United States Patent [19]

Shenker

[11] **3,899,137**

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[54] **CLEANING DEVICE FOR PHOTO-SLIDES**

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[21] Appl. No.: **533,636**

[52] **U.S. Cl.** **239/545;** 239/289; 239/566; 34/160; 34/DIG. 13; 134/122

[51] **Int. Cl.²** .. **B05B 1/26;** B05B 1/20; F26B 13/02; B08B 5/02

[58] **Field of Search** ..... 239/289, 543–545, 239/566, 602; 34/23, 34, 33, 155, 160, DIG. 13; 134/37, 131, 122, 151; 118/316, 325

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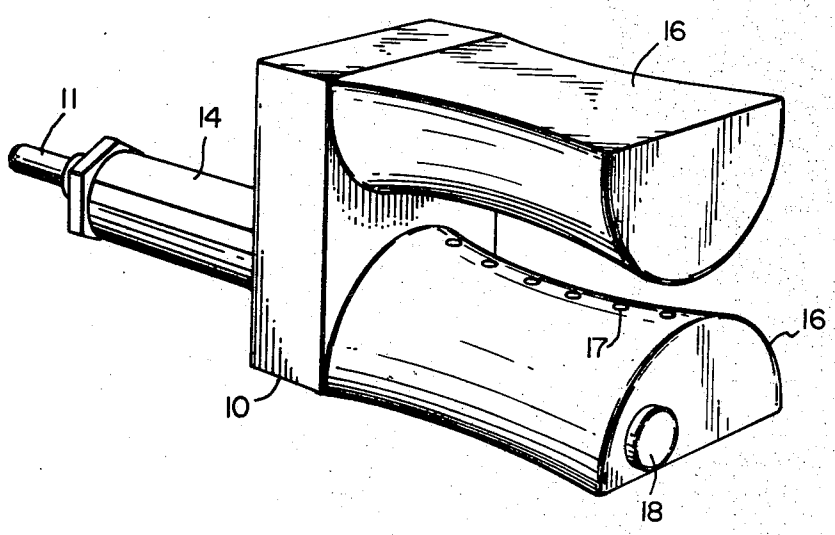
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Primary Examiner—Robert S. Ward, Jr.

[57] **ABSTRACT**

A photo slide cleaning apparatus which includes allochirally shaped members of compound curvature having concavely shaped surfaces which are juxtaposed so as to provide space for easy passage therethrough of a slide and containing opposed openings for passage of air in the form of jets to remove dust from said slide.

6 Claims, 4 Drawing Figures



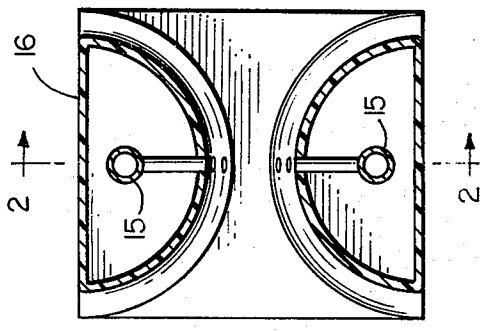


FIG. 3

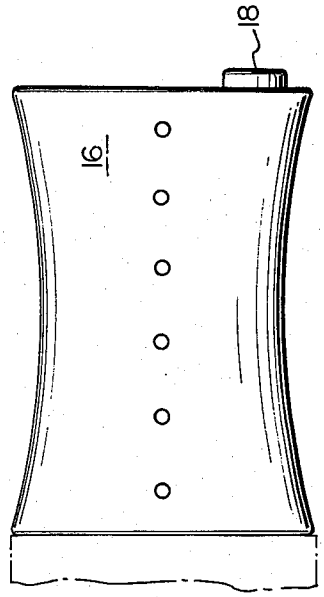


FIG. 4

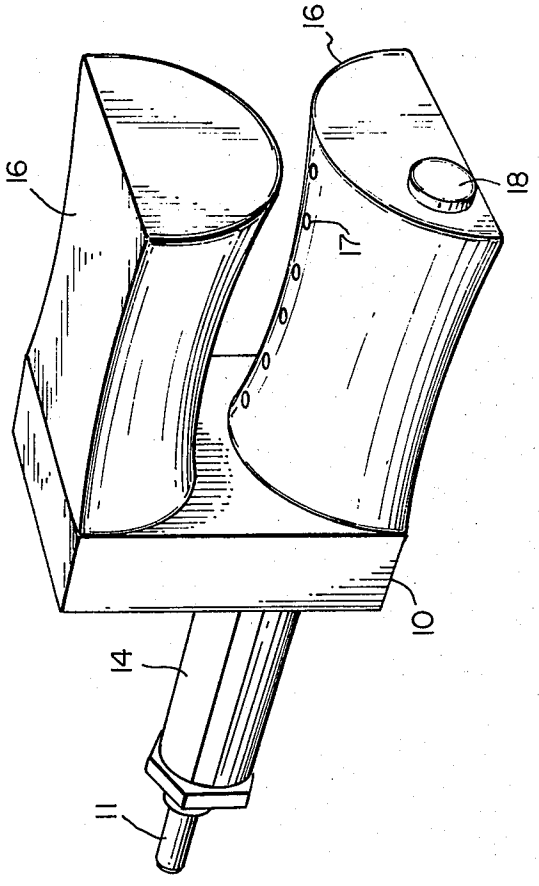


FIG. 1

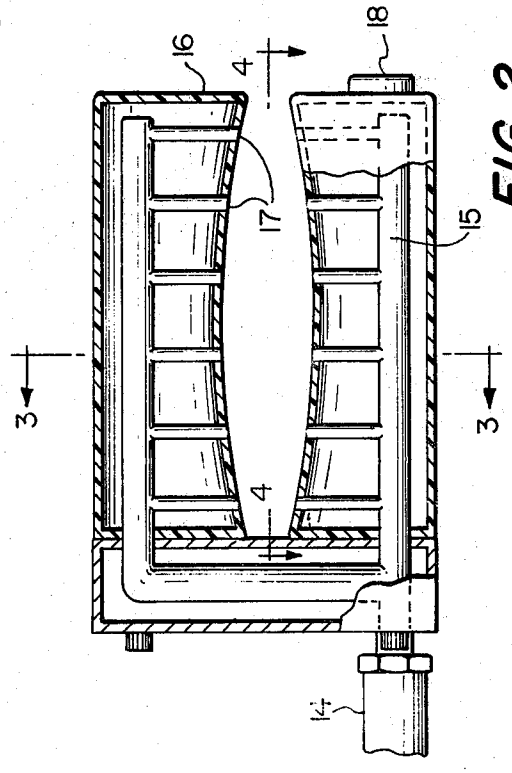


FIG. 2

CLEANING DEVICE FOR PHOTO-SLIDES

This invention relates to photography and is particularly concerned with the removal of dust from photographic transparencies mounted in their holding frames. In recent years, the number of 35 mm cameras in use has greatly increased. When pictures are made from the resulting 35 mm slides from such cameras, they have to be enlarged. However, enlargements will proportionately increase the size of imperfections. Since the cost of an enlargement is substantial, any defect in appearance, such as could be formed by dust particles, becomes an expensive error.

Fine dust particles of under 50 microns in size are invisible to the naked eye. When enlarged, they will show up on the photo print as small black or white dots which are very detrimental to the finished appearance of the pictures. The prior art has attempted to solve this perplexing problem by using opposed cleaning brushes, as in Smith U.S. Pat. No. 2,351,371; by using opposed wiping cloths, as in Christiansen U.S. Pat. No. 3,644,953; and by using vacuum and brushes as in Gould U.S. Pat. No. 1,926,981. Air jets have been used in combination with rotating brushes involving flutter as in Troia U.S. Pat. No. 3,470,576. Opposed air jets are also known, but are used for clearing liquid as in Capstaff U.S. Pat. No. 2,289,753. However, moving brushes and wiping cloths develop static electricity, which holds onto the fine dust, and cannot remove the fine dust particles located in the corners of the holding frame for the slide.

It is therefore an object of this invention to avoid these disadvantages of the prior art devices, and to provide instead a slide cleaning device that allows simple one-handed use by an operator.

It is a further object to provide opposed air jets with apertures large enough to prevent recombination of the ionized air yet still provide enough penetration of laminar air layers to force off dust situated not only on the surfaces of the slide, but also to force the accluded dust off in the corners of the slide frame.

It is a further object to employ a design for the air jet members that will minimize the Bernoulli effect which would draw the slide towards one air jet surface.

It is a further object to design the device so that a slide cannot contact the device even though the slide is manually transported without guides.

The novel features and advantages of the present invention will become apparent after reading the following description which refers to the accompanying drawing wherein:

FIG. 1 is a perspective view of the cleaning device in accordance with the invention as seen from the front end;

FIG. 2 is a cross-section view of the device taken along the line 2 — 2 of FIG. 3;

FIG. 3 is a vertical cross sectional view taken along lines 3 — 3 of FIG. 2; and

FIG. 4 is a top view of the device with the top half removed taken along lines 4 — 4 of FIG. 2.

The device shown in the drawings has a metal base 10 which could be aluminum or any other metal. Pipe 11 is connected at one end to a source of compressed air (not shown) with the other end connected to an air ionizing vessel 12 containing radio active substance, such as polonium, which, in turn, is connected to base 10 by means of pipe 14. As the compressed air flows

through the ionizer, it picks up the ions that will flow through pipes 15 and then through the jet openings 17 to neutralize the static charges that are present and then to remove the dust that is present. The openings 17 in members 16 permit the ions to freely flow through and to provide sufficient penetration of the space between the members 16 and to provide enough force to remove the dust not only on the surface, but also in the corners of the holding frame. To minimize the Bernoulli effect which would tend to draw the slide to one surface or the other requires specially shaping members 16. Members 16 are made of nylon, but any material could be used instead. As illustrated, members 16 are allochirally juxtaposed to provide space therebetween for the slide, and are shown as having a compound curvature of semi-circular cross-section, with concave outer surfaces facing each other, and provided with centrally located, along its longitudinal length, tubular openings equidistantly spaced. The openings are arranged in opposed relation so as to insure that the air completely removes the dust both from the surface and in the corners of the slide frame. The number of such openings will depend upon the size of the flat work to be cleaned, and the amount of pressure needed for such work. Button 18 is a manually operated tripping valve to release an air vent valve (not shown) to open the air flow coming from the compressor (not shown). This manual tripping valve can be replaced with magnetic, electrical, or photo electric switch valves, which can be placed in any required location or configuration.

FIG. 2 clearly shows how pipe sections 15 are fitted into the plastic member 16, with provision for tubular openings 17 more clearly shown in FIG. 3.

In a typical example for using the described dust removing device for cleaning a 35 mm slide mounted in a cardboard frame, the operator holds the frame at one corner, inserts the slide between the jaws and with that same hand also touches button 18. This trips the main air valve which yields a timed pulse of ionized air through the opposed openings 17. The amount of air used is about 35–80 p.s.i., approximately 40 cfm and a blast of time of 1.5 to 3 seconds. As the slide is passed between the air jets, the static electricity is neutralized and all the dust down to micron size is blown off and thus removed. Because the static electric charge is neutralized, the dust is not reattracted to the surface of the slide. Slides put through this simple process have proven to be completely dust free because no spots are observed in the enlarged pictures made from these cleaned slides. The size of the tubular openings 17 used for this 35 mm slide is about 1/16' in diameter. It is emphasized at this point that it is important for maximum dust removal to relate the size of the openings for the jets of air and the air pressure to the size of the work to be cleaned.

Though the example described is for cleaning a photo-slide held in a frame, it is evident that this dust removal device could be equally effective to remove dust from glass photographic plates, lantern slides, tiny transistors, microcircuity, microscopic slides of inorganic or organic cells and crystals, glass or plastic optical or eye lenses, and any miniaturized flat object having surfaces that require clarity for vision or processing. As a matter of fact, even movie film can be cleaned by arranging a conveyor system for intermittent stopping

or continuous passage between the jaws of the dust remover.

Though a manual example is described, this dust remover device could be included in an automatic system with suitable trip valves for locating the flat work to be cleaned between the jaws of the device.

The air ionizing means could be effected with any radioactive element or compound, or with an A.C. or D.C. electrical means, or with corona.

The invention is defined in the claims which follow.

I claim:

1. A device for cleaning dust from a miniaturized flat article comprising two allochirally shaped and juxtaposed members providing a space therebetween for insertion of the work piece, said members having a compound curvature of semi-circular cross-section with opposed surfaces that are concave, with each said face having openings for providing opposed air jets.

2. The device of claim 1 wherein the openings are located along the longitudinal center axis and equidistantly spaced.

3. The device of claim 2 wherein the openings are tubular.

4. The device of claim 3 wherein the openings are about 1/16 of an inch in diameter for removing dust from a photo-slide.

5. The device of claim 1 wherein an air ionizing means is connected to a compressed air source so as to provide ionized air for the jets.

6. A dust removal device for small flat work pieces comprising juxtaposed concavely surfaced members containing a series of longitudinally spaced openings to provide air jets as the sole means for cleaning the dust from said work when placed between the jaws of said members.

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