

July 13, 1965

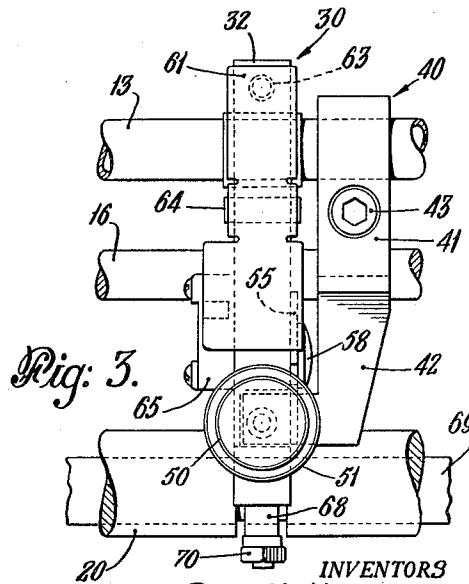
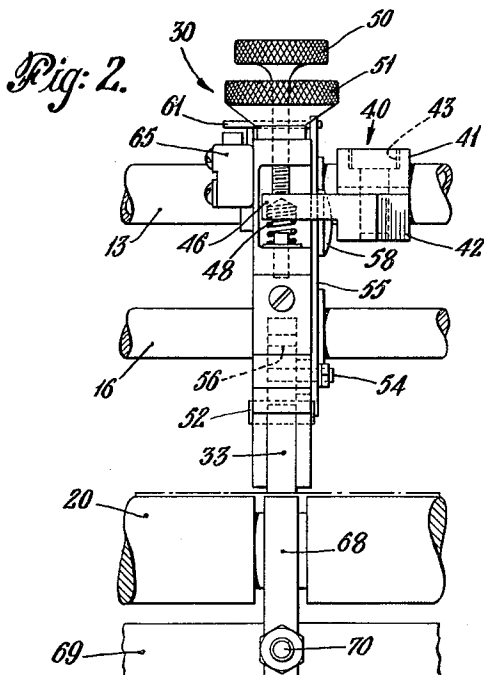
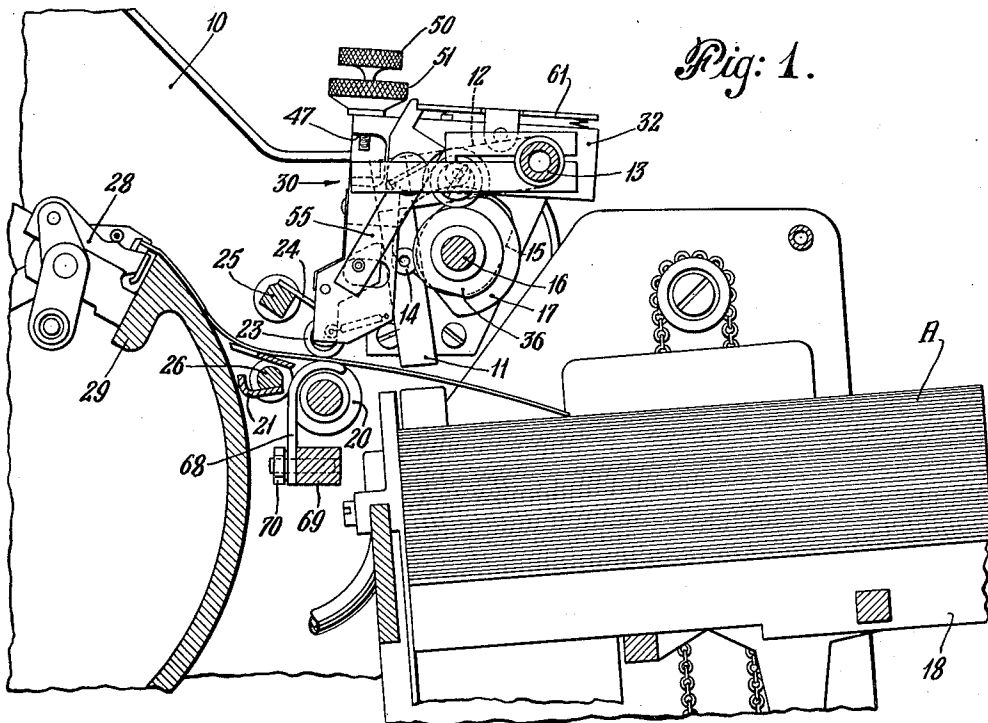
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3,194,554

DOUBLE SHEET DETECTOR FOR PRINTING PRESS

Filed Aug. 22, 1962

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

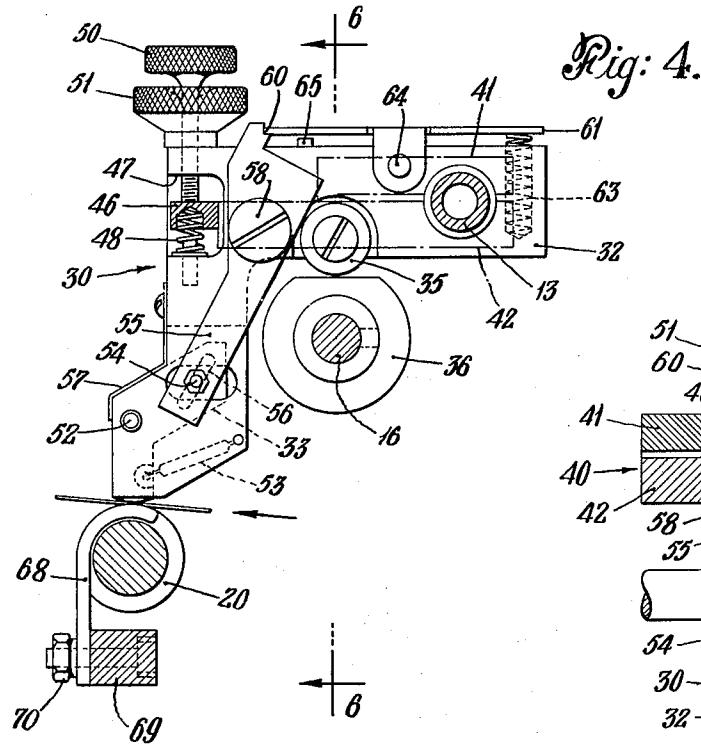


Fig. 4.

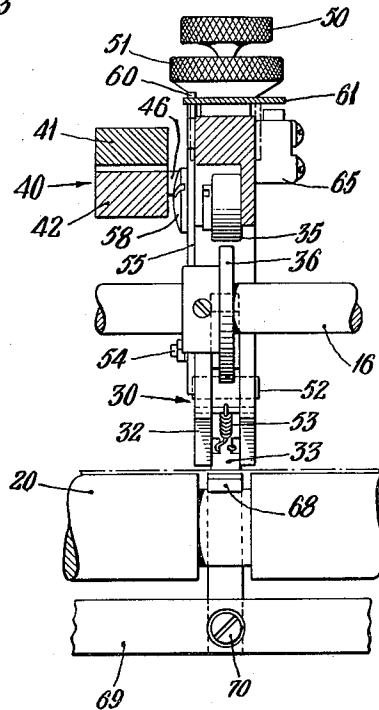


Fig. 6.

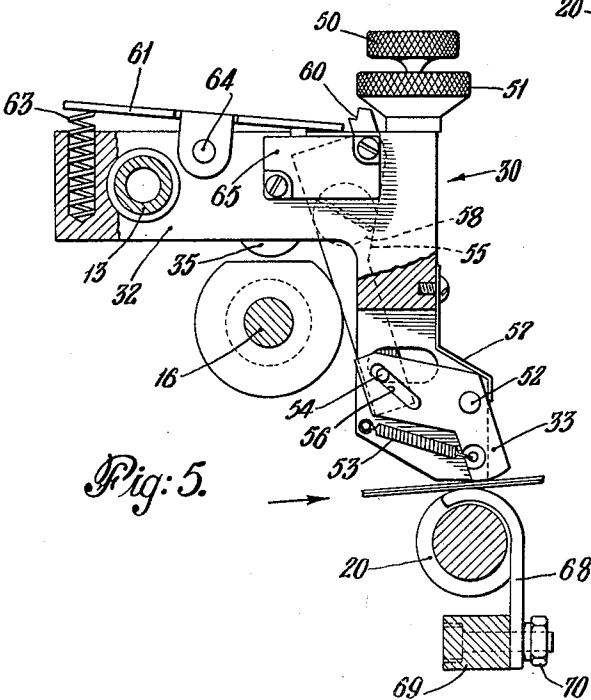


Fig. 5.

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DOUBLE SHEET DETECTOR FOR PRINTING PRESS

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4 Claims. (Cl. 271-57)

The present invention relates to an improved double sheet detector for use in sheet fed printing press.

As is generally well known, the feeding of double sheets to a printing press is undesirable for two reasons. First, the cylinders of a printing couple generally are spaced apart a distance such that when a single sheet is fed therebetween, an optimal printing pressure is exerted to transfer the inked image to the sheet. Hence, if double sheets are fed to the printing couple, the printing pressure is increased with the result that a blurred ink image, rather than a sharp, clear image, is transferred to the sheet. Secondly, when double sheets are fed, only one of the sheets receives an ink image and the pile of printed sheets contains blank sheets. This, of course, is undesirable, particularly if the printed sheets are to be automatically handled. For example, if the sheets are machine inserted in envelopes for mailing, certain of the envelopes would contain blank sheets.

In view of the foregoing, double sheet detectors have long been provided on printing presses. Such devices operate when a double sheet is detected either to shut the printing press off or, in the usual case, to divert the double sheet to a discard pile.

Even though double sheet detectors have been used widely in the past, certain type printing presses present unique problems that render double sheet detectors heretofore used unreliable. For example, in office type printing presses, such as disclosed in U.S. Patent No. 2,759,416, a sheet is fed directly from the sheet pile to the printing press without the use of a conveyor board. More specifically, sheets are individually fed by a suction type sheet feeder over a continuously rotating lower feed roller into abutting relationship with a series of stop fingers which control the feed of the sheet to the printing couple at the proper time in the machine cycle. When the sheet gripper (generally carried by the printing cylinder) approaches the waiting sheet, an upper feed roller descends to grasp the sheet of paper between itself and the lower feed roll and the stop fingers pivot out of the path of the sheet so that the sheet is fed to the gripper in perfect synchronism. It is obvious that there is little room between the feeder and the press in which to provide a double sheet detector, particularly if it is appreciated that double sheet detection should take place when a sheet is held flat. Otherwise, a sheet having an upwardly curled leading edge would actuate a sensitive double sheet detector.

It is therefore an object of the present invention to provide an improved double sheet detector especially adapted for use on a printing press wherein sheets are fed directly from the pile of sheet stock to the printing couple.

In carrying out the present invention there is provided a double sheet detector that is positioned to detect double sheets when they are grasped between the feed rollers. Moreover, the detector is normally held out of detecting position until the upper feed roller is lowered to feed a sheet into the printing couple, after which the detector is moved into position to detect for a double sheet.

Features and advantages of this invention may be gained from the foregoing and from the description of a preferred embodiment thereof which follows.

In the drawings:

FIG. 1 is a partial cross sectional side elevational view

of a short run printing press equipped with the preferred embodiment of the present double sheet detector mechanism;

FIG. 2 is a fragmentary end view of the double sheet detector;

FIG. 3 is a fragmentary top plan view of the double sheet detector;

FIG. 4 is an enlarged side elevational view showing the detector in a double sheet detecting position;

FIG. 5 is a view of the operating position of the detector shortly after the detection of a double sheet; and

FIG. 6 is a sectional elevational view taken along line 6-6 of FIG. 4.

In FIG. 1 of the drawings there is shown an office type printing press 10 embodying the double sheet detector mechanism of the present invention. The apparatus selected has a suction foot 11 pivotally fastened to an arm 12 which in turn is pivotably supported on a shaft 13. Arm 11 is provided with a cam follower 14 that engages a cam 15 keyed to shaft 16. This latter shaft is continuously rotated so that a cam 17 pivots arm 12 downwardly to lower section foot 11 into proximity with the top sheet of pile A mounted upon an elevator mechanism 18. As arm 12 pivots upwardly the suction foot lifts the top sheet from the pile. At this time cam 15 pivots foot 11 forwardly to feed the sheet over a continuously rotating lower feed roller 20 to a series of stop fingers 21 which project upright into the path of the sheet. Follower 14 rotatably mounted on suction foot 11 is the means whereby cam 15 advances the suction foot and the sheet carried thereby to the stop fingers. Roller 20 in the form of an elongated cylinder extending across the width of the machine is continuously driven by any convenient source of power and imparts a driving force to the sheet which insures that it lead edge abuts the stop fingers. Thereafter a plurality of spaced apart upper feed rollers 23 operated by a lever 24 secured to a rotative shaft 25 are pivoted downwardly to press the sheet into engagement with the lower roller. The means for driving shaft 25 and consequently the upper feed rollers is a cam (not shown) secured to the continuously operated shaft 16. At this time stop fingers 21 carried by a rotatably mounted shaft 26, are pivoted counterclockwise by shaft 26 out of their sheet arresting position allowing the cooperating feed rollers to deliver the sheet to a gripper mechanism 28 mounted on a printing cylinder 29. The means for operating shaft 26 is also a cam secured to shaft 16. Close synchronism can be effected between the operation of the stop fingers, upper feed rollers and double sheet detector 30 (to be described) as they are all driven by means of shaft 16. The operation of the feed rollers continues until the sheet is seized by the gripper which pulls the sheet through the printing couple and transfers it to a delivery area. For a more complete explanation the operation and functioning of this type of printing press see the aforementioned patent.

Mounted in association with the feed rollers 20 and 23 is the double sheet detector 30 of the present invention. This double sheet detector is periodically presented to a detecting position in relation to a fixed reference member after the upper feed rollers have pivoted down into engagement with the lower roller, thereby minimizing inadvertent actuation of the detector by single sheets. Suffice it to say at this point that the reference member is defined by the lower feed roller 20. The double sheet detector is provided with a support bracket 32, a detector foot 33 pivotally mounted on the bracket, adapted to shut off the sheet feeder when double sheets are fed. Bracket 32, pivotally mounted on shaft 13 fixed in the machine frame, is equipped with a follower roller 35 that engages a continuous rotating cam 36 which periodically moves the detector foot into and out of its double

sheet position. The cam is keyed to shaft 16, which as previously explained operates the sheet feeder. This allows a close synchronism between the movement of the detector into double sheet detecting position and the actuation of the upper feed rollers and the stop fingers. The contour of cam 36 comprises two sections, namely, an arcuate idle section and a straight line section. When roller 35 rides on the idle section the detector foot is withdrawn from its double sheet detecting position. However, when roller 35 engages the straight line section, detector foot 33 is presented to its detecting position. A minimum clearance position between detector foot 33 and feed roller 20 is reached when roller 36 engages the straight line section. Therefore, means are provided for adjusting the detecting position of foot 33 from this minimum position. An assembly 40 having arms 41 and 42 is locked to shaft 13 by a bolt 43 threaded downwardly through both arms. Arm 42, embodied in the form of a cantilever, is provided at its remote end with a finger 46 which projects into a groove 47 cut in bracket 30. Bracket 30 is resiliently urged downwardly by the action of a spring 48, which is disposed in groove 47 and reacts against bracket 30 and finger 46. A screw 50 provided with a thumb nut 51 on its remote end is threaded downwardly through bracket 30 into groove 47. If screw 50 engages finger 46 before roller 35 is pivoted into contact with the straight line position of cam 36, the support bracket will be prevented from further downward movement and consequently foot 33 will be in a detecting position. Therefore, by adjusting the position of screw 50 in relation to finger 46 the detecting position of foot 33 can be varied. Lock nut 51 secures the adjusted position of screw 50 by tightening it against the top of bracket 30. It might be well to note that the above mentioned adjustment means has an inherent safety feature in that if the aggregate thickness of a double sheet is greater than the set clearance, jamming is prevented, as translating sheets can lift the detector foot upwardly against the urging of spring 48.

The detector foot 33 is in the general form of a bell crank and is pivoted at 52 intermediate its ends on bracket 30. It is urged to a detecting position abutting stop plate 57 by the resilient action of a light tension spring 53, secured to the foot and the bracket. A pin 54 provided on a latch member 55, projects into an elongated slot 56 formed at the remote end of foot 33. The latch member 55 is pivoted on screw 58 which is threaded into bracket 30 and is normally urged clockwise (FIG. 1) by the detector foot. The remote end of member 55 is provided with a detent 60 which is adapted to latch a switch actuating lever 61 which is biased by compression spring 63 to pivot counter-clockwise about support pin 64. If the latch member 55 is pivoted counter-clockwise to a non-latch position, lever 61 under the urging of spring 63 actuates a switch 65, mounted on the side of support bracket 30, before its rotation is arrested by engagement with the top of bracket 30. The above operation occurs when double sheets (see FIG. 5) actuate detector foot 33 and cause it to pivot member 55 to a non-latch position. Switch 65, when actuated, completes a circuit which shuts off the suction feeder. This can be done, for example, by energizing a solenoid operated valve located in the air supply of the sheet feeder. Of course, under this arrangement the double sheet will be carried through the printing cycle. The suction feeder is returned to operation by manually rotating lever 61 clockwise until it is latched by member 55 thereby de-energizing the shut-off circuit and returning the detector foot to a detecting position. A signal device, such as a lamp or a buzzer, could be actuated to indicate to an operator that double sheets were fed and that the feeder has been rendered inoperative. Instead of shutting off the suction feeder, the operation of the printing press can be interrupted or, in a different type press, the double sheet can be deflected to a discard pile.

The detecting position of detector foot 33 can be adjusted relative to the lower feed roller as pointed out hereinabove, but in such case, the spacing between the detector foot and the feed roller might vary, for example, if the roller is slightly eccentric. This could lead to the actuation of the double sheet detector by a single sheet. To obviate this possibility it is preferred that the detector foot be set with respect to a fixed part of the press and that sheet thicknesses be detected between such fixed member and the detector foot. Thus a hook-shaped member 68 is fastened to a bar 69 fixed in the machine frame by a bolt 70. The hook position of member 68 projects into a groove cut in the lower feed roller and is curved to conform to the periphery of the feed roller.

In operation the top sheet of pile A is lifted and translated forwardly by sheet feeding means to a series of stop fingers 21 which project upright into a sheet arresting position. At the proper time in the machine cycle upper feed rollers 23 descend upon and press the sheet to the lower roller 20 which is continuously rotating. Thereafter the stop fingers pivot out of their sheet arresting position and the sheet is fed toward the approaching gripper 28. It is at this time that detector foot 33 pivots downwardly to its double sheet detecting position. If a single sheet is fed the detector foot is not actuated and the press continues its normal operation. However, if a double sheet is fed the detector foot will be pivoted into contact therewith and the translating sheet will supply a driving force to foot 33 that causes it to pivot member 55 out of latching position. This action permits lever 61 to actuate switch 65 which in turn shuts off the sheet feeding operation. It is to be understood that many changes can be made in the disclosed embodiment without departing from the spirit and scope of the invention and, therefore, the description and drawings are to be interpreted in an illustrative rather than in a limiting sense.

What is claimed is:

1. In a printing press having a continuously rotating lower feed roller and an upper feed roller intermittently movable into operative relationship with the lower feed roller to advance a sheet to the gripper mechanism of the press and wherein sheets are fed directly from the stack of sheets in a sheet feeder to the press, the combination with said feed rollers of a double sheet detector comprising a fixed member aligned with the surface of said lower feed roller, a detector foot axially aligned with said upper feed roller when the latter is in its operative sheet advancing position, and means for moving said detector foot into double sheet detecting position with respect to said fixed member after said upper feed roller is moved into sheet advancing position and out of the double sheet detecting position prior to the feed of a subsequent sheet.

2. In a printing press, the combination according to claim 1 including a shaft adapted to be continuously rotated, cam means mounted on said shaft to control the intermittent movement of said upper feed roller, and additional cam means mounted on said shaft for controlling the timed operation of said detector foot into and out of double sheet detecting position.

3. In a printing press, the combination according to claim 2 wherein the double sheet detector includes a pivotally mounted bracket member upon which said detector foot is pivotally mounted, a cam follower rotatably mounted on said bracket member for engaging the additional cam means to move said detector foot into and out of double sheet detecting position, a switch mounted on said bracket member, a switch actuating lever mounted on said bracket member, a spring for urging said lever to a switch actuating position, a latch for holding said lever out of a switch actuating position, means connecting said detector foot to said latch to pivot said latch out of lever holding position when a double

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sheet is detected, and spring means for biasing said detector foot to a double sheet detecting position.

4. In a printing press, the combination according to claim 3 including a fixedly mounted element, an abutment member carried by the bracket member which engages said element to determine the lowermost position of said bracket member when the bracket member is lowered into double sheet detecting position by the additional cam means, and means for adjusting the position of said abutment member with respect to said bracket member whereby the double sheet detecting position of said bracket member can be set in accordance with the thickness of the sheet stock being fed.

6

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