

April 27, 1954

G. KANITZ

2,676,537

INTAGLIO PRINTING MACHINE

Filed Oct. 20, 1950

2 Sheets-Sheet 1

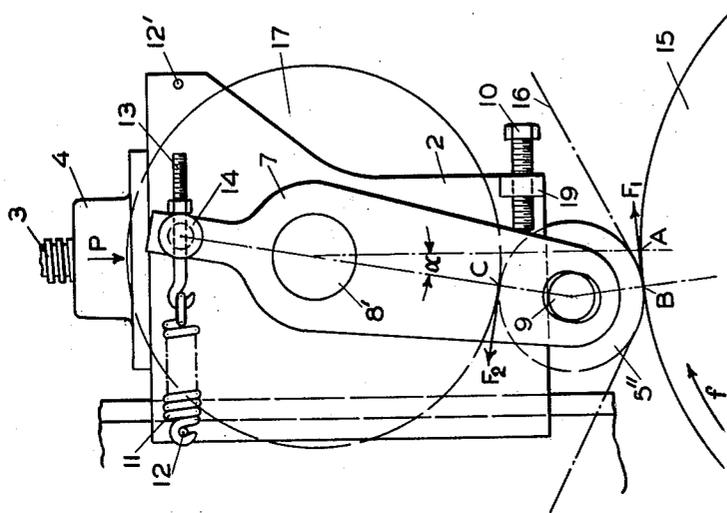


Fig. 2

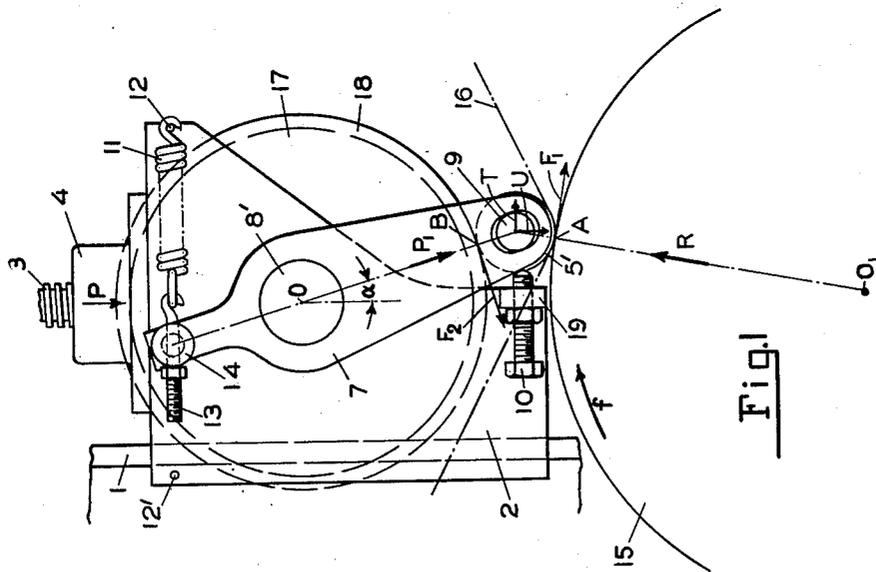


Fig. 1

INVENTOR.
GEORGES KANITZ

BY

Dezso Steinkamp
Attorney

April 27, 1954

G. KANITZ

2,676,537

INTAGLIO PRINTING MACHINE

Filed Oct. 20, 1950

2 Sheets-Sheet 2

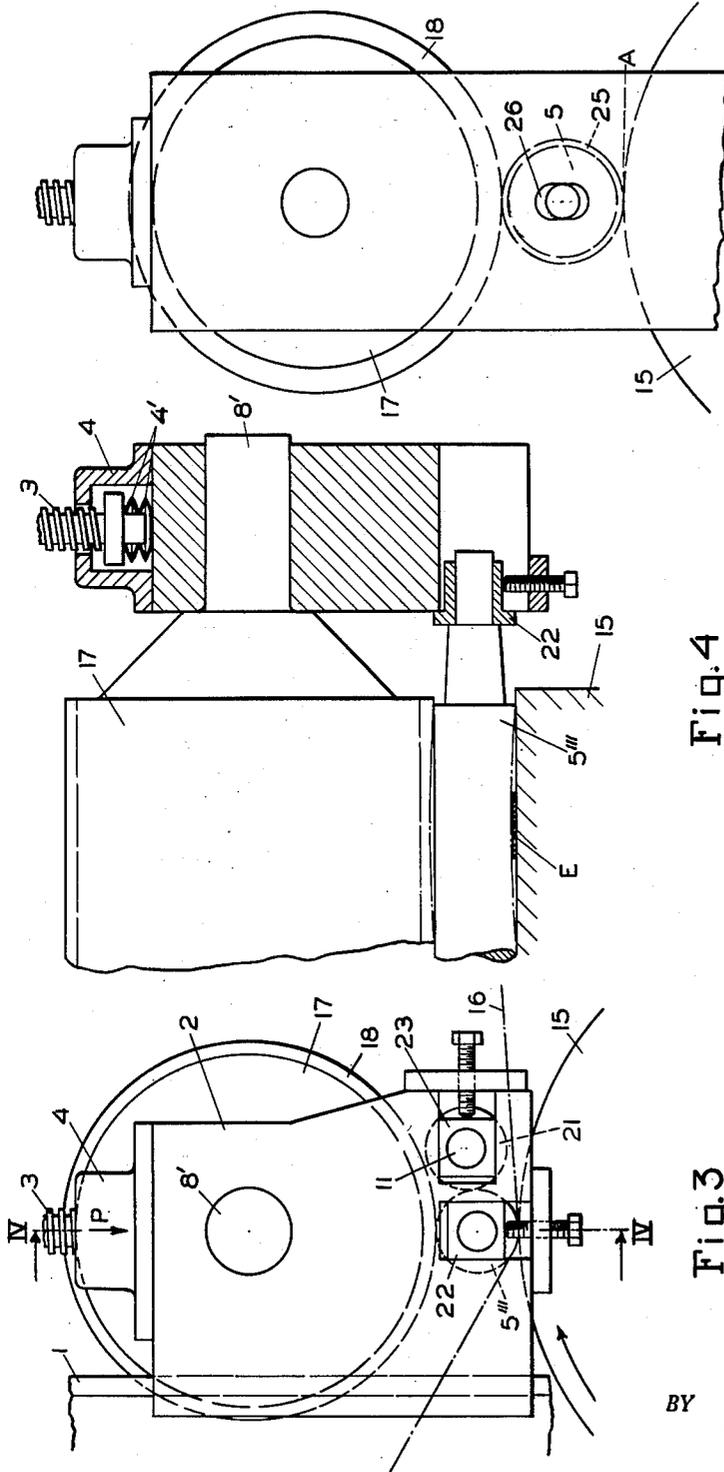


Fig. 4

Fig. 3

Fig. 5

INVENTOR.
GEORGES KANITZ
BY *Dezso Steinherz*
Attorney

UNITED STATES PATENT OFFICE

2,676,537

INTAGLIO PRINTING MACHINE

Georges Kanitz, Caracas, Venezuela

Application October 20, 1950, Serial No. 191,226

10 Claims. (Cl. 101—153)

1

This invention relates to new and improved printing presses and has particular relation to printing presses, in which the material to be printed, for example paper, is passed between a rotating metallic cylindrical printing form and a pressure roller, such as copper plate printing machines or presses.

Various attempts have been hitherto made in order to improve operation of the copper plate printing machines by increasing the hardness of the surface layer of the pressure rollers used. Such increased hardness has the effect of a reduced flattening of the pressure roller at its contact with the cylindrical printing form or gravure cylinder under a predetermined pressure and a corresponding reduction of the area of contact between the gravure cylinder and the pressure roller. This reduction of the contact area results in a corresponding increase of the surface pressure on the paper or other material to be printed, which is passed between the gravure cylinder and the pressure roller. Therefore, the ink will be deposited more vigorously and this results in a smoother print under which the structure of the paper is not visible.

The above suggestion has not been adopted up to date in certain printing press types, particularly presses for printing on paper in reels by means of continuously acting cylinders. The reason is that owing to a rupture of the reel or formation of a fold in the paper to be printed, in such machines several superposed layers may be caused to pass between the gravure cylinder and pressure roll, and in such a case a considerably increased pressure at the contact surface and pressure roller may occur, which may cause caving of the gravure cylinder and the pressure roller, if the surface of the latter is not flexible enough for yielding to the passage of layers of increased thickness and thus absorbing the occurring excess pressure.

In view of the above difficulties it was suggested to use pressure rollers provided with an elastic surface layer, consisting, for example, of sufficiently elastic rubber, but practical experience has shown that the use of such rollers results in two considerable disadvantages:

(1) In the use of elastic pressure rollers capable of avoiding accidents caused by the above mentioned reasons, a substantial flattening of the pressure roller at the contact point with the gravure cylinder occurs by local deformation, under the action of the pressure applied to said roller. If this pressure is increased, flattening of the elastic surface layer of the pressure roller is also increased, thus preventing substantial increase of the surface pressure, which is indispensable for improving the quality of print. Therefore, the use of such elastic pressure rollers does not improve the quality of print beyond certain limits and, moreover, it requires the use of an extremely strong framework for the machine, as the framework is subjected to rather high stresses.

2

(2) The elastic deformation, to which the surface layer of the pressure roll is subjected in each and every rotation, causes excessive heating and often even bursting of said layer.

The main object of my present invention is to improve printing presses of the above mentioned type, by overcoming the difficulties described above.

Accordingly, it is a primary object of my invention to provide an improved printing press or machine of the beforementioned type, comprising a counter-pressure roller having an elastic resilient surface layer and used in combination with a pressure roller having a hard surface layer.

Another object of my invention consists in mounting the pressure roll in such manner that it can automatically deviate from its contact with the metallic cylindrical printing form or gravure cylinder at the moment when a paper layer of increased thickness or some foreign matter adhering to the paper or other material to be printed, passes between the pressure roller and the gravure cylinder, and can automatically return to normal position after the passage of said material of increased thickness or said foreign matter.

Other objects and the advantages of my invention will be apparent from the appended claims and drawings and the following specification which describes by way of example and without limitation some embodiments of my invention.

In carrying out my invention, I use pressure rollers, consisting of hard material and/or having a hard surface layer and having a cross-section substantially incapable of plastic deformation.

An essential characteristic of my invention consists in that the movement of displacing the pressure roller is not opposed to the action of pressure acting on the bearings of the pressure roller and this results in bringing about the desired movement without substantially increasing the reaction at the respective point. This principle is clearly opposed to the principles on which the hitherto used devices are based. In several of said known devices, the bearings of the pressure roll are connected by springs to the driving mechanism in such manner that said bearings may slide in a direction opposite to that of pressure, under the effect of a substantial reaction. However, this movement is opposed by the resistance of springs which are already under compression by the effect of pressure. Likewise, in the use of counter-pressure rolls, free sliding of the bearings of the pressure roll in vertical direction is rendered theoretically possible by the mechanism employed, but this movement cannot take place in the use of pressure rolls, which are not capable of deformation, without displacement of the counter-pressure roller proper, which has to take up all of the pressure. Thus, the known devices operate in a manner completely

different from that of my present invention and all the above mentioned difficulties occur in their use.

In the arrangement according to the present invention, the device which brings about displacement of the pressure roller during the passage of paper or the like of increased thickness or the passage of foreign matter, may be operated by external means, but I prefer to utilize the reaction caused by the passage of foreign matter or by increased thickness of the material to be printed, for progressively bringing about displacement of the pressure roll, without substantial increase of surface pressure at the point of printing.

According to another feature of my invention, in devices provided with a counter-pressure roll, in which the pressure roll is mounted in such manner that it is capable to deviate from the printing form, quality of printing can be improved by using a pressure roll of as small diameter as possible and considerably increasing adherence between the pressure roll and counter-pressure roll. As in this arrangement, the pressure roll is displaced with regard to the direction of pressure, the effect of friction occurring between the counter-pressure roll and the pressure roll, pushes the latter and wedges it between the gravure cylinder and the counter-pressure roll, without causing bending of the axis of the pressure roll, in the direction of pressure or the direction of rotation.

In order to facilitate deviation of the hard and non-compressible pressure roll from the gravure cylinder during passage of foreign matter or increased thickness of the material to be printed and to avoid abnormally strong reaction on the contact surface, the counter-pressure roll is provided with a soft, elastic surface layer. The use of such surface layer on the counter-pressure roller does not cause any increase of the area of contact between the gravure cylinder and hard pressure roll, but permits instantaneous displacement of the pressure roll, in the direction of the counter-pressure roll without displacement of the bearings. In this movement, the pressure roll has to overcome only the resistance of the above mentioned soft, elastic surface layer of the counter-pressure roll.

According to an embodiment of my invention, the counter-pressure roll provided with an elastic, soft surface layer is used in combination with a pressure roller of very small diameter, which is flexible in longitudinal or axial direction, but has a substantially non-compressible cross-section. Such pressure roller may consist for example of a tubular cylindrical, thin-walled body. Such tubular body may undergo deformation in axial direction. It may also undergo, local longitudinal deformation under the action of strong forces. Such longitudinal deformations of the pressure roller are absorbed by the elastic surface layer of the counter-pressure roller.

Mounting of the pressure roll on a device permitting deviation of the pressure roll from the cylindrical printing form or gravure cylinder (for example mounting of the pressure roll on pivotally supported arms or levers), the use of a counter-pressure roller having a high friction coefficient, use of a counter-pressure roll provided with an elastic surface layer and the use of a pressure roller which is flexible in longitudinal direction, but has a substantially non-deformable cross-section, may be used in various combinations in carrying out my invention.

In the appended drawings

Figure 1 is the side elevation of a part of a device according to my invention, comprising a pressure roller and a counter-pressure roller;

Figure 2 illustrates an embodiment similar to that shown in Figure 1, likewise in side elevation;

Figures 3 and 4 illustrate another modification in front elevation and in section along line IV—IV of Figure 3, and

Figure 5 diagrammatically illustrates a further modification of my invention.

In the embodiment shown in Figures 1-2, the pressure roller is mounted on an arm or lever capable of oscillating around an axis in order to permit displacement of the pressure roller during the passage of foreign matter or a layer of excess thickness of the material to be printed.

In the embodiment shown in Figure 1, bearings 2 glide on slide bars 1 of the frame. Pressure is exerted in conventional manner by a mechanism comprising screw 3, which acts in the direction of arrow P by compressing springs 4' housed by box 4 (see Figure 4). Springs 4' transmit the pressure to bearings 2.

According to my invention, pressure roller 5', which has a surface layer of hard material, is mounted on a pair of arms or levers 7, provided at their upper part with pivots 8', by means of which they are jointed around axis 8' of counter-pressure roll 17, but these arms could be jointed also at other convenient points of the bearings. Only one lever and bearing is shown in the drawings. Pressure roller 5' contains pivots 9, by means of which it is carried by the bearings provided in the lower end part of arms 7. A stop screw 10 serves for adjusting the angular position of arms 7. The latter are under the action of springs 11, one end of which is fastened at 12, while their other end contains means 13 for adjusting tension. The other end of springs 11 is attached at 14 to the upper end of arms 7.

Counter-pressure roller 17 is provided with a cylindrical surface layer 18 consisting of elastic rubber, in contrast to known printing presses, in which the counter-pressure roller consists entirely of hard material, such as metal and serves only for enabling the pressure roller to resist flexion. The elastic cylindrical surface layer 18 according to my invention has two objects: first, to provide a greater friction coefficient at B (i. e. the contact point between the pressure roller and counter-pressure roller) than at A (i. e. the contact point between the pressure roller and the gravure cylinder); second, owing to the presence of said surface layer, the counter pressure roller can yield to pressure exerted thereon by the pressure roller, particularly in the case of a very strong reaction at B in Figure 2 and at A in Figure 1.

Pressure roller 5' is applied in conventional manner by the above described pressing mechanism and by counter-pressure roller 17, against cylindrical printing form or gravure cylinder 15, and the paper to be printed passes between said cylinder 15 and pressure roller 5'.

Owing to the fact that the surface layer of pressure roller 5' consists of a hard material, this layer does not show any substantial flattening at the point of its contact with printing form or gravure cylinder 15 under the action of pressure on the pressure roll.

In the embodiments illustrated in Figures 1 and 2, respectively, a pressure roller of small diameter is used in combination with a counter-pressure roller of substantially larger diameter.

The latter can be put under pressure applied to its journal without flexion of its axis.

The surface layer of pressure rollers 5' and 5'', shown in Figures 1 and 2, respectively, is made of preferably very hard material. Due to the small diameter of these press rollers, the contact area between the latter and cylindrical printing surface 15 is rather small.

In operating the device shown in Figure 1, the pressure roller being pressed by press mechanism 3 and counter-pressure roller 17 toward printing form or gravure cylinder 15 driven in the direction of arrow *f*, contact point A will not be in the line OO₁ along which pressure P is exerted. The latter, which is transmitted by lever 17 and becomes P₁, and determines the pressure actually exerted at A, will be decomposed into a radially acting force U and a tangential force T which tends to cause arms 7 to pivot. This tangential force is opposed by the friction which is proportional to U and depends on the friction coefficient between the printing form and press roller. As long as the angle α of displacement of the arms is small enough, the tangential component remains inferior to the effect of friction and any vertical force P will not cause pivoting of arms 7. But if said angle α is increased by the action of screw 10, a moment will arrive when the tangential force will be superior to the effect of friction and will, therefore, cause pivoting of arms 7. Spring 11 must be tightened. In accordance with the tension produced, the system will be at equilibrium at a predetermined pressure and lower pressure. A maximum pressure will correspond to each value of spring tension. If this maximum limit is exceeded, the tangential component becomes again preponderant and causes pivoting of arms 7.

In the embodiment shown in Figure 1, displacement of arms 7 and pressure roll 5' take place in the direction of rotation of cylinder 15 indicated by arrow *j*, while in the embodiment shown in Figure 2, arms 7 and pressure roll 5'' are displaced in a direction opposite to the direction of rotation of cylinder 15, indicated by arrow *f*.

In operating a device according to Figure 1, paper supplied from the reel (not shown) is introduced between pressure roller 5' and metallic cylindrical printing form 15 and ink is supplied to the latter. Springs 11 are then progressively tensioned until sufficient pressure is produced for obtaining satisfactory printing. Owing to the hard surface of pressure roll 5', this can be attained more easily than in the known printing machines. Springs 11 preferably contain a great number of spires so that a relatively small variation of the length does not cause a substantial change of tension. Operation of the device shown in Figure 2 is substantially similar to that of the device of Figure 1.

According to my invention, pressure roll 5' has preferably a very small diameter and is flexible in longitudinal, axial direction. This results in an additional advantage explained in detail further below.

During operation of the devices illustrated in Figures 1 and 2, owing to the adherence of the contacting surfaces of pressure roll 5' or 5'' and counter-pressure roll 17, the tangential force F₂ at said contact points, is superior to friction force F₁ occurring at A. As a consequence of this, pressure roll 5' is wedged between counter-pressure roll 17 and metallic cylindrical printing form 15. Therefore, the pressure roll can-

not yield in the direction of rotation of cylinder 15.

The device can be adapted to a change of the direction of rotation of the machine. In order to attain this, support 19 of stop screw 10 is arranged in the vertical axis, and pivot 14 of spring 11 is adjustable, on the other hand, said spring can be hooked in at 12' symmetrically with regard to the position shown in the drawing.

If, during printing, foreign matter of greater thickness than that of the paper, happens to pass between the pressure roller and the metallic cylindrical printing form in the above described devices, the amount of reaction R (see Figure 1) increases at the same time as the tangential component of the force, under the action of which spring 11 yields, is being adjusted to an equilibrium at a smaller force. The result is a progressive removal of the pressure roll by pivoting of the supporting arms, without substantially increasing the reaction at the point of increased thickness. Removal of the noncompressible pressure roll is in any case secured by means which do not cause displacement of bearings 2, on which the pressing force P acts. Therefore, said removal is delayed neither by inertia, nor resistance of the bearings.

Figures 3 and 4 show another embodiment of a device according to my invention, in which removal of the noncompressible pressure roll is secured. In this device too, any simultaneous displacement of the bearings, on which the pressure is exerted, is prevented. The counter-pressure roller is provided with a surface layer 18 of elastic rubber. Pressure roller 5''' is preferably rather flexible in longitudinal direction, but has a substantially not compressible cross-section. In the embodiment shown, the pressure roller is placed in the same axis as force P. Pressure roller 5''' is sustained by counter-pressure roller 17, which prevents the pressure roller from being bent by pressure and by auxiliary counter-pressure roller 21. Bearings 22 and 23 are adjustable.

As best shown in Figure 4, if foreign matter E, or material of increased thickness, happens to pass between pressure roll 5''' and cylinder 15, said pressure roll is bent in longitudinal direction, without deformation of its cross-section; this flexion is absorbed by the soft surface layer 18 of counter-pressure roll 17. Therefore, the foreign matter may pass between cylinder 15 and the non-compressible pressure roller 5''' without substantial increase of the pressure at E.

In the embodiment diagrammatically illustrated in Figure 5, 15 indicates the cylindrical printing form or gravure cylinder. 5 is the pressure roller provided with a hard surface layer 25 and 17 denotes the counter-pressure roller 17 provided with an elastic surface layer 18. The bearing of pressure roller 5 is displaceable in slot 26 and pressure roller 5 can yield to strong pressure caused by material of excess thickness at A.

In carrying out my invention, I use a hard pressure roller in combination with a counter-pressure roller provided with an elastic surface layer. But I have found that the use of pivotally arranged arms of the type described above has the useful and beneficial effect of causing under the above described conditions deviation from its normal position of a pressure roller used in the absence of a counter-pressure roller.

It will be understood by those skilled in the art that my present invention is not limited to the specific details described above and illustrated

in the drawings and can be carried out with various modifications. For example, the pressure roller may be hard throughout or may have a hard surface layer only, and the latter may consist of various materials, such as metal or hard plastic. Instead of the two-armed levers, one-arm levers may be used. Furthermore, the diameter of the pressure roller may vary. I prefer to use a pressure-roller and a counter-pressure roller, the diameter of which correspond to the proportion of 1:2 to 5. These and other modifications may be made without departing from the scope of the invention as defined in the appended claims.

The term "copper plate printing machine or press" is used in the present specification and claims to denote a printing press in which a metallic, preferably copper cylinder, on which the design to be printed is engraved, is used for printing said design on the material to be printed. Such printing presses are also known in the art under the name "gravure printing press."

What I claim is:

1. In a copper plate printing machine or press, in combination a rotary metallic cylindrical printing form, a substantially non-compressible cylindrical pressure roller capable of rotating in contact with said printing form, a counter-pressure roller capable of rotating in contact with said pressure roller, said counter-pressure roller having an elastic surface layer adapted to yield pressure exerted by the pressure roller.

2. In a copper plate printing machine or press, in combination a rotary metallic cylindrical printing form, a substantially non-compressible cylindrical pressure roller capable of rotating in contact with said printing form, a counter-pressure roller capable of rotating in contact with said pressure roller, and bearings supporting the device, said counter-pressure roller having an elastic surface layer adapted to yield to pressure exerted by the pressure roller, without substantial displacement of the bearings supporting the device.

3. In a copper plate printing machine, in combination a rotary metallic cylindrical printing form, a substantially non-compressible cylindrical pressure roller capable of rotating in contact with said printing form, a counter-pressure roller capable of rotating in contact with said pressure roller, said counter-pressure roller having an elastic surface layer adapted to yield to pressure exerted by the pressure roller, a pair of pivotally arranged two-armed levers carrying in one of their ends the ends of the pressure roller, spring means acting on one arm of the levers, for urging the pressure roller toward a position of contact with the printing form and the counter-pressure roller, and means for limiting displacement by said spring action of the other arm of the lever.

4. In a copper plate printing machine, in combination a rotary metallic cylindrical printing form, a substantially non-compressible cylindrical pressure roller capable of rotating in contact with said printing form, a counter-pressure roller capable of rotating in contact with said pressure roller, and bearings supporting these elements of the machine, said counter-pressure roller having an elastic surface layer adapted to yield to pressure exerted by the pressure roller, without substantial displacement of the supporting bearings, a pair of pivotally arranged two-armed levers carrying in one of their ends the ends of the pressure roller, spring means acting on one

arm of the levers, for urging the pressure roller toward a position of contact with the printing form and the counter-pressure roller, and means for limiting displacement by said spring action of the other arm of the lever.

5. A copper plate printing machine of the type claimed in claim 2, in which the diameter of the pressure roller amounts only to a fraction of the diameter of the counter-pressure roller.

6. A copper plate printing machine of the type claimed in claim 4, in which the pressure roller consists of a thin-walled, cylindrical, tubular body of substantially non-compressible cross-section.

7. A copper plate printing machine of the type claimed in claim 4, in which the pressure roller consists of a thin-walled, cylindrical tubular body of substantially non-compressible cross-section, the diameter of which amounts only to a fraction of the diameter of the counter-pressure roller.

8. In a copper plate printing machine, in combination a rotary metallic cylindrical printing form, a substantially non-compressible cylindrical pressure roller capable of rotating in contact with said printing form in a bearing capable of a limited movement to and from the printing form, a counter-pressure roller capable of rotating in contact with said pressure roller, and bearings supporting these elements of the machine, said counter-pressure roller having an elastic surface layer adapted to yield to pressure exerted by the pressure roller, without substantial displacement of the supporting bearings.

9. In a copper plate printing machine, in combination a rotary metallic cylindrical printing form, a substantially non-compressible cylindrical pressure roller capable of rotating in contact with said printing form, a counter-pressure roller capable of rotating in contact with said pressure roller, a pair of pivotally arranged two-armed levers carrying in one of their ends the ends of the pressure roller, spring means acting on one arm of the levers, for urging the pressure roller toward a position of contact with the printing form and the counter-pressure roller, and means for limiting displacement by said spring action, of the other arm of the lever.

10. In a copper plate printing machine, in combination a rotary metallic cylindrical printing form, a substantially non-compressible cylindrical pressure roller capable of rotating in contact with said printing form, a counter-pressure roller capable of rotating in contact with said pressure roller, a pair of pivotally arranged levers carrying in one of their ends the ends of the pressure roller, spring means acting on the levers, for urging the pressure roller toward a position of contact with the printing form and the counter-pressure roller, and means for limiting displacement by said spring action of the levers.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,581,151	Yetter	Apr. 20, 1926
2,188,148	Harless	Jan. 23, 1940
2,207,785	Crafts	July 16, 1940
2,270,374	Kanitz	Jan. 20, 1942

FOREIGN PATENTS

Number	Country	Date
368,610	Great Britain	Mar. 10, 1932