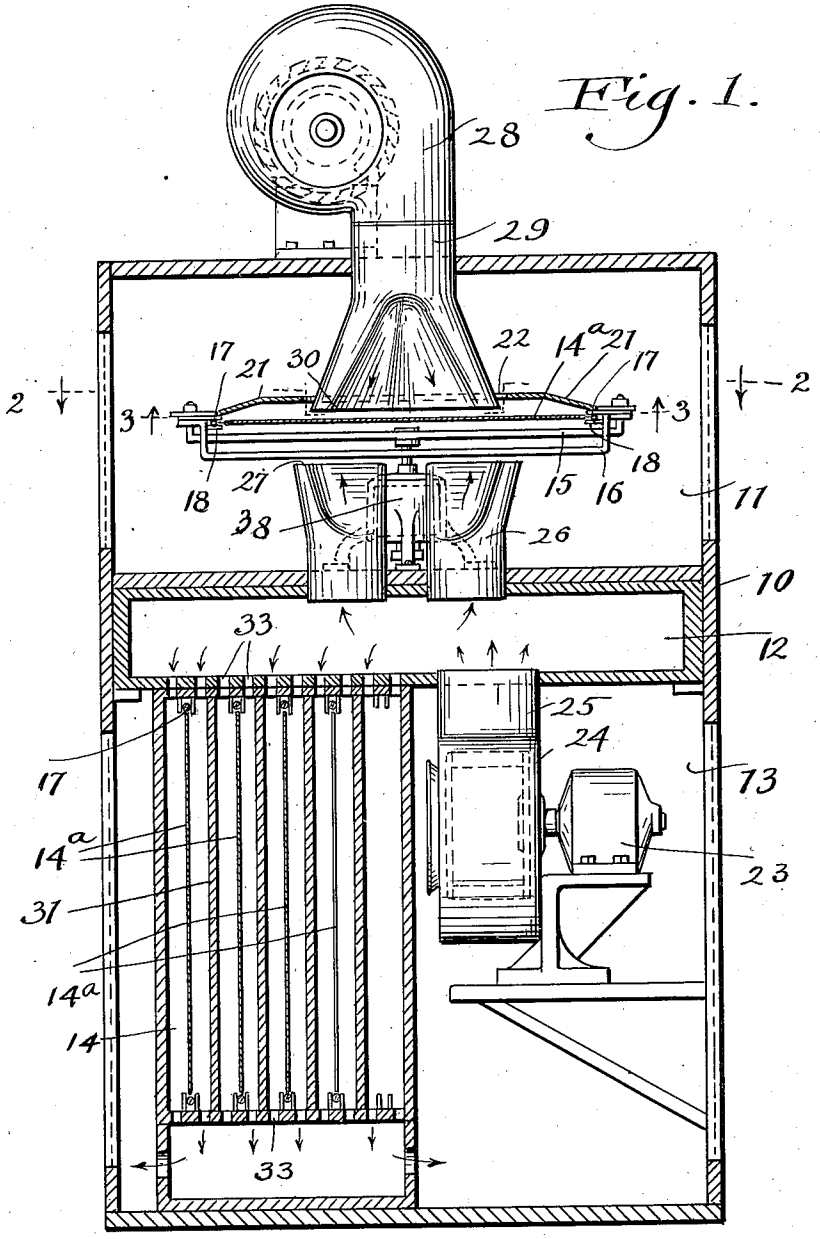
April 29, 1930 G. W. HOPKINS 1,756,197

FILM DRIER

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Fig. 1.



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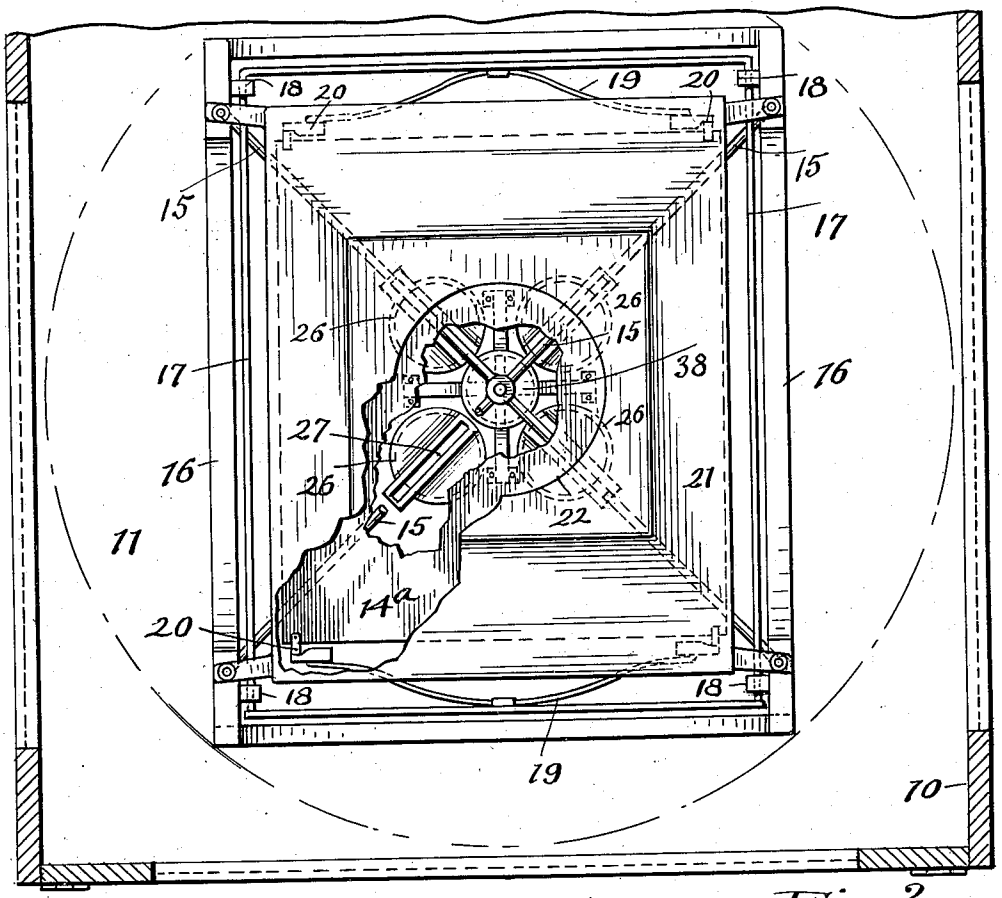


Fig. 2.

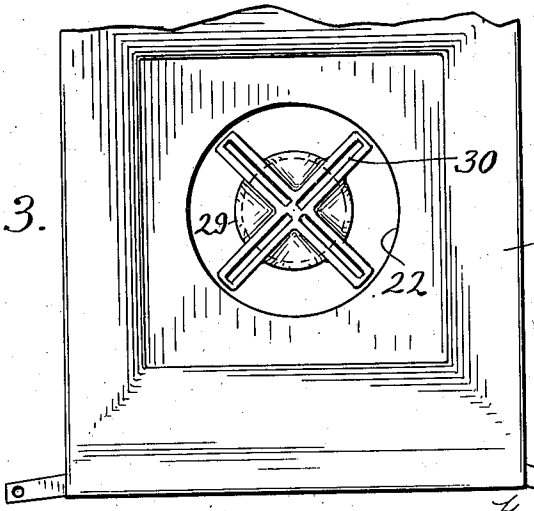


Fig. 3.

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UNITED STATES PATENT OFFICE

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FILM DRIER

Application filed February 23, 1926. Serial No. 89,967.

This invention relates to a drier adapted particularly for drying photographic films, especially those made by Roentgenologists. In view of the fact that wet films cannot be interpreted with safety or with the degree of accuracy required by careful Roentgenologists, the films are required to be dried before interpretation, and it is often the case that Roentgenologists' work is delayed for hours waiting for films to dry.

Attempts have been made to produce film driers which would overcome or reduce this delay, but the best film driers or film drying methods known to me are not satisfactory because they do not dry the films quickly enough and, furthermore, the heat which is generally employed is hazardous in dealing with such inflammable and explosive articles, as celluloid films.

The principal object of the present invention is to provide a film drier which will greatly reduce the time now required to dry films even with the best apparatus at present available and which will dry the films with absolute safety. More particularly, it is one of the chief aims of the present invention to provide a film drier which enables a film to be dried and, therefore, interpreted in a few minutes after the exposure and development so as to dispense with the necessity of waiting a relatively long time for the film to dry and to avoid delays which are often dangerous and at times fatal to the subject of the film.

In carrying out my invention, drying is accomplished exceedingly quickly and with safety by rotating it and simultaneously directing on to it one or more streams of air, and preferably the film is rotated about a transverse axis while streams of air are directed on to opposite surfaces thereof.

The invention may be further briefly summarized as consisting of certain novel combinations and arrangements of parts as will be described in the specification and set forth in the appended claims.

In the accompanying drawings wherein I have shown a film drier embodying the important or essential features of my invention Fig. 1 is a vertical sectional view of the drier; Fig. 2 is a horizontal sectional view substantially along the line 2—2 of Fig. 1 with portions broken away for the sake of clearness and Fig. 3 is a fragmentary sectional view substantially along the line 3—3 of Fig. 1 looking upward.

The device embodying my invention includes a cabinet 10 having an upper compartment 11 which may be termed the drying compartment, below which is an air duct or chamber 12 and below the latter a motor and blower compartment 13 and an auxiliary drying compartment 14 which may or may not be employed. The particular arrangement of the compartments is unnecessary but as this arrangement has been employed by me very effectively the same is illustrated in the drawings.

In the upper or drying compartment 11 the film to be dried, which is indicated at 14^a, is rotated preferably in a horizontal plane and about an axis transverse to the film, that is to say—the rotation takes place in the plane of the film. In the embodiment illustrated a motor 38 supported on the base of the compartment 11 and beneath the film 14^a rotates a spider 15 carrying a rectangular frame 16 adapted to receive a film holder 17 which in this instance is in the form of a rectangular frame formed of rod or heavy wire and which is adapted to be slid into guides, indicated at 18, projecting inwardly from opposite sides of the frame 16. The film 14^a may be supported by the holder 17 in different ways but in this instance there is attached to opposite ends of the holder 17 spring arms 19 provided at their free ends with spring clips 20 which may be gripped on the marginal portions of the film adjacent its four corners. In practice one side of the cabinet has a door which will permit the film holder 17 to be slid into the frame 16 or removed when desired. The frame 16 also carries a dome or cover 21 having a central opening indicated at 22. Thus it will be seen that when the motor is set into operation a film mounted in the holder and inserted in the frame 16 is adapted to be very rapidly rotated in the plane of the film and that there is therefore a strong tendency for the moisture to be thrown from the fim by centrifugal force and also to be evaporated by reason of its ro-

tation through the air in the upper compartment 11.

It was previously stated that quick drying is obtained by me by simultaneously rotating the film and directing onto it streams of air, and in this connection it might be stated that rotation alone while important is not sufficient for my purpose, and furthermore the use of air currents for drying without rotation is inadequate to produce rapid drying. I have discovered, however, that by the combined actions, a highly efficient method of drying is obtained, the time of drying being a great deal less than one-half the average time required by the two methods employed alone or singly. That is to say, the effects of the two drying methods employed simultaneously are not merely additives but by the conjoint use of the two, a drying method is obtained with a dehydrating efficiency out of all proportion to the efficiencies of the two drying methods separately considered or separately employed, showing that there is a peculiar cooperation each apparently increasing or enhancing the drying or dehydrating efficiency of the other. This is true particularly when the film is rotated in its own plane and when air currents are directed onto opposite surfaces of the film in the form of streams or jets preferably directed onto the film at right angles to its surfaces, although I do not regard my invention as limited to this particular arrangement either as to the plane of rotation or as to the manner of supplying the air currents or as to the directions in which the air currents are supplied relative to the plane of rotation or to the plane of the film.

As intimated above, the preferred method is to direct streams of air onto opposite sides of the rotating film, and apparatus for carrying out that method is illustrated in the drawings. However, I wish it to be understood that I do not regard it important whether fans or blowers are employed nor do I regard it essential to the invention whether one or two motor driven fans or blowers are utilized to create the air flow directed against opposite sides of the film, or whether or not the motor which rotates the film is employed also to actuate the air flow inducing device or devices.

In the embodiment illustrated, separate motor driven blowers are employed as this embodiment in practice has proven to be effective. In this instance, a motor 23 is arranged in the lower compartment 13 and drives a blower 24 whose outlet 25 extends through the lower wall of compartment 12. Extending up through the upper wall of compartment 12 and spaced around the film rotating motor 15 are series of ducts 26, in this case four in number, these ducts being substantially vertically disposed and in this instance, being provided with circular lower inlet ends and with narrow elongated orifices 27 at their upper ends (see Fig. 2), which orifices are just beneath and close to the rotatable frame 16 and are equally spaced around the axis of the film rotating motor 38, and so disposed as to direct air currents in streams which impinge against the lower surface of the film at right angles thereto.

On top the cabinet 10 I provide in this instance, a separate motor driven blower 28 having a discharge member 29 which extends down through the top wall of the cabinet through the opening 22 of the rotating cover or hood 21. The lower end of member 29 is formed into four narrow elongated orifices 30 (see Fig. 3), which are equally spaced about the axis of rotation of the film and are close to the upper surface of the film, and serve to direct the air currents down onto the film at substantially right angles thereto. In this instance, the auxiliary drying compartment 14 is provided with a series of vertically disposed partitions between which may be slid, from one end of compartment 14, a series of holders carrying films, indicated at 14^a. If desired, air may be admitted from compartment 12 on opposite sides of the films between the partitions 31 by means of openings 33 between compartment 12 and the top of compartment 14, and the air may escape from the bottom of compartment 14 by way of openings 33. The air communication between compartments 12 and 14 may be shut off by any suitable means, it being intended that this auxiliary drying compartment 14 be utilized for drying films which circumstances do not require to be dried quickly. This is an adjunct which is not essential to the main features of the invention and may or may not be employed as is found desirable.

It will be seen from the above that when a film is placed into a rotatable frame and when the film rotating motor and blowers are set into operation, the film is rotated in its own plane or about a transverse axis and at the same time, streams of air are directed onto both sides of the film. In this way, the film is dried so quickly that it can be interpreted almost immediately after the exposure and development, and there is avoided the heretofore long delay between the development and drying to the point where the film could be safely interpreted. It is to be noted that this quick drying is accomplished without the use of hot or heated air which can not be employed with absolute safety but, if it should be desired to modify the arrangement so as to heat the air by any of the well known means, this may be done.

While I have shown simply one embodiment of the invention, showing the main features or principle and omitting many minor

features which may be desirable but are not essential, other arrangements or ways of carrying out the principle of the invention may occur to one skilled in the art and I, therefore, aim to cover in my claims all changes and modifications which do not involve a departure from said spirit and scope of the invention as defined in the appended claims.

Having described my invention, I claim:

1. In a drier, a cabinet having means for rapidly rotating a film about a transverse axis, and having means for creating an air flow on opposite sides of the film while it is being rotated.

2. A drier comprising a cabinet having a rotatable film holder, means for rotating the holder so that the film is revolved in substantially its own plane, and means for directing streams of air separately onto opposite sides of the film while it is being rotated.

3. In a film drier, a cabinet, a rotatable film holder, means for rotating the same so that the film is rotated about a transverse axis, and means for directing a plurality of streams of air on opposite sides of the film and at substantially right angles thereto.

4. A method of drying a film which comprises simultaneously rotating said film in its own plane and blowing air onto opposite sides thereof.

5. The method of drying a film which consists in rotating it about an axis transverse to the plane of the film, and causing streams of air to flow over both surfaces of said film.

6. In a film drier, means for rapidly rotating a film about a transverse axis, and means for creating an air flow on opposite sides of the film while it is being rotated.

7. In a film drier, a rotatable film holder, means for rotating the holder so that the film is revolved in substantially its own plane, and means for directing streams of air separately onto opposite sides of the film while said film is being rotated.

8. In a film drier, a rotatable film holder, means for rotating the same so that the film is rotated about a transverse axis, and means for directing a plurality of streams of air on opposite sides of the film and at substantially right angles thereto.

9. In a drier for films and the like, the combination of means having contact with edge portions only of a non-rigid film whereby said film is supported in a substantially flat position, means for rotating said supporting means about an axis transverse to the plane of the film, and means for directing air onto the film while it is being rotated.

10. In a drier for films and the like, a rotatable holder having means adapted to grip a non-rigid film adjacent the edge thereof and support the same in a substantially flat position transverse to the axis of rotation of said holder, means for rotating said holder, and means for creating a flow of air past the film while it is being rotated.

11. In a drier for films and the like, means for supportingly engaging edge portions only of a non-rigid film and rotating the same in a plane which is transverse to the axis of rotation, and means for directing air under pressure onto a surface of the film while it is being rotated.

12. In a drier for films and the like, a rotatable holder adapted to supportingly engage edge portions only of a non-rigid film whereby said film is supported in a substantially flat position, means for rotating said holder, and means for creating a flow of air over surface portions of the film while it is being rotated.

13. The method of drying films which consists in supporting a non-rigid film at edge portions only thereof, rotating said film in its own plane and causing air under pressure to flow over the surfaces of the film while it is being rotated.

In testimony whereof, I hereunto affix my signature.

GEORGE W. HOPKINS.