May 27, 1952 W. F. HUCK ET AL 2,597,932

ROTARY PRINTING MACHINE WITH REVERSIBLE PRINTING UNIT

Original Filed Feb. 15, 1945 6 Sheets-Sheet 1

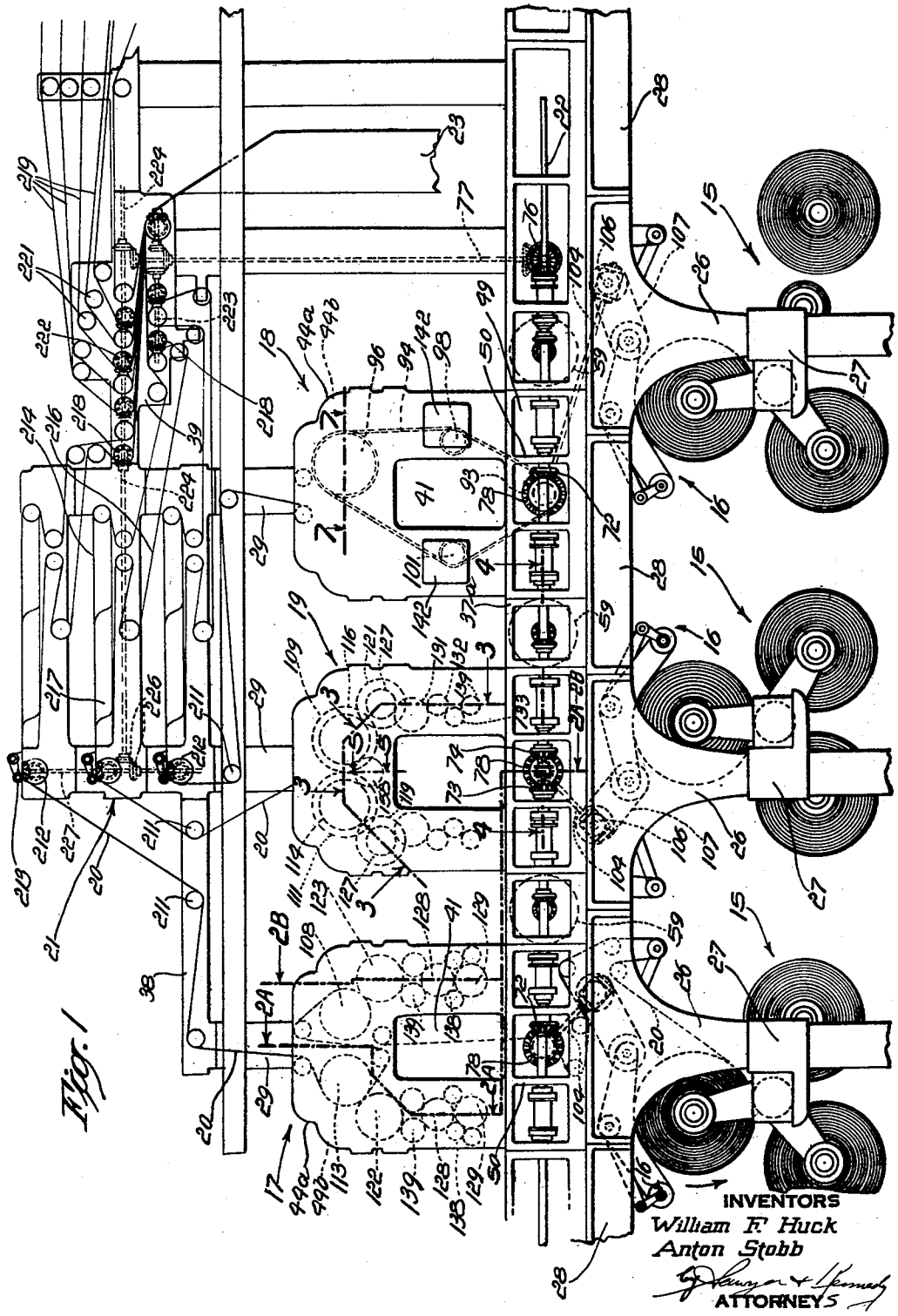

Fig. 1

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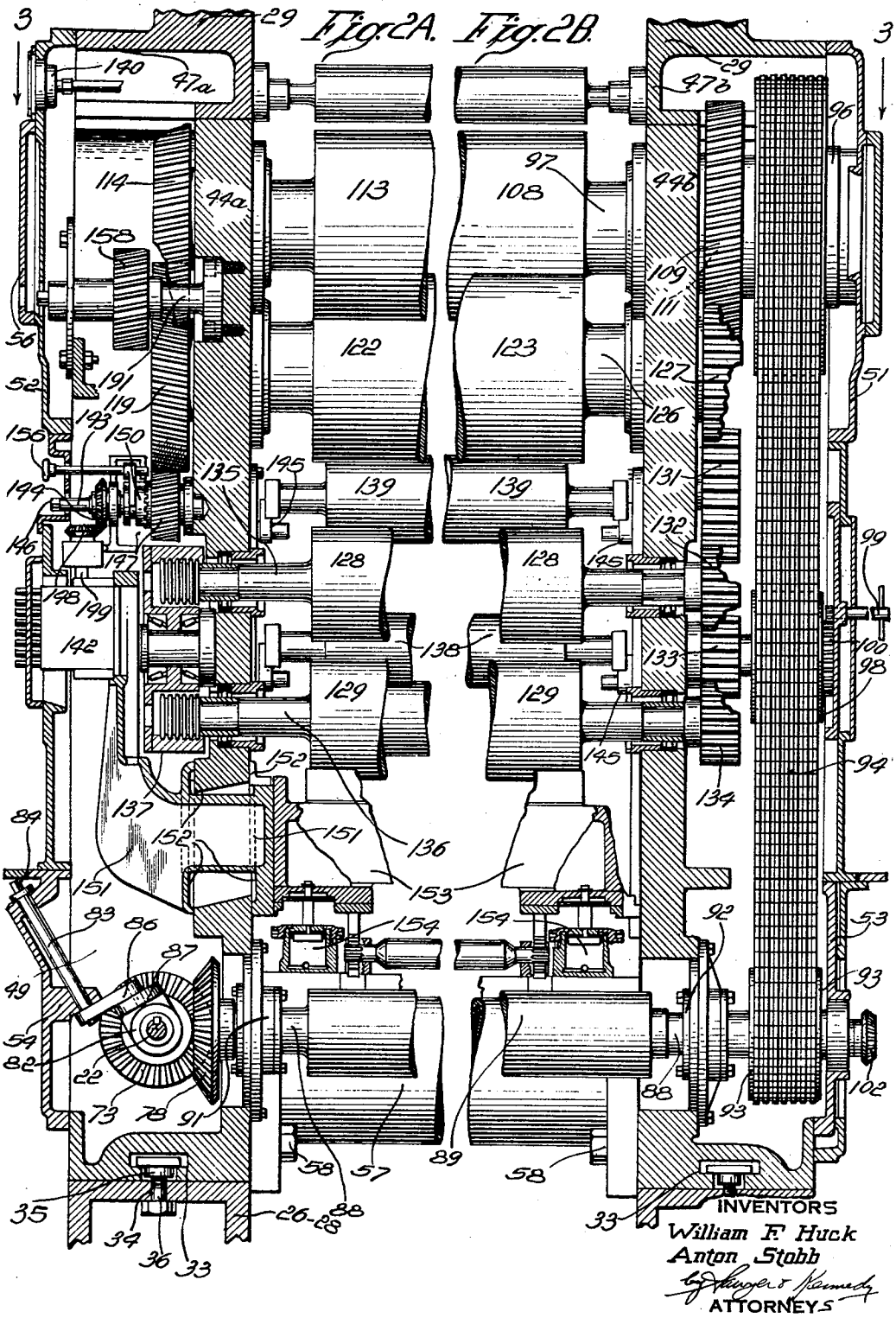
ROTARY PRINTING MACHINE WITH REVERSIBLE PRINTING UNIT

Original Filed Feb. 15, 1945 6 Sheets-Sheet 2



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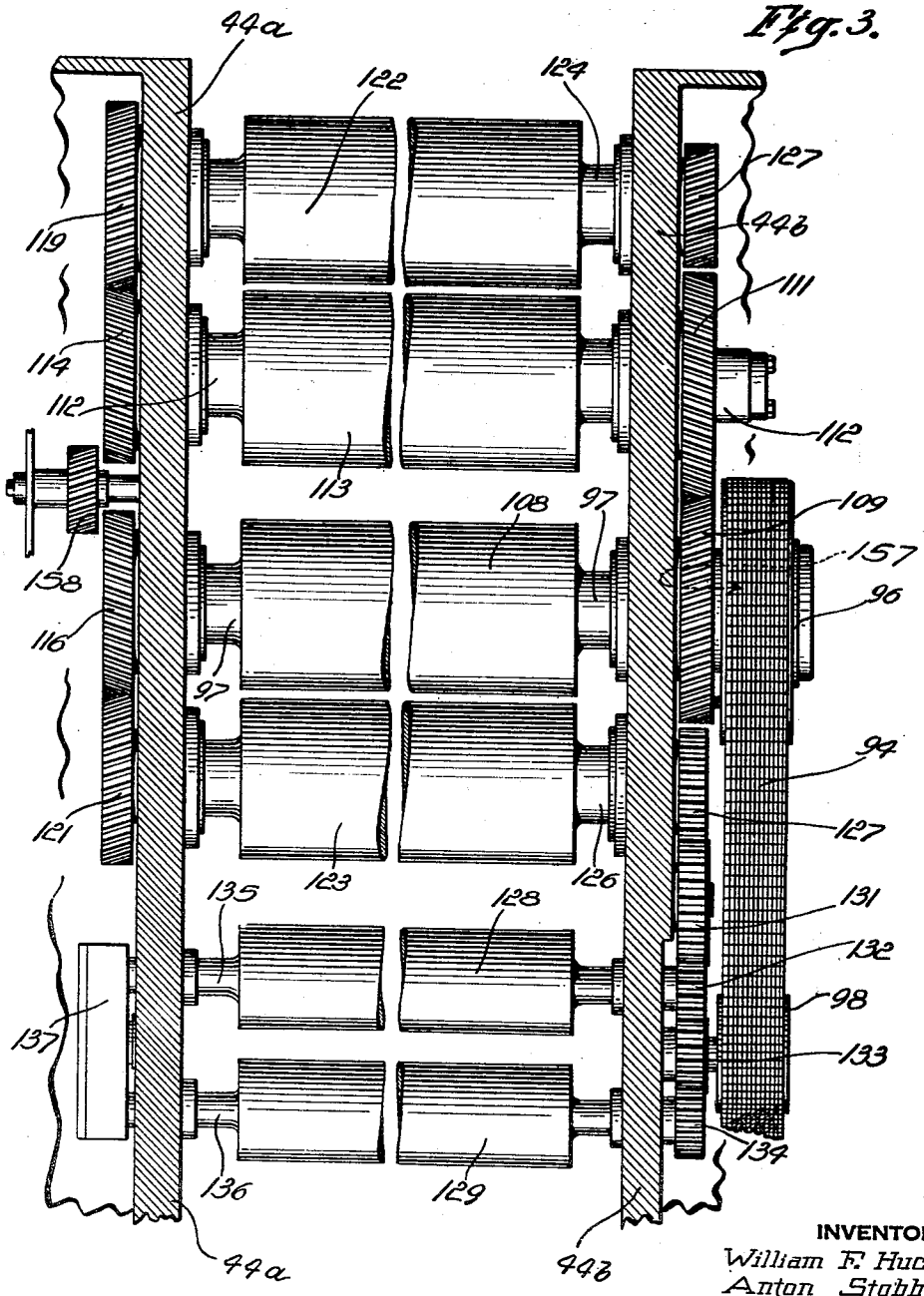
ROTARY PRINTING MACHINE WITH REVERSIBLE PRINTING UNIT

Original Filed Feb. 15, 1945 6 Sheets-Sheet 3

Fig. 3.



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ROTARY PRINTING MACHINE WITH REVERSIBLE PRINTING UNIT

Original Filed Feb. 15, 1945 6 Sheets-Sheet 4

Fig. 4.

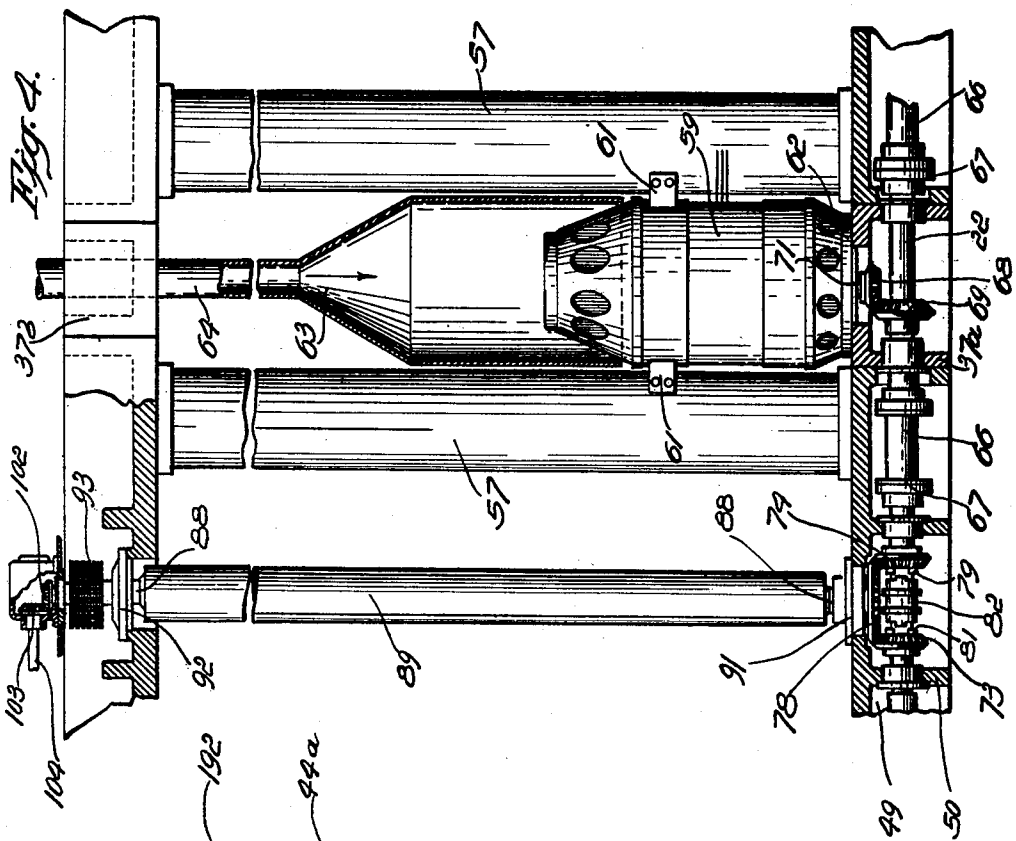


Fig. 5.

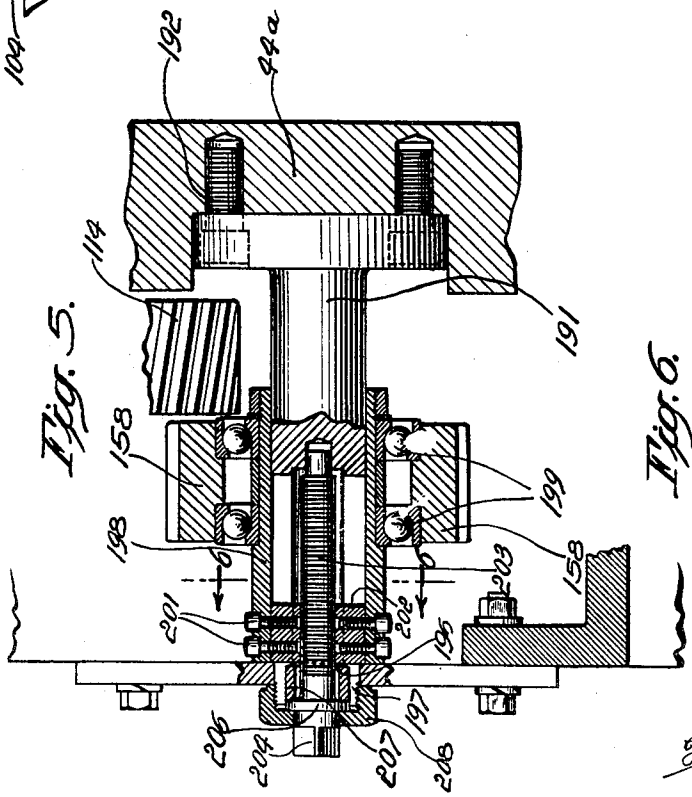
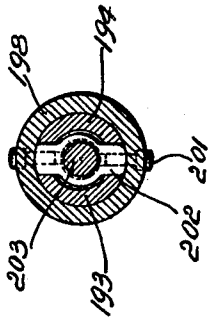


Fig. 6.



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ROTARY PRINTING MACHINE WITH REVERSIBLE PRINTING UNIT

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Fig. 7

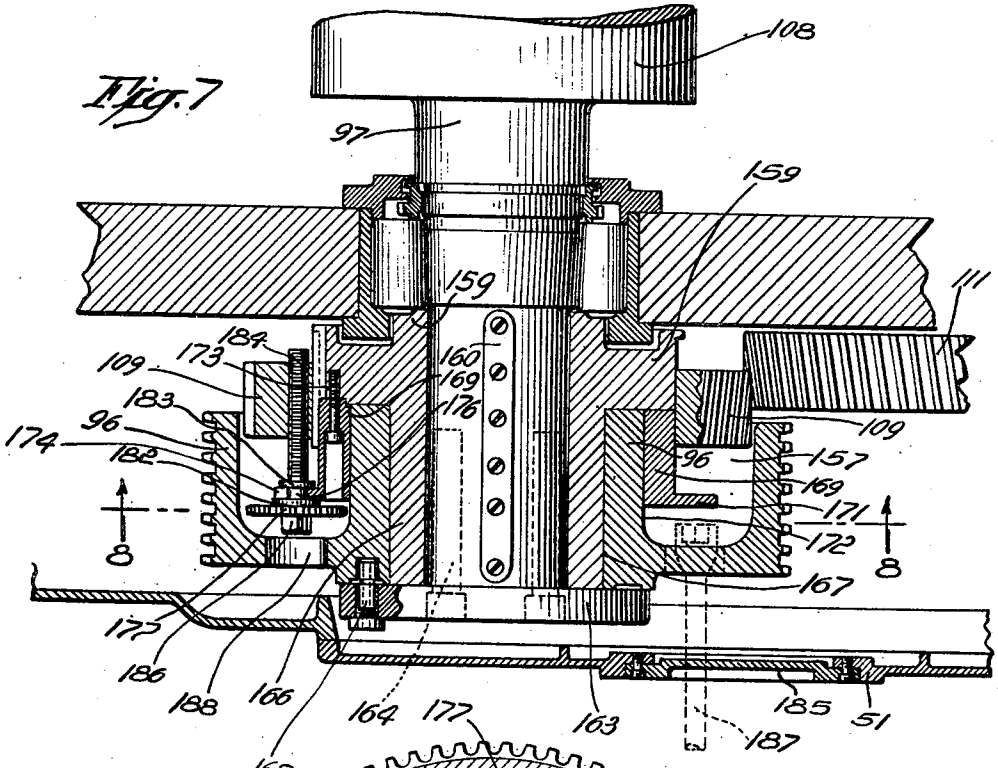
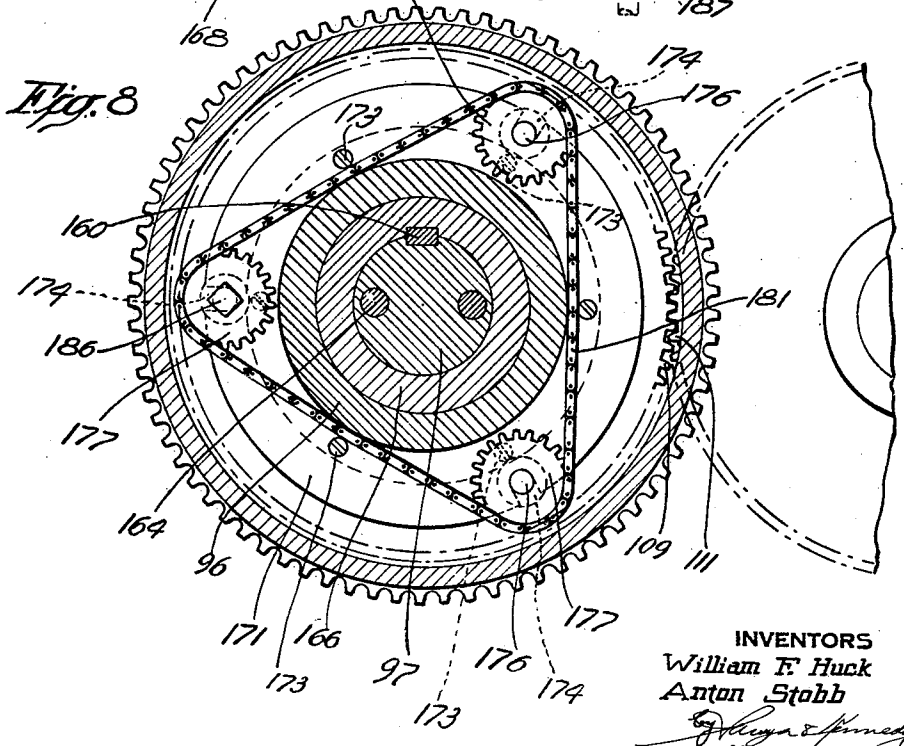


Fig. 8



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ROTARY PRINTING MACHINE WITH REVERSIBLE PRINTING UNIT

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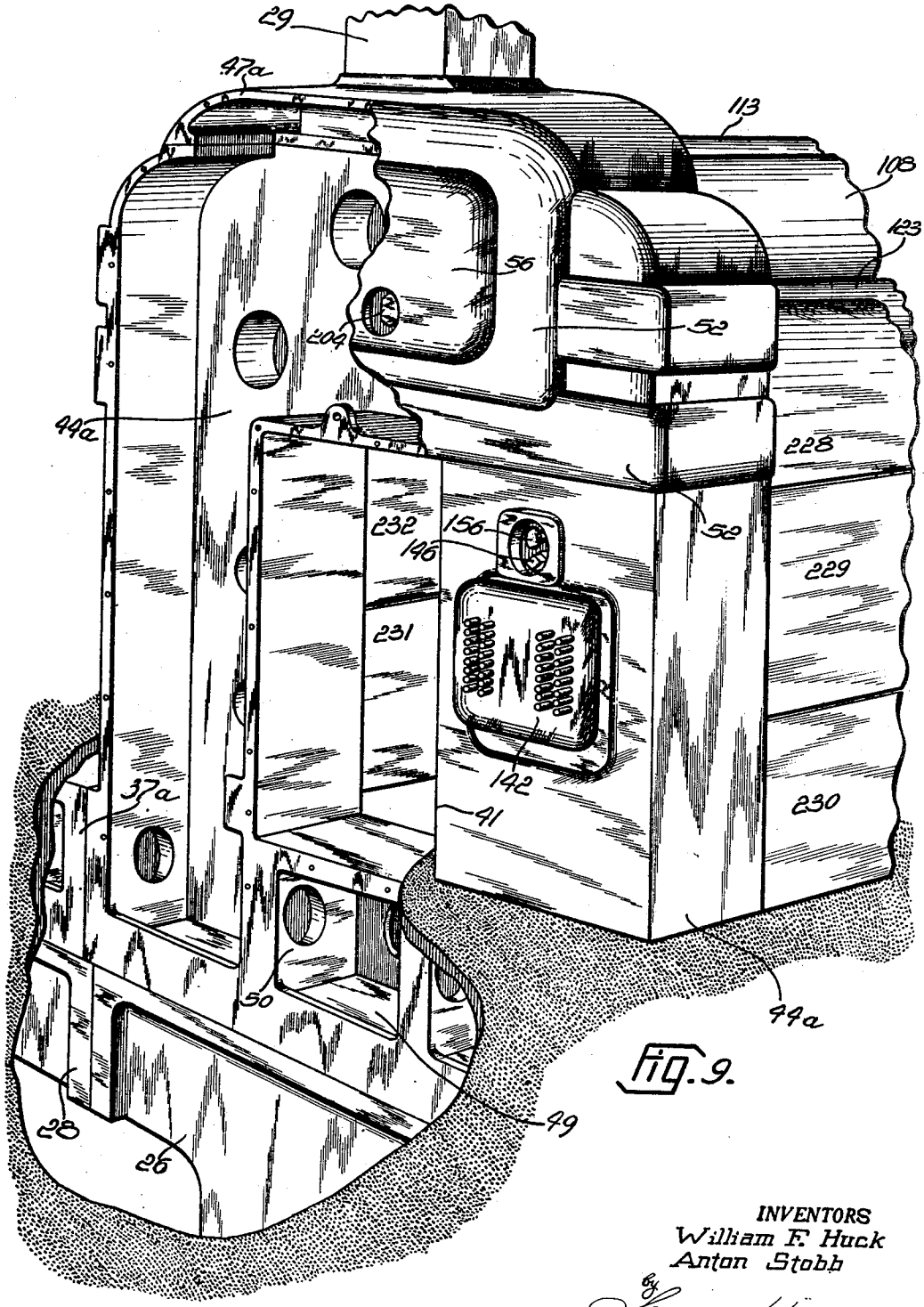

Fig. 9.

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2,597,932

UNITED STATES PATENT OFFICE

2,597,932

ROTARY PRINTING MACHINE WITH REVERSIBLE PRINTING UNIT

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Original application February 15, 1945, Serial No. 577,980. Divided and this application July 17, 1946, Serial No. 684,099

2 Claims. (Cl. 101—220)

1

This invention relates to printing machines and more particularly to large web fed printing machines having a plurality of individual printing units arranged in alignment for use primarily in printing newspapers.

An object of the invention is to provide a new and improved web printing machine made up of a plurality of substructure units, printing units, spacing members, superstructure units and folders, which without change of design, may be arranged in various combinations as may be required to produce a desired range of printed products.

Another object of the invention is to provide a new and improved printing machine having self-contained printing units, in each of which all of the gearing and driving mechanism of the unit and also a portion of the main driving shaft of the machine, is enclosed.

Another object of the invention is to provide an enclosed printing unit having novel means operable from outside of the enclosure for reversing some or all of the printing cylinders.

Another object of the invention is to provide a new and improved printing unit with a fully enclosed driving mechanism, and in which access to the printing cylinders, all of the ink rollers, and of all the rollers about which the web is led, is not restricted by the driving mechanism.

Still another object of the invention is to provide a web fed printing machine of generally improved construction, whereby the various units of the machine will include all desirable features, and will be simple, as well as convenient and efficient in use. Other objects of the invention will appear in the following description and claims.

The present application is a division of my application Serial Number 577,980, filed February 15, 1945, which has become Patent No. 2,549,813, issued April 24, 1951, for Printing Machines, the claims of the present application being directed to the improved gearing arrangements disclosed, while the claims of the parent application are directed to improved combinations and arrangements of the press components.

The preferred embodiment of the invention is illustrated in the accompanying drawings wherein:

Figure 1 is an elevational front view with certain cover members omitted, showing a web fed printing machine composed of a plurality of web supplying devices, and a plurality of printing units, combined with a folder and web forwarding means;

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Figures 2A and 2B are vertical sectional views showing details of a printing unit, taken respectively along the offset lines 2A—2A and 2B—2B of Figure 1;

Figure 3 is a development of a portion of one of the printing units showing the relationship between the printing cylinders, the inking cylinders, and the driving mechanism as viewed in the direction of the arrows 3 of Figure 2, and along the irregular line 3 of Figure 1;

Figure 4 is a plan view showing a portion of the driving mechanism taken along the line 4—4 of Figure 1;

Figure 5 is an elevational view, partly in section, showing a portion of the cylinder reversing mechanism taken along the line 5—5 of Figure 1;

Figure 6 is a sectional view taken along the line 6—6 of Figure 5, and looking in the direction of the arrows;

Figure 7 is a view, partly in section, showing another portion of the cylinder reversing mechanism taken along the line 7—7 of Figure 1, and as viewed from the rear of the unit;

Figure 8 is a view, partly in section, taken along the line 8—8 of Figure 7; and

Figure 9 is a perspective view of a portion of one of the printing units, with some parts omitted and other parts broken away.

Referring to the drawings, the invention has been shown in Figures 1 to 9, which depict a printing machine including a plurality of printing units, of which there are shown herein, two non-reversible units 17 and 18, and one reversible unit 19, a plurality of web roll reels 15, web tension controlling mechanisms 16, a plurality of web forwarding units 21, a main line drive shaft 22 and a folder 23, assembled to produce a complete printing machine for operating upon a plurality of webs 20. Except for the reversible feature of the printing unit 19, that is more fully described hereinafter, the three printing units 17, 18 and 19 are identical in structure. In Figure 1 the printing unit 17 is shown with printing cylinders and inking rollers, while the units 18 and 19 are shown with the gearing and chain drive respectively.

Web supplying devices each comprising a web roll reel 15, and web tensioning devices 16 are supported from a substructure having a plurality of front and back columns 26 each having a bracket 27 secured thereto for supporting the web roll reel 15. Columns 26 that are not immediately adjacent are joined together at their tops by horizontal spacers 28 to form a substructure.

Box-type front and back printing unit side

frames 44a and 44b respectively (Figures 1 and 2), are each made in the general form of a box with a rectangular walled opening or passage 41 extending through its center portion. Compartments are thus formed for all of the gearing associated with the printing unit, including the driving gears and the main shaft. Front and back frames 44a and 44b are each provided with a T slot 33 extending along its under side and holes 34 in the top portion of the columns 26, and the spacers 28 receive bolts 36 which engage nuts 35 in the slots 33 to fasten the frames 44a and 44b to the substructure. Due to the longitudinally extending slots 33, the printing units 17, 18 and 19 can be positioned at any desired location, lengthwise of the printing machine, and with respect to the columns 26. Cap members 47a and 47b, forming the top of the side frames 44a and 44b respectively, are formed with posts 29 on which rest the web forwarding units 21 and other superstructure members 38 and 39. The outward-facing sides of the frames 44a and 44b are closed by a plurality of removable covers 51, 52, 53 and 54. Some of the covers, as for example the cover 52, are provided with cover plates such as 56 that can be removed to give access to certain portions of the internal mechanism. Adjacent printing units are spaced lengthwise of the printing machine by box-type front and rear spacers 37a and 37b (Figure 4), which rest on the front and rear columns 26 and spacers 28. The lower portion 49 of the front frame 44a is formed with a plurality of vertical ribs 50 which support bearings for the horizontal drive shaft 22.

The lower portions of the frame 44a and of the frame 44b of each printing units are preferably connected by flanged tubular members 57 attached to the frame members by bolts 58. Between the front and rear spacers 37a and 37b, a motor 59 is supported by brackets 61 secured to the adjacent tubular members 57. The front end of the motor 59 is provided with a flange 62, and secured to the front spacer 37a. A ventilating hood 63 and an air duct 64 extend from the rear of the motor and through the rear spacer 37b as shown in Figure 4. Preferably the air ducts for each motor 59 will be connected to a supply of cool air from a blower, not shown.

The main line shaft 22, composed of a plurality of shaft sections 66 (Figure 4), joined by couplings 67, extends the complete length of the printing machine and is journaled in parts of the lower portion of each front frame 44a and in the front spacers 37a. The shaft 22 is driven by each motor 59 through bevel gears 68 and 69 secured to the motor shaft 71 and a shaft 22 section respectively. The main line shaft 22 drives the various printing units 17, 18 and 19 through bevel gears 72, 73, 74, and 78. The shaft 22 also by a pair of bevel gears 76, drives a horizontal cross shaft (not shown). The horizontal shaft, by a pair of bevel gears drives a vertical shaft 77 which in turn, drives rollers carried by the superstructure. The bevel gears 73 and 74 for driving the reversible unit 19 are rotatably mounted on the main line shaft 22 and are both in mesh with a large bevel gear 78 (Figures 1 and 4). The gears 73 and 74 each have a coupling face 81 and 79 respectively which is engaged alternatively by a double ended coupling member 82 that may move lengthwise of the shaft 22 but is keyed against rotation thereon. When the coupling member 82 is moved lengthwise of the shaft to engage the coupling face 79, the cylinders of the printing unit 19 will be driven in one direction, and when the coupling member is moved to engage the coupling face 81, the printing unit cylinders will be driven in the opposite direction. As herein shown, the double ended coupling member 82 of the reversible printing unit 19 is operated by mechanism including a shaft 83 (Figure 2), carried by the cover plate 54 and having a wrench engaging portion 84. Secured to the lower end of the shaft 83 is a lever 86 that pivotally supports a yoke 87 engaging the coupling member 82. Turning the shaft 83 by a wrench (not shown), moves the coupling member 82 lengthwise of the main shaft 22 and connects it to either the gear 73 or gear 74, and thereby drives the reversible printing unit in either direction desired. The units 17 and 18 are driven by the gear 72, permanently secured to the shaft 22 and in mesh with gears 73. Each bevel gear 78 is secured to a cross shaft 88 (Figures 2 and 4) that carries a web guiding roller 89. The shaft 88 is journaled in bearings 91 and 92 that are secured to the front and rear frames. A driving sprocket wheel 93 secured near the rear end of the shaft 88 cooperates with a chain 94 (Figures 1, 2 and 3), to drive each printing unit through a driven sprocket wheel 96 supported on an impression cylinder shaft 97. Sprocket wheels 98 and 101 are supported from the rear frame and are equipped with an eccentric type tightening means 100 operated by a wrench 99 for tightening or loosening the chain as desired. The chain 94 is carried from the driving sprocket wheel 93 to the sprocket wheel 98, then to the driven sprocket wheel 96, then to the sprocket wheel 101, and then back to the sprocket wheel 93 in such a manner that all the parts are contained within the frame enclosure. This permits the opening 41 in the center of the frame entirely free of operating mechanism.

The shaft 88 also carries a bevel gear 102 (Figures 2 and 4) on its extreme rear portion. The gear 102 cooperates with a bevel gear 103 secured to one end of a diagonally extending shaft 104 (Figure 1), the other end of which is connected to drive belts 107 of the web tensioning mechanism 16, through a pair of bevel gears in a gear box 106.

Each printing unit 17, 18 and 19 has two printing couples composed of cylinders 108—123 and 113—122 respectively. The shaft 97 (Figure 3), which is journaled in the main front and rear frame members 44a and 44b in addition to carrying the driven sprocket 96, and the impression cylinder 108, has a helical gear 109 slidable axially on the shaft 97 (Figure 7), but secured against rotation thereon. The gear 109, when in the position shown in Figure 3, meshes with a second helical gear 111 mounted on the back end of a shaft 112 of the second impression cylinder 113. Helical gears 114 and 116, secured to the front ends of the impression cylinder shafts 112 and 97, are each in mesh with helical gears 119 and 121 secured to the front ends of shafts 124 and 126 for driving the form cylinders 122 and 123 respectively. The shafts 124 and 126, that are journaled in the front and rear frame members 44a and 44b each carry at their rear end, a helical gear 127 for driving inking cylinders 128 and 129 of the printing unit in a well known manner. For example, each gear 127 is in mesh with an intermediate gear 131 which is in mesh with the first of a train of ink motion gears 132, 133 and 134. The shafts 135 and 136 of the

inking cylinders are provided with a reciprocating mechanism 137, preferably constructed in accordance with Patent No. 2,282,655 issued May 12, 1942. The driving mechanism is all fully enclosed by the frames, and it is lubricated by an oil circulating system (not shown) having a gauge 140 (Figure 2) for indicating the oil pressure.

The inking rollers 138 and 139 (Figure 2) are preferably supported from a plurality of cam brackets 145 more fully shown and described in a pending application, Serial Number 447,091, filed June 15, 1942, which has become Patent No. 2,383,970, issued September 4, 1945.

An ink pump 142, preferably of the type shown in a pending application, Serial No. 573,038, filed January 16, 1945, which has become Patent No. 2,469,796, issued May 10, 1949, is employed there being one for each printing couple. The pump 142 is driven through a pinion 147 which meshes with the gear 119 (Figure 2). A clutch 150, having an operating handle 156 connects a shaft 143, which carries a bevel gear 144 and has a wrench engaging portion 146, with the pinion 147. A bevel gear 148 in mesh with gear 144 is carried on a shaft 149 which drives the ink pump 142. The ink pump is supported on a bracket 151 having lugs 152 slidably fitted to the front unit frame member 44a. An ink rail 153, through which ink is supplied to the ink cylinder 129, is secured to the bracket 151, and a pair of fluid pressure cylinders 154 are provided for raising and lowering the ink rail 153 with the bracket 151 and the pump 142 attached thereto.

To reverse the direction of rotation of the impression cylinder 113 and the form cylinder 122 of the printing unit 19, with respect to the rotation of cylinders 108 and 123 respectively, the helical gear 109 (Figures 3 and 7) is slipped out of engagement with the impression cylinder gear 111 and into a recess 157 provided inside of the driven sprocket wheel 96, and a slip gear 158 (Figures 1, 3, and 5) is meshed with both of the impression cylinder gears 114 and 116. When this is done, the second impression cylinder 113 is driven in a direction opposite to that in which it is driven when the gears 109 and 111 are in mesh. The mechanism by which the impression cylinder gear 109 is thus moved, includes a sleeve 166 (Figure 7), having a flange 159 and secured to the end of the shaft 97 by a key 160, and the sprocket wheel 96 has an internal bore 167 which is fitted to the outside of the sleeve 166. An end plate 163 is secured to the end of the shaft 97 by a plurality of bolts 164, and a shear pin 168 drives the plate 163 and causes the shaft 97 to rotate with the driven sprocket wheel 96. A collar 169 carried within the recess 157, on a hub 172 of the sprocket 96, has an outside diameter equal to the outside diameter of the flange 159 and the collar 169 has a flange 171.

The collar 169 is secured to the sleeve 166 by a plurality of bolts 173 screw threaded into the flange 159, and the periphery of the flange 171 has notches 174 each acting as a bearing for a shaft 176. Small sprocket wheels 177 are secured to the shafts 176, and a bicycle type chain 181 (Figure 8) is led about the sprockets. Each shaft 176 is provided with collars 182 and 183 positioned to engage opposite sides of the flange 171, and also has a threaded stem 184 that is screwed into a threaded hole in the gear 109. One of the shafts 174 is formed with a squared end 186 for receiving a wrench 187 (Figure 7),

which after removing a hand hole cover 185, may be passed through a hole 188 in the large sprocket wheel 96, when the sprocket wheel is turned to bring the hole opposite the hand hole. When the sprockets 177 are rotated in one direction, the gear wheel 109 is moved out of engagement with the gear wheel 111 and is pulled into the recess 157 in the sprocket wheel 96. Rotating the sprockets 177 in the opposite direction causes the gear 109 to move out of the recess 157 and into engagement with the gear 111.

The mechanism by which the gear 158 is slipped into and out of mesh with the gears 114 and 116 of the two impression cylinders 113 and 108, includes (Figures 3, 5 and 6), a flanged stud 191 secured to the front frame 44a by bolts 192. The stud 191 at its unflanged end, is bifurcated to form two semi-cylindrical fork members 193 and 194, each of which near its outer end is provided with an internal shoulder 196 and an externally threaded portion 197. A sleeve 198, longitudinally slidable on the stud 192, carries the inner race of two ball bearings 199, the outer races of which carry the slip gear 158. The left hand end of the collar 198, as seen in Figure 5, is secured by screws 201 to a specially formed nut 202 positioned in the slot formed by the fork members 193 and 194. The nut 202 is engaged by a screw 203 having a wrench engaging portion 204 and a collar 206. The screw 203 is prevented from longitudinal movement in one direction by a cap nut 208, that is screwed to the threaded portion 197, and held from movement in the opposite direction by a sleeve 207, that abuts the shoulder 196. Turning the screw 203 causes the sleeve 193 and the gear 158 to move axially along the stud 191 and thus engage or disengage the slip gear with the two gears 114 and 116.

Figure 9 shows a perspective view of the outside of one of the printing units, with the cover broken away, the driving mechanisms removed and some of the cylinder shafts cut off to better show the construction of the front box-type side frame 44a in the lower portion of which the line shaft 22 and its associated members is carried. This view also shows the cover of the ink pump 142 through which the regulating screws project, and shows hinged outside cylinder-guard panels 228, 229, and 230, and similar inside panels 231 and 232. These panels extend between the front and back frames and are arranged to be swung out of the way to give access to the cylinders and inking mechanism for minor adjustments, and are readily removable.

As each web 20 leaves the web supply mechanism, it is carried by the usual guide rollers to the printing cylinders, and as each printed web 20 leaves its printing unit, it is led about guide rollers 211 to one of the web forwarding units 21, each of which may include a web propelling roller 212, one or more slitters 213, turning bars 217, and guide rollers, as required. The web forwarding units 21 are similar in construction and are stacked one upon another. In each unit 21 the web propelling roller 212 cooperates with the slitting knife 213 to drive the web and to slit it into two ribbons 214 and 216. The ribbon 214 from each web, passes over turning bars 217 and thereby is aligned with the ribbon 216.

The ribbons then pass over guide rollers and about other web propelling rollers 218 and are carried to the folder 23. Other ribbons 219, from printing units not shown, also pass over rollers 221 and web propelling rollers 222 and then are carried to the folder 23. The web propelling roll-

ers are driven by means of the vertical shaft 77, from the main drive shaft by the bevel gears 76. The shaft 77 is geared to a pair of horizontal shafts 223 and 224, which in turn drive the several web propelling rollers 218 and 222, and the horizontal shaft 224 is also connected by a pair of bevel gears 226, to a vertical shaft 227 for driving the web propelling rollers 212.

From the foregoing description it is evident that a printing machine for simultaneously printing any desired number of webs can be assembled, using the required number of printing units, folders and other unit parts herein disclosed. The substructure can be assembled using front and back columns 26, for supporting the web roll reels 15, each below its printing unit, and front and back horizontal spacers 28, used where necessary for spacing the web roll reels, and below the folders. The reels require more space longitudinally of the machine than the printing units, and hence the reels and units are not vertically aligned, but the tension controlling mechanism for each reel is driven by its associated printing unit by using a connecting shaft 104 of suitable length. Also any member of web forwarding rails 21 as required may be stacked in order to associate all of the webs to be printed and forwarded to the adjacent folder.

It is also evident that with printing units having the box-type of frame herein disclosed, in which the driving mechanism is all within the frame structure, a wide opening is left through the center of the frame on both sides of the machine, making all of the rollers and cylinders of each unit far more accessible than in conventional printing units, and making it much easier to thread a web through the machine. Furthermore, the location of the controls for the ink pumps and the mechanism for reversing the cylinders, and for adjusting the chain, all being accessible from the outside of the frame, contribute to making the printing unit herein disclosed much more convenient to operate than any heretofore known.

It is also evident that the printing machine disclosed can be operated with covers removed to expose any or all of the gearing and drive shafts. This is possible, because all of the shafts, gearing, and other moving parts are supported from main frame members and not by the covers. The arrangement is especially advantageous when the machine is being assembled, and when it is desirable to observe the mechanism in operation.

It will be understood that the invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof, and it is therefore desired that the present embodiment be considered in all respects as illustrative and not restrictive, reference being made to the claims rather than to the foregoing description for an indication of the scope of the invention.

What we claim is:

1. In a printing machine having a plurality of individual printing units, one of the printing units comprising a first impression cylinder having a shaft, a sprocket wheel carried by the shaft for driving the same and having a recess, a first gear on the shaft and secured against rotation relative thereto, a second gear fixed on the shaft, a second impression cylinder having a shaft and a first and second gear fixed on the shaft of the second impression cylinder; reversing mechanism comprising a means for slidably moving the first gear of the first impression cylinder out of mesh with the first gear of the second impression cylinder and into the recess in the sprocket wheel, and a slip gear slidably mounted for movement into engagement with the second gear of each of the impression cylinders.

2. In a printing machine having a plurality of individual printing units each having a pair of box-type side frames, at least one of the printing units having a first impression cylinder shaft, a sprocket wheel carried by the shaft for driving the same and having a recess, a first gear on the shaft and secured against relative rotation thereto, a second gear fixed on the shaft, a second impression cylinder shaft and a first and a second gear fixed on the second impression cylinder shaft; reversing mechanism comprising means for slidably moving the first gear on the first impression cylinder shaft out of mesh with the first gear on the second impression cylinder shaft and into the recess in the sprocket wheel, and a slip gear slidably mounted for movement into engagement with the second gears of the first and second impression cylinders, all of the said gears and sprockets being positioned within the box-type side frames.

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