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WATER DAMPENING SYSTEM WITH SOFT DRIVEN WHEELS AND HARD DRIVE WHEELS

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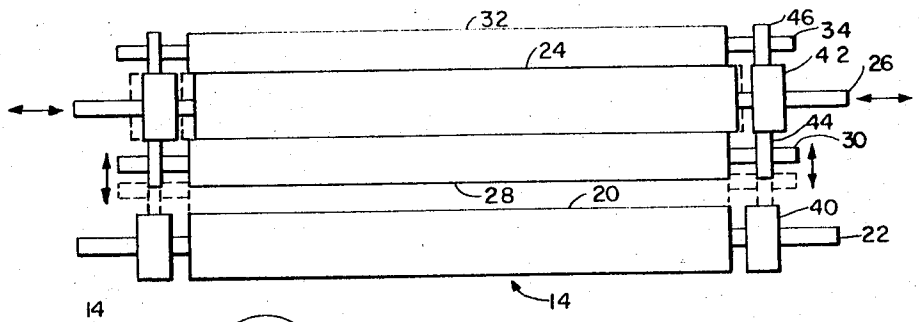


FIG. 2.

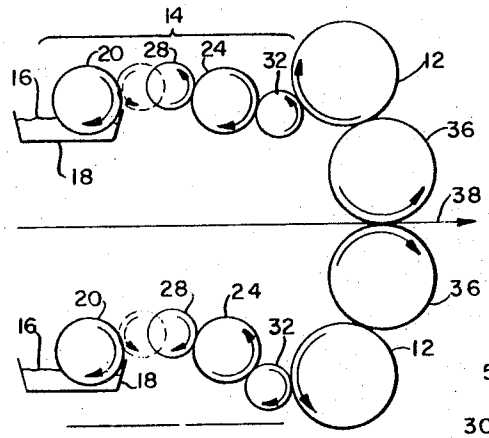


FIG. 3.

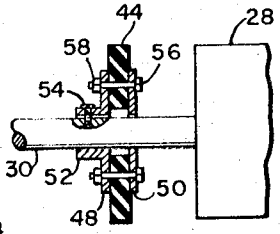


FIG. 5.

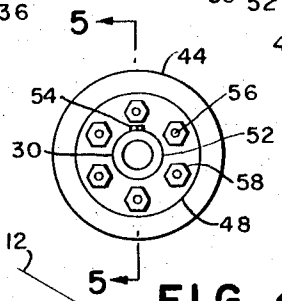


FIG. 4.

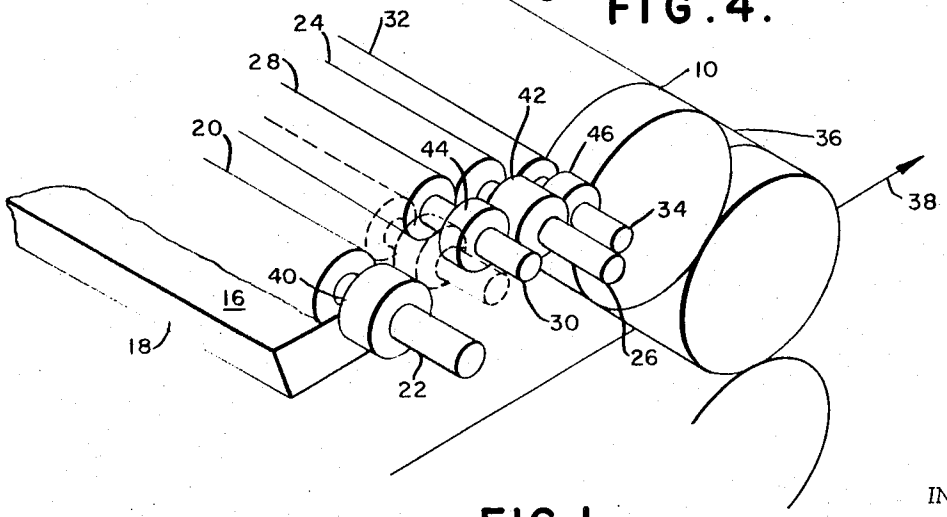


FIG. 1.

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WATER DAMPENING SYSTEM WITH SOFT DRIVEN WHEELS AND HARD DRIVE WHEELS

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ABSTRACT OF THE DISCLOSURE

Improved water dampening system for lithographic offset printing presses capable of improved water-ink balance regulation.

This invention relates generally to the art of lithography and more particularly to a water dampening system for a lithographic printing press which finds particular utility when applied to a lithographic printing press of the offset type.

Lithography is the process of printing from a plain surface such as a metal plate on which the image to be printed has been rendered ink-receptive and the blank areas have been rendered ink impellant as by applying a water layer thereto. In offset lithography, an inked impression is first made on a rubber blanket cylinder and then the ink impression on the blanket cylinder is transferred to the paper or other material upon which the final image is to be printed. In each of these lithographic processes, it is necessary that the printing plate be dampened with water or other ink-repellant fluid to render the non image areas thereof ink repellant. In a modern offset printing press, the ink impression is produced on the blanket cylinder by a lithographic printing plate having raised image forming areas and relieved blank areas, the raised image forming areas being ink-receptive and the relieved blank areas being treated with an ink repellant fluid such as water or a water-alcohol mixture to render such blank areas ink-repellant.

The dampening system for a modern high speed lithographic printing press must provide water or other repellant fluid in such a manner that the ink-repellant fluid layer applied to the printing plate will be evenly distributed over the surface thereof and in such a quantity to provide for proper coverage of the surface area without interferring with the ink-receptive properties of the image area and without applying excess fluid to the printing plate which might damage the material, such as paper, upon which the final image is to be printed or smear the resultant image on such material.

The dampening system in convenitonal offset lithographic printing presses, generally and by way of example only, comprises four rollers leading from a tray or fountain, containing water or other ink-repellant fluid, which transmits a measured quantity of fluid from the fountain to the printing plate and distributes such fluid evenly over the surface thereof.

The first roller of the system is generally a chrome plated steel fountain roller which is driven by a variable speed motor system. The lower portion of the fountain roller is immersed in the fountain and variations in the rotational speed of the fountain roller varies the quantity of water picked up thereby from the fountain and transmitted therefrom to the succeeding rollers enabling the quantity of ink-repellant fluid applied to the printing plate to be readily controlled.

The second roller in the conventional dampening system is called the ductor roller. The ductor roller is normally covered with a flannel or lamb's wool type material known as molleton to enable the ductor roller to act like a sponge, transmitting the measured quantity of water from the fountain roller to the next succeeding roller. The ductor roller is generally undriven and so constituted and arranged as to rock back and forth alternately being in rolling contact with the fountain roller and the next succeeding roller of the system.

The next roller, that is, the third roller in the conventional system is a vibrating or oscillating roller and is generally a gear driven chrome plated steel roller which is axially reciprocated parallel to the rotational axis thereof to spread the fluid received from the ductor roller into an even film.

The fourth or final roller in the conventional dampening system is a dampener or form roller and is generally an undriven roller of the molleton type in constant contact with both the oscillating roller and the printing plate, receiving ink-repellant fluid from the oscillating roller and transmitting such fluid to the plate in an even film to render the blank areas thereof ink repellant.

The conventional system described above, however, has several distinct disadvantgaes. It is difficult to accomplish a proper repellant fluid to ink balance at the printing plate by means of the above described system due to the molleton type rollers which must, by the nature thereof, retain quantities of water. If too much water, for example, is applied to the system as by too high a speed of the fountain roller, there is a slow response time of the system to a reduction in the quantity of repellant fluid applied to the plate due to the sponge like fluid retaining characteristics of the molleton covered rollers. Furthermore, when water is used as the basic ink-repellant fluid, quantities of alcohol or similar substances must be mixed with the water for proper operation of the system which results, subsequently, in higher operation costs than would occur if water alone could be used.

The greatest disadvantage, however, is the short life of the molleton covered rollers. Replacement is expensive, not only because of the direct cost of recovering such rollers but also because the labor costs involved in removal and replacement thereof and because of the lost press time during such removal and replacement.

Accordingly, it is an object of this invention to provide a water dampening system for a lithographic printing press which will supply a measured thin film of water to the printing plate and which is capable of rapidly varying the quantities of water applied thereto.

Another object of this invention is to provide a water dampening system for lithographic printing presses comprising a plurality of substantially non-absorbant rollers to transfer and distribute water or other ink repellant fluid from a fountain to the printing plate.

A further object of this invention is to provide a water dampening system for a lithographic printing press which operates properly without requiring the addition of alcohol or similar substances to the water.

Still another object of this invenion is to provide a water dampening system for lithographic printing presses comprising rubber or plastic form and ductor rollers.

Another and still further object of this invention is to provide a water dampening system for offset presses comprising a chromed fountain roller, a rubber ductor roller, a chromed oscillating roller, and a rubber form roller.

A still futher object of this invention is to provide a unique drive arrangement for a water dampening system for lithographic printing presses.

Yet another object of this invention is to provide a drive arrangement for the rollers of a dampening system for

lithographic printing presses comprising soft driven wheels and hard drive wheels.

A yet still further object of this invention is to provide a drive arrangement for a water dampening system for lithographic printing presses which comprises rubber driven wheels for the form and ductor rollers engaging metallic or nylon drive wheels associated with the fountain and oscillating rollers.

Yet another and still further object of this invention is to provide a drive arrangement for a water dampening system of a lithographic printing press comprising a brass drive wheel associated with the fountain roller thereof, a rubber drive wheel associated with the ductor roller thereof, a brass drive wheel associated with the oscillating roller thereof and a rubber drive wheel associated with the form roller thereof.

A still further object of this invention is to provide a drive arrangement for a roller of a water dampening system of a lithographic printing press comprising a replaceable rubber drive wheel.

Yet a further object of this invention is to provide a rubber drive wheel for a roller of a water dampening system of a lithographic printing press, the diameter of the rubber drive wheel being adjustable.

Yet another object of this invention is to provide a water dampening system for offset printing presses which is economical in installation and operation and capable of long duration of use while providing rapid modification of the quantity of water applied to the printing plate.

Other objects and inventive characteristics of this new and unique water dampening system for lithographic printing presses will become apparent to those versed in the art from the following description of a particular embodiment of my invention, as illustrated in the drawing, in which:

FIGURE 1 is a perspective view of the water dampening system according to the instant invention;

FIGURE 2 is a plan view of the water dampening system shown in FIGURE 1;

FIGURE 3 is a side elevational view of a water dampening system constructed according to the instant invention shown on a lithographic printing press adapted to print on both sides of a sheet of paper or other material.

FIGURE 4 is an end elevational view of one of the ductor rollers of the dampening system showing the replaceable rubber driven wheel associated therewith; and

FIGURE 5 is a partial sectional view taken along the line 5—5 of FIGURE 4.

Referring more particularly to the drawing, in which similar reference character identify similar parts in the several views, a plate cylinder **10** of any conventional lithographic printing press has mounted thereon a lithographic plate **12**. In a conventional manner, the plate **12** is provided with image areas adapted to receive ink from an inker (not shown) and non-image areas adapted to receive ink-repellant from a dampening system **14**. To obtain proper print quality, it is essential that a certain balance be obtained and maintained between the ink and water fed to the plate on all portions of the plate, regardless of variations in ink coverage from one portion of the plate to the next.

An ink-repellant solution such as water **16** is placed in a shallow pan or fountain **18** which comprises a portion of the dampening system **14**. A chrome plated steel fountain roller **20** is operatively associated with the water fountain **18**, the lower portion of the fountain roller **20** being immersed in the water **16**. The fountain roller **20** is driven in a conventional manner by means of a variable speed motor system (not shown) through an axle **22** affixed centrally to the fountain roller **20**.

A vibrating or oscillating roller **24** having a central axle **26** is rotatably supported parallel to and spaced from the fountain roller **20**. The oscillating roller **24** comprises a chrome plated steel roller which is reciprocated transversely in a standard manner to evenly distribute the water film received from the fountain. The axle **26** of the roller **24** is, likewise, driven in any standard manner, such as by a gear drive, not shown.

Positioned between the fountain roller **20** and the oscillating roller **24** and parallel thereto is a rubber covered ductor roller **28** having a central axle **30**. The ductor roller **28** is moved between positions of rolling contact with the fountain roller **20** and the oscillating roller **24** in a standard manner.

A rubber covered form roller **32** having a central axle **34** is positioned in rolling contact with the oscillating roller **24** and with the plate **12** of the plate cylinder **10**. A blanket cylinder **36** is positioned in contact with the plate **12** and with paper or the like **38** to transfer the inked impression from the plate **12** to the paper **38**.

The axles **22** and **26** of the fountain roller **20** and the oscillating roller **24**, respectively, are provided with relatively hard drive wheels **40** and **42**. The hard drive wheels **40** and **42** are so configured as to comprise a drivsurface along the peripheral thereof, as by knurling, or the like, and comprise a hard material such as brass, aluminum, nylon or the like. It has been found in practice that it is preferable that the material be non-ferrous and that brass is especially suitable. These drive wheels **40** and **42** are each equal in diameter to the diameter of the roller with which it is associated.

The axles **30** and **34** of the ductor roller **28** and the form roller **32**, respectively, are each provided with a driven wheel **44** and **46**, respectively, comprising a soft material such as rubber.

Referring now more particularly to FIGURES 4 and 5, in which the details of the driven wheel **44** of the ductor roller **28** is shown, the rubber driven wheel **44** is held on the axle **30** by means of a pair of clamping washers **48** and **50**. The clamping washer **48** is provided with a flange **52** and drives the axle **30** by means of a set screw **54** or the like engaging the flange **52** and the axle **30**, and is in turn driven by the rubber driven wheel **44** by means of a plurality of transverse screws **56** provided with nuts **58** to secure the rubber driven wheel **44** and the clamping washers **48** and **50** together. It is readily apparent that squeezing the clamping washers closer together by means of increased tightening of screws **56** and nuts **58** will result in an increase in the outside diameter of the rubber driven wheel **44**, which in turn enables a small adjustment to be made in the drive ratio between the rubber driven wheel **44** and the engaging drive wheel **40** or **42**. While FIGURES 4 and 5 have been shown and described as relating the driven wheel **44** and the ductor roller **28**, the driven wheel **46** of the form roller **32** is identical to the arrangement shown in FIGURES 4 and 5.

The operation of the instant device is now believed to be readily apparent. The fountain roller **20**, as described above, is driven by means of a variable speed drive of conventional design, the actual rotational speed thereof at any given time being selected to provide for a desired rate of water pick-up from the water fountain **18** corresponding to the dampening rate required by the printing plate **12**.

The oscillating roller **24**, as described above is driven by means of a conventional drive arrangement therefore, preferably at approximately 1% faster tangential velocity than the velocity of the plate cylinder, according to standard practice. The brass drive wheel **42** of the oscillating roller **24**, as described above, is in constant driving engagement with the driven rubber wheel **46** of the form roller **32**. The form roller **32** and the rubber driven wheel **46** thereof are in light contact with the printing plate **12** and the plate cylinder **10**, respectively, and, preferably, the form roller **32** is driven at approximately ½% slower than the oscillating roller **24**, thereby averaging the velocities of the oscillating roller **24** and the printing plate **12**.

The rubber ductor roller **28** and the driven rubber wheel **44** are alternately moved into contact with the

oscillating roller 24 and the drive wheel 42 and are thereby driven rapidly by the oscillating roller 24 and the drive wheel 42, respectively, and then moved back to the fountain roller 20 and the drive wheel 40 which are turning slowly, and are driven thereby. While the ductor roller 28 is in contact with the oscillating roller 24, the ductor roller 28 is rotated at the same tangential velocity as the tangential velocity of the oscillating roller 24 through both contact of the rubber ductor roller 28 with the oscillating roller 24 and by means of contact between the driven rubber wheel 44 and the brass drive wheel 42, The major driving force, however, is transmitting by means of the brass drive wheel 42 to the driving rubber wheel 44 due to the knurling on the surface of the brass drive wheel 42. And preferably also due to a greater contact pressure between wheels 42 and 44 than the contact pressure between rollers 24 and 28.

While the ductor roller 28 is in contact with the fountain roller 20, the ductor roller 28 is rotated at the tangential velocity of the fountain roller 20 due to contact between the surface of the rubber ductor roller 28 and the surface of the fountain roller 20 and due to the driving connection between the driven rubber wheel 44 and the brass drive wheel 40. As is readily apparent, the major portion of the driving force is transmitted from the brass drive wheel 40 to the driven rubber wheel 44 due to the knurling on the surface of the brass drive wheel 40. And also preferably due to a greater contact pressure between wheels 40 and 44 than the contact pressure between rollers 20 and 28.

While the ductor roller 28 is moving from contact with the oscillating roller 24 to contact with the fountain roller 20 the ductor roller 28 is free wheeling and must be rapidly slowed down before or immediately upon contact with the fountain roller 20 to permit transfer of water therebetween without bouncing. The ductor roller 28 with a new water film then moves forward toward contact with the oscillating roller 24 at which time the ductor roller must be rapidly accelerated to a similar tangential velocity to permit the transmission of water thereto without excessive skid, skitter, or bounce. The timing of these rapid accelerations and decelerations are the most critical adjustments of the entire drive system. The relatively positive driving connection between the knurled brass drive wheel 40 or 42 and the driven rubber wheel 44 allows a positive transfer of rotational speed while the adjustable diameter of the rubber wheel 44 permits exact adjustment to be made for proper timing of the acceleration and deceleration. The novel drive system of this invention thereby minimizes excessive skid or bounce. The slight adjustment of the effective diameter of the rubber driven wheel 44 possible in this system enables the critical adjustments of the acceleration and deceleration rates for the ductor roller 28 to be maintained at the proper levels and to compensate for wear.

The desired quantity of water is therefore picked up from the fountain 18 by the chrome plated fountain roller 20, the quantity picked up being varied by variations in the rotational speed of the fountain roller 20 in a conventional manner. The rubber covered ductor roller 28 is periodically brought into contact with the fountain roller 20 and receives such measured quantity of water therefrom for transmittal to the oscillating roller 24. Since the rubber covered ductor roller 28 is not absorbant, and has no tendency to store water for long time as would be true with the conventional molleton type ductor roller, the quantity of water transmitted by the rubber ductor roller 28 may change rapidly with the changes in rotational speed of the fountain roller 20 and the attendant rapid change in the quantity of water picked up thereby from the water fountain 18.

As the rubber covered ductor roller 28 is moved between contact with the fountain roller 20 and the oscillating roller 24, the rubber driven wheel 44 of the rubber ductor roller 28 alternately contacts the knurled brass drive wheels 40 and 42 of the fountain and oscillating rollers 20 and 24, respectively, causing rapid synchronizing of the rotational speed of the ductor roller 28 with the speeds of fountain roller 20 and the oscillating roller 24 as required.

The oscillating roller 24, as described above, reciprocates parallel to the rotational axis thereof and is in constant contact with the rubber form roller 32 and thereby distributes a thin uniform film of water along the surface of the rubber form roller 32.

The rubber form roller 32, similarly to the ductor roller 28, is substantially non-absorbant, and therefore does not retain large quantities of water as would a conventional molleton type form roller, and therefore, does not add a long response time to the system to changes in the rate of water transmittal selected by the selected rotational speed of the fountain roller 20.

The form roller 32, in turn, transfers the thin uniform film of water to the plate 12 for usage in the conventional lithographic printing process.

The major driving connection between the various rollers of the instant device is by means of alternating knurled brass driven wheels and rubber driven wheels, allowing substantially positive driving action therebetween without skid or bounce. The exact driving ration between the various rollers of the instant device may be readily varied by means of variations in the diameter of the rubber driven wheels 44 and 46 by means of variations in the clamping forces applied thereto by the clamping nuts 56 and 58, which also minimize any tendency towards skid or bounce. The rubber driven wheel 46 of the form roller 32 is maintained in light contact with the plate cylinder 10 to aid in proper synchronization of the tangential velocities of the form roller 32 and the plate 12.

Having thus described our invention, what is claimed is:

1. A dampening system for applying an ink-repellant fluid to the printing plate of a lithographic printing press comprising:

a fountain for containing an ink-repellant fluid;

a fountain roller partially immersed in the ink-repellant fluid contained by said fountain;

drive means for said fountain roller to enable said fountain roller to pick-up ink-repellant fluid from said fountain;

a second roller parallel to and spaced from said fountain roller;

drive means for said second roller;

a ductor roller having a non-absorbant surface;

means for alternately placing said non-absorbant surface of said ductor roller into rolling contact with said fountain roller to receive ink-repellant fluid therefrom and in rolling contact with said second roller to transmit thereto such ink-repellant fluid;

a form roller having a non-absorbant surface;

said non-absorbant surface of said form roller being in rolling contact with said second roller to receive such ink-repellant fluid from said second roller and in rolling contact with the printing plate to transmit such ink-repellant fluid thereto;

said fountain roller and said second roller being each provided with a hard drive wheel having a peripheral surface so constituted and arranged as to provide a frictional driving surface;

said ductor roller and said form roller each being provided with a soft driven wheel having a high coefficient of friction;

said soft driven wheel of said ductor roller being alternately brought into frictional driven contact with the driving wheels of said fountain roller and said second roller when said ductor roller is in fluid transmitting contact with said fountain roller and said second roller, respectively;

enabling said ductor roller to be driven at the tangential

velocities of said fountain roller and said second roller, respectively;

said soft driven wheel of said form roller being in constant engagement with said hard driving wheel of said second roller and arranged to engage the printing cylinder to enable said form roller to be rotated at a velocity intermediate that of the printing cylinder and the second roller.

2. The dampening system as defined in cliam **1** wherein:

said fountain roller and said second roller are driven at different tangential velocites,

said soft driven wheel of said ductor roller enabling said ductor roller to be rapidly accelreated and decelerated to the tangential velocities of said fountain roller and said second roller upon the respective engagement therewith.

3. The dampening system as defined in claim **1** wherein:

said soft driven wheel of said form roller is in frictional drive contact with the plate cylinder of the printing press to assist in synchronizing of the tangential velocities of the form roller and the printing plate.

4. The dampening system as defined in claim **1** wherein:

said hard driving wheels comprise brass discs having a knurled peripheral surface.

5. The dampening system as defined in claim **1** wherein:

said soft driven wheels comprise rubber discs.

6. The dampening system as defined in claim **1** wherein:

the diameter of said soft driven wheels is adjustable.

7. The dampening system as defined in claim **1** together with:

clamping means clamping said soft driven wheel of said ductor roller into driving association with said ductor roller, and

means associated with said clamping means for varying the clamping pressure applied to said driven wheel of said ductor roller,

enabling the diameter of said driven wheel to be varied.

8. The dampening system as defined in claim **1** wherein:

said second roller is so constituted and arranged as to be reciprocated parallel to the rotational axis thereof to assist in the even distribution of the ink-repellant fluid therealong, and

said hard and soft wheels are so constituted and arranged as to maintain driving contact throughout the reciprocation of said second roller.

9. A water dampening system for applying water to the printing plate of a lithographic printing press comprising:

a water fountain for containing therewithin a quantity of water;

a chrome plated steel fountain roller partially immersed in the water contained within said water fountain;

variable speed drive means for said fountain roller to enable said fountain roller to pick-up variable quantities of water from said water fountain;

a chrome plated steel vibrating roller rotatably supported parallel to and spaced from said fountain roller;

drive means for rotating said vibrating roller;

drive means for reciprocating said vibrating roller back and forth along the rotational axis thereof;

a rubber surfaced ductor roller supported parallel to said fountain roller and said vibrating roller;

means for alternately positioning said ductor roller into contact with said fountain roller and said vibrating roller,

enabling said ductor roller to receive water from said fountain roller and apply such water to the surface of said vibrating roller;

a rubber surfaced form roller rotatably supported parallel to said vibrating roller and in rolling contact therewith to receive such water from said vibrating roller;

said form roller being in rolling contact with the printing plate to transmit such water thereto;

said fountain roller and said vibrating roller being each provided with a brass drive wheel having a knurled peripheral surface;

said ductor roller and said form roller each being provided with a soft driven rubber wheel;

the soft driven rubber wheel of said ductor roller being alternately frictionally driven by contact with the drive wheels of said fountain roller and said vibrating roller when said ductor roller is in fluid transmitting contact with said fountain roller and said vibrating roller, respectively;

enabling said ductor roller to be driven at the tangential velocities of said fountain roller and said vibrating roller, respectively;

said rubber wheel of said form roller being in constant contact with said brass wheel of said vibrating roller and arranged to engage the printing cylinder to enable said form roller to be rotated at a velocity intermediate that of the printing cylinder and the vibrating roller;

said rubber wheels being clamped to the associated roller by means of a variable pressure clamping arrangement,

enabling the diameter of said rubber wheels to be varied.

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