July 6, 1948. W. A. WHITEHEAD 2,444,547

PRINTING MACHINE

Filed Nov. 21, 1944 6 Sheets-Sheet 1

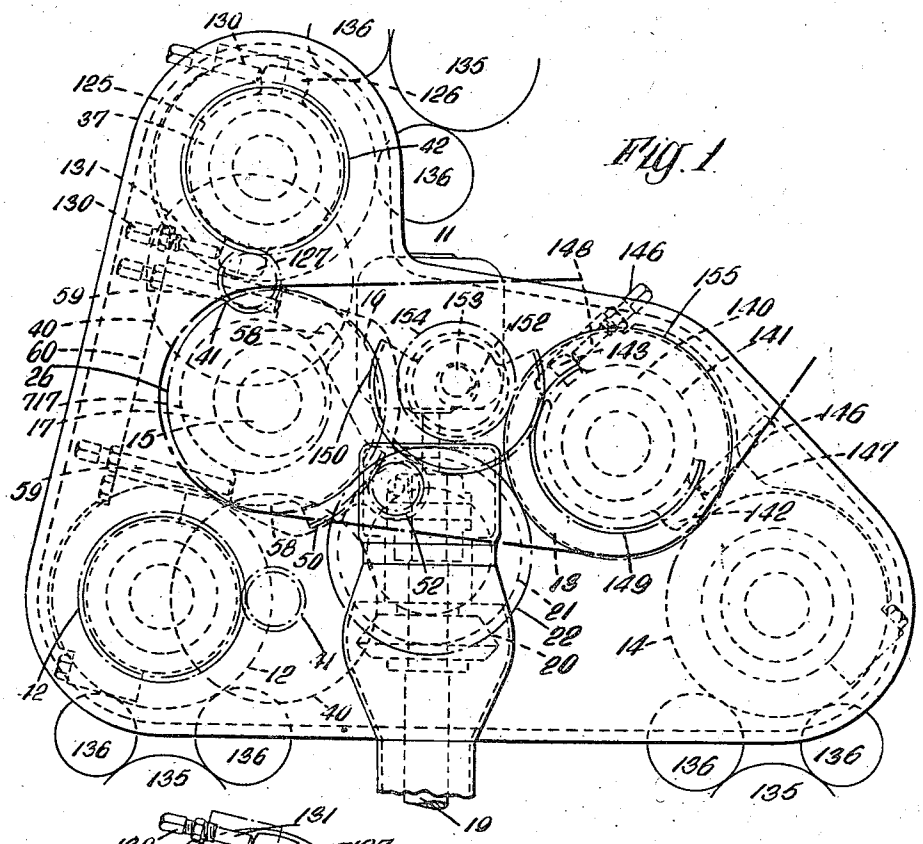


Fig. 1

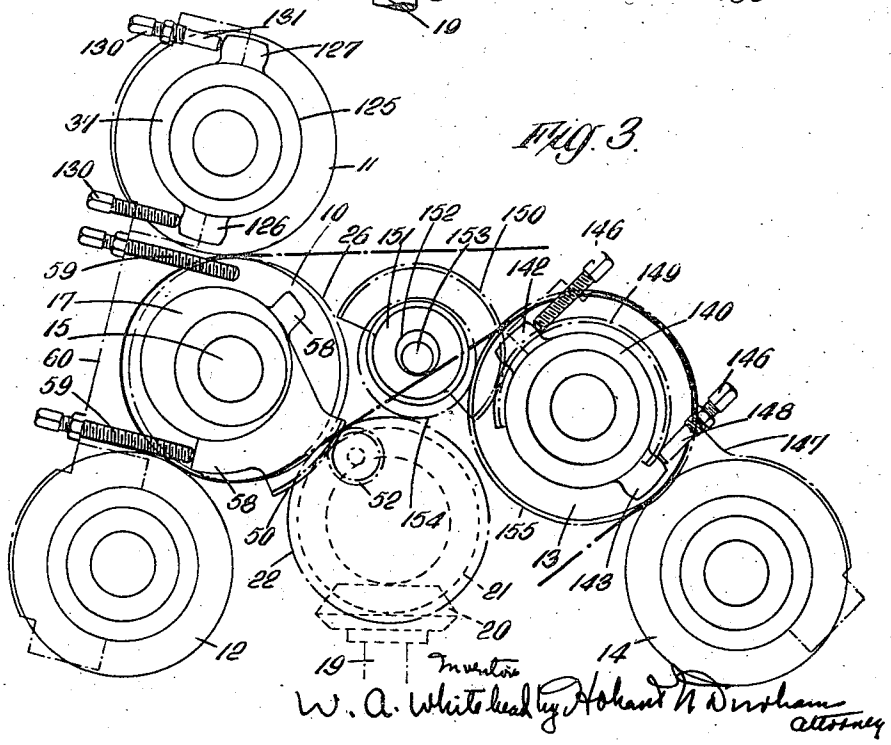


Fig. 3

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PRINTING MACHINE

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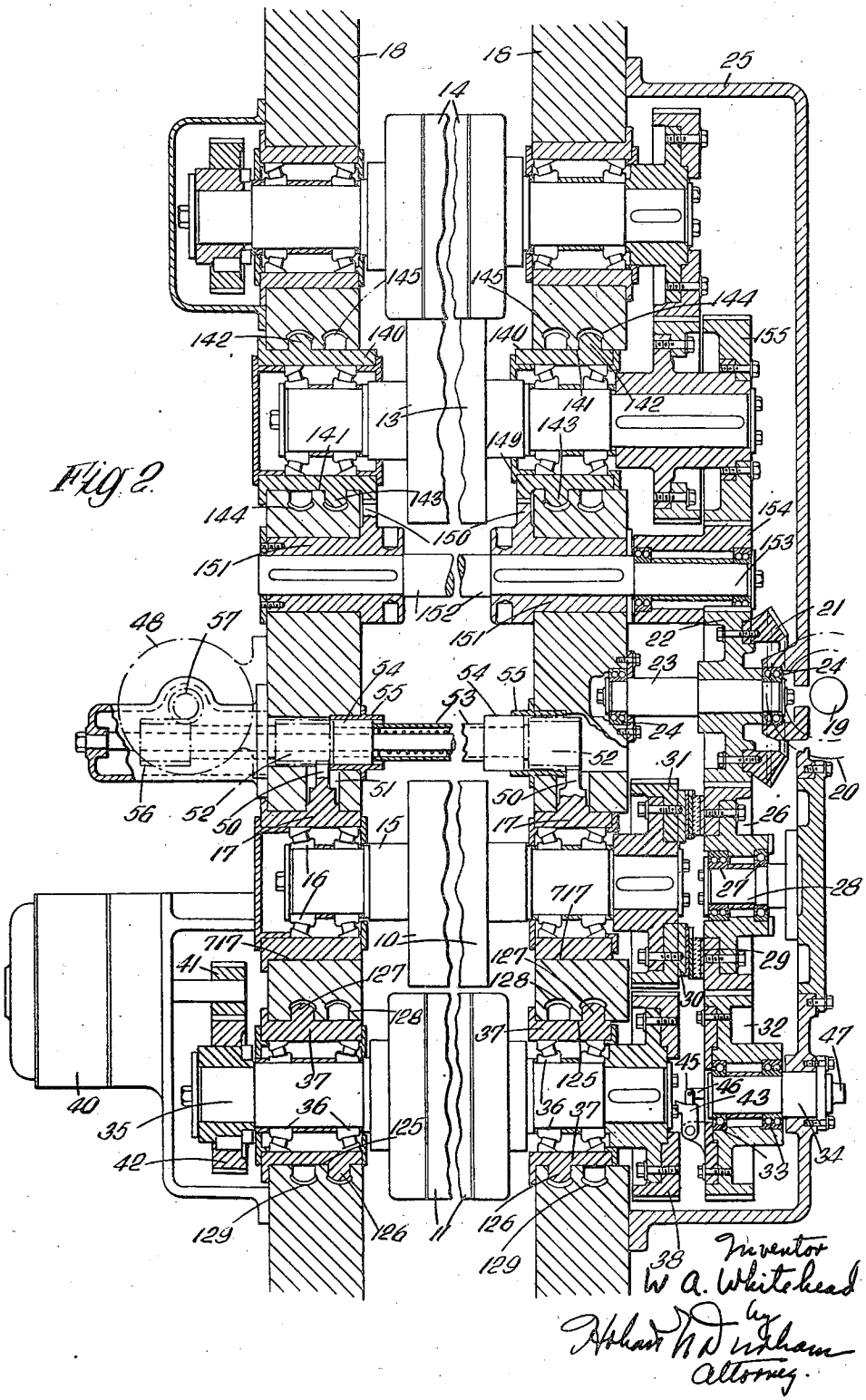


Fig 2.

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July 6, 1948. W. A. WHITEHEAD 2,444,547

PRINTING MACHINE

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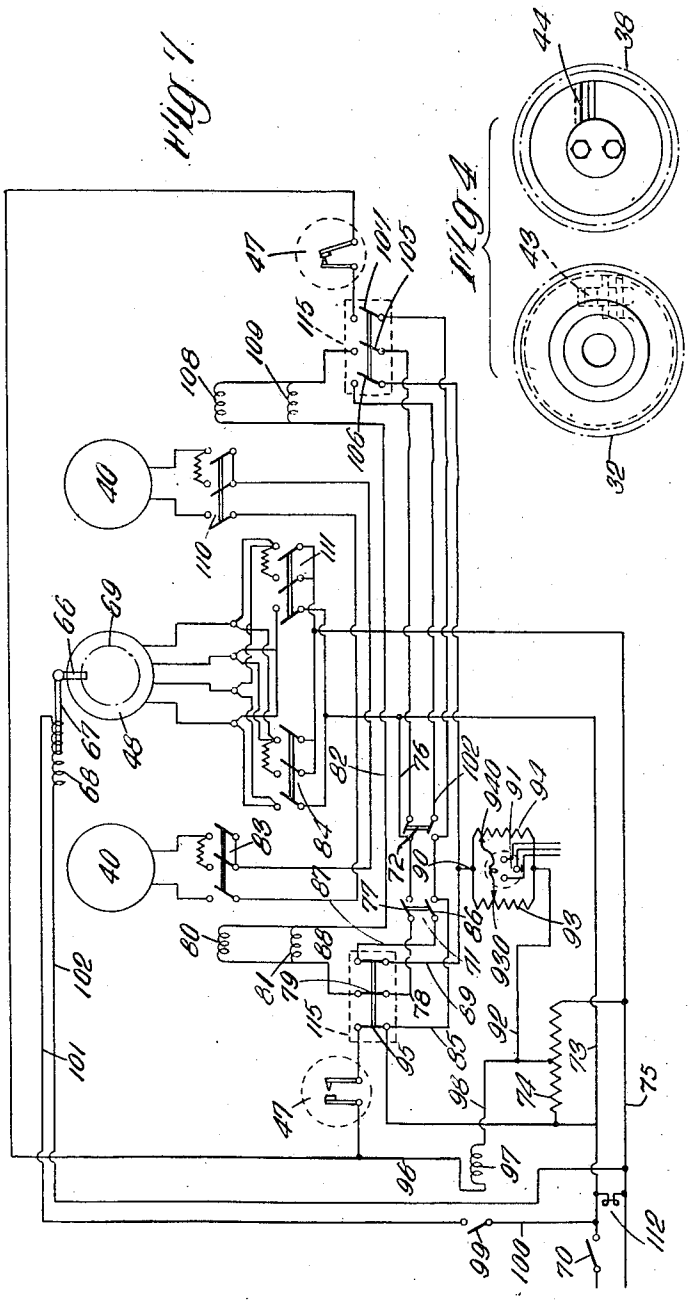

Fig. 1.



Fig. 4.

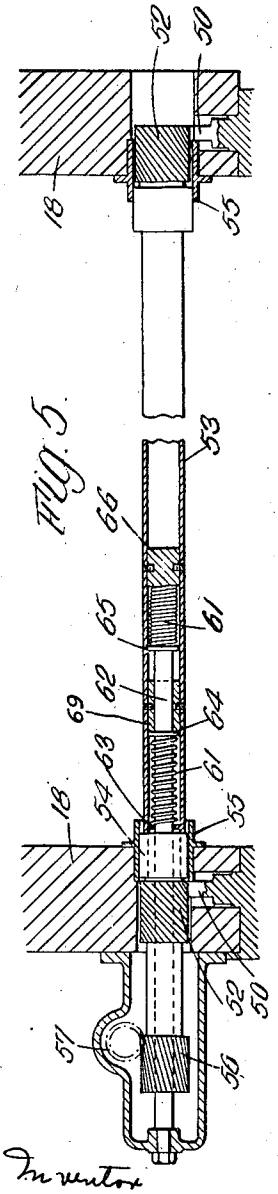

Fig. 5.

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July 6, 1948. W. A. WHITEHEAD 2,444,547

PRINTING MACHINE

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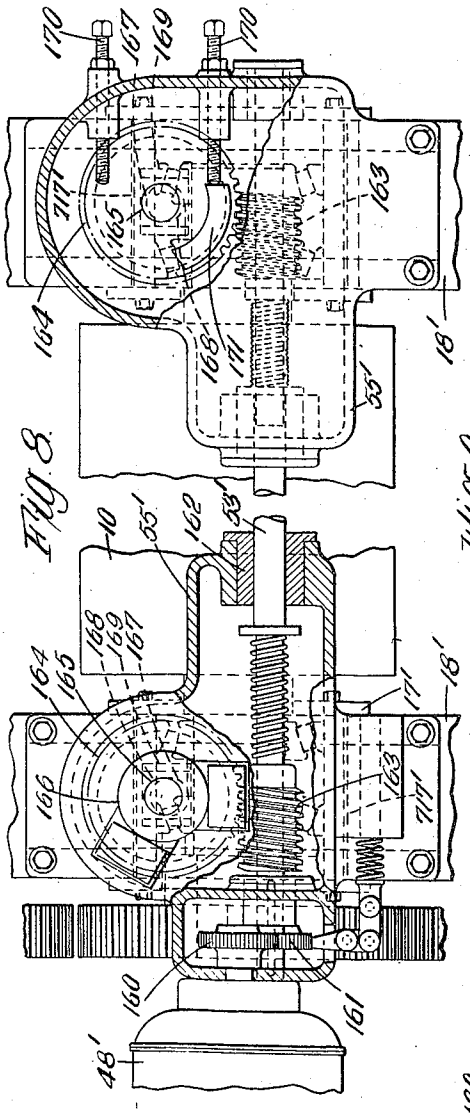

Fig. 8.

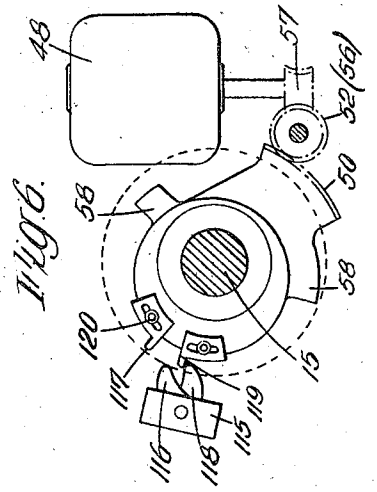

Fig. 6.

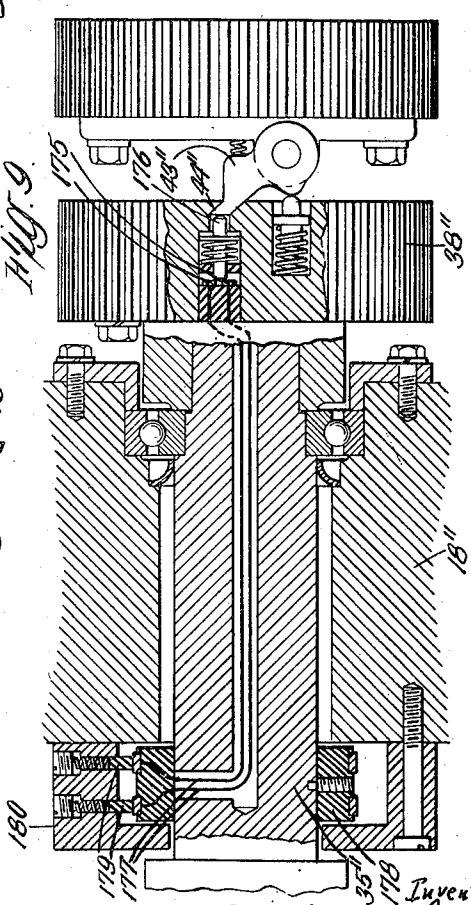

Fig. 9.

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July 6, 1948. W. A. WHITEHEAD 2,444,547

PRINTING MACHINE

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Fig. 10.

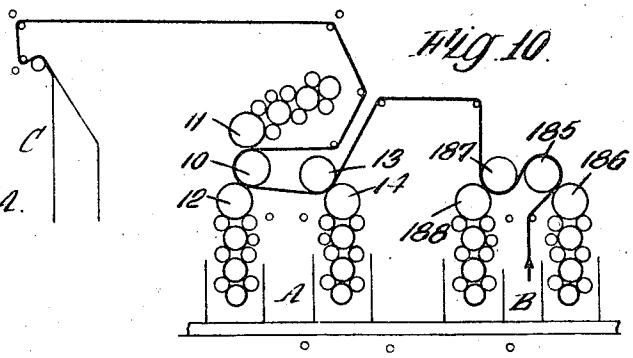


Fig. 10A.

1
3 NS

Fig. 11.

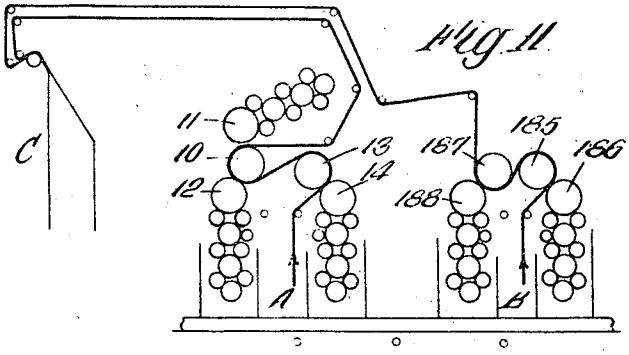


Fig. 11A.

1
1 1
1 NS

Fig. 12.

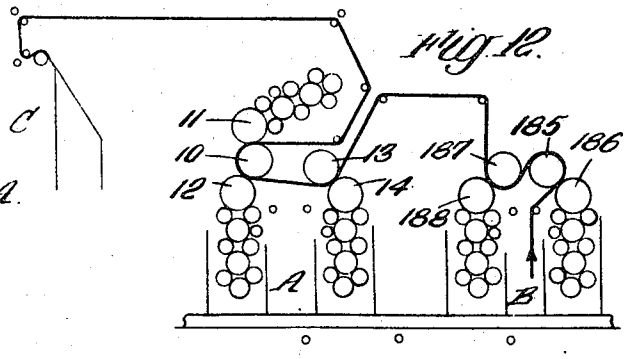


Fig. 12A.

1
4

Fig. 13.

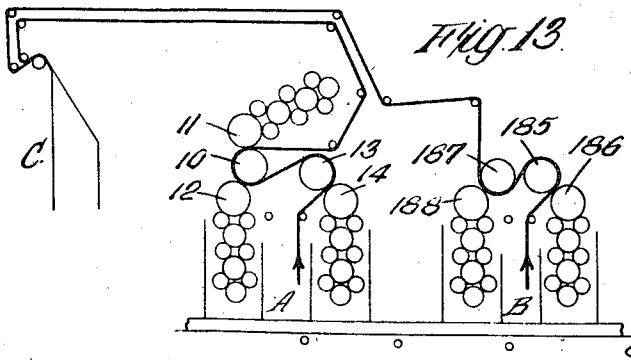


Fig. 13A.

1
1 1
2

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July 6. 1948. W. A. WHITEHEAD 2,444,547

PRINTING MACHINE

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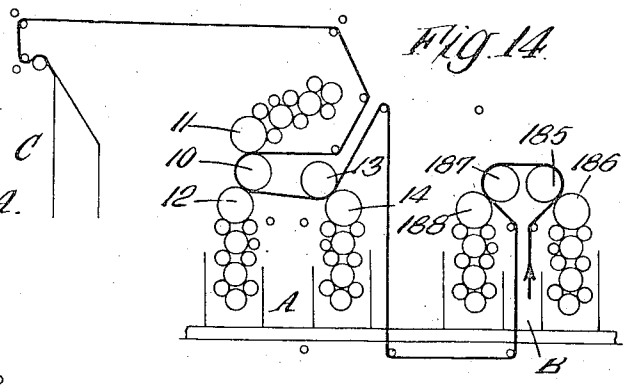


FIG. 14

FIG. 14A.

2
3

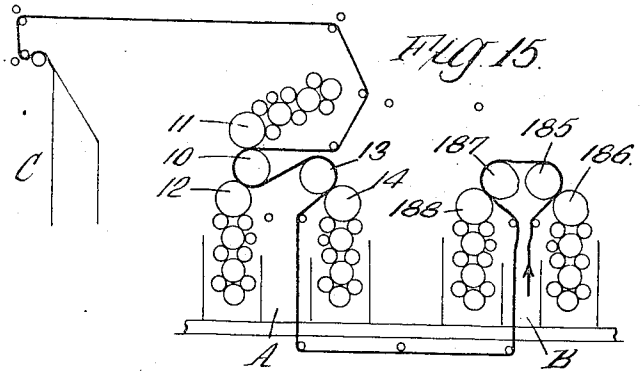


FIG. 15

FIG. 15A.

3
1 NS

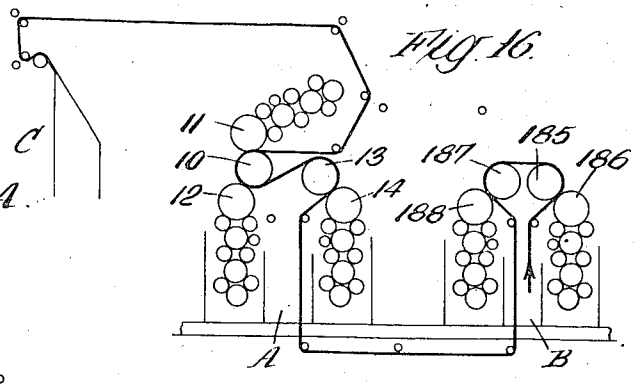


FIG. 16.

FIG. 16A.

3
2

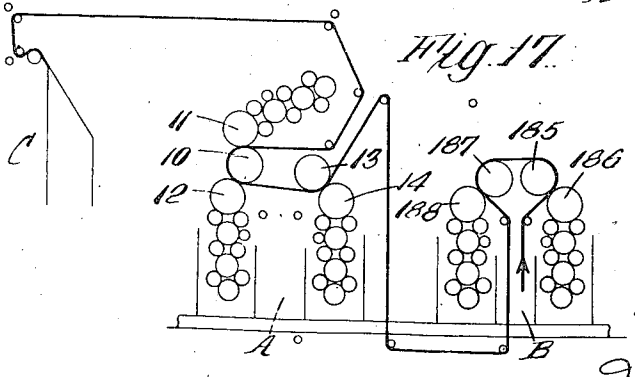


FIG. 17.

FIG. 17A.

2
2 NS

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Patented July 6, 1948 2,444,547

# UNITED STATES PATENT OFFICE

2,444,547

## PRINTING MACHINE

William Arnold Whitehead, Fulwood, Preston, England, assignor to The Goss Printing Press Company, Chicago, Ill., a corporation of Illinois

Application November 21, 1944, Serial No. 564,444
In Great Britain September 14, 1943

Section 1, Public Law 690, August 8, 1946
Patent expires September 14, 1963

6 Claims. (Cl. 101—221)

1

This invention relates to printing presses and refers more particularly to "non-stop" printing mechanism such as is commonly employed in the production of newspapers for printing late news or like matter of the kind in which the impression cylinder or impression cylinder assembly is movable laterally into printing engagement with one or other of a pair of type cylinders arranged at opposite sides of said impression cylinder or impression cylinder assembly.

It is an object of the present invention to provide a "non-stop" printing mechanism of the kind referred to which may be adapted either for late news or like printing in a single colour or for two-colour printing.

It is another object of the invention to provide a "non-stop" printing mechanism in which the said lateral movement of the impression cylinder or impression cylinder assembly is effected automatically upon synchronization of the speeds of said impression cylinder or impression cylinder assembly with that type cylinder with which the impression cylinder or cylinder assembly is to be engaged.

A further object of the invention is to provide a printing unit which may be adapted for producing a variety of "non-stop" and/or multi-colour printing combinations on a single web.

A still further object of the invention resides in the provision, in a "non-stop" printing mechanism, of means for producing coloured seals or headings.

Other objects and advantages of the present invention will be clear from the following description of a preferred embodiment thereof, reference being made to the annexed drawings.

In said drawings:

Fig. 1 is an end elevation of a portion of a printing unit embodying a reversible printing couple and a "non-stop" mechanism, the latter mechanism here being shown in one of the non-stop printing positions;

Fig. 2 is a developed sectional view of the reversible couple and a part of the "non-stop" mechanism of Fig. 1;

Fig. 3 is a diagram of the unit shown in Fig. 1 illustrating the positions of the cylinders and associated gearing for multi-colour printing;

Fig. 4 is a dissected detail view of part of the the speed synchronizing mechanism shown in Fig. 2;

Figs. 5 and 6 are detail views of part of the mechanism for moving the impression cylinder of the "non-stop" mechanism laterally into engagement with the respective type cylinders;

2

Fig. 7 is a diagram of the electrical equipment and connections for the "non-stop" printing mechanism;

Fig. 8 shows in plan view, partly in section, a modification of the bearing housings supporting the impression cylinder of the "non-stop" mechanism;

Fig. 9 is a detail sectional view showing a modified form of part of the speed synchronizing mechanism, and

Figs. 10 to 17 inclusive are diagrams of a printing press aggregate comprising a unit as illustrated in Figs. 1 to 3 and a second unit embodying a reversible couple and a non-reversible couple, Figs. 10A to 17A illustrating the various printing combinations obtainable.

In accordance with the invention and as shown in the illustrative embodiments thereof, a late news or like "non-stop" printing mechanism comprises an impression cylinder assembly (which may include either one or two impression cylinders), and a pair of type cylinders arranged at opposite sides thereof, the impression cylinder assembly being movable laterally into impression engagement with either one or other of said type cylinders, and either one or each of said latter cylinders itself being movable towards and away from the impression cylinder assembly. In this way, the impression cylinder assembly may be run in engagement with either of the type cylinders or with both of said cylinders simultaneously.

To provide for this lateral movement of the impression cylinder assembly, the or each impression cylinder shaft is mounted in bearing housings which are movable in the front and rear press frames. These bearing housings may be either eccentric or rectilinear and are suitably offset with relation to a plane through the axes of the type cylinders. The latter cylinders are preferably independently rotatable by means of gearing from the impression cylinder assembly and means are provided for synchronizing the surface speed of the inoperative type cylinder during "non-stop" printing with that of the impression cylinder assembly before the latter is moved into contact with said type cylinder. This lateral movement of the impression cylinder assembly is effected by a reversible electric motor which is automatically actuated through a switch or other means when the speed of the then inoperative type cylinder has been brought into synchronization with that of the impression cylinder assembly. Initial rotation of the type cylinders up to the speed of the impression cylin-

der assembly is effected by separate electric motors and means are provided whereby said motors and also the aforesaid reversible motor are automatically de-energized upon engagement of the impression cylinder assembly with either of the type cylinders.

To provide for adjustment of the or each of the type cylinders so that the impression cylinder assembly may be run in engagement with both type cylinders simultaneously, eccentric bearing housings are provided in which the type cylinder shaft or shafts is or are journalled, said bearing housings having means by which they may be readily angularly adjusted and secured in the desired positions. When only one type cylinder is in surface engagement with the impression cylinder assembly the machine is capable of "non-stop" printing as described in my application for Letters Patent Serial No. 490,459, filed June 11, 1943, which issued as Patent No. 2,425,167, Aug. 5, 1947, which when both type cylinders are in surface engagement with the impression cylinder assembly the mechanism is capable of printing in two colours, i. e., each type cylinder printing in a different colour.

With either single-colour "non-stop" or two-colour printing as aforesaid the printed matter appears on only one side of a web, but the mechanism may be adapted so as considerably to facilitate colour printing on opposite sides of one or more webs. For example, this "non-stop" mechanism may be employed in association with a standard reversible printing couple to provide a single printing unit capable of producing at will single colour printing on one side of a web and single colour "non-stop" or two-colour printing on the reverse side; two colour and "non-stop" printing on one side of a web; or three-colour printing on one side of a web. The range of printing combinations may be extended by employing an additional unit comprising two printing couples of which one is reversible, such combination of units being capable of printing simultaneously on two webs, one in a single colour on each side and the other in a single colour on one side and "non-stop" or in two colours on the reverse side. This combination of units may alternatively be arranged to print on a single web in one colour on one side and three-colour and "non-stop" or four-colour printing on the reverse side; in three colours on one side with "non-stop" or three-colour printing on the reverse side, or in two colours on one side with two-colour and "non-stop" or three-colour printing on the reverse side.

Referring now to the drawings and more especially to Figs. 1 to 3 thereof, the printing unit here illustrated comprises a "non-stop" late news or like mechanism including an impression cylinder 10 which may be moved laterally into printing engagement with one or other of a pair of type cylinders 11, 12 arranged at opposite sides of the impression cylinder and a printing couple having an impression cylinder 13 and co-operating type cylinder 14.

The impression cylinder 10 is carried by a shaft 15 journalled in bearings 16 and in order that said cylinder may be moved from a position where, as shown in Fig. 1, it is in printing engagement with the type cylinder 12 to a position where it is in printing engagement with the type cylinder 11, or vice versa, the bearings 16 are arranged within eccentric bearing housings 17 which are rotatable in openings 717 in the front and rear press frame members 18. The shaft



15 is continuously driven from, for example, the main press drive through a shaft 19 having secured thereto a bevel gear 20 which meshes with a second bevel gear 21 secured to a gear 22, said gear 22 being secured to a stub shaft 23 mounted for rotation in bearings 24 arranged in one of the press frame members 18 and in a gear casing 25 secured to said frame member. The gear 22 drives a gear 26 which is rotatably carried as by races 27 on a stub axle 28 secured to the gear casing 25 and substantially coaxial with the impression cylinder shaft 15 when said cylinder is in an intermediate position and out of engagement with the type cylinders 11, 12. The drive is transmitted from the gear 26 to the impression cylinder shaft 15 through on "Oldham" or other equivalent coupling allowing relative displacement of the driving and driven axes, one of the friction members 29 of said coupling being secured to the gear 26 and the other friction member 30 to a gear 31 keyed on the shaft 15.

The gear 26 is constantly in mesh with a pair of gears 32 one of which is shown in Fig. 2 and which are each rotatably carried as by means of races 33 on a stub axle 34 secured to the gear casing 25. Each of the stub axles 34 is coaxial with one of a pair of shafts 35 rotatably journalled as by means of taper roller bearings 36 in bearing housings 37 carried in the press frame members 18, one of said shafts having secured thereto the type cylinder 11 and the other shaft the type cylinder 12. The gear 26 and the gears 32 constitute a timing gear train of which the gears 32 rotate at the same angular speed as the type cylinders 11, 12. One or other of the type cylinder shafts is adapted to be driven, in each extreme transverse position of the impression cylinder 10, by means of the gear 31 which is of slightly lesser pitch diameter than the gear 26, said gear 31 meshing with one or other of a pair of gears 38 keyed on the shafts 35. The gears 38 are also of slightly lesser pitch diameter than the gears 32 to provide the same gear ratio in relation to the gear 31 as that between the gear 26 and the gears 32. Thus in either of such positions of the impression cylinder one of the type cylinders is driven through the gear 31 and the corresponding gear 38, the other gear 38 being out of mesh with the gear 31 and its type cylinder therefore being stationary.

Provision is made for bringing each of the type cylinders 11, 12 from stationary to printing speed before the impression cylinder is moved into engagement therewith. As shown, a pair of electric motors 40 are mounted on the press frame, one of said motors being coupled to the shaft 35 carrying one of the type cylinders through a pinion 41 meshing with a spur wheel 42 on said cylinder shaft and the other motor being similarly coupled to the shaft carrying the other type cylinder. Each of the timing gears 32 has pivotally mounted on its inner face and positioned for rotation about the axis of said gear a pawl or dog 43 (see also Fig. 4) which, when the motor 40 is actuated and the speed of the gear 38 reaches or slightly exceeds that of the corresponding gear 32, engages a ratchet groove or recess 44 in said gear 38 and thus brings the speed of the type cylinder into registry with that of the timing gear 32. The pawls 43 are suitably spring-pressed towards the corresponding recess 44 and with said recesses also ensure that the type cylinders are in proper angular relationship to the impression cylinder

before the latter is moved to make printing contact with either type cylinder. The construction and arrangement of each pawl 43 is such that it will remain within the recess in the corresponding gear 38 until the latter is disengaged from the gear 31 and its speed drops.

In addition to synchronizing the speed of the inoperative type cylinder with that of the impression cylinder before these cylinders are brought into impression contact, engagement of the pawl or dog 43 within the recess in the corresponding driving wheel 38 serves to control the movement of the impression cylinder 10 to disengage it from the operative type cylinder and move it into engagement with the inoperative type cylinder now brought to printing speed. For this purpose each of the pawls has connected for pivotal movement therewith an arm or lever 45 to which is connected one end of a rod 46 extending through and axially movable within the stub axle 34 of the corresponding timing gear 32. The opposite end of the rod 46 cooperates with a switch 47 secured on the outer end of the stub axle 34 and connected in the control circuit of a reversible electric motor 48 which, through mechanism later to be described, operates to impart lateral movement to the impression cylinder. When the pawl 43 is disengaged from its recess 44, the switch 47 is open and when the pawl enters said recess the rod 46 is moved to permit the switch to close and thereby, as will later appear, energize the reversible electric motor 48 to traverse the impression cylinder 10.

As mentioned hereinbefore, the eccentric bearing housings 17 are rotatable in the press frame members 18, this rotational movement of said housings causing the impression cylinder 10 to move laterally between the type cylinders. Each of these bearing housings has formed integrally therewith a helically toothed quadrant 50 (see also Figs. 5 and 6) which is arranged within an arcuate recess 51 formed in the corresponding press frame members 18. Each quadrant is meshed with one of a pair of helical gears 52 which are fast on a tubular shaft 53 arranged parallel to the impression cylinder shaft 15 and having enlarged diameter bearing portions 54 towards its opposite ends which cooperate with bearing bushes 55 carried by the press frame members 18. At one end the tubular shaft 53 also has fast thereon a worm wheel 56 which is meshed with a worm 57 which is driven direct by the motor 48. The bearing housings 17, as shown in Figs. 1 and 3, are each formed with radially outwardly extending shoulders or abutments 58 which, by engagement with adjustable stop screws 59 threaded into bearing caps 60 on the press frame members 18, limit the angular movement of said housings 17 and thereby the lateral movement of the impression cylinder relatively to the type cylinders. As will be later described, this limitation of the angular movement of the bearing housings 17 is synchronized with the actuation of limit switches associated with one of said housings to de-energize the reversible electric motor 48 and also that motor 40 by which the type cylinder now in impression contact with the impression cylinder 10 has been brought to printing speed.

Although the motor 48 is de-energized when the impression cylinder engages the hitherto inoperative type cylinder, its rotor continues to revolve due to its inertia. As, however, rotational movement of the tubular shaft 53 has been arrested by engagement of the shoulders 58 on the bearing housings 17 with the stop screws 59, the continued rotation of said rotor will be translated into axial movement of the tubular shaft. This axial movement of the shaft in one direction or the other serves to compress one of a pair of springs 61 coiled about a fixed spindle 62 which passes axially through one end portion of the shaft 53, one of said springs being arranged between an internal rib 63 on the tubular shaft and a collar 64 rigid with said fixed spindle 62 and the other spring being positioned between a further collar 65 on said fixed spindle and a plug 66 secured within the tubular shaft. A pawl 66A (Fig. 7) coupled to the armature 67 of a solenoid 68 is operable, as will hereinafter be described, to hold the motor 48 stationary until the inoperative type cylinder has been brought to printing speed, thereby also holding one of the springs 61 in compression. When the motor 48 is again energized, this time in the opposite direction to that which produced compression of said spring 61, the energy stored in said latter spring causes the shaft 53 to move axially to a midway position where the two springs 61 are balanced. Since during this axial movement of the shaft the quadrants 37 will remain stationary, the motor 48 is not under load and quickly reaches maximum speed so that, in the midway position of the shaft 53, the motor has developed sufficient power to turn the quadrant 50 and thus cause the impression cylinder to move into engagement with the other type cylinder. Thus the shaft 53, which is alternately spring-loaded in opposite directions, assists in quickly developing maximum torque in the motor 48 to move the impression cylinder. Axial movement of the shaft 53 is limited in each direction by an internal sleeve 69 fixed thereon and having limited movement between the collars 64, 65 on the fixed spindle.

Fig. 7 shows schematically the electrical equipment and connections by which the operation of the "non-stop" printing mechanism described above is controlled. This equipment includes a manually operable mains switch 70 and manually operable two-pole switches 71 and 72 for connecting either of the motors 40 into circuit to bring the then inoperative type cylinder, as previously described, to approximately the surface speed of the impression cylinder, said switches thereafter also controlling, in conjunction with the aforesaid switch 47 and the pawl 66A, the operation of the motor 48 to change the position of the impression cylinder.

Assuming the press to be running and the impression cylinder 10 to be in the position shown in Fig. 1, i. e. in printing engagement with the type cylinder 12, the circuit connections are as shown in Fig. 7, the switch 70 being open and the motors 40 and reversible motor 48 being deenergized. When it is desired to produce "non-stop" printing from the type cylinder 11, the switch 70 is closed, which completes a circuit from one side 73 of a direct current supply source, through a resistance 74 and back to the other side 75 of said current source. The switch 71 is then actuated to complete a circuit from the line 73, through line 76, one contact 77 of the switch 71, line 78, closed contact 79, contactor coils 80 and 81, and line 82 back to the other line 75 of the current source. Energization of the coils 80 and 81 closes a pair of triple pole switches 83, 84, the former constituting an automatic contactor starter for the motor 40 associated with the type cylinder 11, and the switch 84 constituting an automatic contactor starter for the motor 48. This motor 40

is thereby connected in the mains circuit 73, 75 to rotate the shaft 35 carrying the inoperative type cylinder 11, while the motor 48 is held stationary by engagement of the pawl 66A with a toothed wheel 69 secured to the motor shaft carrying the worm 57 thus to prevent displacement of the impression cylinder until the type cylinder reaches printing speed. A circuit is also established from the line 73, through line 85, contact 86 of switch 71, line 87, closed contact 88, lines 89 and 90 and thence by way of a moving coil, centre zero voltmeter 91 and line 92 to the other side of the mains 75. The voltmeter, which includes two resistances 93 and 94, records the potential difference between a fixed tapping 930 of the resistance 93 which governs the speed at which the change is to be made, and a variable tapping 940 of the resistance 94 the position of which varies in accordance with the speed of the press, being connected to a relay associated with the press-operating motor so that when the meter is energized the press is brought to the desired speed.

When the speeds of the type cylinder 11 and impression cylinder 10 have been brought into register and the pawl or dog 43 on the timing gear 32 associated with said type cylinder has engaged within the recess in the corresponding driving gear 38 to close the switch 47, a circuit is completed from line 73, through line 85, closed contact 95, switch 47, line 96, coil 97, and line 98 to the resistance 74 and thence to the other line 75 of the supply mains. A single pole contactor gravity switch 99 is thus actuated to close a circuit from the line 73 through line 100, switch 99, line 101, solenoid 68 and line 102 to the line 75. Energization of the solenoid 68 causes the pawl 66A to disengage from the gear 69 thereby to permit rotation of the rotor 48 in a direction to move the impression cylinder 10 laterally out of impression engagement with the type cylinder 12 and into engagement with the type cylinder 11.

During the preceding operation of the press, i. e. with the impression cylinder in engagement with the type cylinder 12, the switch 47 on the associated timing gear 32 remained closed under the action of the corresponding pawl 43. However, immediately upon disconnection of the drive from the gear 31 to the gear 38 associated with the type cylinder 12 by movement of the impression cylinder 10 to engage the type cylinder 11, the speed of the shaft 35 carrying the type cylinder 12 drops and the corresponding pawl 43 disengages from the cooperating recess 44 in the driving gear 38, with the result that the switch 47 associated with type cylinder 12 is opened. Similarly, the switch 47 associated with the other type cylinder 11 will remain closed as long as the impression cylinder remains in printing engagement with said type cylinder.

When the impression cylinder reaches a position where it is in printing engagement with the type cylinder 11, the contacts 79, 88 and 95 are opened, in a manner to be described, the contact 79 releasing the switches 83 and 84 to de-energize the motor 40 associated with said type cylinder and the motor 48. Opening of the contact 88 disconnects the speed control voltmeter 91 and thus permits variation of the speed of the press at the discretion of the operator. Finally opening of the contact 95 enables the pawl 66a to reengage with the gear 69 to lock the motor 48 against rotation. The switch 70 is then actuated to break the supply circuit and the switch 71, which is mechanically interlocked with the switch



70, is opened, this interlocking preventing subsequent operation of switch 71 until switch 70 is again closed.

Simultaneously with the opening of contacts 79, 88 and 95, three similar contacts 105, 106, and 107 associated with the other motor 40 are closed. The contacts 105 and 106 are in circuit with the switch 72 which is also mechanically interlocked with the mains switch 70 and is therefore inoperable until said mains switch has been closed. The other switch 107 is in circuit with the switch 47 corresponding to the type cylinder 12 which switch has been opened following disengagement of the driving gear 31 from the gear 38 of said cylinder 12 and the consequent stopping of said latter gear. These contacts 105, 106 and 107 are therefore in the same positions as were the corresponding contacts 79, 88 and 95 during the preceding operation, i. e. with the impression cylinder in engagement with the type cylinder 12.

The contact 105 is also in circuit with a pair of coils 108, 109 the former of which controls the operation of a triple-pole switch 110 in the circuit of the motor 40 associated with the type cylinder 12 and the latter controlling the operation of a triple-pole switch 111 in the circuit of the motor 48 and through which said motor is energized to rotate in the reverse direction and thereby return the impression cylinder to the position shown in Fig. 1. An electrical signalling or warning device, such as a lamp, horn or bell, may be provided as shown at 112.

The two sets of switches 79, 88 and 95, and 105, 106 and 107 are each housed in one of a pair of boxes 115 (see also Fig. 6) which are fixed on the rear press frame member 18 or other rigid support. These switches are of the toggle kind having pairs of coaxially arranged pivoted arms 116, 117 engageable with trip dogs 118, 119 mounted on the corresponding rotatable bearing housing 17. The trip dogs are angularly adjustable on the bearing housing as by means of slot and bolt connections 120 so that their positions may be varied in accordance with the setting of the stop screws 59.

In addition to the mechanism described above by which the impression cylinder 10 is movable laterally to engage either of the type cylinders 11, 12, to provide for "non-stop" late news or like printing, either one or each of said type cylinders is mounted in the press frame so as to be capable of lateral movement relatively to the impression cylinder. As here shown only the type cylinder 11 is, however, movable in this way, the axis of the type cylinder 12 being fixed. Fig. 3 shows the type cylinder 11 moved into its innermost position to contact the impression cylinder, the mechanism being here conditioned for printing simultaneously by the type cylinders 11, 12 and in different colours.

To provide for this lateral movement of the type cylinder 11, the bearings housings 37 associated therewith are eccentric and are rotatable within circular openings 125 in the press frame members 18. Each of the housings 37 is formed with a pair of diametrically opposite radially outwardly extending lugs 126, 127 which are arranged in different planes axially of said housings and are accommodated within a pair of annular grooves or recesses 128, 129 respectively formed in each press frame member 18. Each lug 126 is arranged to engage, in either of its extreme positions, with one or other of a pair of setting screws 130 threaded into holes in the bearing cap 60, said screws being arranged tan-

gentially with respect to the type cylinder 11 and being adjustable to vary the extent of angular movement of each of the housings 37 and therefore the lateral movement of said type cylinder towards and away from the impression cylinder 10. Each of the other lugs 127 is adapted to be engaged by a locking or fixing screw 131 which may be inserted into one or other of a pair of threaded holes in the bearing cap 60, said screw 131 having only a short threaded portion at its outer end to facilitate its removal from one of said holes and its insertion in the other.

Each of the type cylinders 11, 12 has associated therewith a separate ink-supply mechanism. Each of said mechanisms may be of the fountain type comprising an ink fountain and fountain and transfer rollers (not shown), and a train of ink-distributing drums 135 and form inking rollers 136. Each of the ink fountains or an additional fountain provided for the purpose, may be divided along its length into sections so as to print, for example, a four-page wide sheet in a number of colours, such as a different colour for each page. These divisions of each fountain or other divisions therein may alternatively or additionally be used to print a coloured heading or seal on any of the pages.

Assuming the "non-stop" mechanism to be set for two-colour printing as shown in Figure 3, and that it is desired to change to "non-stop" printing of, for example, late news matter, the locking screw 131 is removed and the eccentric housing 37 then rotated in a counter-clockwise direction until the lug 126 engages the upper of the two setting screws 130. The type cylinder 11 is thus moved laterally through an appropriate distance, for example, one-half inch, away from the impression cylinder 10 and is secured in its new position by insertion of the locking screw 131 in the lower of the two holes in the cap 60 so as to engage the lug 127, these parts then being in the positions shown in Figure 1. The impression cylinder 10 is thus free for lateral movement and, after attaching the printing plates to the cylinder 11, the motor 48 may, as previously described, be operated to rotate the bearing housings 17 in a counter-clockwise direction until the upper abutment 58 engages the upper stop screw 59. The impression cylinder is returned to the position shown in Figure 1 before the mechanism is re-conditioned for two-colour printing.

The paper web may be fed around the impression cylinders 10 and 13 to provide for printing either on one side of the web or on both sides thereof, for which purpose the drive for the impression cylinder 13 is reversible. As here shown, the impression cylinder 13 is mounted in a pair of eccentric bearing housings 140 which are rotatable within openings 141 in the press frame members 18 and which, similarly to the housing 37 supporting the type cylinder 11, are each formed with a pair of diametrically opposite, radially outwardly extending lugs or projections 142, 143 which are arranged in different planes axially of said housings and which move within annular recesses 144, 145 respectively in the corresponding press frame members 18. The lug 142 is arranged to abut, in each of its extreme positions, with one of a pair of setting screws 146 threaded into holes in a cap frame member 147 and a locking screw 148 having a short threaded portion at its outer end is provided for engagement with the lug 143, said locking screw being threaded into one or other of a pair of holes in said cap frame member.



Each of the bearing housings 140 has formed integrally therewith a toothed segment 149 which is in mesh with one of a pair of toothed segments 150, the latter being integral with bearing rings 151 journalled in the press frame members 18. The bearing rings 151 have keyed thereto a spindle 152 which at one end has an eccentric portion 153 on which a pinion 154 is freely rotatable, said pinion running in mesh with a gear 155 fixed to the impression cylinder 13. In one extreme position of the bearing housings 140 the gear 155 is meshed with the gear 22 while the pinion 154, due to the eccentricity of its supporting spindle portion 153 is disengaged from the gear 22 and is rotated idly by the gear 155, the impression cylinders 10 and 13 rotating in the same direction to provide for printing on one side of the web (see Figure 1). In the other extreme position of the bearing housings 140, the gear 155 is moved out of mesh with the gear 22 while the pinion 154 is moved into mesh with said gear 22. As shown in Figure 3, the impression cylinder 13 in this position of the parts is driven in the opposite direction to the impression cylinder 10 to provide for printing on both sides of the web. Thus it will be evident that a printing unit comprising a "non-stop" mechanism and a reversible couple as described with reference to Figures 1 to 3 may be set to provide one-colour printing on one side of the web and one-colour non-stop or two-colour printing on the other; two-colour and non-stop printing on one side of the web; or three-colour printing on one side of the web.

An ink-supply system similar to that employed with each of the type cylinders 11, 12 is provided for the type cylinder 14.

As will be seen from Figures 1 and 3, the impression cylinder 10 is offset in relation to a plane through the axes of the type cylinders 11, 12. The teeth of the gears 31 and 38 are cut on the addendum to a point and each of the isosceles angles formed by the intersection of planes through the axes of the impression cylinder and each type cylinder is less than the pressure angle of the gear teeth. This ensures that the gear 31 shall engage either gear 38 without jamming.

While the provision of eccentric annular bearing housings 17 for the impression cylinder 10, due to the housings being supported around their entire peripheries by the solid metal of the press frame members, enables said cylinder to withstand heavy loads such as when printing from pages of text or half tones, said bearing housings may be arranged for movement in a rectilinear instead of an arcuate path. Such an arrangement is illustrated in Fig. 8, where the bearings 17' are externally of generally square contour and are carried within elongated or rectangular openings 717' in the press frame members 18'. Movement of the bearing housings within the openings 717' to produce traverse of the impression cylinder is effected by a motor 48' which is controlled in the same manner as the motor 48 of the previous embodiment. The motor shaft carries a gear 160 which meshes with a gear 161 fast on a shaft 53' which is mounted in bushes 162 in bearing housings 55' on the front and rear press frame members 18', the shaft 53' performing the same functions and being axially movable in the same manner as the shaft 53 of Figures 1 to 7. Keyed on the shaft 53' adjacent either end thereof is a worm 163, each of these worms meshing with a worm wheel 164 secured to a shaft 165

rotatably mounted in bushes 166 in the corresponding bearing housings 55'. Also secured to each of the shafts 165 is an eccentric 157 which runs within a bore in a rectangular block 168 which slides within an elongated recess 169 in the associated bearing housing 17'. Thus upon energization of the motor 48', the eccentrics cause the bearing housings 17' to move within the slots 117' to traverse the impression cylinder.

The setting screws 59 of the previous embodiment are here replaced by screws 170 threaded into one of the bearing housings 55', said screws being arranged to cooperate with a concentric curved block 171 secured to the adjacent worm wheel 164 to limit the angular movement of the worm wheels and therefore of the eccentrics 167. Fig. 8 also shows two switch boxes 115' within which are housed triple pole switches similar to the switches 79, 88, 95 and 105, 106, 107 of the earlier embodiment, and which are actuated by trip dogs (not shown) on the corresponding worm wheel 164. The trip dogs are adjustable to synchronize with the setting of the screws 170. A solenoid 68' is provided to control the operation of a pawl 66' which cooperates with the gear 161 to lock the motor 48' against rotation.

Fig. 9 shows a modified form of equipment for controlling the operation of the reversible electric motor 48. In the modification each of the driving gears 38'' associated with the "non-stop" type cylinders carries a pair of contacts 175 with which is adapted to cooperate a push-button 176 to close a circuit through said contacts 175, conductors 177, a slip ring 178 rotatable with the shaft 35'' and brushes 179 on a housing 180 secured to the adjacent press frame member 18''. The brushes 179 are connected in the control circuit of the reversible electric motor in the same way as the switch 47 of the first embodiment described. The push-button is spring-loaded normally to break the circuit through the contacts 175 and is caused to close said circuit under the action of the timing pawl 43'' when the latter enters the recess 44'' in the gear 38''.

The impression cylinder assembly of the "non-stop" mechanism may comprise a pair of impression cylinders arranged in side-by-side parallel relationship, the two cylinders each being mounted in eccentric bearing housings which are formed with quadrant gears which are in mesh with a pair of helical pinions arranged to be driven by a reversible electric motor as above described. The impression cylinders are thus caused to move in unison, the arrangement being such that with "non-stop" printing only one of said cylinders is in contact with a type cylinder, the other impression cylinder being out of contact with the other type cylinder. As in the earlier embodiments, either one or both of the type cylinders is or are adjustable towards and away from the impressive cylinder assembly to provide for two-colour printing by said "non-stop" mechanism. The paper web passes successively about peripheral portions of the two impression cylinders and a further train of bevel gears is provided for driving the additional cylinder.

The range of printing combinations which may be obtained with a unit comprising a "non-stop" mechanism and a standard reversible couple may be extended to provide for multi-colour printing on one or two webs and with or without non-stop printing by employing an additional unit comprising two printing couples of which one is reversible. Examples of such printing combinations are illustrated diagrammatically in Figures 10 to 17, which show, in addition to a printing unit A similar to that described with reference to Figures 1 to 3, a further printing unit B comprising an impression cylinder 185 and co-operating type cylinder 186, and an impression cylinder 187 and co-operating type cylinder 188, the latter couple being reversible.



In the arrangement shown in Figure 10, where the impression cylinder 10 is in engagement with one of the type cylinders 11, 12, a single web is printed in one colour on one side and in two colours and non-stop on the reverse side. By adjusting the "non-stop" mechanism to engage both type cylinders with the impression cylinder 10, as shown in Figure 12, the web is printed in one colour on one side and four colours on the other.

Figures 11 and 13 show the two units A and B adapted for printing on two webs. In Figure 11, where the impression cylinder 10 is adjusted to engage only one of the corresponding type cylinders, one of the webs is printed in one colour on each side and the other web in one colour on one side and non-stop on the other side. With both type cylinders 11, 12 in engagement with the impression cylinder 10, as shown in Figure 13, one web is printed in one colour on each side and the other web in one colour on one side and two colours on the other.

In Figure 14, the two printing units A and B are adapted for multi-colour printing on both sides of a single web, one side being printed in two colours and the other side in three colours. Figure 17 shows the same web lead with the mechanism 10, 11, 12 conditioned for non-stop printing, this arrangement providing for two-colour printing on one side of the web and one-colour and non-stop printing on the reverse side.

Figure 15 shows the two units A and B conditioned for printing in three colours on one side of a web and non-stop on the reverse side. In Figure 16 both type cylinders 11, 12 are operative, the web lead being similar to that shown in Figure 15 and being printed in three colours on the other.

The colour combinations obtainable in accordance with Figures 10 to 17 are shown graphically in Figures 10A to 17A.

A folder is diagrammatically illustrated at C in Figures 10 to 17. With the unit A positioned, as shown, between the unit B and the folder and the printing aggregate arranged to print on two webs, non-stop printing is performed, as in the case of newspapers, on the outside pages. Where non-stop printing is required on the inside pages the unit A will be reversed and positioned on the left of the folder.

The plate clips on the cylinders 11 and 12 may be arranged to grip narrow plates such as are generally used for single column "stop-press" news. With the present arrangement, therefore, it is possible to print both late news and a seal on one page and for these to be in different colours.

What I claim and desire to secure by Letters Patent in the United States is:

1. A late news or like printing mechanism comprising an impression cylinder, a pair of type cylinders operatively disposed relative to said impression cylinder, means for moving the impression cylinder into impression engagement with one or the other of said type cylinders, and means supporting one of said type cylinders for

movement towards and away from the impression cylinder.

2. A late news or like printing mechanism comprising an impression cylinder, a pair of type cylinders operatively disposed relative to said impression cylinder, means for driving the impression cylinder, means for moving said cylinder into impression engagement with one or the other of said type cylinders, means supporting one of the type cylinders for movement towards and away from the impression cylinder, and means for driving said type cylinders from the impression cylinder.

3. A late news or like printing mechanism comprising an impression cylinder, a pair of type cylinders at opposite sides of said impression cylinder, eccentric bearing housings supporting said impression cylinder and rotatable to move said cylinder into engagement with one or the other of said type cylinders, and eccentric bearing housings supporting at least one of the type cylinders and rotatable to move said type cylinder towards and away from the impression cylinder.

4. A printing mechanism as claimed in claim 1 which includes means for rotating each type cylinder when disengaged from the impression cylinder and at substantially the surface speed of the impression cylinder, and means for driving each type cylinder from the impression cylinder when the type cylinder is engaged with the impression cylinder.

5. A printing mechanism as claimed in claim 1 which includes means for rotating each type cylinder independently of the impression cylinder and for synchronizing the surface speeds of said type and impression cylinders when they are disengaged from one another and means for driving each type cylinder from the impression cylinder when the type cylinder is in impression engagement.



6. A printing mechanism as claimed in claim 1 which includes means for rotating each type cylinder independently of the impression cylinder and for synchronizing surface speeds of the type and impression cylinders when one of the type cylinders is out of operative engagement with one impression cylinder, means for automatically moving the impression cylinder into engagement with one of the type cylinders when synchronization of speeds has been achieved, and means thereafter for driving said type cylinder from the impression cylinder.

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