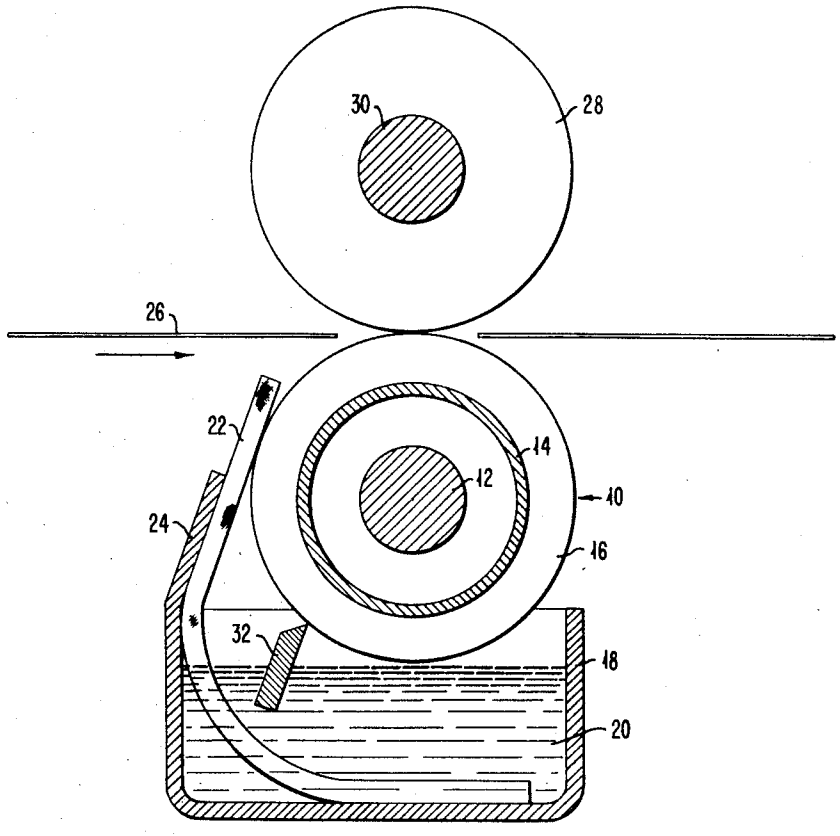
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LOOSE TONER PICK-UP DEVICE

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LOOSE TONER PICK-UP DEVICE

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1 Claim. (Cl. 15—3)

This invention relates to mechanism for removing loose toner particles from sheets or webs which have been subject to electrostatic printing. The invention is particularly useful for the removal of toner flakes and background from statistical cards produced by xerographic printing.

In the xerographic process of printing, a plate of electroconductive material has formed thereon a coating of photoconductive material, i.e., a material which possesses the property of being electrically conductive only when exposed to light. The plate so coated is given an electrostatic charge and while being maintained in darkness, is next exposed, in part, to light. Wherever light strikes the charged plate, the surface coating thereon becomes conductive, thereby permitting the electrostatic charge at such exposed areas to be dissipated. Wherever no light strikes the charged plate, the electrostatic charge remains upon the coating in the form of a latent electrostatic image.

The latent electrostatic image is then developed by bringing into contact therewith an electroscopic powder or xerographic toner, as it is sometimes called; this powder is a very fine powder usually made up as a resin base material, and contains a color imparting substance.

The xerographic toner may be negatively charged, for example, in respect to the image charge on the plate and is attracted only to the unexposed portions of the coated plate constituting the latent electrostatic image. The powder on the exposed areas will not adhere to the coated plate and can be removed by gravity, for example. This produces an electroscopic powder image which is transferred to a copy sheet where it is fixed, by heat, for example, into or onto the copy sheet to produce a permanent print of the image.

The image fixing step leaves a certain amount of background toner particles which for ordinary purposes may be tolerated. However, when documents so produced are intended for repeated use in automatic accounting systems, as in the case of statistical cards, all loose toner particles must be removed from the document if difficulty resulting therefrom in the accounting equipment is to be avoided.

The problems resulting from loose toner particles can be partially eliminated by passing the documents through card brush stations in which a substantial amount of the loose toner is removed. Even so, a small deposit of loose toner remains which causes toner build-up in the form of toner flakes in feeds through which the documents are subsequently passed. A mere wiping or brushing of electrostatically printed documents fails to remove all the loose toner for the reason that loose toner particles and flakes thereof are carried to an edge of the document where, apparently by reason of an electrostatic charge, they pass about such edge and to the opposite side of the document.

The accumulation of toner flakes and background particles in the mechanism of automatic accounting systems will cause failure in the operation of such systems. For

example, such accumulations have caused failure when xerographically printed statistical cards were run through a card collator.

Toner flakes are caused by the loose toner of electrostatically printed documents being picked up on the feed rolls and other components of automatic accounting machines in close contact with the documents. Continued toner build-up on these components forms a loosely packed layer. When these components come in direct contact with the printed card or document, a hard layer of toner is formed on the components. This layer, continually disturbed by the passage of the card or document in contact therewith, causes small flakes to travel from the feed rollers and the like to the surfaces of the documents.

It is, therefore, the principal object of this invention to provide means to effect the removal of toner flakes and unfixed toner background particles from electrostatically printed documents, such as statistical cards.

The manner in which the principal object of the invention can be attained, together with other objects and advantages thereof, will become apparent from a consideration of the following specific description of one form of mechanism illustrated in the drawing, forming a part hereof, and, in which:

Fig. 1 is a cross-sectional view of mechanism containing a pair of rollers adapted to remove loose toner from electrostatically printed documents.

The mechanism illustrated in the drawing is suitably designed as an attachment for an electrostatic printer, although it may be constructed as an independent cleaning device through which electrostatically printed documents are passed after the printing thereof and before the use of such documents in automatic accounting systems. The illustration of Fig. 1 is, therefore, of a diagrammatic nature illustrating the essentials of the necessary mechanism in whatever form it is embodied.

Essentially, the mechanism comprises a gelatin roller **10** whose surface is maintained in a tacky condition such that toner particles carried into contact therewith on the face of electrostatically printed documents will adhere to the gelatin roller whereby the document is freed of such loose particles. The gelatin roller **10** is adapted to rotate on an axis **12** and includes a cylindrical structural member **14** of steel, brass or other suitable material to the peripheral surface of which is molded a gelatin layer **16** composed of a gelatin-glycerin compound such that the surface of the layer **16** can be maintained in an adhesive or tacky condition.

Beneath the roller **10** and extending throughout the length of the roller is a trough **18** adapted to receive a non-evaporative plasticizer **20** for the gelatin layer **16**; such plasticizer can be suitable ethylene glycol or glycerin compounds. Application of the plasticizer **20** to the gelatin layer **16** maintains the face of the roller in a suitable tacky condition such that loose toner particles will adhere to it. The plasticizing composition **20** is suitably applied to the gelatin roller by means of a wick **22**, which extends into the trough **18** where it is immersed in the plasticizing composition **20** such that the plasticizer is lifted through the wick by capillary action and applied to the face of the gelatin roller where the wick and the roller lie in contact with each other. Suitable contact between the wick **22** and the gelatin face of the roller **10** can be maintained by an inturned flange **24** constituting one longitudinal lip of the trough **18**.

Electrostatically printed documents, such as statistical cards **26**, having loose toner particles on a face thereof, are fed in contact with the tacky gelatin face of the roller **10** by means of a feed roller **28** which is adapted to rotate on an axis **30**. As illustrated in the drawing, the feed roller **28** is rotated in a counterclockwise direction

such that the documents or cards **26** are fed between the feed roller **28** and the gelatin roller **10** from left to right.

The feed roller **28** may also be provided with a tacky face, such as the gelatin face **16** of the roller **10**. In such an event, the document **26** can be fed between the roller with the printed face contacting either roller. If a single gelatin roller is employed as in the illustrated embodiment, the printed document should be fed between the rollers with the printed face in contact with the gelatin roller **10**. As the document **26** passes between the rollers, any loose toner particles adhering to the document will be transferred to the gelatin face **16** of the roller **10** and will consequently be removed from the document. Excess plasticizer and toner particles are removed from the gelatin face of the roller **10** by means of a doctor blade **32** within the trough **18** and extending in axial contact with the face of the gelatin roller.

An electrostatically printed statistical card was examined under a microscope before and after the same was subjected to the cleaning action of the gelatin roll herein. A large number of toner particles were observed over the unprinted part of the card before cleaning. Some particles were loosely disposed on top of the paper fibers, others, which were very fine particles, were located in the cavities formed in the interlocked fiber structure of the card. The microscopic examination of the card after cleaning with the gelatin roller mechanism herein described demonstrated that all of the loosely held particles on the face of the card were removed by the cleaning operation.

When the mechanism is not in use, the gelatin roller should be taken out of contact with the wick **22**, the feed roller **28** and the doctor blade **32** to avoid deformation of the face of the gelatin layer. To prevent swelling of the gelatin roller when not in use, it should be lifted out of contact with the plasticizing composition contained in the trough **18**. Continued stationary contact of the gelatin roller with the feed roller **28** and the doctor blade **32** may cause flat areas on the gelatin roller since the gelatin shows a tendency to take a set when in prolonged stationary contact with other surfaces, such as the feed roller **28** and the doctor blade **32**. Continued application of the plasticizer to the gelatin roller through the wick **22** while the roller is stationary may cause swelling of the gelatin layer in that area by reason of the continued plasticizing action of the glycerin or ethylene glycol solution being fed by the wick.

While the illustrative embodiment of the invention refers specifically to gelatin as a suitable compound for the face of the cleaning roller, it is understood that a variety of other materials can be employed. For example, rubber latex, maintained in a suitable plastic state, exhibits a tacky characteristic which can be suitably employed as a cleaning surface for the removal of the toner particles.

While the fundamentally novel features of the invention have been illustrated and described in connection with specific embodiments of the invention, it is believed that these embodiments will enable others skilled in the art to apply the principles of the invention in forms departing from the exemplary embodiments herein, and such departures are contemplated by the claim.

What is claimed is:

Mechanism for removing loose toner particles on the surface of electrostatically printed documents comprising: a first roller mounted for rotation on a fixed horizontal axis, a second roller mounted for rotation above said first roller on a fixed axis parallel to the axis of said first roller such that the peripheries of said rollers are substantially in contact with each other to form a document feed path therebetween in which loose toner particles are adapted to be removed from the face of an electrostatically printed document in contact with said first roller, means for rotating said rollers to feed said document through said feed path, said first roller having a peripheral surface composed of a material adapted to become tacky when treated with a plasticizing agent, a trough located under said first roller and extending along the entire length thereof for holding a plasticizer for the peripheral surface material of said first roller, a wick extending from said trough into contact with the peripheral surface of said first roller for transferring plasticizer from said trough to said first roller, means in said trough for holding said wick in contact with said first roller, and a doctor blade in said trough extending into contact with said first roller for removing plasticizer and toner therefrom, said doctor blade being in contact with the peripheral surface of said first roller along an axial line located behind said feed path but in front of said wick when viewed in relation to the direction of rotation of said first roller.

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