Jan. 17, 1956 L. F. MITCHELL 2,730,949

CLAMP FOR MASTER SHEETS OF PRINTING MACHINE

Filed July 30, 1954 3 Sheets-Sheet 1

FIG -1

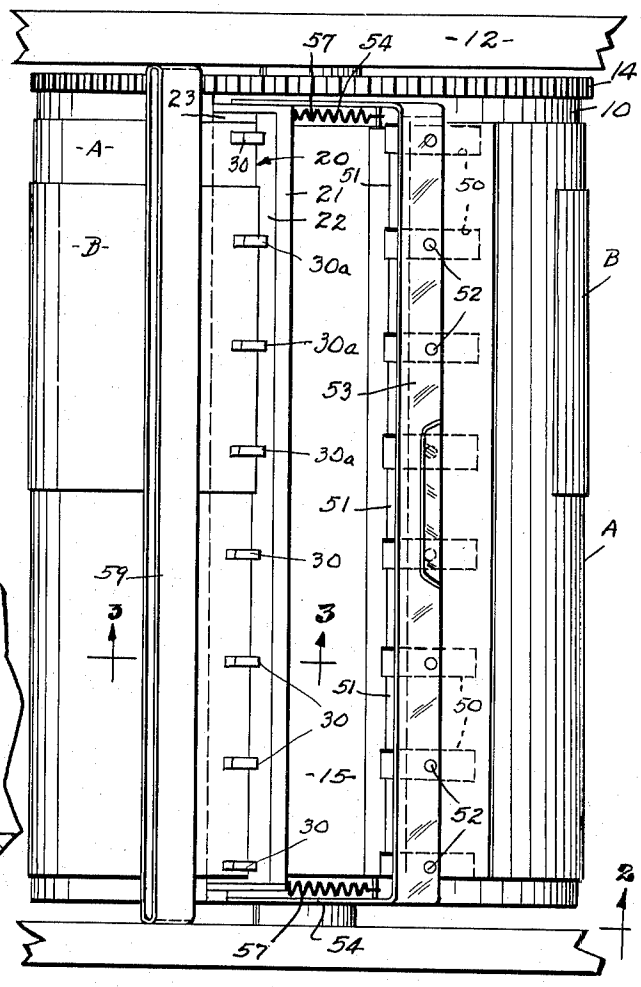
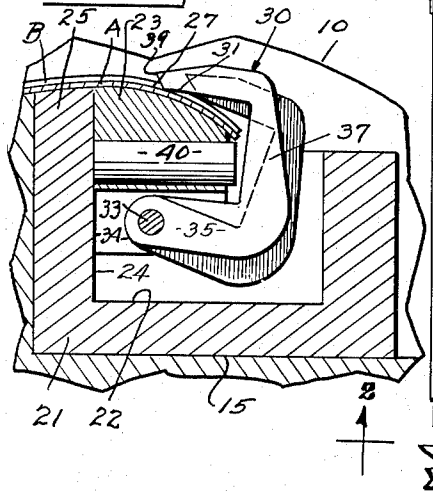



FIG - 6



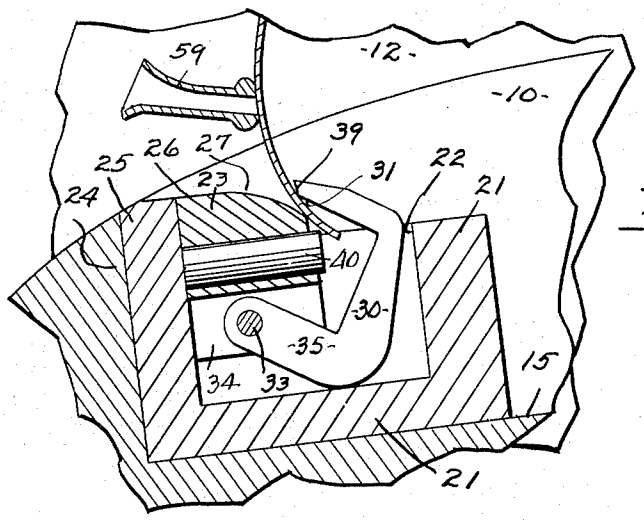




FIG - 7

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Jan. 17, 1956 L. F. MITCHELL 2,730,949

CLAMP FOR MASTER SHEETS OF PRINTING MACHINE

Filed July 30, 1954 3 Sheets-Sheet 2

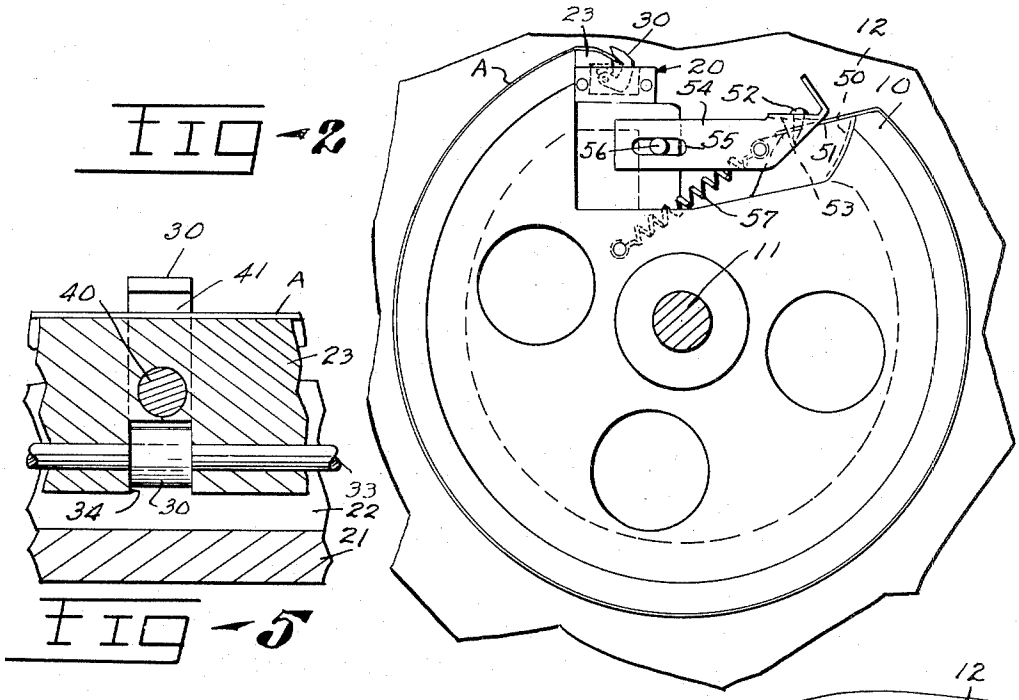



FIG-2

FIG-5

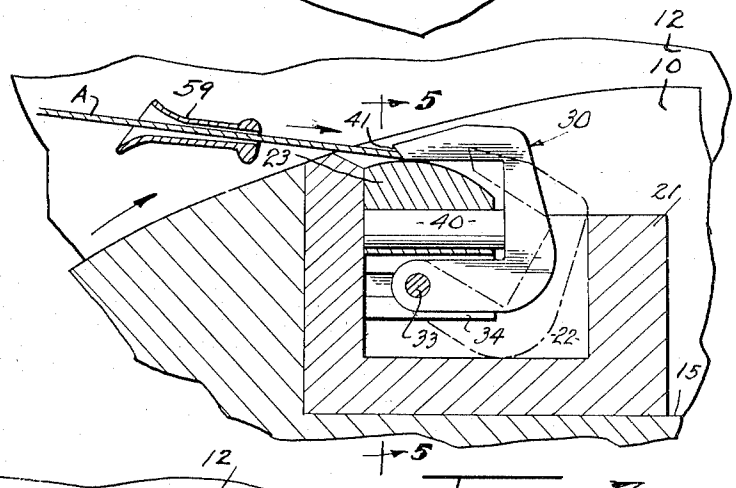



FIG-3

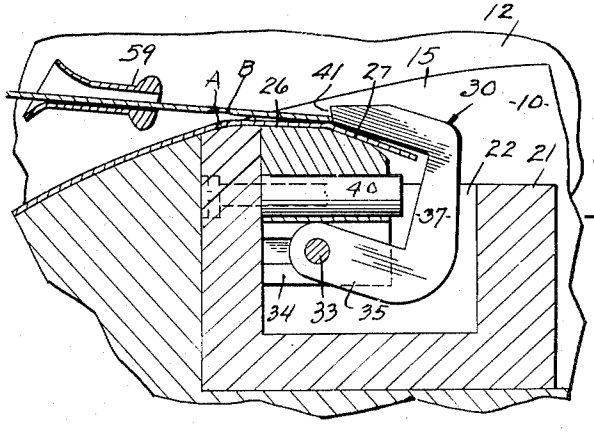



FIG-4

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Jan. 17, 1956 L. F. MITCHELL 2,730,949

CLAMP FOR MASTER SHEETS OF PRINTING MACHINE

Filed July 30, 1954 3 Sheets-Sheet 3

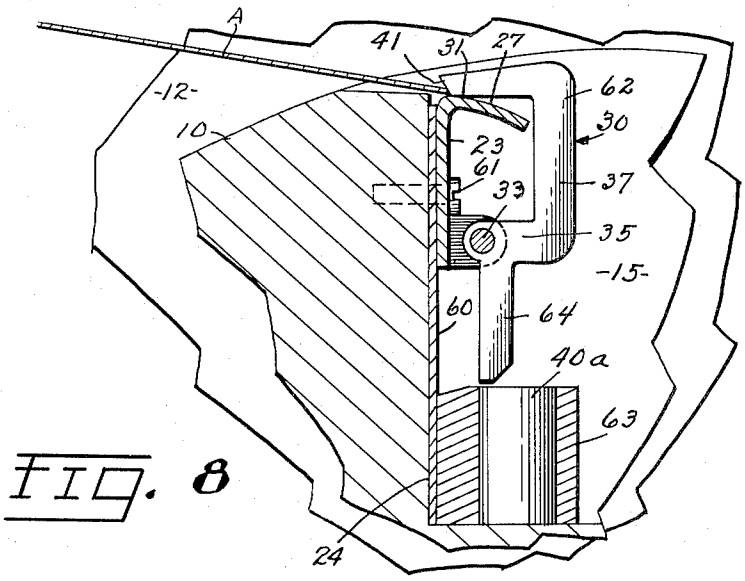



FIG. 8

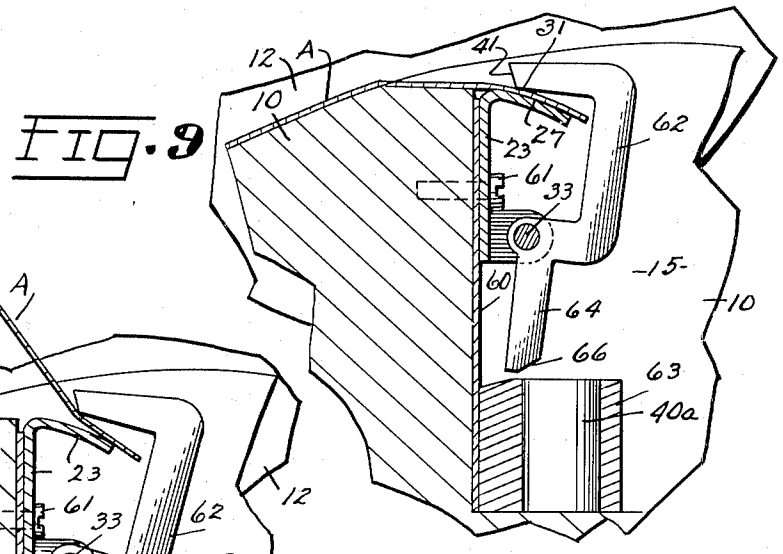



FIG. 9

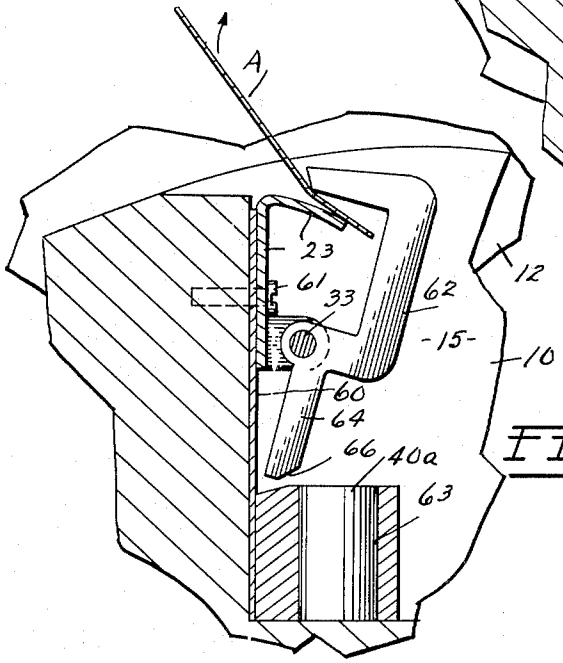



FIG 10

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2,730,949

# CLAMP FOR MASTER SHEETS OF PRINTING MACHINE

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Application July 30, 1954, Serial No. 446,885

9 Claims. (Cl. 101—415.1)

This application is a continuation in part of my prior application filed January 22, 1952, and assigned Serial No. 267,530, now abandoned.

This invention relates to improvements in or relating to devices for securing the ends of a printing plate or master sheet on the drum or cylinder of a rotary printing machine. More particularly, the invention is concerned with the provision of a clamping device which will facilitate rapid mounting of the leading end of a thin flexible printing plate on the drum or cylinder of a rotary printing machine and the subsequent removal thereof without manipulation of thec lamping device. Further, the invention is concerned with the provision of an improved clamping device which will accurately position and secure one end of a thin flexible printing plate to the periphery of a printing drum without damage to the plate, and in a manner which will permit the plate to be readily removed without manipulation of the clamping device or damage to the plate. These therefore are the general objects of the present invention.

A further object of the invention is to provide an improved clamping device for clamping one end of a thin flexible printing plate to the periphery of a printing drum in a manner which will permit a second narrow printing plate to be superimposed on the first plate and held in position by the same clamping mechanism without diturbing the position of the previously clamped plate.

Another object of the present invention is to provide a clamp for positioning the leading edge of a thin flexible metal or paper printing plate to the drum of a rotary printing machine by engaging the leading edge of the plate with one or more clamping members which are yieldingly urged into clamping position in such manner that the clamping pressure increases as the clamps move into position and decreases as the clamps move away from clamping position to disengage the plate.

According to the present invention there is provided a printing drum having an axially extending recess formed in its periphery and in which an anvil and one or more master sheet or printing plate clamping members are mounted, each clamping member being movable to and from wedging engagement with a master sheet inserted between the anvil and such members, there being magnetic means acting to move the clamping members individually toward the anvil. Further according to the invention, means are provided whereby the movement of the clamping members from the anvil is restricted to retain them in the magnetic field of the magnetic means.

In the drawings,

Fig. 1 is a fragmentary plan view of a printing machine having a printing drum equipped with the improved printing plate or master sheet clamping mechanism;

Fig. 2 is a transverse section, as indicated by the lines 2—2 on Fig. 1, and illustrates the printing drum and clamping mechanism in end elevation;

Fig. 3 is a sectional view, on an enlarged scale, illustrating the clamping mechanism in position to receive a printing plate, the plane of the section being indicated by the line 3—3 on Fig. 1;



Fig. 4 is a sectional view similar to Fig. 3 but illustrating a second printing plate about to be superimposed upon a previously positioned plate;

Fig. 5 is a sectional detail, the plane of which is indicated by the line 5—5 on Fig. 3;

Fig. 6 is a sectional view, similar to Fig. 4, but illustrating the position of the clamping device after the second printing plate has been inserted;

Fig. 7 is a sectional view similar to Figs. 3, 4 and 6, illustrating the removal of a printing plate from the clamping mechanism; and

Figs. 8, 9 and 10 are enlarged sectional details similar to Figs. 3, 4 and 7 but illustrating a modified clamping device.

Referring now to the drawings, particularly Figs. 1 and 2, the improved clamping device is illustrated as being mounted on a printing drum or cylinder **10** carried by a shaft **11** which is suitably supported by a pair of spaced frame members **12**. The drum **10** may be rotated by a driving mechanism, not shown, but which coacts with a gear **14** secured to one end of the drum. The drum **10** has an axially extending slot or recess **15** formed in its periphery in which the improved clamping device is mounted.

The improved clamping device **20**, as shown in Figs. 1 to 7 inclusive, includes an elongated channel-like support **21** which is secured to the drum **10** within the recess **15** with its flanges upstanding to provide an upwardly facing recess **22** which extends axially of the drum adjacent to but below the periphery thereof. An anvil **23** comprising an elongated bar extends axially of the drum and is secured to the upstanding flange **25** of the support which lies adjacent the surface **24** of the drum recess. The upper surface of the flange **25** provides a bridging surface between the periphery of the drum and the upper surface **26** of the anvil. The anvil surface **26** recedes from the periphery of the drum and terminates in an inwardly curved surface **27** extending axially relative to the drum.

A plurality of individually axially spaced C-shaped clamping members **30** are pivotally mounted on the anvil **23**. One end of each member **30** provides a clamping surface **31**. As illustrated in Fig. 5, the underside of the anvil **23** is provided with a plurality of longitudinally spaced narrow clamp receiving slots **34** into which the other ends **35** of the clamping members **30** extend respectively. A bar or rod **33** extends through the anvil and the clamping members to provide an individual pivotal connection therebetween.

The pivot **33** is located relative to the axis of the curvature of the anvil surface **27** so that the swinging movement of each clamping member **30** about its pivot in a clockwise direction (Fig. 3) moves its clamping surface **31** away from the anvil surface **27** while movement in a counterclockwise direction moves such surface **31** into wedging engagement with the anvil surface **27**. The movement of the clamping members **30** away from the curved surface **27** of the anvil is limited by contact of such members with the support **21**.

The clamping members **30**, at all times, are yieldingly urged in a clamping or wedging direction, relative to the anvil **23**, by a series of permanent magnets **40**. Accordingly, the support **21** and the anvil **23** are made of nonmagnetic materials, that is materials either not noticeably attracted by magnetism or weakly attracted thereby, while the clamping members **30** are made of a magnetic material, that is, a material capable of being attracted by a magnet.

In the form illustrated in Figs. 3 to 7 inclusive, a magnet **40** is provided for each clamping member **30**. These magnets comprise relatively small cylindrical bars of lugs

of a material which when magnetized will have a high coercive force such as "Alnico." These magnets are mounted in suitable recesses formed in the anvil **23** and are retained therein by frictional engagement with the recess walls. The magnets **40** are positioned so that one end of each magnet faces the web portion **37** of a respective clamping member **30**. The magnets are of such strength as to readily move their respective clamping members into a wedging position with the anvil surface **27** or with a printing plate positioned thereon. As heretofore mentioned, the movement of the clamping members **30** away from the anvil is restricted by their engagement with the support **21**. This movement is so related to the strength of the magnet as to maintain the clamping members in the magnetic field of their respective magnets.

To facilitate the positioning of a printing plate in the clamp, the end surface **39** of the clamping end **31** of each member **30** is beveled to provide a surface which forms an acute angle with the surface of the anvil. This angle provides an entrance angle or throat **41** to receive the leading end of a printing plate. As shown in Fig. 3 a printing plate A is placed with the leading end thereof in the entrance angle or throat **41** formed between the surfaces **39** of the clamping members **30** and anvil surface **27**. The clamping members are then moved rearwardly, swinging in a clockwise direction about their pivots against the action of their respective magnets, merely by moving the sheet or printing plate in the direction of the arrow of Fig. 3. The plate A is moved in the direction of the arrow in Fig. 3 until its leading edge strikes the webs **37** of the clamping members, which webs form a stop for the printing plate. The plate then is drawn in the opposite direction. This movement of the plate is followed by the clamps **30** which are constantly drawn into wedging engagement with the plate, now atop the anvil, by the attraction of their respective magnets **40**. This causes the clamping members to wedge the plate A tightly against the anvil and prevent its withdrawal.

If desired, the opposite or trailing end of the printing plate may be secured to the drum by any suitable tensioning device. As indicated in the drawings the drum **10** is provided with a series of spaced slots **50** which extend into the wall of the drum adjacent the side of the drum recess **15** which lies opposite the clamp, and across which the trailing edge of the printing plate is positioned. The plate is held against the surfaces **51** of the drum between the recesses **50** by a series of pins **52** mounted in an axially extending bar **53**, the ends of which are provided with extensions **54**. Each extension **54** is provided with a slotted opening **55** (Fig. 2) to receive a respective pin **56** which extends axially from the opposite end of the drum. Suitable springs **57** interposed between the bar **53** and the drum **10** retain the bar in position adjacent the drum surface and at the same time draw it inwardly, whereby the pins **52**, which have been forced through the trailing end of the printing plate, draw the plate tightly across the drum surface and maintain it tensioned.

If desired, a slotted guide **59** may be provided to guide the printing plate into the throat **41** formed between the clamping members **30** and the anvil **23**. This guide **59** may be secured to the frame members **12** to extend parallel with the axis of the drum with its inner end spaced from the periphery thereof. This member is positioned to guide the printing plate A into the bite of the anvil **23** and clamping fingers **30** when a suitable indicator mark on the drum has been aligned with a similar mark on the frame.

When it is desired to remove the plate from the drum, the trailing end of the plate is released by raising the trailing end clamping bar **53** from engagement with the plate. For this purpose the operator grasps a suitable arm **58** and moves the bar **53** outward against the action of its springs **51**, thus freeing that end of the plate. The operator then grasps the free end of the plate, turns the drum in a counter-clockwise direction, and strips the plate from the drum. As the drum is so turned the plate itself swings the clamping fingers **30** about their pivots, thus releasing the wedging action between the fingers and the anvil and permit the plate to be readily withdrawn from the clamp.

As heretofore mentioned it is preferred that a series of individually movable, spaced clamping members **30** be used. Accordingly, when the plate A has been clamped to the drum, a narrow plate B may be positioned to overlie portions of the plate A by inserting one end of the plate B between the plate A and certain of the clamping members, as for instance the clamping members **30***a*. This is accomplished without disturbing the other clamping members which maintain the position of the main plate A. This facilitates the use of supplemental master plates to supply data in addition to that on the main plate. Likewise, the supplemental plate may be blank so that it may be used to eliminate part of the data on the main plate A. The supplemental plate B is inserted and removed in the same manner as heretofore described in connection with the main plate A.

It is to be noted that when the clamping members **30** are moved in a plate releasing direction they move away from their respective magnets **40**. Accordingly the forces acting on the clamping members **30** decreases as such members are moved in a plate releasing direction. This is an important feature of this invention as it permits a thin paper or metal foil printing plate to be removed from the clamp other than that imparted to it by the plate. This introduction and removal of the printing plate is accomplished quickly and without damage to the plate. These are important advantages in instances where a small number of copies are to be made of each of a number of printing plates. In such instances it is often customary to omit the use of a clamp for the trailing end of the plate, which, combined with the use of the clamp of this invention enables the printing plates to be changed in a minimum length of time.

Figs. 8, 9 and 10 illustrate a modified form of the invention. This form is similar in many respects to that heretofore described. Accordingly, the same references will be given similar or identical parts. In this modified form the anvil **23** is formed of sheet metal and is secured to a support **60**, which in this instance, comprises a relatively thin metallic plate. The support **60** is secured to the wall **24** of the drum recess **15** as by bolts **61**.

The clamping members **62**, like the members **30** heretofore described, comprise a series of C-shaped members which are individually pivoted on a rod **33** carried by the anvil **23**. These clamping members are yieldingly urged into their clamping positions by a series of individual magnets **40***a*. The magnets **40***a* are mounted in an elongated bar of non-magnetic material **63** which is secured to the support **60** some distance below the clamping members **62**. These magnets, like those heretofore described are cylindrical. However they are mounted with their axes extending in a radial direction, to the rear and below the pivots **33** of the clamping members. As shown in Fig. 8 each clamping member has a downwardly extending leg **64** which extends from a point adjacent its pivotal connection with the rod **33** to a point slightly above the respective magnet **40***a*. When there is no printing plate between the clamping members **62** and the anvil **23**, the magnets **40***a* just overlay the edges of their respective magnets. As the members **62** are moved to their open positions, shown in Fig. 10, the lower ends of the legs **64** thereof swing across the tops of the magnets toward the support **60** so that they overlay the bar **63**. These legs **64** abut the support before they leave the field of force of their respective magnets **40***a*.

The modified form, like that first described, is so arranged that the effect of the magnets on their respective clamping members decreases as the clamping members

move from a clamping to an open position, and increases as they return to their clamping positions. The modified form permits the use of comparatively strong magnets and so positions them that the printing plates cannot project between the magnets and their clamps when being introduced into the clamps thereby avoiding any possible interference thereby with the clamping forces. Further the modified form permits the magnets to be mounted closer to axis of the printing cylinder to which the clamp is applied and thereby minimizes the centrifugal force of the rotating cylinder.

From the foregoing it will be seen that the present invention provides a simple and efficient device for clamping the leading end of a printing plate to a printing drum, and which device is readily applied to the drum of a rotary printing machine. The movable members of the device are so positioned that the centrifugal force developed by the rotation of the drum acts to bring the clamping member to a closed position. Further, the arrangement is such that a relatively small force is required to move the members to clamping position and such force decreases as the clamping members move to an open position thereby avoiding possible damage to the plate even when the printing plate is inserted and removed from the clamping device without manipulation of the device other than by the plate itself.

I claim:

1. A clamping device for securing a thin flexible printing plate on the periphery of a printing machine cylinder having an axially extending recess formed in its peripheral surface, said device comprising a support mounted in said recess and made of a non-magnetic material, said support having a surface on which one end of a printing plate may be positioned, a plate clamping member mounted in said recess for movement to and from wedging engagement with said surface whereby a printing plate positioned thereon may be wedgingly held in position on said surface by said clamping member, a second member carried by said support and coacting with said first named member to constantly tend to yieldingly move said clamping member toward a wedging position, one of said members being a permanent magnet, the other of said members being formed of a material magnetically attractable relative to the magnet and wherein said members are positioned relative to each other and to said surface to cause the force of the magnetic attraction to increase as the clamping member moves toward wedging position and to decrease as the clamping member moves from wedging position.

2. A clamping device according to claim 1 in which the second named member is a permanent magnet and is fixed relative to said support.

3. A clamping device according to claim 1 having a row of axially spaced individually movable clamping members.

4. A clamping device according to claim 3 in which the clamping members are made of a magnetically attractable material and there is an individual permanent magnet for each clamping member.

5. A clamping device according to claim 4 wherein each clamping member has a surface extending at an acute angle from its contact with the said support surface to provide a bite or entrance angle into which the end of a printing plate may be moved and wherein continued movement of the printing plate may cause the plate to move the clamping members away from the clamping position and wherein the forces opposing such movement decrease with opening movement of the clamp.

6. A clamping device for securing one end of a thin flexible printing plate on a rotary printing drum having an axially extending recess formed in its periphery, said device comprising an axially extending anvil mounted in said recess and made of a non-magnetic material, said anvil having a printing plate supporting surface and a series of axially spaced inwardly facing transverse slots, a series of spaced cylindrical magnets mounted in said anvil above and parallel with respective slots, a plurality of C-shaped clamping members, each member having one end extending into a respective slot and pivotally connected to the anvil for movement in a plane parallel with the slot, each member extending outwardly and upwardly from the slot across the path of magnetic flux of the respective magnet and having its other end overlaying the end of a printing plate positioned on said anvil surface, said members being made of a magnetic material whereby the magnets act to yieldingly urge them into contact with such printing plate, non-magnetic means to limit the movement of the members away from the anvil, and wherein the last-named end of each clamping member has a surface forming an acute angle with the upper surface of the anvil to provide a bite to receive a printing plate.

7. A clamping device for securing one end of a thin flexible printing plate to the drum of a rotary printing machine having an axially extending recess in its periphery, said clamping device comprising an axially extending anvil mounted in said recess and made of non-magnetic material, said anvil having an outwardly facing printing plate supporting surface having a free edge projecting into said recess, a plurality of axially aligned C-shaped clamping members having lower arm portions pivotally connected beneath said anvil for independent pivotal movement about an axially extending axis relative to said drum, said members being made of a magnetic material and extending from their pivots around the free edge of said anvil and having upper arm portions overlaying said plate supporting surface and movable to and from wedging engagement with the end of a printing plate supported by such surface, each of said clamping members having a downwardly extending leg projecting toward the axis of said drum, a support of non-magnetic material secured to said drum within said recess and spaced below said legs, a plurality of permanent magnets mounted in said support with their magnetic axes extending substantially radially relative to said drum, said magnets being so positioned relative said clamp legs that the latter swing substantially across one pole of a respective magnet as they rock about their pivots and to cause the magnetic force to act at all times to rock said members into clamping position, and wherein the force of said magnets acting on said members increases as the members move into clamping position and decreases as said members are moved away from clamping position.

8. A clamping device according to claim 4 wherein said support has an arcuate plate supporting surface and each clamping member comprises an individual C-shaped member made of magnetically attractable material one end of which is pivotally connected with the support below said surface and the other end of which projects above said surface and is adapted to contact a printing plate on said surface, and wherein said magnets comprise cylindrical members and are mounted in said support with one end projecting toward a portion of its respective clamping member intermediate the ends thereof.

9. A printing plate clamping device according to claim 8 having means to limit the movement of the clamping members away from the plate supporting surface of said support and retain them in the magnetic field of said magnets.

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