AUTOMATIC FILM CLEANER


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7 Claims. (Cl. 15—100)

Our invention relates to an improved automatic film cleaner particularly useful with an automatic film inspecting device of the type shown in Robert Grunwald Patent 2,699,676 and in the co-pending application of Robert Grunwald and Richard R. Wallace, Serial Number 591,962, filed June 18, 1956, entitled Control Mechanism for Automatic Film Inspecting Device, now Patent No. 2,939,972.

In accordance with the present invention a lengthy motion picture film is cleaned by drawing the same between a pair of moving cleaner tapes. These cleaner tapes sandwich the film being cleaned and are guided to the sandwiching position by a pair of conducting shoes. One shoe, preferably the lower shoe, is in fixed position. The other shoe, preferably the upper shoe, is swingable up and down to provide access to the gap between the shoes to permit the film to be inserted and removed. The movable shoe includes tape guide elements which serve to bias or force the shoe towards the closed position in response to the tension on the tape. Further in accordance with the present invention the lower shoe includes a liquid cleaner well which is controllably supplied with a conducting cleaner liquid. The amount of cleaner liquid in the gap determines the resistance measured between the two shoes. The supply of liquid cleaner fed to the gap is interrupted when the resistance falls below a predetermined value.

In use, the shoes and cleaner tapes are drawn into a tight relationship with the film to wipe in constant pressure therewith and the liquid cleaner supply is maintained at a value giving a predetermined resistance between the shoes. This resistance is in fact a measure of the degree of extent of the lower and upper tapes that absorb the liquid cleaner. Consequently the action serves to provide a uniform degree or quantity of liquid cleaner for film cleaning purposes. Since the action that controls the amount of liquid cleaner supply is an integrating action, the mechanism operates in a self-regulating fashion to compensate for local flooding of the tape. It does not tend to give excessive liquid cleaner feed when there is an excess of liquid cleaner in one spot and an inadequate amount in another. Such flooding accordingly remains local in nature and after a period of operation the liquid cleaner spreads to cover the entire portion of the tape between the shoes due to capillary action.

It will be seen from a general view of the present invention to provide an improved automatic film cleaner particularly suitable for use with an automatic film inspecting device.

A more particular object of the present invention is to provide an improved automatic film cleaner in which the requisite amount of film liquid cleaner is automatically supplied to the film cleaning tapes.

Still another object of the present invention is to provide an improved automatic film cleaner in which the liquid cleaner is supplied to one tape and is uniformly distributed by capillary action of the tapes.

It is yet another object of the present invention to provide an improved automatic film cleaner utilizing a pair of conducting shoes between which the film cleaning tapes are sandwiched and in which an eccentrically located well on the lower shoe serves to supply liquid cleaner in controlled amounts for distribution by capillar
is overlap beyond the film edges which enhances the distribution of the cleaning liquid to top tape 14a as will be discussed in more detail hereinafter. The reels 46 and 40 are power driven by motors or similar means (not shown). The tapes 14c and 16a move in the direction of the arrows, towards edge 12a of panel 12 whereas the film 18 travels in the opposite direction, as shown by the dotted arrow, FIGURE 1. The purpose of the opposed movement of the tapes and film is to insure that a maximum wiping effect is realized between the same to achieve maximum cleaning results. Slave reels 36 and 38 have retarding or braking devices (not shown) which exert considerable resistance to power reels 46 and 40, respectively. The tape 18 travels on a relatively fast forward pace through the gap of shoes 14 and 16 to provide maximum production of cleaned film.

Referring now to FIGURE 2, top shoe 14 and bottom shoe 16 are of stamped sheet metal of channel-shaped cross section. Cleaner tapes 14c and 16a travel across horizontal portions 14b and 16b of the shoes, respectively. The film 18 is sandwiched between the tapes in the manner shown. The tapes, which are of soft, resilient material, such as velvet, will compress in the center to accommodate the narrower film. There will be overlap of the tapes at either edge, however, because of the greater width of some shoes. As can readily be seen, the liquid absorbing tapes 14c and 16a bear down against both sides of the film 18 to create a substantial frictional relationship which insures good cleaning action.

As best seen in FIGURES 1 and 2, bottom shoe 16 has a liquid cleaner well 20 depending upon the fluid applied to the horizontal portion 16b by welding or similar means (not shown). The well has an opening 28a which is cut out from horizontal portion 16b of bottom shoe 16. Tape 16a travels across the opening 28a and picks up the liquid cleaner 21 which is contained therein. It will be noted that only tape 16a travels across well 20 and consequently is the only cleaner tape that initially picks up the liquid cleaner. The top tape 14c absorbs liquid cleaner from bottom tape 16a by capillary action which takes place at the edges of the tapes that overlap. To facilitate this capillary action, the well 20 is mounted eccentrically, that is, as shown in FIGURE 2. A heavy concentration of absorbed liquid cleaner at one edge of bottom tape 16a is transferred much more readily and effortlessly to the top tape 14c than a heavy concentration in the center of the bottom tape. Thus both tapes absorb the requisite amount of liquid cleaner for efficient and effective cleaning action.

The well 20 has a downwardly extending nipple 48 with a bore 48b leading to the well proper. Rubber or plastic tubing 50 is fitted over the nipple in air tight fashion and extends upwardly to the drip chamber 26 and is secured on nipple 52 thereon as best seen in FIGURE 1. The drip chamber 26 is secured to panel 12 by bolts or otherwise (not shown) and has a glass covered opening 26a through which the rate of drip of the liquid cleaner 21 can be observed. Needle valve 28 controls the rate of liquid drip which can be varied by turning handle 28a which extends out of edge 12c of panel 12. It will be noted that drip chamber 26 is raised with respect to well 20 so that the well is supplied liquid cleaner by gravity feed.

A feed pipe 54 connects solenoid operated valve 24a with drip chamber 26. The solenoid 24, when actuated, releases plunger 56, which is a valve stem, to open the supply liquid cleaner from feed bottle 22. The solenoid operates intermittently and is energized by electrically operated control elements which will be described in more detail hereinafter. The solenoid 24 and its associated valve 24a are supported by elements 57 which are secured to bracket 58 by screws 60. The bracket 58 is mounted on panel 12 by welding or similar means (not shown). The feed bottle 22 is received in a spout pan 23 which fits over the portion of solenoid valve 24a projecting above edge 12d as seen in FIGURE 1.

Referring now to FIGURE 3, bottom shoe 16 is rigidly affixed to panel 12 by welding, as shown at 17. Top shoe 14 is situated above and coextensive with the bottom shoe 16. As will be discussed in more detail hereinafter, top shoe 14 is mounted on insulating bracket 68 which is secured to panel 12 by screws 72. U-bar 44 is affixed to the front face 13c of element 13 and contacts 90, thus opening the valve and supplying cleaning fluid. Through this action, the tube 80 and the relay 82 call for fluid when there is no fluid between the plates 14 and 16.

The above condition continues to exist so long as the...
resistance between shoes 14 and 16 is above a predetermined value—that is so long as the liquid cleaner between these shoes is less than a predetermined amount. When this amount is exceeded, the resistance between the plates 14 and 16 falls below a predetermined amount and this resistance—combined with resistances 88 and 89—defines a voltage divider that reduces the negative potential on the control electrode 88a to a value that permits the tube 88 to conduct during a part of the A.C. voltage cycle of source 84. The result is that current flows through the relay 82 to energize that relay, open contacts 90, and deenergize the solenoid valve 24. The fluid supply is accordingly interrupted. Capacitor 85 limits chatter of the relay 82 when tube 88 is conducting.

It will be seen from the foregoing that the tube 80 and the relay 82 call for liquid cleaner when the resistance between plates 14 and 16 is above a predetermined value and that they bring the fluid supply to an end when that resistance is below a predetermined value.

The solenoid valve circuit has a test switch 94 which by-passes contacts 90 to energize solenoid 24 and lamp 96 for test purposes. Test switch 94 may also be used to operate the film cleaner 10 manually.

It is evident from the above discussion that the amount of liquid cleaner supplied to the cleaner tapes 14a and 16a is controlled by the amount of liquid present in the gap at any one time. Too little liquid in the gap causes well 20 to fill; too much liquid halts the supply. The elements that control the amount of liquid cleaner supply operate in self-regulating fashion. That is local flooding of bottom tape 16a in the vicinity of well 20 deenergizes solenoid 24 until the liquid is distributed evenly in the tapes by capillary action. At that time, the resistance increases and solenoid 24 is again energized to admit more liquid to the system. It is also evident that the force exerted by tape 14a on U-bar 44 to compress movable top shoe 14 closer to bottom shoe 16 has no relation to the control elements which influence solenoid 24 and solenoid valve 24c.

The liquid cleaner used in the present invention may be a cleaning solution using triethanolamine as a solvent to provide substantial conductivity. A blower (not shown) is received behind a hood 100 which is mounted in panel 12 to withdraw fumes from the cleaned film. The hood is so placed that it overlays film 18 after the film has been cleaned as seen in FIGURE 1.

While we have shown and described specific embodiments of the present invention it will, of course, be understood that alternative forms may be provided without departing from the true spirit and scope thereof. We therefore intend by the appended claims to cover all such modifications and alternative constructions falling within their true spirit and scope. What we claim as new and desire to secure by Letters Patent of the United States is:

1. An automatic film cleaner of the type in which a pair of relatively wide liquid cleaner-absorbing tapes sandwich a relatively narrow film travelling therebetween, comprising: a top conducting shoe complementary to the top shoe and receiving and supporting the second tape, the bottom shoe having a liquid cleaner well with an open face across which the second tape travels; means to supply conducting liquid cleaner to said well; an electrically operated control valve operable to arrest liquid flow through said means; means to draw the tapes across the shoes; means responsive to the tape pull to press the shoes together; and control elements responsive to the electrical resistance between said shoes to actuate said control valve to arrest the liquid flow to the well when the resistance between the shoes falls below a predetermined value.

2. An automatic film cleaner of the type in which a pair of relatively wide liquid cleaner-absorbing tapes sandwich a relatively narrow film travelling therebetween, comprising: a top conducting shoe receiving the
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7. Control means connected to said valve, said control means including a first electrode in electrical contact with the outer face of one of said tapes, a second electrode in electrical contact with the outer face of the other of said tapes, and resistance measuring means connected to said electrodes to open said valve when the electrical resistance between said electrodes is greater than a predetermined amount indicative of a dry condition of said tapes and to close said valve when the electrical resistance between said electrodes is less than a given value indicative of an excessively wet condition of said tapes.

8. An apparatus for controlling the flow of liquid to a film cleaning machine, said machine having liquid absorbent pads on which the film is wiped, said apparatus including an electrically conductive cleaning liquid; supply means to supply said liquid to said pads; and control means being connected to said supply means to increase the liquid flow to said pads when the electrical resistance is greater than a predetermined amount indicative of dry pads and to decrease the liquid flow to said pads when the electrical resistance is less than a given value indicative of excessively wet pads.

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