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DEVICE FOR REMOVING AND DETECTING FOREIGN MATTER FROM A SURFACE

Filed April 25, 1960

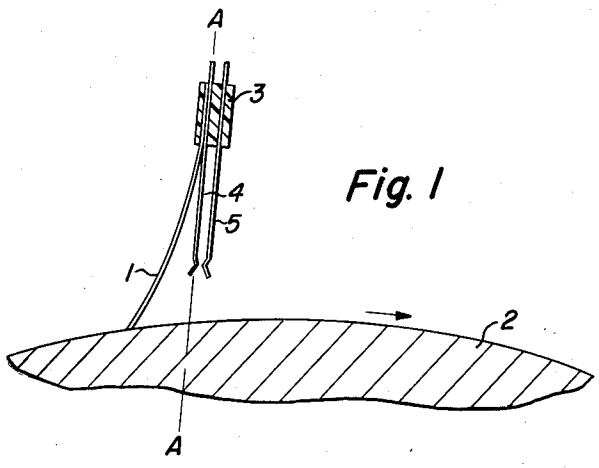


Fig. 1

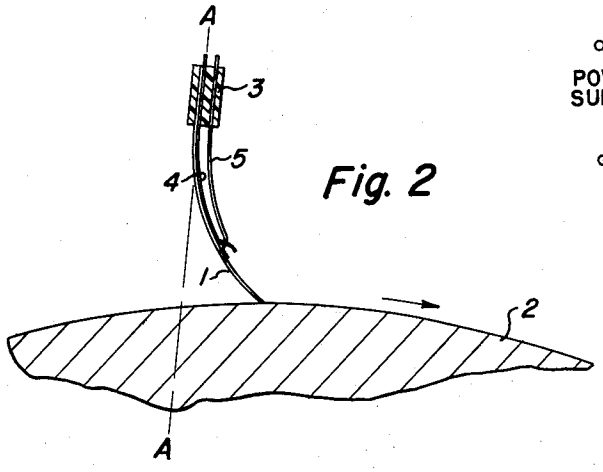


Fig. 2

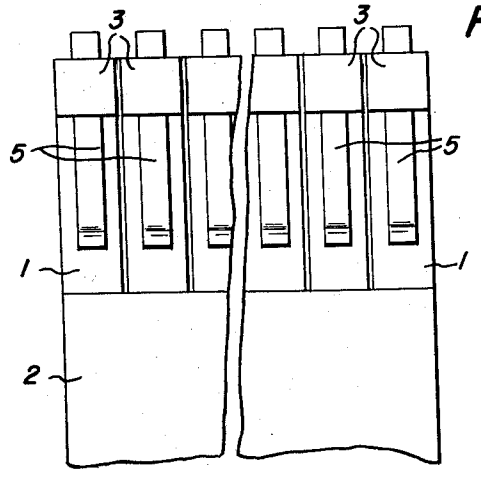


Fig. 3

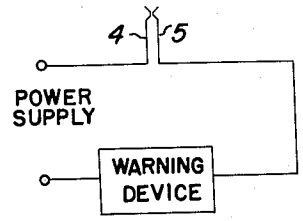


Fig. 4

ANTHONY S. CROSS
INVENTOR.

BY R. Frank Smith
Steve W. Grembau
ATTORNEYS

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DEVICE FOR REMOVING AND DETECTING FOREIGN MATTER FROM A SURFACE

Anthony S. Cross, Harrow, England, assignor to Eastman Kodak Company, Rochester, N.Y., a corporation of New Jersey

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This invention relates generally to detectors, and more specifically to a device for removing any removable foreign matter from a surface and detecting any foreign matter not removable therefrom.

During calendering operations on paper, foreign matter, such as a piece of sticky paper, may adhere to the roller and cause damage to the paper. This foreign matter may be so small that it cannot be seen on the moving surface, but can nevertheless cause damage.

It is an object of the present invention to provide a device that will detect the presence of foreign matter on a moving surface without stopping the surface.

Another object of this invention is to provide a detecting mechanism of simple design and construction, thoroughly reliable and efficient in operation, and economical to manufacture.

In accordance with the present invention, there is provided a device for detecting foreign matter including projections and other imperfections on a moving surface. The device comprises a thin flexible blade having one end resting against a moving surface and normally flexed in a direction opposite to the direction of movement of the surface for scraping foreign matter off of the surface. A switch which is connected in the circuit of a warning device, not shown, is disposed adjacent to the flexible blade, and when the blade is engaged by a foreign body or projection on the moving surface which resists the scraping action of the blade, the latter is flexed past its dead center position and actuates the switch to energize the warning device.

According to a preferred embodiment of the invention, a plurality of flexible blades and associated switches extend transversely across the moving surface.

In order that the invention may be clearly understood, one form thereof will now be described, by way of example, with reference to the accompanying drawing, in which:

FIG. 1 is a segmental side elevation view of a roller and detecting device constructed in accordance with a preferred embodiment of the invention, the flexible blade being shown in its normal flexed condition;

FIG. 2 is a view similar to FIG. 1, but with the flexible blade moved to a warning position;

FIG. 3 is a front elevation of FIG. 1 showing a plurality of the detecting devices extending along the axis of the roller; and

FIG. 4 is a schematic view of the electrical circuit of the warning device.

As illustrated, a thin flexible blade **1** has one end resting against the surface of a rotatable roller **2**, such as is used in calendering operations on paper, and the other end secured in a clamp **3** which is attached to a fixed part of the apparatus. The length of blade **1** is greater than the distance between the clamp **3** and the surface of roller **2** so that blade **1** may be flexed to take up either the normal wiping position shown in FIG. 1, in which it extends in a direction opposite to the direction of rotation of roller **2**, or the detecting position shown in FIG. 2 in which blade **1** extends in the direction of rotation of roller **2**. Stated in another way, in the normal wiping position, the surface engaging end of blade **1** is disposed on one side of a plane A—A within which the greater

portion of a contact **4** lies as seen in FIG. 1, and in the detecting position of FIG. 2, the surface engaging end of blade **1** is disposed on the opposite side of plane A—A.

An electrical switch contact **4** and a similar switch contact **5** comprise flexible strips secured at one end to clamp **3** and having their free ends formed inwardly towards one another. Conveniently, clamp **3** comprises three pieces of insulating material between which blade **1** and switch contacts **4** and **5** are sandwiched. The switch contacts **4** and **5** are connected in the circuit of a warning device shown schematically in FIG. 4 of any suitable type which will provide a visible and/or audible signal when contacts **4** and **5** are closed by blade **1** as hereinafter explained. The switch contacts **4** and **5** have greater flexibility than blade **1** and offer litle resistance to the movement of the blade from the position shown in FIG. 1 to the position shown in FIG. 2.

In practice, it has been found that a foreign body 0.0015 in. thick can be detected by employing a flexible blade 1 in. wide and 3 ins. long made from 0.005 in. thick polyester film and ½ in. wide contacts made from 0.002 in. chromium-plated brass shim.

The blade **1** may extend the full length of roller **1**, but it is preferred to employ a plurality of flexible blades, as shown in FIG. 3, so that the position of a foreign body may more readily be located. As shown in FIG. 3, the flexible blades **1** extend along the full length of roller **2** and each blade **1** is associated with its own pair of switch contacts **4** and **5**, these contacts being connected in parallel in the circuit of the warning device.

In use, each flexible blade **1** is flexed to the normal position shown in FIG. 1 in which it extends in a direction opposite to the direction of rotation of roller **2**. When a foreign body on roller **2** engages the tip of one of the blades **1**, it will either be scraped off the surface of roller **2** by blade **1** or it will flex the blade past its dead center position to the position shown in FIG. 2 in which blade **1** presses contact **4** against contact **5**, thereby causing energization of the warning device. The detected foreign body may then be removed from the surface of roller **2** and blade **1** re-set by raising it from the surface of roller **2** and flexing it to the normal position shown in FIG. 1.

Although the detecting device according to the invention has been described and illustrated as applied to the detection of foreign bodies on a rotating roller, it may also be employed for the detection of foreign bodies on other moving surfaces. The device will also detect projections and other imperfections on any moving surface.

The invention has been described in detail with particular reference to a preferred embodiment thereof, but it will be understood that variations and modifications can be effected within the spirit and scope of the invention as described hereinabove and as defined in the appended claims.

I claim:

1. In a device for removing foreign matter from a surface and detecting any such matter not removable therefrom, the combination comprising: a surface; detecting means having a portion thereof in wiping engagement and relative movable relation with said surface and responsive to foreign matter on said surface which it is incapable of removing for movement of said portion in the plane of said surface from a normal wiping position, in which it removes foreign matter from said surface to a detecting position; a normally open switch responsive to said detecting means for movement to a closed position upon movement of said portion to its detecting position; and a warning device in circuit with said switch and actuable upon closure thereof by said detecting means.

2. The invention according to claim 1 wherein said detecting means comprises a flexible member.

3. The invention according to claim 1 wherein said

detecting means comprises a thin flexible blade of polyester film having one end engaging said surface.

4. In a device for removing foreign matter from a surface and detecting any such matter not removable therefrom, the combination comprising: a moving surface; a support spaced from said surface; a flexible member having one end secured to said support and the opposite end in wiping engagement with said surface and movable between a normal wiping position, in which said member is flexed in a direction opposite to the direction of movement of said moving surface, and so remains as long as it does not encounter any foreign matter on said surface which it is incapable of removing, and a detecting position in which said member is flexed in the same direction as the direction of movement of said surface and to which it is moved by any foreign matter on said surface which it is incapable of removing; a normally open switch including a pair of parallel, spaced apart flexible switch contacts carried by said support, said contacts being out of engagement with said member while in its normal wiping position and adapted to be engaged and closed by said member as it moves to its detecting position; and a warning device in circuit with said switch and actuable upon closure thereof by said member.

5. The invention according to claim 4 wherein one of said switch contacts in the open position lies in a plane transverse to said moving surface, and said flexible member comprises a thin blade having one end secured to said support adjacent said switch contacts and the opposite end in the normal wiping position of said member being disposed on one side of said plane, and in the detecting position being disposed on the opposite side of said plane.

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