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Abendroth et al.

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[45] **July 31, 1973**

[54] **DAMPING DEVICE FOR LITHOGRAPHIC PRINTING PRESSES**

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[52] **U.S. Cl.** **101/148**, 101/247

[51] **Int. Cl.** **B41l 25/16**

[58] **Field of Search** 101/137, 140, 144, 101/145, 147, 148, 184, 185, 192, 209, 351, 352, 247

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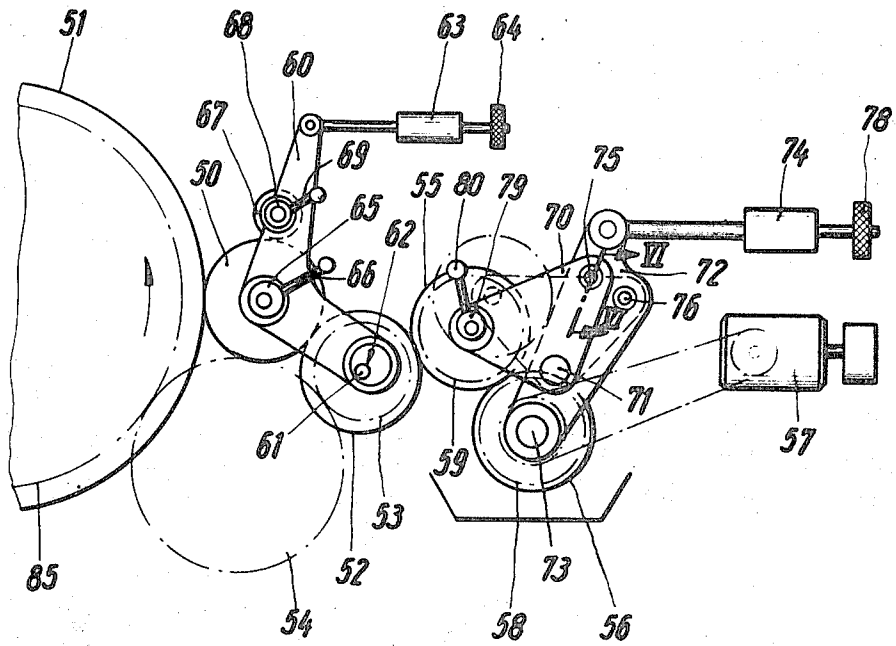
[57] **ABSTRACT**

A damping device for lithographic printing presses comprises a train of four rollers formed by a damping roller to engage the press plate cylinder and a distributing roller which in turn engages an intermediate roller in rolling contact with a fountain roller dipping in a damping solution container. The distributing roller and the fountain roller are both mounted on fixed axes, the other two rollers in the train having their axes on pivoted levers so that they can be brought into and out of engagement with each of the two rollers they respectively engage during operation of the press. The intermediate and damping roller mountings also include provision for adjustment of the inter-axial distance of the rollers. Movement of the rollers between engaged and disengaged positions may be manual or automatic.

8 Claims, 8 Drawing Figures



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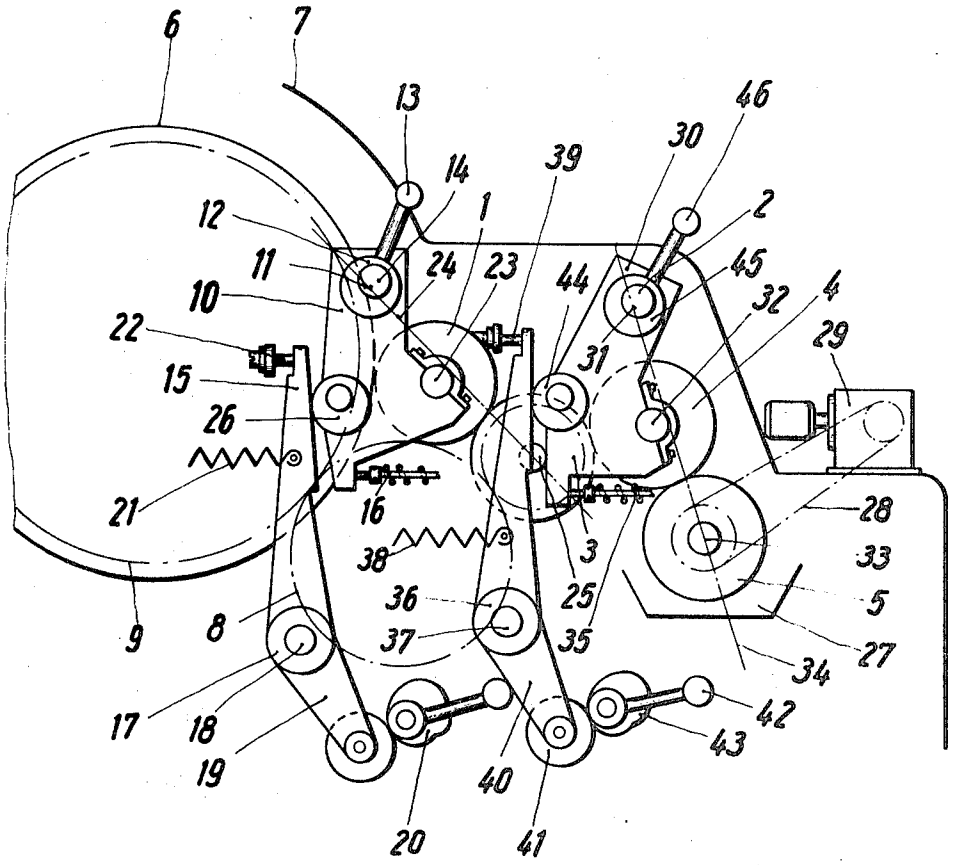

Fig.1

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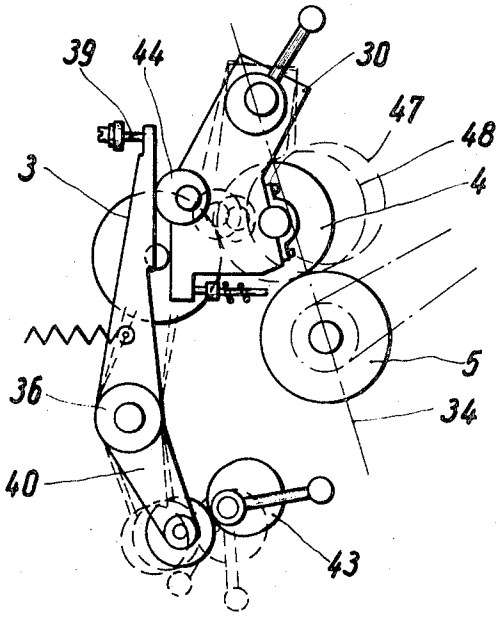

Fig.2

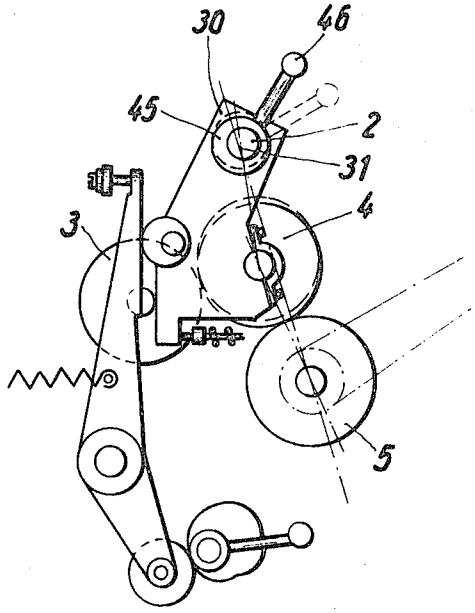

Fig.3

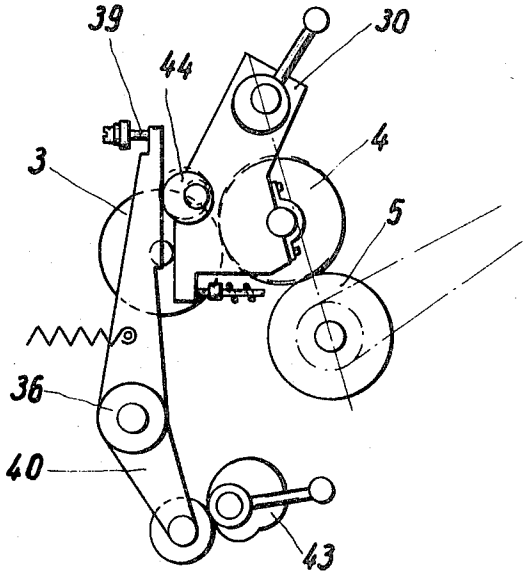

Fig.4

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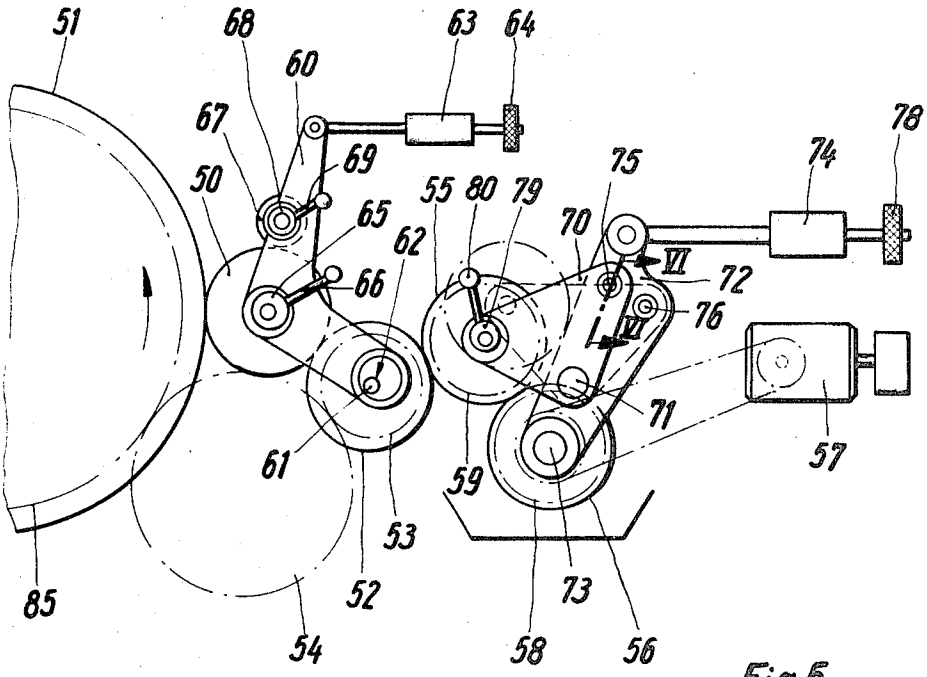

Fig.5

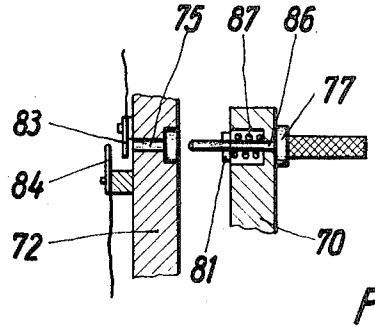

Fig.6

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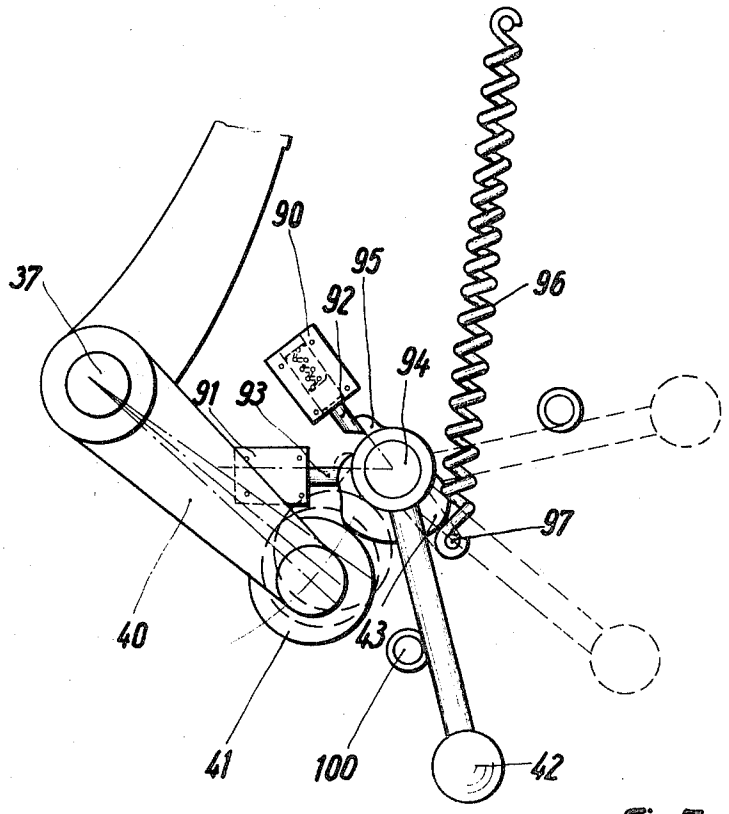

Fig.7

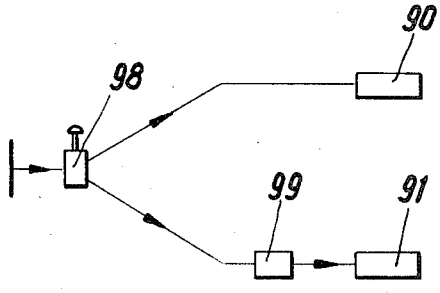

Fig.8

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DAMPING DEVICE FOR LITHOGRAPHIC PRINTING PRESSES

The invention relates to a damping device for lithographic printing presses having at least one distributing roller which runs on the plate cylinder and which is continuously supplied with damping solution by a fountain roller dipping into a damping-solution container and in turn followed by an intermediate roller and a distributing roller, the series-connected rollers being in uninterrupted contact during operation, and the supply of moisture being adjustable by varying the peripheral speed of the fountain roller.

Continuous working damping devices are not always accepted without reserve in practice although the advantages proved in principle are generally recognised. In fact, continuously working damping devices are more sensitive than those working conventionally.

In order to overcome this disadvantage, the rollers of known damping devices are mounted for adjustment in order to be able to set the mutual contact pressures finely. In a damping device according to United States Patent Specification No. 3,283,707, a damping roller, fountain roller and squeeze roller are all mounted for adjustment. The bearing arrangements in each case cannot, however, fulfil the tasks laid down in the invention.

Furthermore, a continuous working damping device is disclosed in United States Patent Specification No. 3,433,155, wherein four rollers are mounted one behind the other. In this damping device, the three rollers preceding the damping roller are displaceable horizontally, together with the drive motor for the variable drive of the fountain roller. In addition, provision is made for the fountain roller to be mounted adjustably in relation to the roller following it and this following roller in turn in relation to the distributing roller mounted next. The means described cannot, however, overcome the disadvantages occurring in continuous working damping devices. In addition, the design is complicated because the fountain-roller drive must likewise be adjustable in position.

It is the object of the present invention to overcome the disadvantages in previously known, continuous working damping devices. At the same time, the device is simpler in design and more reliable in operation. The invention is based on the idea that, in contrast to the fabric-covered, moisture-storing rollers of so-called lifter damping devices, the uncovered rollers of continuous working damping devices obviously have to be machined and adjusted in relation to one another much more accurately. Minor deviations in the roller radius, a slight radial out-of-true or deviations from the axis parallelism obviously have a greater effect. In the design of such damping devices, however, attention has not hitherto been paid to the fact that even manufacture within the closest tolerance ranges is not sufficient if care is not taken to ensure that the rollers retain their external shape during operation. Since relatively hard metal rollers generally co-operate with relatively soft rubber or plastics rollers, there is the risk of the rubber rollers being permanently deformed, particularly, of course, if the machine is at standstill for a long time. The difficulties with plastics rollers are already known, the running and transfer characteristics of which are altered in an unforeseeable manner by ageing. These difficulties are correspondingly increased by unilateral

mechanical stressing. A design must therefore be found wherein the rollers, which are in contact in operation, can be slightly separated from one another when the machine is at a stand-still, and wherein the positively driven rollers are mounted in stationary supports. Furthermore, for reliable operation, care must be taken to ensure that, when the rollers are reengaged, only a roller which has already been moistened ever comes into contact with a roller which is still dry.

In the present invention the intermediate roller can be engaged, disengaged and adjusted in relation to both the fountain roller and also the distributing roller. By this relatively simple means, the fountain roller, the intermediate roller and the distributing roller can be completely separated from one another, and the distributing roller and the fountain roller can be mounted on stationary supports for the easier introduction of a driving torque. Thus it is possible to drive the fountain roller by means of a toothed belt which makes little noise, is free of servicing, has little stretch and in addition is inexpensive.

One embodiment of the invention provides for the damping roller to be able to be engaged, disengaged and adjusted in relation to both the plate cylinder and also of the distributing roller. Thus all the rollers mounted in the damping device can be separated from one another.

In one form of the invention, a device is provided for the gradual engagement of the intermediate roller first with the fountain roller and then with the distributing roller. Thus the operational reliability of the damping device is considerably improved because contact between two drive rollers and hence wear or even "seizing" of rollers is avoided. The gradual engagement may be effected by a construction in which the intermediate roller is mounted in a pivotable lever, the pivotal axis of which is so arranged that a partial pivoting of the lever brings the intermediate roller into contact with the fountain roller wetted with moisture and only further pivoting of the lever engages the now moistened intermediate roller with the distributing roller. It is often sufficient for the sequence of roller engagement to be prescribed while the timing of the sequence is left to the printer. In this case, a stepped cam lever is sufficient for the pivoting of the bearing lever. The position of the cam lever indicates to the printer whether the intermediate roller is engaged and if so where.

Structures in accordance with the invention may include a timing element which determines the difference in time between the intermediate roller being engaged first with the fountain roller and then with the distributing roller. Thus the prerequisites are provided for an automatic course of the engagement operation.

In a further embodiment of the invention, the intermediate roller is mounted in a first lever which is mounted for pivoting on a second lever, this second lever being mounted for pivoting about the axis of rotation of the fountain roller. With this arrangement, "switching through" as with a stepped cam is impossible, because the engagement with the particular roller is effected by pivoting a separate lever in each case. In addition, engagement, disengagement or positional adjustment of the intermediate roller in relation to the distributing roller is possible by pivoting the second lever about the axis of rotation of the fountain roller without the fine adjustment of the intermediate roller in relation to the fountain roller being altered.

In a further embodiment of the invention, two detents are provided which co-operate with the first lever and by means of which the engaged and disengaged position of the intermediate roller is determined in relation to the fountain roller, the fine adjustment between intermediate roller and fountain roller being effected by adjusting eccentric bearing bushes in which the intermediate roller is mounted. When eccentric bearing bushes are used, advantageous transmission ratios may be used for fine adjustment while the engagement and disengagement of the intermediate roller is effected by pivoting a lever between two end positions. By transferring the fine adjustment and the engagement and disengagement to members adapted to be actuated independently of one another, a particularly favourable design is possible for the particular purpose to be fulfilled.

In a development of the invention, a lock is provided which permits actuation of the second lever only when the first lever is in that stop position which corresponds to the engaged position of the intermediate roller in relation to the fountain roller. This ensures that the intermediate roller can only be engaged with the distributing roller when it is also engaged with the fountain roller. The fine adjustment of the intermediate roller in relation to the distributing roller can, however, be effected at any time independently thereof. The lock may be electrical in the form of a microswitch, the actuation of which is a prerequisite for a working cylinder or magnet becoming active, but it may also be mechanical in the form of a locking pawl.

The damping roller is preferably driven positively at the peripheral speed of the plate cylinder and a further distributing roller is provided which can be driven by friction over its circumference is engageable with and disengageable from the damping roller. It is particularly favourable to mount the distributing roller at a point situated after contact with the plate cylinder seen in the direction of rotation of the roller. A distributing roller brought into contact with the damping roller after contact with the printing plate has a satisfactory cleaning effect and its arrangement is necessary particularly with non-absorbent rubber damping rollers. Here, too, however, care must be taken to ensure that the distributing roller does not make any indentations on the damping roller and that it is separated from the damping roller at least during prolonged periods of standstill.

Embodiments of the invention by way of example are illustrated diagrammatically in the accompanying drawings in which:

FIG. 1 shows a side view of a damping device according to the invention;

FIG. 2 shows the diagrammatic illustration of the engagement or disengagement of an intermediate roller in stages in relation to a stationarily mounted fountain roller as shown in FIG. 1;

FIG. 3 shows the diagrammatic illustration of the fine adjustment of the intermediate roller in relation to the fountain roller as shown in FIG. 1;

FIG. 4 shows the diagrammatic illustration of the fine adjustment of the intermediate roller in relation to a distributing roller as shown in FIG. 1;

FIG. 5 shows the side view of a further embodiment of a damping device according to the invention;

FIG. 6 shows a detail on section line VI—VI in FIG. 5;

FIG. 7 shows a device for the automatic engagement of the intermediate roller in stages; and

FIG. 8 shows a flow chart of the automatic system shown in FIG. 7.

The damping device shown in FIG. 1 consists of a damping roller 1, a distributing roller 3, and intermediate roller 4 and a fountain roller 5. The damping roller 1 is in contact with the plate cylinder 6 of a printing press 7 indicated in outline, and the distributing roller 3. It is driven over tis circumference by frictional contact with the distributing roller 3 and the plate cylinder 6. The distributing roller 3 is positively driven, through an intermediate gearwheel 8, by a gearwheel 9 secured to the plate cylinder 6. The damping roller 1 is mounted in bearing levers 10 which are mounted for pivoting about the axis of rotation 11 of adjustable bushes 12 which are drilled eccentrically. The eccentric bushes 12 are mounted on pins 14 secured to the side walls of the machine and are turned by means of hand levers 13. Since both ends of the individual rollers are mounted in the same manner, the description is restricted to one side of the damping device. The pivoting of the bearing lever 10 and hence the adjustment of the damping roller 1 in relation to the plate cylinder 6 is limited by a stop 15 which is urged against the bearing lever 10 by a compression spring 16. The stop 15 is constructed in the form of a two-armed lever 17 which is mounted for rotation about a pin 18. One arm of the lever 17 represents the stop for the bearing lever 10 while the other arm is a roller lever 19 which is in contact with a two-step cam 20. The two-armed lever 17 is urged, by spring force 21, against an adjustable stop 22 and can be turned in clockwise direction by the stepped cam 20, against the spring force 21, for the purpose of disengaging the damping roller 1 from the plate cylinder 6, first stage, and for disengaging the damping roller 1 from the distributing roller 3, second stage. The axis of rotation 23 of the damping roller 1 lies, when the damping roller 1 is engaged with the plate cylinder 6, outside the straight line 24 which intersects the pivotal axis 11 and the axis of rotation 25 of the distributing roller 3 on the side of the line adjacent to the plate cylinder 6, so that disengagement of the damping roller 1 from the distributing roller 3 is only effected after a relatively great angle of pivoting of the bearing lever 10, corresponding to the second step of the stepped cam 20. The fine adjustment of the damping roller 1 in relation to the plate cylinder 6 is effected by turning a cam 26 mounted on the bearing lever 10. The fine adjustment of the damping roller 1 in relation to the distributing roller 3 is effected by turning the eccentric bush 12 by means of the hand lever 13.

The distributing roller 3, which is mounted in stationary supports, is in contact with the intermediate roller 4 to which the damping solution is transferred by contact with the fountain roller 5 dipping into a damping-solution container 27. The fountain roller 5 is likewise mounted stationary and is driven by a variable-speed electric motor 29 through a toothed belt 28. The intermediate roller 4 is mounted for pivoting about an axis 31 in bearing levers 30, in a similar manner to the damping roller 1. The axis of rotation 32 of the intermediate roller 4 engaged with the distributing roller 3 and a fountain roller 5 is likewise outside the straight line 34 intersecting the pivotal axis 31 and the axis of rotation 33 of the fountain roller 5, namely at the side adjacent to the distributing roller 3. The bearing lever 30 is urged, by spring force 35, against a two-armed

stop lever 36. This is mounted for pivoting about a pin 37 and is pulled towards an adjustable stop 39 by a tension spring 38. The other arm of the stop lever 36 is constructed in the form of a roller lever 40, the roller 41 of which is in contact with a two-step cam 43 which can be turned by means of a hand lever 42. It is obvious that a partial pivoting of the bearing lever 30, corresponding to the first step on the cam 43, merely brings the intermediate roller 4 out of contact with the distributing roller 3, and only further pivoting of the bearing lever 30, corresponding to the second step of the cam 43, brings the intermediate roller 4 out of contact with the fountain roller 5. The fine adjustment of the intermediate roller 4 in relation to the distributing roller 3 is effected by turning a cam 44 which is mounted on the bearing lever 30 and which is in contact with the stop lever 36. The fine adjustment of the intermediate roller 4 in relation to the fountain roller 5 is effected by turning a bearing bush 45 which is mounted eccentrically on a pin 2 and on which there is mounted the bearing lever 30, by means of a hand lever 46.

FIG. 2 shows the different positions of the intermediate roller 4 in relation to the distributing roller 3 and the fountain roller 5, which can be reached by pivoting the bearing lever 30 (shown in broken lines). The roller as shown in broken lines 47 is disengaged both from the distributing roller 3 and also from the fountain roller 5. The roller as shown in broken lines 48 is engaged only with the fountain roller 5 and not with the distributing roller 3. FIG. 3 likewise shows, illustrated in broken lines, the fine adjustment of the intermediate roller 4 in relation to the fountain roller 5 by turning the eccentric bush 45. The pivotal axis 31 travels over a circle about the pin 2. FIG. 4 shows, likewise in broken lines, the fine adjustment of the intermediate roller 4 in relation to the distributing roller 3 by turning the cam 44.

A further embodiment of a damping device according to the invention is illustrated in FIG. 5. This damping device likewise contains four rollers mounted one behind the other; a damping roller 50 which is in contact with the plate cylinder 51 and is driven by frictional contact over the circumference of the roller; a distributing roller 52 which is positively driven through gearwheels 53, 54 and 85; an intermediate roller 55 and a fountain roller 56. The fountain roller 56 is driven by an independent, variable-speed electric motor 57. The intermediate roller 55 may appropriately be driven by the fountain roller through a pair of gearwheels 58, 59. The gearwheel ratio may be 1 so that slip occurs between the rollers 52 and 55, but it may also be selected so that slip occurs between the rollers 55 and 56 or between both pairs of rollers 52, 55 and 55, 56. The damping roller 50 is mounted in a lever 60 which is pivotable about an axis 62 situated outside the axis of rotation of the distributing roller 52. The position of the axis 62 is selected so that, on pivoting of the lever 60, as a result of actuation of a pneumatic cylinder 63, the damping roller 50 comes out of contact both with the plate cylinder 51 and also with the distributing roller 52. The fine adjustment of the damping roller 50 in relation to the plate cylinder 51 is effected by adjusting the pneumatic cylinder 63 by means of a micrometer screw 64. The damping roller 50 is mounted in eccentric bushes 65. The fine adjustment of the damping roller 50 in relation to the distributing roller 52 is effected by turning these bushes 65 by means of hand levers 66. Furthermore, a further distributing roller 67 is mounted in the eccentric bushes 68 in the lever 60. By turning the eccentric bushes 68 by means of a hand lever 69, the distributing roller 67 can be engaged with or disengaged from the damping roller 50.

The intermediate roller 55 is mounted in a first lever 70 which is pivotable about a pin 71. The pin 71 is secured in a second lever 72 which is mounted for pivoting about the axis of rotation 73 of the fountain roller 56. The pivoting is effected by actuating a pneumatic cylinder 74. Two bores 75, 76 are provided in the second lever 72 (see also FIG. 6) and co-operate with a pin 77 mounted on the first lever 70 and so determine the two end positions of the pivoting of the lever 70. Thus, as a result of actuating the first lever 70, the intermediate roller 55 is engaged with or disengaged from the fountain roller 56, in the engaged state, independently of its fine adjustment in relation to the rollers 52 and 56. The fine adjustment of the intermediate roller 55 in relation to the distributing roller 52 is effected by adjusting the pneumatic cylinder 74 by means of the micrometer screw 78. The fine adjustment of the intermediate roller 55 in relation to the fountain roller 56 is effected by turning an eccentric bush 79 in which there is mounted the intermediate roller 55. The eccentric bush 79 is turned by means of a hand lever 80 but it may also be turned by means of a toothed-wheel gearing. The pin 77 is displaceable in a bore 86 in the first lever 70 as shown in FIG. 6. The pin 77 is urged into the position shown in FIG. 6 by the force of the compression spring 87 which is wound round the shank of the pin 77 and bears on the one hand against the first lever 70 and on the other hand against a disc 81 secured to the pin. Mounted at the bore 75 of the second lever 72 is a pair of contacts 83, 84 which can be closed by the pin 77. The pneumatic cylinder 74 can only be actuated if the pair of contacts 83, 84 is closed, that is to say if the pin 77 is engaged in the bore 75, that is to say the intermediate roller 55 is engaged with the fountain roller 56.

FIGS. 7 and 8 indicate in diagrammatic form how an engagement operation in steps can be made automatic. Two lifting magnets 90, 91 are provided, of which the armatures constructed in the form of stops 92, 93 project, in the de-energised state, within the pivotal range of a cam 95 which is secured to the shaft 94 and can be turned with this. Likewise secured to this shaft 94 is the two-step cam 43. A tension spring 96 engages on a strap 97 secured to the shaft 94 and causes this to turn in counter clockwise direction. The turning is prevented by a first stop 92 as shown in FIG. 7. On actuation of a circuit element 98 as shown in FIG. 8, the first magnet 90 attracts and permits turning of the shaft 94 until the cam 95 comes into abutment with the second stop 93. At the same time, as shown in FIG. 8, a timing element 99 is controlled which, after an adjustable interval of time, controls the second magnet 91, whereupon a further turning of the shaft 94 is effected until the hand lever 42 comes into abutment against an end stop 100.

What is claimed is:

1. A dampening device for a printing press including a rotary plate cylinder, said device comprising in combination: a train of rolls sequentially including a dampening roll, a distributing roll, a moistening fluid transmitting intermediate roll and a fountain roll, said rolls being movable into and out of fluid transmitting and

driving engagement with each other, said dampening roll being further movable into and out of fluid transmitting engagement with the plate cylinder, the distributing roll and the fountain roll being rotatable about stationary axes and the dampening roll and the intermediate roll being rotatable about pivotally displaceable axes; drive means for positively driving the dampening roll and variable speed drive means for positively driving the fountain roll; first setting means for moving the dampening roll into and out of engagement with the plate cylinder and the distributing roll, said setting means including a pivotal member mounting the dampening roll and actuating means coacting with said pivotal member for successively pivoting the same through a first distance for gradually engaging and reengaging, respectively, the dampening roll and the plate cylinder and subsequently through a second distance for gradually engaging and reengaging, respectively, the dampening roll and the distributing roll also; and second setting means for moving the intermediate roll into and out of engagement with the distributing roll and the fountain roll, said second setting means including a pivotal member mounting the dampening roll and actuating means coacting with said pivotal member for successively pivoting the same through a first distance for gradually engaging and disengaging, respectively, the fountain roll and the intermediate roll and subsequently through a second distance for gradually engaging and disengaging, respectively, the intermediate roll and the distributing roll also.

2. The dampening device according to claim 1 and comprising first fine adjustment means coacting with the pivotal member of the first setting means for selectively varying the engagement pressure between the plate cylinder and the dampening roll when the latter is set for engagement with the plate cylinder, and second fine adjustment means coacting with the pivotal member of the second setting means for selectively varying the engagement pressure between the fountain roll and the intermediate roll when the latter is set for engagement with the fountain roll.

3. The dampening device according to claim 1 and comprising delay means for controlling the time differential between moving the intermediate roll into engagement with the fountain roll and then with the distributing roll, said delay means including a first and a second stop supported by the pivotal member of the second setting means for turning in unison with said member, the first stop controlling turning of the pivotal member into the angular position for moving the intermediate roll into engagement with the fountain roll and the second stop controlling further turning of the pivotal member into the angular position for moving the intermediate roll into engagement with the distributing roll also, first solenoid means coacting with said first stop and second solenoid means coacting with said second stop, circuit means connected in circuit with said solenoid means, and a timing means included in said circuit means, energization of said circuit means activating the first solenoid means for releasing the first stop and also activating the timing means, said timing means activating the second solenoid means for release of the second stop after a predetermined delay time.

4. The dampening device according to claim 1 wherein the pivotal member of the second setting means comprises a first lever mounting the intermediate roll, and a second lever pivotally mounts said first lever, said second lever being pivotal about the rotational axis of the fountain roll.

5. The dampening device according to claim 4 wherein two detents in the second lever are engageable by means on the first lever forming stops whereby the engaged and disengaged position of the intermediate roll is determined in relation to the fountain roll, and wherein a fine adjustment between intermediate roll and fountain roll is effected by adjusting eccentric bearing bushes in which the intermediate roll is mounted.

6. The dampening device according to claim 5 and comprising a lock which permits actuation of the second lever only in the stop position of the first lever which corresponds to the engaged position of the intermediate roll in relation to the fountain roll.

7. The dampening device according to claim 1 wherein the actuating member of each of said setting means comprises a rotatable stepped cam member in engagement with the respective one of said pivotal members, turning means for rotating said cam member step-by-step, turning of the cam member through one step pivoting the respective pivotal member through said first distance and turning of the cam member through a second step pivoting the respective pivotal member through said second distance.

8. The dampening device according to claim 7 wherein each of said pivotal members comprises a two-arm lever, one arm of the levers forming a follower for the respective cam member and the other arm of the levers coacting with the dampening roll and the intermediate roll, respectively, for causing movements thereof into and out of engagement with the respective rolls as aforesaid.

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