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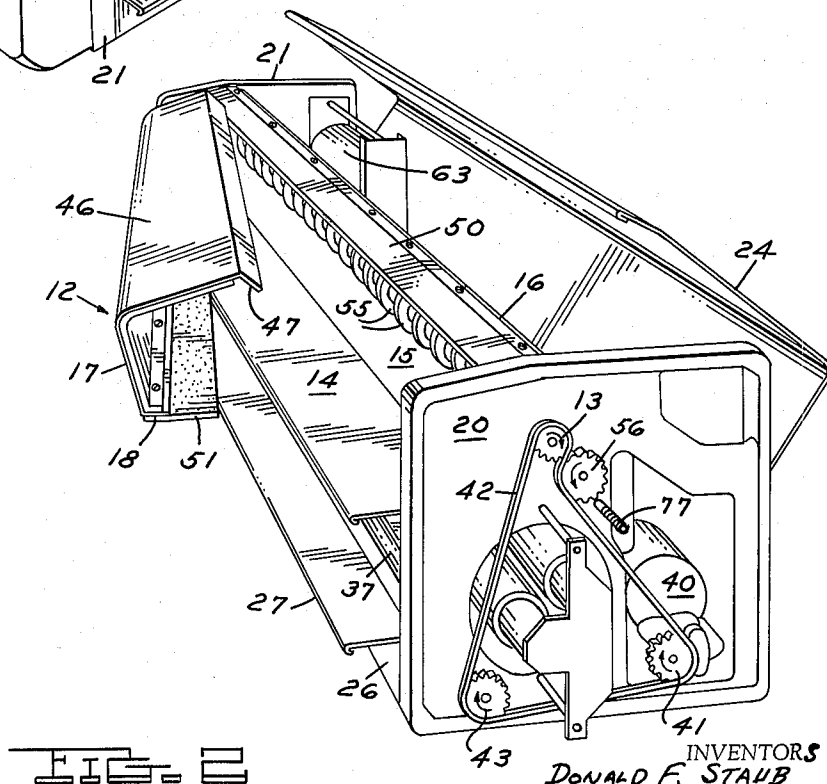
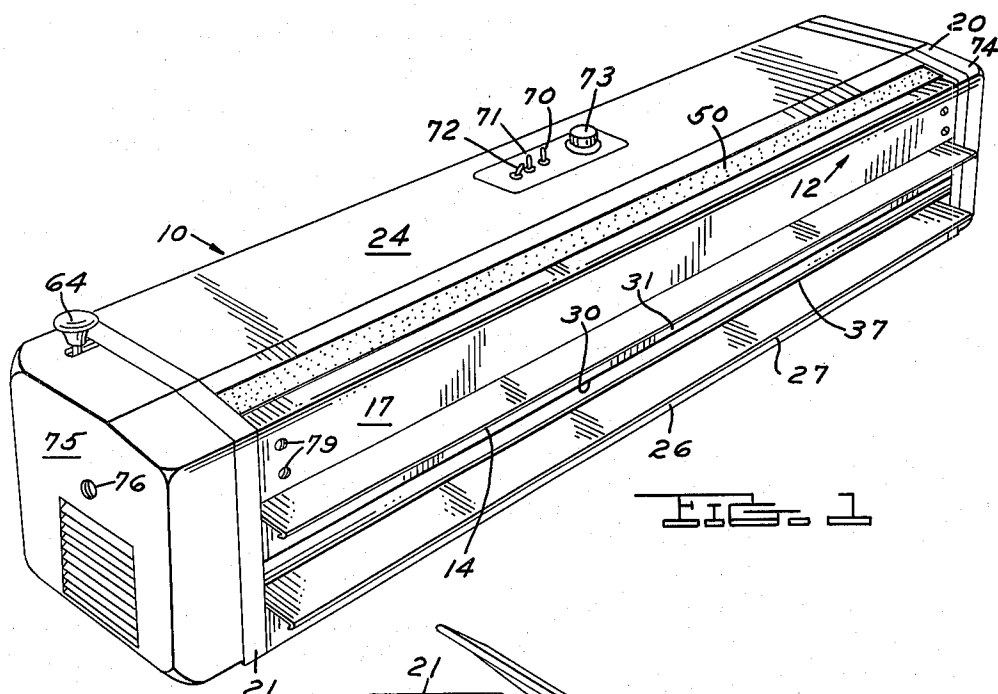
D. F. STAUB ETAL

3,229,608

PRINTING AND DEVELOPING MACHINE

Filed Jan. 3, 1964

2 Sheets-Sheet 1



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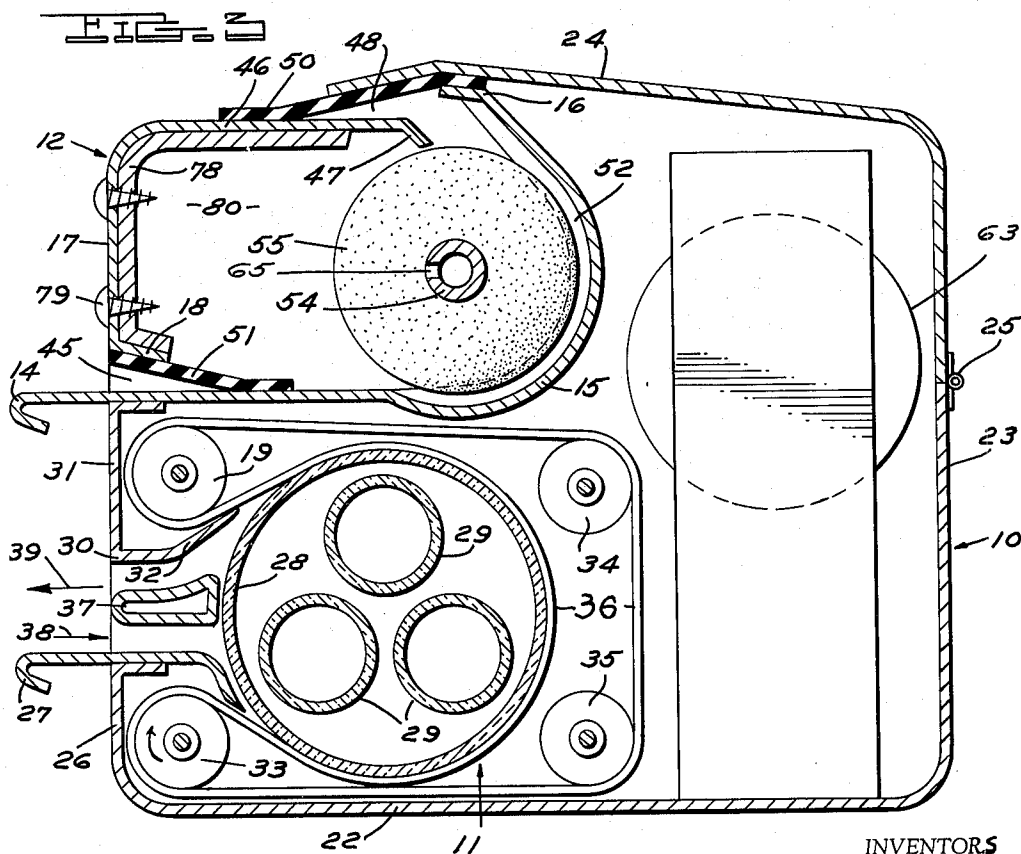
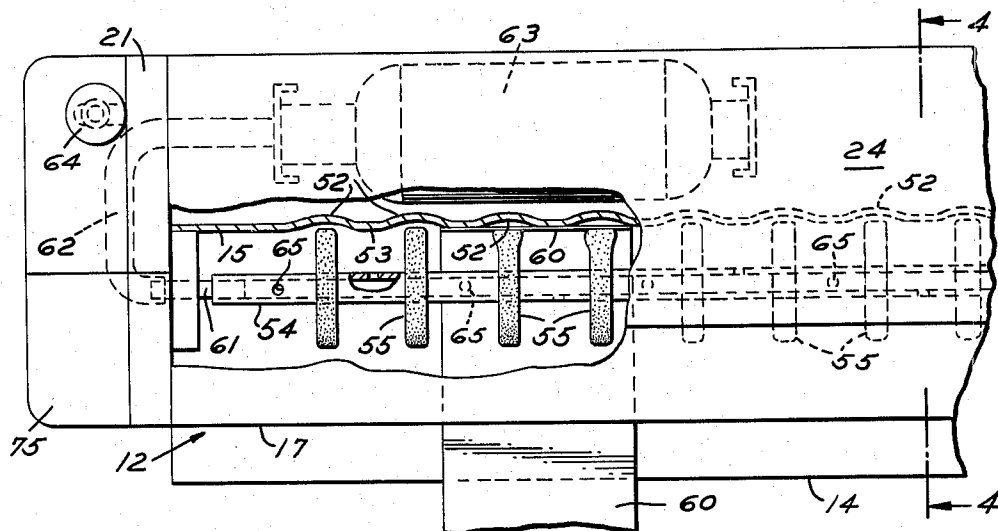


FIG. 4

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3,229,608

PRINTING AND DEVELOPING MACHINE

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6 Claims. (Cl. 95-94)

This invention relates to a machine for treating sheet material in a sealed chamber such as a diazo process machine having a sealed developing chamber capable of receiving, driving, and emitting sheet material without escape of ammonia gas from the chamber and without admitting air into the chamber.

Various devices have been employed in the prior art to treat sheet material with gas to develop a previously induced impression, however, they are usually characterized by contaminated adjacent atmosphere, incident loss of gas, and diluted gas concentration from atmospheric penetration.

With the foregoing in view, it is an object of the invention to provide a housing forming an internal chamber and means for introducing treating gas in a known concentration into the chamber from outside the housing to insure and maintain proper treating conditions in the chamber.

An object of the invention is to provide a flexible flap seal at a bottom entrance slot which extends into the chamber with gravity urging it into sealing relationship, upon which the weight of the gas bears urging it into sealing relationship; and which internal pressure urges into sealing relationship.

An object of the invention is to provide an inwardly displaceable flexible seal at the bottom entrance slot of the housing for admitting sheet material into the chamber while maintaining the gas and air sealing condition.

An object of the invention is to provide a flexible flap seal at a top exit slot which extends outwardly of the chamber with gravity urging it into sealing relationship and which internal pressure may displace as a one-way valve to evacuate air from the chamber upon the introduction of treating gas into the chamber under pressure.

An object of the invention is to provide a displaceably sealed chamber so oriented that upon the introduction of gas heavier than air under pressure into the chamber that the bottom entrance seal is urged into sealed condition trapping the gas and the top exit seal is displaced permitting the evacuation of air from the chamber as the gas is introduced with the gas concentration building upwardly from the bottom so that all air is driven from the chamber through displacement by the gas leaving the chamber filled with the desired gas concentration.

An object of the invention is to provide a sealed gas chamber which contains treating gas and prevents escape of the gas so that the developing chamber may be located closely adjacent the impression chamber without causing damage to the sensitized sheet material in the location of the machine.

An object of the invention is to provide a novel drive for moving the sheet material which is completely sealed in the sealed gas chamber and which is capable of receiving sheet material in one direction of travel and capable of reversing the direction of travel of the sheet material and delivering it out of the machine on the same side of the machine upon which it was inserted.

An object of the invention is to provide a novel drive for moving the sheet material in the gas chamber which is extremely simple and which contacts only a small portion of the sheet material for a short time thereby leaving the face of the sheet material substantially completely exposed for treatment by the gas.

An object of the invention is to provide a sheet material drive having a single drive shaft and resilient radially compressible annular drive members such as discs fixed on and rotating with the shaft.

An object of the invention is to provide a sheet material drive having a stationary reversely curving rear pan with a face surface curving around the drive shaft and drive discs with the pan having a dished pocket in its face surface at each drive disc receiving the radial extremity of each disc in the pocket below the face surface of the pan.

An object of the invention is to provide a rotating drive shaft and resilient drive discs cooperating with a stationary pan with the discs extending radially past the face surface of the pan into dished pockets in spaced relationship to the pockets so that no friction contact occurs between the rotating discs and the stationary pan at any time.

An object of the invention is to provide drive discs extending past the face surface of the pan in the dished pockets with the discs being radially resiliently compressible so that, when the sheet material is fed to the drive means, the sheet material bridges the pockets radially compressing the discs with the discs frictionally engaging the sheet material and sliding the sheet material over the stationary face surface of the pan.

An object of the invention is to provide a flexible flap seal and table combination at the gas chamber entrance slot which feeds the sheet material to the drive discs and pan.

An object of the invention is to provide a flexible flap seal and flange combination at the exit slot which receives sheet material from the drive discs and pan and feeds the sheet material through the exit slot outwardly of the gas chamber.

An object of the invention is to provide a hollow drive shaft leading into the sealed gas chamber from a point outside the chamber for introducing gas into the chamber through orifices in the side wall of the drive shaft within the gas chamber.

An object of the invention is to provide a cylinder of compressed treating gas in the machine connected to the hollow drive shaft.

An object of the invention is to provide a valve on the machine between the gas cylinder and the hollow drive shaft for easily controlling gas supply to the chamber.

These and other objects of the invention will become apparent by reference to the following description of a machine embodying the invention taken in connection with the accompanying drawings in which:

FIG. 1 is a front perspective view of the inventive machine.

FIG. 2 is an end perspective view of the machine taken from the opposite end shown in FIG. 1 with the end cover removed, the hinged top cover swung back, and the front panel swung out showing details of construction.

FIG. 3 is a partial top plan view of the device seen in FIG. 1 with the top cover and pan broken away showing the drive discs, pan, and dished pockets in more detail, and showing the gas supply in dotted lines; and

FIG. 4 is a vertical cross-sectional view of the device seen in FIG. 3 taken on the line 4-4 thereof.

Referring now to the drawings wherein like numerals refer to like and corresponding parts throughout the several views, the printing and developing machine disclosed therein to illustrate the invention comprises, cabinet 10, FIG. 1, enclosing an impression section 11 and a developing section 12, FIG. 4. Sensitized sheet material or paper is first passed through the impression section 11 to produce a latent impression in the sheet material and then passed through the developing section 12 to develop and fix the latent impression in the sheet material. The material may be light sensitized and lamps provided in the

impression section to produce a proper impression together with a masking sheet or tracing having the master impression thereon. The diazo blue-print process is used herein as illustrative wherein light sensitized paper is overlaid with a light-permeable tracing having opaque portions to create the desired latent impression by blocking light transmission to the paper in the impression section 11. The paper and the tracing are then separated and the paper passed through the developing section 12 wherein the latent impression is developed and fixed by treating the paper with ammonia gas.

More particularly, the machine disclosed and described to illustrate the invention comprises end frames 20 and 21. A bottom wall 22 is connected to the end frames 20 and 21. The bottom wall 22 has an upwardly extending back flange 23 forming the lower portion of the back wall. An L-shaped cover 24 is connected by hinges 25 to the back flange 23 and is swingable on the hinges 25 from the position seen in FIGS. 1 and 4, through the position seen in FIG. 2, to a fully open position to expose the interior of the machine behind the impression section 11 and the developing section 12. The bottom wall 22 has a front flange 26 upon which a table plate 27 is secured. The table plate 27 lies between the end frames 20 and 21 and is connected to them at its ends.

A hollow transparent drum 28 is rotatably positioned in the impression section 11. Lamps 29 lie within the drum 28 and project light energy through the drum 28. A top shroud 30 is secured between the end frames 20 and 21 and includes a face portion 31 and an inwardly extending flange portion 32 leading upwardly relative to the drum 28 in spaced relationship thereto.

A drive roller 33, an idler roller 34, an idler roller 19, and an idler roller 35 are located about the transparent drum 28. Endless strip belts 36 are looped around the rollers 33, 19, 34, and 35 and also around the drum 28 as indicated in FIG. 4. Rotation of the drive roller 33 in the angular direction indicated by the arrow moves the strip belts 36 upwardly around the drum 28 causing it to rotate counter-clockwise as seen in FIG. 4. A separator nose 37 lies between and is spaced from the table plate 26 and the shroud 30 dividing the space in front of the drum 28 into a lower entrance passage 38 and an upper exit passage 39. A motor 40 rotates a sprocket 41 moving a chain 42 rotating a sprocket 43 fixed on the drive roller 33, FIG. 2. The chain 42 is also looped around an idler sprocket 13 and drives a sprocket 56 as hereinafter set forth.

When the paper and tracing are fed into the entrance passage 38 on the table plate 27, the angular direction of movement of the drum 28 feeds the paper and tracing between the drum 28 and the belts 36. The belts 36 and drum 28 convey the tracing and paper around to the exit passage 39 where the belts 36 lift off the paper and tracing permitting them to emit out the exit passage 39. The lamps 29 are energized as the paper and tracing travel around with the transparent drum 28 and the light energy penetrates the drum 28 and induces the latent impression in the paper as masked by the tracing. After the paper and tracing are emitted from the impression section 11, they are separated. The paper is now ready to be treated in the gas chamber of developing section 12 to develop and fix the latent impression in the paper.

Referring now to the developing section 12, a table 14 is fixed on the face portion 31 and extends between and is connected to the end frames 20 and 21. The table 14 extends inwardly to a reversely curving substantially arcuate pan 15. The table 14 and pan 15 may be formed integral as shown or made separately and connected together as desired. Both the table 14 and pan 15 are connected to the end frames 20 and 21 at their ends. The pan 15 terminates upwardly toward the top front of the machine in a tangential flange 16. The tangential flange 16 is spaced above the table 14 and leads outwardly from the pan 15.

A substantially L-shaped front panel 17 has a bottom flange 18 spaced above the table 14 creating an entrance slot 45 therebetween. The panel 17 has a top leg 46 leading into the developing section 12 terminating in a paper or sheet material pick-up foot 47. The leg 46 and foot 47 are spaced below the tangential flange 16 creating an exit slot 48 therebetween. The panel 17, bottom flange 18, top leg 46, and foot 47 may be made integral and are removably connected at their ends to the end frames 20 and 21.

A flexible flap top sealing strip 50 is connected at its inner edge to the top of the tangential flange 16 on the pan 15. The top sealing strip 50 extends sidewise outwardly and terminates in an outer edge lying in sealing contact with the front panel top leg 46. The adjacent bottom face of the top sealing strip 50 is also in sealing contact with the leg 46. The top sealing strip 50 displaceably seals the top exit slot 48 leading from the developing section 21. The top sealing strip 50 is displaceable by sheet material or paper by the thickness of the paper moving outwardly through the exit slot 48 whereupon the top sealing strip 50 seals against the paper maintaining the gas seal at the top of the developing section 12.

A flexible flap bottom sealing strip 51 is connected at its outer edge to the bottom of the front panel flange 18. The bottom sealing strip 51 extends sidewise inwardly and terminates in an inner edge lying in sealing contact with the table 14. The adjacent bottom face of the bottom sealing strip 51 is also in sealing contact with the table 14. The bottom sealing strip 51 displaceably seals the bottom entrance slot 45 leading into the developing section 12. The bottom sealing strip 51 is displaceable by sheet material or paper inserted into the bottom entrance slot 45 by the thickness of the paper moving inwardly through the entrance slot 45.

When an operator or a feeding device inserts sheet material or paper in the developing section 12, the paper is placed on the table 14 and its leading edge advanced into the entrance slot 45 where it displaces the bottom sealing strip 51 by the thickness of the paper whereupon the bottom sealing strip 51 seals against the paper thereby maintaining the gas seal at the bottom of the developing section 12.

Referring now to the driving means for moving sheet material or paper through the developing chamber, the arcuate pan 15 has dishd arcuate pockets 52 at spaced intervals, FIGS. 3 and 4. The pockets 52 provide depressions in the pan 15 below its interior face 53. A hollow drive shaft 54 is rotatably bearinged in the end frames 20 and 21 and lies in the developing section 12 radially relative to the arcuate pan 15 and pockets 52. Resilient annular members such as drive discs 55 are fixed on the shaft 54 opposite each pocket 52. Each disc 55 extends radially into each pocket 52 past the curved face 53 of the pan 15. The discs 55 are slightly radially spaced from the pockets 52 to avoid friction contact. The discs 55, being resilient, are radially compressible.

The sprocket 56, FIG. 2, is fixed on one end of the drive shaft 54. The sprocket 56 is in mesh with the drive chain 42. The motor 40 driving the sprocket 41 and chain 42 thereby also drives the sprocket 56, drive shaft 54, and discs 55. The resilient annular members or discs 55 may be made of sponge rubber or resilient synthetic foam or other suitable material as desired and suited to the operation.

Thus it will be understood that the compressible drive discs 55 normally extend radially into the pockets 52 in the arcuate pan 15 so that the discs radially extend past the curving face 53 of the pan 15. It is to be further understood that the discs 55 are resilient and may be radially compressed so that they do not project into the pockets 52 and extend radially in their compressed condition only to a point at the face 53 of the pan 15. This is now described.

Upon the sheet material or paper 60 being inserted in the developing chamber 12 past the bottom sealing strip 51, the paper 60 slides along the table 14 to the location of the pan 15 and drive discs 55. The paper 60 bridges over the pockets 52 and comes in contact with the drive discs 55. This is shown in FIG. 3 relative to two drive discs 55 with the paper 60 bridging the pockets 52 and compressing the two drive discs 55 which are in contact with the paper 60. The paper 60 in the location of the arcuate face 53 of the pan 15 is also arcuately disposed against the arcuate face 53 of the pan 15. This gives the otherwise low strength paper a high-strength structural shape providing it with a curved cross-section in the location of the drive discs 55 which prevents the discs 55 from pushing the paper 60 into the pockets so that the paper 60 bridges the pockets 52 and radially compresses the resilient drive discs 55. Thus the drive discs 55 are in compressed driving relationship to the paper 60 so that as they rotate the drive discs 55 move the paper 60 in sliding relationship over the curved face 53 of the pan 15.

The resistance force in the paper 60 compressing the drive discs 55 is not concentrated radially of the discs 55 as the pockets 52 are spaced from the back of the paper 60 at this location radially of the discs 55. Thus the resistance force of the paper 60 is dissipated over the adjacent face 53 of the pan 15 thereby dissipating the friction contact between the paper 60 and the pan 15 over a large area so that the paper 60 slides smoothly and easily over the face 53 of the pan 15 as driven by the rotation of the discs 55.

When the paper 60 is moved around the curving face 53 of the pan 15 by the drive discs 55, the paper 60 emits from between the drive discs 55 and the pan 15 adjacent the top of the developing chamber 12 where the paper 60 runs into contact with the tangential flange 16 on the pan 15 which directs the paper 60 outwardly through the exit slot 48 past the top flap sealing strip 50 as previously stated.

Referring now to means for introducing treating gas into the developing section 12, a tube 61, FIG. 3, is fixed in the end frame 21 and extends into the interior of the hollow drive shaft 54. The tube is stationary and provides a turning pivot for the adjacent end of the drive shaft 54 which is sleeved over the tube 61.

The tube 61 also extends outwardly of the end frame 21 and connects with a pipe 62 leading from a cylinder 63 of compressed treating gas such as ammonia gas. A hand knob 64 operates a valve in the pipe 62 of on the cylinder 64. By moving the hand knob 64, the valve is actuated to release gas from the cylinder 63 through the pipe 62 and tube 61 and then into the interior of the hollow drive shaft 54. The hollow drive shaft is provided with side wall orifices 65 between the discs 55 and the gas bleeds through the orifices 65 into an enclosed gas chamber 80 of the developing section 12.

When the treating gas emits from the orifices 65 into gas chamber 80, the gas displaces the air in the chamber 80. The pressure in the gas chamber 80 inside developing section 12 is raised slightly internally by the introduction of the gas under pressure. This internal pressure urges the bottom flap sealing strip 51 into sealing relationship against the table 14 preventing escape of gas from the bottom of the section 12 and causing the gas to build upwardly in the gas chamber 80. Upon the internal pressure of the gas chamber 80 being raised slightly, the pressure displaces the top flap sealing strip 50 and permits the escape of air through the exit slot 48. As the gas concentration builds up from the bottom, air escapes at the top. When gas starts to emit from the top exit slot 48, the operator then knows that the gas chamber 80 of the developing section 12 is charged with treating gas. The operator then releases the hand knob 64 and the pressure equalizes in the gas chamber 80 relative to

ambient atmospheric pressure and the escape of gas terminates.

It is to be noted that the treating gas is introduced in gas form and that it is not introduced as a liquid and allowed to produce gas by evaporation. This is particularly advantageous as no liquid wells are required and as a result there is no liquid overflowing and wetting the paper. It will be understood that while the direct introduction of gas is preferred, it is within the purview of the invention to use liquid in the developing section if desired.

Control switches are mounted on the top cover 24 and may include a motor switch 70, a lamp switch 71, a heater switch 72 for a heater in the gas chamber 80 is used, and a rheostat 73 for controlling motor 40 speed. Adjustable control of the speed of the motor 40 enables the operator to vary the exposure time in the impression section 11 and also to vary the developing time in the developing section 12. Like end covers 74 and 75 fit over the outer ends of the end frames 20 and 21 respectively. A nut 76 in the covers 74 and 75 threads on a stud 77 fixed on each A-frame. This removably secures the end covers 74 and 75 on the machine.

Each end frame 20 and 21 has an inwardly extending rib 78 which abuts the front panel 17 and its bottom flange 18 and top leg 46. The ribs 78 support the front panel 17 at either end on the end frames 20 and 21 and provide means for removably sealing and mounting the front panel 17 in position and in sealed condition. Screws 79 secure the front panel 17 to the ribs 78 on the end frames 20 and 21.

The developing section 12 thereby encloses the gas chamber 80 which contains the treating gas without escape to atmosphere and without allowing penetration of atmosphere into the gas chamber thereby preserving the concentration of gas supply in the chamber during continuous use, intermittent use, and during periods of standing idle. Thus the developing section 12 is always ready to be used. Obviously, the operator or workman replenishes the gas supply in the gas chamber 80 from time to time to replace the gas used in the development of sheets. This is easily done by the operator occasionally opening the gas valve by actuating the hand knob 64.

In operation, the user turns on the switches 70-72, sets the rheostat 73 for proper motor speed, and actuates the hand knob 64 if necessary. The machine is now running and ready to print impressions and develop them.

The user then places sensitized paper 60 and a masking overlay, such as tracing, on the table plate 27 and pushes them into the impression section 11 through the entrance passage 38. The paper 60, and tracing are picked up by the moving belts 36 and rotating drum 28 and conveyed around the lamps 39 which induce the impression in the paper by light energy. The paper 60 and tracing are then ejected from the exit passage 39. The user then separates the paper 60 and the tracing.

The user then lays the leading edge of the paper 60 on the table 14 and pushes it through the entrance slot 45 past the sealing strip 51 into contact with the drive discs 55 and the face 53 of the pan 15. The drive discs 55 then move the paper around the face 53 of the pan 15 and the leading edge of the paper rides into contact with the tangential flange 16 which directs the leading edge of the paper 60 outwardly through the exit slot 48 past the top flap seal 50. The inner face surface of the paper is exposed to the gas in the gas chamber 80 in its travel between the seals 51 and 50 and the gas develops the latent impression in the paper as the paper moves from the bottom seal 51 to the top seal 50.

It can now be seen that the novel machine allows and provides closely coupled printing and developing sections which are both ready to operate at all times without delay. The novel machine with the structural improvements and operational efficiency disclosed and described is easily operated to print and develop sheet material such

as sensitized paper. The novel machine and novel portions thereof are described relative to a specific use for purposes of illustration and it will be understood that the devices are not limited to such specific use.

Although but a single embodiment of the invention has been shown and described in detail, it is obvious that many changes may be made in the size, shape, detail, and arrangements of the various elements of the invention within the scope of the appended claims.

We claim:

1. A device having sealed gas chamber for containing a treating gas having displaceable sealing means for admitting and emitting sheets to be treated by the gas and drive means for moving a sheet into, through, and out of the gas chamber comprising,

a table forming the bottom of said chamber having opposite ends, a back edge, and a front edge, end frames secured to said opposite ends of said table, a reversely curving rear pan having a bottom edge joined with said table back edge, a reversely curving face portion leading upwardly and then forwardly terminating in a top tangential flange lying spaced above said table; said pan having end edges joined to said end frames;

a front panel having a bottom flange lying spaced above said table forming a sheet entrance slot therebetween; said front panel having a top leg lying and slightly spaced below said pan top tangential flange forming a sheet exit slot therebetween; said panel having end edges secured to said end frames;

a first flexible flap sealing strip sealed on said front panel bottom flange extending inwardly and displaceably sealing against said table at said sheet entrance slot;

a second flexible flap sealing strip sealed on said pan top tangential flange extending outwardly and displaceably sealing against said panel top leg at sheet exit slot;

said table, end frames, pan, panel, and flap seals forming an enclosed gas chamber;

drive means in said chamber drivingly engageable with a sheet inserted through said entrance slot past said first flap seal for thereafter moving said sheet over said table and inwardly around said curving pan and outwardly through said exit slot past said second flap seal;

and means for providing treating gas internally of said gas chamber.

2. In a device as set forth in claim 1, said drive means including drive shaft rotatably bearing in said end frames;

radially compressible axially spaced friction discs fixed on said drive shaft for rotation therewith; said drive shaft and discs lying parallel to and adjacent to said pan reversely curving face portion of said pan, and

dished pockets in said pan below the surface of said pan adjacent said discs;

said discs radially extending into said pockets in said pan below the surface of said pan;

said discs normally not contacting said pan surface because of the relief provided by said pockets;

a sheet lying against said pan surface at said discs bridging said pockets and compressing said discs radially in friction driving contact with said paper whereby said discs drive a sheet over said pan face surface;

said friction discs being out of contact with said pan in the absence of a sheet to eliminate friction and preserve said discs.

3. In a device as set forth in claim 2, said drive shaft being hollow; said drive shaft having vent orifices lying between said discs; said drive shaft having an open end and a closed end; said open end communicating through

one said end frame; and means for introducing gas into said open end internally of said hollow shaft whereby the gas escapes from said hollow shaft through said vent orifices internally of said gas chamber.

4. A machine for treating sheet material in an enclosed chamber comprising,

end walls,

a table constituting a bottom wall lying between said end walls,

a curved pan constituting the back wall lying between said end walls and leading from said table; said curved pan reversely curving above said table and terminating in a tangential flange spaced above said table lying between said end walls;

said end walls, table, pan, and flange being sealably attached to one another,

a front panel sealable fixed between said end walls spaced from said pan and spaced slightly above said table creating an entrance slot therebetween,

an inwardly extending bottom flap sealing strip on said front panel displaceably sealing against said table,

a leg flange on said front panel spaced from said table extending over said table toward said pan; said front panel leg flange lying spaced slightly below said pan tangential flange forming an exit slot therebetween,

an outwardly extending top flap sealing strip on said tangential flange of said pan displaceably sealing against said leg flange at said exit slot;

said end walls, table, pan, front panel and sealing strips creating an enclosed and sealed gas chamber, and means for introducing gas under pressure into said chamber whereupon said chamber internal pressure is raised urging said bottom seal against said table and displacing said top seal to evacuate air from the chamber as the gas concentration builds upwardly in said chamber,

sheet material being movable into said chamber past said bottom sealing strip without disturbing the sealed condition of said chamber and sheet material being movable out of said chamber past said top sealing strip without disturbing the sealed condition of said chamber with said sealing strips sealing against said sheet material as it moves into and out of said chamber.

5. In a machine as set forth in claim 4, drive means for moving sheet material through said enclosed gas chamber past said sealing strips comprising,

a drive shaft in said chamber lying radially of said curved pan;

said curved pan having a face surface;

depressed portions in said curved pan at axially spaced intervals lying radially of said drive shaft creating pockets in said pan below the face surface of said pan;

resilient radially compressible drive discs fixed on said drive shaft extending radially into said pan pockets so as to extend past said face surface of said pan; sheet material lying against said face surface of said curved pan bridging said pockets and compressing said drive discs in friction driving contact with said sheet material;

rotating of said drive discs by said drive shaft driving the sheet material over said face surface of said curved pan in sliding contact therewith.

6. Drive means for conveying sheets comprising a drive shaft,

radially compressible annular members fixed on said drive shaft, and

a pan adjacent said drive shaft and said annular members having depressed pockets receiving the radial extremity of said annular members and a face surface lying within the radius of said annular members;

the presence of a sheet disposed between said pan and said annular members bridging said pockets and compressing said annular members in friction engagement with the sheet;

rotation of said drive shaft and annular members in friction engagement with the sheet driving the sheet over said pan surface in sliding relationship thereto.

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