# United States Patent [19]

**Fugman et al.**

[11] **3,769,909**

[45] **Nov. 6, 1973**


[54] **WET NIP DAMPENER**


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[73] Assignee: **Rockwell International, Corporation**, Pittsburgh, Pa.



[22] Filed: **Mar. 10, 1971**

[21] Appl. No.: **122,965**

[52] **U.S. Cl.** ..... **101/148**, 101/363

[51] **Int. Cl.** ..... **B411 25/00**, B41f 1/46

[58] **Field of Search** ..... 101/147, 148, 350, 101/363



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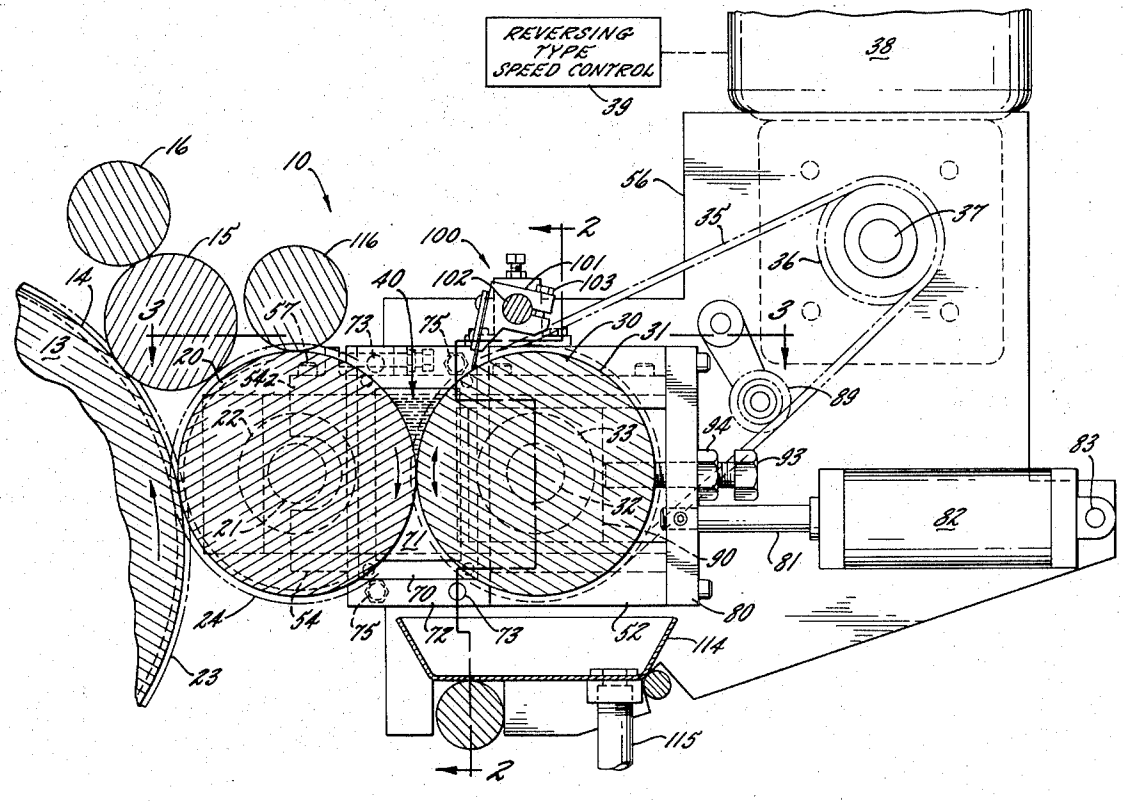
[57] **ABSTRACT**

A dampening arrangement for a lithograph press which includes a fountain roller and a resilient water form roller arranged side by side with dams bridging the ends thereof to form a reservoir of water along the nip between the rollers. The form roller is rotated at press speed and in such direction that a continuously reformed, uniform film of water is transferred directly from the nip to the surface of the printing plate. Means are provided for varying the pressure between the rollers and for controlling the direction and speed of rotation of the fountain roller to control the thickness of the film. The rollers are mounted on a subframe which is supported on horizontal ways, with an actuator for pressing the subframe against stops which are adjustable to control the "squeeze" of the form roller against the printing plate. A scraper blade is provided on the fountain roller above the nip to retain the water in the reservoir and prevent it from traveling around to the lower side of the nip when the fountain roller is rotated in the same direction as the form roller. In the preferred form of the invention the water form roller engages the plate just ahead of the ink form roller. An auxiliary, self-oscillating roller preferably engages the presented top surface of the form roller to smooth out the casual film of ink picked up by the water form roller.


**1 Claim, 6 Drawing Figures**



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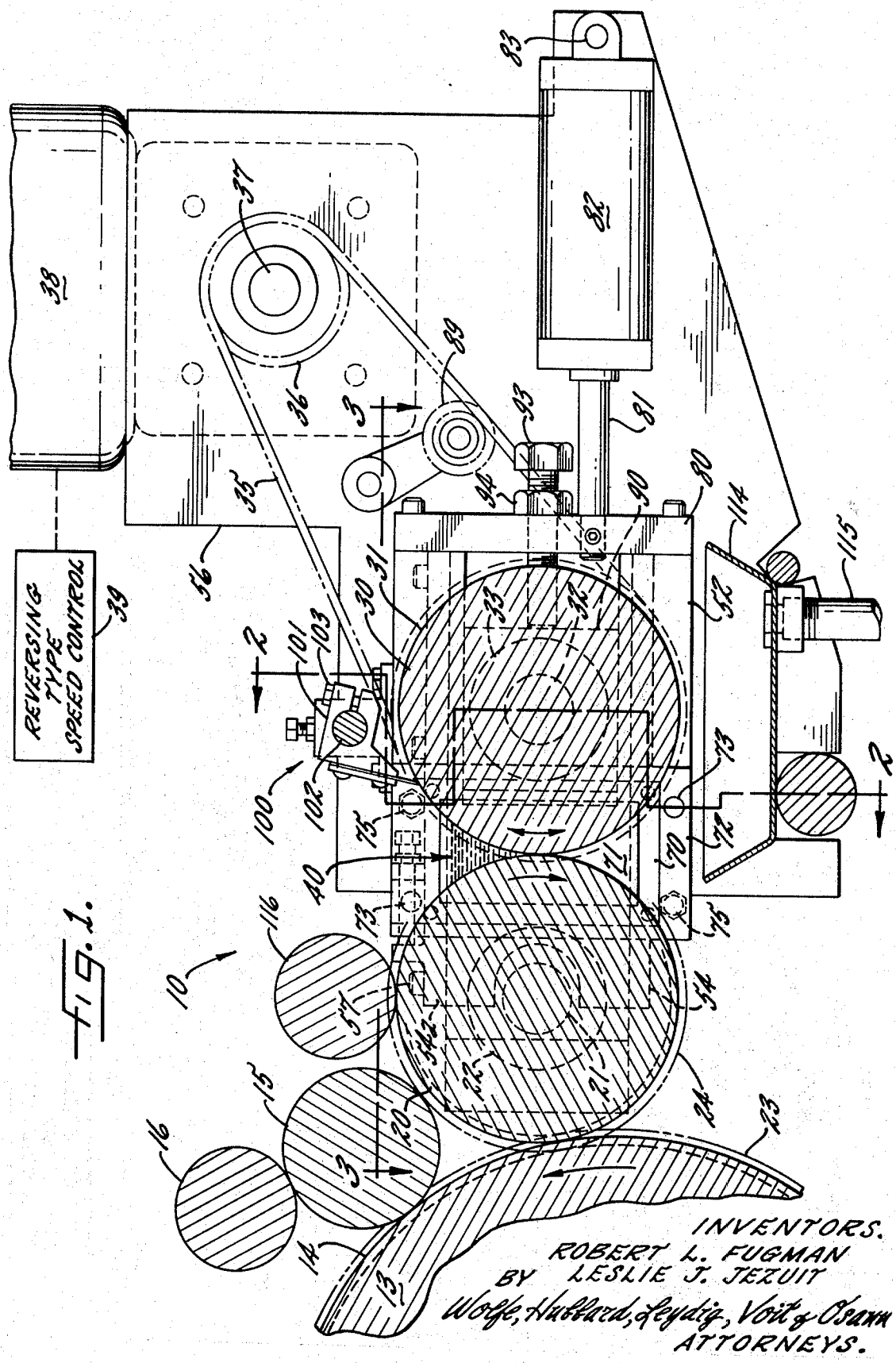


FIG. 1.

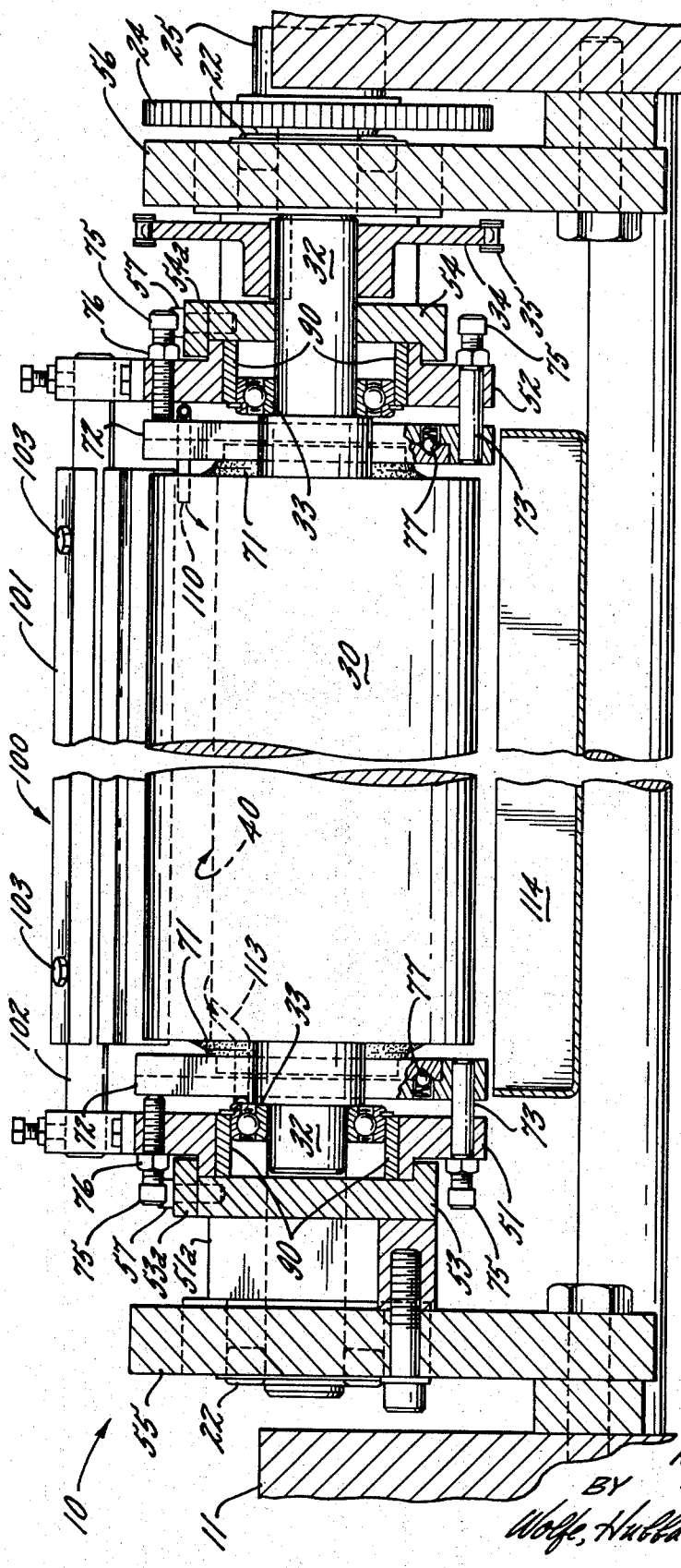


FIG. 2.

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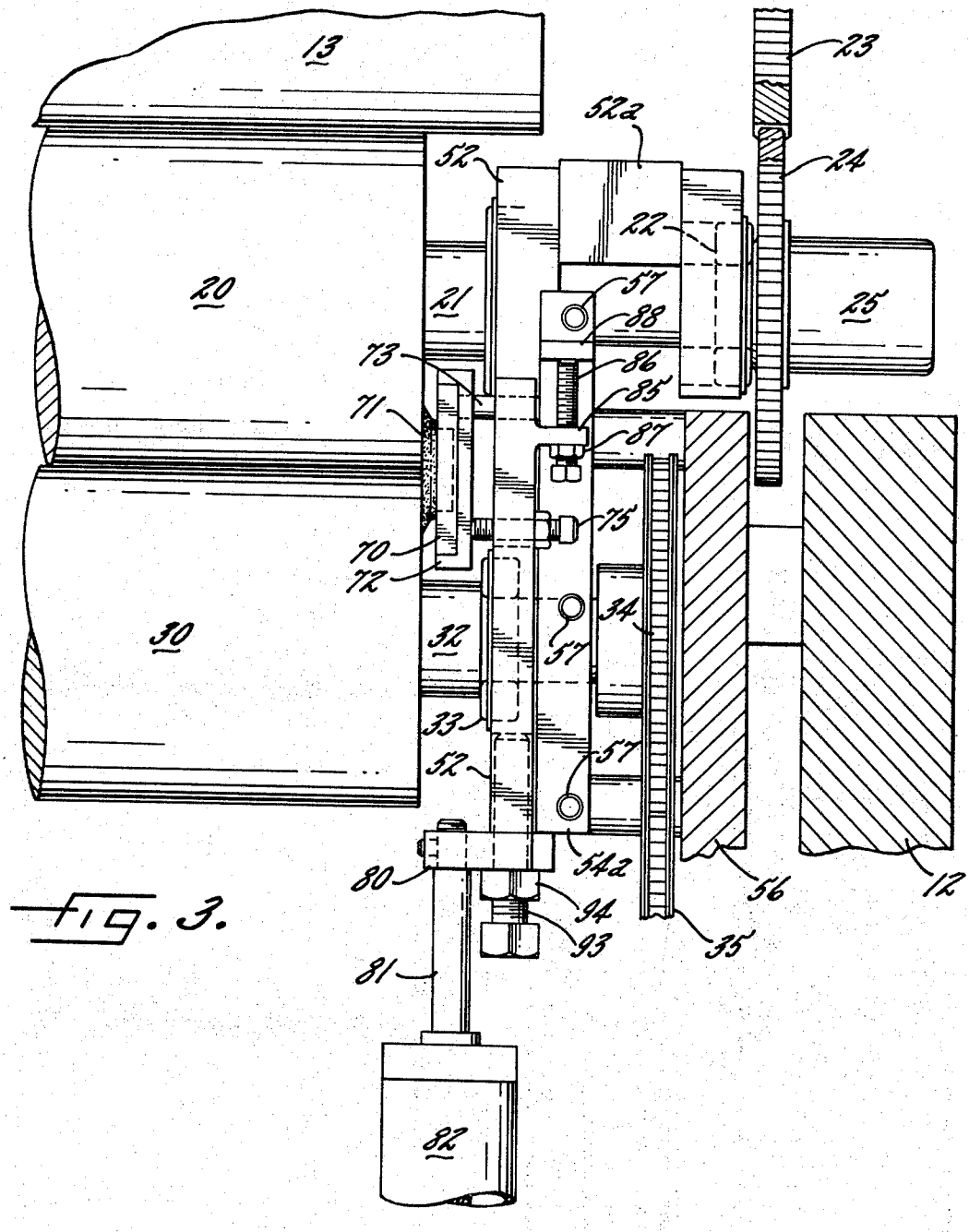


FIG. 3.

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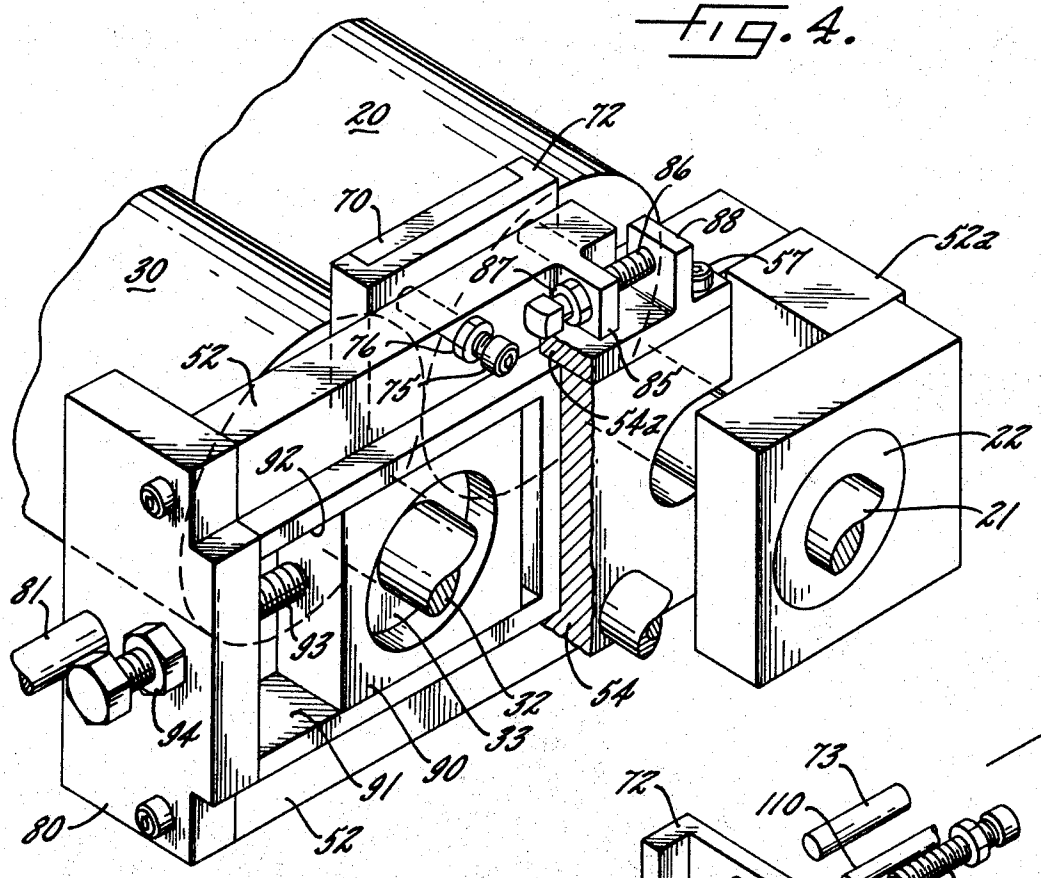
Fig. 4.



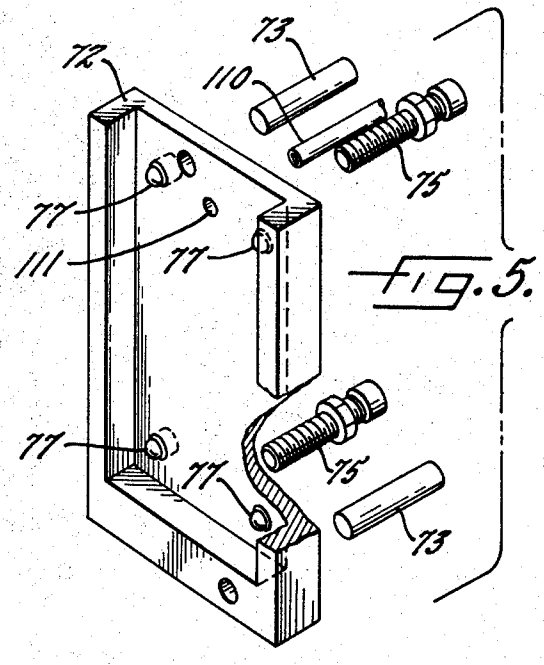




Fig. 5.

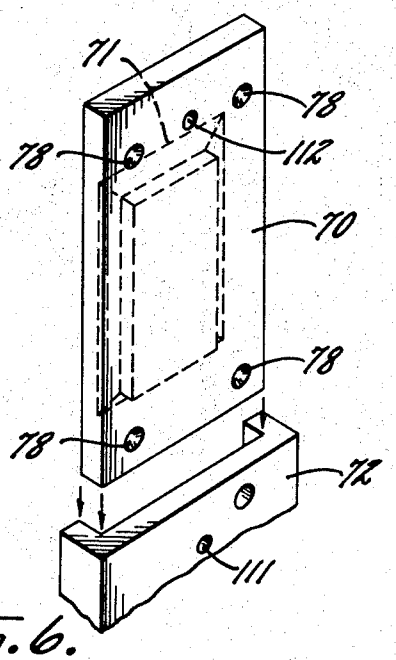



Fig. 6.

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# WET NIP DAMPENER

Continuous duty type dampeners currently in use on lithographic printing presses are an improvement over conventional ductor type dampeners and they have received wide acceptance. It is generally conceded that the precise control and quick response of these dampeners has greatly simplified the initial setting and subsequent maintenance of a proper ink-water balance.

Notwithstanding their acknowledged advantages, the continuous duty type dampeners presently in use all have one inherent shortcoming in that they tend to produce "gap streaks." This is a condition or result caused by the gap formed in the periphery of the plate cylinders and which must be provided to accommodate the plate clamping devices. The problem is most acute in sheet fed presses wherein the gaps occupy about one fifth to one quarter of the cylinder circumference.

During operation, the dampeners supply a constant film of water to the form dampening roller which, in turn, transfers the water at the same rate to the printing plate as it rolls over the surface thereof. When the form roller passes over the gap, however, no water is removed from its surface although it continues to receive a fresh supply from the reservoir. This results in a temporary flooding of the form roller until it reengages the plate and as a result an excess of water is transferred to the leading portion of the plate during each cycle of operation. This, in turn, produces a readily discernible "gap streak" in the printed product, the width of which substantially coincides with the circumference of the form roller. The elimination of this condition is therefore highly desirable.

It is an object of the present invention to provide a dampening arrangement for lithograph presses which is extremely simple yet highly effective and which feeds a film of water of precisely constant byt controllable thickness into engagement with the surface of the printing plate.

It is a related object to provide a dampening arrangement which is capable of supplying a continuous, uniform film of water to the surface of the form roller as it approaches the nip between the form roller and the printing plate and which film is not affected by water which may remain upon the surface of the form roller after it leaves the printing plate.

More specifically it is an object to provide a dampening arrangement which consists of a minimum number of components, which is economical and highly compact, being formed simply of a resilient form roller and a hard surfaced fountain roller arranged side by side with a body of water dammed in the nip between them with independent means for adjusting the pressure between the two rollers and the pressure exerted by the form roller against the plate on the plate cylinder. It is a related object to provide a dampening arrangement which is mounted for retraction from the plate cylinder when feeding of water is not required, and which may be returned to a preestablished setting relative to the plate on the plate cylinder automatically without special attention by the operator.

It is another object of the present invention to provide a dampening arrangement which permits wide variation in water feed rate and which has provision for rotating the fountain foller in either the forward or reverse direction. It is also an object to provide a novel dam construction for prevention of leakage at the ends of the rollers.



Other objects and advantages of the invention will become apparent upon reading the attached detailed description and upon reference to the drawings in which:

FIG. 1 is a section taken transversely through the rollers of the invention structure.

FIG. 2 is a vertical section taken along line 2—2 in FIG. 1.

FIG. 3 is a fragmentary top view looking along the line 3—3 in FIG. 1.

FIG. 4 is a fragmentary perspective view showing one of the side frame members fitted into ways provided in the press frame and showing the means for bringing about roller-to-roller pressure adjustment.

FIG. 5 is a perspective view of the receptacle for the dam-supporting plate.

FIG. 6 is a perspective view of the dam-supporting plate and showing the manner in which it is received in the receptacle.

While the invention has been described in connection with a certain preferred embodiment, it will be understood that we do not intend to limit the invention to the particular embodiment shown but intend, on the contrary, to cover the various alternative and equivalent constructions incuded within the spirit and scope of the appended claims.

Turning now to the drawings, there is disclosed a portion of a lithograph press **10** having end frames **11** and **12** in which is journaled a conventional plate cylinder **13** mounting a lithographic printing plate **14** in the manner disclosed in U.S. Pat. No. 2,635,539 assigned to the assignee of this application. It will be understood that the press includes the usual blanket cylinder and impression cylinder which do not, however, form a part of the present invention. Ink is applied to the surface of the plate by means of a resiliently surfaced ink form roller **15** to which a film of ink is furnished by a suitable ink fountain via a set of transfer rollers, only the terminal one **16** of which is shown.

In accordance with the present invention a resiliently surfaced water form roller is provided for rolling engagement, at press speed, with the surface of the plate on the plate cylinder together with a smooth, hard surfaced fountain roller which is driven independently by variable speed drive means. The two rollers are pressed into engagement to form a nip which is dammed at its ends to form a V-shaped reservoir of water, with the form roller being rotated in such direction that, upon leaving the plate cylinder, the surface thereof passes into the water nip. Means are also provided for adjusting the pressure between the two rollers and between the form roller and the plate cylinder.

In the exemplary embodiment shown on the drawings the form roller indicated at **20** is resiliently surfaced with synthetic rubber or the like and mounted upon a shaft **21**, the ends of which are journaled in bearings **22** (see FIG. 3). For the purpose of driving the form roller at press speed, a gear **23** on the plate cylinder meshes with the form roller gear **24**. Interposed between the form roller gear and the shaft **21** is a friction type one-way clutch **25**. The frictional nature of the clutch enables the form roller to rotate at precisely the same surface speed as the plate on the plate cylinder by reason of the friction between the form roller and the plate cylinder, which form roller speed may depart slightly from the theoretical speed resulting from the drive ratio of the gears, with the difference being accommo-

dated by slight slippage at the clutch. The clutch **25** is of the one-way type so that the form roller is driven only when the plate cylinder is rotated in the forward direction, clockwise as viewed in FIG. **1.** When the plate cylinder is rotated in the opposite direction for wash-up or make-ready, with the form roller retracted from the plate cylinder, the form roller remains stationary notwithstanding the fact that the gears **23, 24** remain in mesh. One-way clutches with frictional engagement in the "drive" direction are well known to those skilled in the art.

Arranged horizontally alongside the form roller, and in slipping engagement with it, is a smooth, hard-surfaced fountain roller **30.** The fountain roller is preferably surfaced with a smoothly polished layer **31** of chromium, although other relatively hard materials may be used if desired. This roller has a shaft **32** journaled in bearings **33** at each end. Keyed to one end of the shaft is a sprocket **34** about which is trained a drive chain **35** which is driven by a drive sprocket **36** mounted upon a shaft **37.** The shaft **37** is driven by a reversible gear motor **38,** the speed of which is adjustable by means of a reversing type speed control **39.**

The two rollers **20, 30** together form a nip which contains a body or reservoir of water **40.** The term "water" will be employed throughout in a generic sense to denote any liquid which is sufficiently grease-repellent as to perform the traditional role of wetting the non-printing areas of the plate. The water is, however, preferably modified by addition of alcohol or similar wetting agent so that the water tends to form in a continuous and evenly distributed film superimposed upon the casual film of ink which tends to form on the surface of the form roller **20** during operation of the press.

Further in accordance with the invention the water form roller **20** and fountain roller **30** are mounted upon a horizontally slidable subframe made up of side members which are supported in ways formed in brackets on the press frame, and dams are provided in the form of resiliently surfaced plates at the respective ends of the rollers which are dimensioned to span the nip to define a water nip reservoir, the plates being spaced inwardly from the subframe side members and in biased sealing engagement with the ends of the rollers. Thus, positioned at the ends of the rollers, and supporting the same, are a pair of subframe side members **51, 52** (see especially FIG. **2**) which extend horizontally in the direction of the plate cylinder. To enable bodily movement of the rollers toward and away from the plate cylinder, the subframe members **51, 52** are slidably received in way members **53, 54** which are respectively mounted upon brackets **55, 56,** respectively secured to the press side frames **11, 12.** To maintain the subframe side members captive, the way members **53, 54** have cap strips **53***a*, **54***a*, respectively, which are secured in place by suitable screws **57.**

For the purpose of supporting the bearings **22** at the ends of the form roller shaft **21,** the subframe members **51, 52** are each provided with an outboard bracket, the brackets being indicated at **51***a*, **52***a* (see **52***a* in FIG. **3**). Such brakets are preferably formed by a weldment.

Turning attention to the dams at each end of the water nip, each of the dams includes a rectangular plate **70,** spaced inwardly from its associated subframe member and having a flat body or pad of resilient sealing material **71** which is sufficiently large as to seal the nip, as shown in FIG. **1,** to a substantial depth. The dam plates **70** are fitted in receptacles **72** (see especially FIGS. **5** and **6**) in vertical sliding engagement. For the purpose of mounting the receptacles **72** a pair of guide pins **73** engage each of the receptacles at diagonally opposite points, the pins **73** having a press fit with respect to the respective subframe side members **51, 52** and a sliding fit with respect to the receptacles so that the latter may be moved inwardly toward the presented ends of the rollers to effect a liquid seal. For the purpose of pressing the receptacles **72,** and hence the dam plates **70,** inwardly, screws **75** having lock nuts **76** are screwed into the members **51, 52** at the remaining diagonal points of the receptacles. The screws are screwed inwardly until the requisite sealing force is achieved, following which the adjustment is maintained by tightening the lock nuts **76.** If any additional sealing pressure is required from time to time the lock nuts **76** may be loosened and the screws **75** turned inwardly a small amount following which the screws are again locked in place.

The pads **71** may be made of any suitable wear-resisting, resilient material capable of being water lubricated, for example, felt.

To maintain the dam plates **70** seated in working position in receptacles **72** while enabling withdrawal for servicing, ball detents **77** are used, with the balls being spring pressed into recesses **78** (again refer to FIGS. **5** and **6**).

For the purpose of biasing the subframe members **51, 52** in the direction of the plate cylinder while limiting the force between the form roller and the plate to that corresponding to a predetermined flat or "squeeze" on the form roller, each of the members **51, 52** is provided with a fluid actuator and an adjustable bottoming stop with respect to the supporting way members **53, 54** which in turn are supported, by brackets **55, 56,** to the press frame members. Thus, taking the subframe member **52** by way of example, and which is shown in FIG. **4,** the member **52** has an end plate **80** to which is secured the shaft **81** of a fluid actuator **82,** the actuator being pinned to the press frame at **83.** It will be understood that the side member **51** has a similar end plate **80** and a similar actuator although not shown in the drawings. For limiting the forward movement of the subframe side member **52,** the member **52** is formed with a tab **85** into which is threaded a bottoming screw **86** having a locking nut **87.** Arranged in the path of the screw is an upwardly extending tab or projection **88** which is formed integrally with the cap member **54***a* on the way member **54.** A similar bottoming adjustment is provided, in mirror image, at the other end of the rollers although not illustrated in these drawings.

It is one of the features of the invention in its preferred embodiment that the end plate **80** does not extend bridgingly between the side members **51, 52** which together form the subframe. Thus, the side members are independently movable and the bottoming screws **86** are independently adjustable so as to provide the desired and constant width of flat along the entire length of the resilient form roller. During operation of the press fluid pressure is constantly applied in both of the fluid actuators **82** so that both of the subframe side members **51, 52** are constantly urged into a solidly bottomed position. When simultaneous retraction is necessary the pressure condition in the actuators is reversed. When forward pressure is again applied, the side fra-

mesmove forwardly until the respective screws **86** bottom for precise restoration of the flat.

The gear motor **38** is preferably mounted on the bracket **56** which is secured to the press side from **12.** In order to accomodate the slack which may exist in the drive chain **35** as the side members **51, 52** are retracted from the plate cylinder, the chain **35** is engaged by a spring pressed idler **89** which is pivoted and swingable with respect to the press frame.

Means are additionally provided for independently adjusting the pressure which is exerted by the fountain roller **30** against the form roller **20.** To this end, the bearings **33** which journal the fountain roller shaft **32** are mounted in rectangular bearing blocks **90** which are movable in respective openings in the side members **51, 52** defined by horizontal way surfaces **91, 92** which extend parallel to one another (FIG. **4**). For the purpose of positioning the bearing blocks **90,** each is engaged by its own adjusting screw **93** threadedly received in the associated end plate **80** and provided with a lock nut **94.** The movable bearing blocks, by their limited translatory movement, thus provide a means for independently adjusting the pressure exerted by the fountain roller, in a horizontal direction, against the form roller. As previously noted, the form roller is fixedly journaled with respect to the side members **51, 52.** Consequently, turning of the adjusting screws **93** does not in any way affect the position of the side members **51, 52** with respect to the press frame members. The relative movement of the fountain roller **30** which does occur when the screws **92** are rotated is readily accommodated by the resilient dams.

It is one of the features of the construction that the fountain roller **30** may be rotated at variable speeds, either clockwise, as viewed in FIG. **1,** with the surface rotating in a direction away from the nip, or counterclockwise, with the surface rotating toward the nip. Under normal conditions the fountain roller is rotated in clockwise direction and by varying the speed thereof, the film of water remaining on the surface of the form roller as it leaves the nip can be varied from substantially nil to the maximum amount that would be required under normal printing conditions. Should it be necessary under specific conditions to feed a greater amount of water, the fountain roller can be rotated in counterclockwise direction. By varying the speed of the roller, a controlled, substantially thicker film of water can be transferred. When the fountain roller is rotated in clockwise direction there is a tendency for water to be carried around the periphery of the fountain roller to accumulate below the nip from which the water could be fed erratically and in profusion along the form roller surface. To prevent this "carry around" of water, a scraper blade is provided in running engagement with the presented upper surface of the fountain roller. Such blade, indicated at **100,** (see FIG. **1**) is mounted in a longitudinally extending blade holder **101** which is clamped to a longitudinally extending blade support bar **102** of circular cross section. A series of clamping screws **103** are provided for holding the blade supporting member **101** in a desired angled position corresponding to a desired pressure between the blade and the surface of the fountain roller when the latter is in its working condition. In the present construction the longitudinally extending supporting bar **102** is secured to the subframe members **51, 52.** Thus when the subframe members **51, 52** are retracted by applying reverse pressure within the actuators **82** causing bodily withdrawal of the members **51, 52** and the rollers **20, 30** mounted thereon, the scraper blade **100** moves in unison therewith to maintain its setting relative to the fountain roller. Continued engagement of the scraper blade with the fountain roller is essential to prevent water from being carried around to the lower side of the nip when the dampener is retracted because the drive gears remain engaged and the rollers continue to rotate.

Means are provided for constantly replenishing the water in the nip and for maintaining it at a constant level. Thus as shown in FIGS. **2** and **5,** a small diameter fill pipe **110** connected to a suitable source of water at low pressure penetrates one of the dam plates at openings **111, 112,** whereas an overflow connection **113** penetrates the dam plate at the opposite end. Flow through the inlet **110** is continuous and the level is maintained constant at a suitable depth level established by the overflow. The connections **110, 113** may, if desired, be brought ofer the tops of the dam plates, so as to avoid any need for penetrating them provided that a small amount of suction is provided at the overflow connection **113.** Any casual excess of water tends to drip into the pan **114** which is located directly under the fountain roller and which has a drain connection **115.** Experience shows that even though the water form roller **20** is intended to be water-receptive, being surfaced with resilient rubber or the like, it will, nevertheless, pick up casual ink from the plate **23,** particularly during extended press runs. It is found that this ink film does not prevent the formation of a uniform film of water on the form roller **20,** particuarly if the water includes a wetting agent or the like and provided that the ink film is maintained smoothly continuous. Consequently, in carrying out the invention, a self-oscillating roller **116** is provided which engages the upper surface of the water form roller. Thus any irregularities in the distribution of the ink which is casually accumulated by the form roller will tend to be evened out so that the presence of the ink on the form roller **20** in no way prevents the feeding of a uniform film of water. Indeed, the ink tends to serve as a lubricant to facilitate slippage at the engaged surfaces of the rollers **20, 30** which, as stated, rotate at different speeds.

From the foregoing description it will be evident that when operated, the dampener assembly is located relative to the plate cylinder so that the desired "squeeze" or flat is obtained at the nip between the form roller **20** and the plate cylinder **13** with the dampener in the operative position, accomplished by adjusting the screws **86.** Thereafter, the fountain roller **30** is adjusted relative to the form roller by means of the screws **93** until the desired pressure is obtained. The squeeze or flat should be enough to insure contact between the two rollers along their entire length such that water in the nip will not leak through, but it should not be so great as to apply an excessive torque load on the driving mechanism.

Once the reservoir is filled with water and the press is started, the form roller will rotate in clockwise direction through the reservoir to the nip with the fountain roller and thence directly to the plate cylinder. The fountain roller will be rotated in clockwise direction and will serve to meter the film of water remaining on the form roller as it passes the nip. The fountain roller tends to wipe the water off the form roller and its effect

is dependent upon the speed at which it is rotated. When the fountain roller is rotated at a very slow speed, a relatively thick film of water will be transferred ans as the speed of the fountain roller is increased, its wiping effect will be increased until substantially no water is permitted to pass. Accordingly, a very precise and uniform film of water can be metered onto the surface of the form roller which can readily be controlled to establish a desired ink-water balance.

It will also be evident that upon leaving the plate cylinder, the surface of the form roller returns directly to the reservoir. Thus any water remaining on the form roller, as when it passes over the gap in the plate cylinder, will be returned to reservoir and a fresh, uniform accurately metered film of water will be continuously reapplied to the form roller as it passes through the nip with the fountain roller.

Since there is nothing contacting the surface of the form roller between the fountain roller and the plate cylinder, the metered film of water will remain undisturbed and will be transferred directly to the plate in precisely the amount required thereby avoiding any local flooding which would produce gap streaks.

The term "scraper blade" used in the following claims refers to any blade or equivalent longitudinally extending element which bears against the fountain roller for the purpose of preventing water from being carried, on the surface of the fountain roller, to the lower side of the nip. The term "guide ways" refers to any surfaces or members which serve to guide the subframe along a predetermined path of movement.

We claim as our invention:

1. In a printing press having a structural frame, in combination:

a plate cylinder mounted in the frame for rotation about the cylinder longitudinal axis, and having a cylindrical surface and a longitudinal recess in said cylinder cylindrical surface for receiving the attachment ends of a lithographic printing plate;

a lithographic printing plate supported by said cylinder cylindrical surface, having a plate cylindrical surface conprised of ink-receptive, printing surface areas in combination with dampening fluid-receptive, non-printing surface areas co-planar to said printing surface areas and rotated at a selected printing surface speed, and having attachment ends spaced apart by a gap width and secured to said plate cylinder at said plate cylinder longitudinal recess;

a plurality of elongated ink roller members having cylindrical surfaces engaging said lithographic printing plate cylindrical surface at circumferentially spaced-apart positions relative to said plate cylinder, and applying ink to said printing plate printing surface areas from ink films extending substantially throughout the lengths of said ink roller member cylindrical surfaces;

a resiliently-surfaced dampening fluid roller member rotated in non-contacting relation to said ink roller members, having a cylindrical surface of different diameter than said plate cylindrical surface, and applying a film of dampening fluid to said lithographic printing plate non-printing surface areas in each revolution of said plate cylinder during printing and in advance of the application of films of ink to said printing plate printing surface areas by said ink roller members;

first drive means rotating said dampening fluid roller member in non-slipping, contacting relation to said lithographic printing plate cylindrical surface:

a non-resiliently surfaced fountain roller member positioned generally horizontally with respect to said dampening fluid roller member, and having a cylindrical surface engaging said dampening fluid roller member cylindrical surface in slipping relation;

a body of dampening fluid defined in lateral extent by said dampening fluid roller member cylindrical surface and by said fountain roller member cylindrical surface adjacent their zone of initial engagement;

second drive means rotating said fountain roller member relative to said dampening fluid roller member in a manner whereby said fountain roller member cylindrical surface has a speed in an opposite direction relative to said engaged dampening fluid roller member cylindrical surface substantially greater than said lithographic printing plate selected printing surface speed; and

blade means engaging said fountain roller member cylindrical surface in scraping relation throughout its longitudinal extent exteriorly of said body of dampening fluid,

said dampening fluid roller member cylindrical surface, at zones registered with said printing plate attachemnt ends gap width, being rotated through said body of dampening fluid and afterwards engaged with circumferential portions of said fountain foller member cylindrical surface scraped by said blade means to meter dampening fluid applied to said lithographic printing plate cylincrical non-printing surface areas to a submicron film thickness.

* * * * *