

[54] **DRUM CLEANING DEVICE FOR AN
ELECTROPHOTOGRAPHIC DUPLICATOR**

[75] Inventor: **Katsuo Suzuki**, Tokyo, Japan

[73] Assignee: **Fuji Xerox Co., Ltd.**,
Ashigara-Kamigun, Kanagawa,
Japan

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[51] Int. Cl. **G03g 15/00**

[58] Field of Search 15/256.51, 256.5;
242/68; 355/15

References Cited

UNITED STATES PATENTS

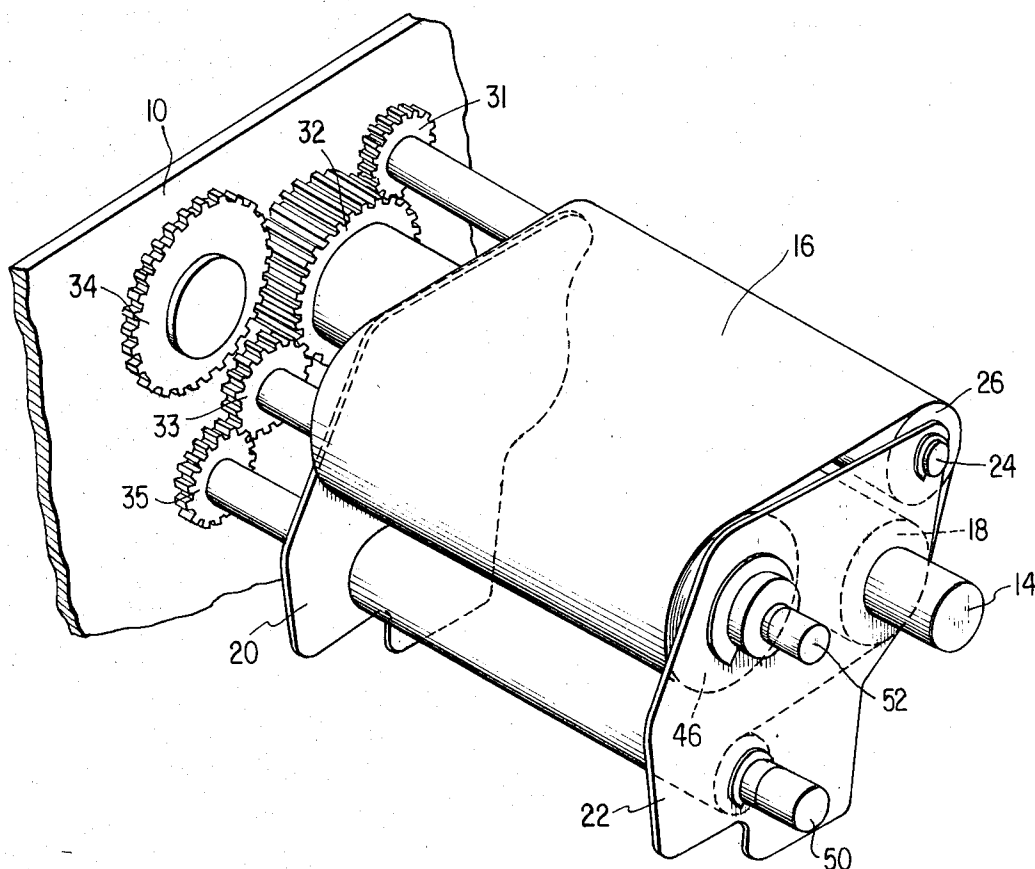
3,526,457 9/1970 Dimond et al. 15/256.51 X

Primary Examiner—Leon G. Machlin
Attorney—Ferguson & Baker

[57] **ABSTRACT**

A drum cleaning device for an electrophotographic duplicator including (1) web core supporting shafts disposed substantially parallel to the axis of the drum, (2) a pressure roller, (3) winder shafts, the web being connected from the web core supporting shafts to the winder shafts via the pressure roller which presses the web to the drum to thereby clean the surface of the drum, (4) first and second side plates between which are connected the web core supporting shafts, the pressure roller, and the winder shafts so as to constitute a cleaning unit, and (5) means for removably mounting the cleaning unit with respect to the drum so that the entire cleaning unit can be operatively positioned with respect to the drum or removed therefrom for maintenance.

5 Claims, 6 Drawing Figures



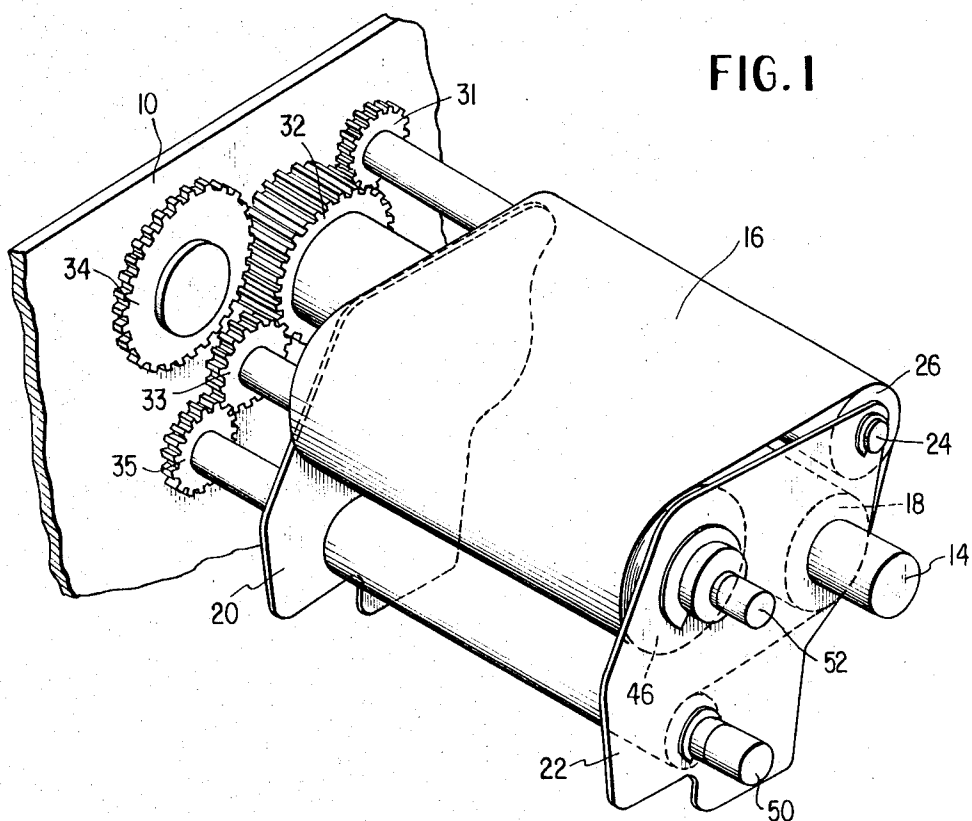


FIG. 1

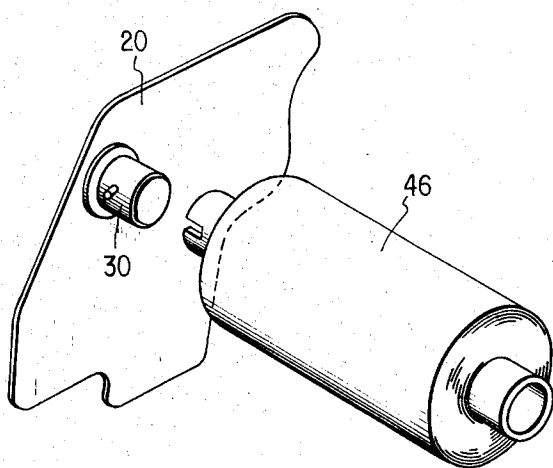


FIG. 5

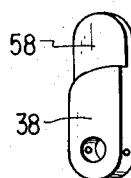


FIG. 6

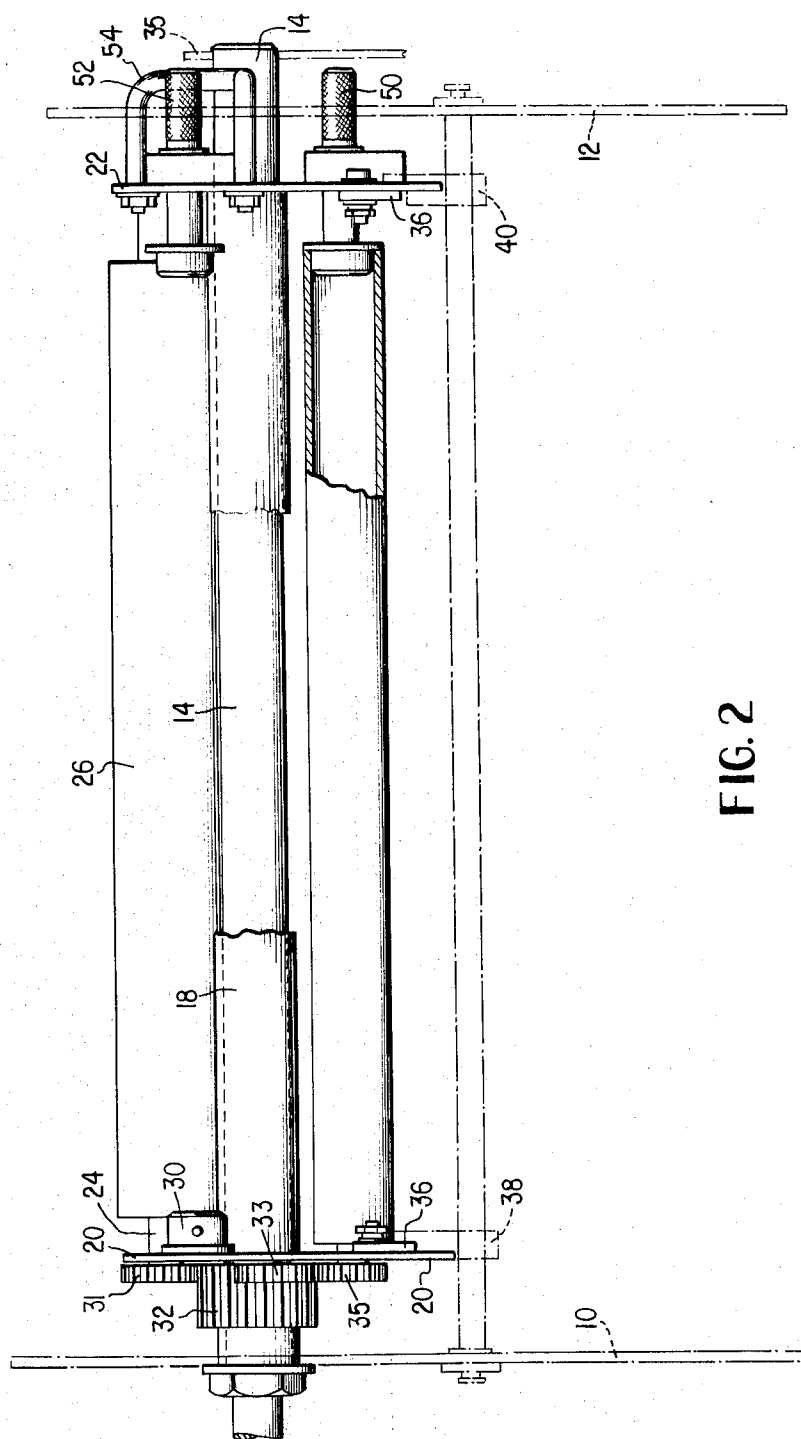


FIG. 2

FIG. 3

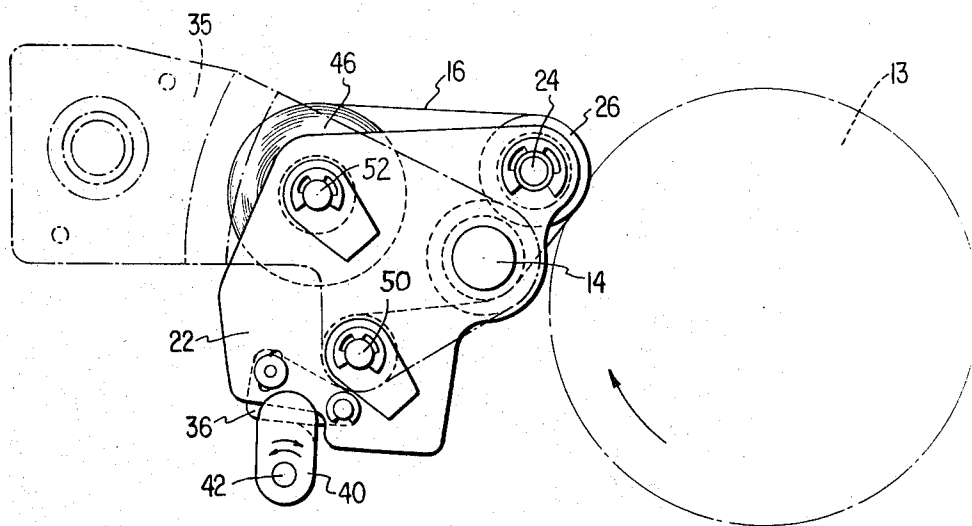
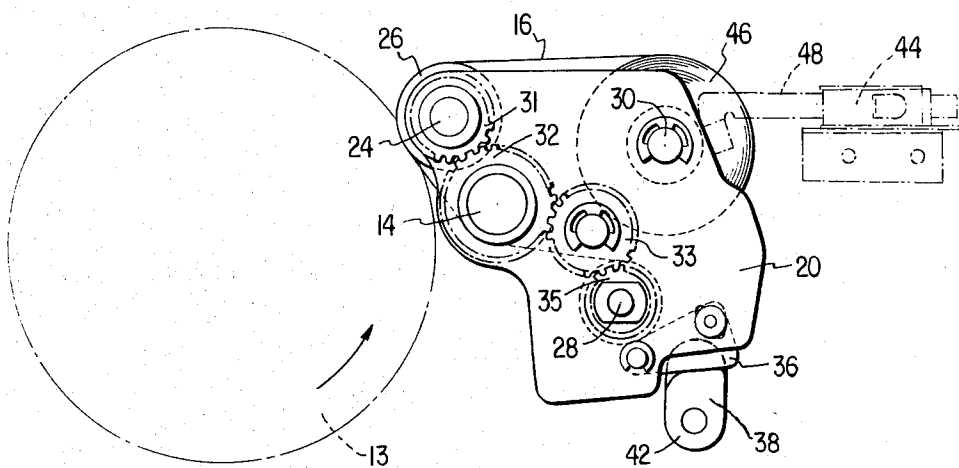


FIG. 4

DRUM CLEANING DEVICE FOR AN ELECTROPHOTOGRAPHIC DUPLICATOR

BACKGROUND OF THE INVENTION

This invention relates to a cleaning device for use in an electrophotographic copying machine and in particular to a cleaning device which may be readily removed for maintenance or replacement thereof.

Further, in particular, the present invention relates to a device for removing and cleaning powders remaining on a photoconductive drum after a powder image has been transferred on paper or the like from the drum in an electrophotographic copying machine.

SUMMARY OF THE INVENTION

The primary object of the present invention is to provide an improved drum cleaning device that is an integral unit which is easily withdrawn from the duplicator body when the web is replaced so that web replacement is readily effected.

A further object of this invention is to provide an improved drum cleaning device of the above type which permits ready web replacement or maintenance in a compact space.

A further object of this invention is to provide an improved drum cleaning device of the above type which is simple in construction and easily manufactured.

Other objects and advantages of this invention will become apparent upon reading the appended claims in conjunction with the following detailed description and the attached drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a schematic perspective view of an illustrative drum cleaning device in accordance with the present invention.

FIG. 2 is an elevation of the device of FIG. 1.

FIG. 3 is a left side view of the device of FIG. 1.

FIG. 4 is a right side view of the device of FIG. 1.

FIG. 5 is a schematic perspective view illustrating how the web core is supported in accordance with the invention.

FIG. 6 is a perspective view of a cam for use with the invention.

Referring to the figures of the drawing, like reference numerals refer to like parts. In the figures, there are shown frame members 10 and 12; photoconductive drum 13; and support shaft 14 fixedly mounted on frame 10. A cleaning unit generally indicated at 16 comprises a hollow cylindrical shaft 18 which is transversely connected between side plates 20 and 22; a shaft 24 supporting a pressure roller 26; winder shafts 28 and 50 and web core supporting shafts 30 and 52. The support for web core is so constructed that only the end portions are supported, as seen in FIG. 5.

The web core supporting shaft 30 constitutes a dependent friction shaft, and the winder shaft 28 constitutes a friction driving shaft. The winder shaft 50 and the web core supporting shaft 52 are withdrawable in the axial direction, so as to facilitate web replacement. The cleaning unit 16 is rotatably mounted on support shaft 14 by means of hollow shaft 18 which is concentrically disposed on the support shaft.

The driving force for pressure roller 26 and winder shaft 28 is obtained by a train of gears 31, 33, and 35 extending from a gear 32 mounted on pipe 18. Gear 32 engages a gear 34 mounted on frame 10, gear 34 being

driven from an appropriate external source located within the duplicator. Gears 31 and 35 are mounted on shafts 24 and 28 respectively while gear 33 is mounted on side plate 20. A removable or pivotable stay 35 supports support shaft 14 at its end opposite from frame 10. Cam guide pieces 36 are mounted onto the side plates 20 and 22, these guide pieces respectively contacting two cams 38 and 40 mounted on a cam shaft 42 which is connected between frames 10 and 12. Rotation of cam shaft 42 to the position shown in FIGS. 3 and 4 causes the contacting state of the pressure roller 26 to operatively engage the drum.

A microswitch 44 attached to the frame 10 is responsive to cleaning unit 16 which, as will be brought out in more detail hereinafter, slides on support shaft 14 via hollow shaft 18, when the cleaning unit is placed in a predetermined position. The switch 44 is set "on" by the end surface 46 of the web. The actuator 48 of microswitch 44 is so constructed that the "on" state will be maintained even when the cleaning unit 16 is moved in a circular movement around support shaft 16. The tip of the actuator 48 generally points towards the tangent of an imaginary circle which has as its center the center of the support shaft.

When gears 32 and 34 do not engage well one with another, the gear 32 is rotated by turning the shaft 24 manually until gear engagement is effected.

In operation, when the two cams 38 and 40 are turned to a certain angle in the direction of the drum 13, the cleaning unit 16 is rotated about support shaft 14 under the influence of the cam guide pieces 36 whereby pressure roller 26 is pushed against the drum with the web 46. The pressure roller 26 and the winder shaft 28 are subsequently rotated by means of gears 32 and 34 so that the web 46 is displaced and cleans the surface of the drum.

When the cleaning unit 16 is to be withdrawn from the duplicator body, the stay 35 supporting the support shaft 14 is removed or pivoted out of the way. The cam shaft 42 is next turned anticlockwise by approximately an angle of 90°. The unit 16 is then rotated in the anticlockwise direction. A handle 54 is provided on side plate 22 to facilitate withdrawal of the cleaning unit. The cleaning unit is ext withdrawn, sliding along and guided by shaft 14 as it escapes from the drum. An aperture is provided in frame 12 to permit withdrawal of the cleaning unit through frame 12.

The cams 38 and 40 also have the function of preventing transversal movement (in axial direction) of the cleaning unit when it is in working position, as can be seen in FIG. 2, this being effected by the raised portions 58 of the cams (see FIG. 6) which engage the side plates 20 and 22. Where only the exchange of the web 16 is desired, it is possible that, after the stay 35 is removed, and after the cam shaft 42 has been turned anticlockwise, the cleaning unit may be withdrawn along and guided by fixed shaft 14 to a position where it is stopped by a stopper (not shown in the drawing) mounted in the duplicator. This position would be such that web replacement could be easily effected.

The drum cleaning device according to the present invention is such that the web core supporting shafts 30, 52 the pressure roller 26 and the winder shafts 28, 50 are supported by the side plates 20 and 22. The cleaning unit is so mounted that it is freely attached and detached to support shaft 14 fixedly mounted with respect to the frame. The cleaning unit as a whole can be

withdrawn from the frame and the web exchanged. Accordingly the web can be replaced more easily than in conventional apparatus where web replacement is effected in a narrow space. Further, this cleaning device is remarkably simple in construction and easily manufactured.

Numerous modifications of the invention will become apparent to one of ordinary skill in the art upon reading the foregoing disclosure. During such a reading it will be evident that this invention provides a unique drum cleaning device for accomplishing the objects and advantages herein stated.

What is claimed is:

1. In drum cleaning device for an electrophotographic duplicator having web core supporting shafts disposed substantially parallel to the axis of the drum, a pressure roller and winder shafts, the web being connected from said web core supporting shafts to said winder shafts via said pressure roller which presses said web to said drum to thereby clean the surface of said drum, the improvement comprising

first and second side plates between which are connected said web core supporting shafts, said pressure roller, and said winder shafts so as to constitute a cleaning unit; and

means for rotatably and slidably mounting said cleaning unit with respect to said drum so that the entire cleaning unit can be operatively positioned with respect to said drum or removed therefrom for maintenance.

2. In drum cleaning device for an electrophotographic duplicator having web core supporting shafts disposed substantially parallel to the axis of the drum, a pressure roller and winder shafts, the web being connected from said web core supporting shafts to said winder shafts via said pressure roller which presses said web to said drum to thereby clean the surface of said drum, the improvement comprising

first and second side plates between which are connected said web core supporting shafts, said pressure roller, and said winder shafts so as to constitute a cleaning unit; and

means for removably mounting said cleaning unit with respect to said drum so that the entire cleaning unit can be operatively positioned with respect to said drum or removed therefrom for maintenance, said means for removably mounting the cleaning unit with respect to the drum including:

1. a support shaft fixedly mounted in said electrophotographic duplicator, said cleaning unit being rotatably and slideably mounted with respect to said support shaft; and

2. cam means for holding said cleaning unit in a first position so that said pressure roller operatively engages said drum and for permitting rotation of said cleaning unit to a second position removed from said drum so that said cleaning unit may be slid along said support shaft away from said drum for maintenance thereof.

3. The improvement in claim 2 where said cleaning unit includes a hollow cylindrical shaft connected between said first and second plates and concentrically mounted on said support shaft.

4. The improvement as in claim 2 where said cam means includes at least two cams mounted on a rotatable cam shaft, said cams being respectively mounted adjacent said first and second plates, each of said cams including a portion disposed against the side of its associated plate to prevent lateral movement of said cleaning unit along said support shaft when said cleaning unit is in said first position.

5. The improvement as in claim 2 including a removable stay for supporting one end of said support shaft to facilitate the removal of said cleaning unit from said support shaft.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,766,592 Dated October 23, 1973

Inventor(s) Katsuo Suzuki

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

On the cover sheet insert -- Claims priority,
application Japan, Dec. 21, 1970 114282/70 --.

Signed and sealed this 26th day of March 1974.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents