July 21, 1964 F. W. DE TOMBEUR 3,141,405

CLAMP FOR FLEXIBLE PRINTING PLATE

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FIG. 1

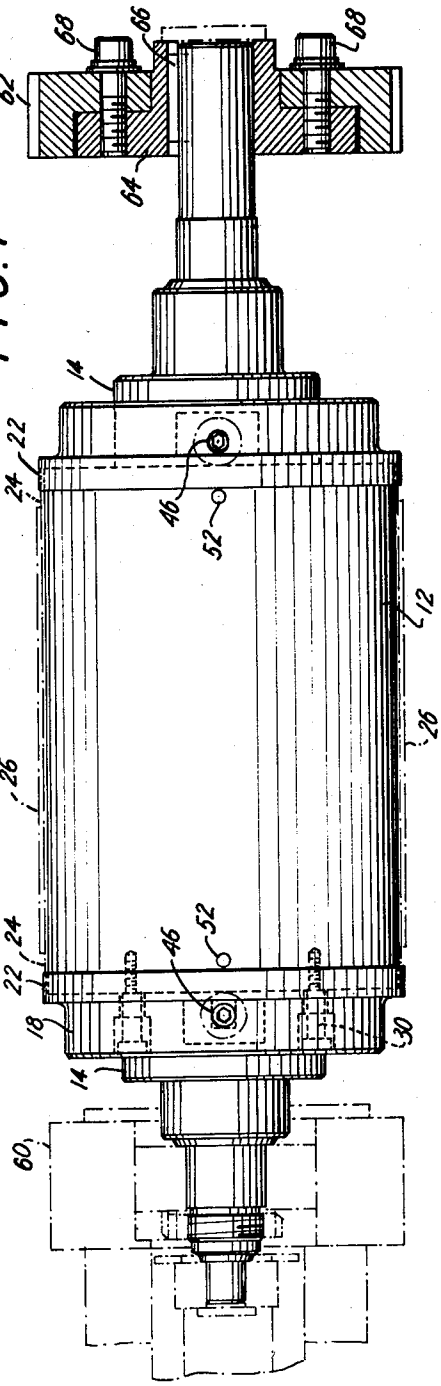


FIG. 3

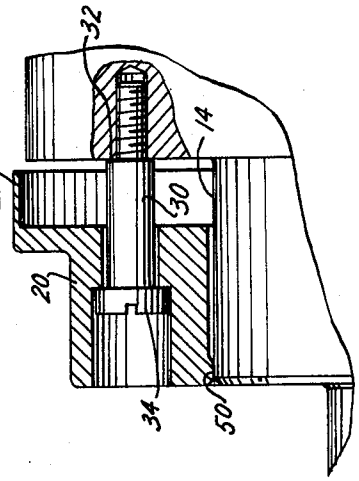
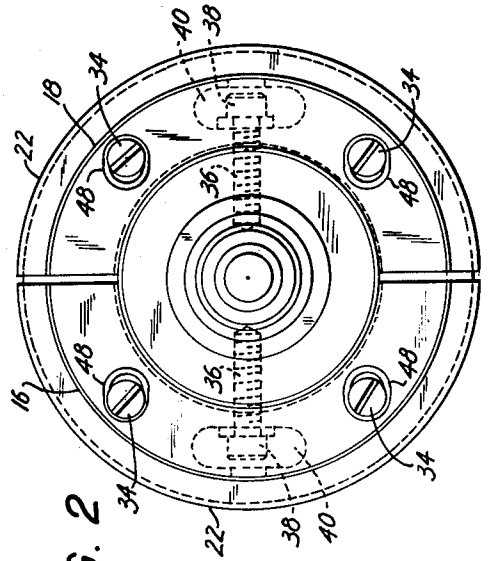


FIG. 2



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FIG. 4

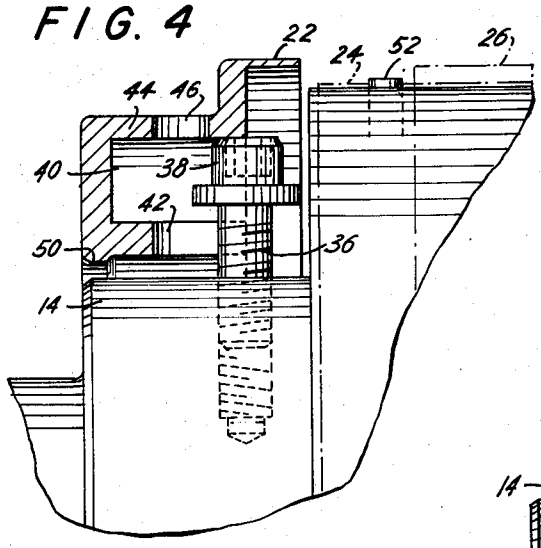
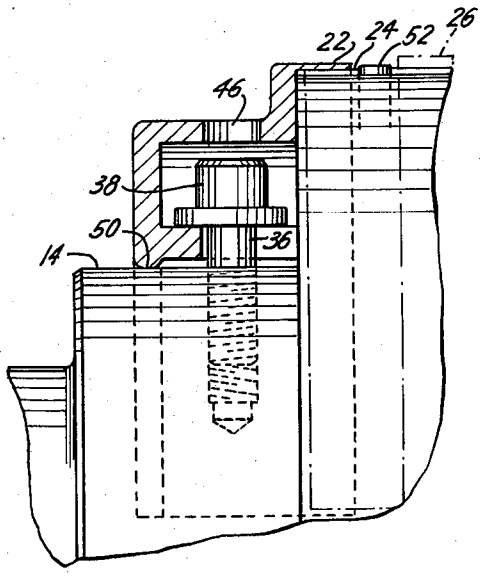


FIG. 5



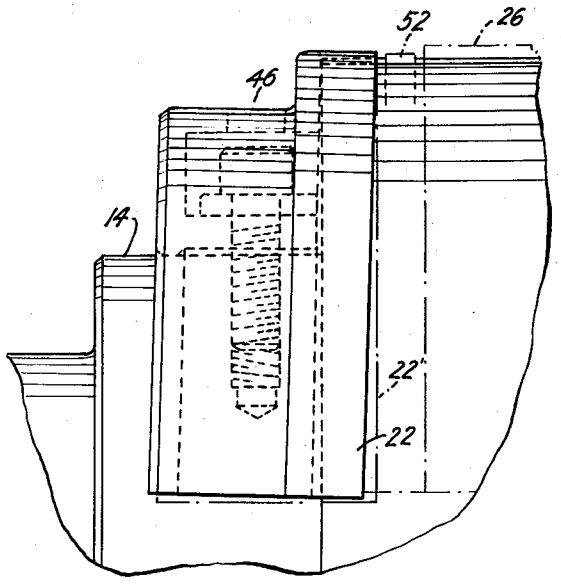


FIG. 6

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CLAMP FOR FLEXIBLE PRINTING PLATE

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11 Claims. (Cl. 101—378)

This invention relates to printing, and more particularly to rotary printing presses using flexible printing plates.

Flexible printing plates, usually made of rubber, are secured around the rigid cylinder of a printing press. In one form the rubber plate is mounted by means of an adhesive. In another it is secured to a rigid back, which in turn is secured to the cylinder. In still another arrangement the rubber plate is secured to a thin strong film made, for example, of "Mylar," and excess film is passed through a slit in the cylinder and pulled tight by means of eccentric shafts located inside the cylinder. In another form the rubber plate is secured to a relatively thin flexible metal back which is somewhat longer than the plate in axial direction, and the protruding metal edges are secured to the cylinder by releasable bands applied around the cylinder.

The primary object of the present invention is to generally improve the clamps used with such printing plates, particularly "flexographic" printing plates in which the rubber is secured to an exceedingly thin sheet metal back.

The printing cylinder commonly receives two plates, each occupying half the cylinder. It is important to be able to change the plates quickly, because with modern high speed operation a large quantity is run off in a short time, following which the plates must be changed, and if this cannot be done quickly the down time of the printing press will be excessive. It is also desirable to make the changeover a one man operation. These things have not been feasible with the flexible ring-like clamps heretofore used.

In accordance with features and objects of the present invention, there are four separate rigid clamps for a cylinder, each clamp being a semicircular ring of heavy cross-section, preferably received in the stepped end of the cylinder, and having a thin semi-cylindrical lip dimensioned to be received over one end of the metal backing of the printing plate. A clamping screw is disposed radialy, preferably with its head received within the body of the ring so that there is no radial projection. By using a ring which is slightly undersize relative to the cylinder and plate, the ends of the ring exert a radial pressure even when using only a single radial screw at the middle of the clamp. This single screw and clamp need not be removed. They are merely loosened, and the clamp is slid axially.

A further object of the invention is to prevent complete removal of the clamp, and for this purpose retainers are provided to limit the sliding movement of the clamp to an amount which brings the lip of the clamp off the plate, thereby releasing the plate.

With flexible printing plates of the character described, the unsupported axially-directed edges of the plate extending between the clamps may tend to lift slightly from the cylinder. A further object of the invention is to provide a clamp which tends to stretch or draw the plate taut in axial direction at the said free edges. For this purpose the ring has an inward radial bead near its outer edge, such that when tightened, the clamp screw causes ends of the clamp to move axially outward, thereby tensioning the edges of the printing plate.

To accomplish the foregoing objects, and other more specific objects which will hereinafter appear, my invention resides in the clamp elements and their relation one to another, and to the printing plates and cylinder, as are hereinafter more particularly described in the following

specification. The specification is accompanied by drawings in which:

FIG. 1 shows a printing cylinder equipped with clamps embodying features of my invention;

FIG. 2 is an end view of the same;

FIG. 3 is a fragmentary section explanatory of the action of the retainers;

FIG. 4 is a similar section, but taken at a clamp screw instead at a retainer;

FIG. 5 is a section like FIG. 4, but showing the clamp moved into operative position; and

FIG. 6 shows how the clamp draws the edges of the printing plate taut in axial direction.

Referring to the drawing, and more particularly to FIG. 1, the printing cylinder **12** has stepped ends indicated at **14**. There are four clamps, two at each end, as shown at **16** and **18** in FIG. 2. Each clamp is a semicircular ring of heavy cross-section, fitting over the stepped end **14** of the cylinder, and mostly received in the step. The section is indicated at **20** in FIG. 3, the metal being solid except at the clamping and retainer screws. Each clamp has a thin semicylindrical lip **22** dimensioned to be received over one end of the metal backing **24** of the rubber printing plate **26**, the parts **24** and **26** being shown in broken lines.

Retainers **30** limit the axial sliding movement of the clamp to an amount which brings the lip **22** off the backing **24** in order to release the plate. This retracted position is shown in FIG. 3. The retainers as here illustrated are screws which are shouldered at **32** and headed at **34**. The screws are permanently secured in position, and in normal use need not be loosened or handled by the operator. They are disposed in axial direction, and act to hold the clamps in assembled relation with the cylinder, and thus simplify use of the same.

Referring to FIG. 2 the clamps are tightened by means of clamping screws **36** which are disposed radially. The head **38** is preferably received within the body of the ring. In the present case the screw is a socket head cap screw, and the otherwise solid ring is cut away at **40** to receive and enclose the head of the screw. This prevents removal or loss of the screw, and lets it serve also to raise the ring, as shown in FIG. 4.

Referring to FIG. 4 the bottom wall beneath the cavity **40** is slotted as shown at **42** to receive the shank of screw **36**. The wall **44** of the ring outside the cavity **40** has an opening **46** affording access to the socket head **38** of the screw. FIG. 5 shows how the opening **46** is aligned with the head **38** of the screw when the clamp has been slid axially into clamping position, that is, when the lip **22** is over the edge **24** of the metal backing of printing plate **26**. The head **38** is larger in diameter than the hole **46**.

Reverting to FIG. 2 the clamps **16** and **18** are preferably made out of a single accurately machined circular body. This is given a diameter slightly smaller than the diameter of the plate as secured around the cylinder. The difference may be slight, say only 0.005 of an inch. When the two halves are cut apart by means of a diametrical cut, there is an additional loss of metal because of the width of the cut, and this provides clearance for the clamping action. A single clamping screw **36** may be used because the ends of the undersized ring exert a radial pressure as the screw **36** is tightened. It is primarily for this reason that the clamp is made of heavy cross section, and any slight deformation of the ring is well within its elastic limit, so that it retains its shape and dimension even though repeatedly used.

It will be understood that the holes in the clamp which receive the retainer screws **30** are made slightly oversized in order to accommodate the radial motion attendant upon the release or tightening of the clamp. As viewed in FIG. 2 with the clamp screws **36** disposed horizontally

the clamp movement is horizontal, and the holes for the retainers have been widened or made slot-like in horizontal direction, as shown at **48**. These slots readily accommodate even a somewhat extensive release movement of the clamps.

A further feature of the clamp is the provision of means to tension the free or axially directed edges of the printing plate. In FIGS. 3, 4 and 5 it will be seen that the clamped ring has an inwardly, radially directed bead or so-called "heel" **50** near its outer edge. When the clamp screw **36** is tightened, the clamp ring first is moved downward as shown in FIG. 5, until the heel **50** engages the reduced diameter portion **14** of the printing cylinder. As the clamping screw is further tightened, the clamp ring is tilted somewhat, as shown by the change from the broken line position **22'** to the solid line position **22** in FIG. 6. This motion at the free ends of the clamp draws the corresponding free edge of the printing plate taut, so that there is no tendency to leave the surface of the printing cylinder. The amount of this tilt of the clamp has been exaggerated in FIG. 6 for clarity, but even a slight motion is highly effective for the intended purpose.

To facilitate locating the printing plate on the cylinder, the cylinder may be provided with locating pins indicated at **52**, and the printing plates have mating holes. The pins and holes are usually centered, relative to the clamp and plate. The operation then is simple and expeditious. The operator inserts a T or L shaped wrench through the hole **46** into the socket head of the clamping screw, and loosens the same. On loosening the clamp at each end, they are readily moved back, the printing plate removed, and another applied. The plate is properly located by the pilot pins **52**. The clamps are then slid back over the ends of the plate, and the clamping screw at each end is tightened. If both plates are to be changed the cylinder is turned a half revolution, and the same operation is repeated for the opposite side of the cylinder.

The head of the clamping screw is confined, and therefore it cannot be excessively loosened or lost. Moreover, the clamping screw serves also to release the ring by forcing it outward despite its tight fit on the cylinder. The retainer screws need not be touched, and remain permanently in position (unless the machine is being disassembled for servicing or repeair). The clamp itself is held against removal or loss.

Reverting to FIG. 1, the printing cylinder may be conventional, and may be mounted and driven in conventional fashion. In the present case the bearing and bearing housing at one end is suggested in broken lines at **60**. The corresponding bearing at the other end has been omitted, but the driving gear for the printing cylinder is shown at **62**. This is secured to a hub portion **64** which is keyed to the printing cylinder at **66**, and rotative adjustment may be provided by means of screws **68** received in arcuate slots.

It is believed that the construction and method of use of my improved clamp for mounting flexible printing plates on a printing cylinder, as well as the advantages thereof, will be apparent from the foregoing detailed description. The printing cylinder commonly receives two plates, as here illustrated. However, the present invention may also be used with a single printing plate occupying the complete circumference of the cylinder, or with more than two printing plates, each occupying only a portion of the periphery of the cylinder. It will therefore be apparent that while I have shown and described the invention in a preferred form, changes may be made without departing from the scope of the invention, as sought to be defined in the following claims. In the claims the term "semi circular" is used for convenience, although the clamp pieces are very nearly but not quite a full semi circle in length.

I claim:

1. A clamp for mounting a flexible printing plate on a printing cylinder having stepped ends, said clamp being a semicircular ring of heavy section fitting in the stepped end of the cylinder and having a thin semicylindrical lip dimensioned to be received over one end of the printing plate, retainers to limit sliding movement of the clamp in axial direction to an amount which brings the lip off the plate in order to release the plate, a clamping screw disposed radially with its head within the body of the ring, said ring having an opening for the clamping screw affording the aforesaid axial sliding of the clamp relative to the clamping screw after loosening but without removal of the clamping screw, there being four such clamps for a printing cylinder intended to receive two printing plates.

2. In combination, a printing cylinder having stepped ends, two flexible printing plates, and four clamps for mounting said flexible printing plates on said printing cylinder, each clamp being a semicircular ring of heavy section fitting in the stepped end of the cylinder and having a thin semicylindrical lip received over one end of a printing plate, a clamping screw disposed radially with its head within the body of the ring, said screw being located about midway between the ends of the ring, said ring having an opening affording access to the head of the clamping screw, said ring having a diameter slightly smaller than that of the cylinder and plate so that the ends of the ring exert a radial pressure when using only the aforesaid single radial clamp screw at the middle of the clamp, the said four clamps holding the said two printing plates on said cylinder.

3. A clamp for mounting a flexible printing plate on a printing cylinder having stepped ends, said clamp being a semicircular ring of heavy section fitting in the stepped end of the cylinder and having a thin semicylindrical lip dimensioned to be received over one end of the printing plate, retainers to limit sliding movement of the clamp in axial direction to an amount which brings the lip off the plate in order to release the plate, a clamping screw disposed radially with its head within the body of the ring, said ring having an opening for the clamping screw affording the aforesaid axial sliding of the clamp relative to the clamping screw after loosening but without removal of the clamping screw, said ring having a diameter slightly smaller than that of the cylinder and plate so that the ends of the ring exert a radial pressure when using only a single radial clamp screw at the middle of the clamp, there being four such clamps for a printing cylinder intended to receive two printing plates.

4. A clamp for mounting a flexible printing plate on a printing cylinder having stepped ends, said clamp being a semicircular ring of heavy section fitting in the stepped end of the cylinder and having a thin semicylindrical lip dimensioned to be received over one end of the printing plate, a clamping screw disposed radially with its head within the body of the ring, said ring having an opening affording access to the head of the clamping screw, said ring having an inward radial bead near its outer edge such that the aforesaid clamp screw causes the ends of the clamp to move axially outward to stretch the axially directed edges of the printing plate, there being four such clamps for a printing cylinder intended to receive two printing plates.

5. A clamp for mounting a flexible printing plate on a printing cylinder having stepped ends, said clamp being a semicircular ring of heavy section fitting in the stepped end of the cylinder and having a thin semicylindrical lip dimensioned to be received over one end of the printing plate, retainers to limit sliding movement of the clamp in axial direction to an amount which brings the lip off the plate in order to release the plate, a clamping screw disposed radially with its head within the body of the ring, said ring having an opening affording access to the head of the clamping screw, said ring having an inward radial bead near its outer edge such that the aforesaid clamp screw causes the ends of the clamp to move axially out-

ward to stretch the axially directed edges of the printing plate, there being four such clamps for a printing cylinder intended to receive two printing plates.

6. A clamp for mounting a flexible printing plate on a printing cylinder having stepped ends, said clamp being a semicircular ring of heavy section fitting in the stepped end of the cylinder and having a thin semicylindrical lip dimensioned to be received over one end of the printing plate, a clamping screw disposed radially with its head within the body of the ring, said ring having an opening affording access to the head of the clamping screw, said ring having a diameter slightly smaller than that of the cylinder and plate so that the ends of the ring exert a radial pressure when using only a single radial clamp screw at the middle of the clamp, and said ring having an inward radial bead near its outer edge such that the aforesaid clamp screw causes the ends of the clamp to move axially outward to stretch the axially directed edges of the printing plate, there being four such clamps for a printing cylinder intended to receive two printing plates.

7. A clamp for mounting a flexible printing plate on a printing cylinder having stepped ends, said clamp being a semicircular ring of heavy section fitting in the stepped end of the cylinder and having a thin semicylindrical lip dimensioned to be received over one end of the printing plate, retainers to limit sliding movement of the clamp in axial direction to an amount which brings the lip off the plate in order to release the plate, a clamping screw disposed radially with its head within the body of the ring, said ring having an opening affording access to the head of the clamping screw, said ring having a diameter slightly smaller than that of the cylinder and plate so that the ends of the ring exert a radial pressure when using only a single radial clamp screw at the middle of the clamp, and said ring having an inward radial bead near its outer edge such that the aforesaid clamp screw causes the ends of the clamp to move axially outward to stretch the axially directed edges of the printing plate, there being four such clamps for a printing cylinder intended to receive two printing plates.

8. In combination, a printing cylinder, two flexible printing plates and four clamps for mounting said flexible printing plates on said printing cylinder, each clamp comprising an arcuate ring of heavy section having a thin arcuate lip dimensioned to be received over one end of the printing plate, said ring being about a half circle long, and a clamping screw disposed radially about midway between the ends of the ring, said ring having a diameter slightly smaller than that of the cylinder and plate so that the ends of the arcuate ring exert a radial pressure when using only a single radial clamp screw at the middle of the clamp.

9. A clamp for mounting a flexible printing plate on a printing cylinder, said clamp comprising an arcuate ring of heavy section having a thin arcuate lip dimensioned to be received over one end of the printing plate, retainers to limit sliding movement of the clamp in axial direction to an amount which brings the lip off the plate in order to release the plate, and a clamping screw disposed radially, said ring having an opening for the clamping screw affording the aforesaid axial movement of the clamping screw after loosening but without removal of the clamping screw.

10. In combination, a printing cylinder, two flexible printing plates and four clamps for mounting said flexible printing plates on said printing cylinder, each clamp comprising an arcuate ring of heavy section having a thin arcuate lip dimensioned to be received over one end of the printing plate, said ring being about a half circle long, retainers to limit sliding movement of the clamp in axial direction to an amount which brings the lip off the plate in order to release the plate, and a clamping screw disposed radially about midway between the ends of the ring, said ring having a diameter slightly smaller than that of the cylinder and plate so that the ends of the arcuate ring exert a radial pressure when using only a single radial clamp screw at the middle of the clamp.

11. A clamp for mounting a flexible printing plate on a printing cylinder, said clamp comprising an arcuate ring of heavy section having a thin arcuate lip dimensioned to be received over one end of the printing plate, retainers to limit sliding movement of the clamp in axial direction to an amount which brings the lip off the plate in order to release the plate, and a clamping screw disposed radially, said ring having a diameter slightly smaller than that of the cylinder and plate so that the ends of the ring exert a radial pressure when using only a single radial clamp screw at the middle of the clamp, said ring having an inward radial bead near its outer edge such that the aforesaid clamp screw causes the ends of the clamp to move axially outward to stretch the axially directed edges of the printing plate.

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