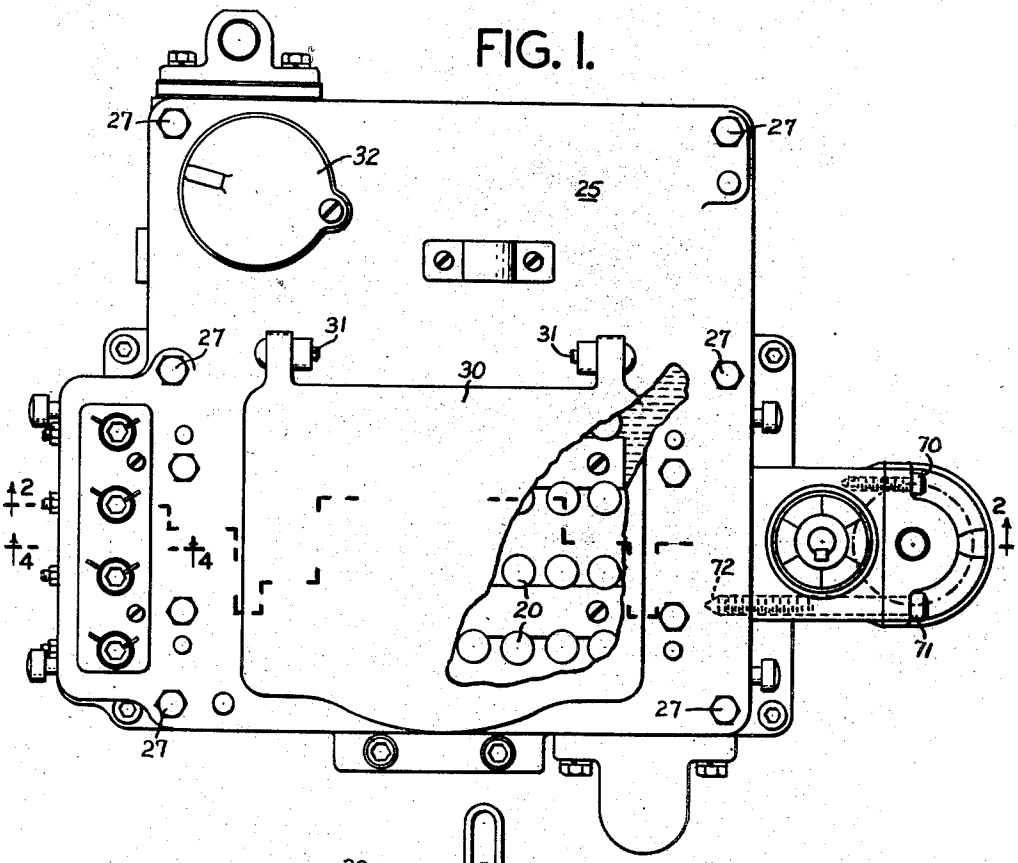
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VARIABLE SPEED REVERSING DRIVE FOR PRINTING MACHINE INK PUMPS

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FIG. 1.



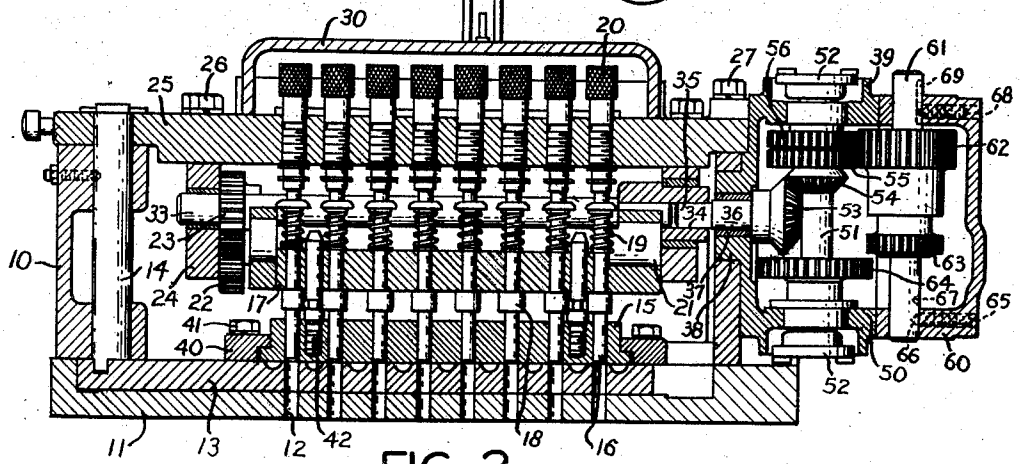


FIG. 2.

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FIG. 3.

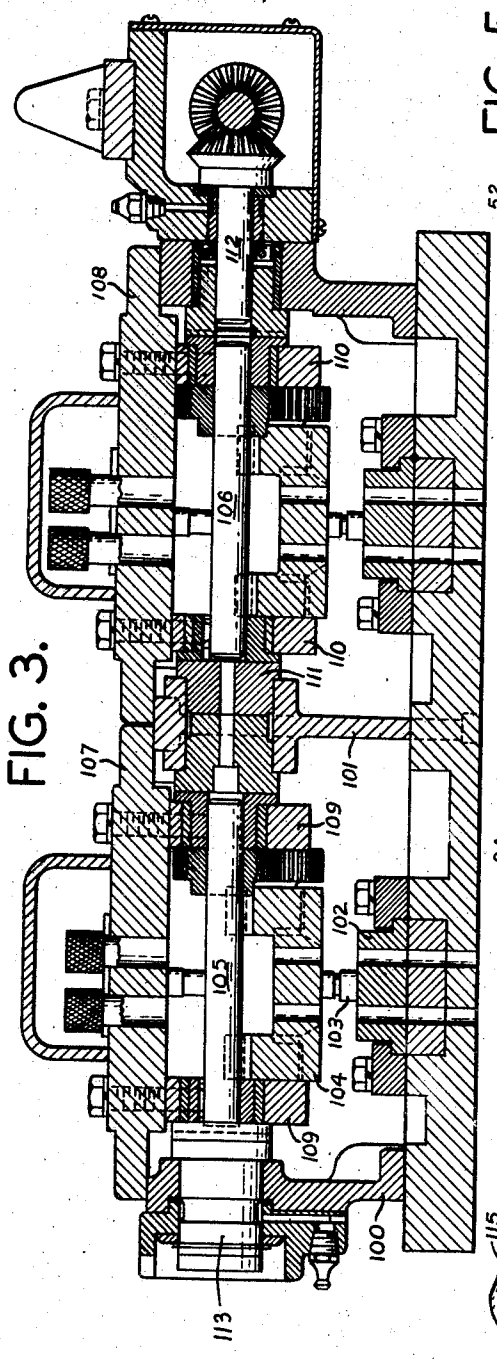


FIG. 5.

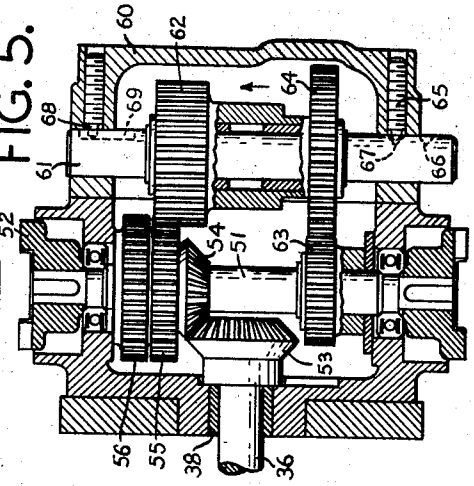


FIG. 4.

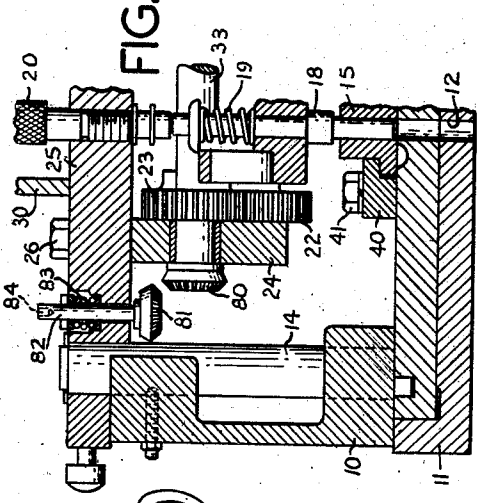
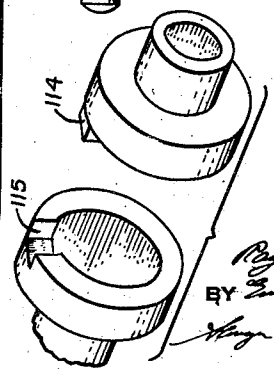


FIG. 6.



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2,854,853

VARIABLE SPEED REVERSING DRIVE FOR PRINTING MACHINE INK PUMPS

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Application July 21, 1955, Serial No. 523,457

7 Claims. (Cl. 74—325)

This invention relates to ink pumps for printing presses, and more particularly to such pumps adapted to use in multicolor presses or in applications where the quantity and color of ink used is subject to considerable variation.

One object of the invention is to facilitate cleaning, particularly where the color of ink used is being changed.

Another object of the invention is to facilitate change of pumping speed and rate at which ink is delivered and to accomplish this with maximum efficiency.

A pump embodying the invention in a preferred form will now be described with reference to the accompanying drawing, and the features forming the invention will then be pointed out in the appended claims.

In the drawing:

Fig. 1 is a plan view, partly broken away, of a pump embodying the invention in a preferred form;

Fig. 2 is a section on the line 2—2 of Fig. 1;

Fig. 3 is a section similar to Fig. 2 but showing a modification of the invention;

Fig. 4 is a fragmentary sectional view, showing a part of Fig. 2 with modification of certain of the parts thereof;

Fig. 5 is a section on a somewhat enlarged scale, corresponding also to a part of Fig. 2 and showing certain modifications therein; and

Fig. 6 is a detail showing a coupling element in the device of Fig. 3.

The pumps with which the present invention is concerned are of a generally familiar type, such as shown in prior White Patent 1,311,198 and Schmidt Patent 1,348,900, and characterized by the provision of an individual pump plunger or piston for each column or other unit width of the product produced or printing cylinder or cylinders which print it, and by the grouping of these plungers or pistons in banks corresponding to a page width or other larger sub-division of product and cylinder.

The pump shown in Figs. 1 and 2 comprises a general housing 10 affixed to a bottom 11 in which openings 12 are provided for the conduits leading to the ink rail and supplying the individual columns. An adjustable port plate 13 is slidably supported in the bottom 11 and may be adjusted to cut off the supply of ink to a page by means of an operating shaft 14. The details of this part of the structure are shown and described in prior Worthington et al. application Serial No. 446,212, filed July 28, 1954, for Page Cut-Off for Inking Mechanism, and will not be further described herein.

A cylinder plate 15 receives the plungers or pistons 16 in cylinder bores as shown. The plungers are reciprocated by an operating member 17 thrusting against collars 18 on the pistons, and the pistons are urged upwardly by means of springs 19, as indicated. The upward stroke of any piston may be limited by means of an adjusting screw 20 abutting against its end, in the usual way.

The operating member or plate 17 is reciprocated vertically and horizontally (at right angles to the plane of Fig. 2) by means of an eccentric 21 driven by a gear 22, which in turn, is driven by a gear 23, these elements

being supported in downwardly depending blocks 24, as indicated. The operating plate 17, its eccentrics and drive gearing, as well as the adjusting screws 20 are all mounted in a cover or upper element 25 forming part of the housing, the blocks 24 being removably attached thereto by bolts 26. The cover plate 25 is, in turn, secured in place to the housing walls 10 by bolts 27. A dust cover 30 is mounted by means of hinges 31 on the upper housing element 25, and the element 25 is further provided with an ink filling opening covered by a pivoted cover plate 32.

The pump internal drive shaft 33 (Fig. 2) upon which gear 23 is mounted, is provided at one end with a square socket 34 receiving and fitting the squared end 35 of drive shaft 36 which passes through a supporting and sealing bushing 37 supported in a boss 38 on an external gear housing 39 affixed to housing wall 10, as shown.

When it is desired to clean the pump, shaft 36 is pulled outwardly, in a manner later described, so as to clear shaft 33. Bolts 27 may then be removed and the entire structure, with the exception of the cylinder plate 15 and subjacent elements, may be removed. As will be noted in Fig. 2, the plate 15 is held in position and guided by gibs 40, which, in turn, are removably secured to the housing bottom by bolts or screws 41, so that this element also may be removed although this is ordinarily not necessary. Cylinder plate 15 is connected to operating plate 17 by pins 42 secured to the plate 15 and reciprocable in bores in the plate 17, as indicated. The upper ends of the pins 42 are tapered or rounded, as shown, to facilitate reinsertion of the removable elements.

The drive for shaft 36 is similar to that shown in prior Lamatsch Patent 2,444,656, in that it includes a housing and associated elements which may be turned through 180° about the axis of the shaft for the purpose of reversing the direction of drive of the ink pump with reference to a unit with which it is associated. However, in the present structure, means is provided for also moving the housing and associated elements axially of the said shaft, to permit removal of the pumping elements as just mentioned and for further varying the drive ratio in a very simple manner.

The boss 38, previously mentioned, is formed on an inner or main gear housing element 39, in which there is journaled a cross shaft 51 having a clutch coupling element 52 at each end for cooperating with a corresponding clutch element on a press driven shaft (not shown). A bevel gear 53 fixed to the end of shaft 36 meshes with a bevel gear 54 fixed to a spur gear wheel 55 and rotatable therewith on the shaft 51. A similar spur gear 56 fixed to the shaft 51 takes the axial thrust of the bevel gear 54 through the gear wheel 55 to which it is attached.

An outer gear housing element 60 supports an axially movable shaft 61 upon which are rotatably mounted a coupling gear 62, an intermediate drive gear 63 which is adapted to mesh with a further drive gear 64 fixed to the shaft 51. A spring detent 65 cooperating with notches 66, 67 in the shaft 61 and a guide pin 68 fitting a groove 69 in the shaft 61 serve to hold this shaft from turning and to hold it in either of two axial positions, as indicated in the drawing. In the first axial position, which is that of Fig. 2, gear pair 63, 64 are out of mesh and, hence, inoperative, while gear 62 which is twice the width of gears 55 and 56 is in mesh with both these gears, serving to couple them together in 1–1 driving relation and thus to form a driving connection between shaft 51 and bevel gear 54. It will be noted that gear 63 is of smaller diameter than gear 64, and typically in a ratio of about 4–7, so that if the shaft 61 is slid to its other

position, bringing gear **62** out of mesh with gear **56** and gears **63** and **64** into mesh, a correspondingly reduced drive speed ratio between shaft **51** and bevel gear **54** will be provided, the drive in this case being from shaft **51** through gear pair **64**, **63** to shaft **61** and thence through gear pair **62**, **55** to the bevel gear **54**.

In Fig. 5, the shaft **61** is shown in its other position, and the gears **63** and **64** are shown as transposed between the two shafts **51**, **61**, so that the smaller gear **63** is on the shaft **51** and the larger gear **64** is on the shaft **61**, in this case the operation will be the same, except that there will be an increase of speed as between shaft **51** and bevel gear **53**.

Gear housing elements **39**, **60** are secured together by bolts **70** at two opposite corners, and bolts **71** pass through both elements **39** and **60** at the two opposite corners and engage in threaded bores or sockets **72** in the ink pump housing wall **10**, as indicated in Fig. 1.

The following operations are provided for by the ink pump drive gear arrangement as shown:

In the first place, by loosening bolts **71**, the entire gear housing structure may be turned end to end through 180°, thus reversing the direction of drive of the ink pump. Similarly, by unscrewing bolts **71**, the housing structure **39**, **60** may be pulled outwardly parallel to the axis of shaft **36**, thus withdrawing this element so as to remove its squared end **35** from socket **34**, for permitting removal of the pumping mechanism from its housing, as previously described. In either case, the housing **39**, **60** will be returned in the desired angular position about the axis of shaft **35** and again secured in that position by means of bolts **71**.

It further is possible, with the pump being driven in either direction, to vary its drive speed with relation to shaft **51** from a 1–1 ratio, as described above, to a 4–7 or 7–4 ratio, according to placement of gears **63**, **64**.

Where a modified drive speed ratio different from the 4–7 or 7–4 ratios, just mentioned, is desired, it will be apparent that this involves merely the selection of suitable sizes of the gears **63**, **64** and that practically any desired ratio may be obtained. However, the ratios mentioned will be sufficient for most cases.

The pump drive arrangement just described, provides great flexibility of operation, and in many cases an actual improvement in ink distribution, while permitting the use of standard parts throughout. Some of the applications for this mechanism will now be indicated briefly by way of example.

A first typical problem encountered in press operation involves the regulation of ink pumps as between monotone or key color printing and color or spot color printing. In some cases, the quantity of ink required from certain pumps may be small due to the application of the color in question to only certain pages or columns, and the customary arrangements permitting the cut off of a page or the silencing of selected plungers corresponding to certain columns are entirely adequate. However, where the quantity of ink required is diminished by reason of faintness of tint desired or by reason of a circumferential limitation in the amount of ink needed, a considerable reduction in the quantity of ink pumped by a given individual plunger is necessary. While such reduction is possible in conventional constructions by limiting the stroke of the plunger, this gives less satisfactory regulation and also limits the length of time involved in the discharge or ink delivering stroke, thus creating an increased unevenness in the supply of ink to the ink motion by confining the ink supplied from the pump to a small portion of the periphery of the first cylinder of the ink motion. This results in greater difficulty in obtaining an even distribution of ink upon the form rollers for application to the printing cylinders. It will be apparent that the present invention, in such cases, permits a greatly improved regulation by providing means for driving the pump at a lower speed for spot color printing.

A second problem encountered involves press design and structure and the supplying of standard units for printing light and heavy color. The alteration of gear components attached to the press frame and forming part of the drive for the various ink pumps is a difficult and costly procedure, so that provision for altered ink requirements in the original design of conventional units presents difficulties and the alteration of existing equipment presents even greater difficulties. However, with the ink pump of the present invention, no more is required in most cases to suit particular requirements, than a shifting of gears wherever necessary and perhaps the interchange of a meshing gear pair as between shafts or adopting different ratios. In this connection, it will be apparent that the control of quantity of ink pumped is considerably greater with given equipment than may be apparent at first consideration. For example, with only the 1–1, 4–7 and 7–4 ratios available, it is possible to rotate the ink pumps having the heaviest requirements, and typically those printing in monotone, with the 7–4 drive ratio, while the ink pumps supplying a moderate quantity of ink may run at a 1–1 drive ratio and those supplying a very small amount of ink at a 4–7 ratio, thus providing a basic speed selection in the same printing press among speeds in the ratios 16–28–49, which, as is apparent, provides an extremely wide range.

In order to facilitate cleaning of a pump and also the lining up of coupling elements, such as the element **34**, when a pumping mechanism is restored to its housing, a manual ink pump drive may be provided, and such a drive is shown in Fig. 4. This figure shows one end of the housing of Fig. 2, which is modified as described below but in such a way as not to affect the remaining parts of the pump of Fig. 2. In the structure of Fig. 4, the housing has been elongated somewhat, as indicated, shaft **33** has been fitted with a bevel gear wheel **80** and a cooperating bevel pinion **81** carried on a vertical shaft **82** is provided. This shaft is journaled in the upper cover **25** and is vertically slidable therein, being urged toward an upward position of disengagement between the gears **81** and **80** by spring **83**. The upper end of shaft **82** is fitted with a wrench socket **84**, so that by placing a wrench in this socket and pushing downwardly against spring **83**, gear **81** may be brought into mesh with gear **80** and may be used to turn the ink pump driving mechanism by means of the wrench inserted in socket **84**. With the pump mechanism attached to cover **25** removed from the housing and immersed in a container of solvent, this manual drive furnishes a convenient method of flushing out and thoroughly cleaning the entire mechanism in preparation for a change in color of ink to be pumped. As above mentioned, the manual drive also furnishes a convenient way of alignment of coupling elements.

A further modification is shown in Fig. 3, which shows essentially a partitioned ink pump utilizing different shaft coupling arrangements. In this structure, the housing **100** is divided by a partition **101** and includes pumping mechanisms, as shown, to the right and left thereof. In the drawing, the cylinder plates **102**, coupling pins **103** and operating or plunger carrying plates **104** are indicated, but the plungers have been omitted so as to show the shaft structure more clearly. The drive shaft is formed in two sections **105** and **106**, which together with the operating plates **104** and associated mechanism, are carried by cover plates **107** and **108**, to which supporting bracket elements **109** and **110** are bolted. A central connecting shaft **111** journaled in the partition **101** connects the shaft sections **105** and **106**. Shaft **106** is driven by a shaft **112** at the outer end thereof and a further shaft section **113** for driving further pump elements or other printing machine elements may be provided and may be driven by the shaft section **105**.

Couplings are provided between shaft sections **112** and **106**, **106** and **111**, **111** and **105**, and **105** and **113**, these couplings having, in each case the form shown in Fig. 6 and including a transverse key **114** and groove or keyway **115**. This form of coupling permits the separation of the coupled shafts by a purely transverse movement of one of them with relation to the other, or movement involving no axial component. The keys for the couplings in each of the chambers to each side of the partition **101** are lined up in the same direction, so that it is possible to remove the cover **107** or **108** together with all parts attached thereto, by merely turning the shaft to a position where the keys extend in the vertical direction. Preferably the alignment of coupling elements throughout is the same, so that all couplings may be brought to a position to permit such removal, with a single positioning of the drive shaft.

What is claimed is:

1. A drive for printing machine ink pumps of the positive displacement measuring type comprising a drive shaft element and means for mounting it in the wall of an ink pump housing for driving pump mechanism therein, a housing rotatable about the axis of the said shaft element, means for reversibly driving the said shaft element, comprising means for fixing the said housing selectively in either of two positions 180° apart, a cross shaft within the housing, bodily movable therewith and having couplings at each end accessible from outside the housing for driving it in either of the two said positions from an external drive in fixed position relative to the ink pump housing, and gearing within the housing for connecting the said cross shaft and the first said shaft element comprising gear elements for connecting the same in two different drive ratios, and a gear shifting member operable from outside the housing for selecting the drive ratio.

2. A drive according to claim 1, in which the said gearing includes a pair of gears which are adapted to be interchanged, for reversing the said drive ratio.

3. A drive for printing machine ink pumps of the positive displacement measuring type comprising a drive shaft element and means for mounting it in the wall of an ink pump housing for driving pump mechanism therein, a housing rotatable about the axis of the said shaft element, means for reversibly driving the said shaft element, comprising means for fixing the said housing selectively in either of two positions 180° apart, a cross shaft within the housing, bodily movable therewith and

having couplings at each end accessible from outside the housing for driving it in either of the two said positions from an external drive in fixed position relative to the ink pump housing, and gearing within the housing for connecting the said cross shaft and the first said shaft element comprising gear elements for connecting the same in a one-to-one drive ratio and a different drive ratio, and a gear shifting member operable from outside the housing for selecting the drive ratio.

4. A drive according to claim 3, in which the gear elements for connecting the said shaft and shaft element in a different drive ratio comprise an interchangeable gear pair, whereby by interchanging the gears of the said pair the said ratio may be either a step-down or step-up, as desired.

5. A drive for printing machine ink pumps of the positive displacement measuring type comprising a drive shaft element and means for mounting it in the wall of an ink pump housing for driving pump mechanism therein, a housing rotatable about the axis of the said shaft element, means for reversibly driving the said shaft element, comprising means for fixing the said housing selectively in either of two positions 180° apart, a cross shaft journaled in the housing and having couplings at each end accessible from outside the housing for driving it in either of the two said positions from an external drive in fixed position relative to the ink pump housing, a second cross shaft also journaled to the housing, gear elements carried on the two said cross shafts for driving the first said shaft element from the first said cross shaft selectively at either of two drive ratios and comprising axially slidable gear elements supported by the second said cross shaft and means for axially sliding the same to either of two predetermined positions.

6. A drive according to claim 5, in which the said housing comprises two housing sections attached together and containing respectively the two said cross shafts.

7. A drive according to claim 5, in which the second said cross shaft is bodily and axially slidable and comprising detents for holding the same in either of the two said predetermined positions.

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