PATENTED APR 20 1971

3,575,507

SHEET 1 OF 5

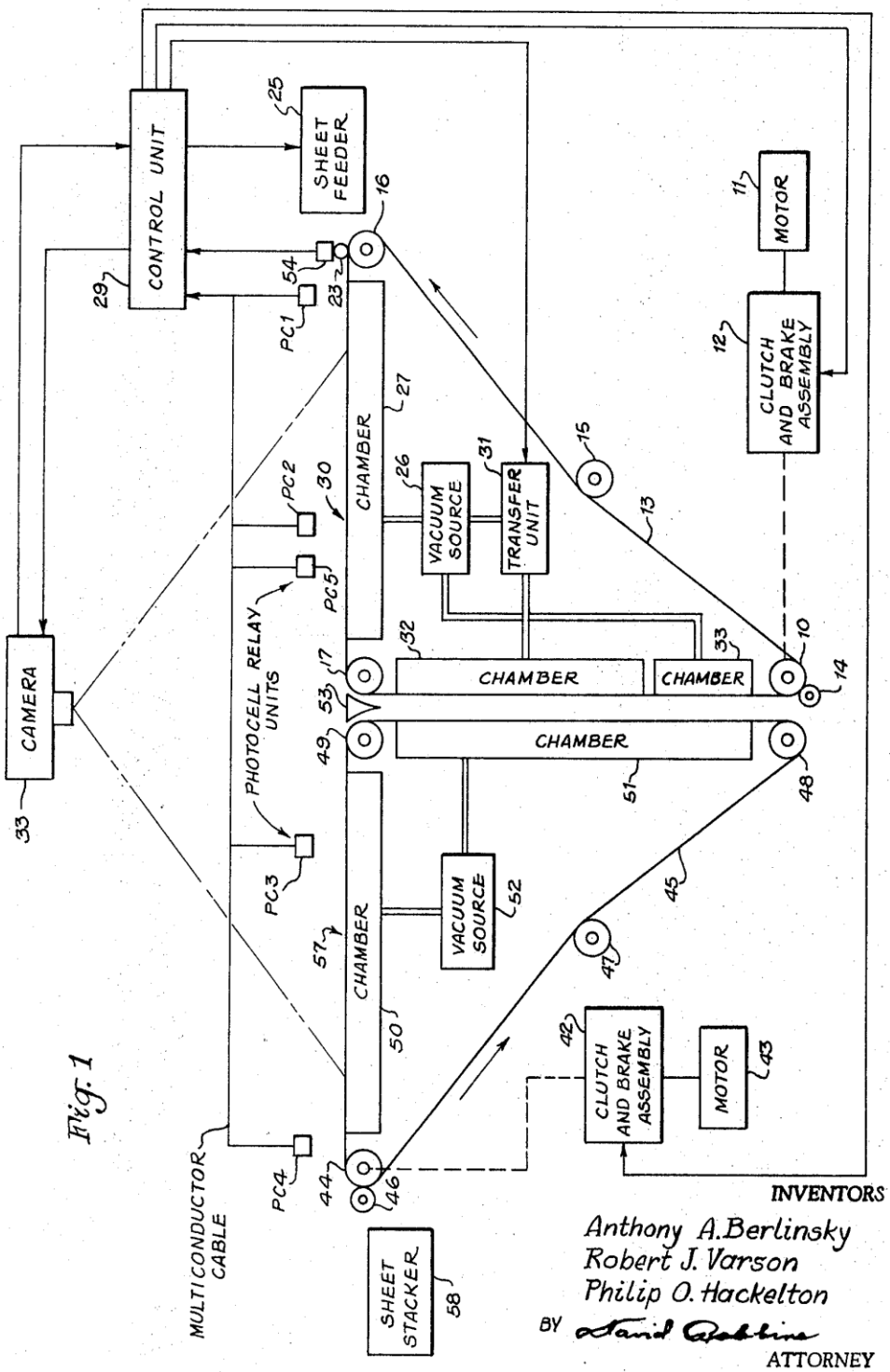

Fig. 1

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AUTOMATIC CAMERA AND LOOSE SHEET TURNER USING VACUUM CONVEYOR BELTS

BACKGROUND OF THE INVENTION

In the prior art, when more than one loose sheet had to be photographed on both sides, each sheet was positioned by hand for location and squareness and then photographed. The sheet was then turned and positioned, again by hand, and the other side was photographed. If the sheet was wavy or folded, it had to be held flat by a piece of glass or vacuum before it was photographed. If the sheet was wrinkled, it had to be smoothed by hand before it was held flat by the glass or vacuum.

When the principles of the present invention are employed, the sheet is automatically smoothed, positioned, and photographed. It is then automatically turned and transferred to another area where the other side is photographed.

SUMMARY OF THE INVENTION

When the present invention is used to photograph a plurality of loose sheets, each sheet is fed in sequence to a moving conveyor belt and automatically positioned in a first area where it is photographed. The sheet is then automatically turned and fed to another conveyor belt which carries it to a second area where the other side is photographed.

In one embodiment, a sheet is fed from a feeder to a first vacuum belt which carries the sheet to a first photograph area where it comes to rest. Side A of the sheet is then photographed. The first sheet is then carried on the first belt to a transfer area where a second vacuum belt is positioned adjacent to the first and is driven in a direction opposite to that of the first. A vacuum source is normally applied to the portion of the first belt in the transfer area and is removed shortly after the first sheet arrives in the area. Thus, the first sheet is transferred, with side B up, from the first to the second belt and is then carried to another photograph area where it comes to rest. At the same time a second sheet is carried from the feeder to the first area. Side B of the first sheet and side A of the second sheet are then photographed simultaneously. The first sheet is then moved to a stacker, while the second sheet is moved to the second area and a third sheet is moved to the first area.

The feeder is inactivated when an item fed to the first belt is thicker than a single sheet, e.g., when a double sheet is fed, or the sheet contains a paper clip or similar object. Simultaneously, a camera cycle is inhibited and the first belt is stopped so that the item comes to rest in the first area but is not photographed.

If a sheet is not moved entirely off the second belt to the stacker, circuits are completed to inhibit the operation of the camera which prevents a bad frame from being taken.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a block diagram of an embodiment of the invention;

FIGS. 2, 3, and 4 comprise a circuit diagram of the control circuits used in FIG. 1;

FIG. 5 is a block diagram illustrating the assembly of FIGS. 2 to 4;

FIG. 6 is a side view of the transfer unit used in FIG. 1;

FIG. 7 is a top view of the transfer unit in FIG. 1; and

FIG. 8 illustrates the slide and metal plate employed in the transfer unit in FIG. 6.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Block Diagram

Automatic Operation. With reference to FIG. 1, when the sheet turner is in operation, roller 10 is driven by motor 11 through clutch and brake assembly 12. The roller in turn drives perforated conveyor belt 13 in the direction shown in the FIG. Roller 14 functions as a pressure roller, 15 as an idler roller, and 16 and 17 as follower rollers.

Feeder 25 feeds a first sheet between roller 23 and moving belt 13. The sheet is held against the belt by vacuum applied by source 26 through chamber 27, which has a pattern of perforations in its side adjacent to perforated belt 13. The speed of the feeder is slower than that of the belt so that the belt tries to stretch the sheet which is smoothed if it contains waves, wrinkles or folds. The hopper of feeder 25 is aligned with belt 13 to provide vertical and horizontal alignment of the sheet on the belt. Hence the sheet is positioned for location and squareness in the first photograph area 30 when the belt comes to rest as described immediately below.

As the first sheet is carried on belt 13, it is sensed by the photocells in units PC1 and PC2. The output of the photocells energize relays whose contacts open circuits in control unit 29 to release the clutch and activate the brake in assembly 12. Belt 13 then stops and the first sheet is positioned in area 30. The relay in PC1 also operates control circuits in 29 which inactivate feeder 25 and initiate a cycle of operation of camera 33. Side A of the sheet is then photographed. During the camera cycle, contacts are closed to activate a circuit in unit 29 to restart the movement of belt 13. Simultaneously, circuits are completed in 29 which cause feeder 25 to supply a second sheet to belt 13.

When the first sheet is in area 30, it is sensed by the photocell in unit PC5 which energizes the relay in the unit 29. As the relay is energized, its contacts complete a control circuit in unit 29 to operate transfer unit 31. The output of vacuum source 26 is then applied through 31 to chamber 32. It is noted that the output of the source is applied continually to chamber 33.

There are a number of holes in the sides of chambers 32 and 33 adjacent to perforated belt 13. There are also a number of holes in the ends of chambers 27 and 32 adjacent to roller 17, which contains a plurality of holes in its circumferential surface. Thus, vacuum is applied from source 26 through the chambers to the roller.

When belt 13 is restarted, the first sheet is moved over roller 17 on its way to a position over chambers 32 and 33. If the vacuum in the roller is not strong enough to hold the sheet against the belt and it continues to move in a horizontal direction, the sheet is deflected downward on the belt by guide 53.

When the first sheet is in area 30, it is sensed by the photocell in unit PC2 which, as previously indicated, energizes the relay in PC2. This causes a control circuit in unit 29 to be conditioned for operation. As the sheet leaves area 30, its trailing edge is sensed by the photocell in unit PC5. The relay in PC5 is then released to complete the circuit conditioned for operation. When the circuit is completed, the brake in assembly 42 is released and the clutch is engaged so that motor 43 drives roller 44. The roller in turn drives perforated conveyor belt 45 in the direction shown in the FIG. Pressure roller 46 keeps constant pressure on belt 45 against roller 44. Roller 47 is an idler roller, while 48 and 49 are follower rollers.

Chambers 50 and 51 have a plurality of holes in their sides adjacent to perforated belt 45 and a plurality of holes in their ends adjacent to roller 49. The roller has a pattern of perforations in its outer circumferential surface. Hence source 52 applies vacuum through the chambers to the roller. It will be understood that vacuum sources 26 and 52 could be combined as a single source of vacuum or that separate sources could be used for each chamber in FIG. 1.

After belt 13 is restarted, as the first sheet leaves area 30 and moves to its position over chambers 32 and 33, its trailing edge is sensed by the photocell in unit PC5. The photocell releases the relay in PC5 to operate transfer unit 31. The transfer unit then cuts off the vacuum to chamber 32 and vents vacuum source 26 to the atmosphere. When the vacuum is cut off, the lower portion of the first sheet is held in position on belt 13 by the vacuum in chamber 33, while the upper