FIG. 1

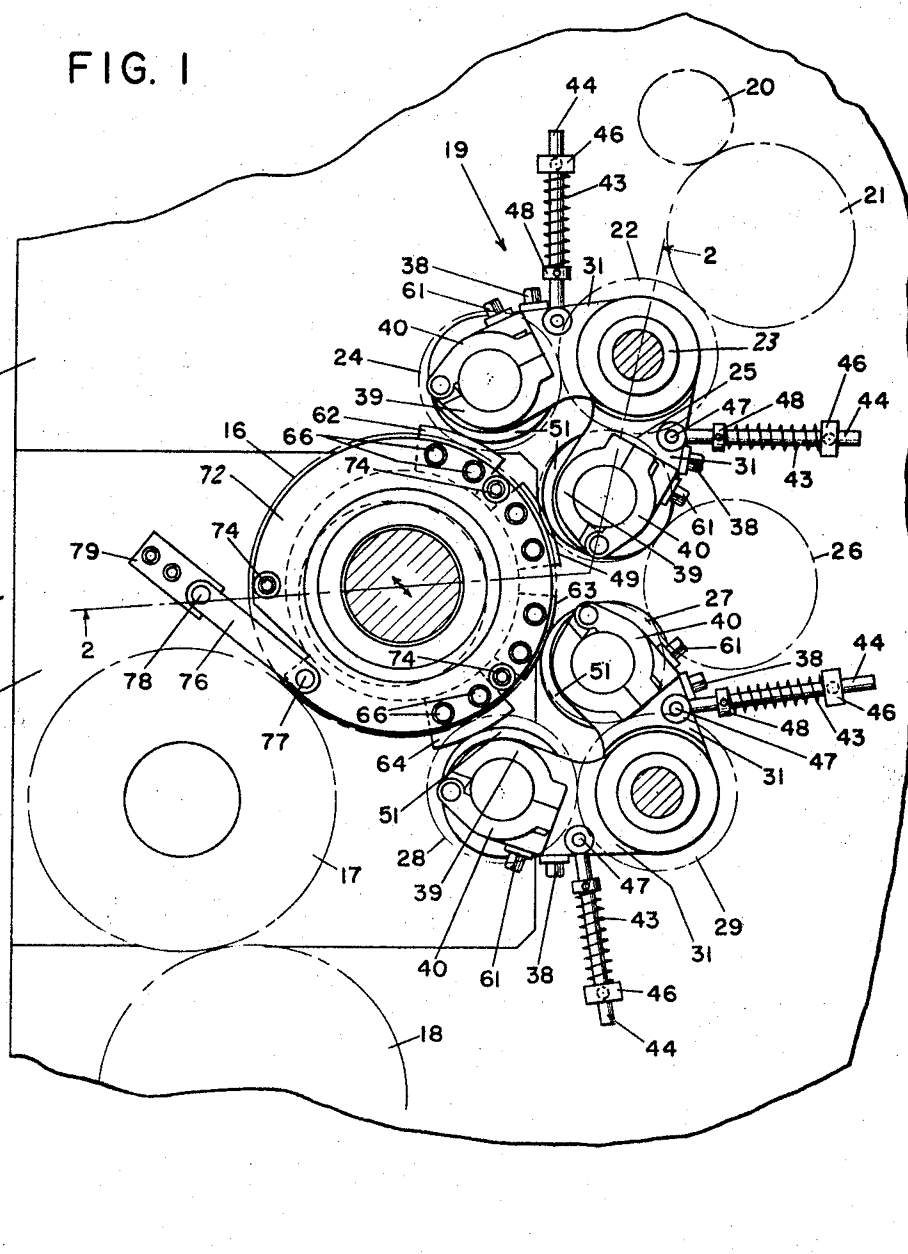

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FIG. 3

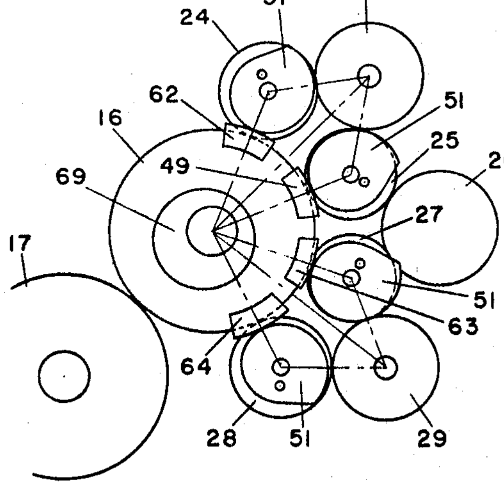


FIG. 4

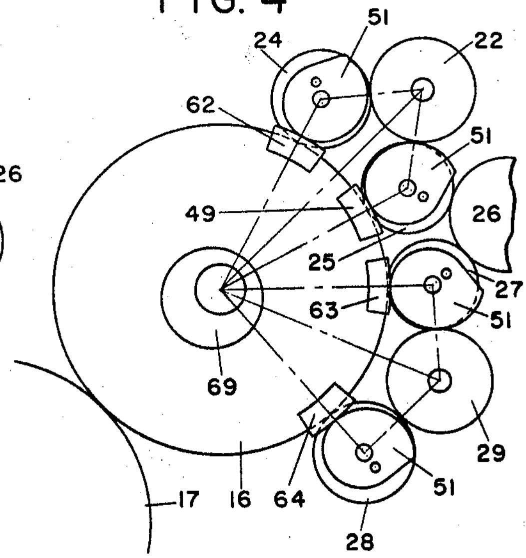
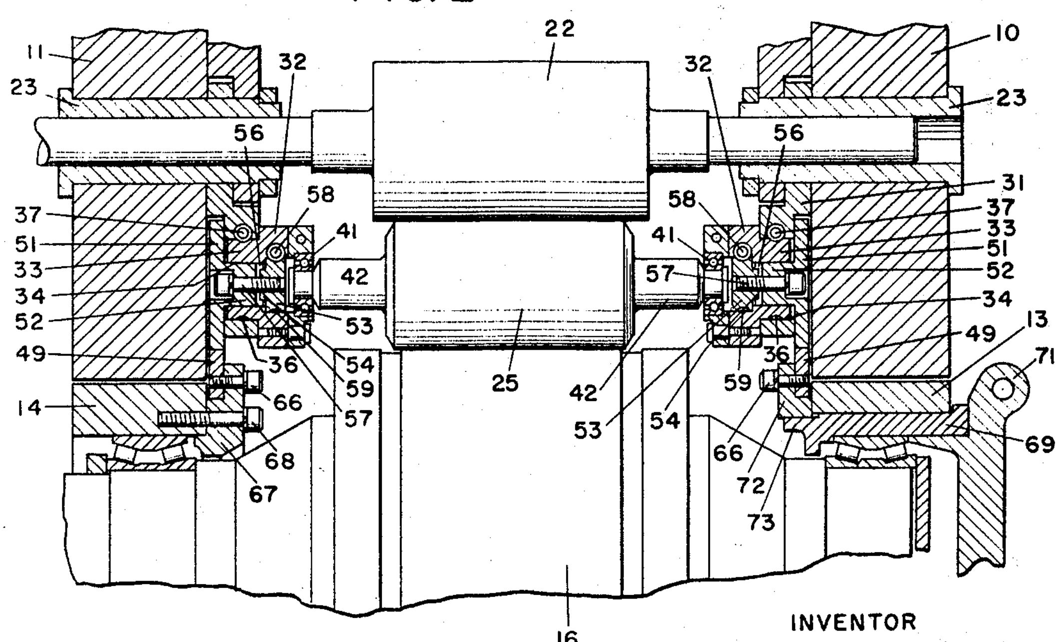


FIG. 2



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FORM ROLLER SETTING AND CONTROL MEANS

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ABSTRACT OF THE DISCLOSURE

The invention is directed to the use of a spiral shaped disc and a relatively fixed coacting stop for controlling the pressure between a resiliently biased form roller and a plate cylinder. The disc is mounted coaxially with the form roller and is formed on a radius which is a linear function of the angular displacement of the contact point thereof with the coacting stop which characteristic permits predetermining the position of the stop for any size, interchangeable plate cylinder of a variable cutoff web, press.

This invention pertains to the inking and/or dampening mechanisms for printing presses. It is directed more specifically to improved means for adjusting and controlling the form inking and dampening rollers, particularly in a variable cutoff web press, and which readily accommodates changes in plate cylinder diameters and skewing of the plate cylinders without requiring manual readjustment of the rollers.

In variable cutoff web presses, it is desirable that the form inking and dampening rollers be capable of automatically adapting to the different diameter plate cylinders so that manual readjustments are not required each time a new module having a different diameter plate cylinder is installed. This has not been possible heretofore because of the physical characteristics of the known form roller control means.

One known type of form roller control means comprises eccentrics and adjustable links which are connected directly to the form roller support and thus hold the respective form rollers rigidly in position. While this type of mechanism is satisfactory for conventional presses, it is not suitable for variable cut-off presses. Because of its relatively inflexible nature, the form rollers would have to be manually retracted and then readjusted relative to the new plate cylinder each time a different module was inserted and since the squeeze between each form roller and the plate cylinder must be accurately set, considerable time would be lost in making the readjustments. Moreover, the range of adjustment of such mechanisms is relatively limited and only a comparatively small variation in plate cylinder diameters could be accommodated.

It is also known to employ resilient means for biasing the form rollers toward the plate cylinder in combination with coacting fixed and adjustable stops to control the pressure or squeeze between the rollers and the plate cylinder. Such arrangements provide flexibility whereby different diameter plate cylinders can readily be accommodated, but in the known devices, any change in plate cylinder diameter will produce a shift in the contact points of the respective fixed and adjustable stops which, in turn, alters the distance between the roller axis and the plate cylinder. Since there are so many variables involved, the change in center distance, due to the shift in contact points, cannot be predetermined and, therefore, manual readjustments are required to compensate for the variations after the plate cylinder is installed.

Under certain conditions it is possible to maintain a predetermined squeeze relation between resiliently biased form rollers and different diameter plate cylinders if a

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circular disk is utilized as one of the stops. In such case, however, the disk must be mounted coaxially with the form roller and its radius must be determined from the exact roller size and the amount of squeeze required. As long as the relationship between the respective radii remains unchanged, the center distance between the form roller axis and the plate cylinder periphery will remain constant regardless of the diameter of the cylinder. This arrangement has the distinct disadvantage, however, in that a relatively small variation in the form roller radius, due to wear, etc., will affect the form roller setting and it is necessary to change the discs or to recover the rollers at frequent intervals which is too costly and time consuming for practical purposes.

Accordingly, the principal object of this invention resides in the provision of new and improved means for initially setting and thereafter maintaining the contact relation between the form rollers and the plate cylinder of the printing press.

Another object resides in the provision of improved form roller setting and control means which will assure a minimal pressure change at the form roller-plate cylinder interface when plate cylinders of different diameters are installed.

A further object resides in the provision of improved form roller setting and control means which will accommodate discreet variations in the radius of the form roller.

Still another object resides in the provision of improved setting and control means for resiliently biased form rollers which will assure a minimal pressure change at the form roller-plate cylinder interface when the plate cylinder is skewed for register purposes.

A further object resides in the provision of improved form roller setting and control means which includes a spiral shaped disc mounted coaxially with the form roller and having a predetermined characteristic, i.e. the radius thereof is a linear function of the angular displacement from a predetermined reference point, such that the requirements for a coacting stop associated with each one of a plurality of different diametered, interchangeable plate cylinders can be predetermined, without specific knowledge of the actual form roller size, so as to maintain a pre-established contact relationship at the form roller-plate cylinder interface upon interchanging the different diametered plate cylinders.

Further objects and advantages of the invention will be apparent to persons skilled in the art to which it pertains from the following description and the accompanying drawings which form a part of this specification and in which,

FIGURE 1 is a side elevational view showing the invention as incorporated in a variable cut-off web press of the interchangeable module type;

FIGURE 2 is a sectional view taken substantially along line 2—2 of FIGURE 1; and

FIGURES 3 and 4 are schematic views illustrating the approximate positions assumed by the various form rollers when minimum and maximum diameter plate cylinders, respectively, are installed.

For the purpose of illustration, a preferred embodiment of the invention has been shown as incorporated in a variable cut-off web offset press in conjunction with which its use is particularly advantageous. However, it will become readily apparent from the following description that the invention is not limited to ues in variable cut-off presses and that it constitutes a convenient and effective means for adjusting the form rollers in conventional presses as well.

With reference now to FIGURES 1 and 2 of the drawings, the variable cut-off offset press selected for the purpose of illustrating the invention, essentially comprises a base unit having spaced side frames **10** and **11** each of which has an aligned recess provided in one vertical edge thereof to accommodate interchangeable printing modules such as that generally indicated by the reference number **12**. Ordinarily, a plurality of such printing modules will be provided for each base unit, each of which essentially comprises end frame members **13** and **14** in which a plate cylinder **16** and a coacting blanket cylinder **17** are rotatably mounted. The plate and blanket cylinders of each of the modules preferably differ in diameter from the plate and blanket cylinders of the other modules and, therefore, a multiplicity of product sizes can be printed by simply selecting a module having the appropriate size cylinders and mounting it in the base unit.

When mounted in operative position the respective blanket cylinders are adapted to coact with a common impression cylinder **18** which is adjustably mounted in the base unit so that it can be moved into operative position relative to the respective blanket cylinders to provide the desired impression pressure on a web passing through the nip of said cylinders.

The inking mechanism, generally indicated by the reference number **19**, also comprises a part of the base unit and, in a press of this type, it is highly desirable, if not actually essential, that the form rollers of said mechanism be capable of adapting automatically to the respective plate cylinders each time a different module is inserted and regardless of any change in the diameter of the plate cylinder within the size range of a given press. This has not been possible heretofore because of the inherent limitations of the known form roller control devices and, therefore, it has been necessary to effect time consuming, manual adjustments of the individual form rollers each time a different module was installed.

This problem has been solved in accordance with the present invention by employing unique form roller control means which not only are effective to automatically maintain a pre-established contact relation between the form rollers and any diameter plate cylinder within a given size range, but which also provide infinitely variable adjustability whereby discreet variations in the diameters of the form rollers can readily be accommodated.

As shown in FIGURES 1 and 2, the inking mechanism essentially comprises a series of rollers such as the distributing rollers **20** and **21** which function to convey a continuous supply of ink from a reservoir, not shown, to the vibrator roller **22**. These rollers are all suitably supported in the base unit side frames **10** and **11**, the vibrator roller **22**, for example, being journalled in bushings **23** so that it can be rotated and axially reciprocated about a fixed axis. From the vibrator roller **22** the ink is transferred to the first two form rollers **24** and **25** which deposit the ink in the form of a thin film on a form carried by the plate cylinder **16**. A portion of the ink, however, is transferred by means of a distributor roller **26** to the third and fourth form rollers **27** and **28**, respectively, which are in contact with the plate cylinder and a second vibrator roller **29** which may be mounted in the same manner as roller **22** for rotation and axial reciprocation in the side frames **10** and **11**.

The form rollers **24**, **25**, **27** and **28** must be adjustable relative to the plate cylinder and the respective vibrator rollers in order to establish the desired squeeze at the respective inter-faces. They must also be capable of shifting bodily about the axes of the vibrator rollers so that they can accommodate different diameter plate cylinders ranging between the minimum and maximum sizes as illustrated in FIGURES 3 and 4, respectively.

The means whereby this adjustability is accomplished will now be described, but because the mounting means for the respective form rollers are all substantially identical in construction, only the mounting means for the form roller **25** will be described in detail and similar reference numbers will be used to designate the corresponding parts for the other form rollers.

As will be seen more clearly in FIGURE 2, the mounting means for the form roller **25** comprises a bracket **31** mounted on the projecting end of the vibrator roller bushing **23** so that it is free to swing about the axis of the vibrator roller **22**. At its free end, the bracket **31** carries an eccentric bushing **32** formed with a reduced diameter, laterally projecting portion **33** that is mounted for rotation in a bore **34** provided in the bracket. Worm teeth **36** formed in the periphery of the projecting portion **33** are arranged to mesh with a worm **37** rotatably mounted in the bracket for adjustment purposes. One end of the worm shaft projects beyond the bracket **31** and it is squared as at **38**, see FIGURE 1, to receive a tool whereby the worm can be rotated to in turn rotate the eccentric bushing **32** relative to the bracket. At its inner end, the bushing **32** is provided with a form roller socket which consists of a base portion **39** and a releasable cap **40** in which the roller bearing **41** carried at the end of the shaft **42** of the form roller **25** is seated.

Accordingly, by rotating the bushing **32** through adjustment of the worm **37**, the form roller can be adjusted relative to the vibrator roller to establish the desired squeeze at the form roller-vibrator roller interface and this setting will remain constant regardless of any angular adjustment of the form roller about the axis of the vibrator roller.

The form roller is arranged to be biased toward the plate cylinder by resilient means which, as illustrated in FIGURE 1, may consist of a coil spring **43**. This spring is mounted about a rod **44** having one end thereof slideably mounted in a pivot block **46** on the side frame **10** with the opposite end thereof being pivotally connected as at **47** to the bracket **31**. The spring **43** is confined between the block **46** and a collar **48** on the rod **44** and thus it exerts a force tending to move the form roller toward the plate cylinder about the axis of the vibrator roller. Although a coil spring has been illustrated as the resilient biasing means for the form roller, this is merely by way of example and it will be readily apparent that any other suitable means such as hydraulic or pneumatically actuated devices can be used for this purpose.

In order to establish and thereafter maintain the desired contact relation or squeeze at the form roller plate cylinder interface, the form roller is arranged to be controlled by coacting stops in the form of an arcuate segment **49** located on the module and a non-circular control disc **51** associated with the bracket **31**. The control disc is arranged to be rotatable relative to the bracket and for this purpose it is formed with a reduced diameter portion **52** which fits into a bore formed in the bushing **32** and in a manner that its axis is precisely coincident with the axis of the form roller. At the opposite end of the bore is a worm wheel **53** which also is rotatable in the bushing and it is arranged to be interlocked with the control disc by means of a diametrically disposed rib or tongue **54** formed on the end face of the worm wheel, which is adapted to fit into a corresponding groove **56** formed in the adjacent end face of the control disc. The worm wheel and control disc are secured together as a unit in the bushing by means of the bolt **57** so that they cannot move axially in the bushing but they are permitted to rotate within the bore for roller adjustment purposes. Adjustment of the control disc is effected by means of the worm **58** located in the bushing **32** and which meshes with the worm teeth **59** of the worm wheel. The worm **58** also has a squared projecting end **61** to accommodate a wrench whereby adjustment thereof can be effected.

With reference to FIGURES 3 and 4 it will be seen that the periphery of the control disc has a spiral configuration and therefore, by imparting appropriate angular adjustment to said disc, it will be evident that the center distance between the form roller and the plate cylinder can be varied to obtain the desired squeeze at the interface.

In accordance with the invention the spiral surface of the disc is formed on a radius which is a linear function of the angular displacement from a predetermined reference point or, stated in another way, the radius is a linear function of the angular displacement of the contact point of the disc with the coacting arcuate segment. The actual rate of change of the radius is dependent upon the characteristics of a particular press and it is preferably one that will provide a maximum range of adjustment and yet will not adversely affect the established form roller setting when the plate cylinder is skewed for register purposes.

For practical purposes the rate of change may vary between .0001 and .002 inch per degree or more, depending upon the type of control desired. For example, if a wide range of adjustment is not essential, a rate of change of .0001 inch per degree will afford very precise, micrometric type of adjustments of the form roller which will remain virtually constant even when maximum skewing adjustments of the plate cylinder are made. On the other hand, if a greater range of adjustment is desired, a rate of change of .002 inch per degree may be used. This would still provide accurate control of the form roller setting and although some change in squeeze would be caused by skewing adjustments of the plate cylinder such change would remain within acceptable limits under most circumstances.

If, however, the particular press does not incorporate means for skewing the plate cylinder, the rate of change of the radius may be increased substantially beyond .002 inch per degree but it will be recognized that as the rate of change is increased the capability of effecting very fine adjustments of the form roller will decrease.

It has been determined that a rate of change of .0004 inch per degree is preferred because it will afford very precise and accurate control of the form roller under all conditions and it also provides an overall range of adjustment which will accommodate variations of as much as ±⅛ inch in the form roller diameter.

In other words, from the mean position or a point midway between the minimum and maximum radii of the control disc there is a total variation of about 1/16 inch in each direction. It is thus possible for the pressman to start operations with form rollers which are about ⅛ inch oversize in diameter and by making appropriaae adjustments of the control discs to compensate for wear over extended periods of use, these same rollers may be used until their diameters become about ⅛ inch less than the normal size. This is an important advantage because it materially increases the length of time a particular form roller may be used before it must be recovered.

Also, by forming the surface of the control disc on a radius which is a linear function of the shift in the contact point, of the disc with its coacting arcuate segment it is possible to predetermine what the radius of the arcuate segment must be for any given plate cylinder diameter so that the squeeze between the form roller and the plate cylinder will remain substantially constant when plate cylinders or different diameters are interchanged.

For economy of manufacture, maintenance and assembly, all of the control discs for the various form rollers are identical except for the fact that the discs for the form rollers **24** and **27** will be formed for left hand mounting whereas the discs for rollers **25** and **28** will be formed for right hand mounting as will be evident from FIGURES 3 and 4. Each one of the form rollers, however has a diameter different from the other form rollers and, therefore, in order to compensate for these differences in the nominal sizes of the form rollers it is necessary to vary the radii of the respective arcuate segments accordingly.

As will be readily apparent from FIGURE 1, because the diameter of the form roller **24** is greater than that of the form roller **25**, the radius of its arc segment **62** must be greater than the radius of segment **49** to compensate for the difference. The same condition exists with regard to form rollers **27** and **28** which are smaller and larger, respectively, than for roller **25** and thus their respective arc segments **63** and **64** are dimensioned accordingly.

Prior to installing a module in the press, the radius of the respective arcuate segments can be predetermined from the geometry of the various elements and without specific knowledge of the actual sizes of the respective form rollers, so that upon installation of the module, each form roller will automatically assume the proper contact relation with the plate cylinder. For example, the radius of the plate cylinder, the vibrator roller and the mean radius of each form roller is known as is also the center distance between the vibrator roller and the plate cylinder. From this information it is possible to locate the position the center of the form roller will assume upon installation of a given plate cylinder as well as the angles of the triangle which is formed by connecting the centers of the plate cylinder, the form roller and the vibrator roller.

The mean radius of the control disc also is known and by using this as a basis it is possible to determine what the radius of the arcuate segment must be to maintain the established contact relation between the form roller and the plate cylinder because the mean radius of the control disc plus the radius of the arcuate segment must equal the radius of the plate cylinder plus the radius of the form roller, less that amount which is necessary to provide the desired squeeze at the form roller-plate cylinder interface.

With the arc segments proportioned in the foregoing manner, each form roller will be positioned automatically relative to the particular plate cylinder upon insertion of the module into the base unit. In the event the actual size of a form roller is different, either over or undersize with respect to the mean diameter, this difference can readily be compensated, up to ⅛ inch in either direction, by appropriate angular adjustment of the control disc.

Once the control disc has been adjusted to compensate for the actual form roller diameter, no further adjustments thereof will be required when interchanging modules. This adjustment is only used thereafter at infrequent intervals when the form roller wears to such extent as to require a compensating adjustment.

To illustrate, let us assume that the press has been prepared to operate with a module having a minimum diameter plate cylinder, as illustrated in FIGURE 3 for example, and that the control discs have been adjusted to provide the desired squeeze between the respective form rollers and the plate cylinder. If it now becomes necessary to insert a module having a larger diameter plate cylinder, the maximum diameter for example, as illustrated in FIGURE 4, it is necessary to determine the appropriate radii of the respective arcuate segments for the new module so that the form rollers will maintain the established contact relation with the new plate cylinder automatically upon insertion of the module.

By using the known data mentioned hereinabove it is possible to determine what angular positions the form rollers will assume upon insertion of the module, and the resultant angles formed by the centers of the plate cylinder, the vibrator roller and the form roller. From this data it is possible to determine precisely how many degrees the contact point of the control disc with the arcuate segment will shift upon insertion of the new module. Since the radius of the control disc is a linear function of the shaft in the contact point, and thus not dependent on the actual roller size, the change in the effecive radius of the control disc can be ascertained. Once the effective radius of the control disc is known, it is a simple matter to determine what the radius of the respective arcuate segments should be to maintain the established form roller settings.

Accordingly, when the new module is inserted the squeeze between the form rollers and the new plate cylinder will remain precisely the same as between the form rollers and the previous plate cylinder.

It will be understood that the arcuate segments will remain as an integral part of their respective modules and, therefore, it is only necessary to determine their radii when the unit is initially installed in the press. From that point on the various modules can be interchanged freely and the form rollers will always assume the required positions without manual resetting.

In a press wherein the plate cylinder is mounted for rotation about a fixed axis the arcuate segments at each end thereof will be mounted in a manner as shown at the left in FIGURE 2. Each segment is secured by means such as the bolt **66** to an annular bracket **67** having its axis located precisely coincident with the plate cylinder axis and the bracket is in turn rigidly secured to the module end frame **14** by a series of bolts **68**. However, if the plate cylinder is mounted for cocking or skewing movement thereof for register purposes, one end thereof, as illustrated to the right in FIGURE 2, is journalled in an adjustable eccentric housing **69**. Accordingly when the housing is adjusted by any conventional means connected to the bracket **71**, the adjacent end of the plate cylinder will move to a limited extent in a path substantially normal to a plane extending through the axis of the plate and blanket cylinders, as indicated by the arrow in FIGURE 1. Although the extent of this skewing adjustment is generally limited to about .020 inch to either side of center, it is sufficient nevertheless to disturb the setting of the form rollers across the width of the plate cylinder. It is necessary therefore to have the form rollers shift in unison with the plate cylinder to avoid the need for effecting manual readjustments.

This is accomplished by mounting the arcuate segments on the feed side of the press, to the right in FIGURE 1, on an annular bracket **72** which is mounted on a flange **73** formed on the housing **69**. The periphery of the flange is formed about an axis precisely coincident with the plate cylinder axis and, therefore, the bracket and the arcuate segments will shift precisely in unison with the plate cylinder when the housing **69** is adjusted and they will remain precisely concentric with the plate cylinder in all adjusted positions.

The control discs also will follow the arcuate segments under the influence of the biasing springs **43** and, therefore, the respective form rollers will maintain their pre-established contact relation with the plate cylinder. Such skewing adjustments will obviously produce a slight shift in the contact point of the control discs with the respective arcuate segments, but the angular displacement of the contact point will, because of the rate of change of the spiral disc as previously described, result in a squeeze change which is so minute that it is well within acceptable limits.

To permit the shifting movement of the annular bracket **72** with the plate cylinder it is fastened to the end frame **13** by bolts **74**, see FIGURE 1. There bolts are inserted through enlarged openings in the bracket and are threaded into the end frame so that that bracket will be held snugly against the end frame but it will be permitted to shift with the housing **69** when the latter is adjusted.

To prevent any appreciable angular displacement of the bracket **72** when the housing **69** is rotated, it is connected to the module end frame **13** by means of a link **76**. One end of the link is pivotally connected to the bracket as at **77** whereas the other end is pivotally connected at **78** to an offset flange **79** secured to the end frame. The link **76** will thus permit the bracket to shift laterally with the plate cylinder, but it will prevent it from turning about the axis thereof when the housing **69** is rotated.

It will be apparent from the foregoing description that

this invention comprises a relatively simple and effective means for setting and controlling resiliently biased form inking rollers in conventional presses as well as in variable cut-off presses which require maximum flexibility to accommodate a relatively wide range of plate cylinder diameters. Moreover, although the invention has been illustrated and described as applied to the form inking rollers of a printing press, it will be readily apparent that it is applicable to the form dampening rollers of such press which were not illustrated in the interest of simpilicity.

What is claimed is:

1. In a printing press having a plate cylinder, at least one coacting form roller for applying a fluid substance to the peripheral surface of the plate cylinder, and resilient means for biasing the form roller toward the plate cylinder, the provision of means for controlling the center distance between the form roller and plate cylinder comprising a relatively fixed stop associated with the plate cylinder, a coacting, non-circular control member mounted coaxially with said form roller, the radius of said control member being a linear function of the angular shift of the contact point of said member with the fixed stop, and means for rotating the control member about the axis of the form roller.

2. The combination as set forth in claim **1**, wherein the means for rotating the control member comprises a worm and a coacting worm gear.

3. The combination as set forth in claim **1**, wherein the control member comprises a spiral cam having a radius which varies at a linear rate of .0001 to .002 inch per degree.

4. The combination as set forth in claim **1** wherein said control member comprises a spiral cam having a radius which varies at a linear rate of .0004 inch per degree.

5. The combination as set forth in claim **1**, wherein said fixed stop comprises an arcuate segment formed on a radius having its center coincident with the axis of the plate cylinder.

6. The combination as set forth in claim **1**, additionally including a vibrator roller mounted for rotation about a fixed axis spaced from the plate cylinder, a bracket mounted for swinging motion about the axis of the vibrator roller, and means on said bracket for supporting the form roller.

7. The combination as set forth in claim **1**, wherein the supporting means for the form roller includes an adjustable eccentric bushing, and means for rotating said bushing to thereby adjust the center distance between the form roller and the vibrator roller.

8. The combination as set forth in claim **6** wherein the means for rotating said bushing includes a worm rotatably mounted in the bracket and coacting worm teeth formed in the periphery of said bushing.

References Cited

UNITED STATES PATENTS

1,470,194	10/1923	Robinson	101—352
2,539,383	1/1951	Davidson	101—352
2,853,943	9/1958	Royer	101—352
3,065,690	11/1962	Heller et al.	101—247
3,323,452	6/1967	Pasquinelli	101—352 X

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