

May 10, 1955

C. W. HARROLD
DRIVE FOR MULTICOLOR PRESS

2,707,914

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2 Sheets-Sheet 1

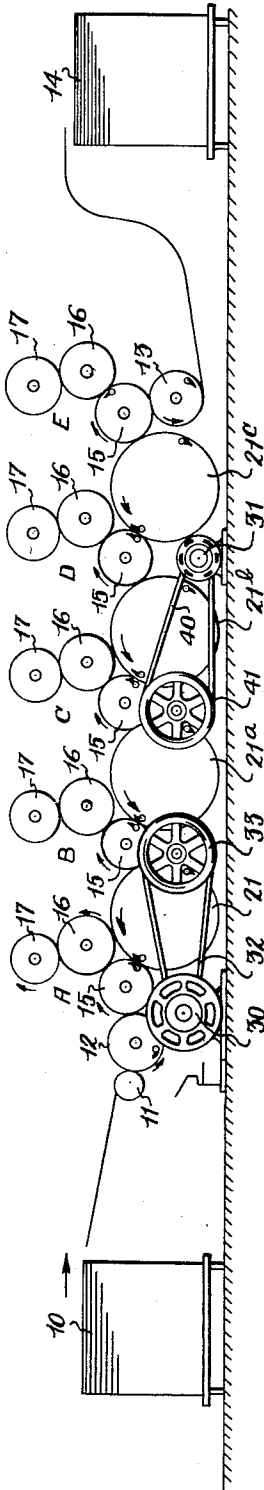


FIG. 1

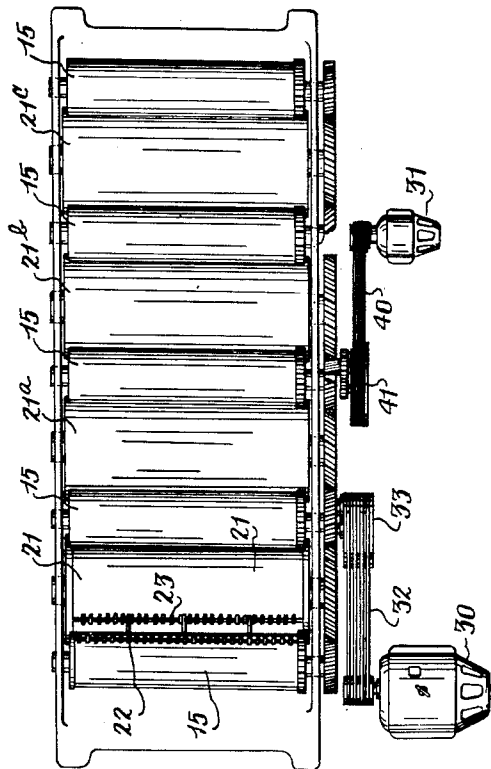


FIG. 2

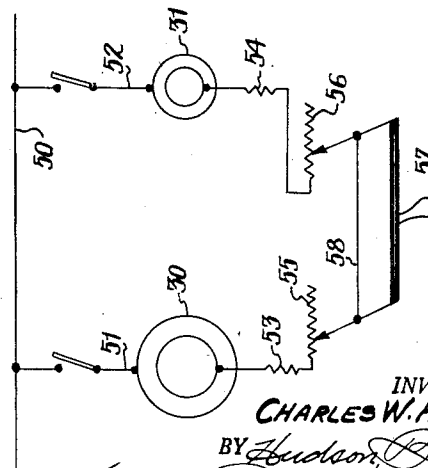


FIG. 5

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DRIVE FOR MULTICOLOR PRESS

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12 Claims. (Cl. 101—183)

This invention relates to improvements in drives for sheet fed multicolor presses.

Customarily the different units are driven through a train of gears powered by a single motor. A long train of gears, such as would be necessary for driving the printing units of a five color press for example, including means for transferring sheets from each unit to the next, is placed under heavy stress if connected at one point with a single driving motor. The gearing itself absorbs considerable power in addition to that required for driving the different units of the machine. Also under the pressure applied by the driving motor the different gear elements tend to yield or bend slightly and in order to counteract this tendency wider faced gears must be provided in that part of the train nearest the motor which is a disadvantage in that it interferes with standardization of the different units of the press.

When two motors are applied at different points to a train of gears connecting the units of a sheet fed multicolor press, the gear train is relieved of some of this undue stress and a more efficient drive results. I have found however that in such a case there may occur what may be termed floating backlash, which is the condition that exists when an overbalancing part of the load shifts from one motor to the other. At such times the direction of the backlash changes and the feed of sheets is so affected thereby that registration is impaired. In order to overcome this difficulty I employ two motors of like type but of substantially different power output, with controls for operating them at equal speed.

One of the objects of the invention therefore is the application of driving force at two or more different points in a sheet fed multiunit printing press, while preventing floating backlash, that is backlash shifting back and forth.

Another object is the provision of driving means for multiunit presses such that the number of units may be increased without increasing the strength of the gears in the gear train.

Another object is the provision of a two motor drive for multiunit presses requiring less horsepower than a drive employing a single motor.

Another object is the provision of a drive for a multiunit press comprising two motors of the same speed but different torque applied at spaced points along a gear train connecting the units, whereby the motor which is more powerful in relation to the load imposed upon it controls backlash at all times.

Still another object is the provision of a drive for multiunit presses which will produce minimum deflection in the gears of the driving train and cause a minimum of register trouble.

Other objects and features of novelty will appear as I proceed with the description of that embodiment of the invention which, for the purposes of the present application, I have illustrated in the accompanying drawings, in which:

Fig. 1 is an elevational side view, diagrammatic in

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character, of a five unit rotary offset printing press embodying the invention;

Fig. 2 is a plan view of a portion of the press, the blanket and plate cylinders being removed in order to better illustrate the invention;

Fig. 3 is a side elevational view on a larger scale of a portion of the machine illustrated in Fig. 1;

Fig. 4 is a fragmental cross sectional view taken substantially on the line 4—4 of Fig. 3, and

Fig. 5 is a wiring diagram of a common control for a pair of A. C. motors employed in connection with the invention.

In the drawings I have illustrated the application of the invention to a sheet fed offset printing press. The diagrammatic showing of Figure 1 includes a feed pile 10 of sheets, feed cylinders 11 and 12, a delivery cylinder 13 and a delivery pile 14. The press itself comprises five printing units A, B, C, D and E, in each unit of which there are impression, blanket, and plate cylinders 15, 16 and 17 respectively. All three cylinders of each unit are of substantially the same size, as is usual, and are operatively interconnected to turn at the same surface speed by means of intermeshing gears 18, 19 and 20.

Between each pair of successive printing units there is a sheet transfer means, which may conveniently consist of a transfer cylinder 21, 21a, 21b or 21c of twice the diameter of the impression cylinders. Each impression cylinder is provided with a set of sheet grippers 22 shown in Fig. 2 on one unit only, and each transfer cylinder is provided with two sets of diametrically opposed sheet grippers 23, one set only of which is shown in Fig. 2 in connection with transfer cylinder 21. It is to be understood that all impression cylinders and transfer cylinders are similarly equipped. This sheet gripper arrangement and means for operating grippers being well known in the art, further disclosure with respect to the same is deemed unnecessary.

As indicated in Fig. 4 of the drawing the gears 18, 19 and 20 may be mounted on their respective cylinders 15, 16 and 17 internally of the machine frame 24. Outside of one side member of the frame the shaft of each impression cylinder 15 carries a gear 25. The gear 25 of each end unit meshes with a double size gear 26 on the shaft of the transfer cylinder adjacent thereto, while the impression cylinder gear 25 of each of the three intermediate units meshes with a double size transfer cylinder gear 26 on either side thereof. In this way there is constituted a train of gears interconnecting the various units to cause their cylinders to turn at the same surface speed. Correct angular relationship between the cylinders of the various units is thus maintained, and this synchronizing of the units is of course essential for maintaining register in the several color impressions made by the different units.

Power is communicated to the train of gears just referred to by two motors 30 and 31 of the same type but of unequal power output. The difference in power output should be substantial in order that there may be no shift of drive control from one motor to the other under any foreseeable load shifting as between printing units. I have found that a power output of the larger motor equal to twice that of the smaller motor is entirely effective and satisfactory, but I do not wish to confine the invention to that ratio.

Motor 30 by means of a plurality of V-belts 32 drives a pulley 33 mounted on a shaft 34 journaled in the frame between two transfer cylinders 21 and 21a. Shaft 34 carries a pinion 35 which meshes with a pinion 36 on another shaft 37, this latter shaft carrying also a pinion 38 which meshes with gear 26 on transfer cylinder 21a.

The smaller motor 31 drives a plurality of V-belts 40 which run over a pulley 41 mounted on a shaft 42 jour-

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naled in the frame between transfer cylinders 21a and 21b. Through pinions 43, 44 and 45, similar in all respects to pinions 35, 36 and 38, power from motor 31 is transmitted to transfer cylinder 21b. The power transmitted to transfer cylinder 21b from the larger motor through transfer cylinder 21a and impression cylinder 21 of the C unit is always greater by a substantial amount than the power transmitted to it from the smaller motor through the pinions 43, 44, 45. Hence there is no tendency toward floating backlash. Consequently good printing register in all colors is maintained.

Means is provided for controlling the two motors to cause them to turn at the same speed and to maintain the ratio of their power outputs constant. In Fig. 5 I have shown by way of example, using a conventional single line diagram, two A. C. slip ring motors connected to the supply line 50 by conductors 51 and 52. In the slip ring circuit of the larger motor 30 there is a resistor 53, while a similar type resistor 54 is included in the slip ring circuit of the smaller motor 31. These resistors are selected to produce substantially the desired relationship in the power outputs of the two motors at normal speed. The slip ring circuits also contain variable resistors 55 and 56 respectively which can be adjusted manually, as indicated by means of a handle 57, or by automatic means, to obtain different but always equal operating speeds in the two motors. Auxiliary circuits necessary for accomplishing the above functions are not shown since their construction and use are well known.

Instead of two A. C. motors, two D. C. motors of similar characteristics may be employed and a common control provided for varying the speed while maintaining a given power output ratio. Circuits for this purpose are known in the electrical art, but as the details of the same are not per se a part of the present invention no specific disclosure is given.

The use of two or more motors permits the use of the same width of gears throughout the gear train of a five color press as are satisfactory for a two color and four color press, whereas a single motor of sufficient horsepower to operate a five color press would wear out such gears rapidly or cause breakage of the same. Driving from two motors is also more efficient from the standpoint of power consumption, it having been found in practice that two motors require about ten percent less horsepower than a single motor in the operation of a five color press.

In the embodiment illustrated the more powerful motor is the one which is applied to the train first in respect to the direction of travel of sheets through the press. That arrangement is satisfactory and is preferred. However, the reverse arrangement is entirely workable provided that the ratio of power output of the first motor to the load on its side of the gear driven by the other motor is greater than the ratio of the power output of the second motor to the remaining load. In other words the output of the first motor must be such that after it has assumed the load to the rear of the gear driven by the second motor, there is a substantial excess of power left to be fed into the train in advance of the gear driven by the second motor, thus preventing a shift in backlash such as may tend to occur when the load on a unit is changed somewhat due to different printing conditions.

Having thus described my invention, I claim:

1. In a multicolor sheet fed printing press or the like, a gear train for driving the press including a plurality of continuously meshed gears, two motors in driving relation with spaced apart gears of said train, the ratio of power output of one of said motors to the load on its side of the gear driven by the other motor being greater than the ratio of the power output of the latter motor to the remaining load, whereby backlash at all points in said gear train is maintained always in the same direction.

2. In a multicolor sheet fed printing press, a series

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of three or more printing units each including an impression cylinder and associated mechanism, sheet transfer means between the impression cylinders of each pair of adjacent units, sheet grippers on said impression cylinders and on said sheet transfer means adapted to convey sheets in register through the printing units, a gear train for driving said printing units and said sheet transfer means including a gear for each of said impression cylinders and sheet transfer means, two motors of unequal power output, each of said motors being in driving relation with a gear on each of two sheet transfer means, the ratio of power output of one of said motors to the load on its side of the gear driven by the other motor being greater than the ratio of the power output of the latter motor to the remaining load, whereby backlash at all points in said gear train is maintained always in the same direction.

3. In a multicolor sheet fed printing press including a series of three or more printing units each including an impression cylinder and associated mechanism, sheet transfer means between the impression cylinders of each pair of adjacent units, and sheet grippers on the impression cylinders and on the sheet transfer means adapted to convey sheets in register through the printing units, a gear train for driving the press including a plurality of continuously meshed gears, two driving pinions each meshing with a different gear of said gear train, two motors, one connected to the rear driving pinion and the other connected to the forward driving pinion considered with reference to the direction of sheet travel, the ratio of power output to load effective on the train to the rear of the gear with which the forward pinion meshes being greater than the ratio of power output to load on that gear and parts forward thereof, whereby power from the rear motor is transmitted through said gear to the forward portion of the train and whereby backlash throughout the gear train is maintained always in the same direction.

4. In a multicolor sheet fed printing press, a series of three or more printing units each including an impression cylinder and associated mechanism, sheet transfer means between the impression cylinders of each pair of adjacent units, sheet grippers on said impression cylinders and on said sheet transfer means adapted to convey sheets in register through the printing units, a gear train for driving said printing units and said sheet transfer means including a gear for each of said impression cylinders and sheet transfer means, a driving pinion in driving relation with the gears of each of two sheet transfer means, two motors of unequal power output, one connected to the rear driving pinion and the other connected to the forward driving pinion considered with reference to the direction of sheet travel, the ratio of power output to load effective on the train to the rear of the transfer means gear driven by the forward pinion being greater than the ratio of power output to load on that transfer means gear, whereby power from the rear motor is transmitted through said forward transfer means gear to the forward portion of the gear train, and whereby backlash throughout the gear train is maintained always in the same direction.

5. In a multicolor sheet fed printing press including a series of three or more printing units each including an impression cylinder and associated mechanism, sheet transfer means between the impression cylinders of each pair of adjacent units, and sheet grippers on said impression cylinders and on said sheet transfer means adapted to convey sheets in register through the printing units, a gear train for driving the press including a plurality of gears, two motors in driving relation with spaced apart gears of said train, the difference in power output of said motors with relation to the load borne by each of them being such as to cause power from the motor of greater output to be transmitted through the gear driven by the motor of smaller output, whereby backlash at all points

in said gear train is maintained always in the same direction.

6. In a multicolor sheet fed printing press, a series of at least three printing units each including an impression cylinder and associated mechanism, sheet transfer means between the impression cylinders of each pair of adjacent units, sheet grippers on said impression cylinders and on said sheet transfer means adapted to convey sheets in register through the printing units, a gear train for driving said printing units and said sheet transfer means including a gear for each of said impression cylinders and sheet transfer means, two motors of unequal power output, each of said motors being in driving relation with a gear of each of two sheet transfer means, the difference in power output of said motors with relation to the load borne by each of them being such as to cause power from the motor of greater output to be transmitted through the gear driven by the motor of lesser output, whereby backlash at all points in said gear train is maintained always in the same direction.

7. In a multicolor sheet fed printing press, a series of at least three printing units each including an impression cylinder and associated mechanism, a sheet transfer cylinder between each pair of adjacent impression cylinders, sheet grippers on said impression cylinders and transfer cylinders adapted to convey sheets in register through the printing units, a gear for each transfer cylinder meshing with gears for the impression cylinders on each side thereof, two driving pinions each meshing with a different transfer cylinder gear, two motors of unequal power output, each motor connected to one of said driving pinions for applying power thereto, the difference in power output of said motors being such as to cause power from the motor of greater output to be transmitted through the transfer cylinder gear meshing with the pinion driven by the motor of lesser output, whereby backlash at all points in the press between said driving pinions is maintained in the same direction as would be the case if the press were driven only by the motor of larger output.

8. In a sheet fed rotary offset printing machine, a series of at least three printing units each embodying plate, blanket and impression cylinders, transfer cylinders between the impression cylinders of successive units, a motor of a given type and given power output operatively connected with one of said transfer cylinders, a motor of the same type and lesser power output operatively connected with another of said transfer cylinders, a gear on the impression cylinder of each unit, a gear on each transfer cylinder intermeshing with the impression cylinder gears on both sides thereof, whereby all impression cylinders are interconnected to turn at the same surface speed, and gear means for driving the blanket and plate cylinders of each unit from the impression cylinder thereof, said motors being electrically interconnected to turn at the same speed, whereby the larger motor at all speeds assumes the greater part of the load in a fixed ratio to the load assumed by the smaller motor.

9. In a sheet fed rotary offset printing machine, a series of at least three printing units each embodying plate, blanket and impression cylinders, transfer cylinders between the impression cylinders of successive units, a motor of a given type and given power output operatively connected with one of said transfer cylinders, a motor of the same type and lesser power output operatively connected with another of said transfer cylinders, a gear on the impression cylinder of each unit, a gear on each transfer cylinder intermeshing with the impression cylinder gears on both sides thereof, whereby all impression cylinders are interconnected to turn at the same surface speed, a gear concentric with and turning with each of said impression cylinders, and gears on the

plate and blanket cylinders of each unit driven by said last named gear, said motors being electrically interconnected to turn at the same speed, whereby the larger motor at all speeds assumes the greater part of the load in a fixed ratio to the load assumed by the smaller motor.

10. In a sheet fed rotary offset printing machine, a series of at least five printing units each embodying plate, blanket, and impression cylinders, transfer cylinders between the impression cylinders of successive units, a motor of a given type and given power output operatively connected to drive the second transfer cylinder viewed from the feed end of the machine, a motor of the same type and lesser power output operatively connected to drive a transfer cylinder between said last named transfer cylinder and the transfer cylinder nearest the delivery end of the machine, a gear on the impression cylinder of each unit, a gear on each transfer cylinder intermeshing with the impression cylinder gears on both sides thereof, whereby all of the impression cylinders are interconnected to turn at the same surface speed, and gear means for driving the plate and blanket cylinders of each unit from the impression cylinder thereof, said motors being electrically interconnected to turn at the same speed, whereby the larger motor at all speeds assumes the greater part of the load and the smaller motor contributes driving force in a fixed ratio to that of the larger motor, strain on the gears is minimized and backlash maintained always in the same direction.

11. In a sheet fed rotary offset printing machine, a series of at least four printing units each embodying plate, blanket and impression cylinders, transfer cylinders between the impression cylinders of successive units, a motor of a given type and given power output operatively connected to drive the second transfer cylinder viewed from the feed end of the machine, a motor of the same type and lesser power output operatively connected to drive the third transfer cylinder, a gear on the impression cylinder of each unit, a gear on each transfer cylinder intermeshing with the impression cylinder gears of the units on both sides thereof, whereby all the impression cylinders are interconnected to turn at the same surface speed, and gear means for driving the blanket and plate cylinders of each unit from the impression cylinder thereof, said motors being electrically interconnected for speed control, whereby the larger motor assumes the greater part of the load and the smaller motor contributes driving force in a fixed ratio to that of the larger motor, strain on the gears is minimized and backlash maintained always in the same direction.

12. In a sheet fed rotary offset printing press or the like, a gear train for driving the press including a plurality of continuously meshed gears, a first motor operatively connected with one of the gears in said gear train, a second motor operatively connected with another of the gears in said gear train, means electrically interconnecting said motors for turning said motors at the same speed, the load assumed by each motor being such that the ratio of the power output of the first said motor to the load on its side of the gear driven by the second motor being greater than ratio of the power output of the second motor to the remaining load whereby the first motor drives part of the load located on the other side of the gear driven by the second motor.

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