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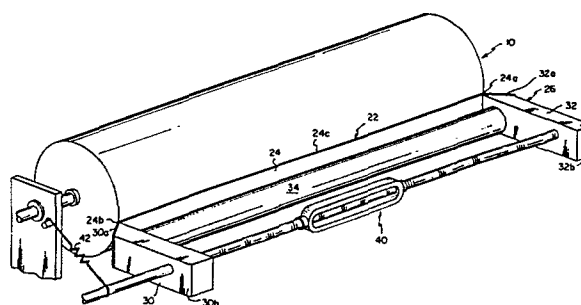
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⑤④ **Tensionable skive for magnetic brush applicator.**

⑤⑦ Skiving apparatus for use in electrographic copiers for stripping magnetically attractive developer from the outer sleeve of a magnetic brush applicator (10). Such apparatus comprises an elongated and flexible skive blade (22) and means (26) for applying equal and opposite axial forces at spaced locations along the blade (22) to produce tension in the skive blade and thereby provide a straight skiving edge (24c). Preferably, the skive blade (22) is made of a magnetically attractive material so that it is attracted toward the magnetic core piece of the brush applicator (10).



TENSIONABLE SKIVE FOR MAGNETIC BRUSH APPLICATORBACKGROUND OF THE INVENTION5 Field of the Invention

This invention relates to electrographic recording and, more particularly, to apparatus for stripping magnetically attractive developer from the surface of the magnetic brush applicator after being  
10 used to develop an electrostatic image.

Description of the Prior Art

In the commonly assigned U.S. Patent No. 4,473,029, issued to Fritz et al, there is disclosed an electrographic development system comprising a  
15 magnetic brush applicator and a magnetic development mix. The applicator basically comprises a non-magnetic cylindrical sleeve having a rotatably driven magnetic core piece positioned therein. The magnetic core piece is driven at a high speed (e.g. 1500 RPM).  
20 The magnetic developer comprises a mixture of thermoplastic toner particles and magnetically "hard" carrier particles, the latter having relatively high magnetic coercivity and remanence. Rotational movement of the applicator's core piece serves to  
25 transport the development mix over the sleeve's outer surface and into contact with an electrostatic image-bearing surface located at a development zone. While in contact with the image, the electrostatic forces associated with the image overcome the triboelectric  
30 attraction between toner and carrier, thereby stripping the toner from the carrier and depositing it on the image to effect development thereof. After development, the partially denuded carrier particles are returned to a reservoir to be replenished with  
35 toner particles.

In development systems of the above-mentioned type, some difficulty has been encountered in stripping the developer mix from the applicator's sleeve

after development to effect toner replenishment. Owing to the relatively small size of the carrier particles (e.g. 20-40 microns) and their high magnetic affinity for the magnetic core piece located within  
5 the sleeve, it is necessary to physically scrape the development mix from the applicator's sleeve in order to achieve separation. For this purpose, it is generally known in the art to use a thin, flexible scraper blade, often referred to as a "skive". For  
10 example, U.S. Patent Nos. 4,338,880 and 4,392,735 disclose skives made from thin strips (30-100 microns thick) of plastic or non-magnetic metal. Such flexible skives are commonly supported along one edge by a rigid member which is positioned to urge the free edge  
15 of the skive into contact with the periphery of the applicator's sleeve. Similar skiving devices are disclosed in U.S. Patent Nos. 4,328,762 and 4,391,503.

Stripping skives of the type disclosed above are sometimes difficult to maintain in alignment and  
20 in uniform contact with the periphery of the magnetic brush's non-magnetic sleeve. This is particularly true when the sleeve is rotatably driven. Non-uniform contact produces non-uniform wear of the blade, producing worn spots or "steps" in which developer may  
25 become trapped. Moreover, non-uniform contact will produce differential frictional heating which can cause such trapped developer to agglomerate and form large "flakes" which adversely affect image quality.

#### SUMMARY OF THE INVENTION

30 In view of the foregoing discussion, an object of this invention is to provide an improved skiving apparatus which is significantly easier to maintain in alignment and in uniform contact with the outer sleeve of a magnetic brush applicator, whereby  
35 the above-identified problems are reduced. The skiving apparatus of the invention comprises an elongated and flexible skive, and means for producing tension in the skive to provide a straight scraping

edge which, by proper positioning of the tensioning means relative to the magnetic brush sleeve, can contact the sleeve with substantially uniform pressure over its length. According to a preferred embodiment, 5 the blade itself is made of a magnetically attractive material, such as "blue steel", so as to be attracted to the brush sleeve by the internal magnetic forces.

The invention and its various advantages will become more apparent to those skilled in the art from 10 the ensuing detailed description of preferred embodiments, reference being made to accompanying drawings.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a perspective view showing a preferred embodiment of the invention in use with a 15 magnetic brush applicator;

Figure 2 is a cross-sectional illustration of the apparatus shown in Fig. 1; and

Figure 3 is a perspective view which illustrates an alternative form of the apparatus of 20 the invention.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to Figs. 1 and 2, there is shown a magnetic brush applicator 10 of the type commonly used in electrographic copiers for applying a development 25 mix D to a dielectric recording member M to effect development of an electrostatic image formed thereon. Applicator 10 basically comprises a non-magnetic cylindrical sleeve 12 having a multi-pole, magnetic core piece 14 concentrically arranged therein. Con- 30 ventional drive means (not shown) are provided for rotatably driving core piece 14 in the direction of arrow A, and, optionally, for rotatably driving sleeve 12 in the direction indicated by arrow B. As explained in detailed in the aforementioned patent to 35 Fritz et al (U.S. 4,473,029), the effect of the rotational movement of core piece 14 is to advance magnetic developer over the sleeve surface (in a

direction indicated by arrow C) from a reservoir 16 to a development zone 18 at which point the developer contacts the electrostatic image borne by the dielectric recording element M. Developer D may be of the  
5 two-component variety comprising a mixture of either magnetic or magnetically-attractive carrier particles and thermoplastic toner particles. Alternatively, the developer could be of the single component type in which the toner particles themselves are magnetically  
10 attractive. The apparatus of the invention, as described below, is particularly useful with development systems of the type disclosed in the aforementioned Fritz et al patent. It will be understood, however, that the invention does have utility with a variety of  
15 different development systems.

During development of the electrostatic image on recording member M, toner particles are stripped away from their associated carrier particles by the stronger electrostatic forces associated with the  
20 charge image. Thus, it is necessary to replenish the partially denuded carrier particles with additional toner particles prior to being used again for development. To effect such toner replenishment, it is necessary to physically separate the developer mixture  
25 from the outer periphery of sleeve 12 after development occurs. Toward this end, a tensionable skive blade 22 is provided in accordance with the present invention.

As better shown in Fig. 1, skive blade 22  
30 comprises an elongated strip 24 of flexible and thereby tensionable material. According to a preferred embodiment, such material is a magnetically attractive material, such as "blue steel", having a thickness of between 25 and 250 microns. A preferred width for the  
35 skive is between 10 and 50 millimeters. Means 26 are provided for exerting equal but opposite longitudinal forces (i.e., end loads) at spaced positions 24a, 24b along the skive blade in order to provide tension in

the blade, the function of such tension being to provide a straight, unwavering edge 24c which, when brought into contact with the periphery of sleeve 12, will provide uniform pressure along its entire  
5 length. While the skive material may be non-magnetic, such as aluminum or even plastic film, a magnetic material is preferred because of its attraction to the magnetic core piece 14 within sleeve 12. Such magnetic attraction reduces, if not eliminates, the  
10 need for mechanically loading the skive in the radial direction, i.e. toward the axis of rotation of the magnetic brush.

Skive-tensioning means 26 may comprise, for example, a pair of end plates 30, 32 which are main-  
15 tained in spaced relation by a connecting rod 34. The opposite ends of rod 34 are connected to end plates 30, 32 at points intermediate the ends of the plates, thereby providing fulcrum points about which plates 30, 32 may pivot slightly. The opposite ends of the  
20 flexible skive strip are connected (e.g. by screws) to beveled edges 30a, 32a located at one end of their respective end plates. A turnbuckle 40, or the like, is connected between the opposite ends 30b, 32b of the end plates and serves, when tightened, to exert equal  
25 but opposite axial forces on the flexible skive strip 24 to produce a desired tension therein. The skive tensioning means is mounted relative to sleeve 12 so that the tensioned skive strip contacts the sleeve periphery at a location approximately 90 degrees down-  
30 stream of the development zone 18. A pair of springs 42 (only one being shown) may be provided to urge the skive into contact with the brush sleeve.

Referring to Fig. 3, a variation of the skiving apparatus of the invention is shown to com-  
35 prise a pair of tensionable skive strips 46, 48, which are connected to and stretch between a pair of spaced plates 50, 52. Tensioning means 54, e.g. a com-

pression spring, serves to exert equal but opposite forces on plates 50, 52 via connecting rods 56, 58. Such an arrangement provides four skiving edges, 46a, 46b, 48a and 48b, any one of which can be arranged to  
5 contact the applicator sleeve by merely changing the orientation of the assembly relative to the brush applicator.

The invention has been described in detail with particular reference to preferred embodiments  
10 thereof, but it will be understood that variations and modifications can be effected within the spirit and scope of the invention.

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CLAIMS

1. An electrographic magnetic brush applicator system (10) of the type including (i) a cylindrical outer sleeve (12) to which developer (D) is attractible by a magnetic core piece (14) positioned within the sleeve (12), (ii) means for producing relative movement between the sleeve and core piece to transport such developer (D) between a development zone (18) and a supply (16), and (iii) skiving means for skiving developer from such sleeve (12), said skiving means comprising a flexible, elongated skive blade (22; 46, 48), and means for supporting an edge of said blade proximate the sleeve (12) periphery, characterized in that said skiving means further comprises means (26; 54) for applying equal and opposite longitudinal forces on said blade (22; 46, 48) in order to tension and thereby straighten said blade edge (24c; 46a, 46b, 48a, 48b).

2. The apparatus as defined by claim 1 wherein said blade (22; 46, 48) is magnetically attractive, whereby said blade (22; 46, 48) is urged into contact with said sleeve (12) periphery by said magnetic core piece (14).

3. The apparatus as defined by claim 2 wherein said skive (22; 46, 48) is made of steel having a thickness between 25 and 250 microns.

4. The apparatus as defined by any of claims 1, 2 or 3 further comprising means (42) for biasing said skiving edge (24c) toward said sleeve periphery.



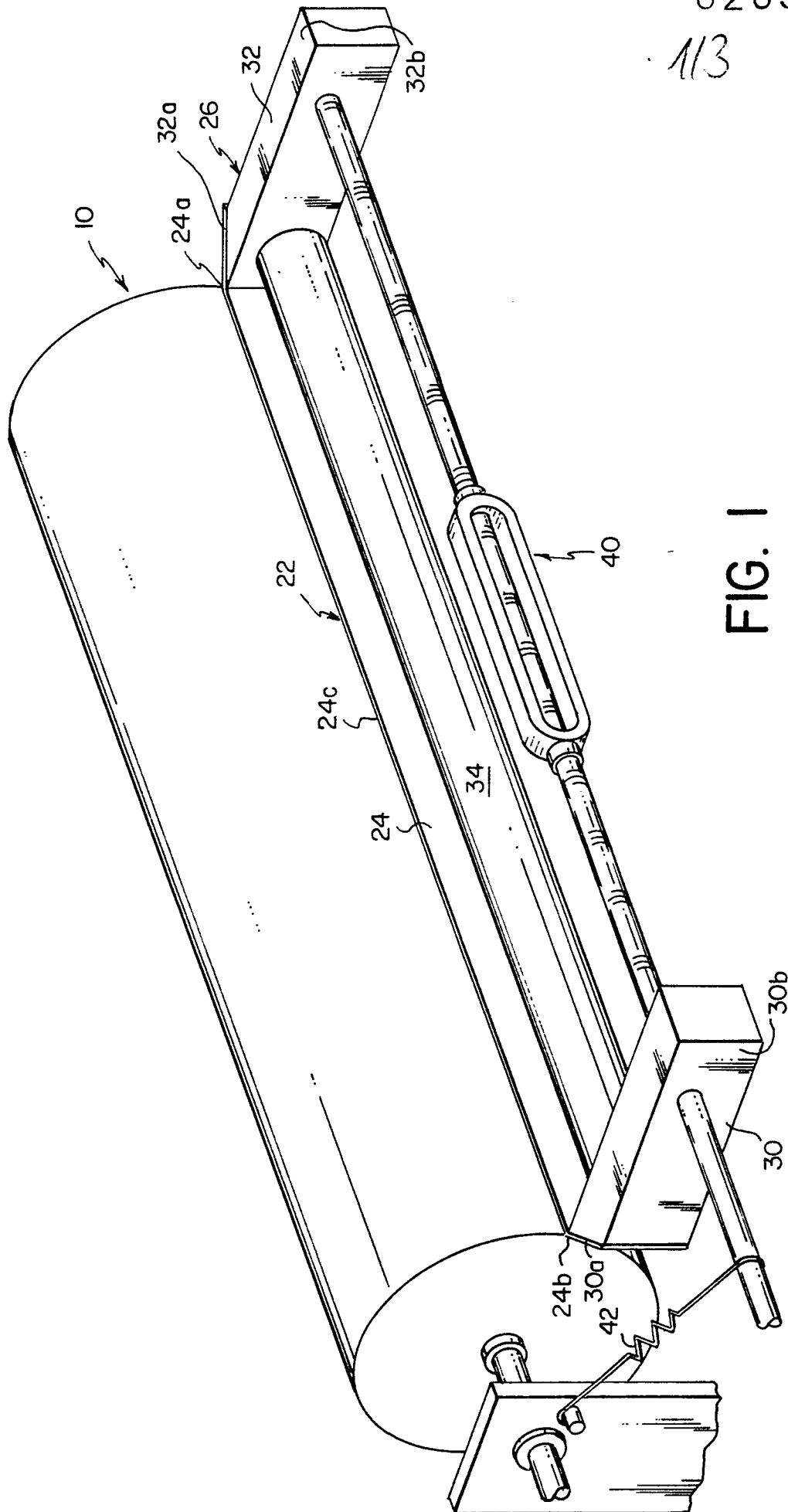
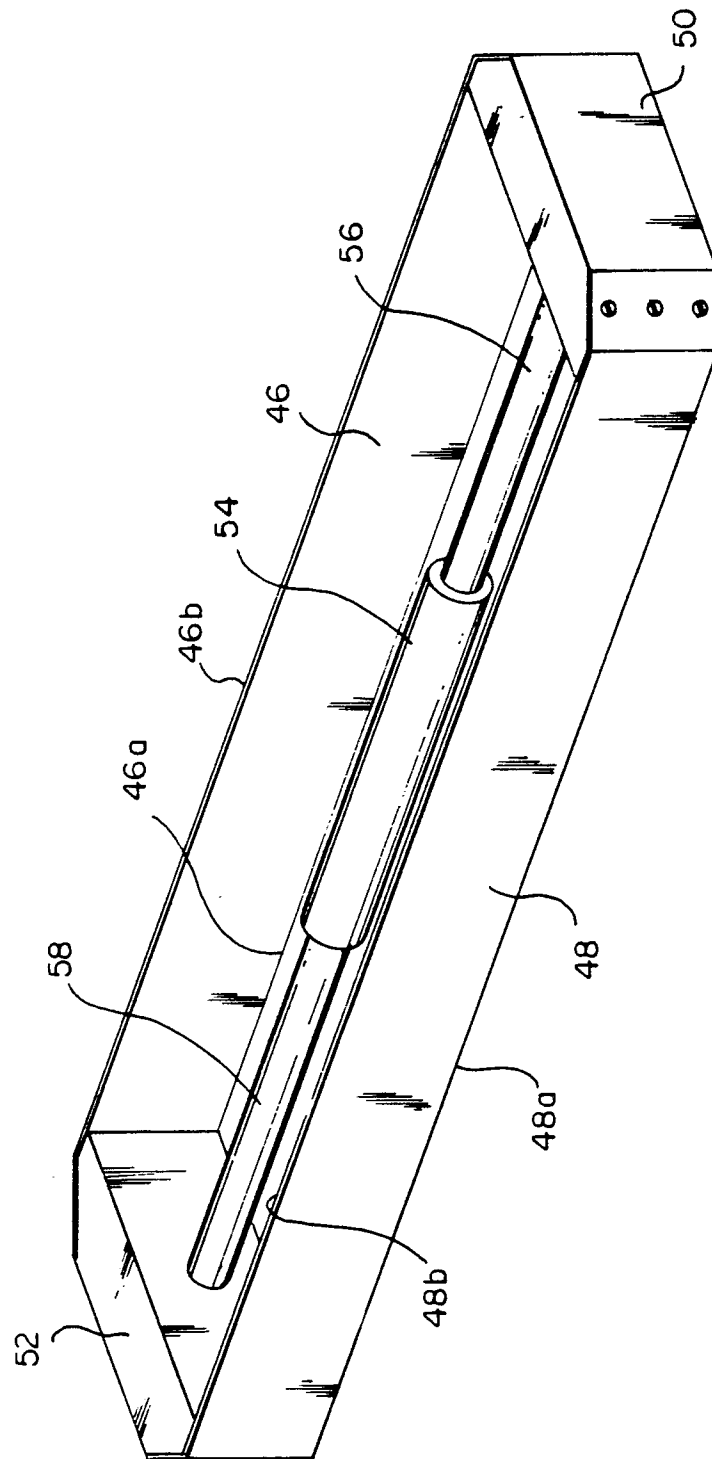




FIG. 3





European Patent  
Office

# EUROPEAN SEARCH REPORT

0203492  
Application number

EP 86 10 6810

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
D,A	US-A-4 338 880 (K. TABUCHI et al.) * figures 2, 5, 7, 8 *	1	G 03 G 15/09
D,A	--- US-A-4 392 735 (T. OKA) * figures 1-3 *	1	
A	--- DE-A-2 225 287 (KONISHIROKU PHOTO INDUSTRY) * figures 1, 2 *	1	
A	--- DE-A-2 758 239 (CANON) * figure 2 *	1	
A	--- US-A-4 083 633 (A.L. SHANLY) * figure *	1	
A	--- DE-A-3 343 701 (RICOH) * figures 1-8 *	1	G 03 G 15/00 G 03 G 21/00
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The present search report has been drawn up for all claims			
Place of search BERLIN		Date of completion of the search 11-08-1986	Examiner HOPPE H
<b>CATEGORY OF CITED DOCUMENTS</b>			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons - : member of the same patent family, corresponding document	