

April 22, 1947.

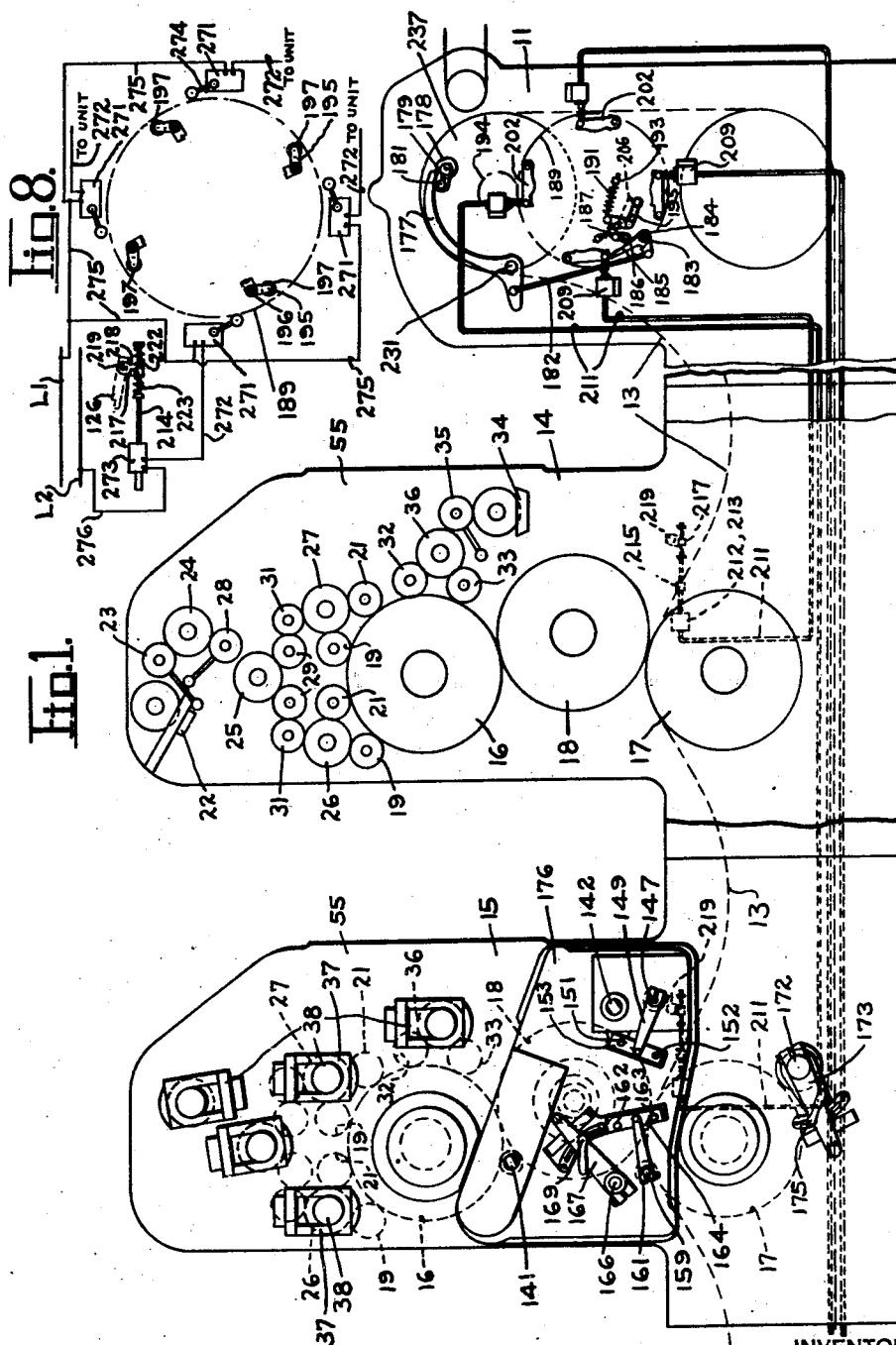
A. J. HORTON ET AL

2,419,403

PRINTING MACHINE

Filed Aug. 9, 1941

3 Sheets-Sheet 1



INVENTORS

Albert J. Horton and
William K. Eckhard.

BY

Albert J. Horton
ATTORNEY

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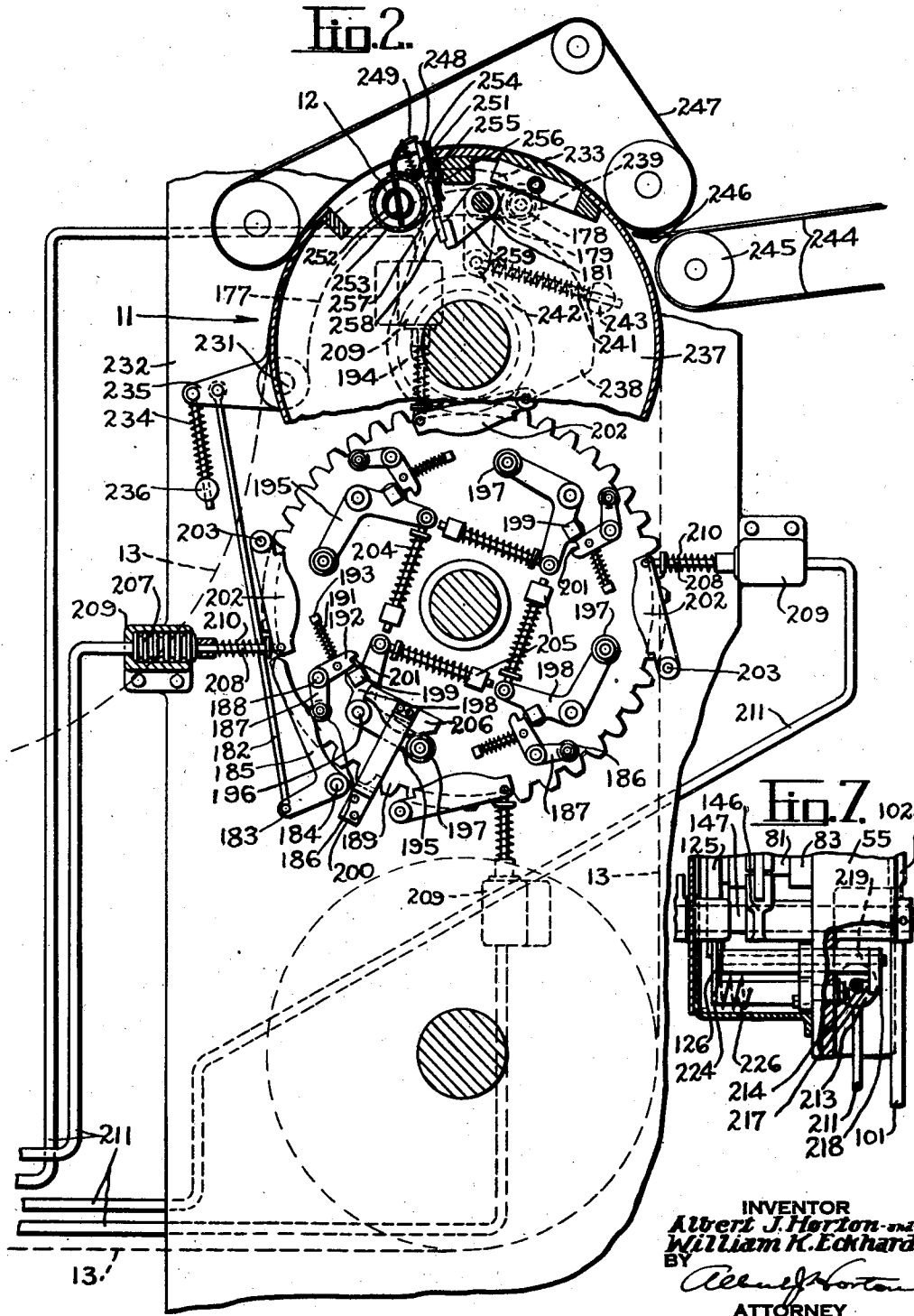
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PRINTING MACHINE

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3 Sheets-Sheet 2



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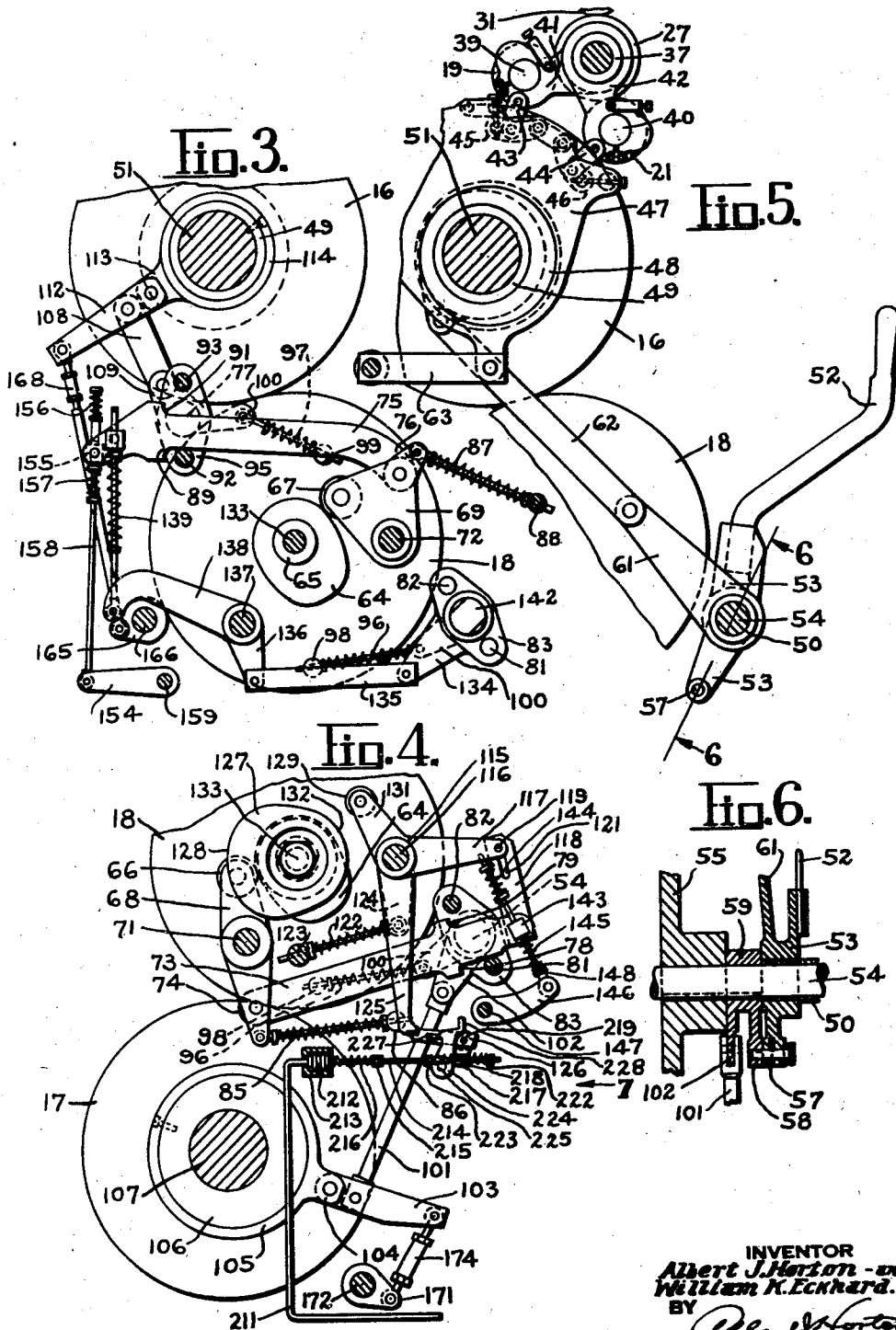
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3 Sheets-Sheet 3



INVENTOR
Albert J. Horton - *et al.*
William K. Eckhard.
BY *Albert J. Horton*
ATTORNEY

UNITED STATES PATENT OFFICE

2,419,403

PRINTING MACHINE

Albert J. Horton, White Plains, N. Y., and William K. Eckhard, Newark, N. J., assignors to R. Hoe & Co., Inc., New York, N. Y., a corporation of New York

Application August 9, 1941, Serial No. 406,110

1 Claim. (Cl. 101—137)

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This invention relates to printing machines of the planographic type in which the printing cylinders are tripped or separated if a sheet to be printed is not presented properly or at the proper time, and is especially adapted for use in multi-color printing machines of the offset type in which sheets are carried successively through several printing units to be printed in several colors, and it is desirable to automatically trip the cylinders of the several units successively in the order of their operation on sheets presented to them.

A printing machine of the class mentioned is disclosed in Patent No. 2,231,914, granted February 18, 1941. As shown in that patent, a sheet detecting device is provided to detect the absence or out of register positioning of a sheet presented to a machine and to remove it therefrom. The detecting device also constitutes means for automatically actuating the tripping mechanism of the several units of the printing machine. Certain improvements in machines of this class are shown in Patent No. 2,335,010, in which tripping control mechanism having features of the present invention is shown, but not claimed.

One object of this invention is to provide in a printing machine in which the printing cylinders are tripped, an improved form of tripping control mechanism, whereby the printing cylinders will be tripped "off" whenever a sheet is improperly presented, or is not presented at the proper time.

Another object is to provide a tripping control mechanism for a multi-unit printing machine having means to carry sheets from one unit to another, and means at each unit to trip the printing cylinders thereof, whereby the tripping mechanism of the respective units will be actuated in sequence whenever a sheet is absent, or is not presented in register.

Still another object is to provide a control mechanism for the tripping device of a printing machine of the class mentioned, and which is adapted to be set by the part of a sheet registering mechanism by which the absence or misplacement of a sheet is detected, whereby the tripping device will automatically act to move cooperating printing components of the printing machine away from each other whenever a sheet is absent or is presented out of register, and will subsequently act to move the said components together when normal conditions are restored.

It is also an object of this invention to provide a tripping control mechanism of generally improved construction, that is relatively simple,

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durable and inexpensive in construction, as well as convenient, practical, serviceable and efficient in use.

With the foregoing and other objects in view, which will appear as the description proceeds, the present invention resides in the combinations and arrangements of parts, and in the details of construction hereinafter described and claimed.

A preferred embodiment of this invention is illustrated in the accompanying drawings, wherein:

Figure 1 is a side view, somewhat diagrammatic in form, of a portion of a multicolor sheet printing machine embodying the features and principles of the invention;

Figure 2 is a composite side view of parts of a sheet registering device and of the tripping control mechanism of this invention, parts being broken away to show certain cooperating parts and their connections;

Figure 3 is a fragmentary view showing parts included in a mechanism for tripping the plate cylinder of a unit of the printing machine, which the control mechanism of this invention is adapted to control;

Figure 4 is a fragmentary view showing mechanism for tripping the impression cylinder of the machine;

Figure 5 is a fragmentary view showing mechanism to trip the ink rollers from the plate cylinder and includes means for manually tripping these ink rollers;

Figure 6 is a sectional view taken on the line 6—6 of Figure 5 to show the means to disconnect the ink roller tripping means from the automatically operable means for tripping the plate cylinder;

Figure 7 is a fragmentary side view broken away and looking in the direction of arrow 7 in Figure 4; and

Figure 8 is a diagrammatic view of a modified form of tripping control mechanism.

The printing machine selected to illustrate the features and principles of this invention (see Figure 1) includes a sheet receiving, registering, and detecting unit 11 from which sheets to be printed are carried by suitable sheet conveying mechanism having gripper bars 12 (Figure 2) secured to conveyor chains which are indicated by the dotted lines 13, to a first printing unit 14 and successively to any number of similar additional units, one such 15, being shown. The sheet conveying mechanism is fully shown in Patent No. 2,138,405.

Although the sheet receiving, registering and

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detecting unit 11, is herein shown as a separate unit, it is to be understood that the essential parts which are operably associated with the control mechanism of this invention, may be associated with the impression cylinder of the first printing unit 14, if desired.

Each of the printing units includes a plate cylinder 16, an impression cylinder 17, both preferably mounted in movable bearings and cooperating in printing relation with a blanket cylinder 18 mounted in fixed bearings. Suitable pairs of ink rollers 19 and 21 are arranged about the plate cylinder 16 and are supplied with ink from an ink fountain 22 by means of a ductor roller 23, reciprocating ink cylinders 24, 25, 26 and 27, and intermediate ink transfer rollers 28, 29 and 31. A suitable pair of moistening rollers 32 and 33 with a moistening fluid fountain 34 and ductor roller 35, and a moisture distributing cylinder 36 are also provided for the plate cylinder 16.

The ink cylinders 26 and 27 are mounted to be axially reciprocated in fixed bearings 37, preferably by mechanism indicated at 38 (Figure 1) and fully disclosed in Patent No. 2,300,549. The ink rollers 19 and 21 are arranged to be tripped away from and toward the form or plate cylinder 16 by means shown in Figure 5, that includes mechanism shown in the last mentioned application. This mechanism is arranged to be actuated automatically, and includes bearings 39 and 40 for the respective ink rollers, which are mounted in arms 41 and 42 rotatably supported to swing about the axis of the ink cylinders 26 and 27 to move the ink rollers 19 and 21 away from the plate cylinder 16, or oppositely toward it.

The arms 41 and 42 are connected by links 43 and 44 respectively, to adjustable arms 45 and 46 mounted on and carried by a plate 47. The plate 47 is journaled on an eccentric ring 48 which is, in turn, journaled on an eccentric bearing sleeve 49 supporting a bearing for the shaft end 51 of the plate cylinder 16. Rotation of the eccentric ring 48 upon the sleeve 49 will, due to its eccentricity, move the plate upwardly with respect to the axis of the plate cylinder 16 and through the arms 45 and 46, and links 43 and 44, swing the bearing supporting arms 41 and 42 to carry the ink rollers 19 and 21 away from the plate cylinder 16. This action is accomplished by the cylinder tripping means to be hereinafter described.

The rollers 19 and 21 may be moved toward the plate cylinder 16, while it is tripped "off" or away from the blanket cylinder 18, by manual manipulation of an operating bar 52 (Figures 5 and 6), to engage these rollers with a printing plate on the cylinder 16, to ink it prior to printing. The bar 52 is arranged to fit into a socket formed in a lever 53 secured upon a sleeve 50 that is rotatably mounted on a trip shaft 54 for the impression cylinder 17. The trip shaft 54 is journaled in and extends between machine side frames 55, and the sleeve 50 extends between hubs 59 at each side of the machine. The lever 53 is arranged to be operably connected to and disconnected from the shaft 54 by a pin 57 carried in the lever 53 and adapted to slide into and out of an arm 58 on a hub 59 keyed to the shaft 54. An arm 61 of the lever 53 is connected by a link 62 to the eccentric ring 48, whereby swinging movement of the lever 53 by the bar 52 will move the plate 47 to move the ink rollers 19 and 21 toward and away from the cylinder 16. The plate 47 is held against rotative movement by a link 63 connected thereto and to the machine frame 55. The plate 47 and

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its operating mechanism, with the exception of the portion of the lever 53 that receives the bar 52, is duplicated at the opposite side of the machine.

The tripping mechanism shown is automatically operated, while the machine is running, to trip "off" whenever no sheet is being carried forward from the registering unit 11 to the printing units 14, 15, by the conveyor chains 13. Tripping is effected by a cam 64, continuously rotating with the blanket cylinder 18, by being mounted on and connected to its shaft end 65 adjacent the side frame 55 (Figures 3 and 4). Cam engaging rollers 66 and 67 ride on the cam 64 and are carried by rockable levers 68 and 69 respectively. The levers 68 and 69 are rockably mounted on stud shafts 71 and 72 respectively, which extend out from the side frame 55. The peripheral spacing of the cam rollers 66 and 67 about the cam 64 is proportioned so as to trip the impression cylinder 17 and the plate cylinder 16 in proper sequence and in such timed relation that no tripping will occur while a sheet is being printed.

The swinging lever 68 (Figure 4) reciprocates a trip bar 73, which is pivoted at 74 to the lever 68 and extends toward and beyond the trip shaft 54. A similar trip bar 75 (Figure 3) is pivoted at 76 to the lever 69 and extends toward and beyond a trip shaft 77 for the plate cylinder 16. The trip bar 73 (Figure 4) is provided with spaced apart shoulders 78 and 79 adapted to engage respectively, spaced apart pins 81 and 82, which are secured to a plate 83 formed on or secured to the end of the trip shaft 54. The bar 73 slides between the pins 81 and 82 by the action of the cam 64 through the cam roller 66 and the lever 68. When the bar 73 is in normal, or "down" position (Figure 4), the shoulder 78 will engage the pin 81 to swing the plate 83 to rock the shaft 54 in the direction to trip "on" the impression cylinder 17, and it will be necessary to raise the bar 73 to cause the shoulder 79 to engage the pin 82 to rock the shaft 54 in the opposite direction to trip it "off." A spring 85 reacting between a stud 86 and the lever 68 maintains the cam roller 66 against the cam 64.

The swinging lever 69 (Figure 3) reciprocates the trip bar 75 due to the action of the cam 64 upon the roller 67, which is maintained against said cam 64 by a spring 87, reacting between a stud 88 and the lever 69. The bar 75 is provided with spaced apart shoulders 89 and 91 adapted to engage respectively, spaced apart pins 92 and 93, which are secured to a plate 95 formed on or secured to the end of the trip shaft 77 and between which the bar 75 slides when reciprocated by the cam 64. When the bar 75 is in normal, or "down" position (Figure 3), the shoulder 89 will engage the pin 92 to rock the shaft 77 in the direction to trip "on" the plate cylinder 16, and it will be necessary to raise the bar 75 to cause the shoulder 91 to engage the pin 93 to rock the shaft 77 in the opposite direction to trip it "off." Springs 96 and 97 act against studs 98 and 99 respectively to maintain pressure on arms 100, formed on each of the plates 83 and 95 (Figures 3 and 4) to maintain the plates 83 and 95, and through them, the shafts 54 and 77 in their rocked position until the respective bars 73 and 75 act thereon to change such position.

Rocking movement of the plate 83 (Figure 4), and by it of the trip shaft 54 (Figure 6), rocks

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the hub 59. The hub 59 is connected through a link 101, attached to an arm 102 of the hub 59, to a link 103, which is connected to a lug 104 on a ring 105. The ring 105 is secured as by a screw to an eccentric bearing sleeve 106 which supports a bearing in which the shaft end 107 of the impression cylinder 17 is journaled. Thus, rocking movement of the hub 59 in one direction, will rotate the eccentric bearing for the impression cylinder 17 and trip this cylinder "off," or away from the blanket cylinder 18 and rocking motion in the opposite direction will move the parts oppositely and trip the cylinder "on." The plate 95 (Figure 3) is rocked by the bar 75 through a link 108 connected to an arm 109 on a sleeve (not shown), but keyed to the shaft 77, and connected to a link 112 secured to a lug 113 on a ring 114 which is connected, as by a screw to the eccentric bearing sleeve 49. Thus, when the plate 95 is rocked in one direction, the eccentric bearing for the plate cylinder 16 is rotated to trip it "off" or away from the blanket cylinder 18, and when the plate 95 is rocked in the opposite direction the plate cylinder 16 will be tripped "on." Rocking movement of the hub 59 when it is connected by the pin 57 to the lever 53, as above described, will also move the plate 47 (Figure 5) to cause the ink rollers 19 and 21 to be tripped either "off," and away from the plate cylinder 16, when rocked in one direction, or "on" when rocked in the opposite direction.

The trip bar 73 (Figure 4) is raised into trip "off" position by a lever 115 mounted on a stud shaft 116. An arm 117 of the lever 115 is connected to a link 118 by a pin 119 which rides in an elongated slot 121 provided in one end of the link 118. The other end of the link 118 is connected to the bar 73. A spring 122 reacting between a stud 123 and a short arm 124 also of the lever 115, tends to rock this lever to raise the bar 73, but is prevented from doing so, by a catch arm 125 that is normally engaged by a spring catch 126. When the catch 126 is moved out of engaging position, the spring 122 tends to rock the lever 115 to raise the bar 73, but may be prevented from doing so by a timing cam 127 that is secured to the shaft end 65 of the blanket cylinder, along with the cam 64, by a bolt 133. The cam 127 is provided with a high land portion 128 which when engaged by a cam roller 129 mounted on an arm 131, also of the lever 115, holds this lever against the urge of the spring 122. When the cam 127 is rotated to present its low land portion 132 to the roller 129, the lever 115 is rocked by the spring 122, provided the catch arm 125 is released from the catch 126, and the arm 73 is raised into tripping position, whereby the impression cylinder 17 will be tripped as above described when the cam 64 reciprocates the bar 73.

Raising movement of the trip bar 75 also is under the control of the catch 126, the catch arm 125, and the cam 127 indirectly through the plate 83. The arrangement is such that after the bar 73 has been raised by the spring 122, and the cam 64 has reciprocated this bar to rock the plate 83 to trip the impression cylinder 17, the bar 75 is raised into tripping position. This action takes place when the plate 83 is rocked by means of an arm 134 (Figure 3), secured to or formed as a part of the plate 83. The arm 134 is connected by a link 135 to an arm 136 of a lever pivoted upon a stud shaft 137. The other arm 138 of

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this lever is resiliently connected by a spring rod 139 to the bar 75, which is thus urged upwardly to engage the pin 93 and rock the trip shaft 77 when the arm 138 is raised, thereby tripping the plate cylinder 16 as above described.

Provision is included whereby either the plate cylinder 16 or the impression cylinder 17 may be manually tripped either "off" or "on." The plate cylinder 16 may be manually tripped by rocking the plate 95 and through it the trip shaft 77 by applying a wrench (not shown) to the outer end of a stud 141 (Figure 1) connected to the pins 92 and 93 on the plate 95 (Figure 3). Likewise, the trip shaft 54 may be rocked to manually trip the impression cylinder 17 by the application of a wrench (not shown) to the outer end of a stud 142, that is connected to the pins 81 and 82 on the plate 83.

Means to individually set and lock the trip bars 73 and 75 in raised "trip off" or lowered "trip on" positions, for making the machine ready for printing, or in trip "on" position for the purpose of silencing a unit, is also included (Figure 4). The means for so setting the trip bar 73 includes a post 143 mounted thereon and adapted to be acted upon by either of opposing springs 144 and 145 carried on a rod 146 connected to an arm 146 that is secured to a shaft 147. The arm 146 is arranged to be swung in either direction by an operating handle 149 (Figure 1) secured to the outer end of the shaft 147. A spring pin (not shown, but located in the hand gripping end of the handle 149) normally holds the handle in the center position as shown, but is adapted to snap into holes 151 and 152 in a plate 153. Movement of the handle to engage the pin in hole 152 results in raising the trip bar 73 and locking the mechanism in trip "off" position, but when the handle is moved to engage the pin in hole 151 the mechanism is locked in trip "on" position. The provision of the elongated slot 121 in the link 118 permits movement of the bar 73 into raised position.

The means to set the trip bar 75 (Figure 3) in raised trip "on" or lowered trip "off" position includes an arm 154 connected to a post 155 mounted on the end of the bar 75 by a rod 156 and opposing springs 156 and 157. The arm 154 is secured to a shaft 159 which has an operating handle 161 (Figure 1) secured upon its outer end. As in the case of the handle 149, a spring pressed pin (not shown) is provided in the hand gripping end of the handle 161 and normally holds the handle in the center position as shown, but is adapted to drop into holes 162 and 163 provided in a plate 164. Movement of the handle to engage the pin in the hole 163 results in raising the trip bar 75 and locking the tripping mechanism for the plate cylinder and inking mechanism in the trip "off" position, while movement of the handle to the hole 162 locks the mechanism in trip "on" position.

Inasmuch as the tripping bars 73 and 75 (Figures 4 and 3) are normally held in their trip "on" position by gravity, they are moved at every revolution of the printing cylinders to trip "on" even though the machine has not been tripped "off." Hence, the trip "on" relation of the cylinders and rollers is normally maintained. When a properly registered sheet is not presented, a detector mechanism hereinafter described is actuated and the tripping bars of each unit are raised in succession to trip "off" each of the several units successively and it remains so during the period when that unit should have been printing a sheet,

but each unit is tripped "on" automatically immediately after such period, unless a succession of sheets are presented improperly. In any case when a sheet is properly presented, the cylinders and inking rollers of each unit will be in tripped "on" relation when the sheet reaches it, unless they have been tripped "off" by operation of the sheet detector or by one of the manual controls previously described.

Provision is also included to adjust the distance between the cooperating plate and blanket cylinders to suit the blankets and packing used and between the axes of the impression and blanket cylinders to permit printing sheets of various thickness. The means for so adjusting the distance between the plate cylinder 16 and the blanket cylinder 18 includes an arm 165 (Figure 3) secured to a shaft 166 having an operating handle 167 (Figure 1) secured to its outer end. The arm 165 (Figure 3) is connected by an adjustable rod 168 to the end of the link 112. Swinging of the arm 165 in one direction by the handle 167 will, through the rod 168, and the link 112, rock the ring 114 to move the plate cylinder 16 closer to the blanket cylinder 18 through the medium of the eccentric bearing sleeve 49 of the plate cylinder 16. A clamp 169 (Figure 1) is provided to act upon the handle 167 to retain it in adjusted position.

The means for adjusting the impression cylinder 17 (Figure 4) in respect to the blanket cylinder 18 includes an arm 171 and an adjustable rod 174, which connects the link 103 to a shaft 172 having an operating handle 173 (Figure 1) secured upon its outer end. Swinging movement of the link 103 will then rock the ring 105 to move the impression cylinder 17 relative to the blanket cylinder 18 through the medium of the eccentric bearing sleeve 106 of the impression cylinder 17. A clamp 175 is provided to act upon the handle 173 to retain it in adjusted position.

A sheet receiving, registering and detecting unit 11 with the parts thereof operably associated with the control mechanism of this invention is shown in Figures 1 and 2, and includes a long lever 177 (Figure 1) pivoted at 231 to a frame member 232 (Figure 2) of the unit 11. The outer end 233 of the lever 177 is pressed downward by a spring 234 acting between the end of a short lever arm 235 formed as part of the lever 177 and a stud 236 extending out from the frame member 232. The lever 177 is thus held in the path of a roller 178 carried by an arm 179 secured to a shaft 181. The shaft 181 is carried by a rotatable cylinder 237 forming part of the sheet receiving, registering and detecting unit 11, but it is obvious that the sheet detecting elements could be associated with the impression cylinder 17 of the first printing unit 14 instead of as herein shown. The shaft 181 is adapted to be rocked by a stationary cam 238 through a roller 239, also carried on the arm 179, and which is urged against the periphery of the cam 238 by a spring 241 acting between an arm 242 secured on the shaft 181 and a post 243 secured to the cylinder 237.

Sheets to be printed are fed to the cylinder 237 by means of endless belts or tapes 244 running over suitable rollers 245. From the tapes 244, the sheets are directed onto a guide plate 246 which directs the sheets upwardly in under a plurality of endless tapes 247, and between them and the cylinder 237. Due to the tapes 244 and 247 being driven at a speed slightly faster than that of the cylinder 237 the forward edge of the sheets being fed are pushed firmly against a series of stops

248 extending outwardly from the periphery of the cylinder 237 and spaced apart lengthwise therealong.

In this manner the sheets are located on the cylinder 237 in a predetermined position on its periphery as they are fed thereto by the tapes 247 to be forwarded by the sheet gripper carriers 12, that are secured on chains 13 which extend about the cylinder 237 at each end thereof. The gripper carriers 12 have a series of cooperating fingers 249 and 251 secured to and actuated by telescoped tubes 252 and 253 respectively in a known manner, and which extend lengthwise of the cylinder 237 from one chain 13 to the other.

An absent sheet or one misplaced in respect to the stops 248 is detected by a plurality of fingers 254, spaced apart lengthwise of a cylinder 237 and pivoted at 255 to and between adjacent stops 248. Leaf springs 256 act against the fingers 254 to tend to press them toward the approaching sheets as they are fed onto the cylinder, and the fingers 254 are pressed back into alignment with the stops 248 by the forward edge of a sheet as it engages the stops 248. A bar 257 is secured at the lower end of each finger 254 and these bars 257 are normally disposed in the path of a stop plate 258 secured on an arm 259, that is secured to the shaft 181.

When the sheet detecting fingers 254 are all engaged by a sheet urged against the stops 248, the bars 257 are moved out of the path of the stop plate 258 and the shaft 181 is permitted to be rocked under control of the cam 238. Should, however, a sheet be absent or sufficiently misplaced on the cylinder 237 so that any one of the fingers 254 is not depressed sufficiently to swing the bar 257 carried thereby out of the path of the stop plate 258, the shaft 181 will be prevented from rocking, and the roller 239 will not follow the periphery of the cam 238 and drop when the high portion of the cam has passed, but will be held up. Failure of the shaft 181 to rock will maintain the roller 178 in an "up" position where it is in the path of the outer end 233 of the lever 177 and, as the cylinder 237 rotates, the roller 178 will thus rock this lever 177 about its pivot 231 to set the trip control mechanism of this invention to trip "off" position, as will be hereinafter described.

Counter-clockwise movement of the lever 177, pushes a rod 182 connecting the lever 177 to a lever 183 (Figure 2), and rocks the lever 183, which is pivoted at 184 to an adjacent frame member, and moves a camming arm 185 out of the path of each of a set of rollers 186. These rollers 186 are carried on arms of levers 187 each of which swings on a pivot 188 secured to a gear 189. A spring 191 reacts between another arm 192 of each of the levers 187 and a post 193 on the gear 189 to constantly urge the roller 186 toward the camming arm 185. The gear 189 is in mesh with a pinion 194 (indicated immediately above it by dotted lines), which rotates with the cylinder 237, and is timed so that the interval between the engagement of successive rollers 186 with the camming arm 185 is proportional to the length of sheet the machine is adapted to print. As herein shown, the gear 189 carries four levers 187 and four sets of the trip control parts associated with each lever, and thus provides for the control of a four unit printing machine, such as is shown in Patent No. 2,231,914, although only two of the printing units 14 and 15 are herein shown. For machines hav-

ing a different number of units, the number of sets of trip control parts carried by the gear 189 would be changed to correspond.

A plurality of levers 195, there being one for each of the catch levers 187, are each pivoted at 196 to the gear 189. An arm of each lever 195 carries a roller 197 while the other arm 198 thereof has a post 199 thereon adapted to be engaged by a catch notch 201 formed at the end of the arm 192 of the lever 187, when the lever 195 is swung in one direction to dispose the roller 197 thereon in an outstanding position where it will engage a cam arm 202 pivoted at 203 to an adjacent frame member. A spring 204 acts between a post 205 on the gear 189 and the arm 198 of the lever 195 to urge the lever 195 in a direction to swing the roller 197 toward the center of the gear.

A stationary cam 206 is held by a bracket 200 secured to the machine frame in position to be engaged by each of the rollers 197 as the gear 189 rotates, to swing the roller carrying arm of the lever 195 outwardly. The cam 206 and the camming arm 185 are disposed in such relation that when the lever 195 is swung by the cam 206, the catch notch 201 will engage the post 199 and hold the lever 195 in such position, if the camming arm 185 has been moved away from the roller 186. Thus, when a sheet is displaced, absent, or out of register, on the cylinder 237, and the camming arm 185 is moved in consequence, a roller 197 will be disposed in outstanding position and will successively engage each of the cam arms 202 successively and swing them outwardly on their pivots 203.

In the preferred construction, each of the cam arms 202 is operably connected to a metallic bellows 207 by a rod 208, the bellows 207 being contained in a casing 209 secured to an adjacent frame member. A spring 210 reacts between the casing 209 and the cam arm 202 to return it to its normal position, as soon as the roller 197 has been carried past by rotation of the gear 189. A tube 211 (Figures 1, 2 and 4) extends from each bellows 207 to a corresponding bellows 212 at each of the printing units 14, 15, etc., in consecutive order so that, as the bellows 207 are successively compressed by the outstanding roller 197 moving the cam arm 202 to compress the bellows 207, the bellows 212 at the units will be expanded in turn, starting with the first unit 14 next to the registering unit 11. The bellows 207, tubes 211 and bellows 212 are preferably filled with a substantially non-compressible fluid and sealed, so that an oil-tight fluid power transmitter will be provided and no lost motion will result.

The bellows 212 at each unit (Figure 4) is held in a casing 213, secured to the frame member 55 and actuates a push rod 214 slidably supported in a stationary post 215. A spring 216 is provided to act between the post 215 and the bellows 212 tending to maintain the bellows in contracted condition. The rod 214 is extended through a post 217 mounted on an arm 218 secured to a shaft 219 which passes outwardly through the frame member 55 (Figure 7) and has the catch 126 secured upon its outer end.

Centralizing springs 222 and 223 (Figure 4) are provided reacting between the post 217 and the rod 214. With this structure, expansion of the bellows 212 will swing the catch 126 counterclockwise and release the arm 125 to allow the roller 129 to follow down the periphery of the cam 127 to the low land portion 132, whereby the trip bar 73 will be raised and the tripping operation will be started. A catch 224, pivoted at 225 to

the frame 55 is acted upon by a coiled spring 228 (Figure 7), to urge it toward and into engagement with a boss 227 (Figure 4) provided on the catch 126 to hold the catch down after it has been so moved by the bellows 212. A tongue 228 provided on the catch 224 is disposed in the path of the arm 125 to be engaged thereby, when it swings outwardly due to the roller 129 riding upon the low land portion 132 of the cam 127, to release the catch 126, whereby it will swing into position to engage the catch arm 125 when the arm is again swung inwardly by the roller 129 riding upon the high land portion 128 of the cam 127.

It will be understood that means other than the fluid actuated form shown in Figures 1 to 7 inclusive may be employed to cause the control mechanism to successively actuate the catches 126 at each of the printing units. As shown in Figure 8, an electrically operated control means is shown in which the cam arms 202, the bellows 207, the tubes 211 and the bellows 212 of Figures 1 to 7 are replaced by normally open switches 271, conductors 272, and solenoids 273 respectively. In this form, a solenoid 273 is provided at each unit and is arranged to actuate the rod 214 in the same manner as the bellows 212, when a switch 271 is closed by the engagement of its operating lever 274 by a roller 197. One terminal of each of the switches 271 is connected by a conductor 275 to a line wire L1 and the other terminal to a solenoid 273 from which connection is made to a line wire L2 by a conductor 276.

Briefly, the operation of the improved control mechanism is as follows, assuming that the absence of a sheet, or the presence of one that is out of register, has been detected by the fingers 254 (Figure 2) on the cylinder 237, and that in consequence, the lever 177 has been swung by the roller 178 to move the camming arm 185 outwardly, and thus out of possible engagement with the rollers 186. This action disposes the catch notch 201 on the lever 187 in position to engage the post 199 when the lever 195 is swung by the cam 206, and thus maintain the roller 197 in the outstanding position. As the gear 189 rotates clockwise in timed relation to the cylinder 237, the outstanding roller 197 first engages the cam arm 202 that is first in its path, this being the arm which actuates the bellows 207 connected by the tube 211 to the first unit 14 (Figure 1). Such engagement of the cam arm 202 compresses the bellows 207 creating a pressure of fluid in the system whereby the bellows 212 is expanded lengthwise to push the rod 214 and through the spring 222 to rock the arm 218 (Figure 4). Rocking of the arm 218 in turn rocks the shaft 219 and through it the catch 126 to release the catch arm 125.

Release of the catch arm 125 from the catch 126 allows the spring 122 to act on the lever 115 to cause the roller 129 to engage and ride on the timing cam 127. The cam 127 is rotated with the blanket cylinder 18 in timed relation to the feed of the sheet carrying chains 13 and with the gear 189, as well as with the registering cylinder 237. Therefore, as a sheet gripping means 12, carried by the chains 13, approaches a desired point in respect to the bite between the impression and blanket cylinders 17 and 18 without carrying a sheet, the low land portion 132 (Figure 4) of the cam 127 is opposite the roller 129, allowing the lever 115 to swing, whereby the arm 117 through the link 118 will raise the trip bar 73. In timed relation with this operation, the cam 64 acts on the roller 66 to rock the lever

68 and reciprocate the trip bar 73, whereupon the shoulder 79 will engage the pin 82 to rock the plate 83 into trip "off" position.

Rocking of the plate 83 into trip "off" position, first trips the impression cylinder 17 "off" and away from the blanket cylinder 18 through the link 101, ring 105, and the eccentric bearing sleeve 108, and at the same time by its arm 134 (Figure 3) and through the link 135 to the lever arm 136 swings the lever arm 138 upwardly to impose a spring tension, by means of the spring rod 139, upon the trip bar 75 to raise it. Thus, when the cam 64 arrives at the roller 67, the lever 69 is rocked to reciprocate the trip bar 75, whereupon the shoulder 91 will engage the pin 93 to rock the plate 95 into trip "off" position. Rocking of the plate 95 into trip "off" position will cause the plate cylinder 16 to be tripped "off" and away from the blanket cylinder 18. At the same time that the impression cylinder 17 is tripped as above described, the ink rollers 19 and 21 (Figure 5) are tripped "off" and away from the plate cylinder 16 through the medium of the trip shaft 54, the hub 59, arm 58, pin 57, lever 53, arm 61, link 62 and the eccentric ring 63, which acts as hereinbefore described, on the plate 47 for this purpose.

It will be understood that in normal operation, the sheets are properly presented to the cylinder 237, and the sheet detector mechanism permits normal motion of the arm 259. Hence, the levers 177 and 185 are not moved from their normal position shown in Figure 2, and when the rollers 197 engage the cam 206, they return to their normal position as the catch notch 201 is prevented from engaging with the post 199, because the roller 186 is prevented from swinging outward by the lever 185. Under these normal conditions, the roller 197, not being latched in its outstanding position, does not engage the cam arms 202, and no tripping impulses are communicated through the hydraulic system to the several printing units, but whenever a sheet is not properly presented to the cylinder 237 (Figure 2), the mechanism will function to automatically trip "off" the printing cylinders and ink rollers, because one of the rollers 197 will be locked in an outstanding position, and rotation of the gear 189 carrying the outstanding roller 197 successively past each of the cam arms 202, will cause the printing mechanism of each unit to be successively tripped "off" immediately after it completes the printing of a sheet that is followed by a gripper bar 12 to which a sheet was not properly presented.

If subsequent sheets are misplaced on or missing from the cylinder 237, the tripping mechanism will continue to function to throw "off" the impression successively at each unit, but whenever a sheet is properly disposed on the registering cylinder 237 against the stops 248 and fingers 256 and registered thereby, that sheet will be carried through the several printing units without tripping "off" the impression.

From the foregoing, it will be understood that when any one of the levers 195 has been latched in its tripping position, that the gear 189 will make at least a complete revolution, tripping all printing units in sequence, but if a sheet is properly registered on the cylinder 237 when the revolution of the gear 189 is completed, the lever 195, just referred to, will then be allowed to assume its normal position and regular operation of the machine will continue, this resetting being effected due to the camming arm 185 then being

in normal position, and the arm 185 would not be latched to hold the roller 197 in extended position so as to engage the cam arms 202.

It will be understood that the invention herein disclosed 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 had to the claim rather than to the foregoing description to indicate the scope of the invention.

What we claim is:

In a sheet-fed rotary offset printing machine having a sheet registering device including a sheet detector, a plurality of rotary printing units, a flexible conveyor having spaced sheet carrying elements for taking sheets from the registering device and conveying them through the printing units, and tripping means on each unit for tripping the mechanisms thereof off and on in a predetermined cycle timed with relation to the rotation of the unit, and in combination, a unit trip control on each unit settable in advance of a cycle of operation of the tripping means for determining whether the tripping means trips on or off during the said cycle of operation, and a sequential trip control comprising a rotary member driven with the machine, a series of power-transmitting devices, one for each printing unit and spaced around the rotary member, means connecting the said power-transmitting devices in order to the respective unit trip controls for setting the same successively upon momentary actuations of the power-transmitting devices, actuating elements, equal in number to the printing units but fewer than the sheet-carrying elements, the said actuating elements being spaced around and carried by the rotary member and each said actuating element being settable to an actuating position or a non-actuating position with relation to said power-transmitting devices, during the travel of the said actuating element from a power-transmitting device for a unit to that for the next unit, and means responsive to the sheet detector for so setting an actuating element during the passage of a sheet carrying element from the registering device to the first printing unit for setting the unit trip control of the first unit for controlling the tripping thereof upon arrival of a sheet carrying element and thereafter sequentially setting the unit trip controls of the succeeding units for controlling the tripping thereof upon arrival of the said sheet carrying means.

ALBERT J. HORTON.

WILLIAM K. ECKHARD.

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