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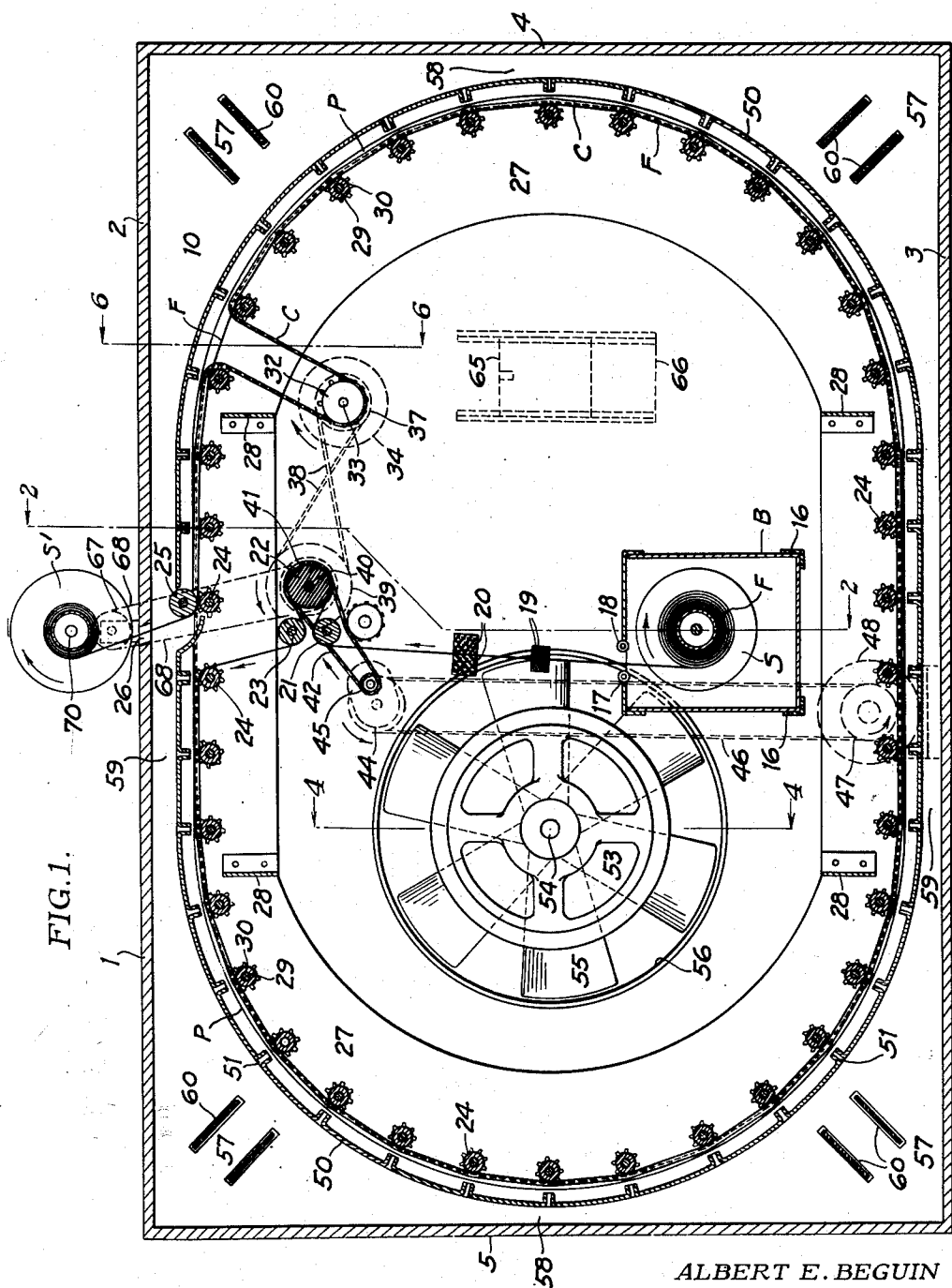
A. E. BEGUIN

2,448,854

CONTINUOUS FILM DRIER

Filed Dec. 20, 1946

2 Sheets-Sheet 1



ALBERT E. BEGUIN
INVENTOR

BY *Newton M. Pomeroy*
Donald H. Stewart
ATTORNEYS

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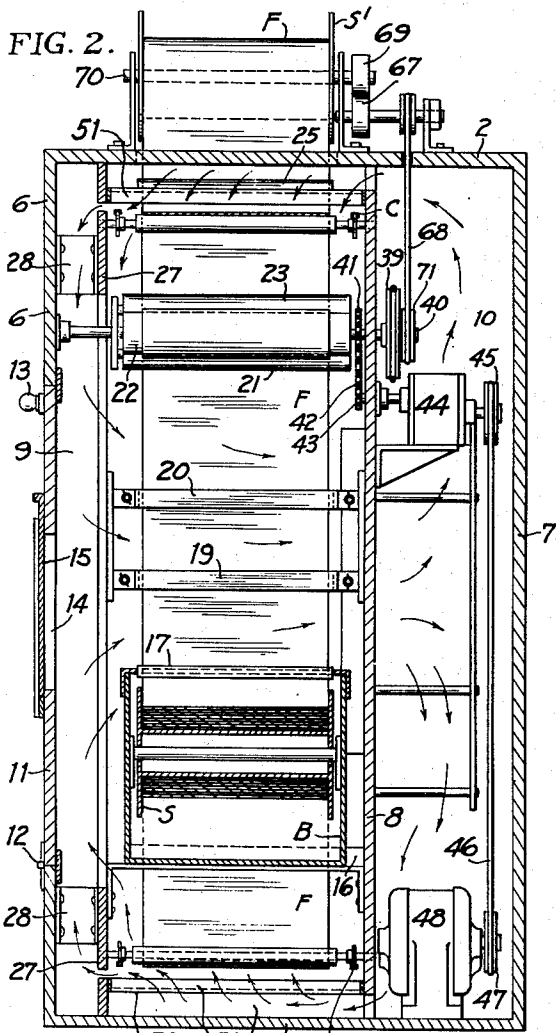
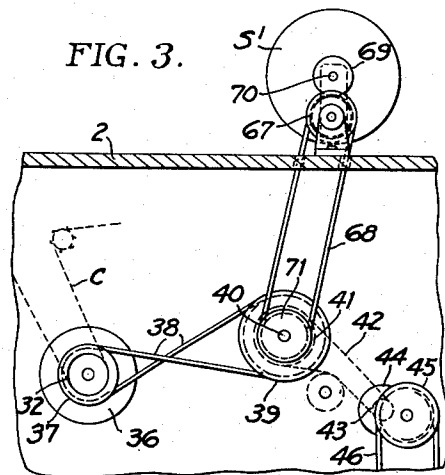
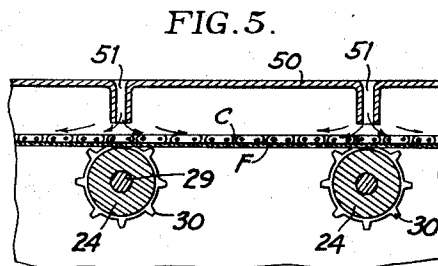
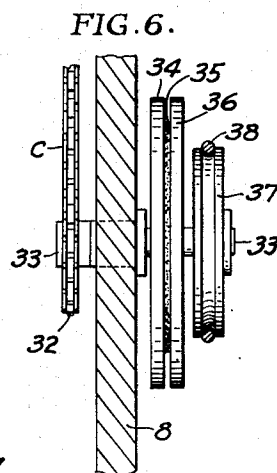
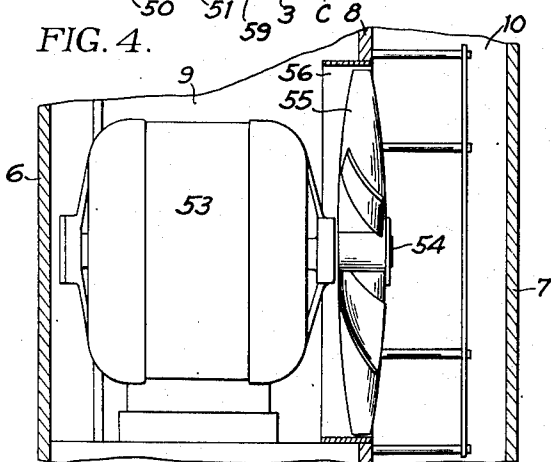
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CONTINUOUS FILM DRIER

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2 Sheets-Sheet 2



ALBERT E. BEGUIN
INVENTOR

BY *Winton M. Perrins*
Donald R. Stewart
ATTORNEYS.

UNITED STATES PATENT OFFICE

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CONTINUOUS FILM DRIER

Albert E. Beguin, Rochester, N. Y., assignor to
Eastman Kodak Company, Rochester, N. Y.,
a corporation of New Jersey

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3 Claims. (Cl. 34-155)

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This application relates to photography and more particularly to driers for photographic film. One object of my invention is to provide a film drier which can be readily transported and which is particularly designed for drying film of aviation cameras in the field. Another object of my invention is to provide a drier which is continuous so that the wet film may be inserted in one part of a machine and may be wound up as dry film after passing through the machine. Another object of my invention is to provide a machine which will dry the film uniformly and which will avoid water marks, and other uneven-appearing areas, sometimes due to uneven drying. Other objects will appear from the following specification, the novel features being particularly pointed out in the claims at the end of the specification.

Coming now to the drawings wherein like reference characters denote like parts throughout:

Fig. 1 is a part-section, part-side elevation of a drying machine constructed in accordance with and embodying a preferred form of my invention. Certain parts are omitted from the drawings to avoid over-complications;

Fig. 2 is a section taken on line 2-2 of Fig. 1;

Fig. 3 is a fragmentary detail showing a portion of the power-drive mechanism;

Fig. 4 is a fragmentary section taken on line 4-4 of Fig. 1;

Fig. 5 is an enlarged fragmentary section showing the air distribution plate and nozzles in their relationship with film; and

Fig. 6 is a fragmentary detail section through a tendency drive used in the machine, shown in Fig. 1.

My drier was especially constructed for drying a standard type of aviation camera film which, in the present instance, is for film 9 inches wide although, obviously, the width of the film is relatively immaterial. Such film comes in long lengths, wound on spools, and the film may be processed, or fluid-treated, in continuous machines, being wound into a container which may be placed directly in my improved form of drying machine. The drier consists of a means for moving the film through a path which is driven through a tendency drive and in providing the casing which will relatively evenly distribute air transversely of the film as it passes a plurality of nozzles arranged in close proximity to the film path. More specifically, my drier may consist of a preferably rectangular casing 1 having a top wall 2, a bottom wall 3, and end walls 4 and 5. The top, bottom, and end walls are connected by two side walls 6 and 7 and an intermediate wall 8 dividing the drier into a film chamber 9 and an air chamber 10.

The film chamber, which is adjacent the side wall 6, may be provided with a hinged door 11, the hinge of which 12 permits the door to swing

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open when the handle 13 is drawn outwardly. Any suitable latch, not shown, for holding the door closed may be used. The door 11 is provided with an opening 14 which may be partially, or totally, closed by a slide 15 to admit outside air, if this should be desirable.

The embodiment of my invention shown in the drawings shows a typical film spool S on which convolutions of film F have been wound as being carried in a box, or container, B which may be mounted in the machine on suitable rests 16. When placed in this machine, the film F is wet and it may be drawn upwardly between a pair of guide rollers 17 and 18 which are so spaced that the film preferably does not touch either roller. The film is passed upwardly through a pair of rubber film wipers 19 and then through a pair of sponges (viscose, in the present instance), squeeze members 20, so that these two members will wipe off all of the surface moisture on the film. The film will then be led over a roller 21 with the emulsion side toward the roller after which it is passed about a positively-driven roller 22 having a relatively-large diameter. The emulsion side is facing outwardly from this roller. There is a guide roller 23 for directing the film to the first tendency-driven roller 24. This roller, together with all of the other rollers 24, provides a film path about which the film may pass in a generally oval-shaped path until the film reaches the last tendency-driven roller 24 which lies beneath a guide roller 25. From this roller the film passes upwardly through an opening 26 in the housing 1 so that it may be wound upon a spool S₁ in a dry condition. All of the rollers 24 are carried by a generally oval-shaped frame member 27 supported by a frame 28 extending from the wall 6 of the casing. The rollers 24 are all carried in a like manner and driven in a like manner, each roller being supported by a shaft 29 having a sprocket 30 on one end; these sprockets being driven by an endless chain C. The chain C passes around a drive sprocket 32 which, as best shown in Fig. 6, is carried by a short shaft 33 supported by the wall 8 and carrying a friction disk 34. This friction disk may contact with friction material 35 carried by the disk 36, which disk is connected to move with a pulley 37 driven by a belt 38. Thus, there is a tendency drive between the disks 34 and 36 in that the disk 36 always tends to move the disk 34 at a predetermined speed, but in case too heavy a load is imposed, there will be slippage between these disks to prevent damage to the film F.

The pulley 37, as shown in Fig. 1, is connected by means of the belt 38 to a pulley 39 which is positively driven in the following manner. The pulley 39 is attached to a shaft 40 to which the roller 22 is also attached, this roller and the pulley being connected together and being also con-

nected to a sprocket wheel 41 driven by a chain 42 from a pinion 43. This pinion operates through a known type of gear reduction 44, a pulley of which 45 is driven through a belt 46 from the pulley 47 of a motor 48 resting on the bottom 3 of the casing. The path of the film designated generally as P is, as above explained, generally oval in shape and as the film F passes through this path, it passes adjacent a nozzle plate 50 which conforms generally to the shape of the film path, being spaced therefrom only a short distance. The nozzle plate 50 is provided with a plurality of nozzles 51 which are preferably located one adjacent each roller 24. Thus, the air passing through these nozzles under pressure tends to hold the film F against the rollers 24 which, as above explained, are tendency driven, so that the film passes freely and easily through the path P until it reaches the guide roller 25. At this point, the film is dried and is withdrawn.

The air is circulated in the following manner. The intermediate wall 8 of the drier forms an air chamber 10 on one side of the wall and a film chamber 9 on the opposite side thereof. A blower may consist of a motor 53 mounted on the wall 8, the shaft of which 54 turns the fan 55 which fits into an aperture 56 in the wall 8. Thus, air is moved by the fan from the film chamber 9 into the air chamber 10 and is then forced through the chamber 10 back into the film chamber again through the opening extending completely around the outside of the nozzle plate 50. This opening is wider at the corners 57 where more area is open than it is intermediate the corners as at 58 on the two ends and 59 on the top and bottom of the machine so that most of the air comes through the corners of the drier. However, the entire area between the nozzle plate 50 and the outside walls 2, 3, 4, and 5 is filled with air under some slight pressure so that the air passes through the nozzles 51 directly against the emulsion side of the film. It is not necessary that the pressure on each nozzle should be identical, but the shape of the air chamber is such that the air distribution is relatively even and since it contacts with the film transversely of the film, and since the film is moving past the nozzles, the film is evenly dried.

I prefer to provide strip heaters 60 in the enlarged air spaces at the corners of the machine and, if desired, separate switches, not shown, may be utilized to energize one or more of these heaters, as conditions may require. It might be pointed out that the humidity of the outside air is a factor to be determined in drying film and should be taken into consideration when the slide 15 of the front door 11 is operated to admit, retract, or prevent the entrance of fresh air into the film chamber 9. The exit of heated air may also be controlled by a similar slide member 65 on the rear wall 7 of the machine, this slide being movable to open and close a window 66 to permit the drying air, which may become saturated, to move directly from the machine while fresh air is being drawn into the opening 14.

The film, in passing through the exit slot 26, is wound up on a spool S¹ which is preferably frictionally driven by means of a friction roll 67 which may be driven through a belt or chain 68 from a suitable pulley carried on the shaft of the power-driven roller 22. The friction pulley 67, as best shown in Fig. 3, may drive a friction roller 69 on the shaft 70 on which the wind-up spool S¹ may be mounted. Thus, the wind-up spool

may slip but is turned with sufficient friction to evenly wind the convolutions of film F thereon.

With the machine as above described, a spool of wet film may be placed directly in the machine and may be first wiped and then dried by the multitude of nozzles conducting warm or hot air to the emulsion surface of the film as it moves through a predetermined path. The operation is continuous and I have found that drying can readily be accomplished under normal conditions while the film is passing through this path with reasonable rapidity, as, for instance, approximately 5 feet per minute. The heated air is circulated by the blower with a certain amount of fresh air in order to maintain the desired humidity. The machine can readily be transported to film processing stations and requires a comparatively small amount of power to produce the desired results.

I claim:

1. A film drier comprising a generally rectangular casing divided into parallel chambers, a film chamber and an air chamber, by intermediate wall between two outside walls, a plurality of rollers mounted in the film chamber positioned to conduct film through a path, means for turning the rollers, a nozzle plate dividing the film chamber into sections and extending between one outside wall and the intermediate wall, said plate having a generally oval shape and including nozzles extending transversely and ending adjacent the film path, an opening in the intermediate wall between the air chamber and the film chamber, and air openings around the edges of the intermediate wall, said openings being larger at the corners than between the corners tending to equalize air pressure at the nozzle, means for heating air in the casing before passing through the nozzles in the nozzle plate, a door through an outside wall of the drier to admit fresh air to be heated, a door on an outside wall for exhausting moisture-laden air after said air has passed into the film chamber, and an air circulating motor-driven fan positioned in an opening through the intermediate wall to move air from the film chamber to the air chamber whereby air may pass through the intermediate wall for distribution through the air chamber and through the nozzles to film moving through the path defined by the rollers.

2. The film drier defined in claim 1 characterized by a tendency drive for the plurality of rollers for conducting film through its path, and a positively driven film-driving roller for moving film towards the tendency driven plurality of rollers.

3. The film drier defined in claim 1 characterized by a positively driven roller for moving film towards the path defined by the plurality of rollers, a tendency drive for the plurality of rollers, and a film wind-up outside of the casing and including a tendency drive for winding up the dried film.

ALBERT E. BEGUIN.

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