United States Patent [19]

Tsubo

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[54] **COPY SHEET-FEEDING APPARATUS**

[75] Inventor: **Shuzo Tsubo, Kawasaki, Japan**

[73] Assignee: **Tokyo Shibaura Denki Kabushiki Kaisha, Kawasaki, Japan**

[21] Appl. No.: **608,277**

[22] Filed: **May 8, 1984**

Related U.S. Patent Documents

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Appl. No.: **145,878**
Filed: **May 1, 1980**

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May 10, 1979 [JP] Japan 54-57408
May 10, 1979 [JP] Japan 54-57411
May 10, 1979 [JP] Japan 54-57412
May 10, 1979 [JP] Japan 54-57416

[51] **Int. Cl.**[4] **B65H 1/04; B65H 1/12**
[52] **U.S. Cl.** **271/9;** 271/127; 271/155; 271/157; 271/160
[58] **Field of Search** ..... 271/9, 147, 152, 153, 271/154, 155, 157, 160, 162, 163, 164, 171, 126, 127, 117, 118, 156, 158, 159; 355/14 R

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Primary Examiner—Bruce H. Stoner, Jr.
Assistant Examiner—Lawrence J. Goffney, Jr.
Attorney, Agent, or Firm—Cushman, Darby & Cushman

[57] **ABSTRACT**

A copy sheet-feeding apparatus comprises a switch and control mechanism. The switch detects an open state of a sheet cover capable of exposing a stack of copy sheet and a closed state of the cover sheet capable of enclosing the stack, and generates signals denoting the open and closed states of the sheet cover. The control mechanism controls a drive mechanism for moving a sheet rest supporting the stack of copy sheets between a first position capable of receiving the copy sheets and a second position capable of supplying the sheet to a copying press. Receiving the signal denoting the open state of the sheet cover from the switch, the control mechanism causes the sheet rest to be moved to the first position, and, receiving the signal denoting the closed state thereof, causes the sheet rest to be moved to the second position.

6 Claims, 29 Drawing Figures

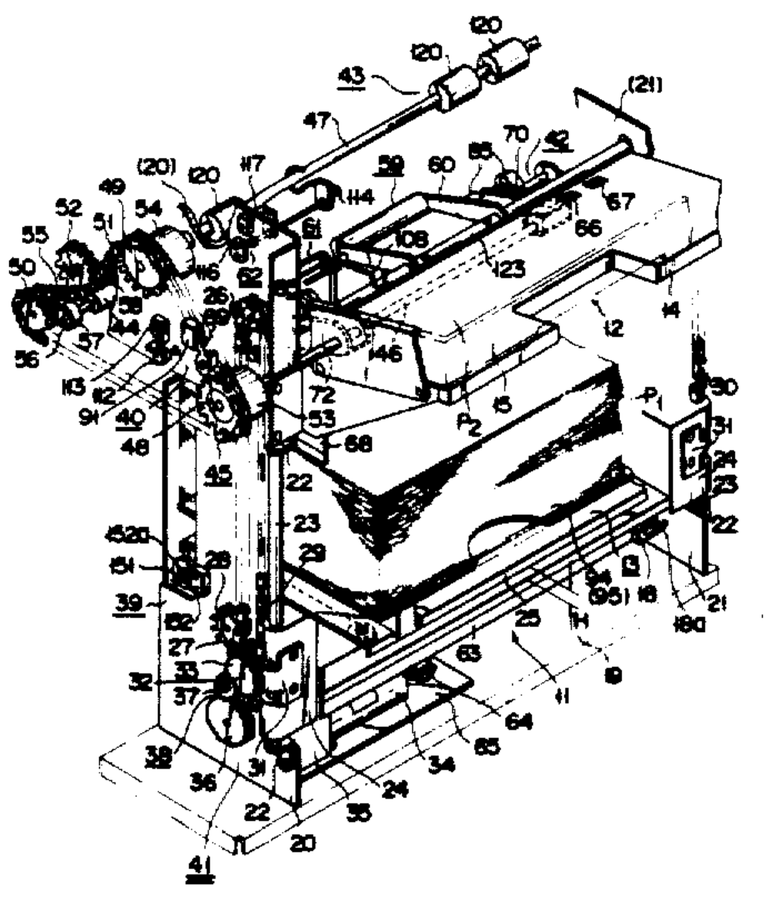

FIG. 1

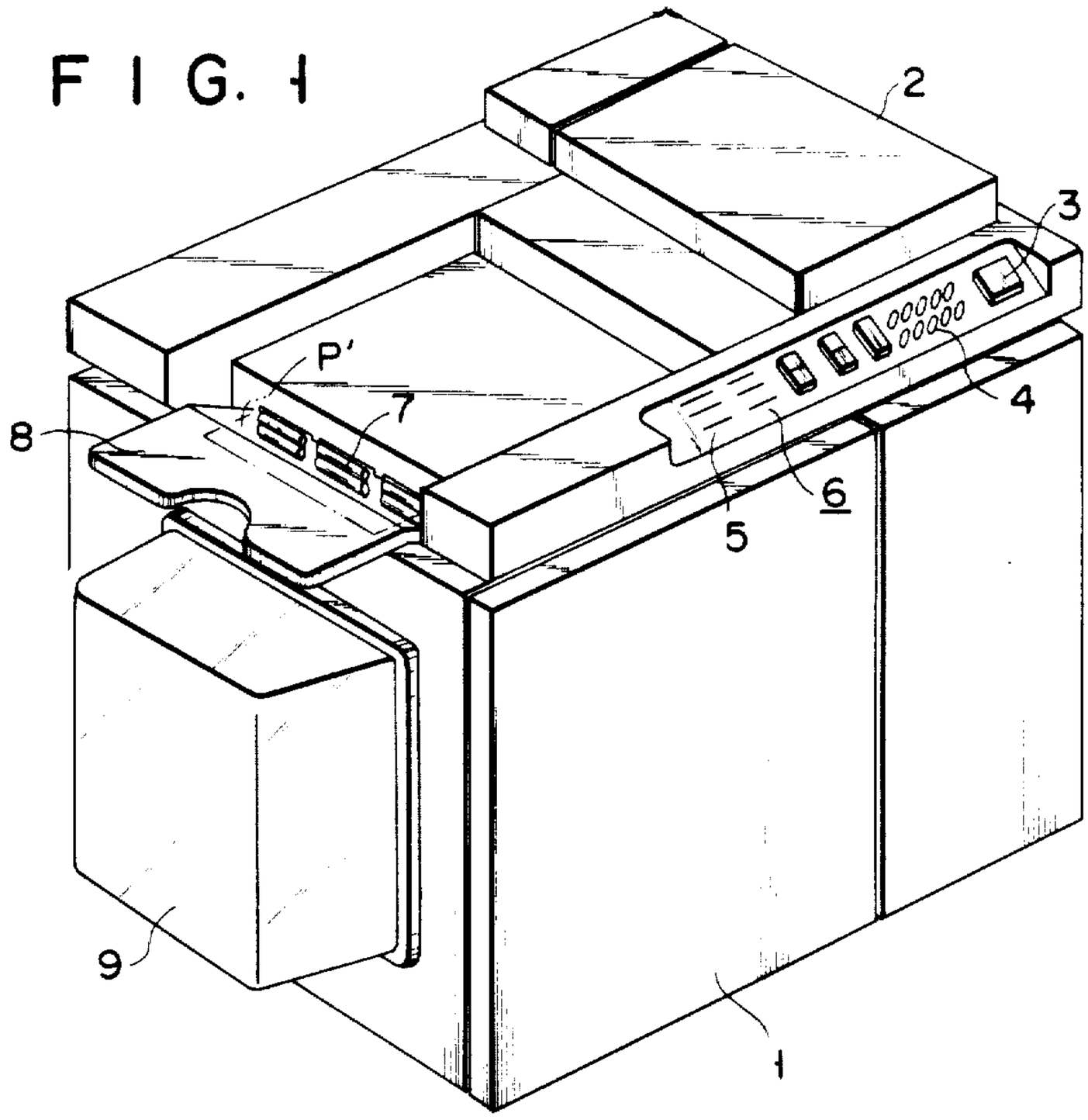

FIG. 2

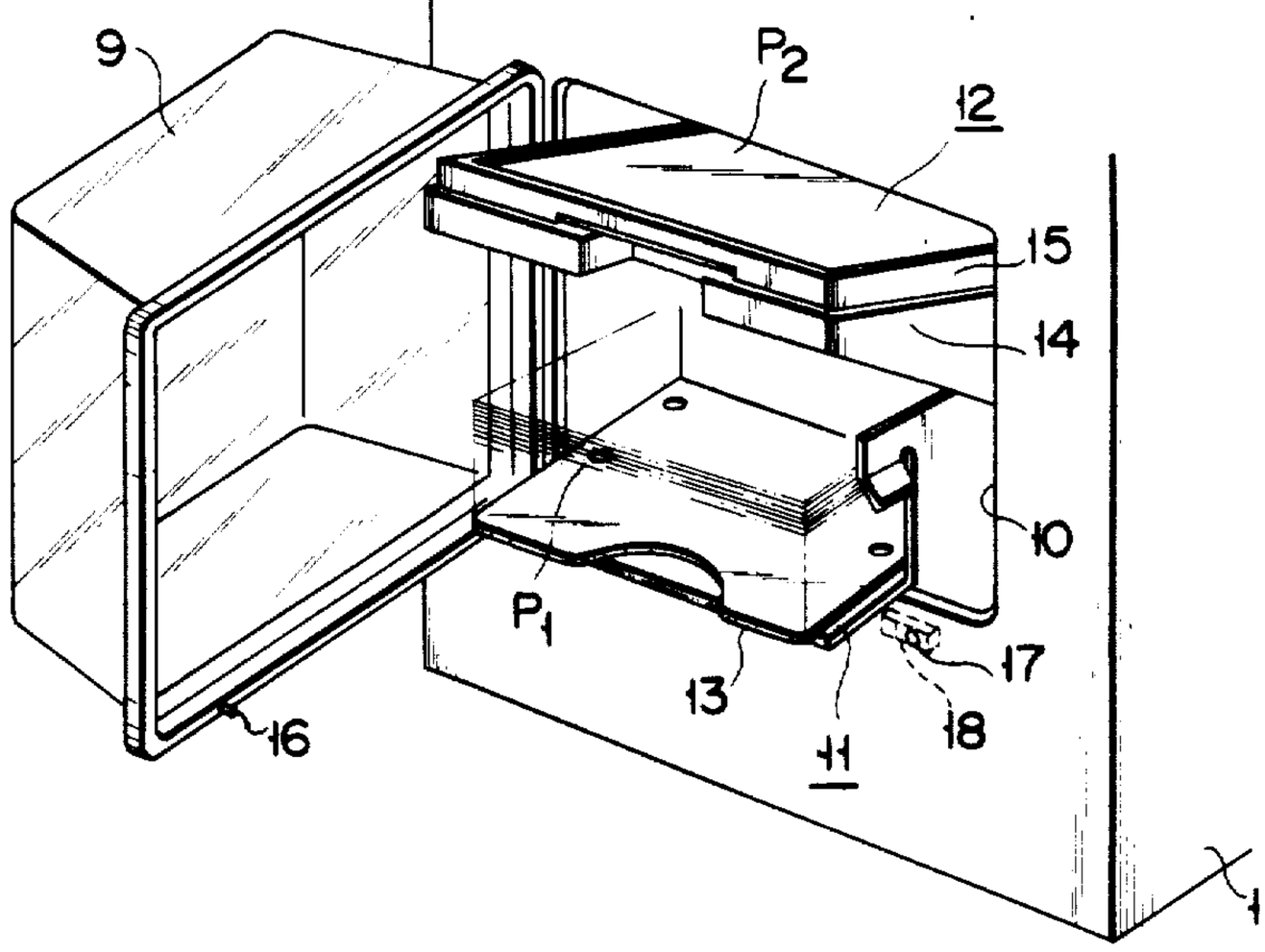

FIG. 3

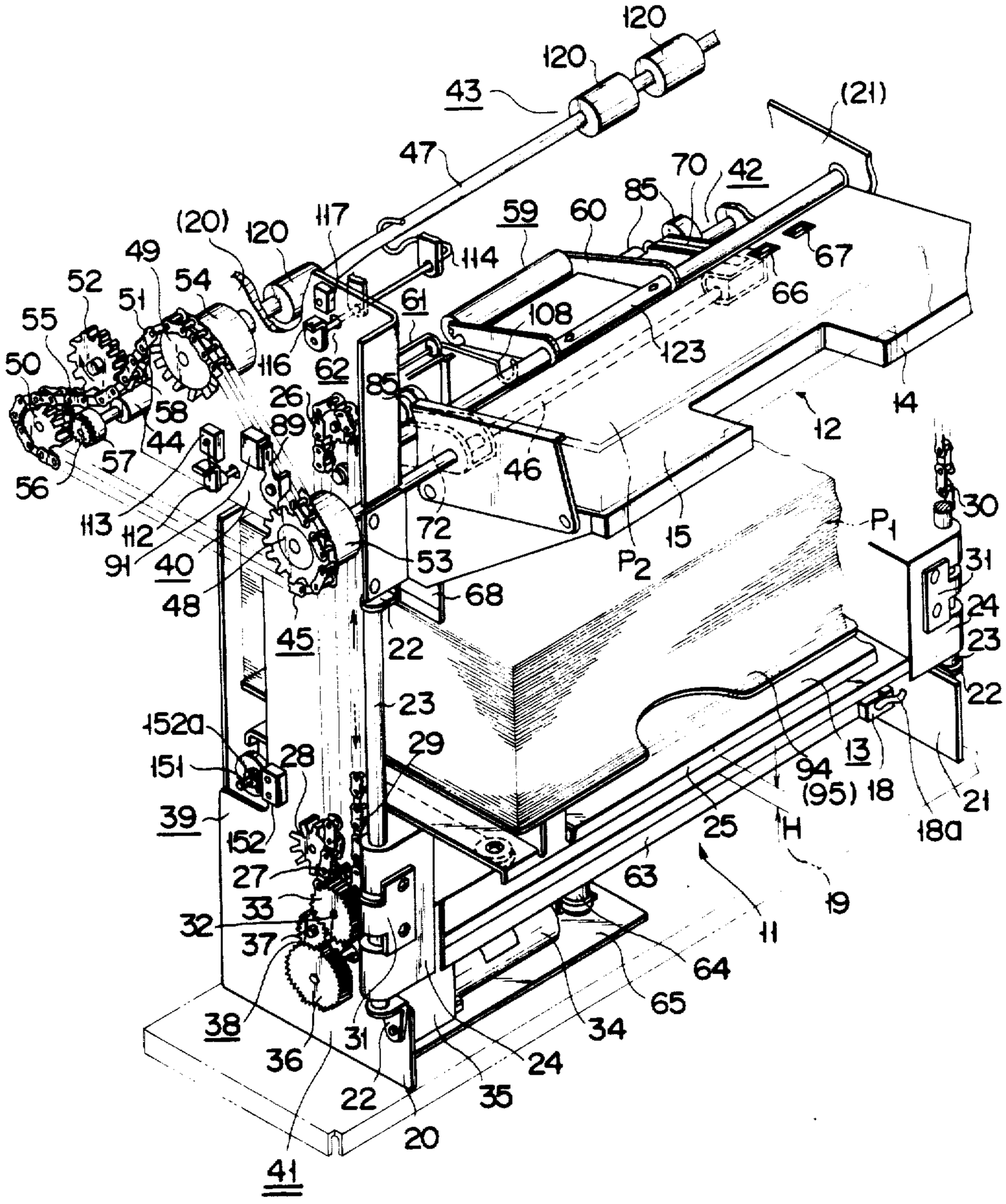
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FIG. 4

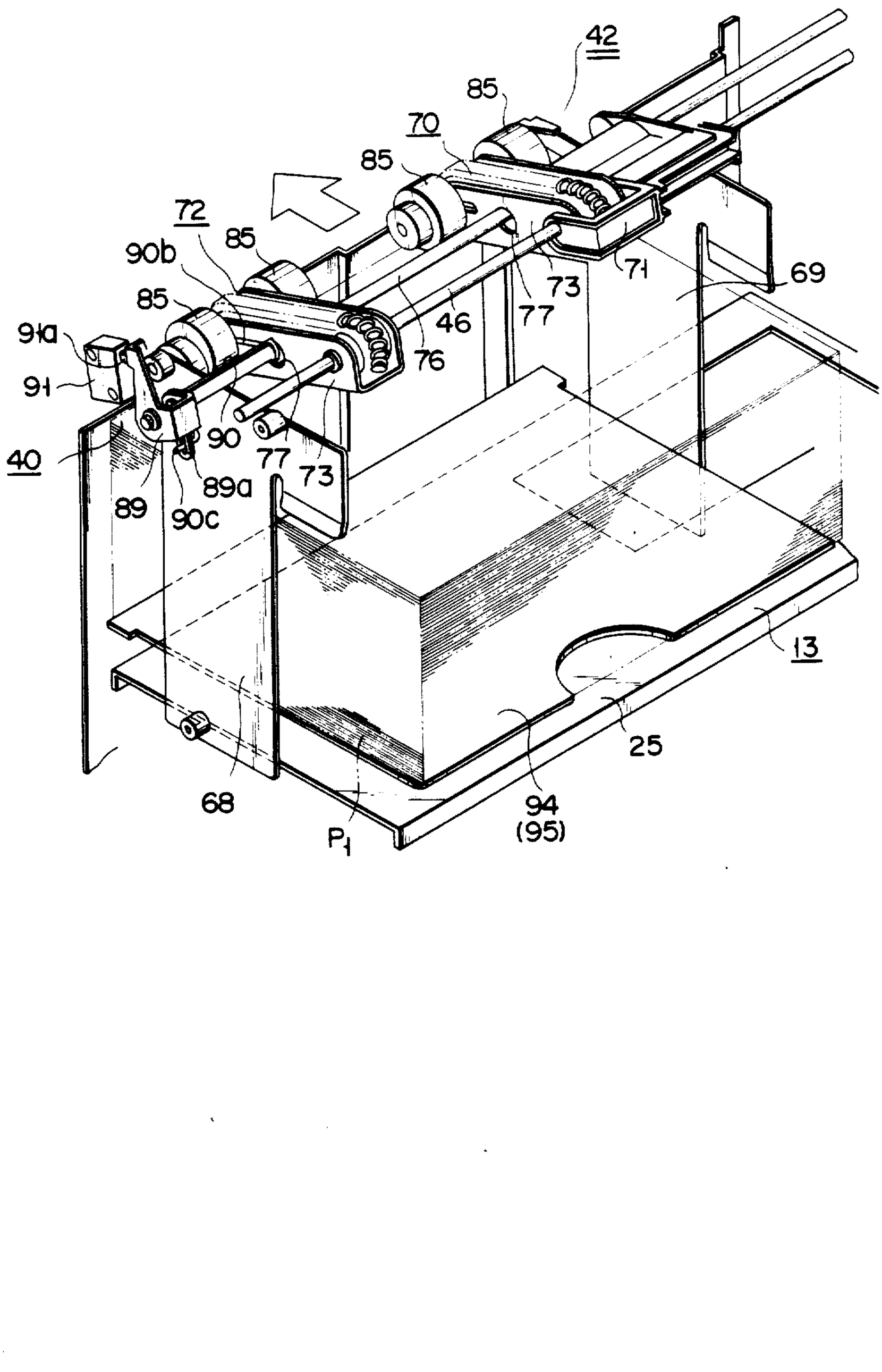
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FIG. 5

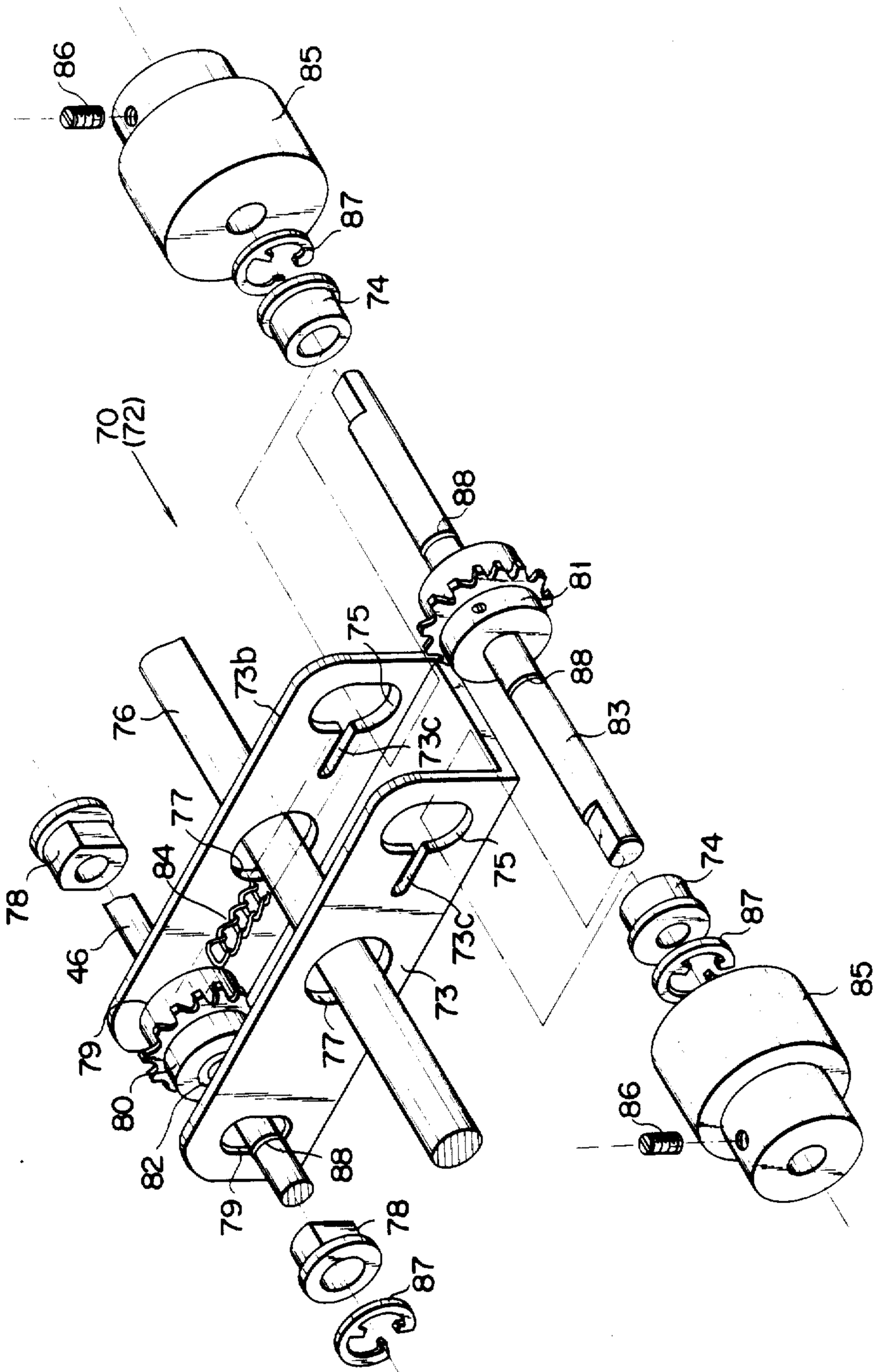
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FIG. 6A

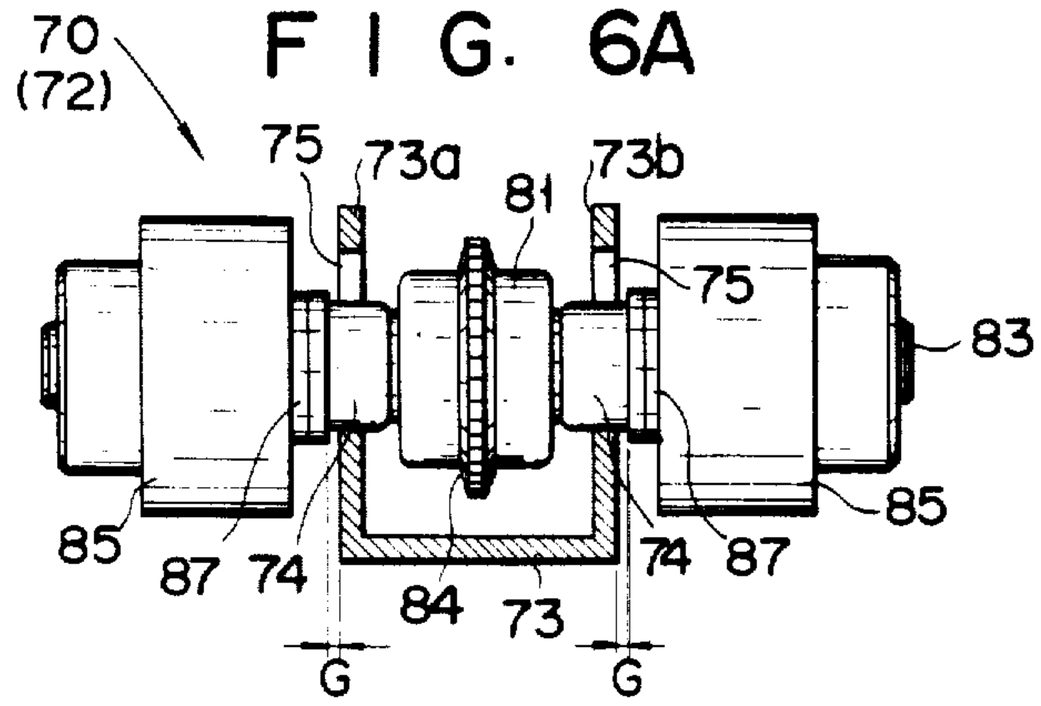

FIG. 6B

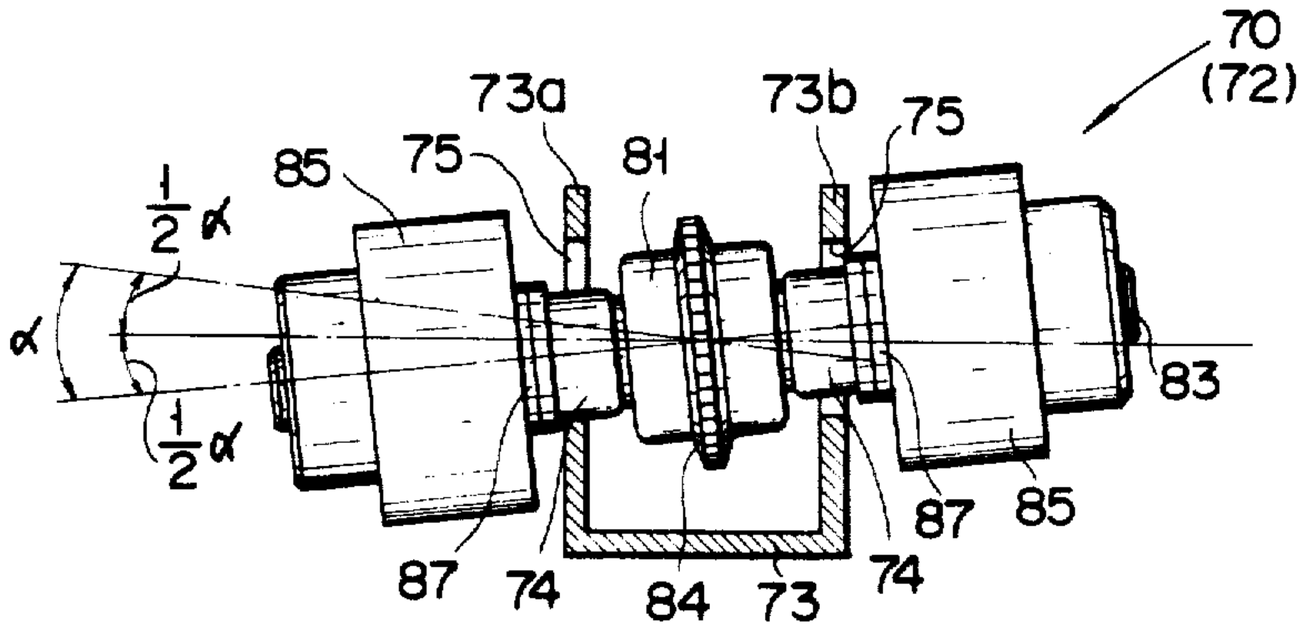

FIG. 7A

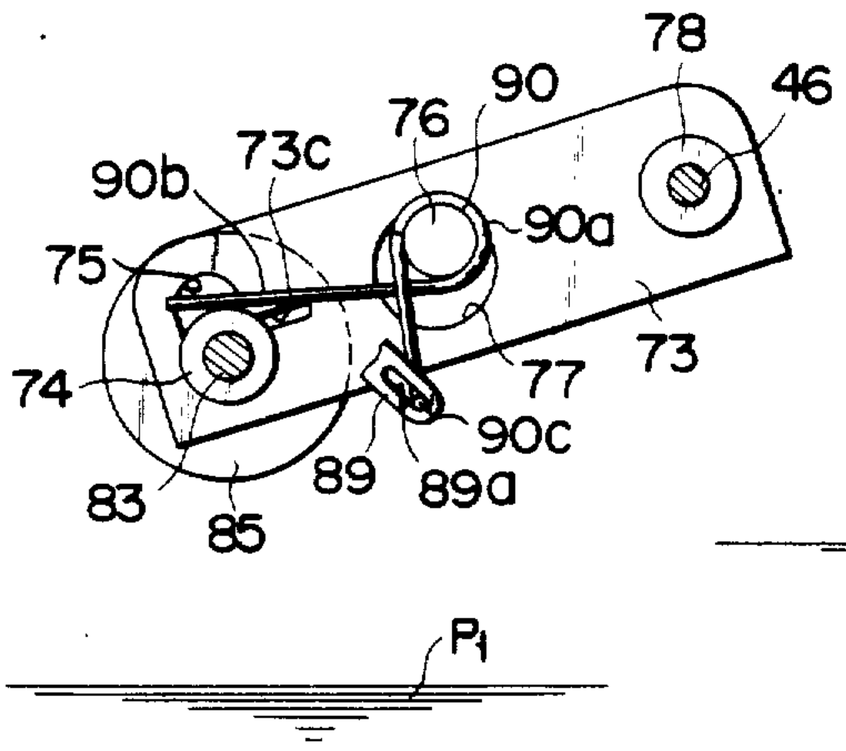

FIG. 7B

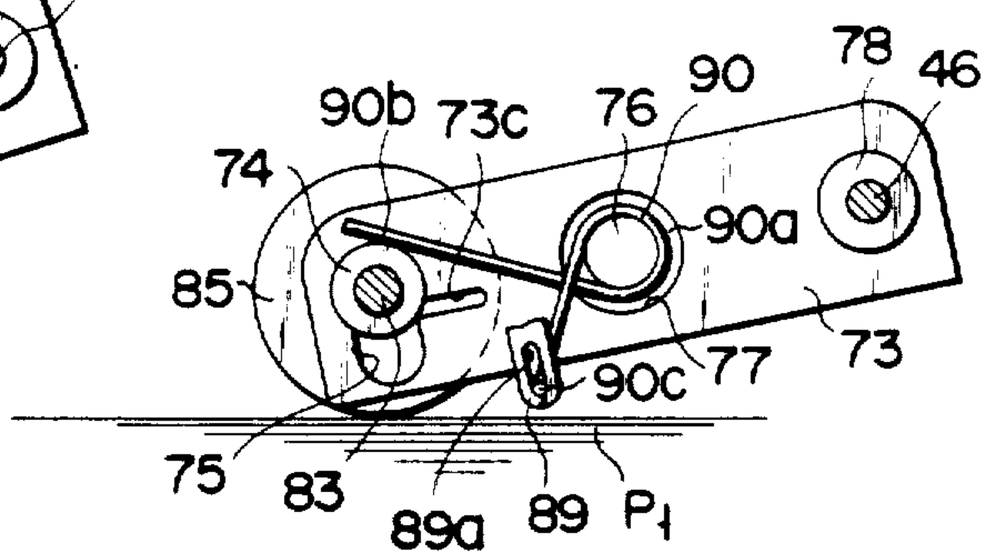

FIG. 8

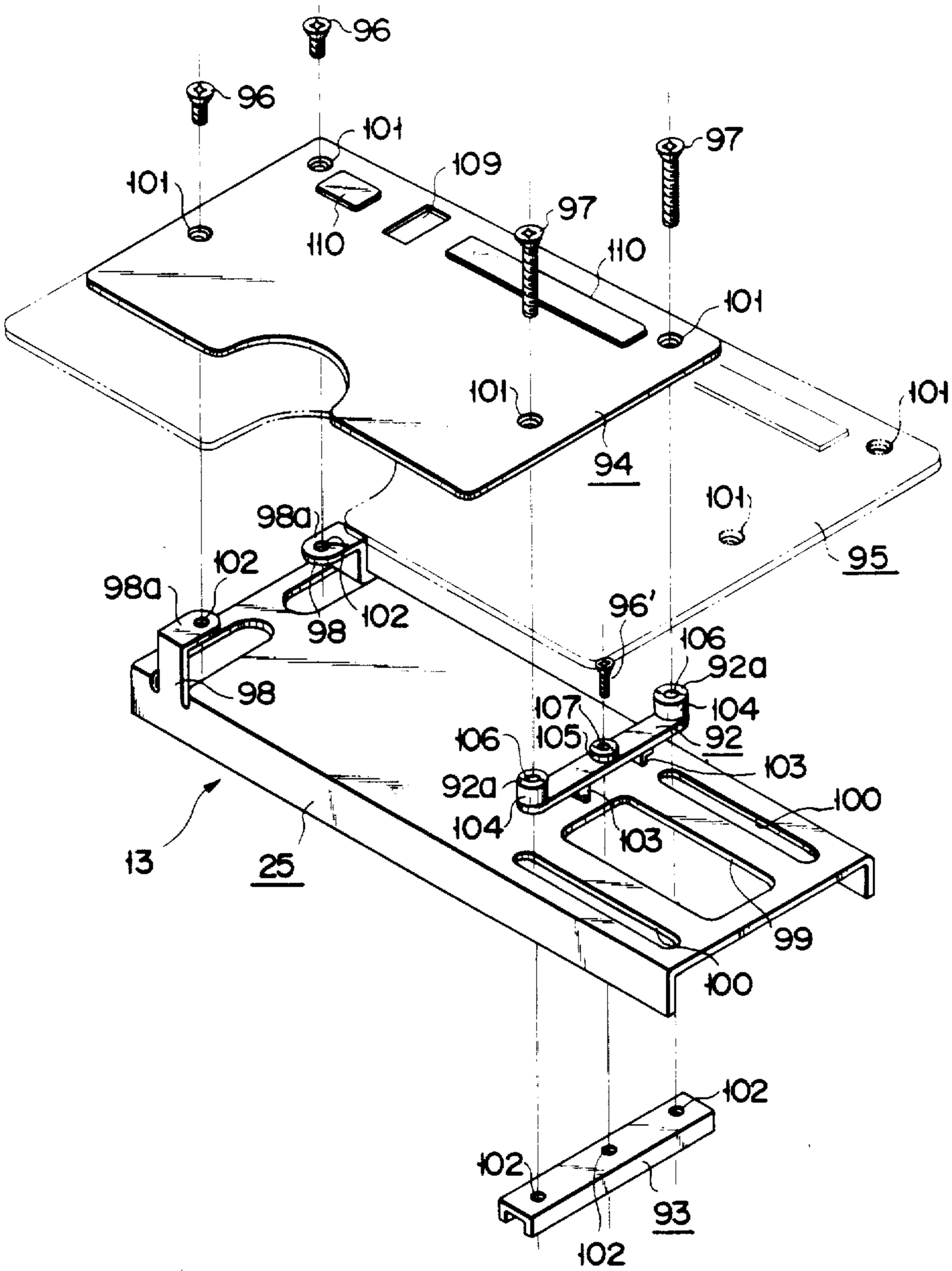
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FIG. 9

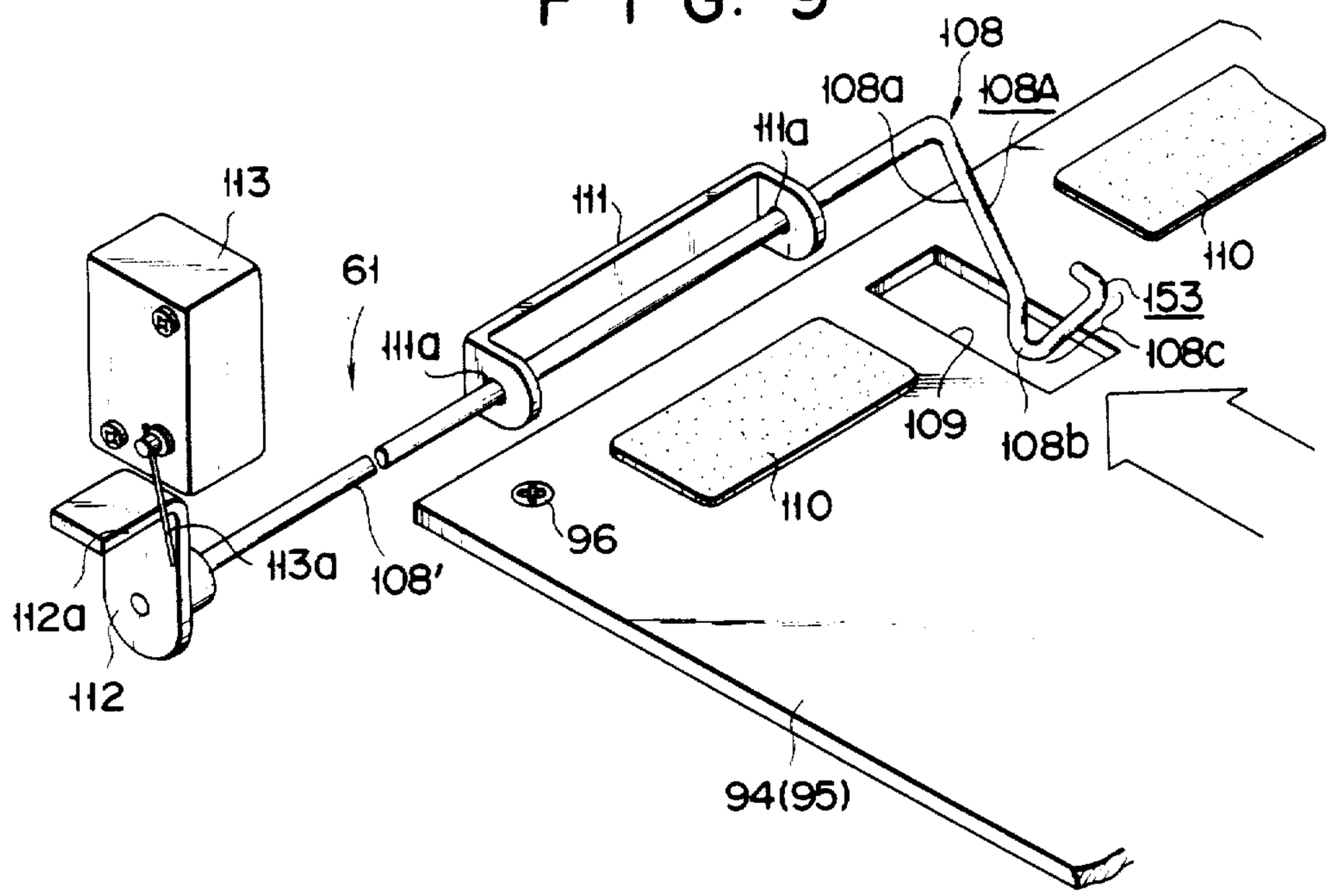


FIG. 10A

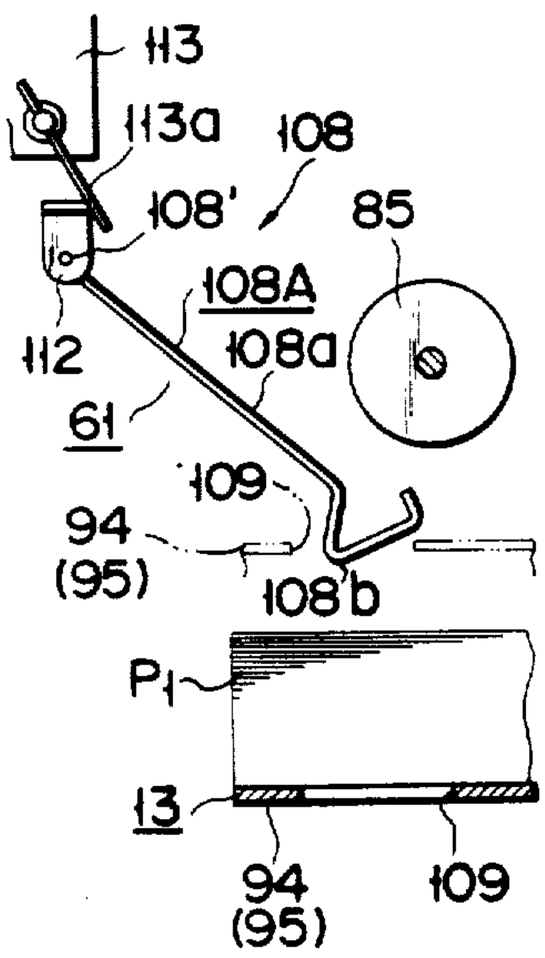


FIG. 10B

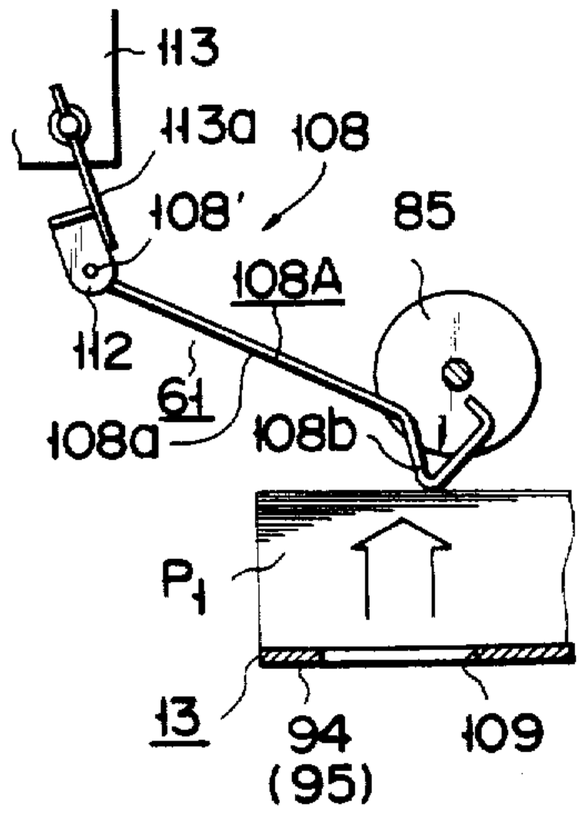


FIG. 10C

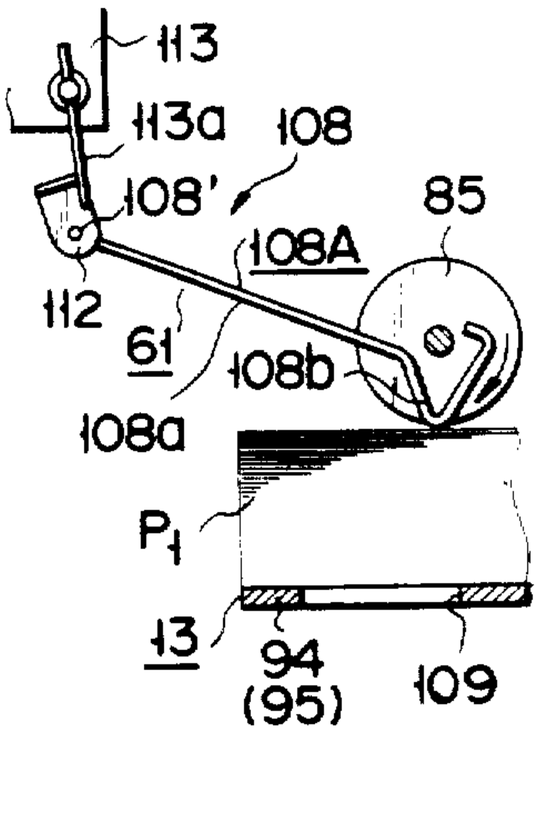


FIG. 11

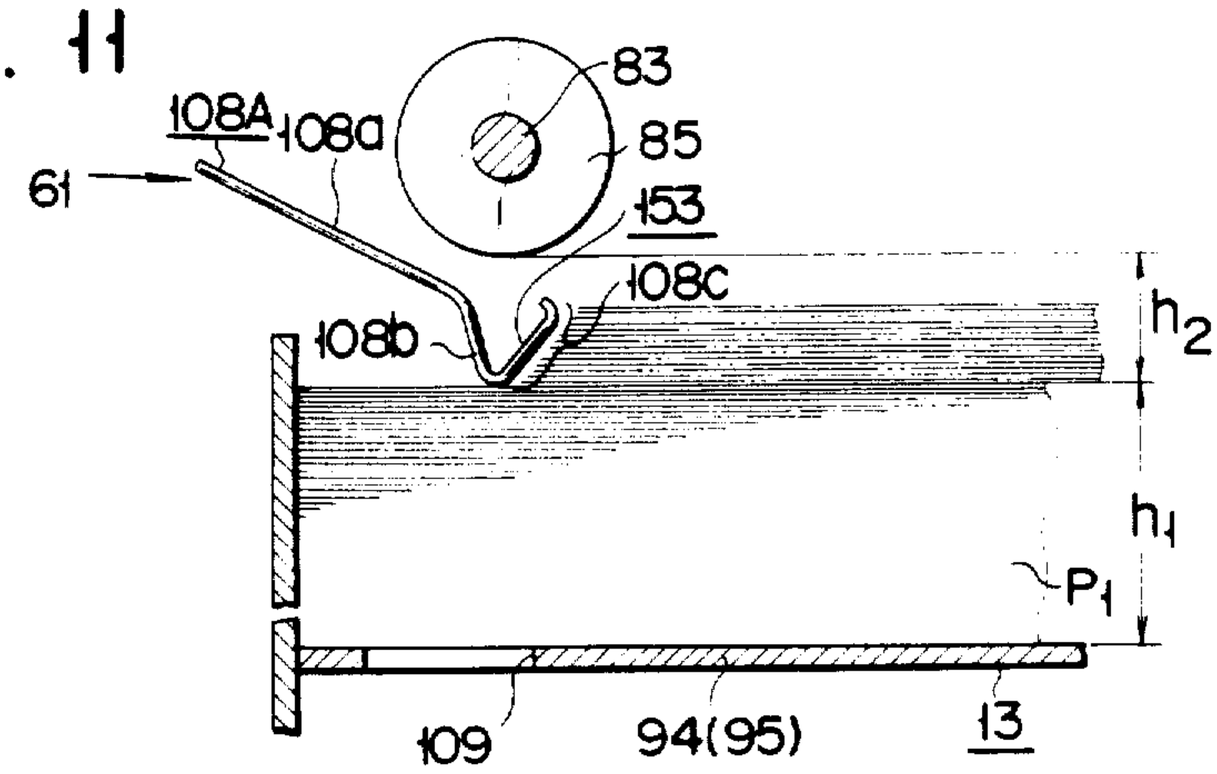


FIG. 12

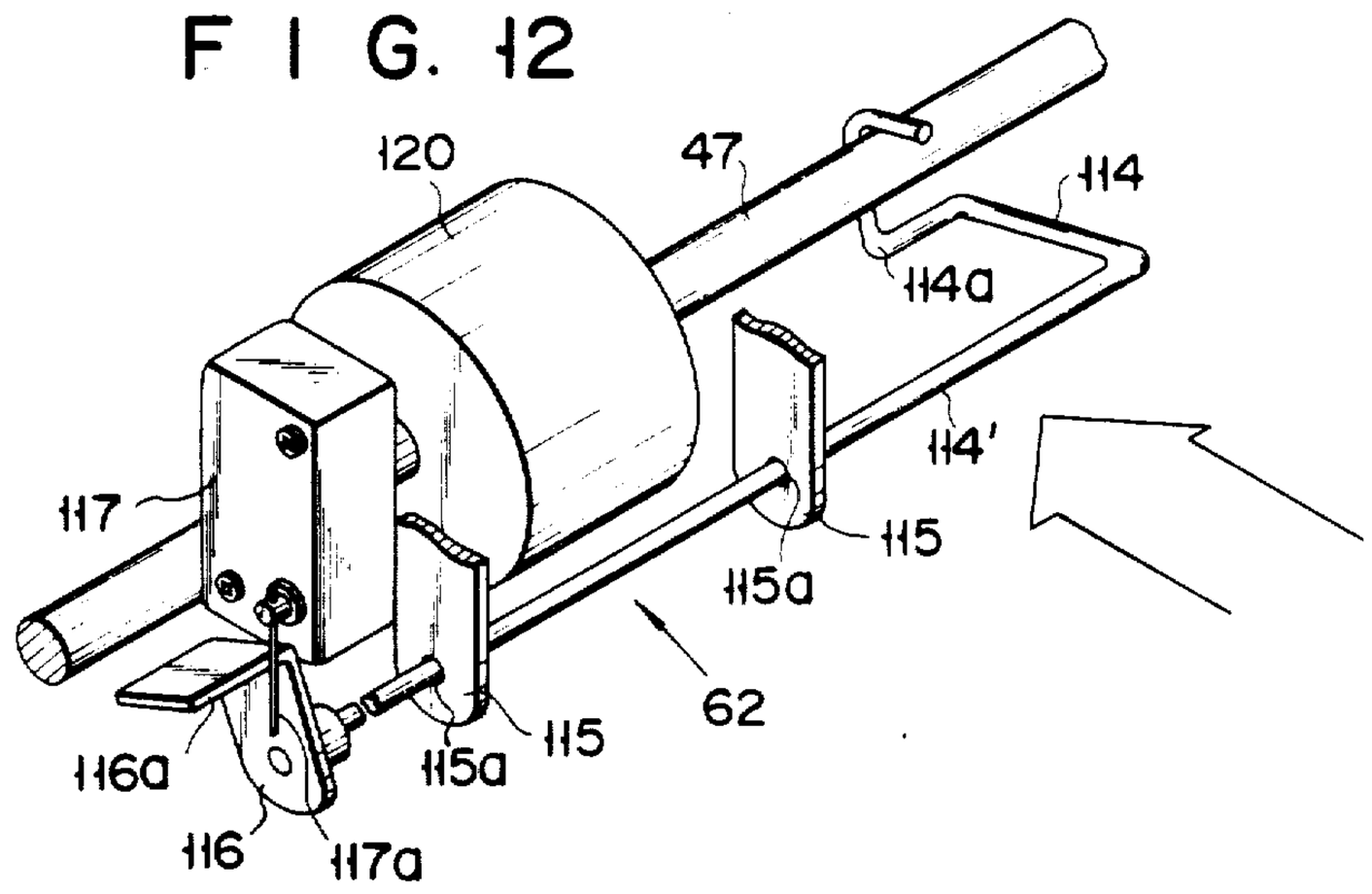


FIG. 13A

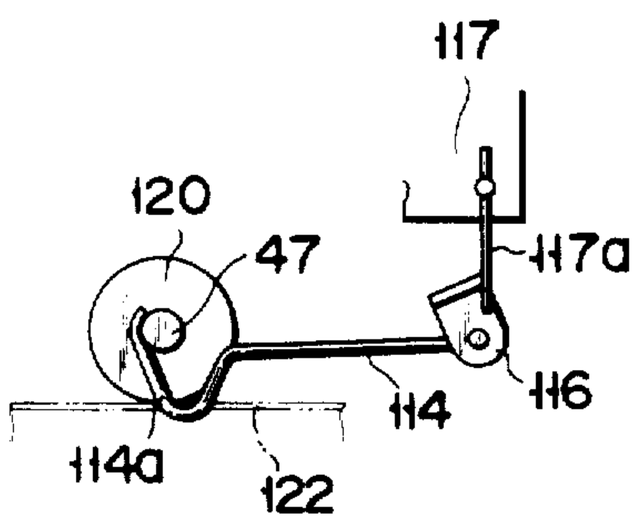
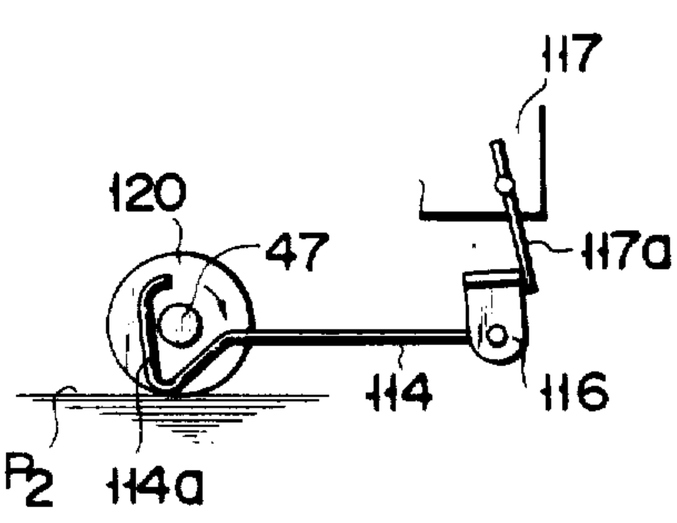


FIG. 13B



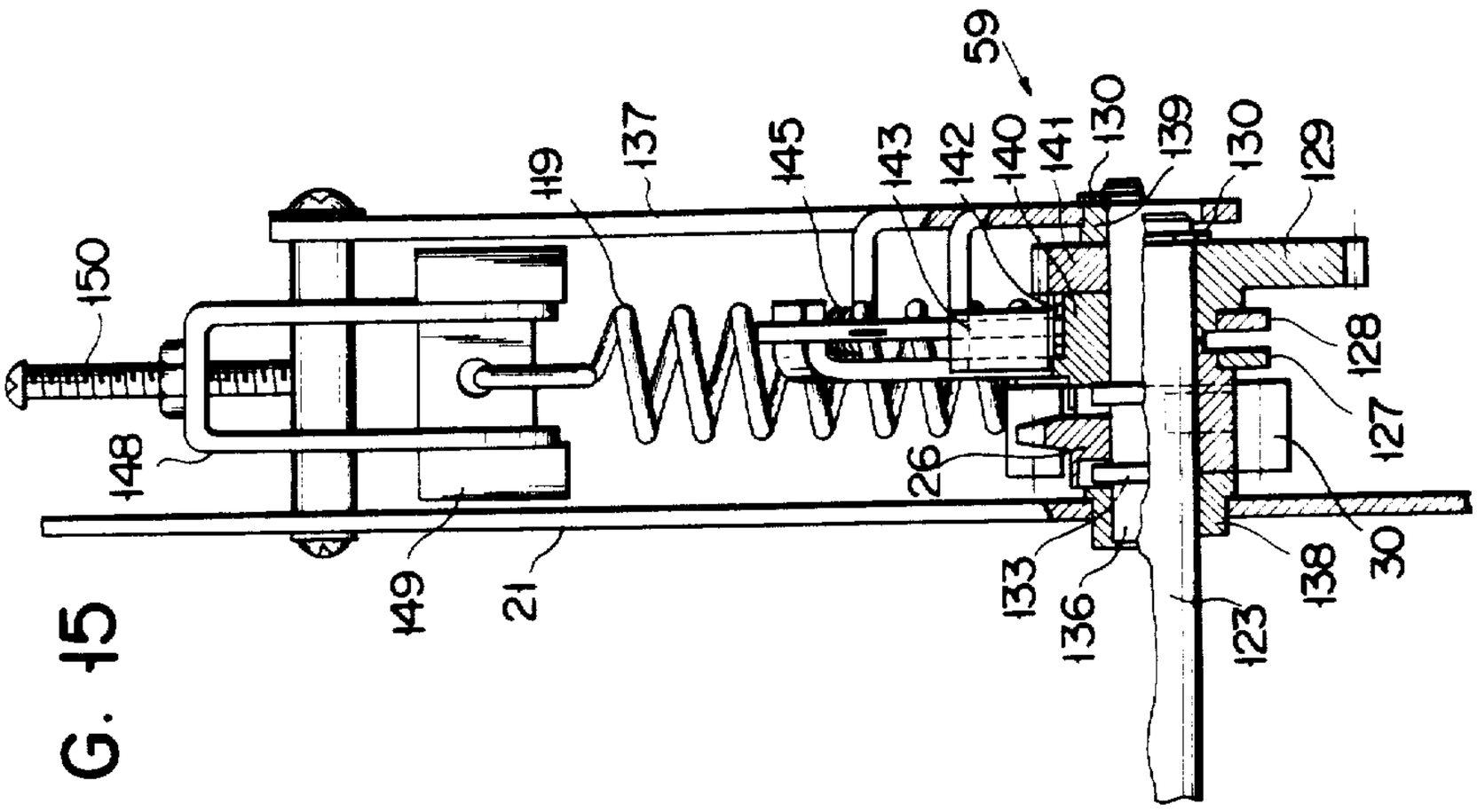

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FIG. 15

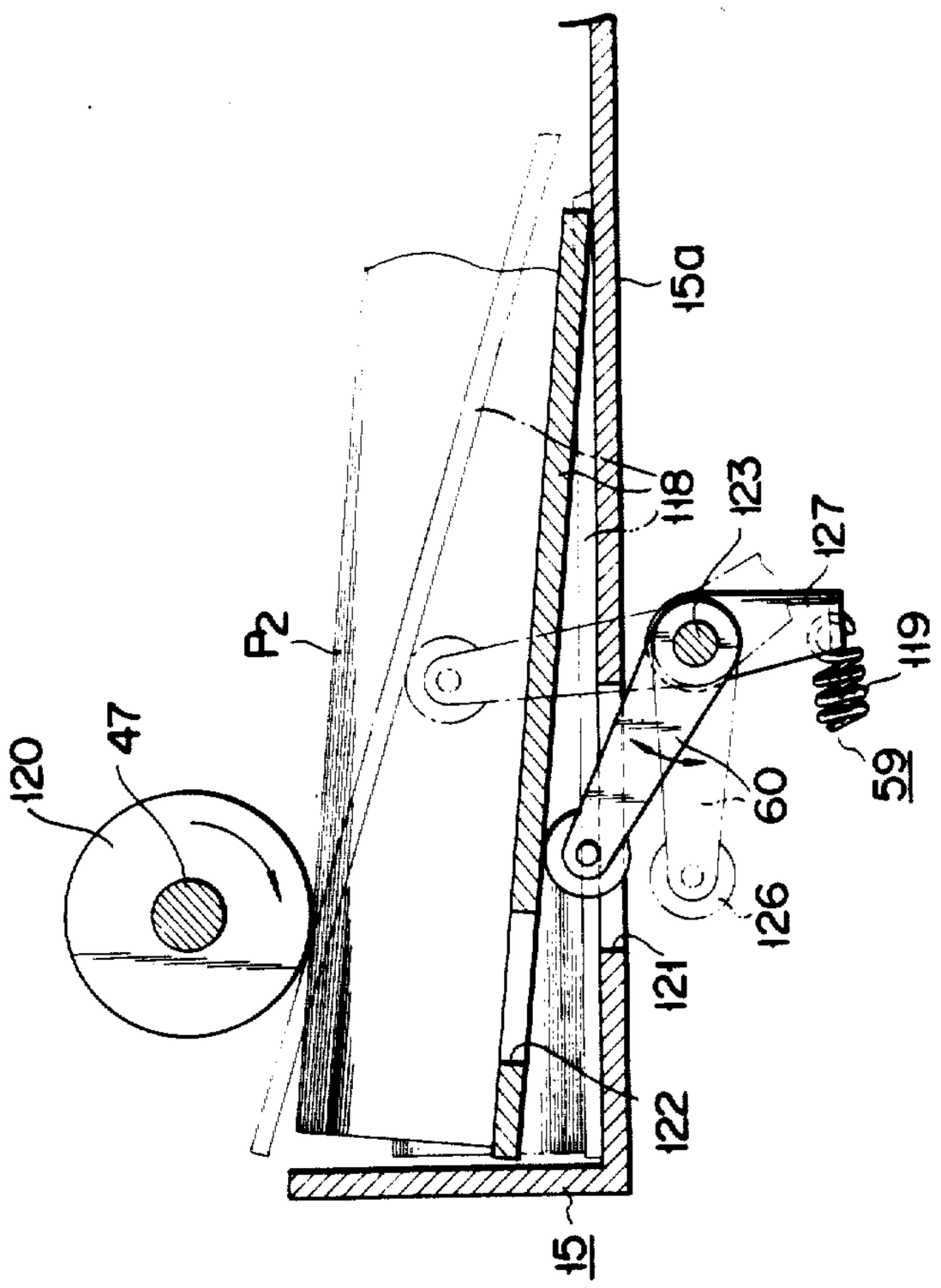
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FIG. 14

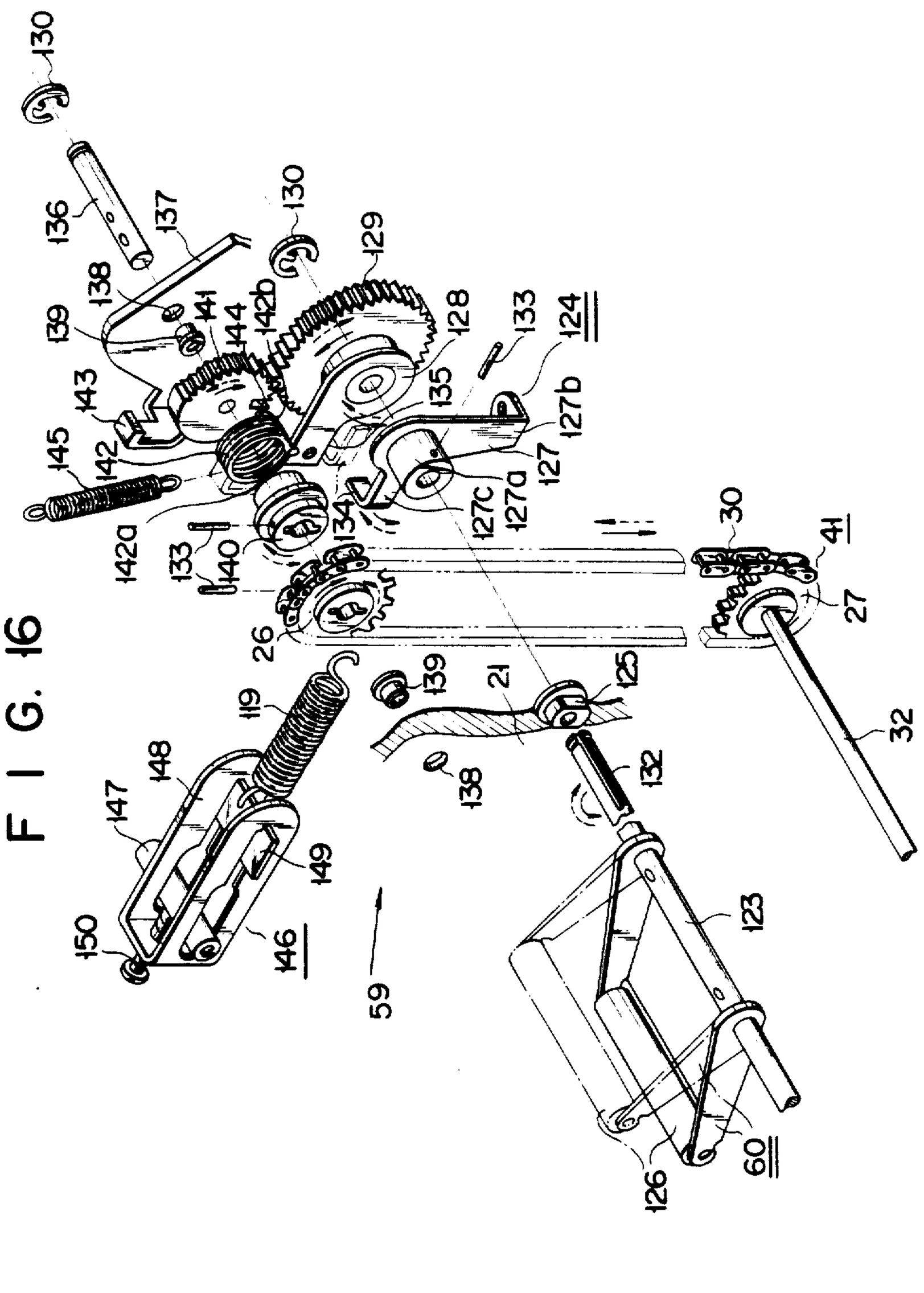
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FIG. 16

FIG. 17

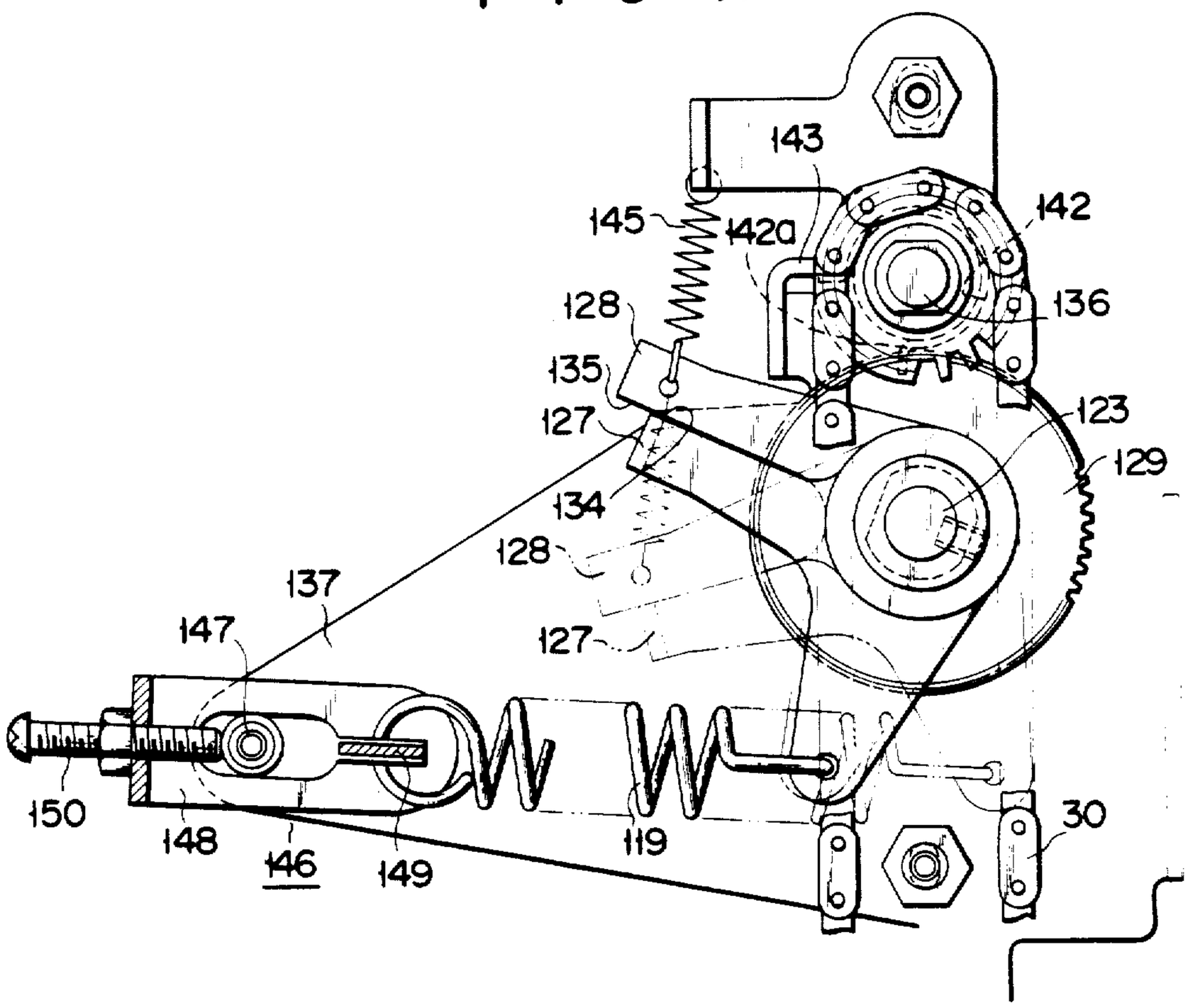


FIG. 18A

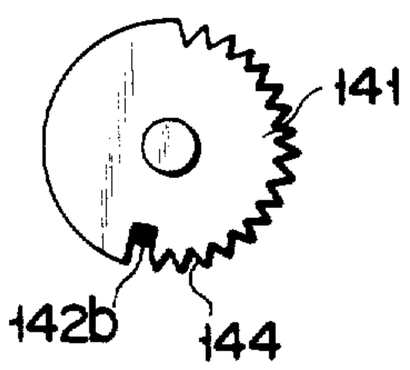


FIG. 18B

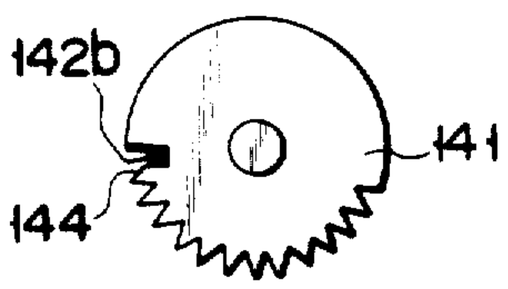


FIG. 19A

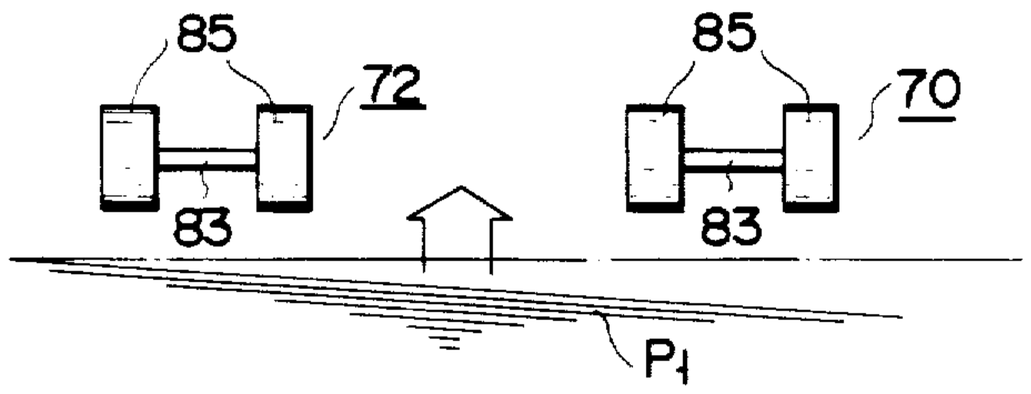


FIG. 19B

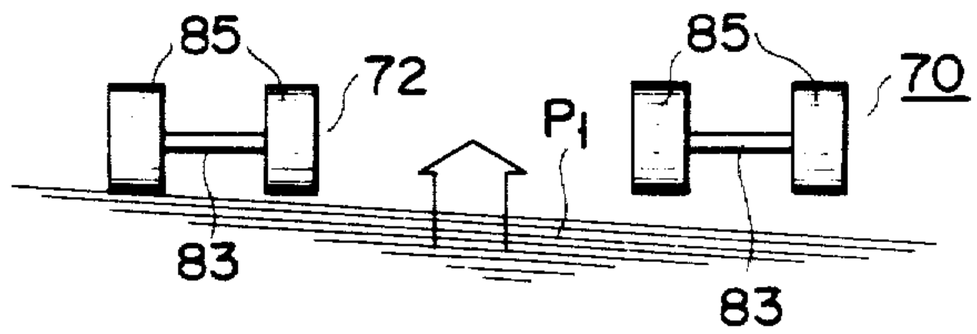


FIG. 19C

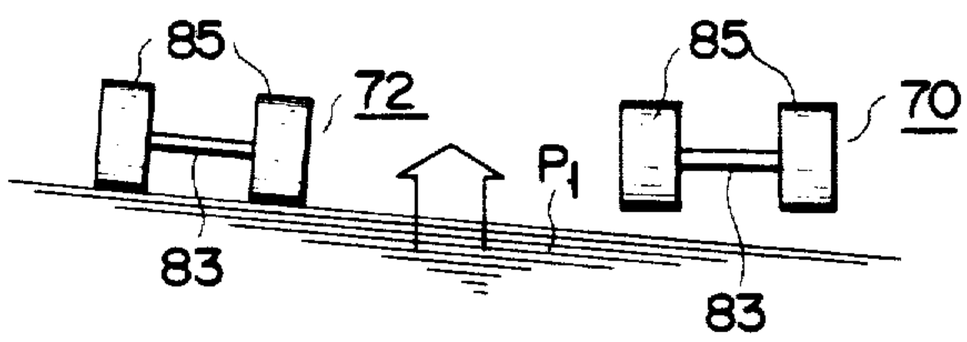


FIG. 19D

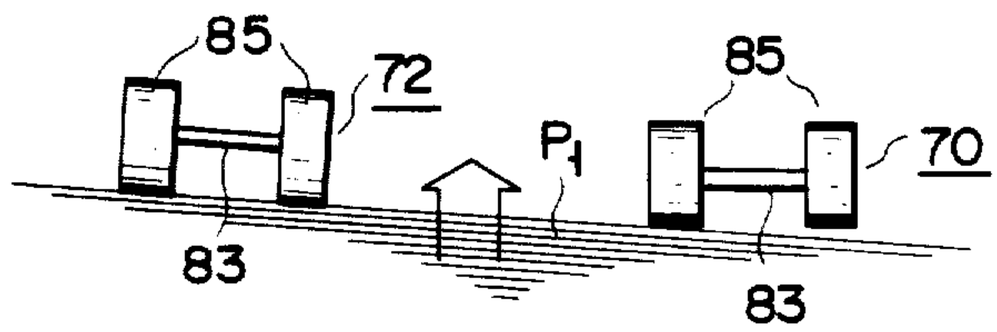
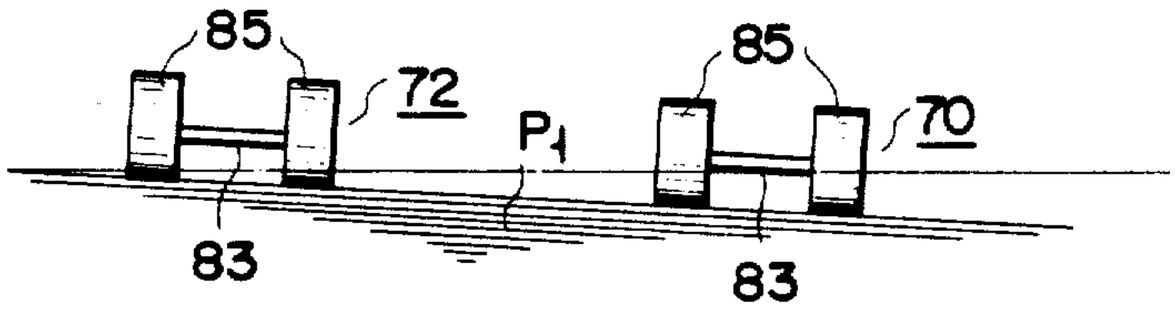


FIG. 19E



COPY SHEET-FEEDING APPARATUS

Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue.

BACKGROUND OF THE INVENTION

This invention relates to a copy sheet-feeding apparatus and more particularly to a copy sheet-feeding apparatus provided with an elevator mechanism.

An elevator type copy sheet-feeding apparatus is generally adapted for the continuous supply of a large series of copy sheets, and is usually used with an electrostatic copying press. The elevator type copy sheet-feeding apparatus includes a copy sheet rest means on which can be set a stack of about 2 to 4 times as many copy sheets (more than 1,000 sheets) as can be contained within and fed by a cassette type copy sheet-feeding apparatus. The copy sheet rest means is gradually lifted, each time a prescribed number of copy sheets are drawn off from the stack mounted thereon. This arrangement enables the uppermost copy sheet of the stack to be easily conducted to a copy sheet-feeding roller, namely to be brought to a position ready for the copying operation.

Where, with the above-mentioned elevator type copy sheet-feeding apparatus, a certain number of copy sheets have to be additionally supplied to the stack or it is necessary to take off copy sheets jammed together during the copy sheet-feeding operation, then the copy sheet-rest means is sufficiently lowered to meet such requirements. To this end, the conventional elevator type copy sheet-feeding apparatus comprises dedicated switch mounted on, for example, the control panel of said apparatus. The copy sheet rest means is brought down to a required level by the actuation of the switch.

In this case, the operator has to take two discrete steps. He must first open a copy sheet cover after lowering the copy sheet rest means. Secondly, he must pull out a copy sheet drawer, for example, to load additional copy sheets.

SUMMARY OF THE INVENTION

This invention is provided in view of the above-mentioned circumstances and is intended to provide a copy sheet-feeding apparatus of high operating efficiency which enables a copy sheet rest means to be automatically lowered to a position allowing for the supply of additional copy sheets when a copy sheet cover is opened and also to be automatically raised to a position ready for the copying operation when said copy sheet cover is closed.

According to an aspect of the present invention, there is provided a sheet-feeding apparatus which comprises:

a sheet-holding means which supports a stack of sheets and is movable between a first position capable of receiving the sheets and a second position capable of supplying the sheet;

a sheet cover which is movable between a close state capable of enclosing the stack of sheets supported by the sheet-holding means and open state capable of exposing the stack of sheets; and

a drive mechanism for moving the sheet-holding means between the first position and the second position,

the improvement in which comprises:

a detection mechanism which detects the open and closed states of the sheet cover, and generates signals denoting the open and closed states of said sheet cover;

a control mechanism for controlling the operation of said drive mechanism which, when receiving the signal denoting the open state of the sheet cover from the detection mechanism, causes the sheet-holding means to be moved to the first position, and, when receiving the signal denoting the closed state of the sheet cover from the detection mechanism, causes the sheet-holding means to be moved to the second position.

BRIEF DESCRIPTION OF THE DRAWING

FIG. **1** is an oblique view of a copying apparatus provided with a copy sheet-feeding apparatus embodying this invention;

FIG. **2** is an oblique view of a copy sheet cover when opened;

FIG. **3** is an oblique view schematically showing the arrangement of the copy sheet-feeding apparatus;

FIG. **4** is an oblique view of an uppermost copy sheet-picking up device of an elevator mechanism installed in the lower section of the copy sheet-feeding apparatus of FIG. **3**;

FIG. **5** is an exploded oblique view of a copy sheet roller mechanism;

FIGS. **6A** and **6B** are front views, partly in section, of a copy sheet roller assembly fitted to an arm;

FIGS. **7A** and **7B** are schematic side views of the parts of a mechanism for detecting the uppermost position of the copy sheet rest assembly;

FIG. **8** is an exploded oblique view of the copy sheet rest assembly;

FIG. **9** is an oblique view of a mechanism for detecting the absence of copy sheets from the plate of the copy sheet rest assembly installed in the lower stage of the copy sheet-feeding apparatus, or the presence of copy sheets on said plate;

FIGS. **10A**, **10B** and **10C** are schematic side views of the copy sheet-detecting mechanism of FIG. **9** when operated to detect the presence of copy sheets on the plate of the copy sheet rest assembly;

FIG. **11** is a schematic side view of the lever of the paper-detecting mechanism of FIG. **9** when actuated to limit a maximum number of copy sheets to be additionally supplied to the stack currently mounted on the plate of the copy sheet rest assembly;

FIG. **12** is an oblique view of a mechanism installed in the upper section of the copy sheet-feeding apparatus to detect the presence of copy sheets in a copy sheet cassette or the absence of copy sheets therefrom;

FIG. **13A** is a side view of the copy sheet-detecting mechanism of FIG. **12** when actuated to detect the absence of copy sheets from the copy sheet cassette;

FIG. **13B** is a side view of the copy sheet-detecting mechanism of FIG. **12** when operated to detect the presence of copy sheets in the copy sheet cassette;

FIG. **14** is a side view showing, partly in section, the relative positions of the copy sheet cassette set in the upper section of the copy sheet-feeding apparatus and a lever for lifting a copy sheet support board;

FIG. **15** is a schematic plan view, partly in section, of a mechanism for lifting and releasing the copy sheet support board;

FIG. **16** is an exploded oblique view of the copy sheet support board lifting-releasing mechanism of FIG. **15**;

FIG. 17 is a front view of the main section of the copy sheet support board lifting-releasing mechanism of FIG. 15;

FIGS. 18A and 18B are front views showing the relative positions of the anomalous gear of FIG. 16 and a drive transmission spring; and

FIGS. 19A to 19E are front views showing the relative positions of a pair of copy sheet rollers and the uppermost copy sheet of a stack to be contacted by said copy sheet rollers.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Description is now given with reference to the accompanying drawing of a copy sheet-feeding apparatus embodying this invention when used with, for example, an electrostatic copying press.

FIG. 1 shows the external appearance of an electrostatic copying press 1. An original sheet table 2 is disposed on the upper right hand side of the copying press 1. A control panel 6 is set on the upper front side. Arranged on the control panel 6 are a print button 3 for commencing the copying operation of the copying press 1, a ten-key system 4 for controlling the copying operation and a display section 5 for visually informing the operator of the general condition of the copying press 1. A copy sheet discharge port 7 is provided on the upper left hand side of the copying press 1. A tray 8 for receiving a copy sheet P' drawn off through the discharge port 7 is projectively provided on the left side of FIG. 1 closely below said discharge port 7. A box-shaped cover 9 prepared from translucent material and used to protect an interior stack of copy sheets held by a copy sheet-feeding apparatus (not shown) is positioned near to center of the left hand wall of the copying press 1 in a state hinged at the rear edge as illustrated in FIG. 2.

A window 10 is formed in the central part of the left hand wall of the copying press 1. Part of an elevator type copy sheet-feeding mechanism 11 is projectively provided below the window 10. Part of a cassette type copy sheet-feeding mechanism 12 is projectively provided above the window 10. These projections are normally enclosed in the cover 9, and, where required, can be exposed.

Where the box-shaped protective cover 9 is opened, namely, when the above-mentioned projections are exposed, then a stack of copy sheets P_1 can be mounted on the tray of the copy sheet rest means 13 of the elevator type copy sheet-feeding mechanism. Also, a copy sheet cassette 15 can be freely set on the cassette rest 14 of the cassette type copy sheet-feeding mechanism 12 or released from said cassette rest 14. A sufficient space is provided on the tray of the copy sheet rest means 13 to hold a stack of about 1,000 copy sheets P_1 (for example of A4 size). Formed in the copy sheet cassette 15 is a sufficient space to hold a stack of a smaller number (for example, about 200) copy sheets having a different size, for example, B5 which may have to be often exchanged for other sizes.

Provided at the lower edge of the box-shaped copy sheet cover 9 is a projection 16 fully narrower than any of the operator's fingers. When the copy sheet cover 9 is closed, then projection 16 is directed toward the left side wall of the copying press 1. A small hole 17 which allows for the insertion of the aforesaid projection 16, but obstructs the entry of any of the operator's fingers is opened at that point of the left side wall of the copying press 1 which exactly faces said projection 16. The small hole 17 is fitted with an actuator 18a (FIG. 3) of a switch 18 for detecting the open or closed state of the copy sheet cover 9. The small hole 17 and switch 18 jointly constitute a mechanism for controlling the operation of the copy sheet cover 9. In this case, the switch 18 is operated in two different modes according as the copy sheet cover 9 is opened or closed. In other words, when receiving a signal denoting the open state of the copy sheet cover 9 from said switch 18, then the control mechanism causes the copy sheet rest means 13 to be sufficiently lowered to allow for the additional supply of copy sheets to a stack already mounted on the tray of the copy sheet rest means 13. When receiving a signal showing the closed state of the copy sheet cover 9 from said switch 18, then the control mechanism causes the copy sheet rest means 13 to be raised to a position ready for the copying operation.

The elevator type copy sheet-feeding mechanism 11 and cassette type copy sheet-feeding mechanism 12 jointly constitute a copy sheet-feeding unit in which the elevator type 11 occupies the lower section of the copying press, and the cassette type copy sheet-feeding mechanism 12 occupies the upper section. As seen from FIG. 3, a copy press-supporting base 19 is disposed in the copy press 1 itself. Right and left upright frames 21, 20 are fixedly set on the right and left sides of the upper surface of the supporting base 19. The cassette rest 14 is fixed in the upper part of a space defined between the right and left frames 21, 20. The copy sheet rest means 13 is positioned in the lower part of said space. A guide rail 23 is fitted to the outer wall of each of the right and left frames 21, 20 by means of a bracket 22. The guide rail 23 is fixedly set in place at both ends. Each guide rail 23 supports a block 24 in a vertically movable state. The crosswise edges of the rectangular base 25 of the copy sheet rest means 13 are fixed to both movable blocks 24.

The blocks 24, 24 are coupled to endless chains 29, 30 by means of brackets 31, 31 to be vertically moved with the endless chains 29, 30. The left endless chain 29 is stretched over an upper sprocket 26, lower sprocket 27 and tension sprocket 28 all rotatably fitted to the left frame 20, extending along the left guide rail 23 on the outside of the left frame 20. The right endless chain 30 is stretched over the similar sprockets rotatably fitted to the right frame 21, extending along the right guide rail 23 on the outside of the right frame 21. The right and left lower sprockets 27, 27 are engaged with both ends of a common rotatable shaft 32. A driven gearwheel 33 is fitted to the left end of said common rotatable shaft 32. The right and left lower sprockets 27, 27 and common rotatable shaft 32 are jointly driven by the rotation of the driven gearwheel 33. This driven gearwheel 33 is rotated with a driving gearwheel 36 by means of an intermediate gearwheel 37. The driving gearwheel 36 is supplied with the drive force of a reversible motor 34 through a gear box 35.

Where the reversible motor 34 is rotated in the normal or backward direction, then the right and left endless chains 29, 30 are made to run similarly in the normal direction (indicated by a solid line arrow) or backward direction (indicated by a broken line arrow). The above-mentioned gearwheels 33, 37, 36, common rotary shaft 32 and reversible motor 34 jointly constitute a chain drive mechanism 38.

The chain drive mechanism 38, and the later described mechanism 39 for detecting the allowable low-

ermost position of the copy sheet rest means **13**, and mechanism **40** for detecting the allowable uppermost position of said copy sheet rest means **13** jointly constitute a mechanism **41** for controlling the drive of the copy sheet rest means **13**. This control mechanism **41** enables the copy sheet rest means **13** to be so moved that the uppermost copy sheet P_1 of the stack always takes a position falling within the range in which the copy sheet can get ready for the copying operation.

A mechanism **42** for removing the uppermost copy sheet of the stack mounted on the tray of the copy sheet rest means **13** installed in the lower section of the copy sheet-feeding apparatus is set on the lower rear side of the cassette rest **14**. A mechanism **43** for removing the uppermost copy sheet from the stack mounted on the cassette rest **14** positioned in the upper section of the copy sheet-feeding apparatus is provided on the upper rear side of the cassette rest **14**. Provided on that side of both uppermost copy sheet-picking up mechanisms **42**, **43** on which the copying operation is carried out is a timing-adjusting restart copy sheet-feeding roller **44** used in common to both mechanisms **42**, **43**. A drive mechanism **45** is set on the same side of the copy sheet-feeding apparatus left frame **20** to actuate the copy sheet-picking up mechanisms **42**, **43** respectively provided for the upper and lower copy sheet rest means **14**, **13** and the timing-adjusting restart copy sheet-feeding roller **44**. An uppermost copy sheet P_1 or P_2 is selectively picked up from the stack mounted on the lower or upper copy sheet rest means **14** or **13** to the timing-adjusting restart copy sheet-feeding roller **44** when actuated by the drive mechanism **45**. Thereafter, the removed copy sheet is supplied in proper timing to the electrostatic image transcription section (not shown) of the copying press **1** by the timing-adjusting restart copy sheet-feeding roller **44**.

Namely, a sprocket **48** is fitted to the left end of a drive shaft **46** of the copy sheet-picking up mechanism **42** by means of a first electromagnetic clutch **53**. Similarly, a sprocket **49** is fitted to the left end of a drive shaft **47** of the copy sheet-picking up mechanism **43** by means of a second electromagnetic clutch **54**. A gearwheel **56** is fitted to the left end of the timing adjusting restart copy sheet-feeding roller **44** by means of a third electromagnetic clutch **57**. The gearwheel **56** is engaged with a gearwheel **55** provided concentrically with a sprocket **50**. An endless chain **51** is stretched over the three sprockets **48**, **49**, **50**. This endless chain **51** is actuated by a driving sprocket **52** provided in the copying press **1** to rotate the driving shafts **46**, **47** and timing-adjusting restart copy sheet-feeding roller **44**.

Upon receipt of a signal instructing the feeding of a copy sheet to a copying press **1**, the first or second electromagnetic clutch **53** or **54** is selectively energized to rotate the driving shaft **46** of the copy sheet-picking up mechanism **42** or the driving shaft **47** of the copy sheet-picking up mechanism **43**. In either case, the third electromagnetic clutch **57** is energized in the timing in which a copy sheet is supplied to the copying press **1**.

Set above the timing-adjusting restart copy sheet-feeding roller **44** is a press roller **58** which gravitationally abuts against said roller **44** in a rotatable state. A copy sheet P_1 or P_2 is supplied to the copying press **1** in a state clamped between both rollers **44**, **58**.

Disposed above the copy sheet-picking up mechanism **42** for the lower copy sheet rest means **13** is a push lever **60** to push up the later described mechanism **59** for lifting or releasing the copy sheet support board in the

cassette **12**. The later described copy sheet-detecting mechanism **61** is positioned near the copy sheet-picking up mechanism **42** for the lower copy sheet rest means **13**. The later described copy sheet-detecting mechanism **62** is similarly provided near the copy sheet-picking up mechanism **43** for the upper copy sheet rest means **14**.

The gear box **35** of the chain-driving mechanism **38** and reversible motor **34** are enclosed in a cover **63** provided below the lower copy sheet rest means **13**. Fitted to the right side of the front wall of said cover **63** is a switch **18** for detecting the open or closed state of the previously described copy sheet cover **9**. The cover **63** is set in such a position that when the lower copy sheet rest means **13** is brought to an allowable lowermost level, a space H (FIG. **3**) is still left between said lower copy sheet rest means **13** and the cover **63** which is wide enough to prevent the operator's fingers from being injured, even if they happen to be put under the lower copy sheet rest means **13**. A capacitor **64** is mounted on a fitting board **65** disposed below the reversible motor **34**. Copy sheet size-detecting switches **66**, **67** are provided on the right side of the upper surface of the cassette rest **14**. The size of a copy sheet is defined by the switches **66**, **67** which are rendered conducting or non-conducting by a movable member (not shown) which is provided on the underside of the copy sheet cassette **15** and whose position various with a movable guide board (not shown) of the copy sheet cassette **15**.

As shown in FIG. **4**, a stationary guide board **68** is provided on the left side of the passage of the lower copy sheet rest means **13**, and a movable guide board **69** is positioned on the right side thereof. These guide boards **68**, **69** guide both side planes of a stack of copy sheets P_1 superposed one above the other on the lower copy sheet rest means **13**, thereby preventing both crosswise edges of the respective copy sheets from being irregularly arranged. The movable guide board **69** is connected to a copy sheet-feeding roller unit **70** disposed on the right side of the copy sheet-picking up mechanism **42** for the lower copy sheet rest means **13** by means of a coupling member **71** (FIG. **4**). Where, therefore, the movable guide board **69** is shifted in conformity to the lateral length of the respective copy sheets P_1 superposed one above the other, then the copy sheet-feeding roller unit **70** is made to move jointly with said movable guide board **69**. Therefore, a distance between the left edge of the copy sheet P_1 and the central line extending lengthwise of the left copy sheet-feeding roller unit **72**, when perpendicularly projected from said unit **72** on the surface of the copy sheet P_1, is always rendered equal to a distance between the right edge of the copy sheet P_1 and the central line extending lengthwise of the right copy sheet-feeding roller unit **70** when perpendicularly projected from said unit **70** on the surface of the copy sheet P_1.

The copy sheet-feeding roller unit is arranged as illustrated in FIG. **5**. Namely, both upright walls **73a**, **73b** of a trough-shaped arm **73** are each provided with a vertically elongate hole **75** capable of vertically guiding a bush **74**, a loose roller unit-locating hole **77** penetrated by a stopper shaft **76**, and a hole **79** for fixedly holding a bush **78**. All the holes **75**, **77** and **79** are arranged in the order mentioned as counted from the rear side of the roller unit facing the copying press to the front side thereof. A driving sprocket **80** is disposed between the upright walls **73a**, **73b** of the trough-shaped arm **73** to face the bush-holding holes **79**. A driven sprocket **81** is set between the upright walls **73a**, **73b** to

face the bush-holding holes **75**. The driving sprocket **80** is fitted to the driving shaft **46** by means of a one-way clutch **82**. The driven sprocket **81** is fitted to a copy sheet-feeding roller shaft **83**. The relative positions of the arm **73**, driving shaft **46** and copy sheet-feeding roller shaft **83** are maintained by the bushes **74, 78**. An endless chain **84** is stretched over the driving sprocket **80** and driven sprocket **81** to transmit the motive force of the driving shaft **46** to the copy sheet-feeding roller shaft **83**.

A copy sheet-feeding roller **85** is fitted to both ends of the copy sheet-feeding roller shaft **83** by means of a fixing screw **86**. The bushes **74, 78** are securely set in a prescribed position due to a snap ring **87** being engaged with an annular groove **88** formed in the peripheral walls of the driving shaft **46** and copy sheet-feeding roller shaft **83**.

The trough-shaped arm **73** of the respective right and left copy sheet-feeding roller units **70, 72** which is constructed as described above is made swingable about the driving shaft **46**, until the inner wall of the roller unit-locating hole **77** is pressed against the peripheral wall of the stopper shaft **76**. The copy sheet-feeding roller shaft **83** is made vertically movable, until the bushes **74** are pressed against the upper or lower inner wall of the bush holes **75**. As seen from FIG. **6A**, a very small gap G is provided between the outer surfaces of the upright walls **73a**, **73b** of the trough-shaped arm **73** and the inner surfaces of the flanges of the bushes **74**. As shown in FIG. **6B**, therefore, the roller unit **70** or **72** as a whole is made swingable about the axis of the copy sheet-feeding roller shaft **83** within the range of half an angle α as measured upward or downward from the axis of the roller unit **70** or **72**. In other words, the right half section of the roller unit **70** or **72** rises, while the left half section thereof falls. Or conversely, the right half section of the roller unit **70** or **72** falls, while the left half section thereof rises. The above-mentioned angle α is herein defined to mean a maximum range of swing derived from the widths of both gaps G.

A mechanism **40** for detecting the position of the uppermost copy sheet of a stack mounted on the tray of the lower copy sheet rest means **13** is provided on the left side of the stopper shaft **76**. This uppermost copy sheet position-detecting mechanism **40** comprises a roller swing-transmitting member **90**, switch-actuating lever **89** and switch **91** through which a signal is sent forth to denote the detection of the position of the uppermost copy sheet of the stack (hereinafter referred to as "the uppermost position switch **91**"). Fitted to the left end of the stopper shaft **76** is a member **90** (FIGS. **7A** and **7B**) for transmitting the extent of the vertical swing of the copy sheet-feeding roller **85** to the switch-actuating lever **89**. This transmission member **90** is formed of a bent wire. The intermediate part of the wire which is bent in the circular form **90a** is fitted about the stopper shaft **76**, thereby enabling the transmission member **90** to be rotated about the axis of the stopper shaft **76**. One end portion **90b** of the transmission member **90** is abutted to the top of the bush **74**. The other end portion **90c** is inserted into an elongate hole **89a** formed in the lower end portion of the switch-actuating lever **89** rotatably fitted to the left end of the stopper shaft **76**. The upper end portion of the switch-actuating lever **89** is made to face an actuator **91a** of the uppermost position switch **91** (FIG. **3**) fitted to the left frame **20**. Where the uppermost copy sheet P_1 is separated from the copy sheet-feeding roller **85** as shown in FIG. **7A**, and the

bush **74** rotatably supporting the copy sheet-feeding roller shaft **83** is pressed against the lower inner wall of the bush hole **75**, then the actuator **91a** of the uppermost position switch **91** is pressed by the switch-actuating lever **89**, causing said switch **91** to be rendered conducting. Where the copy sheet-feeding roller **85** is pushed by the uppermost copy sheet P_1 of the stack as shown in FIG. **7B**, and the bush **74** is pressed against the upper inner wall of the bush hole **75**, then the swing of the copy sheet-feeding roller **85** is transmitted to the switch-actuating lever **89** by means of the transmission member **90**. As a result, the switch-actuating lever **89** is rotated away from the actuator **91a** of the uppermost position switch **91**, which in turn is rendered nonconducting.

The lower copy sheet rest means **13** comprises, as shown in FIG. **8**:

a base **25**;

a spacer **92**;

a press board **93**;

a tray **94** or **95** which is of different size and selectively used in accordance with the size of copy sheets P_1 stacked one above the other; and

a plurality of fitting screws **96, 97**.

Tray supports **98** are provided on the front and back sides of the left end portion of the base **25**. Each tray support **98** is formed of an upright cutout piece formed like an overturned L-shape. Formed in the crosswise central part of the right side of the base **25** is a rectangular window **99** extending lengthwise of said base **25** to allow for the escape of the movable copy sheet stack guide board **69** (hereinafter referred to as "the stack guide board escape window"). A pair of slits **100** extending lengthwise of the base **25** are provided along both lateral edges of the rectangular window **99**. These slits **100** are penetrated by the threaded portions of the screws **97**. The tray supports **98** are each provided with a tray-supporting plane **98a** which is made spatially parallel with the base **25**. The tray-supporting plane **98a** is provided at the center with a screw hole **102**, with which there is engaged the threaded portion of a fitting screw **96** passing through a screw hole **101** formed on the left side of the tray **94** or **95**.

The spacer **92** is mounted on the right side of the upper surface of the base **25** in a state extending crosswise thereof. A pair of projections **103** provided on the underside of the spacer **92** are made to abut against both inner lateral walls of the rectangular stack guide board escape window **99**, thereby causing the spacer **92** to be set on the base **25** in a state slidable only lengthwise of said window **99**. A boss **104** is projectively mounted at both ends of the spacer **92**. This boss **104** has a tray-supporting plane **92a** having the same height as the tray-supporting plane **98a** of the tray support **98**. A boss **105** is provided at the center of the upper surface of the spacer **92** at a smaller height than the aforesaid boss **104**. A screw hole **106** is formed at the center of the tray-supporting plane **92a** of both bosses **104**. The threaded portions of the fitting screws **97** passing through the two screw holes **101** opened on the right side of the tray **94** or **95** penetrate said screw holes **106**. The threaded portions of the fitting screws **97** further pass through both screw slits **100** extending lengthwise of the base **25** and are threadedly fitted into those two of the three screw holes **102** threadedly formed in the press board **93** which are disposed at both ends of said press board **93**. A screw hole **107** is formed at the center of the middle boss **105** of the spacer **92**. The threaded portion of a

separate fitting screw **96'** passes through the stack guide board escape window **99** to be threadedly fitted into a screw hole **102** opened at the center of the narrow press board **93** disposed below the base **25**. In other words, the spacer **92** and press board **93** are coupled together by the fitting screw **96'** in a state slidable along the base **25** to an extend corresponding to the lateral length of the tray **94** or **95** which varies with the size of the copy sheets set in a copy sheet-feeding apparatus. The tray **94** or **95** is fitted to the base by means of the fitting screws **96, 97**.

That side of the tray **94** or **95** from which a copy sheet is supplied to the copying press (not shown) is provided, as shown in FIG. **9**, with a hole **109** at a point facing a detection part **108a** of a detection lever **108** of the mechanism **61** for detecting the presence of copy sheets on the tray of the lower copy sheet rest means **13** or the absence of copy sheets therefrom. The hole **109** receives the detection part **108a** when it is let to fall (the hole **109** is hereinafter referred to as "the detection part fall hole"). A pair of friction boards **110** extending along the lateral edge of the tray **94** or **95** are set near both sides of said detection part fall hole **109**. The friction boards **110** cause the uppermost copy sheet alone to be unfailingly fed into the copying press **1** even when the stack consists of a few copy sheets.

The copy sheet-detecting mechanism **61** for the lower copy sheet rest means **13** comprises, as shown in FIG. **9**, the detection lever **108**, detection lever holder **111**, switch-actuating lever **112** and copy sheet detecting switch **113**. The detection lever **108** is formed of a rigid wire and comprises a linear support section **108'** and a bent detection part **108A** contiguous to said support section **108'**. This bent detection part **108A** comprises a lever stem **108a** bent from the linear support section **108'** at right angles. The outer end portion of said lever stem **108a** is further bent substantially in the triangular form to form a detection section **108b**. The linear support section **108'** rotatably penetrates a support hole **111a** formed in the detection lever holder **111**. The left end of the linear support section **108'** is fitted with the switch-actuating lever **112**, which comprises an actuator-pressing plane **112a**. This actuator-pressing plane **112a** is normally pressed against an actuator **113a** fitted to a copy sheet-detecting switch **113**. An arrow indicated in FIG. **9** shows the direction in which a copy sheet P_1 is supplied from the stack to the copying press. Where the lower copy sheet rest means **13** is brought downward, as seen from FIG. **10A**, or cleared of all copy sheets, then the detection part **108A** is rotated more clockwise through the detection part **108A** fall hole **109** of the tray **94** or **95** than when a stack of copy sheets P_1 is mounted on the tray of the lower copy sheet rest means **13**. The clockwise rotation of the detection part **108A** leads to the similar large clockwise rotation of the switch lever **112**. The actuator-pressing plane **112a** of the switch-actuating lever **112** rotates the actuator **113a** of the copy sheet-detecting switch **113** counterclockwise. Therefore, the copy sheet-detecting switch **113** is rendered non-conducting, causing a signal to be issued to denote the absence of copy sheets from the tray of the copy sheet rest means **13**. Where the copy sheet rest means **13** carrying a stack of copy sheets P_1 is lifted, causing the uppermost copy sheet P_1 to abut against the detection part **108A** of the detection lever **108**, then the detection lever **108** is rotated about the axis of the linear support section **108'**. The copy sheet-detecting switch **113** is rendered conducting, a little before the uppermost copy sheet P_1 touches the copy sheet-feeding roller **85** as shown in FIG. **10B**, causing a signal denoting the presence of copy sheets to be sent forth. The detection lever **108** is rotated with the copy sheet-detecting switch **113** rendered conducting, until the uppermost copy sheet P_1 is pressed against the copy sheet feeding roller **85** with a proper pressure in a state ready for the copying operation.

As shown in FIG. **11**, the base portion of the substantially triangular detection section **108b** of the detection lever **108** constitutes an additional copy sheet supply-restricting stopper **108c**. This stopper **108c** prevents any more copy sheets than a prescribed number h_1 from being additionally supplied to a stack already mounted on the copy sheet rest means **13**. Therefore, a required space at least as wide as h_2 is ensured between the bottom of the copy sheet-feeding roller **85** and the uppermost copy sheet P_1 of a maximum stack.

As shown in FIG. **12**, a mechanism **62** for detecting the presence of copy sheets in a cassette type copy sheet rest means disposed in the upper section of the copy sheet-feeding apparatus or the absence of copy sheets from said cassette type copy sheet rest means comprises a detection lever **114**, detection lever holder **115**, switch-actuating lever **116**, and copy sheet-detecting switch **117**. The detection lever **114** is formed of a rigid wire whose right end is bent. Provided at the right end of the detection lever **114** for the cassette type copy sheet rest means is a detection part **114a** whose forward and rear sides are reversed from those of the detection part **108A** of the detection lever **108** for the lower copy sheet rest means **13**. A detection lever support **114'** contiguous to the above-mentioned right end portion of the detection lever **108** rotatably penetrates a support hole **115a** formed in the detection lever holder **115**. The detection part **114a** of the detection lever **114** penetrated by the drive shaft **47** can swing vertically within a prescribed range. The left end of the detection lever support **114'** is fitted with a switch-actuating lever **116**. An actuator-pressing plane **116a** of the switch-actuating lever **116** is pressed against an actuator **117a** fitted to a copy sheet-detecting switch **117**. Where a cassette **15** is not loaded in a copy sheet-feeding apparatus, or a stack of copy sheets is not received in a cassette **15** already set in the copy sheet feeding-apparatus, then the detection part **114a** of the detection lever **114** occupies the lowermost position as shown in FIG. **13A**. As in the lower copy sheet-detecting mechanism **61**, therefore, the copy sheet-detecting switch **117** is rendered nonconducting, causing a signal denoting the absence of copy sheets to be sent forth. Where at least one copy sheet P_2 is left in the cassette **15**, then the detection part **114a** of the detection lever **114** is lifted, as shown in FIG. **13B**, by said copy sheet P_2. As a result, the copy sheet-detecting switch **117** is rendered conducting, causing a switch denoting the presence of a copy sheet to be issued. An arrow indicated in FIG. **12** shows the direction in which a copy sheet P_2 is supplied to the copy press (not shown).

The front underside of a stack of copy sheets P_2 received in the cassette **15** is supported by a copy sheet stack support board **118**. This copy sheet stack support board **118** is pushed upwardly by a push lever **60** normally urged upward by a spring **119**. Therefore, the uppermost copy sheet P_2 of a stack abuts with a proper pressure against a copy sheet-feeding roller **120** fitted to the drive shaft **47** of the copy sheet-feeding mechanism of FIG. **12**. The push lever **60** is pushed on to the upper

surface of the bottom board **15**a of the cassette **15** or pressed below said bottom board **15**a through an opening **121**. A detection part fall hole **122** is formed in the copy sheet stack support board **118** at a point facing the detection lever **114** of the copy sheet-detecting mechanism **62** for the upper cassette type copy sheet rest means **14**. The detection part **114**a of the detection lever **114** is let to fall into said detection part fall hole **122**.

As shown in FIG. **3**, the cassette type copy sheet-feeding mechanism **12** is provided with a copy sheet support board push-release mechanism **59**. This push-release mechanism **59** causes the means for lifting the copy sheet support board **118** to be operated in two different modes in accordance with the vertical movement of the lower copy sheet rest means **13** resulting from the opening and closure of the copy sheet cover **9**.

Description is now given with reference to FIGS. **15**, **16** and **17** the construction and operation of the copy sheet support board push-release mechanism **59**. This mechanism **59** comprises a push lever **60** and a mechanism **124** for rotating said push lever **60**. The front side of the push lever **60** is fixedly set in place by a fitting shaft **123** which is rotatably fitted to the right and left frames **20**, **21** in a horizontal position by means of a bush **125** (only the right one is indicated). The free end of the push lever **60** is provided with a guide roller **126** allowing for the smooth attachment and detachment between the push lever **60** and copy sheet support board **118**. The right end portion of the push lever-fitting shaft **123** projects out of the right frame **21**. Mounted on the right end portion of the push lever-fitting shaft **123** are a first lever **127** engaged with a spring and a gearwheel **129** integrally provided with a second lever **128** engaged with a spring, all in the order mentioned as counted from the outer wall of the right frame **21**. The first lever **127** and gearwheel **129** including the second lever **128** are prevented from falling off the right end portion of the push lever-fitting shaft **123** by means of a snap ring **130**. Formed in the surface of the right end portion of the push lever-fitting shaft **123** is an axially extending groove **132** with which a pin **133** is engaged. This pin **133** crosswise penetrates the engagement shaft member **127**a formed on the first spring-engaged lever **127**, and is inserted into the axially extending groove **132**, thereby effecting the joint rotation of the push lever-fitting shaft **123** and first spring-engaged lever **127**. The first spring-engaged lever **127** comprises a vertical portion **127**b and a horizontal portion **127**c and takes a substantially overturned L-shape. One end of the push lever spring **119** is connected to the vertical portion **127**b of the first spring-engaged lever **127**. Said push lever spring **119** normally urges the first spring-engaged lever **127** for clockwise rotation under the condition of FIGS. **16** and **17**. Therefore, the push lever **60** is urged to be rotated up to a position indicated in 2 dots-dash lines. The outer end of the horizontal section **127**c extending rearward of the first spring-engaged lever **127** is bent outward of the right frame **21** at right angles to the body of said horizontal section **127**c. A pressure-transmitting plane **135** constituted by the underside of the free end portion of the second spring-engaged lever **128** is pressed against a pressure-receiving plane **134** constituted by the upper edge of the rectangularly bent part of the horizontal section **127**c of the first spring-engaged lever **127**.

A driven shaft **136** (FIG. **16**) is disposed above the push lever-fitting shaft **123** is parallel relationship therewith. The driven shaft **136** is rotatably fitted to the right frame **21** and a subframe **137** fitted thereto in parallel by means of a bush **139** engaged with a hole **138** formed in the right frame **21** and subframe **137**. Mounted on the driven shaft **136** are the upper sprocket **26**, hub **140** and anomalous gearwheel **141** engaged with the gearwheel **129** in the order mentioned as counted from the outer wall of the right frame **21** (FIG. **16**). The upper sprocket **26** and hub **140** are fixed to the driven shaft **136** by means of the pin **133**. A motive force-transmitting coil spring **142** is fitted around the outer peripheral wall of the hub **140**. One end **142**a of the motive force-transmitting coil spring **142** is engaged with the underside of an engagement pawl **143** integrally formed with the subframe **137**. The other end **142**b of the motive force-transmitting coil spring **142** is always fitted into an engagement groove **144** formed in the anomalous gearwheel **141**. The second spring-engaged lever **128** is normally urged to regain a prescribed position by a return spring **145**.

The push lever spring **119** has its tension controlled by a tension-adjusting mechanism **146**. This tension-adjusting mechanism **146** is fixed to the right frame **21**, and comprises a guide shaft **147** concurrently acting as a fitting shaft for the subframe **137**, a movable guide block **148** slidably set in place by means of the guide shaft **147**, a coupling member **148** which is supported by the movable guide block **148** and with which the other end of the push lever spring **119** is engaged, and an adjustment screw **150** which is threadedly inserted into the movable guide block **148**, and whose inner end face is pressed against the outer peripheral wall of the guide shaft **147**. The movable guide block **148** is retracted when the adjustment screw **150** is tightened and advanced when said adjustment screw **150** is loosened, thereby controlling the tension of the push lever spring **119**.

In other words, when the lower copy sheet rest means **13** is brought down about 12 mm (in about one second), then the sprocket **26**, hub **140** and driven shaft **136** are rotated clockwise. At this time, the motive force-transmitting spring **142** presses the hub **140** by a frictional force. Therefore, the drive of the hub **140** is transmitted to the anomalous gearwheel **141** by means of the motive force-transmitting spring **142**. The transmission of the motive force is continued, until the engagement end **142**a of the motive force-transmitting spring **142** is pressed against the engagement pawl **143** to release the tightening force (FIG. **16**). The motive force of the anomalous gearwheel **141** is transmitted to the gearwheel **129** engaged with said anomalous gearwheel **141**. The second spring-engaged lever **128** integrally formed with the gearwheel **129** is rotated counterclockwise against the urging force of the return spring **145**. Therefore, the pressure-transmitting plane **135** of the second spring-engaged lever **128** presses the pressure-receiving plane **134** of the first spring-engaged lever **127**. As a result, the first spring-engaged lever **127** is rotated counterclockwise against the urging force of the push lever spring **119** from the solid line position of FIG. **17** to a position indicated in two dots-dash lines. The push lever **60** integrally formed with the first spring-engaged lever **127** is rotated from the two dots-dash line position of FIG. **16** to the solid line position thereof, namely from the solid line position of FIG. **14** to the two dots-dash line position to remove the copy sheet-feeding cassette **15**. When the tightening force of the motive force-transmitting spring **142** is released, then the sprocket **26**, hub **140** and driven shaft **136** alone

are rotated. At this time, the other end engagement section **142b** (FIG. **16**) engaged with the engagement groove **144** of the anomalous gearwheel **141** is shifted from a position shown in FIG. **18A** to a position indicated in FIG. **18B**.

Where the lower copy sheet rest means **13** is lifted when the copy sheet cover **9** is closed, then the upper sprocket **26**, hub **140** and driven shaft **136** are rotated counterclockwise of FIG. **16** by the run of the right side endless chain **30** in the direction of a broken line arrow indicated in FIG. **16**. At the above-mentioned counterclockwise run, the motive force-transmitting spring **142** and anomalous gearwheel **141** are jointly rotated counterclockwise. Where the other end engagement section **142b** of the motive force-transmitting spring **142** is shifted from a position shown in FIG. **18B** to a position indicated in FIG. **18A**, then a frictional force ceases to take place between the motive force-transmitting spring **142** and hub **140**. Accordingly, the hub **140**, upper sprocket **26** and driven shaft **136** alone are rotated. The anomalous gearwheel **141** and gearwheel **129** engaged therewith cease to be rotated. As a result, the second spring-engaged lever **128** integrally formed with the gearwheel **129** and the first spring-engaged lever **127** are rotated from a position shown in two dots-dash line in FIG. **17** to a solid line position indicated therein. The push lever **60** integrally formed with the first spring-engaged lever **127** is rotated from the one dot-dash line position of FIG. **16** to the solid line position indicated therein, namely, from the solid line position shown in FIG. **14** to the two dots-dash line position indicated therein. Therefore, the push lever lifts the copy sheet support board **118** without shaking it, thereby enabling copy sheets to be supplied from the cassette **15** to a copying press (not shown).

The mechanism **39** for detecting the lowermost position of the lower copy sheet rest means **13** comprises a pin **151** provided in the left side rear part of said copy sheet rest means **13**, and a lowermost position-detecting switch **152** whose actuator **152a** is set in the traveling course of the pin **151** at a point capable of detecting the prescribed lowermost position of the copy sheet rest means **13**.

Description is now given chiefly with reference to FIG. **3** of the operation of a copy sheet-feeding apparatus embodying this invention. Where the copy sheet cover **9** shown in FIGS. **1** and **2** is closed, then the switch **18** for detecting the open state of the copy sheet cover **9** is rendered conducting, thereby effecting the drive of the reversible motor **34** of the chain drive device **38** of the mechanism **41** for actuating the lower copy sheet rest means **13**. Where the right and left endless chains **30**, **29** run in the normal direction (the direction of a solid line arrow indicated in FIG. **3**) then the lower copy sheet rest means **13** is lifted. Where the uppermost copy sheet P_1 of a stack mounted on said rest means **13** pushes the detection lever **108** (FIG. **9**), then the copy sheet detection switch **113** is rendered conducting to generate a signal denoting the presence of copy sheets on the copy sheet rest means **13**. Where the lower copy sheet rest means **13** is further lifted to push the copy sheet-feeding rollers **85** of the right and left copy sheet-feeding roller units **70**, **72**, then the uppermost position-detecting switch **91** of the uppermost position-detecting mechanism **40** is rendered conducting to stop the drive of the reversible motor **34**, and consequently the lifting of the copy sheet rest means **13**, thereby rendering an elevator type copy sheet-feeding mechanism **11** ready to supply a copy sheet to a copying press (not shown).

The rise of the lower copy sheet rest means **13** also causes the copy sheet stack support board **118** of the copy sheet cassette **15** of the cassette type copy sheet-feeding mechanism **12** to be pushed by the push lever **60** (FIG. **14**).

Where the print button **3** of FIG. **1** is pushed under the condition in which an instruction is already given to specify the supply of copy sheets stacked on the tray of the lower elevator type copy sheet rest means **13**, then the drive sprocket **52** (FIG. **3**) is actuated. At this time, the first electromagnetic clutch **53** is rendered conducting, causing the drive of the endless chain **51** to be transmitted to the drive shaft **46** of the uppermost copy sheet-picking up mechanism **42** for the lower copy sheet rest means **13**. As a result, the uppermost copy sheet P_1 of a stack mounted on said rest means **13** is taken out of the stack by the rotation of the copy sheet-feeding roller **85** and conducted to that side of the copy sheet-feeding apparatus on which the timing-adjusting restart copy sheet-feeding roller **44** is set. Thereafter the third electromagnetic clutch **57** is actuated in proper timing, causing said timing-adjusting restart copy sheet-feeding roller **44** to be rotated for the supply of a copy sheet to the copying press.

Where the copy sheet-feeding roller **85** is progressively brought down as copy sheets are removed from a stack one after another, starting with the uppermost one, then the uppermost position-detecting switch **91** of the uppermost position-detecting mechanism **40** is rendered nonconducting. As a result, the lower copy sheet rest means **13** is lifted in a prescribed stepwise mode. This stepwise or intermittent lifting of the copy sheet rest means **13** enables the uppermost copy sheet of a stack to be always set in a position falling within a prescribed range in which an electrostatic image of the original material never fails to be impressed on the copy sheet. Where all the copy sheets P_1 of a stack have been supplied to a copying press, then the detection part **108a** of the detection lever **108** of the paper-detecting mechanism **61** is allowed to fall, as shown in FIG. **10A**, into the detection part fall hole **109** of the tray **94** or **95** of the lower copy sheet rest means **13**. As a result, the copy sheet-detecting switch **113** is rendered nonconducting. At this time, the display section **5** of the control panel **6** indicates the absence of copy sheets.

Where the print button **3** of the copying press **1** of FIG. **1** is pushed under the condition in which an instruction is already given to specify the supply to the copying press of copy sheets P_2 received in the cassette type copy sheet-feeding mechanism **12**, then the drive sprocket **52** is actuated. At this time the second magnetic clutch **54** of the copy sheet feeding roller-driving mechanism **45** is actuated, causing the drive of the endless chain **51** to be transmitted to the drive shaft **47** of the uppermost copy sheet-picking up mechanism **43** for the upper cassette type copy sheet-feeding mechanism **12**. As a result, the uppermost copy sheet P_2 of a stack received in the cassette type copy sheet-feeding mechanism **12** is picked up by the rotation of the copy sheet-feeding roller **120**, and then conducted to that side of the copy sheet-feeding apparatus on which the timing-adjusting restart copy sheet-feeding roller **44** is provided. When the third electromagnetic clutch **57** is actuated in proper timing for the rotation of the timing-adjusting restart copy sheet-feeding roller **44**, then the copy sheet is supplied to the copying press. When the

cassette **15** is cleared of all copy sheets, then the detection part **114a** of the detection lever **114** of the copy sheet-detecting mechanism **62** is allowed to fall, as shown in FIG. **13**, into the detection part fall hole **122** formed in the copy sheet stack support board **118** (FIG. **14**). As a result, the copy sheet-detecting switch **117** is rendered non-conducting. The display section **5** of the control panel of FIG. **1** indicates the absence of copy sheets.

When the absence of copy sheets is indicated in the display section **5**, then the operator opens the copy sheet cover **9** for the supply of a fresh stack of copy sheets P_1 or P_2 to the lower copy sheet rest means **13** or cassette type copy sheet-feeding mechanism **12**. Where the copy sheet cover **9** is opened, the switch **18** for detecting the open and closed states of the copy sheet cover **9** is rendered nonconducting. As a result, the reversible motor **34** of the chain-driving mechanism **38** of the copy sheet rest means-actuating mechanism **41** is driven backward, causing the right and left endless chains **30, 29** to run backward in the direction of a broken line arrow indicated in FIG. **3** for the lowering of, for example, the lower copy sheet rest means **13**. When the actuator **152a** of the lowermost position-detecting switch **152** is pushed by the pin **151** integrally formed with the lower copy sheet rest means **13**, then the reversible motor **34** stops its run, causing the copy sheet rest means **13** to stand still in the allowable lowermost position. On the other hand, where the lower copy sheet rest means **13** is brought down, then the push lever **60** for lifting the copy sheet stack support board **118** (FIG. **14**) of the copy sheet-feeding cassette **15** is rotated to the two dots-dash line position for the removal of the copy sheet-feeding cassette **15**.

Where the used cassette **15** is taken out, a stack of fresh copy sheets is supplied to the lower copy sheet rest means **13** or some additional copy sheets are supplied to a stack still mounted on the copy sheet rest means **13**. Or fresh copy sheets having different sizes from those already impressed are supplied to the cassette **15** thus taken out. Or where necessary, the cassette **15** itself maybe replaced by one having a different size in anticipation of the different sizes of fresh copy sheets which will be used in any of the following copying cycles. Later when the copy sheet cover **9** is closed, all automatically becomes ready for the immediately succeeding copying operation.

Where it is attempted to supply additional copy sheets P_1, as shown in FIG. **11**, to a stack still mounted on the lower copy sheet rest means **13**, then the stopper section **108c** of the detection lever **108** of the copy sheet-detecting mechanism **61** physically prevents those of additionally supplied copy sheets whose stacked height would rise above the upper limit height h_1 of a normal stack of copy sheets from being superposed on the stack already placed on said copy sheet rest means **13**.

As seen from FIGS. **6A** and **6B**, the right and left copy sheet-feeding roller units **70, 72** of the uppermost copy sheet-picking up mechanism **42** for the lower copy sheet rest means **13** are each vertically movable relative to the arm **73** and also can be rotated about the lengthwise center of the copy sheet-feeding roller shaft **83** relative to said arm **73**. Therefore, no matter how the uppermost copy sheet of a stack is positioned relative to a horizontal plane, namely whether the right or left side of the uppermost copy sheet is displaced, for example, downward from said horizontal plane, as shown in FIGS. **19A** to **19D**, the copy sheet-feeding roller units **70, 72** never fail to be eventually pressed against the surface of the uppermost copy sheet as seen from FIG. **19E**, thereby enabling the uppermost copy sheet to be reliably carried forward to the copying press with a uniform pressure.

What is claimed is:

1. A sheet feeding apparatus comprising:

first sheet-holding means having a sheet rest for supporting a stack of sheets which sheet rest is movable up and down between a sheet replenishing position and a sheet supply position;

second sheet-holding means having a cassette for supporting a stack of sheets and which is movable between a sheet replenishing position and a sheet supply position;

a sheet cover movable between a closed position at which it covers [both] the first [and second] sheet-holding means and an open position at which [both of] said first [and second] sheet-holding means [are] *is* exposed;

a first drive mechanism for driving the first sheet-holding means between the sheet replenishing position and the sheet supply position;

a detection mechanism for detecting the open position and the closed position of the cover and for supplying to the first drive mechanism an open signal when the cover is open and a closed signal when the cover is closed, the first drive mechanism causing the sheet rest to (a) move from the sheet supply position to the sheet replenishing position in response to the open signal and (b) move from the sheet-replenishing position to the sheet supply position in response to the closed signal; and

a second drive mechanism for causing the cassette to (a) move from the sheet supply position to the sheet replenishing position in response to the movement of the sheet rest from its sheet supply position to its sheet replenishing position and (b) move from the sheet replenishing position to the sheet supply position in response to the movement of the sheet rest from its sheet replenishing position to its supply position.

2. A sheet feeding apparatus according to claim **1**, wherein said second sheet-holding means includes a cassette rest fixedly mounted such that the cassette is removably placed thereon, the cassette including a case body and a paper support plate rotatably mounted within the case body to support the front portions of the sheets, the paper support plate being rotatable by the second drive mechanism between the sheet replenishing position and the sheet supply position.

3. A sheet feeding apparatus according to claim **2**, wherein said second drive mechanism includes a push-up lever mounted such that it is rotatable and engageable with the paper support plate, and a push-up lever operating mechanism for causing the push-up lever to rotate the paper support plate between the sheet replenishing position and the sheet supply position by a drive force for causing the first drive mechanism to move the sheet rest from the sheet replenishing position to the sheet supply position.

4. A sheet feeding apparatus according to claim **3**, wherein said first sheet-holding means is disposed below the second sheet-holding means and the cassette and which, when at the sheet replenishing position, is positioned such that it can be removed from the cassette rest.

5. A sheet feeding apparatus according to claim 1, 2, 3 or 4, wherein said first sheet-holding means includes a replenishing amount restricting member.

6. A sheet-feeding apparatus according to claim 5, wherein the sheet rest has a slit in a portion thereof adapted to receive a stack of sheets, and which further comprises a mechanism for detecting the presence of sheets on the sheet rest or the absence of sheets therefrom, the sheet-detecting mechanism including a detection lever which is moved to a first position capable of abutting against the uppermost sheet of a stack when

the stack is mounted on the sheet rest, and, at the absence of any sheet, is moved to a second position in which said detection lever is allowed to fall into the slit formed in the sheet rest and a sheet-detecting switch for generating (a) a signal indicating the presence of a sheet when the detection lever is in said first position, and (b) a signal indicating the absence of a sheet when the detection lever is in said second position, the replenishing amount restricting member being provided on the forward end of the detection lever.

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