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METHOD AND MECHANISM FOR CONTROLLING THE OPERATION OF PRINTING MACHINES

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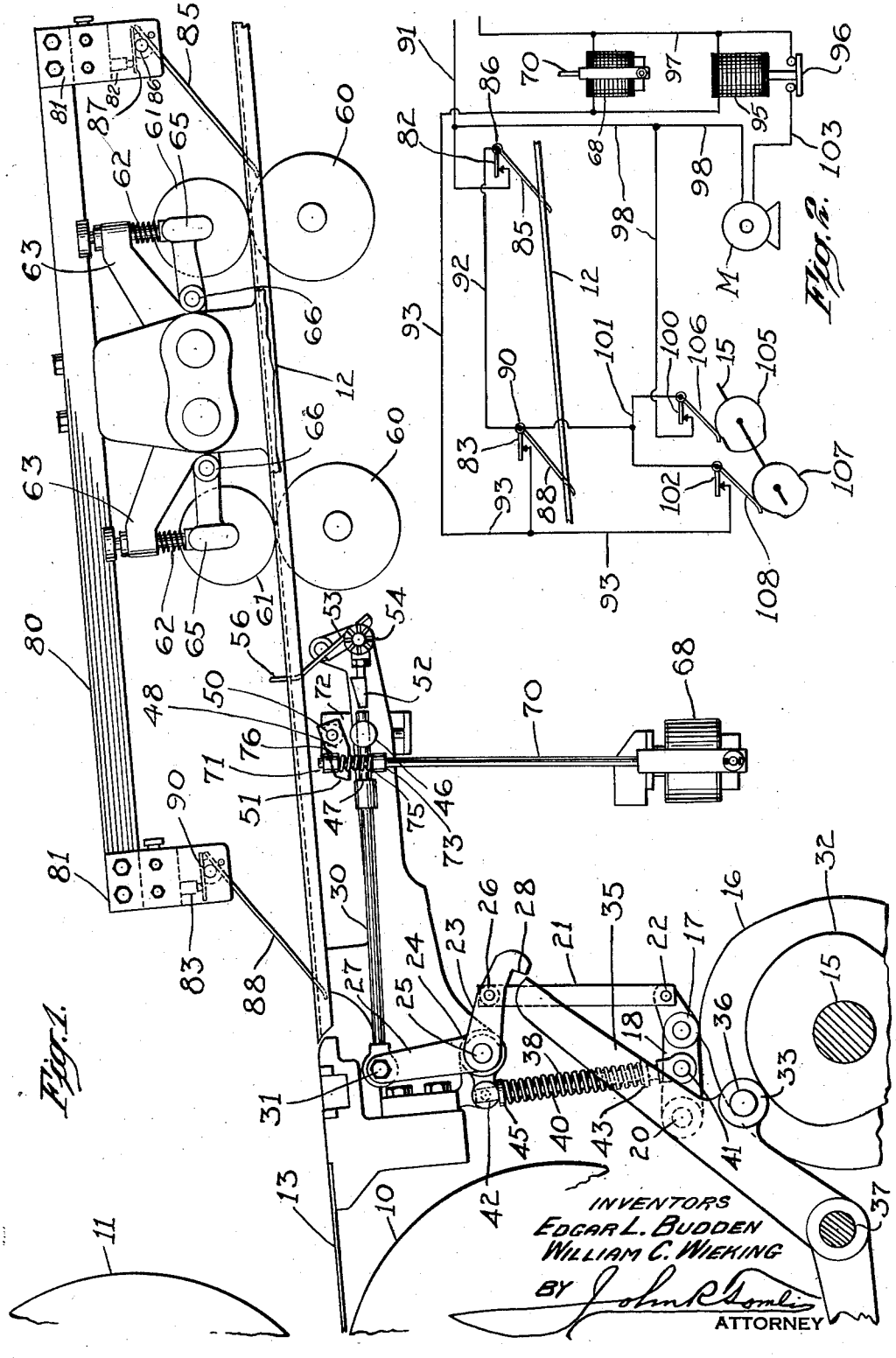


Fig. 1.

Fig. 2.

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METHOD AND MECHANISM FOR CONTROLLING THE OPERATION OF PRINTING MACHINES

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This invention relates to printing machines, and more particularly to method and mechanism for controlling the operation of printing machines having cooperating printing cylinders to which separate sheets are successively fed along a feed path.

Heretofore, the operation of sheet-fed printing machines of the offset type has been controlled by detectors located in the feed path. The detector mechanism usually cooperates with an interrupter mechanism, of well known construction, and the interrupter mechanism operates to interrupt the printing operation of the machine under certain conditions. If each sheet is fed in the usual manner along the feed path or feedboard towards the printing cylinders, the sheet engages the detector and moves it to such position that the interrupter mechanism is not operated, thus permitting the machine to continue to operate so as to perform its printing functions. If, however, through some inadvertence, a sheet is not fed along the feed path to engage the detector mechanism, then the detector mechanism remains in position to cause the interrupter mechanism to operate and separate the cylinders, thus discontinuing the printing operation of the machine.

In this well known arrangement, the interrupter mechanism is caused to be actuated by the absence of a sheet at the detector location, but if a sheet travels along the feed path to or from the detector location during a time interval which does not conform with the operating time of the machine, then there is no provision made for detecting this incorrect timing.

It is, therefore, an object of this invention to provide method and mechanism for controlling the operation of a printing machine, to which sheets are fed along a feed path at a speed commensurate with the operating speed of the printing cylinders, by checking each sheet during its movement along the feed path to determine if each sheet travels in correct time relation to the operating time of the machine, and to automatically interrupt the printing operation of the machine if the sheet's travel along the feed path is not in conformity with the operating time of the machine.

Another object of this invention is to provide method and mechanism for controlling the operation of a printing machine, to which separate sheets are successively fed along a feed path at a speed of travel commensurate with the operating speed of the printing machine, by providing an area in the feed path, automatically checking each sheet during its movement along the feed path to determine if the sheet arrives at and travels through the area in proper time relation to the operating speed of the machine, and automatically interrupting the printing operation of the machine if a sheet arrives at the area at an improper time or passes therethrough during an improper time interval.

A further object in this invention is to provide method and mechanism for controlling the operation of a printing machine, to which separate sheets are successively fed along a feed path at a speed of travel commensurate with the operating speed of the printing machine, by providing an area in the feed path of substantially the same length or slightly greater than the length of the longest sheet to be fed, automatically and progressively checking each sheet during its movement along the feed path to determine if the sheet arrives at and travels through the area in proper time relation to the operating speed of the machine, and automatically interrupting the printing operation of the machine if a sheet arrives at the area at an improper time or passes therethrough during an improper time interval.

An additional object of this invention is to provide method and mechanism for controlling the operation of a printing machine having cooperating power-driven printing cylinders, to which separate sheets are successively fed along a feed path at a speed of travel commensurate with the operating speed of the printing cylinders, by providing an area in the feed path, automatically and progressively checking each sheet during its movement along the feed path to determine if the sheet arrives at and travels through the area in proper time relation to the operating speed of the printing cylinders, and automatically separating the printing cylinders and discontinuing the operation of the machine if a sheet arrives at the area at an improper time or passes therethrough during an improper time interval.

It is also an object of this invention to provide a mechanism for controlling the operation of a sheet-fed printing machine, the mechanism being of generally improved construction and arrangement, whereby the device will be simple, durable, and inexpensive in construction, as well as convenient, practical, serviceable and efficient in its use.

With the foregoing and other objects in view, which will appear as the description proceeds, the invention resides in the combination and arrangement of parts and in the details of con-

struction hereinafter described and claimed, it being understood that various changes in form, proportion and minor details of construction may be made within the scope of the claims without departing from the spirit or sacrificing any advantages of the invention.

For a complete disclosure of the invention, a detailed description thereof will now be given in connection with the accompanying drawing forming a part of the specification, wherein:

Figure 1 is a fragmental side elevation of an offset printing machine equipped with an interrupter mechanism and depicting the improved sheet control mechanism applied thereto, and

Figure 2 is a diagrammatic view depicting electric circuits for actuating the interrupter mechanism and the control switch for the drive motor of the printing machine.

Referring to the drawing, in which similar reference characters designate corresponding parts, there is depicted an impression cylinder 10 of a lithographic printing machine, and this cylinder cooperates with a blanket or form cylinder 11 of the usual construction. The impression cylinder 10 and form cylinder 11 are rotatably mounted in the usual manner in the printing machine frame, not shown, and these cylinders are rotatably driven by an electric motor, as will be fully explained hereinafter.

A feed path along which separate sheets are successively fed leads to the printing cylinders, and this feed path includes a feedboard 12 and an alined platform or support 13, the feedboard 12 and platform 13 being supported in the usual manner by brackets or components of the machine frame.

In conformity with the preferred practice, the machine is provided with an interrupter mechanism which is operable to "trip" or separate the impression and form cylinders 10 and 11 in the manner well understood by those skilled in the art. Inasmuch as the interrupter mechanism is well known in the art, only so much of the mechanism as required for the full understanding of this invention is illustrated in the drawing of this application.

The interrupter mechanism includes a cam shaft 15 which is driven by gear connections, not shown, from suitable rotatable components of the printing machine, and this shaft is so driven that it rotates once for each revolution of the impression cylinder 10. A cam 16 is secured to the shaft 15, and this cam engages a roller 17 which is rotatably supported by a lever 18 that is pivotally supported on a fixed pivot 20. The outer terminal of the lever 18 is pivotally secured to the lower terminal of a link 21, as indicated at 22, and the upper terminal of the link 21 is pivotally secured to a hook arm 23 of a bell crank lever 24, as indicated at 26. The bell crank 24 is pivotally supported on a shaft or stud 25, and this bell crank includes the hook arm 23 and an angularly disposed arm 27. At the outer terminal of the hook arm 23 there is provided a hook or shoulder 28, and the outer terminal of the arm 27 is pivotally secured to a tripping bar or rod 30, as indicated at 31.

A cam 32 is secured to and rotates with the cam shaft 15, and this cam operably engages a roller 33 which is rotatably secured to the intermediate portion of a trip arm 35, as indicated at 36. The trip arm 35 is mounted for swinging or oscillatory movement on a shaft 37, and the outer terminal of the arm 35 swings in an arcuate path to be engaged by the hook or shoulder 28, as will be more fully explained hereafter. A helical extension spring 38 surrounds a rod 40, and the lower terminal of this rod is pivotally secured to the lever 18, as indicated at 41. The upper terminal of the rod 40 is slidably received in an aperture formed in the outer terminal of a lug 42 which is secured to the bell crank 24 and extends radially from its hub portion. A collar 43 is carried by the rod 40 and engages the lower terminal of the spring 38, and the upper terminal of this spring engages a washer 45 which is slidably supported on the rod 40 and rests against the lug 42. By this arrangement, the bell crank 24 is biased for clockwise movement, so that the hook 28 of the hook arm 23 is urged into engagement with the outer terminal of the trip arm 35.

The trip arm 35 forms a component of a conventional cylinder-tripping mechanism, and the construction and operation of the tripping mechanism is such that when the trip arm 35 is permitted to fall or move outwardly by the rotation of the cam 32, the tripping mechanism operates to separate the printing cylinders to thereby discontinue the printing operation of the machine. Inasmuch as the tripping construction is well known to those skilled in the art, it has not been depicted in the drawing of this application, except those components of the mechanism which cooperate with elements of this invention.

The outer terminal of the tripping bar or rod 30 is slidably supported by a lug or poppet 46, and the intermediate portion of the tripping bar 30 is provided with a collar having a shoulder 47. A latch 48 is pivotally supported, as indicated at 50, and the outer or nose portion 51 of the latch swings in a position to engage the shoulder 47, to thus interrupt the reciprocatory movement of the tripping bar 30 under conditions that will be hereinafter explained.

A stop member 52 forms one arm of a bell crank 53 which is pivotally supported on a shaft or stud, as indicated at 54, and the opposed arm of the bell crank 53 provides a detector finger 56. The outer terminal of the detector finger 56 extends above the feedboard 12 and lies in the path of travel of a sheet moving towards the printing cylinders along the feedboard. The bell crank 53, when in its normal position, as depicted in Figure 1, positions the stop 52 in the path of movement of the reciprocatory tripping bar 30, for a purpose to be hereinafter explained.

Propeller rollers 60 are located to propel sheets along the feedboard 12, and these rollers are driven by any suitable rotatable components of the printing machine, through the instrumentalities not shown. The necessary traction is imparted to the sheets by free-running traction rollers 61 located immediately above the rollers 60, and these traction rollers are biased towards engagement with the rollers 60 by springs 62 which are operably interposed between bracket arms 63 and bearing arms 65 to which the rollers 61 are rotatably secured, and the bearing arms 65 are pivotally secured to the bracket arms 63, as indicated at 66.

In the normal operation of a conventional sheet-fed offset printing machine, each sheet in traveling along the feedboard 12 towards the printing cylinders engages the detector finger 56 and swings the detector bell crank 53 downwardly so that the stop member 52 is moved from the path of travel of the reciprocating tripping bar 30. The tripping bar 30 makes one complete reciprocation during each revolution of the im-

pression cylinder 10. When the cam 16, acting through the roller 17, permits the lever 18 to drop, it causes the bell crank 24 to rock clockwise so that the hook or shoulder 28 of the hook arm 23 engages the outer terminal of the trip arm 35 to arrest further movement of the arm. As hereinbefore explained, if the trip arm 35 makes a complete downward movement, as permitted by the rotation of the cam 32, this downward movement of the arm 35 actuates the conventional cylinder tripping mechanism, not shown, which trips or separates the printing cylinders to prevent further printing operation. When the downward movement of the trip arm 35 is arrested by engagement with the hook 28, then the machine continues to operate to perform its printing functions. Thus it is seen, that when a sheet engages the detector finger 56 and moves the stop member 52 from the path of movement of the tripping bar 30, then the hook 28 is permitted to engage the outer terminal of the trip arm 35 to permit normal operation of the machine. If, however, a sheet is not fed to engage the finger 56, then the stop member 52 interrupts the reciprocatory movement of the tripping bar 30, thereby permitting the trip arm 35 to move downwardly to actuate the cylinder tripping mechanism.

The foregoing arrangement is well understood by those skilled in the art, and it will be observed that such arrangement merely detects the presence or absence of a sheet. This invention contemplates further steps in which the travel of the sheet along the feedboard is checked, and the operation of the machine is discontinued if the sheet does not travel along the feedboard in proper time relation to the operating speed of the printing cylinders. To accomplish this, a solenoid 68 is provided, and the lower terminal of a rod 70 is secured to the conventional armature of this solenoid, and the upper terminal of the rod is slidably mounted in a stop lug 71 supported by a bracket 72, which forms a component of the machine frame. A collar 73 is secured to the rod, and this collar is engaged by the lower terminal of a helical extension spring 75 which surrounds the rod. The upper terminal of the spring 75 engages an ear 76 which extends laterally from the latch 48, and this ear slidably receives the rod 70. When the solenoid 68 is energized it moves the rod 70 upwardly so that the spring 75 forces the ear 76 of the latch into engagement with the stop lug 71 to hold the nose 51 of the latch 48 out of the path of movement of the shoulder 47 of the collar carried by the tripping bar 30, thus permitting the normal reciprocatory movement of this bar. When the solenoid 68 is de-energized, the rod 70 and latch 48 drop so that the nose 51 of the latch engages the shoulder 47 of the collar carried by the tripping bar 30 to thus interrupt the outward movement of the rod, for a purpose to be more fully explained hereinafter.

A bar or rail 80 is supported by the machine frame, and this bar is located above the feedboard and extends therealong a distance greater than the length of a sheet. A switch housing 81 is supported at each terminal of the bar 80, and a normally-closed switch 82 is located in the outer housing, and a similar normally-closed switch 83 is located in the inner housing. A detector arm 85 is pivotally secured to the outer housing 81, as indicated at 86. This arm is provided with an extension 87 which engages the switch 82 to open the switch when the arm is swung upwardly. The lower terminal of the detector arm 85 extends below the upper surface of the feedboard 12, so that a sheet in moving along the feedboard towards the printing cylinders elevates the arm 85 and opens the switch 82, for a purpose to be hereinafter explained. A similar detector arm 88 is pivotally secured to the inner switch housing 81, as indicated at 90, and the lower terminal of this arm also extends below the upper surface of the feedboard so that a sheet passing along the feedboard towards the printing cylinders swings the arm 88 upwardly about the pivot 90 and opens the switch 83.

The detector arms 85 and 88 are spaced apart a distance substantially equal to or slightly greater than the length of the longest sheet to be fed, for a purpose to be hereinafter explained, and the normally-closed switches 82 and 83, which are actuated by the detector arms, are located in an electric circuit comprising a conductor 91 which leads from one side of a source of electric power to one side of the switch 82. A conductor 92 leads from the opposed side of the switch 82 to one side of the switch 83, and then to a parallel circuit, to be hereinafter described. The opposed side of the switch 83 is connected with a conductor 93 which leads to the parallel circuit and to one side of the solenoid 68, and also to one side of a similar solenoid 95 which actuates a switch 96. A conductor 97 leads from the opposed side of each solenoid and also from one side of the switch 96 back to the source of electric power. A parallel circuit is provided, and this circuit includes a conductor 98 that leads to one side of a switch 100 and to one side of a conventional motor M which drives the printing machine. The opposed side of the switch 100 is connected with a conductor 101 which leads to one side of a switch 102 and to the conductor 92, and the opposed side of the switch 102 is connected with the conductor 93. A conductor 103 leads from the motor M to one side of the switch 96 that is controlled by the solenoid 95.

The cam shaft 15 is provided with a cam 105 which operably engages an arm 106 that controls the switch 100, and a similar cam 107 is secured to the cam shaft 15, and this cam operably engages an arm 108 which controls the switch 102.

In operation, as a sheet in traveling along the feed path passes over the feedboard 12, its leading edge engages the detector arm 85 and raises this arm to open the normally-closed switch 82. The switch 82 remains open until the sheet passes from under the arm 85, and then the leading edge of the sheet engages the switch arm 88 and opens the normally-closed switch 83. This switch, in turn, remains open until the sheet passes from under the detector arm 88. In the meantime the cam shaft 15 is rotating in such relation to the printing machine that this cam shaft rotates once for each revolution of the impression cylinder 10. The cam operation is so timed that the switch 100 is closed immediately before the switch 82 is opened by the sheet as it travels along the feedboard towards the printing cylinder at normal feed speed, and the switch 100 remains closed until the switch 82 is closed by the sheet passing from under the detector arm 85. Switch 100 is then opened by the cam 105. The operation of cam 107 is similarly timed, so that the switch 102 is closed immediately before the switch 83 is opened, and the switch 102 remains closed until the switch 83 is closed by the sheet passing from under the detector arm 88.

Thus it is seen, that when a sheet travels along the feed path in correct time relation to the operating speed of the printing cylinders, the solenoids **68** and **95** remain energized so that the machine motor is driven and the interrupter mechanism is held from actuation. If a sheet, however, should engage either of the detector arms **85** or **88** at an improper time, then the cam shaft **15** would not be in correct angular position to cause the cams **105** and **107** to actuate the switches **100** and **102** to hold the circuits closed to energize the solenoids, with the result that solenoid **68** would be de-energized, thus permitting the latch **48** to drop and interrupt the outward reciprocatory movement of the tripping bar **30**. When the outward movement of the tripping bar **30** is interrupted, the hook **28** of the hook arm **23** is held from engagement with the trip arm **35**, with the result that the trip arm continues to move downwardly, in following the movement of cam **32**, and actuates the usual cylinder tripping mechanism, to thus interrupt the printing operation of the machine. At the same time the circuit to the solenoid **95** is broken, and the deenergization of this solenoid causes the switch **96** to break the circuit to the press drive motor M so that power to the machine is cut off.

Inasmuch as the detector arms **85** and **88** are spaced apart a distance substantially equal to or somewhat greater than the length of the longest sheet to be fed, this, in effect, provides a detector area in the feed path having its length substantially equal to or slightly longer than the length of the longest sheet to be fed. If a sheet remains in engagement with either of the detector arms **85** or **88** during an improper time interval, then the angular position of the cam shaft **15** will be such that the circuit to the solenoids **68** and **95** is broken to thereby interrupt the printing operation of the machine.

Although the switches have been defined as normally-closed, it will be understood, of course, that normally-open switches may be employed and these switches may be controlled by the same instrumentalities that actuate the normally-closed switches.

Thus it is seen that with this arrangement the operation of the printing machine is not alone controlled by the presence of a sheet on the feedboard, but it is also controlled by the progress or speed of travel of the sheet along the feed path.

Although this invention is directed to the disclosed method and mechanism for controlling the operation of printing machines to which sheets of any required material are successively fed, it is peculiarly adapted for application to metal decorating machines to which relatively rigid sheets are fed along a feed path.

It will be understood that the invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof, and it is therefore desired that the present embodiment be considered in all respects as illustrative and not restrictive.

Having thus described our invention, what we claim as new and useful is:

1. The method of controlling the operation of a printing machine having cooperating power-driven printing cylinders to which separate sheets are successively fed along a feed path at a speed of travel commensurate with the operating speed of the printing machine, which consists in providing an area in the feed path of substantially the same length as the longest sheet to be fed, automatically checking each sheet during its movement along the feed path towards the printing cylinders to determine if the sheet arrives at or travels through the area or leaves it in proper time relation to the operating speed of the machine, and automatically separating the printing cylinders and discontinuing the operation of the machine if a sheet arrives at or leaves the area at an improper time or passes therethrough during an improper time interval.

2. The method of controlling the operation of a printing machine having cooperating power-driven printing cylinders to which separate sheets are successively fed along a feed path at a speed of travel commensurate with the operating speed of the printing cylinders, which consists in providing an area in the feed path of a length substantially equal to the length of the longest sheet to be fed, automatically progressively checking each sheet during its movement through the area along the feed path towards the printing cylinders to determine if the sheet arrives at or travels through the area or leaves it in proper time relation to the operating speed of the printing cylinders, and automatically separating the printing cylinders and discontinuing the operation of the machine if a sheet arrives at or leaves the area at an improper time or passes therethrough during an improper time interval.

3. In a printing machine, cooperating printing cylinders, means defining a feed path along which separate sheets are fed to the printing cylinders at a speed commensurate with the operating speed of the printing cylinders, an area in the feed path of substantially the same length as the longest sheet to be fed, interrupter mechanism operable for interrupting the printing operation of the machine, a yieldable detector normally located in the feed path at each terminal of the area and movable from the feed path to actuate the interrupter mechanism by the engagement of a sheet with the detector during the movement of the sheet along the feed path towards the printing cylinders, and means continuously moving in time relation with the printing cylinders and coacting with each detector to control the operation of the interrupter mechanism whereby the said interrupter mechanism is actuated if a sheet engages a detector in arriving at or leaving the area at an improper time the detector from the feed path at an improper time or continues to engage and hold it from the feed path during an improper time interval.

4. In a printing machine, cooperating printing cylinders, means defining a feed path along which separate sheets are fed to the printing cylinders at a speed commensurate with the operating speed of the printing machine, interrupter mechanism operable to interrupt the printing operation of the machine, a plurality of yieldable detectors normally located in the feed path and spaced apart a distance greater than the length of a sheet so that the detectors are successively engaged by each sheet as it moves along the feed path towards the printing cylinders, each detector being operable to actuate the interrupter mechanism by the engagement of a sheet with the detector during the movement of the sheet along the feed path towards the printing cylinders, and a separate means for each detector continuously moving in time relation with the printing machine and coacting with its detectors to control the operation of the interrupter mechanism whereby the interrupter mechanism is actuated if a sheet engages a detector at an improper time or engages it during an improper time interval.

5. In a printing machine, cooperating power-driven printing cylinders, means defining a feed path along which separate sheets are fed to the printing cylinders at a speed commensurate with the operating speed of the printing cylinders, interrupter mechanism operable to separate the printing cylinders, a detector located in the feed path and operable to actuate the interrupter mechanism by the engagement of a sheet with the detector during the movement of the sheet along the feed path towards the printing cylinders, and means continuously moving in time relation with the printing cylinders to coact with the detector to control the operation of the interrupter mechanism and power to the printing cylinders whereby the said interrupter mechanism is actuated and the operation of the machine discontinued if a sheet engages the detector at an improper time or continues to engage it during an improper time interval.

6. In a printing machine, cooperating printing cylinders, means defining a feed path along which sheets are fed to the printing cylinders at a speed commensurate with the operating speed of the printing machine, normally-inoperative interrupter mechanism for interrupting the printing operation of the machine, electrically-actuated means cooperable with the interrupter mechanism to render the interrupter mechanism operable, an electric circuit, a switch located in the circuit, a detector located in the feed path and operable to actuate the switch by the engagement of a sheet with the detector during the movement of the sheet along the feed path towards the printing cylinders, a parallel electric circuit, a second switch in the parallel circuit, and a cam continuously moving in time relation with the printing machine to control the opening and closing of the second switch whereby the two switches control the circuits to the said interrupter actuating mechanism so that the interrupter mechanism is actuated if a sheet engages the detector at an improper time or continues to engage it during an improper time interval.

7. In a printing machine, cooperating printing cylinders, means defining a feed path along which sheets are fed to the printing cylinders at a speed commensurate with the operating speed of the printing machine, normally-inoperative interrupter mechanism for interrupting the printing operation of the machine, electrically-actuated means cooperable with the interrupter mechanism to render the interrupter mechanism operable, an electric circuit, a plurality of switches located in the circuit, a plurality of detectors located in the feed path, each detector being operable to actuate a switch by the engagement of a sheet during the movement of the sheet along the feed path towards the printing cylinders, a parallel electric circuit, a plurality of second switches in the parallel circuit, and a plurality of cams continuously moving in time relation with the printing machine, each cam controlling the opening and closing of a second switch whereby the first and second switches control the circuits to the said interrupter actuating mechanism so that the interrupter mechanism is actuated if a sheet engages a detector at an improper time or continues to engage it during an improper time interval.

8. In a printing machine, cooperating printing cylinders, means defining a feed path along which sheets are fed to the printing cylinders at a speed commensurate with the operating speed of the printing cylinders, normally-inoperative interrupter mechanism for interrupting the printing operation of the machine, electrically-actuated means cooperable with the interrupter mechanism to render the interrupter mechanism operable, an electric circuit, a plurality of switches located in the circuit, a plurality of detectors located in the feed path and spaced apart a distance greater than the length of a sheet, each detector being operable to actuate a switch by the engagement of a sheet with the detector during the movement of the sheet along the feed path towards the printing cylinders, a parallel electric circuit, a plurality of second switches located in the parallel circuit, and a plurality of cams continuously moving in time relation with the printing machine, each cam controlling the opening and closing of a second switch whereby the first and second switches control the circuits to the said interrupter actuating mechanism so that the interrupter mechanism is actuated if a sheet engages a detector at an improper time or continues to engage it during an improper time interval.

9. In a printing machine, cooperating printing cylinders, means defining a feed path along which sheets are fed to the printing cylinders at a speed commensurate with the operating speed of the printing cylinders, normally-inoperative interrupter mechanism for interrupting the printing operation of the machine, solenoid-actuated means cooperable with the interrupter mechanism to render the interrupter mechanism operable, an electric circuit, a switch located in the circuit, a detector located in the feed path and operable to actuate the switch by the engagement of a sheet with the detector during the movement of the sheet along the feed path towards the printing cylinders, a parallel electric circuit, a second switch located in the parallel circuit, and a cam continuously moving in time relation with the printing cylinders to control the opening and closing of the second switch whereby the two switches control the circuits to the said interrupter actuating mechanism so that the interrupter mechanism is actuated if a sheet engages the detector at an improper time or continues to engage it during an improper time interval.

10. In a printing machine, cooperating printing cylinders, means defining a feed path along which sheets are fed to the printing cylinders at a speed commensurate with the operating speed of the printing cylinders, normally-inoperative interrupter mechanism for interrupting the printing operation of the machine, solenoid-actuated means cooperable with the interrupter mechanism to render the interrupter mechanism operable, an electric circuit, a plurality of switches located in the circuit, a plurality of detectors located in the feed path and spaced apart a distance greater than the length of a sheet, each detector being operable to actuate a switch by the engagement of a sheet with the detector during the movement of the sheet along the feed path towards the printing cylinders, a parallel electric circuit, a plurality of second switches located in the parallel circuit, and a plurality of cams continuously moving in time relation with the printing machine, each cam controlling the opening and closing of a second switch whereby the first and second switches control the circuits to the said interrupter actuating mechanism so that the interrupter mechanism is actuated if a sheet engages a detector at an improper time or continues to engage it during an improper time interval.

11. In a printing machine, cooperating printing cylinders, means defining a feed path along which sheets are fed to the printing cylinders at a speed commensurate with the operating speed of the printing cylinders, an interrupter mechanism including a rod mounted for reciprocatory movement and which reciprocates once for each revolution of the printing cylinders during the normal operation of the machine and which interrupts the printing operation of the machine when its reciprocatory movement is interrupted, a movable latch normally located in the path of movement of the reciprocating rod, a solenoid operably connected with the latch and operable to move the latch from the path of movement of the rod when the solenoid is electrically-actuated, an electric circuit in which the solenoid is located, a switch located in the circuit, a detector located in the feed path and operable to actuate the switch when the detector is engaged by a sheet during the movement of the sheet along the feed path towards the printing cylinders, a parallel electric circuit with which the solenoid is electrically connected, a second switch in the parallel circuit, and a cam continuously moving in time relation with the printing cylinders to control the opening and closing of the second switch whereby the two switches control the circuits to the said solenoid to interrupt the reciprocatory movement of the rod of the interrupter mechanism if a sheet engages a detector at an improper time or continues to engage it during an improper time interval.

12. In a printing machine, cooperating printing cylinders, means defining a feed path along which sheets are fed to the printing cylinders at a speed commensurate with the operating speed of the printing machine, an interrupter mechanism including a rod mounted for reciprocatory movement and which reciprocates once for each revolution of the printing cylinders during the normal operation of the machine and which interrupts the printing operation of the machine when its reciprocatory movement is interrupted, a movable latch normally located in the path of movement of the reciprocating rod, a solenoid operably connected with the latch and operable to move the latch from the path of movement of the rod when the solenoid is electrically actuated, an electric circuit in which the solenoid is located, a plurality of switches located in the circuit, a plurality of detectors located in the feed path and spaced apart a distance greater than the length of a sheet, each detector being operable to actuate a switch when the detector is engaged by a sheet during the movement of the sheet along the feed path towards the printing cylinders, a parallel electric circuit with which the solenoid is electrically connected, a plurality of second switches in the parallel circuit, and a plurality of cams continuously moving in time relation with the printing cylinders, each cam controlling the opening and closing of a second switch whereby the first and second switches control the circuits to the said solenoid to interrupt the reciprocatory movement of the rod of the interrupter mechanism if a sheet engages a detector at an improper time or continues to engage it during an improper time interval.

13. In a printing machine, cooperating printing cylinders, means defining an electric motor for driving the cylinders, a feed path along which sheets are fed to the printing cylinders at a speed commensurate with the operating speed of the printing cylinders, an interrupter mechanism including a rod mounted for reciprocatory movement and which reciprocates once for each revolution of the printing cylinders during the normal operation of the machine and which actuates the interrupter mechanism to separate the cylinders to interrupt the printing operation when its reciprocatory movement is interrupted, a movable latch normally located in the path of movement of the reciprocating rod, a solenoid connected with the latch and operable to move the latch from the path of movement of the rod when the solenoid is electrically-actuated, a first electric circuit in which the solenoid is located, a motor circuit and switch for controlling current to the cylinder driving motor, a solenoid in the first circuit for controlling the motor switch, a plurality of first switches located in the first circuit, a plurality of detectors located in the feed path and spaced apart a distance greater than the length of a sheet, each detector being operable to actuate a first switch when the detector is engaged by a sheet during the movement of the sheet along the feed path towards the printing cylinders, a parallel electric circuit with which the solenoids are electrically connected, a plurality of second switches in the parallel circuit, and a plurality of cams continuously moving in time relation with the printing cylinders, each cam controlling the opening and closing of a second switch whereby the switches control the circuits to the solenoids to break the circuit to the cylinder driving motor and to interrupt the reciprocatory movement of the rod of the interrupter mechanism if a sheet engages a detector at an improper time or continues to engage it during an improper time interval.

14. In a printing machine, cooperating printing cylinders, means defining a feed path along which sheets are fed to the printing cylinders at a speed commensurate with the operating speed of the printing machine, normally-inoperative interrupter mechanism for interrupting the printing operation of the machine, electrically-actuated means cooperable with the interrupter mechanism to render the interrupter mechanism operable, an electric circuit, a plurality of normally-closed switches located in the circuit, a plurality of detectors located in the feed path, each detector being operable to open the switch by the engagement of a sheet during the movement of the sheet along the feed path towards the printing cylinders, a parallel electric circuit, a plurality of normally-closed second switches in the parallel circuit, and a plurality of cams continuously moving in time relation with the printing machine, each cam controlling the opening and closing of a second switch whereby the first and second switches control the circuits to the said interrupter actuating mechanism so that the interrupter mechanism is actuated if a sheet engages a detector at an improper time or continues to engage it during an improper time interval.

15. In a printing machine, cooperating printing cylinders, means defining a feed path along which sheets are fed to the printing cylinders at a speed commensurate with the operating speed of the printing cylinders, normally-inoperative interrupter mechanism for interrupting the printing operation of the machine, electrically-actuated means cooperable with the interrupter mechanism to render the interrupter mechanism operable, an electric circuit, a plurality of normally-closed switches located in the circuit, a

plurality of detectors located in the feed path and spaced apart a distance greater than the length of a sheet, each detector being operable to open a switch by the engagement of a sheet with the detector during the movement of the sheet along the feed path towards the printing cylinders, a parallel electric circuit, a plurality of normally-closed second switches located in the parallel circuit, and a plurality of cams continuously moving in time relation with the printing machine, each cam controlling the opening and closing of a second switch whereby the first and second switches control the circuits to the said interrupter actuating mechanism so that the interrupter mechanism is actuated if a sheet engages a detector at an improper time or continues to engage it during an improper time interval.

16. In a printing machine, cooperating printing cylinders, means defining a feed path along which sheets are fed to the printing cylinders at a speed commensurate with the operating speed of the printing cylinders, normally-inoperative interrupter mechanism for interrupting the printing operation of the machine, solenoid-actuated means cooperable with the interrupter mechanism to render the interrupter mechanism operable, an electric circuit, a normally-closed switch located in the circuit, a detector located in the feed path and operable to open the switch by the engagement of a sheet with the detector during the movement of the sheet along the feed path towards the printing cylinders, a parallel electric circuit, a normally-closed second switch located in the parallel circuit, and a cam continuously moving in time relation with the printing cylinders to control the opening and closing of the second switch whereby the two switches control the circuits to the said interrupter actuating mechanism so that the interrupter mechanism is actuated if a sheet engages the detector at an improper time or continues to engage it during an improper time interval.

17. In a printing machine, cooperable printing cylinders, means defining a feed path along which sheets are fed to the printing cylinders at a speed commensurate with the operating speed of the printing machine, normally-inoperative interrupter mechanism for interrupting the printing operation of the machine, electrically-actuated means cooperable with the interrupter mechanism to render the interrupter mechanism operable, a pair of electric switches, a pair of detectors located in the feed path and each operable to actuate a switch by the engagement of a sheet with a detector during the movement of the sheet along the feed path towards the printing cylinders, a pair of second switches, a pair of cams continuously moving in timed relation with the printing machine, each controlling the opening and closing of a second switch, and an electric circuit including all of said switches and the said interrupter actuating mechanism whereby the interrupter mechanism is actuated if a sheet engages a detector at an improper time or continues to engage it during an improper interval.

18. The method of controlling the operation of a printing machine having printing cylinders to which sheets are successively fed along a feed path at a predetermined linear speed, which consists in providing an area in the path in advance of the printing cylinder of substantially the same length as the longest sheet to be fed, automatically checking each sheet as it enters the area and leaves the area to determine if the sheet arrives at, travels through and leaves the area in proper time relation to the operating speed of the printing cylinders, and automatically interrupting the printing operation of the machine if a sheet enters or leaves the area at an improper time and passes therethrough during an improper interval.

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