July 10, 1956 A. W. M. THURMANN 2,753,791

PLATEN ACTUATING MECHANISM FOR ROTARY PRINTING MACHINE

Filed Jan. 19, 1953 7 Sheets-Sheet 1

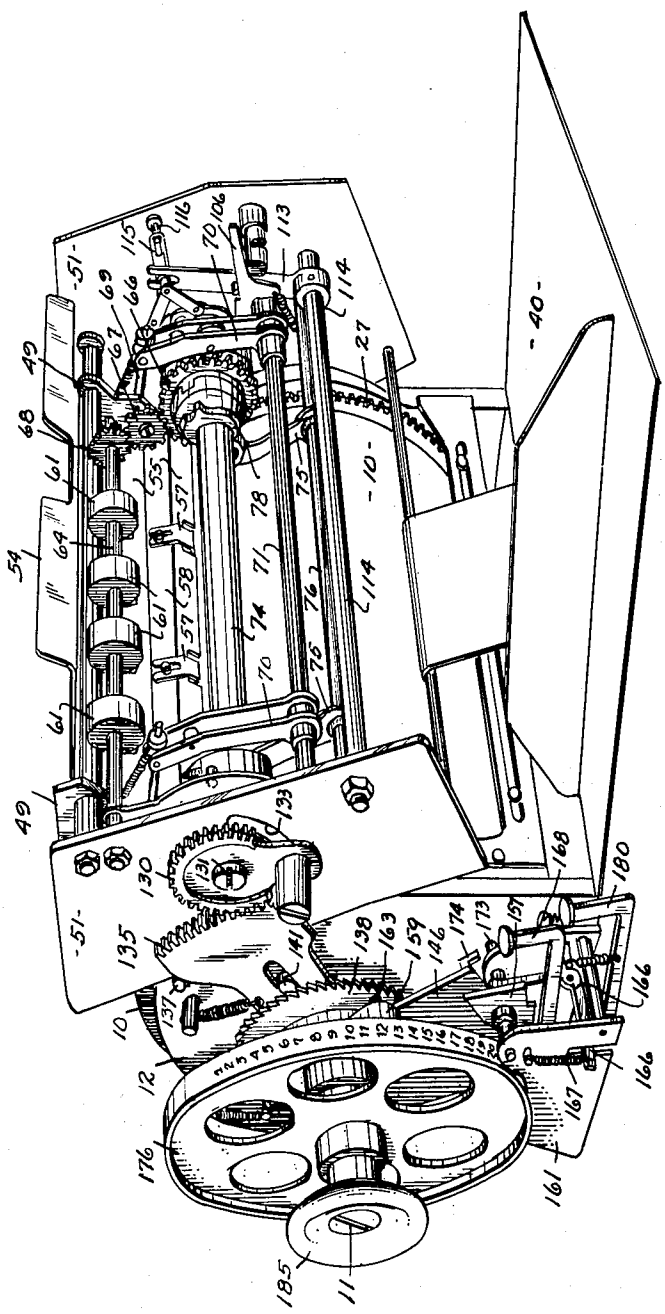


FIG. 1

INVENTOR.
AUGUST WILHELM MAX THURMANN
BY
Bates, Keane, & McBean

July 10, 1956 A. W. M. THURMANN 2,753,791

PLATEN ACTUATING MECHANISM FOR ROTARY PRINTING MACHINE

Filed Jan. 19, 1953 7 Sheets-Sheet 2

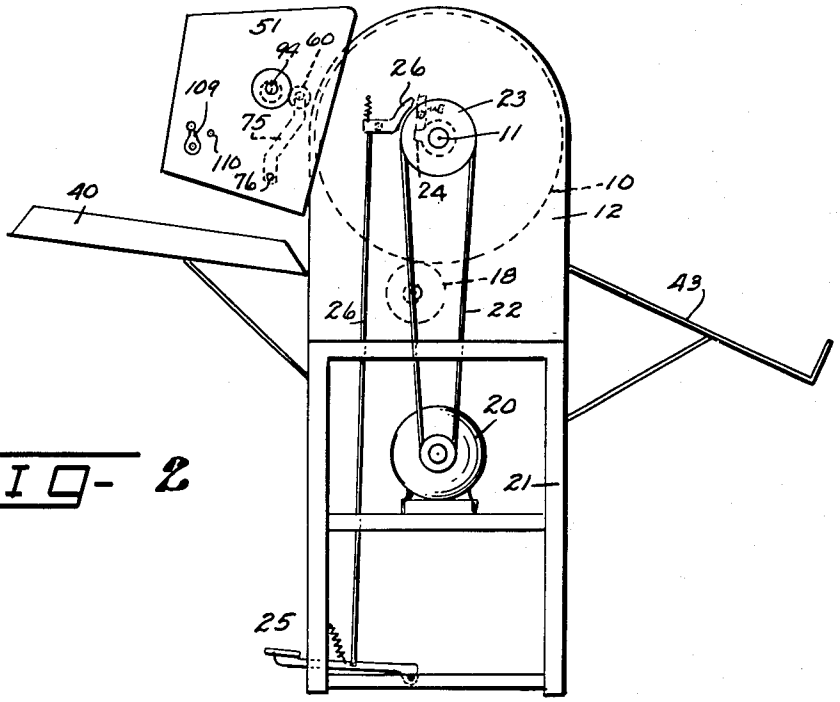


FIG- 2

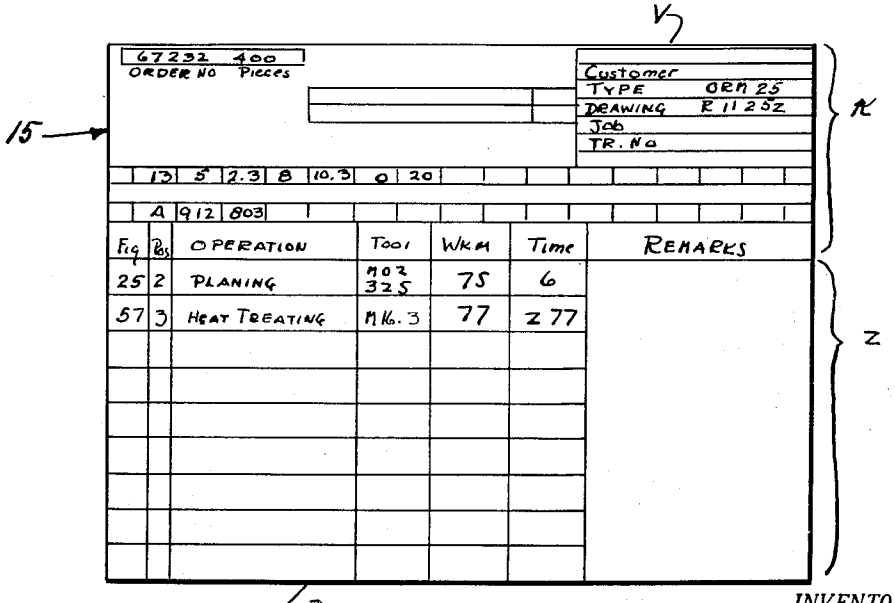


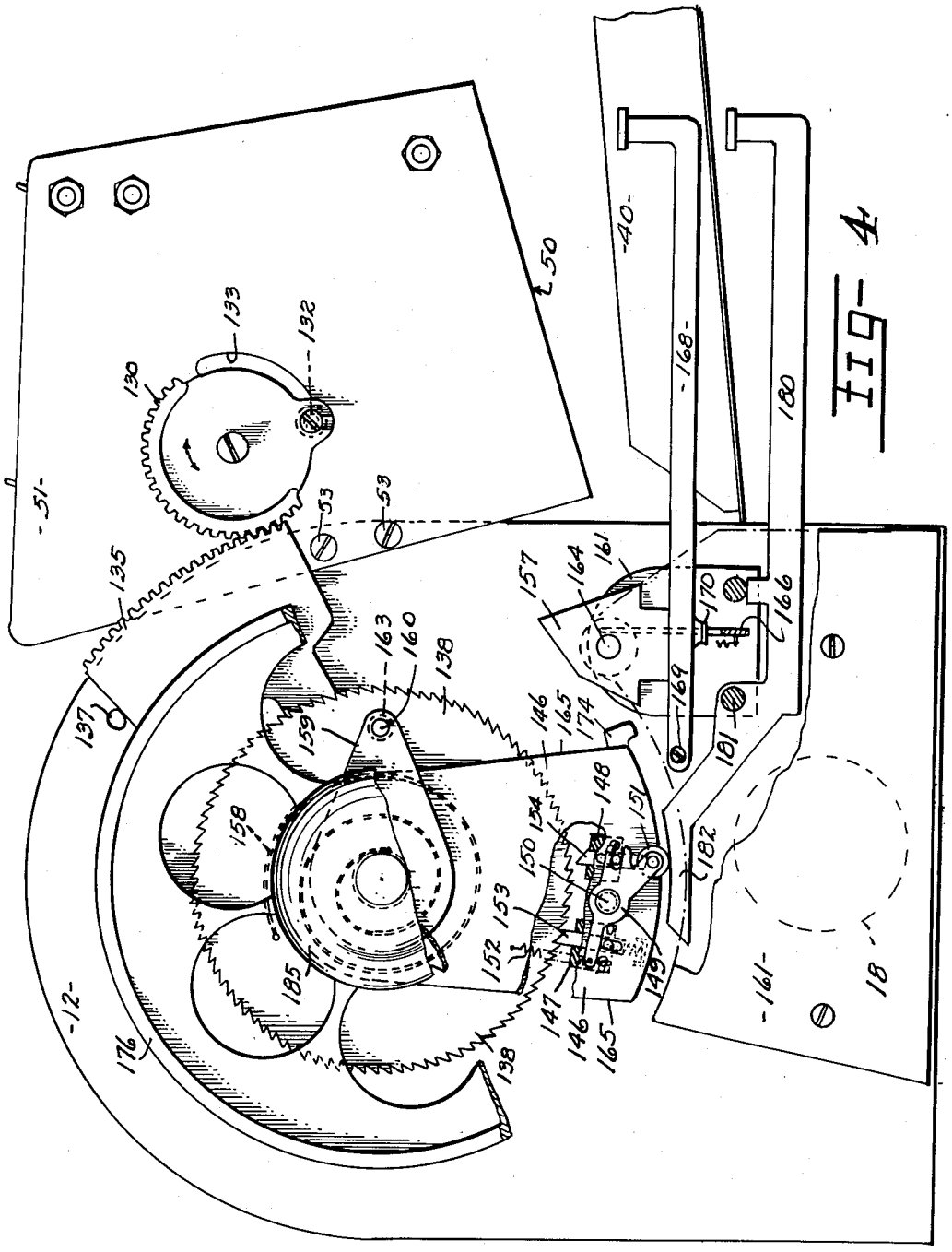
FIG- 3

INVENTOR.
AUGUST WILHELM MAX THURMANN
BY
Bates, Jean, & McJean
ATTORNEYS

July 10, 1956 A. W. M. THURMANN 2,753,791

PLATEN ACTUATING MECHANISM FOR ROTARY PRINTING MACHINE

Filed Jan. 19, 1953 7 Sheets-Sheet 3



INVENTOR.
AUGUST WILHELM MAX THURMANN

BY
Bates, Teare, & McBean
ATTORNEYS

July 10, 1956 A. W. M. THURMANN 2,753,791

PLATEN ACTUATING MECHANISM FOR ROTARY PRINTING MACHINE

Filed Jan. 19, 1953 7 Sheets-Sheet 4

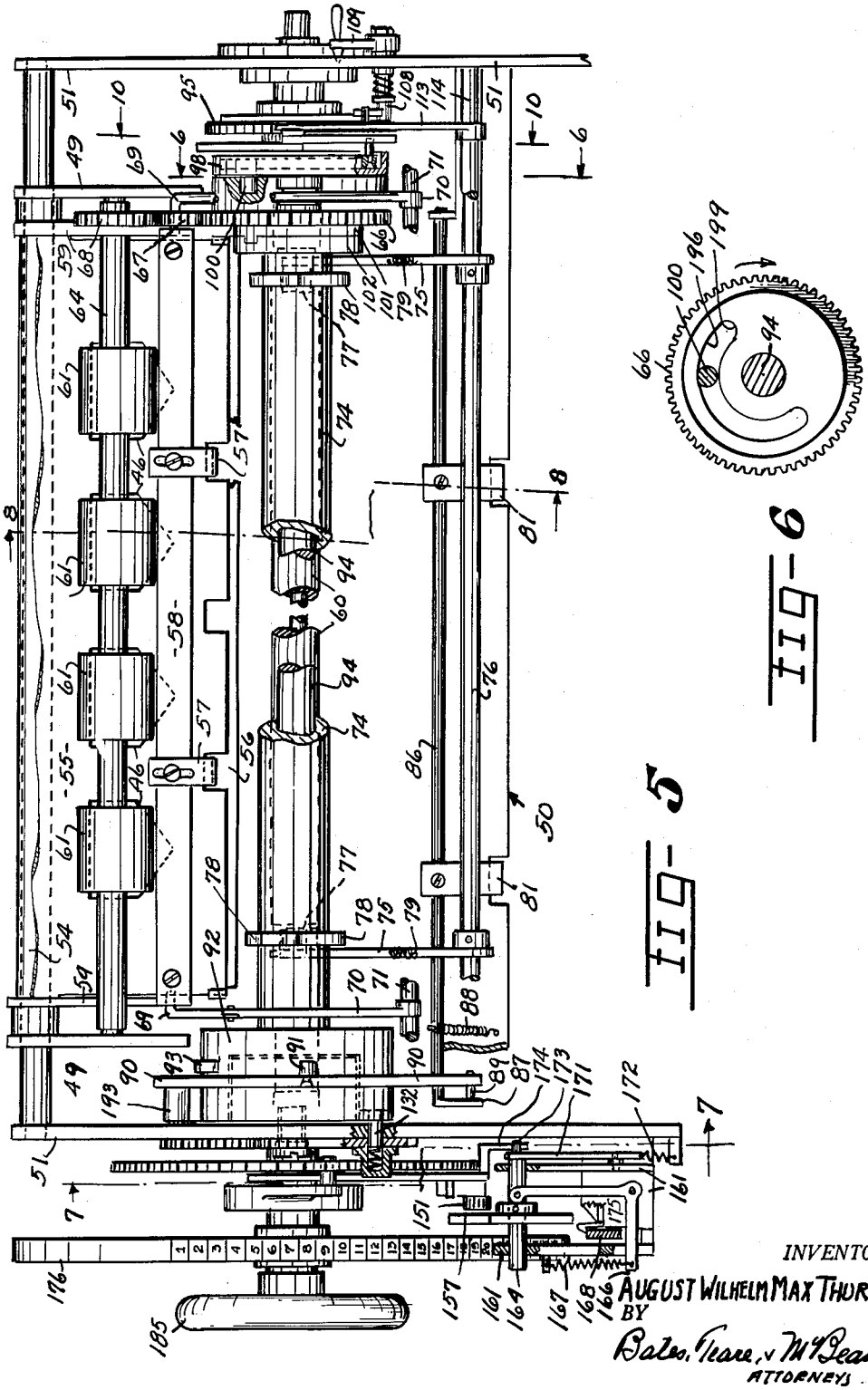


FIG. 6

FIG. 5

INVENTOR.
AUGUST WILHELM MAX THURMANN
BY
Bates, Teare, & McDean
ATTORNEYS

July 10, 1956 A. W. M. THURMANN 2,753,791

PLATEN ACTUATING MECHANISM FOR ROTARY PRINTING MACHINE

Filed Jan. 19, 1953 7 Sheets-Sheet 5

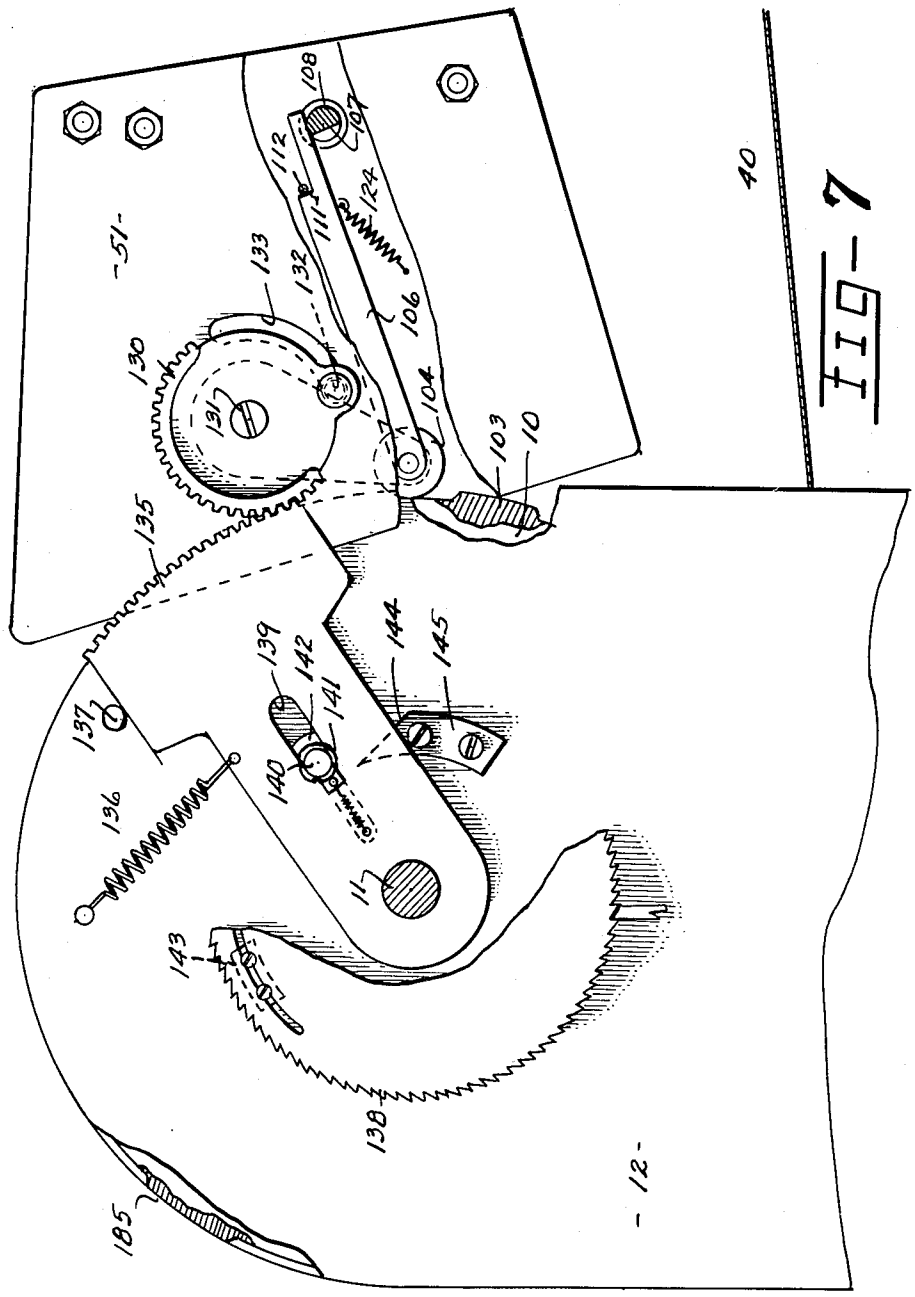


FIG-7

INVENTOR.
AUGUST WILHELM MAX THURMANN

BY
Bates, Teare, & McLean

July 10, 1956 A. W. M. THURMANN 2,753,791

PLATEN ACTUATING MECHANISM FOR ROTARY PRINTING MACHINE

Filed Jan. 19, 1953 7 Sheets-Sheet 6

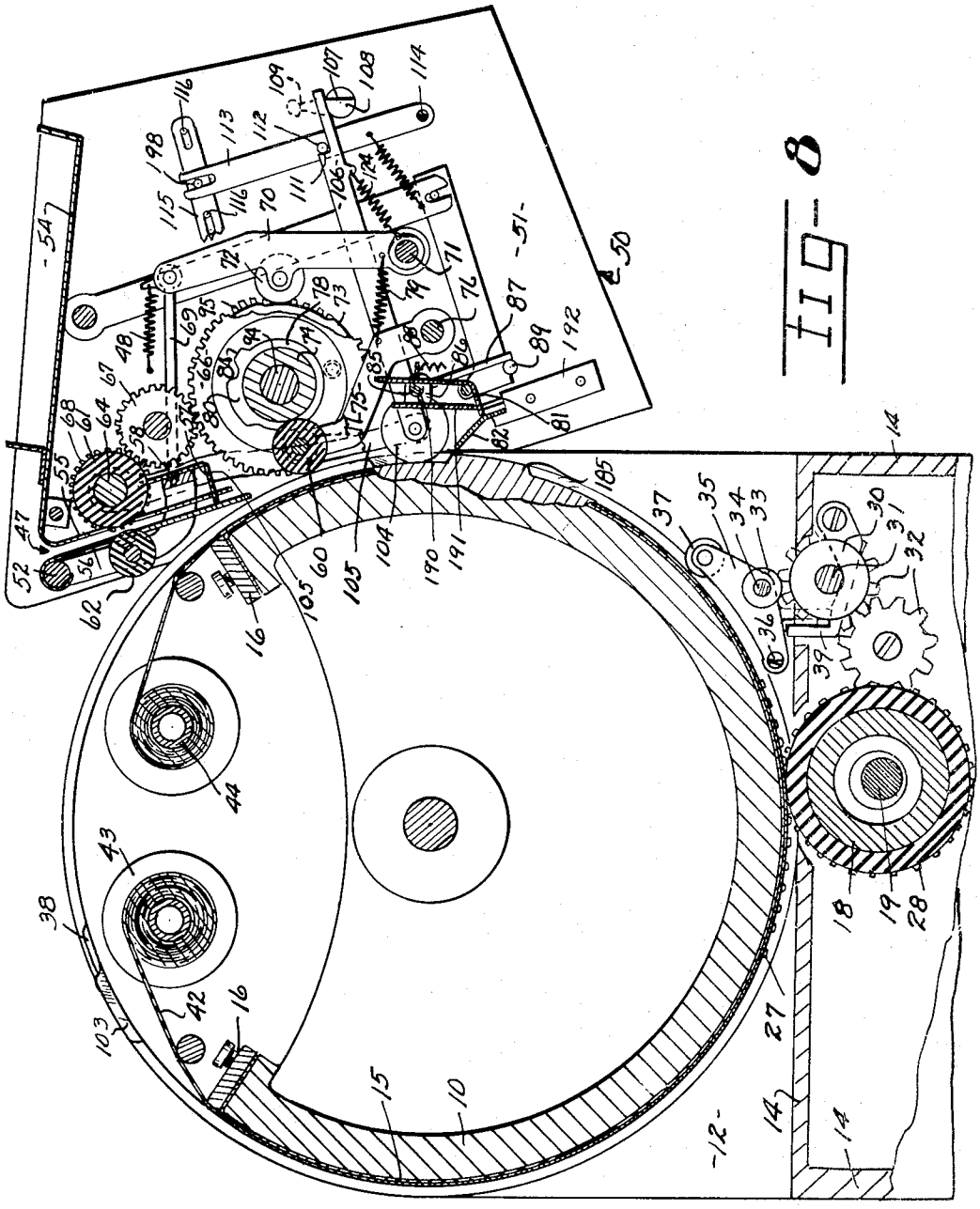


FIG. 8

INVENTOR.
AUGUST WILHELM MAX THURMANN
BY
Bales, Teare & McBean
ATTORNEYS

July 10, 1956 A. W. M. THURMANN 2,753,791

PLATEN ACTUATING MECHANISM FOR ROTARY PRINTING MACHINE

Filed Jan. 19, 1953 7 Sheets-Sheet 7

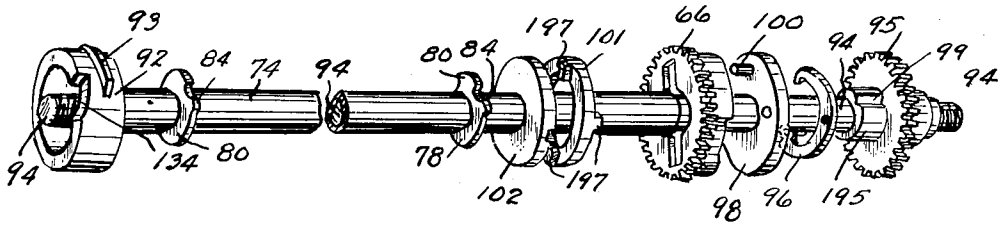


FIG. 9

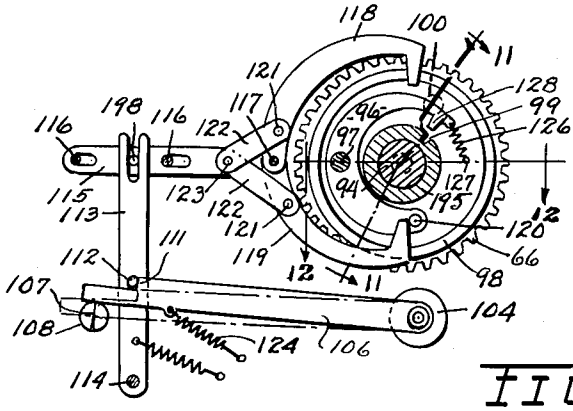


FIG. 10

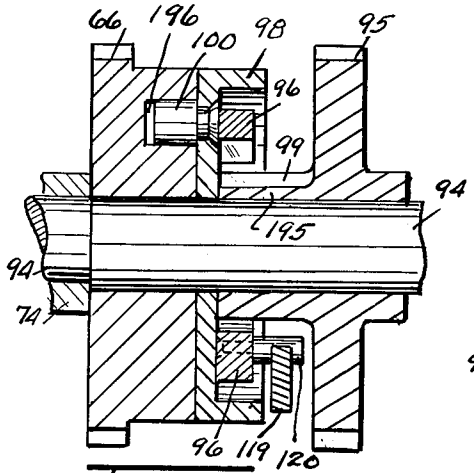


FIG. 11

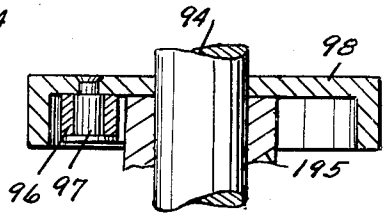


FIG. 12

INVENTOR.
AUGUST WILHELM MAX THURMANN
BY
Bates, Green, & McBean
ATTORNEYS

United States Patent Office 2,753,791 Patented July 10, 1956

2,753,791

PLATEN ACTUATING MECHANISM FOR ROTARY PRINTING MACHINE

August Wilhelm Max Thurmann, Frankfurt am Main, Germany, assignor to Addressograph-Multigraph G. m. b. H., Frankfurt am Main, Oberrad, Germany, a limited liability company of Germany

Application January 19, 1953, Serial No. 331,760

Claims priority, application Germany April 19, 1952

14 Claims. (Cl. 101—91)

This invention relates to improvements in printing machines and especially to improvements in printing machines which include a printing form and a relatively movable platen. The invention further contemplates controlling the relative movement between the platen and form to facilitate the printing from preselected areas of the form. These therefore are the general objects of the present invention.

A further object of this invention is to provide an improved printing machine which will permit the printing of any desired line or group of lines from a printing form having a plurality of parallel lines of printing characters.

A more specific object of the present invention is to provide an improved printing machine including a printing form having a plurality of substantially parallel lines of printing characters and a cooperating printing roller arranged with its axis parallel with the lines of characters, together with mechanism to permit the printing of any desired line or number of lines as desired.

The invention is particularly useful in connection with the printing of business forms, especially forms to be used in industrial establishments to provide information related to the processing of work pieces. It is the practice in some establishments for an office entrusted with the planning and supervision of the work to provide a printing form having a heading which contains the identification of a particular work piece and general data relating thereto. Such form also includes a portion, generally below the heading, which is subdivided in lines or groups of lines each relating to a particular phase of the operations to be performed on the work piece such as turning, milling, shaping of the work piece, or the like, and/or directions for various operators. To effectively process the work each operator receives an imprint made from such printing form. However, it is desirable that such imprints be limited to the data contained in the heading of the printing form and to that contained in the line or lines relating to the particular operation to be performed by the operator receiving the form. Therefore, it is desirable to print the heading and a different predetermined line or group of lines of the printing form for each operator. Moreover, to minimize paper consumption it is desirable that the line or group of lines to be printed on each data sheet be placed on the sheet directly beneath the imprint of the heading of the form. Thus it is often desirable to print the heading and immediately therebelow a second line which on the printing plate may be separated from the heading by one or more lines.

The invention is also useful in connection with a printing form containing a communication and a number of addresses. When so used a selected address may be printed on a sheet of paper above the communication in the form of a letter. In this case the upper portion of the printing form would contain the communication and would be printed from first and the selected address, generally containing a group of lines, would be printed directly thereabove on the sheet.

In the past printing machines have been provided for similar purposes. One such machine utilized a printing form comprising a knurled aluminum foil which was provided with raised printing characters by use of ordinary typewriters. The printing form was carried by a printing cylinder in such manner as to form a loop which extends into the hollow interior of the printing cylinder leaving but the head portion and a selected group of lines exposed on the surface of the printing cylinder for the printing operation. Such arrangements, however, have many disadvantages. For instance, the printing form must be bent in a narrow loop and, therefore, must be made of very thin sheet metal, which results in impressions lacking clarity. Further the constant flexing of the form due to changes in the loop cause rapid deterioration of the form.

According to the present invention, a printing machine having a printing form is provided with a platen roller which is adapted to make repeated imprints from the printing form by rolling contact therewith, and which is arranged to be moved to and from printing contact with the form so as to press each sheet to be printed against the printing form at least twice as the form moves past the platen roller, and wherein one of these operations will cause an imprint, on each sheet to be printed, from the same portion of the printing form while the other operation will cause the platen to cooperate with a selected zone of the printing form, which may differ with each sheet imprinted, such zone being selected by a manually settable selector, and wherein the printing form continues its motion relative to the sheet in the interval between the two imprinting operations. This arrangement offers the advantage that the entire area of the printing form may be supported by the surface of printing cylinder at all times and any desired line or group of lines may be selected for the printing operation with accuracy and reliability. Further the two printing operations may be made from remotely spaced portions of the printing plate or form and yet be effected on the sheet to be printed directly beneath each other without any large space therebetween. The machine of the present invention also permits the impression of the entire printing form in the usual manner.

Other features and advantages of the invention will become apparent from the following description of an embodiment of the invention illustrated in the accompanying drawings in which:

Fig. 1 is a perspective view of the machine;

Fig. 2 is a side elevation of the machine and its supporting and driving structures;

Fig. 3 is a diagrammatic rear view of one type of printing form which may be used;

Fig. 4 is an elevation of the machine as viewed from the opposite side to that shown in Fig. 3, certain elements being broken away to more clearly illustrate the internal construction;

Fig. 5 is an elevation of the supplemental or front printing mechanism including the paper stops, the platen roller and the elements for driving the same, the main printing cylinder and its associated structure being omitted;

Fig. 6 is a fragmentary sectional detail, the plane of the section being indicated by the line 6—6 on Fig. 5;

Fig. 7 is a vertical section taken along the line 7—7 of Fig. 5, certain parts being broken away to clarify the illustration;

Fig. 8 is a sectional view, the plane of the section being indicated by the line 8—8 of Fig. 5;

Fig. 9 is a perspective view illustrating a control shaft and various elements carried thereby, the elements being spaced along the shaft to more clearly illustrate their construction;

Fig. 10 is a fragmentary section, the plane of which is indicated by the line 10—10 on Fig. 5; and

Figs. 11 and 12 are sectional details, the planes of the sections being indicated by the correspondingly numbered lines on Fig. 10.

The printing or duplicating mechanisms which print the entire printing form are well known at the present time. It has been found advantageous to incorporate the present invention in one of these known structures, either as an integral part of the machine or as an attachment therefor.

One type of such machine is illustrated in the accompanying drawings and particularly in Figs. 1, 2 and 8, as comprising a printing drum or cylinder **10** secured to a shaft **11** which is journaled in a pair of end frames or plates **12** which are spaced by suitable cross frame members, some of which are shown at **14**. In the structure illustrated, a flexible printing plate or form **15** is wrapped about the periphery of the drum and held in position thereon by clamping members **16** which engage the ends of the printing plate. A platen roller **18** is rotatably mounted below the printing cylinder on a shaft **19** which like the shaft **11** is journaled in the frame members **12**.

The printing cylinder **10** may be power driven. As shown in Fig. 2, a motor **20** is mounted on a base **21** which supports the printing machine. This motor is connected by a driving belt **22** with a drive pulley **23** loosely mounted on the cylinder shaft **11** and adapted to be selectively coupled therewith by a single revolution clutch generally indicated at **24**. The clutch may be of any well known type and preferably one capable of being controlled by a foot pedal **25** and linkage **26** to cause the printing cylinder **10** to be rotated one complete revolution each time the pedal is depressed, or to rotate continuously if the pedal is maintained in a depressed position.

The platen roller **18** is driven by the cylinder **10**. As indicated in Fig. 8 a gear **27** is secured to one end of the cylinder and drivingly coacts with a gear **28** which is secured to one end of the platen roller **18**. The platen gear **27** is also used to drive sheet feed rollers **30**. These rollers are secured to and spaced axially on a shaft **31** which is journaled in the frame plates **12** and drivingly connected by gears **32** with the platen gear **28**.

A timing device preferably is provided to control the entry of a sheet to be printed into the bite of the printing cylinder **10** and platen roller **18**. Such a device is generally indicated in Fig. 8, as including a series of feed rollers **33** which are mounted on a shaft **34** above respective feed rolls **30**. This shaft is journaled in a pair of brackets which are pivoted to respective frame members **12**. One of these brackets is shown in Fig. 8 at **35** as being pivotally connected with the far frame member **12** as at **36**. This bracket is provided with a cam roller **37** which coacts with a peripheral cam **38** carried by the printing drum **10**. A suitable spring, not shown, acts to maintain the roller in contact with the cam. The cam is so arranged that the rollers **33** are normally spaced above the rollers **30**.

The sheets to be printed are fed across a feed table **40** (Figs. 1 and 2), one at a time, until their forward edges strike one or more stop fingers **39**. At the proper time the cam **38** acts to swing the bracket **35** downward moving the stop fingers **39** out of the path of the sheet and the rollers **33** into engagement with the sheet which overlays the driven feed rollers **30**. This causes the sheet to be fed into the bite of the printing cylinder **10** and platen roll **18** which act to complete the feed of the sheet and form an imprint thereon. The usual platen release mechanism is provided to move the platen roller out of contact with the printing cylinder as long as no sheet is present therebetween. Such mechanisms being well known there is no need to illustrate or describe one here. Suffice it to say that it may include an eccentric portion of the platen shaft generally indicated at **41**.

Any suitable inking device may be used. In Fig. 8 there is shown an elongated inking ribbon **42** which extends from one ribbon spool **43**, carried in a recess in the cylinder **10**, around the cylinder to a second ribbon spool **44** which is also mounted in the cylinder recess. The ribbon **42** may be fed by any well known mechanism.

The printing form or plate **15** (Fig. 13) may comprise a thin sheet of knurled metal. The printing characters may be embossed thereon as, for instance, by typing on the reverse side of the foil with an ordinary typewriter. This form is so typed, that when it is positioned on the drum **10**, the lines of printing characters extend parallel with the axis of the printing cylinder **10**. Near its front edge "V" the printing form has a heading "K" and therebeneath, an area or field "Z" containing a plurality of lines.

With the printing mechanism of the type heretofore generally described the operator feeds a sheet across the table **40** to the stap fingers **39**, and depresses the foot pedal **25**. At the proper time the rollers **30** and **31** will feed the sheet to the bite of the printing cylinder **10** and the platen **18** which coact to make an imprint from the entire printing plate on the sheet, discharging the imprinted sheet to a discharge receptacle **45** (Fig. 3).

The present invention is particularly concerned with the imprinting of the heading "K" of the printing form together with one or more lines selected from the field "Z" of the printing form on a second sheet in such a manner that these imprints are adjacent each other on the printed sheet even though they may be separated on the printing plate or form. These imprints are made by a supplemental printing mechanism generally indicated at **50**. This mechanism, for the most part, is carried by an auxiliary frame which is detachably mounted on the side frame members **12** of the main printing mechanism heretofore described, and is positioned at the front of the printing cylinder **10** (at the right in the drawings).

The auxiliary frame includes a pair of spaced outer side plates **51** and inner side plates **49** spaced by suitable cross frame members such as the rod **52**. This frame may be secured to the main frame **12** by suitable bolts indicated in Fig. 4 at **53**. Extending substantially across this frame, is a substantially horizontal feed table **54** which terminates in a downwardly bent flange **55**. This flange cooperates with a downwardly extending plate **56** carried by the rod **52**, to form a downwardly extending chute **47** for the introduction of a sheet or card to be imprinted.

The sheet or card to be imprinted by the supplemental printing mechanism when fed into the chute **47** will come to rest on paper stops **57** carried by a horizontal bar **58**. This bar is carried by arms **59** swingably mounted on the rod **52**. A forward or counter-clockwise rocking motion of the arms **59** will cause the stops **57** to be withdrawn and will result in the release of the card. The released card then will be fed downwardly into the bite formed by the printing cylinder **10** and by a cylindrical platen roller **60**, hereinafter to be more fully described.

The feeding operation is performed by four pairs of feed rollers **61**, **62**. The rear feed rollers **62** are mounted on a shaft **63** extending between and journaled in the arms **59**. These rollers project into the chute **47** through suitable openings formed in the plate **56**. The front feed rollers **61** are drivingly mounted on a shaft **64** which extends between and is journaled in the inner frame plates **49** of the auxiliary frame and is driven by gears **66**, **67** and **68**, the arrangement and actuation of which will be described later. The rollers **61** project into the chute **47** through suitable openings **46** in the chute plate **55**.

The stop finger bar **58** is actuated to release the sheet or card by a pair of levers **70** which are pivotally connected with respective ends of the bar by rods **69**. The

levers 70 are attached to a shaft 71 which is journaled in the auxiliary frame. One of the levers 70 carries a follower roller 72 which, under the influence of a spring 48, engages a cam 73. The cam 73 revolves in unison with a cam shaft 74 mounted in the auxiliary frame and extending parallel with the axis of the printing cylinder 10. The shaft 74 is intermittently rotated by means to be described later.

The platen roller 60 extends between and is journaled in a pair of arms 75 which are pivotally mounted on a shaft or rod 76 carried by the auxiliary frame plates 51. The platen is thus swingable to and from contact with the printing cylinder 10. The movement of this platen is controlled by the cam shaft 74 which controls the stop fingers 57. To this end, cam followers 77 (Figs. 5 and 8) are rotatably mounted on the arms 75 coaxial with and at the ends of the platen roller 20. Suitable springs 79 maintain these followers in engagement with cam discs 78 provided on the shaft 74. The cams 73 and 78 are so correlated that, at the time when the paper stops 57 are withdrawn, the card in the chute 47 will be engaged by the pairs of feed rollers 61, 62 and will be fed downwardly. At the time of the entry of a card or sheet into the bite of the platen 60 and cylinder 10, the platen roller will be pressed against the card by the cams 78 and, more particularly, by a comparatively long elevation 80 of each cam, said elevation having a circumferential length such as to cause the heading section "K" of the printing form to be imprinted on the card.

When the printing of the section "K" is completed the card will be disengaged by the platen 60 and its lower edge will rest on the stops 81 until the line to be imprinted from the field "Z" of the printing form arrives at the front printing point to opposite the platen 60. During this period leaf springs 82 space the card from the cylinder 10 and prevent the card from being soiled and other springs 79 keep the platen roller 60 disengaged from the card.

As soon as the line to be imprinted from the field "Z" of the printing form arrives at the printing point opposite the platen 60, the cam shaft 74, which had been temporarily stopped, again will be driven in the same direction as before, to cause a short elevation 84 of the cam 80 to act on the platen roller 60. Accordingly, the platen roller 60 again will press the card against the printing form 15. The circumferential length of the cam elevation 81 is such that it will cause the platen 60 to imprint the desired sized area of the portion "Z" of the printing plate.

When the second printing phase commences the paper stops 81 are disengaged. To this end these stops (Figs. 5 and 8) are secured to a shaft or rod 85 which is journaled in brackets 190 carried by a plate 191. This plate is secured to frame members 192 carried by the auxiliary frame and forms one wall of a card receiving chute, the other wall of which is formed by the springs 82. Another arm 87 secured to the rod 85 is drawn by a spring 88 into engagement with a stud 89 of a cam lever 90 (Fig. 5) which is fulcrumed on the left hand frame plate 51 as at 193. The lever 90 carries a cam roller 91 which bears against a cam disc 92 of the cam shaft 74. At the proper time an elevation 93 of the cam 92 coacts with the lever 90 to withdraw the stop fingers 81.

Simultaneously with the withdrawal of the stop fingers 81 the platen roller 60 is released by the cam elevation 84 and is moved from the card by the springs 79, whereupon the printed card drops onto the table 40 (Figs. 1 and 7), and the cam shaft 74 is rotated a third time in the same direction to restore it to its initial angular position.

From the foregoing description it will be seen that the cam shaft 74 must be intermittently rotated three times in the same direction in the course of a single cycle of operation during which the printing cylinder 10 turns one complete revolution. The means for imparting the intermittent rotation to the cam shaft 74 will now be described.

The cam shaft 74, heretofore described as being journaled in the auxiliary frame 51, is formed by a hollow sleeve and is rotatably mounted on a shaft 54 fixed to the auxiliary frame of the machine and is adapted to be adjusted to and from the platen cylinder 60 to adjust the printing pressure betwen the platen 60 and cylinder 10. For the purpose of such adjustment the hollow cam shaft 74 is journaled on an eccentric section of the shaft 94 and the latter is so mounted in the frame plates 51 as to be fixed in an angularly adjustable position. Adjacent its right hand end (Fig. 5) the shaft 94 supports the gear 66 heretofore described as serving to operate the feed roll shaft 64. The gear 66 meshes with the gear 67 and is integral with the cam 73. The gear 67 is mounted on a stud fixed to the right hand frame plate 51 and meshes with the gear 68 which is attached to the feed roll shaft 64.

Two of the three intermittent angular motions to be imparted to the cam shaft 84 are derived from a gear 95. This gear is rotatably mounted on the shaft 94 being located between and spaced from the gear 66 and the right hand frame plate 51. The gear 95 meshes with the gear 27 of the printing cylinder 10 and thereby is driven in timed relation with such cylinder. To this end the hub 195 of the gear 95 (Figs. 9 and 10) has a recess 99 adapted to be engaged by a clutch pawl 96. This pawl is fulcrumed on a stud 97 of a clutch disc 98 which is rotatably mounted on the shaft 94 and adapted to be carried along by the gear 95 as long as the pawl 96 engages the recess 99. The clutch disc 98 has an additional stud 100 which engages an arcuate slot 196 (Figs. 6 and 11) provided in the gear 66 and extending arcuately through an angle of approximately 180 degrees. When the stud 100 is positioned at the front end of the arcuate slot, viewed in the direction of rotation, the clutch disc 98 when rotating will carry the gear 66 with it. The gear 66 in its turn, will drive the hollow cam shaft 74 through an intermediary member 101. A rigid connection of the gear 66 with the cam shaft 74 is not permissible because both are located on relatively eccentrical sections of shaft 94. Accordingly, the intermediary member 101 is provided with projections 197 on either side which engage radial slots of the gear 66 and of a disc 102 respectively in the manner of an "Oldham" coupling. The disc 102 is secured to the shaft 74. Accordingly the rotation of gear 66 may be transmitted to the shaft 74.

The clutch pawl 96 is controlled to engage the recess 99 of the hub 195 of the driving gear 95 as soon as the area "K" of the printing plate 15 of the cylinder 10 reaches a position to cooperate with the auxiliary platen 60 and to disengage such recess as soon as the area "K" of the printing plate has passed the point of such cooperation. Adjacent to its gear 27 the printing cylinder 10 is provided with a cam 103 (Fig. 8) which coacts with a follower roller 104 mounted on the lower end of an arm 105 the upper end of which is swingably mounted on the shaft 64. The arm 105 is mounted on shaft 64 between the right hand frame plate 51 and the gear 95. To the lower end of the arm 105 there is linked a forwardly projecting bar 106 which rides on a stub shaft 108 mounted for both axial and rotative movements in the right hand side plate 51 for a purpose hereinafter to be more fully explained. Suffice it to say at this time, that when the supplemental printing mechanism is in use, the stub shaft 108 so supports the bar 106 that a shoulder 111 formed on the bar (Figs 8 and 10) will engage a pin 112 projecting from a lever 113 which is pivoted on a rod 114 carried by the frame plate 51. Consequently, the cam 103 acting through the follower 104 and bar 106 may rock the lever 113 rearwardly (counter-clockwise in Fig. 8 or clockwise in Fig. 10).

The upper end of the lever 113 is provided with a fork-like formation which engages a stud 198 mounted on a slide 115 (Figs. 8 and 10). This slide is guided for sub-

stantially horizontal movement by a pair of pins 116 projecting from the right hand frame plate 51 and cooperating with suitable slots formed in the slide.

An upper hook-like member 118 and a lower hook-like member 119 (Fig. 10) are fulcrumed on a pivot 117 carried by an auxiliary frame member 49. The two hooks may be moved by the slide 115 either to a position in which they project into the path of a stud 120 carried by the clutch pawl 96 or to a position in which they are withdrawn from such path. To this end each hook is pivotally connected as at 121 with one end of a respective link 122 the other ends of which are pivoted to a common pivot 123 carried by the slide 115.

In Fig. 10 the elements are shown in the position in which the bar 106 has been moved to cause the clutch pawl 96 to be disengaged from the recess 99 of the gear hub 195. In this position the rotation of the gear 95 has no effect on the cam shaft 74. Likewise the bar 106 is kept in engagement with the cam 103 by a spring 124. Likewise, the end of the lower hook 119 projects into the path of the stud 120 and is thus operative to keep the pawl 96 disengaged from the groove 99 of gear hub 195 and the stud 112 is held in engagement with the shoulder 111 by a spring 125 which is connected with the arm 113.

When the parts are in the position shown in Fig. 10, the clutch pawl 96 under the influence of its spring 126, which is connected between the pawl and a pin 127 carried by the disc 98, will exert a rotative force on the clutch member 98 through the pivot 97. This force, however, is such that it is unable to turn the clutch member 98 and the cam shaft 74 connected therewith because it is overcome by the pressure of the follower 72 (Fig. 8) against the cam 73 of the cam shaft 74.

Shortly prior to the instant in which the head portion "K" of the printing form arrives at the supplemental printing point, the cam 103 will act on the follower 104 and will move the slide 115 away from the shaft 94 causing the two hooks 118 and 119 to spread apart. As a result, the clutch pawl 96 will be released by the hook 119 and will be drawn into contact with the hub 195 of the gear 95 by the spring 126. Consequently the nose 128 of the pawl 96 will bear against the hub 195 of the revolving gear 95 until the groove 99 of the hub arrives in registry with the nose, whereupon the nose is drawn into the groove 99 by the spring thereby establishing a driving connection between the disc 98 and the gear 95. This happens at the instant foremost edge of the printing form head portion "K" arrives in registry with the platen roller 60.

The distance between the two hooks 118 and 119 is so chosen as to maintain the driving connection between the gear 95 and cam shaft 74 until the heading or portion "K" of the form "D" has been printed. Upon the completion of such printing operation the stud 120 projecting from the pawl 96, revolving together with the clutch disc 98, reengages the hook 118 which meanwhile had been moved again into the path of the stud 120 by the rotation of the cam 103 out of contact with the follower 104. The pawl 96 will thereby be arrested and will become disengaged from driving engagement with the gear 95. This, in turn, will arrest the movement of the clutch member 98 and the cam shaft 74.

During the rotation of the cam shaft 74 as above described in the direction of the arrow (Fig. 6), the stud 100 will be located at the end 199 of slot 196. Consequently, while the clutch disc 98 and stud 100 are at rest, the cam shaft 74 may be rotated through substantially one hundred and eighty degrees. This is accomplished by means mounted near the other end of the cam shaft 74 which effects the second intermittent rotation of the cam shaft for the purpose of imprinting the selected line from the field "Z" of the printing form which may comprise one, two or more lines depending on the length of the cam 84.

The cam disc 92, which as heretofore described, is secured to the shaft 74 adjacent inner side of the left frame plate 51 forms one member of a one-way clutch, the other member being formed by a sector 130 (Figs 1, 4, 5 and 7) which is journaled on a stub shaft 131 extending outward from the frame plate 51. This sector carries a spring-pressed plunger 132 which projects through an arcuate slot 133 of the frame plate 51 and is adapted to engage a laterally facing notch 134 of the clutch disc 92. This notch is slightly inclined in one direction of rotation and steep in the other, with the result that when the sector turns in anti-clockwise direction with reference to Figs. 1, 4 and 7, the plunger will rotate the clutch disc 92 but the anti-clockwise rotation of the clutch disc 92 will be incapable of driving the sector 130 and will therefore freely rotate when driven by gear 95 as heretofore described in connection with the making of the imprint from the portion "K" of the printing form.

The gear sector 130 is rocked to and fro, through ninety degrees in a cycle of operation of the machine at a time determined by a manually settable selector so that one may select the zone of the printing form "D" to be duplicated or imprinted.

To this end, the gear sector 130 meshes with a gear sector 135 mounted on and rocking about the axis of the shaft 11 which supports the printing cylinder 10 as heretofore described. Normally, the sector 135 is maintained in an abutting relation to a stop 137 by a coil spring 136 interposed between the sector and the frame 12 which supports the cylinder 10. The sector 135 is adapted to be swung clockwise, through a limited angle (Figs. 1, 4 and 7) away from the stop 137 by a ratchet wheel 138. This ratchet wheel is rotatably mounted on the shaft 11 of the printing drum 10.

To drive the gear sector 135, it is provided with a radial slot 139 in which a slide in the form of a pin 140 is mounted. This pin projects to either side of gear sector 135 carrying on its outer end a follower roller 141 and on its inner end a follower roller 142. A driving member 143 is adjustably fixed on the inner face of the ratchet wheeel 138 operates during the rotation of the ratchet wheel to engage the follower roller 141 and carry the gear sector 135 through an angle of twenty-five degrees and bring the roller 142 into engagement with the inclined face 144 of a cam 145 which is fixed to the outer face of the frame 12 by suitable bolts. Due to the inclined surface 144, the continued movement motion of the gear sector 135 results in outward movement of the slide 140 which causes the inner roller 141 to ride off the driving member 143, whereupon the spring 136 returns the gear sector 135 to its initial position, the ratchet gear, however, continues in its rotation. In returning to its initial position the gear sector 130 rotates in clockwise direction but the cam shaft 74 remains at rest due to the one-way clutch 132, 134, etc. This return movement takes place following completion of the impression of the selected zone of the printing form.

The ratchet wheel 138 is cooperatively connected with the printing cylinder 10 by an escapement, and together therewith constitutes the selector above referred to as enabling the operator to predetermine the zone of the printing form to be imprinted or duplicated, as desired.

The escapement is carried by a sector 146 attached to the outer end of the shaft 11 of the printing cylinder. As shown in Fig. 4, a pair of blocks 147 and 148 having radial bores are attached to the inner face of sector 146 by bolts, one of such blocks being preferably adjustable in circumferential direction by means of slots provided in the sector 146. Escapement pawls 153 and 154 are slidably mounted in the bores of respective blocks 147 and 148, and are adapted to engage the teeth of the ratchet wheel 138. The ratchet pawls each has a pin 155 projecting outwardly through slots provided in sector 146 and engaging a three-armed lever 149 mounted on a fulcrum 150 attached to sector 146. One of the three

arms of such lever supports a follower roller 151 which is urged outwardly in a direction away from the cylinder shaft 11 by a spring 152 interconnected between the lever and the segment. This spring moves the lever into a position in which the escapement pawl 153 is permitted to be urged by a compression spring 156 into engagement with the ratchet wheel 138, whereas the escapement pawl 154 is withdrawn by such movement. On any revolution of the printing cylinder shaft 11 and the sector 146, the roller 151 rides on a roof-shaped cam 157 which does not participate in such revolution as it is mounted in a stationary auxiliary frame 161. However, this cam 157 as will be described later, may be shifted into a disabled position.

The normal operation of the cam 157 rocks the three-armed lever 149 in counter-clockwise direction with reference to Fig. 4. When so rocked the lever 149 first engages the pawl 154 with the ratchet wheel and thereafter disengages the pawl 155 whereby the ratchet wheel 138 is permitted to turn relative to the printing cylinder 10 in counter-clockwise direction the distance of one tooth pitch under the impulse of a spiral spring 158 which is interposed between the shaft 11 and ratchet 138, the ends of the spiral spring being attached to such elements respectively. Thereafter the elements will return under the influence of spring 152.

The relative rotation of the ratchet wheel 138 and sector 146 is limited by an arm 159 rotatably mounted on the cylinder shaft 11. This arm carries a pin 160 which extends through a hole formed in the ratchet wheel 138 and which may abut one or the other radial edge 165 of the sector 146.

On each revolution of the cylinder shaft 11 the ratchet wheel 138 and the pin 160 advance one step in counter-clockwise direction, whereby the distance, which must be covered by the driving member 143 as measured from the commencement of the cycle of operation until the driving element 143 engages the toothed gear sector 135 to drive same with it, will be increased. Accordingly, the distance by which the zone of the printing form selected for imprinting or duplication is spaced from the head portion "K" of the printing form also increases.

Means are provided, as above mentioned, to disable the cam 157. When such cam is disabled, the ratchet wheel 138 will retain its angular position relative to the printing cylinder and, as a result, the same line of the field "Z" of the printing form "D" will be selected for successive cycles of operation. This permits duplicate imprints.

The cam 157 is secured to a pin 164 which is slidably mounted in auxiliary frame plates 161 for motion parallel to the cylinder shaft 11. The cam 157 (Fig. 5) is held in its effective position by a bell crank 166 fulcrumed on the auxiliary frame and having one arm pivotally secured to the pin 165 and its other arm connected with the frame 161 by a tension spring 167. A key 168 (Fig. 4) is pivotally mounted as at 169 on the auxiliary frame 161 and is provided with a projection 170 adapted to press upon the lower arm of the bell crank 166. When the operator depresses this key, the cam 157 (Fig. 5) will be moved out of the path of the cam follower 151 and will be locked in disabled position by a latch lever 171 which is mounted on the auxiliary frame and is pulled by a spring 172 into locking position in which it obstructs the right hand movement of the shaft 164. This latch lever 171 is provided with a lateral stud 173 which on each revolution of the cylinder shaft 11 is engaged by a projection 174 carried by the escapement sector 146 and moves the latch 171 out of the path of the shaft 164 thereby permitting shaft and its associated cam 157 to be returned to their effective positions by the spring 167. However, this return may be arrested by a manually releasable detent 175 which is movable to retain the key 168 in its depressed position. The latch 171 makes it possible to automatically print two successive cards in exactly the same manner while the following pair of cards will be provided with an imprint of the following line of the printing form whereas the latch detent 175 enables repeated imprints to be made.

The hub portion of the arm 159 carries an indicating dial 176, the periphery of which is provided with an uninterrupted row of figures corresponding respectively to the numbers of the lines to be selected. A pointer or other indicator, not shown, is provided to coact with this dial and thereby indicate the number of the line being duplicated at any time. After the last line of the printing form has been duplicated, the machine may be stopped and the operator may turn ratchet gear 138 backwards, relative to the escapement carrying sector 146, and return it to its initial position by means of a handle or knob 177 which is attached to the end of the hub portion of the arm 159. By this rotation the spring 158 of the escapement is rewound.

Sometimes, following the duplication of a selected line of the printing form, it is desirable to skip a few lines thereof rather than to duplicate the following line. Where, for instance, the fifth line of the printing form area "Z" has been duplicated, it may be desirable in the following cycle of operation to print the tenth line of such area. For this purpose a second key 180 (Fig. 4) is pivotally mounted in the auxiliary frame as at 181 and has a portion 182 which is positioned beneath the location occupied by the escapement roller 151 whenever the printing cylinder 10 completes a cycle of operation. The use of the single revolution clutch 24, heretofore described, causes the printing cylinder to come to a full stop at the end of each cycle, at which time the parts are positioned substantially as shown in Fig. 4.

By depressing the key 180 the escapement is actuated to permit the ratchet wheel 138 to advance one step. In the example just cited, the operator would depress key 180 four times for the purpose of selecting line ten to follow line five for duplication in the following cycle of operation.

Just before the printing cycle terminates its cycle of revolution, a cam 185 (Fig. 7) of the printing cylinder engages the cam roller 104 thereby withdrawing the hook 118. Consequently, the clutch pawl 96 will be engaged and will drive the gear 95 through an angle of about one hundred and eighty degrees whereupon the clutch pawl 96 is disengaged by the hook 119 which meanwhile has been restored to its effective position. In the course of such movement the stud 100 will first proceed to the front end of slot 196 and will then carry along the gear 66 and the cam shaft 74 connected therewith, turning the latter to its starting position whereby all elements will be ready for the following cycle of operation.

When it is desired to disable the supplemental printing mechanism and use the main platen 18 to make an impression from the entire area of the printing plate, the bar 106 is moved to a position where it will be ineffective and accordingly the hook 118 will remain in engagement with the driving clutch pawl 96. For this purpose the shaft 108 is provided with a slotted or undercut portion 107 which is so arranged that when the shaft is rotated to bring the notch into engagement with the bar 106, the latter will underlie the pin 112 of the lever 113 and the reciprocation of the bar 106 under the impulse of the cams 103 of the drum 10 will be ineffective. For this purpose the shaft 108 is provided with a handle 109 which may be manually moved to either of two angular positions. This handle carries a projection which, as the handle is swung, moves into either of two angularly spaced recesses formed in the frame 51 under the impulse of a spring 110 which encircles the shaft, as indicated in Fig. 5, the shaft being axially movable for this purpose.

The embodiment described is capable of numerous modifications. Thus, in lieu of the printing cylinder, a reciprocating printing carriage may be substituted. In this event, the platen roller 60 and the cam shaft 74 con-

nected therewith would be journaled above the carriage within the frame of the machine, and the gear sector 135 would be replaced by a short gear rack which is arranged to move lengthwise of the printing form.

Moreover, means may be provided to extend the width of the zone selected for the duplication to two, three or more lines. Such means may comprise an auxiliary cam, for instance, which may be mounted on the shaft 74 to set in an angularly adjustable position. The auxiliary cam would be used to determine the effective length of the cam elevation 94. Also, the machine may be equipped with automatic card feeding means operative in any cycle of operation to automatically introduce the following card into the card chute 47 thereby eliminating the necessity of stopping the printing cylinder after each revolution. In this event the printing cylinder would be arrested by the arm 159 or by the ratchet wheel 138 when all of the lines of the printing form have been duplicated.

Also, the duplicating method is immaterial. In lieu of a knurled sheet metal foil, printing forms composed of settable type, offset or planographic forms, linotype forms, or a printing form produced by use of copying ink may be employed, the inking device being of a type normally used with the type of forms used. Moreover, a numbering device may be mounted on the printing cylinder 10 adjacent to the upper end of the printing form, such device comprising a row of adjustable number type wheels enabling the operator to set up numbers for the printing operation. In lieu of the numbering device, exchangeable letter types may be mounted on the printing cylinder. The invention is not limited to a cylindrical platen roller 60 since it is possible to construct the cam shaft 74 as a rubber shaft acting directly on the card, the cam elevations producing the printing operation. In this event the cam body constitutes the platen roller itself.

I claim:

1. In a printing machine having a rotatable printing drum having a printing form wrapped about its periphery, a coacting platen roller, power operated means to rotate said drum to cause substantially the entire form to move past the platen and both the platen and form restored to their original relative positions once in each cycle of operation of the machine, said platen also being mounted to move bodily into and out of rolling contact with the form, operating means to move the platen to and from the printing form twice in each cycle of operation of the machine, means acting on said operating means to control one of said last named movements to cause the platen to coact with the same portion of the printing plate on successive cycles of operation of the machine, and means acting on said operating means and including an advancing mechanism controlled by the rotation of said drum to control the other of said last named movements and cause the platen to coact with successive areas of the printing plate on successive cycles of operation of the machine automatically in response to the rotation of said drum.

2. A printing machine according to claim 13 characterized in that a cam is provided to activate said escapement mechanism, said cam being shiftable to a disabled position, and a manually operable key to move the cam to a disabled position.

3. A printing machine according to claim 2, characterized in that means are provided to restore said cam to its active position following the second revolution of the printing cylinder after the key has been actuated.

4. A printing machine according to claim 3 having a manually releasable latch to prevent restoration of said cam.

5. In a printing machine, a rotary printing drum carrying a printing form, a rotatable platen roll mounted for bodily movement into and out of printing contact with the printing form, means to rotate the printing drum through complete revolutions, a cam rotatable through a predetermined portion of a revolution to move the platen into and out of contact with the form and movable through an additional portion of a revolution to move the platen into and out of contact with the printing form a second time, a clutch actuated in timed relation with the printing drum to rotate the cam through the first named portion of a revolution once for each rotation of the printing cylinder and while the same predetermined area of the printing form is in position to coact with the platen, an overrunning clutch drivingly connected with said cam to permit rotation of the cam by the first named clutch, means actuated in timed relation with the drum to actuate said overrunning clutch to cause it to drive the cam through the second named portion of its revolution, and means under control of the drum to cause said overrunning clutch to actuate the cam on successive rotations of the printing drum, control means to cause the last named portion of the printing form in printing position to be advanced progressively for each rotation of the printing drum, and manually settable means to determine the portion of the printing form during which the overrunning clutch will be active during the first revolution of the printing drum.

6. In a printing machine according to claim 5, a manually operable key, a connection between said key and said control means to disable said control means.

7. In a printing machine according to claim 6, means actuated by the drum to restore the control means following a revolution of the drum during which such control means is inactive.

8. In a printing machine according to claim 5, means to guide a sheet into the bite of the printing drum and platen, means to stop the sheet with a predetermined area in printing position, means to release the sheet while the cam moves through the first named predetermined portion of a revolution, means to stop the progress of the sheet following such revolution, and means to release the sheet while the cam moves through the second named portion of a revolution, whereby spaced portions of the printing form may be impressed on adjacent portions of the sheet to be printed.

9. In a printing machine having a printing form, a coacting platen roller, means to cause relative movement between said platen and said form and to cause substantially the entire form to move past the platen once in each cycle of operation of the machine, said platen also being mounted to move bodily to and from rolling contact with the form, means to move the platen to and from rolling contact with the printing form twice during each cycle of operation of the machine, means to control one of said movements to cause the platen to coact with the same portion of the printing form during each cycle of operation of the machine, manually settable means to cause the other to and from movement to cause the platen to coact with different areas of the printing plate on different cycles of operation of the machine, and means responsive to successive relative movements between the platen and the form and coacting with said manually settable means to advance said manually settable means step by step and thereby cause the platen to engage successive portions of the printing form on such successive cycles of operation of the machine.

10. In a printing machine, a frame, a rotatable cylinder mounted therein, a printing form mounted on said cylinder, a rotatable platen roller, power operated means to rotate said cylinder to cause substantially the entire form to move past the platen by a continuous movement once during each cycle of operation of the machine, said platen being mounted to move bodily to and from rolling contact with the form, a cam movably mounted in said frame and adapted to coact with said platen to move the platen into and out of rolling contact with the printing form twice during each cycle of operation of the machine, actuating means to move said cam in timed relation to the rotation of said cylinder and cause the platen to coact with the same portion of the printing form on each cycle

of operation of the machine thereby providing one of said last named movements, and a second actuating means responsive to the rotation of said cylinder to move said cam and cause the platen to coact with portions of the printing form differing from each other and from said first named portion on successive cycles of operation of the machine thereby providing the other of said last named movements.

11. In a printing machine, a frame, a rotatable cylinder carrying a printing form mounted therein, a rotatable platen roller, power operated means to rotate said cylinder to cause substantially the entire form to move past the platen by a continuous movement once during each cycle of operation of the machine, said platen being mounted to move bodily to and from rolling contact with the form, a cam rotatably mounted in said frame and adapted to coact with said platen to move the platen into and out of rolling contact with the printing form once during each cycle of operation of the machine and consequent upon the rotation of the cam through a predetermined portion of a revolution, said cam being adapted to move the platen into and out of rolling contact with the printing form a second time during each cycle of operation of the machine consequent upon the movement of the cam through a further portion of a revolution, a driving connection between said cylinder and said cam including a clutch controlled by the rotation of the cylinder to actuate the cam through said predetermined portion of a revolution at the same time during each cycle of revolution of the cylinder, and means including one-way clutch to actuate the cam through said further portion of its revolution, driving means interconnecting said cylinder and said one-way clutch and including means to selectively determine the time during the cycle of revolution of the cylinder in which said last named clutch is rendered active.

12. A printing machine according to claim 11 wherein said last named means includes a step by step escapement mechanism to vary the time during the cycle of operation during which said cam is moved through said further portion of its revolution, and means responsive to the rotation of said cylinder to actuate said escapement mechanism once during each cycle of operation whereby the platen will engage successive portions of the form on successive cycles of operation.

13. In a printing machine, a rotatable printing drum having a printing form extending about its periphery, a coacting platen roller, means to rotate said drum to cause substantially the entire form to move past the platen and then restore the platen and form to their original relative positions once in each cycle of operation of the machine, said platen also being mounted to move bodily into and out of rolling contact with the form, means to move the platen to and from the printing form twice in each cycle of operation of the machine, means to control one of said last-named movements to cause the platen to coact with the same portion of the printing plate on successive cycles of operation of the machine, means including an advancing mechanism controlled by the rotation of said drum to control the other of said last-named movements and cause the platen to coact with different areas of the printing plate on different cycles of operation of the machine, said advancing mechanism including a ratchet wheel mounted coaxially with respect to the printing cylinder and an escapement mechanism revolving together with the printing cylinder and cooperating with the ratchet wheel, a stationary cam to actuate said escapement, a segmental gear, a spring biasing the gear for rotation in one direction, a driving member carried by the ratchet wheel and adapted to engage and drive the segmental gear, means acting after the segmental gear has moved a predetermined distance to disengage said driving means and permit the gear to return to its initial position under the force of said spring, means including a one-way clutch connecting the gear with the platen to cause it to move into contact with the printing form, and resilient means to move the platen away from said form while the segmental gear returns to its initial position.

14. In a printing machine, a rotatable printing drum having a printing form on its periphery, a coacting platen roller, power operated means to rotate said drum through successive cycles of rotation, said platen also being mounted to move bodily into and out of rolling contact with the form, means to move the platen to and from the printing form twice in each cycle of rotation of the drum, means to control one of said last named movements to cause the platen to coact with the same portion of the printing form on successive rotations of said drum, an advancing mechanism controlled by the rotation of said drum to control the other of said last named movements and cause the platen to coact with successive areas of the printing form on successive rotations of said drum, said advancing mechanism including a ratchet wheel and an escapement mechanism cooperating therewith, means responsive to the rotation of said drum to actuate said escapement, a gear, a disengageable driving connection between said ratchet and said gear, and means acting after said gear has moved a predetermined distance in one direction to disengage said driving connection, means to return said gear to return to its initial position, and means including a one way clutch connecting the gear with the platen to cause it to move into contact with the printing form, in response to movement of the gear in the first-named direction, and means to move the platen away from said form while the segmental gear returns to its initial position.

References Cited in the file of this patent

UNITED STATES PATENTS

615,107	Schwarzchild	Nov. 29, 1898
2,210,021	Breitling et al.	Aug. 6, 1940
2,536,276	Gretchikhine	Jan. 2, 1951