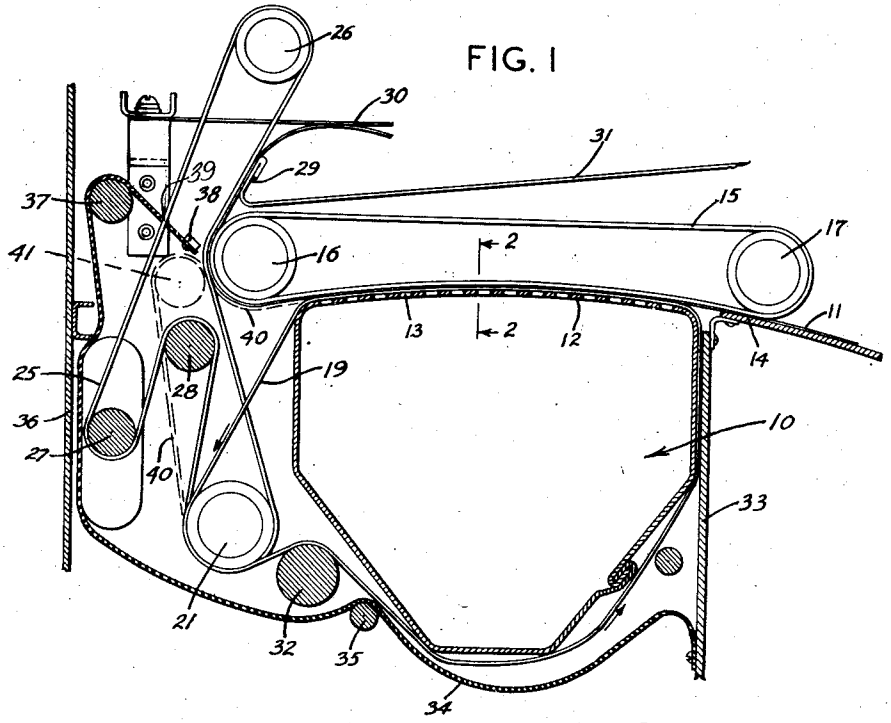
Dec. 28, 1948. F. O. TRUMP 2,457,753

CONVEYING MEANS FOR DRY PRINTING MACHINES

Filed May 14, 1947

FIG. 1



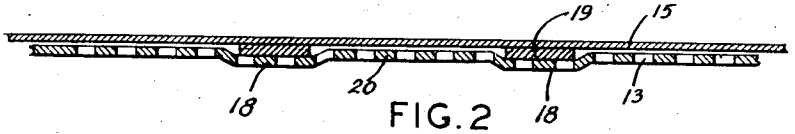


FIG. 2

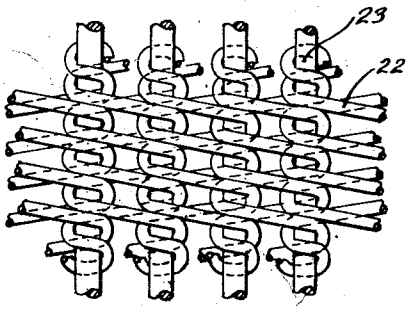


FIG. 3

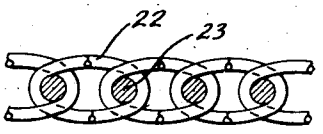


FIG. 4

INVENTOR
FREDERICK O. TRUMP
BY
ATTORNEY

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CONVEYING MEANS FOR DRY PRINTING MACHINES

Frederick Otto Trump, Binghamton, N. Y., assignor to General Aniline & Film Corporation, New York, N. Y., a corporation of Delaware

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6 Claims. (Cl. 95—89)

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This invention pertains to material handling and advancing means for the so-called dry developing machines. More specifically, the invention involves certain improvements in sheet material supporting and advancing means functioning to improve the development and ease of handling diazo-coated sensitized material, and to the combination of such improved means with sheet material conveying means adapted to discharge the developed sensitized sheets in a particular sequence.

Among the objects of the invention is that of providing effective, simple, and relatively inexpensive means for assisting in conveying the exposed sensitized material through a developing zone in which ammonia or other vapors contact the surface of the sensitized material.

Another object of the invention is that of providing certain means in machines of the type described thereby to provide positive supporting and advancing means adapted to contact spaced parallel areas only of the sensitized material to be developed and to control that material through contact with that part of its surface only so that there shall be no adverse effect resulting from the movement of the material through the developing zone.

It is a further object to provide mechanism as just above described which shall function in coordination with a plurality of sheet material conveying and discharging means and to provide improvements in the driving means for said conveying and delivering mechanism which shall also serve the purpose of driving at a predetermined speed the means for supporting and positively advancing the sensitized material through the developing zone.

Other objects of the invention will be apparent from the following disclosure.

In so-called dry developing machines adapted to develop diazo-coated material by the action of ammonia vapors, the ammonia is fed to a chamber in which it is vaporized by application of heat. These vaporizing chambers or tanks are generally perforated at one side and the vapors pass through the said perforations to contact the sensitized surface of the paper which has previously been subjected to light while in registration with an original to be printed. The vapors are confined to the appropriate space, and the sensitized material is engaged and advanced past the perforated portion of the vaporizing chamber by a flexible, composition belt generally termed a sealing sleeve. In most of these machines, the sensitized material is advanced by the sealing

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sleeve and makes a sliding contact with the surface of the vaporizing tank, and since the tank is relatively smooth and the sleeve of rubber composition develops considerable friction, the passage of the material is more or less positively controlled. However, for certain types of sensitized material, such as foil or gelatin-coated diazo material, the effect of frictional contact with the surface of the chamber gives rise to serious objections. These materials are frequently spoiled during their passage over the surface of the chamber and thus it becomes desirable to provide a means for safely handling them.

In a copending application Serial No. 618,834, filed September 27, 1945, certain improvements have been described and claimed, those improvements serving to eliminate the destructive effect of contact between the sensitized material and the surface of the developing tank or chamber. According to the invention of that case, the sensitized material never contacts the surface of the tank and is always spaced therefrom by a mesh, link belt overlying the tank surface and, according to one form of the invention, adapted to be moved at the same rate as the sealing sleeve thereby imparting movement to the sensitized material without developing any relative motion between it and any surface with which it is in engagement.

According to the improvements herein described, the same general effect obtained by employing the apparatus of the above-mentioned case is forthcoming without using a complete mesh, link belt of the same width as the developing tank. The tank itself is divided into spaced, parallel strips, alternate ones of which are slightly depressed so that the surface thereof lies below the general exterior surface of the tank, that is, considering only the perforated developing portion thereof.

A plurality of mesh belts in the form of strips are provided, these mesh belts encircling the tank and being guided within the spaced depressed areas hereinafter called recesses or channels. A positive driving means is provided for these mesh strips and by that means they are driven so that their surface speeds shall be substantially equal to the surface speed of the sealing sleeve.

The employment of the series of parallel mesh strips or belts rather than a continuous, full width belt makes possible the application of the invention to relatively low priced equipment since the cost of a full width belt is relatively high, thereby making it prohibitive for other than the more expensive machines. The mesh belt itself when

confined to the relatively narrow strips may also be more simply and cheaply constructed, yet serves very effectively for its intended purpose.

The parallel channels in the tank are of such a depth compared to the thickness of the mesh strips that the upper or outer surface of the strips projects approximately 1/64 of an inch beyond the outer surface of the tank between the channels. The mesh strips support the sensitized material at spaced, parallel parts thereof so that the intermediate or unexposed portions of the sensitized material move along either out of contact with the surface of the tank, or contact it with very little pressure. It has been found in actual practice that the proper combination between the said elements, their spacing, and the projection of the mesh strips above the intermediate tank surface makes possible the handling of foil, gelatin-coated material, and similar sensitized layers without damage.

As the developed material leaves the tank, it is engaged and controlled by a conveying system comprising a plurality of spaced tapes which frictionally engage it and move it upwardly through certain mechanism adapted to deliver it to a receiving or collecting means. According to the previously employed practice, these tapes were driven independently of the mesh belt, and, of course, there is a problem of synchronization since it is undesirable to have the material or sheet delivery tapes tend to advance material faster than it is delivered by the sealing sleeve and mesh supporting belt, or vice-versa. In either instance, there is a likelihood of destruction of the coated surface. The means herein described are so coordinated as to be driven by a common drive roller by which the synchronization of the speeds is automatically controlled. The tapes are alternated between the spaced mesh supporting and advancing strips and are driven by a single, friction surfaced, drive roller, the speed of which is synchronized with the speed at which other functions of the machine are carried out. The number of parts is greatly lessened, while the compactness of the device and the simplicity thereof are materially affected by employing the common driving means.

The invention will be described in greater detail by reference to one specific form thereof illustrated in the accompanying figures of drawing, wherein:

Fig. 1 is a section through part of a typical machine to which the invention has been applied.

Fig. 2 is a section taken at the line 2—2 showing details of the sealing sleeve, mesh belts, and channeled developing tank surface.

Fig. 3 is a detail of a small portion of one of the mesh belts showing the construction thereof.

Fig. 4 is a section showing further details of the belt of Fig. 3.

Referring to Fig. 1, part of a so-called dry developing machine is illustrated, only so much thereof being shown as seems necessary for an understanding of the invention and its mode of operation. A tank 10 shown and described in greater detail in United States Patent No. 2,350,257, serves to confine ammonia vapors generated therein, but which may be applied to the surface of sensitized material 11 through a relatively great number of staggered openings 13 in the top surface 12 of that tank. The material 11 is fed into the machine over a feed board 14 and is guided along the surface of the tank, or certain mechanism functioning in conjunction therewith by a sealing sleeve 15 travelling about the guiding

rolls 16 and 17, one of which is positively driven. The sealing sleeve 15 is preferably of a rubber composition which is not adversely affected by ammonia.

Normally, the sensitized material advanced by the sealing sleeve 15 passes, coated side downwardly, over the top of the developing surface 12 of the tank. As described in the application Serial No. 618,834, above mentioned, those materials which are easily damaged by rubbing over relatively stationary surfaces while under pressure against those surfaces may be safely handled if supported by a mesh structure such as described herein, which is driven at substantially the same speed as the sealing sleeve, and which is interposed between the surface of the tank and the coated side of the material. According to the improvements herein described, the tank portion 12 is recessed or channeled at 18, said channels being of a width adapted to guide a mesh or link structure formed as a strip or belt, said mesh strips being shown at 19. Intermediate the recesses 18 and mesh strips 19 are the relatively raised portions 20. The entire tank surface 12 is perforated, said perforations preferably being staggered and comprising as much open areas as possible consistent with retention of requisite strength.

The mesh strips 19 pass about the entire tank 10 and are wrapped about a roller 21 which is positively driven from other rotating parts of the machine. The roller 21 is coated or surfaced with rubber or other material adapted to increase the frictional engagement between it and the strips 19 thereby to drive them positively.

A small section of the mesh belt is illustrated in Fig. 3 and, as can be seen, the links are actually comprised of helically coiled wire 22, the shape of the individual coils being more clearly visible in Fig. 4. The adjacent coils are hinged together by transverse wire hinges 23. The hinge wires 23 are headed over as shown at 24. These strips may be made in any convenient width, but in actual practice it has been found that strips from 1¼" to 1½" in width serve very effectively. The coiled links 22 are more or less oval in shape as viewed in the section, Fig. 4, so that as near "point" contact between the links and the supported sensitized material as possible may be obtained.

In some instances, simpler types of mesh or chain structures may be employed so long as they satisfy the general requirements herein outlined. The space between the channels 18 is preferably slightly greater than the actual width of a channel itself, but that may vary with other factors. The sealing sleeve 15, while relatively flexible, is mainly supported by the strips 19 which have a thickness such that they project about 1/64 of an inch above the outer surface of the intermediate tank portions 20. The spacing between channels, or the width of the intermediate portions 20, is such that with a given projection for the strips 19 above the surface of the intermeidate portion 20, and for the general flexibility and tension in the sleeve 15, there will be very little pressure exerted against the sensitized material intermediate the strips 19 so that the frictional contact or rubbing engagement of the sensitized surface with the stationary tank portions 20 is negligible. It has been found that with the conventional sealing sleeve as supplied with machines of this type, the width of the portions 20 may be slightly greater than the width

of the intermediate channels when the strips 19 are of about the dimensions above specified.

A plurality of tapes 25 spaced intermediate the mesh strips 19 are driven by the common driving roller 21 and are also guided about a plurality of rollers 26, 27, and 28. After leaving the driving roller 21, the tapes 25 pass about the sealing sleeve 15 as it is guided about the roller 16. The said tapes engage the sensitized, developed material 11 and conduct it upwardly past a stacking lip 29 to be engaged by a plurality of fingers 30 by which it is so controlled as to be delivered to a stacking tray 31. The roller 27 is a tension roller and serves to maintain the tapes 25 under sufficient tension for their intended purpose. Roller 28 provides for wrapping the tapes about the driving means 21 so as to insure a relatively great extent of contact between the surface of the driving means and the tapes. The roller 32 guides the mesh strips 19 so that they wrap about the driving roller for an angular extent necessary to prevent slippage.

In order to prevent escape of ammonia vapors, an insulating board 33 is positioned at one side of the tank and is attached at its top end to the feed board 14. A rubber sheet 34 is connected adjacent the bottom of the tank to the board 33 and continues along beneath the tank and beneath the mesh strips to be guided by a supporting rod 35, by the rear surface 36 of the machine casing, and by the rods 37 and 38 at the top. The rubber sheet is slotted at 39 to permit passage of each of the tapes 25. It can be seen that the insulating board 33 and rubber sheet 34 serve to isolate the entire space occupied by the tank, mesh strips 19, and the lower portions of the tapes 25. Ammonia which tends to escape due to the fact that the strips 19 pass in an extended pathway about the tank is trapped in this enclosed space and is drawn off under suitable pressure conditions to prevent its escape into the atmosphere about the machine.

According to a modification, the mesh strips 19 may follow the dotted-line pathway indicated at 40, an extra guide roller 41 being provided for the purpose. In such cases the developed material is positively controlled from the moment it is inserted at the feed board until it is ejected at the lip 29. There is no space at which the material is uncontrolled as in the form of the invention first described. This modification may be more desirable when employing certain types of sensitized material.

In operation, the sensitized sheet 11 is placed on the feed board and is pushed inwardly until gripped by the sealing sleeve 15 and the cooperating mesh strips 19. They move the sheet at the correct speed for development, that being a function which may be set or adjusted and which varies for different sensitized surfaces and with other factors. The strips 19 being of mesh construction as described support the sentized layer at spaced parallel areas across its width and at a relatively great number of points of contact at each area due to the shape of the links 22. It has been found that a mesh belt or strip such as that described actually serves to diffuse and to distribute the developing vapors and to accelerate the action of development beyond what might be expected if the material were passed in actual contact with the perforated surface 13 of the tank. The intermediate tank portions 20 are not contacted by the sensitized surface, or the latter is not pressed against the tank surfaces 20 with enough force to damage even the most

delicate of coated material now employed. After development and after release by the strips 19 and the sealing sleeve 15, the material is eventually engaged between the tapes 25 and the sealing sleeve to be carried upwardly and to be ejected above the lip 29. According to the modified form of the invention, the developed sheet is actually under the influence of the sealing sleeve and the strips 19 until engaged by the tapes 25. While the channels 18 guide the strips 19 and tend to prevent any lateral displacement, additional guiding means may be employed comprising properly spaced guide disks on the roller 21 or other lateral spacing means at the tank. Such spacing disks serve to prevent contact between the strips 19 and the tapes 25 and may be duplicated at the roller 26, if desired, so as to keep the tapes running in absolute parallelism thereby to effect better delivery of the material.

The reduction in pressure or actual avoidance of contact between the sensitized surface and the intermediate tank portions 20 makes it possible for the developing vapors to reach all parts of the surface of the material travelling between the mesh strips and, therefore, development at those intermediate areas is facilitated, it having been found that there is no appreciable difference in action there and at the areas supported by the strips.

The proportions or dimensions above given have been found effective and are merely submitted as representative of one specific form which the invention may take. Variations within limits are contemplated and the invention is by no means limited to the specific form illustrated or to the dimensions which have been mentioned by way of example only.

While one embodiment of the invention has been disclosed, it is to be understood that the inventive concept may be carried out in a number of ways. This application is, therefore, not to be limited to the precise details described, but is intended to cover all variations and modifications thereof falling within the spirit of the invention and the scope of the claims.

I claim:

1. In a dry developing machine, the combination of a tank for developing vapors, said tank having a perforated, developing portion through which the said vapors pass, a plurality of channels in the said perforated developing portion of the tank in parallel spaced relation and extending in the direction of travel of material to be developed, a flexible vapor confining and material advancing sleeve overlying the perforated portion of the tank and movable relatively to the surface thereof, a plurality of endless mesh strips cooperating with said vapor confining means to advance the sensitized material to be developed past the developing portion of the tank, each said strip being guided within a channel and having a thickness slightly greater than the depth of the channel so as to support the sensitized material and to lessen the contact pressure between it and the tank surface area intermediate the channels, and means for driving said mesh strips at substantially the same speed as the said sleeve.

2. In a dry developing machine, the combination of a tank for developing vapors, said tank having a perforated, developing portion through which the said vapors pass, a plurality of channels in the said perforated developing portion of the tank in parallel spaced relation and extending in the direction of travel of material to be developed, a flexible vapor confining and material

advancing sleeve overlying the perforated portion of the tank and movable relatively to the surface thereof, and a plurality of endless mesh stripe cooperating with said vapor confining means to advance the sensitized material to be developed past the developing portion of the tank, each said strip being guided within a channel and being of a width slightly less than the distance between adjacent channels, said strips further being of a thickness slightly greater than the depth of the channels so as to support the sensitized material and to lessen the contact pressure between it and the tank surface area intermediate the channels, and means for driving said mesh strips at substantially the same speed as the said sleeve is driven.

3. In a dry developing machine, the combination of a tank for developing vapors, said tank having a perforated, developing portion through which the said vapors pass, a plurality of channels in the said perforated developing portion of the tank in parallel spaced relation and extending in the direction of travel of material to be developed, a flexible vapor confining and material advancing sleeve overlying the perforated portion of the tank and movable relatively to the surface thereof, and a plurality of endless mesh strips cooperating with said vapor confining means to advance the sensitized material to be developed past the developing portion of the tank, each said strip being guided within a channel and having a thickness slightly greater than the depth of the channel, and comprising a flexible, chain-like, metallic structure of fine wire links, each said link being so shaped as to contact the supported sensitized material at a relatively small area as compared to the intermediate unsupported area between adjacent links, and means for driving said mesh strips at substantially the same speed as that at which the said sleeve is driven.

4. In a dry developing machine, the combination of a tank for developing vapors, said tank having a perforated, developing portion through which the said vapors pass, a plurality of channels in the said perforated developing portion of the tank in parallel spaced relation and extending in the direction of travel of material to be developed, a flexible vapor confining and material advancing sleeve overlying the perforated portion of the tank and movable relatively to the surface thereof, and a plurality of endless mesh strips cooperating with said vapor confining means to advance the sensitized material to be developed past the developing portion of the tank, each said strip being guided within a channel having a thickness slightly greater than the depth of the channel, a plurality of tapes and guide means for said tapes, said tapes being substantially vertically disposed so as to engage developed material for discharging it from the machine, a common driving means for said mesh strips and tapes including a driving roller about which both the tapes and strips are passed, said tapes being spaced to engage the driving roller intermediate the mesh strips thereby to avoid interference.

5. In a dry developing machine, the combination of a tank for developing vapors, said tank having a perforated, developing portion through which the said vapors pass, a plurality of channels in the said perforated developing portions of the tank in parallel spaced relation and extending in the direction of travel of material to be developed, a flexible vapor confining and material advancing sleeve overlying the perforated portion of the tank and movable relatively to the surface thereof, a plurality of endless mesh strips cooperating with said vapor confining means to advance the sensitized material to be developed past the developing portion of the tank, each said strip being guided within a channel and having a thickness slightly greater than the depth of the channel, a material receiving tray and a stacking lip for said tray and disposed above said sleeve, a plurality of tapes and guide means for said tapes so disposed that the said tapes at one point in their travel move upwardly in pressure contact with the sleeve and with the stacking lip, said tapes being staggered to be interposed between the mesh strips, and a common means including a driven roller about which the said strips and tapes are wrapped and means for guiding said tapes and strips in a pathway such that a relatively great angle of contact between the tapes and strips and their driving roller is maintained.

6. Mechanism as defined and claimed in claim 5, wherein means is provided for enclosing the said tank, mesh strips and a part of the material delivering tapes, thereby to prevent escape of the developing vapors.

FREDERICK OTTO TRUMP.

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The following references are of record in the file of this patent:

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