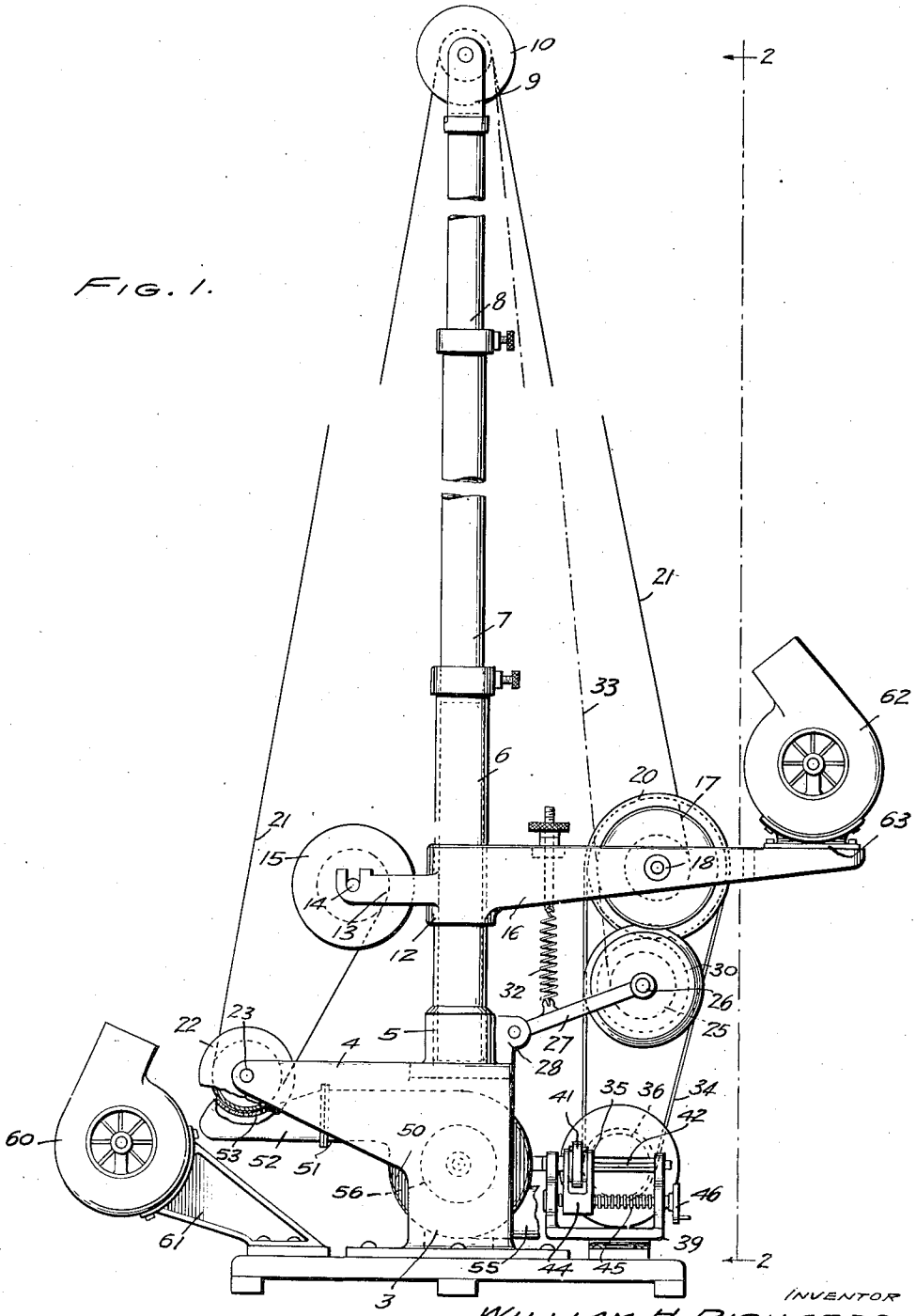
July 13, 1943. W. H. RICHARDS 2,323,934

FILM DRYER

Filed June 24, 1941 2 Sheets-Sheet 1

FIG. 1.



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FIG. 2.

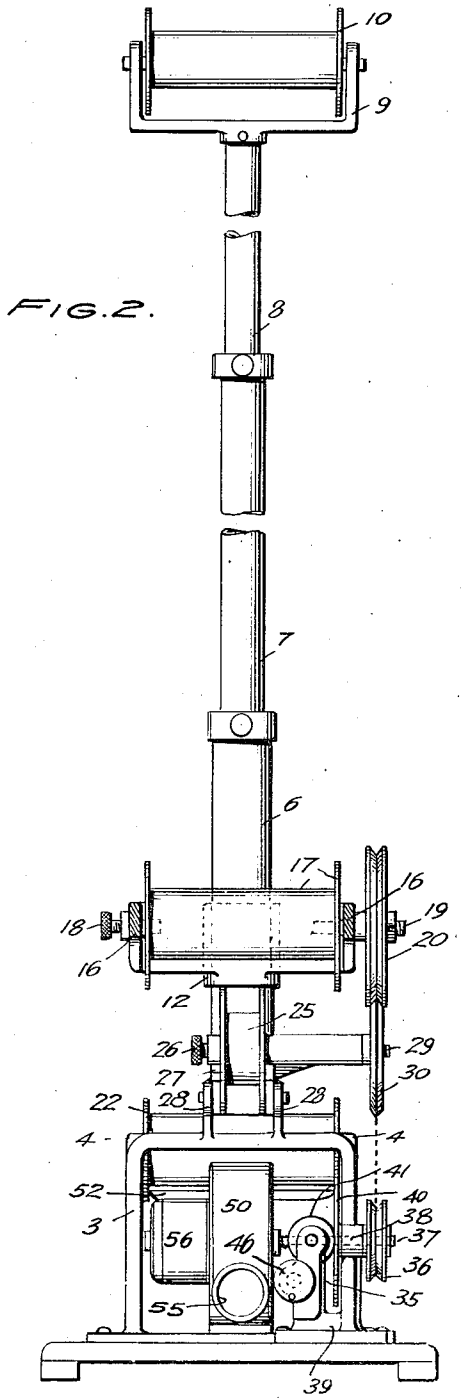


FIG. 3.

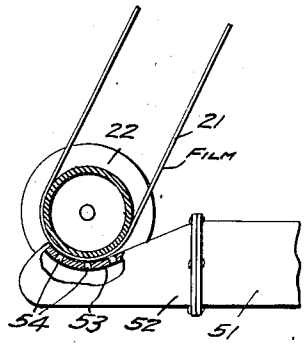
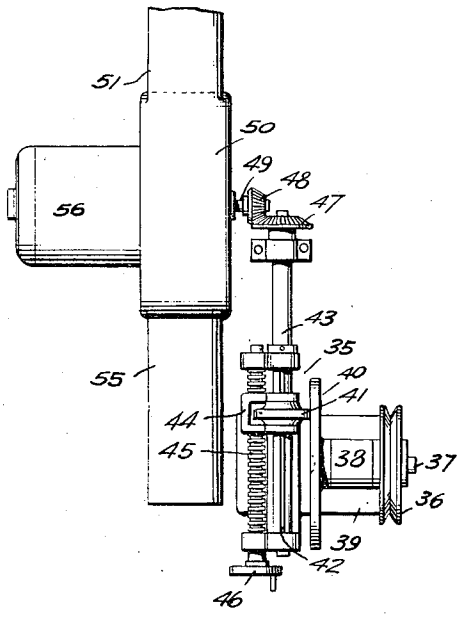


FIG. 4.



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UNITED STATES PATENT OFFICE

2,323,934

FILM DRIER

William H. Richards, Dayton, Ohio

Application June 24, 1941, Serial No. 399,490

6 Claims. (Cl. 34—155)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

The invention described herein may be manufactured and used by or for Government or governmental purposes, without payment to me of any royalty thereon.

This invention relates to apparatus for drying wet photographic film and more particularly relates to portable apparatus for use in the field for drying aerial photographic film and so constructed that the drying time for the film may be adjusted to suit the various atmospheric conditions such as varying temperature and humidity encountered in outdoor field operation.

One type of drying apparatus heretofore in use comprises a cabinet having a plurality of fixed reels therein, interposed between the wet film roll and the dry film reel, over which the film is passed, air being circulated in the cabinet to dry the film and suction water removal nozzles being employed to remove the water drops on the wet film prior to entrance into the drying chamber. Such apparatus while satisfactory for fixed installation is entirely unsuited for field operation because of its weight and bulk and further because the only way the drying time may be varied is to vary the speed of the driving roll which unnecessarily slows down the drying process if used outdoors in humid weather.

Another known type of drying apparatus consists of a large reel having the film supporting part thereof made in the form of slats between which jets of air impinge on the film substantially normal to the surface thereof, and the only means for varying the drying time is to vary the speed at which the film is reeled on the dry film spool. This type of apparatus is also unsuited, due to its bulk and drying time characteristics, for field use.

In accordance with the present invention a portable film drying apparatus is provided which occupies a small space when not in use and which provides a means for varying the drying time of the film to suit weather conditions without materially affecting the speed at which the dried film is reeled, the water in the form of drops being removed from the wet film by suction nozzles and the film being exposed to currents of air created by blowers during the transit thereof from the wet film roll to the dry film spool. The variation in drying time without reducing the speed of reeling is accomplished by interposing a shiftable idler roller between the wet film roll and the dry film reel or spool which is movable to vary the length of the path of the film between the wet roll and the dry film spool. Means are also provided for varying the speed at which the dried film is reeled so that the combination of the variable speed drive with the means for varying the length of the path between the wet roll and the dry film spool together form a means for varying the drying time of the film so as to allow for varying atmospheric condtions such as temperature and humidity. The blowers which furnish the currents of drying air are so arranged that the air stream does not impinge on the film normal thereto but such that a large component of the air velocity is substantially parallel with the moving film so that the air blast does not injure the wet gelatinous coating on the film.

The principal object of the invention is the provision of photographic film drying apparatus which is portable and incorporating means whereby the drying time of the film may be varied to suit changing atmospheric conditions without materially reducing the speed at which the film is reeled on the dry film reel.

Another object of the invention is the provision in a film drying apparatus of a means to vary at will the length of the path of the film from the wet film roll to the dry film reel whereby the time of exposure of the film to the currents of drying air may be varied without materially reducing the speed at which the film is reeled on the dry film reel.

A further object of the invention is the provision of a portable film drying apparatus including a power-driven reel for receiving film from a wet photographic film roll, means to vary the length of the path traversed by the film between said roll and said reel and means for subjecting said film during its travel to said reel to drying currents of air which have a substantial component of their velocity parallel to the film during the traverse of the same from the wet roll to the dry film reel.

Other objects of the invention not specifically described above will become apparent by reference to the detailed description in the specification and to the appended drawings in which:

Figure 1 is a side elevation of a portable film drier constructed in accordance with the invention; and

Figure 2 is an end view of the apparatus of Figure 1 taken substantially along line 2—2 of Figure 1; and

Figure 3 is a view partly in section illustrating details of a suction nozzle of the device of Figure 1; and

Figure 4 is a view illustrating the details of a

variable speed driving mechanism employed in the device of Figure 1.

Referring now to Figures 1 and 2, the reference numeral 1 generally indicates a rectangular supporting base having secured thereto a mounting structure 3 made in the form of an inverted U and provided with a pair of longitudinally extending arms 4 which serve as bearing supports, as hereinafter more fully explained. The upper portion of the support 3 is provided with an enlarged boss 5 into which is secured a vertically extending tubular member 6 which serves as a guide and support for the hollow tubular member 7, adjustably slidably mounted therein and 8 telescopically mounted therein. At its upper end, the tubular member 8 is provided with a forked fitting 9 which serves as a bearing support for a rotatable idler roller or guide 10 which may be shifted in a vertical direction relative to the base 1 by adjustment of the tubular member 8 within the tubular member 7 and adjustment of the latter member within the tubular support 6, the members 7 and 8 being retained in their adjusted position by suitable clamping means, in a manner well known in the art.

The tubular support 6 also serves to support an enlarged boss 12 which may be securely clamped thereto by means not shown, and being provided with a pair of longitudinally extending bracket arms 13 which serve to journal a shaft 14 on which may be removably mounted a wet film roll 15. A similar pair of bracket arms 16 extend longitudinally from the hub member 12 on the opposite side thereof from the bracket 13 and serve to rotatably support a reel 17 upon which the dry film is to be wound. The reel 17 is adapted to be rotatably mounted on bearings one of which indicated at 18 is removable, the reel being adapted to be driven by a shaft 19 which is provided with a grooved driving pulley 20 mounted on the outer end thereof. An idler roller 22 is provided with a shaft 23 rotatably journaled in the previously mentioned supporting arms 4 of the base 3 and serves as a guide for photographic film 21 passing from the wet roll 15 over the idler roller 10 to be wound upon the dry film reel 17. A removable leader tape reel 25 is mounted directly beneath the dry film reel 17 and rotatably supported in bearings in a forked arm 27, one of the bearings indicated at 26 being removable. The arm 27 is pivotally supported at its inner end by lugs 28 formed integral with the supporting member 3. The arm 27 is extended laterally on one side of the reel 25 to rotatably journal a shaft 29 (see Figure 2) which is adapted to drive the reel 25 by means of a friction disk 30 which engages the underside of the grooved pulley 20 and is maintained in frictional engagement therewith by means of an adjustable tension spring 32 (Figure 1) which elevates the forked arm 27. The reel 25 is thus simultaneously driven with the reel 17 and serves to receive a leader tape indicated in dotted lines at 33, and adapted to be connected at its inner end to the film 21, serving to guide the film when the latter is started through the drying process until the end of the film can be wound around the dry film reel 17. The pulley 20 for driving the dry film reel 17 is adapted to be driven by a conventional V belt 34 from the grooved driving pulley 36 of a friction type variable speed mechanism generally indicated by the reference numeral 35. The pulley 36 is mounted on the outer end of a shaft 37 (Figure 2) journaled in a suitable bearing provided by a supporting bracket 39 and having a friction disk 40 mounted on the inner end thereof which is adapted to be driven by means of a friction roller 41 slidably and drivingly connected by means of splines 42 to a rotatable shaft 43 journaled in suitable bearings provided in the mounting bracket 39. The roller 41 may be shifted radially with respect to the friction disk 40 by means of a fork 44 which is shifted by a lead screw 45, also rotatably journaled in suitable bearings in the bracket 39 and adapted to be manually rotated by means of a crank 46. It is thus seen that the speed of rotation of the friction disk 40 and the pulley 36 may be varied through an infinite number of steps between certain predetermined limits by shifting the friction roller 41 radially with respect to the center of the friction disk 40 in a manner well known in the art, so that the rotational speed of the dry film reel 17 and the leader tape reel 25 may be adjusted within predetermined limits by means of the friction drive transmission 35.

The details of the friction drive transmission 35 are more clearly illustrated in Figure 4, and as there seen, the shaft 43 which drives the friction roller 41 is provided at its outer end with a large bevel gear 47 which is adapted to mesh with a pinion bevel gear 48 mounted on the outer end of a shaft 49 which serves to drive the impeller of a suction blower 50, so that the pulley 36 may be driven from the blower shaft 49 through the friction drive transmission 35 at varying speeds, as described above.

Referring again to Figures 1 and 2, the suction blower 50 is seen to be supported by the base 1 within the legs of the supporting member 3, and is provided with an inlet conduit 51 provided at its outer end with a suction nozzle structure 52 which as seen in Figure 3 includes an arcuate portion 53 arranged with a slight clearance from the periphery of the idler roller 22 and provided with suction ports or nozzles 54 which lie closely adjacent the surface of the film 21 and serve to withdraw any drops of water from the emulsion face of the film 21 into the body portion of the suction nozzle head 52 from whence the water is withdrawn into the inlet conduit 51 of the suction blower 50 and discharged into the exhaust outlet 55 of the blower, the latter preferably being provided with a water separator, not shown, for trapping the water drops and preventing the same from being discharged into the atmosphere adjacent the film drying apparatus. The blower 50 is adapted to be driven by an electric motor 56 at a substantially constant speed so as to continuously maintain a suction or low pressure within the suction nozzle head 52 and also serves as the means for supplying power for driving the reels 17 and 25 through the friction drive transmission 35, as previously explained.

As seen in Figure 1, a small positive pressure blower 60 supported by a bracket 61 secured to the base 1 and adapted to be driven by a suitable electric motor (not shown) is arranged so that its outlet delivers a blast of air against the film 21 having a large component of its velocity in a plane parallel to the film and serving to create a moving stream of air along the film between the idler roller 22 and the adjustable idler roller 10. A similar blower 62 mounted on a bracket 63, which is supported on the outer ends of the arms 16, is similarly arranged as seen in Figure 1, to create a current of air which moves relative to the film 21, with a large component of its velocity parallel to the film, as the latter descends from the idler roller 10 to the dry film reel 17,

and it is thus seen that the film 21 in traversing the path from the wet film roll 15 over the idler rollers 22 and 10 to the dry film reel 17, is continually subjected to the drying effect of the currents of air created by the respective blowers 60 and 62. It is to be understood, of course, that the blowers 60 and 62 may be provided with suitable electric heaters to heat the air discharged therefrom when weather conditions, such as extremely low temperatures, require their use.

Operation

When it is desired to use the film drying apparatus above described, the tubular members 7 and 8 are extended so that the idler roller 10 is located at a desired height above the base 1, which is determined by the particular weather conditions, such as temperature and humidity, prevailing at the time. The wet film roll taken from the developing tanks is mounted in the forked arms 13, as previously noted, and the leader tape thereon is led over the peripheries of the idle rollers 22 and 10, and secured to the leader tape reel 25. The friction transmission drive 35 is then adjusted to give a reeling speed judged to be the most rapid suitable for the weather conditions, and the blowers 50, 60 and 62 are then started by energizing the motors from any suitable power source. The leader tape 33, as it is wound upon the reel 25, carries the wet film from the roll 15, past the drying nozzles 53 to thereby remove the water drops therefrom and causes the film to pass upward over the roller 10 and when the end of the film has reached the dry film reel 17, the end of the leader tape is cut and allowed to wind up on the reel 25 and the leading end of the dry film is passed around the dry film reel 17 and the film is then reeled thereon. The blasts of air delivered by the blowers 60 and 62 dry the film in its course from the wet film roll 15 to the dry film reel 17, and if it is seen that the drying is insufficient, the idler roller 10 may be shifted upward to increase the length of the path between the wet film roll and the dry film reel. By means of this adjustment, the film may be thoroughly dried and yet be reeled at a maximum speed, and the combination of this adjustment with the speed adjustment for the winding reel as provided by the variable speed transmission 35, together supply the means necessary for insuring the proper drying of the film under varying field weather conditions and yet insure that the film will pass through the drying process at the maximum possible reeling speed, thus permitting a large number of film rolls to be rapidly dried even under adverse weather conditions.

Though a single preferred form of the invention has been illustrated and described, it will be apparent to those skilled in the art that other modifications and changes may be made therein falling within the scope of the invention as defined by the appended claims.

I claim:

1. A portable device for drying photographic film including a wet film roll and a power-driven reel adapted to receive film therefrom, suction nozzle means adjacent said wet film roll for removing water drops, means for adjustably varying the speed of the power-driven reel, means for subjecting said film to a moving current of drying air having a substantial component of its velocity parallel with said film during substantially the entire traverse of the same from said roll to said reel, and means for adjustably varying over a considerable range the length of the path traversed by said film to thereby vary the length of contact of the current of drying air with the film.

2. The structure as claimed in claim 1, in which the means for varying the length of the path traversed by the film comprises an idler roller located between the wet film roll and the dry film reel and over which the wet film is passed during drying and means for shifting said idler roller so as to increase or decrease the distance through which the film must travel in its traverse from the wet film roll to said reel.

3. A portable device for use in drying wet photographic film comprising, a base structure, means on said base for rotatably mounting a roll of wet film, means on said base for rotatably mounting a reel adapted to have the dried film wound thereon, variable speed driving means for said reel, means including an adjustable guide over which said film is adapted to pass to vary over a considerable range the length of the path traversed by said film from said roll to said reel, and means for subjecting said film to a current of drying air during substantially the entire traverse of the film from said roll to said reel.

4. A portable device for drying photographic film of the roll type under varying atmospheric conditions such as temperature and humidity comprising, a supporting base, means secured to said base for rotatably mounting a wet film roll, a means connected to said base for rotatably supporting a reel adapted to receive the dried film, variable speed power means for driving said reel at a selected speed of rotation, an extensible and retractable support secured to said base and arranged for adjustable extension and retraction in a plane normal to the axes of rotation of the said wet film roll and said reel, an idler roller mounted on said extensible and retractable support over which the film passes in its traverse from said wet film roll to said reel, and power blower means for causing a current of air to pass over said film during the said traverse from the wet film roll to the dry film reel.

5. The structure as claimed in claim 4, in which said extensible and retractable support for said idler roller comprises a plurality of telescoping tubes one of which serves to rotatably support the idler roller.

6. The structure as claimed in claim 4, in which the power blower means is arranged so as to cause the current of air to move relative to the film with a substantial component of its velocity parallel to the path of the film throughout its traverse.

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