

July 5, 1966

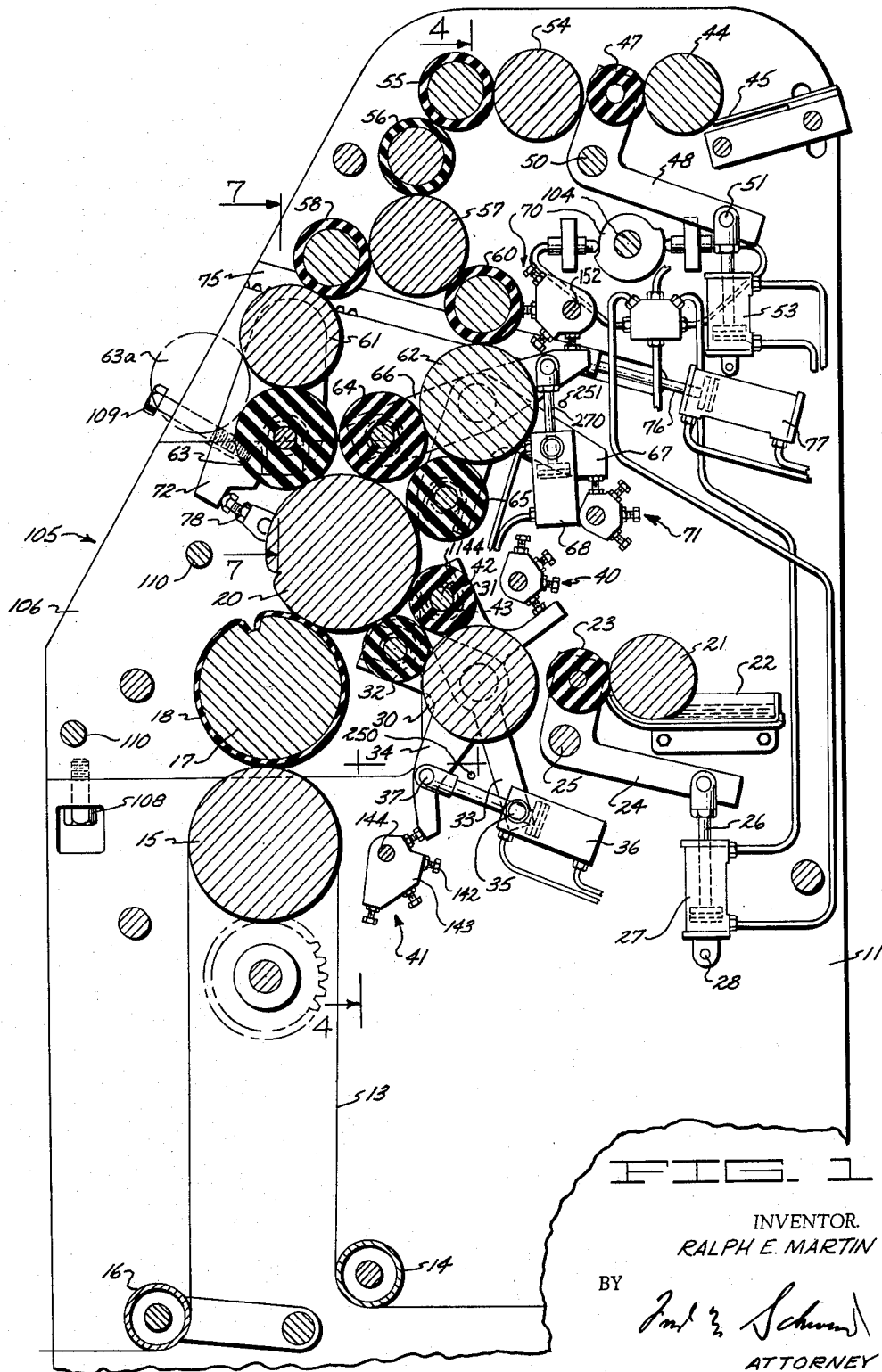
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OFFSET ROTARY PRINTING PRESS

Filed Dec. 23, 1963

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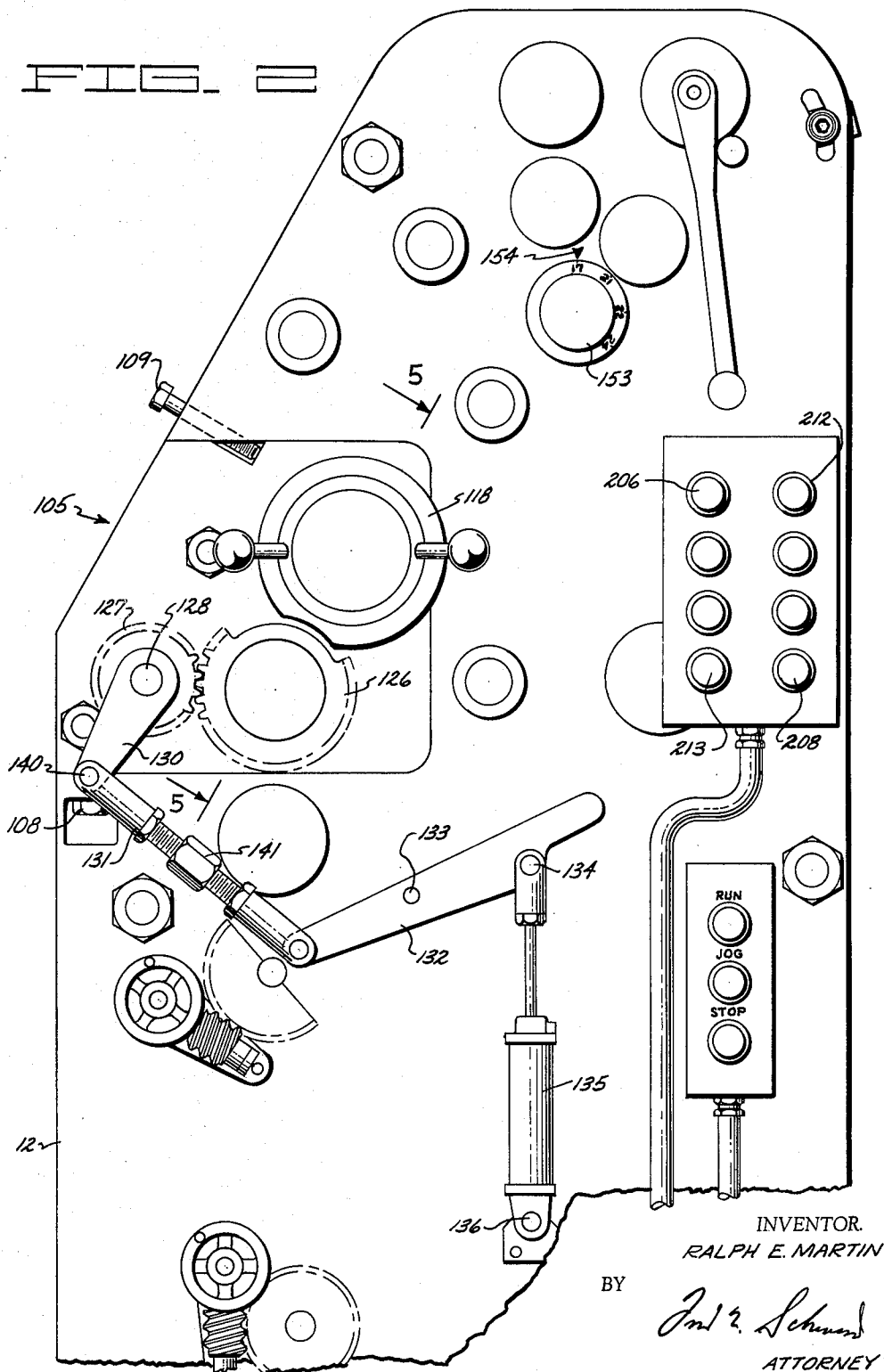
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FIG. 2



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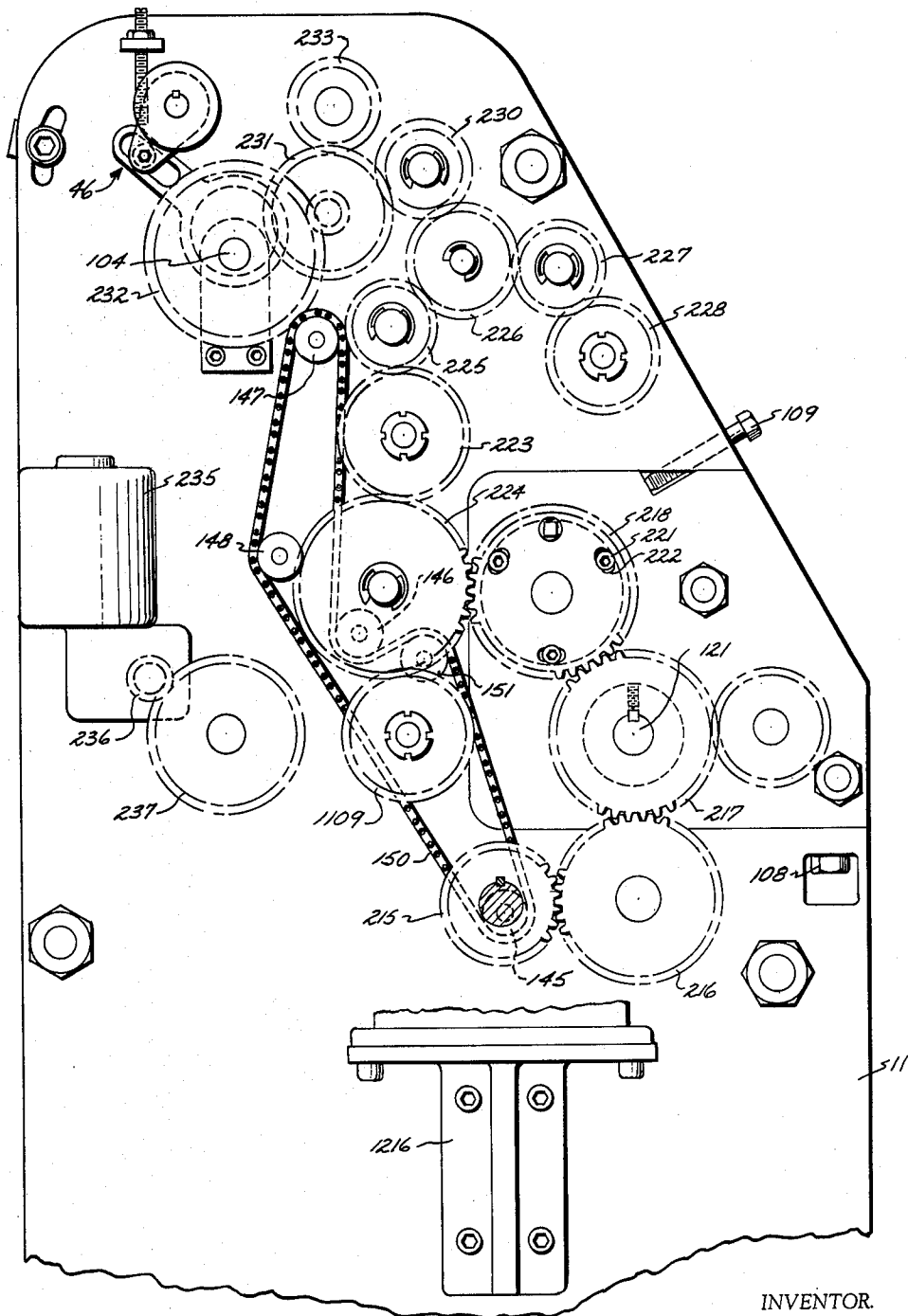


FIG. 3

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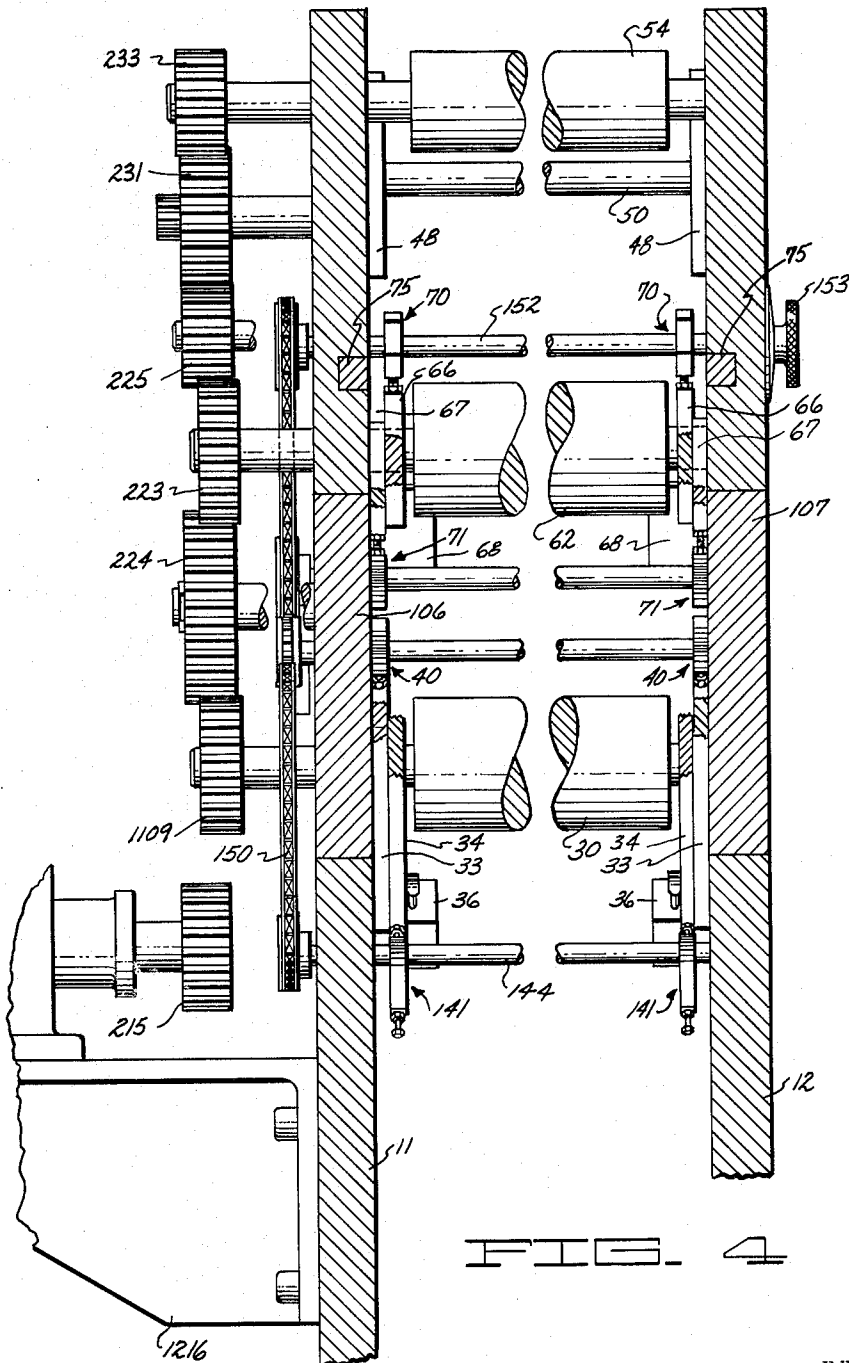


FIG. 4

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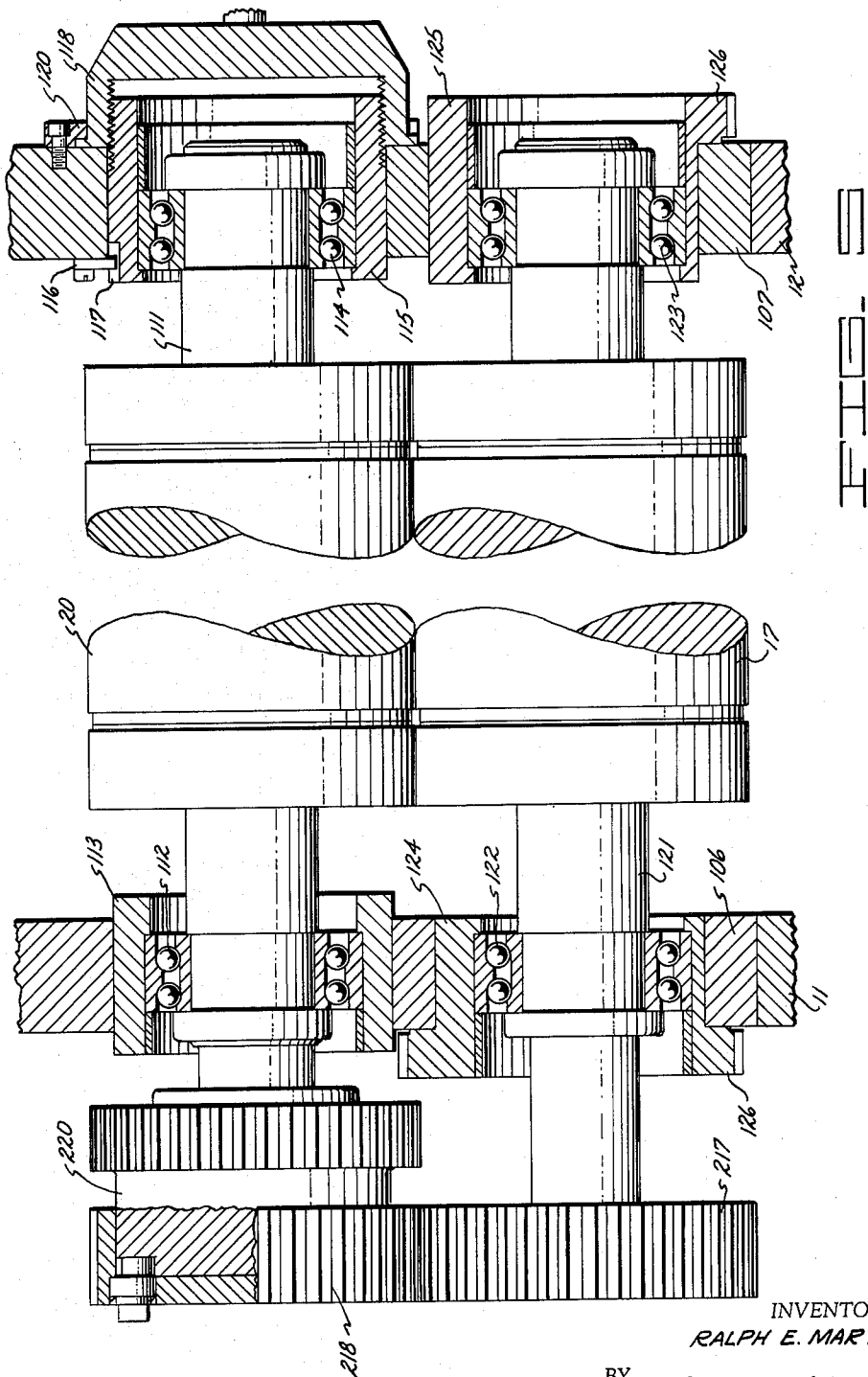
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10 Sheets-Sheet 5



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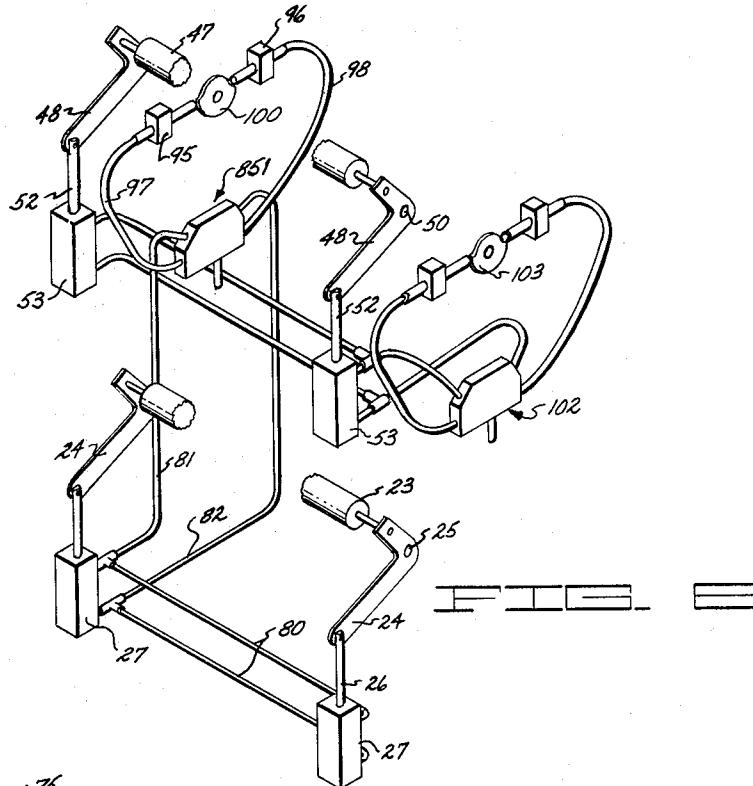


FIG. 6

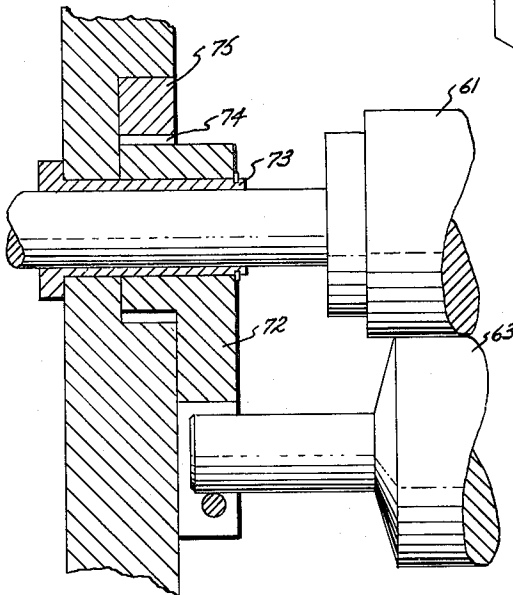


FIG. 7

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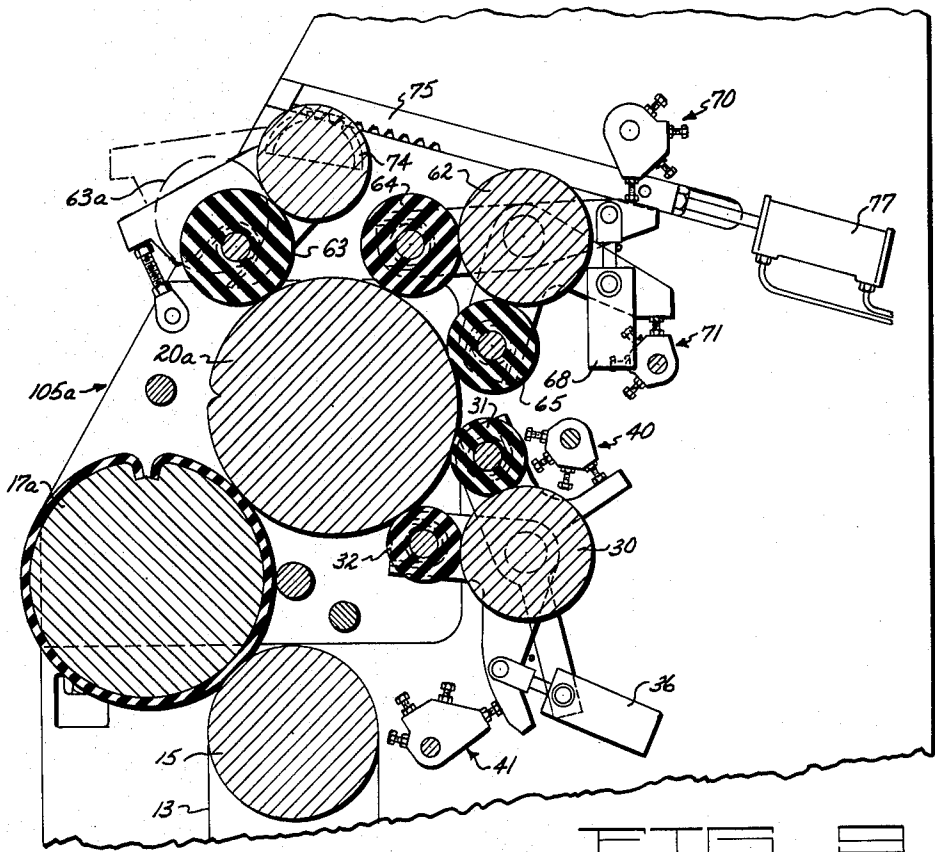


FIG. 1

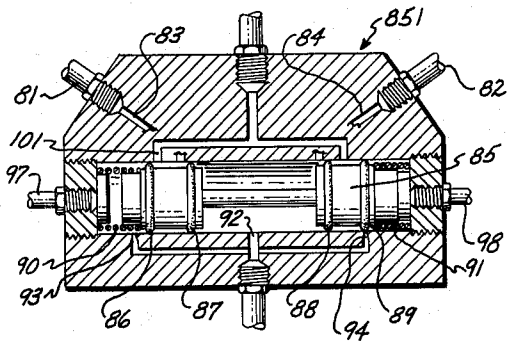


FIG. 2

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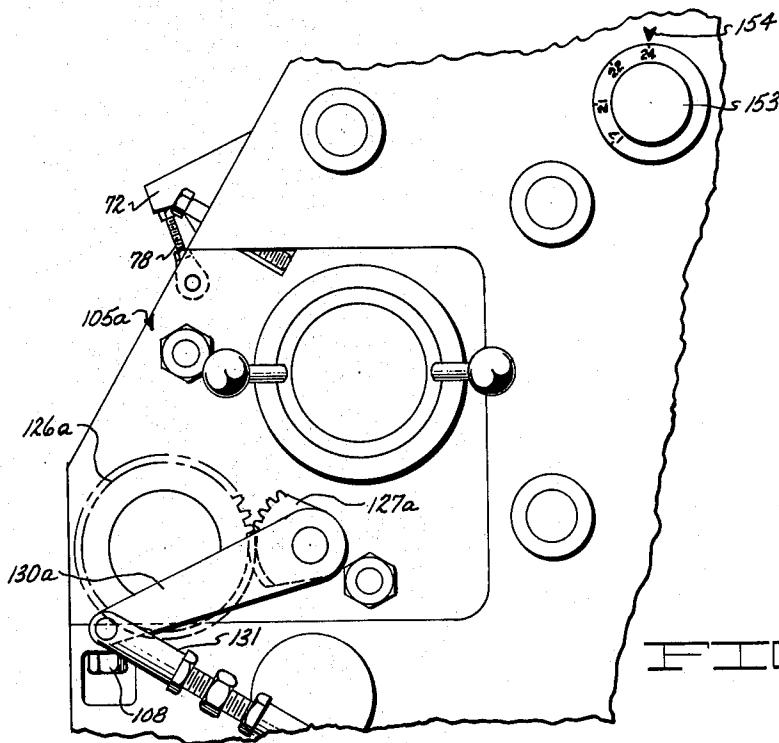


FIG. 10

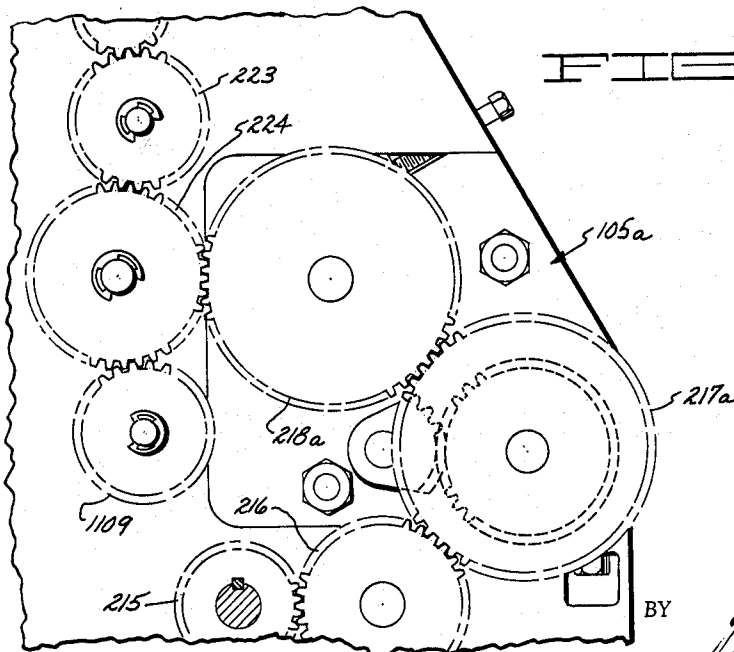


FIG. 11

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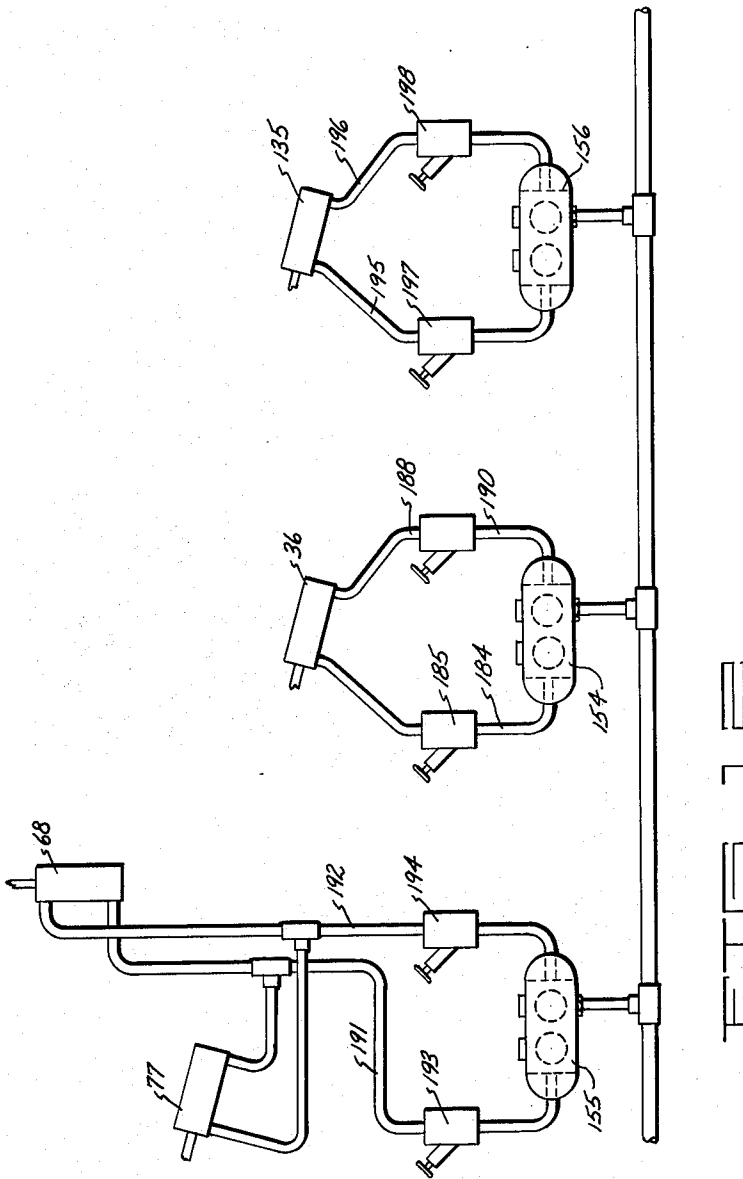
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10 Sheets-Sheet 9



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FIG. 14

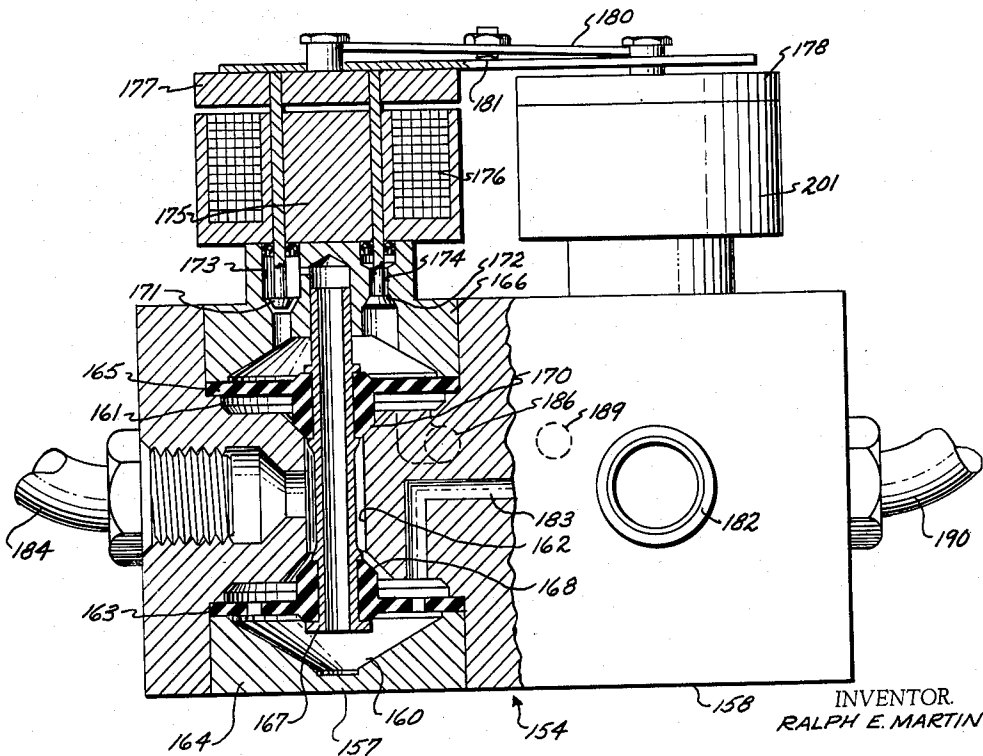
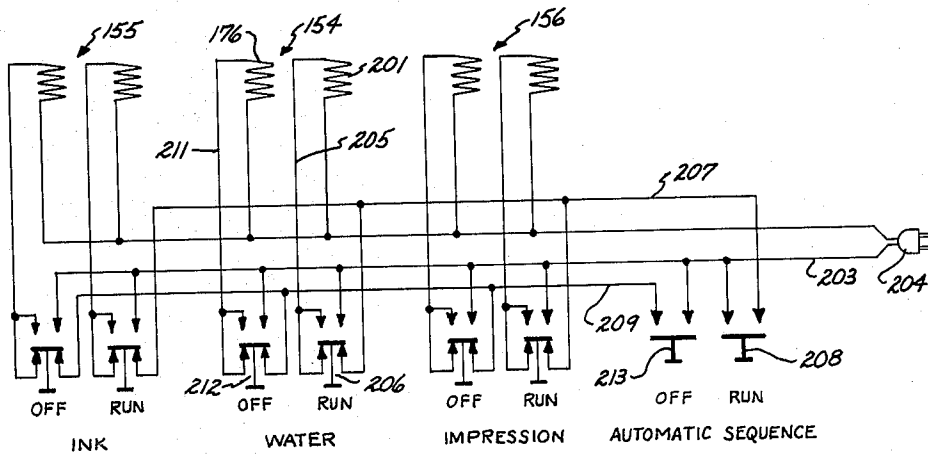


FIG. 15

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23 Claims. (Cl. 101-144)

This invention relates to rotary offset printing presses and has particular reference to presses in which printing cylinders of different diameters may be interchanged.

Offset rotary presses for printing on a continuous web of paper or the like are generally restricted to printing cylinders of a single diameter only so that only impressions of a particular length of multiples of such length may be printed. Although presses accommodating plate and blanket cylinders of different diameters have been proposed and built, such presses generally require considerable dismantling and adjustment of parts in order to substitute cylinders of one diameter for those of another, thus requiring considerable down-time of the press during changeover.

Accordingly, a principal object of the present invention is to provide a rotary offset press in which sets of plate and blanket cylinders of different diameters may be readily interchanged.

Another object is to provide a press of the above type in which a minimum amount of dismantling is necessary to replace a plate and blanket cylinder unit of one diameter by a unit of a different diameter.

Another object is to readily and rapidly adjust the ink, water and impression mechanisms of a press of the above type to accommodate different plate and blanket cylinders of different diameters.

Another object is to automatically separate the ink and water form rollers and blanket cylinder in a predetermined sequence.

Another object is to automatically engage the ink and form rollers and blanket cylinder in a predetermined sequence.

The manner in which the above and other objects of the invention are accomplished will be readily understood on reference to the following specification when read in conjunction with the accompanying drawings, wherein:

FIG. 1 is a sectional elevation view through a printing station of a rotary web-fed press illustrating a preferred embodiment of the present invention.

FIG. 2 is a front view of the printing station showing the operator's side.

FIG. 3 is a rear view of the printing station showing the driving side.

FIG. 4 is a transverse sectional view through the printing station and is taken substantially along the line 4-4 of FIG. 1.

FIG. 5 is a transverse sectional view of a removable printing cylinder unit and is taken substantially along line 5-5 of FIG. 2.

FIG. 6 is a perspective schematic view of the control mechanism for the ink and water ductor rolls.

FIG. 7 is a transverse sectional view illustrating the mounting for one of the ink form rolls and is taken along line 7-7 of FIG. 1.

FIG. 8 is a sectional view through one of the control valves for the ductor rolls.

FIG. 9 is a sectional view similar to FIG. 1 but with parts broken away and showing an alternative printing cylinder unit embodying larger diameter plate and blanket cylinders.

FIG. 10 is a front view similar to FIG. 2 but with parts broken away and showing the printing cylinder unit of FIG. 9.

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FIG. 11 is a rear view similar to FIG. 3 with parts broken away and showing the printer cylinder unit of FIGS. 9 and 10.

FIG. 12 is a schematic view illustrating the pneumatic actuating mechanism for engaging and disengaging the water form rollers, ink form rollers and impression cylinder.

FIG. 13 is a sectional view through one of the control valves illustrated in FIG. 12.

FIG. 14 is a schematic view illustrating the electrical controls for the pneumatic mechanism shown in FIG. 12.

Referring in particular to FIGS. 1 to 4, the press includes a pair of spaced vertical side frames 11 and 12 suitably supported by a base (not shown). Various web feeding, inking and guiding rollers are supported in bearings carried by such side frames, as will appear later.

A continuous web 13 of paper or the like is continually fed at a constant speed from a suitable supply source or from a preceding printing station and is guided around a guide roller 14, over an impression cylinder 15 and under an adjustable compensating roller 16 to either a succeeding printing station or to a delivery station, not shown, where the web may be either cut into appropriate lengths or rewound onto a takeup roll.

A blanket cylinder 17 carrying a rubber blanket 18 on its periphery engages the upper surface of the web as it passes around the impression cylinder to transfer an ink image from a plate cylinder 20 having a lithographic plate thereon to the web in the usual manner.

Water dampening mechanism for the plate cylinder comprises a water foundation roll 21 rotatably mounted in bearings carried by the side frames. The roll 21 is partially emersed in a water tray 22 and is effective to transfer a film of water to a ductor roll 23 supported for free rotation at its opposite ends in bell cranks 24 which are pivotally supported at 25 and are pivotally connected to piston rods 26 of double acting cylinders 27. The latter are pivoted at 28 to respective ones of the side frames 11 and 12.

As will be described later, by alternately applying air under pressure to the opposite ends of the cylinders 27, the ductor roll 23 will be swung between rolling engagement with the fountain roll 21 and rolling engagement with a vibrating roller 30.

The roller 30 is continuously reciprocated in an axial direction in the usual manner to evenly distribute a water film to a pair of water form rollers 31 and 32 rotatably supported at opposite ends thereof by levers 33 and 34, respectively. Both such levers are independently supported for movement about the axis of the roll 30. Lever 33 is pivoted at 35 to a double acting cylinder 36 while the lever 34 is pivoted at 37 to the piston rod of such cylinder. Thus, application of air pressure to the right-hand end of the cylinder 36 will rock the levers 33 and 34 into their illustrated positions, causing the form rollers to engage the plate cylinder 20, at which time the levers are arrested by stop devices generally indicated at 40 and 41, to be described in detail later on. Application of air pressure to the lefthand end of the cylinder 36 will rock the levers 33 and 34 in opposite directions to remove the form rollers 31 and 32 from rolling engagement with the plate cylinder.

It will be noted that the shaft 42 of each of the form rollers carries at each end thereof a bearing sleeve 43 which is guided along spaced parallel guide edges 44 on the respective lever to permit the rollers to properly align themselves in equalized rolling engagement with the roller 30 and plate cylinder 20. When the rollers are moved from engagement with the plate cylinder, they engage the surface of the roller 30 with a minimum pressure, due solely to their own weight, to thus prevent formation

of flat spots along their lengths when the press is shut down for extended lengths of time.

The inking mechanism for the plate cylinder comprises an ink fountain roll 44 rotatably mounted in bearings carried by the side frames and cooperating with an ink tray 45 of conventional construction. The fountain roller 44 is incrementally advanced through an intermittent drive mechanism generally indicated at 46, FIG. 3, to transfer a film of ink to a ductor roller 47. The latter is carried at opposite ends thereof by bell cranks 48 pivoted at 50 and pivotally connected at 51 to the piston rods 52 of double acting cylinders 53. The bell cranks are oscillated, as it will appear later, to transfer an ink film to a train of rollers including a metal distributor roller 54, rubber covered distributor rollers 55 and 56, vibrator roller 57, distributor rollers 58 and 60, vibrator rollers 61 and 62 and ink form rollers 63, 64 and 65.

The form rollers 64 and 65 are rotatably carried by levers 66 and 67, respectively, both independently mounted for movement about the axis of roller 62, there being a pair of such levers at opposite ends of the rollers 64 and 65. Each lever 67 is pivoted to a double acting cylinder 68 and lever 66 is pivoted to the piston rod 70 of such cylinder. Application of fluid pressure at the upper end of each cylinder 68 will move the form rollers into their positions shown wherein they are effective to transfer a film of ink from the vibrator roller 62 to the plate cylinder. In such position, the levers 66 and 67 limit against stop devices generally indicated at 70 and 71, respectively.

The form roller 63 is rotatably supported by arms 72 at opposite ends thereof, one of which is also shown in FIG. 7. Each arm is pivoted on a bearing bushing 73 which also rotatably supports the vibrator roller 61 whereby the form roller may be swung about the axis of the vibrator roller. Means (not shown) are provided to continuously reciprocate all vibrator rollers in an axial direction.

A spur gear 74 is formed integral with the hub of each arm 72 and meshes with a gear rack 75 attached to the piston rod 76 of a double acting cylinder 77 attached to the adjacent side frame. Application of fluid pressure to the righthand end of the cylinder 77 will cause the form roller 63 to be swung into rolling engagement with the plate cylinder 20 so as to transfer a film of ink therefrom to the vibrator roller 61. In such position, the arms 72 limit against stop devices 78.

Describing now the means for oscillating the water and ink ductor rollers 23 and 47, reference is had to FIGS. 1, 6 and 8 wherein it will be seen that the upper, as well as the lower ends, of cylinder 27 are connected in parallel by air lines 80 and are connected by lines 81 and 82 to the service ports 83 and 84, respectively, of a four-way valve generally indicated at 85. The latter has a slideable valve member 85 carrying sliding seals 86, 87, 88 and 89 movable along a bore in the valve body. Compression springs 90 and 91 tend to center the valve member.

Air under pressure is admitted to an inlet port 92 and to orifices 93 and 93 opening into the bore adjacent opposite ends thereof.

The position of the valve member 85 is controlled by a pair of normally closed poppet valves 95 and 96 connected by air lines 97 and 98 to opposite ends of the valve bore. The poppets are alternately opened and closed to the atmosphere by a cam 100 driven by the drive train for the press, as will appear later.

When the poppet 96 is opened, allowing air to exhaust through the line 98, the pressure differential developed in the lefthand end of the valve bore will shift the valve slide 85 to the right into its illustrated position, allowing air under pressure to be transmitted from inlet port 92 through port 84 and line 82 to the lower ends of the cylinders 27, thereby rocking the ductor roller 23 clockwise into engagement with the water fountain roll. At

the same time, air will be exhausted from the upper ends of the cylinders 27, through line 81, port 83 and an exhaust port 101.

Upon opening of line 97 and closing line 98 by cam 100, spring 91 will move the valve slightly toward its center position, causing the seal 85 to uncover orifice 94 whereupon inlet pressure will be applied to the righthand end of the slide member to force the same toward the left position where the seal 86 closes the orifice 93 and the air inlet pressure will be applied through port 83 and line 81 to the upper ends of the cylinders 27 and 28, thereby shifting the ductor roller 23 into rolling engagement with the vibrator roll 30.

A second four-way valve 102, similar to the valve 85, is provided under control of a cam 103 to control positioning of the cylinders 53 in the same manner as the cylinders 27 are controlled so as to alternately shift the ink ductor roller 47 into rolling engagement with the fountain roll 44 and distributor roller 54. The cam 103 is carried by the same shaft 104 that carries cam 100.

The foregoing ductor control mechanism enables the ductor rollers to be alternately yieldably engaged with both the cooperating fountain rolls and distributor rollers and yet reduces any bouncing tendency of such ductor rollers as they move into engagement.

According to the present invention, the plate cylinder 20 and blanket cylinder 17 are mounted as a unit in an auxiliary frame unit, generally indicated at 105. The latter comprises auxiliary frame plates 106 and 107 removably fitted in openings formed in the main side frames 11 and 12 respectively. The auxiliary frame plates are held in place by bolts 108 and 109.

Tie-bars 110 extend between the auxiliary side frame plates 106 and 107 to form a rigid unit which may be readily removed by removing bolts 108 and 109 and then sliding the unit to the left in FIG. 1.

According to FIG. 5, the shaft 111 carrying the plate cylinder 20 is supported at its lefthand end by a ball bearing 112 carried by a bearing bushing 113 slideable endwise in a bearing formed in the auxiliary frame plate 106. The opposite end of the shaft 111 is supported by a ball bearing 114 carried by a bushing 115 slideable endwise in a bearing formed in the auxiliary frame plate 107. A key 116 secured to the side frame plate 107 guides a keyway 117 in the bushing 115 to prevent rotation of the bushing. The bushing 115 is screw threaded to a cap member 118 restrained from axial movement by an annular retainer 120 secured to the auxiliary frame plate 107 so that the plate cylinder may be adjusted lengthwise in either direction by manually rotating the cap member in an appropriate direction.

The blanket cylinder 17 is arranged to be moved out of rolling engagement with the impression and plate cylinders 15 and 20, respectively, when for example, the press is shut down, and for this purpose its shaft 121 is mounted in ball bearings 122 and 123 carried by eccentric bushings 124 and 125, respectively, rotatably mounted in bearings formed in the frame plates 106 and 107. The bushings 124 and 125 have gear sections 126 of equal diameter formed thereon which mesh with gears, one of which is shown at 127 in FIG. 2, carried by shaft 128 extending across the press and rotatably mounted in suitable bearings carried by the auxiliary plates 106 and 107.

An arm 130 fastened to the shaft 128 is connected through a link 131 to a lever 132 fulcrumed at 133 and pivotally connected to the piston rod 134 of a double acting cylinder 135. The latter is pivotally supported at 136 on the side frame 12. Thus, actuation of the cylinder in one direction will rotate the eccentric bushings 124 and 125 to carry the blanket cylinder out of rolling engagement with the plate and impression cylinders and actuation in the opposite direction will carry the blanket cylinder into such rolling engagement.

Additional printing cylinder units such as that shown at 105a, FIGS. 9, 10 and 11, are provided to be substituted for the unit 105. Unit 105a carries larger diameter

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blanket and plate cylinders 17a and 20a, respectively, so as to print longer impressions. Other printing cylinder units carry plate and blanket cylinder couples of different diameters so as to permit selectively different length impressions to be printed on the same press without waste of web material.

The form rollers 31, 32, 63, 64 and 65 are formed of rubber or similar resilient material and in order to obtain proper water and ink transfer characteristics, the indentation or width of contact of each form roller against the plate cylinder must be maintained within close limits. This requires individual adjustment of each form roller which would be relatively time consuming and normally would require adjustment each time a new cylinder unit is replaced in the press. However, according to the present invention, the adjustment of the various form rollers is initially made for all cylinder units carrying different diameter cylinders and need not be made thereafter. For this purpose, the various stop devices 40, 41, 70 and 71 each carry preadjustable stop screw elements, one for each different diameter plate and blanket cylinder couple. Stop device 41, which is representative of the other stop devices 40, 70 and 71, comprises a set of four angularly displaced stop screws 142 screw threaded into a plate 143 secured to a shaft 144. The latter is journaled in a bearing formed in the side plate 11 and carries at its opposite end a chain sprocket 145 (FIG. 3). The other stop devices 40, 70 and 71 are similarly mounted and are attached to similar sprockets 146, 147 and 148, respectively. An endless chain 150 is wrapped over the various sprockets and over a guide roller 151 whereby all stop devices may be rotated in unison to different settings. The shaft 152 carrying the stop device 70 has attached thereto a dial 153 carrying indicia indicating the different diameters of printing plate cylinders and accompanying blanket cylinders. By adjusting the dial 153 to a selected diameter setting relative to an index point 154, the appropriate stop screws 142 on each stop device is set in blocking relation with its respective form carrying lever.

The stop device 78 for controlling positioning of the form roller 63 is mounted in the frame plate 106 of each cylinder unit and therefore each stop device is pre-adjusted for the respective unit.

After all adjustments are initially made, in order to replace one cylinder unit for another having a different diameter plate and blanket cylinder couple, the first cylinder unit is removed, the dial 153 is set to indicate the diameter of the cylinders of the new cylinder unit, and the latter is then mounted in place, at which time the various form rollers will engage the plate cylinder with the proper pressure.

It will be seen that with the foregoing construction, the replacement time is exceedingly short and the replacement can be made without any adjustment of form roller pressure.

It should also be noted that the means for longitudinally adjusting each plate cylinder is contained within the respective cylinder unit so that such adjustment may need be made only initially and need not normally be disturbed thereafter.

Further, it will be noted that the link 131, FIG. 2, is adjustable in length at 141 to obtain proper throw of the eccentric bushings 124 and 125. When replacing such cylinder unit, the pivot pin 140 is removed and the new cylinder unit with its respective pre-adjusted link 131 is mounted in place. The pivot pin 140 is then re-inserted.

Describing now the drive train for the printing station, a motor driven gear unit including a drive gear 215, FIGS. 3 and 4, is supported by bracket 1216 mounted on the side frame 11. The gear 215 drives an idler gear 216 supported by the side frame 11, which idler, in turn, drives a gear 217 fastened to the shaft 121 of the blanket cylinder 17. Gear 217 meshes with a gear 218 (see also FIG. 5) attached to a hub 220 on the shaft of the plate

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cylinder 20 by clamp bolts 221. The latter pass through elongated slots 222 in the gear and are threaded in the hub to permit angular adjustment of the gear relative to the plate cylinder.

The gear 218 drives the gear 223, attached to the drive shaft of the vibrator roller 62, through an idler 224. Gear 223 transfers rotation through a train of gears 225, 226, 227 and 228, certain of which are coupled to the shafts of ink rollers 62, 57 and 61, respectively. Gear 226 also drives a gear 230 entrained through a compound idler 231 with a gear 232 fastened on the cam shaft 104. Idler 231 also drives gear 233 coupled to the distributor roller 54.

When replacing a new cylinder unit, the currently mounted cylinder unit is removed, causing the gears 217 and 218 to recede from meshing engagement with the drive and driven gears 216 and 224. Other cylinder units, for example that shown in FIGS. 9 to 11, have their plate and blanket cylinders so located that the gears carried thereby, i.e., gears 217a and 218a, will directly mesh with the gears 216 and 224 when the new cylinder unit is mounted in place. Thus, no dismantling or adjustment of the drive train need be made upon replacement of one cylinder unit for another.

The water fountain roll 21 is driven by a motor 235, independently of the aforementioned drive train, through gears 236 and 237.

In order to properly start the press, the following sequence is preferably followed. First, the water form rollers are engaged with the plate cylinder to dampen the same. Then, the ink form rollers are engaged and finally the blanket cylinder is moved into rolling engagement with the plate cylinder and the web as the latter moves over the impression cylinder 15. Also, the reverse order is preferably followed in shutting down the press. That is, the blanket cylinder is first disengaged, the ink form rollers are then disengaged and finally the water form rollers are disengaged.

According to the present invention, means are provided to automatically control engagement and disengagement of the various form rollers and blanket cylinder in one or the other of the above sequences, depending upon whether the press is being started or shut down. For this purpose, the cylinder 36 for controlling positioning of the water form rollers, the cylinders 68 and 77 for controlling positioning of the ink form rollers and the cylinder 135 for controlling positioning of the blanket cylinder are actuated pneumatically under control of three four-way valves generally indicated at 154, 155 and 156 (FIG. 12) which operate under control of the electric circuitry shown in FIG. 14.

Describing first the construction and operation of the valves 154-156, all are of similar construction and therefore only the valve 154 will be described in detail. As is shown in FIG. 13, the valve comprises two three-way valve sections 157 and 158. Since both sections are similar, only the section 157 will be described in detail.

Two vertically aligned diaphragm chambers 160 and 161 are formed in the valve section 157 and are connected by a bore 162. A perforated diaphragm 163 of rubber or the like is clamped around its periphery in the chamber 160 by a cap member 164. Likewise, an impermeable resilient diaphragm 165 is clamped around its periphery in the chamber 161 by a cap member 166.

The diaphragms 163 and 165 are secured to a tubular stem 167 extending within the bore 162 and slideably mounted in the cap member 166, the diaphragm 163 guiding the lower end of the stem. The valve sections 163 and 165 have valve seats 168 and 170 formed thereon and adapted to seat against mating seats formed in the valve body at opposite ends of the bore 162.

Pilot poppets 171 and 172 cooperate with corresponding seats formed in valve bores 173 and 174, respectively, formed in the cap member 166. These bores connect at their lower ends with the upper end of the valve chamber

161, while the upper end of the bore 173 communicates with the upper end of the stem 167 and the upper end of the bore 174 is opened to the atmosphere.

The stems of poppets 171 and 172 are slideably mounted in a pole piece 175 of magnetic material, around which an electromagnetic coil 176 is wound. The upper ends of the stems are secured to an armature 177 of magnetic material.

When the armature 177 is spaced from the pole piece 175, as illustrated, the poppet 172 closes the passage through bore 174 while the poppet 171 opens passage through bore 173. However, upon energization of the coil 176 which will hereinafter be referred to as the "off" coil, the armature will be attracted to the pole piece 175 to open the poppet 172 and close poppet 171.

As noted above, the valve section 158 is similar to section 157. However, the armature 178 of section 158 is connected to the armature 177 by a rocker lever 180 which is fulcrummed at 181 so that when one armature is attracted to its respective pole piece the other armature is separated to reverse the condition of its pilot poppets and, accordingly, the valve section proper. The armature 178 is attracted to its respective pole piece by a coil 201, hereinafter referred to as the "run" coil.

In the condition of the valve shown in FIG. 13, air under pressure applied to a common inlet port 182 will pass through a passage 183, valve compartment 160, past valve seat 168, around stem 167, through a fluid line 184 (see also FIG. 12), and through an adjustable flow restrictor 185 to the lefthand end of the cylinder 36, thereby causing the water form rollers 31 and 32 to be disengaged from the plate cylinder. Such a restrictor 185 is available commercially under the trademark "Floreg" and is manufactured by the Westinghouse Air Brake Co.

At this time the seat 170 will be closed to prevent escape of air from line 184 through the chamber 161 to an exhaust port 186. Also at this time, air passing through the chamber 160 will flow through the tubular poppet section 167 and past the pilot poppet 171 to act against the upper end of the diaphragm 165, thus holding the same in its lower illustrated position.

Concurrently, the similar diaphragms and tubular stem in the valve section 158 will be raised, enabling exhaust of air from the righthand side of cylinder 36 through restrictor 188, line 190, now open seat of the upper diaphragm of section 158 (similar to seat 170), and thence into the atmosphere through the righthand section exhaust port 189.

Since the valve is controlled by the pilot poppets, i.e. 171 and 172, the coils, i.e. 176, need only be pulsed momentarily.

When the "off" coil 176 is energized, poppet 171 will be closed and poppet 172 opened, causing the air supply to the upper surface of the diaphragm 165 to be shut off and the remaining air in the upper side of the chamber 161 to be exhausted past poppet 172.

Accordingly, air in the lefthand end of the cylinder 36 will be permitted to escape through seat 170 into the exhaust port 186. At the same time, the section 158 will assume the condition shown in FIG. 13 for section 157 to permit the air to be transmitted through line 190 and restrictor 188 to force the water form rollers into rolling engagement with the plate cylinder.

The cylinders 68 and 77 for controlling the ink form rollers are connected in parallel through fluid lines 191 and 192 (FIG. 12) and adjustable restrictors 193 and 194, respectively, to the service ports of the valve 155. Likewise, the impression cylinders 135 are connected through lines 195 and 196 and adjustable restrictors 197 and 198, respectively, to the service ports of the valve 156 so as to operate in a manner similar to that described in connection with the water form rollers.

It should be noted that the cylinder 77, when actuated to remove the ink form roller 63, causes arms 72 to

swing such roller to its dot-dash line position 63a wherein it permits the cylinder unit 105 to be moved in and out of position without interference. Also, the form roller supporting levers 33, 34 and 66, 67 are swung relative to each other until they strike stop pins 250 and 251, respectively, so as to accommodate the largest diameter plate cylinder acceptable by the press.

Referring to FIG. 14, showing the circuitry for controlling the valves 154, 155 and 156, the "run" coil of each valve, i.e. coil 201 of valve 154, is connected at one side to a line 203 of a power supply circuit 204 and is connected on the other side through a line, i.e. line 205, to the make and break contacts of a double-pole, double-throw pushbutton switch, i.e. switch 206. The latter is normally spring pressed into its illustrated position wherein a second break contact is connected through line 207 to a make contact of a single-pole, single-throw "automatic sequence-run" pushbutton switch 208.

Upon closing of switch 208, a circuit will be completed through each of the "run" coils of the different valves to accordingly cause the respective valves to effect operation of cylinders 36, 68-77 and 135 through the various restrictors 185, 193 and 197, respectively. The latter restrictors are preferably adjusted so that the water form rollers are first engaged, then the ink form rollers and finally the blanket cylinder. In this case, the restrictor 185 may be opened to form a minimum amount of flow restriction or may be adjusted to control the rate of movement of the water form rollers toward engagement with the plate cylinder. By proper adjustment of the restrictors the time lag between engagement of the water and ink form rollers and impression cylinder may be controlled as desired. For example, in certain locations where the humidity is relatively low, the water form rollers should be engaged a considerable time before the ink form rollers in order to prevent improper inking of the plate cylinder.

The "off" coils, i.e. coil 176, of the various valves 154-156, are each connected on one side to the line 123 of the power supply circuit 124 and is connected on the other side through line 211 to make and break contacts of a double-pole, double-throw "off" pushbutton switch 212. The other break contact for the switch is connected through a line 209 to one contact of a single-pole, single-throw "automatic sequence-off" pushbutton switch 213. When switch 213 is closed, a circuit will be completed through the various "off" coils to effect operation of the various cylinders 36, 68-70 and 135 through the restrictors 188, 194 and 198, respectively.

The restrictor valves 188, 194 and 198 are preferably set to cause the cylinders to remove the water and ink form rollers and blanket cylinder in a reverse manner to that in which they are engaged. That is, the blanket cylinder will be first removed from engagement with the plate and impression cylinders, then the ink form rollers will be disengaged, and finally the water form rollers will be disengaged. The restrictor 198 may be opened to form a minimum restriction or may be adjusted to control the rate of movement of the blanket roller.

If desired, the water form rollers, ink form rollers or blanket cylinder may be engaged or disengaged independently of the others by closing selected ones of the respective "run" switches, i.e. 206 or "off" switches, i.e. 212.

It will be noted that the above "run" and "off" switches 206, 208, 212, 213, etc. are conveniently mounted in a group on the side frame 12 (FIG. 2). Duplicate switches (not shown) may be connected in parallel with respective ones of such illustrated switches and may be located in different places on the press for the convenience of the press man.

Although the invention has been described in detail and certain specific terms and languages have been used, it is to be understood that the present disclosure is illustrative

rather than restrictive and that changes and modifications may be made without departing from the spirit or scope of the invention as set forth in the claims appended hereto.

Having thus described the invention, what is desired to be secured by United States Letters Patent is:

1. In a rotary printing press, the combination comprising a main frame including a pair of spaced main side frame elements; said elements having means for locating an auxiliary frame in operative relation thereto, said auxiliary frame including a pair of spaced auxiliary side frame elements; means cooperating with said locating means for detachably securing said auxiliary frame elements and said main frame elements, a plate cylinder rotatably supported by said auxiliary frame, inking mechanism including a rotatable ink form roller for inking said plate cylinder; means supporting said form roller on said main frame, means for moving said form roller out of engagement with said plate cylinder, yieldable means for moving said form roller toward said plate cylinder, and adjustable stop means carried by said auxiliary frame for limiting movement of said form roller toward said plate cylinder when said frames are secured.

2. The combination according to claim 1 wherein said form roller supporting means comprises means pivotally supporting said form roller for movement toward and away from said plate cylinder.

3. The combination according to claim 1 comprising other auxiliary frames, any selected one of said other auxiliary frames adapted to be located by said first mentioned means in lieu of said first mentioned auxiliary frame, plate cylinders rotatably supported by said other auxiliary frames, and respective stop means on said auxiliary frames for limiting movement of said form roller toward a said plate cylinder in accordance with the diameter of a said plate cylinder supported by a selected said auxiliary frame.

4. The combination according to claim 1 comprising other auxiliary frames, any selected one of said other auxiliary frames adapted to be located by said first mentioned means in lieu of said first mentioned auxiliary frame, plate cylinders of diameters different from said first mentioned plate cylinder supported by said other auxiliary frames, and respective stop means on said auxiliary frames for limiting movement of said form roller toward a said plate cylinder in accordance with the diameter of a said plate cylinder supported by a selected said auxiliary frame.

5. The combination according to claim 1 wherein said yieldable means comprises a cylinder and a fluid operated piston movable in said cylinder.

6. The combination according to claim 1 comprising a blanket cylinder supported by said auxiliary frame in cooperative relation with said plate cylinder.

7. The combination according to claim 1 comprising means on said main frame for guiding a web in an endwise manner, other auxiliary frames, any selected one of said other frames adapted to be located by said first mentioned means in lieu of said first mentioned auxiliary frame, plate cylinders of diameters different from said first mentioned plate cylinder supported by said auxiliary frames, blanket cylinders supported by different ones of said auxiliary frames in cooperative relation with respective ones of said plate cylinders for impressing images onto said web, and respective stop means on said auxiliary frames for limiting movement of said form roller toward a said plate cylinder in accordance with the diameter of a said plate cylinder supported by a selected said auxiliary frame.

8. A rotary printing press comprising a plate cylinder, a blanket cylinder, an impression cylinder, inking mechanism including an ink form roller for inking said plate cylinder; a first device for moving said blanket cylinder into engagement with said plate cylinder and said impression cylinder, a second device for moving said ink

form roller into engagement with said plate cylinder, individual fluid operated means for actuating respective ones of said devices, means comprising fluid conduits for applying fluid under pressure to respective ones of said fluid operated means, and flow control devices in said conduits, said control devices restricting flow of said fluid different amounts in different ones of said conduits whereby to cause said fluid operated means to actuate said first and second devices seriatim.

9. A rotary printing press according to claim 8 wherein said flow control devices are adjustable whereby to vary the timing of actuation of said first and second devices.

10. A rotary printing press comprising a plate cylinder, a blanket cylinder, an impression cylinder, a water dampening mechanism including a dampening form roller for dampening said plate cylinder; inking mechanism including an ink form roller for inking said plate cylinder; a first device for moving said blanket cylinder into engagement with said plate cylinder and said impression cylinder, a second device for moving said ink form roller into engagement with said plate cylinder, a third device for moving said dampening form roller into engagement with said plate cylinder, individual fluid operated units for actuating respective ones of said devices, means comprising fluid conduits for applying fluid under pressure to respective ones of said fluid operated means, and flow restricting devices in said conduits, said restricting devices restricting flow of said fluid different amounts in different ones of said conduits whereby to cause said fluid operated means to actuate said devices seriatim.

11. A rotary printing press according to claim 10 wherein said last mentioned means comprises valve means for concurrently admitting fluid under pressure to said conduits.

12. A rotary printing press comprising a plate cylinder, a blanket cylinder, an impression cylinder, a water dampening mechanism including a dampening form roller for dampening said plate cylinder; inking mechanism including an ink form roller for inking said plate cylinder; a device for moving said blanket cylinder into and out of engagement with said plate cylinder and said impression cylinder, a second device for moving said ink form roller into and out of engagement with said plate cylinder, a third device for moving said dampening roller into and out of engagement with said plate cylinder, a first set of fluid operated means for actuating respective ones of said devices to move said blanket cylinder and rollers into engagement; a second set of fluid operated means for actuating respective ones of said devices to move said blanket cylinder and rollers out of engagement, means comprising fluid conduits for applying fluid under pressure to respective ones of said fluid operated means; and flow restricting units in respective ones of said conduits, said restricting units restricting flow of said fluid different amounts in different ones of said conduits whereby to cause said fluid operated means to actuate said devices seriatim in one manner to move said blanket cylinder and said rollers into engagement and in a different manner to move said blanket cylinder and said rollers out of engagement.

13. In a rotary printing press, the combination comprising a frame, means for selectively supporting plate cylinders of different diameters in said frame, inking mechanism including a rotatable ink form roller for inking a selected one of said plate cylinders; means for moving said form roller into and out of engagement with said selected plate cylinder, a plurality of stop elements movable between effective and ineffective positions, each of said stop elements being effective when in a said effective position to limit movement of said roller by said moving means in accordance with the diameter of a selected plate cylinder, and a single manually manipulatable device for selectively moving one of said stop elements to a said effective position and the others of said stop elements to said ineffective positions.

14. The combination according to claim 13 wherein said stop elements are adjustable, independently of each other.

15. In a rotary printing press, the combination comprising a frame, means for selectively supporting plate cylinders of different diameters in said frame, inking mechanism including a rotatable ink transfer roller rotatably supported by said frame; a pair of form rollers for inking a selected plate cylinder, a first support member rotatably supporting one of said rollers in engagement with said transfer roller and for movement about the axis of said transfer roller toward and away from said selected plate cylinder, a second support member rotatably supporting the other of said rollers in engagement with said transfer roller and for movement about the axis of said transfer roller toward and away from said selected plate cylinder, means for moving said support members relative to each other whereby to move said form rollers toward said selected plate cylinder, a plurality of stop elements movable between effective and ineffective positions, each of said stop elements being effective when in a said effective position to limit movement of a said support member toward said selected plate cylinder in accordance with the diameter of said selected plate cylinder, and a single manipulatable device for selectively moving one of said stop elements to a said effective position and the others of said stop elements to said ineffective positions.

16. In a rotary printing press, the combination comprising a frame, means for selectively supporting plate cylinders of different diameters in said frame, inking mechanism including a rotatable ink form roller for inking a selected one of said plate cylinders; dampening mechanism including a rotatable dampening form roller for dampening said selected plate cylinder; means for moving said form rollers out of engagement with said selected plate cylinder and for yieldably moving said rollers toward said selected plate cylinder, a first set of stop elements movable between effective and ineffective positions, each of said stop elements being effective when in a said effective position to limit movement of said ink form roller by said moving means in accordance with the diameter of a selected plate cylinder, a second set of stop elements movable between effective and ineffective positions, each of said stop elements of said second set being effective when in a said effective position to limit movement of said dampening form roller by said moving means in accordance with the diameter of said selected plate cylinder, and a single manipulatable device for selectively moving one of said stop elements in each of said sets to a said effective position and the others of said stop elements to ineffective positions.

17. The combination according to claim 16 wherein said stop elements are adjustable independently of each other.

18. In a rotary printing press, the combination comprising a frame, means for selectively supporting plate cylinders of different diameters in said frame, inking mechanism including a rotatable ink form roller for inking a selected one of said plate cylinders; dampening mechanism including a rotatable dampening form roller for dampening said selected plate cylinder; means for moving said form rollers out of engagement with said selected plate cylinder and for yieldably moving said form rollers toward said selected plate cylinder, a first stop device, a first set of stop elements on said stop device, each of said stop elements being movable from an ineffective position to a position effective to limit movement of said ink form roller by said moving means in accordance with the diameter of a selected plate cylinder, a second stop device, a second set of stop elements on said second stop device, each of said stop elements of said second set being movable from an ineffective position to a position effective to limit movement of said dampening form roller by said moving means in accordance with the diameter of said selected plate cylinder, and means for concomitantly set-

ting said stop devices in accordance with the diameter of said selected plate cylinder to selectively locate one of said stop elements in each of said sets in effective position and the others of said stop elements in ineffective positions.

19. In a rotary printing press, the combination comprising a main frame, a plurality of auxiliary frames, plate cylinders of different diameters rotatably supported by different ones of said auxiliary frames, means on said main frame for supporting a selected one of any of said auxiliary frames, inking mechanism including a rotatable ink form roller; means on said main frame supporting said form roller for movement toward and away from rolling engagement with a said plate cylinder which is supported by said selected auxiliary frame, yieldable means for moving said form roller toward said plate cylinder, a plurality of stop elements, each of said stop elements being adapted to limit movement of said form roller by said moving means in accordance with the diameter of a selected plate cylinder, and means for selectively rendering one of said stop elements effective and the others of said stop elements ineffective.

20. In a rotary printing press, the combination comprising a main frame, a plurality of auxiliary frames, plate cylinders of different diameters rotatably supported by different ones of said auxiliary frames, means on said main frame for supporting a selected one of any of said auxiliary frames, inking mechanism including a rotatable ink roller and a form roller in rolling engagement with said ink roller; means on said main frame supporting said form roller for movement about the axis of said ink roller and toward and away from rolling engagement with a said plate cylinder which is supported by a said selected auxiliary frame, means for moving said form roller toward said plate cylinder, a plurality of stop elements, each of said stop elements being adapted to limit movement of said form roller by said moving means in accordance with the diameter of a selected plate cylinder, and means for selectively rendering one of said stop elements effective and the others of said stop elements ineffective.

21. The combination according to claim 20 wherein said last mentioned means comprises a member selectively settable into different positions to locate different ones of said stop elements in position to limit movement of said form roller, and means for adjusting each of said stop elements on said member.

22. In a rotary printing press, the combination comprising a main frame, a plurality of auxiliary frames, plate cylinders of different diameters rotatably supported by different ones of said auxiliary frames, means on said main frame for supporting a selected one of any of said auxiliary frames, inking mechanism including a rotatable ink form roller; means on said main frame supporting said form roller for movement toward and away from rolling engagement with a said plate cylinder which is supported by a selected auxiliary frame, water dampening mechanism including a rotatable dampening form roller, means on said frame supporting said dampening form roller for movement toward and away from rolling engagement with said last mentioned plate cylinder, yieldable means for moving said form rollers toward said plate cylinder, a set of stop elements, each of said stop elements being adapted to limit movement of said ink form roller by said moving means in accordance with the diameter of a selected plate cylinder, a second set of stop elements, each of said second set of stop elements being adapted to limit movement of said dampening form roller by said moving means in accordance with the diameter of said last mentioned plate cylinder, and means for concomitantly rendering one of said stop elements of each of said sets effective and the others of said stop elements ineffective.

23. In a rotary printing press, the combination comprising a main frame, a plurality of auxiliary frames, plate cylinders of different diameters rotatably supported

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by different ones of said auxiliary frames, means on said main frame for supporting a selected one of any of said auxiliary frames, inking mechanism including a rotatable ink roller and an ink form roller in rolling engagement with said ink roller means on said main frame supporting said ink form roller for movement about the axis of said ink roller and toward rolling engagement with a said plate cylinder which is supported by a said selected auxiliary frame, water dampening mechanism including a rotatable dampening roller and a dampening form roller in rolling engagement with said dampening roller; means on said main frame supporting said dampening form roller for movement about the axis of said dampening roller and toward rolling engagement with said last mentioned plate cylinder, a set of stop elements, each of said stop elements being adapted to limit said movement of said ink form roller in accordance with the diameter of said last mentioned plate cylinder, a second set of stop elements, each of said second set of stop elements being adapted to limit said movement of said dampening form roller in accordance with the diameter of said last men-

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tioned plate cylinder, and means for concomitantly rendering one of said stop elements of each of said sets effective and the others of said stop elements ineffective.

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