United States Patent [19]

Shinaki

[11] **3,883,134**

[45] **May 13, 1975**

[54] **DETECTING AND REMOVING APPARATUS FOR SKEW FED SHEETS**

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[73] Assignee: **Rank Xerox, Ltd.,** London, England

[22] Filed: **Jan. 18, 1974**

[21] Appl. No.: **435,137**

[52] **U.S. Cl.** **271/261;** 271/64

[51] **Int. Cl.** **B65h 29/58**

[58] **Field of Search** 271/227, 228, 261, 265, 271/172, 64, 189; 209/111.7

[56] **References Cited**

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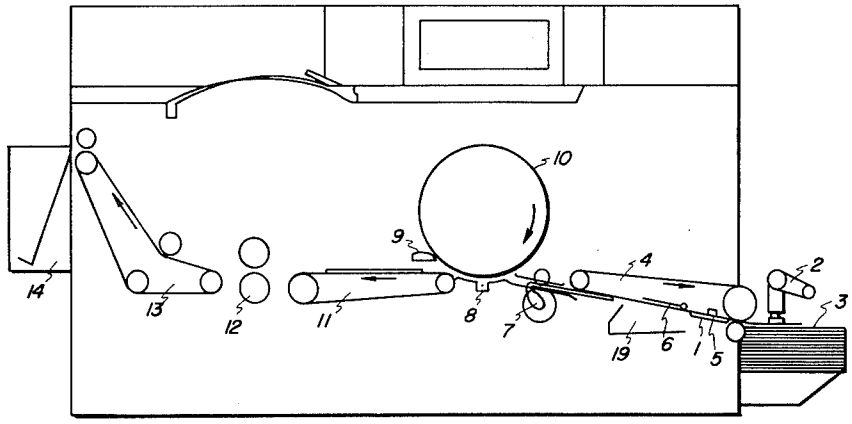
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Primary Examiner—Richard A. Schacher

[57] **ABSTRACT**

In an automatic paper transport system, apparatus is provided for detecting and removing paper sheets which are fed skewed. Sensors and circuitry are provided to detect misaligned sheets and control apparatus to remove the misaligned sheet from the transport mechanism.

1 Claim, 4 Drawing Figures



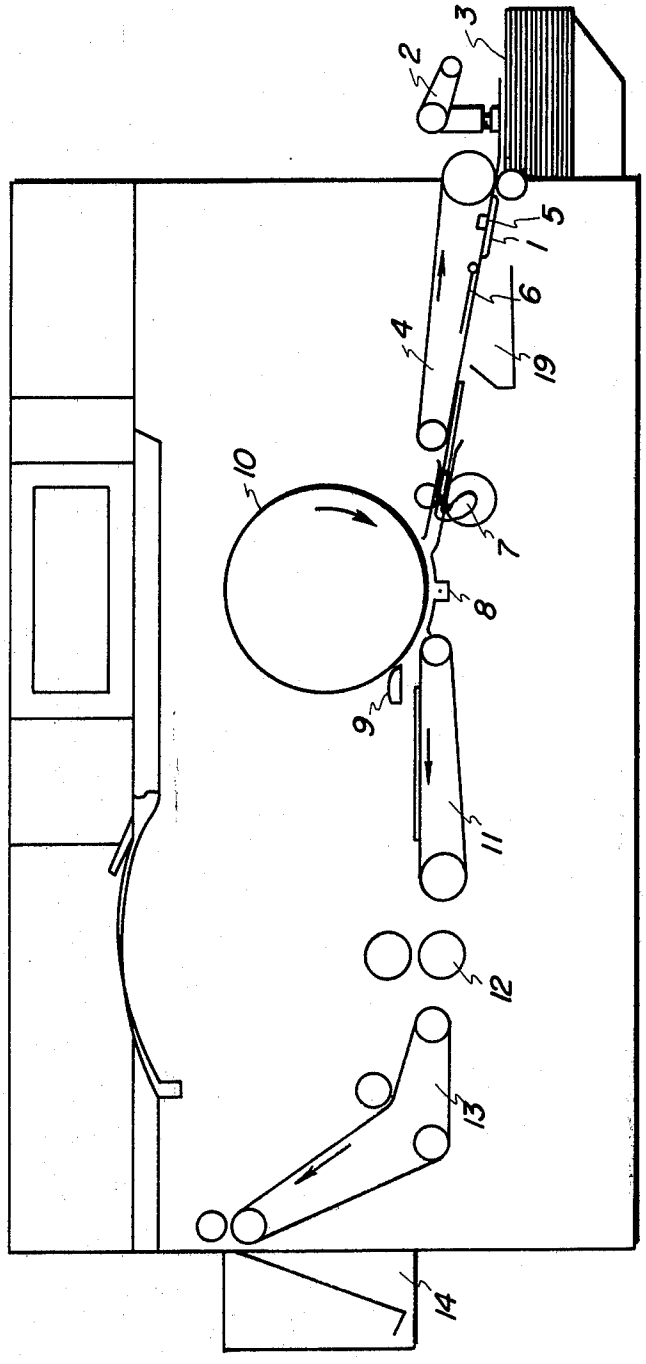


FIG. 1

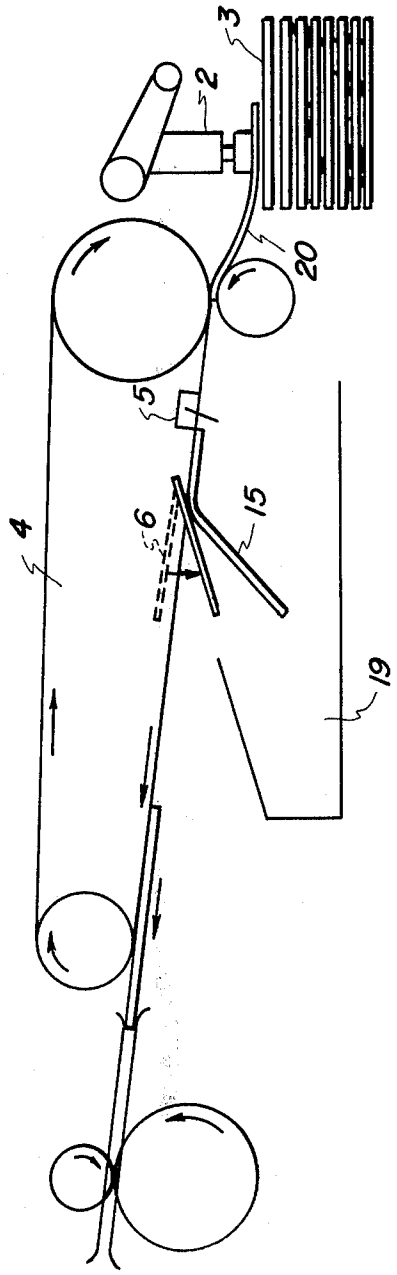


FIG. 2

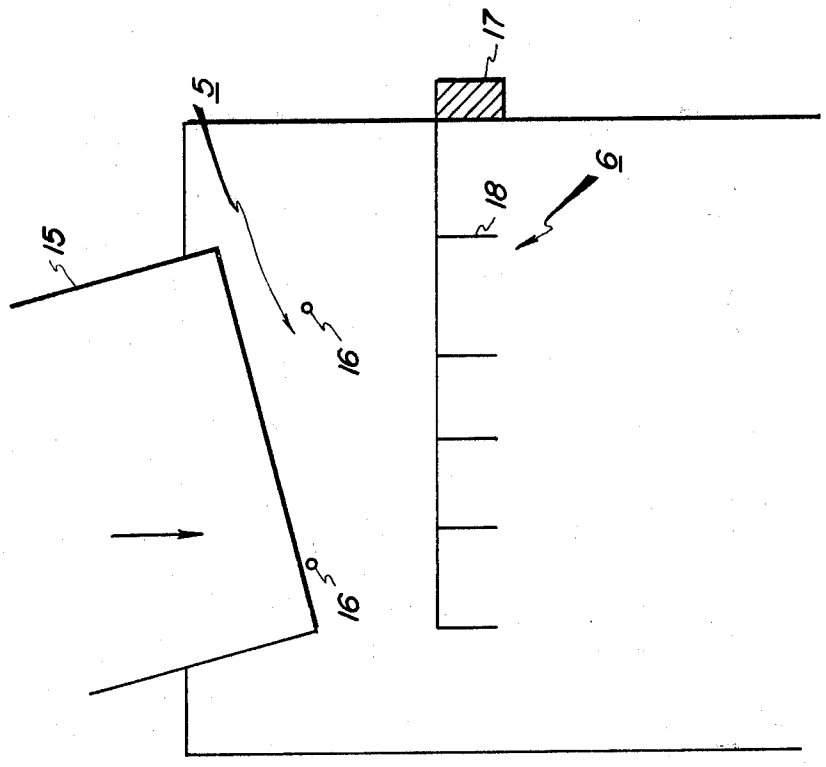


FIG. 3

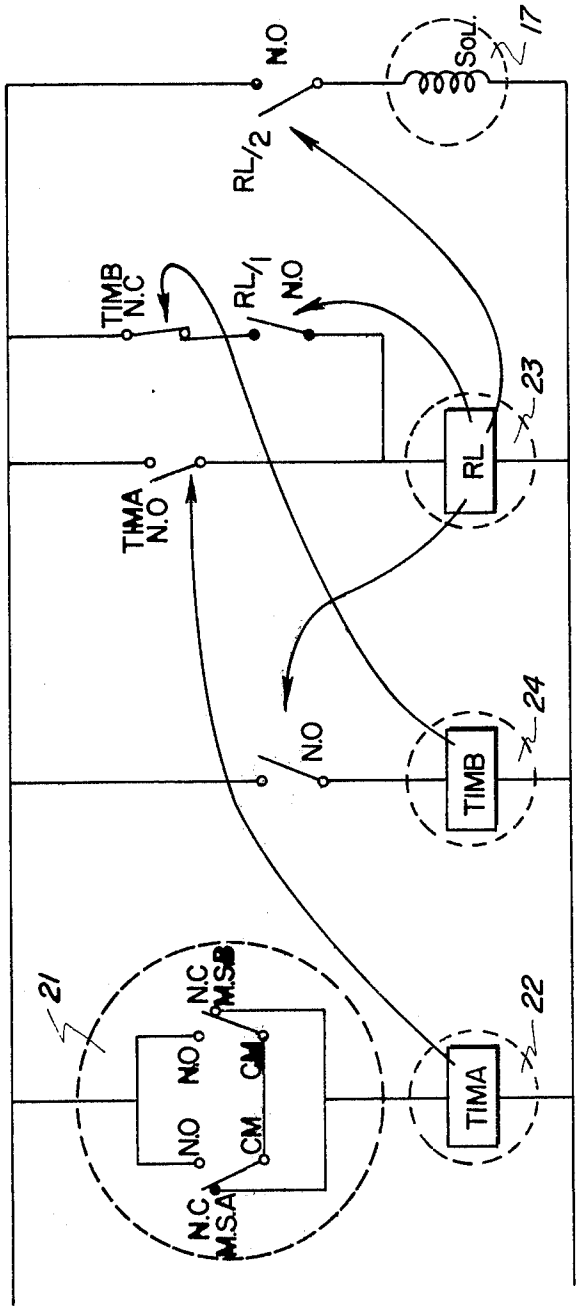

N.O
SOL.
17
RL/2
TIMB
N.C
RL/1
N.O
23
RL
TIMA
N.O
N.O
24
TIMB
21
N.C
M.S.B
N.O
N.O
CM
CM
N.C
M.S.A
22
TIMA

FIG. 4

DETECTING AND REMOVING APPARATUS FOR SKEW FED SHEETS

BACKGROUND OF THE INVENTION

This invention relates to the automatic handling and transporting of paper sheets and, more particularly, to apparatus for detecting misaligned sheets and for removing the misaligned sheets from the transporting mechanism.

In a typical prior art copying machine, the paper handling path typically consists of a paper input tray, a paper feed station, a paper transport area, a register stop, a transfer station, a post-transfer transport portion, and a paper output station. The function of the register stop is to correct minor misalignment of the paper sheet prior to the paper reaching the transfer station. However, a large paper misalignment (hereinafter called skewed feeding) cannot in many instances be corrected by the register stop, and skewed feeding of the paper to the transfer and other stations often causes paper jams, necessitating a shutdown of the machine.

It is therefore an object of this invention to provide apparatus for detecting and removing skewed-fed papers without halting the operation of the machine.

SUMMARY OF THE INVENTION

In accordance with the principles of this invention, apparatus is provide for detecting a paper sheet misalignment above a predetermined threshold of misalignment and controlling apparatus to remove the misaligned paper from the machine without necessitating a shutdown of the machine. Sensors are provided along a line perpendicular to the paper feeding direction. These sensors are connected to circuitry which determines whether the lead edge of the paper passes the sensors within a predetermined amount of alignment. It not, the circuitry activates apparatus for removing the misaligned paper from the paper transport without halting the operation of the machine.

DESCRIPTION OF THE DRAWING

The foregoing will become more readily apparent upon reading the following description in conjunction with the drawing in which

FIG. 1 depicts a schematic diagram of a xerographic reproducing machine including apparatus embodying the principles of this invention,

FIG. 2 depicts an enlarged view of a portion of the machine of FIG. 1,

FIG. 3 depicts a plan view illustrating the operation of apparatus embodying the principles of this invention, and

FIG. 4 depicts a schematic circuit diagram of an electric circuit which may be used with apparatus embodying the principles of this invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIG. 1, depicted therein is a schematic diagram of a typical xerographic reproducing machine. Sheet 1 is picked off paper sheet stack 3 by means of picker 2, which illustratively uses a vacuum principle to remove the topmost sheet from stack 3. Sheet 1 is then fed to the lower side of transport belt 4 which utilizes vacuum to hold sheet 1 to the underside of the belt. Sheet 1 passes through skew detector 5, to be described in greater detail hereinafter, past paper remover 6 and to register stop 7. The sheet then

is fed to transfer station 8, where marking materials are transferred to the sheet from drum 10. The sheet is then removed from drum 10 by mechanism 9 and transferred to conveyor 11 which transports the sheet to fuser 12. Conveyor 13 transports the sheet from fuser 12 to output station 14.

Referring now to FIG. 2, it is assumed that sheet 15 when passing detector 5 has been determined to be out of alignment. Removing means 6 is therefore activated to push sheet 15 off belt 4 and beyond the range of the vacuum mechanism of transport 4 into bin 19. This does not affect the operation of the machine and sheet 20 is subsequently picked from stack 3 to take the place of removed sheet 15.

FIG. 3 illustrates the operation of detector 5 and paper remover 6. It is seen from FIG. 3 that sheet 15 is skewed with respect to the paper feed direction, as shown by the arrow. Detector 5 comprises right and left microswitches 16 which are in a line perpendicular to the paper feed direction. Remover 6 consists of a solenoid 17 connected to a plurality of fingers 18. When it is determined that a sheet such as sheet 15 has been fed skewed, solenoid 17 is energized causing figuers 18 to pivot and protrude downward through transport four, as shown in FIG. 2, so as to force sheet 15 into bin 19. The energization of solenoid 17 is cut off after an appropriate time and fingers 18 return to their initial position above transport 4. Consequently, sheet 20 supplied normally can pass along transport 4 without being thrown into bin 19.

Depicted in FIG. 4 is a simplified schematic diagram of an illustrative electric circuit responsive to signals from detector 5 to control the operation of paper remover 6 for skew fed papers. The circuitry corresponding to detector 5 includes circuit 21 which comprises two microswithces, MSA and MSB, corresponding to microswitches 16. These microswithces are arranged such that a circuit is closed to decision circuit 22 when only one of the two microswitches is closed. This condition occurs when the paper is misaligned. Decision circuit 22 comprises a timer TIMA which is arranged to close a normally open contact so as to supply power to relay 23 only if timer TIMA has had power supplied to it longer than a predetermined period. What this means in terms of the misalignment of the paper is that relay 23 operates only if the skew angle of the paper passing through detector 5 is greater than a predetermined amount. When relay 23 operates, it locks itself up through contact RL/1. Contact RL/2 of relay 23 closes a circuit to energize solenoid 17. The energization of solenoid 17 causes fingers 18 to pivot and push the misaligned paper from the transport into bin 19, as previously described. The operation of relay 23 also causes the closure of contact RL/3 which actuates reset circuit 24 comprised of timer TIMB. Timer TIMB when actuated for longer than a predetermined length of time opens its normally closed contact, removing power from relay 23, which then de-energizes solenoid 17. Timer TIMB is chosen so that enough time lapses during the energization of solenoid 17 so as to remove completely the misaligned sheet from transport 4.

Accordingly, there has been described apparatus for detecting and removing misaligned sheets from a transport mechanism without requiring the halting of the operation of the machine. While this has been shown in the environment of a xerographic reproducing machine, this invention is also applicable to any device

which involves the transporting of sheets. Although the illustrative embodiment was shown to comprise two microswitches, the skew detector is not limited to the use of microswitches and may employ any other devices, for example photoelectric devices that can detect passage of opaque objects, and the number of switches utilized is not considered to be limited by the foregoing description. In addition, the illustrative circuitry for determining the skew threshold was shown as employing a timer, but this invention is not limited to the use of a timer and any modifications thereover are considered to be embraced in the spirit of this invention. The paper removing portion was shown as a solenoid and several fingers but any other modification is also considered to be embraced in the scope of this invention. It therefore is understood that the above-described arrangement is merely illustrative of the application of the principles of this invention. Numerous other arrangements may be devised by those skilled in the art without departing from the spirit and scope of this invention.

what is claimed is:

1. In an automatic sheet handling system including a moving belt for conveying sheets, apparatus for removing skew fed sheets from said belt comprising

a first microswitch and a second microswitch, said microswitches being positioned along a line perpendicular to the direction of movement of said belt such that the leading edge of a sheet traveling along said belt passing each of said microswitches causes the operation of said each of said microswitches, the contacts of said microswitches being connected to pass a signal during the time that only one, but not both, of said microswitches is operated,

first timing means connected to said microswitches and responsive to the time duration of said signal for providing an enabling signal when said time duration is greater than a predetermined amount,

second timing means,

a rotary solenoid,

relay means enabled responsive to said enabling signal for energizing said solenoid, said second timing means, and providing a self locking path for said relay means, and

a plurality of fingers operatively coupled to said solenoid and initially positioned adjacent said belt, said plurality of fingers responsive to the energization of said solenoid for pivoting and separating a passing sheet from said belt,

said second timing means including disabling means opening said self locking path of said relay means after a predetermined interval to disable said relay means, whereby said solenoid is de-energized and said plurality of fingers are returned to their intitial position.

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