

March 14, 1967

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3,308,753

UNIVERSAL PRESS DRIVE FOR ENGRAVED CYLINDERS

Filed Oct. 21, 1965

3 Sheets-Sheet 1

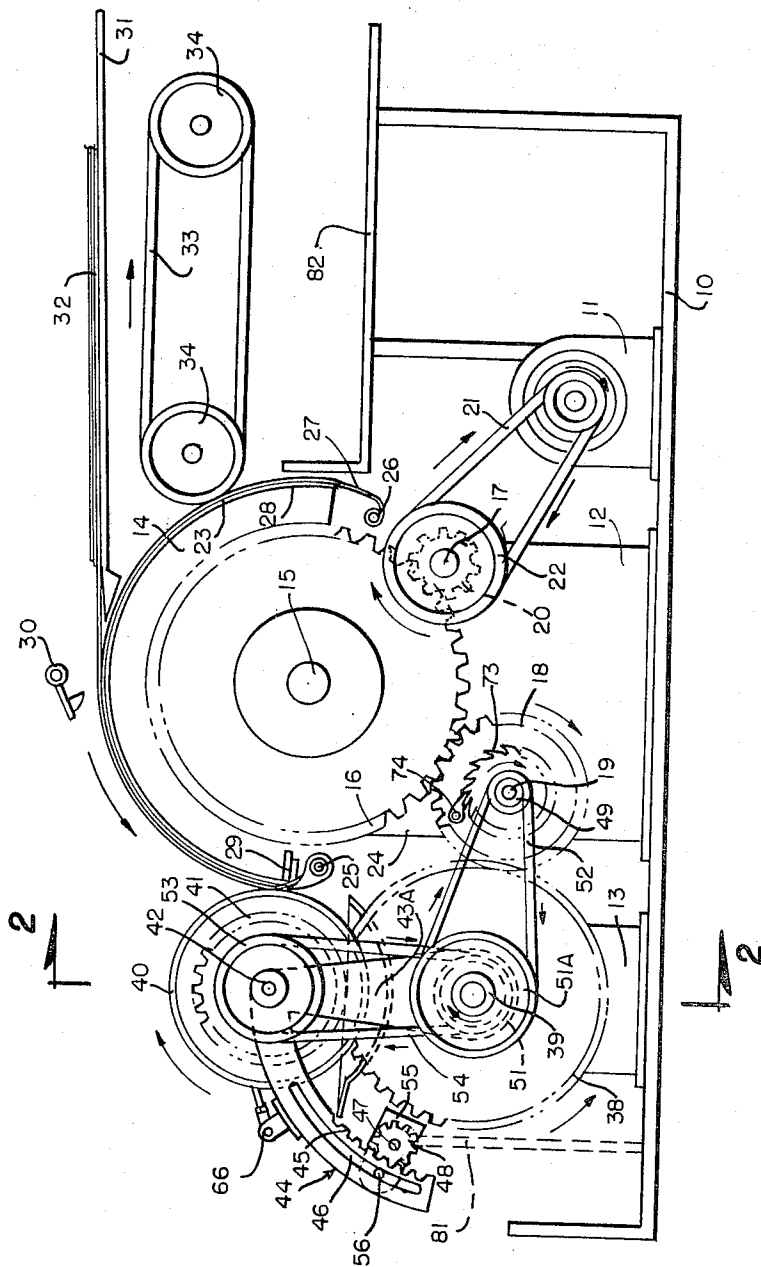


FIG. 1.

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3 Sheets-Sheet 2

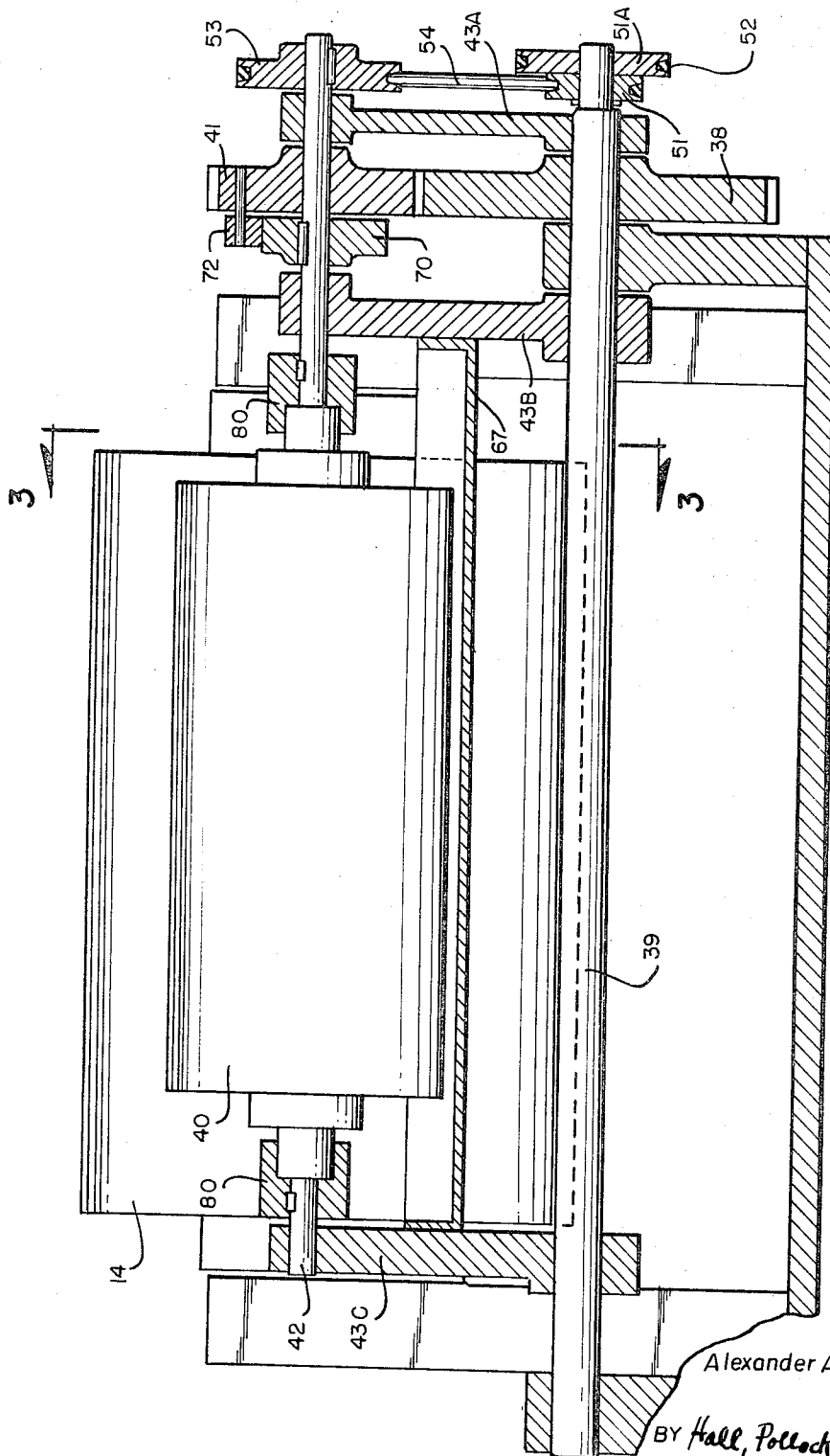


FIG. 2.

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3 Sheets-Sheet 3

FIG. 3.

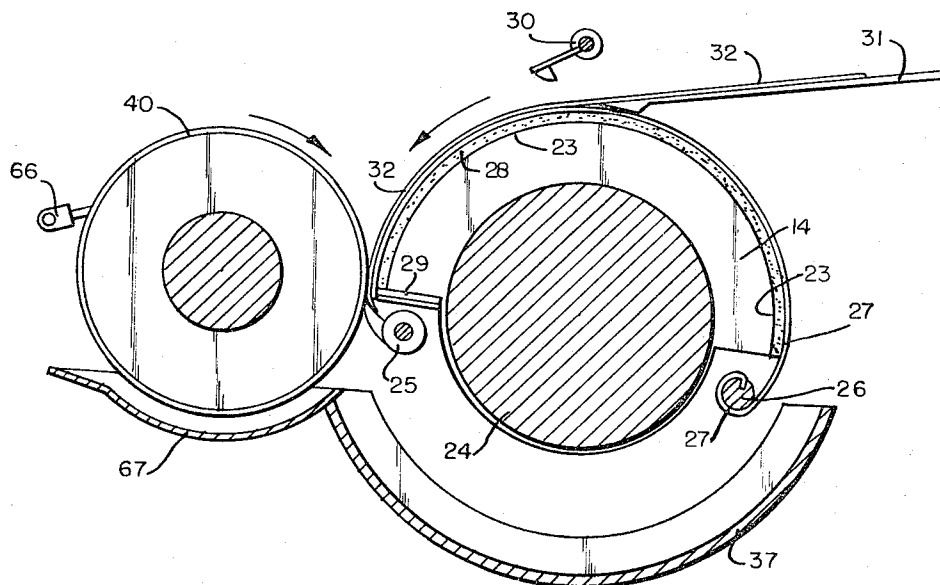


FIG. 4.

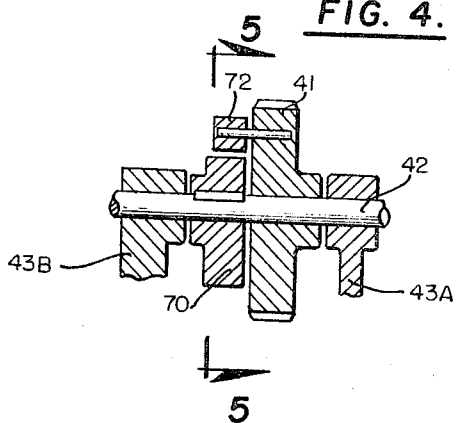
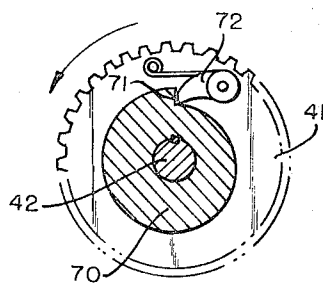


FIG. 5.



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UNIVERSAL PRESS DRIVE FOR ENGRAVED CYLINDERS

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10 Claims. (Cl. 101-248)

This application is a continuation-in-part of my copending application Ser. No. 209,078, filed July 11, 1962, entitled, "Universal Press Drive for Engraved Cylinders," now abandoned.

The present invention concerns a combination drive for presses having engraved cylinders for printing.

It is an object of the invention to provide a universal drive for a press which will enable the press to print from any size engraved cylinder, with all colors in register, on one or more consecutive sheets without stopping the press.

It is an object of the invention to provide a flexible drive for a press using engraved or etched cylinder which permits the surface speed of the etched cylinder to vary in correspondence with the surface speed of the impression cylinder when the two cylinders are in contact and to return to the same register position with each impression cylinder revolution without special adjustment, additional maintenance or equipment.

It is an object of the invention to provide a sheet fed printing press capable of printing from any of a wide range of different size engraved cylinders for any length run of consecutive sheets in a variety of colors in register and of high quality without any major mechanical changes.

It is an object of the invention to provide a universal press drive comprising a novel gear and belt drive in combination with special friction assembly drive which causes the engraved cylinder to return to its original register position after every revolution of the impression cylinder without stopping the press.

Other objects will appear from the following detailed description of one form the invention may take.

In the drawings like numbers refer to like parts throughout. The several figures comprising the drawing are presented as illustrative of the invention and are not to be taken as limiting.

In the drawings:

FIGURE 1 is a side elevation of a press incorporating a preferred form of the invention;

FIGURE 2 is an end elevation of the press of FIGURE 1, partly in section along line 2-2 of that figure;

FIGURE 3 is a section taken along line 3-3 of FIGURE 2;

FIGURE 4 is a portion of a section taken along line 2-2 of FIGURE 1; and

FIGURE 5 is a section taken along line 5-5 of FIGURE 4.

A press frame 10 mounts a driving motor 11, an impression cylinder stand 12 and an etched or engraved cylinder stand 13. Impression cylinder stand 12 mounts an impression cylinder 14 for rotation on a shaft 15 to which is keyed impression cylinder gear 16. Stand 12 also mounts for rotation a driving gear 20 on shaft 17 and meshing with impression cylinder gear 16. Impression cylinder auxiliary gear 18 is mounted on stub shaft 19 journaled in stand 12 and in mesh with gear 16. Gear 20 is driven by motor 11 through V-belt 21 and pulley 22.

Impression cylinder 14 has a 180° sector of active surface 23, the other 180° being recessed as at 24 and mounting therein grippers 25 and spring-biased anchor 26 for flexible sheet 27 which surrounds the 180° active sector 23 and is fastened by releasable means 29 at the opposite side of recess 24 from anchor 26. Between the active sector 23 and flexible sheet 27 is positioned a resilient

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packing sheet 28 having its leading edge aligned with the leading edge of active sector 23. Just above cylinder 14 are mounted front guides 30 and inclined feed board 31 on which is fed the sheet material or stock 32 to be printed.

Sheet delivery belt 33 mounted on pulleys 34 removes imprinted sheets 32 from active sector 23 and delivers them to removing tapes mounted on pulleys. A box 82 to hold imprinted sheets 32 may be used instead of tapes for small runs of a few hundred sheets 32. An air blower 37 surrounds the lower part of impression cylinder 14 to supply air for drying the imprinted sheets 32 prior to removal by sheet delivery belt 33.

Engraved cylinder stand 13 mounts etched cylinder auxiliary gear 38 on shaft 39 and in mesh with impression cylinder auxiliary gear 18. Etched or engraved cylinder 40 and etched cylinder driving gear 41 are mounted on shaft 42 journaled in the support elements 43A, B and C with gear 41 in mesh with gear 38. The lower portions of support elements A, B and C are pivoted on shaft 39, so that as the support elements 43A, B and C rotate about the shaft 39 the gears 41 and 38 remain engaged. Support elements 43A, B and C rotate about shaft 39, so that a wide range in diameter of etched cylinders 40 may be readily installed for operation, using the same cylinder 41 and rotating support elements 43A, B and C clockwise or counterclockwise on shaft 39 to adjust for etched cylinders 40 of smaller or larger diameters.

A connecting arm 44, having a rack 45 and an elongate slot 46 at its free end is mounted on shaft 42 integrally with support 43A.

An adjusting mechanism, including gear 48 mounted on shaft 47, is mounted by a suitable support phantomly indicated at 81 on the press frame 10. The gear 48 engages rack 45 on connecting arm 44 and pin 56, which is connected to the adjusting mechanism and slides in elongate slot 46, provides a more stable engagement between the adjusting mechanism and the connecting arm 44. Gear 48 may be provided with any suitable means, for example, a crank handle, for causing it to rotate and thereby vary the position of shaft 42 with respect to shaft 15. The support 81 for the adjusting mechanism can be of any suitable structure which will cause the adjusting mechanism to maintain a substantially fixed spatial relationship with respect to the press frame 10.

If desired, an automatic or manual mechanism for periodically moving the engraved cylinder 40 closer to the impression cylinder 14 when the two cylinders are to be in contact or further away when the cylinders are not to be in contact may be provided. However, such a mechanism is not necessary.

Ink is applied to etched cylinder 40 by a standard ink fountain not shown. The ink is spread evenly by a doctor blade 66 movably mounted on arm 44 and any excess is held by trough 67.

Shaft 42 has a cam wheel 70, a single sharp rise or tooth 71 and is keyed to shaft 42 between gear 41 and support 43B. A spring biased dog 72 is pivoted adjacent the root of the tooth circle of gear 41 so that it can engage rise or tooth 71 of the cam wheel 70.

Gear 41 is driven clockwise by gear 38 and by means of the dog 72 carries cam wheel 70 with it. Cam wheel 70 drives the shaft 42 by being keyed thereto. The pulley wheel 53 is keyed to the shaft 42 and thus drives belt 54, pulley wheels 51 and 51A which are keyed to one another and float freely on shaft 39, belt 52 and hence pulley wheel 49 and ratchet wheel 73. Pulley wheel 49 and ratchet wheel 73 are keyed to one another and float freely on shaft 19. Thus, whenever shaft 42 is in motion, elements 70, 53, 54, 51, 51A, 52, 49 and 73 are likewise in motion. The diameters of pulley wheels 53, 51, 51A and 49 are

chosen so that the rotational speed, that is, the number of revolutions per unit time, of ratchet wheel 73 is greater than that of gear wheel 18 when engraved cylinder 40 is in contact with printing cylinder 14. Thus lost motion occurs between ratchet wheel 73 on shaft 19 and its dog 74 mounted on gear 18. When engraved cylinder 40 is out of contact with impression cylinder 14, its speed decreases until the rotational speed of ratchet wheel 73 slows down to that of gear 18 and the two speeds are then equalized due to the dog 74 driving the ratchet wheel 73. Thus shaft 42 and cam wheel 70 are maintained at a minimum speed until dog 72 engages tooth 71. Thus elements 49, 51-54 and 73 serve to ensure a smoother transition from that portion of the cycle when engraved cylinder 40, not being in contact with impression cylinder 14, is not yet being driven by gear 41 through dog 72 to that portion when it is again being driven by gear 41 through dog 72.

The size of the impression cylinder 14 is selected as twice the size of the largest etched or engraved cylinder 40 to be used in the press embodying the invention. The length and width of the packing sheet material 28 is determined by the size of the particular etched cylinder 40 to be used and is of the same size. Packing sheet material 28 is preferably a felted sheet or cloth of the same dimensions as the cylindrical surface of the engraved cylinder 40 with which it is to be used. The flexible sheet 27 holds the packing 28 in active position with its leading edge substantially flush with the leading edge of active sector 23 of impression cylinder 14.

The gear drive between impression cylinder gear 16 and engraved cylinder gear has a 2:1 ratio. The gear 41 which drives the printing or engraved cylinders 40 runs free on shaft 42. Spring biased dog 72 pivoted on the side of gear 41 will engage rise or tooth 71 of arm 70 which is keyed to shaft 42 which drives the etched cylinder 40. The V-belt drives 52, 54 maintain the printing cylinder 40 in rotation during the inactive part of the cycle when the engraved cylinder 40 is out of contact with the portion of sheet 27 not supported by packing material 28 and until dog 72 engages rise or tooth 71 on cam 70. Thus the diameters of pulley wheels 49, 51, 51A and 53 must be such that when dog 74 is driving ratchet wheel 73, the rotational speed thereby imparted to shaft 42 must be less than that imparted to shaft 42 when dog 72 is driving cam wheel 70.

Other maximum diameter relationships between the engraved and impression cylinders may be used and, correspondingly, the amount of active surface and recessed portion of the impression cylinder 14 and the gear and pulley wheel drive ratios may likewise be varied. However, the embodiment shown and described above is preferred, although, of course, the engraved cylinder 40 shown (maximum size) is only one of the many sizes usable in the preferred embodiment.

OPERATION

For any particular color printing job to be done an engraved or etched printing cylinder 40 of a diameter large enough to contain the copy to be printed has to be supplied together with a packing felt or cloth 28 of just the right size to cover the cylindrical surface of engraved cylinder 40 or the active part thereof. Support element 43A, B and C are rotated counterclockwise and the particular engraved cylinder 40 is mounted in place for rotation on shaft 42. Shaft 42 may be supplied with variable size couplings as at 80, on both sides, to fit different size shafts and hubs of the many cylinders 40 which may be used in the press. The packing sheet 28 matching the etched cylinder 40 to be used is carefully placed under flexible sheet 27 which firmly anchors it in position. A sheet of stock 32 to be imprinted is placed on feed board 31 against front guide 30. Having rotated shaft 42 so that dog 72 is in contact with the rise or tooth 71, engraved cylinder 40 is rotated relative to its couplings 80, as determined by

its diameter, until it is in its proper printing position on shaft 42.

With motor 11 running, the press is started and grippers 25 take the sheet of stock 32 from feed board 31 and, rotating with impression cylinder, bring the sheet down to the impression point where it contacts the engraved printing surface of etched cylinder 40. As shown in FIGURE 1 this operation requires about a quarter of a revolution so that the engraved roll is in printing position and supplied with the proper amount of ink. When the sheet 32 to be imprinted is at the impression point mentioned above, the ink engraved printing cylinder 40 is forced into contact with the sheet of stock 32 held by grippers 25 on impression cylinder 14 and as it is backed by packing material 28 the sheet is imprinted with the design etched on cylinder 40. Printing cylinder 40 is in firm printing contact with stock 32 and impression cylinder 14, so that the two cylinders have the same circumferential speed during this part of the cycle. This action drives etched cylinder 40 and its shaft 42 and moves tooth 71 ahead of dog 72. This motion is a function of the diameter of cylinder 40 and is faster the smaller the diameter of the etching cylinder 40 employed. Ratchet wheel 73 on shaft 19 is driven as well so that lost motion occurs between it and its dog 74.

When the cylinders 14 and 40 have rotated sufficiently so that there is no longer any packing material 28 between them they lose effective contact and printing on stock 32 ceases. As cylinder 40 is now free of contact with cylinder 14 its speed of rotation decreases slightly until dog 74 engages ratchet wheel 73 and/or until dog 72 again engages tooth 71 and drives engraved cylinder 40 until the next sheet of stock is brought to the point of impression by grippers 25.

The imprinted sheet 32 is dried as it passes through blower 37 and is then removed from impression cylinder 14 by sheet delivery tapes 33 and stored in a suitable tray 82. If, due to miscalculation, the proper printing portion of the engraved cylinder 40 did not contact the desired portion of the sheet material 32 during the printing cycle, the engraved cylinder 40 may again be rotated relative to its couplings 80 until the proper relative position is obtained.

A normal clutch is provided to start and stop impression cylinder 14. The press is intended, however, to run continuously until a job is complete. Best results have been obtained with packing material 28 in sheets about one-sixteenth of an inch thick. Although the gap 24 is made large to allow for considerable relative movement of tooth 71 and dog 72, this can be varied. 180° has been shown as illustrative of a presently preferred value. It is to be noted that connecting arm 44 is adjustable to allow for a wide variation in the size of engraved cylinders 40 the press can accommodate. The only change required is the mounting of the new engraved cylinder 40 with its corresponding packing material sheet 28. The arm 44 with the assembly it carries and the support elements 43A, B and C can be adjusted accordingly. This construction effectively accommodates surprisingly small cylinder 40 without any sacrifice in quality of printing or registration on multiple runs with a plurality of colors. It will be seen from the above statement of operation that the invention provides means for printing in register a variety of colors from a variety of cylinders by means of the combination gear drive shown clearly in FIGURES 2, 4 and 5 together with the friction packing material of particular size as shown in FIGURES 1 and 3.

It will be understood that other lost motion means may be employed in place of cam 70, rise or tooth 71 and dog 72. For example, this lost motion function may be achieved by a magnetic particle clutch coupling, one coupling member of which is keyed to shaft 42, the other member being fastened to the gear 41. When a suitable field coil is energized a magnetic field causes the particles to cohere and the floating gear 41 drives the shaft

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42. As the magnetic field is decreased, any controlled degree of slip may be obtained between the coupling members of the magnetic particle coupling.

The control circuit for the clutch may comprise an energizing coil, a suitable source of power, a rheostat and a relay for other contacts controlled in accordance with the printing cycle and, in particular, the motion of the impression cylinder 14. That is to say, when a sheet of stock 32 is brought to the impression point by grippers 25, the magnetic particle clutch would be de-energized and the gear 41 would float on the shaft 42. In this way the peripheral speed of the engraved or printing cylinder 40 can be the same as that of the impression cylinder 14.

During this part of the cycle the impression cylinder 14 may be thought of as driving the printing cylinder 40. When the printing cylinder 40 has made a complete revolution or the point of contact between the two cylinders has passed the line where flexible sheet 27 is supported by packing means 28, the magnetic particle clutch may be progressively energized so as to continue the drive of printing cylinder 40 until that point in the printing cycle is reached at which the leading edge of the next piece of stock 32 is to be imprinted is near the point of impression. Just before this point the magnetic particle members would be substantially locked due to the coherence of the magnetic particles, being acted upon by the magnetic field. When the point of impression is reached the circuit will be broken and the magnetic coupling members free to rotate with respect to each other. This leaves gear 41 floating on shaft 42 and the printing cylinder 40 free to move with the same peripheral speed as the impression cylinder 14. Suitable control circuits utilizing magnetic particle clutches which may be used with this invention are disclosed in U.S. Letters Patent No. 2,718,157 granted to Benton H. Schaub and continuation-in-part thereof.

While there have been described above what are presently believed to be the preferred forms of the invention, variations thereof will be obvious to those skilled in the art and all such changes and variations which fall within the spirit of the invention are intended to be covered by the generic terms in the appended claims, which are variably worded to that end.

I claim:

1. In combination in a universal drive for a printing press having an impression cylinder for use with a plurality of printing cylinders of differing diameters, a shaft for driving a single printing cylinder, a gear floating on said shaft, drive means for said gear, lost motion means having one part keyed to said shaft and another part connected to be driven by said floating gear whereby said shaft may experience different angular velocities independently of the velocity of said floating gear during each printing cycle.

2. The combination set forth in claim 1, said lost motion means comprising means mounted on said floating gear for engaging said part keyed to said shaft.

3. The combination set forth in claim 2, said means keyed to said shaft comprising a cam means and said means mounted on said floating gear comprising a dog for engaging said cam means.

4. In a printing device, an impression roll, driving means for said roll, a printing cylinder having its axis parallel to that of said roll, said printing cylinder having smaller diameter than the roll, means for feeding object to be printed to said roll, said roll including means for receiving the object to be printed and carrying it between said roll and said cylinder, means for maintaining pressure between the roll and cylinder to effect driving of the cylinder by the roll, and means connecting the cylinder with said driving means to effect a register between the cylinder and the object to be printed at the start of a printing operation and disconnecting the cylinder from said driving means while the roll is driving the cylinder during a printing operation.

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5. A printing device as defined in claim 4 in which the roll has a packing on its surface of a size corresponding to that of the surface of the cylinder so that the roll drives the cylinder only while said packing contacts the sheet to be printed.

6. In a printing device, an impression roll, driving means for the roll, a printing cylinder having its axis parallel to that of the roll, means constituting a temporary support for said printing cylinder to permit interchangeability of printing cylinders of any size between limits so long as the diameter of such cylinder does not exceed that of the roll, means for holding the cylinder and roll together to drive the cylinder from the roll, means for feeding the object to be printed to said roll, said roll including means for receiving said object and carrying it between the roll and the cylinder, means to drive the cylinder into register with the object to be printed at the start of each revolution of the roll irrespective of the size of said cylinder within said limits, said last named means including a gear train and a lost-motion connection which comprises a pawl attached to said gear train and a tooth attached to said cylinder, to effect engagement of the pawl and tooth at the start of a printing operation and to effect disengagement of the pawl and tooth when the roll is driving the cylinder.

7. A printing device as defined in claim 6 in which there are gears for driving the cylinder and the roll, in which there is supplemental means for driving the cylinder when it is not being driven by either the gears or the roll, and in which the roll has a packing on its surface of a size corresponding to that of the surface of the cylinder so that the roll drives the cylinder for one full revolution of the cylinder and then allows the cylinder to be driven next by the supplemental means and then by the gears to effect a register at the start of each revolution of the roll.

8. In a printing device, an impression roll, driving means for the roll, a printing cylinder having its axis parallel to that of the roll, means constituting a temporary support for said printing cylinder to permit interchangeability of printing cylinders of all size diameters within limits so long as the diameter of such cylinder does not exceed that of the roll, means for pressing the cylinder and roll together to drive the cylinder from the roll, means for feeding the object to be printed to said roll, said roll including means for receiving said object and carrying it between the roll and the cylinder, and means including a connection for driving said cylinder from said driving means to effect a register between the cylinder and roll at the time during each revolution of the roll that the cylinder contacts the roll through the object to be printed, said connection comprising a pawl connected to said driving means and a tooth connected to said cylinder for driving said cylinder from the driving means until the roll begins to drive the cylinder at which time the tooth moves away from the pawl and allows the cylinder to rotate independently of the driving means.

9. A printing device comprising:

a first shaft;

a first roll mounted on said first shaft for rotation;

a second shaft substantially parallel to said first shaft;

a second roll mounted on said second shaft for rotation, the circumferential surface of said second roll

being in contact with the circumferential surface of

said first roll during a portion of each rotation cycle

of said first roll, one of said rolls being an impres-

sion roll and the other being a printing roll, whereby

during the circumferential surface contact printing

results, and the shaft on which the printing roll is

mounted being a temporary support for the printing

roll to permit interchangeability of printing rolls of

various size diameters; and

rotary drive means having a central axis of rotation for

imparting rotational motion to said second roll, said

drive means being in motion when said first roll is

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in motion and having an angular speed constantly dependent on the angular speed of said first roll, said drive means including rotary lost motion means having a central axis of rotation for permitting said second roll to rotate at a greater rotational speed than that imparted by said drive means and further including register means for insuring that said second roll regardless of diameter rotates a multiple whole number of times for each complete rotation of said first roll, the central axes of rotation of said drive means and said lost motion means remaining fixed in relationship to said first and second shafts during the complete printing operation.

10. The printing device of claim 9 wherein said drive means imparts rotational motion to said second roll during at least a part of that portion of each rotation cycle

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of said first roll in which said second roll is free of contact with said first roll and said second roll is at its maximum rotational speed when in contact with said first roll.

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