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Greiner et al.

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[54] **COUPLING ARRANGEMENT FOR PERFECTING LITHOGRAPH PRESS UNIT**

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[52] **U.S. Cl.** ..... **101/220**, 101/248, 74/665 G

[51] **Int. Cl.** **B41f 5/04**

[58] **Field of Search** 101/152, 178–181, 101/183, 212–213, 216–225, 248; 74/665

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[57] **ABSTRACT**

A lithograph press in which a web is simultaneously printed on both sides by passing the web between a pair of blanket cylinders, the blanket cylinders being driven from associated plate cylinders and the plate cylinders being coupled to a common drive shaft. The blanket cylinders are coupled together by gears to keep them operating at exactly the same peripheral speed under running conditions but with an interposed clutch to permit the blanket cylinders to be disengaged for individual phase adjustment when the press is running.

1 Claim, 3 Drawing Figures

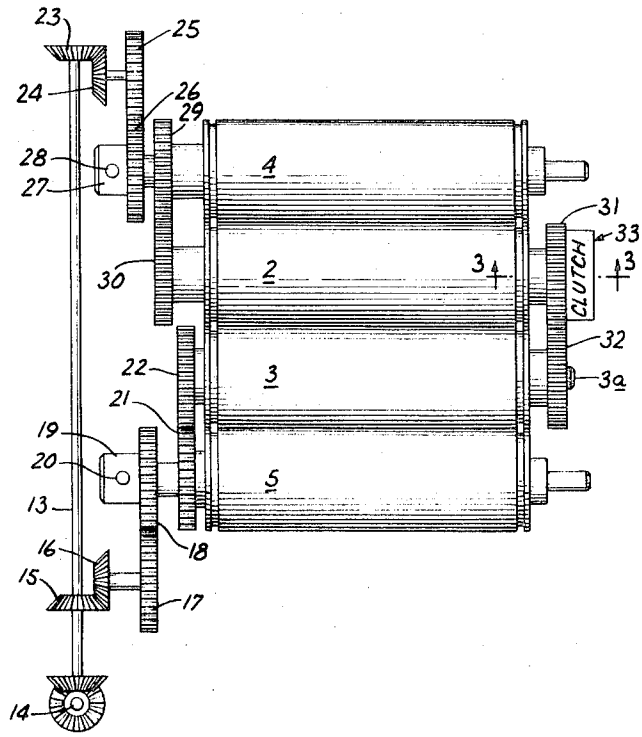
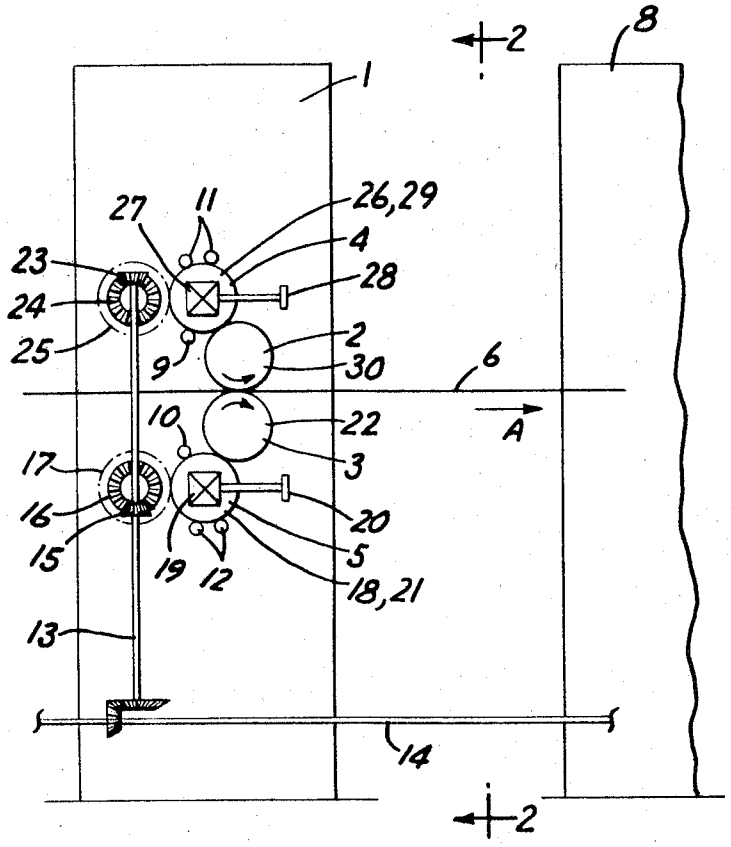


FIG. 1



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FIG. 2

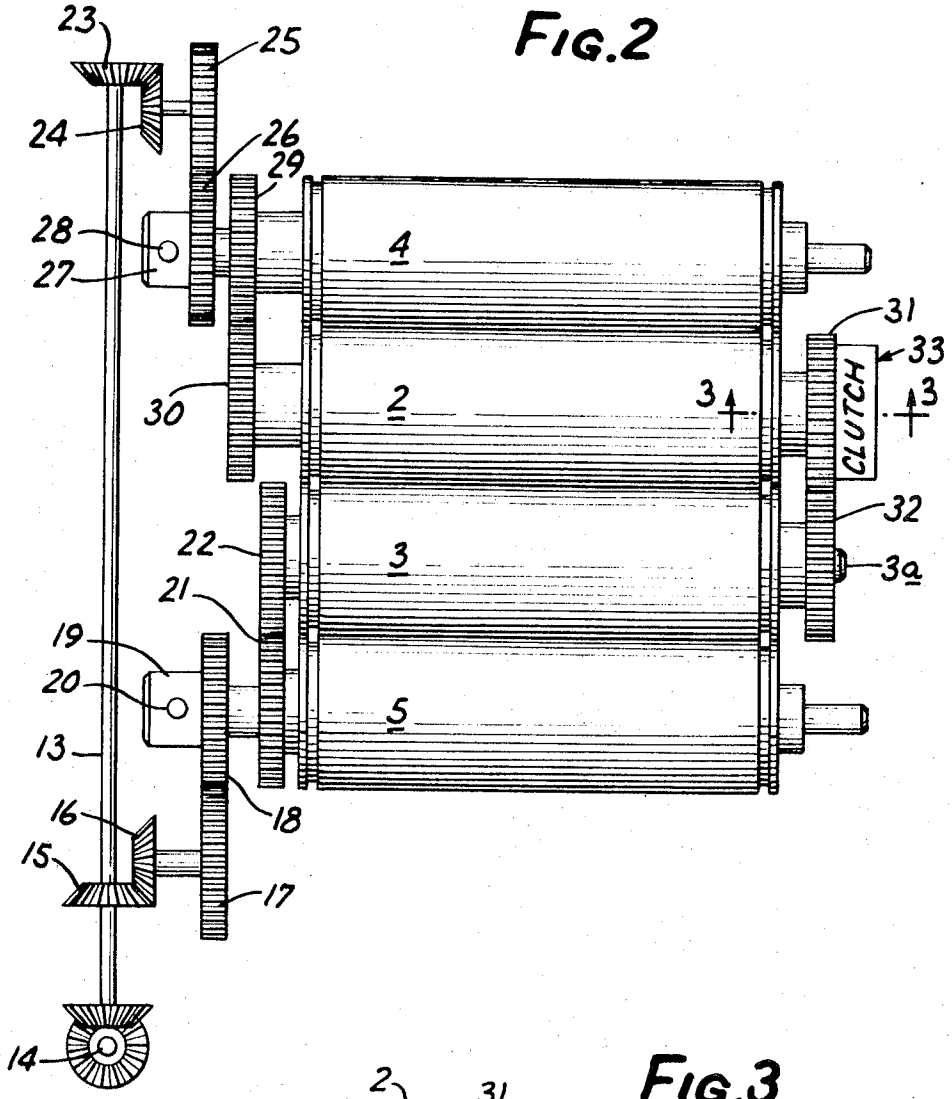
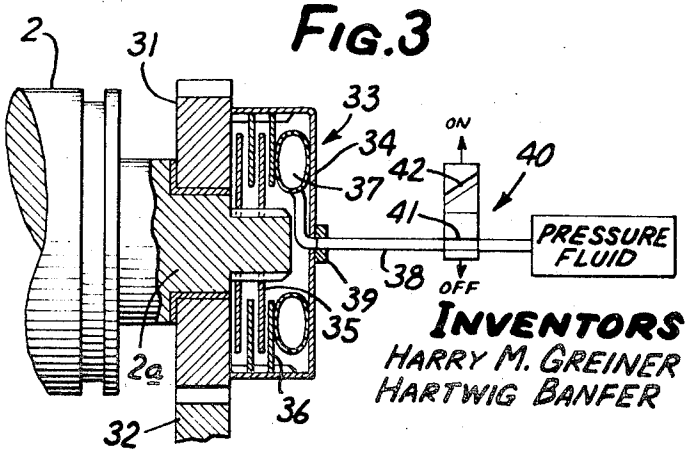


FIG. 3



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COUPLING ARRANGEMENT FOR PERFECTING LITHOGRAPH PRESS UNIT

In a conventional lithograph press of the perfecting type the web is run between two engaged blanket cylinders which are gear driven from the associated plate cylinders which, in turn, are coupled to a common drive shaft. Means are provided between each of the plate cylinders and the common drive shaft in the form of planetary gearing for enabling running adjustment of phase position.

Because of the symmetry of the cylinder drives and because of the close dimensional tolerances which are adhered to in constructing the blanket cylinders, and the blankets which are used thereon, one might assume that perfect printing would be achieved on both sides of the web. However, experience shows that this is not the case. Lack of sharpness has been noted even where a high degree of care and precision have been exercised in the construction and operation of the press unit.

Such lack of sharpness has been traced in part to the fact that the blanket cylinders may vary slightly in speed within a rotative cycle resulting in a tendency toward momentary slight slippage between one of the blanket cylinders and the engaged web.

It is, accordingly, the object of the present invention to provide a perfecting type lithograph press which achieves a higher and more uniform quality of printing than has been possible in the past. It is a related object to provide an improvement for a lithograph press which may be added to conventional designs of presses conveniently, with relatively minor modification of press structure and at low cost.

It is a more detailed object to provide a perfecting type lithograph press in which the blanket cylinders, though separately driven through individual gear trains, are directly coupled together to insure operation precisely in unison but in which means are provided nevertheless for uncoupling them from one another when it is desired to change their relative phase while the press is running.

It is yet another object to provide means for improving the quality of printing in a perfecting type lithograph press but which does not require any wastage of energy in the drive.

Other objects and advantages of the invention will become apparent upon reading the attached detailed description and upon reference to the drawings in which:

FIG. 1 is a diagrammatic side elevational view of a printing unit to which the present invention has been applied.

FIG. 2 is a developed elevational view of the press unit showing the four cooperating cylinders and their associated driving mechanisms looking generally along the line 2—2 in FIG. 1.

FIG. 3 is a section taken through the clutch assembly and diagrammatically showing the clutch control.

While the invention has been described in connection with a preferred embodiment, it will be understood that we do not intend to be limited to the particular embodiment shown, but intend, on the contrary, to cover the various alternative and equivalent constructions included within the spirit and scope of the appended claims.

Referring now to the drawings a lithographic press unit **1** is shown having a pair of blanket cylinders **2, 3** which are arranged in opposition to one another and

which are respectively engaged by plate cylinders **4, 5.** Interposed between the blanket cylinders is a web **6** which travels in the direction indicated at A into a subsequent, similar press unit **8.** The printing plates mounted upon the plate cylinders **4,5** are dampened and inked, respectively, by water form rollers **9, 10** and ink form rollers **11, 12** which are fed films of water and ink by means well known to those skilled in the art.

In the lithographic or "offset" method of printing, the plates have areas which are respectively water-and-ink receptive so that the printed image is imparted, by the plates, to the surface of the blanket cylinders which simultaneously print upon the opposite sides of the web.

For the purpose of driving the cylinders at the desired surface speed a gearing arrangement is used which is set forth in some detail in FIG. **2.** Journaled in the press unit is a common vertical drive shaft **13** which is driven, through a set of bevel gears, from the main horizontal drive shaft **14** which serves a group of printing units. The plate cylinder **5** is powered by a set of bevel gears **15, 16** which drive a set of spur gears **17, 18.** Interposed between the spur gear **18** and the plate cylinder **5** is a set of planetary gearing **19** having an adjustable control **20** whereby the phase of the plate cylinder **5** with respect to the drive shaft **13** may be varied while the press is in motion. Devices to produce a running phase or register adjustment are well known in the art, and reference may be had, for example, to prior U.S. Pat. No. 2,234,674 which issued Mar. 11, 1941. The blanket cylinder **3** is driven from the plate cylinder **5** by a set of meshing spur gears **21, 22.**

Similar means are provided for driving the other pair of cylinders. Thus a drive connection is made from the vertical drive shaft **13** via bevel gears **23, 24** and spur gears **25, 26** to the plate cylinder **4.** Interposed for running phase adjustment is a planetary gear device **27** having a manual or other control **28** similar to the device **19.** The blanket cylinder **2** is driven from its cooperating plate cylinder **4** via spur gears **29, 30.** For accurately predetermining, and maintaining, the desired spacing between the axes of the cylinders, bearer rings, well known to those skilled in the press art, are employed.

It might be assumed that the exercise of close tolerances in the construction of the gear trains **15–22** and **23–30** the blanket cylinders would be driven in precise synchronism with one another to produce printing of highest quality. However, the results obtained in the operation of a well constructed and carefully adjusted lithograph press leave something to be desired. Our observations show that in spite of adherence to close tolerances slight variations occur in the radii of the blanket cylinders and their associated bearer rings within a rotative cycle. For example, during a point in the cycle portions of the blanket cylinder **2,** and its bearer rings, may have a slightly greater radius than the corresponding engaged portions of the blanket cylinder **3.** Thus blanket cylinder **2** which is momentarily moving at a faster peripheral rate than blanket cylinder **3** will attempt to over-drive the latter.

At a subsequent point in the rotative cycle the situation may be reversed, that is, the blanket cylinder **3** and the bearers thereon may be relatively higher (at a greater radius) than the corresponding, engaged portions of the blanket cylinder **2,** causing the latter to tend to be momentarily overdriven.

A complication arises by reason of the fact that the friction between the web and the surfaces of the blankets is not constant but may vary over wide limits depending upon the inking conditions so that when one of the blanket cylinders rotates at a momentarily higher peripheral speed than the other, slippage may occur between one of the blanket cylinders and the web, either in the form of forward slippage by the blanket cylinder of momentarily higher speed or rearward slippage by the blanket cylinder which is momentarily lagging. This affects the quality of the printed result.

In accordance with the present invention means are provided for coupling the blanket cylinders directly together by a pair of closely fitted spur gears mounted on the journals of the cylinders so the blanket cylinders must, during normal operation, operate in precise synchronism, the coupling including a clutch which is disengageable in order to permit the cylinders to be adjusted in phase while the press is running. Thus, referring to FIGS. 2 and 3, we provide a gear **31** concentrically mounted upon the journal **2***a* of the blanket cylinder **2** meshing with a gear **32** fixed to shaft **3***a* of blanket cylinder **3**, the gear **31** being rotatable about the shaft **2***a* but capable of being rigidly coupled to it by means of a clutch assembly **33** having a housing **34**. A first set of clutch plates **35**, which are secured to the shaft **2***a*, are interleaved with a second set of clutch plates **36** which are secured to the housing. For the purpose of squeezing the clutch plates together to form a torque-transmitting connection, the clutch plates are splined or keyed to the shaft and housing respectively and an actuator is provided which may, for example, be in the form of an expandible bladder **37** of annular shape for application of axial pressure. The bladder is fed through a line **38** which leads, via a rotary slip connection **39** and three-way valve **40**, to a source of pressurized fluid. The valve has a first passageway **41** which connects the clutch assembly to the source when the valve is in its upper or "on" position and a second passageway **42**, which vents the line **38** when the valve is in its alternate "off" position.

The torque capability of the clutch assembly **33** is preferably such that no slippage takes place under operating conditions when pressure fluid is applied. Nevertheless when the valve is moved to its "off" position to vent the pressure fluid the plates are separated, using springs if necessary between the plates of each set to assure complete separation, so that the relative phase of the blanket cylinders may be changed by rotation of the controls **20, 28.**

It is one of the features of the clutch **33** that it may be disengaged and then re-engaged while the press is in motion thereby to permit running adjustment of phase. Thus, assuming that the press is rotating and that a phase adjustment is called for, the clutch **33** is disengaged, following which the phase ajusting controls **20, 28** may be operated to bring about the desired adjustment in phase of the associated blanket cylinder. As soon as this adjustment is completed the clutch **33** may be re-engaged to achieve the advantages of direct coupling between the blanket cylinders **2, 3** during the course of the press run. The clutch as shown is of the "continuous" type as contrasted with clutches of the "dog" type so that reengagement may occur at any relative position of the clutch plates and does not affect the adjusted condition of phasing of the blanket cylinders. On the contrary, tight clamping of the clutch plates tends to preserve the adjusted phasing of the blanket cylinders throughout the press run.

It will be apparent that other types of clutches of high torque capability and presenting continuous surfaces capable of closure in an infinately variable range may be substituted without departing from the invention.

When the clutch is engaged, and assuming that teeth of the gears **31, 32** are accurately fitted, free of any discernable play, the two cylinders **2, 3** will be constrained to operate at precisely the same peripheral velocity, precluding slippage between either of the blankets and the web. If the gears are accurately machined, of the same, constant pitch diameter, and closely fitted, there will be no tendency of one of the blanket cylinders to over-drive the other and thus no transient slippage of the web with respect to either of the blanket cylinders.

It is one of the practical features of the present invention that the gears **31, 32** which couple the blanket cylinders together, and the clutch assembly **33** which completes the connection, are inexpensive commercially available components which may be incorporated in the press during manufacture or which may be added as an inexpensive field modification of an existing press.

As used herein the term "spur gears" refers to any meshing gears having parallel axes in peripheral engagement with one another. The term "closely fitted" as applied to the gears **31, 32** has to do with the fact that these gears are so formed and dimensioned as to substantially eliminate any play between them.

What we claim is:

1. In a perfecting type lithograph press unit, the combination comprising a press frame, a pair of blanket cylinders journaled in the frame and in running engagement with one another and having blankets of resilient material for printing on opposite sides of a web passing between them, each of the blanket cylinders having an associated plate cylinder, a common press drive shaft, a pair of individual gear trains both coupled to the press drive shaft for driving of the respective plate cylinders and their respectively associated blanket cylinders, phase adjusting means in the individual gear trains for changing the phase of the printed impression applied to the web, a pair of auxiliary closely fitted gears interposed between the blanket cylinders directly in mesh for directly coupling them together thereby to preclude momentary relative slippage of one of the blanket cylinders with respect to the web, as well as overdriving of one blanket cylinder by the other as a result of local variations in the radius and resilient characteristics of the portions of the blankets which are in engagement with one another, and means including a continuous type clutch interposed in series with the pair of gears, the clutch having provision for tight engagement during normal running of the press and provision for disengagement to permit operation of the phase adjusting means when the press is running as well as tight reengagement in any new adjusted phase position.

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