United States Patent

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[54] **ADDRESSING MACHINE WITH TOGGLE-LINK MECHANISM**
12 Claims, 14 Drawing Figs.

[52] **U.S. Cl.** **101/48,** 101/56, 101/269
[51] **Int. Cl.** **B41l 47/06,** B41f 3/04
[50] **Field of Search** 101/56, 55, 269, 274, 250, 282, 283, 284, 285, 48, 49, 58, 47

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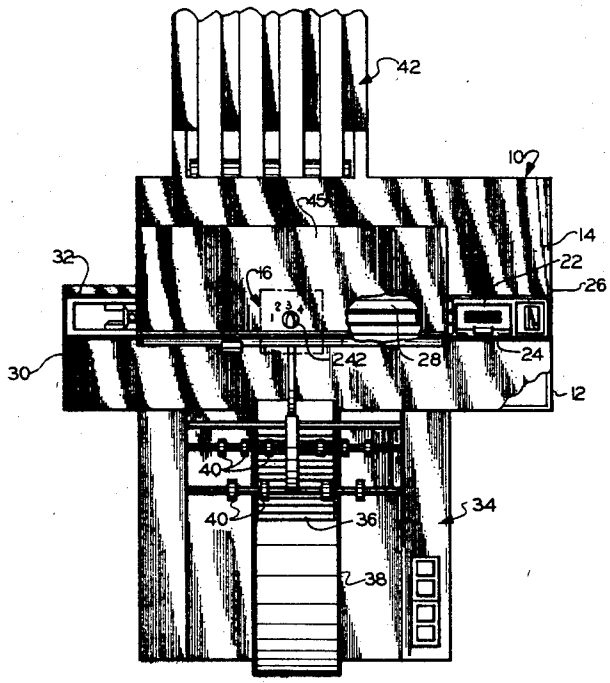
ABSTRACT: An addressing machine of the type in which addresses are sequentially printed upon workpieces by a print roller which is reciprocated into contact with a stencil placed between the print roller and a table on the frame of the machine upon which the workpiece is located, the reciprocation of the print roller being accomplished by a toggle-link mechanism mounted upon the frame of the machine, the toggle-link mechanism having a link which is pivotally mounted on the frame and is selectively movable with respect to the table to selectively change the spacing between the print roller and the table for accommodating workpieces of different thicknesses.



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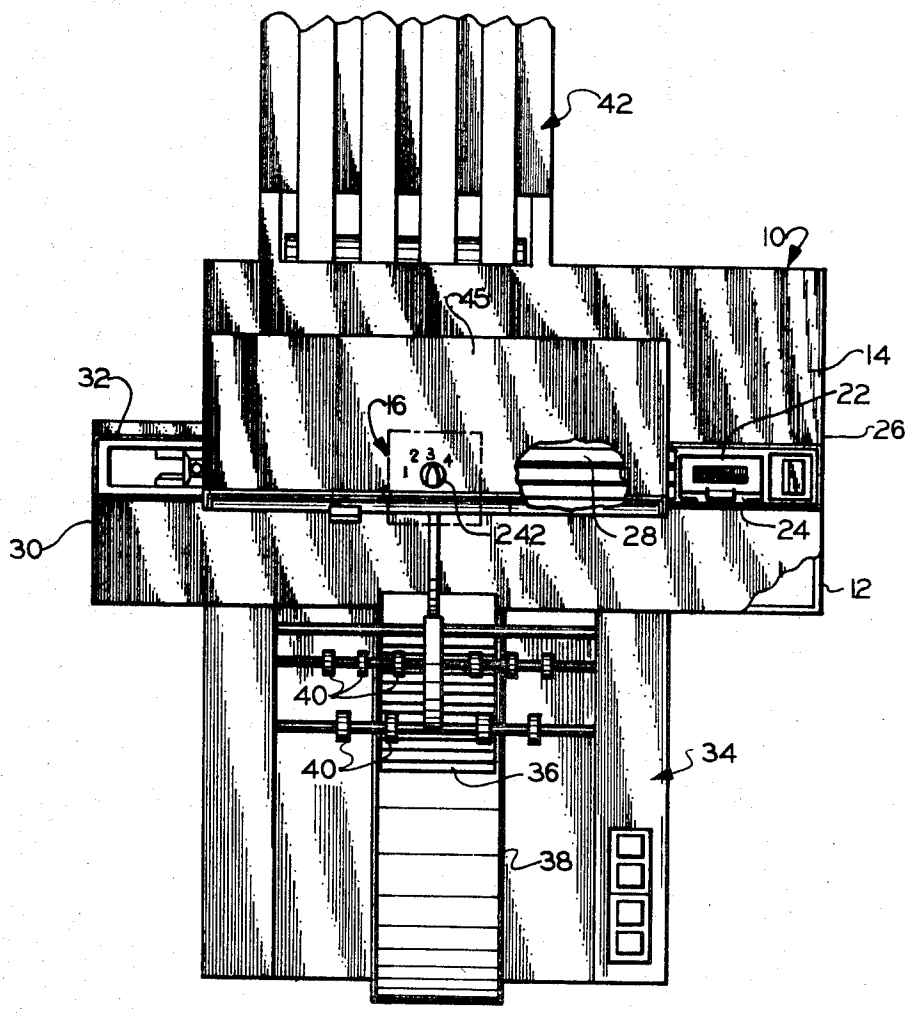

Fig. 1

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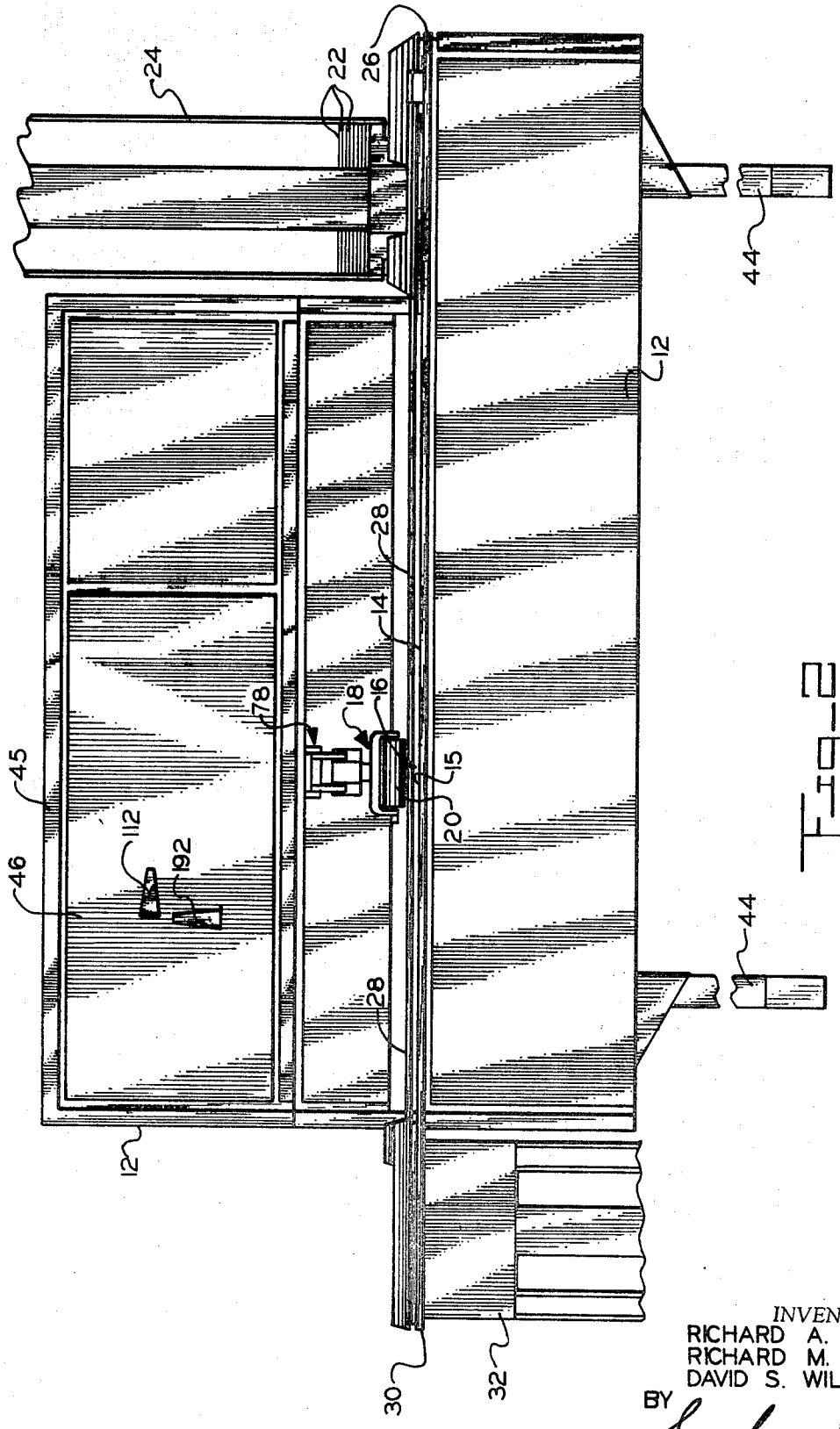

FIG 2

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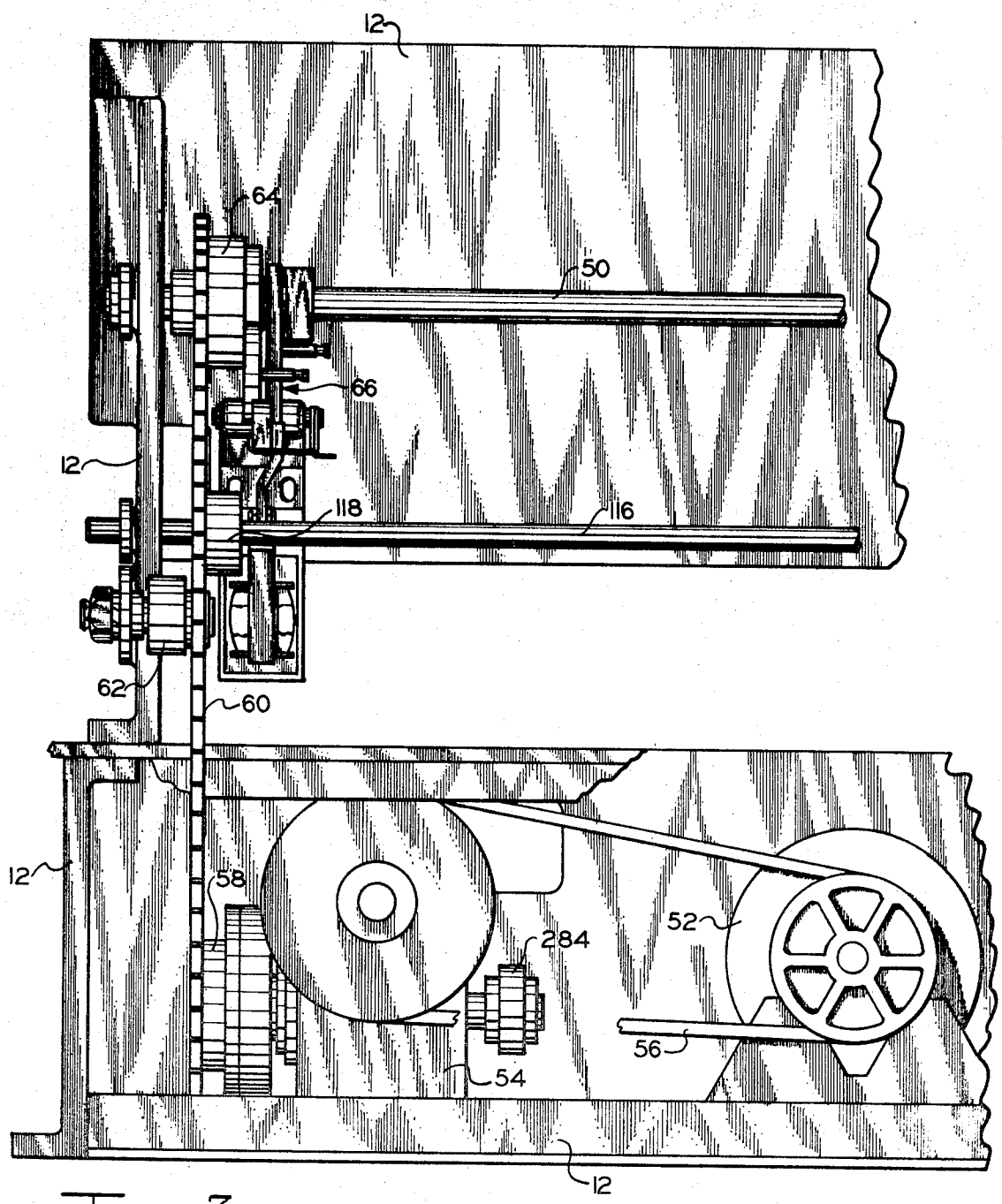

Fig_3

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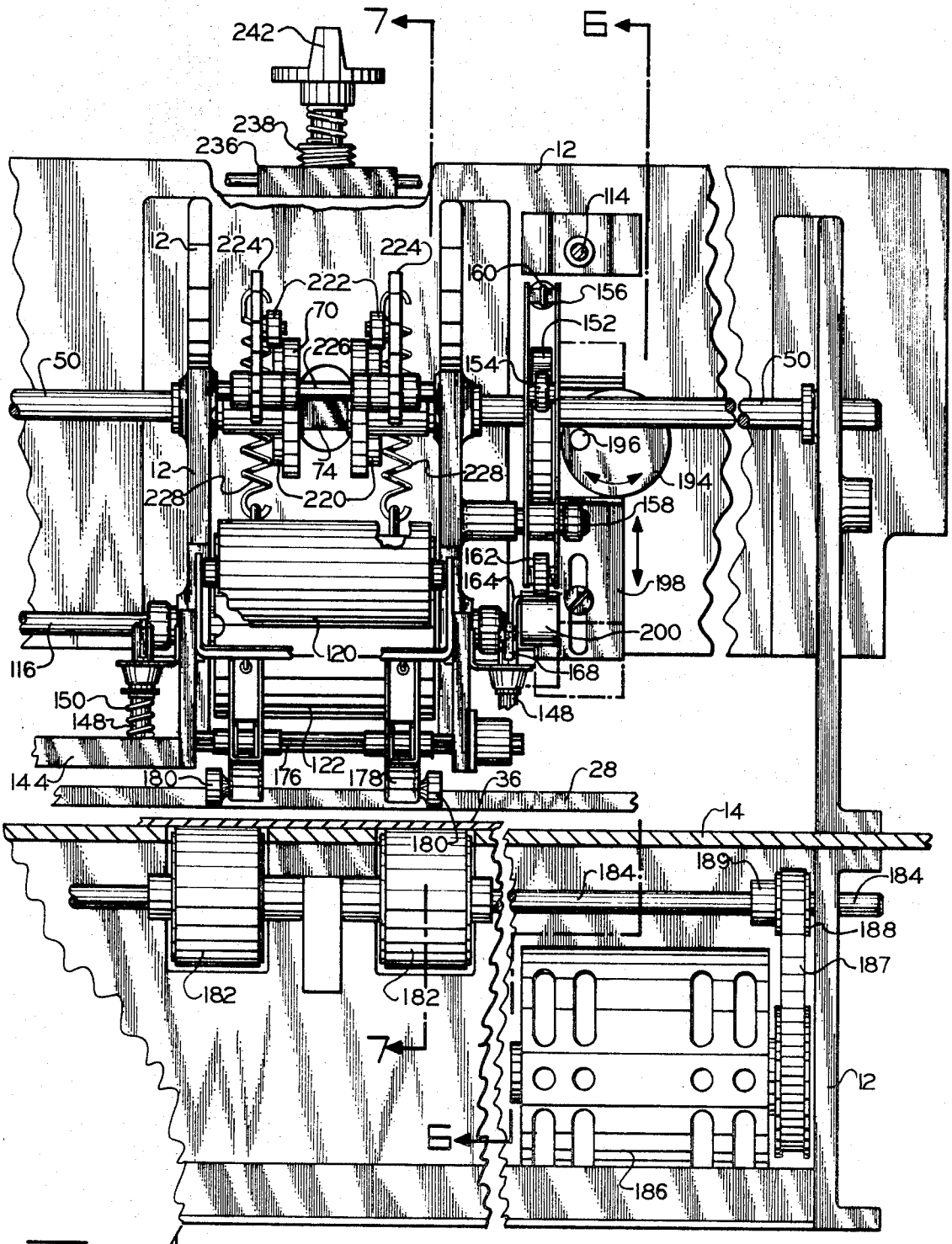

Fig-4

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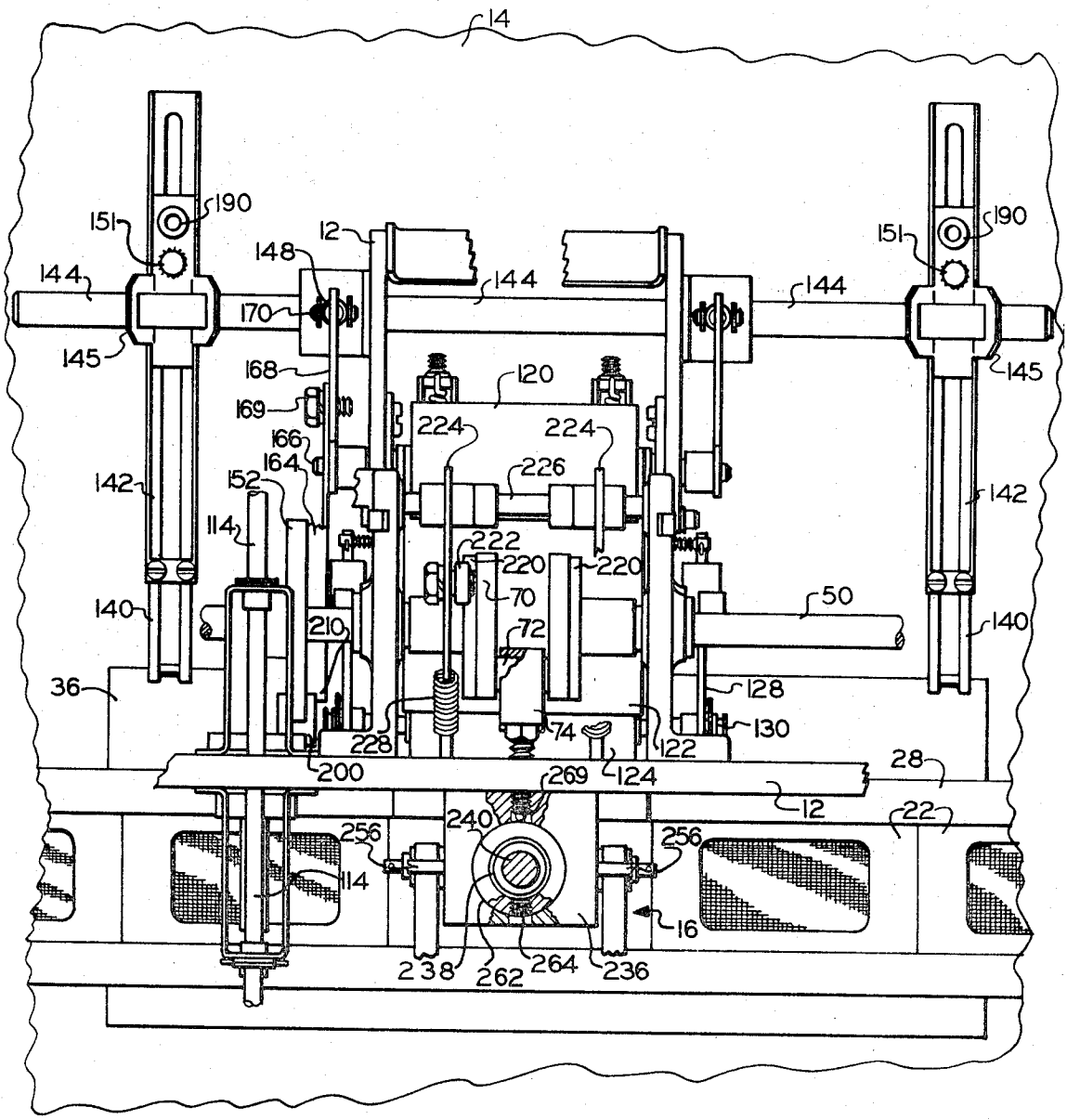

Fig-5

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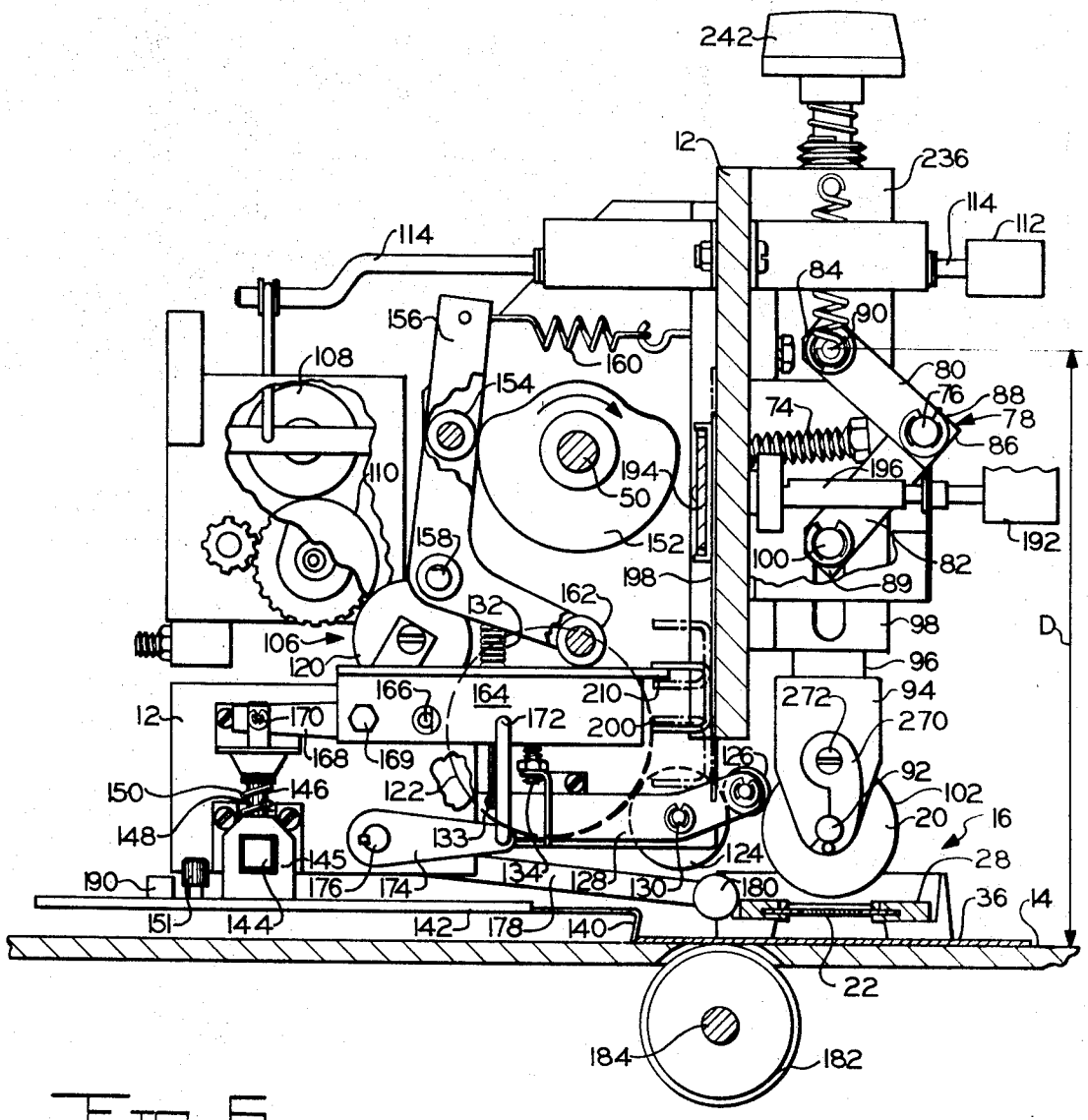

FIG_6

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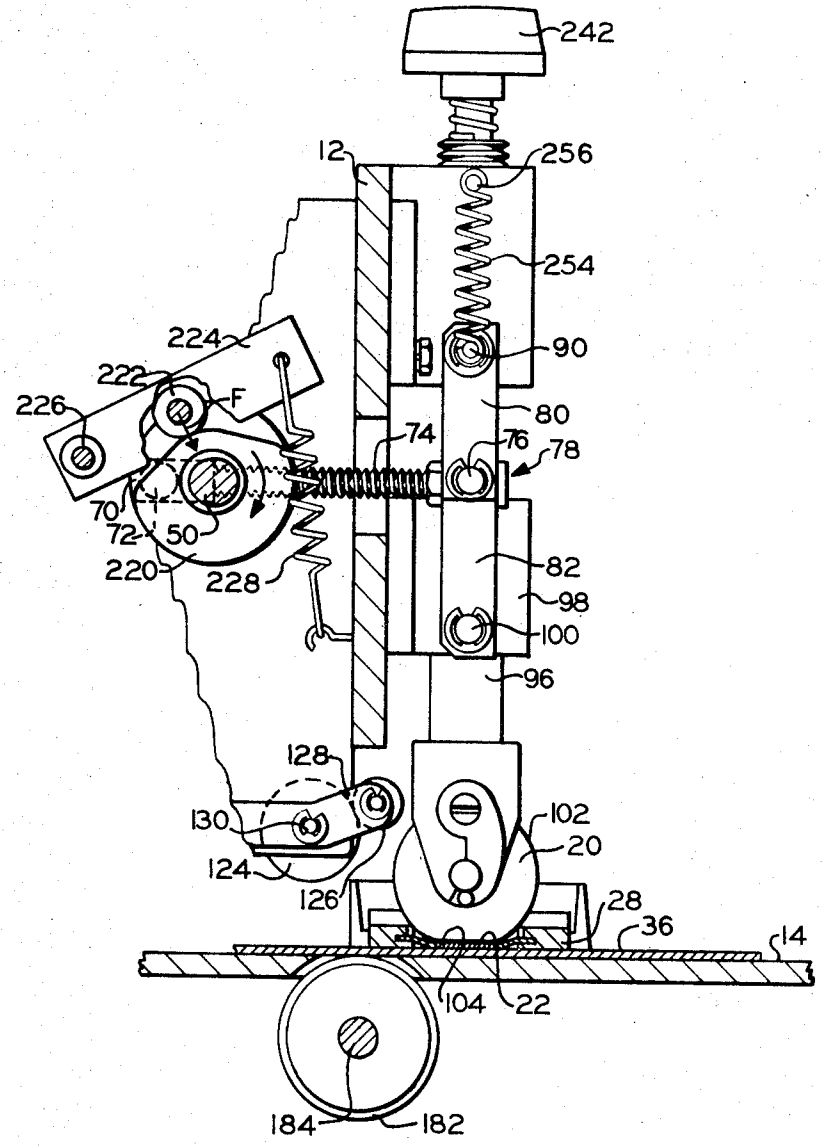

Fig-7

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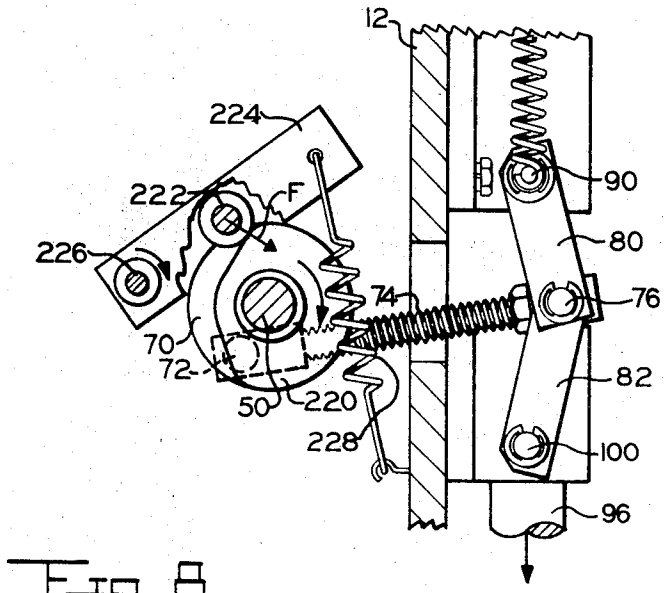

Fig. 8

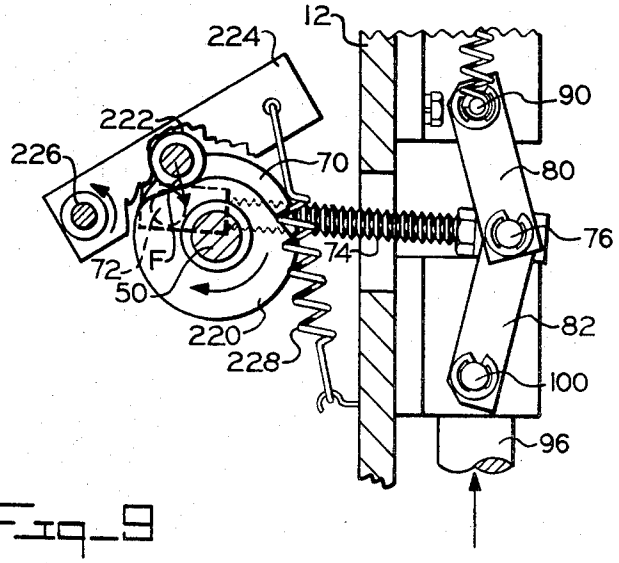

Fig. 9

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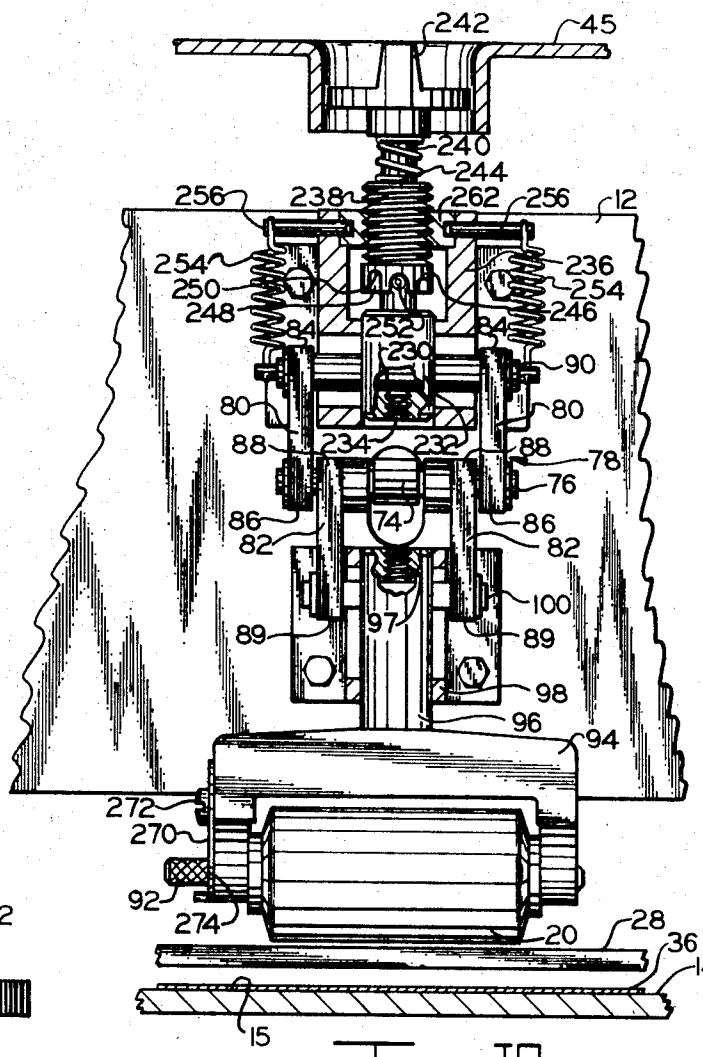

Fig_10

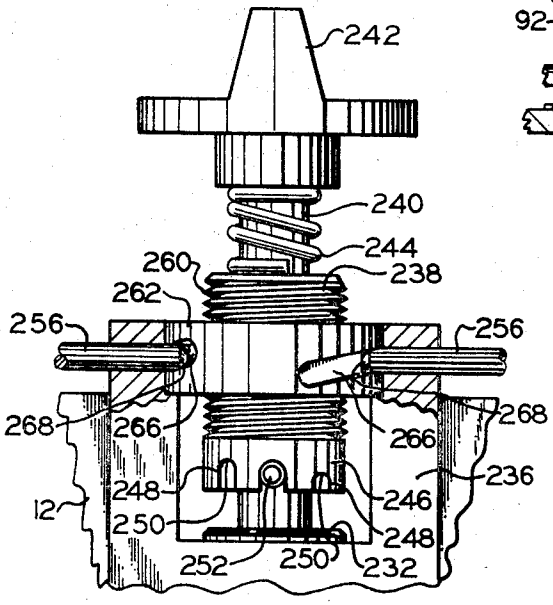

Fig_11

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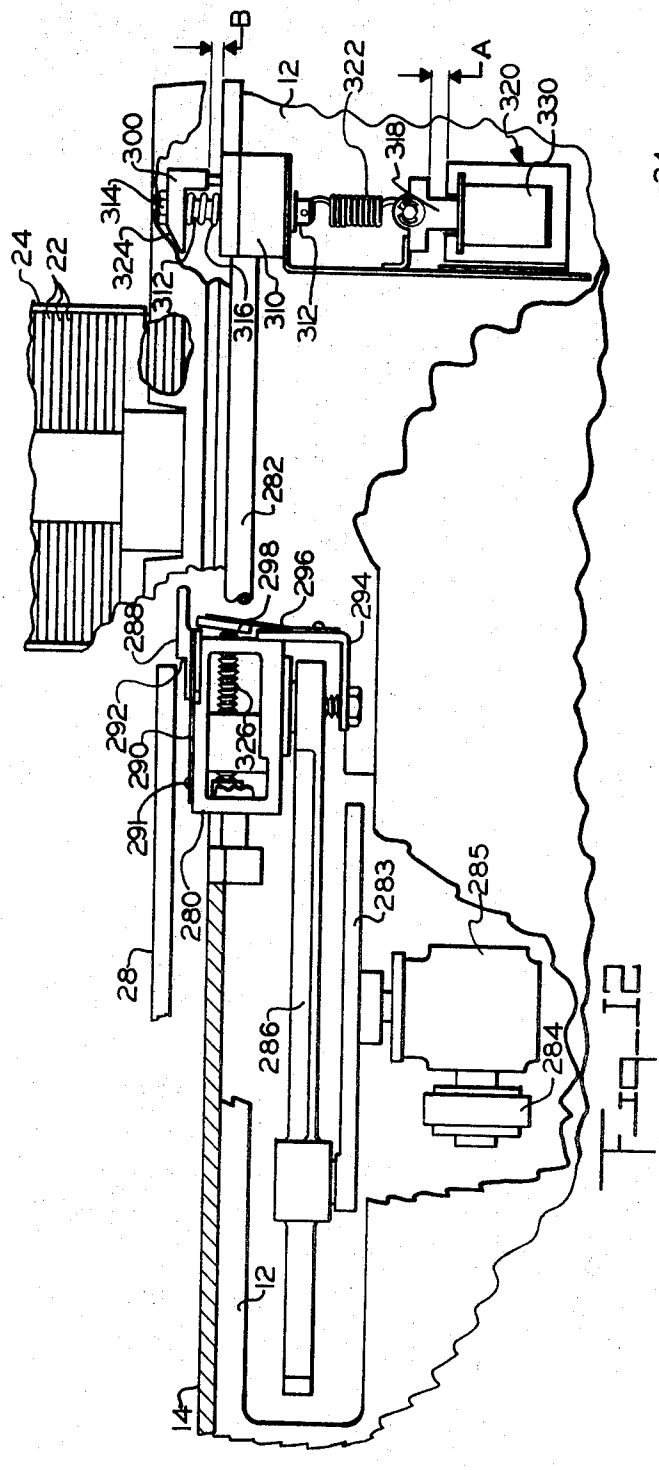

Fig. 12

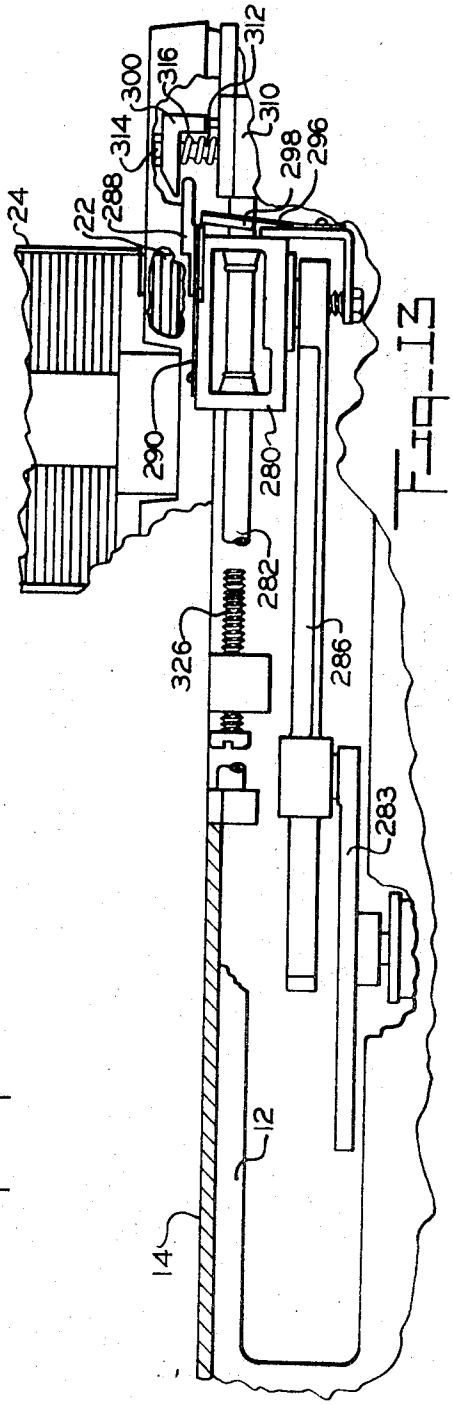

Fig. 13

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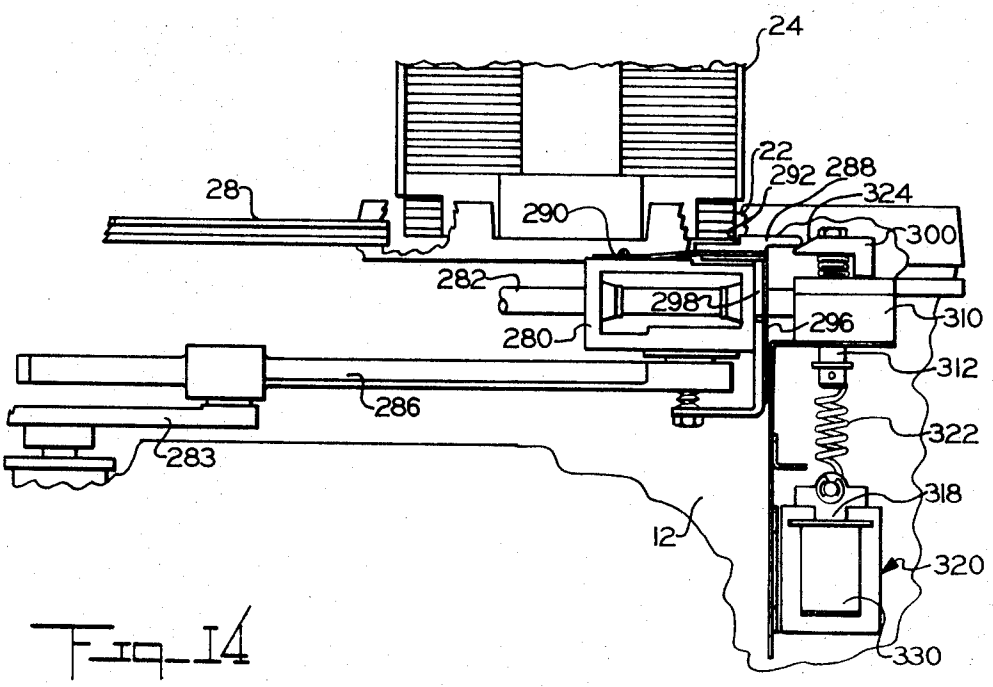

FIG_14

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ADDRESSING MACHINE WITH TOGGLE-LINK MECHANISM

The present invention relates generally to addressing machines and pertains, more specifically, to addressing machines of the type in which addresses are sequentially printed upon workpieces by the transfer of ink through a print-forming element, such as a stencil, to a workpiece, such as an envelope, card or an address list.

The current trend toward increased use of growing mailing lists has developed a demand for high speed, versatile addressing machines which are compatible with commonly used address stencils and which can print addresses carried by such stencils upon a variety of items including mailing envelopes and other mailing pieces of various thicknesses, as well as upon business forms and sheets of indeterminate length. While addressing machines have been developed for such stencils which print addresses rapidly, such machines have been limited to use in connection with rather specific items to be addressed and have lacked the versatility demanded by businesses which cannot justify, from an economic standpoint, the purchases of multiple addressing machines for the various tasks which could be performed through the use of address-carrying stencils.

It is therefore an important object of the invention to provide a versatile, high-speed addressing machine capable of effectively printing addresses upon a variety of different items having various dimensions.

Another object of the invention is to provide an addressing machine of the type described above which employs a toggle-link mechanism for reciprocating the printing means of the machine and which incorporates a simple, yet effective selective adjustment of the toggle-link mechanism for printing addresses upon workpieces of various thicknesses.

A further object of the invention is to provide an addressing machine which employs a toggle-link mechanism for urging a print roller against address-carrying stencils and incorporates a reaction mechanism which compensates for the mechanical characteristics of the toggle-link mechanism to provide smooth and reliable operation. The reaction mechanism further aids in compensating for reaction forces generated by the alternating elastic deformation and releases of the print roller by the toggle-link mechanism.

A still further object of the invention is to provide an addressing machine of the type described above which employs an improved high-speed feed mechanism for selectively advancing stencils through the machine.

The above objects as well as further objects and advantages are attained by the invention which may be described briefly as providing in an addressing machine of the type in which addresses are sequentially printed upon workpieces by the transfer of ink through a print-forming element to a workpiece, the combination comprising a frame, a printing station on the frame, a table located on the frame at the printing station, means for locating workpieces on the table at the printing station, means for sequentially receiving print-forming elements in juxtaposition with the workpieces at the printing station, a toggle-link mechanism mounted upon the frame at the printing station, the toggle-link mechanism including first and second toggle-links, each having opposite ends, the first and second toggle-links being arranged generally in end to end relationship and pivotally interconnected at adjacent ends, pivot means mounting the end of the first link opposite the adjacent end thereof upon the frame for pivotal movement of the first link about a point located at a predetermined distance from the table, printing means mounted upon the frame for reciprocating movement along a path of travel between a first location wherein the printing means is spaced from the juxtaposed print-forming element and workpiece at the printing station and a second location wherein the printing means is urged against the juxtaposed print-forming element and workpiece in response to movement of the end of the second link opposite the adjacent end thereof, actuator means mounted on the frame and interconnected with the adjacent ends of the toggle links for moving the toggle links between a first position wherein the links are at an angle to one another and the printing means is at the first location and a second position wherein the links are in substantial alignment with one another and the straight line distance between the opposite ends of the links is that which is required to urge the printing means into the second location with sufficient force to print the address on the workpiece, and means for selectively moving the point about which the first link is pivoted to change the predetermined distance between the point and the table and accommodate workpieces of different thicknesses.

The invention will be more fully understood and still further objects and advantages thereof will become apparent in the following detailed description of an embodiment of the invention illustrated in the accompanying drawing, in which:

FIG. **1** is a plan view of an addressing machine constructed in accordance with the invention shown with related equipment in an envelope addressing operation;

FIG. **2** is an enlarged, front elevational view of the addressing machine of FIG. **1**;

FIG. **3** is a further enlarged rear elevational view of a portion of the addressing machine illustrating drive components of the machine;

FIG. **4** is a similarly enlarged rear elevational view of a further portion of the addressing machine in the vicinity of the printing station of the machine;

FIG. **5** is a plan view, similarly enlarged, illustrating operating components of the machine in the vicinity of the printing station;

FIG. **6** is a cross-sectional view taken along line **6–6** of FIG. **4**;

FIG. **7** is a fragmentary cross-sectional view taken along line **7–7** of FIG. **4** and showing the component parts in a different operating position from that shown in FIG. **6**;

FIGS. **8** and **9** are fragmentary views of a portion of FIG. **7** illustrating certain operating components in different operating positions;

FIG. **10** is a fragmentary front elevational view primarily illustrating the printing mechanism of the machine;

FIG. **11** is an enlarged fragmentary view of a portion of FIG. **10**;

FIG. **12** is a fragmentary front elevational view illustrating the feed mechanism for advancing stencils through the machine;

FIG. **13** is a view similar to FIG. **12** with the operating components in a different operating position; and

FIG. **14** is a fragmentary view similar to FIGS. **12** and **13** but with the operating components in a different operating position.

Referring now to the drawing and especially to FIGS. **1** and **2** thereof, an addressing machine constructed in accordance with the invention is shown generally at **10** and includes a frame **12** on which is located a table **14** having a table top which provides a flat, planar surface **15** at a printing station **16**. Also located at the printing station **16** is a printing means in the form of a printing mechanism **18** which is mounted upon the frame **12** and which includes a platen in the form of a print roller **20** located above the table and spaced from the flat, planar surface **15**. A supply of print-forming elements shown in the form of address-carrying stencils **22** is placed in a hopper **24** extending upwardly from the table **14** adjacent the right end **26** of the table such that the stencils **22** are maintained in a stack within the hopper.

Below the hopper **24** there is provided a feed means (which will be described in detail hereinafter) for selectively engaging the lowermost stencil in the stack to advance the stencil along a track **28** which extends from the hopper **24** adjacent the right end **26** of the table **14** to adjacent the left end **30** of the table where there is located a bin **32** for receiving the advanced stencils. As the stencils are advanced along the track, each stencil is made to follow a path of travel which brings the

stencil to a position below the print roller **20** at the printing station **16**.

In the mode of operation depicted in FIG. **1**, a feeder **34** is placed in front of the addressing machine **10** and, in this instance, carries a supply of envelopes **36** in a chute **38** which passes below at least some of a plurality of feed rollers **40** such that rotation of the feed rollers will sequentially advance envelopes to printing station **16**. Thus, an envelope **36** may be advanced to the printing station where it is brought to rest upon the flat, planar surface **15** of the table **14**, a stencil **22** is advanced into juxtaposition with the envelope between the envelope and the print roller **20**, and the print roller may be reciprocated in order to be pressed downwardly against the stencil and the envelope to transfer ink from the print roller through the stencil and thereby print an address upon the envelope. Advancement of the envelope along its path of travel from the front of addressing machine **10** to the rear of the machine is then continued in order to eject the envelope from the rear of the machine onto a waiting conveyor **42** which will carry the addressed envelopes to a remote collection point (not shown). As best seen in FIG. **2**, the machine stands upon depending legs **44** and includes a cover **45** having a forward-facing control panel **46**.

Turning now to FIGS. **3**, **4**, **5** and **6**, reciprocation of the print roller is effected by an actuator means which includes a drive shaft **50** mounted for rotation upon the frame **12** of addressing machine **10**. A main drive motor **52** (see FIG. **3**) is carried by the frame and drives a reduction gear in gear box **54** by means of a main drive belt **56**. The reduction gear, in turn, carries a drive sprocket **58** which drives a main drive chain **60** which passes across an idler sprocket **62** and engages a drive shaft sprocket **64**. The drive shaft sprocket **64** is selectively engaged or disengaged with the drive shaft **50** by means of a solenoid operated clutch **66** which may be operated to selectively engage the drive shaft **50** for one full revolution to enable the print roller **20** to be reciprocated through one full cycle of operation at selected intervals while the main drive motor **52**, the reduction gear in gear box **54** and the main drive chain **60** operate continuously.

In order to convert the rotation of the drive shaft **50** into reciprocation of the print roller **20**, a crank **70** (see FIGS. **4** and **5**) is affixed to the drive shaft **50** and carries a crank pin **72** upon which is journaled a connecting rod **74** which, in turn, is journaled upon a drive pin **76** of a toggle-link mechanism **78** mounted upon the frame **12** above the print roller **20**. The toggle-link mechanism **78** includes a pair of first toggle links **80** and a pair of second toggle links **82** (also see FIG. **10**), the first links **80** having opposite ends **84** and **86** and the second links **82** having opposite ends **88** and **89**. The adjacent ends **86** and **88** of the respective first and second links **80** and **82** are interconnected by virtue of the links being journaled at these adjacent ends **86** and **88** upon the drive pin **76**. Pivot means shown in the form of a pivot pin **90** extending in the same direction as the direction of travel of the stencils **22** and perpendicular to the direction of travel of the reciprocating print roller **20** mounts the upper ends **84** of the first toggle links **80** upon the frame **12** for pivotal movement about a point defined by the axis of the pivot pin **90** and located at a predetermined distance D from the table **14**. The print roller **20** is journaled upon an axle **92** carried by a yoke **94** which is affixed to a vertical rod **96** slidably received within a bushing block **98** affixed to the frame **12**. The rod **96** is carried by a support pin **100** fixed within the vertical rod **96** by a set screw **97** such that reciprocation of the connecting rod **74** forward and backward by rotation of the drive shaft **50** and crank **70** will actuate the toggle-link mechanism **78** to reciprocate the vertical rod **96** and the print roller **20** upwardly and downwardly with respect to the table **14**.

As best seen in FIGS. **6** and **7**, the print roller **20** is thus mounted upon the frame **12** for reciprocating movement along a path of travel between a first location (as seen in FIG. **6**) wherein the print roller **20** is spaced from the juxtaposed stencil **22** and envelope **36** at the printing station **16** and a second location (as seen in FIG. **7**) wherein the print roller **20** is urged against the juxtaposed stencil **22** and envelope **36** in response to rotation of the drive shaft **50** and reciprocation of the connecting rod **74** to move the toggle links **80** and **82** between a first position wherein the links **80** and **82** are at an angle to one another and the print roller **20** is at the first location, as seen in FIG. **6**, and a second position wherein the toggle links **80** and **82** are in substantial alignment with one another at a dead center position and the straight line distance between the opposite ends **84** and **89** of the first and second links **80** and **82**, respectively, is that which is required to urge the print roller **20** into its second location, as seen in FIG. **7**, with sufficient force to resiliently deflect the track **28** downwardly and thereby press the print roller **20** against the stencil **22** and the stencil against the envelope **36**. The print roller **20** is constructed of a resiliently deformable material, such as rubber, so that when the print roller is brought to its second location where the print roller is pressed against the stencil, the envelope, and the table, the cylindrical surface **102** of the roller is deformed to conform the surface of the roller to the address-carrying area **104** of the stencil so that ink is transferred from the surface of the print roller through the stencil to the envelope.

Ink is supplied to the surface **102** of the print roller **20** by an ink train **106** which includes a series of ink-working rollers mounted upon the frame for rotation on parallel axes located between an ink reservoir **108** and the print roller **20**. Ink is applied to the first inking roller **110** of the ink train **106** by manual rotation of an ink knob **112** (also see FIG. **2**) to rotate a crankshaft **114** and tilt the reservoir **108** so that ink will spill from the reservoir onto the surface of the first inking roller **110**. All of the inking rollers in the ink train are positively and continuously rotated by an ink train drive shaft **116** which carries a sprocket **118** which is also in engagement with the continuously driven main drive chain **60** (see FIG. **3**). Thus, ink which is applied to the first inking roller **110** is worked into an ink film which is spread from the surface of the first roller to the surface of the second inking roller **120**, thence to the surface of the third inking roller **122** and then to the surface of the lowermost inking roller **124**. The final inking roller in the ink train is a transfer inking roller **126** journaled between a pair of carrier arms **128** which are pivotally mounted upon the frame **12** by virtue of the carrier arms being journaled upon the same shaft **130** as the lowermost roller **124** of the ink train. A helical spring **132** extends from the frame **12** to each carrier arm **128** adjacent the end thereof at **133** to bias the carrier arms in a clockwise direction, as viewed in FIGS. **6** and **7**, so that the transfer inking roller **126** will be urged against the surface of the print roller **20**. In this manner, the transfer inking roller **126** will remain in contact with the surface **102** of the print roller **20** during a substantial portion of the upward and downward movement of the print roller **20** to rotate print roller **20** and ink the surface **102** of the print roller. Clockwise movement of the carrier arms **128** and the concomitant downward movement of the transfer inking roller **126** is limited by a stop **134** which is in position to engage a carrier arm **128** so that the transfer inking roller **126** will not be in contact with the print roller when the print roller is in the second location, as shown in FIG. **7**. In this manner, rotation of the transfer inking roller **126** may continue while rotation of the print roller **20** is stopped during the printing of an address.

In the illustrated mode of operation, addressing machine **10** is fully automatic in that envelopes **36** are fed into the machine in timed relationship with the cycle of operation of the print roller **20**. Thus, an envelope **36** will be advanced across the table **14** below the print roller **20** until the envelope is stopped by envelope stop fingers **140** (see FIGS. **5** and **6**) which are each mounted upon a slide **142** suspended from a bar **144** by brackets **145**, the bar being guided for upward and downward reciprocating movement within a slot **146** in the frame. A plunger **148** is affixed to the bar **144** and is resiliently biased downwardly by a helical spring **150** so that these en-

velope stop fingers **140** will be urged against the table **14** to stop and locate an advancing envelope in the proper position within the printing station **16** during downward movement of the print roller **20** for the printing of an address. The stop fingers **140** themselves are constructed of spring steel and will engage the top of table **14** with a spring pressure which is selectively adjustable to assure proper seating of the stop fingers upon the table. Such selective adjustment of the spring pressure is accomplished by rotation of a knurled thumb screw **151** to move the slide **142** upwardly or downwardly relative to the bracket **145**.

As the print roller is drawn upwardly from its lowermost location toward its uppermost location, an ejector cam **152**, which is affixed for rotation with the drive shaft **50**, will allow a first follower **154**, which is carried by a bellcrank **156** pivotally mounted upon the frame **12** at **158**, to move to the right, as viewed in FIG. **6**, thereby enabling a helical spring **160** to rotate the bellcrank **156** in a clockwise direction and urge a second follower **162** downwardly to rotate a control lever **164**, which is pivotally mounted upon the frame **12** at **166**, in a clockwise direction. Such rotation of the control lever **164** will move a control arm **168**, which is affixed to the control lever by means of a fastener **169** and which is affixed to the plunger **148** by means of a pivot pin **170**, in an upward direction to draw the plunger **148** upwardly against the bias of the helical spring **150** and thereby raise the stop fingers **140** out of the path of travel of the envelope **36**. The control lever **164** is also connected by means of a link **172** to a crank **172** affixed to a shaft **176** journaled within the frame **12** and carrying an idler arm **178** with an idler roller **180** journaled thereon such that upon clockwise rotation of the control lever **164**, and simultaneous with the raising of the stop fingers **140**, the idler rollers **180** are moved downwardly to urge the envelope **36**, which is in the printing station **16**, against complementary ejector rollers **182** carried by an ejector shaft **184** which is continuously rotated by a separate drive motor **186** (see FIG. **4**) through a drive belt **187** and drive sprocket **188** which is engaged with ejector shaft **184** by means of a one-way clutch **189**. In this manner the envelope **36** is frictionally gripped by the ejector rollers **182** and advanced across the table **14** to be ejected from the rear of the addressing machine **10**. The envelope stop fingers **140** are adjustable forward and backward by means of a thumb screw **190** which locks the fingers **140** and the slides **142** at any selected position. The slides **142** themselves may be moved laterally upon the bar **144** by virtue of a sliding engagement between the brackets **145** and the bar. The contour of the ejector cam **152** assures that the envelope is properly located during the downward stroke of the print roller **20** and that the envelope is ejected during the upward stroke of the print roller **20**.

As best seen in FIGS. **4**, **5** and **6**, addressing machine **10** may be selectively set for any one of three modes of operation. For the fully automatic mode described above, a control knob **192** (also see FIG. **2**) is positioned such that an eccentric **194** carried by the control shaft **196** is oriented to locate a slide **198**, which carries a cage **200**, in the position shown in full lines in FIGS. **4** and **6**. In this position of the cage **200** a forward projecting portion **210** of the control lever **164**, which operates between the upper and lower limits of the cage **200**, is permitted to move in response to movement of the bellcrank **156** so as to raise and lower the envelope stop fingers **140** and simultaneously raise and lower the ejector idler rollers **180** as described above. When the eccentric **194** is rotated to move the slide **198** to its uppermost position, as shown in phantom in FIGS. **4** and **6**, the cage **200** will preclude clockwise rotation of the control lever **164** from the position shown in FIG. **6** so that the envelope stop fingers **140** will always remain in the downward position and the ejector idler rollers **180** will always remain in the upper position, as illustrated, regardless of the orientation of the ejector cam **152**. Thus, in this second mode of operation, envelopes **36** may be manually placed in the machine and positively located by the envelope stop fingers **140** during an addressing operation. Each envelope will then be removed manually by withdrawing the envelope manually from the front of the machine.

In the third selectable mode of operation, the eccentric **194** is rotated to move the slide **198** downwardly to its lowermost position, also shown in phantom in FIGS. **4** and **6**. In this lowermost position of the slide **198**, the cage **200** will maintain the forward projecting portion **210** of the control lever **164** in its downwardmost position regardless of the orientation of the ejector cam **152** so that the envelope stop fingers **140** are raised and the ejector idler rollers **180** are in a downward position in engagement with the driven ejector rollers **182**. In this third mode of operation, the separate drive motor **186** is stopped and the ejector shaft **184** is free to rotate, by virtue of one-way clutch **189**, in a direction which permits the advancement of an elongate sheet of indeterminate length (not shown) between the ejector rollers **182** and the idler rollers **180** across the table **14** from the front toward the rear of the addressing machine. An auxiliary sheet feed means (not shown) may be employed to intermittently advance the sheet in predetermined increments of advancement so that the addressing machine may be employed to print addresses, in sequence, upon the elongate sheet. Such a mode of operation would be used where addresses are to be printed upon business forms or where it is desired to create a mailing list from a given group of stencils.

The toggle-link mechanism **78** is well suited for the conversion of the drive torque provided by the drive shaft **50** into a printing force sufficient to deform the print roller **20** and provide the flat area on the surface **102** of the roller necessary for the proper printing of an address by the transfer of ink from the print roller through the stencil to an envelope or another workpiece in that as the print roller approaches its lowermost location and a relatively great downward force must be exerted upon the print roller **20** in order to attain the required deformation of the surface **102** thereof, the toggle-link mechanism **78** approaches its dead center position, at which position the mechanical characteristics of the toggle-link mechanism will provide the maximum downward force for a given drive or pulling force exerted by the connecting rod **74** upon the toggle links **80** and **82**. However, at the point in the downward movement of the print roller **20** where the print roller just begins to be deformed against the stencil **22**, the envelope **36** and the table **14**, the toggle-links are still at a sufficient angle to one another, as seen in FIG. **8**, to require a substantial increase in the amount of pulling force exerted by the connecting rod **74** upon the toggle links **80** and **82** over the amount of pulling force required prior to any deformation of the print roller or the amount of such force required just prior to the arrival of the toggle-link mechanism at the dead center position illustrated in FIG. **7**. Thus, there is a marked increase in the required driving torque as the print roller **20** travels downwardly from the point where deformation of the print roller begins, to the location where the toggle-link mechanism nears its dead center position. By the same token, the amount of pushing force exerted by the connecting rod **74** upon the toggle-link mechanism **78** is suddenly reduced as the toggle links **80** and **82** are moved out of their dead center position as a result of the combination of the mechanical characteristic of the toggle-link mechanism which requires relatively little force to "break" the toggle links from their dead center position, and the force exerted upon the toggle links by the return of the print roller **20** from its fully deformed printing configuration to its undeformed cylindrical configuration, thus engendering a sudden reduction in the required driving torque.

In order to compensate for these variations in drive torque, the latter of which can be quite sudden, and thus eliminate damaging shocks within the drive train while also providing smooth and effective operation of the drive train, reaction means are provided for applying a reaction torque to the drive shaft **50** opposite to the drive torque as the toggle links are moved out of their dead center position and to also apply a supplementary torque to the drive shaft in the same direction as the drive torque as the toggle links are moved toward the

dead center position and into the position where the surface of the print roller begins to become deformed. These reaction means are illustrated in FIGS. **4** and **5** in the form of a pair of reaction cams **220** mounted for rotation with the drive shaft **50**, each reaction cam having a complementary follower **222** carried by a reaction lever **224** which is mounted for pivotal movement upon the frame **12** by means of a shaft **226** and is biased toward its respective reaction cam **220** by a helical spring **228** extending between the reaction lever and the frame to urge the follower **222** against the surface of the reaction cam. As best seen in FIGS. **7**, **8** and **9**, the contour of each reaction cam **220** directs the biasing force exerted by each spring **228** into a reaction force F exerted upon the reaction cam **220** by the follower **222**, which force F is normal to the surface of the cam, such that the force F provides a torque which is directed in a clockwise direction, as seen in FIG. **8**, as the toggle links **80** and **82** are moved toward the dead center position to supplement the drive torque which is also in a clockwise direction and thereby aid in the initial deformation of the print roller, which in this instance begins when the toggle links are in the position shown in FIG. **8**, and provides a reaction torque in a counterclockwise direction, as seen in FIG. **9**, as the toggle links are moved out of their dead center position, to compensate for the sudden decrease in the required drive torque as the toggle links are moved out of the dead center position. During the remainder of the cycle of operation of the toggle-link mechanism **78**, the contour of the reaction cams **220** directs the force F through the drive shaft **50** so that no torque is established by the biasing force of each spring **228**.

Addressing machine **10** is capable of accommodating workpieces having a wide variety of dimensions. Thus, it has been shown that the envelope stop fingers **140** are adjustable forward and backward over a wide range of adjustment to accommodate envelopes or similar items having a wide range of widths. In addition, a wide range of lengths is accommodated by virtue of the length of the table **14** between the right end **26** and the left end **30** of the addressing machine. In order to accommodate workpieces of various thicknesses, addressing machine **10** is provided with means for selectively moving the point about which the first toggle links **80** are pivoted to change the distance between the lowermost location of the print roller **20** and the top of the table **14**. Referring now to FIGS. **10** and **11**, the pivot pin **90**, the axis of which establishes the point about which the first toggle links **80** are pivoted, is affixed within a lateral opening **230** in a slide **232** by means of a set screw **234** and the slide **232** is received for sliding movement upwardly or downwardly within a mounting block **236** affixed to the frame **12** such that the pivot pin **90** may be moved upwardly or downwardly in a direction perpendicular to the plane of the table top. A cylindrical sleeve **238** is mounted within the mounting block **236** and a shaft **240** is received within the sleeve **238** for axial sliding movement in opposite directions parallel to the path of movement of the pivot pin **90** and for angular rotation within the sleeve. A knob **242** is affixed to the top end of the shaft **240** and a helical spring **244** extends between the knob **242** and the sleeve **238** to resiliently bias the shaft **240** in an upward direction. Adjacent the bottom end of the shaft **240** and adjacent the lower end of the sleeve **238**, the shaft and the sleeve carry stop means which are cooperatively engageable in any one of a plurality of angular positions of the shaft relative to the sleeve to locate the shaft in any one of a plurality of corresponding axial positions of the shaft relative to the sleeve. Thus, the lower end of the sleeve terminates in an integral collar **246** having a plurality of circumferentially spaced grooves **248** providing a plurality of shoulders **250** at different axial locations, and the shaft **240** carries a radial projection **252** which may be received within any one of the grooves **248** to engage any one of the shoulders **250**. The axial position of the lower end of the shaft **240** is thus determined by the particular groove in which the radial projection **252** is located.

A pair of helical springs **254** extend between the pivot pin **90** and corresponding spindles **256** affixed within the mounting block **236** and serve to bias the pivot pin **90**, and the slide **232** within which the pivot pin is affixed, in an upward direction against the bottom end of the shaft **240**. Thus, the distance between the pivot pin **90** and the table top may be varied by depressing the knob **242** to slide the shaft **240** downwardly relative to the sleeve **238** and release the radial projection **252** from the grooves **248** to enable rotation of the shaft **240** and relocation of the radial projection **252** within any one of the grooves **248** in the collar **246** so that upon release of the knob **242** the bottom end of the shaft **240** will be accurately located, thereby accurately locating the pivot pin **90** with respect to the top of table **14**. In addressing machine **10**, the knob **242** may be rotated to any one of four positions (see FIG. **1**) to place the radial projection **252** in any one of four grooves **248**, each successive groove being one-sixteenth of an inch longer than the next shorter groove so that the indexing of the knob **242** between two adjacent positions "1," "2," "3," or "4" will either raise or lower the print roller **20** by the amount of one-sixteenth of an inch.

As best seen in FIGS. **5**, **10** and **11**, the sleeve **238** is provided with an external thread **260** and is affixed within a surrounding collar **262** by means of a setscrew **264**. The collar **262** is mounted in the support block **236** by means of spiral segment grooves **266** which receive the inwardly extending ends **268** of the spindles **256**. Should an occasion arise where a workpiece having too great a thickness becomes jammed between the print roller and the top of table **14**, thus stopping the operation of the addressing machine **10**, the jam may quickly be relieved by rotating the knob **242**, the shaft **240**, the sleeve **238**, and collar **262** as a unit to move the collar **262** axially with respect to the mounting block **236** by virtue of the sliding engagement between the inwardly projecting ends **268** of the spindles and the spiral segment grooves **266**. Such axial displacement of the collar **262** is relatively large in comparison to the one-sixteenth inch increments provided by the projection **252** and groove **248** adjusting means and will very quickly relieve a jam resulting from a workpiece which is too thick. Once the jam is relieved, the knob **242** can again be rotated to return the collar **262** to its original position flush with the mounting block **236** where the collar is engaged by a resilient detent **269** (see FIG. **5**) to retain the collar in its prescribed location without affecting the selective adjustment of the distance between the print roller **20** and the top of table **14** through the one-sixteenth inch increments as described above.

Fine adjustments of the spacing between the print roller **20** and the top of table **14** are accomplished in the factory by merely loosening the setscrew **264** which retains the sleeve **238** in place within the collar **262** and turning the sleeve within the collar to move the sleeve axially with respect to the collar over relatively small displacements in comparison to the one-sixteenth inch increments provided by the means which selects the axial position of the pivot pin **90** by virtue of the relatively fine pitch of thread **260**. Thus, a high degree of accuracy may be maintained in the spacing between the print roller and the table top at the printing station **16**.

The print roller **20** itself is removably mounted within the yoke **94** by virtue of a latch **270** which is pivoted about a retaining screw **272** and which is received within a groove **274** in the shaft **92** which carries the print roller **20** (see FIGS. **6**, **7** and **10**). Pivotal movement of the latch **270** out of the groove **274** in the shaft **92** will allow the shaft to be drawn from the yoke **94** and from the print roller **20** to release the print roller for repair or replacement.

Turning now to FIGS. **12** through **14**, the stencil feed means which is located adjacent the right end **26** of the addressing machine **10** is shown in detail. Addressing machine **10** is of the type in which the stencil feed means is capable of advancing the stencils at a much faster rate than the rate at which the printing means can print addresses from the stencils. Thus, where it is desired to print addresses from only selected sten-

cils, which constitute only a portion of the stencils **22** within the stack present in the hopper **24**, the nonselected stencils may be advanced very rapidly and the advancement of the stencils is delayed only when there is present at the printing station **16** a stencil which carries an address to be printed. All other nonselected stencils may be passed through the printing station at a rapid rate since the addresses carried upon these nonselected stencils will not be printed. Such a technique is well known in the art and requires a feed mechanism which will selectively either feed a stencil from the stack or not feed a stencil during a complete cycle of operation of the feed mechanism. By not feeding a stencil **22**, the advancement of the stencils already in the track **28** is delayed for a period of time sufficient to engage the clutch **66** and enable the printing means to print the address carried by the stencil located at the printing station.

The feed mechanism of addressing machine **10** includes a carriage **280** mounted upon a slide **282** for reciprocating movement on the slide along a path of travel passing beneath the stack of stencils **22** supported in the hopper **24**. The carriage **280** is reciprocated through continuous cycles of operation, each cycle including an advancing stroke (from the position shown in FIG. **13** to that shown in FIG. **12**) and a retracting stroke (from the position shown in FIG. **12** to that shown in FIG. **13**), by the continuous rotation of a crank **283** which is continuously driven by the main drive motor **52**, through the reduction gear in gear box **54** and a drive chain **284** (see FIG. **3**) which, in turn, drives a right-angle drive **285** engaging the crank **283**, the crank being interconnected with the carriage **280** by means of a connecting rod **286**. A finger **288** is carried by a leaf spring **290** affixed to the carriage **280** at **291**, the finger **288** having a shoulder **292** of a height not exceeding the thickness of a stencil **22**. The leaf spring **290** resiliently biases the finger **288** downwardly into engagement with the carriage **280** as shown in FIG. **12**. A bracket **294** depends from the rear of the carriage **280** and carries a leaf spring **296** to which is affixed a latch **298** which is resiliently biased by the leaf spring **296** toward the left as viewed in FIG. **12**.

As the carriage **280** is retracted from its most advanced position as seen in FIG. **12** to its retracted position as seen in FIG. **13**, the finger **288**, being maintained against the top of the carriage by the resilient biasing force of the leaf spring **290**, clears the lowermost stencil **22** in the stack. An actuator block **300** is mounted for sliding movement upwardly and downwardly with respect to a mounting bracket **310** affixed to the frame **12** of the addressing machine. An actuator rod **312**, which slides within the mounting bracket **310**, has a head **314** at one end thereof, and a helical spring **316** resiliently biases the actuator block **300** against the head **314** of the rod **312**. The other end of the rod **312** is interconnected with the armature **318** of a solenoid **320** by link means in the form of a relatively stiff helical spring **322** such that upon energization of the solenoid **320**, the armature **318** will be drawn downwardly to draw the helical spring **322** and the rod **312** downwardly and pull the actuator block **300** into its lowermost position, as seen in FIG. **14**.

When the solenoid **320** is not energized, the actuator block **300** will be in its uppermost position as seen in FIG. **12**, and when the carriage **280** is retracted, as seen in FIG. **13**, and when the carriage **280** is retracted, as seen in FIG. **13**, the finger **288** will pass below the actuator block **300** so that upon advancement of the carriage from the retracted position shown in FIG. **13** to the advanced position, as seen in FIG. **12**, the finger **288** will again pass below the lowermost stencil **22** in the stack without advancing that stencil. However, should it be desired that the lowermost stencil be advanced, the solenoid **300** is energized during the retracting stroke of the carriage **280** so that the inclined surface **324** of the actuator block **300** will lie in the path of travel of the finger **288** and the finger will be raised until the latch **298** snaps in below the finger to retain the finger in the raised position, as seen in FIG. **14**. Now, upon forward movement of the carriage **280**, the shoulder **292** of the finger **288** will engage the lowermost stencil **22** in the stack to advance that stencil from the stack along the track **28**.

As the advancing stroke is completed, the latch **298** is engaged by a disengaging means shown in the form of a screw **326** which is adjusted to disengage the latch **298** from beneath the finger **288** such that the finger will once again be snapped downwardly against the carriage **280** by the resilient biasing force of the leaf spring **290**. The cycle is then repeated with the finger **288** either being raised or remaining at its downwardmost position, depending upon the location of the actuator block **300** when the carriage **280** arrives at the retracted position.

In order to assure that the actuator block **300** is pulled completely down to its lowermost position when the solenoid **320** is energized, while assuring that the armature **318** of the solenoid **320** is pulled completely downwardly into the solenoid coil **330**, the length of travel A of the armature **318** is somewhat greater than the length of travel B of the actuator block **300**. Since the helical spring **322** which links the armature **318** to the actuator rod **312** is longitudinally expansible, the armature may be drawn completely into the coil **330** of the solenoid, thereby assuring effective, long life operation of the solenoid **320**, while obtaining full downward movement of the actuator block **300**.

It is to be understood that the above detailed description of an embodiment of the invention is provided by way of example only. Various details of design and construction may be modified without departing from the true spirit and scope of the invention as set forth in the appended claims.

The embodiments of the invention in which an exclusive property or privilege we claim are defined as follows:

1. In an addressing machine of the type in which addresses are sequentially printed upon workpieces by the transfer of ink through a print-forming element to a workpiece, the combination comprising:

a frame;

a printing station on the frame;

a table located on the frame at the printing station;

means for locating workpieces on the table at the printing station;

means for sequentially receiving print-forming elements in juxtaposition with the workpiece at the printing station;

a toggle-link mechanism mounted upon the frame at the printing station, said toggle-link mechanism including

first and second toggle links, each having opposite ends, said first and second toggle links being arranged generally in end to end relationship and pivotally interconnected at adjacent ends;

pivot means mounting the end of the first link opposite said adjacent end thereof upon the frame for pivotal movement of said first link about a point located at a predetermined distance from the table;

printing means mounted upon the frame for reciprocating movement along a path of travel between a first location wherein the printing means is spaced from the juxtaposed print-forming element and workpiece at the printing station and a second location wherein the printing means is urged against the juxtaposed print-forming element and workpiece in response to movement of the end of the second link opposite said adjacent end thereof;

actuator means mounted on the frame and interconnected with said adjacent ends of the toggle links for moving said toggle links between a first position wherein the links are at an angle to one another and the printing means is at said first location and a second position wherein the links are in substantial alignment with one another and the straight line distance between said opposite ends of the links is that which is required to urge the printing means into said second location with sufficient force to print the address on the workpiece; and

means for selectively moving said point about which said first link is pivoted to change said predetermined distance between the point and the table and accommodate workpieces of different thicknesses.

2. The combination of claim 1 wherein:
the printing means includes a platen of resiliently deformable material movable along a prescribed path of travel perpendicular to said table;
the actuator means includes a connecting rod interconnected with said adjacent ends of the toggle links and reciprocable along a direction perpendicular to the direction of the prescribed path of travel of the platen;
the pivot means includes a pivot pin extending perpendicular to the direction of movement of said connecting rod and perpendicular to the direction of the prescribed path of travel of the platen; and
the means for selectively moving said point includes means for moving said pivot pin relative to the table in a direction parallel to the direction of said prescribed path of travel of the platen and for retaining said pivot pin in any one of a plurality of positions along the path of movement of the pivot pin.

3. The combination of claim 2 wherein the means for moving and retaining said pivot pin includes:
a sleeve mounted on the frame;
a shaft mounted for axial sliding movement in opposite directions parallel to the path of movement of the pivot pin and for angular rotation within the sleeve;
means carrying said pivot pin for movement with said shaft along said path of movement;
stop means on said shaft and said sleeve cooperatively engageable in any one of a plurality of angular positions of the shaft relative to the sleeve to locate the shaft at any one of a plurality of corresponding axial positions of the shaft relative to the sleeve;
means resiliently biasing said shaft in one of said opposite directions relative to said sleeve to engage the stop means; and
means for selectively sliding said shaft against said resilient biasing means to disengage the stop means and for selectively rotating the shaft to index the stop means and select any one of said angular positions such that upon release of the shaft, the shaft will be biased to a corresponding axial position and the pivot pin and platen will be placed at a corresponding selected location relative to the table.

4. The combination of claim 3 wherein said stop means includes:
a plurality of angularly spaced shoulders in the sleeve, said shoulders each having a different axial location; and
a radial projection in said shaft selectively engageable with any one of said shoulders.

5. The combination of claim 3 including means mounting said sleeve on the frame for selective axial movement relative to said table over relatively small displacements in comparison to the increments between the plurality of positions of said pivot pin.

6. The combination of claim 3 including means mounting said sleeve on the frame for selective axial movement relative to the table over a relatively large displacement in comparison to the increments between the plurality of positions of said pivot pin.

7. The combination of claim 6 wherein said means mounting said sleeve on the frame includes:
a collar carrying said sleeve and mounted for selective rotation relative to the frame;
a helical groove in said collar and having a relatively large pitch in comparison to the increments between the plurality of positions of said pivot pin; and
a radial spindle affixed to the frame and engaged in said groove such that rotation of the collar will move the sleeve axially over a relatively large displacement in comparison to said increments.

8. The combination of claim 7 including means mounting said sleeve on the frame for selective axial movement relative to the table over relatively small displacements in comparison to the increments between the plurality of positions of said pivot pin, these means including:
threaded means engaging said sleeve and said collar and having a pitch smaller than any one of said increments; and
means for permitting selective rotation of the sleeve relative to the collar for fine adjustment of the location of the pivot pin and the corresponding location of the platen relative to the table.

9. The combination of claim 1 wherein the actuator means includes:
drive means;
a drive shaft rotated in response to a drive torque applied thereto by the drive means;
a crank affixed for rotation with said drive shaft;
a connecting rod interconnecting said crank with said adjacent ends of the toggle links and reciprocable along a direction perpendicular to the direction of the path of travel of the printing means to exert a drive force upon said toggle-link mechanism in response to rotation of the drive shaft, said drive force being sufficient to print an address; and
reaction means for applying a reaction torque to the drive shaft opposite to said drive torque as the toggle links are moved out of their second position toward said first position to compensate for the sudden decrease in the required drive force resulting from movement of the toggle links out of substantial alignment.

10. The combination of claim 9 wherein:
the table includes a flat, planar area at said printing station;
the print-forming elements are stencils received between a workpiece on the flat, planar area of the table and the printing means;
the printing means includes a print roller of resiliently deformable material movable along a prescribed path of travel perpendicular to said flat, planar area of said table and having a surface portion conformable to the area of the stencil upon which the address is carried;
the drive force exerted upon the toggle mechanism is sufficient to resiliently deform the print roller to conform said surface portion to said area of the stencil when the print roller is urged against the stencil, the workpiece and the flat, planar area of the table; and
the reaction torque is great enough to compensate for the decrease in the required drive force resulting from the return of the print roller to its undeformed configuration as the toggle links move out of substantial alignment.

11. The combination of claim 10 wherein said reaction means includes:
at least one reaction cam mounted for rotation with said drive shaft and having a predetermined contour;
a follower engaging the reaction cam; and
means resiliently biasing said follower into engagement with the reaction cam with a biasing force so directed relative to the drive shaft by the contour of the reaction cam as to provide said reaction torque.

12. The combination of claim 11 wherein the contour of the reaction cam directs said biasing force relative to the drive shaft so as to provide a supplementary torque upon said drive shaft in the same direction as said drive torque as the toggle links are moved toward said second position and the drive force begins to deform the print roller.