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Kist et al.

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[54] **DISCONNECT ARRANGEMENT FOR MULTI-UNIT PRINTING PRESS**

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Related U.S. Application Data

[63] Continuation of Ser. No. 85,131, Oct. 29, 1970, abandoned.

[52] **U.S. Cl.** **101/137**, 101/184, 101/247

[51] **Int. Cl.** **B41f 7/06**, B41f 13/28

[58] **Field of Search** 101/136–145, 101/174–185, 247, 248, 216–219

[56] **References Cited**

UNITED STATES PATENTS

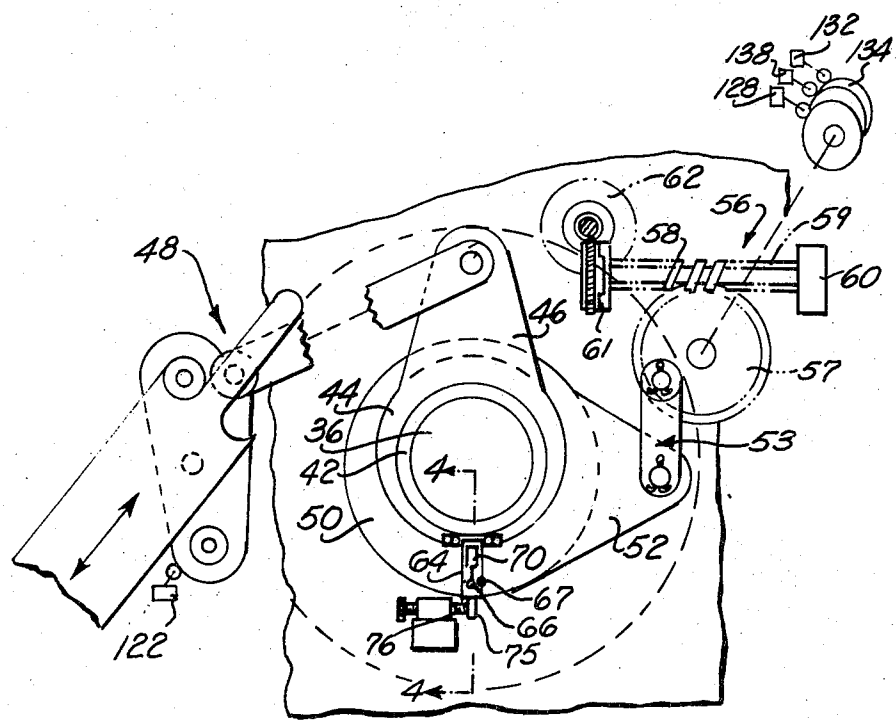
1,818,751	8/1931	Quick et al.	101/247
2,003,798	6/1935	Barber	101/177
2,026,434	12/1935	Quick et al.	101/247
2,258,653	10/1941	Klingelfuss	101/247
2,568,761	9/1951	Peyrebrune	101/218
2,773,445	12/1956	Wood	101/218
2,866,408	12/1958	Stevenson	101/139 X
2,944,482	7/1960	Allen	101/177
3,030,884	4/1962	Lindemann	101/218
3,112,695	12/1963	Seel	101/177 X
3,221,651	12/1965	Tagliasacchi	101/183
3,280,737	10/1966	Huck	101/181
3,516,355	6/1970	Giuiuzza	101/183
1,301,072	4/1919	Mascord	101/247

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[57] **ABSTRACT**

A disconnect arrangement for individual units of a multi-unit press in which the throw-off eccentrics and the stock-thickness adjustment eccentrics for the blanket cylinder are selectively interconnected for simultaneous operation to impart additional throw to the blanket cylinder to shift the blanket cylinder out of mesh with the driving gear. A timing gear train and a single position clutch assure re-engagement of the blanket cylinder in the proper timed relationship. Means are disclosed for returning the stock thickness mechanism to its original setting upon re-engagement of the blanket cylinder.

23 Claims, 8 Drawing Figures



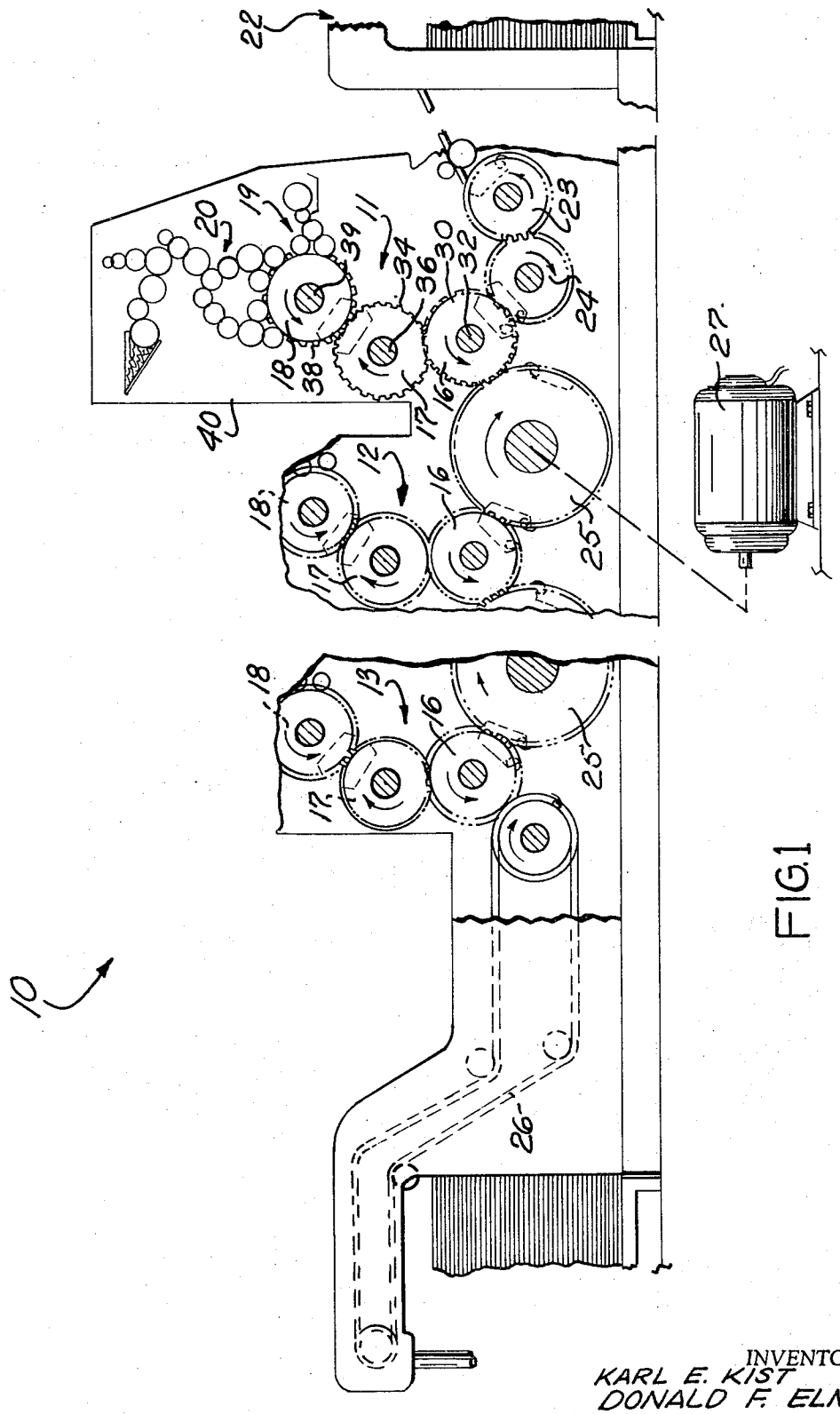


FIG.1

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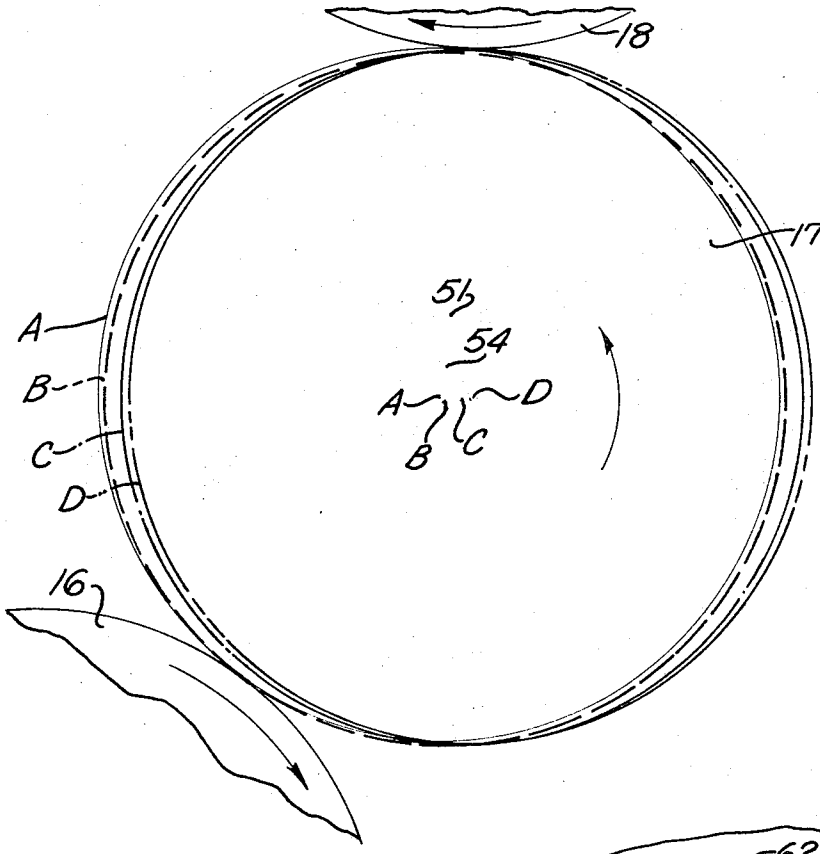


FIG. 2

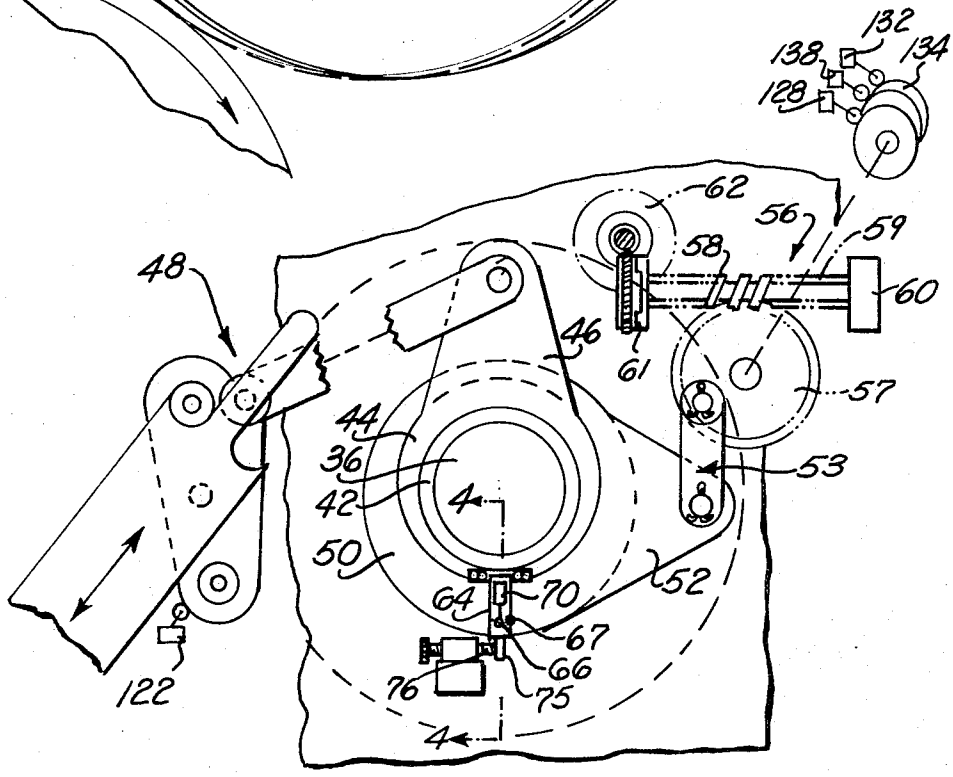


FIG. 3

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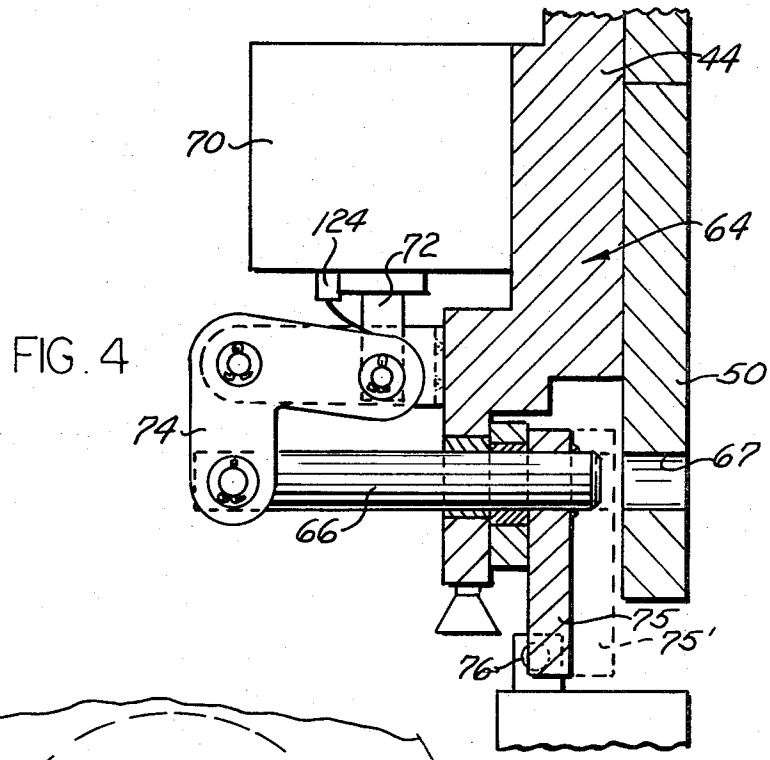


FIG. 4

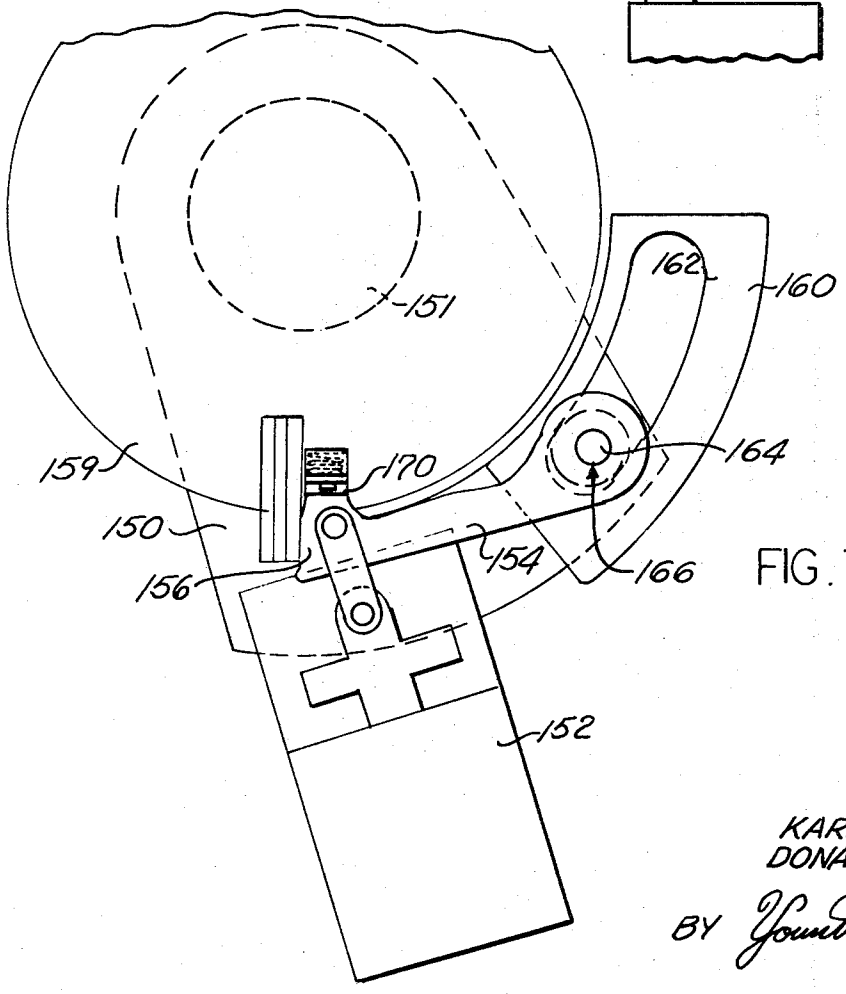


FIG. 7

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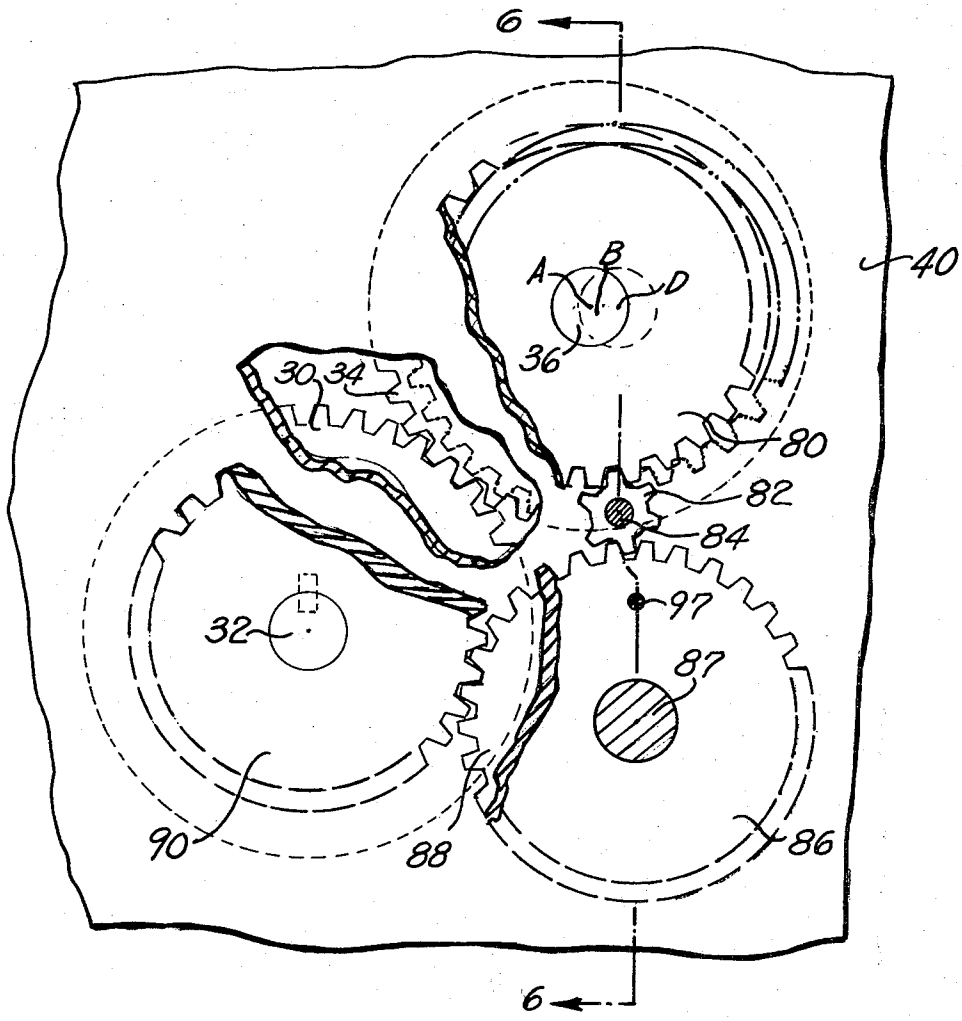


FIG. 5

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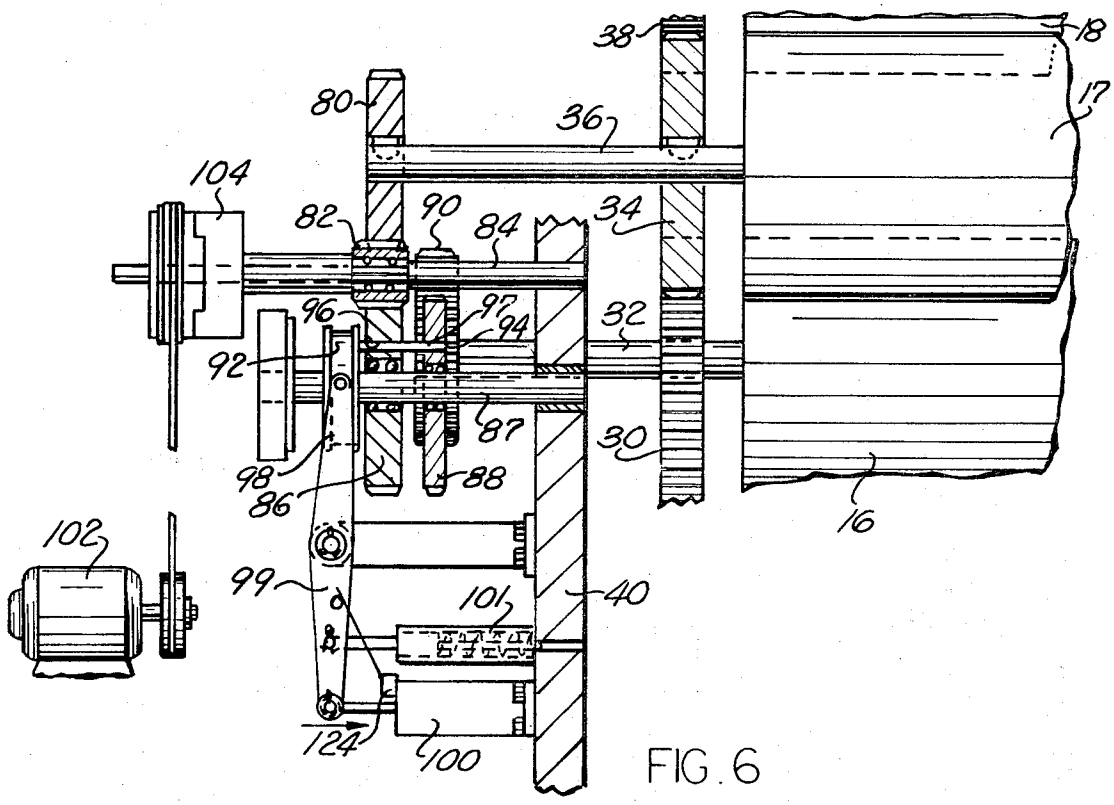


FIG. 6

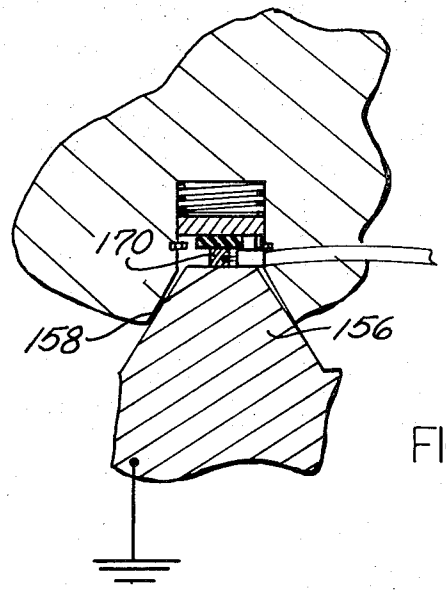
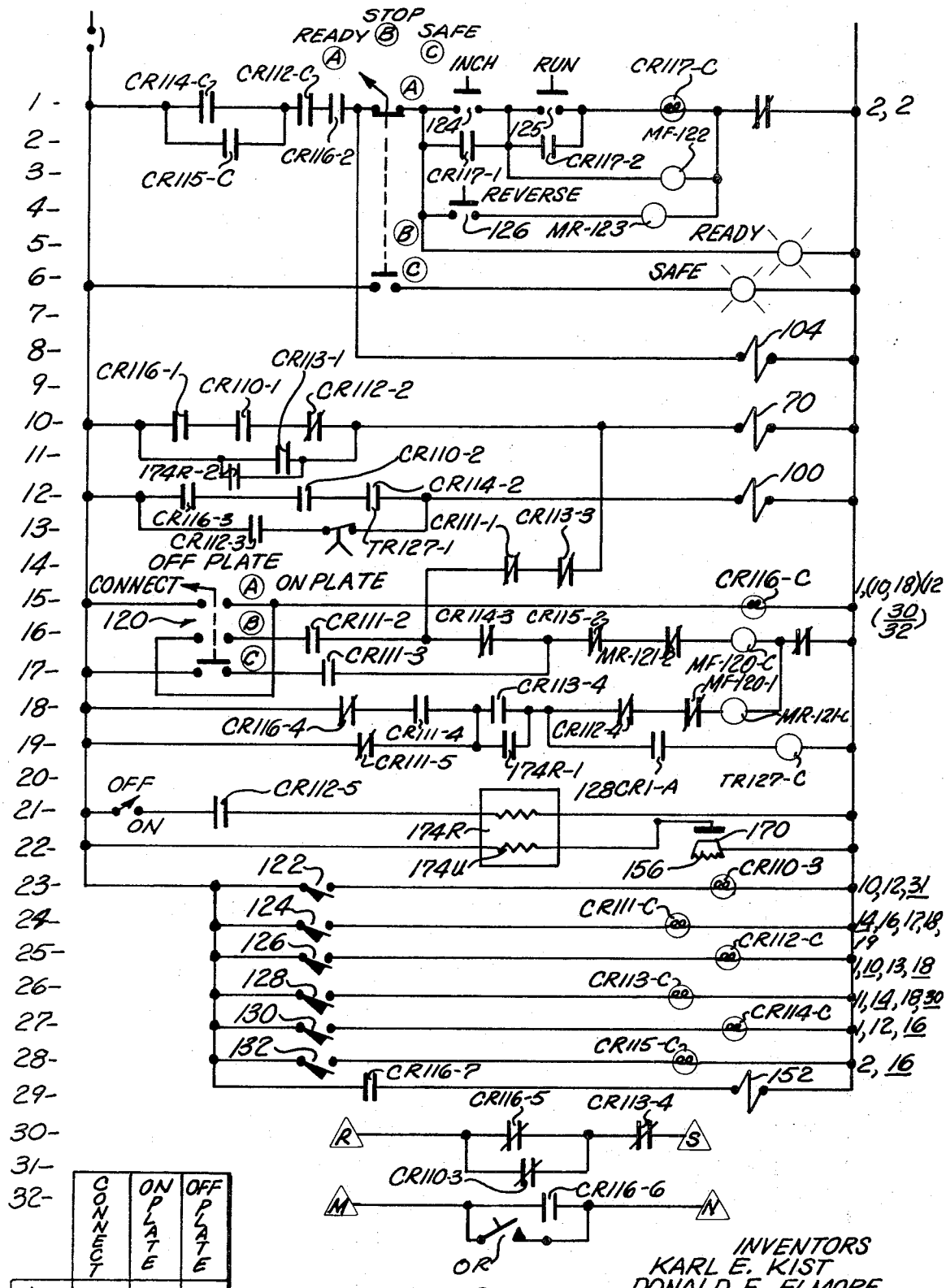


FIG. 8

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	CONNECT	ON PLATE	OFF PLATE
A	O	X	X
B	X	X	O
C	O	O	X

FIG. 9a

FIG. 9

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DISCONNECT ARRANGEMENT FOR MULTI-UNIT PRINTING PRESS

This is a continuation of application Ser. No. 85,131, filed Oct. 29, 1970, now abandoned.

This invention relates to printing presses and, particularly to a disconnect arrangement for allowing the image carrying cylinder means of the individual units of a multi-unit printing press, such as the blanket and plate cylinders of a sheet fed multi-color offset lithographic press, to be rotated separately from the other units for make-ready or clean-up purposes even though the cylinder means of the various units are intergeared during normal printing operations.

Although the invention is particularly useful in three cylinder offset sheet fed presses, it will be appreciated that the concepts may be used in other types of presses.

When a multi-unit printing press is being readied for a printing run, and sometimes during a printing run, it is necessary or desirable to perform certain make-ready or clean-up operations on the individual units of the press. While readying a printing press for printing operations or when cleaning up the press, it is highly desirable that different pressmen be able to drive at least the image carrying cylinder means of the different printing units independently of each other so that more than one man can work on the various printing units and jog the image carrying cylinder means of the unit as desired without endangering the men working on the other printing units. However, it is apparent that if all the image carrying cylinder means of the different printing units are geared together during make-ready or clean up, as they are during normal printing operation, only one pressman can safely work on the press for those operations which require a cylinder of the individual units to be rotated for the make-ready or clean-up operations.

To facilitate make-ready and clean-up, it has been heretofore suggested, in sheet fed printing presses, to disconnect the entire individual printing units from each other and to provide auxiliary motors whereby the entire disconnected units can be individually rotated. In this way, different pressmen can work on different units with each individual unit being rotatable separate from the other units. In such systems the impression cylinder of the unit has normally been driven with the unit after the disconnect and the transfer cylinders between the units have commonly been driven with one of the adjacent units although in one machine it has been locked in position to maintain timing.

The disconnection means for disconnecting a printing unit has generally incorporated a one-toothed clutch or a pin in the main drive to provide for the reconnection of the units in their proper angular relationship. These pins and one-toothed clutches have carried driving forces for the units during normal printing. It is preferable that drives for printing units be through gear teeth during the normal printing operation.

It is an object of the present invention to provide a new and improved multi-unit printing press in which the individual units which are interconnected during running may be operated independently of each other for make-ready, etc., the press being so constructed and arranged that the printing cylinder units to be disconnectable may be individually shifted to throw the drive gear on the printing cylinder out of mesh with its

driving gear to disconnect the printing cylinder from the main drive of the press so that the printing cylinder may be driven independently of the main drive train for make-ready purposes, the disconnect mechanism preferably including timing means for reconnecting the printing cylinder with the main drive train at the proper angular relationship to maintain the timing of the press.

It is another object of the present invention to provide a new and improved multi-unit printing press in which the printing cylinders of the units can be thrown out of meshing engagement with their drive gear so as to be disengaged from the press drive train and driven independently of the press drive and of each other for make-ready and clean-up purposes and in which the main press drive may be operated to rotate the main press drive train and the impression cylinders of the press to effect a reconnection of the disconnected printing cylinders when the printing cylinders have the proper phase relationship with the press drive.

It is a more specific object of this invention to provide an improved disconnect arrangement for individual units of a multi-unit sheet fed press and which is operable without interfering with the sheet handling cylinders or the ability of these cylinders to handle sheets when one or more units are disconnected.

It is a further object of this invention to provide an improved disconnect arrangement which includes improved means for shifting the blanket or printing cylinder of each unit of a multi-unit press out of mesh with its associated driving gear and means for reconnecting the units in the proper timed relationship.

It is another object of the present invention to provide a new and improved throw mechanism for a printing cylinder in which the cylinder may be moved or thrown laterally to throw the pressure on and off without losing the meshing relationship of driving gears for the printing cylinder or of timing gears which interconnect the driving gears and may be moved an additional distance laterally to lose the meshing of the driving gears but not of the timing gears.

It is a still further object of this invention to provide a disconnect arrangement for a printing press unit which utilizes a conventional cylinder throw-off and stock-thickness adjustment mechanism to effect the disconnect.

The invention also contemplates a multi-unit printing press in which a printing cylinder which is movable between printing and non-printing positions while its drive gear remains in mesh with a driving gear is also movable to non-printing condition in which the drive gear is out of mesh with its driving gear to thereby disconnect the printing cylinder so that it can be driven separately from the main press drive by an auxiliary motor, the printing cylinder, if the press is a lithographic press, preferably having positions on and off the plate cylinder with its drive gear out of mesh with its driving gear.

It is another object of the invention to use a conventional stock-thickness mechanism in the disconnect sequence and provide means for returning the mechanism to its original setting upon re-engagement.

More specifically, and in accordance with the principles of this invention, the printing cylinder is so constructed and arranged that it may be thrown off and on printing pressure in a conventional manner without being disconnected from its drive but when it is desired

to disconnect the printing unit from the main press drive, the throw mechanism for the printing cylinder includes means for introducing additional throw into the cylinder with the additional throw being sufficient to move the cylinder gear for driving the cylinder out of mesh with its driving gear. To assure that the cylinder gear re-engages the driving gear in the proper angular relationship, timing gear means connected to the timing gears function only to maintain the proper angular relationship of the cylinders and not to transmit drive therebetween during printing.

More specifically, the timing gears include disconnect means in the form of a solenoid actuated pin which is operable to disconnect a timing gear associated with the blanket cylinder from a timing gear associated with the impression cylinder. The pin can be reconnected in only one angular position of the timing gears thereby assuring that upon reconnection of the timing gears, the proper angular relationship between the plate, blanket and impression cylinders is re-established. Safety means are provided so that when the blanket cylinder is disconnected, the auxiliary motors for the individual units cannot be started to drive the units until the solenoid actuated pin has been energized thereby disconnecting the timing gear train and precluding the transmission of drive through the timing gears.

It is conventional to support a blanket cylinder in eccentrics which are rotated to effect the shifting movement of the blanket cylinder to its on and off pressure positions. In addition, a stock-thickness mechanism is normally provided for adjusting the final position of the cylinder relative to the impression cylinder to adjust for various stock thicknesses. This stock thickness mechanism commonly includes second eccentrics which surround the eccentrics comprising the throw out mechanism so that rotation of the inner eccentrics throws the cylinder off and on pressure while rotation of the outer eccentrics adjusts the position of the cylinder for stock thickness. In accordance with a specific form of the preferred embodiment of this invention, the inner throw off eccentric carries a solenoid operated pin which, upon energization of the solenoid, is receivable in an opening in the outer eccentric thereby coupling the two eccentrics for unitary movement. With this arrangement, the blanket cylinder may be moved to its normal on and off pressure positions through operation of the conventional throw off mechanism which rotates the inner eccentrics. However, when it is desired to throw the blanket cylinder out of mesh with the press drive train, the solenoid is actuated to couple the inner eccentric to the outer eccentric with the two eccentrics providing the additional throw necessary to move the blanket cylinder out of mesh.

An additional feature of a specific form of the invention is the provision of means associated with the stock thickness mechanism to automatically re-establish the previously set position of the stock thickness adjustment mechanism when the blanket cylinder is moved back into meshing engagement with the drive train.

Further objects and features of the present invention will be apparent to those skilled in the art to which it relates from the following detailed description of the preferred embodiment thereof made with reference to the accompanying drawings forming a part of this specification and in which:

FIG. 1 is a schematic side elevational view of a lithographic multi-unit sheet-fed printing press in which the invention may be employed;

FIG. 2 is a view showing various positions to which the blanket cylinder of a printing unit may be moved;

FIG. 3 is a view somewhat diagrammatic of mechanism for moving a blanket cylinder;

FIG. 4 is a view taken approximately along line 4—4 of FIG. 3;

FIG. 5 is a view showing drive gears and timing gears in one of the units;

FIG. 6 is a view taken approximately along line 6—6 of FIG. 5;

FIG. 7 is a view of a stock adjustment restorer;

FIG. 8 is a sectional view of part of the adjustment restorer mechanism;

FIG. 9 is a circuit diagram for use with the press of FIG. 1; and

FIG. 9a is a switch position diagram.

Referring now more in detail to the drawings wherein the showings are for the purpose of illustrating a preferred embodiment only and not for the purposes of limiting same, there is illustrated in FIG. 1 a multi-color sheet-fed offset lithographic press, generally indicated by the reference numeral **10**, and which comprises a plurality of units, three of the printing units, **11**, **12** and **13**, being shown. As is well understood in the art, each of the printing units includes an impression cylinder **16**, and cylinder means comprising a blanket cylinder **17** and a plate cylinder **18** which carry the image to be printed. Each unit also includes a dampening mechanism **19** and an inking mechanism **20**, each of which is conventional in the art and functions in conventional manner to supply dampening fluid and ink to the plate cylinder **18**.

A feeding mechanism, indicated generally by the reference numeral **22**, supplies sheets to the first printing unit **11** through a feed cylinder **23** and an advance cylinder **24** which transfers the sheet to the impression cylinder **16** of the first printing unit. The sheet is then carried through the printing nip of the first printing unit by the impression cylinder **16** and is transferred to a first double size transfer cylinder **25** which carries the sheet to the impression cylinder of the second printing unit **12**. In this manner, the sheet passes through each of the printing units and is ultimately delivered to a delivery mechanism, shown schematically and indicated by the reference numeral **26**.

The press is driven by a main drive motor **27** shown schematically as driving the first transfer cylinder. The cylinders of the press are intergeared in a conventional manner with the transfer cylinders having gears which mesh with gears on the adjacent impression cylinders and the impression cylinder gears drive gears on the respective blanket cylinders which, in turn, drive gears on the associated plate cylinders. The ink rolls and dampener rolls, if driven by the press drive, may be driven from the gears on the plate cylinders.

Referring again to FIG. **1**, the drive arrangement between the impression, blanket and plate cylinders of the units is schematically illustrated for each unit and the drive comprises a gear **30** which is secured for rotation to the impression cylinder shaft **32** and which meshes with a blanket cylinder drive gear **34** secured to the blanket cylinder shaft **36**. The gear **34** meshes with a plate drive gear **38** carried on the plate cylinder

shaft 39. Each of the gears 30, 34 and 38 are disposed on the inside of the frame 40 of the press.

In the printing press illustrated in FIG. 1, the blanket cylinders are each supported for movement between an "on pressure" position for printing in which it has a pressure relationship with the plate and with the impression cylinder of the unit, at least when stock is fed therebetween, and an "off pressure" non-printing position in which it is clear of the plate and impression cylinder. In the normal "off pressure" position, the gears 34 on the blanket cylinders remain in meshing engagement with the impression gears 30. The two primary positions to which the blanket cylinder may be shifted are illustrated in FIG. 2 with the "on pressure" and its axis of rotation being indicated at A, while the "off pressure" position and its axis of rotation being indicated at B.

Referring now to FIG. 3, the arrangement for effecting the shifting movements of a blanket cylinder of the press is schematically illustrated. As shown in that figure, the blanket cylinder shaft 36 is eccentrically and rotatably supported by an appropriate bearing 42 in a rotatable bushing 44, hereinafter referred to as an eccentric or eccentric bushing. The eccentric 44 is connected by appropriate lug means 46 to a conventional throw mechanism 48 including a rocker member 48*a*. By actuating the throw mechanism 48, the eccentric 44 is rotated about its axis of rotation 54 (FIG. 2) to shift the axis of rotation of the shaft 36, and hence throw the blanket cylinder 17, to throw the cylinder to its respective on and off pressure positions shown at A and B in FIG. 2. In the on pressure position, the throw of the rocker member is limited by a stop 48*b*.

It will be understood that the present invention is also applicable to printing presses in which double eccentrics are used to throw to the plate in one movement and to the impression in another movement, with the throw to establish plate pressure being actuated by mechanism separate from that to establish impression pressure.

In addition to the eccentric 44, a second eccentric bushing 50 rotatably supported by frame 40 is provided. The second eccentric rotatably and eccentrically supports the first eccentric and, for purposes of this disclosure, the eccentric 44 will be referred to as an inner eccentric and the eccentric 50 as the outer eccentric. The eccentric 50 is supported in the frame 40 for rotation about an axis 51 (FIG. 2) which is offset from the axis of rotation of both the eccentric 44 and the shaft 36. A lug 52 fixed to the eccentric 50 is connected through an appropriate linkage 53 to a stock-thickness adjusting mechanism, indicated generally by the reference numeral 56. The mechanism 56 may comprise a rotatable gear 57 in meshing engagement with a worm gear 58 on a rotatable shaft 59. A manually operable hand wheel 60 is connected to the shaft 59. The shaft 59 is connected to a clutch 61 which is driven by a motor 62 through a worm and worm wheel drive. With this arrangement, the eccentric 50 may be rotated to shift the position of the blanket cylinder either by manual rotation of the hand wheel 60 or through operation of the motor 62 and clutch 61.

In the illustrated embodiment of this invention, means are provided to interconnect the inner eccentric 44 with the outer eccentric 50 to impart additional throw to the blanket cylinder 17 to move the blanket cylinder gear 34 out of meshing engagement with the impression cylinder gear 30. More specifically, referring to FIG. 3, this is accomplished by an arrangement which includes a bracket 64 carried by the inner eccentric 44 and extending over the outer eccentric 50. The bracket 64 carries a solenoid operated pin 66 which, upon energization of a solenoid 70, can be moved into a pin-receiving opening 67 in the outer eccentric thereby to connect the inner and outer eccentrics for unitary movement. With this arrangement, the blanket cylinder is moved to an off pressure position by the conventional throw-off mechanism and, through energization of stock-thickness motor 62 and the solenoid 70, the two eccentrics may be interconnected by the pin 66 and moved to rotate both eccentrics 44, 50 simultaneously to move the blanket cylinder 17 laterally.

Referring more in detail to the mechanism for interconnecting the two eccentrics, and with particular reference to FIG. 4, it will be observed that the bracket 64 supports the solenoid 70 having a movable armature 72 which is connected by a pivotally supported crank or lever 74 to the solenoid operated pin 66. It will be appreciated that upon energization of the solenoid 70, the armature 72 is retracted thereby pivoting the lever 74 and displacing the pin 66 axially into the opening 67 in the outer eccentric.

To limit the movement of the inner eccentric during the normal throw-off operation, there is provided a stop dog 75 which is carried by the pin 66 and which is adapted to engage an adjustable fixed stop 76 on the frame of the press. The stop dog 75 is connected for movement with the pin 66 so that when the inner eccentric is coupled to the outer eccentric by actuation of the pin 66, the stop member 75 is moved to the dotted line position 75'. In this position, the stop dog clears the fixed stop 76 and permits the inner eccentric to rotate beyond the stop with the outer eccentric to provide the additional throw necessary to move the blanket cylinder out of mesh with the drive gear on the impression cylinder.

In the illustrated embodiment, when the blanket cylinder gear is out of mesh with the drive gear on the impression cylinder, the blanket cylinder may be in an OFF-PLATE or an ON-PLATE position. In the OFF-PLATE position, the blanket is separated from the plate while in the ON-PLATE position, the eccentric is thrown an additional distance and the blanket is moved into engagement with the plate with the drive gears between the blanket and impression cylinders remaining out of mesh.

To assure the proper timed relationship between the cylinders upon re-engagement of the blanket cylinder drive gear with the impression cylinder drive gear, a timing mechanism is provided. This mechanism is illustrated in FIGS. 5 and 6 and comprises timing gear means with a clutch which may be engaged when the clutch members are in only one relative angular position thereby assuring coupling of the timing gear means in the proper timed relationship. More specifically, the blanket cylinder shaft 36 extends through the frame 40 and has secured to the outer end thereof a timing gear 80. The gear 80 meshes with a gear 82 which is supported on a stub shaft 84 rotatably supported in the frame 40. The gear 82 meshes with timing gear 86 rotatably supported on a shaft 87 carried by frame 40. The gears 86, 80 remain in mesh with the idler gear 82 when the blanket cylinder is moved to disengage the

gears of the blanket and impression cylinder. FIG. 2 illustrates the center of the blanket cylinder shaft for the various positions of the blanket cylinder. Position A in FIG. 2 indicates the "on pressure" position, the position B indicates the shaft center line position for the normal "off pressure," position C indicates the position for the OFF-PLATE but out of mesh position of the cylinder and position D indicates the position for ON-PLATE and out of mesh. From FIG. 2 it can be seen that the eccentrics shift the axis of the driving gear **34** and of the timing gear **80** on the shaft of the blanket cylinder **17** along a line which is almost parallel to the line of action between the teeth of the timing gear **80** and of the gear **82** shown in FIG. **5.** This line has a major component of movement along a line joining the axes of the gears **30** and **34** for driving the impression and blanket cylinders, respectively so that these gears will move out of mesh even though the movement is not enough to disengage the teeth of the timing gears **80** and **82.**

Rotatably supported on the same shaft **87** as the gear **86** is a second timing gear **88** which is in meshing engagement with a cooperating gear **90** secured to an end of the impression cylinder shaft **32** for rotation with the impression cylinder and its drive gear **30.**

Referring to FIG. **6,** the shaft **87** also rotatably carries on its outer extremity, throw-out collar **92** which includes an axially projecting clutch pin **94.** The pin **94** normally extends through an axially extending opening **96** in the gear **86** into an opening **97** in the gear **88.** The pin **94** is adapted to be shifted by the collar **92** to a position where it is clear of opening **97** in the gear **88** to disconnect the timing gears and allow independent rotation of the blanket and impression cylinders. The throw-out collar **92** and its associated pin **94** are shiftable axially along the shaft **87** by a throw-out yoke **98** which is connected by a pivoted lever portion **99** to a solenoid actuator **100.** A spring **101** connected to lever **99** normally biases collar **92** to a position where pin **94** extends into opening **97.** It will be appreciated that as the solenoid **100** is energized, the yoke **98** will shift the collar **92** axially on the shaft **87** to withdraw the pin **94** from the opening **97** in the gear **88,** thereby disconnecting the two gears **86, 88** for independent rotation. In this way, the timing gears **80, 82, 86, 88** and **90** may be selectively coupled for unitary rotation but, when desired, the train may be interrupted so that the gears **80, 82** and **86** rotate independently of the gears **88** and **90.**

In the illustrated embodiment, when the blanket cylinder gear **34** is in meshing engagement with gear **30,** the pin **94** will couple the two gears **86, 88** together for unitary rotation. However, it is to be noted that the timing gears are not designed to transmit the drive from the impression cylinder to the blanket cylinder during printing since this drive function is performed by the gears **30, 34** and that during normal operation when the cylinder gears **30, 34** are in mesh, the pin **96** may be disengaged if desired. The only function of the timing gear train is to enable the establishment of the proper timed angular relationship between the cylinders after the blanket cylinder has been thrown off and out of mesh with gear **30.** The timing gears enable the proper angular relationship to be re-established and maintained as the gears are brought back into mesh. This is accomplished in the following manner. On disconnection of the blanket cylinder from the main press drive, the solenoid **100** is actuated to withdraw pin **94** from the aperture **97** thereby disconnecting the timing gear **86** from the timing gear **88.** Thereafter, the blanket cylinder may be rotated through actuation of an auxiliary motor **102,** clutch **104** and gears **82** and **80.** The gear **86,** which is in meshing engagement with the gear **82,** will rotate as the motor **102** is operated but, because the gears **86, 88** are now disconnected, no drive will be transmitted to the impression cylinder. Moreover, operation of the main press drive will transmit no drive to the blanket cylinder.

When it is desired to reconnect the blanket cylinder with the main press drive, the solenoid **100** is deenergized and the main press drive is operated to rotate the impression cylinders, together with their associated gears, until the opening **97** is aligned with pin **94** whereupon spring **101** displaces collar **92** to move pin **94** into the opening. Since clutch pin **94** is receivable in the opening **97** in the gear **88** in only one angular position thereof, it is apparent that, upon re-engagement, the proper timed relationship is re-established between the cylinders of the unit. The drive pin **94** will maintain the relationship by driving the blanket and plate cylinders if the press drive continues operation with the impression and blanket cylinders out of mesh.

It is to be understood that the blanket cylinder drive gear **34** remains in mesh with its associated plate cylinder gear when the blanket gear is out of mesh with the impression cylinder gear **30.** Consequently, operation of motor **102** also operates the plate cylinder.

Referring now to FIG. **9,** there is illustrated a circuit for controlling the engaging and disengaging sequence for one of the units of the printing press. It will be appreciated that, in a multi-unit press, a similar circuit would be employed for each individual unit to have the disconnect feature, preferably all of the units. To facilitate an understanding of the circuit, the notations employed in that figure are as follows. The numbers in the right-hand column opposite each line in which a relay coil is illustrated refer to the lines in which the relays are actuated by that coil. The underlined numbers refer to a normally closed relay and the numbers without underlining indicate the relay is normally open. As an example, there is illustrated in line **23** a relay coil **CR110–C** which, when energized, actuates normally open relays **CR110–1** in line **10** and **CR110–2** in line **12** and normally closed relay **CR110–3** in line **31.** The remainder of the circuit will be described, to the extent necessary, with reference to the operation of the printing press.

Turning now to the operation of the press, there is provided a make-ready switch **120** which may be moved to any of these different positions, connect, OFF-PLATE and ON-PLATE. The circuit further includes an off pressure switch **122,** an eccentric pin engaged switch **124,** a timing pin disengaged switch **126,** an off-home switch **128,** an OFF-PLATE switch **130** and an ON-PLATE switch **132.** The switches **128, 130** and **132** are controlled by a bank of cams **134** connected to the stock thickness adjustment gear **57.**

Assuming it is desired to disconnect one of the units in an OFF-PLATE position, switch **120** is moved to the OFF-PLATE position. However, to assure that the disengage sequence is not initiated until after the blanket cylinder has been thrown off pressure, off-pressure switch **122** is provided. This switch **122** is positioned adjacent a rocker member of the throw mechanism and

is open when the blanket cylinder is in an on pressure position and closes when the eccentric **44** has been rotated to throw the blanket cylinder off pressure. Closure of switch **122** as the blanket cylinder moves to the off pressure condition readies the circuit for the disconnect sequence.

To initiate a disconnect, the switch **120** is put into an OFF-PLATE or ON-PLATE position. When the three position switch **120** is in its OFF-PLATE position, its contacts **120A** and **120B** are closed. FIG. **9***a* illustrates the condition of the contacts for the various conditions of switch **120** with an X mark indicating that the contacts are closed and a O mark indicating that the contacts are open. With the contacts **120A** closed, the relay coil **CR116–C** is energized to close contacts **CR116–1** in line **10** of the circuit diagram to condition a circuit for energizing the solenoid **70** for engaging the eccentric pin **66** for interconnecting the inner and outer eccentrics **44, 50.** The eccentric pin solenoid is energized through the contacts **CR116–1** provided the blanket has been thrown off pressure in a conventional manner to close off pressure blanket switch **122** and energize relay coil **CR110–C** which has normally open contacts **CR110–1** in series with the eccentric pin solenoid **70** and the contacts **CR116–1.** The circuit for energizing the eccentric pin solenoid **70** also effects energization of the motor **62** and its clutch **61** to drive the eccentric **50** through the stock thickness adjusting mechanism by energizing a motor forward and clutch relay coil **MF120–C** through the contacts **CR116–1** and **CR110–1.** This starts the motor **62** running in a direction to position the opening **67** in the outer eccentric to receive the eccentric pin.

When the eccentric pin engages the outer eccentric, the switch **124** closes to energize the relay coil **CR111–C.** This opens contacts **CR111–1** to break the initial energizing circuit for the motor forward relay coil **MF120–C** but completes a holding circuit by closing contacts **CR111–2** to complete a holding circuit through the contacts **120B** of the switch **120,** the switch now being in its "off plate" position. This continues the operation of the motor **62** to move the eccentrics to throw the blanket cylinder to an off plate condition. When the blanket cylinder is in its off plate condition, the switch **130** is closed to energize a relay coil **CR114–C.** This relay has normally closed contacts **CR114–3** in the circuit for energizing the motor forward coil **MF120–C** through the contacts **120B** of the switch **120,** the contacts stopping the motor when relay coil **CR114–3** is energized. If the switch **120** had been set to an "on plate" position, the holding circuit for continuing the operation of the motor **62** to throw the eccentrics would have been completed through the contacts **CR111–3** closed by the relay coil **CR111–C** when the eccentric pin is engaged and contacts **120C** of the switch **120.** In this case, the motor **62** operates until the switch **132** is closed to energize the relay coil **CR115–C** to open normally closed contacts **CR115–2** in series with the motor forward coil **MF120–C.** The energization of the relay coil **CR114–C** by the closing of the switch **130** as the eccentric moves to its OFF-PLATE position also closes contacts **CR114–2** to energize the timing solenoid **100.** The contacts **CR114–2** are in series with contacts **CR116–3** and contacts **CR110–2** which are now closed because of the energization of the relay coil **CR116–C** by the selector switch **120** and the energization of relay coil **CR110–C** by the off-pressure switch **122.** With the timing pin solenoid energized, the timing pin is withdrawn from the timing gear **88** to allow independent rotation of the blanket cylinder and the impression cylinder. Withdrawal of the timing pin solenoid closes switch **126** to energize relay coil **CR112–C** to open its contacts **CR112–2** in the circuit for initially energizing the eccentric pin solenoid. The solenoid, however, is maintained energized through a holding circuit made by contacts **CR113–1** of a relay coil **CR113–3** which is energized by movement from the off-home position of the inner eccentric. Thus, the eccentric pin will be withdrawn only when the relay coil **CR113–C** is de-energized when the inner eccentric is returned to home position.

If the eccentric pin is not received in the outer eccentric when the motor **62** is operated to effect such engagement and the opening moves by the pin in the outer eccentric for receiving the timing pin, the motor **62** will be reversed and another pass at engagement made. When the opening in the outer eccentric moves past the pin, the off-home switch **128** is closed and indicates that the eccentric pin should have been picked up. This switch energizes relay **CR113–C** to close its contacts **CR113–4** in the circuit for energizing a motor reverse relay coil **MR121–C.** Energization of coil **MR121–C** closes contacts to engage clutch **61** and operate the motor **62** in a reverse direction. This circuit for coil **MR121–C** is made through contacts **CR111–5** of the relay coil **CR111–C** which are normally closed contacts and which are now closed because the eccentric pin switch **124** was not actuated to indicate that the eccentric pin had engaged. The motor is operated in a reverse direction until the off-home switch **128** is again opened to deenergize coil **CR113–C** to open its contacts **CR113–4** to deenergize reverse coil **MR121–C** and to close its contacts **CR113–3** to again energize forward coil **MF120–C.** The coil **CR113–C** drops out with a time delay to assure that the outer eccentric will be returned a sufficient distance to be able to pick up the pin **66** when the motor **62** is again operated in the next pass. If engagement had been made, the switch would be closed, the relay coil **CR111–C** energized and this circuit would not be made to reverse the motor.

It will be further noted that the motor forward relay coil **MF120–C** has normally closed contacts **MF120–1** in the circuit for the reversing relay coil **MR121–C.** These contacts will be closed if the eccentric pin does not engage since the relay coil **CR113–C,** which is energized when the inner eccentric is off a home position, has normally closed contacts **CR113–3** in the initial circuit for energizing the motor forward coil **120C** to assure that this circuit is broken when the eccentric pin properly engages. If it does not engage, the motor **62** will operate forwardly until the off-home position switch is actuated to open contacts **CR113–3** to stop the motor running in a forward direction, the holding circuit through contacts **CR111–2** or **CR111–3** not being effective since there was no engagement of the solenoid pin to pick up coil **CR111–C.**

When the outer eccentric has moved in a return direction sufficiently to open the off-home switch **128** to deenergize the relay coil **CR113–C,** the contacts **CR113–4** in the circuit for the motor reversing coil **MR121–C** will be opened to stop movement of the motor in a reverse direction and the contact **CR113–3**

will be closed to again initiate movement in a throw-off direction.

When the printing cylinder has been thrown to its OFF-PLATE position, the relay coil CR114–C will be energized by the closing of switch **130** and when the printing cylinder is in its ON-PLATE position, the relay coil CR115–C is energized by the switch **132.** The relay coils CR114–C, CR115–C have parallel connected, normally open contacts CR114C–1 and CR115C–1 in the circuit for controlling the auxiliary motor **102** and clutch **104.** In the OFF-PLATE and ON-PLATE position, CR116–C will be energized through the switch **120.** In addition, the relay coil CR112–C will be energized because of the disengagement of the timing pin. These relays have contacts in the circuits for energizing the auxiliary motor for operating the unit so that the motor cannot be energized if one of these coils is not energized. The circuitry for controlling the motor **102** and the clutch **104** includes a clutch and motor forward relay coil MF122 and a motor reverse relay coil MR123. The closing of the contacts of the relay coil CR110–C, CR111–C, CR112–C, CR113–C and of the contacts CR114–1 or of the contacts CR115–1 enable the circuit for energizing the motor forward or motor reverse relay coils MF122 and MR123 by inch push button **124** or run push button **125** or reverse button **126.** The depression of the inch push button **124** will complete a circuit to energize the motor forward coil MF122 for inching the auxiliary motor to drive the printing unit in a forward direction. If it is desired to operate the auxiliary motor in a jog manner in a reverse direction, the reverse push button **126** is depressed.

If it is desired to run the auxiliary unit continuously in a forward direction during make ready or clean up, the inch and run push buttons **124, 125** may be both pushed to energize the motor forward relay coil **122** and to complete a circuit to a holding coil CR117–C which has holding contacts CR117–1 and CR117–2 connected across the inch switch **124** and the run switch **125,** respectively.

When the blanket and impression cylinder gears are to be reconnected, the switch **120** is set to the connect position. In this position, only the contacts **120B** of the switch are closed and the relay coil CR116–C is deenergized to close its contacts in a circuit for energizing a time delay relay coil TR127–C to effect deenergization of the timing pin solenoid by opening contacts TR127–1. When the printing cylinder is in its ON-PLATE or OFF-PLATE position, the timing pin solenoid is maintained energized through a holding circuit which includes normally open contacts CR112–3 of the relay coil CR112 which is energized as long as the timing pin is disengaged and the normally closed contacts TR127–1 of a time delay relay coil TR127–C so that the timing pin cannot be reinserted until the relay TR127–C is energized. The circuit for energizing the relay TR127–C includes contacts 128CR1–A which are controlled by a relay on the main press panel which must be set to a connect position before the relay TR127–C can be energized. This is to assure that all units are ready to be connected before reconnection can be effected. However, each unit may be provided with an idle switch which would enable the press to run with the unit in a disconnect condition. The circuit for energizing relay coil TR127–C also includes the normally open contacts CR111–4 of the relay coil CR111–C which is energized when the eccentric pin is engaged and the contacts CR113–4 of the relay CR113–C which is energized when the eccentric has moved off of its normal position to an OFF-PLATE or ON-PLATE position. Consequently, when the contacts 128CR1–A are closed, the relay TR127–C is energized and the timing pin solenoid is de-energized to allow the timing gears to be reconnected. The relay coil in the main panel for operating the contacts 128CR1–A has normally open contacts of the relay coils CR116–C of all units in series therewith so that the relay cannot be operated until all relay coils CR116–C are de-energized by operation of the disconnect switch **120** to a connect position. When all the press units have their switches **120** in the connect position or overridden by the unit idle switch, the relay coil for operating the contacts 128CR1–A in all the units may be energized to energize the relay coils TR127–C in all of the units to reconnect the timing pins. When this happens, the holding circuit through the contacts CR127–1 for the timing pin solenoid is broken and the timing pin solenoid in each unit is de-energized to move inwardly and ride on its cooperating timing gear, which is rotated by driving the main drive and the impression cylinders of the press, until the pin is received in the opening to interconnect the timing gears to cause rotation of the printing cylinder and the plate cylinders with the impression cylinder.

When the timing pin is engaged, the relay coil CR112–C is de-energized. When this relay coil is de-energized, its contacts CR112–4 are closed to operate the eccentric adjustment motor **62** in a reverse direction by energizing the motor control coil MR121–C. The motor will move the outer eccentric until it returns the inner eccentric to a home position at which time the relay coil CR113–C is de-energized to cause the eccentric pin solenoid **70** to be de-energized to withdraw the eccentric pin. At this point, the stock-thickness adjustment is to be reestablished and the blanket cylinder can be thrown on pressure by operating the conventional throw mechanism.

The control for the main drive motor has contacts operated by the relay coil CR113–C in series with the run switch of the main motor drive so that it cannot be operated at a run speed unless the inner eccentric is in a home position.

In FIG. **9,** the relay CR116–C is shown as having contacts CR116–6 in a circuit between junctions M and N. The junctions M and N are connected in series with the relay on the main control panel for operating the connect contacts 28CR1–A. Since each unit has such contacts, the relay 128CR1–A cannot be operated to start the reconnect sequence, until all units have been set to a connect condition. A unit idle switch OR at each unit may be operated to close contacts in parallel with the contacts CR116–6 to allow the unit to be idle. Also, the relay CR116–C has contacts CR116–5 connected in parallel with contacts CR110–3 of relay coil CR110–C between junctions R and S. These contacts are in series with contacts of coil CR113–C which is energized when the inner eccentric is off its home position. The junctions R-S are connected in series with the run speed control circuit for the main drive motor so that this circuit is not operative when the contacts CR113–4 are open or both of the contacts CR116–5 and CR110–3 are open. The contacts CR110–3 and the contacts CR116–5 are open if the connect switch for the unit is placed in an OFF-PLATE or an ON-PLATE

condition and the blanket cylinder is off pressure. The contacts CR113–4 are open whenever the inner eccentric is off of its home position. Consequently, the main drive motor cannot be operated at run speed until all the selector switches have been set to their connect position and the inner eccentric has been returned to its home position.

It will be appreciated from the foregoing that the existing stock thickness adjustment mechanism, including the outer eccentrics, are part of the means employed for disconnecting the blanket cylinder from the main press drive. To assure that upon reconnection of the blanket cylinder, the previously established stock thickness setting is maintained, an additional mechanism, illustrated in FIG. 7, is preferably provided. As shown in that Figure, the stock thickness adjustment mechanism includes a bracket **150** received over the shaft **151** for the gear **57**. The bracket **150** supports a solenoid **152** and a pivotally supported arm **154**. The arm **154** includes a nose portion **156** which is engageable with a notch **158** in a disk **159** rotatable with the gear **57**. A guide bracket **160** is supported on the press frame and includes an arcuate slot **162**, the arcuate extent of which corresponds to the arc through which the gear **57** is normally rotated to adjust the stock thickness. The pivotal support **164** for the arm **154** extends through slot **162** and includes a latch member in the form of a rotatable eccentric **166**.

In the operation of the stock thickness setting indicator mechanism illustrated in FIG. 7, the solenoid **152** is normally deenergized and the arm **154** is thereby spring biased to a position in which the nose **156** is engaged in the notch **158** thereby connecting the bracket **150** to the gear **57**. Upon rotation of the shaft **151**, the disk **159**, the bracket **150**, the arm **154** and the solenoid **152** rotate with the shaft, the slot **162** in the bracket **160** accommodating the angular movement of the bracket **150** and its associated mechanism. It will be apparent that for each angular position of the disk **159**, the pivotal support **164** for the arm **154** will assume a corresponding position along the slot **162**. When it is desired to use the stock thickness mechanism to disengage the blanket cylinder from the impression cylinder, the solenoid **152** is energized by the energization of the relay coil CR116–C thereby withdrawing the nose **156** of the arm **154** from the notch **158** in the disk **159**. This disconnects the bracket **150** from the gear **57** and permits the disk **159** to rotate independently of the bracket. However, the bracket **150** remains in its angularly adjusted position along slot **162** by virtue of an eccentric **166**. More specifically, as the arm **154** is pivoted to withdraw the nose **166** from the notch **158**, the eccentric **166** is rotated and, in effect, wedges in the slot **162** to latch the bracket **150** to the bracket **160**. As a result, the bracket **150** remains in the position at which the disk **159** was last set and thus maintains the stock thickness setting of the disk **159** while the stock thickness mechanism is being used for the disengaging operation. When the selector switch is moved to its connect position, the deenergization of relay CR116–C deenergizes solenoid **152** and the spring bias on its armature urges the nose of arm **154** against the disk **159**. The arm **154** cannot move inwardly to release the eccentric lock because it engages and rides on the periphery of the disk **159**.

When the inner eccentric returns to its home position during reconnection, the stock thickness adjustment has yet to be made. As an example, the eccentric pin may be engageable when the blanket and impression cylinders are separated by 0.035 inches which is approximately the home position. The conventional "off pressure" position for maximum stock thickness may be 0.030 inches so that the inner eccentric must move at least 0.005 inches on return to reach the "off pressure" position for maximum stock thickness. Accordingly, the motor **62** is not stopped when the eccentric is to be automatically returned to its stock thickness adjustment. In this case, the motor continues to operate until the nose **156** enters notch **158** and engages an insulated contact **170** in the bottom of the notch to energize the unlatch coil **174U** of a latching relay **174R** which has contacts **174R–1** in parallel with the contacts CR113–4 in the circuit for energizing the motor **62**. The latching relay is latched in to close its contacts **174R–1** and contacts **174R–2** by the energization of relay coil CR112–C on the disengagement of the timing pin.

From the foregoing, it can be seen that the present invention has provided a new and improved printing press in which the printing cylinder, the blanket cylinder in a lithographic sheet-fed printing press, can be disconnected from the main press drive and the printing cylinder together with the plate cylinder if the press has both a blanket and a plate cylinder, may be driven independently from the main drive for make-ready purposes. Even though the printing units are disconnected, the main drive is maintained intact so that sheets may be fed through the printing press, if desired. Moreover, the main drive is operated to rotate the impression cylinders when the blanket cylinders are to be reconnected and timing means will operate automatically to reconnect the printing cylinder to the main drive when the printing cylinder and the impression cylinder are in their proper relationship. While all of the units preferably include a disconnect for disconnecting the printing cylinder from the main drive, it will be understood that the main drive could be used to drive one of the units, particularly in a two-unit press, and blanket cylinder disconnects and auxiliary drives provided for the other units. However, in such an arrangement, sheets could not be carried to a printing press at the option of those operating on the disconnected units during the make-ready operation.

In addition, the present invention has provided a novel structure and manner for disconnecting the image carrying cylinders of a printing press to disconnect them from the main press drive and to effect a reconnect to the drive.

We claim:

1. In a multi-unit printing press having a plurality of units comprising a printing cylinder and a second cylinder cooperating with said printing cylinder to form a printing nip in each of said units, a drive train interconnecting said cylinders, said drive train including means for operating said drive train to drive said press during printing, means supporting each of said printing cylinders for movement between a printing position and a nonprinting position, said drive train including a respective cylinder gear operatively associated with each printing cylinder for movement with the cylinder and a cooperating drive gear, said cylinder gears and drive gears remaining in mesh when said printing cylinders are moved to said nonprinting position, said means for supporting at least one of said printing cylinders includ-

ing, means which is operable to move the printing cylinder to a further position in which the corresponding cylinder gear and drive gear are out of mesh to disconnect the cylinder gear and the printing cylinder from said drive train, means for actuating said means for supporting at least one of said printing cylinders to move said one printing cylinder to a selected one of its positions, means for driving said one of said printing cylinders independently of said drive train when said drive and cylinder gears are out of mesh, each of said units having a printing cylinder gear which moves out of engagement with its drive gear to said further position including timing means for effecting re-engagement of the cylinder and drive gears in the proper angular relationship.

2. In a printing press as defined in claim 1 wherein said means for effecting re-engagement of the cylinder and drive gears includes means for automatically interconnecting the drive and cylinder gears of the unit when the latter have a particular angular relationship, and said means for driving said one of said printing cylinders is operable to drive said drive gears when a cooperating cylinder gear is out of engagement therewith to position said means for effecting re-engagement of the cylinder and drive gears preparatory to re-engaging said cylinder and drive gears.

3. A printing press as defined in claim 1 wherein said means for supporting each printing cylinder comprises an eccentric which is rotatable to move the printing cylinder of the unit between printing and nonprinting conditions and for adjusting the printing position of the printing cylinder while the cylinder gear and the corresponding drive gear are in mesh and said actuating means rotates said eccentric to move said printing cylinder away from its printing position to effect a disengagement of the corresponding cylinder and drive gears.

4. A printing press as defined in claim 1 wherein each of said means for supporting each printing cylinder comprises a first eccentric operable to move the printing cylinder between printing and nonprinting positions, a second eccentric to adjust the printing position of the printing cylinder, and said actuating means comprises means connected to rotate said second eccentric.

5. A printing press as defined in claim 4 wherein said printing cylinders are blanket cylinders and said printing press includes a plate cylinder in each unit for cooperating with the blanket cylinder and said actuating means is operable to selectively move the blanket cylinder to a position clear of the cooperating plate cylinder or to a position in engagement with the plate cylinder with the cylinder gear and drive gear out of engagement.

6. In a multi-unit printing press as defined in claim 1 wherein each of said units includes a plate cylinder and said printing cylinder is a blanket cylinder and the means for supporting each printing cylinder which is movable to disengage its cylinder gear from the cooperating drive gear is operable to selectively move the blanket cylinder to a plurality of positions where the cylinder gear is out of mesh with its drive gear including a first position in which the blanket cylinder is clear of a plate on the plate cylinder and a second position in which it runs in engagement with a plate on the plate cylinder.

7. In a printing press as defined in claim 1 wherein each drive gear is operable to drive the second cylinder and said cylinder gear of the corresponding unit, and said means for supporting each unit which has a cylinder gear movable out of mesh with a drive gear comprising means for moving said printing cylinder between printing and non-printing positions where the drive and cylinder gears are in mesh and to a third nonprinting position where the drive and cylinder gears are out of mesh.

8. A printing press as defined in claim 1 in which said printing units are units for printing sheets and each said second cylinder comprises an impression cylinder for carrying sheets into a nip formed by the printing cylinder and the second cylinder, said printing press comprising transfer cylinder means for transferring sheets between printing units and said drive train comprises a gear train interconnecting said transfer cylinder means and said drive gears, said drive gears being mounted on said impression cylinders.

9. A printing press as defined in claim 8 wherein said means for operating feed drive train is operable to drive said transfer cylinder means and said impression cylinders to carry sheets through the press with a cylinder gear for a printing cylinder out of mesh with its drive gear.

10. A printing press as defined in claim 9 wherein said press includes control means for preventing operation of said means for operating the drive train at normal printing speeds when a drive gear and its corresponding said cylinder gear are disengaged.

11. A printing press for printing on sheet material, said printing press comprising a plurality of printing units, each of said printing units including a printing cylinder and a second cylinder cooperating to define a printing nip, main drive means for driving said cylinders in said plurality of printing units during operation of said printing press and for maintaining a predetermined rotational relationship between said cylinders in said plurality of printing units during operation of said printing press, said main drive means including a first gear which is connected with a printing cylinder in one of said printing units and a second gear which is connected with said second cylinder in said one printing unit, means in said one printing unit for supporting said printing cylinder in said one printing unit for movement between a printing position in which said first gear is in meshing engagement with said second gear to maintain said printing cylinder in said one printing unit in said predetermined rotational relationship with said printing cylinders in said other printing units and a nonprinting position in which said first gear is out of mesh with said second gear, said printing cylinder in said one printing unit being rotatable relative to the printing cylinders in said other printing units to thereby move said printing cylinder in said one printing unit out of the predetermined rotational relationship with the printing cylinders in the other printing units when said printing cylinder in said one printing unit is in said nonprinting position, means in said one printing unit for moving said printing cylinder in said one printing unit between said printing and nonprinting positions, means for driving said printing cylinder in said one printing unit when said printing cylinder in said one unit is in said nonprinting position, and means for preventing movement of said printing cylinder in said one printing unit from said nonprinting position to said printing position when

said printing cylinder in said one printing unit is out of said predetermined rotational relationship with said printing cylinders in said other printing units.

12. A multi-unit printing press as set forth in claim 11 wherein said means for moving said printing cylinder between said printing and nonprinting positions includes stock thickness adjustment means for setting the spacing between said printing and second cylinders in said one unit to any one of a plurality of distances to accommodate any one of a plurality of thicknesses of sheet material, said stock thickness adjustment means being operated from an initial setting to a second setting upon movement of said printing cylinder in said one unit from said printing position to said nonprinting position, and means for returning said stock thickness adjustment means to said initial setting upon movement of said printing cylinder in said one printing unit from said nonprinting position to said printing position.

13. A multi-unit printing press as set forth in claim 12 wherein said stock thickness adjustment means includes driving and driven members, and drive means for moving said driving and driven members relative to each other to adjust the setting of said stock thickness adjustment means to the initial setting when said printing cylinder in said one unit is in said printing position and for moving said driving and driven members relative to each other to effect operation of said stock thickness adjustment means to the second setting upon movement of said printing cylinder in said one unit to said nonprinting position.

14. A multi-unit printing press as set forth in claim 12 wherein said means for moving said printing cylinder between said printing and nonprinting positions further includes throw-off means for moving said printing cylinder in said one printing unit between said printing position and a thrown-off position intermediate said printing and non-printing positions, said first and second gears being disposed in meshing engagement when said printing cylinder in said one printing unit is in said thrown-off position, said stock thickness adjustment means being maintained at said initial setting during movement of said printing cylinder in said one unit between said printing and thrown-off positions.

15. A multi-unit printing press as set forth in claim 14 wherein said throw-off means includes a first eccentric operatively connected with said printing cylinder in said one unit and means for rotating said first eccentric to effect movement of said printing cylinder in said one unit between said printing and thrown-off positions, said stock thickness adjustment means including a second eccentric operatively connected with said printing cylinder in said one unit and means for rotating said second eccentric to change the setting of said stock thickness adjustment means and effect movement of said printing cylinder in said one unit independently of said first eccentric to vary the spacing between said printing and second cylinders in said one unit.

16. A multi-unit printing press as set forth in claim 15 wherein said means for moving said printing cylinder between said printing and nonprinting positions further includes coupling means for interconnecting said first and second eccentrics to effect movement of said printing cylinder in said one printing unit between the printing and nonprinting positions under the combined influence of said first and second eccentrics.

17. A multi-unit printing press as set forth in claim 16 wherein said coupling means is operable between an engaged condition interconnecting said first and second eccentrics and a disengaged condition in which said first and second eccentrics are rotatable independently of each other.

18. A multi-unit printing press as set forth in claim 11 wherein said means for driving said printing cylinder in said one unit when said printing cylinder in said one unit is in said nonprinting position includes secondary drive means for driving said printing cylinder in said one printing unit independently of said main drive means.

19. A printing press for printing on sheet material, said printing press comprising a rotatable printing cylinder, a rotatable second cylinder operatively connected with said printing cylinder, said printing cylinder being movable relative to said second cylinder between a printing position, a thrown-off position and a nonprinting position, said printing and second cylinders having their axes of rotation spaced a first distance apart and cooperating to define a printing nip when said printing cylinder is in said printing position, said printing and second cylinders having their axes of rotation spaced apart by a second distance which is greater than said first distance when said printing cylinder is in said thrown-off position, said printing and second cylinders having their axes of rotation spaced apart by a third distance which is greater than said second distance when said printing cylinder is in said nonprinting position, main drive means for rotating said printing and second cylinders when they are in the printing position, throw-off means for moving said printing cylinder between said printing and thrown-off position, stock thickness adjustment means operable to any one of a plurality of settings to vary said first distance and the spacing between said printing and second cylinders to accommodate any one of a plurality of thicknesses of sheet material when said printing cylinder is in said printing position, said throw-off means being effective to move said printing cylinder between said printing and thrown-off positions without changing the setting of said stock thickness adjustment means from an initial setting corresponding to a particular thickness of sheet material, means for effecting operation of said stock thickness adjustment means from said initial setting to a second setting to effect movement of said printing cylinder to said nonprinting position, and means for returning said stock thickness adjustment means to said initial setting upon movement of said printing cylinder from said nonprinting position to said printing position.

20. A printing press as set forth in claim 19 wherein said throw-off means includes a first eccentric operatively connected with said printing cylinder and means for rotating said first eccentric to effect movement of said printing cylinder between said printing and thrown-off positions, said stock thickness adjustment means including a second eccentric operatively connected with said printing cylinder and means for rotating said second eccentric to effect movement of said printing cylinder to vary the setting of said stock thickness adjustment means.

21. A printing press as set forth in claim 20 further includes coupling means for interconnecting said first and second eccentrics.

22. A printing press as set forth in claim 19 further including main drive means for rotating said printing and second cylinders when said printing cylinder is in

said printing position and when said printing cylinder is in said thrown-off position, said drive means including a first gear connected with said printing cylinder and a second gear connected with said second cylinder, said first and second gears being disposed in meshing engagement when said printing and second cylinders are in said printing and thrown-off positions, said first and second gears being out of meshing engagement when said printing and second cylinders are in said nonprinting positions.

23. A printing press as set forth in claim **19** wherein said stock thickness adjustment means includes an eccentric which is rotatable relative to said printing cylinder and drive means for rotating said eccentric to vary the setting of said stock thickness adjustment means when said printing cylinder is in the printing position, said means for effecting operation of said stock thickness adjustment means from said initial setting to said second setting including means for effecting operation of said drive means.

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