United States Patent [19]

Miarkowaki et al.

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[45] **June 19, 1973**

[54] **INKING PUMP MECHANISMS FOR PRINTING MACHINES**

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[73] Assignee: **Baker Perkins Limited**, Peterborough, England

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[52] **U.S. Cl.** **101/366**, 101/365, 417/518

[51] **Int. Cl.** **B41f 31/08**

[58] **Field of Search** 101/366, 147, 365; 417/518, 517, 512, 510

[56] **References Cited**

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[57] **ABSTRACT**

Pump unit for metered liquid feed in a printing press, for example used as part of a multiple pump ink rail assembly in which each pump feeds ink to a column width of an inking cylinder, has a body defining a chamber with inlet and outlet ports, a piston reciprocating in a guide of the body to vary the volume of the chamber, and a slide valve reciprocating in a further guide in the body to open and close said ports in timed relationship to the operation of the piston, the piston and slide valve being driven by rotating cams. Conveniently a single cam shaft drives all the pumps of an assembly and provision is made for varying the stroke of the piston.

7 Claims, 5 Drawing Figures

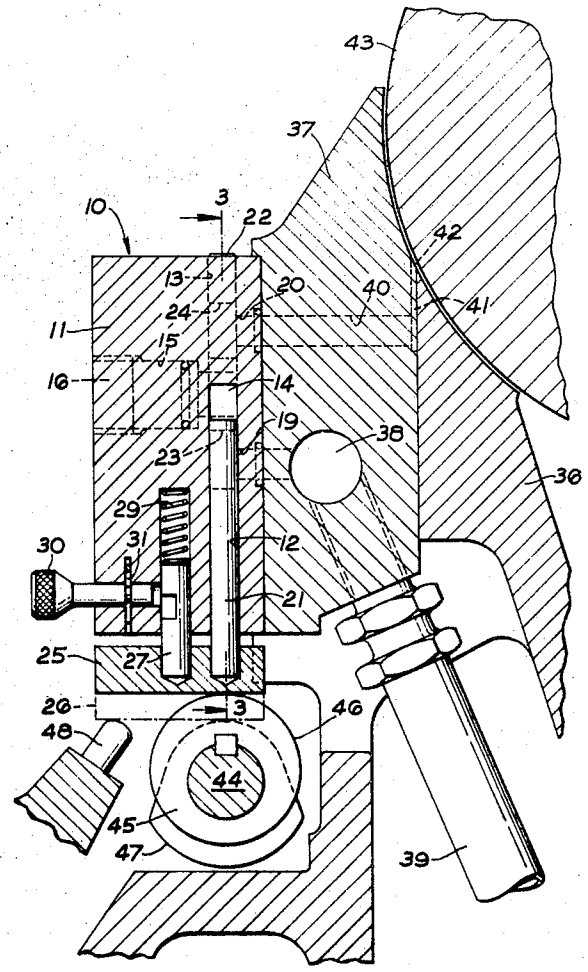

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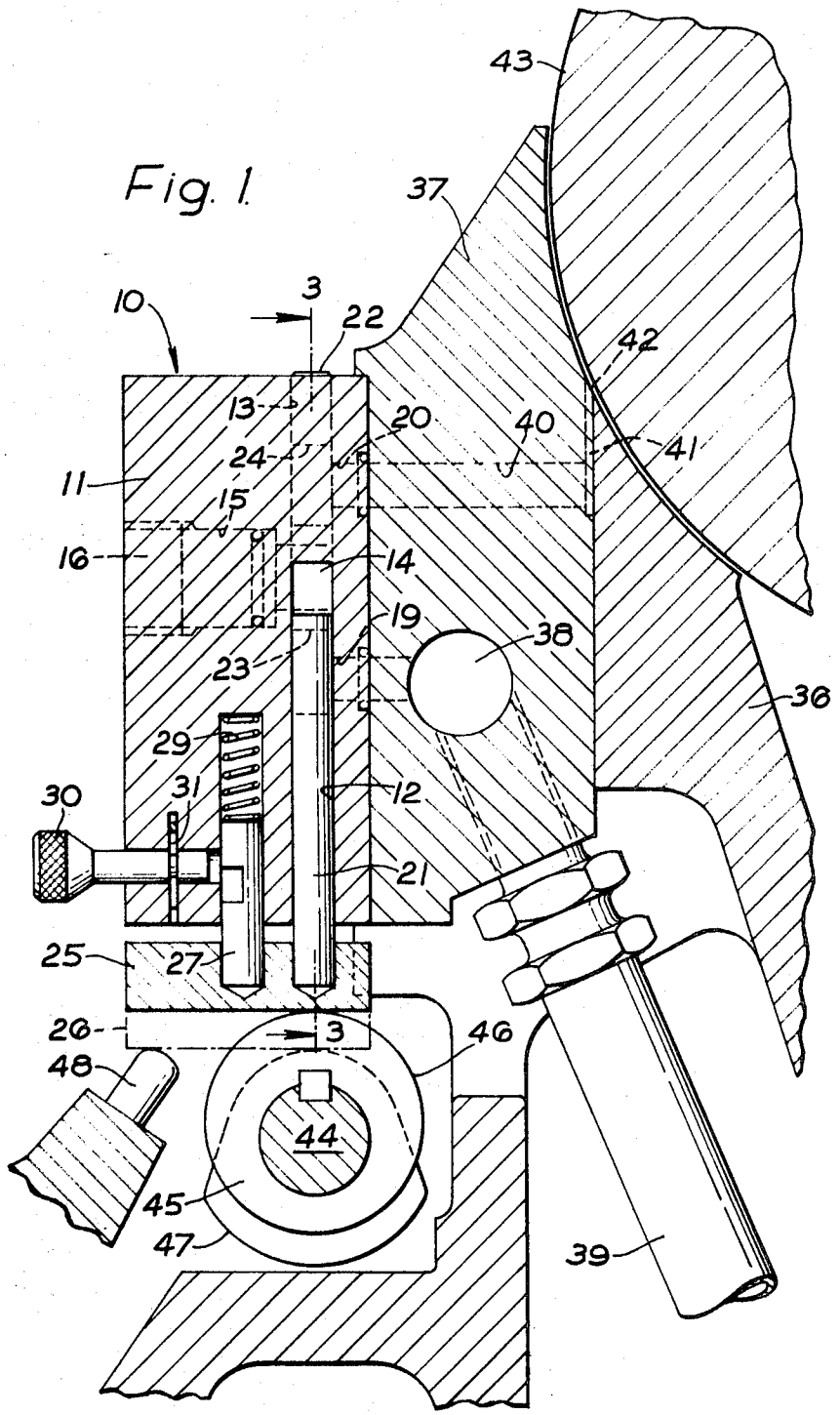
Fig. 1



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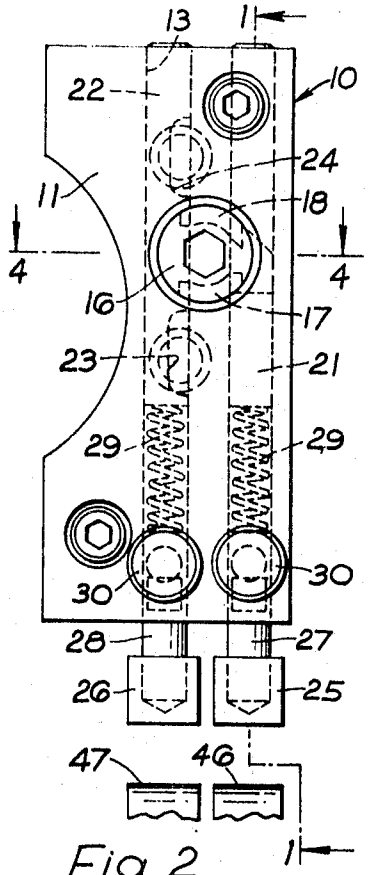

Fig. 2.

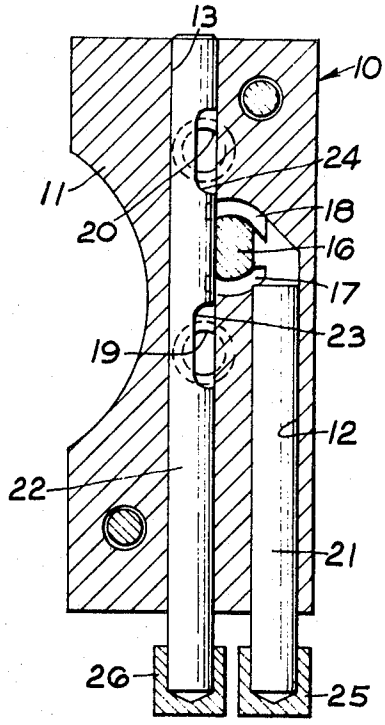

Fig. 3.

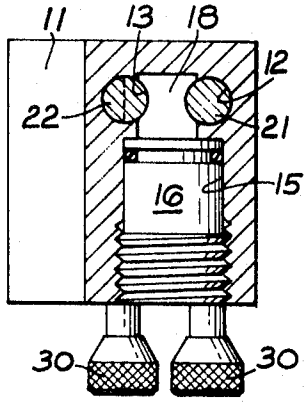

Fig. 4.

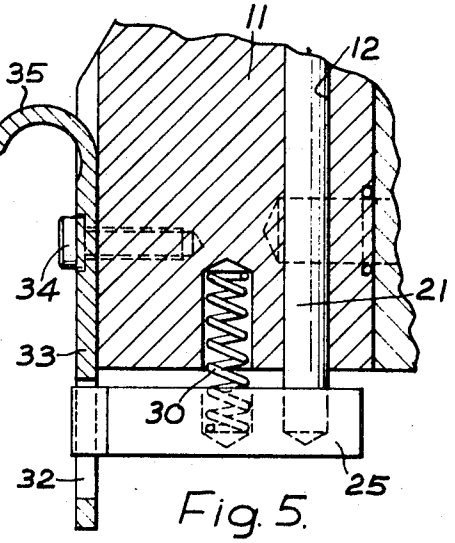

Fig. 5.

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INKING PUMP MECHANISMS FOR PRINTING MACHINES

This invention relates to liquid feed mechanisms for printing presses, particularly but not exclusively rotary offset presses, and has as its object the provision of a metering pump for said mechanisms which provides accurate and reliable feed of ink or other liquids under close control, which is of simple and robust construction, and which is adaptable in use.

According to the invention a metering pump for a printing press liquid feed mechanism is characterized by a body structure defining a chamber, an inlet and an outlet port communicating with the chamber, a piston guide formation opening into the chamber, and a valve guide formation intersecting both said ports; a piston member in sliding engagement with the piston guide formation for reciprocating movement in inward pumping strokes whereby the free volume of the chamber is decreased alternating with outward suction strokes whereby said volume is increased; a slide valve member in sliding engagement with the valve guide formation and shaped to open and close one of said ports while closing and opening the other said port; and drive means including a rotatably drivable piston cam and valve cam engageable with respective cam followers to cause reciprocating motion of the piston and valve members in a predetermined operating cycle in which the inlet port is opened during at least part of the suction stroke and the outlet port is opened during at least part of the power stroke.

A preferred embodiment of the invention, as applied in an ink rail assembly of a rotary web-offset printing press, is now more particularly described with reference to the accompanying drawings, wherein:

FIG. 1 is a vertical sectional view through the assembly mounted for operation,

FIG. 2 is a front elevation of an individual pump unit, the section of FIG. 1 being indicated at 1—1;

FIG. 3 is a sectional view on line 3—3 of FIG. 1;

FIG. 4 is a sectional view on line 4—4 of FIG. 2, and

FIG. 5 is a sectional view of part of a modified form of pump unit.

Said assembly includes a plurality of identical ink metering pump units 10 each comprising a rectangular body block 11 defining a piston guide formation in the form of a piston bore 12 and a parallel valve guide formation in the form of a valve bore 13 both open to a bottom face of the block. Valve bore 13 extends vertically through the block to open to its upper face but piston bore 12 is blind so that its upper end provides a chamber 14.

A transverse blind bore 15 on an axis lying between bores 12 and 13 is of such diameter that it intersects said bores. A shaped plug 16 is screwed into said blind bore 15 to define minimum volume parts 17,18 of inlet and outlet ports connecting chamber 14 with axially spaced parts of valve bore 13, and further transverse bores 19,20 open from the rear face of the block into lower and upper end parts of valve bore 13 to serve as remaining parts of the inlet and outlet ports respectively.

A piston 21 in the form of a cylindrical rod is received in close sliding engagement in piston bore 12 for reciprocal movement so that its inner end enters chamber 14 to vary the free volume thereof, with its outer end protruding from the lower face of the block.

A slide valve 22, also a cylindrical rod, is received in close sliding engagement in valve bore 13 and extends through block 11 to intersect the inlet and outlet ports. Two axially spaced portions of valve rod 22 are cut away on its diameter to leave two D section parts 23,24 coacting with the inlet and outlet ports respectively in such manner that, as the valve is reciprocated axially, the inlet port is opened as the outlet port is closed and vice versa.

A respective cam follower 25,26 in the form of a straight sided bar extending normally to the axis of each rod 21,22 is mounted on the lower end thereof, and mounts a respective plunger 27,28 which engages in a respective bore parallel to but in front of bores 12,13 to prevent relative rotation between piston 21, valve 22 and the block. Compression springs 29 within the block act on the end of each plunger 27,28 to resiliently urge the associated piston or valve member outwards of the block in a downward direction.

A notch is cut out of each plunger 27,28 within the block 11 whereby they can be releasably held in an upper position, with springs 29 compressed, by means of respective headed keep bars 30 extending from the front face of the block and having spring clips 31 located in grooves in the body to retain them at the desired position.

In a modified construction illustrated in FIG. 5 plungers 27,28 are dispensed with and compression springs 29 act directly on the cam followers 25,26. Instead the end of each cam follower 25,26 (only 25 visible in FIG. 5) is extended forward of the front face of block 11 and engages in vertically extending slots 32 in a guide plate 33 attached to said face by screws 34 also passing through vertical slots. The upper edge of plate 33 is curved to form a handle 35 whereby the plate can be pulled upwards and locked in an upper position by means of the screws 34 to hold both cam followers in a raised position with springs 30 compressed.

The ink rail assembly of the press includes a frame 36 (FIG. 1) mounting a manifold 37, and the set of individual pumps are operatively bolted to a front face of said manifold with their inlet bores 19 in alignment with respective passages joining them to a transverse gallery 38 which is fed with ink by way of a flexible hose 39. Outlet bores 20 of the pumps are aligned with respective internal passages 40 of the manifold which lead to a narrow vertical discharge groove 41 leading to a wedge throat 42 defined between a rear face of manifold 37 and the periphery of a non-vibrating cylinder 43.

A cam shaft 44 is journalled in frame 36 to extend longitudinally below the mounted pumps and mounts a double cam 45 for each pump, moulded from synthetic plastics material to provide two relatively phased cam faces 46,47 which are engaged respectively by the piston follower 25 and the valve follower 26 of the associated pump.

Each double cam 45 is 45° out of phase with respect to the immediately adjacent cam along shaft 44 so that the pumps are operated in overlapping consecutive cycles on rotation of said shaft, each pump operates as a single acting pump with positive timed shut off and opening of its inlet and outlet ports. The inlet port 17 is opened on movement of slide valve 22 through the action of a rapid rise portion of the associated cam face 47, the outlet port 18 being simultaneously closed and the piston 21 being withdrawn to increase the volume

of chamber 14 to draw fluid from gallery 38. As rotation of camshaft 44 continues inlet port 17 closes and outlet 18 opens while the piston 21 moves inwards to reduce the volume of chamber 14 to drive a metered volume of fluid through the manifold towards the cylinder 43.

A stop 48 (FIG. 1) is screw-engaged in an operatively fixed part of frame 36 in front of cam shaft 44 to extend generally upwards for adjustable abutment with a lower face of each piston cam follower 25 to limit downwards movement of the latter and so limit the stroke of each piston 21 individually. Stops 48 may be operated manually or each stop may be provided with an electric servo motor for automatic or semi-automatic adjustment.

In a typical example a pump for a press with a cylinder speed of 30,000 cyl. rev/hr. operated at 135 strokes/min. with a maximum stroke of 7mm and a piston diameter of 8mm. There are four page-wide pump assemblies each of eight pumps mounted end to end and driven by a common longitudinal cam shaft (or by four individual camshafts coupled end to end on a common axis) and the total maximum delivery of the four assemblies (32 pumps) is theoretically 1,520 cc/min. at the above speed and at full stroke. Movement of all the stops 48 through 45° changes the feed volume by approximately 34 cc/min. at maximum speed. Each pump feeds approximately a cylinder area corresponding to a single column of a page and the facility of individual adjustment enables close regulation of the inking of cylinder 43 along its length, a movement of one of the stops 48 only through 45° at top speed varying the flow by 1.06 cc/min., the maximum output of each pump being 47.5 cc/min. The pump speed is chosen to give a small ratio between the pulses of ink delivered through the outlet ports to throat 42, and the cylinder revolutions, to ensure even inking of successive pages while not making the speed of the pump so high that adjustment sensitivity is impaired. In one example a ratio of 3.7 : 1 is used.

The flexible tube connection to manifold 37 permits the entire ink rail assembly to be hinged for movement away from the cylinder for adjustment or cleaning, the hinge axis coinciding with the axis of shaft 44 so that no dismantling is needed to permit said movement. Each pump unit can be removed individually and interchanged as required, and/or the sub-unit consisting of the pumps and manifold 37 can be removed from frame 36 entire.

A pressurized fluid supply to gallery 38 is preferred using a conventional feed pump, through in the case of inks or other fluids having low viscosity a gravity feed from a header tank may suffice. The range of adjustment of the stops 48 may provide for the respective piston follower 25 of any pump to be raised clear of the associated cam so that its operation may be halted without halting the press or affecting its operation. Alternatively the keep bars 30 (or guide plate 33 of FIG. 5) may be used to render any one pump inoperative.

Instead of each pump unit 10 being formed in an individual block 11, a plurality of pumps may be formed in a single block providing the width and capacity required, for example eight pumps forming a page-width unit.

As each pump unit 10 is identical, readily interchangeable, and of simple construction it is feasible to supply sets of spare pumps for each press, enabling individual pumps to be reserved to handle respective colors of ink so avoiding time consuming cleaning when a change of color is to be made. Need to clean the inlet feed 39 and gallery 38 can be avoided by providing a front connection on each pump block 11 of a color pump set for a feed of colored ink to the respective inlet port 17 by-passing the manifold, this type of pump having no connecting passage 19 to the gallery 38. These alternative infeeds to the pump blocks can be provided with quick release couplings for flexible feed tubing serving as cut-off valves whereby supply to any individual pump can be cut off at will.

Conveniently block 11 is moulded from a compound of powdered metal or other filling, for example slate powder, and a resin bonding material whereby the bores and passages can be readily formed with little or no machining by moulding around removable core pieces of suitable shape.

What we claim is:

1. A metering pump for a printing press liquid feed mechanism including a body defining a chamber, an inlet and an outlet port communicating with the chamber, a piston guide formation opening into the chamber, and a valve guide formation parallel to said piston guide formation and intersecting both said ports, both said formations extending from one end of the body; a piston member in sliding engagement with the piston guide formation for reciprocating movement in pumping strokes inwardly of the body whereby the free volume of the chamber is decreased alternating with suction strokes outwardly of the body whereby said volume is increased; a slide valve member in sliding engagement with the valve guide formation for reciprocating movement inwardly and outwardly of the body and shaped to open and close one of said ports while closing and opening the other said port; resilient means urging each said member outwardly of the body; drive means including rotatably driveable piston and valve cams adjacent to said one end of the body for operatively engaging respective piston and valve cam followers on outer ends of the piston and valve members to cause reciprocating motion of the latter members in a predetermined operating cycle in which the inlet port is opened during at least part of the suction stroke and the outlet port is opened during at least part of the pumping stroke; adjustable stop means disposed for abutment with the piston cam follower to limit outward travel thereof and so determine the length of said pumping stroke; and keeper means attached to the body and selectively engageable with said cam followers to hold them clear of said cams with said members at inward positions for rendering the pump inoperative.

2. A pump according to claim 1 wherein said resilient means includes compression springs located in respective bores in the body parallel to the guide formations and acting on plungers carrier by the cam followers slidingly engaged in said bores, which plungers also serve to present rotation of the cam followers and attached piston and valve members relative to the body.

3. A pump according to claim 2, wherein the keeper means comprises a pair of bars located in the body for longitudinal movement in paths intersecting said bores for selective engagement with a notch in each plunger to hold the associated cam follower and member in the inward position.

4. A pump according to claim 1, wherein the keeper means includes a guide plate defining respective slots parallel to but spaced from the piston and valve mem-

bers with which end parts of the cam followers are in sliding engagement, said plate being mounted on the body by means permitting selective movement in the direction of inward movement of the cam followers to a position at which the latter are held clear of the cams at said inward positions by abutment of said followers with end parts of said slots.

5. A metering pump for a printing press liquid feed mechanism including a body having first and second parallel bores extending from one end thereof, the first bore serving as a valve guide formation, a major part of the second bore extending from said body end serving as a piston guide formation, and a blind inner end part of the latter bore constituting a chamber; inlet and outlet port means including an inlet duct within the body open to a first part of said first bore, an outlet duct within the body open to a second part of said bore axially spaced from the first part, and inlet and outlet transfer passages leading into the chamber from respective sections of the first bore between but axially separated from the inlet and outlet ducts, which passages are defined as spaced parts of a transverse blind bore in the body on an axis in a plane normal to and extending between the axes of the first and second bores and of a diameter sufficient to intersect both the latter bores, said spaced passage parts being separated by a shaped plug removably received in said transverse bore; a piston member in sliding engagement with said piston guide formation for reciprocating movement in pumping strokes inwardly of the body whereby the free volume of the chamber is decreased alternating with suction strokes outwardly of the body whereby said volume is increased; a slide valve member in sliding engagement with the valve guide formation for movement inwardly and outwardly of the body and shaped to place the inlet duct in communication with the inlet transfer passage while preventing communication between the outlet transfer passage and the outlet duct and to place the latter passage in communication with the latter duct while preventing communication between the inlet duct and the inlet passage; and drive means including rotatably driveable piston and valve cams engageable with respective cam followers to cause reciprocating motion of the piston and valve members in a predetermined operating cycle in which the inlet port means is open during at least part of said suction stroke and the outlet port means is open during at least part of the pumping stroke.

6. A pump according to claim 5, wherein the valve member is a cylindrical rod including axially spaced portions of reduced cross-section serving to provide the sequential opening and closing of the inlet and outlet port means respectively during said reciprocating movement.

7. A pump according to claim 5, wherein said portions are part cylindrical in cross-section, the cam follower associated with the slide valve member is fixedly mounted on the outer end of the latter, and further including means guiding said cam follower for reciprocal motion while preventing rotation of the slide valve member within the valve guide formation.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,739,721 Dated June 19, 1973

Inventor(s) Miarkowaki et al

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

On the Abstract Page, the Foreign Application Priority Data should be inserted as follows:

--May 15, 1970 Great Britain 23538/70--

Signed and sealed this 18th day of December 1973.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

RENE D. TEGTMEYER
Acting Commissioner of Patents