

Sept. 28, 1965

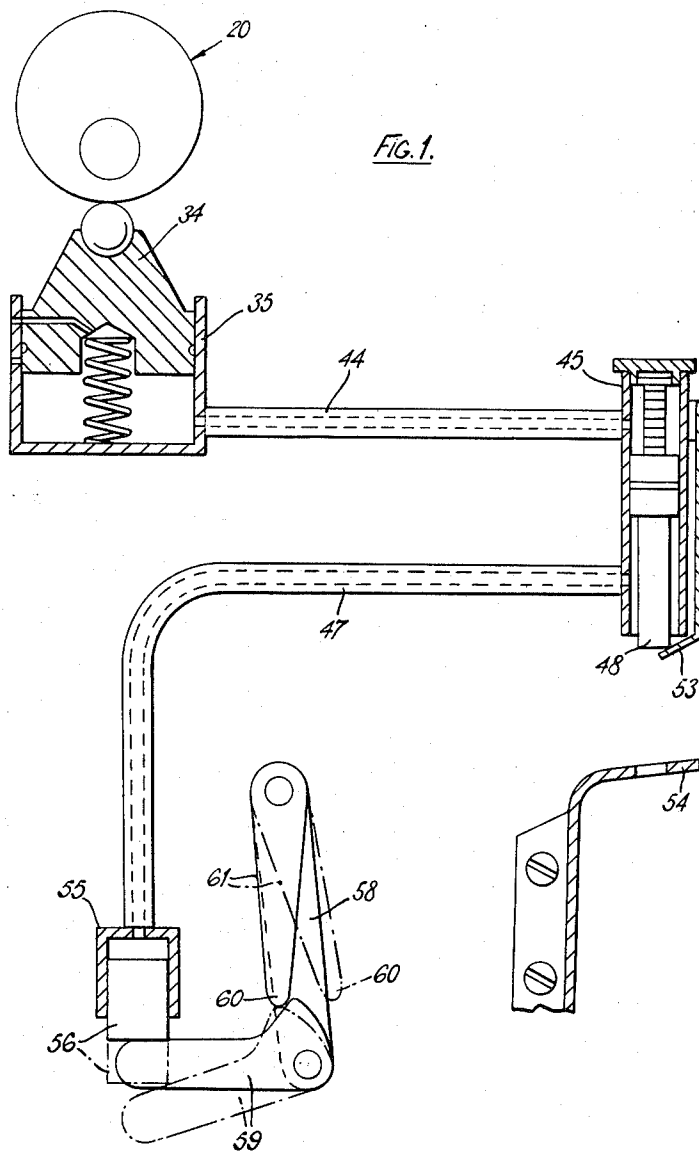
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3,208,376

PNEUMATICALLY CONTROLLED DEVICE FOR PREVENTING
IMPRESSION IF PAPER IS NOT FED

Filed June 17, 1963

6 Sheets-Sheet 1



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6 Sheets-Sheet 2

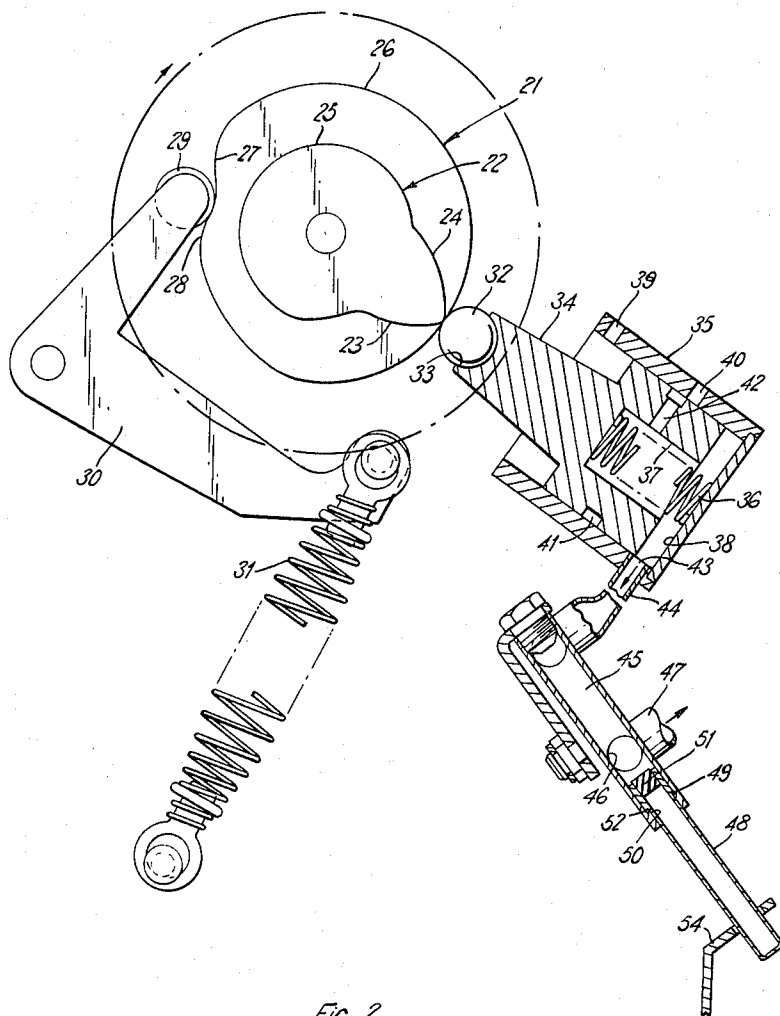


FIG. 2.

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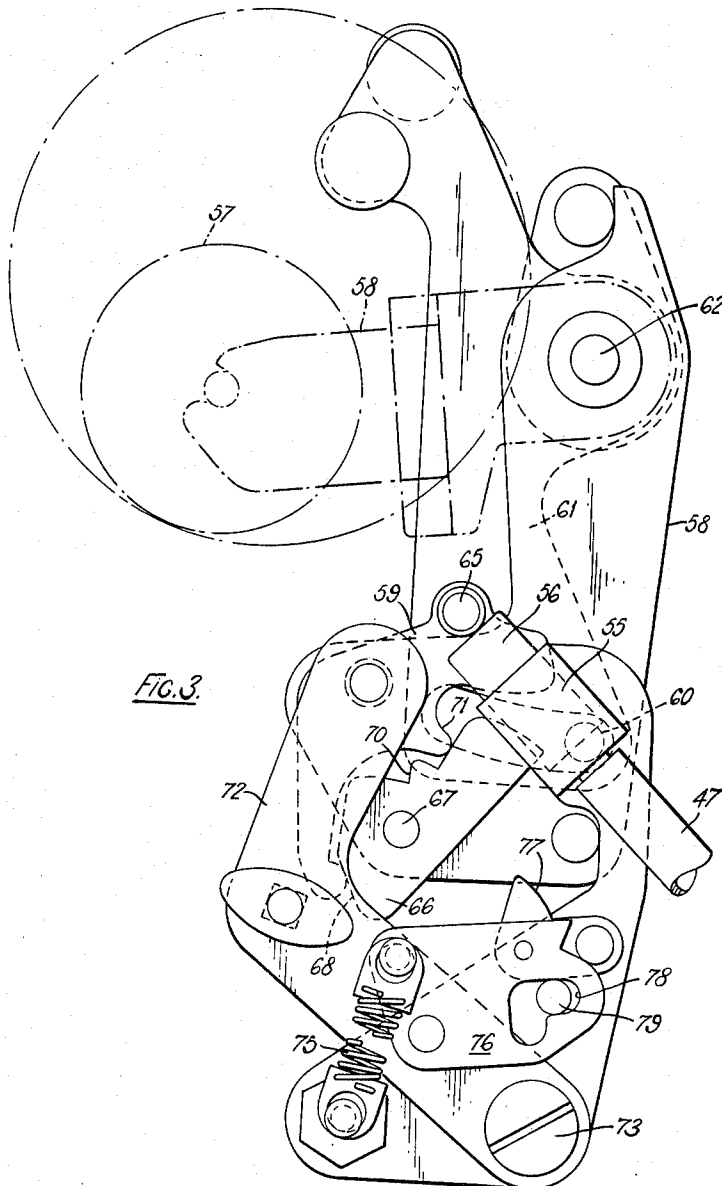
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6 Sheets-Sheet 3



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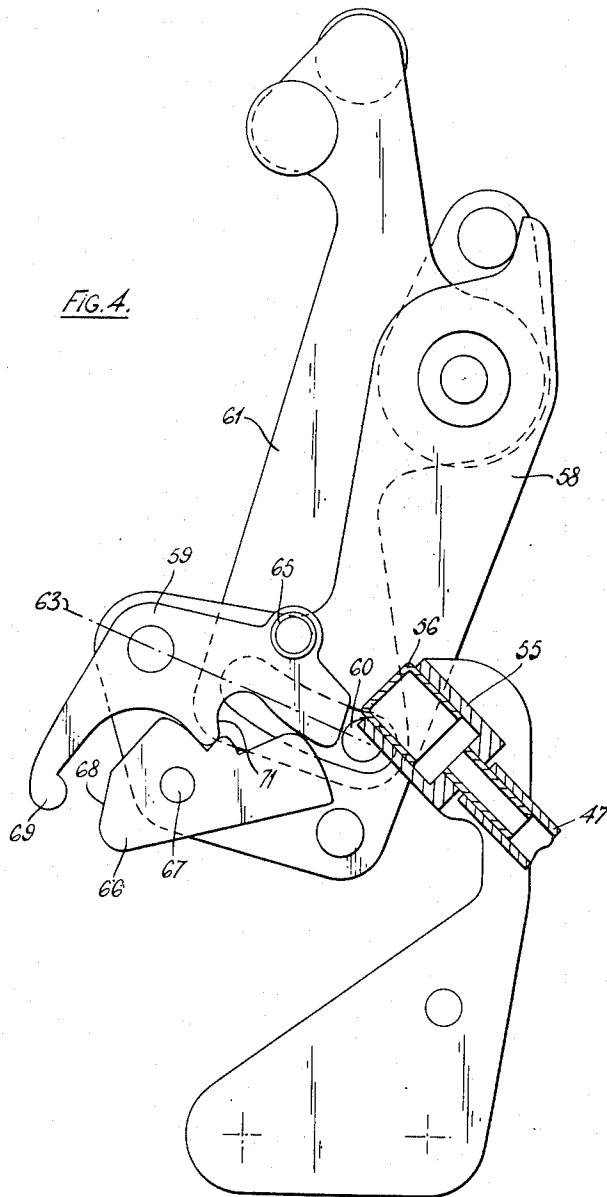
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6 Sheets-Sheet 4



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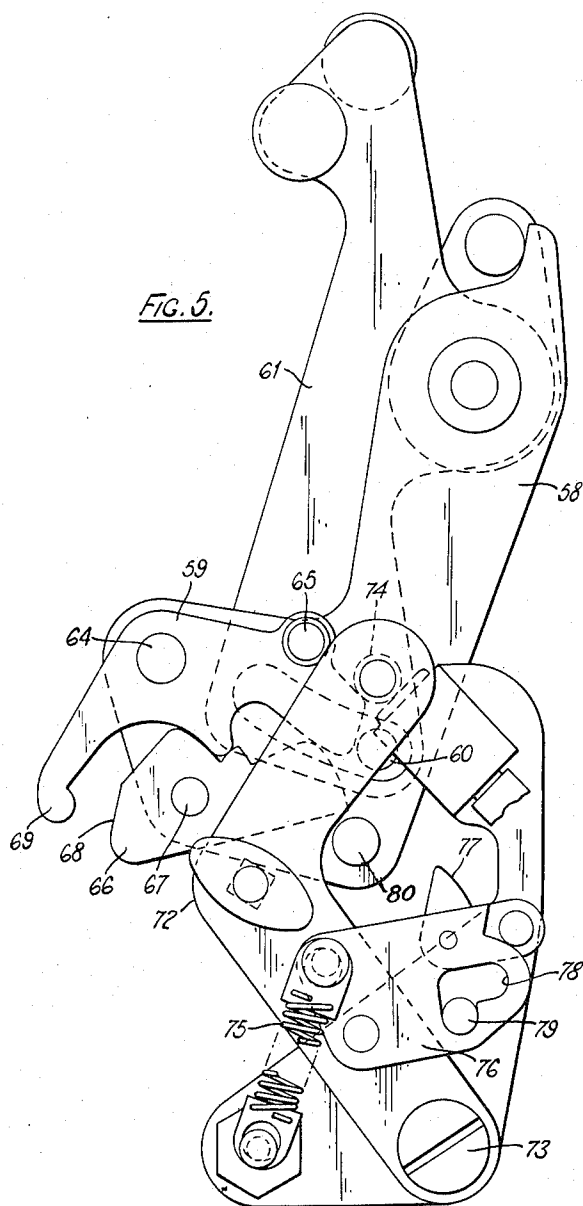
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PNEUMATICALLY CONTROLLED DEVICE FOR PREVENTING
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6 Sheets-Sheet 5



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PNEUMATICALLY CONTROLLED DEVICE FOR PREVENTING
IMPRESSION IF PAPER IS NOT FED

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6 Sheets-Sheet 6

Fig. 6.

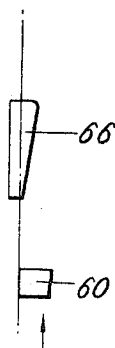


Fig. 7.

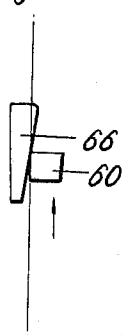


Fig. 8.

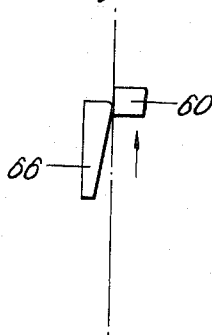


Fig. 9.

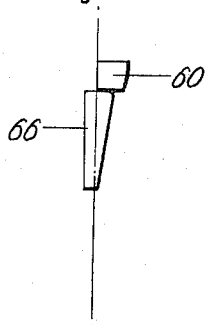
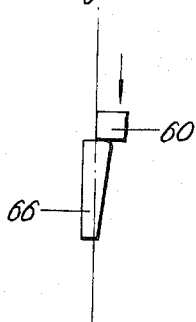


Fig. 10.



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PNEUMATICALLY CONTROLLED DEVICE FOR PREVENTING IMPRESSION IF PAPER IS NOT FED

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Claims priority, application Great Britain, June 26, 1962, 24,532/62

14 Claims. (Cl. 101—118)

The present invention relates to stencil duplicators.

In stencil duplicators, the stencil is carried around a printing cylinder and sheets of paper are passed one at a time between the stencil on the printing cylinder and a pressure roller which presses the paper against the stencil. It is necessary for the pressure roller to move towards and away from the printing cylinder as each sheet of paper is being fed through the machine and also for the pressure roller to be prevented from moving towards the printing cylinder when no sheet is being fed through the duplicator. If such movement were not prevented, the pressure roller would contact the stencil and be inked thereby and soil the backs of sheets subsequently passed through the duplicator.

Conventional duplicators are provided with a paper detecting device which by means of a mechanical linkage to the pressure roller movement mechanism ensures that the movement of the pressure roller is only effected when the sheet is being fed.

It is an object of this invention to provide a novel paper detecting and pressure roller control device.

According to the present invention, there is provided in a stencil duplicator, a paper detecting and pressure roller control device comprising means, synchronised with the rotation of the printing cylinder of the duplicator for producing alternately pressure and suction periods in the air in the cylinder of a detector piston and cylinder arrangement, the detector piston being displaceable by the air in the cylinder of a detector piston and cylinder returnable during a suction period, the detector piston being so placed that movement thereof is arrested before the operative position by a sheet of paper being passed through the duplicator, movement of the detector piston to the operative position admitting the air under pressure to a control cylinder to move a control piston therein, thereby to disconnect a driving mechanism for moving the pressure roller of the stencil duplicator towards the printing cylinder thereof.

Preferably the means for producing pressure and suction comprises a master piston and cylinder arrangement which is driven by the operating cam of the duplicator, and the piston of which is spring loaded into engagement with the cam.

Advantageously the detector piston is arranged, in the operative position, to project through an aperture in a paper fence over which the sheets of paper are arranged to pass, movement of the piston through the aperture being prevented by the presence of a sheet of paper on the fence. Preferably, when the detector piston is in the operative position, it uncovers an orifice in the detector cylinder to admit air under pressure to the control cylinder. Desirably the movement of the detector piston is retarded by a damper and a resilient buffer may be provided to stop the movement of the detector piston in either direction.

When air pressure is admitted to the control cylinder the piston preferably pivots a control lever to disconnect the driving mechanism. The control lever may be pivoted to move the lever away from its working position in the path of movement of a reciprocating drive peg. To return the control lever to its working position a latch may

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be provided, such latch being operated by return movement of the drive peg.

In order that the invention may more readily be understood the following description is given of one embodiment of the device of the invention mounted in a typical stencil duplicator, reference being made to the accompanying drawings in which:

FIGURE 1 is a schematic view of a detector device showing the interconnection between the various parts;

FIGURE 2 is a detailed view of the master air cylinder and detector cylinder arrangement of the device of FIGURE 1;

FIGURE 3 is a detailed view of the control cylinder and pressure cylinder operating mechanism of FIGURE 1;

FIGURE 4 is a view similar to FIGURE 3 with parts omitted for clarity, the mechanism being shown in a different position;

FIGURE 5 is a view similar to FIGURE 4 with the backing sheet lever shown in the operative position; and

FIGURES 6-10 illustrate schematically the operation of the latch mechanism.

In this embodiment, the stencil duplicator is basically a conventional twin cylinder machine, i.e. comprises two cylinders mounted on parallel axes and so as to be spaced one above the other and around these two cylinders passes an ink screen over which the stencil is adapted to be placed. A sheet feeding mechanism is provided for passing copy sheets of papers between the lower of the two cylinders and a pressure roller mounted below such lower cylinder and adapted to be raised and lowered towards and away from such cylinder in synchronism with the feeding of the sheets.

The synchronising of the various mechanisms, such as the sheet feeding mechanism and that for raising and lowering the pressure roller, is effected, as is conventional, by such mechanism being driven by an operating cam 20 carried by the main driving shaft of the machine. In the duplicator of this invention, the cam 20 has two additional cam surfaces, these being a brake arm cam 21 and a master air cylinder operating cam 22. The latter cam has a quick lift portion 23 over about 20° of revolution and a fall portion 24 over about 40° the remaining 300° being rest portion 25. On the brake arm cam the rest portion 26 extends over about 240° of revolution and the remaining cam surface is recessed, the "negative lift" portion 27 being over 20° while rise 28 to the rest portion covers 100° of revolution.

The brake arm cam has a roller follower 29 carried on one extremity of an L-shaped brake arm 30, a brake arm spring 31 acting on the other end pivoting the brake arm to urge the follower into contact with its cam 21. The follower for the master air cylinder cam is in the form of a ball bearing 32 mounted in a cup shaped recess 33 in the top of a piston 34 in a master air cylinder 35. This piston is reciprocable within the cylinder, being forced downwardly into the cylinder by the cam and follower and upwardly again by a return spring 36 located in a recess 37 in the piston face and acting against the cylinder head 38.

At positions near the top of the cylinder wall and about one third of the way along the cylinder wall from the cylinder head upper and lower ports 39 and 40 respectively are provided connecting the inside of the cylinder to atmosphere. An annular groove 41 around the piston is connected by a by-pass passage 42 to the recess 37 in the piston face, the arrangement being such that, when the piston is at the bottom of its stroke and the spring fully compressed, the annular groove registers with the lower port 40. Adjacent the cylinder head, the cylinder wall has an outlet port 43 connected by a conduit 44 to the top of a detector cylinder 45.

The detector cylinder 45 is of narrow cross section and

has at a point about half way along its length an outlet orifice 46 connected to a supply tube 47. Slideably mounted within the detector cylinder is a hollow detector piston 48, having at its upper end an outwardly projecting annular flange 49 which is engageable with an inwardly projecting annular flange 50 on the detector cylinder. In order to reduce noise as the detector piston reciprocates within its cylinder, two rubber buffers are provided, one in the form of a bung 51 closing the top of the hollow piston, the other being a washer 52 fixed to the flange on the detector cylinder.

To moderate the movement of the detection piston, a damper in the form of a resilient arm 53 (FIGURE 1) secured to the outside of the detector cylinder with a part frictionally bearing on that part of the piston which is outside the cylinder.

When the detector piston is at its lowest position, its upper end uncovers the outlet orifice 46 while its lower end passes through an aperture in a paper fence 54 arranged in the path of sheets fed from the sheet feeding mechanism. If a sheet of paper is passing along the fence at the time the detector piston is moving downwardly, such piston will be unable to pass through the aperture and the top of the piston 48 will block the outlet orifice 46.

The supply tube 47 from the outlet orifice 46 provides a connection from the master air cylinder 35 via the detector cylinder 45 to the lower end of a control cylinder (FIGURE 3) which has a control piston 56 reciprocable therein.

As mentioned above, the pressure roller 57 has a driving mechanism to cause it to rise, to press copy sheets against the stencil. For this purpose, the pressure roller is mounted for rotation on a frame 58 which is pivotable to raise and lower the pressure roller. Mounted on the frame is a control lever 59 pivoted near its centre so as to bring the lever into the working position with the end thereof in the path of movement of a drive peg 60 which is caused to move back and forth by means synchronised with the feeding of the sheets. These means comprise a link 61 rockably driven about a pivot 62 by a cam surface on the operating cam 20, the drive peg 60 being secured to such link. The path of movement of the drive peg 60 is such that, when it engages against the end of the lever 59 on the path, the end of the lever 59, the lever itself and the pivot 64 for the lever are substantially in one straight line 63.

An abutment in the form of a lever pin 65 is fixed to the lever at a point thereon near the end engaged by the drive peg 60, the lever pin 65 being so placed that the control piston 56, when forced out from the control cylinder 55, engages thereon to pivot the lever 59 out of the path of movement of the drive peg 60. The lever pin is provided with a rubber sleeve to reduce the noise of impact of control piston 56.

Since the lever must be returned to the position in which its end is in the drive peg's path of movement, when the stencil has completed a revolution, a latch 66 is provided which is engaged by the drive peg 60 when it is returning along its path of movement. The latch 66 then pivots about its own axis 67 and the other end 68 thereof engages the other end 69 of the control lever 59 to return the latter to the working position. In order to lock the lever in the non-working position, the latch has a stopped portion 70 engaging a nose 71 on the control lever.

In operation of the above described device, as the operating cam rotates the master cylinder operating cam 22 and the return spring 36 in such cylinder cause the master air cylinder piston 34 to reciprocate in the master air cylinder 35. On the down stroke air is compressed below the piston causing pressure in the outlet port 43. As the piston reaches the bottom of its stroke the annular groove 41 registers with the lower port 40 and the pressure is released to atmosphere. On the up stroke the volume below the piston increases causing a suction period

at the outlet port 43 and as the piston reaches the top of its stroke the annular groove 41 registers with the upper port 39 and the pressure below the piston once again becomes atmospheric. Thus, alternate periods of pressure and suction are produced at the outlet port 43. To compensate for the out-of-balance forces produced by the ball bearing 32 on the master cylinder operating cam and the master cylinder, the brake arm roller 29 is spring loaded against the brake arm cam 21.

The periods of pressure and suction are transmitted to the top of the detector cylinder 45 by the conduit 44 and the detector piston 48 is caused to reciprocate, noise being reduced by the rubber buffers 51 and 52.

If a sheet of paper is present on the fence 54, then the detector piston 48 will be prevented from travelling to the bottom of its stroke, the force of the air pressure on the piston being quite small. With the lower end of the detector piston above the fence the outlet orifice 46 is blocked and no pressure pulse is transmitted down the supply tube 47 to the control cylinder 55, the control piston 56, therefore, remaining stationary. The end of the control lever 59, as shown in FIGURE 4, is in the path of movement of the drive peg 60 which moves, engages the lever 59 and pivots the frame 58 about its axis 62, thereby lifting the pressure roller 57 and forcing the sheet of paper against the stencil.

If no sheet of paper is present on the fence then the detector piston 48 is forced to the bottom of its stroke, it passes through the aperture in the fence 54, the upper end of the piston uncovering the outlet orifice 46. Air under pressure forces the control piston 56 upwardly in the control cylinder 55 so that the piston strikes the lever pin 65 and pivots the lever 59 to its non-working position, as shown in FIGURE 3. The other end 69 of the control lever simultaneously pivots the latch so that the step portion 70 thereof engages the nose 71 on the lever to hold the latter in the non-working position. In FIGURE 3 the lever 59 is shown pivoted to the position in which the end 69 engages the end 68 of latch 66, in which position there is necessarily a clearance between the nose 71 and step 70. When the contact piston 56 is retracted lever 59 drops slightly so that nose 71 engages step 70 and returns lever 59 to the non-working position. As the drive peg 60 moves along its path, it does not engage the end of the lever 59 and therefore does not raise the pressure roller 57, but merely rides up a ramp portion (not shown) on the latch 66.

On its return the peg engages the ramp portion and trips the latch to disengage the step portion 70 from the nose 71 on the lever and pivots the latter back to its working position, so that, if on the next revolution of the stencil a sheet of paper is present, then the pressure roller will be raised.

The operation of the latch mechanism is illustrated more fully in FIGURES 6 through 10 which show schematically, in plan, the relative positions of the pin and latch. FIGURE 6 shows the pin 60 approaching the latch 66. FIGURES 7 and 8 show the pin engaging the ramp on the rear of the latch and flexing the latter slightly. In the position of FIGURE 9, the pin 60 is shown at the end of the ramp with the latch springing back behind it and finally, FIGURE 10 shows the pin engaged against the latch and moving back taking the latch with it.

Just as when the master air cylinder 35 causes a pressure period the detector piston and control piston are moved, so as the master air cylinder 35 causes a suction period these two pistons will return to their original positions.

It is conventional for the stencils which are used with stencil duplicators to be provided with a backing sheet of stiff paper. When the stencil is initially laid on the ink screen, the operator rotates the stencil and attached backing sheet at least once so that the pressure roller may lift and press the backing sheet onto the stencil so that the stencil is properly inked, the backing sheet being

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torn off thereafter. In conventional duplicating apparatus, a button is provided to override the action of the mechanical sheet detector so that the pressure roller is caused to rise even though no paper is passing through the duplicator.

In the sheet detecting and pressure roller control device of this invention, provision may also be made for enabling the pressure roller to rise when desired, e.g. when wishing to press a backing sheet against a stencil, even though no paper is passing through the duplicator. Thus in the embodiment described, we provide a backing sheet lever 72 which is of L-form and is pivotally mounted about an axis 73 through one end of the lower arm of the lever. The upper arm carries a pin 74 which is movable to an active position (FIGURE 5) to hold the control piston 56 down against the action of air pressure. The lever 72 is normally urged away from this position by a tension spring 75 acting on a catch 76 pivoted to the backing sheet lever 72. Pinned to the catch 76 is a trip pawl 77 which is provided at the right hand end, as seen in the figure, with a pin which can rest against the edge of catch 76. Within the catch, an L-shaped slot 78 encompasses a dowel 79 and on the pressure roller lifting frame 58 an abutment 80 is arranged to move to engage the trip pawl 77 when the backing sheet lever 72 is in the active position.

Normally, with the backing sheet lever 72 in the non-active position the dowel 79 is located in a first part of the L-shaped slot (FIGURE 3) in the catch and positions the latter so that the spring urges the pin 74 carried by the lever away from the control piston 56. However if the backing sheet lever is manually pivoted to the active position, the catch 76 moves so that the dowel 79 is located in the second part of the slot (FIGURE 5). In this position the trip pawl 77 is in the path of the abutment 80. Furthermore, with the catch 76 in this position the backing sheet lever is retained in its active position.

If the backing sheet lever 72 is in this position then the control piston is unable to move and the drive peg 60 engages the control lever 59 and thus causes the pressure roller 57 to rise. As the frame 58 returns, the abutment engages the trip pawl 77 thereby shifting the catch 76 so that the dowel 79 returns to the first part of the slot (FIGURE 3) and the spring 75 moves the backing sheet lever to the non-active position and the control piston 56 can work as normal.

The device according to this invention has the advantage that it operates with little noise. To further reduce the noise of the device the pin on the control lever and the pin on the backing sheet lever are covered with rubber sleeves.

I claim:

1. In a stencil duplicator having a rotatable printing cylinder and a pressure roller, a paper detecting and pressure roller control device comprising a detector cylinder; a detector piston movable in said cylinder along a path to an operative position; means, synchronised with the rotation of said printing cylinder, for producing alternate pressure and suction periods in said detector cylinder effective to move said detector piston towards said operative position in a pressure period and return said piston during a suction period; guide means over which paper may be fed in the path of said detector piston to arrest said detector piston before reaching said operative position; a control cylinder; a control piston movable in said cylinder to a disconnecting position; a driving mechanism for raising said pressure roller into contact with said printing cylinder; disconnecting means in said driving mechanism operated by said control piston in said disconnecting position to disconnect said mechanism; means for admitting air under pressure to said control cylinder to move said control piston to said disconnecting position and means controlled by said detector piston in its operative position to operate said means for admitting air to said control cylinder.

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2. In a stencil duplicator as specified in claim 1, said means for producing alternate pressure and suction periods comprising a master air cylinder; a piston reciprocable in said cylinder; cam means effective to reciprocate said cylinder on pressure and suction strokes and means to vent said cylinder to atmosphere after each said stroke.

3. In a stencil duplicator having a rotatable printing cylinder, a pressure roller and guide means over which paper may be fed along a paper feed path which leads between said cylinder and roller, a paper detector and pressure roller control device comprising a detector cylinder; a detector piston movable in said cylinder along a path crossing said paper feed path to an operative position; means synchronised with said printing cylinder, for producing alternate pressure and suction periods in said detector cylinder effective to move said detector piston towards said operative position in a pressure period and return said piston along said path in a suction period; said guide means positioning said paper in the path of said detector piston to arrest said detector piston before reaching said operative position; a control cylinder, a control piston movable in said cylinder to a disconnecting position; a driving mechanism for raising said pressure roller into contact with said printing cylinder; disconnecting means in said driving mechanism operated by said control piston in said disconnecting position to disconnect said mechanism, means for admitting air under pressure to said control cylinder to move said control piston to said disconnecting position and means controlled by said detector piston in its operative position to operate said means for admitting air to said control cylinder.

4. In a stencil duplicator having a rotatable printing cylinder, a pressure roller and guide means over which paper may be fed along a paper feed path which leads between said cylinder and roller, a paper detector and pressure roller control device comprising a detector cylinder; a detector piston movable in said cylinder along a path crossing said paper feed path to an operative position, means synchronised with said printing cylinder, for producing alternate pressure and suction periods in said detector cylinder effective to move said detector piston towards said operative position in a pressure period and return said piston along said path in a suction period; said guide means positioning said paper in the path of said detector piston to arrest said detector piston before reaching said operative position; means defining an orifice in said detector cylinder; means on said detector piston effective to block said orifice except when said piston is in the said operative position; a control cylinder; a control piston reciprocable in said control cylinder to a disconnecting position; a driving mechanism for raising said pressure roller into contact with said printing cylinder; disconnecting means in said control cylinder operated by said control piston in said disconnecting position to prevent said driving mechanism operating and conduit means for connecting said orifice means to said control cylinder to admit air under pressure to said control cylinder to move said control piston to said disconnecting position when said detector piston is in said operative position.

5. A stencil duplicating machine comprising a rotatable printing cylinder, an operating cam for effecting cyclic operation of said machine, a pressure roller; a driving mechanism for lifting said pressure roller into contact with said printing cylinder; guide means over which paper may be fed along a paper feed path between said pressure roller and printing cylinder; a detector cylinder; a detector piston movable in said detector cylinder along a path crossing said paper feed path to an operative position; a master air cylinder; a master air piston reciprocable in said master air cylinder by said operating cam and effective to produce alternate pressure and suction pulses in said detector cylinder to move said detector piston towards said operative position in a pressure pulse

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and return said piston along said path in a suction pulse; said guide means positioning said paper in the path of said detector piston to arrest said detector piston before the latter reaches said operative position; means defining an orifice in said detector cylinder; means on said detector piston effective to block said orifice except when said piston is in the said operative position; a control cylinder; a control piston reciprocable in said control cylinder to a disconnecting position; disconnecting means in said control cylinder operated by said control piston in said disconnecting position to prevent said driving mechanism operating and conduit means for connecting said orifice means to said control cylinder to admit air under pressure to said control cylinder to move said control piston to said disconnecting position when said detector piston is in said operative position.

6. The duplicating machine specified in claim 5 wherein said guide means comprise a paper fence and means defining an aperture in said fence positioned in the path of movement of said detector piston to pass the latter when in the said operative position.

7. The duplicating machine specified in claim 5 wherein a damper is provided on the detector cylinder effective to dampen the movement of the detector piston.

8. The duplicating machine specified in claim 5 wherein resilient buffer means are provided on said detector piston to stop said piston at the operative position and return position.

9. The duplicating machine specified in claim 5 wherein said disconnecting means comprise a lever pivotable to an out-of-the-way position by said control piston.

10. The duplicating machine specified in claim 5 wherein said drive mechanism comprises frame means supporting said pressure roller; a reciprocating driving peg driven by said operating cam on a forward and a re-

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turn movement along a line passing through said frame means; a pivot on said frame means on said line; control lever means pivotable about said pivot to a working position in which it is engageable by said drive peg to displace said frame means and thereby to lift said pressure roller and abutment means on said control lever engageable by said control piston effective to displace said lever from the line of movement of said drive peg when said control piston moves to its disconnecting position.

11. The duplicating machine specified in claim 10 wherein latch means mounted on said frame means to be engageable by said drive peg in its return movement are effective to return said control lever to its working position after displacement therefrom by said control piston.

12. The duplicating machine specified in claim 5 and including means manually movable to a blocking position and abutment means positioned on said manually movable means to abut said control piston only when the manually movable means are in the blocking position to prevent movement of said control piston.

13. The duplicating machine specified in claim 12 wherein said manually movable means comprises a lever pivotable to said blocking position.

14. The duplicating machine specified in claim 13 and including means associated with said driving mechanism for returning said lever from said blocking position after one cycle of the machine.

References Cited by the Examiner

UNITED STATES PATENTS

2,198,728	4/40	Horii	101-118
2,269,199	1/42	Hildebrandt	101-118
2,639,666	5/53	Halley	101-247

35 ROBERT E. PULFREY, *Primary Examiner*.