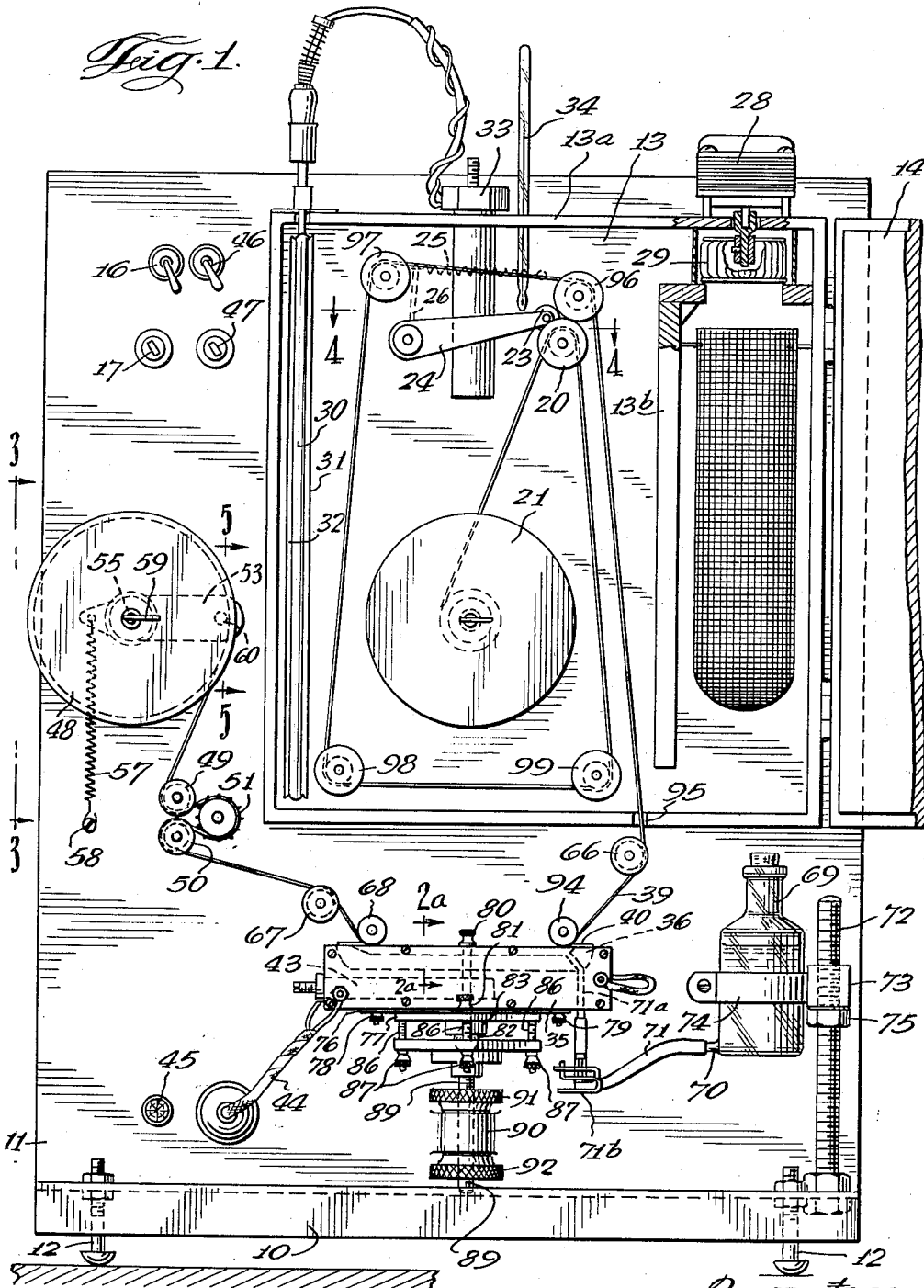


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APPARATUS FOR TREATING ONE SURFACE OF A STRIP

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2 Sheets-Sheet 1



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APPARATUS FOR TREATING ONE SURFACE OF A STRIP

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This invention relates to the continuous treatment of strip material and, in particular, comprises improved apparatus for sensitizing one coated surface of tape or other strip material.

The manufacture of our sensitive film includes the steps of applying a liquid sensitive gelatin coating on a film support such as a continuous transparent and fluid-impervius tape. Subsequently, the coated tape is sensitized by impregnating the gelatin with a reactive solution.

In connection with a hydrogen sulfide analyzer-recorder described in our co-pending patent application Serial No. 375,032, now U. S. Patent No. 2,800,397, we employ a sensitive-to-hydrogen-sulfide tape which comprises an acetate film base having a gelatin coating. This corresponds to motion picture film from which the photo-sensitive silver has been removed. By impregnation, we place a certain amount of lead acetate and sodium acetate into the gelatin coating.

An important object of the invention is to provide an improved apparatus for continuously feeding tape or other strip material over a treating solution to effect a controlled impregnation of a gelatin coating thereon. A further object of the invention is to provide an apparatus for the rapid, accurate and uniform treatment of the gelatin coating without injury or mutilation of the base strip material. A more specific object of the invention is to provide an apparatus which prevents the sensitized or gelatin side of the tape from coming in contact with the parts of the apparatus along which it moves to permit the use of relatively small amounts of treating solution, to provide means for maintaining the surface of the solution at a constant level, and to maintain the solution at the desired temperature.

Another object of the invention is to provide a system utilizing a sensitizing station and a drying chamber with means for feeding the supporting tape through the station and chamber in series so that the tape will be maintained in such a position that the sensitized gelatin coating is dried without contacting any portion of the apparatus. Still another object is to provide a system which controls the temperature and circulates air in the drying chamber whereby there is a progressive drying of the coating to produce a non-tacky sensitized strip. These and other objects of our invention will become apparent as the description thereof proceeds.

Briefly, we attain the objects of our invention by providing means for successively impregnating and drying a gelatin coating on a fluid-impermeable tape or base material which includes a temperature-controlled impregnating station which is provided with means for accurately maintaining the level of the impregnating solution such that it will contact the gelatin-coated surface of the moving tape without submerging the uncoated surface of the tape during the impregnating step. The drying chamber means includes a thermostatic heating unit paralleling a substantial span of the treated tape. Further details of construction and advantages of our apparatus will be described in conjunction with the accompanying drawings

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illustrating a preferred embodiment of the invention and wherein:

Figure 1 is an elevation, partly in section, showing one form of apparatus for impregnating a gelatin coating on a continuous support and for drying the impregnated coating;

Figure 2 is a side elevation, partly in section, of the apparatus shown in Figure 1;

Figure 2a is an enlarged fragmentary section of the trough taken along the line 2a—2a in Figure 1;

Figure 3 is a detail taken along the lines 3—3 in Figure 1;

Figure 4 is a detail taken along the lines 4—4 in Figure 1;

Figure 5 is a detail taken along the lines 5—5 in Figure 1;

Figure 6 is a detail taken along the lines 6—6 in Figure 3; and

Figure 7 is a detail taken along the lines 7—7 in Figure 2.

Similar reference numbers refer to corresponding parts in the several views of the drawings.

Referring to the drawings, the framework 10, comprising angle irons, supports 0.25 inch aluminum panel 11 upon which all of the components of our apparatus are mounted. Four bolts or feet 12 extending through the lateral surfaces of the angle irons 10 permit adjusting the apparatus to a level position.

A compartment 13 comprised of walls 13a and hinged cover 14 comprises the drying chamber.

A motor 15, controlled by switch 16 and fused by 17, provides the drive for moving the film or tape through the instrument. Gears 18 and 19 driven by motor 15 drive sprocket 20 and take-up reel 21 through a friction clutch 22 driven through belt 27. An idler 23 presses the film into engagement with sprocket 20 thereby preventing tape slippage. Tension is given to the idler 23 through pivoted arm 24 which is under tension from spring 25 attached to lever 26.

Electric heater 30 furnishes heat to control the temperature of the cabinet 13 to a constant value and motor 28 drives the squirrel cage blower 29 which circulates air through the drying compartment 13 about baffle 13b.

The heater 30 is shown in Figure 1, but for simplicity has been omitted from Figure 2. Radiating fins 31 and 32 are attached to heater 30 to aid in conduction of the heat. The temperature within the drying chamber 13 is maintained constant by thermal regulator 33 and the temperature is indicated by thermometer 34.

The treating or impregnating station 35 includes the trough 36 within constant temperature bath 37. The trough 36 is provided with parallel knife edges 38 which act like a ruling pen (see Figure 2a) permitting a 0.375 inch trace of chemicals to be impregnated in the gelatin coating 38a on the tape 39. Excess liquid is removed from the gelatin surface by transverse scraper 40.

The constant temperature bath 37 comprises an aluminum block and the temperature is maintained constant by strip heaters 41 and 42 which are controlled by thermal regulator 43, electrical power being brought to the heating elements by lead 44. Pilot light 45 indicates when the current is on. Power is furnished to motor 28 and heaters 30, 41 and 42 through switch 46, the circuit being fused through 47.

Film or tape 39 from the supply reel 48 passes over rollers 49 and 50 which maintain tension on sprocket 51. The supply reel 48 is maintained against a felt brake 52 shown in Figures 3 and 6 and the brake 52 is actuated through lever 53 to which is attached bearing 54. Attached to shaft 55 which rides in bearing 54 is drum 56 which is held against brake pad 52 by spring 57 which

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is anchored by pin 58. The film supply reel 48 is held onto shaft 55 by clamp 59.

Referring to Figure 5, the lever arm 53 is supported by the panel 11. Shaft 55a is held in socket 60 which is fastened to panel 11. A bearing surface for shaft 55a is provided by collar 61, the whole assembly being held onto the shaft 55a by pin 62.

Sprocket 51 furnishes additional braking action against the tape 39 from pulley 63, Figures 2 and 7, on which rides a small section of round leather belting 64 with tension applied by spring 65 which is anchored by pin 66. All of these wheel-like mechanisms are supported to the panel 11 by individual bearing members as shown in Figure 2.

Guide rollers 66 and 67 carry the tape 39 parallel to the exposed upper surface of the impregnation trough 36 and allow the trough 36 to be vertically adjusted so that the gelatin-coated surface of the tape 39 moves over the liquid surface in the trough 36.

The impregnating solution is retained in leveling bottle 69 provided with a tube connection 70 which permits the solution to flow through the plastic tubing 71 into trough 36. The liquid level in trough 36 is raised or lowered by positioning bottle 69 along the threaded rod 72 by collar 73, which supports bottle clamp 74, the selected position being secured by nut 75.

The coating station 35, including the trough 36 and the constant temperature bath 37, is adjusted by plate 76 which is fastened to platform 77 by knurled nuts 78 and 79. Loosening the knurled nuts 78 and 79 permits plate 76 to be positioned with respect to panel 11 through slots therein.

Lateral movement of station 35, parallel to panel 11, is controlled by the studs and knurled nuts 80 and 81 which are fastened to the trough assembly or station 35 through slots in plate 76.

The entire trough assembly 35, plate 76 and platform 77 rest on steel ball 82 which in turn operates in socket 83 in platform 77 and lower socket 84 in sub-platform 85. Stud bolts 86 and knurled nuts 87 secure the platform 77 and the sub-platform 85 together to clamp the steel ball 82 therebetween. Adjustments can be made so as to level the trough assembly 35 and to dispose the trough 36 with respect to the panel 11 and the path of travel of the tape 39 to obtain the desired contact of the gelatin coating with the liquid surface in the trough 36.

Platform 77 and sub-platform 85 are triangular sections, the apex of the triangular facing the viewer. Depending from subplatform 85 is a threaded shaft 89 passing through support collar 90 which is rigidly secured to panel 11. Knurled nuts 91 and 92 on opposite sides of the collar 90, through which the left 89 freely passes, permits the entire assembly of platforms 77 and 85 and trough assembly 35 to be raised or lowered and fixed in the desired position.

The unsensitized film is drawn from supply reel 48 through sprocket assembly 49, 50, 51 over roller 67 along knife edges 38 and under rollers 68 and 94, the excess solution being removed from the gelatin coating by scraper 40.

After the gelatin coating 38a on the tape 39 has been impregnated with the desired chemicals it passes over positioning roller 66 and enters the drying chamber 13 through the port 95. Time for drying the coating is obtained by passing the slowly moving film over positioning rollers 96, 97, 98, 99 and drive roller 20. Thence, the film 39 is collected on take-up reel 21, the temperature-controlled air circulated by blower 29 having dried the gelatin coating on the film. It will be noted that after the tape 39 leaves the scraper 40 the gelatin side of the tape 39 does not touch any component of the apparatus or another portion of the tape 39 until it is fully dried and being accumulated on the take-up reel 21.

A cross-section of the drive sprocket 20, idler 23 and lever arm 24 is shown in Figure 4. The idler 23 is

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pinned to a pair of levers 24 by a pin 100, the other end of the levers 24 operating against the hub and shaft 101. Hub 101 is pinned to retainer bar 102 by rod 103, the entire assembly being fastened to collar 104 through the hub and shaft 101 which passes through bearing 105. The force lever 26 is fastened to pin 106 through spring 25 which furnishes the necessary tension.

The described apparatus has been used successfully for the preparation of sensitized tape for use in connection with the hydrogen sulfide analyzer-recorder described in our co-pending application Serial No. 375,032, filed August 18, 1953 and entitled "Hydrogen Sulfide Analyzer Recorder," now issued as U. S. Patent 2,800,397 and of which this application is a continuation-in-part.

The tape is passed along the trough 36 at a rate of about 45 feet per hour and immediately introduced into the drying chamber 13 wherein a temperature of about 113° F. is maintained, the dried film being accumulated on reel 21.

In preparing such sensitized tape the blank film 39 is fed from supply reel 48 and the gelatin coating thereof contacted at a temperature of about 113° F. in trough 36 with a solution of lead acetate and sodium acetate.

The tape 39 comprises a uniformly transparent strip having a sensitized plastic absorptive coating such as of gelatin or agar agar. The strip is of non-reactive, non-porous, non-absorptive flexible material such as cellulose acetate.

The solution for sensitizing the plastic coating is 1 normal lead acetate and 1 normal sodium acetate at a pH of about 6.7. The pH is important because if too much acidity is present, sensitivity to hydrogen sulfide is decreased whereas if the acidity is too low, the lead will precipitate from the sensitizing solution with the result that substances such as mercaptans will have greater effect on the staining of the tape. The sensitized coating obtained from the defined solution stains uniformly, has the desired optical density for a given concentration of hydrogen sulfide, and has low susceptibility to variations in optical density.

The coating is not light-sensitive and retains its transmittancy when exposed to the light beam and photoelectric cell arrangement used to monitor the moving tape as described in our co-pending application.

The apparatus described may be used on 16-mm. or 35-mm. film when the size of the coating trough 36, the block 37, the pad rollers, the supply and take-up reels, and the tension and drive sprockets are appropriately provided.

Although we have described our invention by reference to a preferred embodiment thereof illustrated in the drawings, it should be understood that this is by way of example only. Further, it is contemplated that modifications in the apparatus and mode of using the apparatus can be made without departing from the scope and spirit of the described invention.

What we claim is:

1. An apparatus for treating one surface of a moving strip with a liquid treating agent which comprises in combination an elongated liquid supply trough having first and second ends, means for maintaining a longitudinally moving strip along said trough adjacent the surface of liquid therein, means for adjusting the level of liquid in said trough, pen means comprising the upper edges of said trough adapted to apply treating liquid to the underside of such strip, said pen means comprising a pair of spaced knife edges extending between said first and second ends on opposite sides of said trough, scraper means at the second end of said trough adapted to remove excess liquid treating agent from the strip as it leaves the trough and to retain the excess treating agent in the trough, and means for adjustably disposing said trough means in alignment with and immediately subjacent the lower side of said strip.

2. In an apparatus for liquid treating one surface of

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a gelatin-coated acetate strip which comprises in combination elongated liquid-applying trough means, constant temperature means for said trough means, movable liquid reservoir means, flexible conduit means between said reservoir and said trough means, an adjustable support for said movable reservoir, adjustable platform means for positioning said trough means with respect to a strip to be treated, pen means applying liquid from said trough means onto the lower surface of such strip, said pen means comprising a pair of spaced knife edges extending between said first and second ends on opposite sides of said trough, and scraper means across the outlet end of said trough means adapted to remove excess treating liquid from the strip and retain it within the liquid-applying trough.

3. An apparatus useful in connection with the selective treating of one surface of a travelling strip which comprises in combination an elongated liquid applicator trough disposed substantially horizontally, parallel knife edge pen means comprising the upper edges of the side walls of said trough means, scraper means across an end of said trough means transverse to said pen means, means for passing a strip along said trough means over said knife edge pen means and said scraper means, said scraper means being adapted to retain in said applicator trough any excess liquid, constant temperature means substantially surrounding the wall portions of said trough means, and adjustable platform means for said constant temperature means adapted to dispose said trough means in alignment with and adjacent to the under surface of said strip.

4. An apparatus for sensitizing a gelatin-coated acetate tape which comprises in combination a panel means, supply reel means on said panel, elongated treating trough means adjustably mounted on said panel, said trough means including parallel knife edge means arranged on

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opposite sides of said elongated trough means as a trace-forming pen and a second knife edge arranged transverse to said parallel knife means to remove excess treating liquid and retain it within said trough, drying chamber means mounted on said panel, an entry port into said chamber through which the treated tape may pass, a plurality of pad rollers in spaced array within said drying chamber means and over which said tape is threaded in a polygonal path, a take-up reel disposed within said array and adapted to receive the treated and dried tape, and drive means for driving said take-up reel.

5. An apparatus for sensitizing a gelatin-coated surface of a fluid-impervious tape which comprises an elongated fluid applicator trough, opposite sides of said elongated trough comprising parallel knife edges, scraper means fixed across said trough and transverse to said knife edges, tape hold-down roller means at opposite ends of said elongated fluid applicator trough, said rollers being adapted to guide the tape along the trough in contact with the surface of the fluid therein, and adjustable fluid reservoir means maintaining the fluid level in the said trough, said scraper means being adapted to remove excess liquid from the tape and to retain such excess liquid within the applicator trough.

References Cited in the file of this patent

UNITED STATES PATENTS

1,377,677	Gelbert	May 10, 1921
1,391,281	Snyder	Sept. 20, 1921
1,837,555	Kratz	Dec. 22, 1931
2,192,453	Rentsch	Mar. 5, 1940
2,368,176	Trist	Jan. 30, 1945
2,569,755	Griffith	Oct. 2, 1951
2,659,343	Kucher	Nov. 17, 1953
2,790,736	McLaughlin	Apr. 30, 1957