Nov. 9, 1965 E. R. BRADLEY 3,216,347

SHEET EJECT REPEAT NUMBER DEVICE

Filed Sept. 14, 1961 3 Sheets-Sheet 1

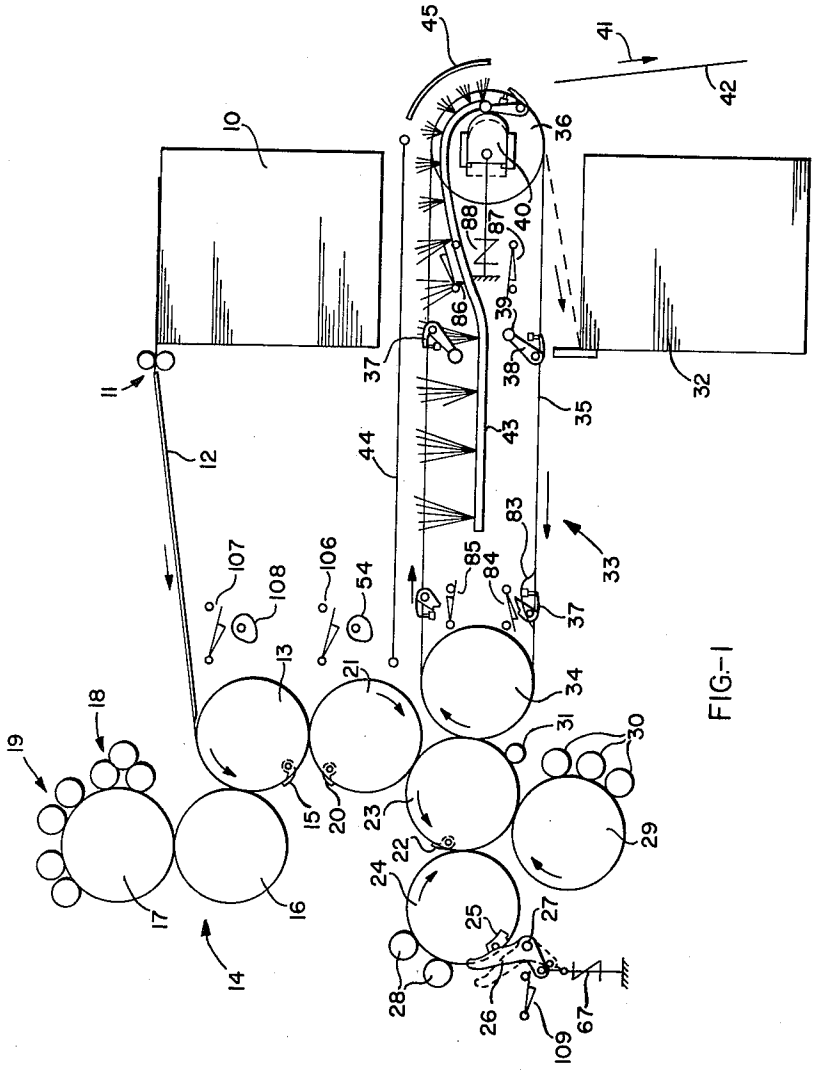


FIG.-1

INVENTOR.
EDGAR R. BRADLEY

BY

William Weigl
ATTORNEY

Nov. 9, 1965 E. R. BRADLEY 3,216,347

SHEET EJECT REPEAT NUMBER DEVICE

Filed Sept. 14, 1961 3 Sheets-Sheet 2

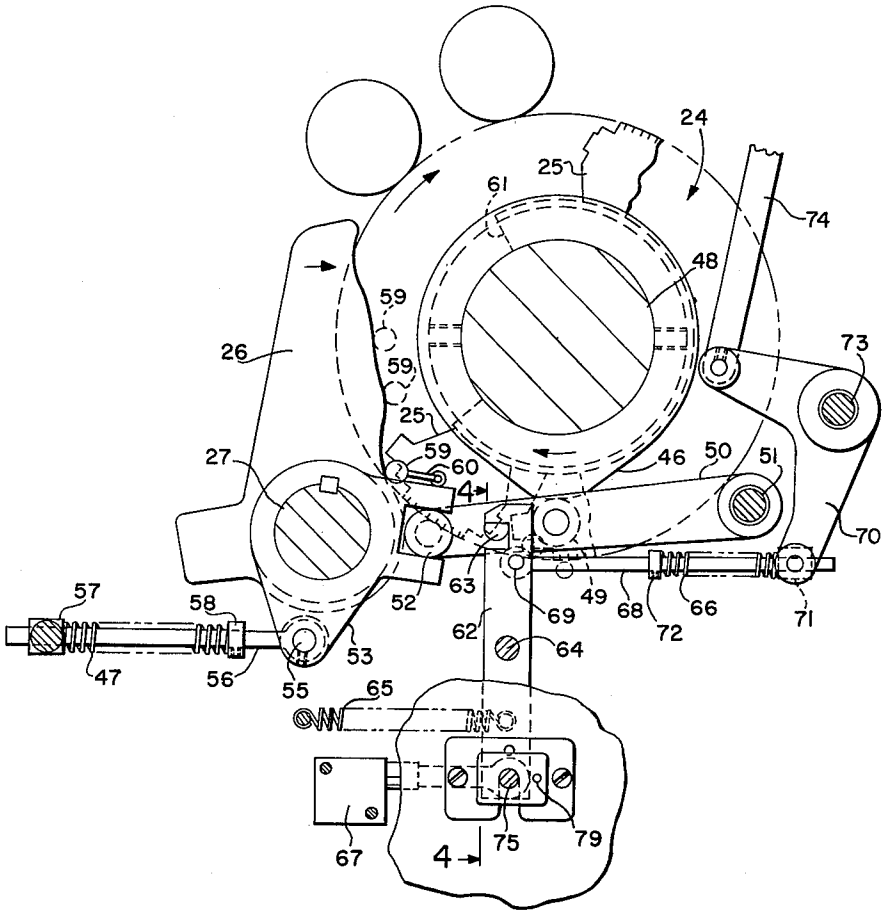


FIG.-2

INVENTOR.
EDGAR R. BRADLEY

BY

William Weigl
ATTORNEY

Nov. 9, 1965 E. R. BRADLEY 3,216,347

SHEET EJECT REPEAT NUMBER DEVICE

Filed Sept. 14, 1961 3 Sheets-Sheet 3

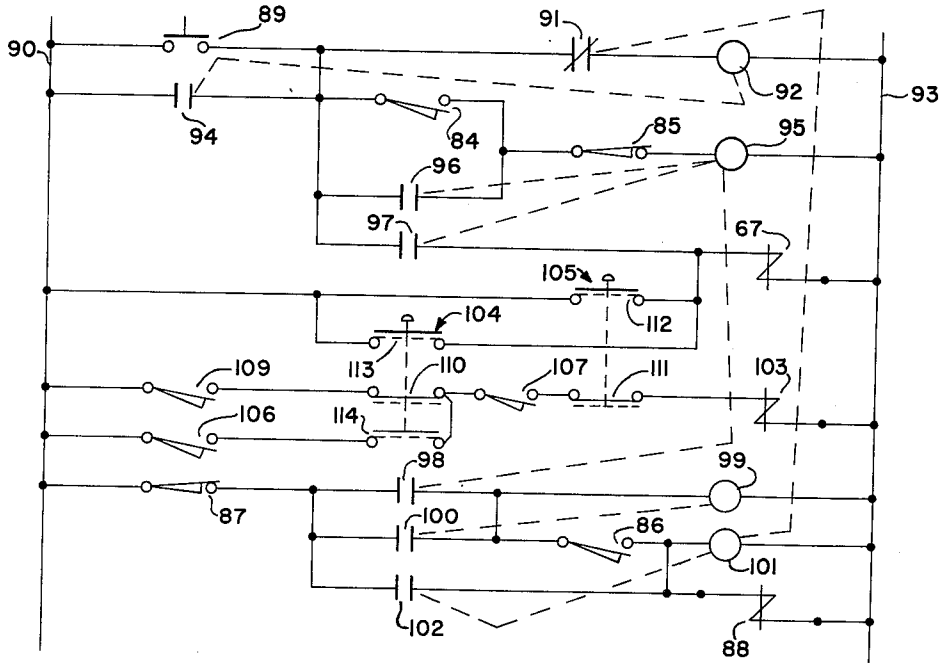


FIG.-3

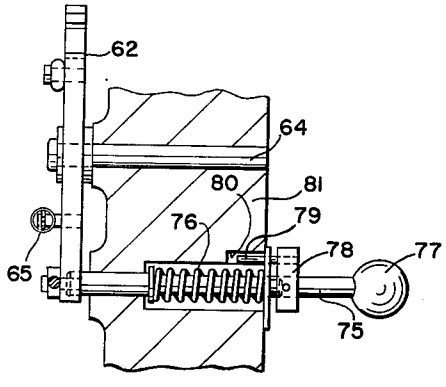


FIG.-4

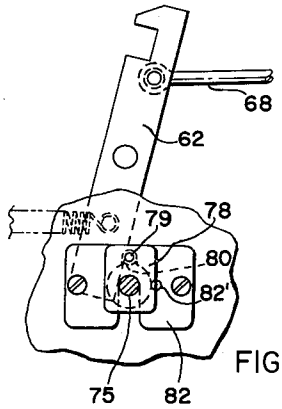


FIG.-5

INVENTOR.
EDGAR R. BRADLEY

BY

William Weigl
ATTORNEY

United States Patent Office 3,216,347 Patented Nov. 9, 1965

3,216,347

SHEET EJECT REPEAT NUMBER DEVICE

Edgar R. Bradley, Vandalia, Ohio, assignor to Harris-Intertype Corporation, Cleveland, Ohio, a corporation of Delaware

Filed Sept. 14, 1961, Ser. No. 138,096
20 Claims. (Cl. 101—76)

This invention relates generally to means for ejecting a printed sheet from a printing press for inspection purposes, and in particular to such sheet ejection means in a press which prints consecutive numbers or the like on successive sheets.

Although the invention may be used in a variety of ways, it will be described in connection with the printing of consecutively numbered bank checks, since such use nicely portrays the various facets of the invention. Whenever printed sheets are consecutively numbered by a printing machine and are deposited in a pile, periodic sheet inspection becomes difficult, in that the inspected sheet which is removed from the pile must later be reinserted into the pile to provide the proper sequence of numbered sheets. To overcome the difficulties encountered in sheet inspection in this type of environment, I provide a means for duplicating numbers on two successive sheets and ejecting one only of those two sheets for inspection purposes. The ejected sheet can be inspected and various press adjustments made if necessary, after which the ejected sheet may be scrapped. In this fashion, there is no need to reinsert the ejected sheet at the proper position in the pile of freshly printed sheets as must be done at present.

Sheet inspection in the class of printing such as that which has been previously utilized for printing bank checks has required only occasional examination of printing quality, since the large bulk of such printing does not require extremely high print quality. However, since the recent introduction of the magnetic ink encoding system which is presently being adopted by the large majority of banks in the United States, sheet inspection during printing must be done at fairly frequent intervals to assure that the code data being printed in magnetic ink is held to close tolerances so as to be accurately readable by check sorting machines. The frequency with which sheets must be inspected imposes a hardship on printers and a loss in production due to additional pile handling in reinserting of the inspected sheets in their proper positions in a delivered pile once the pile has been removed from the press. The necessity for reinserting the inspected sheets in the pile is to provide the proper numbering sequence for the printed checks, which may be made into serialized check books, for example.

A principal object of the present invention is to provide a machine for printing consecutive numbers or sets of numbers or other symbols on successive sheets or successive sets of sheets with means for ejecting and thus enabling inspection of a given sheet without loss of the proper numbering sequence in the delivered pile, and without requiring reinsertion of the inspected sheet into the freshly printed pile.

Other objects and advantages will be apparent from the following description in which reference is made to the accompanying drawings.

In the drawings:

FIG. 1 is a simplified elevational view of a printing machine embodying the present invention.

FIG. 2 is an enlarged detailed view of the number indexing mechanism shown at the lower left end of FIG. 1.

FIG. 3 illustrates a wiring diagram used with the preferred form of the invention.

FIG. 4 is a view taken substantially along lines 4—4 of FIG. 2.

FIG. 5 illustrates a portion of the mechanism of FIG. 2 shown in another postion.

While the structure disclosed herein is capable of being used in several different ways and in a variety of types of printing presses, I prefer to describe it in connection with a printing machine which first deposits magnetic ink by either the lithtographic or letterpress process onto a sheet which is to contain a plurality of bank checks on the face thereof. The magnetic ink, as mentioned earlier, is used to provide a code system for identifying the bank and the individual having the checking account in the particular bank, so that machine sorting of checks may be easily and accurately accomplished. After having been printed with the magnetic coding system, the checks are generally consecutively numbered for record keeping purposes by the party issuing the checks. After having been numbered, the sheets of checks may then be imprinted with the name of the depositor, so as to be personalized, and are then delivered to a properly aligned stack or pile of printed sheets. If desired, the sheets, after having gone through their various printing operations, may also be perforated for the usual tearing purposes.

I wish it to be understood that although I am about to describe my invention with relation to a particular type of printing press performing certain specific operations, it is obvious that the invention may also be utilized for presses printing duplicates, triplicates or any other amount of each number in consecutive order or for printing letters or other symbols instead of numbers.

In the usual printing of personalized checks, a printed sheet may have one or more checks for several different depositors thereon, and in different numbering sequence. Obviously, in such a case a numbering head must be provided for each check to be printed on the face of the sheet. The same sheet may contain check number 1201 for John Doe and check 451 for Richard Roe. After two hundred sheets have been printed, John Doe's checks will have been consecutively numbered from 1201 to 1400, whereas Richard Roe's checks will commence with check number 451 and end with number 650. It becomes apparent then, that if one sheet is missing from the pile of the two hundred printed sheets, not only John Doe's but also Richard Roe's and all the other depositors whose checks were printed at the same time will be missing one check from their sequence. Previously, whenever a given sheet in the sequence was pulled for inspection, it was kept aside and later reinserted into the printed pile in its proper place. Obviously, this consumes time and also creates the possibility of smudging the printed sheets if the reinsertion takes place before the ink on the printed sheets has completely dried. It is the purpose of the present invention to obviate the necessity for such reinsertion without destroying the numbering sequence.

Referring now to FIG. 1, a printing machine is provided with a pile of sheets **10** in a pile feeder. Sheet separating mechanism (not shown) lifts each sheet individually from the top of the pile and presents an edge thereof to take-out rolls **11**. The rolls **11** along with conventional tape belts (not shown) drive the sheet down a feedboard **12** toward the upper side of an impression cylinder **13** of a printing unit **14**. As the sheet arrives at the left hand end of the feedboard **12** as shown in FIG. 1, it is temporarily arrested and front and side registered in customary fashion to properly align the sheet with the printing apparatus. After having been registered, the sheet is taken by grippers **15** on the impression cylinder **13** and passed through a printing zone defined by the line of contact between the impression cylinder **13** and a printing cylinder **16**. In the illustrated form of a printing press, the cylinder **16** is a blanket cylinder of a lithographic printing unit. The unit **14** also includes a plate cylinder

17, a dampening unit 18 and an inker 19 of which only certain of the rolls are shown.

After having been printed by the blanket cylinder 16, the grippers 15 of the impression cylinder 13 carry and transfer the sheet to grippers 20 carried by a transfer cylinder 21. The transfer cylinder 21 presents the sheets from the grippers 20 to grippers 22 on an impression cylinder 23. In the form of the invention disclosed, the impression cylinder 23 comprises a tympan cylinder having a conventional tympan sheet mounted thereon. After the sheet has been taken by the grippers 22, it is presented to a number printing zone between a numbering cylinder 24 and the tympan cylinder 23. The numbering cylinder 24 has a plurality of adjustable positionable number printing devices 25 mounted thereon. The number printing devices 25 will be referred to hereinafter as numbering heads as they are commonly called in the trade. The numbering heads 25 may be of the conventional indexing type of head in which number wheels are indexed for each revolution of the cylinder 24 so that consecutive numbers may be printed by each head for each press cycle. As will be disclosed more fully hereinafter, the indexing of the head is accomplished for each revolution of the cylinder 24 by a cam 26 of which several may be mounted on an oscillatable shaft 27 for indexing the various heads 25 placed longitudinally along the cylinder 24. Form rolls 28 of an inking unit ink the numbers on each of the heads 28 during each revolution of the cylinder 24 and thus enable relief printing of the consecutive numbers on successive sheets held by the grippers 22 of the tympan cylinder 23. After having been printed by the numbering cylinder 24, the grippers 22 carry the sheets through a printing zone formed between the tympan cylinder 23 and a plate cylinder 29 for personalizing the check with the name of the depositor. The cylinder 29 may be provided with rubber printing plates positioned at various locations on the surface of the cylinder. Such plates are preferably relief plates which are inked by form rollers 30 of an inker. After having been imprinted, each sheet held by the grippers 22 may be perforated if desired by perforating wheels 31. The perforating wheels may be adapted to be positioned anywhere along the cylinder 23 and further be adapted to be moved into and out of perforating contact with the sheet by cam means well known in the perforating art.

After the sheet has been completely printed, it is deposited on the top of a delivery pile 32 by means of a sheet delivery 33. The sheet delivery 33 comprises a delivery cylinder 34 and a pair of endless chains 35 which run around sprockets at opposite ends of the cylinder 34 and which also pass around sprockets 36 located above the delivery pile 32. Carried on the chains 35 is a plurality of gripper assemblies 37 each of which is adapted to take sheets one at a time from the grippers 22 of the tympan cylinder 23 and carry them over the top run of the chains 35 in the direction of the arrow, after which they pass around the sprockets 36 and are deposited as shown in dotted lines onto the delivery pile 32. It is to be understood that the delivery pile is properly aligned at its side edges by conventional jogging means to provide the sheets with their printed areas in properly aligned positions to later facilitate cutting the sheets into individual packs of checks for the individual customers. The gripper assemblies 37 may be conventional and are preferably each provided with an operating lever 38 and a cam follower 39 on an end thereof. The grippers of each assembly are normally spring-closed, and are operated to their open conditions by cam means at the time they take a sheet from the grippers 22 of the cylinder 23, and again by other cam means as they deposit a sheet onto the top of the pile 32. Neither of said cam means has been shown, however, since they are conventional and would merely confuse the showing of the apparatus.

Let us now assume a certain number of sheets have been printed and the operator wishes to inspect a sheet to see if his print is within predetermined tolerances. Upon pressing a button, at a proper time in the cycle, each of the cams 26 will move from its full line position of FIG. 1 to the dotted line position, so as to prevent indexing the numbering heads 25 for one revolution of the cylinder 24. This means that the identical numbers will be printed on two consecutive sheets, one of which is to be inspected later and set aside without reinsertion into the delivery pile 32. When one of said two sheets reaches the position of the sprockets 36, a sheet eject cam 40 is moved from a dotted-line position to a full-line position as shown in FIG. 1 to actuate the cam follower 39 as shown at the right end of FIG. 1 and thus release one of said duplicated sheets in the direction of the arrow 41. The ejected sheet is designated by the numeral 42 in FIG. 1. This sheet may be properly inspected to see that the printing, particularly the magnetic ink printing, is held within the necessary close tolerances. Various types of inspection devices which need not be described for a complete understanding of the invention disclosed herein may be utilized for inspecting the sheet. If desired, a tray may be provided to catch the sheet 42 or, upon experience the operator can easily catch the sheet in his fingers by its leading edge. The sheet 42 may later be destroyed, since the pile has been provided with sheets in proper consecutive order. After one cycle of the printing machine, the indexing cam 26 is automatically moved back to its full line position to assure the continuation of numbering of sheets in proper fashion.

It will be noticed that the feeder pile 10 and the delivery pile 32 are vertically aligned and that a portion of the delivery 33 is located between the piles 10 and 32. Since sheets are delivered along the top run of the chains 35, the printed side of the sheets will be facing downwardly while traveling over such top run, and thus must be prevented from contacting anything which might smudge the freshly printed sides of the sheets. I prefer to provide air tubes 43 which provide an upwardly directed blast of air to direct the sheet being delivered toward and against stationary tapes 44. The air tubes 43 are curved at one end and ride between the sprockets 36 to provide a radially outwardly directed air flow toward a curved plate 45 which helps reverse the direction of the sheets as they are delivered to the pile or ejected for inspection.

Referring now to FIG. 2 which illustrates the numbering cylinder 24 and the indexing cam or cams 26, operation of an indexing cam 26 is effected in a clockwise direction by a cam 46, and in the counter-clockwise direction by a spring 47. The cam 46 is keyed to a shaft 48 for the cylinder 24 and is adapted to urge a cam follower 49 mounted on a lever 50 outwardly from the axis of the cylinder 24. The lever 50 is mounted on a fixed shaft 51 and has at its end remote from the shaft 51 a second cam follower 52 encompassed in the bifurcations one one arm of a bell crank lever 53. The bell crank lever 53 and the indexing cam or cams 26 are mounted on the oscillatable shaft 27. Although there may be a number of the indexing cams 26, only one will be described. The bell crank lever 53 has on one of its arms a pin 55 receiving a head on a rod 56. The rod 56 has that end remote from the pin 55 freely sliding through a noddle pin 57 which is pivotally mounted in a side frame of the press. A collar 58 is fastened to the rod 56 to form an abutment for the spring 47. Spring 47 is preloaded and has one end engageable with the noddle pin 57 so as to urge the rod 56 rightwardly as viewed in FIG. 2. It will be seen from the foregoing description that the cam 46 as it rotates clockwise is capable of urging the lever 50 in a counterclockwise direction about shaft 51 to urge the indexing cam 26 radially inward into operative position. It will also be seen that the spring 47 acts upon the bell crank lever 53

so as to permit the shaft mounting the indexing cam 26 to be urged counterclockwise to move cam 26 to its inoperative position whenever permitted to do so by the cam 46.

In its operative position, the indexing cam 26 is adapted to be engaged by a follower 59 connected to conventional operating mechanism of the numbering head 25 by a lever 60. Several positions of the follower 59 are illustrated in FIG. 2 indicating a stroke of the lever 60 which indexes the numbers on the numbering head 25. The cylinder 24 is made up of a plurality of annular holders 61 fastened to the shaft 48. The holders are capable of being slid axially along the shaft 48 and each receives the numbering heads 25 therearound. The heads 25 are preferably adjustable circumferentially around the holders 61. It will be noticed that the holders 61 encompass approximately 270° of the shaft 48, with the open area between the ends of the holder 61 comprising a cylinder gap. The gap of the cylinder and the cam 46 are so related that the movement of the indexing cam 26 to and from operative position is effected wholly within the gap.

In order to maintain the indexing cam 26 in its operative position while numbering consecutive sheets, a latch bar 62 is adapted to engage a flattened pin 63 protruding from one side of the lever 50. When the jaw of the latch bar 62 is engaged with the flat on the pin 63, the lever 50 is held in its position in which the cam 46 is ineffective to operate the indexing cam 26. Whenever the latch bar 62 releases the lever 50, the spring 47 will urge the indexing cam 26 counterclockwise as it is permitted to do so by the cam follower 49 dropping to the low or dwell portion of the cam 46. Upon presentation of the high lobe of the cam 46 the cam follower 49, the indexing cam 26 will again be rocked clockwise to its operative position, such movement taking place as previously mentioned, within the gap of the cylinder 24.

The latch bar 62 is pivoted on a fixed pin 64 with its lower end being urged clockwise by a tension spring 65 and its upper end being urged counterclockwise by a compression spring 66. In the positions shown in FIG. 2, the preload of the compression spring 66 is such as to urge the latch bar 62 into engagement with the flattened pin 63 and overcome the tension in the spring 65. Operation of the latch bar 62 to release the lever 50 is effected by a solenoid 67 engaged with the lower end of the latch bar 62. The solenoid 67 is a pull-type solenoid which overcomes the force of the compression spring 66 to urge the upper end of the latch bar 62 clockwise and thereby release the pin 63 and the lever 50 for the purposes aforementioned. It will be seen that release of the lever 50 by the latch bar 62 permits the indexing cam 26 to move to its inoperative position whenever the cam follower 49 on the lever 50 can move inwardly under the action of the spring 47, but to counteract this, the energization of the solenoid 67 is timed with the machine cycle as will be seen subsequently, so that release of the latch bar 62 can take place only at a predetermined time in the cycle. It will also be shown subsequently that the solenoid 67 is deenergized after the cam 26 has been moved to its inoperative position so that resetting of the cam 26 to its operative position may take place after one cycle of having been inactive. When the lobe on the cam 46 again urges the lever 50 counterclockwise against the action of the spring 47, the indexing cam 26 will move inwardly toward the cylinder 24, and the latch bar 62 will again engage the pin 63 under the action of the spring 66. The lever 50 will thereafter remain in the latched position until subsequently released again.

The spring 66 surrounds a rod 68 pivotally connected to the latch bar 62 by means of a pin 69 and at its remote end to a bell crank lever 70 by means of a noddle pin 71. The rod 68 slides through the noddle pin in customary fashion and also has mounted thereon a collar 72 which, together with the noddle pin 71, mounts a spring 66 therebetween. The bell crank lever 70 is pivotally mounted on a fixed shaft 73. Connected to a second arm of the bell crank lever 70 is a link 74 which is operatively connected to conventional eccentric throw-off means for the blanket cylinder 16. It is desired when the printing press is turning over without printing or passing sheets therebetween, i.e., when the printing cylinders 16, 24 and 29 are not "on pressure," that indexing of the numbering heads be disrupted. To accomplish this, the conventional throwoff eccentrics move the link 74 downwardly as shown in FIG. 2 to urge the bell crank 70 in a counterclockwise direction. This movement of the bell-crank 70 enables the tension spring 65 to overcome the compression spring 66 and effect movement of the latch bar 62 in a clockwise direction to release the pin 63 and thus release the lever 50. Consequently, when sheets are not being passed through the press under pressure, the indexing cam 26 is free to move between its operative and inoperative positions under the control of the cam and spring 47 respectively and will make such movement once for each cycle of the cam 46. Since, however, the movement of the indexing cam 26 between its operative and inoperative positions takes place within the gap of the cylinder 24, no indexing of the numbering heads 25 can take place until the printing pressure is subsequently thrown "on" and the link 74 returns the bell crank 70 to the position shown in FIG. 2. At such time, the latch bar 62 will again engage the pin 63, it being noted that the pin 63 is rounded on its lower side to engage an inclined portion at the uppermost end of the latch bar 62 to snap the latch bar 62 slightly clockwise until its jaws engage over the pin 63 under response of the spring 66.

Referring now to FIGS. 4 and 5, it will be seen that the latch bar 62 can be maintained out of engagement with the pin 63 at any time, even when printing, if it is desired that no indexing of the numbering heads 25 take place. This is preferably accomplished by locking the latch bar 62 in the position shown in FIG. 5. It is accomplished by having a rod 75 interfere with the lower end of the latch bar 62 and prevent its counterclockwise movement into engagement with the flattened pin 63. The rod 75 is capable of being moved from right to left as viewed in FIG. 4 under the action of a spring 76, and can be moved rightwardly by pulling on the ball end 77 to retract the rod 75 and keep it from interfering with the lower end of the latch bar 62 as shown. The rod 75 has a block 78 mounted thereon, in which block a pin 79 is fastened. The pin 79 is parallel to the rod 75 and may be received in a hole 80 in the side frame 81 of the press when in the position shown in FIG. 4. When the end of the rod 75 is retracted from interferring position with the latch bar 62, the ball 77 is pulled rightwardly as viewed in FIG. 4 so as to release the pin 79 from the hole 80. The ball end 77 is then turned clockwise approximately 90° until the end of the pin 79 engages notch 82' in a plate 82. At such time, it will be seen that the spring 76 will be compressed and that the interfering end of the rod 75 will no longer be engageable with the lower end of the latch bar 62.

Referring generally again to FIG. 1, it will be seen that a cam 83 is carried by one of the five gripper assemblies 37. This cam 83 in its travel along the delivery path of sheets about the endless chains 35, will engage limit switches 84, 85, 86 and 87 in that sequence for purposes soon to be described. It will be seen that closing of the normally open limit switch 84 will commence energization of the solenoid 67 to enable the indexing cam 26 to move to its inoperative position, opening of the normally closed limit switch 85 will cause deenergization of the solenoid 67, operation of the normally open limit switch 86 will operate a solenoid 88 to move the sheet eject cam 40 into operative position, and the normally closed limit switch 87, when operated by cam 83 will deactivate the entire circuit for effecting these operations and will prevent sheet ejection until later when the operator may again push the button

for ejection. It is preferable to have but one cam 83 on the conveyor chains to reduce the actuation of the limit switches 84–87 to one-fifth in amount in the machine shown and described.

Referring now to FIG. 3, electrical operation is as follows:

When the operator wishes to eject a sheet 42 for inspection, he presses a button 89 of the momentary contact type. Current will flow from a lead 90 through the now closed button 89, through normally closed contacts 91 to energize the coil of a relay 92, which is connected to a return lead 93. Relay 92 has contacts 94 which now close and provide a hold-in circuit around the momentary contact button 89. It will be seen therefore that the operator can press the button 89 and immediately release it regardless of the position of the cam 83 (FIG. 1) with respect to the limit switches 84–87 operated thereby. The next time the cam 83 arrives at the position to close the normally open limit switch 84, a circuit will be provided through the lead 90, the closed contacts 94, the now closed limit switch 84, the normally closed limit switch 85 to the coil of a relay 95, and then through the lead 93. Energization of relay 95 closes its contacts 96, 97 and 98. Closing of contacts 96 provides a hold-in circuit to the relay coil 95. Such hold-in circuit is required since the limit switch 84 immediately opens upon passage of the cam 83 beyond the limit switch 84. Closing of contacts 97 provides a circuit from the lead 90 to the lead 93 through closed contacts 94 and 97 to the solenoid 67 which operates the latch bar 62 to release lever 50 and thus enable the number indexing cam 26 to move to its inoperative position. It will be seen that at this stage, the numbering heads 25 are prevented from indexing for one cycle of the machine, and thereby, two successive sheets will be printed with the same numbers. As the cam 83 moves around the delivery cylinder 34 and engages the limit switch 85, this latter limit switch is opened to break the circuit to the relay coil 95 thus deactivating the hold-in circuit through the contacts 96 and also opening the contacts 97 to deenergize the coil of the solenoid 67 and enable the cam 46 to move the indexing cam 26 into its operative position at the proper time in the cycle. It will be noticed however, that deenergization of the relay 95 will also open contacts 98, which previously provided a setting function for subsequent action. When the contacts 98 were initially closed by relay 95, the coil of a relay 99 was energized, which relay closed its hold-in contacts 100. As cam 83 moves past limit switch 85, the limit switch again closes, but does not restore current to the relay 95 since the hold-in circuit provided by the contacts 96 has been broken, and limit switch 84 is open. As the cam 83 comes into position to engage the limit switch 86, it closes this limit switch to energize the coil of a relay 101 through normally closed limit switch 87, the now-closed contacts 100, the now-closed limit switch 86 and the lead 93. Energization of the relay 101 closes its hold-in contacts 102 and opens its normally closed contacts 91. It will be seen that the opening of contacts 91 prevents restoration of the circuit by closing of the momentary push button 89 by the operator. Closing of the limit switch 86 also immediately causes energization of the solenoid 88 which moves the sheet eject cam 40 to its operative position. Passage of the cam 83 past the limit switch 86 permits the limit switch to open, but the solenoid 88 is maintained energized through the closed contacts 102 of the relay 101. The cam follower 39 on the lever 38 of the gripper assembly holding the sheet to be ejected is operated by the sheet eject cam 40 to release the sheet in the direction of the arrow 41 (FIG. 1). Further travel of the gripper assembly to the position in which the cam 83 now operates the limit switch 87 causes opening of that limit switch to deenergize the relay 101 and open the hold-in contacts 102, thus deenergizing the solenoid 88. What has just been described is a complete cycle of operation in which consecutive numbering is disrupted for one sheet so that duplicate sheets are printed and one of those two sheets that is so printed is subsequently automatically ejected before it reaches the delivery pile 32 so that it may be inspected. In the preferred form of the invention, restoration of consecutive numbering takes place after but one sheet is duplicated.

Since checks are often ordered in specific quantities, it is desirable to count the number of sheets printed and to disrupt the counting for each ejected sheet. A conventional electrically operated counter may be provided, only the solenoid 103 of which is shown in FIG. 3. When accomplishing both consecutive numbering and counting, a sequence numbering switch 104 and a counter switch 105 are placed in the positions shown in full lines. In addition, the following limit switches are to be in the positions described under certain machine conditions. These limit switches are shown both in FIGS. 1 and 3. A pressure switch 106 is closed by a cam 54 constantly whenever printing pressure is "on" and is open when printing pressure is "off." An impression switch 107 is adapted to operate once for each machine cycle. Switch 107 may be a conventional limit switch operated by a cam 108 as shown in FIG. 1. In addition, a normally open limit switch 109 is adapted to be operated by the indexing cam 26 or parts connected thereto. The switch 109 is closed whenever the indexing cam 26 is in operative position and opens in response to movement of the indexing cam 26 to its inoperative position. Now, it will be seen that with indexing taking place properly so that consecutive printing is effected on successive sheets, switch 109 will be closed and the switch 107 will close for each cycle of the machine so that the counting solenoid 103 is pulsed once for each sheet. Current will flow from the lead 90 through the now-closed switch 109, across contacts 110 of the sequence numbering switch 104, through the temporarily closed switch 107, the closed contacts 111 of the counter switch 105, to the solenoid 103 and then through lead 93. Upon interruption of indexing so that sheets are numbered in duplicate for inspection, movement of the cam 26 to inoperative position will permit the limit switch 109 to open so that subsequent closing of the impression switch 107 for that machine cycle will not permit a pulse to reach the solenoid 103 of the counter. When the indexing cam 26 moves back into its operative position after one machine cycle, the switch 109 again closes and counting will proceed. In this fashion, the sheet 42 or any other ejected sheet will not be counted.

In order to enable printing of the same numbers on all sheets rather than number consecutively, the sequence numbering switch 104 may be moved to its dotted-line position. In this condition, contacts 113 will be closed to mainatin the solenoid 67 energized constantly. This prevents the jaw of the latch bar 62 from engaging the pin 63 and from holding the lever 50 out of cam engaging position. Indexing of the numbering heads 25 cannot take place since the cam 26 will move in and out of operative position during the gap for each cycle, and will never remain locked in operative position to operate the followers 59 of the numbering heads 25. Contacts 110 of the sequence numbering switch 104 will have been opened, thus preventing the closed switch 109 from having any effect whatsoever on the counter solenoid 103. Contacts 114 of the sequence number switch 104 are closed, and under this condition pressure switch 106 performs the function previously provided by the switch 109. It will be seen that pressure switch 106 is closed constantly while printing by cam 54, but upon interruption of printing and throwoff of pressure, the switch 106 will open and thus prevent further energization or pulsing of the solenoid 103

until the pressure is again restored. Switch **107**, being timed by the machine, will coact with pressure switch **106** to provide the pulses to the solenoid **103** once for each sheet printed while the machine is "on pressure."

Various changes may be made in the details of construction without departing from the spirit and scope of the claims.

Having described my invention, I claim:

1. In a printing machine, a device for printing successive numbers or the like on individual sheets, means presenting sheets into a position to be printed by said number printing device, means for indexing said device in direct relation to cyclical operation of the machine to present successive numbers of said device to said printing position for each cycle, sheet delivery means for delivering printed sheets one at a time to the top of a pile thereof, and manually controlled means including deactivating means selectively operable to deactivate the indexing means during a sequential printing operation to interrupt an indexing operation whereby a given number is repeated for an additional machine cycle and for automatically reactivating the indexing means for indexing said device to continue the sequential numbering operation and sheet eject means for delivering the sheets which bear a number which is a duplicate at a station located away from the pile and conditioned to be effective under the control of said manually controlled means.

2. A machine according to claim **1** including sheet counting means and means operatively connecting the sheet counting means with the manually controlled means for interrupting counting of a sheet during interruption of the indexing operation.

3. A machine according to claim **2** including means for maintaining the deactivating means operative during continued machine operation whereby the indexing means is maintained inoperative, and means providing for operation of said counting means while said indexing means is maintained inoperative.

4. In a machine for consecutively numbering sheets, a numbering cylinder, a number printing device mounted on said cylinder, an impression cylinder, means for feeding sheets to said impression cylinder, said impression and numbering cylinders being adapted to run in rolling contact whereby sheets are consecutively numbered, means for indexing the number printing device for each sheet including first cam means movable between operative and inoperative positions and means on said number printing device actuated by the first cam means when the latter is in operative position, a sheet delivery device for transferring sheets from the impression cylinder to a pile thereof, second cam means carried by the sheet delivery device, actuating means selectively operable by said second cam, means at a predetermined point in the operation of the sheet delivery device for effecting movement of the first cam means to its inoperative position for a given cycle whereby indexing of the number printing device is interrupted for one cycle and numbering of an additional sheet is duplicated by said number printing device during said one cycle, and manually controlled means including means for selectively conditioning said actuating means to be operated by said second cam means and sheet eject means operative to deliver a sheet at a station away from the pile.

5. A machine according to claim **4** wherein said sheet eject means is adapted to be operated by the second cam means at a predetermined point of operation of the delivery device and is conditioned to be operable by said second cam means after actuation of said actuating means.

6. A machine according to claim **4** wherein the means for effecting movement of the first cam means includes solenoid means operatively connected to the first cam means and switch means operated by said second cam means for operating said solenoid means.

7. A machine according to claim **6** wherein said sheet eject means includes third cam means, cam-operated gripper means carried by said sheet delivery device, and means for actuating the third cam means to position the third cam means to actuate the gripper means to sheet releasing position at said station.

8. A machine according to claim **7** wherein the means for actuating the third cam means comprises a solenoid and a switch for operating the last-named solenoid in response to actuation of said switch by the second cam means at a predetermined point in sheet delivery operation.

9. A machine according to claim **8** including a second switch for deactivating the solenoid for the third cam means.

10. In a machine for consecutively numbering sheets, a numbering cylinder, a number printing device mounted on said cylinder, an impression cylinder, means for feeding sheets to said impression cylinder, said impression and numbering cylinders being adapted to run in rolling contact whereby sheets are consecutively numbered, means for indexing the numbering printing device for each sheet including cam means movable between operative and inoperative positions and means on said number printing device actuated by the cam means, a sheet delivery device for transferring printed sheets from the impression cylinder to a pile thereof, means for actuating said cam means between its respective positions including a solenoid for actuating the cam means to at least one of said positions, a switch for said solenoid, switch operating means for operating the switch at a predetermined point in the cycle of said machine to operate the solenoid and move the cam means to its inoperative position whereby indexing of the number printing device is interrupted for a machine cycle and numbering of an additional sheet is duplicated by said number printing device, control means for selectively conditioning said switch to be effective to energize said solenoid, means responsive to the operation of said machine for automatically effecting the de-energization of said solenoid after the latter is energized by said switch, and means for ejecting one of said duplicated sheets at a station away from said pile.

11. A machine according to claim **10** including means for automatically operating the ejecting means after the operation of and in timed relation to the movement of the cam means to its inoperative position to eject one of the sheets having a duplicated number thereon.

12. A machine according to claim **10** wherein said sheet delivery device includes gripper means for gripping a sheet and adapted to be cam operated to release a sheet, and wherein the sheet ejecting means includes second cam means for operating said gripper means and means for operating said second cam means between gripper actuating and inoperative positions at a predetermined point in tne delivery of one of said duplicated sheets for delivery of a sheet to a station other than to said pile of sheets.

13. A machine according to claim **10** including sheet counting means and means operatively connected to the cam means for interrupting counting of one of said duplicated sheets upon movement of the cam means to its inoperative position.

14. A machine according to claim **13** including means for locking the cam means in inoperative position during machine operation, and means by-passing said count interrupting means.

15. In a machine for consecutively numbering sheets, a numbering cylinder, an indexible number printing device mounted on said cylinder, an impression cylinder, means for feeding sheets to said impression cylinder, said impression and numbering cylinders being adapted to run in rolling contact whereby sheets are consecutively numbered, means for indexing the numebr printing device for each sheet including cam means movable between operative and inoperative positions and means on said number printing device actuated by the cam means, a sheet delivery device for transferring printed sheets from the impression cylinder to a pile thereof, means for actuating

said cam means between its respective positions including a solenoid for actuating the cam means to at least one of said positions, a switch for said solenoid, switch operating means for operating the switch at a predetermined point in the cycle of said machine to operate the solenoid and move the cam means to its inoperative position whereby indexing of the number printing device is interrupted for a machine cycle and numbering of an additional sheet is duplicated by said number printing device, and means for ejecting one of said duplicated sheets at a station away from said pile, said switch operating means comprising a second cam means carried by the sheet delivery device.

16. In a machine for consecutively numbering sheets, a numbering cylinder, an indexible number printing device mounted on said cylinder, an impression cylinder, means for feeding sheets to said impression cylinder, said impression and numbering cylinders being adapted to run in rolling contact whereby sheets are consecutively numbered, means for indexing the number printing device for each sheet including cam means movable between operative and inoperative positions and means on said number printing device actuated by the cam means, a sheet delivery device for transferring printed sheets from the impression cylinder to a pile thereof, means for actuating said cam means between its respective positions including a solenoid for actuating the cam means to at least one of said positions, a switch for said solenoid, switch operating means for operating the switch at a predetermined point in the cycle of said machine to operate the solenoid and move the cam means to its inoperative position whereby indexing of the number printing device is interrupted for a machine cycle and numbering of an additional sheet is duplicated by said number printing device, and means for ejecting one of said duplicated sheets at a station away from said pile, said sheet delivery device including means for gripping a sheet and adaptedi to be cam operated to release a sheet and said sheet ejecting means includes second cam means for operating said gripper means and means for operating said second cam means between gripper actuating and inoperative positions at a predetermined point in the delivery of one of said duplicated sheets for delivery of a sheet to its station other than to said piled sheets, said second cam operating means including a cam member carried by the sheet delivery device and a solenoid for operating the second cam means in at least one direction and a switch controlling the last-mentioned solenoid and operated by said cam member.

17. A machine according to claim **16** including electrical circuit and control means from said switches to their respective solenoids and providing for operation of said cam means for indexing said number device and said second cam means in sequence by said cam member, and switch means operated by said cam member after a sheet is ejected to restore said circuit and control means to an original condition in which sheets may be consecutively numbered.

18. In a printing machine, an indexible device for printing successive numbers or the like on individual sheets, an indexing control member engageable with said indexible device to change the number setting thereof and actuating said device once during each cycle of operation of said machine to effect a sequential numbering operation, an electrically operable indexing control system for moving said index control member between index and nonindex positions during a sequential numbering operation including manually actuatable control means and operating means rendered effective on the actuation of said manually actuatable control means to operate said member to its nonindex position to duplicate one number on a predetermined number of sheets and to automatically return the indexing member to its index position to continue sequential numbering after the predetermined duplication of the number has been effected, and sheet delivery means for delivering sheets printed by said machine to a pile position and including sheet ejecting means for ejecting a sheet having a duplicate number thereon at a station clear of said pile including means operated under the control of said manual control means to condition said sheet ejecting means to be effective and means operated in timed relation to the machine cycle for effecting the ejection of the sheet.

19. A printing machine as defined in claim **18** wherein said operating means includes means responsive to the operation of said machine to effect a return of the indexing control member to its index position comprising a switch operated once during each cycle of operation of the machine.

20. A printing machine as defined in claim **19** wherein said sheet delivery means includes a sheet conveyor and means on said sheet conveyor for operating switches for initiating the movement of said control member to its nonindex position and for returning said control member to its index position.

References Cited by the Examiner

UNITED STATES PATENTS

1,503,375	7/24	Pendergast	101—426
1,653,765	12/27	Hart	101—426
1,796,099	3/31	Hartsook	101—79
2,629,320	2/53	Baptist	101—77
2,673,735	3/54	Niles et al.	271—64
2,683,409	7/54	Dutro et al.	101—77
3,046,877	7/62	Janke	101—76

WILLIAM B. PENN, *Primary Examiner.*