April 24, 1934. A. ROSS 1,955,977

NOZZLE

Filed Aug. 6, 1929

Fig. 1.

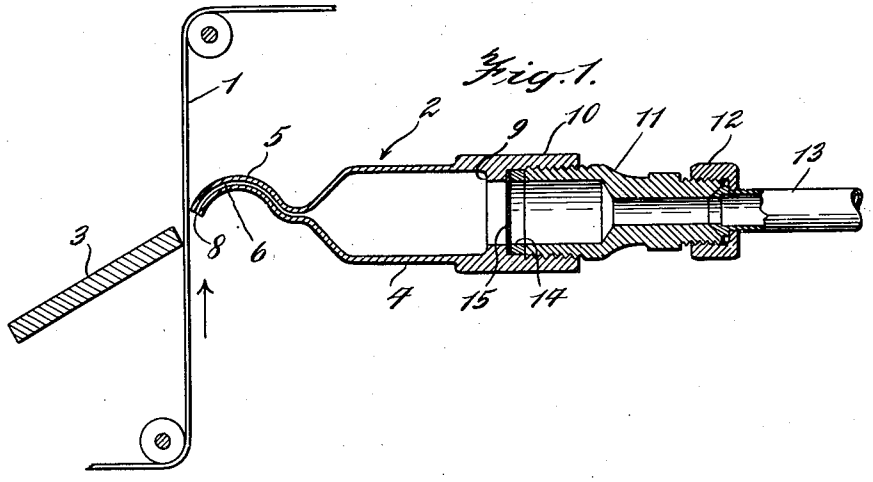


Fig. 2.

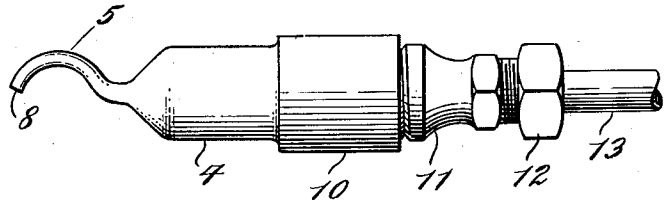
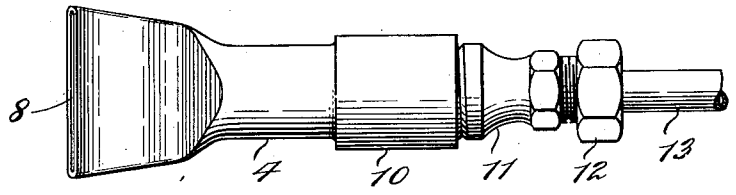


Fig. 3.



ARTHUR ROSS
INVENTOR
BY Pennie & Edmonds
ATTORNEY

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UNITED STATES PATENT OFFICE

1,955,977

NOZZLE

Arthur Ross, Lynbrook, N. Y., assignor, by mesne assignments, to United Research Corporation, Long Island City, N. Y.

Application August 6, 1929, Serial No. 383,957

2 Claims. (Cl. 299—154)

This invention relates to a method and means for removing moisture from a moving web of material.

It is an object of my invention to provide an air jet for removing water from moving picture film as a step in the process of drying the firm.

Another object is the provision of a method for drying a film of moving material wherein a thin flat jet of air is utilized for mechanically removing moisture.

A further object is to provide a nozzle for delivering a thin flat jet of air of comparatively small thickness and having a constant velocity across its entire width.

During the process of developing long films such as those used for moving pictures, it is necessary at times to remove water or chemical solutions from the film. In the past it has been proposed to utilize rollers between which the film is arranged to pass, for the purpose of forcing water from the surface of the film. While this roller method of removing moisture from the film has been successful to a certain degree, it has disadvantages. For example, there is danger of injury to the film due to mechanical abrasion. Furthermore, the film is not always dried to the desired degree. In accordance with my invention, I provide a blast of air for stripping water from the film. The blast is preferably projected in the form of a thin wide jet and directed at an angle to the surface of the film.

In order to secure best results, it is necessary that the nozzle for projecting the blast of air be provided with special means for spreading air column to the desired thinness and width. For doing this I provide a nozzle with a very fine mesh screen for breaking up the air stream to a uniform cross section and a thin flat nozzle bent in the form of a curve for flattening out the stream of air into uniform rectangular shape. Further objects and advantages and the manner of obtaining them will be made clear in the following specification taken in conjunction with the accompanying drawing.

The method and means involving the use of the nozzle herein disclosed for drying motion picture film is disclosed and claimed in my application, Serial No. 602,599, filed April 1, 1932, for "Method and means for removing moisture from films."

In the drawing, Fig. 1 is a view of a film being dried in accordance with my invention by air projected from a nozzle, which is shown in section.

Fig. 2 is a side elevation view of the nozzle shown in Fig. 1.

Fig. 3 is a bottom view of the nozzle.

Referring more particularly to the drawing, reference numeral 1 indicates a film running over a pair of rollers in the direction indicated by the arrow past an air nozzle. For removing water or other moisture from the back side of the film, a soft scraping blade 3 is utilized. This blade may be made of rubber or the like and is set at an angle to the path of the travel of the film so that one edge is presented thereto to act as a scraper. The uncoated side of the film is presented to this scraper. Air is forced from the nozzle tube in the form of a thin wide jet of substantially the same width as that of the film. The jet being very thin and impinging on the surface of the film at an angle, forces the water thoroughly from the surface of the film. For best results, it is necessary that the jet of air be of uniform velocity and density throughout its entire width. This is insured in accordance with my invention by the peculiar construction of the nozzle. This nozzle comprises a chamber portion 4 having a flattened nose 5 of substantially the width of the film and which is made in curved form as indicated in Figs. 1 and 2. This nose is provided with a channel 6 throughout its entire width which terminates at the extreme end of the nose in a very narrow orifice indicated at 8. The width of the opening 8 may be, for example, two thousandths of an inch when the length is about 1¼ inches. This nozzle operates satisfactorily when air is supplied at a pressure of 40 pounds per square inch. With such a nozzle and such pressure the film may be stripped of moisture efficiently when travelling at a speed of about 85 feet per minute. At the rear end of the chamber 4, an internal shoulder 9 and an external threaded sleeve 10 are arranged. The sleeve 10 is firmly joined to the chamber 4, for example, by soldering or welding, or if desirable, the sleeve may be formed integrally with the chamber. The pipe connection 11 is screwed into the threaded portion of the sleeve 10 for supplying air under pressure. This pipe connection may be provided with the usual form of coupling device 12 which serves to connect a suitable air supply pipe 13 therewith. Between the end of the pipe connection 11 and the shoulder 13 is positioned a ring 14 carrying a fine mesh screen 15. The screen may be suitably attached to the ring, for example, by soldering.

In operation air enters the chamber 4 from the pipe 13 and in doing so passes through the fine mesh screen 15, which serves to break up the air

stream and render it uniform in density. Air passes from the chamber 4 through the channel 6 in the nose 5 and out of the orifice 8, whence it is desired at an angle onto the surface of the film. In passing around the curved end portion 5, the air stream is caused to flare out and fill the channel 6 entirely so that it leaves the orifice 8 at uniform velocity and density over the entire width thereof, thereby insuring efficient removal of water from the film. By arranging the nozzle so that the air stream projected therefrom impinges upon the film at an acute angle, the speed of removal of moisture is increased, likewise the film is more completely stripped of moisture.

As indicated in the drawing, the chamber of the nozzle is made in cylindrical form and the nose piece is provided by flattening the end thereof. The nose is therefore tapered and of gradually increasing width. With this type of nozzle it is particularly important that the nose be made curved so that air will be emitted from the orifice at constant velocity throughout its width. Where the curve is omitted the air has a tendency to come at greatest velocity out of the orifice at the center. By utilizing the curve the air blast is made to issue uniformly from the entire width of the orifice. The screen acts as an aid in rendering the air blast uniform and also removes solid matter from the air supply, which might plug the orifice.

In striking on the film the air blast forces it against the scraper 3, thereby insuring perfect contact of the film with the scraper at all times. It is preferable to move the film upwardly and project the blast of air downwardly, so that the force of gravity aids in the moisture removal process and water is prevented from running onto the treated film. By mounting the scraper blade substantially in line with the end of the nozzle nose, as shown in Fig. 1, very good results are obtained.

I have described a particular embodiment of my invention merely for the purposes of illustration and it is to be understood that various modifications and adaptations may be made without departing from the spirit of the invention, as set forth in the appended claims. The method and means has been illustrated as applied to a film, but it might as well be used with any other surface to be dried. Likewise, while the film has been shown as moving and the nozzle stationary, the opposite arrangement might be found best in some cases. The air blast may be made hot or cold, depending on the material being dried.

What I claim is:

1. A nozzle having an elongated orifice of the order of one and one-fourth inches long by two-thousandths of an inch wide, the terminal portion of said nozzle comprising parallel walls curved in the direction of flow and having an opening therebetween of the order of two-thousandths of an inch for a distance of the order of one and one-fourth inches in the direction of flow.

2. A nozzle adapted to deliver air under pressure for drying motion picture film, said nozzle comprising a terminal portion having closely spaced parallel walls separated by a distance of the order of two-thousandths of an inch and curved in the direction of flow, a body portion connected thereto, said parallel curved walls terminating in an elongated orifice, and said curved walls extending parallel in the direction of flow for a distance of the order of the length of said orifice.

ARTHUR ROSS.