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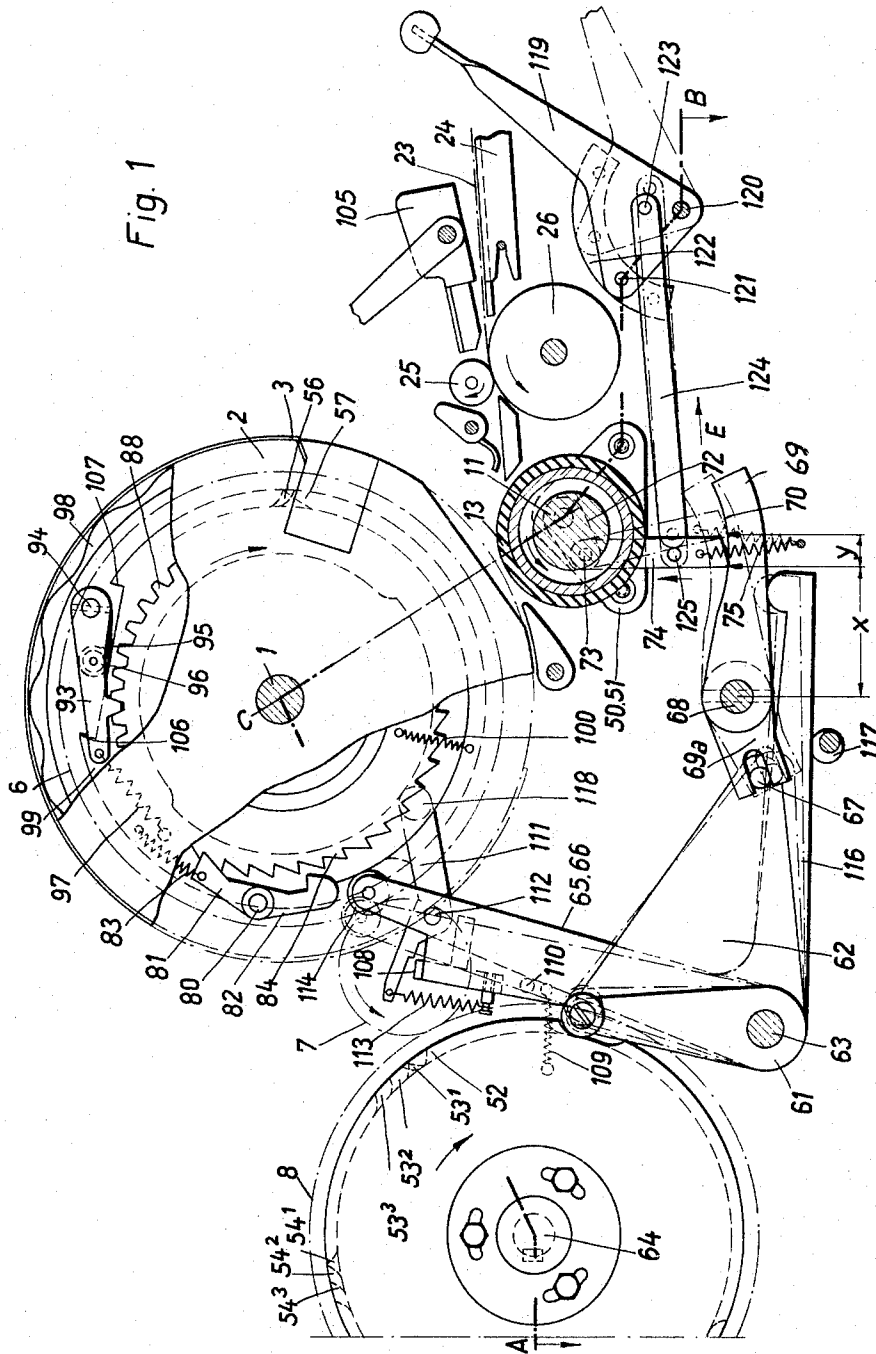
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3,283,706

MULTIPLE CONTROL ARRANGEMENT FOR SELECTIVE PRINTING MACHINES

Filed Dec. 14, 1964

2 Sheets-Sheet 1



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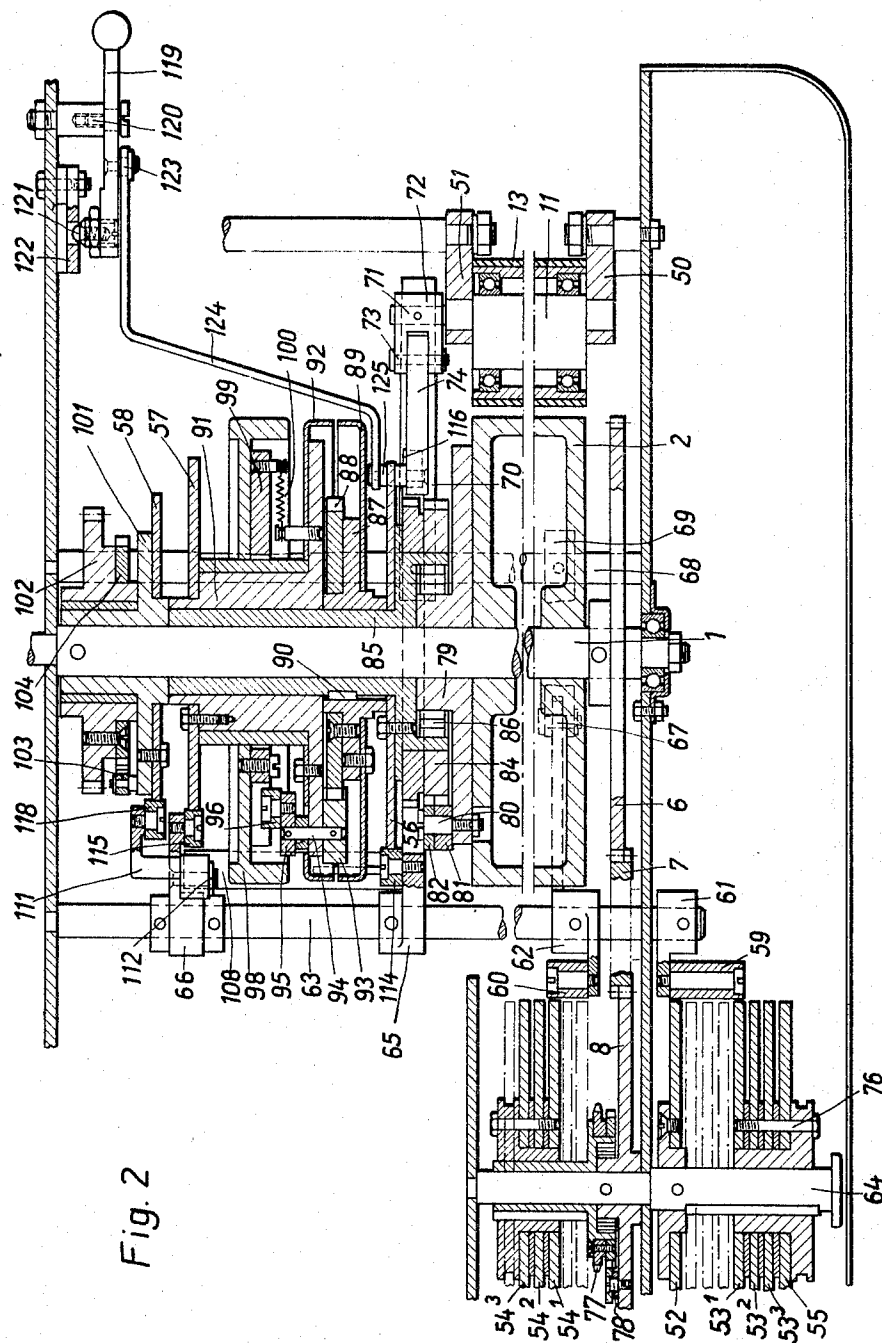


Fig. 2

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MULTIPLE CONTROL ARRANGEMENT FOR SELECTIVE PRINTING MACHINES

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The present invention relates to a multiple control arrangement for selective printing machines, and more particularly to a rotary duplicator in which a counterpressure roller is moved to and from a printing position under the control of a plurality of independently adjustable cams.

Rotary duplicators are known in which cams are mounted on a shaft extending parallel to the axis of the printing roller and are driven in synchronism with the same to control the movements of a counterpressure roller to and from a printing position. Rotary duplicators of this type use an articulated lever system including toggle levers for pressing the counterpressure roller against the printing roller, and more particularly against the copy sheet and printing form located between the two rollers.

Other rotary duplicators are known in which control cams are secured to the printing roller for rotation in synchronism therewith, and are connected by a single bell crank lever to the counterpressure roller for moving the same to the printing position. This has the disadvantage that a force multiplication possible with a toggle lever system, cannot be obtained.

Rotary printing machines in which the cams are arranged in accordance with one or other construction of the prior art have certain limitations, and it is one object of the present invention to provide rotary printing machines with control means, preferably control cams, which permit the performance of selective printing operations which cannot be achieved by the prior art constructions.

Another object of the invention is to control the movements of the counterpressure roller of a selective printing machine by two cam means which can be independently adjusted to select desired sections of a printing form for printing on a copy sheet in adjacent positions.

Another object of the invention is to provide a plurality of control cam means for the counterpressure roller, and to independently adjust each of the control cam means to make a selection of desired sections of the printing form.

With these objects in view, the present invention relates to a rotary printing machine which is capable of printing selected sections of a printing form. One embodiment of the invention comprises a printing roller; a counterpressure roller movable to and from a printing position; operating means for moving the counterpressure roller to and from the printing position; first control means, preferably cam means, connected with the printing roller for synchronous rotation about a common axis; first connecting means, preferably including a cam follower means, connecting the first control means with the operating means; second control means, preferably including cam means, mounted for rotation about another axis and connected with the printing roller for synchronous rotation; and second connecting means, preferably including a cam follower means cooperating with the cam means of the second control means, and connecting the same with the operating means.

In this manner, the operating means of the counterpressure roller is actuated under the control of both control means, and more particularly of both control cam means, whereby the counterpressure roller is moved to and from the printing position under the combined control of the first and second control means.

In the preferred embodiment of the invention, means are provided for changing the angular positions of the first and second control cam means relative to the printing roller. Manually operated means are provided for this purpose.

It is also possible to control the movements of the counterpressure roller alternately by the first and second control cam means.

It is advantageous to connect the first control cam means, which are coaxial with the printing roller, by a single bell crank lever, and to connect the second control cam means with the operating means of the counterpressure roller by an articulated lever system including levers turnable about a plurality of axes.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

FIG. 1 is a fragmentary and schematic side view, partially in section illustrating a selective rotary duplicator in accordance with the present invention; and

FIG. 2 is a horizontal sectional view taken on line A-B in FIG. 1.

Referring now to the drawings, a printing form, such as a hectographic master sheet 3 is secured to the peripheral surface of a printing roller 2. Printing roller 2 is secured to a shaft 1 driven through a one revolution clutch 102, 103, 104 from a motor, not shown.

A hollow counterpressure roller 13 is mounted for turning movement on a shaft 11 which has eccentric journal portions mounted in stationary bearings 50 and 51. Shaft 11 has a projecting stud 71 to which a lever arm 72 is secured. Lever arm 72 carries a pivot 73 on which a shifting rod 74 is mounted. A spring 75 is secured to shifting rod 74, and to a stationary frame point, and urges shifting rod 74 downward so that the free end of shifting rod 74 abuts a curved face 70 of an operating lever 69 which is secured to a shaft 68 and turnable with the same. A link 124 is connected by pivot 125 to shifting rod 74, and the other end of link 124 is connected by pivot 123 to a manually operated lever 119 which can be arrested by catch means 121 in a plurality of positions whereby the position of the end of shifting rod 74 on the cam face 70 is changed and the effective radius of operating lever 69 varied for varying the pressure of counterpressure roller 13 on printing roller 2. A table 24 is provided for supplying copy sheets 23 to a pair of transporting rollers 25 and 26, and moistening means 105 are disposed above table 24 to moisten the copy sheet 23 before the same is transported to the printing plane C between the printing roller and the counterpressure roller.

When lever 69 is angularly displaced in the clockwise actuating direction of rotation, the eccentric shaft 11 is turned, and the printing roller is moved from the illustrated inoperative position to a printing position in close proximity with the printing form 3 and the printing roller 2. A lever 69² has a forked end in which a pin 67 of a lever 62 is received. Actuating lever 62 is mounted on a shaft 63 together with another lever 61, and levers 61 and 62 carry cam follower rollers 59 and 60 cooperating with control cams mounted on a shaft 64. The forked lever 69² and operating lever 69 which has the cam face 70 are spaced in axial direction along shaft 68 and are both secured to the same for rotation.

The control cam means on shaft 64 include a head cam 52 under whose control the head section of a printing form can be printed, head extension cams 53¹,

53², 53³, which are used for printing head sections comprising more lines of the printing form than can be covered by the head cam 52, line cams 54¹, 54² and 54³ by which 1, 2 or 3 lines of the text of the printing form can be selected for printing, and the duplicating cam 55 which effects the printing of the entire text of the printing form.

When a shorter cam dwell, for example the cam dwell of a line cam 54 engages cam follower roller 60 of lever 62, shaft 63 is turned a corresponding angle and angularly displaces lever 69 which turns shaft 68 and thereby lever 69a a corresponding angle so that shifting rod 74 is displaced, turns eccentric shaft 11 and shifts counter pressure roller 13 to the printing position. The other control cams on shaft 64 operate in the same manner.

The duplicating cam 55 is connected with the package of cams 63¹, 63², 63⁴ by a pin 76. The entire cam package is turnable on a bushing connected by a key to shaft 64, and can be secured by pin 76 in adjusted angular positions. The package is also shiftable in axial direction in order to place selected cams thereof in a position cooperating with cam follower roller 59.

A spring-loaded stepping mechanism 77, 78 has pawls controlled by actuating members which can be moved between inoperative and operative positions for actuating the stepping mechanism to turn shaft 64 one, two or three steps. In this manner, line cams 54¹, 54², 54³ are turned after each revolution of the printing roller to effect the printing of different lines of the printing form during each revolution of the printing roller.

The arrangement is known, and described in detail in the U.S. Patent 2,868,116, published on January 13, 1959.

Shaft 64 and the cams thereon rotate in synchronism with the printing roller and are connected to the same by a gear train 8, 7, 6, gear 8 being secured to shaft 64, and gear 6 being secured to shaft 1.

In order to print several successive lines of the printing form together with the head section of the printing form, the machine is provided with other control cam means mounted on shaft 1 of the printing roller. As best seen in FIG. 2, a flange member 79 is secured to one end face of printing roller 2, and carries, as also shown in FIG. 1, a pin 80 on which a shifting pawl 82 and a locking pawl 81 are mounted. A spring 83 urges locking pawl 81 to engage a notch in ratchet wheel 84. Ratchet wheel 84 is fixed to a bushing 85 which is turnable on shaft 1. Bushing 85 has a hollow flange surrounding a hub portion of flange member 79 and forming a cavity with the same in which a spiral spring 86 is mounted. The ends of spring 86 are respectively secured to bushing 85 and flange member 79 so that the angular position of bushing 85 is determined by locking pawl 81, while upon release of locking pawl 81, bushing 85 will perform an angular step. Normally, pawl 81 will couple flange member 79 and printing member 2 with ratchet wheel 84 and bushing 85 for synchronous rotation. A line cam 56 is secured to bushing 85 so as to rotate with the same, but the exact relative angular position of line cam 56 on bushing 85 can be adjusted by adjusting screws. Line cam 56 has a cam dwell whose circumferential length corresponds to the circumferential extension of a line or section of printing form 3.

A flange member 87 is secured by a key 90 to bushing 85 and rotates with the same. A toothed coupling wheel 88 is secured by screws to member 87 and turns with the same. The peripheral notches of coupling wheel 88 are engaged by a tooth of a coupling lever 93 which is secured to a pin 94 which carries a feeler arm 95 with a feeler roller 96 which is located in a cutout between two shoulders 106 and 107 of a control cam 99, as best seen in FIG. 1. A spring 97 is connected to coupling lever 93 and urges the same to a position coupled with coupling wheel 88.

Pin 94 is mounted in a bearing of a flange member 91 which is mounted for rotation on bushing 85. A line

extension cam 57 is secured to member 91 and is consequently free to rotate on bushing 85. An indicator dial 92 is also secured to flange member 91 and carries a scale cooperating with a window on the machine casing, not shown, to indicate the position of the line extension cam 57. Member 87 with coupling wheel 88 are also secured to an indicator dial 89 indicating in the same manner the position of coupling wheel 88 and of control cam 99 which is secured to a manually turnable member 98 which is mounted for turning movement on flange member 91. A spring 100 connects control cam 99 with flange member 91 and holds control cam 99 in a normal position in which feeler roller 96 is located in the recess of control cam 99 between shoulders 106 and 107.

A flange member 101 is fixedly secured to shaft 1 of printing roller 2 and has a flange fixedly secured by screws to a releasing cam 58. The one revolution clutch 102, 103, 104 connects shaft 1 with a motor, not shown, so that the printing roller and other elements driven by shaft 1 perform a single revolution when the machine is started for printing a copy of selected sections or lines of printing form 3.

Shaft 1 rotates printing roller 2, and since ratchet wheel 84 is connected by pawls 81, 82 to flange member 79 and is also fixed on bushing 85, bushing 85 rotates with coupling wheel 88 and line cam 56.

Shaft 64 is driven by gear train 6, 7, 8 so that the respective cams on shaft 64 are rotated in synchronism with the printing roller.

When the movement of the counterpressure roller is to be controlled by the cams on shaft 64, the cam dwell of the line cam 56 is placed in an angular position corresponding to the position of the head cam 52 so that line cams 54¹ to 54³ are effective for controlling the selection of line sections of the printing form by moving the actuating means 62, 67 and thereby the operating means 69, 74, 11 of the counterpressure roller so that the counterpressure roller is moved to the printing position.

In the line extension printing operation, the cam dwell of cam 54¹ is placed behind the shortest cam dwell of head cam 52.

The manually adjustable wheel 98 which has a wavy periphery, as best seen in FIG. 1, is turned against the action of spring 100 until either shoulder 106 or shoulder 107 of control cam 99 engages feeler roller 96 of feeler arm 95 and rises coupling lever 93 so that the same disengages coupling wheel 88. Further turning of the manually operated wheel 98 results in turning of flange member 91 to which the movement is transmitted by a spring 100 so that line extension cam 57 is turned. When manually operated wheel 98 is released by the operator, spring 100 draws wheel 98 together with control cam 99 to a central position in which feeler roller 96 is located between shoulders 106 and 107, permitting the tooth of coupling lever 93 to drop into a notch of coupling wheel 88 under the action of spring 97.

In this manner, the line extension cam 57 is angularly displaced in relation to the line cam 56, and then coupled to the same by the coupling means 88, 93.

When line cam 56 is stepwise turned under the control of spiral spring 86, the line extension cam 57 performs corresponding angular steps without any change in the relative position of cams 56 and 57.

A cam follower lever 65 is secured to shaft 63 and has a locking portion 108, as best seen in FIG. 1. A roller 114 on cam follower lever 65 cooperates with the line cam 56.

Axially spaced from cam follower lever 65, another cam follower lever 66 is mounted on shaft 63 for free turning movement, and has a pivot pin 112 on which a locking lever 111 is mounted for angular movement. A spring 113 urges locking lever 111 to turn in counterclockwise direction as viewed in FIG. 1 so as to engage

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locking portion 108 of cam follower lever 65. Locking portion 108 is an elongated plate extending along shaft 63 to the region of cam follower lever 66 and locking lever 111, as best seen in FIG. 2.

Cam follower lever 66 has a cam follower roller 115 cooperating with line extension cam 57, while another roller on locking lever 111 cooperates with releasing cam 58.

A spring 109 is connected to cam follower lever 66 and urges the same to engage a fixed abutment 110.

When roller 114 of cam follower 65 engages the dwell of line cam 56, cam follower lever 65 with locking plate 108 is turned toward cam follower lever 66 so that locking lever 111 and roller 118 are moved away from cam 58, and locking lever 111 is turned by spring 113 to engage locking plate 108 so that cam follower lever 66 is coupled with cam follower lever 65 and thereby with shaft 63.

When the dwell of line cam 56 has passed roller 114 of cam follower 65, cam follower roller 115 of cam follower lever 66 is operated by the dwell of line extension cam 57 to hold shaft 63 in the same position as before so that counterpressure roller 13 is held in the printing position first by the action of line cam 56 on cam follower means 65, 114, and then by the action of line extension cam 57 on cam follower means 66, 115. When the dwell of line extension cam 57 has passed roller 115, the counterpressure roller returns to its normal inoperative position under the action of spring 75 which causes shifting rod 74 to turn lever 69a in clockwise direction whereby the entire lever system which is connected to shaft 63 is returned to the normal initial position.

Cam follower lever 65 is a bell crank lever which has a long actuating arm 116 with a projection abutting the underside of operating lever 69. When actuating means 65, 116 is turned in counterclockwise direction as viewed in FIG. 1 by a cam dwell of cam 56 or of cam 57 through cam follower means 66, 115, the end portion of arm 116 moves upward and urges operating lever 69a to turn upward in the actuating direction whereby shifting rod 74 is displaced in the direction of the arrow by operating lever 69 so that eccentric shaft 11 is turned by arm 72, and counterpressure roller 13 is moved into engagement with the printing form, or more particularly with a copy sheet located between the printing form and the printing roller whereby an imprint is made.

Thereupon, cam follower lever 65 is turned until its arm 116 abuts an adjustable stop 117 since spring 75 pulls lever 69a in downward direction.

At the end of each revolution of the printing roller, cam follower roller 59 on cam follower lever 61 of shaft 63 is engaged by a dwell of the head cam 82 on shaft 64 so that counterpressure roller 13 is again moved toward the printing roller and is rotated by the same while the copy sheet 23 is ejected. At the same time, roller 118 of locking lever 111 is engaged by a dwell of the releasing cam 58 so that locking lever 111 releases locking portions 108 so that cam follower lever 66 is no longer coupled with cam follower lever 65.

As noted above, the indicator dial 89 is fixedly connected for turning movement with line cam 56 and indicates at an indicator window of the casing which line is selected. The indicator dial 92, which is fixedly connected with line extension cam 57 for rotation therewith, indicates up to which line the printing form is used in addition to the line section selected by line cam 56.

The effective arm of lever 69 is varied by shifting the end of shifting rod 74 by handle 119 and link 124 to displaced positions on cam face 70 so that the effective lever arm of lever 69 is varied. However, the position of lever 69a, shaft 68 and lever 69, and the cam follower lever 61, 62, 65 and 66 is not influenced by the manual adjustment of the printing pressure.

It will be understood that each of the elements de-

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scribed above, or two or more together, may also find a useful application in other types of selective printing machines differing from the types described above.

While the invention has been illustrated and described as embodied in a rotary duplicating machine including two cam systems for influencing the movement of the counterpressure roller to the printing position, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. In a rotary printing machine, in combination, a printing roller rotatable about a first axis; a counterpressure roller movable between an inoperative position, and a printing position cooperating with said printing roller; operating means for moving said counterpressure roller between said positions and including an operating member; first control cam means connected with said printing roller for synchronous rotation about said first axis; first connecting means including cam follower means and first actuating means cooperating with said operating member, said first connecting means operatively connecting said first control cam means with said operating means for actuating the latter; second control cam means mounted for rotation about a second axis and connected with said printing roller for synchronous rotation; and second connecting means including cam follower means and second actuating means cooperating with said operating member, said second connecting means operatively connecting said second control cam means with said operating means for actuating the latter, each of said first and second connecting means, respectively, being arranged and constructed to permit movement of said operating member when the same is actuated by the actuating means of the respective other connecting means whereby said counterpressure roller is moved between said inoperative and printing positions under the control of said first and second control means.

2. In a rotary printing machine, in combination, a printing roller rotatable about a first axis; a counterpressure roller movable between an inoperative position, and a printing position cooperating with said printing roller; operating means including an eccentric member turnable for moving said counterpressure roller between said positions and an operating member operatively connected with said eccentric member for turning the same; first control cam means connected with said printing roller for synchronous rotation about said first axis; means for changing the angular positions of said first control cam means relative to said printing roller; first connecting means including cam follower means and first actuating means cooperating with said operating member, said first connecting means operatively connecting said first control cam means with said operating means for actuating the latter; second control cam means mounted for rotation about a second axis and connected with said printing roller for synchronous rotation; means for changing the relative angular position between said second control cam means and said printing roller; and second connecting means including cam follower means and second actuating means cooperating with said operating member, said second connecting means operatively connecting said second control cam means with said operating means

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for actuating the latter, each of said first and second connecting means, respectively, being arranged and constructed to permit movement of said operating member when the same is actuated by the actuating means of the respective other connecting means whereby said counterpressure roller is moved between said inoperative and printing positions under the control of said first and second control means.

3. In a rotary printing machine, in combination, a printing roller rotatable about a first axis and adapted to support a printing form having line sections; a counterpressure roller movable between an operative position and a printing position cooperating with said printing roller; operating means for moving said counterpressure roller between said positions and including an operating member; first cam means connected to said printing roller for synchronous rotation about said first axis, said first cam means including a line cam and a line extension cam, and coupling means for coupling said line cam with said line extension cam in different angular positions; manually operable means for turning said line extension cam relative to said line cam, and including releasing means for moving said coupling means to a disengaged position; first linkage means including first cam follower means cooperating with said first cam means, and including first actuating means cooperating with said operating member for actuating said operating means, said first cam follower means including two cam followers respectively cooperating with said line cam and said line extension cam; second cam means mounted for rotation about a second axis; transmission means connecting said second cam means with said printing roller for synchronous rotation; and second linkage means including second cam follower means cooperating with said second cam means, and including second actuating means cooperating with said operating member for actuating said operating means, each of said first and second linkage means, respectively, being arranged and constructed to permit movement of said operating member when the same is actuated by the actuating means of the respective other linkage means whereby said counterpressure roller is moved between said inoperative and printing positions under the control of said first and second cam means to print selected line sections of said printing form.

4. In a rotary printing machine according to claim 3, in combination, wherein said releasing means include a manually turnable control cam, and said coupling means include a toothed coupling wheel, and including a spring-biased coupling lever having a tooth cooperating with said coupling wheel, and a feeler lever connected with said coupling lever for turning movement and cooperating with said control cam to move said coupling lever to a position disengaged from said coupling wheel.

5. In a rotary printing machine, in combination, a printing roller rotatable about a first axis and adapted to support a printing form having line sections; a counterpressure roller movable between an operative position and a printing position cooperating with said printing roller; operating means for moving said counterpressure roller between said positions and including an operating member; first cam means connected to said printing roller for synchronous rotation about said first axis, said first cam means including a line cam and a line extension cam, and coupling means for coupling said line cam with said line extension cam in different angular positions; first linkage means including first cam follower means cooperating with said first cam means, and including first actuating means cooperating with said operating member for actuating said operating means, said first cam follower means including two cam followers respectively cooperating with said line cam and said line extension cam, one of said cam followers having a locking portion, and the other cam follower including a spring-loaded locking lever biased to engage said locking portion for

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locking said cam followers to each other, said locking lever having a roller; a cam connected to said printing roller for rotation and operating said locking lever to release said locking portion; second cam means mounted for rotation about a second axis; transmission means connecting said second cam means with said printing roller for synchronous rotation; and second linkage means including second cam follower means cooperating with said second cam means, and including second actuating means cooperating with said operating member for actuating said operating means, each of said first and second linkage means, respectively, being arranged and constructed to permit movement of said operating member when the same is actuated by the actuating means of the respective other linkage means whereby said counterpressure roller is moved between said inoperative and printing positions under the control of said first and second cam means to print selected line sections of said printing form.

6. In a rotary printing machine, in combination, a printing roller rotatable about a first axis and adapted to support a printing form having line sections; a counterpressure roller movable between an operative position and a printing position cooperating with said printing roller; operating means for moving said counterpressure roller between said positions and including a lever means and a linkage connecting said lever means with said counterpressure roller; first cam means connected to said printing roller for synchronous rotation about said first axis, said first cam means including a line cam and a line extension cam, and coupling means for coupling said line cam with said line extension cam in different angular positions; first linkage means having first cam follower means cooperating with said first cam means and including two cam followers respectively cooperating with said line cam and said line extension cam, one of said cam followers having a locking portion, and the other cam follower including a spring-loaded locking lever biased to engage said locking portion for locking said cam followers to each other, said locking lever having a roller; and a cam connected to said printing roller for rotation and operating said locking lever to release said locking portion, said one cam follower being a bell crank lever having an arm engaging said lever means; second cam means mounted for rotation about a second axis; transmission means connecting said second cam means with said printing roller for synchronous rotation; and second linkage means including second cam follower means cooperating with said second cam means, and an articulated lever system connecting said second cam follower means with said lever means of said operating means for actuating the latter, said first and second linkage means, respectively, being arranged and constructed to permit angular movement of said lever means when the same is actuated by said articulated lever system and by said bell crank lever, respectively, whereby said counterpressure roller is moved between said inoperative and printing positions under the control of said first and second cam means to print selected line sections of said printing form.

7. A rotary printing machine as set forth in claim 6 wherein said operating means includes a shiftable rod and an eccentric shaft supporting said counterpressure roller and turnably supporting said shifting rod, said lever means of said operating means having a face slidably engaged by said shiftable rod in turned positions for changing the effective radius of said lever means; and manually operated means connected to said shiftable rod for displacing the same along said face whereby the pressure exerted by said counterpressure roller on said printing roller in said printing position is varied.

8. A printing machine as set forth in claim 6 and including a shaft supporting said first and second cam follower means, the cam follower cooperating with said

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line cam being secured to said shaft, and the cam follower cooperating with said line extension cam being freely turnable on said shaft.

9. In a rotary printing machine, in combination, printing roller means rotatable about a first axis; counterpressure roller means movable between an inoperative position and an operative position; operating means for said counterpressure roller means including biasing means for urging said counterpressure roller means into said inoperative position, and an operating member movable in an actuating direction to cause movement of said counterpressure roller means to said operative position; first control cam means connected with said printing roller for synchronous rotation about said first axis; first linkage means including first cam follower means cooperating with said first control cam means, and first actuating means cooperating with said operating member in said actuating direction to move said counterpressure roller means to said operative position; second control cam means mounted for rotation about a second axis and connected with said printing roller means for synchronous rotation; and second linkage means including second cam follower means cooperating with said second control cam means, and second actuating means cooperating with said operating member in said actuating direction to move said counterpressure roller means to said operative position, each of said first and second linkage means being arranged and constructed to permit movement of said operating member in said actuating direction when the same is operated by the actuating means of the respective other linkage means.

10. A printing machine according to claim 9 including

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supporting means; and wherein said operating member is an operating lever mounted on said supporting means for angular movement; wherein said first and second actuating means include first and second actuating levers cooperating with said operating lever for turning the same in said actuating direction; and wherein said operating means include a shifting member operatively connected with said counterpressure roller means, abutting said operating lever under the action of said biasing means and being moved by said operating lever in said actuating direction for moving said counterpressure roller means to said operative position.

11. A printing machine according to claim 10 wherein said shifting member is mounted on said supporting means for movement between a plurality of positions abutting said operating lever spaced different distances from the fulcrum of said operating lever; and manually operated means for moving said shifting member between said positions thereof whereby the pressure of said counterpressure roller means of said printing roller means is adjusted.

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