Aug. 4, 1970 R. J. VARSON ET AL 3,522,434

PHOTOCELL AND CONTROL CIRCUIT FOR AN AUTOMATIC PAGE TURNER

Filed Nov. 12, 1968 5 Sheets-Sheet 1

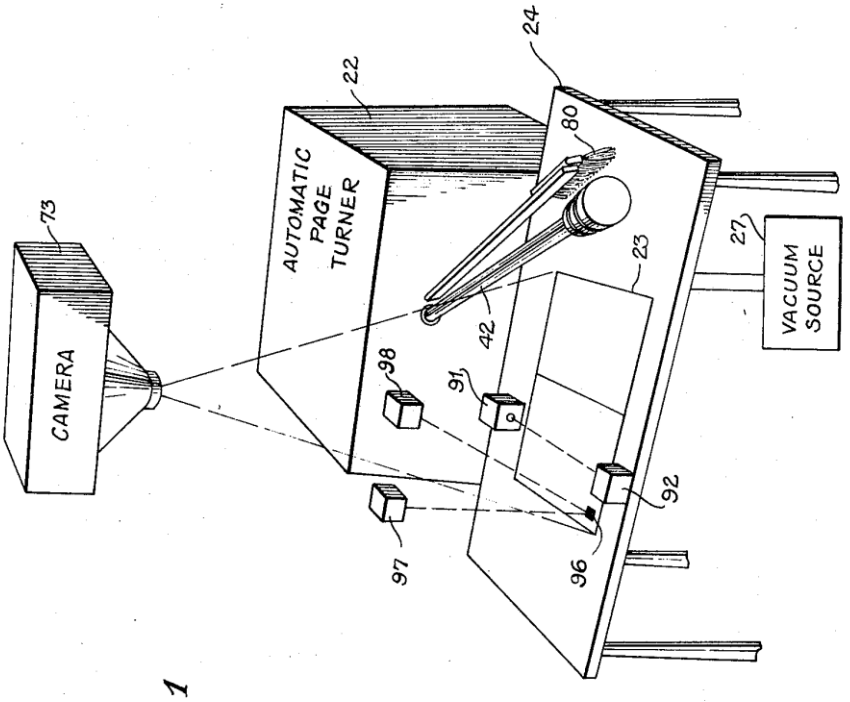

Fig. 1

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PHOTOCELL AND CONTROL CIRCUIT FOR AN AUTOMATIC PAGE TURNER

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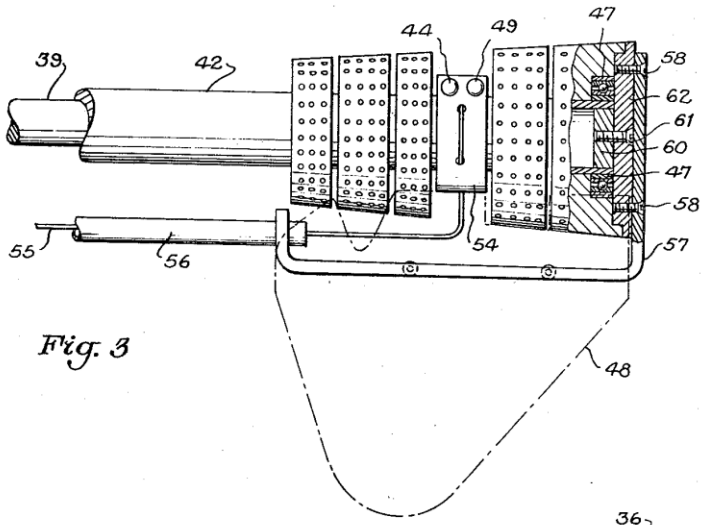

Fig. 3

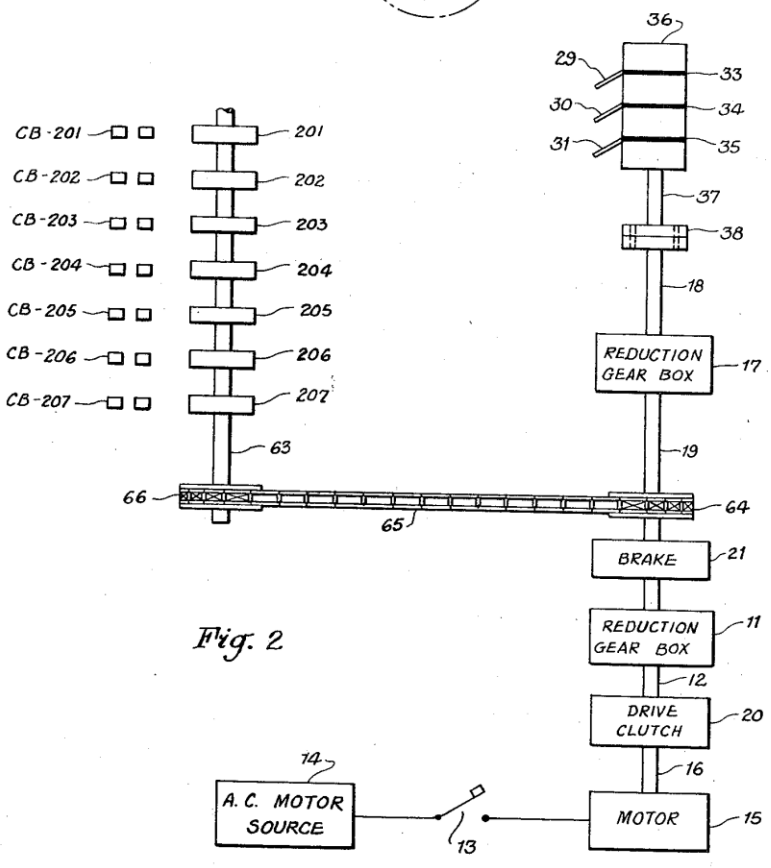

Fig. 2

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PHOTOCELL AND CONTROL CIRCUIT FOR AN AUTOMATIC PAGE TURNER

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U.S. Cl. 250—208 11 Claims

ABSTRACT OF THE DISCLOSURE

A circuit is described for testing the operation of a page turner and for controlling the turner and a related camera. A vacuum head, positioned on a revolving arm, turns the pages of a bound volume and a brush flattens each turned page. When a page is not turned or the arm is reset, the camera remains inoperative. When more than one page is turned or a page is turned but not flattened, the turner is inactivated. The turner is stopped after a spot on a predetermined page is sensed.

BACKGROUND OF THE INVENTION

This invention may be used to coordinate the operation of a camera and an automatic page turner, and to test and control the operation of the turner, whereby the pages in a bound volume can be automatically turned, flattened and photographed in sequence.

One type of turner that may be controlled by the present invention is described in copending application Ser. No. 715,343, entitled "Automatic Sheet Turner Using Rotating Vacuum Head," which was filed on Mar. 22, 1968 by Anthony A. Berlinsky et al. and was issued on Dec. 23, 1969, as U.S. Pat. No. 3,484,970. In the copending application, a vacuum head is rotated around its longitudinal axis and is also revolved in a selected plane on the end of a revolving arm. As the head engages the edge of a page of a booklet held flat on a vacuum table, the page is attracted to the head. As the head continues to rotate the page is turned. A brush sweeps the turned page to flatten it against the table.

The control circuit, described here, monitors and controls the operation of the page turner so that when more than one page is turned, or a page is turned but not flattened, the turner is stopped. The circuit includes an interlock between the camera and page turner so that when a page is not turned or the arm is reset, the camera is not operated. The circuit responds to a spot on a selected page to stop the turner.

SUMMARY OF THE INVENTION

In accordance with the present invention, a control circuit is provided for an automatic page turner. Under normal operating conditions, the pages of a bound volume are turned automatically, flattened, and photographed in sequence. When a single page is turned during a cycle of operation, the control circuit actuates a camera to photograph the turned page. If more than one page is turned, or if a page has been turned but not flattened, the circuit inactivates the page turner. When a page is not turned or the turner is inactivated and then reset, the control circuit prevents operation of the camera during the cycle of operation. When a spot on a predetermined page is sensed, the turner is stopped.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a pictorial representing the cooperation of some of the elements of the present invention with a camera and an automatic page turner;

FIG. 2 illustrates the cooperation of some of the components in the present invention with components in the copending application;

FIG. 3 shows a vacuum head and two of the photocells used in the control circuit in FIGS. 4A and 4B;

FIG. 4 is a block diagram that represents the assembly of FIGS. 4A and 4B;

FIGS. 4A and 4B comprise an embodiment of the control circuit in the present invention;

FIG. 5 is a timing chart used in explaining the operation of the cams shown in FIG. 2; and

FIG. 6 is a sequence chart used in explaining the test operations of the present invention.

DESCRIPTION OF A PREFERRED EMBODIMENT

When switch **13** in FIG. 2 is closed, AC power source **14** energizes motor **15** to drive shaft **16**. If drive clutch **20** is engaged and brake **21** released, shaft **18** will be driven through shafts **12**, **19** and gear reduction boxes **11**, **17**. Shaft **18** in turn drives the mechanism in automatic page turner **22** (FIG. 1) which causes arm **39** (FIG. 3) to revolve in a selected plane. Vacuum head **42** is rotatably mounted on arm **39** by means of bearings **47**.

When arm **39** is revolved in its selected plane, head **42** rotates around its longitudinal axis. The output of vacuum source **27** (FIG. 1) is applied to the head during a time interval that starts prior to the time that the head engages an edge of the top page of booklet **23** and extends to the time after the head passes over the center of the booklet. Thus, as the head engages a corner of the top page of booklet **23**, which is held flat on table **24** by vacuum source **27**, the page is attracted to the head and turned. After the page has been turned, it is flattened by brush **80**, which revolves with arm **39**.

Page turner **22** employs two vacuum heads **42**, positioned 180° apart, on the arm **39** as illustrated schematically in FIG. 6. One of the heads is represented in FIG. 1 and shown in greater detail in FIG. 3.

The details of page turner **22** (which operate arm **39**, heads **42**, and brush **80**) are shown in the copending application. Switch **13**, source **14**, motor **15**, shafts **16**, **18** and gear reduction box **17** are also shown in the latter application.

Brushes **29**, **30** and **31** are in contact with rings **33**, **34** and **35**, respectively, on commutator **36** in FIG. 2. The commutator is mounted on shaft **37** which is connected to shaft **18** by means of coupling unit **38**. The brushes are mounted in a fixed position on vacuum stand **32** (not shown) in the copending application.

As represented in FIG. 4A, photocells **44** and **45** are connected through rings **33**, **34** and brushes **29**, **30** as the input of amplifier **46**, and relay K121 forms the output of **46**. Likewise, photocells **49** and **50** are connected through rings **34**, **35** and brushes **30**, **31** as the input to amplifier **51**, while relay K123 forms the output of **51**.

Relays K121 and K123 are dark operated. More specifically, when a certain level of light, e.g. the light from a source passing through a single sheet of paper, falls on photocell **44** the resistance of the photocell is such that amplifier **46** operates relay K121. Further, when another level of light, e.g. the light from the same source passing through two or more sheets of the same type of paper, falls on photocell **49**, amplifier **51** operates relay K123.

Photocells **44** and **49** are positioned on a support member **54** (FIG. 3) connected to peeler **48** by conventional means (not shown). If a plane is drawn through the center of vacuum head **42** and parallel to the surface of table **24**, the faces of the photocells are positioned in another plane making a 45° angle with the former one. Photocells **45** and **50** are located in the same manner as