

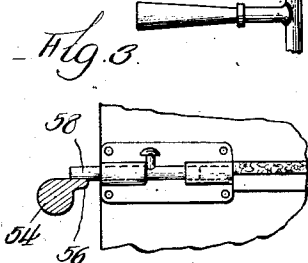
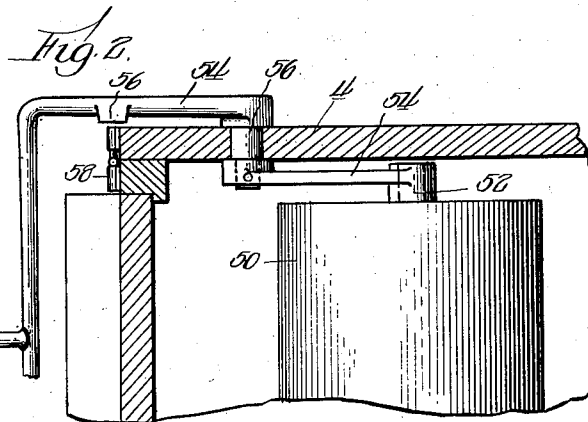
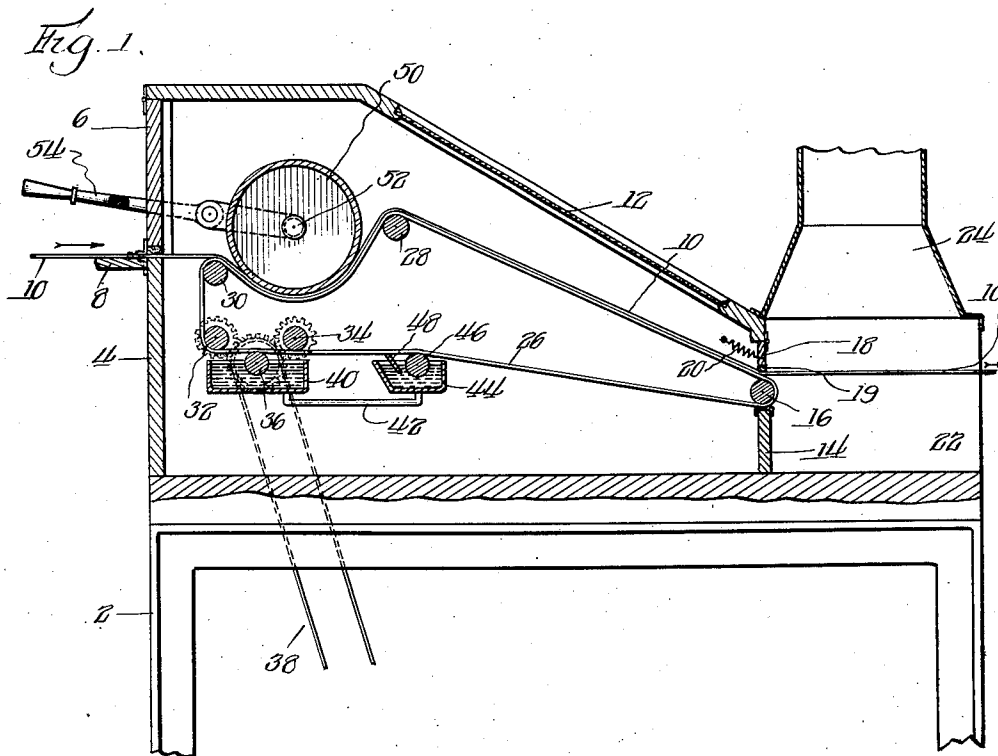
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R. F. ALLIN

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DEVELOPING APPARATUS

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UNITED STATES PATENT OFFICE

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DEVELOPING APPARATUS

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My invention relates to developing apparatus for developing certain kinds of light-sensitive papers, film or other material, particularly light-copying paper which is developed by contact with an alkaline solution or gas, ammonia being a type of such solution or gas. The development takes place in closed cases or cabinets, wherein the paper or other material is treated to the alkaline reaction of the solution or gas.

One of the objects of my present invention is to provide an improved type of apparatus which permits of the continuous development of a long strip of the light-copying material or paper, and in a manner such that the strip of material is passed uninterruptedly through the case or cabinet in which the developing operation is being carried out.

Another object of my invention is to provide means for adjusting the feed of the paper or other light-sensitive material through the developing apparatus so that the strip of paper will always be in registration with the member carrying the developing solution thereon, whereby the entire light-sensitive surface of the material to be developed will be in contact with the solution carrying member so that there will be no undeveloped spots, streaks or areas on the paper as it passes through the machine.

Still another object of my invention resides in providing a convenient arrangement or means for feeding the strip of light-sensitive material through developing drums, rolls, or belts and in a manner which not only permits the adjustment of the paper strip into registry with the feed of the member which applies the developing solution to the strip, but in a manner which also prevents the escape of the alkaline fumes from the developing apparatus.

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

Figure 1 is a cross-sectional view showing my improved type of developing apparatus.

Figure 2 is a plan view in section of Figure 1.

Figure 3 is a detailed view of the lock for holding rotatable drum away from the belt.

Referring now to the drawings in detail my invention comprises a base standard 2 of any desirable description upon which may be mounted a case or cabinet 4 of suitable material. This cabinet has at the front thereof a hinged door 6 and is provided with a platform as the shelf 8, for receiving the strip 10 of the light-sensitive material, paper or film which is to be developed. At the rear of the machine the upper portion of the case is provided with a glass sight opening 12. This portion of the case is preferably formed to incline downwardly and is provided with an upstanding partition wall 14 which terminates short of the incline portion to provide an opening in which is mounted a roller 16 which is of a width equal to the maximum width of the strip which the machine is adapted to receive. This opening in the partition wall 14 is likewise mounted with a pivoted door or gate 18 located directly above the roller 16. This gate is provided with a coiled spring 20 which normally actuates the gate inwardly to closed position as shown in Figure 1. The bottom of the gate has formed along its lower edge the gasket of rubber or other yieldable material which forms a suitable resilient packing or gasket so as to form with the roller 16 which is likewise of rubber or other resilient or yielding material, substantially air and gas proof or gas tight joint at the outlet of the case 4, so that the strip 10 of paper or material developed may pass through the partition at this point and without permitting the gaseous fumes within the casing to escape. The case or cabinet 4 at the rear end is provided with an outer casing or chamber 22 which closes the opening in the partition 14, except that one end of this outer casing 22 is opened to permit of the withdrawal of the developed light-sensitive paper. In addition the top of this casing 22 is formed funnel shaped and connects with a suction device, not illustrated, whereby occluded gases on the developed paper will be withdrawn from the vicinity of the developing apparatus.

The mechanism within the chamber for developing and continuously feeding the strip of material through the chamber preferably comprises an endless belt 26 of material such as rubber which is adapted to pass around a plurality of rollers 16, 28, 30, 32, 34 and 36, the first being mounted as hereinbefore described, in the opening of partition 14. Rollers 28 and 30 are located above the other rollers for purposes hereinafter set forth. Rollers 32, 34 and 36 are placed relatively close together so that intermeshing gears or other driving gears on these rollers will permit them all to be driven through a belt drive 38 on the roller 36. The roller 36 is disposed within a pan or container 40 adapted to contain a quantity of developing liquid such as liquid ammonia, and this roller 36 is arranged so that it will revolve in this liquid and apply it in a very thin film to the underside of the continuous rubber belt 26. While I have described this belt as being formed of rubber, it may be formed of any type of material which will not be saturated. The idea being to apply the ammonia solution in a very thin film to the underside of the belt 26. The container 40 communicates by means of a pipe 42 with the second container 44 in which rotates an additional roller 46. There is also a scraper 48 which contacts with the underside of the belt 26 and cleans it preparatory to receiving a fresh film of developing fluid as the belt contacts with the roller 36 in the main tank. A relatively large and freely rotatable drum 50 is mounted on axis 52 adjacent to rolls 30 and 28, and in a manner such that the periphery of the drum 50 will roll in contact with the endless belt 26—that is, it will contact with the side which has received the film of liquid ammonia thereon. The strip of paper 10 to be developed is fed along the shelf 8 and beneath the lower end of the pivotally mounted door 6 so as to pass into the developing chamber 4. The bottom of this door 6 is formed with a gasket of rubber or other suitable material which is adapted to provide an air or gas proof joint or gasket seal through which the strip may pass while preventing exit of fumes from the developing cabinet. The strip is fed beneath the endless belt 26 as it travels along its rollers at the freely rotatable drum 50. The light-sensitive strip passes under the arcuate surface of the drum and between it and the belt, and thence along and down the incline run of the belt 26 whence it passes between the roller 16 and the gasket on the bottom surface of the pivoted mounted gate 18. From thence it passes through the airing chamber from which it may be removed from the machine.

In the development of relatively long strips of this light-sensitive material, or in the utilization of my apparatus of the continuous developing machine, wherein rolls of printed paper are passed uninterruptedly

through my developing apparatus, it frequently becomes necessary to prevent the strip of paper from getting out of line with the width of the endless traveling belt, or alternatively with a roller, which belt or roller functions to apply the liquid film to the light-sensitive paper. One of the main features of my present invention resides in the means for accomplishing this adjustment—such for instance as the lateral adjustment of the strip of light-sensitive paper with respect to the endless belt 26 and to the rotatable drum 20. I have accomplished this in a very simple manner by mounting the axis 52 of this freely rotatable drum 50 on a lever 54, the outer end of which carries the axle 52 of the drum. This lever 54 is pivoted on the siding of casing 54 at a point 56 and the outer ends of the lever is provided with a handle so that by depressing the outer end of the lever the latter is swung on its pivot 56, so that the drum 50 is raised more or less out of contact with the belt 26 and with the strip of light-sensitive material such as paper 10 there between. Thus when the drum is so raised, the paper may be adjusted laterally or in any other manner to permit registration of the paper with the belt or other liquid applying member. In order to hold the drum in raised position temporarily, I provide the lever 54 with an offset 56 adapted to engage under a latch 58 mounted on the frame of the cabinet 4.

It will thus be seen that I have provided a very simple but most practicable type of apparatus for commercially developing relatively long strips of light-sensitive material by means of contact with a member in a casing which applies the film of developing solution or liquid to the traveling strip of paper to be developed. I have provided a practical, simple means of accomplishing the registration of the paper with the belt, roller or other means which applies the liquid film thereto. This is a very important feature of my invention, because if the belt or roller which carries the liquid gets out of registration with the width of the strip to be developed there will be undeveloped spots or areas on the unregistering parts which will spoil the strip, and particularly so since a strip is constantly moving through the developing cabinet. By means of my simple adjusting mechanism, particularly in the form shown wherein the rotatable drum 50 may be moved relatively away from the traveling belt 26, I permit an almost instantaneous adjustment of the traveling paper while not stopping the feed of the belt itself, since it is the weight of the rotatable drum 50 which insures the positive feed of the paper 10 through the developing cabinet.

Another feature of my invention resides in the means for preventing the discharge of

gaseous fumes in the vicinity of the developing apparatus at the points where the strip of paper or other material are being developed passes into and passes out of the cabinet, and particularly the construction where the paper passes out of the cabinet between the rotatable roll 16 about which the endless belt 16 passes and the opposed and abutting gasket 19 secured to the lower edge of the pivoted gate 18 whereby the traveling belt as it passes about the roller 16 and the gasket 19 form a practically air-tight seal at this exit for the strip 10.

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 and scope of my invention or sacrificing any of its manifest advantages, the form hereinbefore described being but a preferred embodiment for the purpose of illustrating my invention.

I do not claim herein any of the subject matter of invention claimed in and described in my copending applications Serial No. 203,241 filed July 2, 1927, and Serial No. 228,719 filed of even date herewith.

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

1. A developing apparatus for relatively long strips of light-sensitive material comprising an enclosing casing having inlet and outlet openings, means in said casing for feeding the strip of material from the inlet opening through the casing and through the outlet opening, said means including two contiguous traveling elements between which the strip passes, means for causing said elements to travel, means for applying developing liquid to one of said elements whereby said liquid is applied to the strip as it passes through the cabinet and means for moving one of said elements away from the other whereby to permit the adjustment of said strip relative to the elements which applies the developing liquid to the strip.

2. In a device of the class described, the combination of a support frame, a traveling member, capable of receiving a developing medium in a surface thereof, arranged in the frame, a second member therein adapted to have its surface contact with the surface of the traveling member, means for inserting material to be developed between said contacting surfaces, means for applying a developing medium to said travelling member before the same engages the second member, and means for separating the contacting surfaces to facilitate adjustment of the light sensitive material therebetween.

3. In a device of the class described, the combination of an enclosing casing, an end-

less belt mounted therein, means for causing said belt to travel in said casing, a relatively large drum mounted in said casing with its periphery in contact with the belt, means for inserting a relatively long strip of material to be developed into said casing and between the drum and belt and for permitting the discharge of said strip from said casing, and means for applying developing liquid to the surface of said belt for applying said liquid in a thin film to the strip to be developed and means for moving said drum toward and from the traveling belt to permit insertion of the strip of material therebetween.

4. In a device of the class described, the combination of an enclosing casing, an endless belt of non-absorptive material in said casing, means for causing said belt to travel, means for applying a relatively thin film of developing liquid to the surface of said belt, and a relatively large drum having a portion of its periphery adapted to rotate in contact with that surface of the belt having the liquid applied thereto, means for feeding a strip of material to be developed into and out of said casing and between said surface of the belt and the periphery of the drum, and a lever pivotally mounted on said casing and carrying the rotatable shaft of the drum, said lever being constructed and arranged to shift the drum away from the belt.

5. In a device of the class described, the combination of an enclosing casing having two openings forming an inlet and the discharge respectively, means for feeding a relatively long strip of light-sensitive material through said inlet opening through said cabinet and out through said discharge opening, said means including a roller located in said discharge opening, and a conveyor belt of imperforate material adapted to pass over said roller, and a gate pivotally mounted at and forming a part of said discharge opening, said gate having a yieldable surface adapted to make friction contact with said belt and to receive the strip of material between it and said belt whereby to permit the discharge of said strip through the chamber, while at the same time prevent the escape of gases from said exit opening and means in said cabinet for developing said strip.

6. In a device of the class described, the combination of an enclosing casing, an endless belt mounted therein, means for causing said belt to travel in said casing, a rotary member having its periphery adjacent a portion of said belt and adapted to bear against said portion, means for inserting a relatively long strip to be developed into said casing between said rotatable member and said belt, means for applying developing liquid to the surface of said belt whereby to apply said liquid to the strip to be developed, and means for moving said rotary element away from the travelling

belt to permit a lateral adjustment of the strip material on said belt.

7. In a device of the class described, the combination of an enclosing casing, an endless belt in said casing, means for causing said belt to travel in said casing, a rotary drum adapted to bear downwardly against a reach portion of said endless belt, means for directing a relatively long strip of material to be developed to be passed into said casing and between the rotary drum and the reach portion of the belt, means for applying developing liquid to the surface of said belt for applying said liquid in a thin film to the strip to be developed, and means for elevating said rotary drum to separate the same from the endless belt whereby the lateral adjustment of the strip material on the belt may be readily effected.

8. A developing apparatus comprising a frame, an endless belt, guides mounted in said frame for supporting and guiding said endless belt along a predetermined path in said frame, a roller shiftably mounted to receive and grip light sensitive material to be developed between itself and the endless belt, means for moving the belt whereby to carry the light sensitive material around said roller, means for applying a developing medium to the light sensitive material while it is between said roller and said belt, and means for shifting said roller to tighten or loosen the belt whereby to regulate the gripping action of the belt and roller around which the light sensitive material is carried.

9. A developing apparatus comprising means forming a developing chamber, an endless conveyor supported in the chamber, a plurality of guides for supporting and guiding the conveyor along a predetermined path in said chamber, a member mounted to receive and grip light sensitive material to be developed between itself and the conveyor, means for moving the conveyor and said member whereby to carry the light sensitive material along between them, means for subjecting the light sensitive material to the action of a chemically active developer, as it is carried along, and means for bodily shifting said member whereby to tighten said conveyor against said member.

10. A developing apparatus comprising a frame, an endless conveyor supported in the frame, a plurality of guides mounted in said frame for supporting and guiding the conveyor along a predetermined path, a movable member mounted in cooperating relationship with said endless conveyor to receive and grip light sensitive material to be developed between itself and the conveyor, means for moving the conveyor and said cooperating member whereby to carry the light sensitive material along between them, means for subjecting the light sensitive material to the action of a chemically active developer as it

is carried along and means to shift said conveyor and its cooperating member apart whereby to regulate the gripping action exerted therebetween upon the light sensitive material.

In witness whereof, I have hereunto subscribed my name.

RICHARD FRED ALLIN.