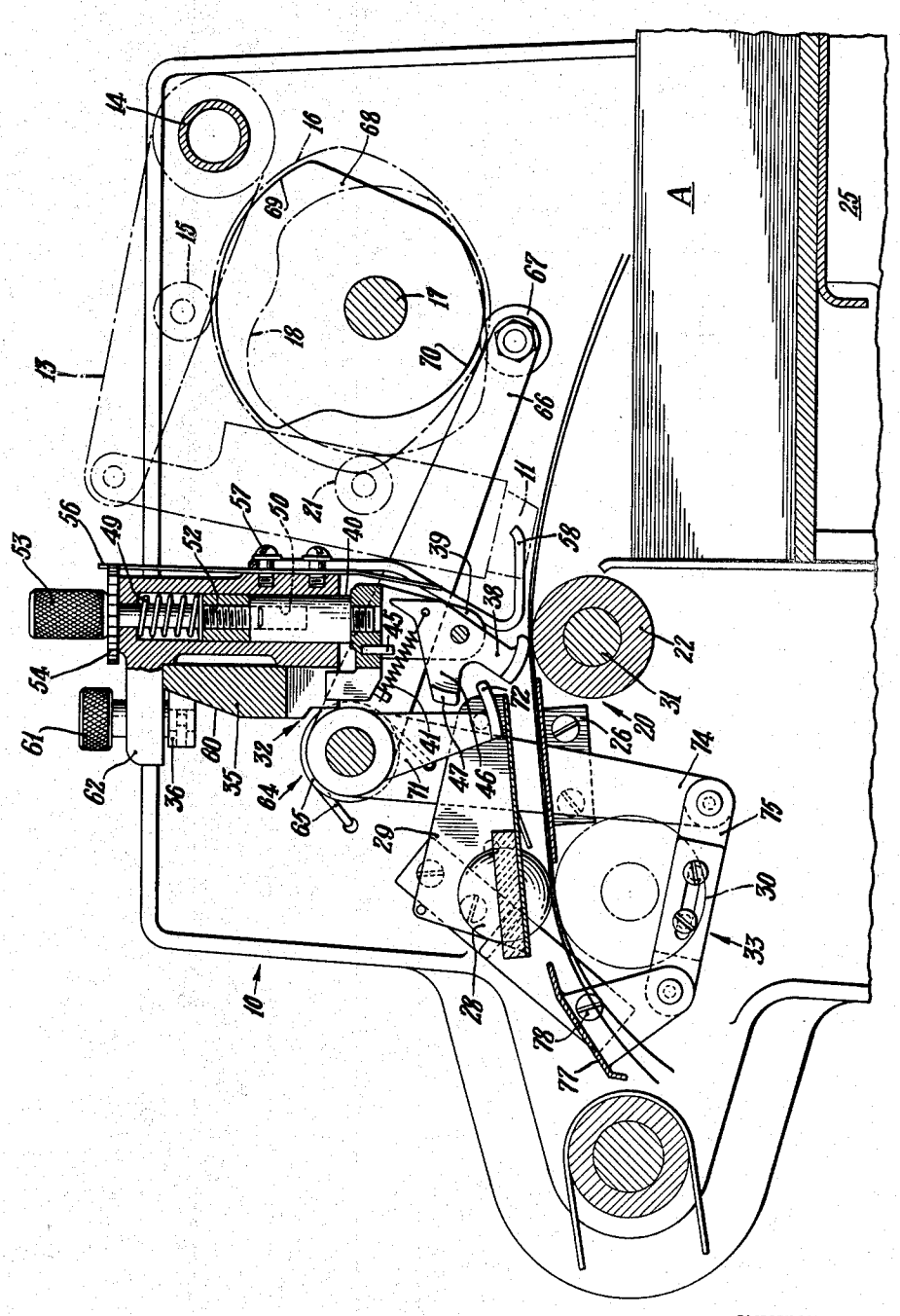
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DOUBLE SHEET DETECTOR FOR PRINTING PRESS

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DOUBLE SHEET DETECTOR FOR PRINTING PRESS

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This invention relates to sheet feeding machines and more particularly it relates to improved means to detect double sheets and divert them from the normal feed path.

The need for a double sheet detector mechanism to prevent the feeding of double sheets is well known in the art. For example, when double sheets are fed to a printing press the inked image will be transferred to only one of the sheets. This transferred image is usually of a poor quality due to the increased pressure exerted upon the printed sheet by the printing cylinders. The pressure exerted by the printing cylinders is set for individual sheets and is a significant factor in obtaining a sharp and clear product. If double sheets are fed this pressure will increase and the transferred image will be blurred. It is thus apparent that many sheets would be improperly printed if provision is not made to prevent doubles from being fed. Moreover, the pile of printed sheets will have blank sheets intermingled therebetween.

In today's sheet feeders the problem of feeding doubles is still immediate in the art, although sheet separating means are in use to try and insure against feeding doubles. The problem is particularly accentuated in automatic high speed suction feeders that are designed for general all purpose operation with different types and sizes of sheet stock. In a usual case when the operating level of the top sheet of a pile is set high, the level being determined by the type and dimensions of sheet stock used, suction feeding means usually embodied in the form of a reciprocating suction foot may intermittently feed doubles.

Heretofore devices were used to detect sheet doubles but they were not positively synchronized with the sheet feeding device. Thus when adapted to be used in higher speed sheet feeders they were too slow in response and allowed doubles to be fed to the printing press.

It is therefore an object of the present invention to provide an improved double sheet detector mechanism adapted especially for use in general purpose high speed sheet feeders.

In the present invention there is provided in a sheet feeding machine an adjustable sheet detector mechanism that allows single sheets to pass freely thereunder, but detects double sheets and actuates a deflector plate mechanism positively synchronized with the feeding device that ejects the double sheets to a sheet holder. More specifically, both the sheet feeder and the detector plate mechanism are driven by a continuously actuated drive shaft that times the sheet feeding cycle. By adapting the deflector plate mechanism to be actuated by this shaft the deflector plate can be pivoted to an ejecting position with a minimum of time delay after the detection of double sheets.

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

In the drawing:

The figure is a side elevation of a feeding machine showing the improved double sheet detector mechanism of the present invention.

Some of the elements in the figure are shown in diagrammatic form as they are of the type commonly used in the art and are only ancillary to the present invention.

In the figure of the drawings there is shown a sheet feeding apparatus **10** embodying the double sheet detector of the present invention. The apparatus selected for illustrative purposes is a suction feeder having a suction foot **11** which is pivotally fastened to an arm **13** which in turn is pivotably supported on shaft **14**. Arm **13** is provided with a cam follower **15** that engages a cam **16** keyed to a shaft **17**. This latter shaft is continuously rotated so that cam **16** pivots arm **13** downwardly to lower suction foot **11** into proximity with the top sheet of a pile A. As arm **13** is pivoted upwardly the suction foot lifts the top sheet from the pile. At this time a cam **18** also mounted on shaft **17** pivots suction foot **11** forwardly to present the sheet to a pullout roller assembly **20**. A follower **21** rotatably mounted on suction foot **11** is the means whereby cam **18** advances the suction foot and the sheet carried thereby to the pullout roller assembly **20**. For clarity, in the drawings only the lower roller **22** has been shown.

The operating height of the pile A can be set so that elevator mechanism **25** driven by a chain drive (not shown) automatically rises to maintain the top sheet of the pile at a predetermined level. This level depends upon the type of stock used and, as for example, when a heavy stock is used this level is set high and the probability of feeding double sheets to the pullout roller assembly is greatly increased. After a sheet is delivered to pullout roller assembly **20** it is translated thereby to a conveyor table **26** which translates the sheet to a printing press (not shown). In the embodiment shown glass marbles **28** are mounted in frame **29** and provide means for pressing the sheets against an intermediate drive roller **30**. The pullout roller assembly comprises a plurality of upper pullout rollers and a lower pullout roller **22**. The latter roller is secured to a driven shaft **31** and is driven thereby at a constant speed. Lower roller **22** which preferably extends across the width of the feeding apparatus is generally made of metal and may have its surface knurled to prevent sheet slippage.

Mounted in association with the lower pullout roller is a detector foot mechanism **32** that, when double sheets are fed, actuates a deflector plate mechanism **33** to deflect the sheet doubles to a holder (not shown). The detector foot mechanism **32** has a recessed body housing disposed to engage cross bar **35** by means of a wedge block **36**. The cross bar is secured in the side walls of the machine. A detector foot **38** is rotatably mounted at the lower end of a clevis assembly **39**. The assembly is threaded into fixed engagement with an end portion of a shaft **40**, which is mounted in the body housing. A spring **41** secured to clevis assembly **39** and detector foot **38** is provided to urge detector foot **38** to a detecting position in contact with a restraining pin **45**, fastened to the top of the clevis assembly. When double sheets are fed, detector foot **38** is rotated clockwise (as shown) against the urging of spring **41**. The detector foot is also provided with an ear **46** that has a lateral projection **47** adapted to be engaged by a lateral projection on the deflector plate mechanism as will be described later. A compression spring **49** mounted in the housing reacts against an end of shaft **40** and urges clevis assembly **39** and detector foot **38** downwardly. Shaft **40** is provided with a threaded hole **50** into which the tip of a spindle **52** is threaded. The remote end of the spindle has a knurled adjustment nut **53** and a graduated indexing wheel **54** secured thereto. The graduated wheel is resiliently urged into engagement with the top of body housing **34** by the downward urging of compression spring **49**. Graduated wheel **54** is positively engaged by an index finger **56**, secured to the body housing by means of machine screws **57**. By turning adjustment nut **53**, spindle **52** causes shaft **40** to translate and thereby changes the clearance of single sheet position of detector foot **38**. This

indexing device allows an operator to set the mechanism for a fine and accurate clearance adjustment of the detector foot in reference to the lower pullout roller 22. Machine screws 57 in addition to securing index finger 56 to the body housing, also secure two tusk shaped guide fingers 58 thereto. These fingers are adapted to help guide sheets with upcurled lead edges into the pullout roller assembly.

Cross bar 35 has a sloping surface 60 which is engaged by wedge block 36 mounted at the end of a thumb screw 61 which can turn in the block. The screw is threaded through an upper arm bracket 62 of the body housing and as it is threaded downwardly it locks the bracket to cross bar 35. When the thumb screw is loosened, the detector foot mechanism can be positioned along the cross bar to accommodate paper stock of different widths.

In practice the detector foot is adjusted by turning thumb nut 53 thereby raising and lowering the detector foot so as to have a clearance space which will permit a single sheet to pass freely but which will be engaged by a double sheet and rotated clockwise. If, however, the aggregate thickness of double sheets is greater than the set clearance, jamming will be prevented inasmuch as the double sheet can raise the detector foot against the compressive force of spring 49. The lower pullout roller 22 is driven at an appropriate speed so as to be able to drive double sheets against the frictional drag of the detector foot.

Deflector plate mechanism 33 is provided with a bell crank member 64 pivotally mounted on the machine frame. Bell crank 64 consists of three arms, as shown, and is resiliently urged in a counter-clockwise direction by means of a coil spring 65. The first arm 66 is provided with a cam follower roller 67 adapted to engage the periphery of a cam 68 and be driven thereby. The periphery of cam 68 comprises two arcuate sections 69 and 70 merged together by two straight line segments. Section 69 is of larger radius than section 70. The cam is keyed to shaft 17 and driven clockwise thereby. Shaft 17 also drives suction foot 11, as above described, and it is for this reason that the operation of the suction foot and the double sheet detector can be positively synchronized. The second arm 71 has a lateral projection 72 formed at its remote end adapted to engage the lateral projection 47 formed on detector foot 38 while the third arm 74 has a connection lever 75 pivotally mounted at its remote end. The lever is rotatably mounted on deflector plate 77 and is capable of having its length varied by means of adjustment screws. The deflector 77 is rotatably mounted on a pin 78 and is rotated to a sheet ejecting position when bell crank member pivots counter-clockwise. When follower roller 67 rides on section 69 of cam 68 there is a slight clearance between the lateral projection on arm 71 and detector foot 38, and when an individual sheet is correctly fed the lateral projections engage and cam follower 67 is prevented from engaging section 70 of cam 68. When double sheets are fed as seen in the figure, detector foot 38 rotates clockwise and cam follower 67 remains in engagement with the periphery of cam 68 causing bell crank member 64 to rotate counter-clockwise and deflector plate 77 to pivot to an ejecting position.

In operation, shaft 17 rotates clockwise causing suction foot 11 to descend upon the top sheet of pile A, lift and feed it to the pullout roller assembly. During this operation, follower roller 67 rides on section 69 of cam 68.

If a double sheet is fed, detector foot 38 is driven clockwise against the urging of spring 41 by the double sheet. Thereafter cam follower 67 rides down from section 69 to section 70 of cam 68. This causes bell crank 64 to pivot counter-clockwise and deflector plate 77 to move to its ejecting position where the double sheets drop by gravity to the sheet holder. Before the next sheet feed cycle, follower roller 67 engages the section 69 of cam 68 and returns the deflector plate to its sheet supporting or normal operating position. Spring 41 then pivotably returns detector foot 38 to its operating position in engagement with pin 45. If then an individual sheet is correctly fed, detector foot 38 remains in its single sheet position and follower roller 67 is prevented from riding on section 70 of cam 68 by the engagement of the lateral projections 72 and 47. The deflector plate therefore remains in its sheet supporting position and the sheet passes unhindered to the conveyor board.

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 a limiting sense.

What is claimed is:

1. In a sheet feeding machine having a drive shaft for timing and controlling the feed of sheets, a double sheet deflector apparatus comprising, a sheet deflector plate, bell crank means for moving said plate between a sheet supporting and a sheet deflecting position, a cam that is continuously rotated to move said bell crank means and said deflector plate to a sheet supporting position, spring means for urging said bell crank means and said deflector plate to a sheet deflecting position, a pivotally mounted detector foot having means for blocking the spring urged movement of said bell crank means and said deflector plate, and a spring for maintaining said detector foot in a blocking position when a single sheet is fed but which permits said foot to be pivoted out of blocking position when a double sheet is fed whereby said spring means moves said bell crank means and said deflector plate to a sheet deflecting position.

2. A double sheet deflector apparatus according to claim 1 wherein said rotatable cam is mounted on the drive shaft which times and controls the feed of sheets whereby movement of the bell crank means and the sheet deflector plate to a sheet deflecting position is timed with the feed of double sheets.

3. A double sheet deflector apparatus according to claim 2 including adjustable mounting means for the detector foot whereby the single sheet position of said detector foot can be varied and set in accordance with the thickness of the sheets being fed.

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