

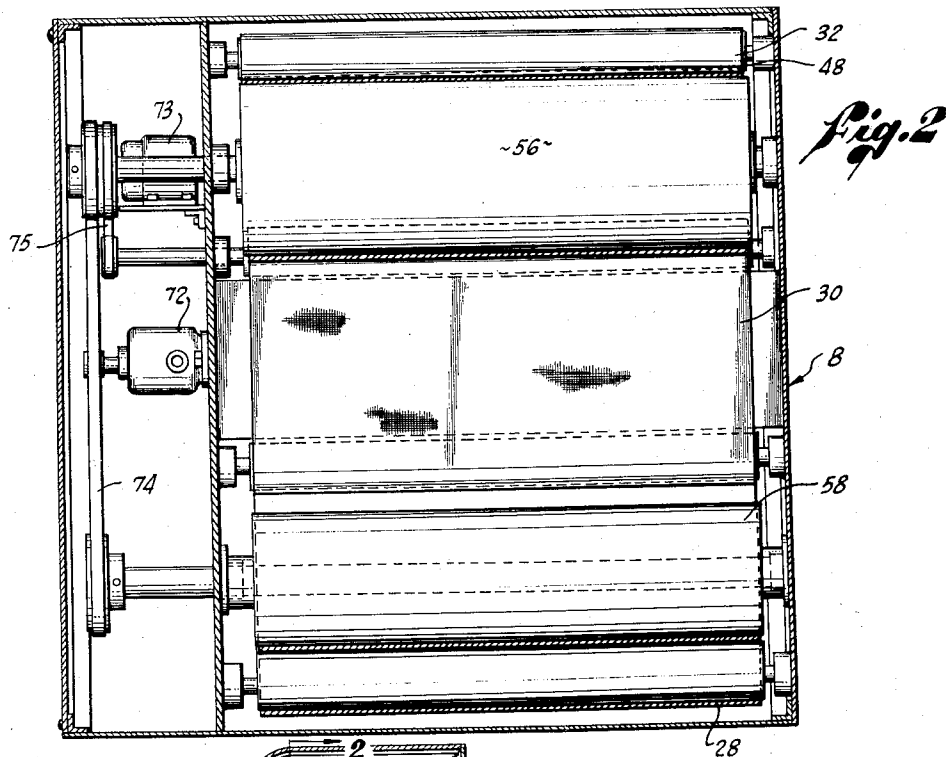
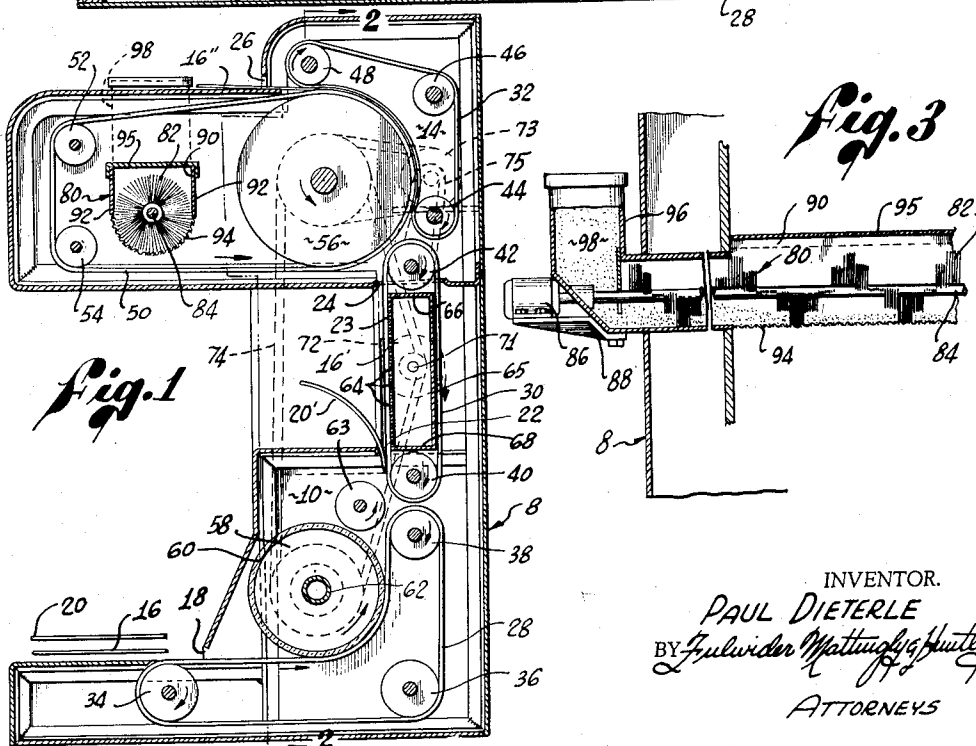
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2,918,858

DUPLICATING MACHINE

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1

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DUPLICATING MACHINE

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6 Claims. (Cl. 95—94)

The present invention relates generally to duplicating machines and more particularly to a duplicating machine especially adapted to produce diazotype prints.

In United States Letters Patent No. 2,228,562 issued to me January 14, 1941, there is disclosed a method for producing diazotype prints. This method broadly includes the steps of subjecting the surface of a diazotype printing paper to exposure to light under a design, overlying the so-exposed paper with a permeable woven textile material that carries a decomposable ammonia compound and finally subjecting the assembly of paper and textile to an elevated temperature of sufficient magnitude and for a sufficient length of time to liberate ammonia by decomposition of the ammonia compound so as to rapidly develop a print on the paper.

It is a major object of the present invention to provide a new and novel duplicating machine for producing diazotype prints in accordance with the method covered by the aforementioned Patent No. 2,228,562.

Another object of the invention is to provide a duplicating machine of the aforescribed nature that is entirely automatic in operation and is capable of the uninterrupted production of any number of prints with uniform results.

A further object is to provide a duplicating machine of the aforescribed nature having means for spreading the decomposable ammonia compound uniformly over the entire surface of the exposed paper.

Yet another object of the invention is to provide a duplicating machine of the aforescribed nature which is simple in design and rugged of construction whereby it may afford a long and trouble-free service life.

An additional object is to provide a duplicating machine which does not require the services of a skilled operator.

Yet another object is to provide a duplicating machine which is economical of construction, light in weight and of compact size.

These and other objects and advantages of the present invention will become apparent from the following detailed description, when taken in conjunction with the appended drawings, wherein:

Figure 1 is a side elevational view taken in vertical section and showing a preferred form of duplicating machine embodying the present invention;

Figure 2 is a vertical sectional view taken on line 2—2 of Figure 1; and

Figure 3 is a fragmentary vertical sectional view showing a developing medium spreading mechanism incorporated in said duplicating machine.

Referring to the drawings, and particularly Figure 1 thereof, the preferred form of developing machine embodying the present invention includes a frame or housing, generally designated 8. The lower portion of this housing 8 defines an exposure chamber 10. A separation chamber 12 is formed at the intermediate portion of the housing 8, and the upper portion of the housing is formed with a developing chamber 14. The develop-

2

ing machine is adapted for use with any number of sheets of paper 16, or the like, that have been suitably treated with a light-sensitive diazo salt and a coupling component. The lower front portion of the housing 8 is formed with a horizontally extending elongated opening 18 that receives a sheet of such paper 16 together with a suitable design-bearing sheet of material, such as a tracing 20, the paper sheet 16 and the tracing 20 being arranged in overlying relationship. The upper front portion of the exposure chamber 10 is formed with an upwardly-facing elongated opening 22 from which the paper sheet 16 and tracing 20 emerge onto the front wall 23 of the separation chamber 12. The tracing 20 separates from the paper sheet 16 at this point and the paper sheet continues moving upwardly into the developing chamber 14 through a downwardly-facing elongated opening 24. The developed paper sheet 16 emerges from the upper front portion of the developing chamber 14 through a horizontally extending elongated opening 26.

More particularly, the paper sheet 16 is caused to move through the aforescribed path by means of three endless transfer belts, designated 28, 30 and 32. The lowermost transfer belt 28 is carried by three parallel, horizontally extending rollers 34, 36 and 38 disposed within the exposure chamber 10. The intermediate transfer belt 30 is carried by a pair of vertically aligned, horizontal rollers 40 and 42, these rollers being parallel to the aforementioned rollers 34, 36 and 38. The lower roller 40 is disposed within the upper portion of the exposure chamber 10 and the upper roller 42 is disposed within the lower rear portion of the developing chamber 14. The uppermost transfer belt 32 is carried by three horizontal rollers 44, 46 and 48 disposed within the rear portion of the developing chamber 14 and parallel to the aforementioned rollers. A developing medium-carrying belt 50 is also arranged in the developing chamber 14. This latter belt 50 is carried by a pair of parallel rollers 52 and 54 arranged in the front portion of the developing chamber and a large heated roller 56 arranged rearwardly thereof and parallel thereto. Preferably, the upper and lower transfer belts 28 and 32 will be formed of a material having a high coefficient of friction, such as rubber. The developing medium-carrying belt 50 and the intermediate transfer belt 30, however, should be formed of a porous material, such as a permeable, chemically inert fabric, as for example canvas, for reasons to be fully set forth hereinafter.

A horizontally extending exposure roller 58 is rotatably mounted in the exposure chamber 10 to furnish the light necessary to destroy or decompose the diazo compound on the area of the paper 16 overlaid by the opaque portions of the tracing 20. The lower rear periphery of this exposure roller 58 is in engagement with the lowermost transfer belt 28. This exposure roller 58 may conveniently be formed of light transmitting glass or plastic cylinder 60 within which is coaxially positioned a mercury illumination tube 62. A guide roller 63 having a diameter approximating that of the rollers 34, 36 and 38 is rotatably mounted within the exposure chamber 10 above the rear portion of the exposure roller 58 and parallel thereto.

The separation chamber 12 is generally rectangular in configuration and its front wall 23 is formed with equally distributed apertures 64 over substantially its entire area. This separation chamber 12 also includes an upstanding rear wall 65 parallel to the front wall 23. The upper and lower ends of the front and rear walls are integrally connected by horizontal upper and lower walls 66 and 68, respectively. The axis of rotation of the rollers 40 and 42 substantially corresponds to the mid-portion of the separation chamber so that the intermediate transfer belt 30 moves over the external surfaces of the front

3

and rear walls 23 and 65, respectively, in close proximity thereto. The separation chamber 12 is substantially airtight except for the apertures 64 formed in its front wall 23. The interior of the separation chamber 12 is in communication with the inlet 71 of a conventional vacuum pump 72.

The heated roller 56 is parallel to all of the aforementioned rollers and its periphery is maintained at an elevated temperature above normal room temperature by suitable means. Conveniently, such heating may be accomplished by conventional electric resistance wires. Other means for effecting such heating, however, may be employed within the scope of the present invention. As indicated in Figure 1, the upper rear periphery of the heated roller 56 imparts a curvature to the uppermost transfer belt 32. The uppermost transfer belt 32 and the developing medium-carrying belt 50 are thus maintained in abutting relationship by the heated roller 56 along the latter's upper rear periphery.

The heated roller 56, the roller 42, the vacuum pump 72 and the exposure roller 53 are each driven by a conventional electric motor 73. This motor 73 is affixed to the housing 8 at one side of the aforescribed rollers. As indicated in Figures 1 and 2, the shafts of the heating and development rollers as well as that of the vacuum pump are coupled to the motor 73 by an endless drive belt 74. The roller 42 is coupled to this motor by a second endless drive belt 75. With this arrangement the relative speeds of the transfer belts 28, 30 and 32 may be coordinated with the speed of the developer medium-carrying belt 50.

A developing medium spreader mechanism, generally designated 80 and shown particularly in Figure 3, is disposed within the developing chamber 14. This mechanism 80 includes a horizontally extending spiral brush 82 which is rotatably positioned within the path followed by the developing medium-carrying belt 50. This brush 82 includes a shaft 84 parallel to each of the aforescribed rollers and is coupled at one end to a small electric motor 86, the latter being supported from the housing by a bracket 88. The spiral brush 82 rotates within a horizontal trough 90 that extends substantially across the width of the housing 8. The trough 90 includes a pair of parallel upstanding side walls 92, the lower ends of which are interconnected by a downwardly curved wall 94 formed of wire mesh. The upper end of the trough is closed by a cover 95. As indicated in Figure 3, one end of the trough 90 is in communication with a hopper 96. This hopper 96 receives a powdered developing medium 98, from a suitable source (not shown).

Rotation of the spiral brush 82 serves to draw powdered developing medium 98 out of the lower portion of the hopper 96 along the length of the trough 90. The fineness of the powdered developing medium should be so selected that it will fall through the wire mesh of the wall 94 onto the inwardly-facing side of the developer medium-carrying belt 50 below the trough 90. As indicated by the directional arrows in Figure 1, the lower leg of the latter belt 50 travels towards the heated roller 56. Thus, the developing medium 98 will be squeezed between the outer periphery of the heated roller 56 and the inwardly-facing side of the belt 50 as the latter travels about the periphery thereof.

According to the present invention, it is contemplated that the prints 16 will be provided by subjecting the paper sheets 16 to developing vapors or gases given off under the influence of heat. As an example, where diazotype prints are employed, such vapors may take the form of ammonia vapors, and the developer medium 98 may consist of a suitable ammonia compound. The necessary heat will be provided by the heating roller 56. An ammonia compound which has been found particularly suitable for development of diazotype prints in accordance with the present invention is ammonium carbonate, ammonium bicarbonate, ammonium carbamate, bicarbamate,

4

or a mixture of these chemicals. Other ammonia compounds, however, could be employed within the scope of the present invention so long as they will decompose freely at temperatures slightly elevated above room temperature with the production of free ammonia gas.

In the operation of the aforescribed duplicating machine and with particular reference to Figure 1, a sheet of diazotype paper 16 in overlying relationship with a tracing 20 is inserted through the opening 22 in the lower front portion of the housing 8. These two sheets will contact the upper front leg of the lowermost transfer belt 28 so as to be drawn underneath the exposure roller 53. The overlying sheets will then be moved upwardly onto the lower portion of the front leg of the intermediate transfer belt 30, the guide roller 63 serving to guide the sheets through the opening 22. As noted hereinabove, the interior of the separation chamber 12 is under sub-atmospheric pressure by virtue of its communication with the vacuum pump 72. Accordingly, as the print 16 moves upwardly in overlying relationship with the separation chamber's front wall 23, it will adhere thereto under the influence of such sub-atmospheric pressure, this sub-atmospheric pressure being communicated to the rear surface of the print 16 by means of the apertures 64 and the porous intermediate transfer belt 30. This sub-atmospheric pressure, however, will be blocked from the tracing 20 because of the relatively impervious nature of the print 16 and hence the tracing will separate from the print at this point. The print 16 moves upwardly into the developing chamber 14 through the opening 26. From this point it will be forced between the developing medium-carrying belt 50 and the uppermost transfer belt 32 so as to be forced around the curved path defined by the engaged portions of these belts to finally emerge 35 through the uppermost opening 26.

As noted hereinabove, the powdered developing medium 98 from the hopper 96 is forced onto the inwardly-facing surface of the lower leg of the developer medium-carrying belt 50 by the spiral brush 82. This developing medium 98 is then squeezed between the outer periphery of the heated roller 56 and the inwardly-facing side of the belt 50 as the latter travels about the periphery of the roller. Assuming that the temperature of the heated roller 56 is sufficient to decompose the developing medium, the latter will liberate gas which permeates the interstices of the belt 50. Since the spiral brush 82 will distribute the powdered developing medium substantially evenly over the entire inwardly-facing surface of the belt 50, the surface of the print 16 will be subjected substantially uniformly to this liberated developing gas. The rotational speed of the heated roller 56 should be so adjusted that the print 16 will be exposed to the developing gas a sufficient length of time to expose the dye image. Accordingly, when the print emerges from the uppermost opening 26, it will be properly developed.

While there has been shown and described hereinbefore what is presently considered to be the preferred embodiment of the present invention, it will be apparent that various modifications and changes may be made thereto without departing from the spirit of the invention or the scope of the following claims.

I claim:

1. A duplicating machine for use with a previously exposed sheet and a solid particle developing medium that releases a developing vapor when heated to an elevated temperature, comprising: a frame; a heated roller rotatably carried by said frame; a vapor permeable belt encompassing at least a portion of the periphery of said heated roller; transfer belt means on said frame; a portion of said transfer belt means abutting a portion of said vapor permeable belt in contact with said heated roller; a horizontal trough disposed within the path followed by said vapor permeable belt and extending thereacross, the lower portion of said trough being formed with a

5

plurality of small apertures; a hopper containing said developer medium connected to one side of said trough; conveyor means within said trough that draws said developing medium thereinto from said hopper and permits said medium to drop through said apertures onto the inwardly-facing side of said belt; and means to actuate said conveyor means.

2. A duplicating machine for use with a previously exposed sheet and a solid particle developing medium that releases a developing vapor when heated to an elevated temperature, comprising: a frame; a heated roller rotatably carried by said frame; a vapor permeable belt encompassing at least a portion of the periphery of said heated roller; transfer belt means on said frame; a portion of said transfer belt means abutting a portion of said vapor permeable belt in contact with said heated roller; a horizontal trough disposed within the path followed by said vapor permeable belt and extending thereacross, the lower portion of said trough being formed with a plurality of small apertures, a hopper containing said developer medium connected to one side of said trough; a spiral brush rotatably mounted within said conveyor to draw said developing medium thereinto from said hopper and permits said medium to drop through said apertures onto the inwardly-facing side of said belt; and power means to rotate said spiral brush.

3. A duplicating machine for use with a previously exposed diazo sensitized sheet material and a solid particle chemical agent which, upon being subjected to an elevated temperature, liberates a developing vapor, comprising a frame, a heated roller rotatably mounted on said frame, an endless vapor permeable belt supported upon guide rollers, said belt surrounding said heated roller and in firm contact with a segmental portion of the periphery thereof, means for conveying said sheet material past said segmental portion and in contact with said belt at that portion and means for applying said chemical agent to said belt for transferring said agent to said segmental portion, said chemical agent being subjected thereat to heat and release of developing vapor.

4. A duplicating machine for use with a previously exposed diazo sensitized sheet material and a solid particle chemical agent which, upon being subjected to an elevated temperature, liberates a developing vapor, comprising a frame, a heated roller rotatably mounted on said frame, an endless vapor permeable belt supported upon guide rollers, said belt surrounding said heated roller and in firm contact with a segmental portion of the periphery thereof, endless transfer belt means supported upon guide rollers engaging said permeable belt for conveying said sheet material past said segmental portion and in contact with said permeable belt at that portion and means for applying said chemical agent to said permeable belt for transferring said agent to said segmental portion, said chemical agent subjected thereat to heat and release of developing vapor.

5. A duplicating machine for use with a previously

6

exposed diazo sensitized sheet material and a solid particle chemical agent which, upon being subjected to an elevated temperature, liberates ammonia vapor, comprising a frame, a heated roller rotatably mounted on said frame, an endless vapor permeable belt supported upon guide rollers, said belt surrounding said heated roller and in firm contact with a segmental portion of the periphery thereof, means for conveying said sheet material past said segmental portion and in contact with said belt at that portion and means located remote from said roller for substantially evenly applying said chemical agent to the inwardly-facing side of said belt for transferring said agent to said segmental portion, said chemical agent being subjected thereat to heat and release of ammonia.

6. A duplicating machine for use with a previously exposed diazo sensitized sheet material and a solid particle chemical agent which upon being subjected to an elevated temperature, liberates a developing vapor, comprising a frame, a heated roller rotatably mounted on said frame, an endless vapor permeable belt supported upon guide rollers, said belt surrounding said heated roller and in firm contact with a segmental portion of the periphery thereof, endless transfer belt means supported upon guide rollers engaging said permeable belt for conveying said sheet material past said segmental portion and in contact with said permeable belt at that portion and means for applying said chemical agent to said permeable belt for transferring said agent to said segmental portion, said chemical agent being subjected thereat to heat and release of developing vapor, and an opening in said frame in the path of said sheet material leaving said transfer belt through which said developed material is delivered.

References Cited in the file of this patent

UNITED STATES PATENTS

1,308,709	Hamburger	July 1, 1919
1,529,750	Plate	Mar. 17, 1925
1,595,534	Wonner	Aug. 10, 1926
1,759,092	Caps	May 20, 1930
1,760,149	Langsner	May 27, 1930
1,980,188	Cullen et al.	Nov. 13, 1934
1,999,965	Hall	Apr. 30, 1935
2,228,562	Dieterle	Jan. 14, 1941
2,302,277	Von Meister	Nov. 17, 1942
2,308,130	Von Meister et al.	Jan. 12, 1943
2,515,455	Lipton	July 18, 1950
2,524,818	McHugh	Oct. 10, 1950
2,583,678	Wilde	Jan. 29, 1952
2,589,748	Trump	Mar. 18, 1952
2,630,744	Wilde	Mar. 10, 1953

FOREIGN PATENTS

223,320	Switzerland	Sept. 15, 1942
111,965	Sweden	Sept. 26, 1944