

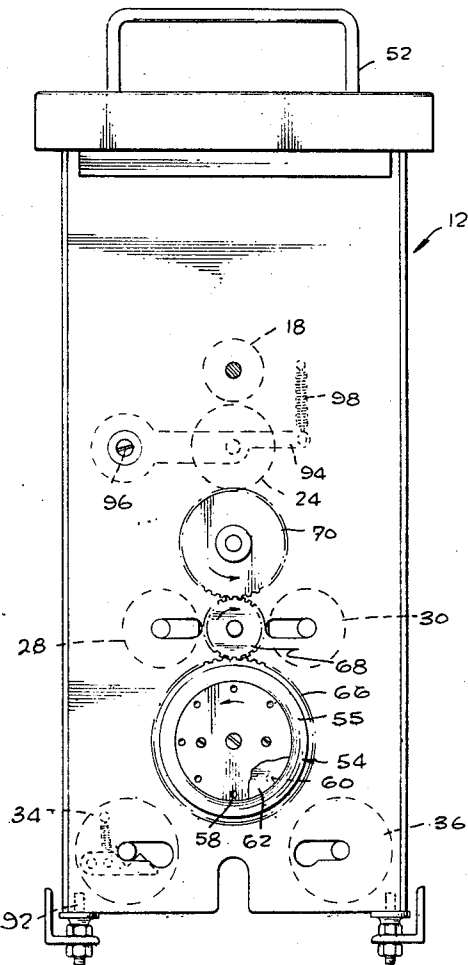
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[45] Patented Aug. 24, 1971
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[54] **INK TRAIN CARTRIDGE**
3 Claims, 6 Drawing Figs.
[52] U.S. Cl. 101/350,
101/352
[51] Int. Cl. B41f 31/34,
B41f 31/02
[50] Field of Search 101/349,
350, 351, 352, 206, 207, 209

ABSTRACT: A cartridge for use in a printing press which allows the inking rollers to be cleaned or replaced without disassembling the press. The cartridge comprises an ink fountain and a train of rollers ending in a pair of form rollers, all of which are contained in a cartridge housing that can be inserted into a printing press and removed therefrom.



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Fig. 1

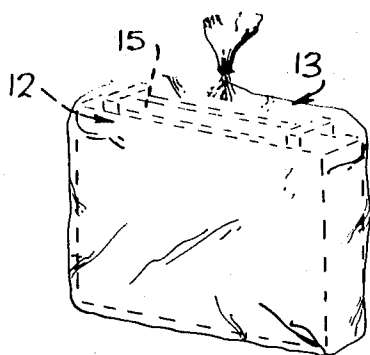
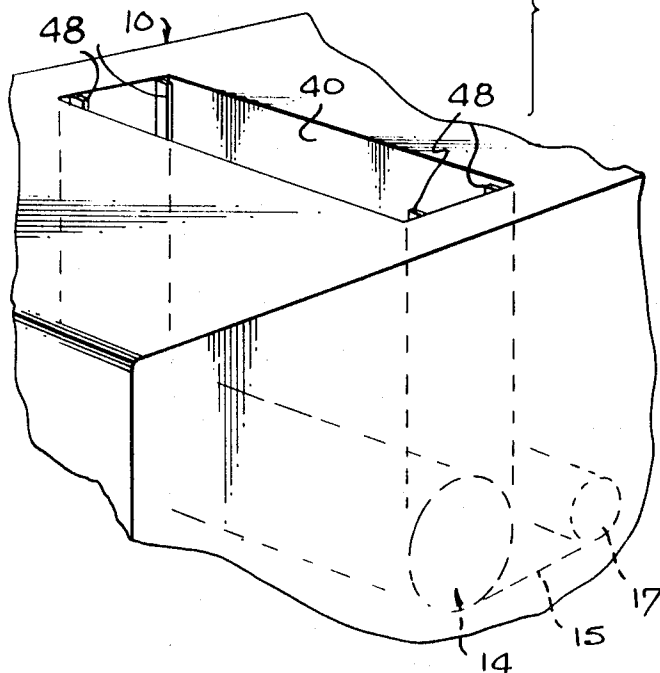
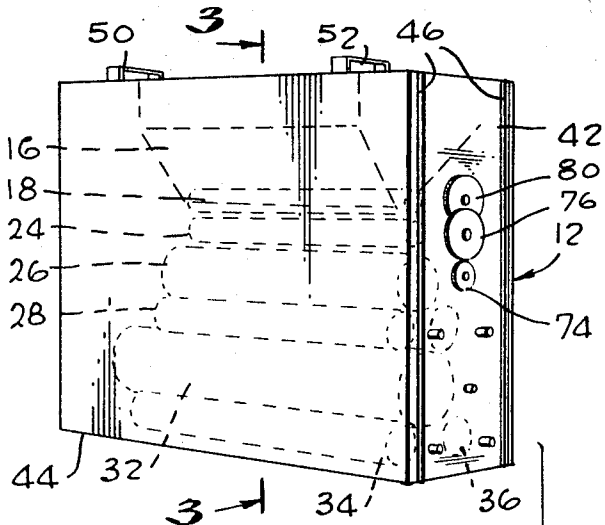


Fig. 2

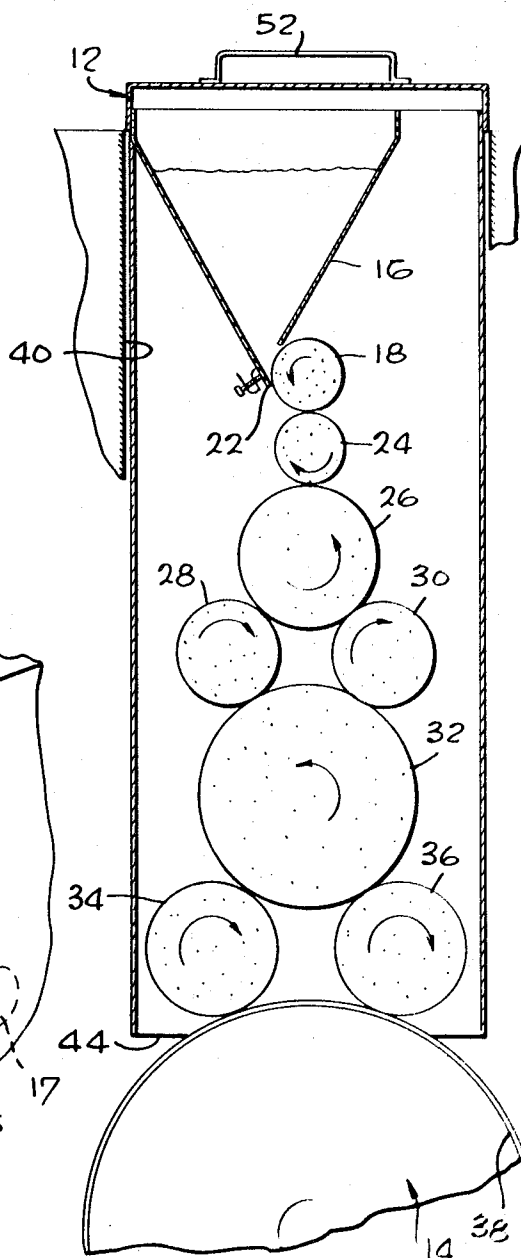


Fig. 6

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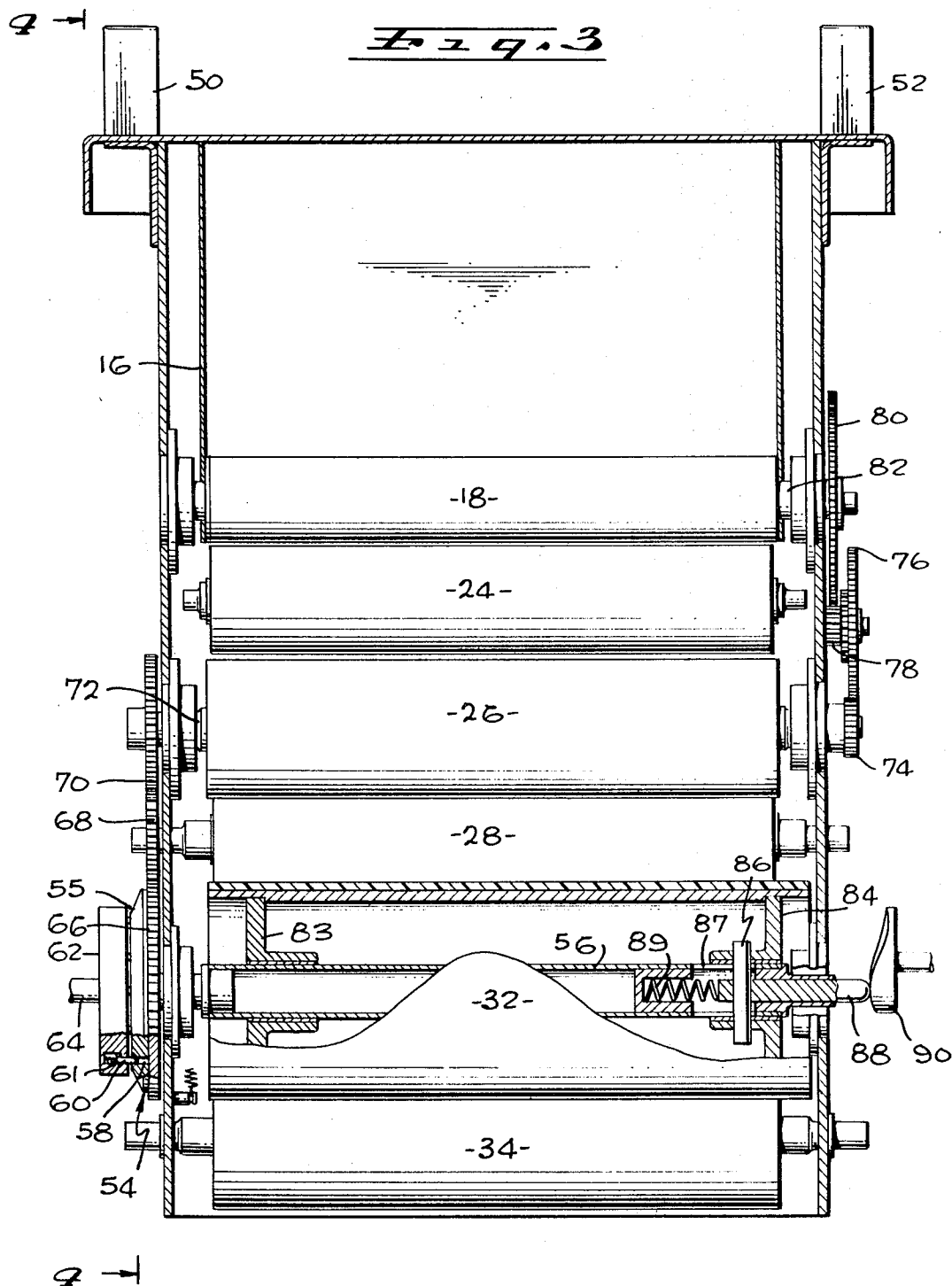
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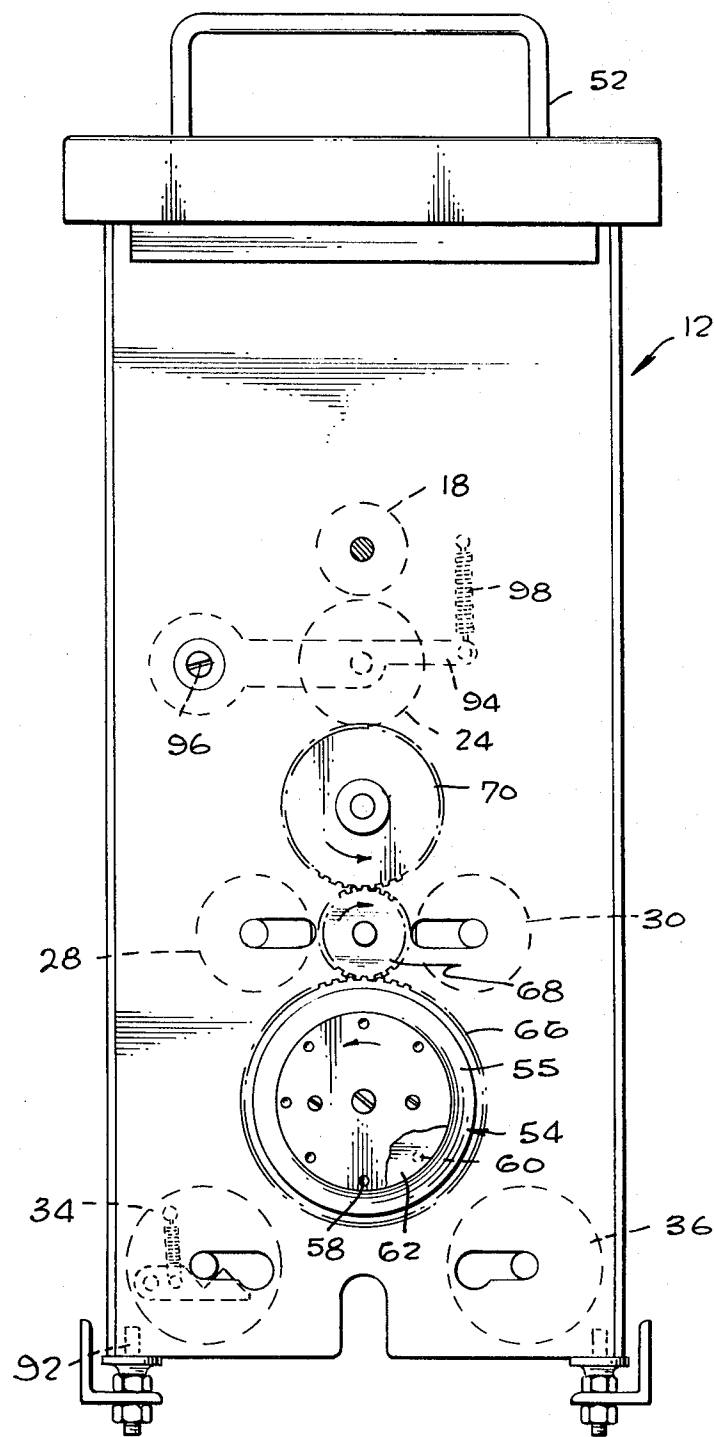


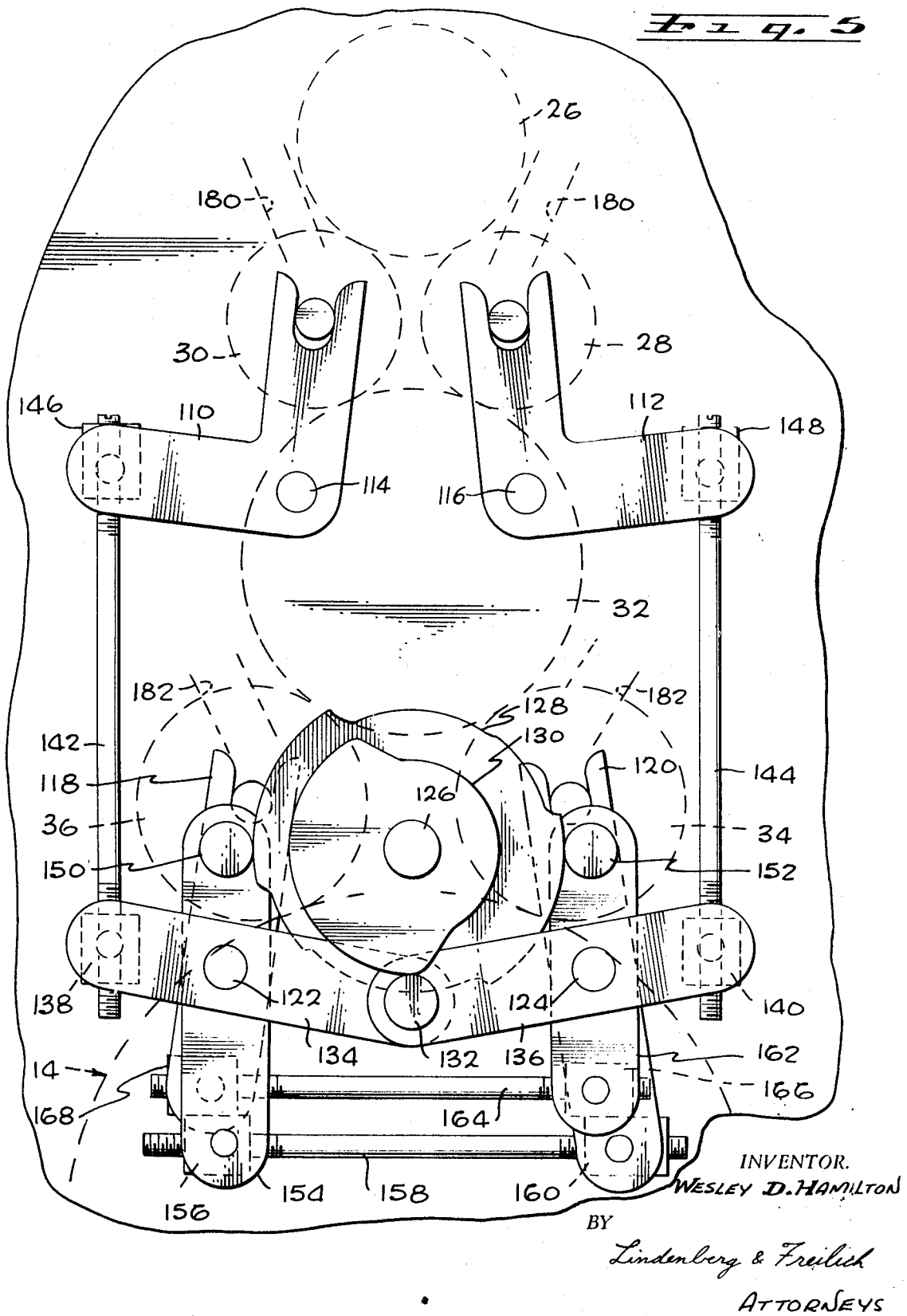
Fig. 4

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INK TRAIN CARTRIDGE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to printing presses and copy apparatus.

2. Description of the Prior Art

A common type of printing press uses cylindrical printing plates that press against paper to print on it. Ink contained in a trough or ink fountain moves along a path that includes several rolls, and onto the printing cylinder which holds a printing plate. The path typically includes a fountain or doctor roll that picks up ink from the fountain, a ductor roll, a set of smoothing rolls, a vibrator roll, one or more form rolls, and the printing cylinder, these rolls and the printing cylinder being arranged in series. The purpose of the train of rolls is to pick up ink at a predetermined rate from the fountain, and to spread and distribute it in a uniform thin film over the printing plate.

The conventional arrangement, found for example in offset lithographic presses, is messy in the handling of the ink and requires frequent cleaning of the rollers to counteract the effects of drying and filming of the ink. Thus, it has been necessary for a skilled press operator to partially disassemble the press and clean the rollers every time a plate is changed, every time the ink is changed, and every time operation of the press is halted for a few hours.

In one prior art example, described in U.S. Pat. No. 3,025,793 by Vischulis entitled Method and Apparatus for Changing Inks in Printing Press Fountains, a cleaning method is used which employs apparatus for quickly draining the ink fountain and admitting a cleaning solvent, and an ultrasonic vibrator for breaking up the remaining film on the rollers. Such methods still require considerable efforts, equipment and time.

OBJECTS AND SUMMARY OF THE INVENTION

An object of the present invention is to provide printing press apparatus which enables cleaning of the ink-distributing apparatus without requiring appreciable press down time.

Another object is to provide printing press apparatus that enables a change of ink color to be made rapidly and with a minimum of effort.

In accordance with the present invention, printing press apparatus is provided which facilitates storage and cleaning of the ink-distributing apparatus and enables a rapid change of ink colors. The apparatus includes an ink cartridge with ink-distributing rolls, which can be inserted as a unit into a printing press to supply a uniform thin film of ink to the printing plate. When the press is to be stopped for several hours or more, the cartridge can be removed and stored in an airtight container to reduce drying of the ink, the cartridge being small enough for easy handling and storage. When another ink color is to be used, the cartridge is removed and replaced with another cartridge that includes the desired color of ink and another set of distributing rolls. There placement can be accomplished quickly, and without cleaning the press (if the printing plate is changed) or the cartridge.

The novel features of the invention are set forth with particularity in the appended claims. The invention will be best understood from the following description when read in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a printing press cartridge and printing press constructed in accordance with the invention, showing the cartridge out of the printing press;

FIG. 2 is a simplified sectional side view of a portion of the apparatus of FIG. 1, showing the cartridge in place within the press;

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

FIG. 4 is a partial side elevation view of the cartridge taken on the line 4—4 of FIG. 3;

FIG. 5 is a partial side elevation view of the cartridge and printing press of FIG. 1; and

FIG. 6 is a perspective view of the cartridge of FIG. 1 in an airtight container.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

As shown in FIG. 1, the printing apparatus comprises a copier or press 10 and an ink cartridge 12 for supplying ink to the press. The press has print cylinder means comprising a printing cylinder 14 that holds printing plate means such as a curved plate with raised type or a flexible sheet with hydrophilic and hydrophobic portions. The plate means on the printing cylinder 14 receives ink and applies it either directly or through a transfer roller to paper or other printing medium 15 that is fed thereto by a feed mechanism 17. The printing cylinder and the apparatus for moving paper through the press to receive ink from it are well known in the art, and therefore will not be described in detail.

FIG. 2 shows the ink cartridge 12 within the press. The cartridge includes an ink reservoir or fountain 16 in its upper portion, which holds a supply of ink. A doctor or fountain roll 18 moves in an opening in the fountain to draw off ink. An adjustable doctor blade 22 enables regulation of the amount of ink drawn from the fountain. A ductor roll picks up ink from the fountain roll and applies it to a primary smoothing roll 26 which applies it to two secondary smoothing rolls 28, 30. The smoothing rolls 28, 30 apply the ink to a vibrator roll 32 that oscillates a limited distance along its axis, and the vibrator roll applies the ink to a pair of form rolls 34, 36. The form rolls, which are positioned in the lower portion of the cartridge housing, are in contact with the plate 38 on the plate cylinder 14, and they apply a film of ink to the plate. As will be described below, the vibrator roll 32 is driven by a motor in the press, and it, in turn, drives the various other rolls in the cartridge.

The purpose of the train of rolls is to spread and distribute ink picked up from the fountain, in order to apply it in a uniform thin film to the ink-receiving portions of the plate. The form rolls 34, 36 serve as the final roll means that transfers ink to the printing plate means, while the other rolls serve as intermediate rolls that apply ink from the fountain to the final roll means. In accordance with the invention, the train of rolls leading from the ink fountain to the plate cylinder are contained in a single cartridge that can be inserted into a slot 40 provided in the press, in the manner shown in FIG. 1. The cartridge frame or housing 42 completely encloses the roll train, except for an opening 44 at the bottom of the cartridge housing. The cartridge is inserted all the way into the slot 40 and upon actuation of form roll controls, to be described below, the form rolls 34, 36 are made to lie against the printing cylinder 14 to transfer ink to portions of the plate thereon. A pair of runners 46 which are mounted on either end of the cartridge housing, are received in guides 48 at the ends of slot 40 to facilitate movement of the cartridge into and out of slot 40. A pair of handles 50, 52 are mounted on the top of the cartridge housing to facilitate lifting and lowering of the cartridge 12 in slot 40.

For effective operation, every other inking roll must be positively driven. To accomplish this, a transmission member 54, shown in FIG. 3, is mounted on a shaft 56 that extends through the vibrator roll 32. The transmission member drives the rolls 32, 26 and 18 in the cartridge through a set of gears on the roll shafts. In order to receive power from the press, several holes 58 are provided in the face of the transmission member that can be engaged by spring plungers 60 on a drive plate 62. The drive plate 62, which is always retained within the press, is connected to a shaft 64 that is driven by the press motor (not shown).

Each of the holes 58 in the transmission member 54 is conical, so that the sidewalls of the holes are oriented at an angle to the direction of movement of plungers 60 by their springs 61. The force of plunger springs 61 and the angle of the conical holes 58 is chosen so that the required operating torque can be transmitted without causing the plunger to move out of the holes. However, if the cartridge 12 is pulled out of the slot 40 with a large force, the plungers will be moved inwardly to disengage from the holes 58. Similarly, in installing the cartridge, it can be pushed down hard enough for the plungers to ride over a beveled edge 55 of the transmission member 54, and the plungers can thereafter fall into the holes 58. The location of transmission member 54 on the exterior of the cartridge also enables engagement by a separate cleaning device (not shown) for power cleaning of the rollers within the cartridge.

The gear train that connects the transmission member 54 to the cartridge rolls includes a gear 66 fixed to the transmission member, and idler gear 68 rotatably mounted on the cartridge housing, and a smoothing roll gear 70 fixed to the same shaft 72 as the primary smoothing roll 26. A pinion 74 fixed to the opposite end of the shaft 72, drives another idler gear 76, which is fixed to a pinion 78 that drives a gear 80 on a shaft 82 of the fountain roll 18. Thus, every other roll is positively driven, namely the rolls 32, 26 and 18. The rolls 24, 28 and 30 in between them are driven by contact of their roll surfaces with the surfaces of adjacent driven rolls.

The vibrator roll 32 is not fixed to the shaft 56, but is mounted on it by a pair of bushings, 83, 84. A pin 86 fixed to the bushings passes through a slot 87 in the shaft 56 to couple the vibrator roll for rotation with the shaft 56 while allowing axial oscillations of the roll. An oscillator shaft 88 engaged with the pin 86 can be oscillated to oscillate the pin and roll 32. A spring biases the oscillator shaft toward an outward position. A cam wheel 90 mounted on the press can push the oscillator shaft in and allow it to move out to oscillate the vibrator roll. The cam wheel 90 is rotatably driven by the press motor.

The driven rolls 18, 26 and 32 are fixed in position. However, the other rolls 24, 28, 30, 34 and 36 are mounted for movement toward and away from the driven rolls to assure proper contact pressure on the roll surfaces. As shown in FIG. 4, the doctor roll 24 is rotatably mounted on a lever 94 that is pivotally mounted at 96 on the cartridge housing. A spring 98 biases the lever 94 upwardly, to urge the doctor roll 24 against the fountain roll 18. Additional mechanisms, to be described, urge the secondary smoothing rolls 28, 30 into contact with the primary smoothing roll 26 and the vibrator roll 32, and urge the form rolls 34, 36 into contact with the vibrator roll and print cylinder means.

A press operator can install the ink cartridge 12 in the press 10, by merely lowering it through the slot 40. During such lowering, the oscillator shaft 88 moves in until it is engaged with the cam wheel 90. The beveled edge 55 is on the transmission member 54 pushes in the plungers 60 until they can enter the holes 58 to engage the transmission wheel. When the cartridge is in place, the form rolls 34, 36 lie adjacent to the plate on the printing cylinder, and the form rolls can be moved together slightly to bear against the printing plate. The cartridge housing is supported, as shown in FIG. 4 by aligning buttons 92 fixed to the press that engage the corners of the cartridge housing. After the cartridge is thus inserted, and the secondary smoothing rolls 28, 30 and form rolls 34, 36 are moved together a small distance, the printing press can be started, to print a color determined by the ink cartridge.

To change cartridges the operator merely pulls the cartridge out of engagement with the press using the handles 50, 52 and lowers a new cartridge into its place. If desired, the printing plate 38 on the plate cylinder 14 may be changed while there is no ink cartridge in the press. The removed ink cartridge may be stored by placing it in an airtight container 13, as shown in FIG. 6. The ink in the fountain need not be poured off prior to such storage, inasmuch as the fountain is covered by a top

plate 15 from above and the doctor roll from below. If it is desired to clean or repair the inking rolls, this can be done while another ink cartridge is in the press, so the press does not have to be shut down.

When the cartridge is stored for a time, there is a possibility that the rolls will become deformed along the lines where they are in contact with each other. Evenness of roll surface is particularly important in the case of the last rolls of the train which must form a uniformly thin film of ink. FIG. 5 illustrates details of the press and cartridge apparatus for bringing the rolls together prior to use. This figure shows a side of the cartridge 12 opposite the side shown in FIG. 4, and members on the press that interact with it.

The secondary smoothing rolls 30, 28 are engaged with levers 110, 112 which are pivotally mounted on the press housing at 114 and 116. The levers 110, 112 can be pivoted to move the secondary smoothing rolls tight against the rolls 26 and 32 for use. When the cartridge is not in the press, the secondary smoothing rolls can move apart to bear with little, if any, pressure against the rolls 26, 32. In a similar manner, the form rolls 36, 34 are engaged with levers 118, 120 that are pivotally mounted on the press housing at 122 and 124, to permit movement of the form rolls tight against the roll 32 for cartridge use or away from it for storage.

A cam shaft 126 which extends from the press housing into the cartridge receiving slot 40 is provided, which carries two cams 128, 130 at its end to enable rapid movement of all four rolls 28, 30, 34, 36 into the use position. Another cam shaft, similar to shaft 126, and connected to rotate with it is provided at the opposite end of the cartridge slot to operate cams and other mechanisms at the other end of the cartridge slot which are similar to those illustrated in FIG. 5, so that both ends of the four rolls are moved simultaneously together and apart. When the cam shaft 126 is in the position shown in FIG. 5, cam 130 presses down a cam follower 132 to cause the secondary smoothing rolls 28, 30 to assume the use position of the figure. The cam follower 132 is pivotally mounted at 122 and 124 on the press. The opposite ends of the levers 134, 136 are pivotally joined to nuts 138, 140 threadably engaged with the lower ends of tie rods or screws 142, 144. The upper ends of the screws 142, 144 carry rotatably mounted bushings 146, 148 that are pivotally joined to the ends of levers 110, 112 which carry the secondary smoothing rolls 30, 28. Downward force of cam 130 on follower 132 causes rolls 28, 30 to move towards each other to the use position. Rotation of cam 130 to a position wherein it no longer pushes down on follower 132 allows rolls 28, 30 to move apart until there is substantially no contact pressure between them and rolls 26 and 32.

The other cam 128 regulates the pressure of the form rolls 34, 36 on the vibrator roll 32 and the print cylinder 14. When the cam shaft 126 is in the position shown in the figure, the cam 128 pushes outwardly on two cam followers 150, 152. Cam follower 150 is mounted on one end of a lever 154 that is pivotally mounted at 122 on the press. The other end of the lever 154 is pivotally coupled to a bushing 156 which is rotatably coupled to one end of a screw 158. The other end of the screw 158 carries a nut 160 that is pivotally coupled to the lever 120 which supports the form roll 34 at its opposite end. When the cam 128 pushes out the follower 150, this causes the form roll 34 to move in tight against the vibrator roll 32 and print cylinder 14, which is the use position. The other cam follower 152 that is operated by the cam 128, is similarly coupled to a lever 162 and screw 164 with a bushing 166 and nut 168 thereon, to the lever 118 on which the other form roll 36 is mounted.

Thus, when the shaft 126 is turned to the position shown in FIG. 5, the smoothing and form rolls 28, 30, 34, 36 are moved to the use position. However, a rotation of about 90° allows the cams 128, 130 to stop pressing out the cam followers 132, 150, 152 to thereby allow the form rolls and secondary smoothing rolls to move outwardly until they do not press against the other rolls in the cartridge and the print cylinder. The level of force of the rolls 28, 30 on the fixed rolls 26, 32

can be changed by turning the screws 144, 142, respectively, to vary the position of the nuts 140, 138 thereon. In a similar manner, the force of the form rolls 34, 36 can be varied by turning the screws 158, and 164, respectively, to vary the positions of nuts 160 and 168 thereon. It should be understood that similar sets of screws on the press at the opposite end of the cartridge-receiving slot also must be turned to maintain alignment of the rolls in their use position.

When the cartridge is pulled out of the housing, the secondary smoothing rolls and form rolls generally move apart slightly, although there is a possibility they may stick in a position where they bear against the primary smoothing and vibrator rolls. To assure that the secondary smoothing rolls and form rolls move apart, a pair of tracks 180 and 182 are provided in the press housing. The tracks are positioned so that they engage the rolls as the cartridge is being pulled out of the press, to move the rolls apart. The tracks also serve to move the rolls together to a predetermined spacing when the cartridge is lowered into the press.

Although particular embodiments of the invention have been described and illustrated herein, it is recognized that modifications and variations may readily occur to those skilled in the art, and consequently, it is intended that the claims be interpreted to cover such modifications and equivalents.

CLAIM:

1. An ink cartridge for mounting in a printing machine having a print cylinder means comprising:

a cartridge housing for reception in said printing machine;

an ink fountain disposed in said cartridge housing;

a plurality of rolls rotatably mounted within said cartridge housing for movement into and out of said press with said cartridge housing, including a form roll for transferring ink to said print cylinder means, said plurality of rolls defining an ink path extending from said fountain to said form roll;

a transmission wheel with a beveled edge and a plurality of holes, mounted on the outside of said housing, for receiving driving forces from said press;

means for coupling said transmission wheel to at least one of said rolls within said housing; and

a printing machine including a slot for receiving said cartridge housing and a drive member including a plurality of plungers biased toward the position occupied by said transmission wheel when it is within said slot.

2. Printing apparatus comprising:

a printing press with print cylinder means, said press having a press housing with walls defining a cartridge-receiving slot;

a cartridge housing for reception in said cartridge-receiving slot of said printing press housing;

an ink fountain disposed in said cartridge housing;

a plurality of rolls rotatably mounted within said cartridge housing for movement into and out of said press with said cartridge housing, including a form roll for transferring ink to said print cylinder means, said plurality of rolls defining an ink path extending from said fountain to said form roll;

said plurality of rolls including first and second rolls normally in contact with each other and a third roll normally in contact with said second roll, for ink transfer from said first roll to said second roll and then to said third roll; and means mounted on said press for moving said second roll between first and second positions wherein it is substantially in contact and out of contact with said first and third rolls, as said cartridge is moved into and withdrawn from said cartridge-receiving slot, respectively.

3. Copy apparatus comprising:

a copy machine including means for moving a printing medium and printing plate means defining type areas for receiving ink to be transferred to said printing medium; and

a cartridge for mounting on and removal from said copy machine, said cartridge including a housing, fountain means disposed in said housing for holding a supply of ink, final roll means disposed in said housing for applying ink to said printing plate means when said cartridge is mounted on said copy machine, and a plurality of intermediate rolls disposed within said housing for applying ink from said fountain means to said final roll means;

said final roll means including a pair of form rolls mounted on said cartridge housing for movement toward and away from each other, and having end portions projecting from said housing; and

said copy machine includes members for receiving said end portions of said form rolls when said cartridge is mounted on said copy machine, and means for moving said members towards and away from each other.