Oct. 18, 1949. H. E. PEYREBRUNE 2,484,905

DRIVE FOR MULTIUNIT PRINTING PRESSES

Filed Aug. 28, 1946 2 Sheets-Sheet 1

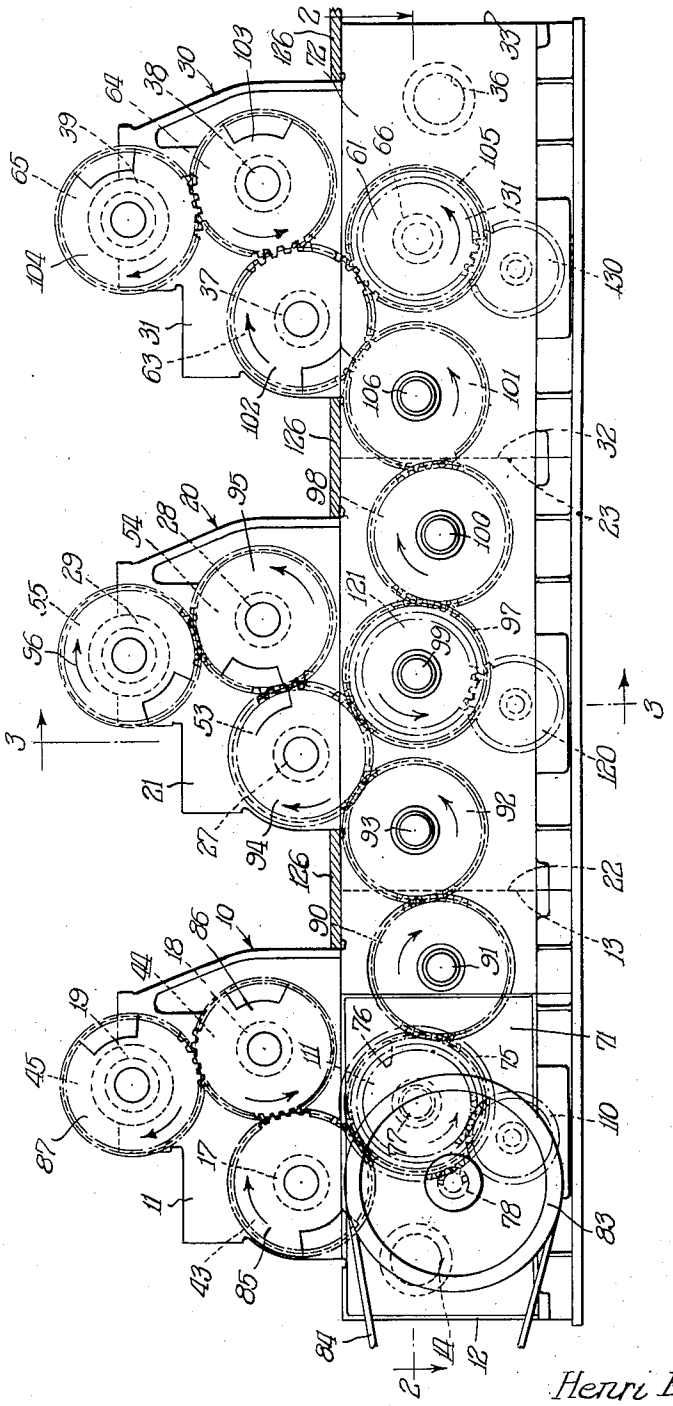


Fig. 1.

INVENTOR.
Henri E. Peyrebrune,
BY
Wilkinson Huxley Byron & Knight
Attys.

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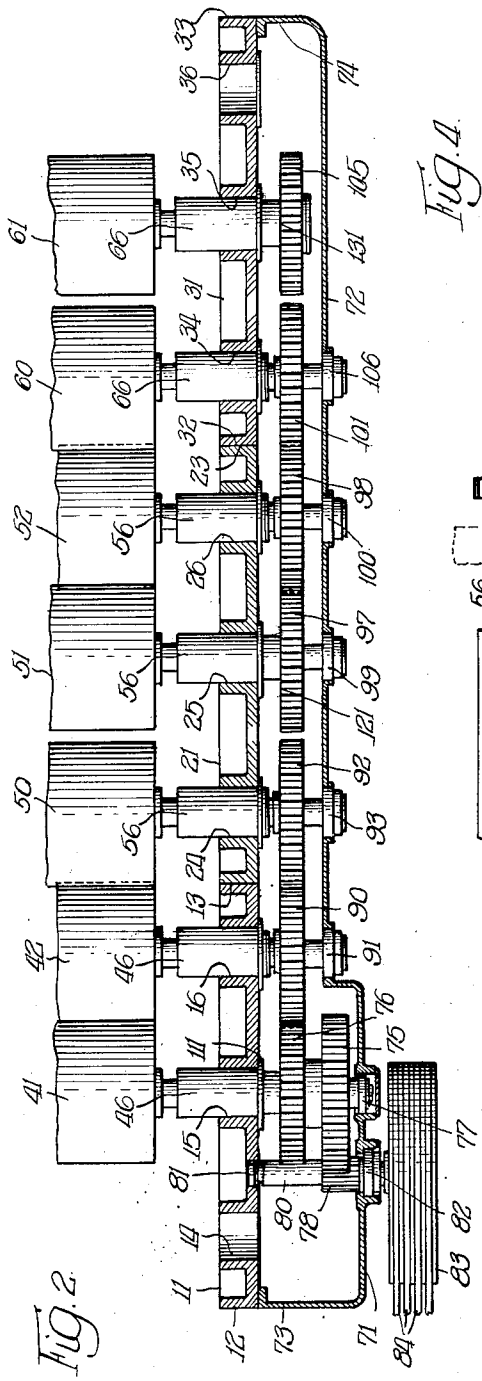


Fig. 2.

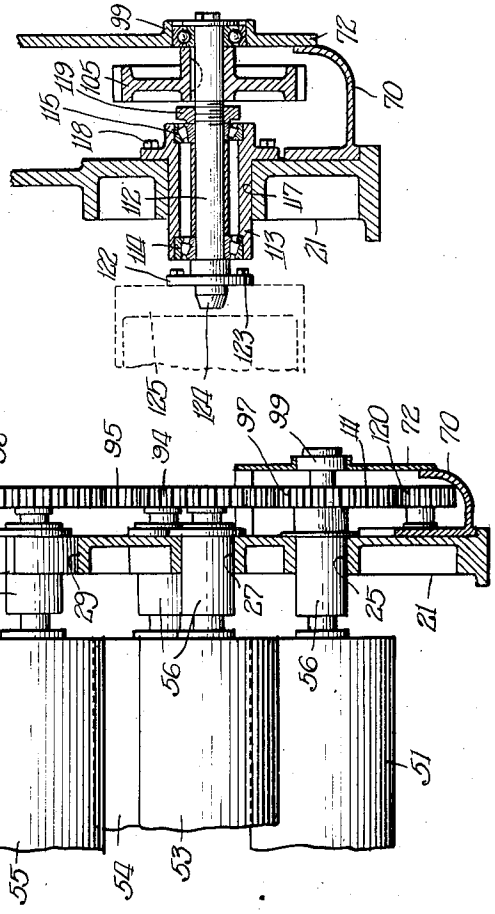


Fig. 4.

Fig. 3.

INVENTOR.
Henri E. Peyrebrune,
BY

Wilkinson Huxley Byron & Knight
Attys.

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UNITED STATES PATENT OFFICE

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DRIVE FOR MULTIUNIT PRINTING PRESSES

Henri E. Peyrebrune, River Forest, Ill., assignor, by mesne assignments, to Miehle Printing Press & Manufacturing Company, Chicago, Ill., a corporation of Delaware

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2 Claims. (Cl. 101—183)

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The invention relates to printing presses and, while it can be adapted to any type of sheet fed rotary printing press, it has reference in particular to sheet fed lithographic offset presses of the rotary type and to improved drive mechanism and associated structure for such presses when coupled in tandem relation for multi-color printing.

In the multiple unit press shown in U. S. Letters Patent No. 2,479,023, issued jointly to me and Arthur G. Jacobson, August 16, 1949, and entitled Frame structure for printing press units and assembling method therefor, a plurality of press units of similar construction arranged in tandem to provide a series of printing couples having rotary transfer drums therebetween for transferring the sheets from the impression cylinders of one printing couple where they are printed in one color to the impression cylinder of an adjacent couple where they receive another color impression. The structural frame members of each press unit have been especially designed to facilitate the coupling of the units in tandem for such multi-color printing. For example, the front and rear surfaces of each side frame are machined to maintain the length of the frames accurate within predetermined tolerances and the journal openings for the cylinders have a precise location in the frames with respect to the machined surfaces so that related journal openings are in alignment when the frames are properly erected. An important result of the above design is that coacting transfer drums of adjacent coupled units have a correlated relation and perfect registration is secured for each color impression.

Some of the principal advantages which my invention presents reside in the simplicity and economy of manufacture, for example, a single train of gear being provided to drive the printing cylinders, sheet transfer drums and associated sheet delivery means of the combined units in a multi-color press. Moreover, intermediate driving assemblies are associated with the axis of every sheet transfer and delivery member or drum, which assemblies support and rotate the respective drums.

Further, the assembling of the transfer drums is very convenient and the drums may be removed for shipping or replacement without disturbing the adjustment of any of the driving gears.

This feature represents considerable economy as compared to previous methods of timing the associated driving and driven members since all the necessary adjustments may be accomplished

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at the manufacturer's plant without the necessity of retiming them when a press is being installed in the printer's plant.

The matter of rigidity of the driving means between adjacent units is also of considerable importance. It makes possible the keeping of accurate timing between the units at different speeds of operation. This point also is emphasized by the introduction of preloadable antifriction bearings which render the drum and driving gear assembly very rigid under varying load conditions. The outer or outboard bearings, for example, prevent excessive deflection of the drive shaft.

A still further important feature resides in the durability and permanency of adjustments and in the manner of maintaining the associated drive gears lubricated. For example, the lowest gear of a single train of gears dips in oil and picks up lubricant which is transferred by rolling action to the uppermost gear, namely the plate cylinder gear. This constant supply of lubricant also tends to remove foreign particles such as metal chips and the like from the gears, which particles might otherwise cling to the teeth of the gears, ultimately wearing the surface of the gear teeth.

One of the primary objects of the invention resides in the provision of improved driving mechanism for multiple unit rotary printing presses whereby the cylinders of all the combined press units will be driven synchronously from a single source of power applied to one of the press units, preferably the first unit.

A further, outstanding object of my invention is the accomplishment of a driving shaft assembly for the sheet transfer members and associated sheet delivery means, which shall be adapted for selectively accommodating, or for removal and replacement of the transfer and delivery means, without disturbing the driving gear unit of the press.

Another object is to provide drive mechanism for driving the cylinders of unit presses coupled in tandem for color printing and which will include a single train of gearing, the same extending from the transfer drums of the first unit through intermediate units to the transfer drums of the adjacent forward unit or units.

In the drive structure of the invention the driving gears forming said gear train are fixed to the projecting end of their cylinder shaft on the gear side of the press and since considerable power is transmitted by certain gears of said train the resulting stress and strain applied thereto could in severe cases produce cylinder shaft

deflection such as to seriously interfere with the maintenance of perfect registration for the color impressions.

Therefore, another object of the invention resides in the provision of outboard bearings for those members included in the gear train and which function to drive adjacent units whereby the shafts which support the transfer drums are additionally journalled at their ends beyond the driving gears to prevent said shaft deflection during operation.

Another object is to provide a single train of gearing as herein described for a multiple unit press which will additionally include means for maintaining adequate lubrication for the gears and which lubricating function will be effected automatically by gears that dip into an oil trough.

Another object is to provide a combination oil trough and auxiliary frame for a multiple unit printing press and wherein the trough and auxiliary frame will be located on the gear side of the press for mounting said outboard bearings which are provided for journalling the transfer drum supporting shafts.

Still further objects of my invention reside in the provision of a multi-unit printing press in whch at least two printing couples are arranged for multi-color printing, including sheet transfer mechanism for conveying sheets from one printing couple to an adjacent one and having driving means associated with the sheet transfer mechanism to thereby drive the respective printing couple. Furthermore, the invention contemplates the combination of at least three printing units arranged in tandem of which units, alternate ones are timed alike, whereas the angular gearing relation between adjacent units is 180°.

With these and various other objects in view, the invention may consist of certain novel features of construction and operation, as will be more fully described and particularly pointed out in the specification, drawings and claims appended hereto.

In the drawings which illustrate one preferred embodiment of the device and wherein like reference characters are used to designate like parts—

Figure 1 is an elevational view of the gear side of a multiple unit printing press showing the gear drive and associated structure comprising the present invention;

Figure 2 is a fragmentary horizontal sectional view taken substantially along line 2—2 of Figure 1 showing the driving gears in line with the transfer drums of the coupled press units, and also showing the outboard bearings mounted by the auxiliary frame;

Figure 3 is a fragmentary vertical sectional view taken substantially along line 3—3 of Figure 1; and

Figure 4 is a cross sectional view of one of the driving shaft assemblies associated with each one of the sheet transfer drums and delivery member.

Referring to the drawings, the frame structure of each unit press consists of a pair of side frame members of identical construction and which are suitably mounted and secured in spaced relation for journalling the printing cylinders and transfer drums as well as the delivery drum of the unit. Only one side frame of each unit is shown in the drawings, that is, the frame on the gear side of the press since these frames have associated relation with the gear drive of the present invention. For a more complete disclosure of the frame

structure of the individual press units reference is made to the U. S. patent previously referred to. The press units are identified by numerals 10, 20 and 30, with each unit having a side frame 11, 21, and 31, respectively, on the gear side of the press. The frames have been designed and are therefore particularly adapted for a unit press operable as an independent unit or capable of having other units combined therewith in tandem relation for color printing. It will be observed that each frame has a shape in side elevation simulating an inverted T, including a base section and a top section integral therewith, and the frame has considerable thickness so as to satisfactorily journal the necessary printing cylinders and transferring drums.

The frames 11, 21, and 31 are each machined to provide front surfaces 12, 22 and 32 and rear surfaces 13, 23 and 33 whereby the length of the base section of each frame is maintained accurate within predetermined tolerances. Frame 11 has a plurality of journal openings 14, 15 and 16 formed therein, each opening having a precise location in the frame with respect to the machined front and rear surfaces and also with respect to the top and bottom surfaces of the frame. The openings 15 and 16 journal the supporting shafts for transfer drums 41 and 42. Opening 14 is not used in the first unit, it being understood that conventional feeding mechanism will be associated with this unit for feeding the sheets directly to the impression cylinder. The top portion of frame 11 is provided with additional journal openings 17, 18 and 19 and which are accurately located in the frame for journalling the impression cylinder 43, blanket cylinder 44 and the plate cylinder 45, respectively. Opening 19 interrupts the top surface of frame 11, the said opening being semi-circular. However, this section of each frame is supplemented by additional structure, not shown, which is securely bolted to the top surface for completing the opening 19 and which additional structure also supports an ink distributing unit for inking the plate on cylinder 45 in the conventional manner.

Frame 21 of the intermediate press unit is similarly provided with journal openings 24, 25 and 26 for the supporting shafts of the transfer drums of said unit which drums are identified by numerals 50, 51 and 52. The impression cylinder 53 is journalled in opening 27, the blanket cylinder 54 in opening 28, and the plate cylinder 55 in opening 29, as clearly shown in Figures 1 and 3. Frame 31 of the forward unit is provided with the journal openings 34 and 35 for the shafts supporting the transfer drums 60 and 61. The third opening in this press unit, namely 36, is not used since the transfer drum at the extreme end of the unit is omitted owing to the fact that conventional delivery mechanism is associated with transfer member 61 which completes the transferring function of the sheets to said mechanism. The impression cylinder 63 of this last unit is journalled in opening 37, the blanket cylinder 64 in opening 38, and the plate 65 in opening 39.

Roller bearings are provided for journalling the shaft of each cylinder in its frame member. The bearings are substantially identical in construction and are therefore interchangeable as regards each unit press and may also be used in other press units. This is an important factor in the construction and maintenance of a press of this kind. Numeral 46 indicates the bearings for the various cylinder drum supporting shafts of press unit 10 whereas numeral 56 indicates the bear-

ings for the various supporting shafts of the intermediate unit 20. The bearings for the cylinder drum supporting shafts of the forward unit are indicated by numeral 66. Said bearings are suitably retained in their respective journal openings, which openings have sufficient width for securely mounting the bearings in perfect alignment for receiving the shaft for their respective cylinder drum which is accordingly journalled for substantially frictionless rotation.

In coupling the present units in tandem it will be understood that the rear surface 13 of unit 10 is bolted in proper doweled relation to the front machined surface 22 of the intermediate unit 20 and in a similar manner the forward unit 30 is bolted to 20 with the surfaces 23 and 32 in contacting relation. The sheets of paper to be printed are presented to the impression cylinder 43 by the conventional feeding mechanism associated with this first unit. The sheets are printed as a result of passing between the impression cylinder 43 and the blanket cylinder 44 following which the printed sheets are delivered to transfer drum 41 and then transferred to drum 42 located adjacent the rear machined edges of the unit frame structure. The next transfer takes place between the drum 42 and cylinder 50, it being understood that these drums have a correlated relation for effecting this transferring function as a result of the construction of the coupled press units. Transfer drum 50 of the intermediate press unit operates to deliver the sheets to the impression cylinder 53, whereupon the sheets are subjected to a second printing operation upon passing between cylinders 53 and 54. The sheets are delivered to transfer drum 51 and then to cylinder 52 which transfers the sheets to drum 60 of the forward unit 30 having coupling relation with the intermediate unit. From transfer drum 60 the sheets which have now received two impressions are delivered to impression cylinder 63 where they receive a third impression upon passing between said cylinder and cylinder 64. The sheets are then taken from the cylinder 63 by the delivery member 61 which transfers the sheets to the conventional delivery mechanism associated with the forward end of the last unit.

It will be understood that the shaft, i. e. bearing assembly 66, on which the delivery member 61 is mounted, is preferably of the same construction as are those of the sheet transfer drums 41 etc. and such that said delivery member can be readily removed and substituted by a sheet transfer member in the event that a supplementary color printing unit is to be incorporated in the established multi-unit press for the purpose of adapting such press for printing an additional color. The advantageous features and constructional details of such bearing assembly will be explained herein with reference to Figure 4.

As best shown in Figures 2 and 3, the frame members 11, 21 and 31 are provided with an oil trough 70 suitably fixed to said frames and which extends along the base of the same on the gear side. An auxiliary frame is associated with the oil trough, the said auxiliary frame including a section 71 having parallel association with the side frame 11 of the first unit, and a section 72 which extends from section 71 in parallel relation with side frames 21 and 31. The frames 71 and 72 are suitably fixed along the base portion thereof to the oil trough 70 so as to form a substantially integral unit with said oil trough. The said frames extend vertically to a height substantially equal to that of the base sections of the

frame and at the end of side frame 11 the auxiliary frame 71 is provided with an end portion 73 having secured relation to the side frame. Also at the forward end of frame 31 the auxiliary frame 72 has an end portion 74. The auxiliary frame is thus securely bolted to the frame structure of the multiple unit press in combination with the oil trough so that said auxiliary structure is sufficiently strong and rugged to provide supporting means for a plurality of outboard bearings which journal the outer ends of the transfer drum supporting shaft of the coupled press units, which structure will now be described.

In the illustrated embodiment power is initially supplied to transfer drum 41, the shaft supporting this cylinder having suitably secured thereto a driven gear 75 and a driving gear 76. The end of the shaft beyond gear 75 is equipped with an outboard bearing 77 suitably mounted by section 71 of the auxiliary frame. The driving pinion 78, preferably steel hardened, has meshing relation with gear 75, the pinion being mounted on stud shaft 80 supported for rotation by the side frame 11 and the auxiliary frame section 71. The bearing 81 journals one end of stud shaft 80 in side frame 11, whereas the bearing 82 journals the other end of said shaft in frame 71. It will be observed that the stud shaft 80 projects beyond bearing 82 to receive the driving pulley 83 which is driven by any suitable source of power such as an electric motor through the instrumentality of friction belts 84. Power applied to the driving pulley 83 will rotate the driving pinion 78 which meshes with gear 75 to rotate the transfer drum 41 of the first press unit. Gear 76, in line with transfer drum 41 also drives the impression cylinder 43 since it meshes with gear 85 on the impression cylinder shaft. From gear 85 power is applied to gear 86 on the shaft of blanket cylinder 44 and then to gear 87 on the shaft of plate cylinder 45 to thus drive all three printing cylinders of this first unit.

The second transfer drum 42 of the first unit is driven from gear 76 by means of gear 90 mounted on the shaft which supports this drum. The end of this shaft projecting beyond gear 90 is journalled by the outboard bearing 91 mounted in section 72 of the auxiliary frame. As a result of the precision and accuracy in the coupling relation of intermediate unit 20 with unit 10, not only are the transfer drums 42 and 50 properly correlated to perform the necessary transferring function but the gear 90 will also be brought into proper mesh with gear 92 on the shaft supporting transfer drum 50. The end of said shaft beyond gear 92 is journalled by the outboard bearing 93. Gear 92 meshes with gear 94 on the shaft of impression cylinder 53 for driving said cylinder and the drive is transmitted to blanket cylinder 54 through gear 95 and to the plate cylinder 55 through gear 96. Gear 94 for the impression cylinder 53 meshes with and drives the gear 97 mounted on the shaft which supports transfer drum 51. From this shaft the drive is transmitted through gear 98 to transfer drum 52. Outboard bearings 99 and 100 are provided in auxiliary frame 72 for the shafts supporting the transfer drums 51 and 52.

The gear train provided by the invention for synchronously driving the cylinders and drums of the various coupled press units is completed by a gear on the shaft supporting each transfer drum in the adjacent forward unit and which function precisely as described with respect to the intermediate unit. Accordingly, it will be

understood that as a result of coupling unit 30 to unit 20 gear 98 will be located in proper meshing relation with gear 101 on the shaft supporting transfer drum 60, which gear meshes with and drives gear 102 on the shaft of the impression cylinder 63. The blanket cylinder 64 is driven from the impression cylinder by means of gear 103 which meshes with gear 101 and in a similar manner the plate cylinder 65 is driven by gear 104. The delivery member 61 of this forward unit is driven by means of gear 105 on the shaft supporting said member and which gear has meshing relation with gear 102. This completes the gear train for driving the cylinders and drums of the coupled units since it will be understood that conventional delivery mechanism is associated with delivery member 61 for taking the sheets from said member. Only one outboard bearing 106 is provided, namely, for the shaft supporting transfer drum 60. The delivery member 61 does not require a third bearing since it does not perform an intermediary driving function as is the case with the other elements preceding it in the gear train.

All the gears included in the drive of the invention are wide face gears of large pitch having a diameter as regards their pitch circle substantially equal to that of their cylinder or drum and which are uniform in diameter. This makes for greater interchangeability between various gears and gear hubs. The single gear train essentially includes the transfer drums 41, 42 and 50, the impression cylinder 53, the transfer drums 51, 52 and 60, the impression cylinder 63 and the transfer member 61. It will be seen, therefore, that the group of the three transfer drum drives between the impression cylinders perform the function of transferring the sheets from one printing couple to the other and also the function of transmitting the rotary drive to a forward unit or units. It is this dual function that makes necessary the outboard bearings for the shafts supporting the transfer drums. This third support for said shafts is located outwardly beyond the driving gears and as a result shaft deflection, which might otherwise occur due to the stress and strain incident to the intermediary driving function, is effectively prevented. It is absolutely essential to prevent undue radial displacement of the transfer drums, shafts and gears if perfect registration during transfer is to be secured.

The gears of the drive are conveniently and adequately lubricated by the lowest gears which dip into the oil trough, the same being identified by numerals 110, 120 and 130 for the units, respectively. The gear 110 is driven by gear 76 on the shaft which supports the transfer drum 41. In a similar manner gear 120 is driven by gear 97 on the shaft which supports transfer drum 51 and gear 130 by gear 105 on the shaft which supports transfer drum 61. These gears therefore rotate during a printing operation and since they dip in the oil in trough 70 the splashing which takes place and the oil which is carried upwardly is sufficient to maintain proper lubrication of the main gear drive.

A preferred construction of driving shaft and bearing assembly is illustrated in Figure 4. It comprises a supporting shaft 112 mounted in the bearing sleeve 113 by means of preloaded antifriction bearings 114 and 115. This sleeve is formed with a flange 116 by means of which the sleeve is securely positioned in the opening 117 provided in the side frame 21 by means of a series of bolts 118. To the outer end of shaft

112 is keyed in any conventional manner a gear 105 which has meshing relation with the printing couple of the respective printing unit. The free end of the shaft is suported in an outboard bearing 99, the same as are all of the supporting shafts for the sheet transfer members and associated sheet delivery drum. A retaining nut 119 is threaded onto the shaft 112 by means of which nut the shaft is locked against any lateral shifting. The inner end of the shaft is formed with a flange 122 whereby driving connection is established with a sheet transfer member or a sheet delivery drum, indicated by broken lines, whichever the case may be, by means of bolts 123 threaded into the lateral wall thereof. The tapered centering end 124 of the shaft enters a corresponding recess provided in the end wall 125 in order to accurately center the respective transfer members or delivery drum. With this arrangement, it is possible to readily install, remove, or interchange the sheet transfer members or delivery drum without in any way interfering with the press drive.

In Figure 1 I have indicated the position of the gaps in the respective printing members, and it will be seen that with the arrangement shown, where at least three printing couples are combined for multi-color printing, alternate ones are timed alike, whereas the angular gearing relation between adjacent units is 180°.

The arrangement of the printing units illustrated in the drawings renders the press exceptionally accessible and provides ample space for the press operator to work between adjacent units for which purpose removable platforms 126 are provided. The direction of rotation of the printing cylinders, sheet transfer members, and delivery drum is indicated by arrows.

Having thus described and illustrated one preferred embodiment of my invention, I wish it to be understood that I intend to cover and seek protection for any modifications in construction, arrangement and design disclosed herein that will come within the broad terms and meaning of the appended claims.

What I claim is:

1. In a printing press of the multiple unit type, the combination with a plurality of printing couples and associated transfer drums, of drive means for said drums including shafts on which the respective drums are removably supported, said shafts being fixedly mounted for rotation in axial alignment with their respective drums, gears mounted on said shafts and having meshing relation with similar gears adjacent thereto and forming a continuous train for driving the printing couples and transfer drums of the respective units in precise timed relation, an outboard bearing for journalling the outer end of said shafts projecting beyond the gear to eliminate any deflection thereof, and an auxiliary frame on the gear side of the press for mounting said outboard bearings, said drive means remaining intact and in proper timed relation when a transfer drum is removed as well as when all drums are in their operative positions.

2. In a printing press of the multiple unit type, the combination with a plurality of printing couples and transfer drums of the respective units, of a single train of gears for driving said couples and said drums, said gear train extending from the transfer drum of the first unit through the intermediate unit or units to the transfer drums of the forward unit and including a drive shaft for each of said drums fixedly

journalled in axial alignment with the drums and on the gear side of the press, a gear fixed to each shaft having meshing relation with the gears adjacent thereto, an outboard bearing providing additional journalling means for said shafts beyond the gear on the respective shaft, and an auxiliary frame on the gear side of the press for mounting said outboard bearings, said drums being removably connected to their respective drive shafts whereby said drums may be removed while the drive means remains intact and in proper timed relation with the associated elements of the gear train.

HENRI E. PEYREBRUNE.

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