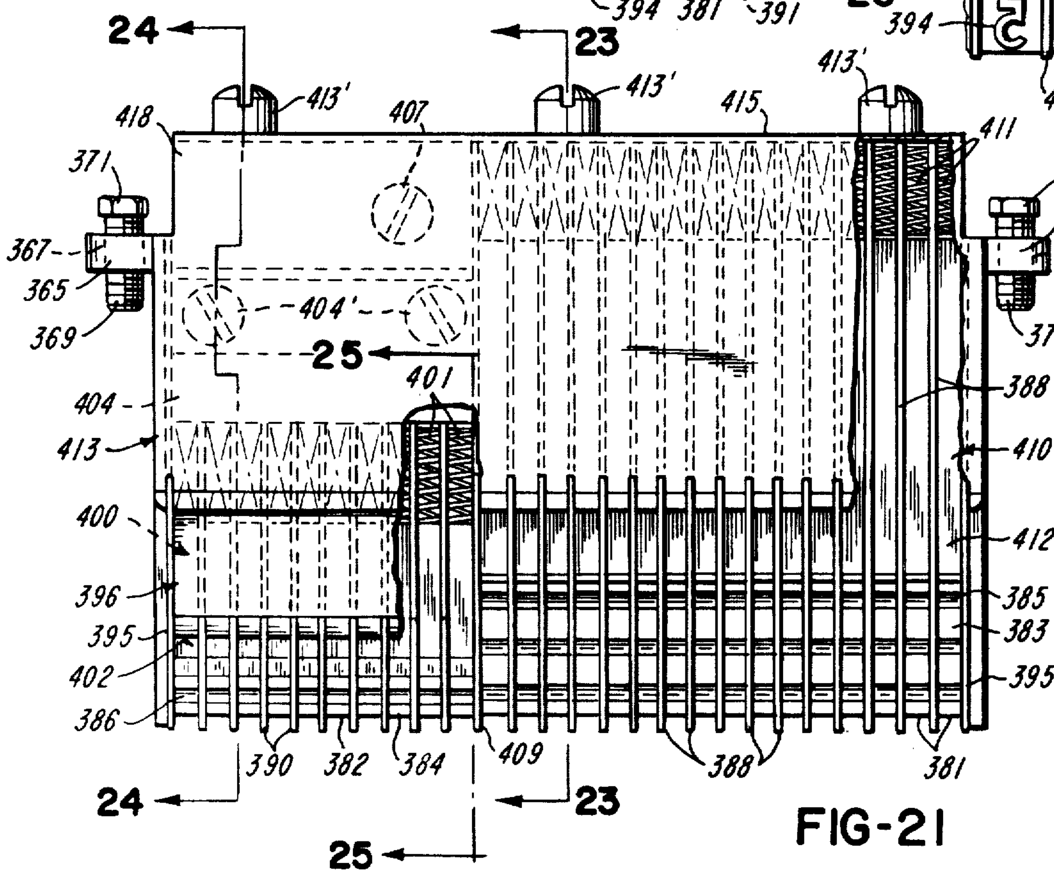

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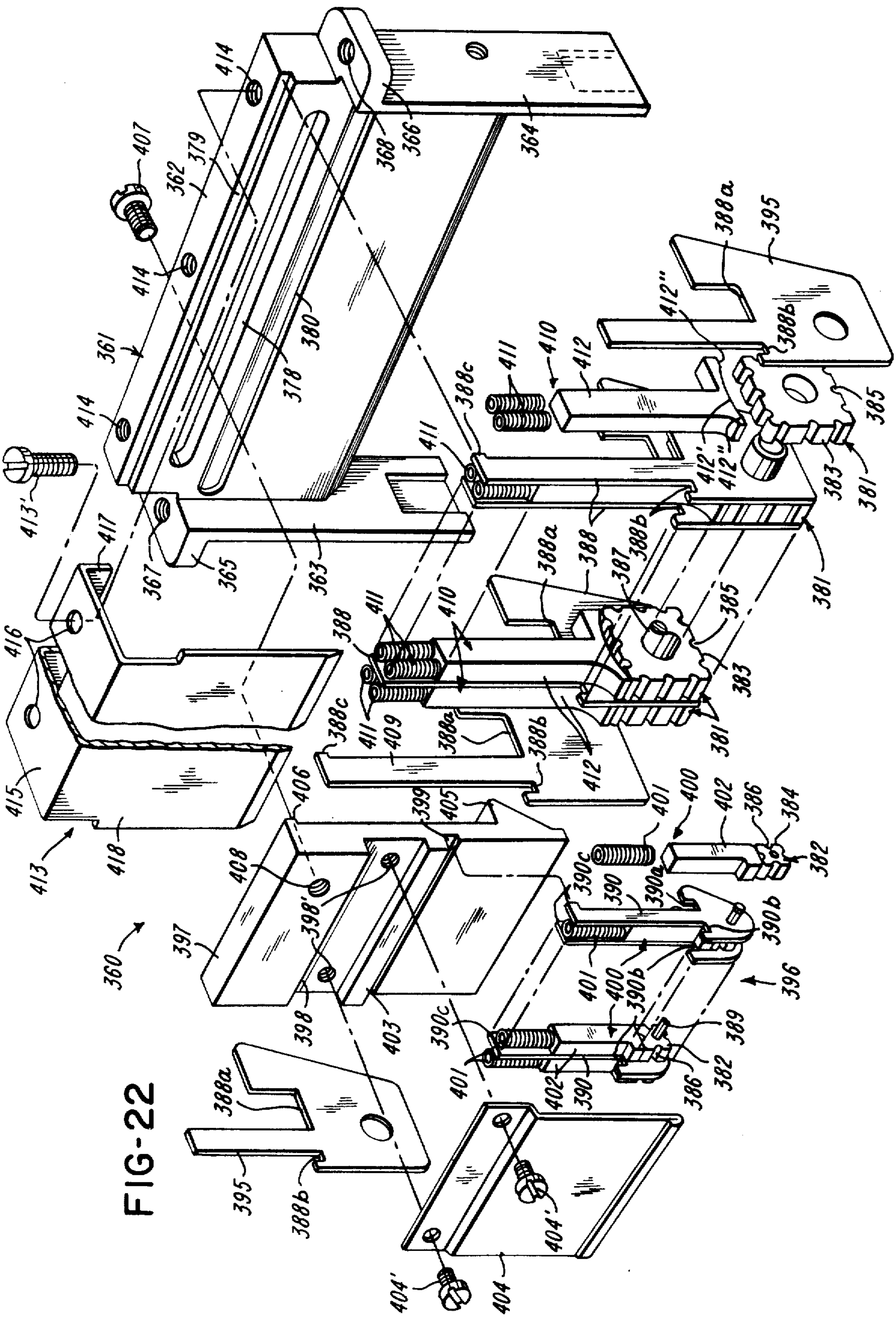

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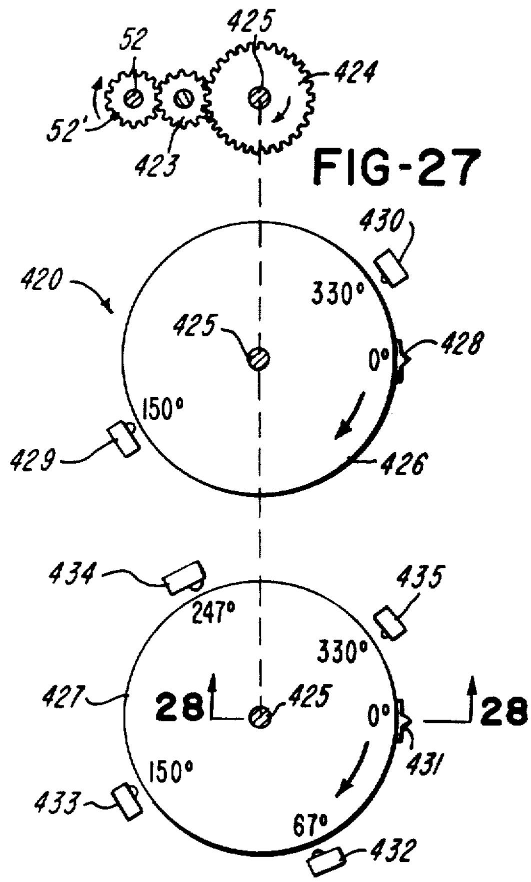
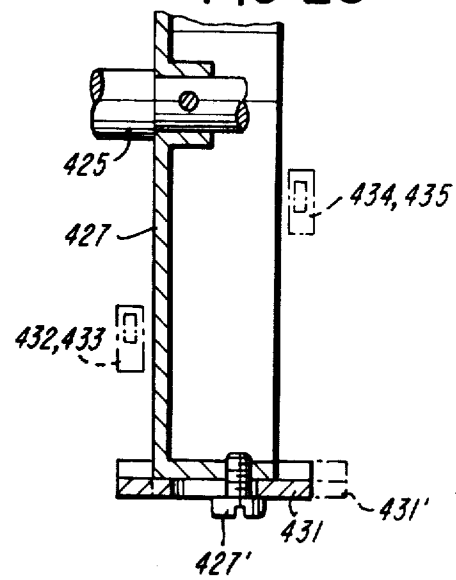


FIG-27

FIG-28



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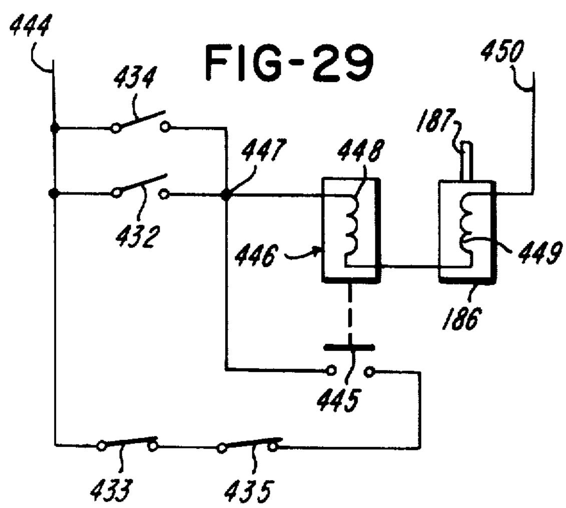

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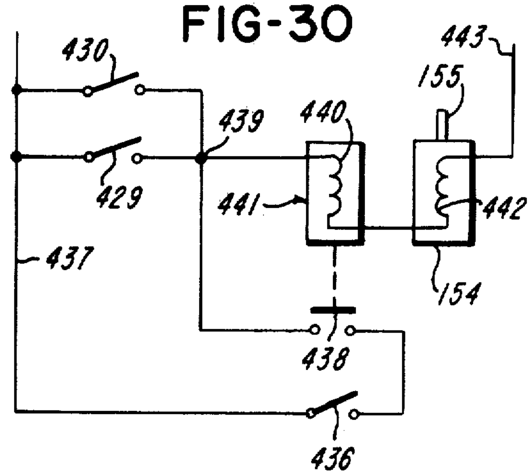


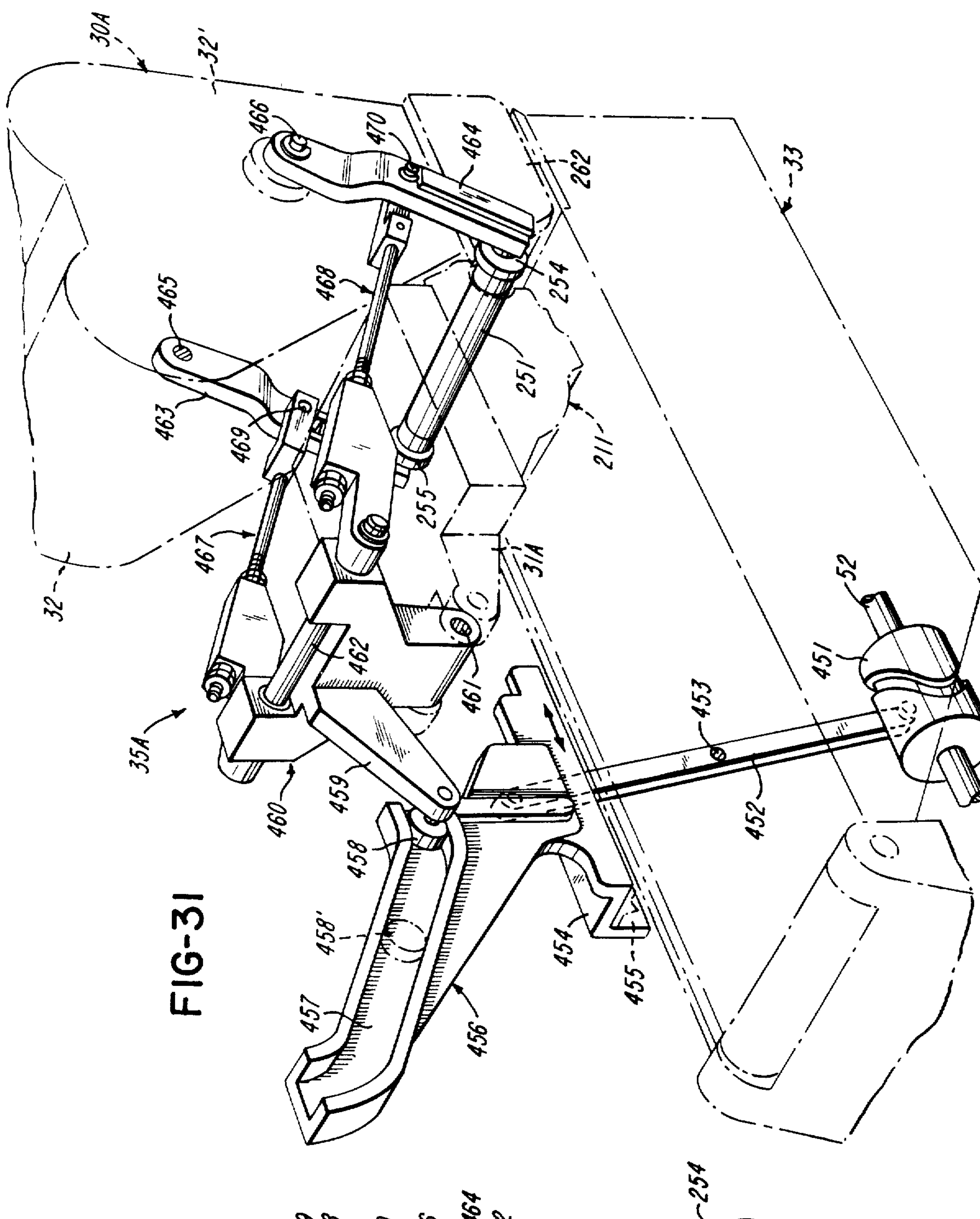


FIG-31

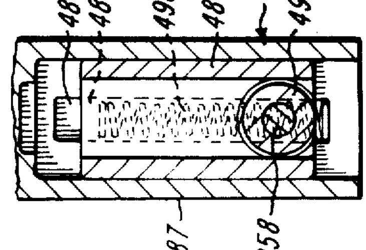


FIG-34

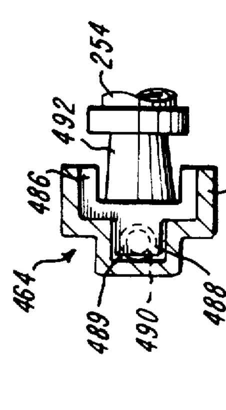
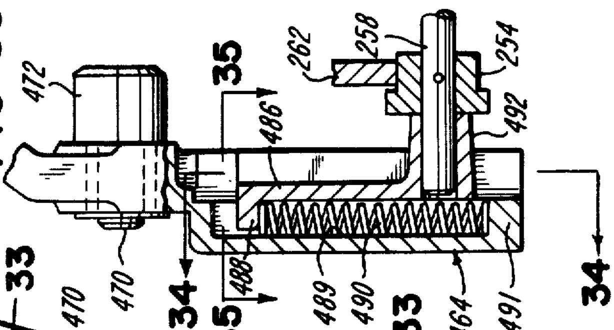


FIG-35

FIG-33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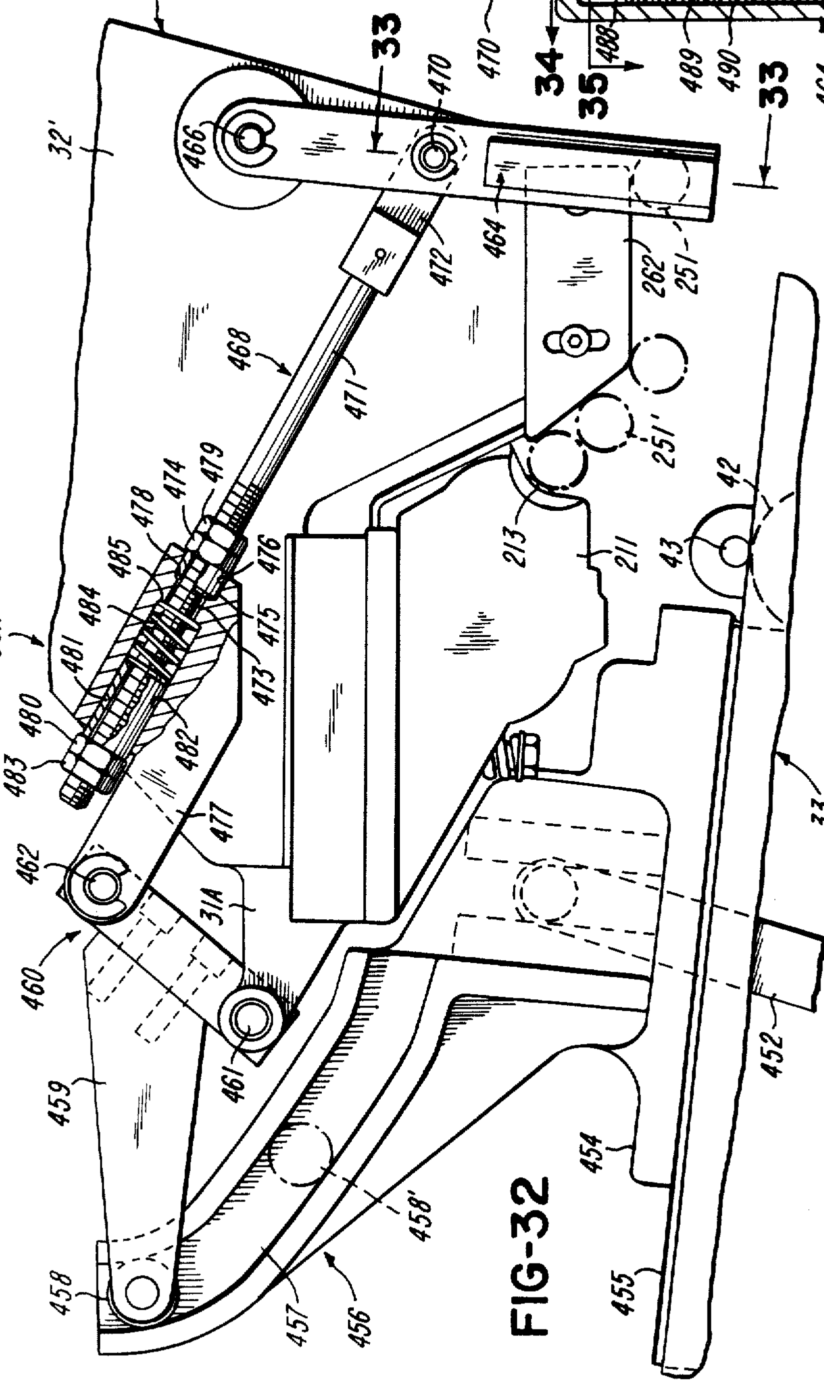
30A
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466
464
472
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251
33
468
471
251'
42
479
474
478
476
485
213
211
43
484
35A
481
475
473
480
482
483
477
462
31A
33
460
452
461
459
454
458'
458
457
456
455

FIG-32

INK PUMP

CROSS-REFERENCE TO RELATED APPLICATION

This is a division of application Ser. No. 215,783, filed Jan. 6, 1972.

SUMMARY OF THE INVENTION

The ink is delivered to the fountain by an improved pump comprised of a tension spring driven by the ink supply roll shaft. The spring extends into a pump body disposed in a vented ink sump. A rod is disposed inside the part of the spring in the pump body. That part of the spring and the rod function as a screw or worm in cooperation with the pump body to pump ink into the fountain. Excess ink is returned from the fountain to the sump.

PRIOR ART

The following U.S. patents are made of record: U.S. Pat. Nos. 1,822,573; 3,045,592; and 2,018,959.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a side elevational view showing one side of printing apparatus in accordance with the invention;

FIG. **2** is a top plan view generally along lines **2—2** of FIG. **1**;

FIG. **3** is a partial front elevational view generally along line **3—3** of FIG. **2**;

FIG. **4** is a sectional view taken along line **4—4** of FIG. **2**;

FIG. **5** is a rear elevational view taken along line **5—5** of FIG. **1**;

FIG. **6** is a sectional view taken along line **6—6** of FIG. **5**;

FIG. **7** is a sectional view taken along line **7—7** of FIG. **2**;

FIG. **8** is a partly diagrammatic side elevational view showing the platen assembly in printing cooperation with the print head assembly, showing the inking mechanism in a position in which the ink roll is in engagement with the ink transfer roll, and showing the severing mechanism as having severed a record member from the web;

FIG. **9** is a fragmentary side elevational view similar to FIG. **8**, but showing the ink roller as having inked the printing members during its forward stroke and showing exaggeratedly the platen in its downward position;

FIG. **10** is a fragmentary view showing part of the linkage of the inking mechanism in both solid and phantom line positions;

FIG. **11** is a sectional elevational view showing the manner in which the ink roll is mounted for travel relative to the print head assembly;

FIG. **12** is an enlarged fragmentary elevational view illustrating the severing mechanism in both solid and full line positions;

FIG. **13** is a fragmentary elevational view showing the inking mechanism in section;

FIG. **14** is a sectional view taken generally along line **14—14** of FIG. **13**;

FIG. **15** is a sectional view taken generally along line **15—15** of FIG. **14**;

FIG. **16** is a sectional elevational view of apparatus by which ink is delivered to the fountain from the sump and excess ink is returned to the sump;

FIG. **17** is a fragmentary sectional view on an enlarged scale showing a wiper blade and ink return ducts and a header;

FIG. **18** is an elevational view showing the feeding mechanism by which the record members are fed;

FIG. **19** is a sectional view taken along line **19—19** of FIG. **18**;

FIG. **20** is an elevational view through the print head assembly showing the manner in which the printing bands are mounted;

FIG. **21** is an elevational view taken generally along line **21—21** of FIG. **20**, but omitting the printing bands;

FIG. **22** is an exploded perspective view of the modular printing band support assembly shown in FIG. **21**;

FIG. **23** is a sectional view taken along line **23—23** of FIG. **21**;

FIG. **24** is a sectional view taken along line **24—24** of FIG. **21**;

FIG. **25** is an elevational sectional view taken along line **25—25** of FIG. **21**;

FIG. **26** is a view taken generally along line **26—26** of FIG. **25**;

FIG. **27** is a diagrammatic view showing the manner in which the functions of the printing apparatus are timed;

FIG. **28** is a sectional view taken generally along line **28—28** of FIG. **27**;

FIG. **29** is a schematic circuit diagram showing a manner in which the record severing function can be accomplished;

FIG. **30** is a schematic circuit diagram for the record feed mechanism;

FIG. **31** is a perspective view of an alternate form of drive and mounting mechanism for the ink roll;

FIG. **32** is a side elevational view of the mechanism shown in FIG. **31**;

FIG. **33** is a sectional view taken along line **33—33** of FIG. **32**;

FIG. **34** is a sectional view taken along line **34—34** of FIG. **33**; and

FIG. **35** is a sectional view taken along line **35—35** of FIG. **33**.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. **1**, there is shown a printing apparatus generally indicated at **30** including a frame generally indicated at **31**. A print head assembly **32** is fixedly mounted to the frame **31** and a platen assembly generally indicated at **33** is pivotally mounted to the frame **31** by a pivot pin **34**. An inking mechanism or inker generally indicated at **35** is provided for inking the print head assembly 32. A roll **36** of record members **37** arranged in web form is mounted by a rotatable reel **38** mounted by the frame **31**. The web of record members **37** passes under and partly around a rotary feed member **98**, from there it passes into contact with, over and partly around the roll **36** of record members **37** and from there onto the upper surface **39** of the platen assembly **33** beneath a hold-down plate **40** and an aligning roll **41**. From there the web of record members **37** passes between a feed wheel **42** and a roll **43**. From there the web of record members **37** is advanced to a rigid platen **44** of the platen assembly **33**. The feed wheel **42** operates near the end of each machine cycle to advance the printing record member or members **37** to a position in which the trailing edge of the advanced record member or members **37** are at a fixed knife **45** of a severing mechanism generally indicated at **46.** The severing mechanism **46** which is downstream of the feed wheel **42** also includes a movable knife **47.** The movable knife **47** is pivotally mounted about a pivot **48** and is cooperable with the fixed knife **45** to sever the previously printed record member or members **37** from the remainder of the web.

An electric motor **49** is mounted to the frame **31.** The electric motor **49** drives a speed reducer **50** which in turn is connected to the input of a clutch indicated diagrammatically at **51.** The clutch **51** is shown in greater detail at **153** in U.S. Pat. No. 3,180,254. The output of the clutch **51** is connected to a drive shaft **52** journaled in a bearing **53.** An eccentric generally indicated at **54** in the form of a crank **55** has an eccentrically mounted crank pin **56.** The pin **56** is received by a ball **57** received in a socket **57'.** The socket **57'** forms part of a connecting rod generally indicated at **58.**

With reference to FIG. **3,** the connecting rod socket **57'** is shown to threadably receive a rod **59.** A lock nut **60** threadably received by the rod or rod section **59** maintains the adjusted position of the rod **59** relative to the socket **57'.** The rod **59** also threadably receives a pair of nuts **61.** A compression spring **62** is received about the rod **59** between the nuts **61** and a socket or socket section **63.** The nuts **61** are adjusted so that the spring **62** is always under some compression irrespective of the position of the crank pin **56.** The rod **59** has an enlarged section **64** received in an elongated recess **65** in the socket **63,** thereby permitting relative movement between the rod **59** and the socket **63.** The socket **63** movably mounts a ball **66** in a socket hole **67.** The ball **66** has a hole **68** in which a shaft **69** is received. The shaft **69** is rigidly connected to the platen assembly **33.** Before the clutch **51** is engaged, shaft **56** is in the phantom line position indicated at **56'** in FIG. **3.** In this position, the platen **44** of the platen assembly **33** is spaced from printing members **70** of the print head assembly **32.** As the shaft **52** rotates clockwise (FIG. **3**), the platen assembly **33** continues to move away from the print head assembly **32** until the crank pin **56** rotates clockwise to its lowermost position (FIG. **3**). As the shaft **52** continues to rotate clockwise, the platen assembly **33** starts moving toward the print head assembly **32.** Before the crank **56** reaches the highest position shown by solid lines in FIG. **3,** stop screws **71** engage a stop provided by a stop plate **72** rigidly mounted to the frame **31** by a bracket **73.** The bracket **73** is considered to be part of the frame **31.** While the stop screws **71** are in contact with the stop plate **72** the record member is in contact with the printing members **70.** The stop screws **71** are adjustable to effect adjustment of impression control.

With reference to FIGS. **1** and **5,** the electric motor **49** has a gear **74** secured to its output shaft **75.** The gear **74** drives a gear **76** secured to a pulley **78.** The gear **76** and the pulley **78** are rotatably mounted on a shaft **77.** The pulley **78** drives a pulley **79** via belt **80.** The pulley **79** is secured to a shaft **81.** A bracket **82** secured to the frame **31** mounts the shaft **77** and a stationary bearing **83.** The gear **76** and the pulley **78** are secured to a hub member **77'.** The shaft **81** is rotatably mounted by the bearing **83** and drives pulleys **84** and **85** and **99.** The pulley **84** drives a pulley **86** via belt **87.** The pulley **86** and a pulley **88** are keyed together so that they rotate as a unit about stationary shaft **89.** The shaft **89** is secured to the frame **31** by a bracket **90.** The pulley **88** drives a pulley **91** (FIG. **15**) via belt **92.** The pulley **91** drives the mechanism **35.**

The pulley **85** (FIG. **5**) drives a pulley **94** via belt **95.** The pulley **94** is secured to a shaft **96** rotatably mounted by a bearing **97.** A rotary frictional feed member **98** is secured to the shaft **96.**

A pulley **99** secured to the shaft **81** drives a pulley **100** via belt **101.** The pulley **100** and another pulley **102** are keyed together so that they rotate as a unit about a stationary shaft **103.** The pulley **102** drives a pulley **104** (FIGS. **18** and **19**) via belt **105.** As best shown in FIGS. **18** and **19,** the pulley **104** drives the record feeding mechanism generally indicated at **107.**

With reference to FIG. **18,** the platen assembly **33** is shown to be comprised of a platen frame **108** in which the shaft **103** is adjustably mounted to tension the belt **105.** The tension on the belt **101** is maintained by a pair of springs **109** (FIGS. **2** and **18**). A pair of plates **110** and **111** are shown to be mounted in spaced parallel fixed relationship with respect to each other by spacer rods **112, 113** and **114.** The ends of the rods **112, 113,** and **114** are suitably secured to the plates **110** and **111** to provide a unitary feed assembly frame **115.** The plates **110** and **111** of the feed assembly frame **115** are pivotally mounted by studs **116** and **117** carried by a bracket **33'** secured to the platen frame **108.** The studs **116** and **117** pivotally mount the solenoid housing **157.** The entire feed assembly frame **115** is accordingly pivoted by the studs **116** and **117** with respect to the platen frame **108.** The plate **110** is shown to be in abutment with a stop screw **118** threadably mounted by the platen frame **108.** The stop screw **118** adjustably limits the position to which the feed assembly frame **115** can be pivoted by a tension spring **119,** thereby adjusting the amount of pressure which the feed wheel **42** exerts on the underside of the record web. The tension spring **119** is connected at one end to the rod **114** and at its other end to the platen frame **108.**

With reference to FIG. **19,** there is shown a wrapped-spring clutch generally indicated at **120.** The clutch **120** includes a tubular sleeve **121** having a flat **122.** The pulley **104** matingly receives the sleeve **121** at the flat **122** so that the pulley **104** and the sleeve **121** rotate as a unit. An annular tubular drive member **123** is press-fitted onto the sleeve **121** so that the sleeve **121** and the drive member **123** rotate as a unit. A control sleeve **124** is received about the drive member **123.** The sleeve **124** can be constructed of suitable plastic material. The sleeve **124** has an annular external groove **125** which receives a resilient O-ring **126,** composed of a material having a relatively high co-efficient of friction such as rubber. As the O-ring **126** is snugly received in the groove **125** in a slightly stretched condition, the O-ring **126** does not rotate relative to the sleeve **124.** An output driven member generally indicated at **127** has an enlarged annular section **128,** the diameter of which is illustrated as being equal to the diameter of the drive member **123.** The feed wheel **42** is shown to be formed integrally with the enlarged annular section **128.** A spring **130** is shown to be received about a portion of the outer surface of the drive member **123** and about the outer surface of the annular section **128.** One end of the spring **130** is turned out to provide a tang **131** received in an open-ended slot **132** in the sleeve **124.** The sleeve **124** is shown to have an enlarged internal diameter as indicated at **133** to provide clearance between the spring **130** and the sleeve **124**. The output driven member **127** has a reduced diameter section **134** which extends through the sleeve **121**, a spacing and retaining sleeve **135**, a bushing **136**, washers **137** and **138**, an O-ring **139**, and into the knob **140**. The output driven member **127** also has a stub end **141** received by a bushing **142**. The bushing **142** is non-rotatably mounted by the plate **111**. A set screw **143** threadably mounted by the sleeve **134** and received in a groove **144** of the section **134** prevents the driven member **127** from shifting in a direction perpendicular to the plates **110** and **111**, but allows the member **127** to be rotated. The bushing **136** is non-rotatably mounted by the plate **110**. In the solid line position shown in FIGS. **18** and **19**, a control member **145** is shown to have a pair of blunt, spaced-apart teeth **146**; the control member **145** is shown in contact with the O-ring **126**, thereby holding the sleeve **124** and the spring **130** uncoiled or expanded so that it has a larger internal diameter than when the clutch **120** is engaged. As the pulley **91** rotates continuously, the sleeve **121** and the drive member **123** rotate continuously relative to the sleeve **124** and the spring **130**. While the control member **145** is in contact with the O-ring **126**, the spring **130** is expanded thereby preventing the drive member **123** from driving the annular section **128** of the output member **127**. When the control member **145** is moved to the phantom-line position (FIG. **18**) out of contact with the O-ring **126**, the spring **130** coils up, that is, its internal diameter is reduced, thereby gripping the drive member **123**. The clutch **120** is now engaged as the spring **130** drivingly connects the input member **123** and the output member **127**. When the clutch **120** is engaged, the feed wheel **42** rotates. The web of record members **37** is fed between the feed wheel **42** and a roll **43** which is rotatably mounted in a block **148** by a bearing **150**. The block **148** is suitably mounted to the platen frame **108**. The outer surface of the feed wheel **42** is provided with straight knurls **42'** which engage the underside of the web of record members **37**. The feed wheel **42** is considerably narrower than the width of the web being fed. However, the roll **43** is long enough to engage the upper surface of the web across a considerable portion of its width. Thus, the roll **43** serves to hold the web down against the upper surface of the platen frame **108** immediately upstream of the platen **44**. When the control member **145** is moved to the phantom line position (FIG. **18**) out of contact with the O-ring **126**, the rotation of the O-ring **126**, the sleeve **124**, and the spring **130** is arrested, thereby causing the spring **130** to uncoil or expand. Uncoiling of the spring **130** effects disengagement of the clutch **120** by causing the spring **130** to move outwardly away from the outer surface of the drive member **123**. Accordingly, the feed wheel **42** is no longer driven and the movement of the web of record members **37** stops. It is noted that the control member **145** contacts the O-ring **126** above the center of the control sleeve **124** at an obtuse angle A relative to the direction of travel of the O-ring at the point of contact. Moreover, considering a first line between the point of contact and the pivot **113**, a second line perpendicular to the first line and intersecting the first line between the point of contact and the pivot **113** passes through the center line of the sleeve **124**. This results in effective disengagement at the clutch **120** when the member **145** contacts the O-ring **126**.

The end section **149** of the driven member **127** has a flat **150**. The knob **140** is received by the end section **149** and has a flat **151** which cooperates with the flat **150** of the end section **149** to prevent rotation of the knob **140** relative to the end section **149**. A friction clutch **152** includes the washer **138** which is keyed to the section **149**, the O-ring **139**, the washer **137** and the end surface of the bushing **136**. A screw **153** threadably received by the end section **149**, is adjustable to adjust the amount of frictional drag of the clutch **152**. It is apparent that the feed wheel **42** can be driven either through torque applied by the pulley **104** when the clutch **120** is engaged, or manually by rotation of the knob **140** but the clutch **152** frictionally holds the feed wheel **42** in the position into which it has been advanced, either as a result of the engagement of the clutch **120** or as the result of manually rotating the knob **140**.

A solenoid **154** (FIG. **18**) mounted by the platen frame **108** has an armature **155**. A compression spring **156** is received about the armature **155** between the end of the solenoid housing **157** and a flange **158** on the armature **155**. The armature **155** is connected to the control member **145** by a pin **159**. The spring **156** normally holds the control member **145** in the solid line position (FIG. **18**). Energization of the solenoid **154** causes the armature **155** to shift, thereby pivoting control member **145** clockwise into the phantom line position (FIG. **18**) out of contact with O-ring **126**. Energization and deenergization of the solenoid **154** is controlled by a circuit shown in FIG. **30**.

The feed wheel **42** advances the web once during each machine cycle so that a record member **37** is presented to the printing position or zone between the platen **44** and the printing members **70**. When the record member **37** arrives at the printing zone, the clutch **120** is disengaged and the feed wheel **42** stops rotating. However, as the output shaft **75** of the electric motor **49** rotates continuously, the rotary feed member **98** is continuously driven. The rotary feed member **98** is shown in FIGS. **5** and **6** to have a hub **160** secured to the driven shaft **96**. The hub **160** is shown to be provided with four dove-tail slots **161** for receiving respective drive members **162**. The drive members **162** are in the form of outwardly extending vanes or blades. The drive members **162** are composed of a flexible, resilient material preferably having a high co-efficient of friction, such as rubber. When the drive members **162** are in driving engagement with a section of the web which has been paid out of the roll **36**, the drive members **162** flex slightly as they engage the web. As the rotary feed member **98** continues to rotate, additional web material is paid out of the roll **36** until gradually slackness develops. As the slackness increases, the contact between the rotary feed member **98** and the web decreases and it can decrease to such an extent that the paid out web section looses contact with the feed member **98** as indicated by phantom lines. As rotation of the rotary feed member **98** continues, the feed wheel **42** and the roll **43**, together with the feed member **98** provides a simple arrangement for feeding the web material from the roll **36**. As the roll **36** has a relatively large amount of inertia, and as the feeding by the feed wheel **42** is intermittent, the construction, arrangement and location of the feed member **98** prevents an undue amount of web material from being paid out of the roll **36**. This is accomplished without applying any braking force either to the reel **38**, to the roll **36**, or to the paid out web material, although the art is replete with such devices. As best shown in FIG. **5**, it is noted that the reel **38** and the rotary feed member **98** are disposed at the same slight angle with respect to the horizontal. Assuming the apparatus is mounted on a generally horizontal surface, the roll **36** will not come off the reel **38** and yet the rotary feed member **98** can make full contact with the underside of the web. The peripheral speed of the drive members **162** is greater than the peripheral speed of the feed wheel **42**.

With reference to FIGS. **2** and **7**, there is provided an aligning mechanism generally indicated at **163**. The aligning mechanism **163** includes an arm **164** pivotally mounted by the pivot pin **34**. A tension spring **165** is connected at one end to the arm **164** and at its other end to a plate **108'** secured to the platen frame **108**. A shaft **166** secured to the arm **164** is disposed at a slight angle with respect to the direction of travel of the record members **37** and to a plate **108''** secured to the platen frame **108**. An aligning roll **41** is comprised of a bushing **167** rotatably mounted by the shaft **166** and a one-piece molded annular frictional member **168** having a plurality of external annular flanges **169**. The spring **165** urges the roll **41** toward platen surface **39**. As the web advances, the web rotates the roll **41** which causes the web to move into alignment with an upstanding guide edge provided by the plate **108''**.

The platen **44** is shown in FIG. **7** to be adjustably mounted to the platen frame **108** by screws **170**. The screws **170** pass through elongated slots **171** in the platen frame **108** and are rotatably received by respective nuts **172**. In this manner, the platen **44** and the knife **45** formed at the terminal end of the platen **44** can be adjusted relative to the movable knife **47**.

A bracket **173** is suitably secured to the platen frame **108**. The bracket **173** threadably receives the adjusting screws **71**. Lock nuts **71'** lock the respective screws **71** in their adjusted positions. The bracket **173** mounts pivot **48**. The movable knife **47** has a pair of flanges or arms **176** and **177** which are pivotally mounted by the pivot **48**. A link **178** is connected to the arm **176** by a pivot pin **179**, and a link **180** is connected to the arm **177** by a pivot pin **181**. The links **178** and **180** are identical and have respective elongated slots **182** and **183** and respective stop shoulders **184** and **185**. A solenoid **186** is secured to the bracket **73**. Armature **187** (FIG. 7) is shown to be received in a compression spring **188**. The spring **188** is compressed between the end of the solenoid **186** and a washer **189** which bears against a pin **190'**. A generally U-shaped yoke **190** secured to the end of the armature **187** by a screw **191** has a pair of forwardly extending arms **192** and **193**. The arm **192** is pivotally connected to the link **178** by a pivot pin **194**, and the arm **193** is pivotally connected to the link **180** by a pivot pin **195**. Arms **192** and **193** have respective stop shoulders **192'** and **193'**.

The severing mechanism **46** is only effective when the solenoid **186** has been energized. The solenoid **186** is energized during the time in the machine cycle when the shoulders **184** and **185** are below a stop face **196** provided by a plate **197** secured to the bracket **73**. Energization of the solenoid **186** drives the links **178** and **180** against the end **198** of the plate **197**. As the platen assembly **33** moves upwardly, the shoulders **184** and **185** of the respective links **178** and **180** engage the stop face **196** (FIG. **8**) to pivot the movable knife **47** counterclockwise into severing cooperation with the knife **45**, thereby severing a record member **37** from the web. During the remainder of the machine cycle, the platen assembly **33** moves away from the print head **32**. Upon deenergization of the solenoid **186**, the springs **199** and **200** respectively connecting the link **178** and the bracket **173**, and the link **180** and the bracket **173** cause the movable knife **47** to pivot to its clockwise position shown in FIG. **9**.

The spring **188** normally holds the yoke **190** and the pins **194** and **195** in the position shown for example in FIG. **7**. Assuming that the solenoid **186** is not energized, the shoulders **184** and **185** will not engage the stop face **196** as the platen assembly **33** moves upwardly. Accordingly, the movable knife **47** will remain in its initial position relative to the knife **45** (FIGS. **1** and **7**).

The movable knife **47** has a manually engageable upstanding tab or handle **47'** by which the movable knife **47** can be moved into record severing relationship with respect to the knife **45**. As the movable knife **47** pivots, the slots **182** and **183** allow the links **178** and **180** to be moved downwardly as viewed in the drawings. The springs **199** and **200** thereafter return the movable knife **47** to its initial position shown in FIGS. **1** and **7**. Flange **177** has a projection **177'** which is urged into control with a stop **177''** by springs **199** and **200** to define the initial position.

With reference to FIGS. **3** and **7**, the bracket **173** is shown to have an extension **201**. A resilient deflector generally indicated at **202** includes inwardly and upwardly extending spring fingers **203** which in their normal positions extend to immediately adjacent and slightly below the cutting edge of the knife **45**. The marginal ends **204** of the spring fingers **203** are turned away from the edge of the knife **45**. The spring fingers **203** are integrally joined to a mounting portion **205** disposed in underlying relationship to the extension **201**. Screws **206** secure the mounting portion **205** to the extension **201**. When the movable knife **47** is actuated into cutting relationship with the knife **45** to sever a record member **37** from the web, the movable knife **47** deflects the spring fingers **203** from the position shown in FIG. **7** to the position shown in FIG. **8**. As the movable knife returns from the position shown in FIG. **8** to the position shown in FIG. **7**, the spring fingers **203** also return to the position shown in FIG. **7**. The fingers **203** not only prevent the severed record member **37** from falling out of reach in the apparatus **30**, but they also serve to propel the individual record members into a discharge chute indicated by phantom lines **206** in FIG. **7**. The chute **206** is disposed between arms **176** and **177** of the movable knife **47**.

Referring to FIGS. **11** and **13** through **17**, and initially to FIG. **13**, there is shown the inking mechanism generally indicated at **35**. The inking mechanism **35** includes a reservoir or fountain **211** by which an ink supply roll **212** and an ink transfer roll **213** are mounted. The ink transferring roll **213** is an anilox roll having typically microscopic geometric shaped holes or cells in its surface. These holes or cells carry the ink to an ink roll **251**. The fountain **211** has a fountain cover **211'**. The ink supply roll **212** has a hub **214** and an ink receptive cover **215** made of rubber. The hub **214** is keyed to a shaft **216** by a key **217**. A screw rod **218** threadably received by the shaft **216** is shown to be tightened to drive the key **217** into keying engagement with the hub **214**. The shaft **216** is rotatably mounted near one end by a bearing **219** in an arm **220** of a U-shaped frame generally indicated at **221**. The shaft **216** is also mounted near its other end by a bearing **222** received by the other arm **223** of the U-shaped frame **221**. The frame **221** is pivotably mounted by a shaft or pivot **224** mounted at opposed ends **225** and **226** by the fountain **211**. A set screw **227** prevents the frame **211** from shifting axially along the shaft **224**.

The frame **221** has an extension **228** with a hole **229**. A screw **230** passes through a hole **231** in the fountain **211** and the hole **229** in the extension **228**. A rod **232** having a threaded bore **233** threadably receives the screw **230**. A compression spring **234** is received about the screw **230** between the screw head **235** and the fountain **211**. Tightening the screw **230** causes the ink supply roll **212** to be pressed more tightly against the ink transferring roll **213**, thereby diminishing the amount of ink which is transferred to the ink transferring roll **213** by the ink supply roll **212**. Loosening the screw **230** results in more ink being transferred to the ink transferring roll **213**.

The ink transferring roll **213** is secured to a mounting shaft **236** by a set screw **237**. The shaft **236** is rotatably mounted in bearings **238** and **239**. The shaft **236** is driven by the pulley **91**. A pinion **240** secured to the shaft **236** is in meshing engagement with a gear **241** secured to the shaft **216**. As the external diameter of the ink supply roll **212** and the ink transferring roll **213** are the same, the gears **240** and **241** cause the ink supply roll **212** to be driven at a slower rate of speed than the ink transfer roll **213**. This difference in the peripheral speeds of the rolls **212** and **213** results in a slight wiping action or slippage as the rolls **212** and **213** rotate in the directions of arrows **212'** and **213'** (FIG. **13**). This wiping action is found particularly beneficial with inks of relatively high viscosities in effecting diminuation in the amount of ink transferred to the ink transferring roll **213**. As the amount of pressure adjustment between the rolls **212** and **213** is relatively small upon the loosening or tightening of the screw **230**, the correct meshing engagement between the gears **240** and **241** is not affected.

A wiper blade **242** secured to the fountain **211** is slightly longer and thus extend slightly beyond both ends of the roll **212**. The blade **242** both limits the amount of ink which is transferred to the roll **213** and distributes the ink relatively evenly over the surface of the roll **212**. As best shown in FIG. **17**, the amount of ink **I** in the fountain **211** is limited by a weir **244**. Excess ink in the fountain **211** pours over the weir **244** and gravitates through openings **245** between a plurality of bosses **246** which receive screws **243**. From openings **245** the ink flows gravitationally through a plurality of drain holes **247** (one of which is shown) into ink return header **248** from which the excess ink is returned via flexible tube **250** to a sump in the form of a glass jar **249**.

An ink roll **251** is shown in FIG. **13** to be in inking cooperation with the ink transferring roll **213**. The ink roll **251** includes a tubular sleeve **252** having a covering **253** of ink receptive material such as rubber. Guide rollers **252** and **255** are secured to a shaft **258**. The sleeve **254** is rotatable on the shaft **258** by bearings **256** and **257**.

A knurled wheel **259** is secured to the shaft **236** by a set screw **259'**. The wheel **259** drivingly engages an annular rubber wheel **260** secured to the sleeve **252** when the roll **251** is in inking relationship with the roll **213** as shown in FIG. **13**. A gap **261** between the covering **253** and the wheel **260** to prevent any ink from being transferred to the wheel **260** from the covering **253**.

With reference to FIG. **11**, the rolls **254** and **255** are shown to be in contact with guide means in the form of respective cams **262** and **263**. The diameter of the wheel **260** is slightly larger than the diameters of the rolls **254** and **255**. The wheel **260** is shown to be in contact with a plate **262A** the lower surface of which is spaced slightly above the lower surface of the cam **262** as viewed in FIG. **11**. The ink roll **251** is normally in the position shown by phantom lines **251'** in FIG. **13**. As the platen assembly **33** pivots downwardly, the ink roll **251** is driven from the position shown by phantom lines **251'** to the position shown by phantom lines **251''**. The cam tracks **262** and **263** can be individually and independently adjustable upwardly and downwardly relative to the printing members **70** carried by the print head assembly **32**. Adjustment of the cam tracks **262** and **263** by screws **262'** and **263'** which extend through enlarged slots **262''** and **263''** adjusts the amount of pressure or inking contact between the roll **251** and the printing members **70**, thereby controlling the application of ink to the printing members **70**. While the ink roll **251** is moving from the position shown by phantom lines **251'** to the position shown by phantom lines **251''**, the ink roll **251** is driven by the plate **262A** which is in driving engagement with the wheel **260**. The fact that the wheel **260** has a slightly larger diameter than the covering **253** of the ink roll is of no practical consequence in that the contact area between the printing members **70** and the covering **253** is many times greater than the contact area between the plate **262A** and the wheel **260**. Accordingly, the ink roll **251** rolls across the printing members **70** without slipping.

With reference to FIG. **1**, a gear section **264** specifically in the form of a gear segment, the center of rotation of which is the axis of the pivot **34**, is secured to the platen frame **108** by screws **265**. Accordingly, the rack **264** rotates as a unit with the platen frame **108**. A pinion **266** is secured to a shaft **267** pivotally mounted in a stationary bracket **268**. The bracket **268** is secured to the frame **31**. An arm **269** secured to the shaft **267** carries a roller **270**. With reference to FIG. **9**, as the platen assembly **33** moves generally downwardly, the rack **264** drives the pinion **266** and the arm **269** counterclockwise. The roller **270** is received in a cam slot **271** of a cam follower **272**. The follower **272** is secured to a shaft **274** pivotal about a bearing **273** suitably secured to the frame **31**. A rocker **275** secured to the shaft **274** carries a spaced apart pair of ball joints **276** and **277**. The ball joints **276** and **277** are received by respective sockets **278** and **279**. The ball joints **276** and **277** and the sockets **278** and **279** are identical in construction. Accordingly, only the ball joint **277** and its respective socket **279** are shown in detail in FIG. **10**.

With reference to FIG. **10**, the ball joint **277** is shown to have a threaded shank **280** threadably received in a threaded bore **281** in the rocker **275**. The ball joint **277** includes a spherical ball **282** joined to the shank **280**. The distance between the ball **282** and the centerline of the shaft **274** can be varied by turning the ball joint **277**. This changes the length of the arc through which theh ball **282** travels. A lock nut **283** and washer **284** lock the shank **280** in its adjusted position. The socket **279** includes a housing **285** and an opposed pair of socket members **286** and **287**. The housing **285** has a threaded bore **288** which receives a screw **289**. A compression spring **290** is compressed between the socket member **286** and the screw **289**. The socket member **287** is suitably rotatably mounted in the housing **285**, but the socket member **286** is slidable generally to the left (FIG. **10**) away from the socket member **287** to further compress the spring **290** as shown by phantom lines in FIG. **10** during the inking of the ink roll **251**.

Rods **291** and **292** are suitably secured at their one ends to the socket members **287** of the respective sockets **278** and **279**. The other ends of the rods **291** and **292** are threadably received by respective connectors **293** and **294**. The connectors **293** and **294** are connected by pivot pins **295** and **296** to respective carriages **297** and **298**. The carriage **297** (FIG. **8**) rotatably mounts rollers **299, 300** and **301** by respective pivot pins **299', 300'** and **301'**. The carriage **298** (FIG. **1**) rotatably mounts rollers **302, 303,** and **304** by respective pivot pins **302', 303'** and **304'**. The rollers **299, 300** and **301** are in guided rolling contact with a guide track **305** shown in detail in FIG. **11**. The rollers **299, 300** and **301** make three-point contact with the track **305**. The rollers **302, 303** and **304** are in guided, rolling, three-point contact with a guide track **306** (FIG. **1**). Links **307** and **308** are mounted to carriages **297** and **298** by respective pivots **309** and **310**. The opposite ends of the shaft **258** are mounted by the arms **307** and **308**. Springs **309'** and **310'** connected to respective links **307** and **308** and carriages **297** and **298** urge rollers **254** and **255** against respective cam tracks **262** and **263**.

With references to FIG. **16**, the jar **249** is mounted by a holder **311** secured to the frame **31**. A cap **312** is threadably secured to the jar **249**. The cap **312** has a large opening **313**. A metal plate **314** and a compressible liner **315** are clamped between end wall **316** of the cap **312** and the terminal end of the jar **249**. A pump generally indicated at **317** is shown to include a tubular pump body **318**. The pump body **318** has an enlarged external diameter section or flange **319** and a threaded section **320**. A nut **321** received by the threaded section **320** bears against the line **315** and draws the flange **319** against the plate **314** to mount the pump in an upright position. Spaced slightly above the lower terminal end **322** of the pump body **318** are a plurality of inlet ports **323**. A ball **324** is received in a recess in the lower end of the pump body **318**. A helical spring **325** receives a rod **326**. One end of the spring **325** contacts the ball **324** which acts as a bearing for the spring **325**. The other end of the rod **326** extends to about the end of the pump body **318**. The spring **325** exerts a gripping force in the rod as the outside diameter of the rod **326** is greater than the internal diameter of the spring **325** before the rod **326** is inserted into the spring **325**. Accordingly, the spring **325** and the rod **326** are rotatable as a unit. There is only a slight amount of clearance between outside of the spring **325** and the inside bore **327** of the pump body **318**. The spring **325** extends all the way from the lower end of the rod **326** (FIG. **16**) to the slotted marginal end **328** (FIG. **15**) of a connector **329** secured to the shaft **216**. The end of the spring **325** has a tang **330** which extends into the bolt **331** of the slotted end **328**, thereby connecting or keying the spring **325** to the connector **329**. As the shaft **316** and the connector **329** rotate, the spring **325** rotates within a flexible piastic tube **332**. The flexible tubes **250** and **332** are curved and the spring **325** conforms generally to the internal contour of the tube **332**. The portion of the spring **325** in the bore **327** is not in the same axis as the drive shaft **216**. The tube **332** is received about a tubular extension **333** of the fountain **211**. A wire stiffener **334** is wrapped about the marginal end portion **335** of the tube **332**. The stiffener **334** insures that the portion **335** of the tube **332** between the upper and lower passes **92'** and **92''** of the continuously moving belt **92** does not come into contact with the belt **92**. Similarly, a wire stiffener **336** is wrapped about the marginal end portion **337** of the tube **250**. The stiffener **336** insures that the portion **337** of the flexible tube **250** does not come into contact with the lower pass **92''** of the belt **92**.

The lower end of the tube **250** is connected to a tubular fitting **338** (FIG. **16**). The fitting **338** has a flange **339** and a threaded section **340**. A nut **341** secures the fitting **338** to the plate **314**.

With reference to FIG. **14**, as the shaft **216** rotates continuously, the spring **325** is also continuously rotated within the flexible tube **332**. The spring **325** extends into the tubular pump body **318** and rotates together with the rod **326**. The rod **326** fills up the space within the coils of the springs **325**. As the spring **325** rotates, ink I in the jar **249** is drawn through the inlets **323**. As the ink I has a relatively high viscosity, the ink I trapped between the rod **326** and the bore **327** of the pump body **318** and between the coils of the spring **325** is conveyed upwardly. The ink I in the tube **332** above the rod **326** completely fills the space in the tube **332** which is not occupied by the spring **325**. Accordingly, the continuous rotation of the spring **325** causes ink to be delivered continuously through the pump body **318**, through the flexible tube **332** and through the fitting **333** (FIG. **14**) into the fountain **211** as indicated by arrow I'. The ink I supplied to the fountain **211** always exceeds the amount required so that excess ink is continuously returning through the header **248** to the jar **249** via the tube **250**. The inside of the jar **249** is at atmospheric pressure because of aligned vent holes **314'** and **315'** in the plate **314** and the liner **315**, respectively.

With references to FIG. **20**, the print head assembly **32** is shown to include a pair of print heads **341** and **342** mounted by a print head assembly frame **32''**. The frame **32''** is suitably secured to the machine frame **31**. Each print head **341** and **342** rotatably mounts a respective series of drive wheels **343** and **344**. The wheels **343** are in axial alignment with each other, and the wheels **344** are in axial alignment with each other. The wheels **343** and **344** are rotatably mounted by any suitable means such as stationary elongated bearings **345** and **346** rigidly secured to the print head assembly frame **32''**. Toothed drivers or pinions **347** and **348** are secured to respective shafts **349** and **350**. The shafts **349** and **350** are rotatably mounted by the print head assembly frame **32''**. Manually engageable knobs **351** and **352** are secured to the respective shafts **349** and **350**. By shifting the shaft **349** and its pinion **347** to the selected axial position by use of the knob **351**, the pinion **347** is brought into meshing engagement with teeth **353** of the wheel **343** corresponding to a selected printing member **70** in the form of a selected endless printing band **354**. Thereupon, manual rotation of the knob **351** causes the gear **347** to drive the selected wheel **343** to be driven to advance the respective printing band **354** to the selected position to print the selected data on the record member. By shifting the shaft **349** and thereafter rotating the shaft **349** each printing band **354** in the series or any one of them, can be set to print the desired data. There is a printing band **354** individual to and in engagement with each of the wheels **343**. Each wheel **342** has about the same width as the associated band **354**. The printing bands **354** are shown to be of the endless type and to have teeth **355** on their undersides in engagement in notches **356** on the periphery of the respective wheel **343**. Similarly, by shifting the shaft **350** and its pinion **348** to the selected axial position by use of the knob **352**, the pinion **348** is brought into meshing engagement with teeth **357** of the wheel **344** corresponding to a selected printing member **70** in the form of a selected endless printing band **358** or **358'**. It is preferred to construct the printing bands **354, 358** and **358'** of resilient material such as rubber. Therefore, manual rotation of the knob **352** causes the gear **348** to drive the selected wheel **344** to advance the respective printing band **358** or **358'** to a position to print the selected data on the record member. By shifting the shaft **350** and the gear **348** and thereafter rotating the shaft **350** each printing bands **358** and **358'** in the series, or any of them, can be set to print the desired data.

There is a support assembly generally indicated at **359** for the printing bands **354** and there is a support assembly generally indicated at **360** for the printing bands **358** and **358'**. The support assembly **360** is shown in FIGS. **20** through **26**. With reference initially to FIG. **22**, the support assembly **360** is shown to be of modular construction. The assembly **360** is illustrated as having a support frame **361** with an elongated section **362** and integrally formed end plates **363** and **364**. The frame **361** mounts a support assembly module generally indicated at **396**.

Outwardly extending flanges **365** and **366** of the support frame **361** have respective threaded holes **367** and **368**. Screws **369** and **370** (FIG. **21**) threadably received in the respective holes **367** and **368** are used to adjust the tension on the printing bands **358** and **358'** as best shown in FIG. **11**. The head **371** of the screw **369** bears against a shoulder **372** of the one end plate **32'** of the print head assembly **32**. The head **373** bears against a similar shoulder (not shown) of the other end plate **32'**. Accordingly, adjustment of the screws **369** and **370** will effect movement of the support assembly **360** toward or away from the wheels **344**, that is, upwardly or downwardly as viewed in FIG. **20**. Once the support assembly **360** has been adjusted, screws **374** and **375** threadably received by the support frame **361** and which extend through an elongated slot **376** in one end plate **32'** and an elongated slot **377** (shown only by phantom lines in FIG. **20**) in the other end plate **32'** are tightened to lock the support assembly **360** in the adjusted position.

Referring again to FIG. **22**, the elongated section **362** of the support frame **361** has an elongated slot **378**, an elongated notch **379**, and an elongated groove **380**. The space between the end plates **363** and **364** is occupied by support members specifically in the form of wheels **381** and by support members specifically in the form of wheels **382**. The wheels **381** are square and have relatively long sides **383**, while the wheels **382** are square and have relatively short sides **384**. The sides **383** and **384** have respective notches **385** and **386**. The wheels **381** are individually rotatably mounted by a shaft **387** mounted by mounting and spacing members **388** and **395**. The members **388** are identical in construction and have notches **388***a* and **388***b* and a tang or projection **388***c*. The wheels **382** are individually rotatably mounted by a shaft **389** mounted by mounting and spacing members **390**. The members **390** are identical and have notches **390***a* and **390***b* and a tang or projection **390***c*.

As best shown in FIGS. **25** and **26**, the printing bands **358** have relatively long printing blocks **391**, while the printing bands **358'** have relatively short printing blocks **392**. One of printing blocks **391** of one printing band **358** is illustrated as having bar-shaped printing elements **393** for printing machine readable code data and a character element **394** for printing a corresponding human readable character; the remainder of this printing band **358** can have other and different bar-shaped and corresponding character elements. If desired, the printing blocks **391** can carry large size character elements (not shown) for printing a large human readable character. It is apparent that the large printing blocks **391** and the small printing blocks **392** can print different sizes and types of data. The invention provides an arrangement by which the line can be composed of wheels **381** and wheels **382** in any arrangement. The printing blocks **391** and **392** which are supported by the respected wheels at the printing zone are disposed in a row to print a line of data and lie on a common plane. Shafts **387** and **389** are parallel.

With reference again to FIG. **22**, wheels **381** and members **388** and one end mounting member **395** occupy only part of the space between the end plates **363** and **364** of the support frame **361**. The remainder of the space is occupied by the support assembly module **396**.

The module **396** includes a module frame **397** having elongated grooves **398** and **399**. Tangs **390***c* of the members **390** fit into the groove **399**. Each wheel **382** is provided with a detent generally indicated at **400**. Each detent **400** includes a compression spring **401** and a plunger **402**. The one ends of the springs **401** abut an elongated flange **403** of the module frame **397**, and the other ends of the springs **401** abut the ends of the plungers **402**. A plate **404** is secured to the module frame **397** by screws **404'** received in threaded holes **398'**. The plate **404** retains the springs **401**, the plungers **402** and the mounting and spacing members **390** in their assembled relationship as shown in FIGS. **21** and **24**. With reference to FIG. **24**, it is seen that the module frame **397** has an elongated projection **405** which fits against the lower end of the support assembly frame **361**. The module frame **397** has an elongated projection **406** that fits into the notch **379** of the support assembly frame **361**. The module **396** is secured to the support assembly frame by a screw **407** which extends through the slot **378** and is threadably received in a threaded hole **408** in the module frame **397**.

It is apparent that part of the space between the end plates **363** and **364** is occupied by the module **396**; the remainder of the space is occupied by wheels **381** and associated detents **410**, and mounting and spacing members **388** and end plates **395** and **409**. The lower end of the frame 361 is received in notches 388a of members 388, 395 and 409.

Each wheel 381 is provided with a detent 410 which includes a pair of springs 411 and a plunger 412. The springs 411 urge the plungers 412 into detenting relationship with respective wheels 381. The lower ends of the plungers 412 are concave as indicated at 412' so that when the associated wheel 381 rotates a corner of the wheel 318 will ride on concave surface 412' and the plunger 412 will travel a shorter distance and the associated spring 412 will be compressed to a lesser degree than if the lower surface were flat as is the lower surface 402' of the plunger 402. The ends of the plungers 412 have short flats 412'' to provide two-point detenting contact with associated wheels 381. A retainer plate 413 is secured to the section 362 of the support assembly frame 361 by screws 413' received in respective threaded holes 414. The plate has a top portion 415 with holes 416 through which the screws 413' extend, a flange portion 417 joined to the top portion 415, and a retainer portion 418 joined to the top portion 415 which extends into notches 388b of the members 388, 395 and 409.

The illustrated arrangement shown in FIGS. 20 through 26, shows the support assembly 360 as composed in part of a module 396 having small support wheels 382, and in remainder of large wheels 381 and detents 410, members 409, 388 and 395. As viewed in FIGS. 21 and 22, the module 396 comprises the left hand portion of the assembly 360 and the wheels 381, the members 388, 395 and 409 comprise the remainder of the assembly 360. If desired, the module 396 can comprise the right hand portion of the assembly, or the central portion. The module frame can be longer or shorter than shown. The assembly 360 can comprise two or more modules, such as the module 396 and the remaining space or spaces can be comprised of large wheels 381, members 409, 388 and 395 and detents 410 and a shaft of appropriate length like the shaft 387. The assembly 360 can also be comprised of two or more modules, like the module 396, mounted end-to-end with one or more modules having large wheels like the wheels 381 and with one or more modules having small wheels like the wheels 382.

The support assembly 359 can be constructed using the same components as the support assembly 360 in any desired arrangement.

With reference to FIG. 2, the record members 37 are shown to be guided by a guide 108''. The record members 37 are shown to comprise tickets arranged in a web and partially severed by lines of perforation 37'. Control elements in the form of notches 37'' are disposed in the web in transverse alignment with the perforations 37'. A switch 436 is mounted by the frame 31 in the path of the notches 37''. The record members 37 can as well comprise pressure sensitive labels carried on a web of supporting material (not shown). To make a multipart ticket such as a two-part ticket (or label) the web would be severed at every other line of perforation 37'.

Referring fo FIGS. 27 through 30, there is shown diagrammatically a control system 420. The clutch 51 can be operated by any suitable means such as the controls fully disclosed in U.S. Pat. No. 3,228,601. The clutch is diagrammatically illustrated as being mechanically connected by controls 422 disclosed in U.S. Pat. No. 3,228,601 to a control panel 421 having a start button 421'. The controls 422 can be set to operate the printing apparatus 30 for the desired number of machine cycles. The desired number of cycles is initiated by depressing start button 421'. At the end of the cycles corresponding to the number to which the counter (38 in U.S. Pat. No. 3,228,601) is set, the clutch 51 is disengaged. As indicated in FIGS. 1 and 27, a gear 52' is secured to the drive shaft 52. The gear 52' drives an idler gear 423 which in turn drives a gear 424. The gear ratio between the gears 52' and 424 is 2 to 1 so that the gear 424 rotates one-half as fast as the gear 52'. The gear 424 is secured to a shaft 425 to which cams 426 and 427 are secured. The cam 426 is circular except for a pointed lobe 428 which momentarily closes a switch 429 during one machine cycle and which momentarily closes a switch 430 during the next machine cycle. With reference to FIG. 3, it will be recalled that at the initial or rest position of the machine and also at the initiation of a machine cycle the shaft 52 is in an initial position such that the crank pin 56 is in the position shown by phantom lines 56' in FIG. 3. This position corrresponds to the 0° position of the cams 426 and 427. The switch 429 is at the 150° position of the cam 426 which, because of the speed reduction effected between gears 52' and 424, corresponds to the 300° position of the crank pin 56. The switch 430 is at the 330° position of the cam 426 which corresponds to the 300° position of the crank pin 56. The cam 427 is circular and mounts an adjustable pointed cam lobe 431 best shown in FIG. 28. Switches 432, 433, 434 and 435 are in the path of the cam lobe 431 when the cam lobe 431 is in the solid line position shown in FIG. 28. The switch 432 is at the 67° position of the cam 427 which corresponds to the 134° position of the crank pin 56. The switch 433 is at the 150° position of the cam 427 which corresponds to the 300° position of the crank pin 56. The switch 434 is at the 247° position of the cam 427 which corresponds to the 134° position of the crank pin 56. The switch 435 is at the 330° position of the cam 427 which corresponds to the 300° position of the crank pin 56. When screw 427' is loosened and the lobe 431 is shifted to the phantom line position indicated by phantom lines 431' and the screw 427' is thereupon tightened, the switches 432 and 433 are out of the path of the lobe 431 and hence the switch 432 will not be closed and the switch 433 will not be opened upon rotation of the cam 427. If the lobe 431 is completely removed upon unscrewing the screw 427', none of the switches 432, 433, 434 or 435 will be in the path of the lobe 431 and hence none will be operated during rotation of the cam 427.

With reference to FIG. 30, a lead 437 is directly connected to the switches 429, 430 and 436. A switch 438 connects the switch 436 and a node 439. The switches 429 and 430 and one side of winding 440 of a relay 441 are also connected to the node 439. The other side of the winding 440 is connected to one side of a winding 442 of the solenoid 154. The other side of the winding 442 is connected to a lead 443.

With reference to FIG. 29, a lead 444 is connected directly to the switches 432, 433 and 434. A switch 435 and a switch 445 which forms part of a relay 446 are connected in series with the switch 433 to a node 447. The switches 432 and 433 and one side of a winding 448 of the relay 446 are also connected to the node 447. The other side of the winding 448 is connected to one side of a winding 449 of the solenoid 186. The other side of the winding **449** is connected to a lead **450.**

Assuming that the apparatus **30** is set to print six one-part tickets **37** the start button **421'** (FIG. **1**) of the controls **422** is depressed which effects engagement of the clutch **51.** The shaft **52** starts to rotate, causing the gears **52'**, **423** and **424** and cams **426** and **427** to rotate. As the cam **427** rotates through 67°, the switch **432** is momentarily closed to complete a circuit from the line **444,** through the switch **432,** through the winding **448** of relay **446,** through the winding **449** of the solenoid **186** to the line **450,** thereby completing a circuit. Energization of the relay winding **448** causes closure of the switch **445,** thereby completing a holding circuit from the line **444,** through switches **433, 435** and **445,** through the windings **448** and **449** to the line **450.** Energization of the solenoid **186** pivots the links **178** and **180** counterclockwise from the position shown in FIG. **9** into abutment with end **198** of the plate **197.** As the drive shaft **52** continues to rotate the platen assembly **33** is driven counterclockwise, and links **178** and **180** move generally upwardly together with the platen assembly **33** until respective stop sholders **184** and **185** contact the stop face **196** of the plate **197.** The trailing edge of the record member **37** which was previously printed is in alignment with the knife **45**; as the platen assembly **33** moves counterclockwise to the fullest extent as shown in FIG. **8,** the movable knife **47** has moved from the position shown in FIG. **9** to the position shown in FIG. **8,** thereby severing the previously printed ticket. When the platen assembly **33** is in the position shown in FIG. **8,** the dirve shaft **52** has rotated through 275° and the cams **426** and **427** have rotated through 137.5°. The cam lobe **431** opens the switch **433** when the cam **427** has rotated through 150°, thereby deenergizing the solenoid **186.** The spring **188** immediately causes the links **178** and **180** to return to their clockwise positions (FIG. **9**). When the drive shaft **52** has rotated through 300°, the platen **44** has moved downwardly sufficiently to permit the web of record members **37** to be advanced; at this instant in the machine cycle the cam **426** has rotated through 150° and the switch **429** is momentarily closed, completing a circuit from the lead **437,** through the switch **429,** through windings **440** and **442** to the lead **443.** Energization of the relay winding **440** causes closure of the switch **438,** and energization of the solenoid **154** causes the control member **145** to pivot to the phantom line position shown in FIG. **18** out of contact with the O-ring **126,** thereby causing the clutch **120** to engage to drive the web of record members **37.** As soon as the switch **436** no longer senses a notch **37''**, the switch **436** closes. Now that switches **436** and **438** are both closed, a holding circuit from the lead **437** through switches **436** and **438,** andn through the windings **440** and **442** is completed. As long as the solenoid **154** is energized the control member **145** is held away from the O-ring **126** and the clutch **120** is engaged to cause the advance of the web. As soon as the switch **436** senses the next notch **37''**, the switch **436** opens to deenergize the solenoid **154,** so that the spring **156** pivots the control member **145** to the solid line position shown in FIG. **18** to effect disengagement of the clutch **120.** As the clutch **51** remains engaged, the drive shaft **52** continues to rotate through the 360° (or 0°) position and the cams **426** and **427** continue to rotate through their 180° positions. When the drive shaft **52** has rotated through 360° the feeding of the web has already been completed. When the cam **427** has rotated through 247° the switch **434** closes momentarily to energize the windings **448** and **449** and to close the switch **445** to establish the previously described circuit for the purpose previously described. When the cam **426** and **427** have rotated through 330° the lobe **431** of the cam **427** opens the switch **435** to deenergize the solenoid **186,** and the lobe **428** of the cam **426** closes the switch **430** to energize the windings **440** and **442** to consequently close switches **436** and **438** as previously described to maintain energization of the solenoid **154** to advance the web until the switch **436** again senses a notch **37''** in the web. The drive shaft **52** and the cams **426** and **427** and the machine continues to cut, print and feed until the counter of the controls **422** has reached the sixth count at which time the clutch **51** is disengaged.

If it is desired to provide two-part tickets, the cam lobe **431** is shifted to the phantom line position shown by lines **431'** in FIG. **28,** in which event the cam lobe **431** never closes switch **432** or opens switch **433.** Accordingly, the knife **47** is only operated at every other rotation of the drive shaft and is only under the control of switches **434** and **435.**

If it is not desired to sever automatically any of the tickets **37** from the web, the cam lobe **431** is removed, in which event neither the switch **432** nor the switch **434** is ever closed and neither the switch **433** nor the switch **435** in ever opened.

Another embodiment of an inking mechanism **35A** is illustrated in FIGS. **31** through **35,** in conjunction with the printing apparatus **30A** and the fountain **211** illustrated by phantom lines in FIG. **31.** The printing apparatus **30A** differs from the apparatus **30** in that part of the drive mechanism for the ink roll **251** is of the same construction disclosed in U.S. Pat. No. 3,180,254; in that patent a barrel cam **160** drives an arm **166** which in turn drives a feed finger carriage **167,** and that mechanism which is shown in detail in that patent and which is shown diagrammatically in FIG. **31** of the drawings of this application provides a part of the ink roll driving mechanism of the inker or inking mechanism **35A.** More specifically, a barrel cam **451** (**160** in the patent) secured to the shaft **52** (**149** in the patent) rocks or pivots an arm **452** (**166** in the patent) about a pivot **453** (**179** in the patent) during one complete revolution to drive a carriage **454** (**167** in the patent). The carriage **454** is mounted by a guide or way **455** secured to the platen assembly **33** (**20** in the patent). The record feed mechanism is the same in the printing apparatus **30A** as in the apparatus **30** and consequently the carriage **454** is not used to feed the record as is true in the patent.

A cam track **456** having a cam groove **457** is secured to the carriage **454.** A roller **458** captive in the cam groove **457** is carried by an arm **459** of a bell crank **460.** The bell crank **460** is pivotally mounted to the frame **31** of the apparatus **30A** by a pivot pin **461.** The bell crank mounts a pivot pin **462.**

A pair of identical arms **463** and **464** are pivotally mounted by pivot pins **465** and **466** to end plates **32'** of print head assembly **32** of the apparatus **30A.** The arms **463** and **464** rotatably mount the ink roll **251.** Spaced apart identical connecting rods or links **467** and **468** are connected at their one ends respectively to the arms **463** and **464** by pivot pins **469** and **470** and at their other ends to the pivot pin **462.**

With reference to FIG. 32, one of the connecting rods **467** and **468**, namely the connecting rod **468**, is shown in section. The connecting rod **468** includes a rod **471** suitably connected by a connector **472** to the pivot pin **470**. The rod **471** has a threaded section **473** which threadably receives nuts **474** and **480**. The nut **474** has an annular tubular section **475** received about threaded section **473** in an open-ended bore **476** in a connector **477**. The section **475** abuts a shoulder **478** at the end of the bore **476**. A lock nut **479** can be tightened against the nut **474**. The nut **480** has an annular tubular section **481** received about threaded section **473** slidably received in a bore **482** in the connector **477**. A lock nut **483** can be tightened against the nut **480**. A compression spring **484** is received in the bore **482** about the threaded section **473** between a shoulder **485** and one end of the tubular section **481**. By adjusting the nuts **474** and **480** relatively toward or away from each other the path of travel of the ink roll **251** can be adjusted and the spring **484** can be compressed the desired amount. When the ink roll **251** is in the position shown in FIG. 32, the roller **458** is near the end of the cam groove **457** and with the ink roll **251** having inked the printing members.

The ink roll **251** which includes a shaft **258** and carries the wheels **254** and **255** (FIG. **15**) is rotatably mounted in identical arms **463** and **464**. A fragment of the arm **464** is shown in detail in FIGS. **33, 34** and **35.** A slide **486** is slidably mounted in a channel-shaped section **487** of the arm **464**. The slide **486** has a tab **488** which extends into an adjoining groove **489**. A compression spring **490** is disposed in the groove **489** in abutment with the tab **488** and with a shoulder **491** at the end of the groove **489** at the lower end of the arm **464** opposite from the pin **466**. The slide **486** has an integral tubular bearing **492** which received the end of the shaft **258**. As the arms **463** and **464** move between the extreme positions shown in FIGS. **31** and **32**, rollers **254** and **255** follow cams **262** and **263** and the respective springs **490** compress and extend.

Referring again to FIGS. 31 and 32, the roller **458** is initially in the position indicated at **458'** by phantom lines, the ink roll **251** being in the position indicated by phantom lines **251'**. As the barrel cam **451** starts rotating the platen assembly **33** pivots clockwise (FIGS. **31** and **32**) and the arm **452** pivots clockwise so that the roller **458** moves to near the end of the cam groove **457** as shown by solid lines in FIG. **32**, causing the ink roll **251** to be driven into ink-transferring relationship with the printing members. Continued rotation of the barrel cam **451** causes the cam **456** to be driven to the position shown in FIG. **31** in which the ink roll **251** is in ink receiving contact with the ink transferring roll **213**. Continued rotation of the barrel cam **451** returns the roller **458** to the initial position shown by phantom lines **458'**. The roll **251** is now out of the path of the platen assembly **33** as indicated by phantom lines **251'**.

Other embodiments and modifications of this invention will suggest themselves to those skilled in the art, and all such of these as come within the spirit of this invention are included within its scope as best defined by the appended claims.

I claim:

1. A pump, comprising: a liquid container including a plate, a one-piece pump body extending through the plate and into the container, the pump body having a straight bore and a liquid inlet providing communication between the inside of the container and the bore, the pump body having a flange and a threaded section on one side of the flange, a nut received by the threaded section, the plate being disposed and held between the flange and the nut, a curved tube connected to the pump body on the other side of the flange and communicating with the bore, a helical spring rotatable in the tube and having a portion extending into the bore, a straight rod disposed substantially only within the portion of the spring in the pump body, the rod and the spring being in contact and being rotatable as a unit in the bore, and means for driving the spring and the rod as a unit, there being only slight clearance between the spring and the bore so that as the spring and the rod rotate, liquid between the rod and the bore and between the coils of the spring is conveyed upwardly.

2. A pump, comprising: a liquid container including a plate, a one-piece pump body extending through the plate and into the container, the pump body having a straight bore and a liquid inlet providing communication between the inside of the container and the bore, the pump body having a flange and a threaded section on one side of the flange, a nut received by the threaded section, the plate being disposed and held between the flange and the nut, a curved tube connected to the pump body on the other side of the flange and communicating with the bore, a helical spring rotatable in the tube and having a portion extending into the bore, a straight rod disposed substantially only within the portion of the spring in the pump body, the inside diameter of the rod being greater than the internal diameter of the spring before the rod is inserted into the spring so that when the rod is inserted into the spring the spring grips the rod and the rod and the spring are rotatable as a unit, and means for driving the spring and the rod as a unit, there being only slight clearance between the spring and the bore so that as the spring and the rod rotate, liquid between the rod and the bore and between the coils of the spring is conveyed upwardly.

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