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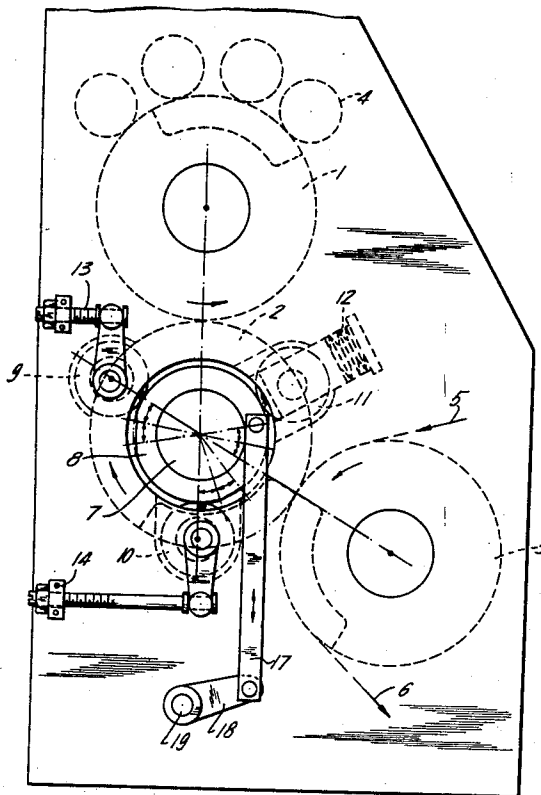
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[54] **CYLINDER CONTROLLING AND INTERRUPTER**
STRUCTURE FOR PRINTING PRESSES
18 Claims, 10 Drawing Figs.

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101/247
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B41f 13/36
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352; 100/168, 171

ABSTRACT: Printing press includes a pair of outer cylinders and an intermediate cylinder, all having parallel axes, and an assembly operatively connected to the intermediate cylinder for supporting the latter for rotary movement and for movement toward and away from an operative position with respect to the outer cylinders. The assembly includes at each end of the intermediate cylinder a pair of thrust-absorbing members, one of which extends through a plane which includes the axis of the outer cylinders and the other of which extends through a plane which includes the axis of the intermediate cylinder and the axis of the other of the outer cylinders.



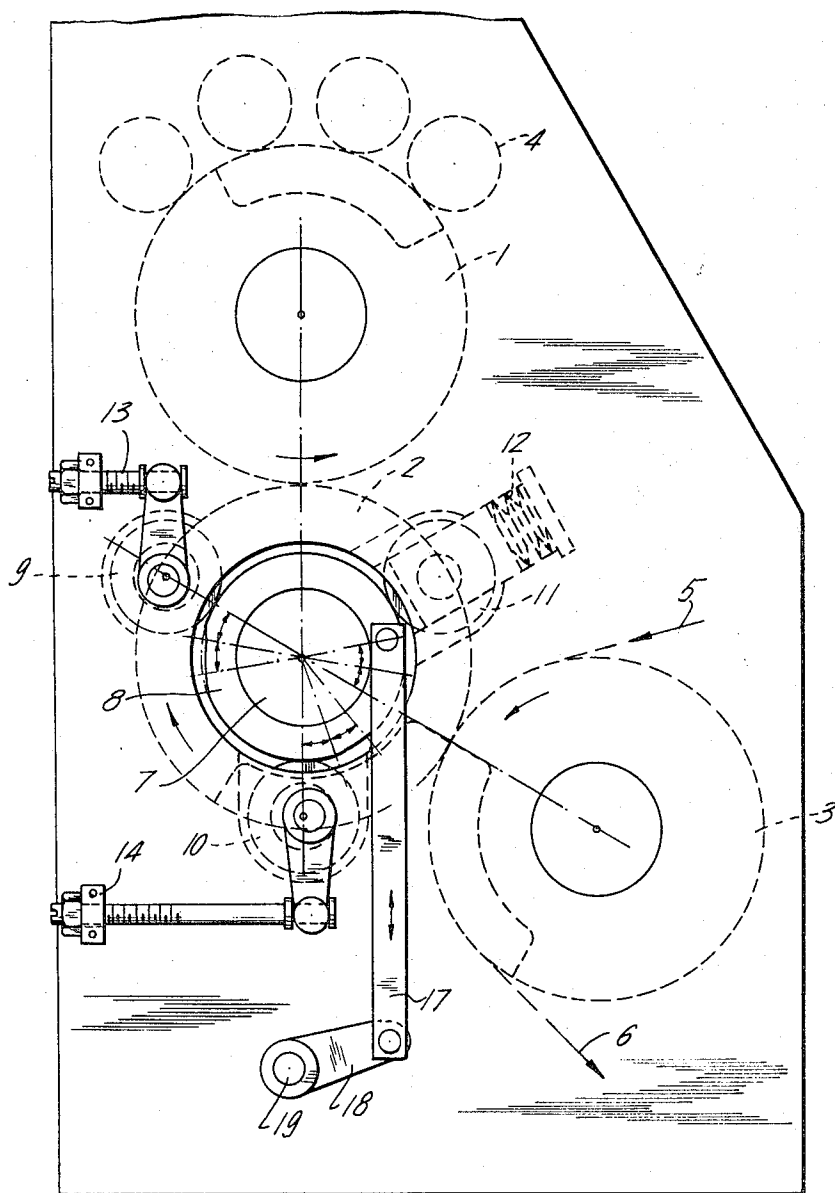


FIG. 1

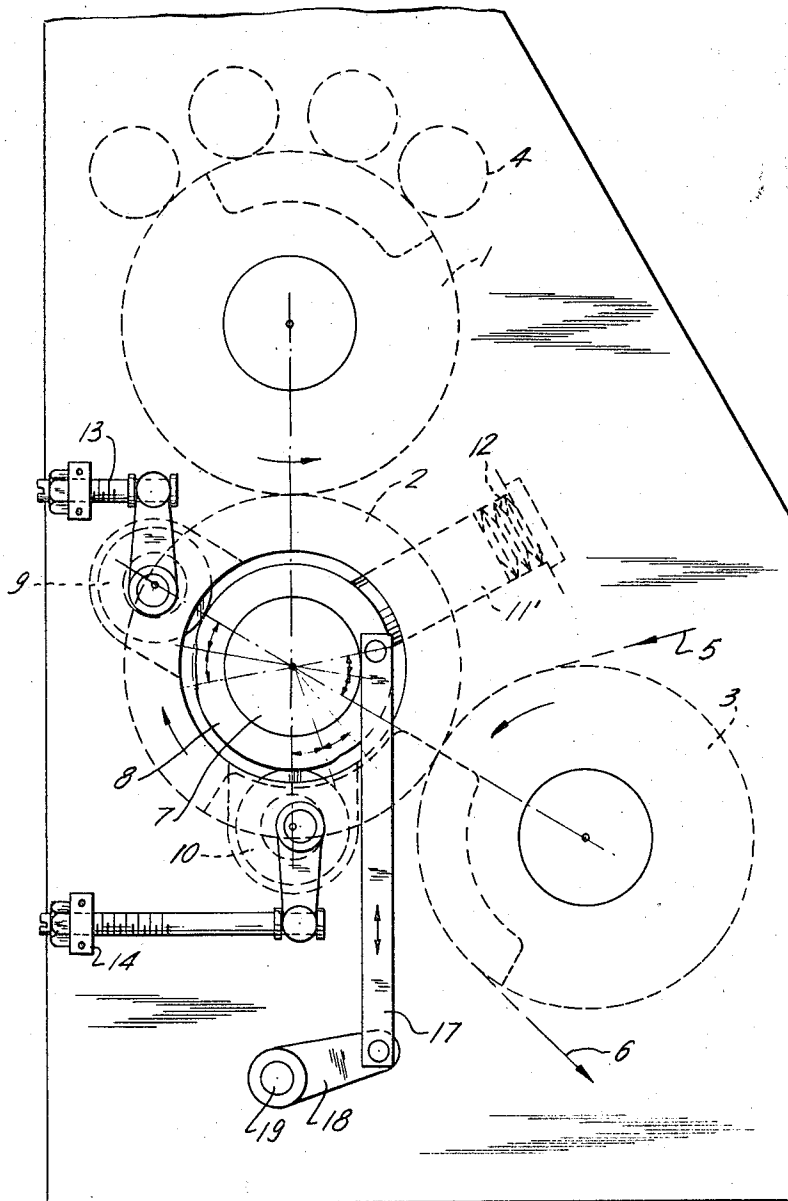


FIG. 1A

FIG. 2

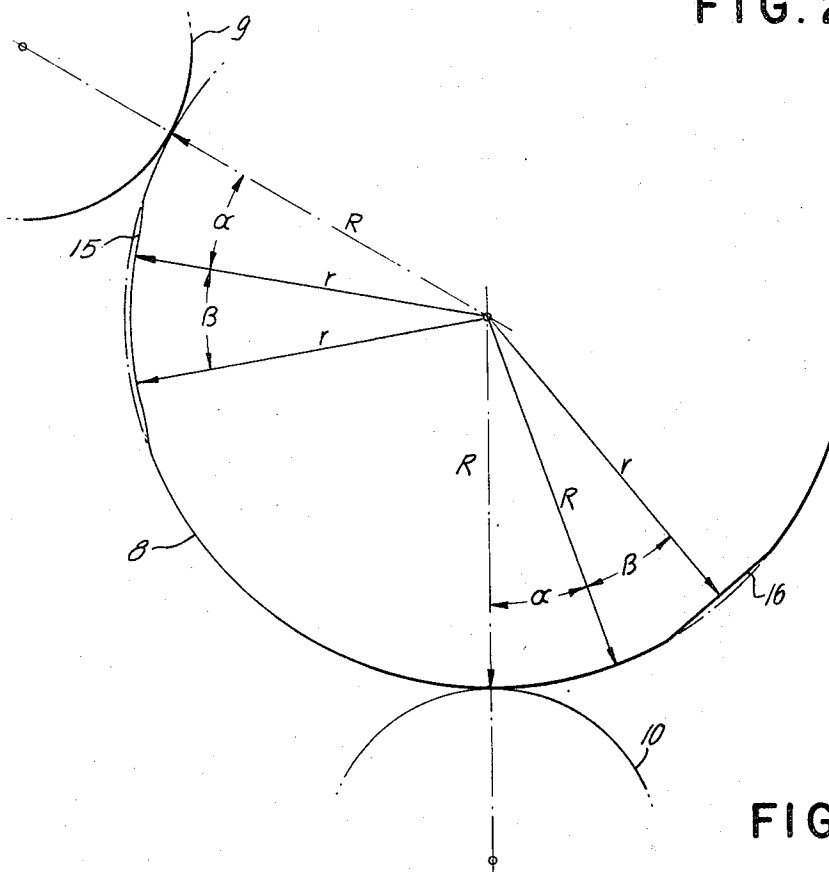
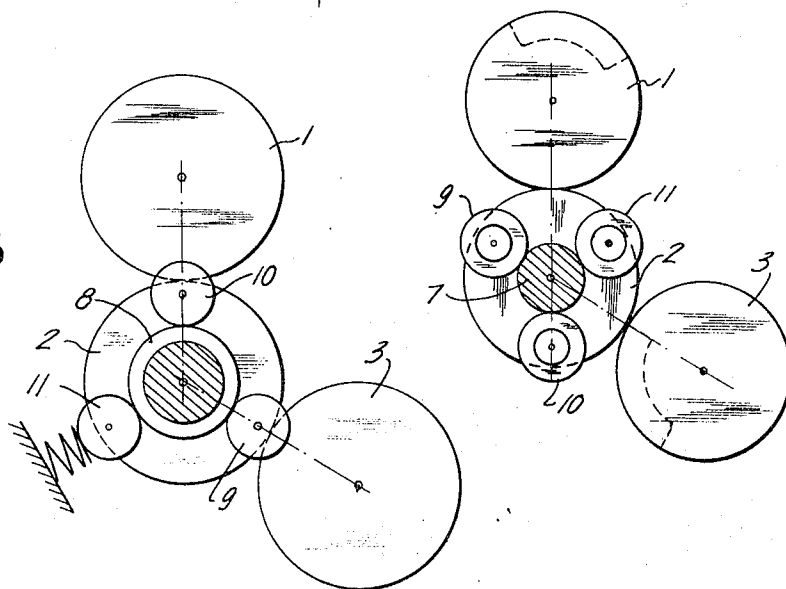
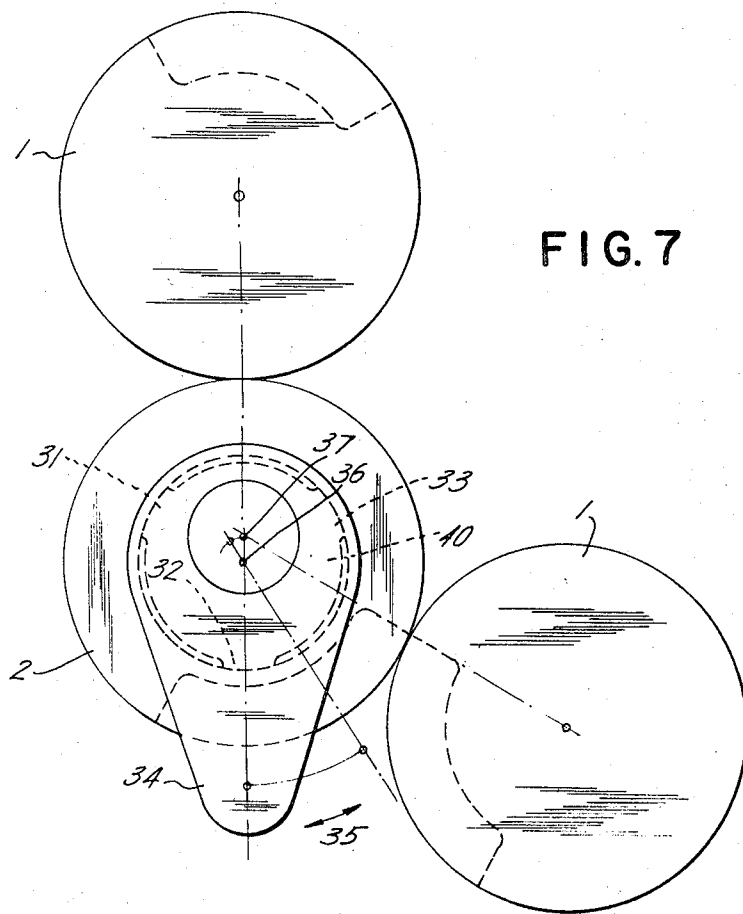
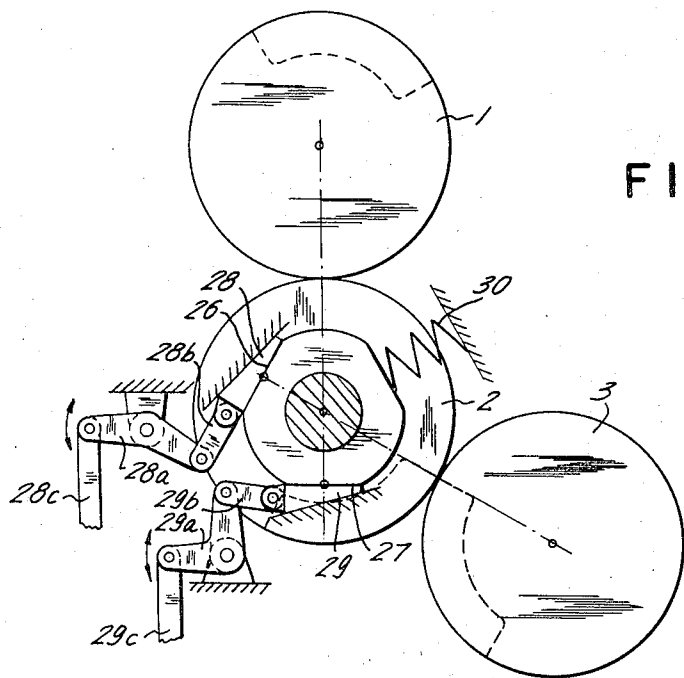
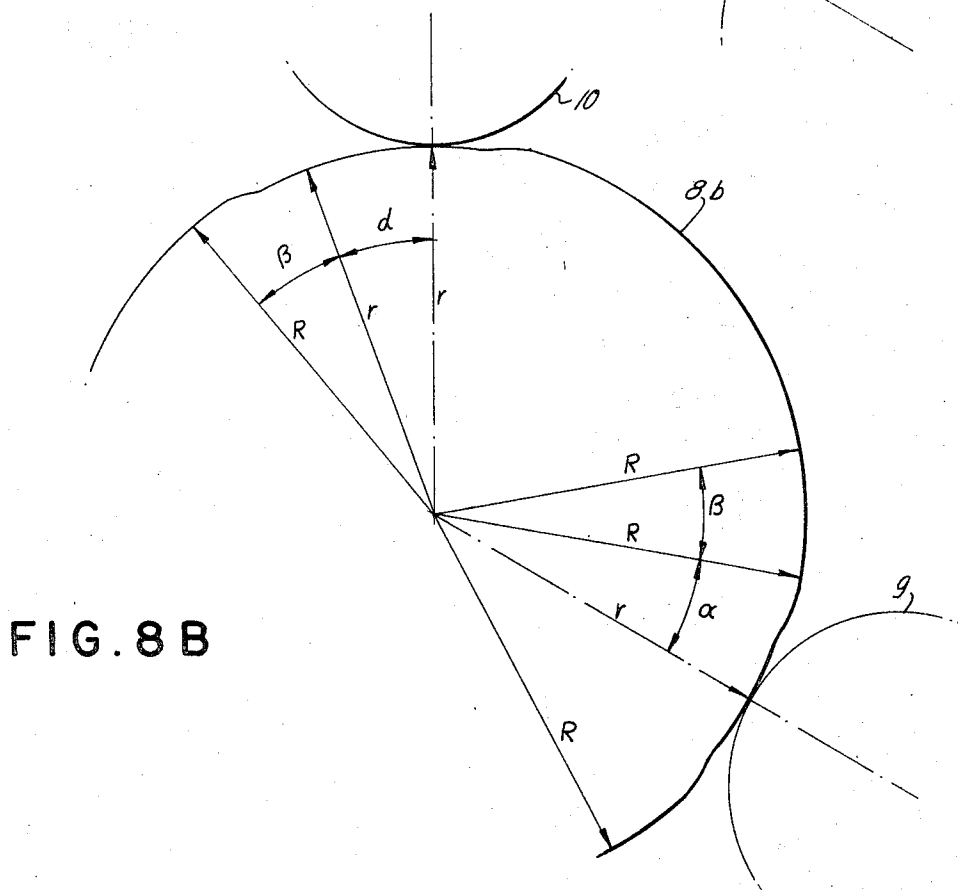
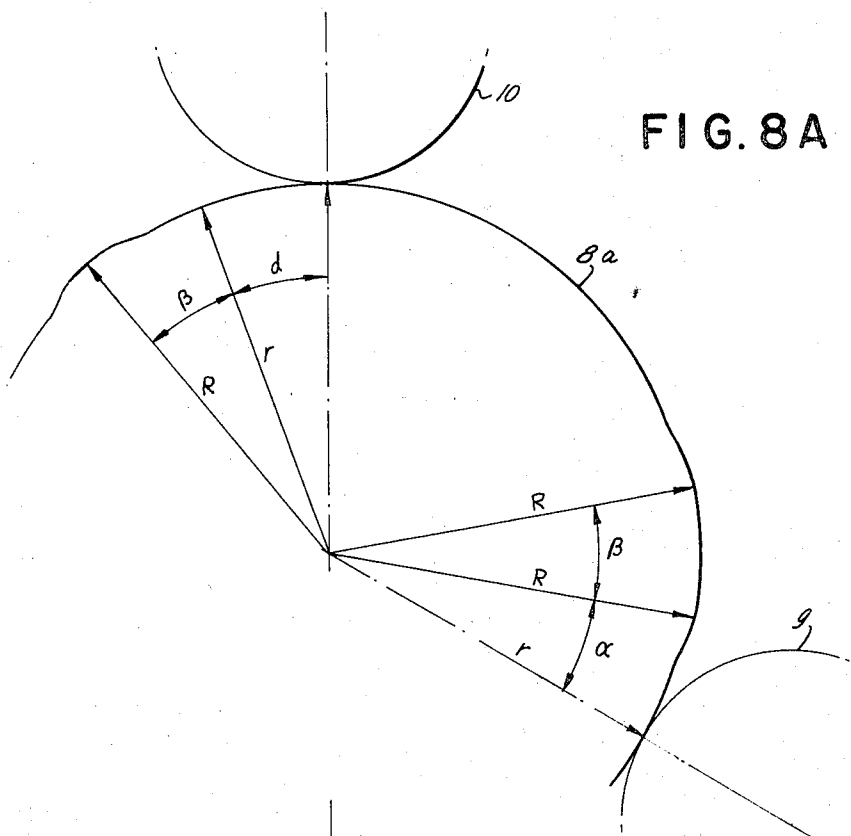


FIG. 5

FIG. 3







CYLINDER CONTROLLING AND INTERRUPTER STRUCTURE FOR PRINTING PRESSES

This application is a continuation of Ser. No. 491,666, filed Sept. 30, 1965, now abandoned.

My invention relates to printing presses.

In particular, my invention relates to structure for controlling the position of an intermediate cylinder which is situated between a pair of outer cylinders of a printing press. For example, in an offset type of printing press the intermediate cylinder is the rubber-blanketed impression cylinder which is situated between the plate cylinder and the transfer cylinder. The plate and transfer cylinders form the pair of outer cylinders between which the intermediate impression cylinder is at least partly situated. The structure of my invention acts on the intermediate cylinder so as to displace the latter to and from an operative position with respect to the pair of outer cylinders.

With offset printing machines, for example, there are conventional structures which serve to displace the impression cylinder on the one hand to and from its operative position with respect to the plate cylinder and on the other hand to and from its operative position with respect to the transfer cylinder. The control of this movement of the impression cylinder to and from its operative position is carried out by means of eccentric sleeves or by means of shiftable bearings, and for each movement of the impression cylinder to and from an operative position with respect to one of the outer cylinders a shiftable bearing or an eccentric bearing sleeve is required so that at least two bearing structures are required at each end of the intermediate cylinder for controlling the position thereof with respect to both the outer cylinders. It has also been proposed to provide eccentric bearing sleeves of relatively large eccentricity so that a single bearing sleeve will suffice to displace the intermediate cylinder first to and from its operative position relative to one of the outer cylinders and then to and from its operative position relative to the other of the outer cylinders.

All of these known adjusting structures unavoidably include an amount of bearing play which increases with the number of eccentric bearing sleeves or shiftable bearings, as well as with the extent of the eccentricity of a single bearing sleeve where such a device is used for both adjustments. This unavoidable bearing play results, however, in displacement of the intermediate cylinder when the beginning or the end of the printing surface portion of the intermediate cylinder comes into engagement with either one of the outer cylinders. As a result, the cooperation between the cylinders becomes faulty.

With modern printing presses, particularly of the offset type, it is customary to use cylinders of relatively small diameter, and such cylinders are covered by the copy sheet over an angular distance of 200°—300° about the axis of the cylinder. This means that with conventional three-cylinder offset printing machines, the printing takes place in such a way that while the impression is transferred from the impression cylinder to the sheet on the transfer cylinder, simultaneously part of the impression is delivered from the plate cylinder to the impression cylinder, so that the beginning as well as the end of the actual print-transferring operations which take place between the intermediate cylinder and the outer cylinders necessarily occur at different times with both of the outer cylinders. As a result of these conditions the intermediate cylinder is frequently shifted during the actual printing, producing highly undesirable, visible cylinder gap marks in the printing. Such defective printing cannot be tolerated in high quality work.

It is therefore a primary object of my invention to provide a structure which will reliably eliminate all bearing play in the intermediate cylinder, so that in this way this source of defective printing will be eliminated.

In particular, it is an object of my invention to eliminate the bearing play while still maintaining the possibility of adjusting the intermediate cylinder so as to be capable of displacing it to and from its operative position with respect to the outer cylinders.

In particular, the objects of my invention include the provision of thrust-absorbing means which coax with the shaft of the intermediate cylinder directly, or with a bearing in which this shaft is journaled, in such a way that undesirable shifting of the intermediate cylinder cannot occur when the different printing operations are started.

Furthermore, it is an object of my invention to provide a structure for supporting the intermediate cylinder in a far simpler and far more reliable manner than has heretofore been the case.

In addition, my invention includes the provision of a structure which will operate in such a way that the forces exerted by one of the outer cylinders will not be transferred to the other of the outer cylinders.

My invention is illustrated by way of example in the accompanying drawings which form part of this application and in which:

FIG. 1 is a schematic side elevation of a three-cylinder rotary printing press in which the intermediate cylinder is controlled with one possible embodiment of a structure according to my invention;

FIG. 1A shows a somewhat different embodiment of the structure of FIG. 1;

FIG. 2 diagrammatically illustrates on an enlarged scale as compared to FIG. 1, details of the structure of FIG. 1;

FIG. 3 is a partly sectional schematic illustration of another possible embodiment of a structure according to my invention;

FIG. 4 is a schematic side elevation of a three-cylinder rotary printing press provided with another embodiment of a structure according to my invention;

FIG. 5 schematically illustrates a further embodiment of my invention;

FIG. 6 is a schematic illustration of yet another embodiment of a structure according to my invention;

FIG. 7 is a schematic illustration of another embodiment of a structure according to my invention;

FIG. 8A shows in detail how the structure of FIG. 3 is controlled; and

FIG. 8B illustrates a practical embodiment of a structure for producing the controls shown in FIG. 8A.

The rotary printing press schematically illustrated in FIG. 1 can be either an offset printing press or a direct or indirect relief printing press. In the following description, reference is made to a three-cylinder offset printing press, but it is to be understood that the invention is applicable to other types of printing presses. The upper cylinder 1 indicated in FIG. 1 is the plate cylinder while the intermediate cylinder 2 is the rubber-blanketed impression cylinder and the lower cylinder 3 is the transfer cylinder.

The rotary plate cylinder 1 has a fixed axis of rotation. At the side of the plate cylinder 1 which is directed away from the intermediate cylinder 2 is the inking mechanism indicated by the four transfer rollers 4. The structure for dampening the planographic surface is not illustrated for the sake of clarity. The transfer cylinder 3 has a fixed axis of rotation in the same way as the plate cylinder 1, and of course the axes of all three cylinders are parallel to each other. A known feeding system serves to feed the unprinted copy sheet 5 to the transfer cylinder 3, while the printed sheet is withdrawn from the transfer cylinder 3 in the direction of the arrow 6 indicated in FIG. 1.

The rubber-blanketed cylinder 3 is provided at both of its ends with identical journals 7 which are respectively received in bearing rings 8. These bearing rings 8 can either be roller bearings or they can be plain slide bearings. The assembly which cooperates with the intermediate cylinder 2, in order to control the location of the axis thereof, includes, in addition to the bearing ring 8 for the journal 7 at each end of the cylinder 2, a pair of thrust-absorbing means which, in the example of FIG. 1, take the form of a pair of counterrollers 9 and 10 situated at each end of the cylinder 2. These counterrollers 9 and 10 directly engage the exterior peripheral surface of the bear-

ing ring 8, and it is to be noted that the two counterrollers 9 and 10 are situated on the same side of the axis of the intermediate cylinder 2.

A thrust-producing means is provided for urging the axis of the intermediate cylinder toward the space which is defined between the pair of thrust-absorbing means 9 and 10. This thrust-producing means includes the guide roller 11 which also directly engages the exterior peripheral surface of the bearing ring 8. This guide roller 11, it will be noted, is situated symmetrically with respect to the counterrollers 9 and 10 at the side of the axis of the intermediate cylinder 2 which is opposite from the counterrollers 9 and 10. Thus, the thrust-producing means 11 will urge the ring 8 into engagement with the thrust-absorbing means 9 and 10 so as to be maintained at all times in engagement with the latter, and at least part of the thrust which is absorbed by the thrust-absorbing means 9 and 10 is derived from the thrust-producing means 11.

The counterroller 9 extends through a plane which includes the axis of the intermediate cylinder 2 and the axis of the outer cylinder 3, and in the example of FIG. 1 this counterroller 9 is situated on the side of the axis of the intermediate cylinder 2 which is opposite from the outer cylinder 3. The counterroller 10 extends through a plane which includes the axis of the intermediate cylinder 2 and the outer cylinder 1, and in the example of FIG. 1 the counterroller 10 is situated on the side of the axis of the intermediate cylinder 2 which is opposite from the outer cylinder 1. In fact, in the example shown in FIG. 1 it will be found that the axes of the rollers 9, 2 and 3 are all situated in a common plane, while the axes of the rollers 10, 2 and 1 are also all situated in a common plane. The guide roller 11 is constantly urged toward the space between counterrollers 9 and 10 by a spring means which in the illustrated example is formed by a number of dished spring members 12 acting on the bearing which supports the guide roller 11 for rotary movement, this bearing being guided for movement toward the axis of the intermediate cylinder through any suitable structure of the frame of the machine.

The central axes of the pair of pins which extend through and carry the counterrollers 9 and 10, to support the latter for rotation, are spaced from and parallel to the axes of the rollers 9 and 10, respectively, so that these rollers 9 and 10 are supported by eccentric pins which can be angularly turned for adjusting the rollers 9 and 10. For this purpose the eccentric pin which carries the counterroller 9 is fixed to lever which through a suitable joint is connected to a screw 13 capable of being turned by the operator and maintained by locknut in its adjusted position, so that in this way the angular position of the eccentric pin which carries the roller 9 can be adjusted, and in much the same way an adjusting mechanism 14 is operatively connected with the eccentric pin of the roller 10 so that the position of the axis of the latter can also be adjusted. By adjusting the counterrollers 9 and 10 it is possible to determine the position of the impression cylinder with respect to the plate and transfer cylinders. Moreover, these adjustments can be carried out in order to compensate for manufacturing tolerances.

The bearing ring 8 is provided, as shown particularly in FIG. 2, with outer peripheral surface portions of a lesser radius than the maximum radius R of the outer periphery of the ring 8, this ring 8 having the maximum radius R over most of its outer periphery. However, the circumferentially extending peripheral area 15 and the outer peripheral surface area 16 of the ring 8 have smaller radius r , as indicated in FIG. 2. The longer peripheral surface area 15 is situated adjacent the counterroller 9, while the shorter peripheral surface area 16 is situated adjacent the counterroller 10. Within the angular α the radius of the ring 8 diminishes from α to r , at the surface 15, and then through the additional angular increment β the surface 15 remains at the radius r before again becoming enlarged to the maximum radius R . The radius of the outer periphery of the ring 8 remains at its maximum until it reaches the surface area 16. Thus, in a counterclockwise direction from the point of engagement with the counterroller 10, the

periphery of the ring 8 remains at its maximum radius through the angle α and then through the subsequent angle β it will be diminished to the smaller radius r for the peripheral portion 16. While it is not essential that the radius of the surface portion 16 be the same as that of the circumferentially extending surface portion 15, in the illustrated example these smaller radii are identical.

A linkage is operatively connected with the bearing ring 8 for angularly turning the latter, and this linkage includes the elongated connecting rod 17 pivotally connected at one end to the bearing ring 8 and pivotally connected at its opposite end to lever 18 which is fixed to a rotary member 19 of a control drive. This control drive can either be motor driven or can be manually driven, and of course it is to be understood that the structure shown in FIG. 1 has its mirror image situated at the other side of the press so that the same structure and operation are to be found at both ends of the intermediate cylinder 1.

For the purpose of displacing the intermediate cylinder 2 away from and back toward its operative position with respect to the outer cylinders 1 and 3, the adjusting mechanism operatively connected to the bearing ring 8 is actuated. The ring 8 is initially turned clockwise, as viewed in FIG. 2, through the angle α so that the initial part of the peripheral surface portion 15 is displaced into engagement with the counterroller 9, and then the ring 8 is turned through the second angular increment α so that while the surface portion 15 remains in engagement with the counterroller 9 the surface portion 16 is displaced into engagement with the counterroller 10. As soon as the surface portion 15 is situated opposite the counterroller 9, the guide roller 11 pushes the intermediate cylinder in a direction tangential to the plate cylinder 1 so that as a result the intermediate cylinder 2 is displaced away from the transfer cylinder 3. After the second increment of turning of the ring 8, when the second surface area 16 at the periphery of the ring 8 has been displaced into engagement with the counterroller 10, the intermediate cylinder has been displaced downwardly away from the plate cylinder 1, so that it is also spaced from the latter. With this displacing of the intermediate cylinder away from its operative position advantage is taken not only of the weight of the intermediate cylinder itself but also of the thrust produced by the guide roller 11 which maintains a constant engagement between the bearing ring 8 and both of the counterrollers 9 and 10.

The return of the intermediate cylinder to its operative position with respect to the outer cylinders 1 and 3, takes place by turning the ring 8 in the opposite direction so that initially the ring 8 is turned, either by hand or by a suitable source of power, through the angle β in a counterclockwise direction, as viewed in FIG. 2. Thus, an outer peripheral surface of ring 8 which is of maximum radius R again is displaced into engagement with the counterroller 10. This operation results in raising the intermediate cylinder into operative engagement with the plate cylinder 1. Thereafter when the ring 8 is turned through the additional angle α , in a counterclockwise direction as viewed in FIG. 2, the outer peripheral surface of maximum radius R is again displaced into engagement with the counterroller 9 which serves to shift the intermediate cylinder tangentially with respect to the plate cylinder to the right, as viewed in FIG. 1, into its operative position with respect to the transfer cylinder 3. This latter shifting of the intermediate cylinder of course takes place in opposition to the force of the spring means 12.

Of course, it is not essential that a guide roller be used for the thrust-producing means 11. Instead, for example, it is possible, as shown in FIG. 1, to use a slide block 11' made of a suitable plastic and pressed against, while slidably engaging, the exterior surface of the ring 8. Also, it is not absolutely essential that the thrust-producing means 11 be situated symmetrically with respect to the counterrollers 9 and 10. With the particular construction illustrated it is in fact preferable to situate the guide roller 11 so that it is at a location where it is closer to the common plane which includes the axes of the rollers

lers 9, 2 and 3, with the roller 11 situated in the vicinity of a position where it is more diametrically opposed to the roller 9, since the weight of the intermediate cylinder itself guarantees proper cooperation of the ring 8 with the counterroller 10. In this way, a greater part of the force of the thrust-producing means 11 can be used for urging the ring 8 into engagement with the higher counterroller 9. Where a roller bearing is used instead of a plain bearing it is preferably adjusted so as to be free of any play.

The structure of my invention may be modified so as to have an arrangement as illustrated in FIG. 3 where the axes of the counterrollers 9 and 10 are still situated in the planes which include the axes of the intermediate cylinder 2 and the axes of the outer cylinders 3 and 1, respectively, but in this case it will be noted that on the one hand the roller 9 and cylinder 3 are both situated on the same side of the axis of the intermediate cylinder 2, while, on the other hand, the counterroller 10 and the cylinder 1 are also both situated on the same side of the axis of the intermediate cylinder 2. Of course, if preferred, only the roller 9 can be situated at the location shown in FIG. 3 while the roller 10 can remain at the position as shown in FIG. 1. With an arrangement as shown in FIG. 3 the thrust-producing means 11 will, of course, be situated again at the side of the axis of the intermediate cylinder 2 which is opposite from the pair of counterrollers 9 and 10, and the thrust-producing means 11 will urge the axis of the intermediate cylinder 2 toward the space which is defined between the counterrollers 9 and 10. In the illustrated example the thrust-producing means can also take the form of a guide roller which is acted upon by a spring, as indicated in FIG. 1. Of course, the force which acts on the thrust-producing means need not be a spring force since it is possible to use the force of a fluid under pressure, such as a suitable hydraulic fluid or even a pneumatic arrangement may be used for this purpose. Irrespective of the type of force which is used for the thrust-producing means in the embodiment of FIG. 3, this force, of the spring, for example, must be greater than the opposing forces, so that the thrust-producing means 11 will reliably maintain the exterior periphery of the ring 8 in engagement with the counterrollers 9 and 10.

With the particular arrangement shown in FIG. 3, it is possible to very precisely adjust the position of the intermediate cylinder through corresponding adjustments of the counterrollers 9 and 10. Moreover, the yieldable mounting of the guide roller of the thrust-producing means 11 permits the intermediate cylinder 2 yield when, for example, a pair of copy sheets are simultaneously delivered to the transfer cylinder 3. Thus, the position of the counterrollers 9 and 10 illustrated in FIG. 3 provides safety against overloading of the press. The displacement of the intermediate cylinder to and from its operative position with respect to the outer cylinders 1 and 3 can take place in the embodiment of FIG. 3 precisely in the same way as in the embodiment of FIGS. 1 and 2, the only difference being that the counterrollers 9 and 10 are situated during normal press operation in shallow peripheral recesses of ring 8 and during rotation of the bearing ring 8 will become located one after the other on the exterior peripheral portion of the ring 8 which has the maximum radius R. Thus, the control structure is precisely the opposite of that of the embodiment of FIG. 1.

This construction is illustrated in FIGS. 8A and 8B. As is indicated in FIG. 3, the counterroller 10 is situated on the same side as the plate cylinder 1 and the counterroller 9 is situated on the same side as the transfer cylinder 3. The adjustment of both of these counter rollers brings about a setting of the operating pressure of the intermediate cylinder 2. This cylinder 2 is, as is apparent from FIG. 3, urged by the guide roller 11 against both of the counterrollers 9 and 10 and also against both of the cylinders 1 and 3. In order to displace the cylinder 2 away from the cylinders 1 and 3, the peripheral portions of the ring 8 which engage the counterrollers to displace the cylinder 2 away from the cylinders 1 and 3 must have the larger radius so that after turning the ring 8 initially through

the angle α and then through the angle β the cylinder 2 will be displaced in opposition to the force of the spring acting on roller 11 away from both of the cylinders 1 and 3.

Thus, referring to FIG. 8A, it will be seen that the ring 8a illustrated therein will accomplish these results and has at its periphery a construction which is the reverse of that of the ring 8 of FIG. 2. Referring to FIG. 8A, it will be seen that during normal operations the counterrollers 9 and 10 engage a peripheral portion of the ring 8a which has the smaller radius r . During the initial turning of the ring 8a through the angle α the right peripheral portion of the ring 8a, which has the larger radius R, will move into engagement with the counterroller 9 shown at the lower right portion of FIG. 8A so as to displace the intermediate cylinder 2 tangentially with respect to the plate cylinder 1 to the left, as viewed in FIG. 3, away from the transfer cylinder 3. Then, during the subsequent turning of the ring 8a through the additional angle β the right portion at the periphery of the ring 8a which has the maximum radius R will remain in engagement with the counterroller 9 while the additional portion of maximum radius R shown at the upper left of FIG. 8A will now move into engagement with the counterroller 10 to displace the intermediate cylinder 2 downwardly away from the plate cylinder 1. In this way, the structure of FIG. 3 operates to bring about the shifting of the intermediate cylinder 2 between its operative and inoperative positions.

As a practical matter, however, it is preferred to provide the ring 8b which is shown in FIG. 8B rather than the ring 8a of FIG. 8A. Thus, referring to FIG. 8B, it will be seen that the ring 8b illustrated therein has recessed portions of the smaller radius r engaging the counterrollers 9 and 10 during normal operation of the press. It is the much more extensive larger peripheral portion, having the maximum radius R, which is moved into engagement with the rollers 9 and 10 in the manner described above in connection with FIG. 8A. Therefore, with the construction shown in FIG. 8B it is only necessary to form the relatively short recesses of the smaller radius r to engage the counterrollers during normal operations, so that from an economical and manufacturing standpoint the structure of FIG. 8B is preferred and will operate precisely in the manner described above in connection with FIG. 8A.

The three-cylinder rotary printing press which is illustrated in FIG. 4 can also, as was the case with FIG. 1, be either an offset or a relief type of printing press. For the sake of simplicity, in this case also it is assumed that the press is an offset printing press. The plate cylinder 1 again has a fixed axis of rotation. The printing plates which are mounted on the cylinder 1 are provided with ink by the rollers 4. The rubber-blanketed impression cylinder 2 is also supported for rotary movement at both of its ends by bearing structure which includes the journal 7, formed by shaft portions of the intermediate cylinder 2, and the bearing rings 8 which respectively receive the journals 7, which are respectively situated at the opposite ends of the intermediate cylinder 2. The transfer cylinder 3 also has a fixed axis of rotation, and the copy sheets are delivered to and withdrawn from the cylinder 3 in the directions of the arrows 5 and 6, respectively. In this case there are a pair of cams 9' and 10' respectively corresponding to counterrollers 9 and 10 and respectively situated at locations diametrically opposed to the cylinders 3 and 1. These cams 9' and 10' are carried by eccentric pins 20 and 21 capable of being adjusted either by hand or by a suitable motor drive acting on the linkages 22 and 23. The position of the guide roller 11 of the thrust-producing means corresponds to that of FIG. 1. In this case also a force constantly acts on the thrust-producing means and this force is derived from the illustrated spring means 24. While in the case of FIG. 4 the cams 9' and 10' are directly in engagement with the exterior periphery of the bearing ring 8, this ring 8 is formed with an opening 25 through which the roller 11 extends directly into engagement with the journal 7. This particular construction, where the thrust-producing means acts directly on the shaft portions which form the journals of the intermediate cylinder, has the advantage of eliminating even an extremely small amount of bearing play which might be present at the interior of the bearings 8.

The eccentric pins 20 and 21 of the cams 9' and 10' serve to determine the operating position of the intermediate cylinder, and of course this adjustment can also be used to compensate for any manufacturing tolerances. After the operating position of the intermediate cylinder is determined, then the turning of the eccentric pins through the linkages 22 and 23 can be used for the purpose of displacing the intermediate cylinder to and from its operative position with respect to the transfer cylinder 3 and the plate cylinder 1. The sequence of movement of the intermediate cylinder during displacement to and from its operative position can be that which was described above with respect to FIG. 1. Thus, the turning of the eccentric pin 20 can be used initially for lateral movement of cam 9' to displace the cylinder 2 tangentially with respect to cylinder 1 away from the cylinder 3, and then the subsequent turning of the pin 21 to lower the cam 10' can be used to provide movement of the cylinder 2 tangentially of the cylinder 3 downwardly away from the cylinder 1. The cylinder 2 is returned to its operative position with the reverse of these operations.

It is to be noted that with this arrangement also the cam 9' takes up all of the forces exerted by the transfer cylinder 3, while the cam 10' takes up all of the force exerted by plate cylinder 1. In other words, both with the embodiment of FIG. 1 and that of FIG. 4, there is no transfer to the cylinder 3 of forces coming from the cylinder 1 or transfer to the cylinder 1 of forces coming from the cylinder 3. One of the advantages of the arrangement of the invention is that all the forces of the cylinders 1 and 3 are respectively taken up by the counterrollers 10 and 9 in FIG. 1 and cams 10' and 9' in FIG. 4.

The arrangement which is shown in FIG. 4 may be modified in the manner indicated in FIG. 5 according to which the bearing rings 8 at both ends of the intermediate cylinder are eliminated and instead not only the guide rollers 11 but also the counterrollers 9 and 10 directly engage the exterior surfaces of the shaft portions 7 at both ends of the cylinder 2. Of course, with the embodiment of FIG. 5 all of the rollers 9-11 continuously rotate during operation of the press.

The thrust-absorbing means, instead of taking the form of cams or counterrollers, can also take the form of wedges. FIG. 6 shows an embodiment of my invention according to which such wedges are used for the thrust-absorbing means. In this case the bearing ring 8 at each end of the intermediate cylinder has pair of flat peripheral surface portions 26 and 27. The surface portion 26 is situated opposite the transfer cylinder 3, and the surface portion 27 is situated opposite the plate cylinder 1. These flat surface portions engage the elongated wedge members 28 and 29. A suitable structure, such as the linkages illustrated diagrammatically in FIG. 6, is operatively connected with these wedge members 28 and 29 to shift them longitudinally in the direction of the double-headed arrows indicated in FIG. 6. These linkages include pivotally mounted levers 28a and 29a connected by links 28b and 29b, respectively, to the wedges 28 and 29, respectively. The levers are turned by elements 28c and 29c, respectively. The inclination of the wedging surfaces of these wedge members is such that during longitudinal shifting movement of the wedge member 28, for example, the intermediate cylinder 2 will be displaced away from the transfer cylinder 3 tangentially with respect to the plate cylinder 1, while remaining in contact with the latter. In other words, while remaining in contact with the plate cylinder 1, the intermediate cylinder 2 is moved practically tangentially with respect to the periphery of the plate cylinder 1 during this displacement of the wedge 28. It is only during longitudinal displacement of the wedge member 29 that the intermediate cylinder 2 will be displaced away from the plate cylinder 1. The return of the intermediate cylinder to its operative position takes place with the reverse of these steps in a manner analogous to that described above. It is possible to control the wedges with practically the same control structure as has been described above in connection with the counterrollers. Inasmuch as in the embodiment of FIG. 6 no rotary movement of the ring 8 is required, the spring 30 which forms the thrust-producing means of this embodiment

can directly engage a flat surface portion of the ring 8. Of course, this latter flat surface portion is situated symmetrically with respect to the flat surface portions 26 and 27, so that the spring 30 serves to maintain the flat surface portions 26 and 27 at all times pressing against the wedge members 28 and 29, respectively.

My invention, of course, is in no way limited by the particular details described above and shown in the drawing. Many modifications are possible. For example, it is possible to use, instead of the bearing ring 8, an eccentric ring whose periphery is partially cut away in such a way that a pair of cams or supporting projections remain situated respectively diametrically opposed to the plate cylinder and the transfer cylinder. Moreover, the periphery of the eccentric sleeve, or bearing ring, can be provided with a further load bearing area on which the thrust-producing means can act, this latter means taking the form of a suitable spring structure, for example. The load-bearing areas of the ring, which are respectively situated diametrically opposed to the pair of outer cylinders, respectively receive the full load of these outer cylinders and directly engage the frame of the machine in suitable bores thereof, for example. Also in this case, there is a definite two-point support insofar as the length of the load-bearing areas extends through a relatively small circumferential region. Since the two load-bearing areas are constantly in engagement with the frame, in this case also there will be no disadvantages resulting from bearing play of the eccentric ring at each end of the cylinder.

A construction of this type is illustrated in FIG. 7. Referring to FIG. 7, it will be seen that there is provided for the end of the cylinder 2 shown in FIG. 7, as well as for its opposite unillustrated end, the eccentric sleeve or bearing ring 40 which has as its outer periphery a pair of elongated, arcuate cam supports 31 and 32. The cam support 31 is situated in line with the transverse cylinder 3, while the cam support 32 is situated in line with the plate cylinder 1. Moreover, a guiding cam 33 is provided at the outer periphery of the eccentric sleeve 40. The cam 33 of course corresponds to the guide roller 11 and absorbs the forces which are encountered during adjusting of the position of the intermediate cylinder 2. The cam 31 corresponds to the counterroller 9 and the cam 32 corresponds to the counterroller 10. The outer arcuate surfaces of the cams 31-33 engage the cylindrical surface of an opening formed in a side frame of the press.

Thus, the exterior periphery of the eccentric sleeve 40, which is mounted on the shaft of the intermediate cylinder, is machined away, over the major part of its periphery, so as to leave only the three camming portions 31-33 projecting in the manner indicated in FIG. 7. This construction operates precisely in the same way as the above-described embodiments which include the counterrollers, for example. Thus, during the printing operations there will be no possibility of undesirable movement of the intermediate cylinder 2 as a result of bearing play.

The adjustment of the intermediate cylinder 2 of FIG. 7 is brought about by turning the eccentric sleeve 40, and this turning can be produced by turning a lever 34 which is fixed to and extends radially from the eccentric sleeve 40. This adjusting lever 34 can be turned in the manner indicated by the double-headed arrow 35. The turning takes place about the axis 36 of the opening in the wall of the machine frame which receives the sleeve 40. This axis 36 is of course displaced from the axis 37 of the intermediate cylinder 2, so that during turning of the lever 34 and the eccentric sleeve 40 therewith the axis 37 will be displaced along and describe part of a cylinder whose axis coincides with the axis 36. Part of this cylinder is indicated in FIG. 7. Therefore, during turning of the eccentric sleeve 40 the axis 37 of the intermediate cylinder 2 will be displaced in the manner indicated in FIG. 7 with the result that the intermediate cylinder 2 will be displaced toward and away from the outer cylinders 1 and 3 either simultaneously or in a given sequence. Turning the lever 34 in one direction will displace the intermediate cylinder 2 away from the outer cylinders

ders 1 and 3 and in the opposite direction will return the intermediate cylinder 2 into its operative position with respect to the outer cylinders 1 and 3.

The mounting of a pair of counterrollers, for example, as described above, is much simpler than the conventional eccentric rings or shiftable bearings. Moreover, it is of particular advantage to provide the arrangement of counterrollers which respectively absorb all of the forces of the outer cylinders without transmitting these forces between these outer cylinders.

With a suitable arrangement of the three cylinders of the press, the rotary support for the intermediate cylinder can be provided by both counterrollers which receive the weight of the intermediate cylinder itself. The force of the thrust-producing means 11 is so great that in no position of the intermediate cylinder can there be any play between the counterrollers and the bearing structure for the intermediate cylinder, so that there is no play between the ring 8 and the counterrollers or between the journals of the intermediate cylinder and the ring 8. According to the particular form of the adjusting structure it is possible to displace the intermediate cylinder to and from its operative position with respect to the outer cylinders either in two stages, one of which follows the other, or simultaneously with respect to both of the outer cylinders.

I claim:

1. In a printing press, a pair of outer cylinders and an intermediate cylinder situated at least in part between said outer cylinders, all said cylinders being mounted on respective shafts coaxial therewith having parallel axes, respectively, and an assembly operatively connected to the shaft of said intermediate cylinder to support the latter for rotary movement and for movement toward and away from an operative position with respect to said outer cylinders, a pair of thrust-absorbing means located adjacent each end of the shaft of said intermediate cylinder, surface means on each end of the shaft of said intermediate cylinder in play-free engagement with a respective pair of said thrust-absorbing means, one means of said pairs of thrust-absorbing means respectively extending through a plane which includes the axis of said intermediate cylinder and the axis of one of said outer cylinders and the other means of said pairs of thrust-absorbing means respectively extending through a plane which includes the axis of said intermediate cylinder and the axis of the other of said outer cylinders, and a thrust-producing means located at each end of the shaft of said intermediate cylinder in play-free engagement with said surface means for urging the axis of said intermediate cylinder toward a space defined between said pair of thrust-absorbing means, and said thrust-producing means providing at least part of the thrust which is absorbed by said pair of thrust-absorbing means, all of said thrust-absorbing means and said thrust-producing means being in continuous engagement with said surface means, respectively.

2. In a press as recited in claim 1, adjusting means connected to said pair of thrust-absorbing means and movable so as to transmit a force through the latter to said surface means for displacing the same to adjust the location of said axis of said intermediate cylinder.

3. In a press as recited in claim 1, said surface means comprising at each end of said intermediate cylinder a bearing ring in which said intermediate cylinder shaft is journaled, and said adjusting means including at said respective intermediate cylinder end a linkage operatively connected to said ring and movable so as to transmit a force to said bearing ring for adjusting the angular position thereof, said bearing ring being in continuous peripheral engagement with a respective pair of said thrust-absorbing means, said bearing ring having peripheral regions of varying diameter whereby the location of said axis of said intermediate cylinder is altered when the angular position of said ring with respect to said axis is altered.

4. In a press recited in claim 1, said one thrust-absorbing means including a roller engaging said surface means and situated at that side of the axis of said intermediate cylinder which is opposite from the axis of said one outer cylinder, and the

other of said thrust-absorbing means including a roller engaging said surface means and situated at that side of the axis of said intermediate cylinder which is opposite the axis of said other outer cylinder.

5. In a press as recited in claim 1, said one thrust-absorbing means including a roller engaging said surface means and situated on the same side of said axis of said intermediate cylinder as said one outer cylinder and the other of said thrust-absorbing means including a roller engaging said surface means and situated on the same side of said axis of said intermediate cylinder as said other outer cylinder.

6. In a press recited in claim 1, said pair of thrust-absorbing means including a pair of rollers engaging said surface means and situated at each end of said intermediate cylinder on one side of the axis thereof.

7. In a press as recited in claim 6, said thrust-producing means including a roller in engagement with said surface means and a spring structure urging said roller toward the axis of said intermediate cylinder.

8. In a press as recited in claim 6, said thrust-producing means including a slide block engaging with and slidable on said surface means and a spring structure urging said slide block toward the axis of said intermediate cylinder.

9. In a press as recited in claim 1, each of said thrust-absorbing means being in the form of a thrust-absorbing member which remains stationary during operation of the press.

10. In a press as recited in claim 9, each of said thrust-absorbing members being a wedge.

11. In a press as recited in claim 9, each of said thrust-absorbing members being a cam.

12. In a press as recited in claim 1, said assembly including a bearing ring of eccentric configuration in which an end of said intermediate cylinder is journaled and said eccentric bearing ring carrying at its outer periphery a pair of thrust-absorbing cams which form said pair of thrust-absorbing means, respectively.

13. In a press as recited in claim 1, said surface means comprising a bearing at each end of the shaft of said intermediate member wherein the respective shaft end is journaled.

14. In a press as recited in claim 13, said bearing being a plain bearing.

15. In a press as recited in claim 13, said bearing being a roller bearing.

16. In a printing press, a pair of outer cylinders and an intermediate cylinder situated at least in part between said pair of outer cylinders, all of said cylinders having parallel axes and said intermediate cylinder having a journal at each of its ends, a bearing ring surrounding and engaging said journal at each end of said intermediate cylinder, said bearing ring having at its outer periphery a pair of flat surfaces respectively situated diametrically opposite to said pair of outer cylinders and a third flat surface situated at the side of the axis of said intermediate cylinder which is opposite from the side thereof where said pair of flat surfaces are situated, and a pair of elongated wedge members respectively slidably engaging said pair of flat surfaces and being longitudinally shiftable, one of said wedge members when longitudinally shifted providing for movement of said intermediate cylinder with respect to the outer cylinder which is situated opposite the other of said wedge members and said other wedge member when longitudinally shifted providing for movement of said intermediate cylinder with respect to the outer cylinder which is situated opposite said one wedge member, and a spring engaging said third flat surface and urging said ring against said wedge members.

17. In a printing press, a pair of outer cylinders and an intermediate cylinder situated at least in part between said pair of outer cylinders, all of said cylinders having parallel axes, and said intermediate cylinder having a journal at each of its ends, a bearing ring surrounding and engaging said journal at each end of said intermediate cylinder, said bearing ring having at its outer periphery a maximum radius portion, a first circumferentially extending surface portion of a smaller radius than

said maximum radius portion, and, angularly spaced from said first circumferentially extending surface portion, a second circumferentially extending surface portion which is also of a smaller radius than said maximum radius portion and which extends through an angular distance less than that through which said first surface portion extends, and a pair of counter-rollers engaging the outer periphery of said bearing bearing ring at each end of said intermediate cylinder, said counterrollers engaging the exterior surface of said bearing ring which is of maximum radius during normal operation of the press, and turning means operatively connected to said bearing ring for turning the latter through a first increment placing said first surface portion in engagement with one of said counterrollers and then through a second increment placing said second surface portion in engagement with the other of said counterrollers while maintaining said first surface in engagement with said one counterroller, said counterrollers respectively having

axes situated in planes which include the axis of said intermediate cylinder and which respectively include the axes of said outer cylinders, so that during the first increment of the turning of said bearing ring said intermediate cylinder will be tangentially displaced with respect to one of said outer cylinders while during the second increment of turning of said bearing ring said intermediate cylinder will be tangentially displaced with respect to the other of said outer cylinders, both of said counterrollers being situated on the same side of the axis of said intermediate cylinder, and means situated on the other side of said axis and engaging said bearing ring for urging the latter against said counterrollers.

18. In a press as recited in claim 17, a pair of eccentric means respectively connected operatively with said pair of counterrollers for adjusting the latter.

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