March 12, 1963 E. RAINFORD 3,080,814

PRINTING PRESS

Filed Aug. 26, 1959 2 Sheets-Sheet 1

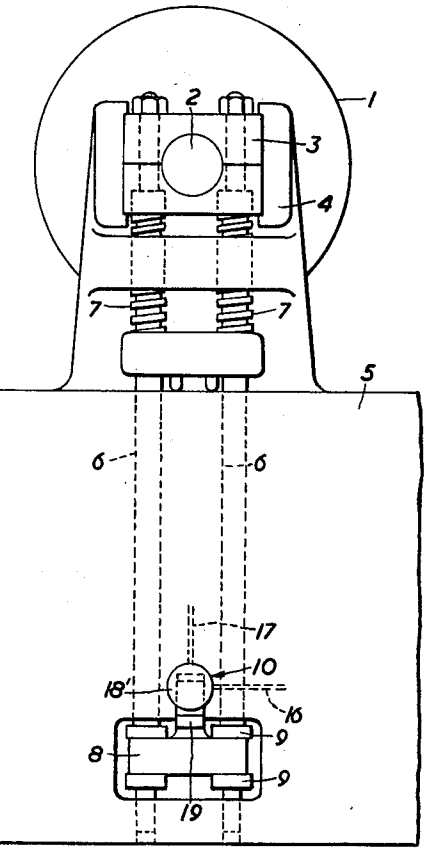


FIG. 1.

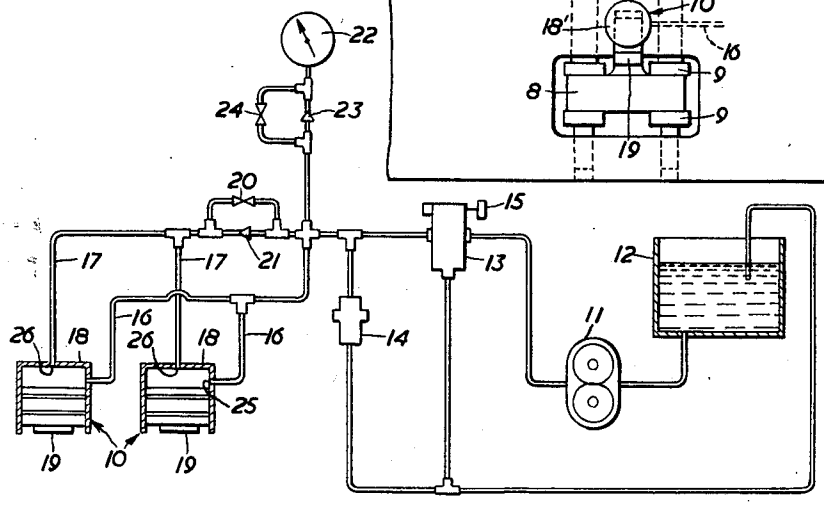


FIG. 2.

INVENTOR
Edwin Rainford
BY
Morrison, Kennedy & Campbell
ATTORNEYS

March 12, 1963 E. RAINFORD 3,080,814

PRINTING PRESS

Filed Aug. 26, 1959 2 Sheets-Sheet 2

Fig. 3.

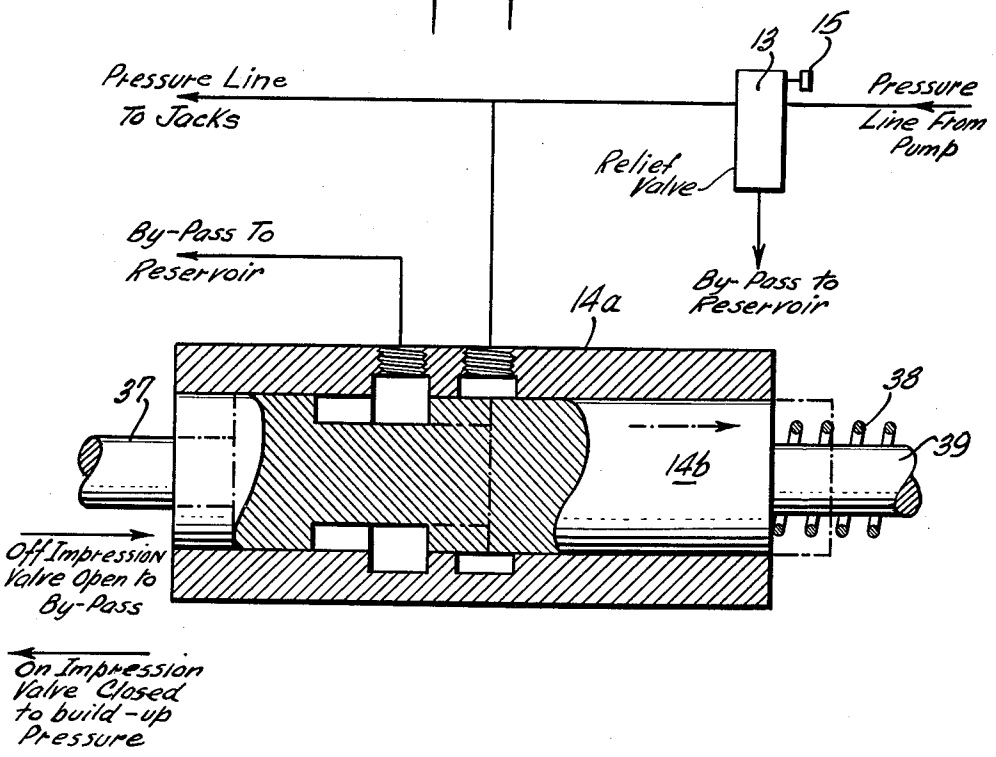
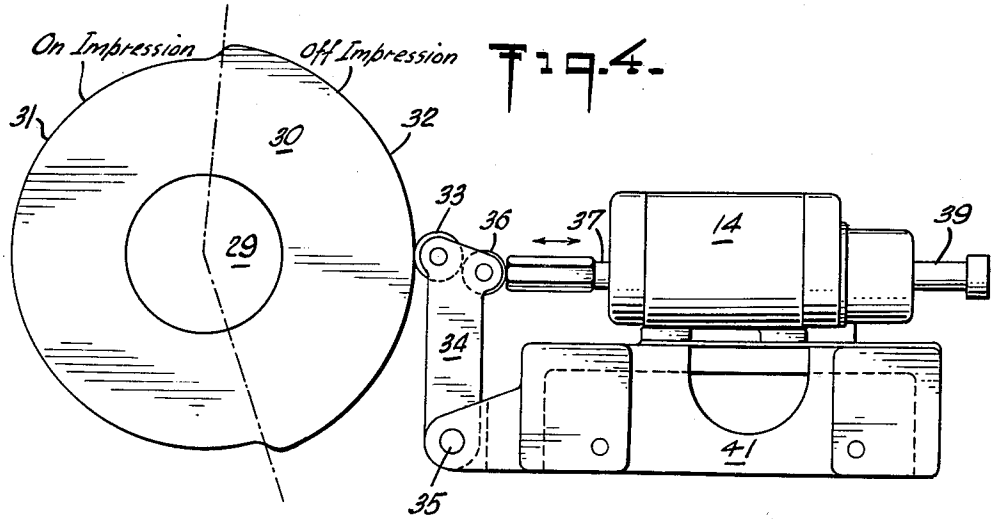


Fig. 4.



INVENTOR
EDWIN RAINFORD

BY
Morsoni Kennedy & Campbell
ATTORNEYS.

United States Patent Office 3,080,814
Patented Mar. 12, 1963

3,080,814

PRINTING PRESS

Edwin Rainford, Manchester, England, assignor to Linotype and Machinery Limited, London, England, a company of Great Britain

Filed Aug. 26, 1959, Ser. No. 836,298
Claims priority, application Great Britain Sept. 8, 1958
5 Claims. (Cl. 101—283)

This invention comprises improvements in printing machines or presses, rotary or other, and in particular flat-bed presses, having a cylinder mounted for displacement to bring it periodically to an impression position for the printing operation.

The invention is characterised by the provision of hydraulic means for moving the cylinder to its impression position.

In a convenient arrangement, the hydraulic operating means comprises a pump supplying hydraulic fluid under pressure under control of an automatic valve operated in timed relation with the press for delivering pressure fluid periodically to hydraulic jacks acting on the cylinder so as to move it to the impression position at the appropriate time in the machine cycle.

The pump, of fixed displacement type, is driven at a speed related to press speed so that the pull-down always occupies the same fraction of the machine cycle. Thus interference with paper feeding arrangements over the full range of press speeds is prevented.

A manually-operated control valve and a pressure gauge in the hydraulic circuit permit an accurate control over the pressure supply to the jacks and thereby the pressure applied by the cylinder during the impression stroke.

Means are preferably provided in the hydraulic system for cushioning return movement of the cylinder to its "off" impression position.

One form of invention will now be described by way of example with reference to the accompanying drawings.

FIG. 1 is a fragmentary side elevation of a two-revolution flat-bed press showing the impression cylinder and the manner in which it is mounted;

FIG. 2 is a diagrammatic view of the complete hydraulic system which characterizes the present invention;

FIG. 3 is a longitudinal section taken through the automatic valve forming part of the hydraulic system; and

FIG. 4 is a side elevation of the mechanism employed for operating the automatic hydraulic valve in timed sequence with the press.

The impression cylinder 1 of the press (FIG. 1) has each shaft end 2 supported in the normal way in a bearing box 3 mounted in a guide 4 on the machine frame 5 for up-and-down movement. The box 3 is carried on the upper ends of pulldown rods 6. Compression springs 7 resiliently hold the cylinder in a raised or "off" impression position. At their lower ends each pair of rods is spanned by a bearer block 8 adjustable in height on the rods by means of nuts 9.

In a round opening within the frame 5 is fitted a cylindrical block 18' bored to act as a cylinder of an hydraulic jack 10 (FIG. 2). The ram 19 of the jack extends downwardly on to the adjacent bearer at the lower ends of the pull-down rods.

As shown in FIG. 2 of the drawings, the two jacks 10 are actuated by a pump unit 11 which is driven continuously from the press shaft and receives an oil supply from a tank 12. The pump unit is of the fixed displacement type. The pump is by-passed by two valves 13, 14. The valve 13 is a relief-valve having a manual adjustment 15 for controlling the hydraulic pressure and thereby the impression load produced by the rams. The other

valve 14 is a main control valve which is mechanically (or electro-magnetically) operated from the press by a suitable control. The other valve 14 is a main control valve which is mechanically (or electromagnetically) operated in timed sequence with the press to produce operative strokes of the rams during the impression stroke in the machine cycle. The valve 14 may be of the common on-off variety as shown in FIG. 3, comprising a cylindrical casing 14*a* and a valve plunger 14*b* slidable therein, the full lines showing the valve plunger in its closed position, and the dotted lines showing it in its open position. In consequence, the rams 19 are urged downwardly against the bearer blocks 8 so as to pull down the cylinder to its "on" impression position.

It will be seen from the drawings that the supply pipes 16 lead to ports 25 in the sides of the cylinders, whereas the pipes 17 extend from ports 26 in the tops of the cylinders. The operation of opening the valve 14 permits the oil to be exhausted from the jack cylinders 18 and returned via the pipes 16, 17 to the reservoir 12. This arrangement is to provide an hydraulic cushion for each ram at the terminal part of its upward return stroke. When the side ports 25 are shrouded by the upwardly-moving rams, the oil is then exhausted through the top ports only, and return of the oil to the system is restricted by a needle-valve 20 by-passing a non-return valve 21 in the piping 17. The flow of oil through the needle-valve 20, and thereby the cushioning effect on the rams, is adjusted by a manual control on the needle-valve.

A pressure gauge 22 in the hydraulic circuit permits the load pressure of the cylinder on impression readily to be ascertained. In order to reduce oscillation of the gauge needle during the operation of the press through periodic changes in oil pressure, the piping to the gauge incorporates a non-return valve 23 in parallel with a needle-valve 24 for restricting the oil flow.

A suitable mechanism for operating the valve 14 in timed sequence wtih the press is shown in FIG. 4, comprising a rotary shaft 29 operated from or in synchronism with the press drive and having fixed thereto a cam 30 with a circular portion 31 and a circular portion 32 of greater diameter than the portion 31. Tracking on the cam 30 is a cam follower 33 carried on an arm 34 pivotally mounted at 35 on the valve base or support 41. The arm 34 also carries a second roller 36 which is engaged by a stem portion 37 projecting from the adjacent end of the valve plunger 14*b*, which latter is urged constantly toward the left by a spring 38, surrounding a stem portion 39 at the opposite end of the valve plunger, so as thereby to maintain the follower 33 in constant contact with the cam 30.

When the press is off-impression, the cam follower 33 rides on the raised circular portion 32 of the cam 30 (as shown in FIG. 4) and thus maintains the valve plunger 14*a* in its open position (as indicated by the dotted lines in FIG. 3). When the press is on-impression, the cam follower rides on the depressed circular portion 31 of the cam 30 and thus allows the valve plunger to occupy its closed position (as indicated by the full lines in FIG. 3) under the influence of the spring 38. Of course the movements of the valve plunger to one position or the other are effected by the sloping surfaces 39 which join the two circular portions 31 and 32. As well understood in the art, in a two-revolution flat-bed press, the printing operation is performed during the first revolution of the impression cylinder 1 or during the first half of the machine cycle, while the return of the printing form to its starting position is performed during the second revolution of the impression cylinder or during the second half of the machine cycle. In its second revolution, the impression cylinder delivers the printed sheet to the cus-

tomary transfer devices. Hence it can be seen that the automatic hydraulic valve **14** is operated in timed sequence with the press during each printing cycle for, first, delivering pressure fluid to the hydraulic jack unit so as to move the impression cylinder to its on position for the printing operation during its first revolution and, then, exhausting the pressure fluid from the hydraulic jack unit so as to cause the impression cylinder to be moved by the lifting springs **7** to its off position after the printing operation and during its second revolution.

Such an hydraulic operation of the impression cylinder affords various advantages over the normal mechanical operation. Among the advantages are: there is equality of printing pressure on both sides of the press; the hydraulic cushioning afforded by the relief valve **13** is a protection against breakages arising through objects left on the type bed or bearer; there is a very simple control available at all times even during printing for removing or adjusting the pressure on impression; and the impression pressure can be checked at all times from the gauge.

I claim:

1. A two-revolution flat-bed printing press comprising, in combination, an impression cylinder mounted in a stationary support and movable alternately into and out of impression contact with the bed during a complete machine cycle, spring means for effecting the movement of the cylinder out of impression contact with the bed, a one-way acting hydraulic jack unit for effecting the movement of the cylinder into impression contact with the bed against the force of the spring means, said unit comprising a stationary cylinder having a constantly open port for the admission and exhaust of the pressure liquid and a ram slidably mounted in the cylinder and operatively connected to the impression cylinder, a hydraulic pressure line in permanent open communication with said cylinder port, a liquid reservoir, a continuously operating power driven pump for supplying liquid under pressure to said pressure line, a by-pass from the pressure line to the reservoir, a valve located in said by-pass and movable alternately to open and closed position, and automatic means for operating said by-pass valve in timed sequence with the press during each machine cycle for, first, closing said valve to admit pressure liquid to the jack cylinder for moving the impression cylinder into impression contact with the bed during its first revolution for the printing operation and, then, opening said valve to permit the pressure liquid to be exhausted from the jack cylinder under the influence of the aforesaid spring means for causing the impression cylinder to move out of impression contact with the bed during its second revolution following the printing operation.

2. A two-revolution flat-bed printing press as claimed in claim 1, wherein the jack cylinder is formed with a second port in circuit with the hydraulic pressure line for the admission and exhaust of the pressure liquid, said second port being located in advance of the first mentioned port in the direction of the return stroke of the ram and in such position that said second port will be masked by the ram before the completion of its return stroke while the first port remains in circuit with the hydraulic pressure line, and wherein the hydraulic pressure line is provided between the jack cylinder and the aforesaid automatically operated control valve with a non-return valve and a constriction valve arranged in parallel in the hydraulic circuit so as thereby to restrict the rate of exhaust of liquid from the jack cylinder during the movement of the impression cylinder out of impression contact with the bed.

3. A two-revolution flat-bed printing press as claimed in claim 1, wherein the hydraulic pressure line is provided with an adjustable pressure relief valve located between the pump and the aforesaid automatically operated control valve to govern the liquid pressure supplied to the hydraulic jack unit and thereby the pressure applied to the impression cylinder when it is moved into impression contact with the bed.

4. A two-revolution flat-bed printing press as claimed in claim 3, incuding a second by-pass from the hydraulic pressure line to the reservoir, and wherein the aforesaid pressure relief valve is arranged in said second by-pass to permit the return of liquid to the reservoir when the pressure exceeds a predetermined value.

5. A two-revolution flat-bed printing press as claimed in claim 1, wherein the hydraulic pressure line is provided with a pressure gauge located between the hydraulic jack unit and the aforesaid automatically controlled valve, said gauge being connected to the pressure line through a non-return valve and a constriction valve arranged in parallel in the hydraulic circuit so as to reduce oscillation of the gauge needle during the operation of the press through periodic changes in liquid pressure.

References Cited in the file of this patent

UNITED STATES PATENTS

674,819	Wheeler	May 21, 1901
1,262,223	Martin	Apr. 9, 1918
1,285,600	Blake	Nov. 26, 1918
1,575,973	Coleman	Mar. 9, 1926
1,783,888	Sheedy et al.	Dec. 2, 1930
1,860,693	Sheedy et al.	May 31, 1932
1,985,845	Trotter	Dec. 25, 1934
2,009,686	Cottrell	July 30, 1935
2,571,323	Yoder	Oct. 16, 1951
2,628,382	Fechheimer	Feb. 17, 1953
2,662,002	Sunderhauf et al.	Dec. 8, 1953
2,663,150	Dolch	Dec. 22, 1953
2,681,611	Jocobs	June 22, 1954
2,852,965	Wallace	Sept. 23, 1958

FOREIGN PATENTS

836,694	Germany	Apr. 15, 1952

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,080,814 March 12, 1963

Edwin Rainford

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 4, line 22, for "incuding" read -- including --.

Signed and sealed this 24th day of September 1963.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

DAVID L. LADD
Commissioner of Patents