United States Patent

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[54] **CYLINDER THROW MECHANISM FOR PRINTING PRESSES**
6 Claims, 6 Drawing Figs.

[52] **U.S. Cl.** **101/143,** 101/220
[51] **Int. Cl.** **B41f 13/28**
[50] **Field of Search** 101/137, 139, 140, 143, 144, 145, 177, 179, 180, 182, 184, 185, 217, 218, 220, 229, 247

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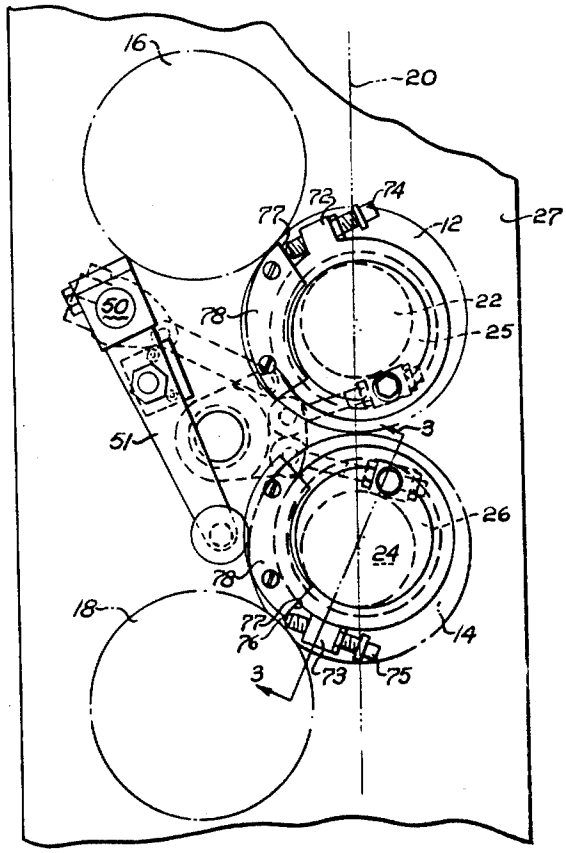
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ABSTRACT: An improved printing press includes a cylinder throw mechanism for moving a pair of printing cylinders between a throw on position in which they define a printing nip and a throw off position. The cylinder throw mechanism includes a first eccentric and toggle linkage for operating one of the printing cylinders between the throw on and throw off positions. A second eccentric and toggle linkage is provided for operating the other printing cylinder between the throw on and throw off positions. These toggle linkages are operated in response to operation of a third toggle linkage. This operation of the cylinder throw mechanism moves high points of eccentricity on the two eccentrics through a plane extending through the axes of rotation of the printing cylinders.



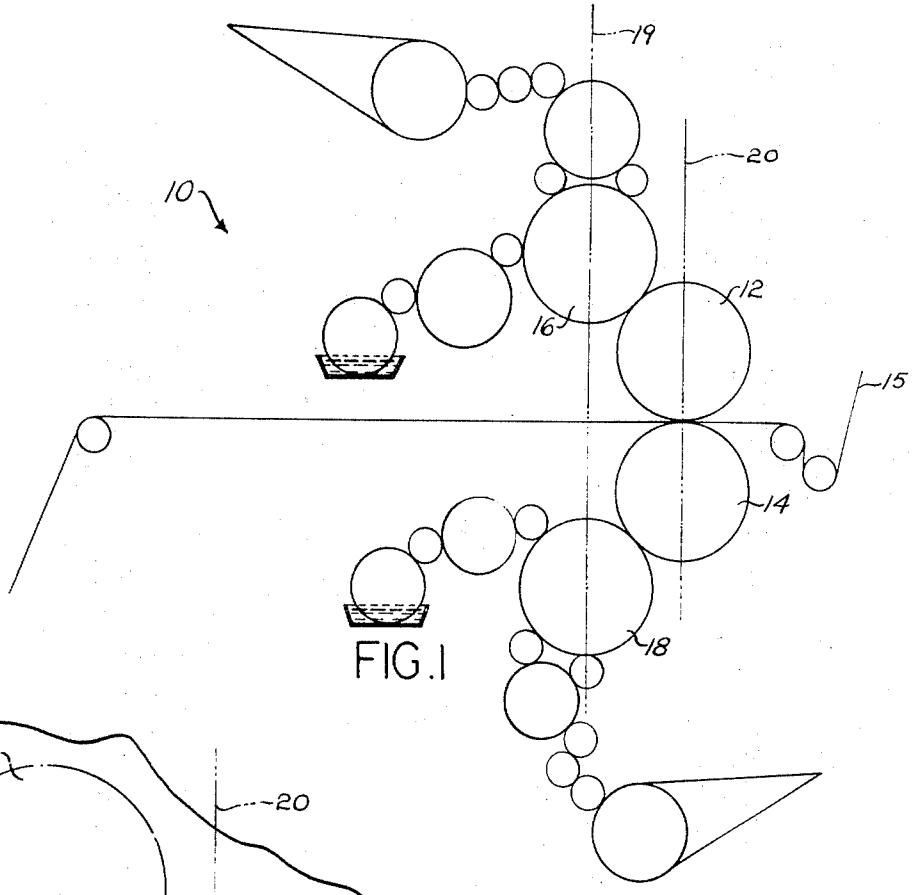


FIG. 1

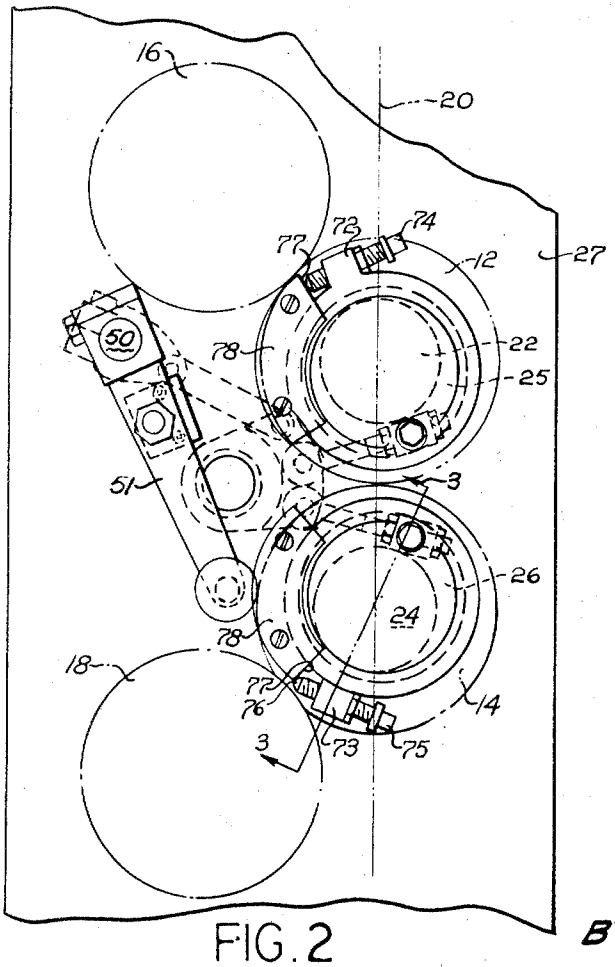


FIG. 2

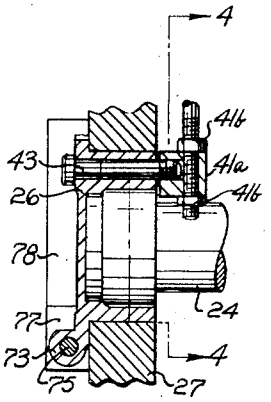


FIG. 3

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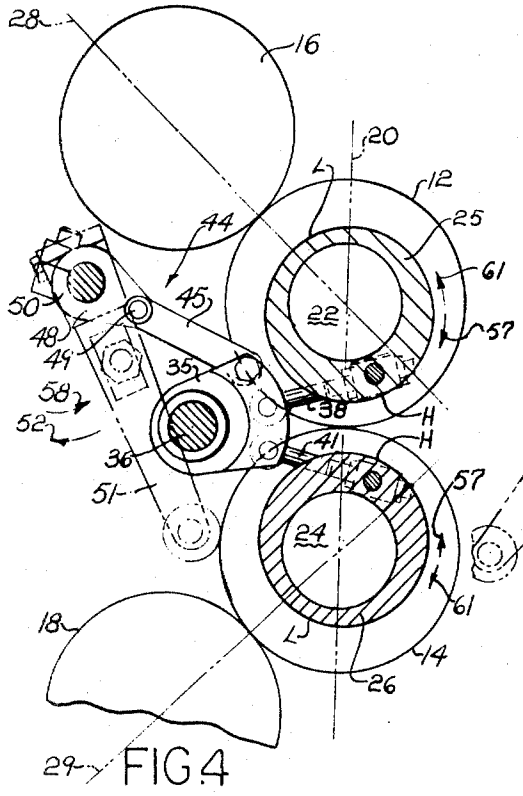


FIG.4

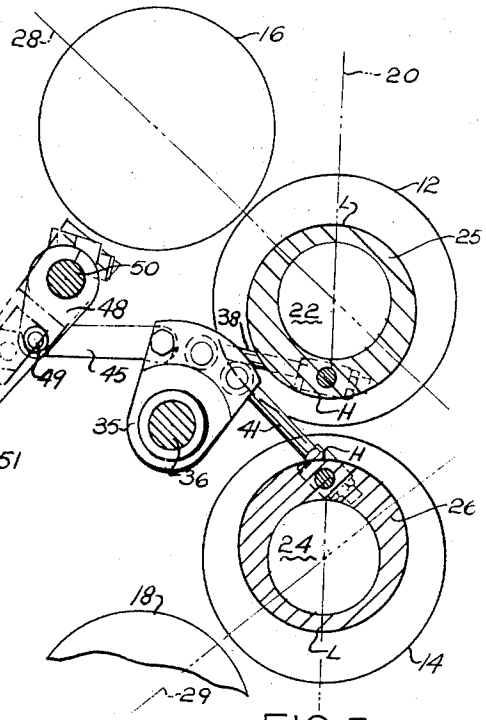


FIG.5

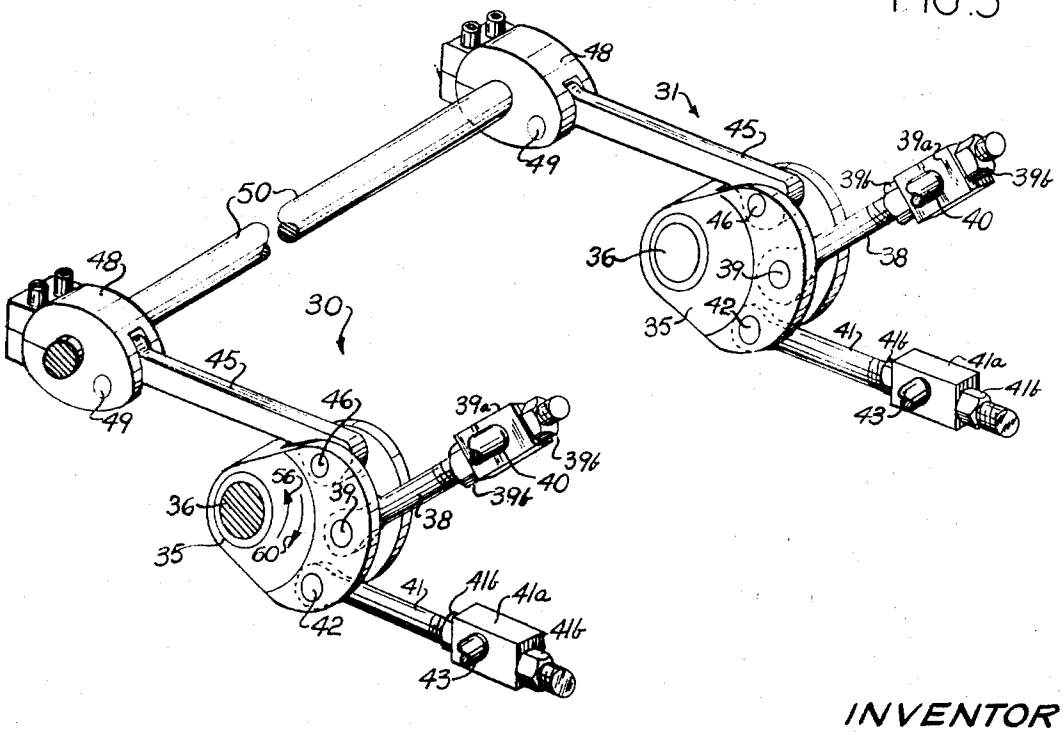


FIG.6

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CYLINDER THROW MECHANISM FOR PRINTING PRESSES

The present invention relates to a cylinder throw mechanism for establishing an impression or printing pressure between a pair of cylinders, and in particular to a cylinder throw mechanism for simultaneously moving a pair of cooperable printing cylinders between a throw on position in which they are in operative printing relation with each other and a throw off position in which they are out of printing relation with each other.

An important object of the present invention is to provide a new and improved cylinder throw mechanism for simultaneously moving a pair of printing cylinders of a rotary printing press between a throw on position in which they are in operative printing relation with each other and a throw off position in which they are out of operative printing relation with each other, and in which the cylinder throw mechanism is of a simple and economical construction, reliable in operation, and so constructed and arranged that it is effective to maintain the cylinders in the throw on position with a maximum mechanical advantage so as to prevent accidental movement thereof toward their throw off position.

Another object of the present invention is to provide a new and improved cylinder throw mechanism of the character referred to and wherein the cylinder throw mechanism includes a movable member operatively connected with the printing cylinders for moving the same between their throw on and throw off positions and a toggle linkage connected with said movable member for moving the latter when actuated, and wherein the toggle linkage is substantially in an on center position, preferably a slightly over center position, when the printing cylinders are in their throw on position whereby the printing cylinders are effectively held in this position and accidental movement thereof toward their throw off position is prevented.

Yet another object of the present invention is to provide a new and improved cylinder throw mechanism for simultaneously moving a pair of cylinders between a working position and another position, and in which the cylinder throw mechanism comprises first and second toggle linkages respectively connected with the cylinders and which have a common link member and a third toggle linkage connected with the common link member of the first and second toggle linkages and operable to move the latter to move the cylinders between their positions when actuated, and wherein the third toggle linkage is preferably arranged such that it is in a substantially on center or slightly over center position when the cylinders are in their working position whereby the cylinders are held in their working position against movement.

A further object of the present invention is to provide a new and improved cylinder throw mechanism, as defined in the next preceding object, and wherein the first and second toggle linkages are arranged such that they are in a substantially on center or slightly over center position when the cylinders are in their working position to further hold the cylinders in their working position against movement.

The present invention further resides in certain novel constructions and arrangement of parts, and further objects and advantages thereof will be apparent from the following detailed description of an illustrated embodiment of the present invention and in the accompanying drawings forming a part of the present specification and in which similar reference numerals are employed to designate corresponding parts throughout the several views, and in which:

FIG. 1 is a schematic view of a printing press embodying the present invention;

FIG. 2 is a fragmentary side elevational view of part of the printing press shown in FIG. 1;

FIG. 3 is a fragmentary sectional view taken approximately along line 3—3 of FIG. 2;

FIG. 4 is a side elevational view with parts thereof shown in section of the preferred embodiment of the cylinder throw mechanism of the present invention;

FIG. 5 is a fragmentary side elevational view like that shown in FIG. 4 but with certain parts thereof shown in a different position; and

FIG. 6 is an isometric view of part of the cylinder throw mechanism shown in FIGS. 4 and 5.

The present invention provides a novel cylinder throw mechanism for simultaneously moving a pair of cylinders between working and non-working positions. Although the novel cylinder throw mechanism of the present invention is susceptible for use in various kinds of machines or apparatuses, it is particularly useful for simultaneously moving a pair of cooperating printing cylinders of a rotary offset printing press between a throw on position in which they are disposed in operative printing relationship with each other and a throw off position in which they are out of printing relation with each other, and for the purposes of illustration it is herein shown and described as being embodied in a rotary offset lithographic printing press **10**.

Referring to the FIG. 1 of the drawings, the rotary offset printing press **10** is there shown as comprising upper and lower rotatable cooperating blanket cylinders **12** and **14** defining a printing nip therebetween through which a web **15** to be printed is adapted to pass. The web **15**, in the illustrated embodiment, is adapted to be printed on both of its sides, with the blanket cylinder **14** being the impression cylinder for the blanket cylinder **12** and the blanket cylinder **12** being the impression cylinder for the blanket cylinder **14**. The press further comprises upper and lower rotatable ink transferring or plate cylinders **16** and **18**, respectively, disposed in operative ink transferring relation with the blanket cylinders **12** and **14**. As shown in FIG. **1**, the axes of rotation of the plate cylinders **16** and **18** and the axes of rotation of the blanket cylinders **12** and **14** lie in common vertical planes, designated by reference numerals **19** and **20**, respectively, with the plane containing the axes of rotation of the blanket cylinders **12** and **14** being disposed on one side of or spaced from the plane containing the axes of rotation of the plate cylinders **16** and **18**.

The blanket cylinders **12** and **14** are supported for movement toward and from the plane **19** containing the axes of rotation of the plate cylinders **16** and **18** between a throw on position, as shown in FIG. 4, in which they are disposed in operative printing relationship with each other and in operative ink transferring relation or in contact with their respective plate cylinders **16** and **18**, and a throw off position, as shown in FIG. **5**, in which they are out of printing relation with each other and separated from or out of contact with their respective plate cylinders **16** and **18**. To this end, the blanket cylinders **12** and **14** have shafts **22** and **24** which are rotatably journalled at their opposite ends within movable bearings **25** and **26** which, in the preferred embodiment, are annular eccentrics having circular outer and inner peripheries. The eccentrics **25** and **26** are rotatably supported by the spaced side frames **27** of the printing press **10** for rotation about their center axes, the center axes of the eccentrics being laterally spaced from the axes of rotation of the blanket cylinders **12** and **14**. The eccentrics **25** and **26** have their high and low points of eccentricity H and L located 180° apart and with their high radius points of eccentricity H being disposed beneath and above the axes of rotation of the blanket cylinders **12** and **14**, respectively.

The eccentrics **25** and **26** are adapted to be simultaneously moved from a first position, as shown in FIG. **4**, in which their high and low radius points of eccentricity H and L are located on one side of a boundary defined by planes **28** and **29** containing the axes of rotation of the plate and blanket cylinders **16** and **12** and the plate and blanket cylinders **18** and **14**, respectively, and the plane **20** and a second position, as shown in FIG. **5**, in which their low radius points of eccentricity L are located on the one side of the boundary and their high radius points of eccentricity are located on the other side of the boundary or to the left of the plane **20**. The eccentricity of the eccentrics **25** and **26** and the relative dispositions of the high

and low points of eccentricity thereof with respect to the plate and blanket cylinders are such that the shafts **22** and **24** and hence, the blanket cylinders **12** and **14** are caused to be moved away from the plate cylinders **16** and **18** and away from each other in a direction away from the plane **19** toward their throw off position when the eccentrics are moved from their first position toward their second position and caused to be moved in the opposite directions toward their throw on position when the eccentrics **25** and **26** are moved from their second position toward their first position.

The eccentrics **25** and **26** are adapted to be moved between their first and second positions by cylinder throw means, generally designated by reference numerals **30** and **31**. The cylinder throw means **30** and **31** are respectively operatively connected with the eccentrics **25** and **26** at the opposite ends of the shafts **22** and **24**. Since both the cylinder throw means **30** and **31** are of an identical construction, only the throw means **30** connected with the eccentrics **25** and **26** at the left ends of the blanket cylinders **12** and **14**, as viewed in FIG. **6**, will be described in detail, and corresponding parts of the throw means **31** will be given the same reference numerals.

The cylinder throw means **30**, sometimes hereinafter referred to as throw off means, comprises first and second toggle linkages operatively connected with the eccentrics **25**, **26**, respectively, and which have a common link member in the form of a lever **35**. The lever **35** is rotatably supported on a stub shaft **36** which in turn is fixed to the adjacent side frame **28** of the printing press **10**. The lever **35** at its other end is bifurcated and is pivotally connected to one end of a toggle link or arm **38** by a pivot pin **39**. The other end of the arm **38** is threaded and connected to a generally rectangularly shaped block **39***a* by a pair of nuts **39***b* disposed at the opposite ends of the block **39***a*, the block in turn being pivotally connected to the inner side of the eccentric **25** and along the radial line passing through its high radius point by a pivot pin means **40**. The lever **35** at its other end is also pivotally connected to one end of a toggle link or arm **41** by a pivot pin **42**. The other end of the arm **41** is threaded and connected to a generally rectangularly shaped block **41***a*, by a pair of nuts **41***b* disposed at the opposite ends of the block **41***a*, the block in turn being pivotally connected to the inner side of the eccentric **26** and along the radial line passing through its high radius point by a pivot pin **43**.

The cylinder throw means **30** further comprises a third toggle linkage **44** connected with the lever **35**. The third toggle linkage comprises a toggle link or arm **45** extending generally opposite to the arms **38** and **41** and which has one end pivotally connected to the other end of the lever **35** by a pivot pin **46** and its other end pivotally connected to one end of a link or lever **48** by a pivot pin **49**. The lever **48** at its other end is fixed or clamped to a shaft **50** having its opposite ends rotatably supported by the side frames **28** of the printing press **10**. The shaft **50** is adapted to be rotated about its axis in opposite directions and functions to actuate the throw off means **30** to cause the eccentrics **25** and **26** to be rotated. The shaft **50** can be rotated by any suitable or conventional means, such as by a hydraulic motor or, as here shown, by a crank **51** having one end fixed to one of the ends of the shaft **50**.

As best shown in FIG. **4**, the third toggle linkage **44** is in a substantially on center position, preferably a slightly over center position, when the printing cylinders **12** and **14** are in their throw on position and thereby provides a maximum resistance to movement or accidental throwing off of the cylinders from their throw on position. The on center position occurs when the axis of the pivot pin **49** is aligned with the line of centers between the axis of the pivot pin **46** in the axis of rotation of the rotatable shaft **50**. A slightly over center position is effected when the axis or center of the pivot pin **49** is spaced slightly from the line of centers and in a direction opposite to the direction of movement of the pivot connection **49** that is to be prevented. As is apparent from FIG. **4**, when the third toggle linkage **44** is in its on center position movement of the lever **35** cannot take place and hence, the cylinders **12** and **14** are held in their throw on position.

Moreover, the first and second toggle linkages are also in substantially on center positions, preferably slightly over center positions, when the cylinders **12** and **14** are in their throw on position, since the axes of the pivot pins **39** and **42** are in substantial alignment with the line of centers between the axis of the shaft **36** and the pivot axes of the pivot pins **40** and **43**, respectively. Thus, the first and second toggle linkages are also effective to maintain the cylinders **12** and **14** in their thrown on position.

When it is desired or it becomes necessary during operation of the press to move the blanket cylinders **12** and **14** from their throw on position, as shown in FIG. **4**, to their throw off position, as shown in FIG. **5**, the crank **51** is rotated in the direction of the arrow **52**. Rotation of the crank **51** in the direction of the arrow **52** causes the shaft **50** and the lever **48** to be rotated in this direction and to break the substantially on center position of the third toggle linkage **44**. Movement of the lever **48** in the direction of the arrow **52** in FIG. **4** causes the toggle arm **45** to be moved toward the left which in turn causes the lever **35** to be moved in the direction of the arrow **56** and break the on center position of the first and second toggle linkages. Movement of the lever **35** in this direction causes the toggle arms **38** and **41** to be moved toward the left which in turn causes the eccentrics **25** and **26** to be moved in the direction of the arrow **57** from their first position in which their high point of eccentricity is disposed to the right of the plane **20** containing the axes of rotation of the blanket cylinders **12** and **14** toward their second position in which their high point of eccentricity is located slightly to the left of the plane. Movement of the eccentrics **25** and **26** from their first position toward and to their second position causes the blanket cylinders **12** and **14** to be moved from their throw on position toward their throw off position in which they are separated from or out of operative printing relation with each other and separated from or out of contact with their respective plate cylinders **16** and **18**. A suitable stop carried by the side frame **28** and which is engageable by the crank **51** can be provided to enable the operator to readily determine when the throw off position for the blanket cylinders **12** and **14** has been reached.

When the cylinders **12** and **14** are in their throw off position, as shown in FIG. **5**, the high radius points of the eccentric **25** and **26** are preferably disposed to the left of the plane **20** and thus, to enable the cylinders to be moved in a reverse direction toward their throw on position it is necessary to cam or move the cylinder **12** upwardly against the downward force of its weight. This downward force is normally sufficient to hold the cylinders in their throw off position and prevent accidental movement thereof toward their throw on position. However, to positively prevent such movement a suitable releasable detent member **57** carried by the crank **51** and which is cooperably engageable with a recess (not shown) in the side frame **28** is preferably provided, to positively lock the cylinders in their throw off position.

To return the blanket cylinders **12** and **14** from their throw off position, as shown in FIG. **5**, to their throw on position, as shown in FIG. **4**, the crank **51** is rotated in the opposite direction, as indicated by the direction of the arrow **58**. Movement of the crank **51** in the direction of the arrow **58** causes the shaft **50** and the lever **48** to be moved in this direction, which in turn causes the link **45** to be moved toward the right, as viewed in FIG. **5**. Movement of the link **45** toward the right cause the lever **35** to be moved in the direction of the arrow **60** which in turn causes the arms **38** and **41** to be moved toward the right. Movement of the arms **38** and **41** toward the right causes the eccentrics **25** and **26** to be moved in the direction of the arrow **61** from their second position toward their first position. Movement of the eccentrics **25** and **26** from their second position toward their first position causes the blanket cylinders **12** and **14** to be moved from their throw off position toward their throw on position in which they are in ink transferring relation or contact with the plate cylinders **16** and **18** and in operative printing relation with each other.

The relative positions of the blanket cylinders **12** and **14** with respect to each other when in their throw on positions can be varied to enable webs of different thicknesses to be printed and the printing pressure to be varied. To this end, the eccentrics **25** and **26** are provided with the ears **72** and **73** which carry adjusting screws **74** and **75**, respectively. The screws **74** and **75** are threadably engaged with the ears **72** and **73** and have tips **76** which form an abutment and which are adapted to abuttingly engage radially extending abutment surfaces **77** of arcuately extending abutments **78** fixed to the side frames **28** of the printing press. When the adjusting screws **74** are in abutting engagement with the adjacent abutments **78**, the eccentrics **25, 26** are in their first position and the blanket cylinders **12** and **14** are in their throw on position.

From the foregoing, it should be apparent that the abutments **78** form a stop and limit the movement of the eccentrics **25, 26** in the direction of the arrow **61** and thus, position the blanket cylinder **12** and **14** in their throw on position. By suitably rotating the adjusting screws **74** and **75** and adjusting the nuts **39***b* and **41***b* on the arms **38** and **41**, the position of the eccentrics **25** and **26** relative to the shafts of the blanket cylinders **12** and **14** can be adjusted so as to adjust the gap or space between the blanket cylinders so as to compensate for various thickness of webs to be printed.

From the foregoing, it can be seen that the hereinbefore enumerated objects and others have been accomplished and that a novel cylinder throw on or throw off mechanism which is of a simple and economical construction, reliable in operation, and which effectively holds the printing or blanket cylinders **12** and **14** in their throw on or throw off positions has been provided.

I claim:

1. A mechanism for simultaneously moving a pair of cylinders between working and non-working positions comprising, rotatable eccentrics operatively associated with said cylinders and having high and low points of eccentricity for moving said cylinders from their working and non-working positions, and means for rotating said eccentrics to effect movement of said high and low points of eccentricity to thereby move said cylinders between their working and non-working positions, said means comprising first and second toggle linkages respectively connected with the eccentrics of the pair of cylinders, said first and second toggle linkages including a common link member, said first toggle linkage further including an arm pivotally connected at one end to said common link member and pivotally connected at the opposite end to one of said rotatable eccentrics along a radius through the high point of eccentricity of said one eccentric and inwardly of the outer arcuate surface of said one eccentric, said second toggle linkage further including an arm pivotally connected at one end to said common link member and pivotally connected at the opposite end to the other of said rotatable eccentrics along a radius through the high point of eccentricity of said other eccentric and inwardly of the outer arcuate surface of said other eccentric, a third toggle linkage connected to said common link member and operable to move said common link member to effect movement of said eccentrics when actuated, and means for actuating said third toggle linkage.

2. A mechanism, as defined in claim **1**, and wherein said third toggle linkage comprises first and second links pivotally connected together at their adjacent ends, said first and second links at their other ends being pivotally connected to said common link member and a fixed pivot means, respectively, said pivotal connection between the adjacent ends of said first and second links being substantially aligned with the line of centers of the pivotal connections at the other ends of said first and second links when said cylinders are in their working position whereby said third toggle linkage is effective to hold said cylinders against movement when in their working position.

3. A mechanism, as defined in claim **2**, and wherein said common link member of said first and second toggle linkages is supported for movement in opposite directions about a fixed pivot, said first and second toggle linkages having an on center position and being substantially in their on center positions when said cylinders are in their working position to further hold said cylinders against movement.

4. A mechanism as defined in claim **1**, and wherein said pivotal connection between the opposite end of the arm of said first toggle linkage and the high point of eccentricity of said one eccentric is disposed on one side of the plane through the axes of said cylinders when said cylinders are in their working positions, said pivotal connections between the opposite end of the arm of said first toggle linkage and the high point of eccentricity of said one eccentric being disposed on the opposite side of the plane when said cylinders are in their non-working positions.

5. A mechanism for simultaneously moving a pair of cylinders between working and non-working positions comprising, rotatable eccentrics operatively associated with said cylinders for moving said cylinders between their working and non-working positions, a first toggle linkage operatively connected with one of said eccentrics for rotating said one eccentric to move one of said cylinders between its working and non-working positions, a second toggle linkage operatively connected with another of said eccentrics for rotating said other eccentric to move the other of said cylinders between its working and non-working positions, said first and second toggle linkages including a common member mounted for pivotal movement about a first axis, said first toggle linkage further including a first arm pivotally connected at one end portion to said common member for pivotal movement about a second axis and pivotally connected at the opposite end portion with said one eccentric for pivotal movement about a third axis, said second and third axes being in substantial alignment with said first axis when said cylinders are in said working positions and partially defining a first reference line extending through said axes, said second toggle linkage further including a second arm pivotally connected at one end portion to said common member for pivotal movement about a fourth axis and pivotally connected at the opposite end portion with said other eccentric for pivotal movement about a fifth axis, said fourth and fifth axes being in substantial alignment with said first axis when said cylinders are in said working positions and partially defining a second reference line extending through said first, fourth and fifth axes and positioned at an acute angle to said first reference line, and a third toggle linkage connected to said common member and operable to move said common member and said eccentrics to move said cylinders to their non-working positions, said second, fourth and fifth axes being located on the same side of said first reference line when said cylinders are in their non-working positions.

6. In a rotary printing press as set forth in claim **5** wherein said first arm is pivotally connected to said one eccentric along a radius through the high point of eccentricity of said one eccentric and said second arm is pivotally connected to said other eccentric along a radius through the high point of eccentricity of said other eccentric.