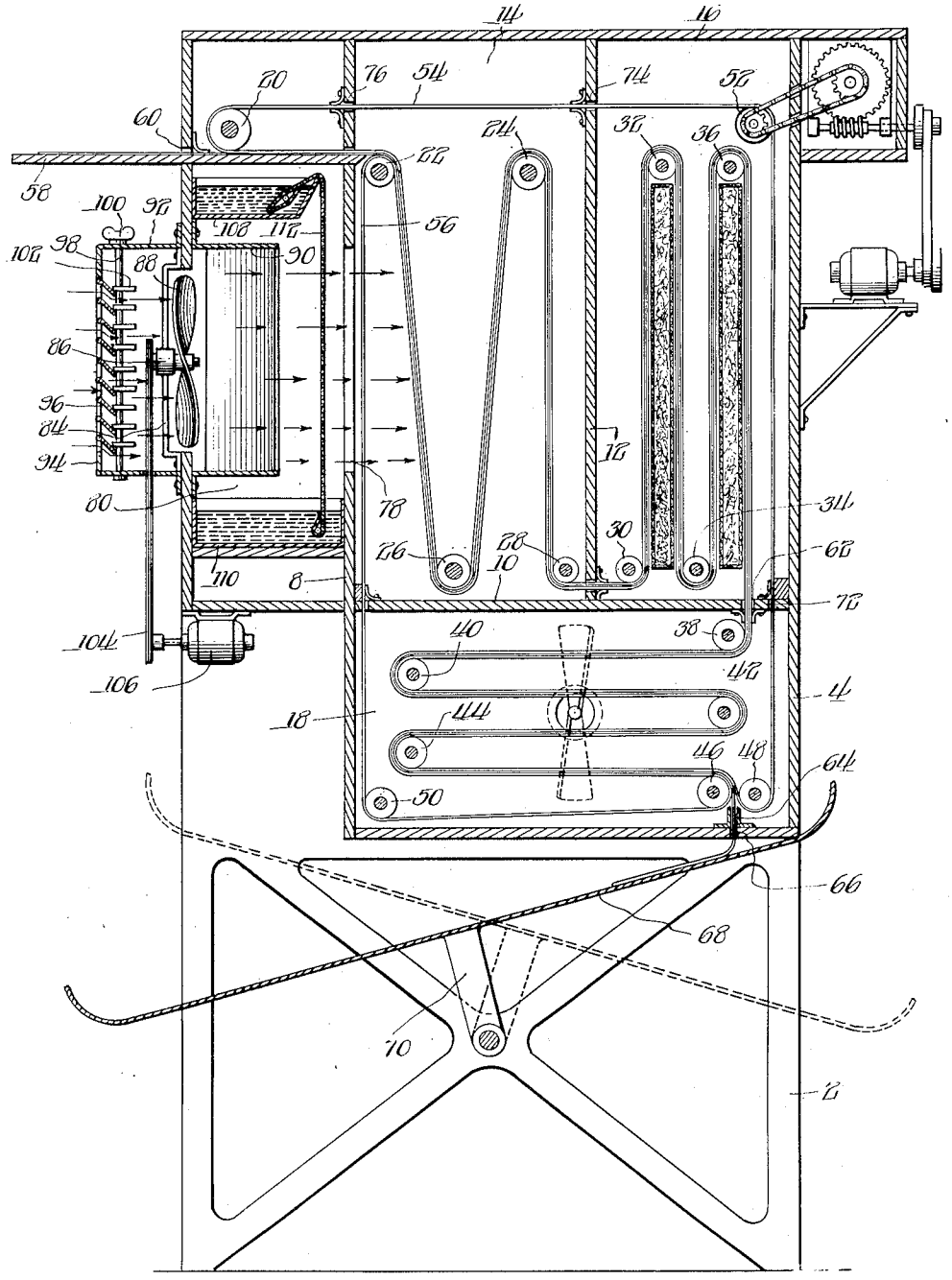
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DEVELOPING APPARATUS

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DEVELOPING APPARATUS

Application filed March 7, 1928. Serial No. 259,751.

My invention relates to developing apparatus for light sensitive material and more particularly to a device for developing such material by the aid of a chemically active gas such for instance as ammonia gas.

One of the objects of my present invention resides in providing an improved means for quickly creating an effective developing gas such as ammonia gas and for effectively and intimately bringing the gas into contact with the light sensitive materal to develop the latter.

Still another object of my invention resides in the improved means whereby I bring about the quick evaporation of the liquid ammonia, its conversion into ammonia gas, and its application to the light sensitive material.

Yet another object of my invention resides in the automatic means whereby a fan blower or the like is used for projecting the developing gas onto the light sensitive material and in the manner wherein an automatic shutter is utilized for opening and closing the developing cabinet to permit the current of air to be blown by the fan onto the developing material.

Yet another object of my invention resides in the specific arrangement of wicks and the manner in which these wicks draw the liquid ammonia from points above and below the fan so that the liquid ammonia is held in a fine state of suspension directly in the path of the travel of air from the fan, and the gas evaporated thereby is projected onto the light sensitive material.

These and other objects of my invention will be apparent from a perusal of the following specification when taken in connection with the accompanying drawings, wherein:

The figure shows a sectional view of a preferred type of my invention.

For illustrative purposes and not by way of limitation, I have shown one form of my invention as applied to the construction disclosed and claimed in my co-pending application, Serial No. 252,717, filed February 8th, 1928, it being understood that the invention claimed herein is of broad application and is not to be confined to the exact type of machine therein shown.

In general, my invention comprises an enclosing developing cabinet having means therein adapted to support light sensitive material to be developed and specifically having means therein for causing the continuous passage of the light sensitive material such as paper, from an inlet in the cabinet to an outlet in the cabinet. During its passage through the developing cabinet, the light sensitive paper is subjected to the action of the developing gases and the broad features of my invention herein comprise the provision of means for quickly and effectively evaporating the liquid developing material such as liquid ammonia and then projecting the developing ammonia gas, as by means of a blower, into contact with the paper. One of the broad aspects of my invention resides in the manner in which I accomplish the quick evaporation of the liquid ammonia. In the present instance, I provide feeding means such as wicks which extend across the path or zone of travel of the air from the blower and these wicks by capillary attraction feed the liquid ammonia so that the projected air will quickly evaporate the ammonia and carry the gas into contact with the light sensitive paper. In particular, I provide a pan above and a pan below the path of travel of the air and the opposite ends of the wicks are contained in these paths so that the liquid ammonia travels by capillary attraction in two directions and I provide a plurality of wicks preferably spaced apart slightly, although a single open mesh wick co-extensive with the zone of the blown air may be used, and these wicks being located so that the currents of air strike them, will provide a quick evaporation of the liquid ammonia and an effective means whereby the developing gas given off will be forcibly projected against the light sensitive material to be developed. In cooperation with this blower fan and the wicks, I provide the developing cabinet with an opening and a shutter constructed and arranged automatically to open when the blower is operated so as to permit a current of air to pass to the blower and also constructed so

that when the blower stops, the shutters will automatically close. In addition, I provide positive means for holding the shutters in practically air-tight and closed position.

In certain instances, the air sucked in through the shutters may be moist air to accelerate the developing action.

Referring now to the drawings in detail and as set forth in my prior application, hereinbefore referred to, my invention comprises a support or base 2 upon which is mounted a cabinet 4 of substantially air-tight or gas-tight nature. This cabinet is preferably provided with a front glass wall 6 whereby the operations going on within the cabinet may be viewed. In addition, the cabinet is provided with internal partitions 8, 10, and 12 to provide a main developing chamber 14, a de-gasifying chamber 16 and an airing or ventilating chamber 18. Within these chambers are provided a number of guide rolls 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, and 52, around which pass a plurality of endless feeding cords or belts 54 and 56. These belts are arranged so as to come together initially at the guide roll 22 just opposite the end of the ledge 58 located at the inlet opening 60 in the cabinet near the top front wall thereof. From the pulley or guide roll 22 the belts travel together downwardly around the roll 26, thence upwardly around the guide roll 24 and thence downwardly around the guide roll 28. The foregoing path of travel occurs in the developing chamber 14. From the guide roll 28, they pass together through an opening or slot in the lower portion of the partition 12 and thence pass into the de-gasifying chamber 16. The slot in the partition 12 is provided with flexible gaskets which wipe along the belts and prevent the escape of gases through the slot.

The two belts pass together through the de-gasifying chamber, passing from the guide roll 30 upwardly around the guide roll 32, thence down around the guide roll 34, and thence upwardly around the guide roll 36 and thence downwardly and through a slot 62 in the horizontal partition 10. The de-gasifying chamber 16 is provided with any type of means for removing the occluded gases from the developed paper passing between the belts or cords. As claimed in my foregoing application, I prefer to utilize containers holding copper sulphate crystals or other dry substance for effectively removing ammonia gas.

The two belts traveling together thence pass into the ventilating chamber where they turn about the guide roll 34 and thence about in succession the guide rolls 40, 42, 44, and 46 which causes the belts to move in circuitous or serpentine paths before they pass between the two end spaced apart guide rolls 46 and 48. At this point, the paper which has been carried by the belts or cords, is passed through the slotted guide 64 which has its inner mouth projecting close to the bight between these rolls so that the paper is discharged through the slot 66 in the bottom wall of the cabinet onto a tiltable receiving trough 68 pivotally mounted as at 70 on the base 2, all as shown in my foregoing application. From the roll 48 the belt 54 passes upwardly through a slot 72 in the wall 10, thence upwardly through the de-gasifying chamber around driven pulleys 52, thence forwardly through openings 74 and 76 in partitions 12 and 8 respectively and thence back to pulley 20 as shown. In a similar manner, the other belt 56 after leaving the guide roll 46 passes forwardly around guide roll 50, thence upwardly and through another slot in partition 10 and passes upwardly around pulley 22 again to meet the other feeding member or cord 54.

The pulley or guide roll 52 is driven by means of a sprocket chain and a motor drive, all as set forth in my preceding application.

The constructional features which form the basis of my present application resides in the manner of projecting the developing gas onto the light sensitive material as it is fed through the developing chamber 14 or alternatively, as it is supported therein. In the present instance, the vertical wall 8 is provided with an opening 78 and this opening communicates with a preliminary chamber 80, the front wall 6 of which is formed with an opening 82 carrying a bracket 84 on which is mounted a shaft 86 carrying a fan or blower 88. This blower is mounted directly in this opening and I also provide a tubular guide-way for the air for this blower so as to confine the air projected by the blower in a prescribed path or zone. In the present instance, this guide-way is formed by means of a tubular shell 90 suitably attached to the inner face of the front wall 6. I also provide a corresponding or registering outer tubular sleeve 92 to form an extension of the inner sleeve 90. This outer sleeve is preferably provided with an internal flange 94 to provide a support for a plurality of spaced apart and pivotally mounted shutters 96 of very light material such as aluminum. These shutters are pivotally mounted in vertical superimposed relation and in a manner so that when no current of air is created they fall by gravity to a closed over-lapping position so that the opening in the outer sleeve 92 is practically air-tight. However, these leaves or shutters, being of very light-weight and light material are caused to automatically open as soon as the blower starts since a draft of air will draw them open and permit air to flow through the shutters and through the tubular guide around the fan. In order to hold the shutters in closed position, I provide any

suitable means such for instance as a vertically disposed rod 98 having bearings in the upper and lower portions of the guide 92 provided with a turning member 100 on the outside thereof. This rod is provided intermediate its length with a plurality of claws or other turning members 102 which when the rod is turned come into contact with the shutters and move them to closed position and thereafter hold them in such position until the rod is again turned to released position after which the shutters will automatically open and close as hereinbefore set forth. The motor shaft 86 is driven by means of a belt 104 from a motor 106 mounted on the under side of the partition 10.

Within the chamber 80 I provide one or more containers adapted to hold liquid developing material such as liquid ammonia. In the present instance, I prefer to provide two containers 108 and 110 suitably mounted and as shown, in a position above and below the air tube 90. Other locations for the pan or pans may be availed of, however, I desire to place them in vertical arrangement with respect to the tube 90 so that the wick members mounted therein will receive liquid ammonia from both ends whereby the liquid ammonia will travel by capillary attraction toward the center of the wicks. In the present instance, I prefer to provide a plurality of wicks suitably spaced apart just sufficient distance to prevent the free passage of the air currents from the lower fan 88. There are a sufficient number of these wicks to provide a relatively extensive saturated wick surface through which and around which wick surfaces the air currents will pass from the fan 88. These wicks 112 are of any desired material and are arranged so that their upper and lower ends are suitably submerged and held in the pans 108 and 110. By holding the wicks in predetermined spaced apart position, I thus provide an open construction of these surfaces or liquid conveying members which are adapted to give off developing gas. In the present instance, the ammonia will flow by capillary attraction downwardly along the wicks 112 and at the same time the liquid ammonia in the path 110 will be drawn upwardly by capillary attraction meeting at the center of the wick. In lieu of a plurality of wicks, any suitable type of open mesh or open weave wick may be used to the same end.

In the operation of my device, when the light sensitive material is fed either in strip or sheet form through the opening 60 it will be carried along by contact with the upper belt 58 into position between the bights of the travel belts as they come together about the periphery of the guide roll 22. From this point, the material is carried along between the plurality of cords constituting each belt through the developing chamber. It will be noticed that the light sensitive paper will be carried directly across opening 78 and thence backward and forward in a tortuous path through the developing chamber 14. During its passage the air from the blower 88 will pass through the saturated wicks and the evaporated ammonia gas will be blown against the light sensitive side of the paper. It will be appreciated, of course, that each belt is composed of a plurality of spaced apart cords running in spacing grooves in the guide rolls so that the gas will have ample opportunity to come into intimate contact with the light sensitive material. During the time that the blower is rotating the air pressure will cause the light shutters to swing to open position.

After the light sensitive material has been developed in chamber 14, it will be passed by the traveling cords through the de-gasifying chamber where by the action of the copper sulphate crystals, the occluded gas will be removed. From this point the material continues to travel between the cords into the ventilating chamber where the exhaust fan connected thereto will serve to hold a column of fresh air through the ventilating chamber to remove any last traces of residual gases on the paper.

It is thought that the invention and numerous of its attendant advantages will be understood from the foregoing description and it is obvious that numerous changes may be made in the form, construction and arrangement of the several parts without departing from the spirit or scope of the invention or sacrificing any of its attendant advantages, the form hereinbefore described being a preferred embodiment for purposes of illustrating my invention.

I do not claim herein the specific element of the compartments of the developing apparatus, nor the degassing or airing features, since the same forms the subject matter of my co-pending applications to-wit, Serial No. 287,139, Serial No. 253,558, and Serial No. 248,745, and I do not claim herein any of the subject matter of invention set forth and claimed in these co-pending applications.

In certain instances, I desire to connect the air opening leading to the shutters with any type of means for supplying moist air to the opening through the shutters.

In the present instance, I prefer to provide my apparatus with air deflecting means located between the fan and the wicks and in the illustration shown I have provided a plurality of preferably sheet metal guides arranged so that when the current of air is caused to move by the fan, through the tubular guide-way, it will pass through the spaced apart guides and will be directed outwardly and laterally in fan-like direction against the saturated wicks. It is apparent

that any desired means for suitably diffusing the current of air and causing its even and uniform distribution in the developing chamber is within the contemplation of my invention.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. In a device of the class described, the combination of a frame, means for supporting light sensitive material therein, means carried in said frame and adapted to be saturated with liquid ammonia, means for blowing air against said saturated means whereby to evaporate the saturant and to blow the same upon the light sensitive material.

2. In a device of the class described, the combination of means forming a supporting frame forming a housing provided with an opening, an air blower mounted in said opening, means for supporting light sensitive material in said housing in the path of the air from the blower, and means disposed in said path between the blower and the light sensitive material, said means being saturated with liquid ammonia.

3. In a device of the class described, the combination of an enclosing casing providing a developing chamber, means for supporting light sensitive material therein, an opening for said casing, a blower disposed in said opening, a wick disposed between said blower and said light sensitive material and directly in the path of travel of the air from the blower, said wick having its opposed ends located in pools of liquid ammonia.

4. In a device of the class described, the combination of a supporting frame, means therein for supporting light sensitive material, means for forcing air against said light sensitive material, and a wick disposed in the path of travel of the forced air on its way to the light sensitive material, said wick being saturated with liquid ammonia.

5. In a device of the class described, the combination of an enclosing casing forming a developing chamber, means for supporting light sensitive material therein, an opening for said casing, means for blowing air through said opening and against the light sensitive material, a container for liquid ammonia disposed above said opening and a container disposed below said opening, and a wick having its opposed ends in the liquid ammonia in the upper and lower containers.

6. In a device of the class described, the combination of a support frame, means for supporting light sensitive material therein, a wick mounted in said frame, means for saturating said wick with liquid ammonia and means for blowing air through said saturated wick onto the light sensitive material.

7. In a device of the class described, the combination of an enclosing casing, means therein for supporting light sensitive material, means therein for evolving ammonia gas, a blower connected to said casing for blowing the evolved gas onto said light sensitive material, said blower having an opening connecting with a source of air, and a plurality of very light shutters mounted in said opening and normally being disposed in closed position, said shutters being constructed and arranged to open due to a suction created by the rush of air into said casing.

8. In a device of the class described, the combination of means forming an enclosing casing provided with an opening, means forming a tubular guide-way in said opening, a bracket in said opening, a blower shaft mounted on said bracket, a blower on said shaft, means for driving said shaft, a plurality of shutters pivotally mounted at their upper ends and disposed in the opening in said guideway in overlapping relation, said shutters being composed of very light material and adapted to open upon the operation of said blower and adapted to automatically close upon the discontinuance of the operation of said blower, means disposed in the path of said blower and adapted to contain a quantity of liquid ammonia for evolving developing gas.

9. A developing apparatus comprising means forming a developing chamber, means therein for supporting light sensitive material, means for directing an air current against the light sensitive material, and a wick depending in the path of said air current and means for saturating said wick with liquid ammonia.

10. In a device of the class described, the combination of means forming an enclosing chamber, means for supporting light sensitive material in said chamber, air forcing means for blowing air against said light sensitive material and a saturated wick arranged between the forming means and light sensitive material for impregnating the moving air with ammonia gas.

11. In a device of the class described, the combination of means forming an enclosing chamber having a wall provided with an opening, means for supporting light sensitive material in said chamber, air forcing means arranged in said opening for blowing air into the cabinet and against said light sensitive material, means saturated with liquid ammonia disposed in the chamber in the path of travel of said forced air.

12. In a device of the class described, the combination of means forming an enclosing chamber, means for supporting light sensitive material in said chamber, a blower for blowing air against said light sensitive material, and means saturated with liquid ammonia disposed in the path of the air blast.

13. In an apparatus of the class described,

the combination of a support frame, means carried in the frame for creating a draft of air, means for conveying light sensitive material into the path of said draft and means for impregnating the draft with gases capable of developing light sensitive material.

14. In an apparatus of the class described, a frame having means therein forming a developing chamber, means carried by said frame for creating a draft of air in said developing chamber, means in said chamber for conveying light sensitive material through the said draft of air and means mounted in the frame and extending in the path of the air current to impregnate said current with a gas capable of developing light sensitive material.

15. In an apparatus of the class described, a frame having means therein forming a developing chamber, means carried by said frame for creating a draft of air in said developing chamber, means in said chamber for conveying light sensitive material through the said draft of air and an air pervious member mounted in the frame and extending in the path of the air current, and means for saturating said pervious member mounted in the frame with a medium capable of evolving gases for the development of light sensitive material.

In witness whereof, I have hereunto subscribed my name.

ADOLPH LANGSNER.