United States Patent [19]

Motter et al.

[11] **3,736,869**

[45] **June 5, 1973**

[54] **PRESSURE ROLLER DEVICE FOR A ROTOGRAVURE PRINTING PRESS**

[75] Inventors: **John C. Motter; John C. Motter, Jr.,** both of York, Pa.; **Louis A. Lachman,** Princess Anne, Md.

[73] Assignee: **John C. Motter Printing Press Co.,** York, Pa.

[22] Filed: **Mar. 16, 1971**

[21] Appl. No.: **124,832**

[52] **U.S. Cl.** .....**101/153,** 29/116 AD, 100/162 B, 100/170

[51] **Int. Cl.** **B41f 9/00**

[58] **Field of Search**.....101/153; 29/116 AD; 100/162 B, 155, 170

[56] **References Cited**

UNITED STATES PATENTS

3,272,122	9/1966	Behringer	101/153 X
3,119,324	1/1964	Justus	29/116 AD X
2,718,827	9/1955	Whittum	100/170 X
3,204,552	9/1965	Beachler et al.	100/170
3,266,414	8/1966	Wahlstrom et al.	100/170 X
3,557,689	1/1971	Teplitz	101/35
3,405,633	10/1968	Price, Jr. et al.	101/30 A UX
2,395,915	3/1946	Specht	100/162 B

FOREIGN PATENTS OR APPLICATIONS

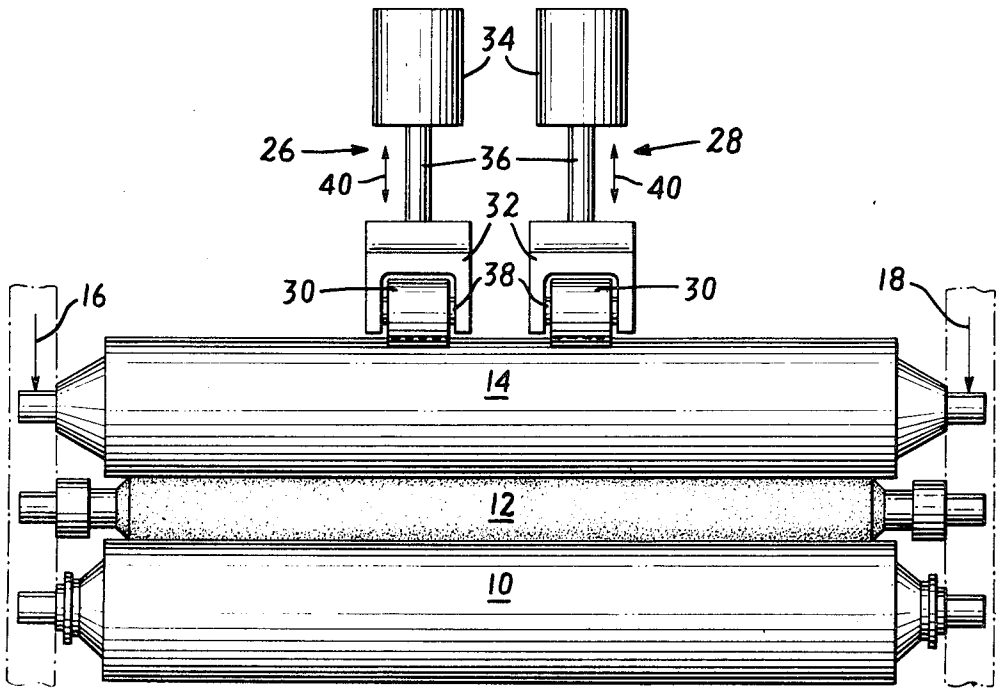
28,503	7/1914	Great Britain	101/153

Primary Examiner—Robert E. Pulfrey
Assistant Examiner—Clifford D. Crowder
Attorney—Brumbaugh, Graves, Donohue & Raymond

[57] **ABSTRACT**

Pressure roller device for equalizing the printing pressure in a rotogravure press. The press includes a printing cylinder, an impression roller and a back-up roller arranged in tangential relationship. It also includes common movable supports for the ends of the impression roller and back-up roller to maintain the impression roller and back-up roller in tangential relationship and to bring the impression roller into pressure engagement with the printing cylinder. At least one pressure roller device is provided, according to the present invention, for applying a force against the back-up roller intermediate the ends thereof in the direction of the impression roller and the printing cylinder. This force increases the uniformity of the pressure applied by the impression roller against the surface of the printing cylinder.

10 Claims, 5 Drawing Figures

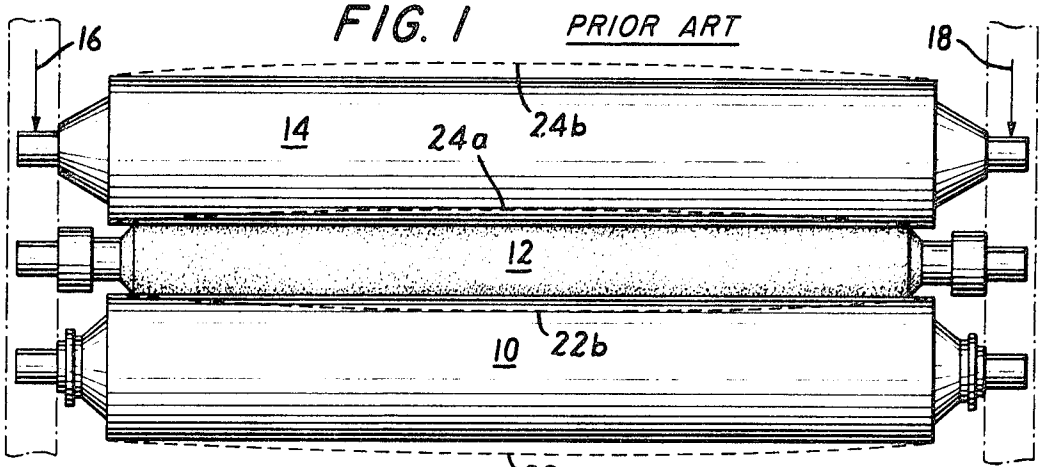


PATENTED JUN 5 1973

3,736,869

SHEET 1 OF 2

FIG. 1 PRIOR ART



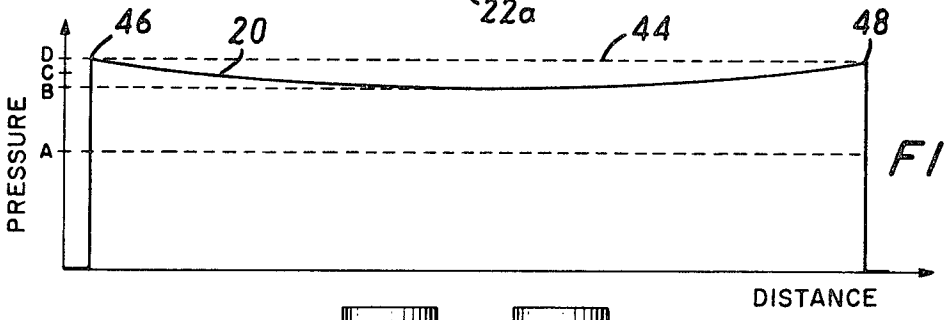


FIG. 2

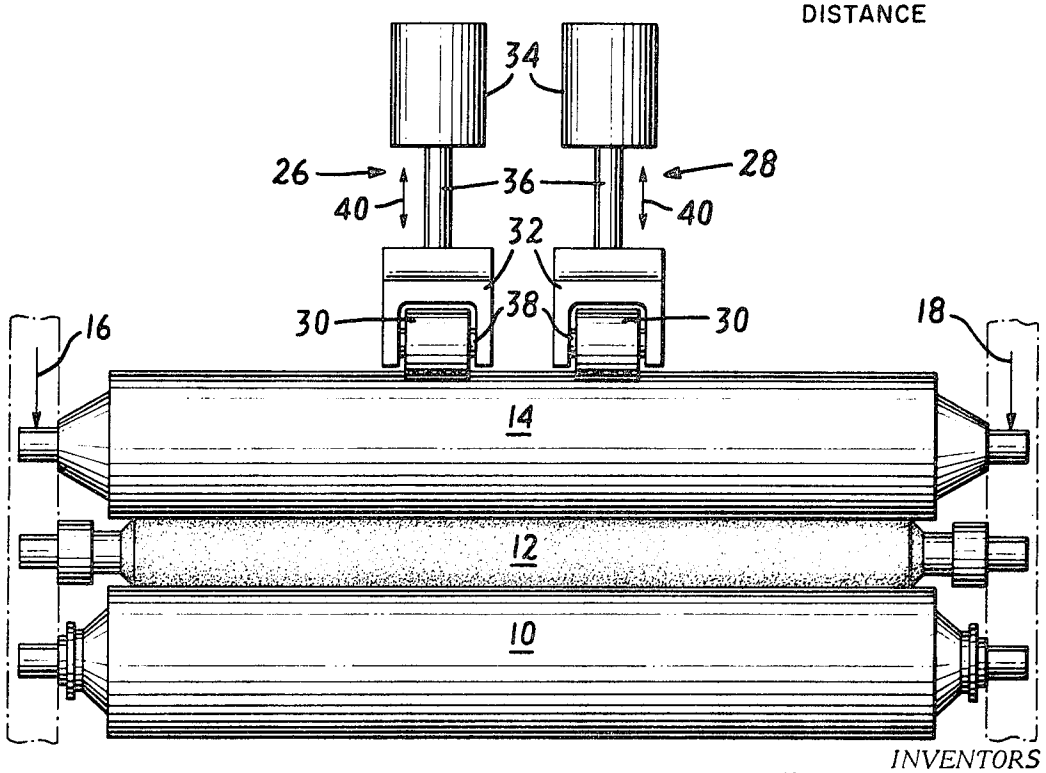


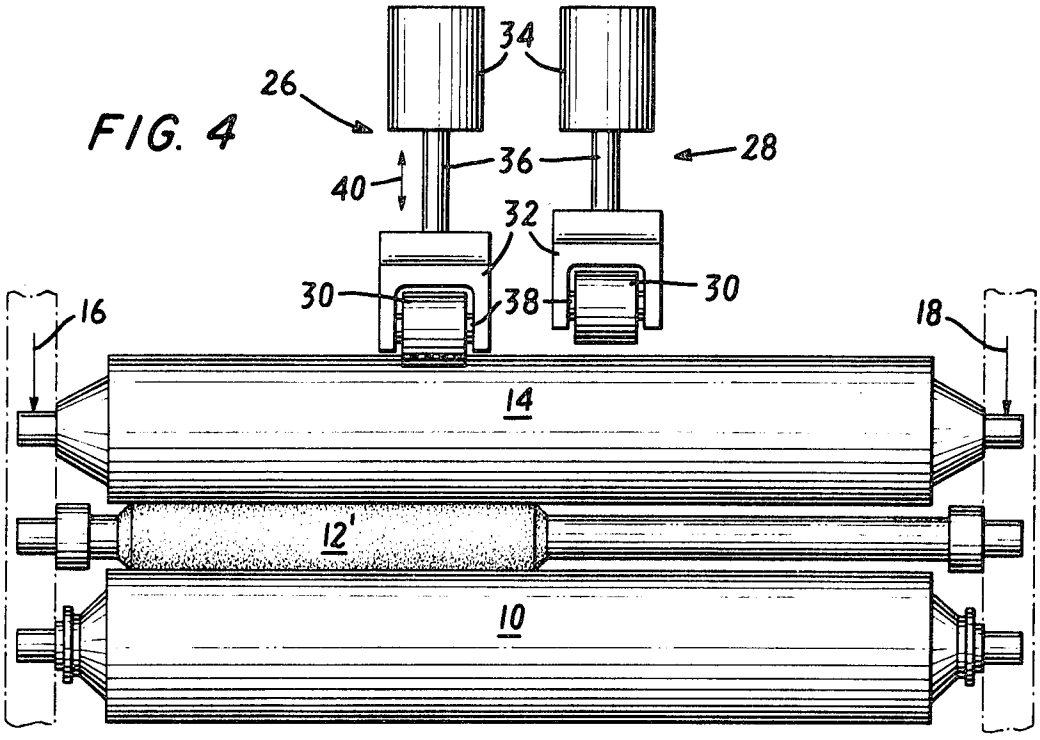
FIG. 3

INVENTORS
JOHN C. MOTTER,
JOHN C. MOTTER, JR. &
BY LOUIS A. LACHMAN

Brumbaugh, Graves, Donohue & Raymond

their ATTORNEYS

FIG. 4



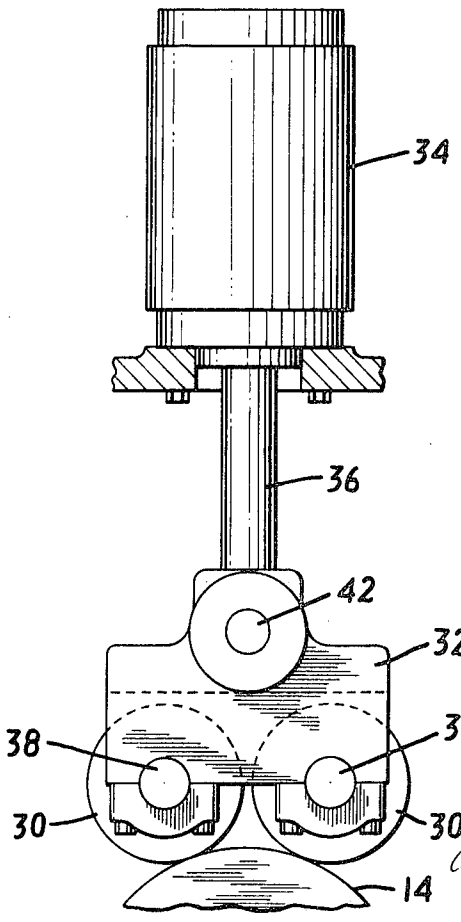


FIG. 5

INVENTORS.
JOHN C. MOTTER,
JOHN C. MOTTER, JR. &
BY LOUIS A. LACHMAN
Brumbaugh, Graves, Donohue & Raymond
their ATTORNEYS

PRESSURE ROLLER DEVICE FOR A ROTOGRAVURE PRINTING PRESS

BACKGROUND OF THE INVENTION

The present invention relates generally to rotogravure printing presses and, in particular, to a device for equalizing the printing pressure in a rotogravure press.

As illustrated in FIG. **1**, the conventional rotogravure press includes a vertical arrangement of three rollers: a printing cylinder **10** which carries an etched printing surface, an impression roller **12** having a rubber surface and a back-up roller **14** for the impression roller **12** which has a smooth surface of hard metal. When the printing press is in operation, the impression and back-up rollers **12** and **14**, respectively, press downward under the force of their own weight as well as the additional forces applied in the direction shown by the arrows **16** and **18** to the journals of the back-up roller. The pressure is transmitted to the printing cylinder **10** through a web to be printed which is sandwiched between the cylinder **10** and the impression roller **12.** This pressure, which is the "printing pressure" of the rotogravure press, must be accurately controlled to produce the desired printing quality. Due to the inherent nature of the system of rollers, however, accurate control and, in fact, uniformity of pressure is impossible to achieve.

FIG. **2** is a graph of the pressure applied by the impression roller **12** against the upper surface of the printing cylinder **10.** Indicated at A is the average level of the pressure produced by the combined weight of the impression roller **12** and the back-up roller **14.** Since these rollers are large, this weight produces considerable pressure of itself. Indicated at C is the average total pressure applied along the upper surface of the cylinder **10.** The pressure C is the sum of the pressure due to gravitational forces and due to the forces **16** and **18** applied at the journals of the back-up roller **14.**

As may be seen in FIG. **2,** the actual pressure **20** applied to the printing cylinder **10** is greatest at the outer extremities and falls to a minimum at the center of the cylinder. The relative difference between the height of the maxima, designated as D, and the minimum, designated as B, is exaggerated in the graph of FIG. **2**; nevertheless, this difference is sufficiently great to produce an imprint which is visibly darker at the edges of the web than at the center.

The chief reason for the reduction in pressure between the two maxima at the outer extremities of the printing cylinder **10** is that this cylinder as well as the rollers **12** and **14** are not completely rigid. In spite of the strength engendered by their size, the cylinder and rollers are caused by pressure to slightly bow in a direction which relieves the pressure at their central portions. As shown in FIG. **1,** the cylinder **10** bows downward under the weight of and force applied against the rollers immediately above. This bow is shown in greatly exaggerated fashion by the dashed lines **22***a* and **22***b*.

Likewise, the back-up roller **14** is caused to bow upward slightly by the upward force transmitted by the impression roller **12** as shown in greatly exaggerated fashion by the dashed lines **24***a* and **24***b*. This microscopic flexing of the printing cylinder **10** and the back-up roller **14** relieves the pressure at the central portion of the cylinder and produces the nonuniformity shown in the graph of FIG. **2.**

Various attempts have been made in the prior art to make the pressure uniform between the impression roller and the printing cylinder of a rotogravure press. One suggestion has been to align the impression roller **12** along an axis which makes a slight angle with the axis of the printing cylinder **10.** This arrangement increases the pressure at the center relative to the ends of the printing cylinder because the points of contact at the center are higher in the vertical plane than the points of contact at the outer extremities of the cylinder. Although this arrangement can theoretically solve the problem of equalizing the pressure, it requires extremely accurate positioning and alignment of the impression roller bearings. In addition, this arrangement is impractical in cases where the printing press is to be operated with less than a full length impression roller. When the rubber portion of the impression roller is less than the full width of the printing press, the pressure profile is considerably changed so that, if equalization is desired, it is necessary to change the position of the axis of the impression roller relative to the axis of the printing cylinder. This can only be accomplished by repositioning and aligning the bearings of the impression roller.

SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide apparatus for making the printing pressure uniform in a conventional rotogravure printing press.

This object, as well as other objects which will become apparent in the discussion that follows, is achieved, according to the present invention, by providing at least one pressure roller of less than the full length of the back-up roller for applying a downward force to the back-up roller between the two ends thereof. Because of the inherant flexibility of the back-up and impression rollers, this force will be transmitted through these rollers to the surface of the printing cylinder. By adjusting the force applied by the pressure roller or rollers it is possible to equalize the pressure along the entire upper surface of the printing cylinder.

According to a preferred embodiment of the present invention, two pressure roller units are positioned symmetrically about the center of the back-up roller. When a full length impression roller is used, the two pressure rollers can be operated in synchronism; when an impression roller of less than full length is used, one pressure roller may be adjusted to provide either all or at least a larger portion of the equalizing force.

Each pressure roller unit is preferably designed as a pair of rollers rotatably mounted on a common yoke. When this arrangement is in its operative position in contact with the back-up roller, it will maintain its position without application of lateral aligning forces.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is an elevational view of the printing cylinder, impression roller and back-up roller of a conventional rotogravure printing press.

FIG. **2** is a graph showing the printing pressure applied to the upper surface of the printing cylinder in the printing press of FIG. **1.**

FIG. **3** is an elevational view of a portion of a rotogravure printing press which includes two pressure roller units according to the preferred embodiment of the present invention.

FIG. 4 is a diagram showing the same apparatus illustrated in FIG. 3. In FIG. 3 the impression roller is of full length while in FIG. 4 the impression roller is of half length.

FIG. 5 is a side elevational view of a single pressure roller unit according to the preferred embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The preferred embodiment of the present invention will now be described with reference to FIGS. 3–5 of the drawings. Identical elements of the apparatus shown in FIGS. 3–5 and in FIG. 1 are designated by the same reference numerals.

FIG. 3 shows the conventional vertical arrangement of the printing cylinder **10**, impression roller **12** and the back-up roller **14** of a rotogravure press as discussed above in connection with FIG. **1**. In addition, the arrangement of FIG. 3 is provided with two pressure roller units **26** and **28** which are operative to apply a controlled downward pressure against the back-up roller **14**. Each of these units includes a pair of rollers **30**, a yoke **32** and a hydraulic or pneumatic cylinder arrangement **34**. The yoke **32** is connected to a piston within the cylinder **34** by means of a rod **36**. The rollers **30** are rotatably mounted in the yoke **32** on horizontal axles **38**.

The hydraulic or pneumatic cylinder **34** of each unit is operative to raise or lower the corresponding yoke **32** as indicated by the arrows **40**.

The cylinders **34** are supplied with hydraulic fluid or air at a pressure controlled by the printing press operator. At the choice of the operator, the fluid or air can be supplied to both the cylinders from a common line (thus operating the cylinders in synchronism) or from separate lines to permit individual control of each unit. In the latter instance, for example, one pressure roller unit may be employed to apply pressure while the other is raised completely off the back-up roller.

FIG. 4 illustrates the rotogravure press of FIG. 3 with the full length impression roller **12** replaced by a half length impression roller **12'**. With such a roller arrangement, which is used to print a web of correspondingly reduced width, the printing pressure is equalized by only one pressure roller unit **26**. The remaining roller unit **28** is not used during this printing operation and is thus raised out of the way. The effect of applying a downwardly acting force with the pressure roller unit **28** would be to apply a far greater pressure at the right hand end of the impression roller **12'** than at the left hand end.

FIG. 5 is a side elevational view of a pressure roller unit showing the pair of rollers **30** attached to the yoke **32** by means of the axles **38**. The yoke **32**, in turn, is attached to the connecting rod **36** by means of a pivot or pin **42**. Rotation of the piston within the cylinder **34** permits the connecting rod to rotate about its axis. The freedom of movement permitted by the pin **42** and the axial rotation of the connecting rod **36** allows the yoke **32** to find its own best position when a downward force is applied to the back-up roller **14**.

The rollers **30** of the pressure roller unit may be made entirely of steel. It may also be desirable to encase the rolling surfaces of the rollers **30** in rubber or a plastic material to prevent scratching or undue wear of the surface of the back-up roller **14**.

During operation of the printing press the pressure roller units are effective to increase the printing pressure at the center of the printing cylinder to a value equal to the pressure at the cylinder extremities. More particularly, these units function to equalize the pressure along the entire length of the printing cylinder so that the pressure versus distance graph will follow the dashed line **44** at pressure D between points **46** and **48** on the graph of FIG. **2**. Since the average pressure is then made equal to the pressure applied at the extremities of the printing cylinder, the pressure at these extremities (as well as at the center of the cylinder) may be reduced somewhat to the optimum printing pressure of the press.

In operation, the printing pressure is controlled by the pressman with the aid of loading guages on the usual loading devices which apply the forces **16** and **18** to the journals of the back-up roller **14**. The pressure applied by the pressure roller units may likewise be conveniently controlled with the aid of pressure guages on the hydraulic fluid or air lines serving the cylinders **34**.

It will be understood that the present invention is susceptible to various modifications, changes and adaptations as will occur to those skilled in the art. For example, the number of pressure roller units is not limited to two. It is possible to provide but a single pressure roller unit or to distribute three or more pressure roller units along the back-up roller **14**. In addition, the pressure roller unit need not be provided with two rollers **30** as illustrated in FIG. **5**. It is possible, rather, to construct the roller unit with but a single pressure roller or with three or more pressure rollers arranged on floating bearings.

It is therefore intended that the scope of the present invention be limited only by the following claims or their equivalents.

We claim:

1. A rotogravure press comprising a rotatable printing cylinder, means for supporting the printing cylinder at both ends, a rotatable impression roller, a rotatable back-up roller, common movable supports for the ends of the impression roller and back-up roller to carry the impression roller and back-up roller in tangential relationship and means for applying a force against the ends of the back-up roller in a direction such that the impression roller is brought into pressure engagement with the printing cylinder, the build-up of pressure between the surfaces of the impression roller and the printing cylinder being greater at the ends thereof than at a point midway between the ends, wherein the improvement comprises at least one pressure roller means, arranged adjacent to and substantially midway between the ends of said back-up roller on the side thereof which is opposite said impression roller, for applying a force against said back-up roller substantially midway between the ends thereof, to bow said back-up roller intermediate the ends thereof in the direction of said impression roller to increase the uniformity of the pressure applied by said impression roller against said surface of said printing cylinder.

2. The press defined in claim **1**, having two pressure roller means arranged adjacent to said back-up roller on the side thereof which is opposite said impression roller.

3. The press defined in claim **2**, wherein each of said two pressure roller means is arranged adjacent to said

back-up roller between one end and the center thereof, said two pressure roller means being equidistant from but on opposite sides of said center.

4. The press defined in claim **1,** wherein said pressure roller means includes at least one roller which is substantially shorter in length than said back-up roller.

5. The press defined in claim **1,** wherein each of said pressure roller means includes:

a. a yoke;

b. two rollers rotatably mounted on said yoke with their axes in parallel; and

c. means for applying a force against said yoke to press said rollers against said back-up roller.

6. The press defined in claim **4,** wherein said force applying means is hydraulically actuated.

7. The press defined in claim **4,** wherein said force applying means is pneumatically actuated.

8. The press defined in claim **5,** wherein said force applying means includes a cylinder rigidly mounted on said press; a piston, arranged within said cylinder and means connecting said piston to said yoke.

9. The press defined in claim **8,** wherein said connecting means is attached to said yoke by means of a pivot which extends parallel to said axes of said two rollers and transverse to the longitudinal axis of said connecting means.

10. The press defined in claim **8,** wherein said connecting means is rotatable about its longitudinal axis.

* * * * *