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Weishew

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[54] **SEAL FOR FOUNTAIN CHAMBERED DOCTOR BLADE FOR A FLEXOGRAPHIC PRINTING PRESS**

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[73] Assignee: **The Langston Corporation**, Cherry Hill, N.J.

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Related U.S. Patent Documents

Reissue of:

[64] Patent No.: **5,243,907**
Issued: **Sep. 14, 1993**
Appl. No.: **824,822**
Filed: **Jan. 22, 1992**

[51] **Int. Cl.**[6] **B41F 31/00**

[52] **U.S. Cl.** **101/208**; 101/364

[58] **Field of Search** 101/208, 207, 101/210, 364, 367, 366

[56] **References Cited**

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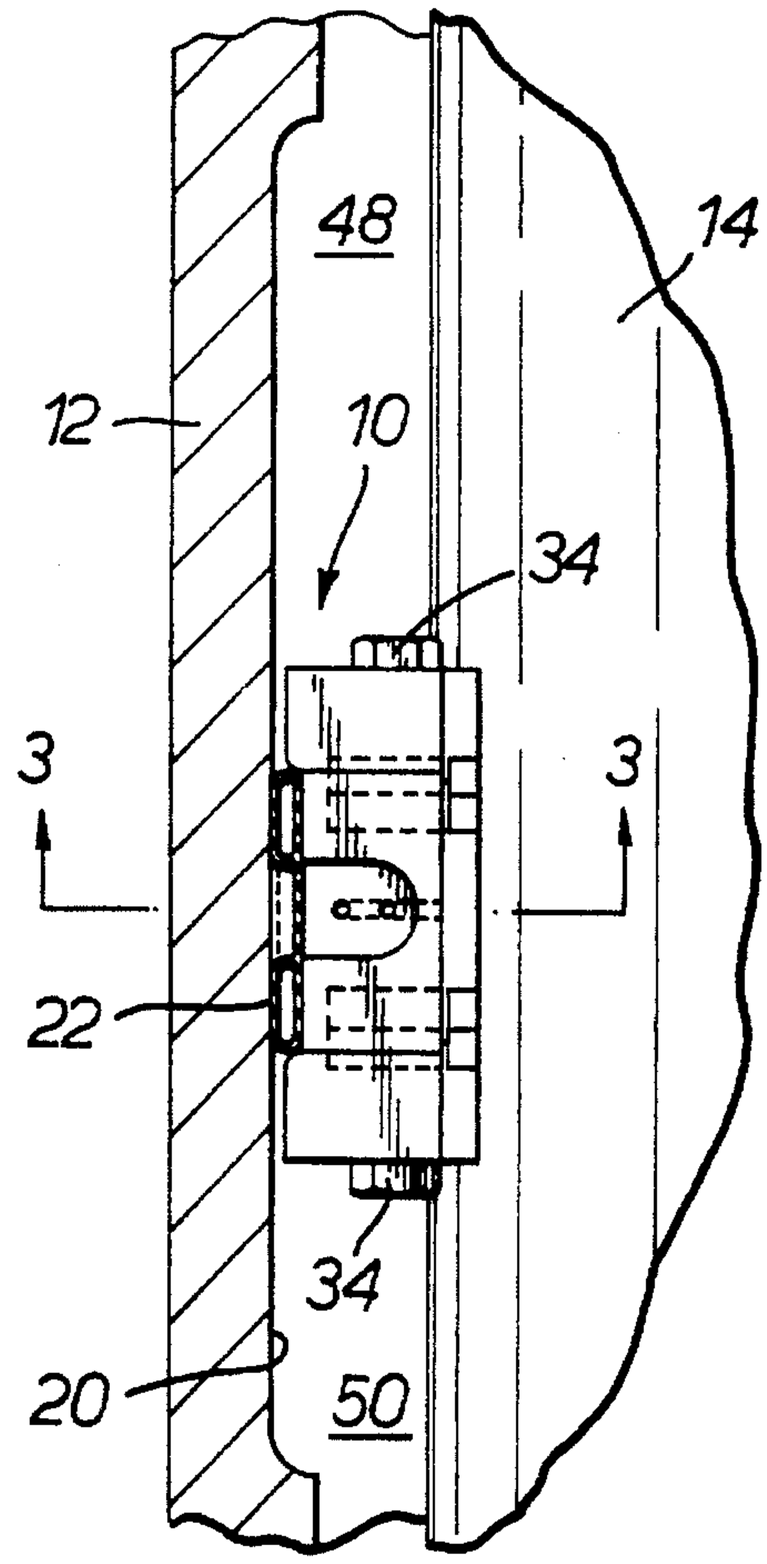
[57] **ABSTRACT**

A **[**divider**]** seal for a **[**split-fountain**]** *fountain* chambered doctor blade for a printing press, comprising a seal contoured to sealingly engage a circumferential surface of a rotating cylinder, a seal retainer for retaining the seal in sealing engagement with the rotating cylinder, and pneumatic biasing structure, such as a pneumatic bladder, acting on the seal retainer for resiliently biasing the seal into sealing engagement with the rotating cylinder.

24 Claims, 2 Drawing Sheets



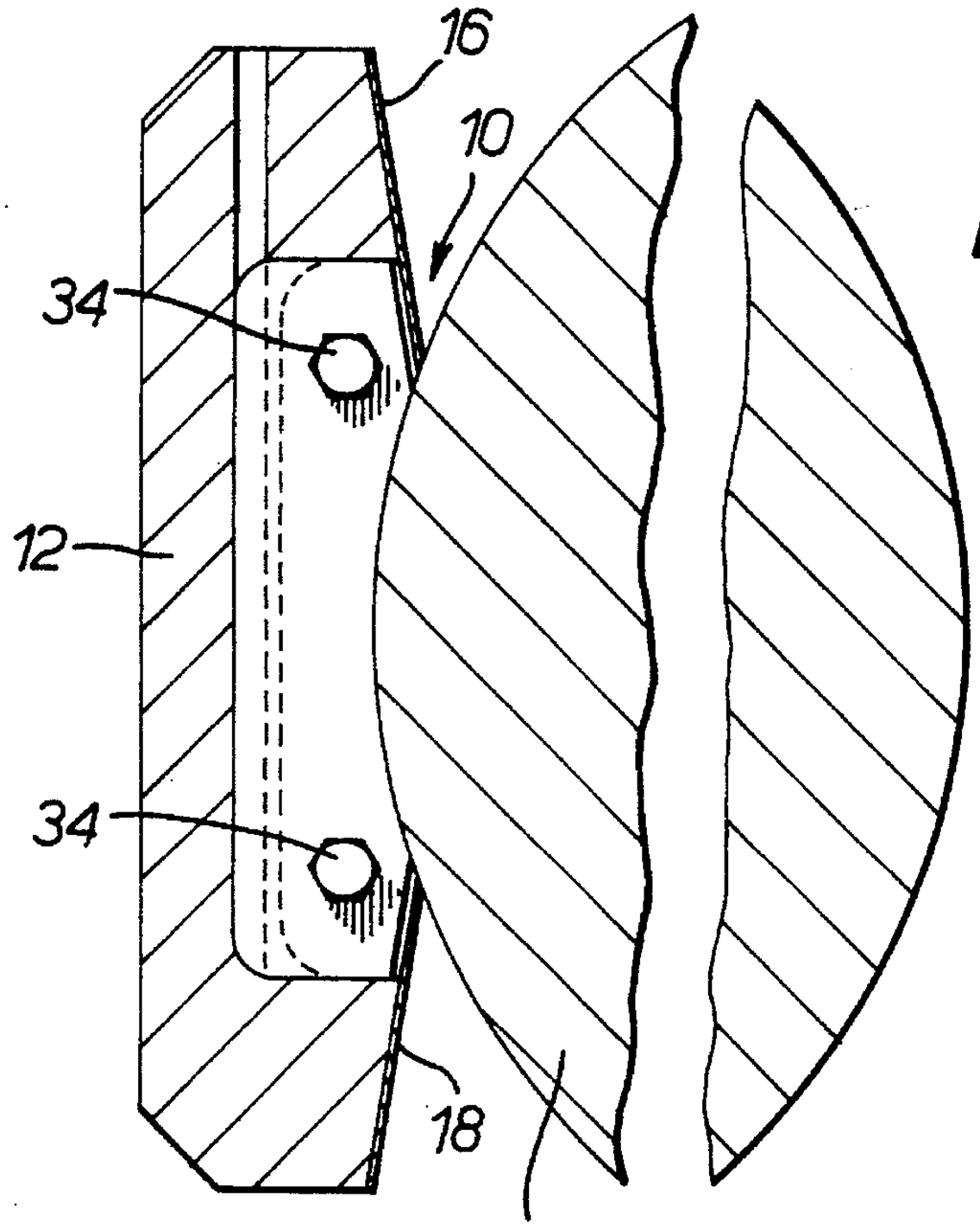
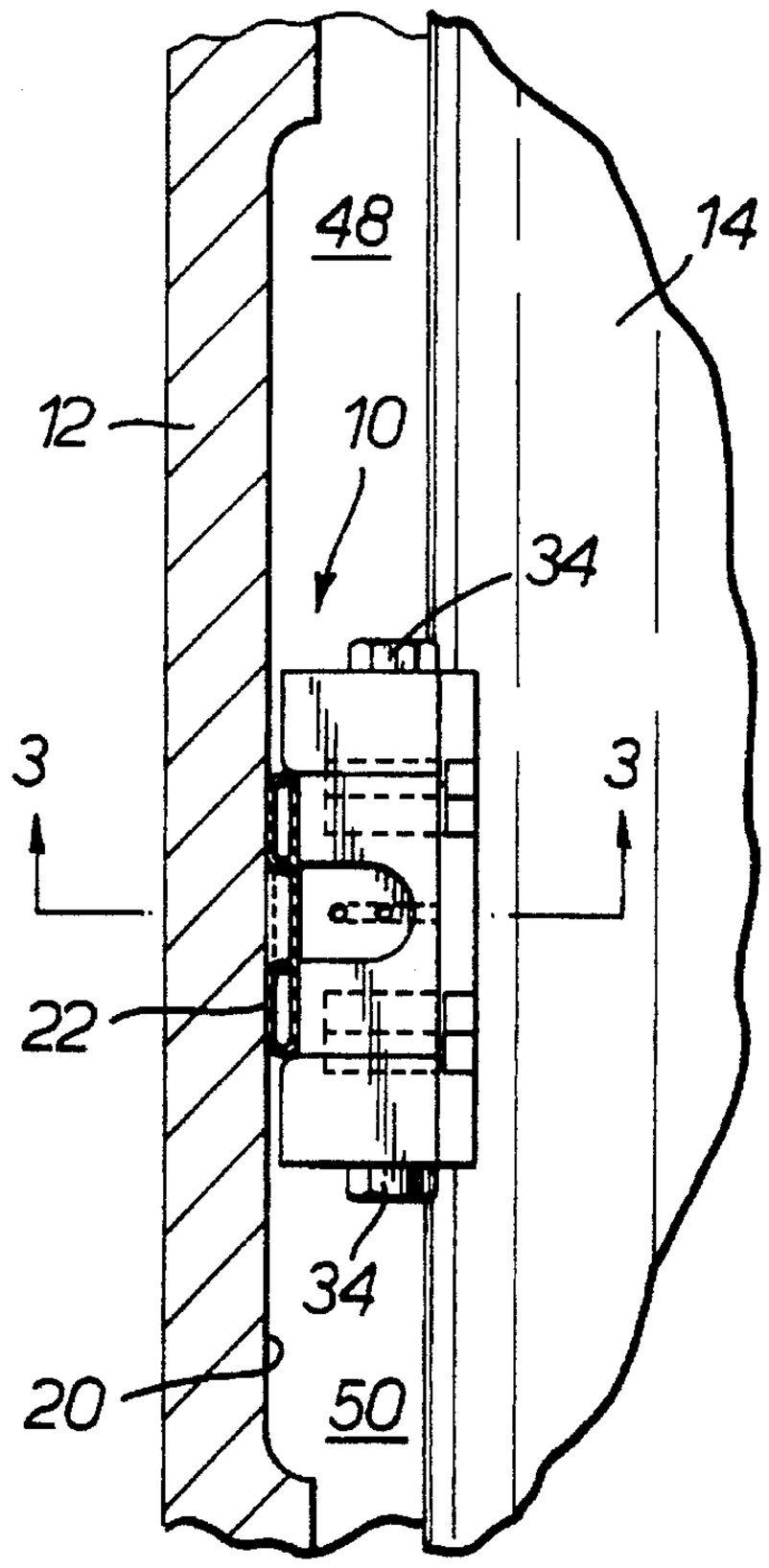


Fig. 1.

Fig. 2.



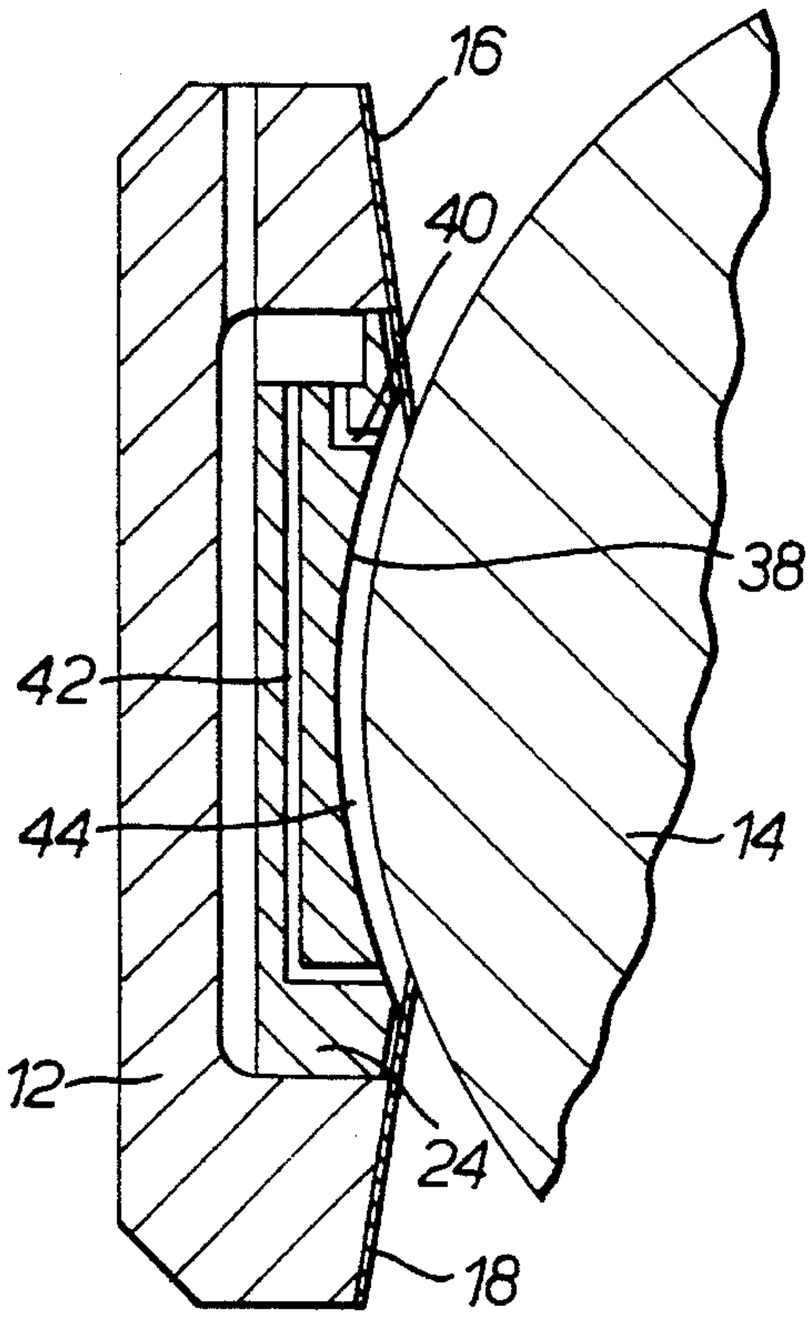

16
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Fig.4.

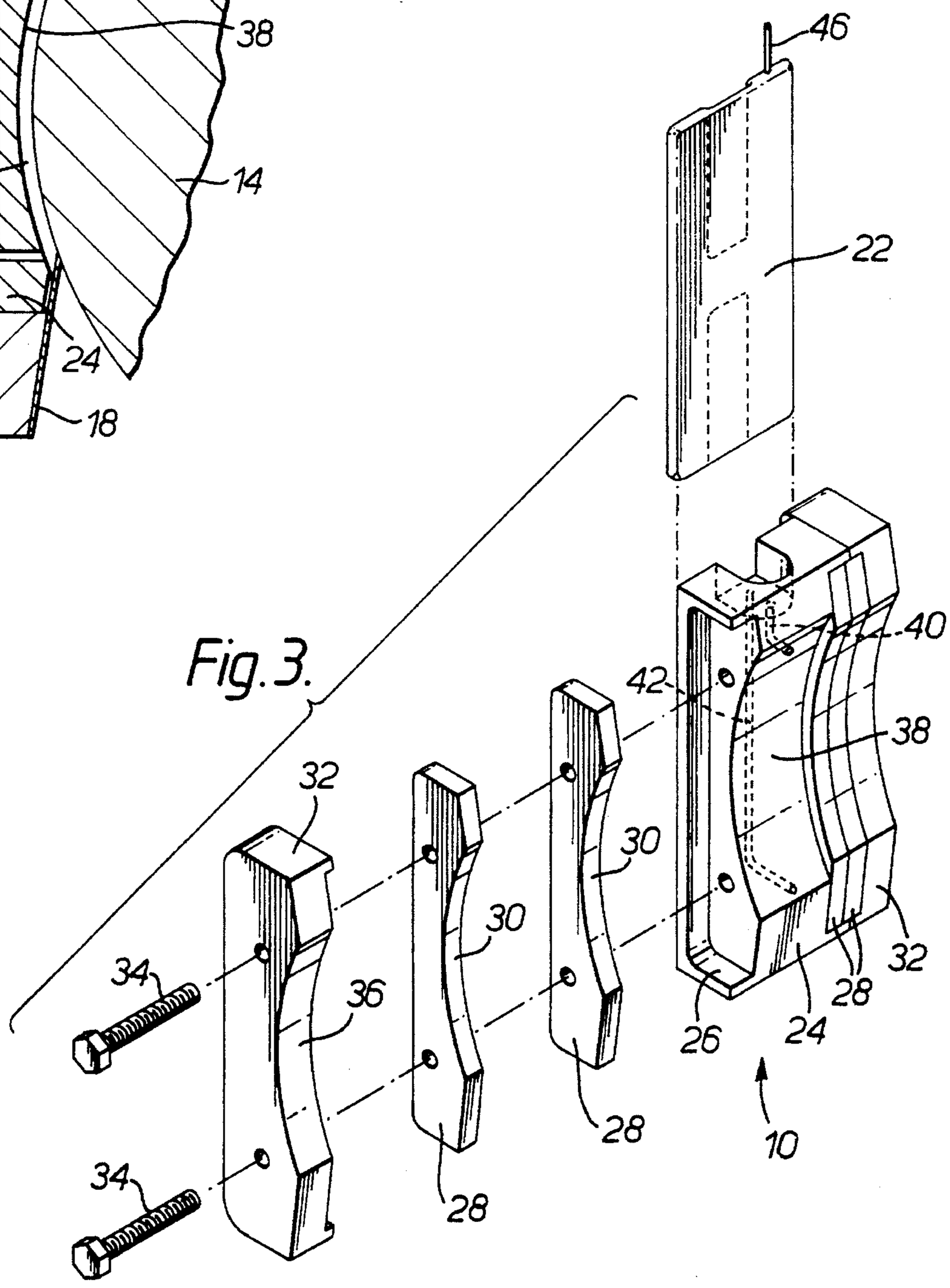
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Fig.3.

SEAL FOR FOUNTAIN CHAMBERED DOCTOR BLADE FOR A FLEXOGRAPHIC PRINTING PRESS

Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue.

FIELD OF THE INVENTION

The present invention relates to flexographic printing presses, in particular flexographic printing presses which utilize a chambered doctor blade ink fountain. The invention finds particular utility in connection with split-fountain chambered doctor blades which permit simultaneous printing with two or more different color inks, where the seal of the present invention may be used to divide the chambered doctor blade into two or more chambers, but the present invention is useful in other contexts where it is desired to effect a seal with respect to a rotating cylinder, *such as an end seal*. Thus, although the invention is described in the context of a flexographic printing press, the invention is not limited to use in such devices.

BACKGROUND OF THE INVENTION

Flexographic printing is a rotary letter press printing process which traditionally uses flexible rubber, or other elastomer, printing plates and liquid, fast drying ink. An advantage of flexographic printing is its simple ink distribution system.

In flexographic printing, a web to be imprinted is passed between an impression cylinder and a plate cylinder, from which the ink is transferred to the web. Ink is applied to the plate cylinder in precisely-controlled quantities by an anilox metering roll. The circumferential surface of the anilox roll is divided into a very large number of small cells (typically, 15,000 cell per square centimeter). The surface of the anilox roll is flooded with ink, thus filling the cells on the roll's surface. Ink is fed to the anilox roll by an ink fountain. A commonly-used ink fountain comprises an ink reservoir and a pair of doctor blades which contact the anilox roll above and below the reservoir. The surface of the anilox roll, the doctor blades and the reservoir define a closed chamber for containing the ink. As the anilox roll rotates, the doctor blades shave surplus ink from the surface of the anilox roll so that ink is carried only in the interior of the cells on the roll's surface and not on the lands between cells. This results in a uniformly metered film of ink being applied to the surface of the plate cylinder.

Typically, the ink fountain extends the entire length of the anilox roll and plate cylinder. In cases where it is desired to print more than one color on a web, which requires more than one color of ink, the chamber containing the ink in the ink fountain is divided into two or more subchambers or compartments by ink dams or dividers. These dividers are designed to maintain a fluid-tight seal between compartments in the ink fountain and to maintain a seal against the anilox roll.

Ink fountain dividers per se are known in the art, and are illustrated in, for example, U.S. Pat. Nos. 3,381,517, 4,559,871, 4,667,595, and 4,796,528.

U.S. Pat. No. 3,831,517 discloses an apparatus for resiliently urging a seal member against a roller in the context of a fountain divider for a printing press ink fountain. The seal member is urged against the roller by a flat flexible spring strap with an arcuate outside surface which engages the sealing member. The biasing force exerted by the spring strap on the seal member can be adjusted by means of an adjusting rod, one end of which engages the spring strap and the other end of which engages a desired serration in a saw-toothed member.

U.S. Pat. No. 4,559,871 discloses divider plates for an ink dividing assembly for an inking roller in an ink fountain of a rotary printing press, with the divider plates resiliently biased against the ink roller. The divider plates are shown in conjunction with a chambered doctor blade assembly. The divider plates are slidingly mounted in guide plates. The front surface of the divider plates is curved and engages an inking roller. The divider plates are spring-biased into contact with the inking roller by leaf springs.

U.S. Pat. No. 4,667,595 discloses divider plates between axially-spaced doctor bars in an inking system for a rotary printing press. The divider plates rotate about a pin whose axis is parallel to the axis of the inking roller so that they are biased against the inking roller by gravity.

U.S. Pat. No. 4,796,528 shows a separator element located within a chambered doctor blade ink fountain to separate the fountain into axial zones. The separator element comprises a separator strip which extends over a portion of the surface of an anilox roller. A thin film of liquid, such as water or an aqueous solution of alcohol, is supplied to the separator strip so that the strip rides on a liquid film between the strip and the anilox roller, thus forming a fluid seal between axial zones in the ink fountain.

It will be appreciated that all of these prior arrangements are mechanically very complex. They are thus expensive to fabricate, require careful and precise alignment, and are susceptible to misalignment in use. There is therefore a need for a simple, inexpensive divider seal which is easy to fabricate and install, requires no time-consuming alignment, can compensate for wear and misalignment, and still provides an effective [divider] seal. The present invention fulfills that need.

SUMMARY OF THE INVENTION

The present invention is a [divider] seal for a [split-fountain] *fountain* chambered doctor blade for a printing press, comprising seal means contoured to sealingly engage a circumferential surface of a rotating cylinder, retaining means for retaining the seal means in sealing engagement with the rotating cylinder, and pneumatic biasing means acting on the retaining means for resiliently biasing the seal means into sealing engagement with the rotating cylinder.

The pneumatic biasing means offers a high degree of compliance and allows for variations in wear and alignment in use.

DESCRIPTION OF THE DRAWINGS

For the purpose of illustrating the invention, there is shown in the drawings a form which is presently preferred; it being understood, however, that this invention is not limited to the precise arrangements and instrumentalities shown.

FIG. **1** is a side elevational view, partially in section, of an ink fountain and an anilox roll, which the ink fountain being equipped with the divider seal according to the present invention.

FIG. **2** is a top plan view, partially broken away, of the divider seal and anilox roll shown in FIG. **1**.

FIG. **3** is an exploded view of the divider seal according to the present invention.

FIG. **4** is a sectional view, partially broken away, taken along the lines **3—3** of FIG. **2**.

DESCRIPTION OF THE INVENTION

Referring now to the drawings, wherein like numerals indicate like elements, there is shown in FIG. **1** a divider seal **10** according to the present invention, mounted in a chambered doctor blade ink fountain **12**, in sealing engagement with an anilox roll **14**. Anilox roll **14** has already been described and is known in the art, and need not be described in further detail, except to note that, as previously described, anilox roll **14** rotates on its axis relative to ink fountain **12**. Also, ink fountain **12** has already been described and is known in the art, and will be described only with the degree of detail necessary to understand the present invention. In that regard, ink fountain **12** comprises an upper **16** and a lower **18** doctor blade which contact the surface of the anilox roll and meter the amount of ink supplied to the anilox roll by ink fountain **12**. Doctor blades **16** and **18** are conventional and known in the art.

As seen in FIG. **1**, divider seal **10** has a sealing surface which is contoured to and contacts the surface of anilox roll **14** which extends into ink fountain **12** between doctor blades **16** and **18**. Divider seal **10** is otherwise dimensioned to fit within the chamber of chambered doctor blade ink fountain **12**.

FIG. **2** illustrates the divider seal **10** as seen from above, with ink fountain **12** partially in section to permit divider seal **10** to be clearly seen. As best seen in FIG. **2**, divider seal **10** is spaced a short distance from the rear wall **20** of ink fountain **12**. Between the rear wall of ink fountain **12** and divider seal **10** is a biasing means in the form of a pneumatic bladder **22**. Pneumatic bladder **22** may be pressurized and depressurized in conventional fashion to apply more or less biasing force to divider seal **10**, thereby controlling the loading force of divider seal **10** against anilox roll **14**.

Referring now to FIG. **3**, the various parts of divider seal **10** are shown in an exploded view. Divider seal **10** comprises a manifold **24**, which includes lateral recesses on either side. Recess **26** is visible in FIG. **3**. Recess **26** receives at least one, and preferably two, seal members **28**. Seal members **28** are preferably made of an ultrahigh molecular weight closed foam material, and each seal means has a contoured surface **30** contoured to the curvature of anilox roll **14** so as to intimately engage the surface of anilox roll **14** when the seal means **28** are brought into contact with the surface of anilox roll **14**. Seal means **28** are retained in place with respect to manifold **24** by an end cap seal **32**. Seal means **28** and end cap **32** may be retained on manifold **24** by any suitable means, such as threaded fasteners **34**. End cap seal **32** also has a contoured surface **36**, which has substantially the same contour as contoured surface **30** of seal means **28**.

Manifold **24** is substantially symmetrical along its longitudinal axis, and therefore receives a pair of seal means **28** and an end cap seal **32** on both sides.

Manifold **24** may be made of any suitable material. For example, manifold **24** may be machined from aluminum, or molded in plastic. A preferred, but not necessarily the only, material for manifold **24** is aluminum with a Teflon® coating. End cap seals **32** are preferably, although not necessarily, molded from an ultrahigh molecular weight plastic. It should be understood, however, that the choice of

materials for manifold **24** and end cap seals **32** is not critical to the present invention, and other materials can be used without departing from the scope of the invention. Likewise, although seal means **28** are preferably made from ultrahigh molecular weight closed foam material, other suitable sealing materials may be used without departing from the scope of the invention.

It will be seen in FIG. **3** that, as with seal means **28** and end cap seals **32**, manifold **24** has a contoured surface **38**. However, contoured surface **38** is contoured to a curvature having a radius slightly greater than the curvature of contoured surfaces **30** and **36** of seal means **28** and end cap seals **32**. This provides a small gap between anilox roll **14** and contoured surface **38**, as best seen in FIG. **[3]** *4*.

Referring now to FIG. **4**, manifold **24** is shown in section. Manifold **24** includes a pair of liquid flow channels **40** and **42**. (Channels **40** and **42** are shown in phantom in FIG. **3**.) Liquid flow channels **40** and **42** serve to supply and drain water to the gap **44** between contoured surface **38** and anilox roll **14**. Gap **44** forms a water reservoir defined by contoured surface **38**, anilox roll **14** and top and bottom doctor blades **16** and **18**. Water is preferably supplied to reservoir **44** through flow channel **40** and drained, preferably by vacuum, through channel **42**. The water in reservoir **44** fills the interstices in seal means **28**, so that there is a film of water between seal means **28** and the surface of anilox roll **14**. The film of water serves as both a low-friction bearing and a fluid seal.

Seal means **28** are biased into sealing engagement with anilox roll **14** by the pneumatic bladder **22**. Bladder **22** is positioned between manifold **24** and the rear wall **20** of ink fountain **12**, as previously described. Air is supplied to and exhausted from bladder **22** through an air supply conduit **46**. The air may be supplied and exhausted by any conventional means. By pressurizing bladder **22**, seal means **28** are biased into sealing engagement with the surface of anilox roll **14**. The biasing force can be controlled by controlling the internal pressure of bladder **22**. Since bladder **22** is pneumatically pressurized, bladder **22** is resilient. That is, bladder **22** permits divider seal **10** to move toward and away from rear wall **20** as anilox roll **14** rotates, to compensate for variations in the surface of anilox roll **14**, such as a slightly out-of-round condition or slight misadjustment, for example where the ink fountain **12** is not exactly parallel to the axis of anilox roll **14**. In addition, bladder **22** enables divider seal **10** to move toward anilox roll **14** to compensate for wear of both the surface of anilox roll **14** and the contoured surface **30** of seal means **28**, as a result of normal use. Since air is compressible fluid, bladder **22** can be pressurized to a degree that will enable divider seal **10** to move toward and away from rear wall **20** of ink fountain **12**, as may be required by out-of-round conditions in anilox roll **14**, misalignments, and wear.

It will be appreciated that ink fountain **12** can be divided into two or more compartments **48** and **50** (see FIG. **2**) by using one or more divider seals **10**. Thus, ink fountain **12** may be divided into two compartments **48** and **50** by using a single divider seal **10**. If two divider seals are used, ink fountain **12** can be divided into three compartments, and so on, so that any number of compartments as desired may be provided.

It will also be noted that neither bladder **22** nor divider seal **10** are fixedly attached to rear wall **20** of ink fountain **12**. Thus, divider seal **10** can be placed at any desired location along anilox roll **14**, so that the lateral extent of the compartments **48** and **50** can be infinitely variable. Thus, the

invention permits not only any desired number of compartments to be formed in ink fountain **12**, but enables the lateral extent of the compartments so formed to be infinitely varied as desired. Hence, the present invention makes it very simple to reconfigure ink fountain **12** for different colors and dimensions. This reduces set-up time between printing runs, thereby reducing press down time and increasing equipment utilization and throughput.

The present invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof and, accordingly, reference should be made to the appended claims, rather than to the foregoing specification, as indicating the scope of the invention.

I claim:

1. A [divider] seal for a [split-fountain] chambered doctor blade for a printing press, comprising

a. seal means contoured to sealingly engage a circumferential surface of a rotating cylinder,

b. retaining means for retaining the seal means in sealing engagement with the rotating cylinder,

c. pneumatic biasing means positionable with the retaining means and acting on the retaining means for resiliently biasing the seal means into sealing engagement with the rotating cylinder; and

means for mounting the retaining means and the pneumatic biasing means for axial movement together along the surface of the cylinder, thereby allowing the retaining means and the pneumatic biasing means to be selectably positionable along the surface of the cylinder.

2. A [divider] seal according to claim **1**, wherein the pneumatic biasing means comprises a pneumatic bladder.

3. A [divider] seal according to claim **2**, said pneumatic bladder further comprising a conduit for selectably permitting an increase or decrease in pneumatic pressure in said bladder.

4. A [divider] seal according to claim **2**, wherein the seal means comprises an ultra-high molecular weight closed foam.

5. A [divider] seal according to claim **1**, further comprising a gap between the retaining means and the circumferential surface of the rotating cylinder, and means for supplying a liquid to said gap to form a liquid interface between said retaining means and circumferential surface.

6. A [divider] seal according to claim **1**, wherein said retaining means comprises recess means for receiving the pneumatic biasing means, thereby fixedly attaching the biasing means to the retaining means.

7. In a flexographic printing press having an anilox roller with an outer circumferential surface and a chambered doctor blade ink fountain adjacent the anilox roller for applying printing ink thereto, a positionable divider seal for dividing the doctor blade chamber into at least two compartments, the compartments containing different color inks therein, said divider seal comprising a seal member contoured to and in sealing engagement with the outer circumferential surface of the anilox roller, a seal retainer for retaining the seal member in engagement with the circumferential surface of the anilox roller, and an inflatable and deflatable pneumatic bladder operatively engaged with the seal retainer and positionable with said divider seal for applying a biasing force to the seal retainer and the seal member for resiliently biasing the seal member into engagement with the circumferential surface of the anilox roller, and means for mounting the divider seal and the bladder for axial movement together along the surface of the roller, thereby allowing the divider seal and the bladder to be selectably positionable along the surface of the roller.

8. [A divider seal] *In a flexographic printing press* according to claim **7**, wherein said pneumatic bladder is positioned between the seal retainer and a rear wall of the ink fountain.

9. [A divider seal] *In a flexographic printing press* according to claim **8**, wherein the divider seal and the pneumatic bladder are both longitudinally positionable with respect to said rear wall of the ink fountain, thereby allowing the divider seal to be infinitely positionable along the length of the anilox roll between the anilox roll and said rear wall of the ink fountain.

10. [An inflatable and deflatable pneumatic bladder] *In a flexographic printing press* according to claim **7**, wherein said divider seal comprises recess means for receiving the bladder, thereby fixedly attaching the bladder to the divider seal.

11. Printing apparatus comprising an ink fountain mounted adjacent to a roll adapted to receive a film of ink from the fountain, the fountain comprising an ink chamber extending parallel to the axis of the roll and containing a chamber divider having a first preselected width which is selectably positionable at various positions in the chamber, the chamber divider including at least one sealing portion having a concave surface adjacent to and conforming with the surface of the roll, and including a bladder positioned between a back surface of the divider and an opposed wall of the chamber and adapted to seal the gap between the said back surface and the chamber wall and, when pressurized, to bias the concave seal surface of the divider resiliently into sealing engagement with the roll, the bladder having a second preselected width which is not greater than the first preselected width.

12. Printing apparatus according to claim **11**, in which the chamber divider includes a second sealing portion spaced from and similar to the first-mentioned sealing portion, the surface of the divider between the sealing portions being recessed to define a semi-annular chamber adjacent to the roll, and including means for delivering liquid into the semi-annular chamber to form an additional barrier, supplementing the sealing effects of the seal portions, between inks contained during use in the portions of the ink chamber on opposite sides of the divider.

13. Printing apparatus according to claim **11**, wherein the back surface of the divider comprises recess means for receiving the bladder, thereby attaching the bladder to said divider.

14. Printing apparatus according to claim **13**, in which said recess means hold said bladder so as to allow said bladder to be positionable with said divider.

15. Printing apparatus according to claim **11**, in which the said back surface of the divider and the said opposed chamber wall are both substantially flat and are both substantially parallel to a tangent to the roll at approximately a midpoint along the said concave surface of the sealing portion, whereby expansion of the bladder produces a series of biasing forces on the divider which are substantially parallel to a radius of the roll at the said midpoint.

16. Printing apparatus according to claim **15**, in which the chamber divider includes a second sealing portion spaced from and similar to the first-mentioned sealing portion, the surface of the divider between the sealing portions being recessed to define a semi-annular chamber adjacent to the roll, and including means for delivering liquid into the semi-annular chamber to form an additional barrier, supplementing the sealing effects of the seal portions, between inks contained during use in the portions of the ink chamber on opposite sides of the divider.

17. A [divider] seal in a [split-fountain] chambered doctor blade for a printing press having an ink chamber, comprising

a. seal means contoured to sealingly engage a circumferential surface of a rotating cylinder,

b. retaining means having a first preselected width for retaining the seal means in sealing engagement with the rotating cylinder, [and]

c. pneumatic biasing means, disposed between a back surface of said retaining means and an opposed wall of said ink chamber and acting on the retaining means for resiliently biasing the seal means into sealing engagement with the rotating cylinder, the pneumatic biasing means having a second preselected width which is not greater than the first preselected width, *and*

d. said retaining means and pneumatic biasing means being slideably movable into different positions along said cylinder.

18. A [divider] seal according to claim 17, wherein said retaining means is positionable to various positions within the ink chamber, said retaining means comprising recess means for receiving the pneumatic biasing means, thereby fixedly attaching the biasing means to the retaining means, said recess means holding said biasing means so as to allow said pneumatic biasing means to be positionable with said retaining means.

19. A [divider] seal according to claim 17, wherein said retaining means comprises recess means for receiving the pneumatic biasing means, thereby fixedly attaching the biasing means to the retaining means.

20. In a flexographic printing press having an anilox roller and a chambered doctor blade ink fountain adjacent the anilox roller for applying printing ink thereto, a divider seal having a first preselected width for dividing the doctor blade chamber into at least two compartments, the compartments containing different color inks therein, said divider seal comprising a seal member contoured to and in sealing engagement with the outer circumferential surface of the anilox roller, a seal retainer for retaining the seal member in engagement with the circumferential surface of the anilox roller, and an inflatable and deflatable pneumatic bladder mounted between a back surface of the divider seal and an opposed wall of the doctor blade chamber for applying a biasing force to the seal retainer and the seal member for resiliently biasing the seal member into engagement with the circumferential surface of the anilox roller, the bladder having a second preselected width which is not greater than the first preselected width.

21. [A bladder] *In a flexographic printing press* according to claim [29] *20* wherein said divider seal is selectably positionable at various positions in the chamber, the divider seal comprising recess means for receiving the bladder, thereby fixedly attaching the bladder to the divider seal so as to allow the bladder to be positionable with said divider seal.

22. [A bladder] *In a flexographic printing press* according to claim 20 wherein said divider seal comprises recess means for receiving the bladder, thereby fixedly attaching the bladder to the divider seal.

23. Printing apparatus comprising an ink fountain mounted adjacent to a roll adapted to receive a film of ink from the fountain, the roll having an outer circumferential surface, the fountain comprising an ink chamber extending parallel to the axis of the roll, at least a portion of the chamber containing a chamber [divider] *seal member* which is selectably positionable at various positions in the chamber, the chamber [divider] *seal member* including at least one sealing portion having a concave surface adjacent to and conforming with the surface of the roll, and including a bladder selectable positionable with the [divider] *seal member*, and adapted to seal the gap between the said back surface and the chamber wall and, when pressurized, to bias the concave seal surface of the [divider] *seal member* resiliently into sealing engagement with the roll, and means for mounting the [divider] *seal member* and the bladder for axial movement together along the surface of the roll, thereby allowing the [divider] *seal member* and bladder to be selectably positionable along the surface of the roll.

24. A seal for a chambered doctor blade for a printing press, comprising:

seal means contoured to sealingly engage a circumferential surface of a rotating cylinder, the seal means being positionable at an end of the chambered doctor blade;

retaining means for retaining the seal means in sealing engagement with the rotating cylinder;

pneumatic biasing means acting on the retaining means for resiliently biasing the seal means into sealing engagement with the rotating cylinder; and

means for mounting the retaining means and the pneumatic biasing the seal means for axial movement together along the surface of the cylinder, thereby allowing the retaining means and the pneumatic biasing means to be selectably positionable along the surface of the cylinder.

* * * * *