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AUTOMATIC SHEET TURNER USING A ROTATING VACUUM HEAD

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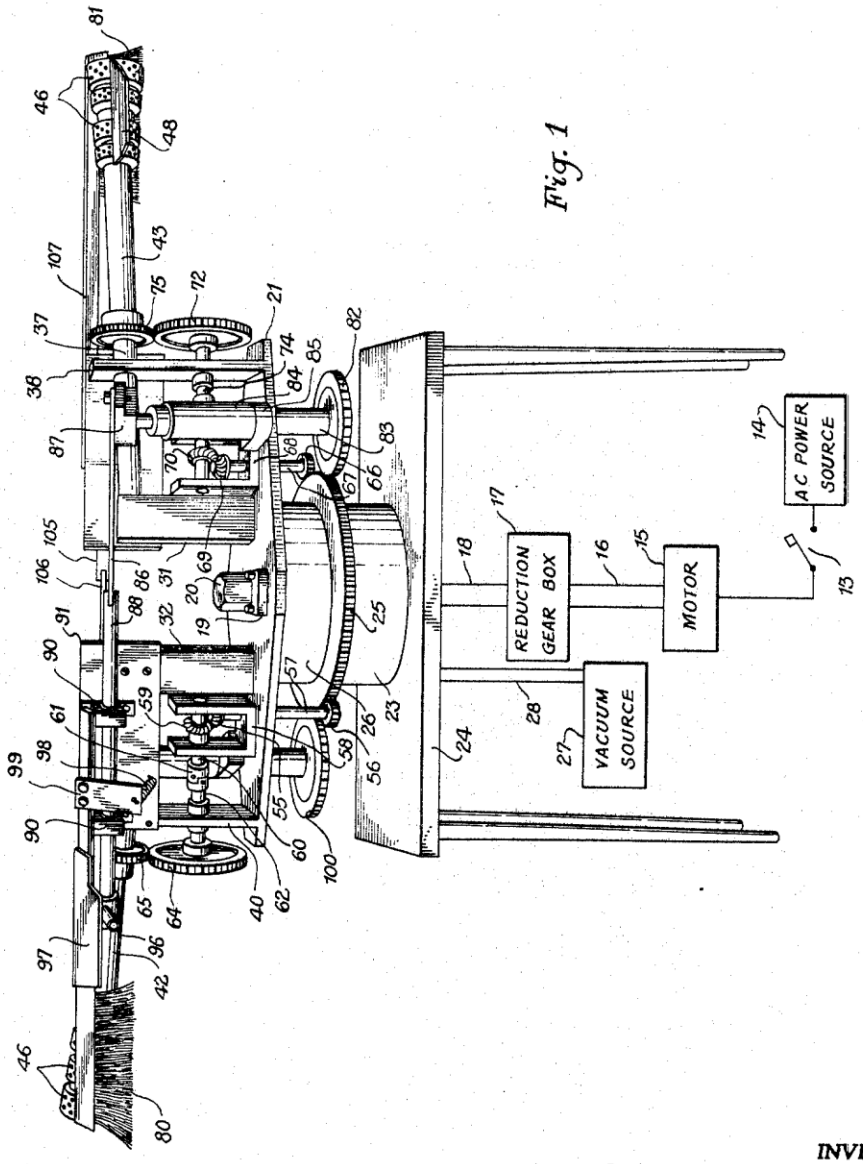

Fig. 1

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AUTOMATIC SHEET TURNER USING A ROTATING VACUUM HEAD

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ABSTRACT OF THE DISCLOSURE

An arrangement is described for turning the sheets of a booklet. A vacuum head is rotated on an arm and is also rotated around its longitudinal axis. As the head engages the edge of a sheet, it is attracted to the head and turned. The sheet is then flattened by a brush or roller.

BACKGROUND OF THE INVENTION

This invention may be used to automatically turn and flatten the sheets of a booklet when the pages of the booklet are to be photographed on microfilm. The sheets are flattened to obtain a high degree of uniformity of reduction in taking the photograph. This is desirable when the microfilm is to be used with a scanner that requires a high degree of precision in the location of marking positions on the sheets and in particular when the sheets have been folded before being photographed.

The scanner could be of the type used in the FOSDIC System (a film optical sensing device for input computers) and the booklets could be census questionnaires. When the questionnaires are received at the Bureau of Census, an image of each page is transferred to 16 mm. microfilm. The film is fed into the FOSDIC System where each part of the recorded information is located by means of related marking positions on the film. The information is then scanned and concisely recorded on magnetic tape ready for computer input.

SUMMARY OF THE INVENTION

In one embodiment of the inventive concept, a booklet is placed on a table and is held in a flattened position by means of vacuum. A vacuum head is rotated around its longitudinal axis and is also rotated in a selected plane on the end of a rotating arm. A source of vacuum is applied to the head during a time interval that starts prior to when the vacuum head engages an edge of a sheet of the booklet and extends to the time after the head passes the center of the booklet. As the head engages the edge of the sheet, it is attracted to the head by means of vacuum, and as the head continues to rotate the sheet is turned. A brush is positioned to sweep the sheet during a time interval that starts after the sheet has been turned, and thereby flattens it against the vacuum able.

In another embodiment, after the sheet is turned a roller, instead of the brush, flattens the sheet against the vacuum table.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a pictorial view of the arrangement for rotating the vacuum heads and brushes used in the present invention;

FIG. 2 is a partial side view of the arrangement shown in FIG. 1;

FIG. 3 is a top view of the structure represented in FIG. 2;

FIG. 4 represents a section taken along the longitudinal axis of a vacuum head in FIG. 1;

FIG. 5 is a top view of the vacuum chamber plate and its related gear as well as a section of the associated shaft illustrated in FIG. 2;

FIGS. 6 and 7 represent a brush and its support and control mechanism used in FIG. 1;

FIG. 6A is a side view of the structure shown in FIG. 6;

FIG. 7A is a side view of the structure shown in FIG. 7;

FIGS. 8 and 9, and 10 represent the operation of a vacuum head and brush as they turn and flatten a sheet in a booklet;

FIG. 11 presents a roller and its support and control mechanism that can be used with the structure in FIG. 1; and

FIG. 11A is a side view of the mechanism in FIG. 11.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

With reference to FIGS. 1 and 2, when switch **13** is closed, AC power source **14** energizes motor **15** which drives shaft **18** through shaft **16** and reduction gear box **17**. Collar **19** is keyed to shaft **18** and nut **20** is screwed on the shaft. Since the collar is attached to plate **21**, the plate is rotated when motor **15** is energized.

Vacuum chamber plate **23** is fastened to the top of table **24**, and gear **25** is fastened to flange **26** on the chamber plate. For clarity in illustration, the width of **23** in FIG. 1, has been enlarged slightly. The output of vacuum source **27** is fed through hose **28** and the top of table **24** to recess **29** (FIGS. 2 and 5) in the chamber plate.

Vacuum stands **31** and **32** are located over holes **33** and **34** (FIG. 2), respectively, in rotating plate **21**. Hollow arm **37** is supported by member **38** and has one end positioned in stand **31**, while hollow arm **39** is supported by member **40** and has one end positioned in stand **32**.

Vacuum head **42** is rotatably mounted on hollow arm **39** (FIGS. 2 and 4), while vacuum head **43** is rotatably mounted on arm **37**. As represented by the cross section of head **42** and arm **39** in FIG. 4, the heads are rotatably mounted on the arms by means of bearings **47**. Further, the arms contain holes **44** and slots **45**, while the vacuum heads contain holes **46**.

When motor **15** is energized, as plate **21** is rotated vacuum is applied through recess **29** (FIG. 5), holes **33**, **34**, and stands **31**, **32** to heads **42** and **43** during respective 30 degrees rotation of the plate.

A paper peeler **48** (FIGS. 1 and 10) is attached to each vacuum head and is supported on a bracket **49**.

Bevel gear **55** and pinion gear **56** are positioned on shaft **57**, which is supported by bracket **58** on rotating plate **21**. Pinion **56** rotates around gear **25**, while bevel gear **59** engages **55** and is connected through shaft **60** to coupling unit **61**. The shaft is supported by bracket **58**. The coupling unit is also connected through shaft **62**, which is supported on member **40**, to gear **64**. The latter gear drives gear **65**, which is attached to head **42**. Thus, when plate **21** is rotated vacuum head **42** revolves around its longitudinal axis.

Likewise, a pinion gear **66** (FIG. 1) rotates around gear **25** and is located on shaft **67**. The shaft is supported in bracket **68** connected to plate **21**. Bevel gear **69** is also located on the shaft and engages bevel gear **70** (FIG. 1). Coupling unit **71** (FIG. 2) is connected between gears **70** and **72** by means of shafts **73** and **74**, respectively. Shaft **74** is supported by member **38** and shaft **73** by a leg of bracket **68**. Gear **72** drives gear **75** which is connected to vacuum head **43**. This arrangement rotates the head around its longitudinal axis when plate **21** is rotated by motor **15**.

The mechanical arrangement for controlling brush **80** (FIG. 1) will now be described. The gear **25** engages gear **82** which is located on shaft **83**. The shaft as well