

# United States Patent

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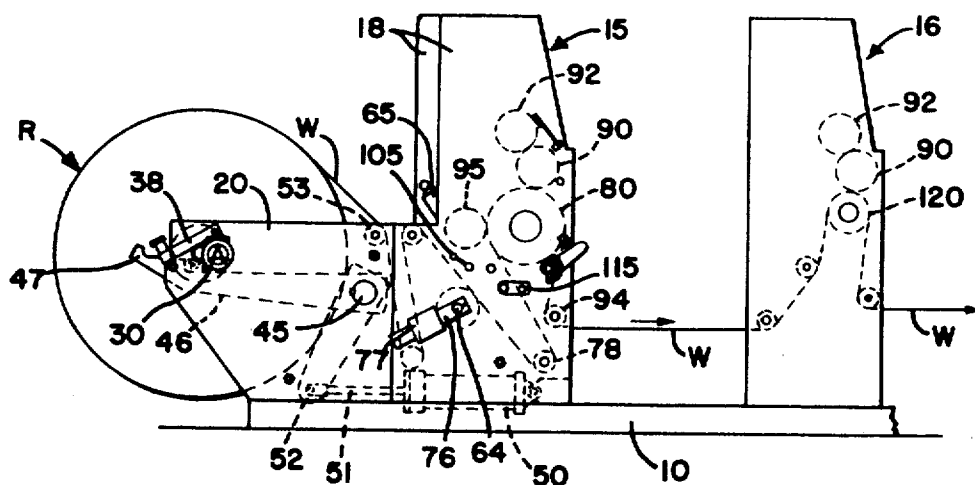
[54] **PRINTING APPARATUS**  
 4 Claims, 4 Drawing Figs.

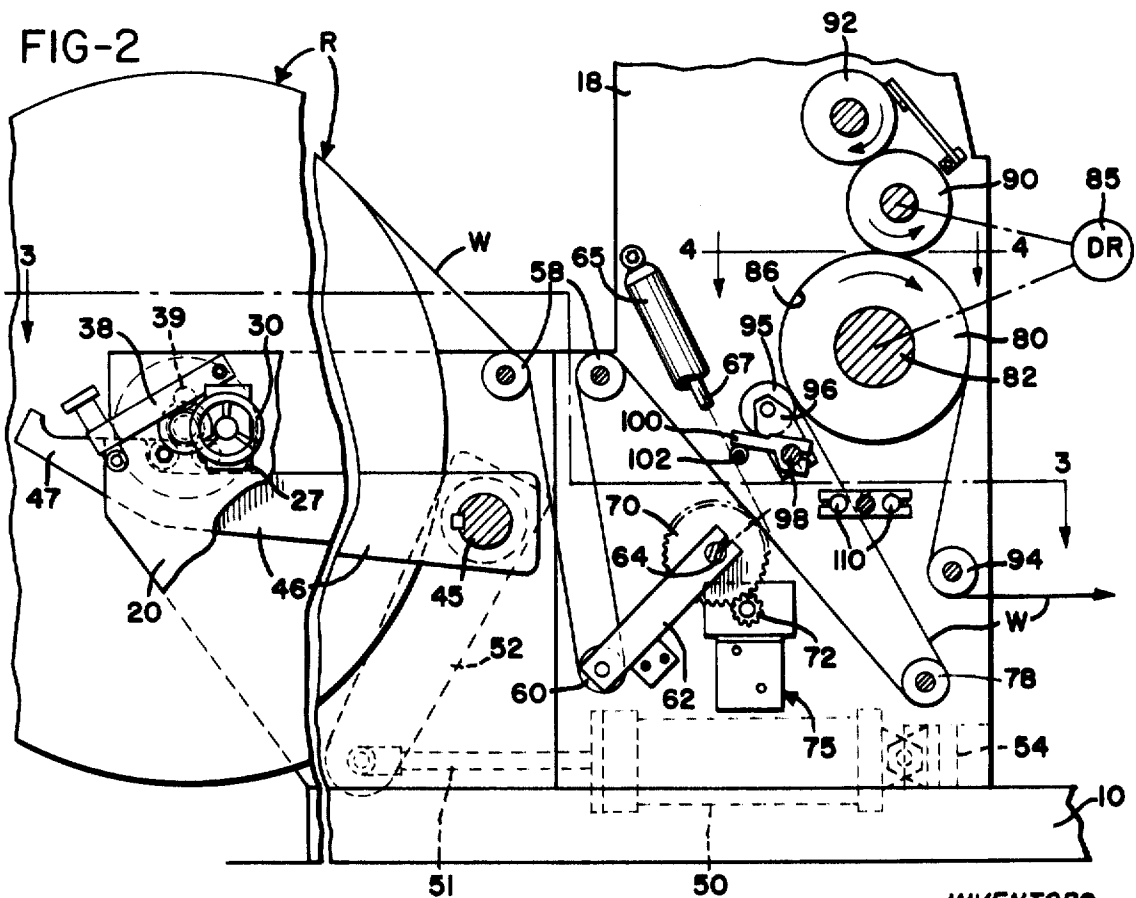
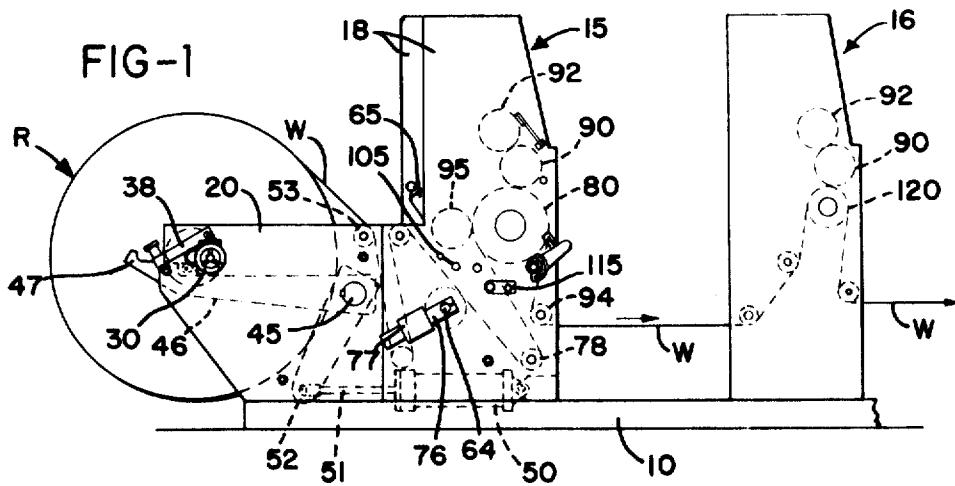
[52] U.S. Cl. 101/228,  
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 227, 219

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**ABSTRACT:** A web of material is fed from a supply roll around a tension control roll to a printing unit including a large diameter cylinder having a high friction outer surface. Guide rolls provide for a substantial wrap of the web around the cylinder, and gripping rollers press the web against the outer surface so that rotation of the cylinder effects precise metering of the web from the supply roll through the printing unit and other units which perform successive operations on the web.





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FIG-3

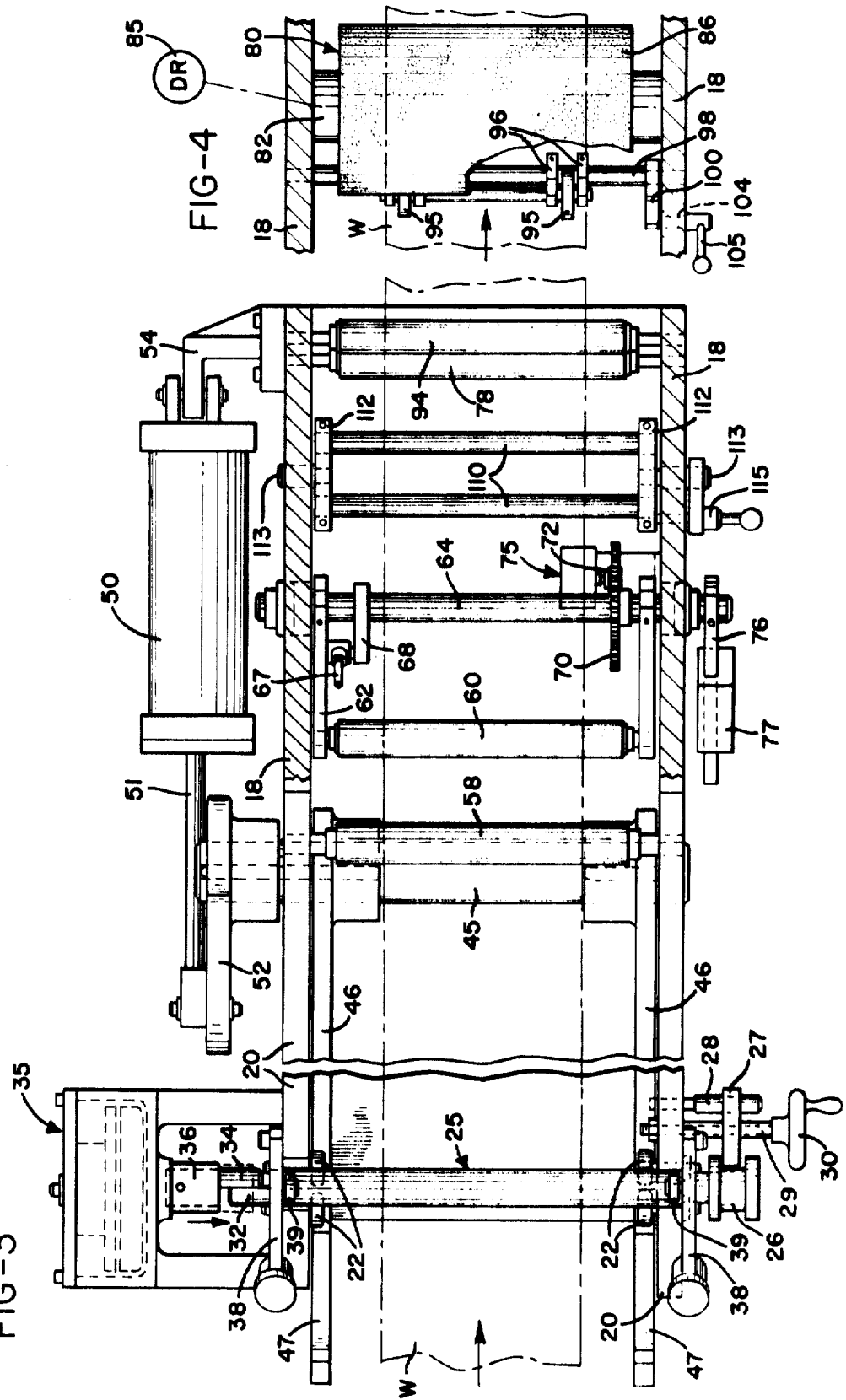
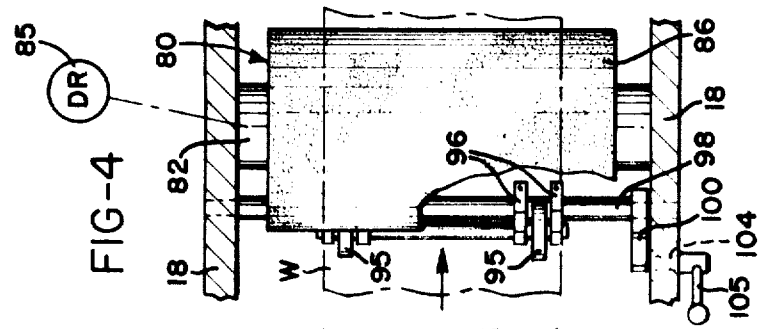


FIG-4



## PRINTING APPARATUS

### BACKGROUND OF THE INVENTION

In a machine for performing successive operations on a web of material, such as a machine which prints and perforates web material for producing continuous lengths of business forms, it is necessary to provide for precise feeding of the web through the printing and perforating units. Thus when different webs are processed for producing multiple copy business forms, the printing on the webs and the spacing of the perforations are in precise registration when the webs are subsequently assembled on a collating machine. For example, the machine disclosed in U.S. Pat. No. 3,249,316 which issued to the assignee of the present invention, incorporates a large diameter drum for precisely metering web material from a supply roll to an offset printing and perforating machine. The offset printing unit includes an impression cylinder, a blanket cylinder and a plate cylinder each having substantially the same diameter. The metering drum is driven at a speed which is correlated with the operating speed of the cylinders so that each web is fed through each unit at a precise predetermined speed.

### SUMMARY OF THE INVENTION

The present invention is directed to an improved and simplified means for precisely metering a web of material through a series of printing and perforating units. The machine of the invention is ideally suited for printing relatively narrow web material although it is possible for the invention to be employed in a machine for printing web material having substantial width. While a primary advantage of the invention is to provide a significant reduction in the construction cost of the machine, the invention also simplifies threading of the web material from the supply roll through the first printing unit.

In accordance with a preferred embodiment of the invention, a supply roll of web material is supported by a shaft connected to a brake. The web material is directed around a web tension sensing roller which controls the brake and is then directed to an offset printing unit including an impression cylinder having a high friction sand blasted outer surface and a diameter twice the diameter of an adjacent blanket cylinder. The web is directed to have substantial wrap of approximately 220° around the impression cylinder, and resilient gripping rollers press the web against the outer surface of the impression cylinder to prevent relative slip between the web and the impression cylinder. Thus the impression cylinder of the first printing unit also serves as a means for precisely metering the web from the unwinding roll through the printing unit and through other units for performing successive operations on the web.

### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary and somewhat diagrammatic side elevational view of printing apparatus constructed in accordance with the invention;

FIG. 2 is an enlarged fragmentary and somewhat diagrammatic view of the first printing unit with the forward side frame broken away;

FIG. 3 is a fragmentary section taken generally on the line 3-3 of FIG. 2; and

FIG. 4 is a fragmentary section taken generally on the line 4-4 of FIG. 2.

### DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, the apparatus illustrated includes a base 10 which supports two lithographic offset printing press units 15 and 16 and one or more perforating units (not shown) for performing perforating, punching and/or slitting operations on a web W of material which is supplied from a roll R. The press unit 15 includes parallel spaced vertical side frames or plates 18 which are rigidly connected to the base 10 and to cor-

responding rearwardly extending side frames or plates 20 also supported by the base 10. A pair of rollers 22 (FIGS. 2 and 3) are mounted on each side plate 20 and form a cradle for a shaft 25 which supports the supply roll R of web material.

A grooved collar 26 (FIG. 3) is mounted on the forward end of the shaft 25 and receives a plate 27 mounted on a fixed guide rod 28 and a rotatable threaded shaft 29 connected to a handwheel 30. The rearward end of the shaft 25 includes a semicylindrical portion 32 which engages a correspondingly shaped shaft 34 of an electromagnetic brake 35 when the shaft 25 is moved laterally onto the rollers 22 or when the handwheel 30 is rotated to shift the shaft 25 axially. A cylindrical sleeve 36 is mounted on the shaft 34 and is shifted axially to form a coupling between the shaft 34 and the end portion 32 of the roll support shaft 25. A lever 38 is pivotally mounted on each side plate 20 and carries a roller 39 which cooperate with the adjacent rollers 22 to assure that the shaft 25 is retained in the position shown in FIGS. 2 and 3.

A cross shaft 45 is supported by the side plates 20, and a pair of arms 46 are rigidly secured to the shaft 45. The arms 46 extend rearwardly adjacent the side plates 20 and include hook-shaped end portions 47 which are adapted to engage the end portions of a shaft 25 extending through the roll R for lifting the roll to the position shown in FIGS. 1 and 2. The arms 46 are pivoted by a hydraulic cylinder 50 having a piston rod 51 connected to a lever 52 mounted on an end portion of the cross shaft 45 projecting from the rearward side plate 20. A bracket 54 is secured to the rearward side plate 20 and supports the cylinder 50 for pivotable movement.

The web W is directed from the supply roll R between a pair of guide rolls 58 and loops downwardly to extend around a dancer or web tension sensing roll 60 supported by a pair of arms 62 mounted on a cross-shaft 64 extending between the side plates 18 of the press unit 15. A dampening cylinder 65 (FIG. 3) is pivotally supported by the rearward side plate 18 and includes a piston rod 67 connected to an arm 68 (FIG. 3) mounted on the cross-shaft 64. A gear 70 is also mounted on the cross-shaft 64 and meshes with a pinion 72 mounted on a shaft extending from a controller 75 which operates the brake 35. An arm 76 is secured to the shaft 64 adjacent the forward side plate 18 and carries an adjustable weight member 77 which produces a predetermined torque on the shaft 64.

From the second guide roll 58, the web W extends downwardly to a guide roll 78 which is supported by the side plates 18 of the press unit 15. An impression cylinder 80 is supported by a shaft 82 which is supported by the side plates 18 and is connected to a drive 85. The impression cylinder 80 has a roughened or high friction outer surface 86 which is obtained by a sand blasting operation.

A printing or blanket cylinder 90 is located above the impression cylinder 80 and in nip relation with a plate cylinder 92. In a conventional manner, the blanket cylinder 90 has a diameter substantially the same as the diameter of the plate cylinder 92 which is inked by an inking and dampening system such as shown in the above patent. The impression cylinder 80, however, has a diameter which is substantially larger than the diameter of the blanket cylinder 90. Preferably, the diameter of the impression cylinder 80 is exactly twice the diameter of the blanket cylinder 90 so that the gears (not shown) which connect the shaft of the blanket cylinder 90 to the shaft 82 of the impression cylinder 80 have exactly a two to one ratio. This simplifies machining of the gears and assures that the blanket cylinder 90 will rotate precisely twice as fast as the impression cylinder 80 so that the surface speeds of each cylinder is the same.

Referring to FIG. 2, the web W is directed upwardly from the guide roll 78 and extends around or wraps the impression cylinder 80 by approximately 220° as determined by another guide roll 94. A pair of resilient gripping wheels or rollers 95 press the web W against the outer surface 86 of the impression cylinder 80 and cooperate with the substantial wrap of the web W around the impression cylinder 80, the constant tension in the web and the high friction outer surface 86 of the

impression cylinder to assure that there is no relative slip between the web and the impression cylinder.

Each roller 95 is supported by a pair of arms 96 which are mounted on a cross-shaft 98 supported by the side plates 18. A lever 100 is rigidly secured to one end portion of the cross-shaft 98 and engages a cam 102 eccentrically mounted on a shaft 104 which extends through the forward side plate 18. A hand lever 105 is mounted on the shaft 104 and provides for adjusting the pressure of the rollers 95 against the impression cylinder 80.

A pair of snubbing rods 110 are positioned on opposite sides of the web W below the impression cylinder 80 and are supported by a pair of brackets 112 mounted on aligned shafts 113 supported by the side plates 18. A hand lever 115 is mounted on the shaft 113 extending through the forward side plate 18 and provides for revolving the snubbing rods 110 to produce additional snubbing of the web W around the impression cylinder 80.

From the guide roll 94 on the offset printing unit 15, the web W extends to the second color printing unit 16 which is constructed substantially as shown in the above patent. That is, the printing unit 16 includes an impression cylinder 120 which has a diameter the same as that of the adjacent blanket cylinder 90 and substantially the same as the diameter of the plate cylinder 92.

From the drawings and the above description, it is apparent that apparatus constructed in accordance with the present invention provides desirable features and advantages. For example, by employing a relatively large diameter impression cylinder 80 within the first printing press unit 15 and by preventing relative slip between the web W and the outer surface 86 of the impression cylinder, the impression cylinder 80 also serves as a drum for precisely metering the web W at a predetermined constant rate from the supply roll R and through the printing units 15 and 16 and each perforating unit. That is, the high friction outer surface 86 of the impression cylinder 80, the substantial angle of wrap of the web W around the impression cylinder, preferably exceeding 200°, and the gripping rollers 95 cooperate with the substantially constant tension provided by the sensing roll 60, the controller 75 and the brake 35 to assure that the web W does not slip on the impression cylinder 80.

As mentioned above, preferably the impression cylinder 80 has a diameter exactly twice that of the blanket cylinder 90 so that the gear drive between the two cylinders can be precisely constructed to assure the same surface speed of each cylinder. However, it is within the scope of the invention to have other ratios between the blanket and impression cylinders, as for example, a 24 inch diameter blanket cylinder and a 36 inch diameter impression cylinder providing a 2:3 ratio. Another

feature of the invention is provided by the adjustable rods 110. That is, with a relatively heavy web, the rods 110 may be rotated to provide additional snubbing of the web around the impression cylinder 80 to assure that the web does not slip on the surface 86.

While the form of apparatus herein described constitutes a preferred embodiment of the invention, it is to be understood that the invention is not limited to this precise form of apparatus, and that changes may be made therein without departing from the scope of the invention.

What I claim is:

1. Apparatus for printing a web of paper, comprising means including a shaft for supporting a supply roll of the paper web, adjustable brake means connected to said shaft, a plurality of offset printing press units positioned in aligned spaced relation, each said printing press unit including an impression cylinder and a blanket cylinder positioned in nip relation, a plate cylinder positioned in nip relation with each said blanket cylinder, guide roll means for directly the web from said supply roll successively between said impression and blanket cylinders of each said printing unit, said impression cylinder of the first said printing unit receiving the web, having a diameter substantially larger than the diameter of the adjacent said blanket cylinder and also substantially larger than the diameter of said impression cylinder of each successive said press unit, said guide roll means effecting substantial wrap of the web around said impression cylinder of the first said printing unit, said impression cylinder of the first said printing unit further including a roughened high friction outer surface, means for sensing the tension of the web between said supply roll and said impression cylinder of the first said printing unit, means responsive to said sensing means for controlling said brake means to produce a substantially constant tension within the web fed to said impression cylinder of the first said printing unit, and means for driving said impression, blanket and plate cylinders of each said printing unit at a predetermined speed to effect precise metering of the web from the supply roll through said printing units in addition to printing of the web.

2. Apparatus as defined in claim 1 wherein the ratio between the blanket and impression cylinders of the first said press unit is 1:2.

3. Apparatus as defined in claim 1 wherein the ratio between the blanket and impression cylinders of the first said press unit is 2:3.

4. Apparatus as defined in claim 1 wherein the diameter of said impression cylinder of the first said press unit is twice the diameter of the adjacent said blanket cylinder, and said impression cylinder comprises a sandblasted said outer surface.

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