United States Patent [19]

Barber

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[45] **Apr. 8, 1975**

[54] **SHEET SENSOR FOR OFFSET PRINTER**

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[22] Filed: **Aug. 13, 1973**

[21] Appl. No.: **387,868**

Related U.S. Application Data

[63] Continuation of Ser. No. 223,580, Feb. 4, 1972, abandoned.

[52] **U.S. Cl.** **101/217;** 101/233; 271/57

[51] **Int. Cl.** **B65h 7/12;** B41f 7/06

[58] **Field of Search** 101/232–235, 101/247, 218, 217; 100/47, 49; 271/56, 57

[56] **References Cited**

UNITED STATES PATENTS

2,665,907	1/1954	Ribich	271/57
2,719,483	10/1955	Smith	101/247 X
2,860,577	11/1958	Fowlie	101/218
3,158,369	11/1964	Blenner et al.	101/247 X
3,249,354	5/1966	Egnaczak et al.	271/57
3,593,989	7/1971	Crittenden	271/57
3,625,509	12/1971	Claybourn	271/57

FOREIGN PATENTS OR APPLICATIONS

1,282,026	11/1968	Germany	101/247

Primary Examiner—J. Reed Fisher
Attorney, Agent, or Firm—Townsend and Townsend

[57] **ABSTRACT**

A sensor for sensing the passage of a predetermined number of paper sheets between two cylinders of a printing machine, such as the impression and blanket cylinders of an offset printing machine. The sensor includes a switch mounted adjacent to one of the two side arms which supports one of the cylinders so that, when the two side arms pivot excessively, such as when two or more sheets pass between the aforesaid cylinders, the switch will be actuated to de-energize an operating component of the machine, such as the drive for the paper feed mechanism thereof. In one form of the invention, the sensor is mounted on the inner surface of one sidewall of the machine with the switch projecting through an opening and into alignment with the adjacent side arm exteriorly of the sidewall. In another form, the sensor is mounted on the outer surface of the other sidewall of the machine and has a spring which yields to prevent damage to the switch when more than a minimum number of sheets pass together between the cylinders.

2 Claims, 10 Drawing Figures

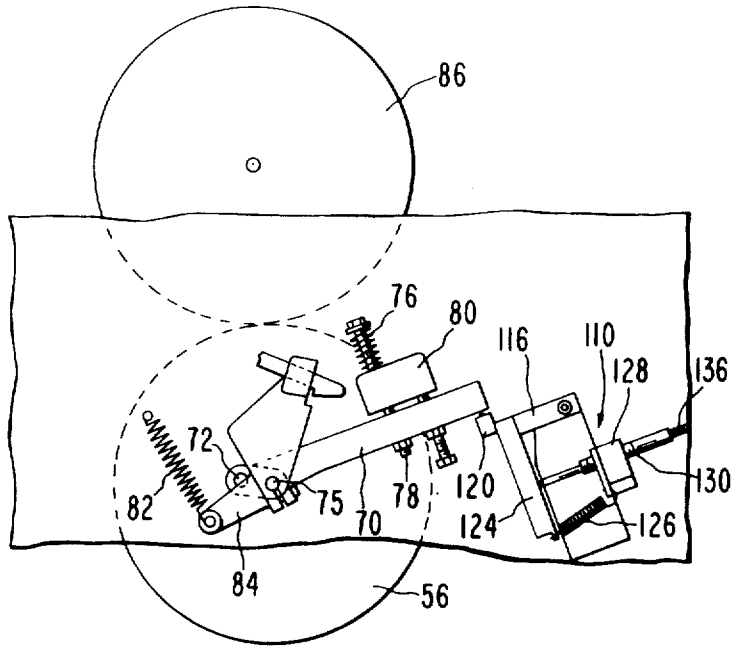


FIG. 1

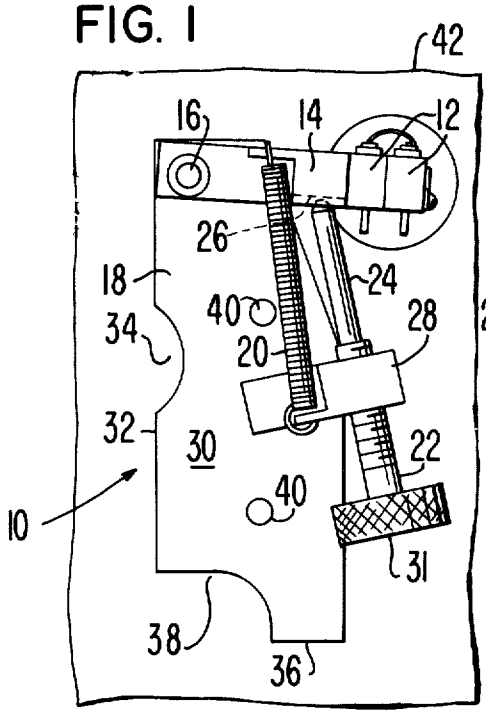


FIG. 2

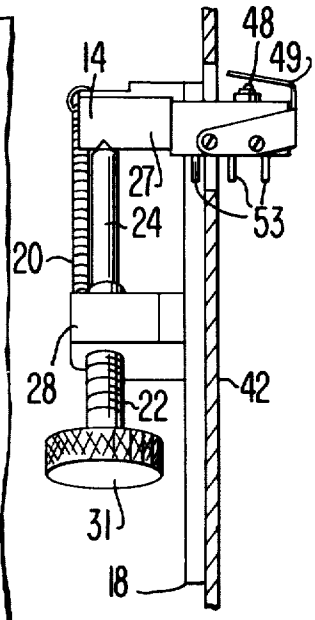


FIG. 3

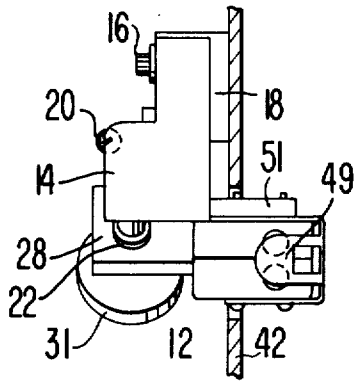
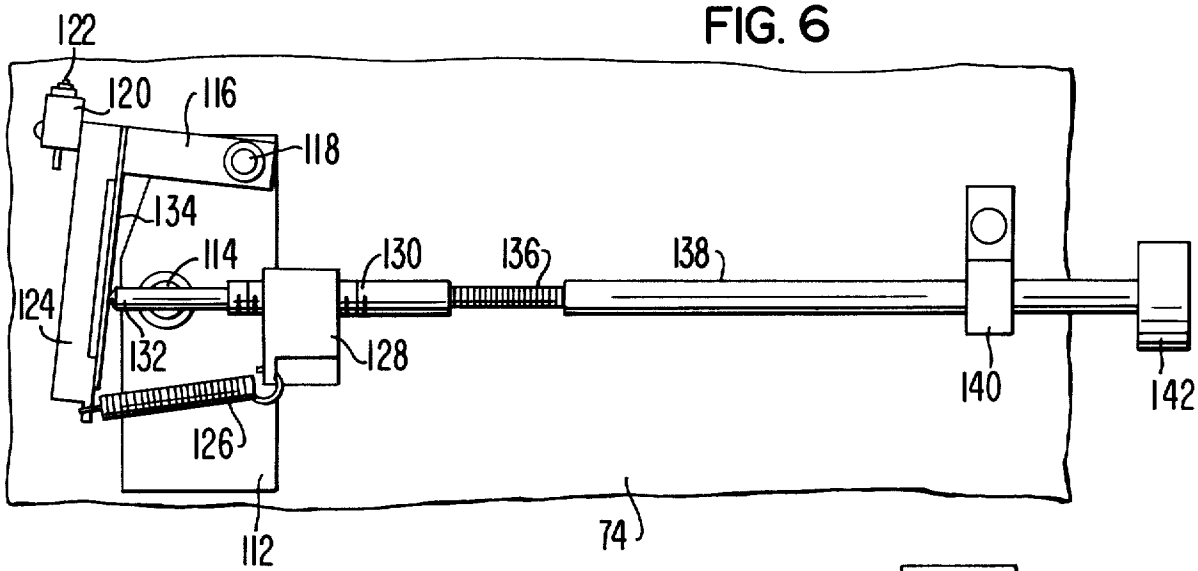


FIG. 6



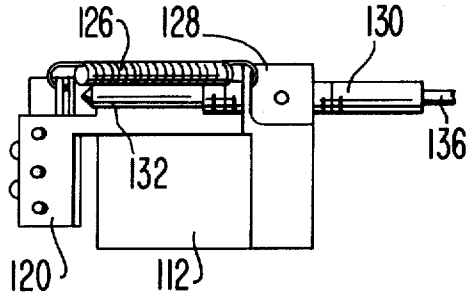


FIG. 8

FIG. 7

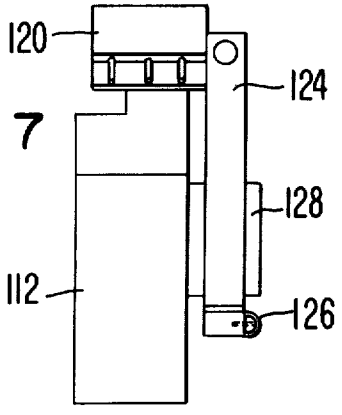


FIG.4

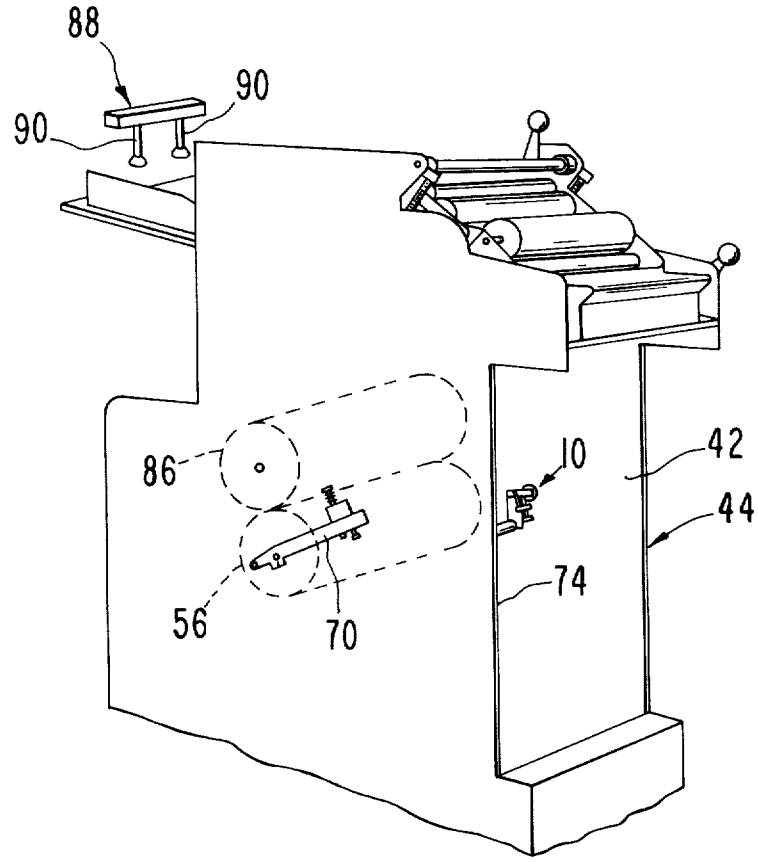

88
90
90
86
10
42
44
74
56
70

FIG.9

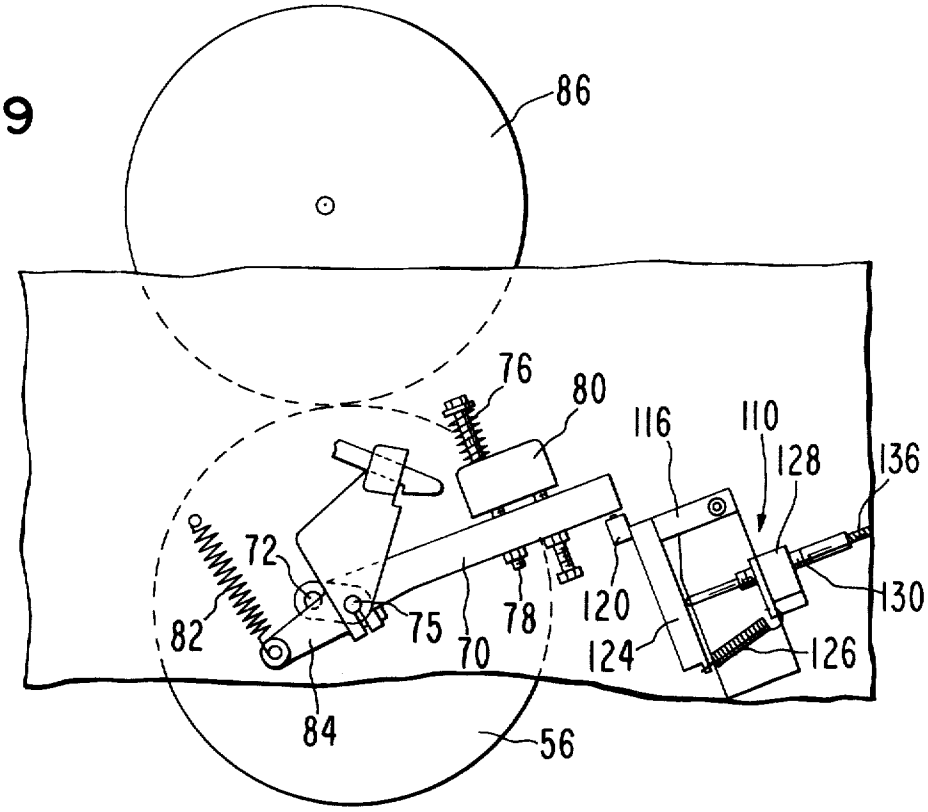
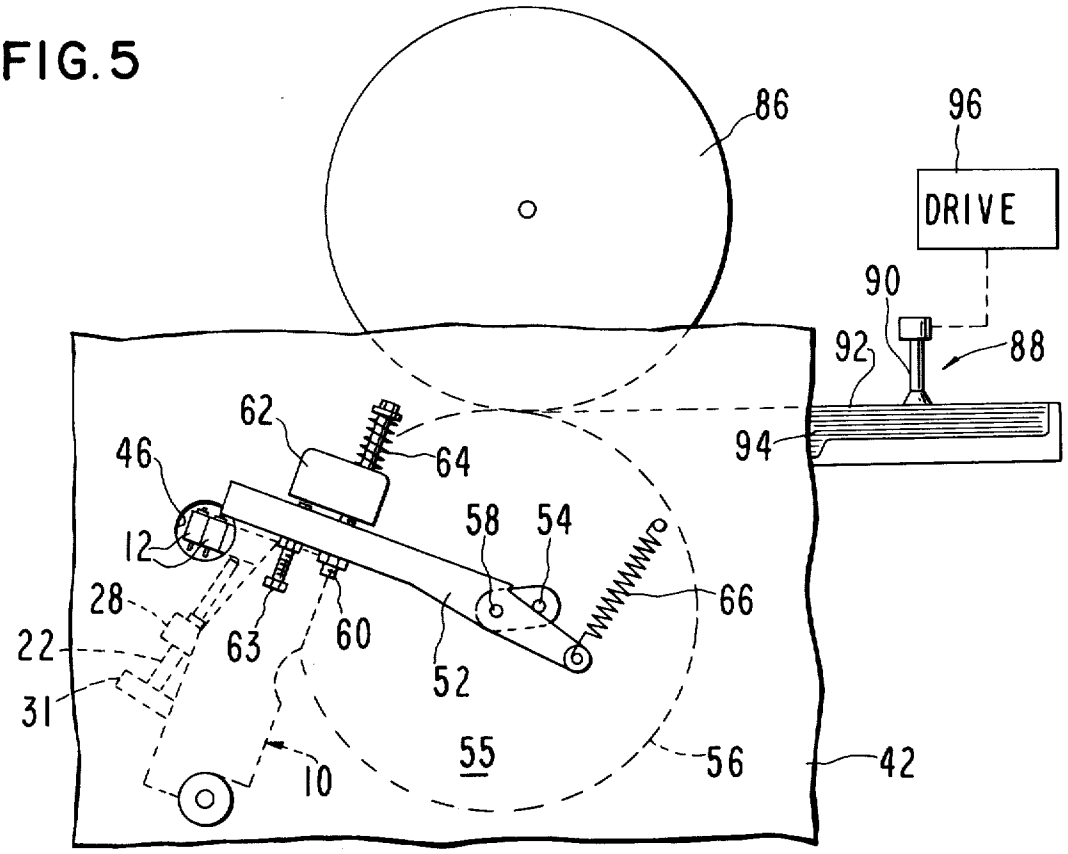

86
76
80
116
110
128
136
72
82
75
70
78
120
124
126
130
84
56

FIG. 5


86
96
DRIVE
90
92
88
94
62
64
46
12
58
54
66
28
22
63
60
52
31
55
56
42
10

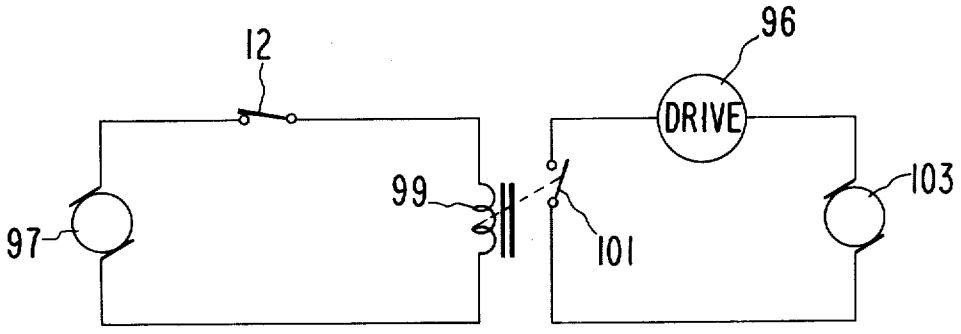

12
96
DRIVE
99
103
97
101

FIG. 5a

SHEET SENSOR FOR OFFSET PRINTER

This is a continuation of application Ser. No. 223,580, now abandoned, filed Feb. 4, 1972.

This invention relates to improvements in printing machines and, more particularly, to a device for sensing the number of paper sheets which simultaneously pass between the impression and blanket cylinders of an offset printer.

In an offset printing machine, paper sheets are fed desirably one at a time from a stack along a path between the impression and blanket cylinders of the machine. The blanket cylinder is fixed between a pair of sidewalls but the impression cylinder is mounted by a pair of support arms pivotally mounted on the sidewalls so that the impression cylinder can translate downwardly away from the blanket cylinder when a sheet passes therebetween. Oftentimes, two or more sheets of paper stick together and pass simultaneously between the cylinders. This causes a printing problem since each of two sheets passing in this manner will only be printed on one face. Thus, when the sheets are inverted and printed on the opposite sides, the two faces of the sheets adhering together will be unprinted, leaving two blank pages facing each other.

In the past, attempts have been made to sense when two or more sheets have simultaneously passed between the two cylinders. Typical of such attempts is the use of a photocell detector which is placed upstream of the blanket cylinder and in the path of the second of two sheets simultaneously moving toward the cylinders from the sheet feed mechanism. This approach required a precision adjustment of the detector with respect to the sheet path; also, the detector served as a barrier for the second sheet, causing jamming of the second sheet with the first sheet. For this reason, the prior attempts of sensing two sheets has been unsatisfactory.

The present invention avoids this problem by sensing the over-travel of one of the two support arms for a cylinder of a printing machine, such as the impression cylinder of an offset printer. Knowing the general thickness of a single sheet of paper, it is possible to determine the maximum linear travel of the outer end of such a support arm when a single sheet passes between the cylinders. When two or more sheets pass between the cylinders, the travel of the outer end of the support arm will be greater. By placing a switch near this outer end of the support arm and adjusting the switch so that it will remain unactuated only if a single sheet passes between the cylinders, it is possible to detect the passage of two or more sheet between the cylinders. By coupling the switch to an operating component of the machine, such as the drive for the sheet feed mechanism of the machine, it is possible to stop the operation of the machine automatically when two or more sheets pass between the cylinders. Thus, the machine operator can remove the second sheet, following which machine operation can again commence upon manual actuation of the machine.

The present invention is suitable for use on offset printing machines of the type manufactured by A. B. Dick Company, 5700 West Touhy Avenue, Chicago, Ill., especially on Models 369, 380, 382 and 385 of the machines of such company. In each of these machines, the rotatable impression and blanket cylinders are mounted in the space between two sidewalls and the paper feed mechanism of each machine utilizes a number of suction tubes which lift the top sheet of a stack of sheets and directs the top sheet toward and between the rotating impression and blanket cylinders.

By the use of the present invention, such a printing machine is vastly improved inasmuch as it is impossible for two or more sheets to pass through the machine without being detected. Thus, the problem of blank sheets occurring in a finished work product is clearly avoided since the machine is immediately shut down even after a single occurrence of two or more sheets passing through the machine simultaneously. Moreover, the machine can remain shut down until it is manually actuated once again by the machine operator.

The primary object of this invention is to provide an improved sheet sensor for a printer of the type utilizing a shiftable first cylinder adjacent to a stationary second cylinder wherein the sensor is adapted to sense the presence of an excessive number of sheets passing between the cylinders so that the machine can be deactuated to remove the excessive number of sheets prior to continuing operation of the machine.

Another object of this invention is to provide an improved offset printing machine having a sensor for detecting two or more sheets passing between the impression and blanket cylinders thereof so that the presence of two or more sheets between the cylinders will be detected to cause the machine to cease operation to thereby assure that the stack of sheets, after having passed through the machine, will not have blank faces to thereby increase the quality of the work product of the machine.

Other objects of this invention will become apparent as the following specification progresses, reference being had to the accompanying drawings for several embodiments of the invention.

In the drawings:

FIG. **1** is a fragmentary, side elevational view of an offset printing machine with one form of the sheet sensor of this invention mounted thereon;

FIG. **2** is a fragmentary, vertical cross section of the machine showing the sensor in front end elevation;

FIG. **3** is a horizontal cross section of the machine with the sensor shown in top plan;

FIG. **4** is a fragmentary, perspective view of the machine showing the sensor on the inner surface of one sidewall thereof;

FIG. **5** is a fragmentary, side elevational view of the machine, showing the sensor coupled with the adjacent support arm;

FIG. **5***a* is a schematic view of the sensor coupled to the paper feed drive of the machine;

FIG. **6** is a side elevational view of a second form of the sensor of the invention;

FIG. **7** is an end elevational view of the sensor of FIG. **6**;

FIG. **8** is a top plan view of the sensor of FIGS. **6** and **7**; and

FIG. **9** is a fragmentary, enlarged, side elevational view of the machine showing the sensor of FIGS. **6–8** thereto in an operative position with respect to the adjacent support arm.

One form of the sensor of the present invention is shown in FIGS. **1, 2** and **3** and is denoted by the numeral **10.** It includes a pair of micro-switches **12** mounted at the outer end of a short arm **14** which is pivotally mounted by a pin **16** on the upper end of a mounting plate **18.** A stretched coil spring **20** biases

arm 14 in a clockwise sense when viewing FIG. 1, spring 20 being coupled at one end to arm 14 and at the opposite end to a boss 28 rigid to one face 30 of plate 18. A screw 22 threaded into boss 28 has an upper end 24 in engagement with a groove 26 formed in the lower face 27 of arm 14. Thus, upper end 24 serves as a stop to limit the downward movement of arm 14 under the influence of spring 20. Screw 22 has a head 31 to facilitate manual rotation thereof.

Sensor 10 is adapted to be secured to the inner surface 41 of a first sidewall 42 on offset printing machine 44 (FIG. 4). Machine 44 can be of the type known an Model 369 of A. B. Dick Company, Chicago, Ill. To adapt sensor 10 to machine 44, one side edge 32 of plate 18 is dished out to present a recess 34 for clearing a first shaft of the machine. Also, the lower edge 36 of plate 18 has an end recess 38 which clears a second shaft of the machine. Otherwise, the size and location of plate 18 are such that the plate can be easily attached to sidewall 42 without interfering with the operation of the machine. Spaced holes 40 are provided through plate 18 for receiving mounting screws attachable to sidewall 42.

Sidewall 42 has an opening 46 (FIGS. 1 and 2) therethrough for receiving switches 12 (FIGS. 2 and 3), so that the actuating button 48 of each switch 12 is exteriorly of sidewall 42. A spring arm 49 overlies both buttons 48 (FIG. 3) so that they can simultaneously be forced downwardly to actuate the switches. A projection 51 (FIG. 3) connects the switches to the adjacent end of arm 14, the switches having electrical terminals 53.

Buttons 48 are aligned with the lower, generally flat face (FIG. 5) of one end of an arm 52 which is pivotally mounted intermediate its ends by a pin 54 on the outer surface 55 of sidewall 42. Arm 52 is provided to rotatably support one end of an impression cylinder 56 forming a part of machine 44 and spanning the distance between sidewall 42 and a second sidewall 74 (FIGS. 4 and 9). Cylinder 56 is coupled at its axis to a location 58 on arm 52 in proximity to and spaced from pivot pin 54 so that, as impression cylinder 56 moves downwardly, both the cylinder and arm 52 pivot about pin 54 relative to sidewall 42, the latter having a slot for receiving and clearing the connecting member between cylinder 56 and arm 52 while allowing limited downward movement of cylinder 56.

Cylinder 56 is biased by a coil spring 64 upwardly and toward a blanket cylinder 86 (FIGS.4, 5 and 9) also spanning the distance between and rotatably mounted on sidewalls 42 and 74. Blanket cylinder 86 cannot shift relative to the sidewalls; it can only rotate relative thereto. Spring 64 is normally under compression and surrounds a screw 60 shiftably mounted on and extending through a boss 62 secured to the outer face 55 of sidewall 42. Screw 60 is also rigidly secured to arm 52. An adjustment screw 63 can be used to adjust the compression of spring 64. Also, a second coil spring 66 secured to the end of arm 52 opposite to the end having lower face 50 (FIG. 5) biases arm 52 and thereby impression cylinder 56 downwardly relative to blanket cylinder 86, spring 64 exerting a greater force on arm 52 than does spring 66.

Impression cylinder 56 is supported at its opposite end by a second support arm 70 (FIG. 9) identical in construction to arm 52 but being a mirror image thereof. Arm 70 is pivotally mounted by a pin 72 on sidewall 74 and is coupled at location 75 to the axis of cylinder 56, whereby the latter can rotate and translate relative to sidewalls 42 and 74, the latter sidewall having a slot to allow for translation of cylinder 56. Arm 70 is biased in a counterclockwise sense when viewing FIG. 9 by a coil spring 76 under compression and surrounding a screw 78 passing through a boss 80 secured to sidewall 74. Screw 78 is rigid to support arm 70 in spaced relationship to pivot pin 72. An adjustment screw 79 is used to vary the compression force of spring 76.

A second coil spring 82 is secured at its ends to sidewall 74 and to the opposite end 84 of support arm 70 to bias arm 70 in a clockwise sense when viewing FIG. 9. Thus, both pivot arms 52 and 70 will pivot downwardly about respective pins 54 and 72 as a sheet of paper passes between impression cylinder 56 and blanket cylinder 86.

Machine 44 also includes a paper feed mechanism 88 (FIG. 5) which includes a number of shiftable suction tubes 90 operable for feeding the uppermost sheet 92 of a sheet stack 94 toward and between cylinders 56 and 86. Tubes 90 are shifted by a suitable drive 96 which, for purposes of illustration, can include a motor. The tubes lift the upper sheet 92 and then pivot to move the sheet toward cylinders 56 and 86. Then the tubes return to their starting position to repeat the foregoing steps for the second sheet and so on.

One of the switches 12 is normally closed and is coupled to drive 96 to deactuate the same when cylinder 56 moves a predetermined distance away from roller 86, such as when two or more sheets 92 are fed simultaneously between cylinders 56 and 86. Circuitry suitable for this purpose is shown in FIG. 5a wherein a first circuit has a switch 12 in series with a power source 97 and with the coil of a relay 99 whose switch 101 is in a second circuit containing a power source 103 and drive 96. When switch 101 is opened, i.e., when switch 12 of the first circuit is opened, power to drive 96 is cut-off and remains off until switch 101 is manually closed by the machine operator. The other switch 12 can be coupled to another operating component of machine 44 to stop the operation of the component when arm 52 shifts through a predetermined distance, such as the distance traveled because of two or more sheets 92 passing simultaneously between cylinders 56 and 86.

In operation, sensor 10 is coupled to the inner surface of sidewall 42 and the position of arm 14 is initially adjusted by the manipulation of screw 22 so that switches 12 will not be actuated until arm 52 travels a predetermined linear distance, such as 8 mils or the like. Assuming that the thickness of a paper sheet 92 is 5 mils, two such sheets passing between cylinders 56 and 86 will cause the outer end of support arm 52 to deflect through a linear distance of approximately 10 mils. Thus, if switches 12 are actuated when arm 52 has linear travel of 8 mils. one of the switches 12 will sense the presence of two sheets and will open the first circuit shown in FIG. 5a, thereby opening the second circuit and deactuating drive 96 so as to prevent further actuation of sheet feed mechanism 88. Then, the second sheet can be removed from the stack of sheets already printed, following which the operation of machine 44 can commence once again by manual actuation of switch 101. The second switch 12 can be used to deactuate other parts of the machine or can be used to oper-

ate a buzzer or a bell to signal when two or more sheets have been directed between the impression and blanket cylinders.

A second embodiment of the sensor of this invention is denoted by the numeral **110** and is adapted for use with support arm **70** as shown in FIG. **9**. Sensor **110** includes a mounting plate **112** (FIG. **6**) which has a screw hole **114** for securing it to the outer surface **115** of sidewall **74**. An arm **116** is pivotally mounted by a pin **118** on the upper end of plate **112** and extends rearwardly therefrom. A switch **120** having an actuating button **122** is secured to the rear end of arm **116**.

A leg **124** is rigid to and extends downwardly from arm **116** as shown in FIGS. **6** and **9**. A coil spring **126** urges leg **124** toward a boss **128** rigid to the front side edge of plate **112**. Also, boss **128** threadably receives a screw **130** having a rear end **132** which serves as a stop to bear normally against a resilient leaf spring **134** carried by leg **124**. Spring **134** is free to yield or bow as leg **124** moves relative to and toward boss **128**. A flexible cable **136** is rigid to and extends forwardly from screw **130**, cable **136** having an outer, cylindrical sleeve **138** which is secured by a bracket **140** to sidewall **74**. The outer end of sleeve **138** has a head **142** to facilitate rotation of screw **130**.

In use, sensor **110** is secured to the outer surface of sidewall **74** (FIG. **9**). In this position, switch **120** will be actuated when support arm **70** pivots downwardly a predetermined distance about the axis of pivot pin **72**, such as when two or more sheets of paper are fed through the space between cylinders **56** and **86**. The position of switch **120** will initially have been adjusted as mentioned above with respect to switches **12** so as to sense two sheets. Moreover, leaf spring **134** provides a safety feature to prevent damage to switch **120** in the event that three or more sheets of paper simultaneously move between cylinders **56** and **86**. In effect, if button **122** of switch **120** "bottoms out", spring **134** will yield and be caused to bow because of its resilience, thereby allowing arm **116** and switch **120** to pivot downwardly through a greater distance to accommodate the third and fourth sheets. In this way, the switch will not be damaged.

The switch is coupled to the drive of the sheet feed mechanism to cause the latter to be shut down as mentioned above with respect to the operation of sensor **10**. The machine operator can then remove the second sheet, the one which is unprinted, so as to avoid the problem of unprinted sheets.

I claim:

1. A sensor for determining the simultaneous passage of a number of sheets moving between two cylinders of an offset printing machine of the type having a pair of support arms pivotally mounted on respective sidewalls of the machine for rockably supporting one of the cylinders between the sidewalls, the improvement comprising: a support plate having means for removably mounting the same on one of said sidewalls adjacent to the outer end of the corresponding support arm remote from its axis of rocking movement; an L-shaped device pivotally mounted on said plate and having a leg provided with a pair of spaced projections and a leaf spring secured to and spanning the distance between the projections; a stop; means adjustably mounting the stop on said plate; means biasing the leg toward the stop with the stop normally engaging the leaf spring intermediate the ends of the latter; a switch; and means mounting the switch on the device at a location spaced from the pivotal axis thereof, said switch adapted to be engaged by said outer end of the corresponding arm and actuated in response to the pivotal movement of the same through a predetermined distance when said support plate is mounted on said one sidewall and when said one cylinder rocks relative to and away from said other cylinder, said switch adapted to be coupled to an operative component of the machine to cause the latter to be deactuated when said corresponding arm travels through said predetermined distance.

2. In an offset printer: a pair of spaced sidewalls; a blanket cylinder mounted on the sidewalls and extending therebetween for rotation about a fixed axis relative thereto; a pair of arms, each arm being pivotally mounted intermediate its ends on a respective sidewall; an impression cylinder below the blanket cylinder, the ends of said impression cylinder being rotatably secured to respective arms in spaced relationship to the axis of pivotal movement thereof so that the impression cylinder can pivot downwardly and away from the blanket cylinder when one or more sheets to be printed pass therebetween; a plate; an L-shaped device pivotally mounted on said plate, said device having a leg provided with a pair of spaced projections and a leaf spring secured to and spanning the distance between the projections; a stop; means adjustably mounting the stop on said plate; means biasing the leg toward the stop with the latter engaging the leaf spring intermediate the ends thereof; a switch carried by said device, said plate having means for removably mounting the same on one of the sidewalls with said switch disposed adjacent to the corresponding arm, said switch being actuated in response to the movement of the arm through a predetermined distance as the impression cylinder pivots away from the blanket cylinder; and an operative component of the machine for sustaining the operation thereof, said component having an electrically actuated drive, said switch being coupled to the drive to deactuate the same in response to the movement of said arm through, said predetermined distance.

* * * * *