United States Patent

Welch, Jr.

[15] **3,670,646**

[45] **June 20, 1972**

[54] MAGNETICALLY SECURABLE PRINTING PLATE

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[73] Assignee: **W. R. Grace & Co.**

[22] Filed: **Oct. 9, 1970**

[21] Appl. No.: **79,606**

[52] **U.S. Cl.** .....**101/382 MV**, 24/73 NM, 101/415.1, 248/206 A, 402/503

[51] **Int. Cl.** **B41f 27/02**, B41f 27/12

[58] **Field of Search** .....101/382 MV, 415.1; 24/73 NM; 248/206 A; 40/142 A; 402/503

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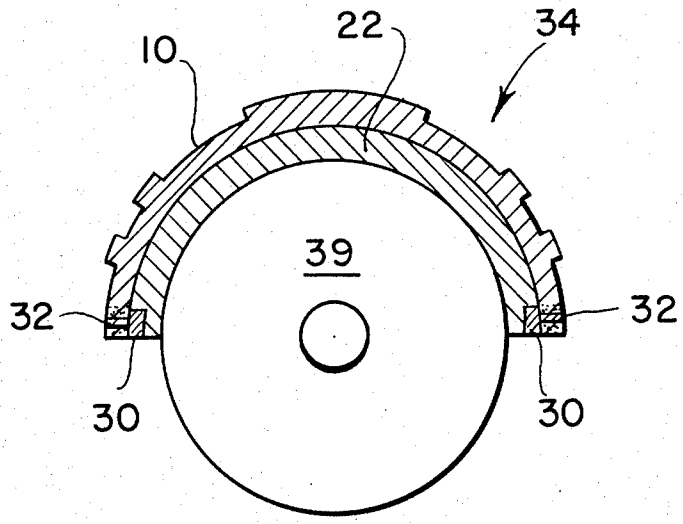
Primary Examiner—Clyde I. Coughenour

Attorney—Eugene M. Bond and Kenneth E. Prince

[57] **ABSTRACT**

The invention disclosed is directed to a flexible printing plate having magnetic particles disposed in nonprinting regions thereof and to a method for removably securing the plate to a printing press element having magnetic means associated therewith. Also disclosed is a printing press saddle having magnetic means for cooperating with the printing plate disposed magnetic particles to removably secure the plate to the saddle for printing use. The present invention provides an effective means for rapidly replacing printing plates used in high-speed printing operations.

1 Claim, 17 Drawing Figures



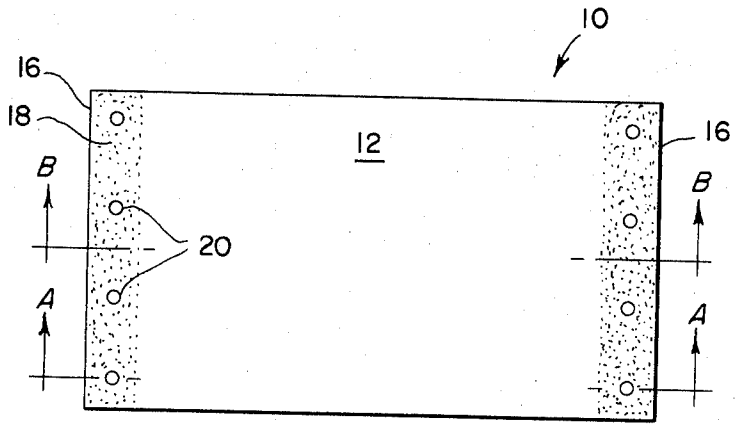


FIG. 1

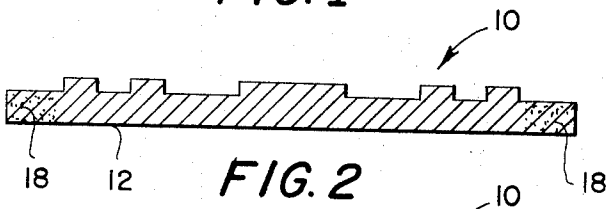


FIG. 2

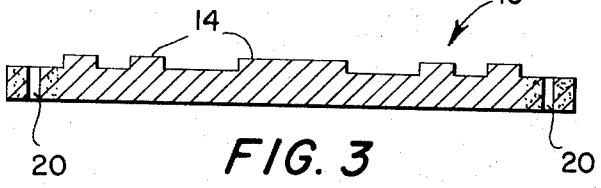


FIG. 3

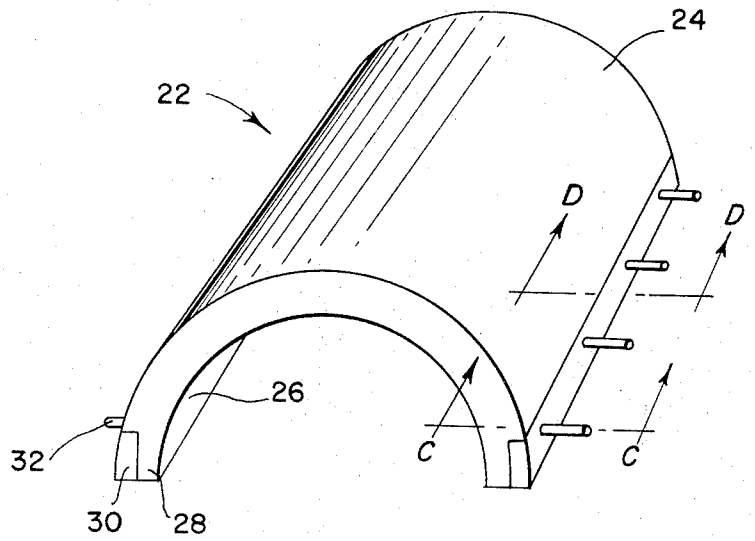


FIG. 4

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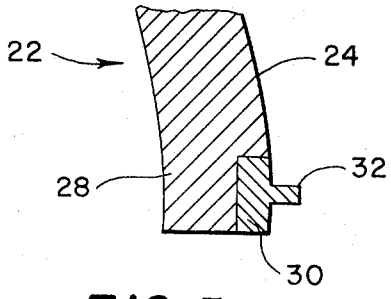

FIG. 5

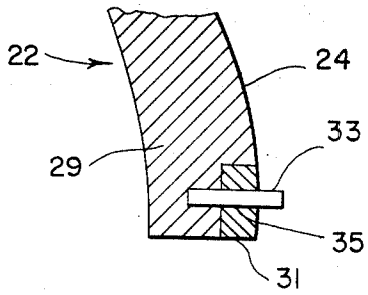

FIG. 6

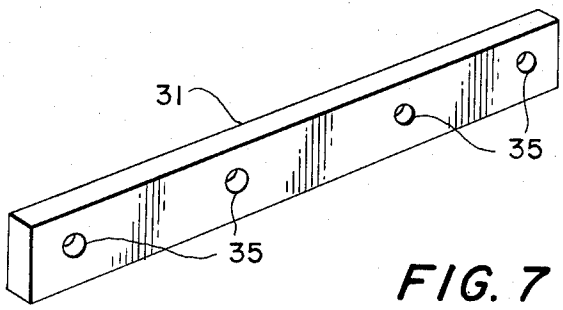

FIG. 7

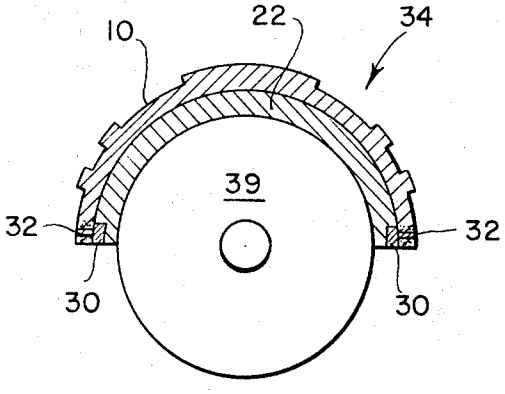

FIG. 8

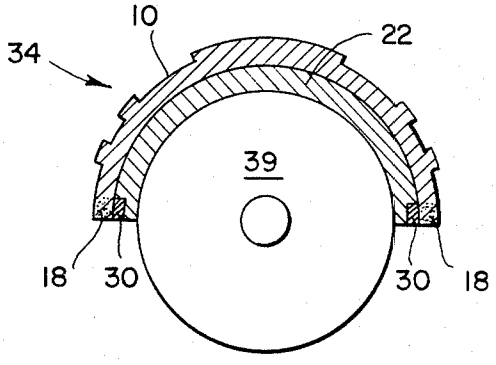

FIG. 9

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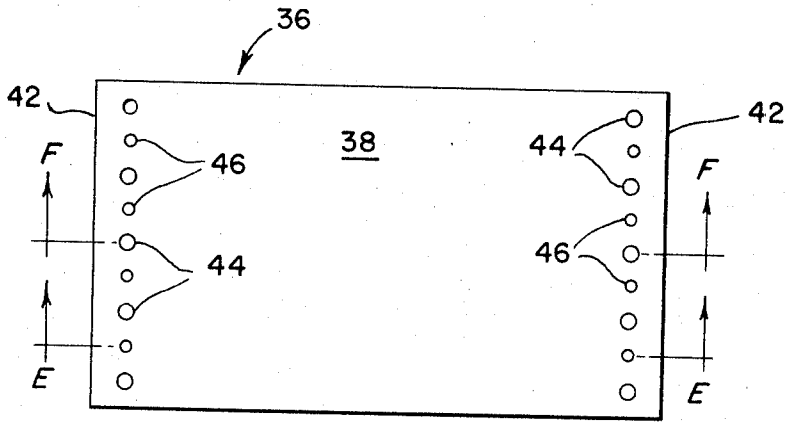

FIG. 10

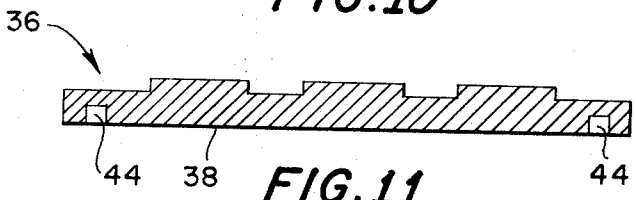

FIG. 11

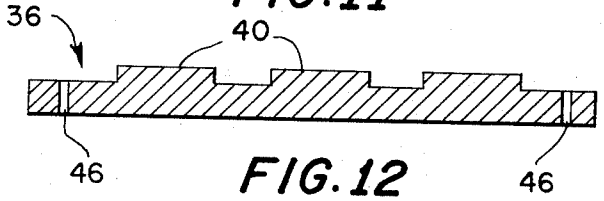

FIG. 12

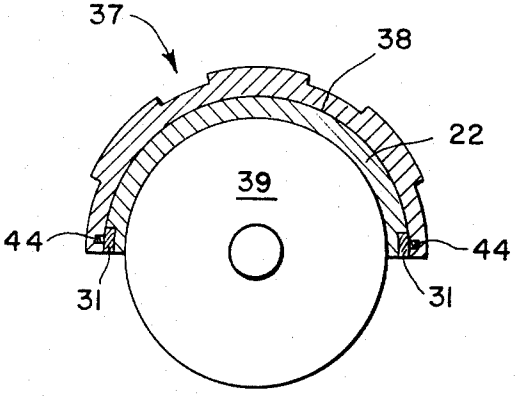

FIG. 14

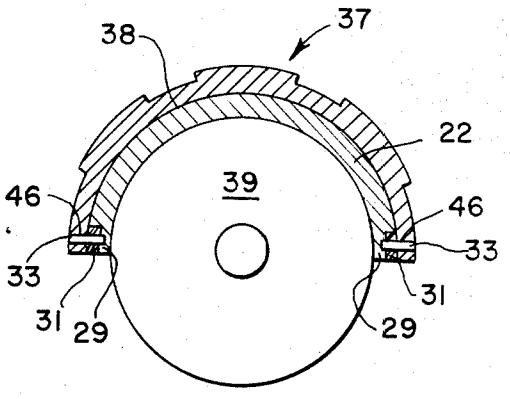

FIG. 13

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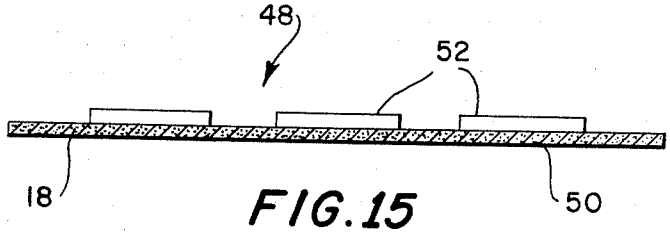

FIG. 15

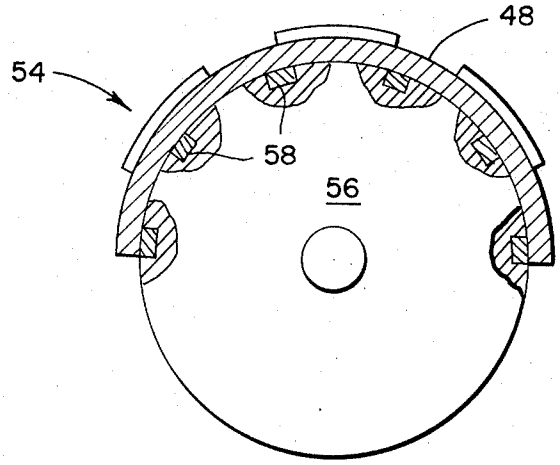

FIG. 16

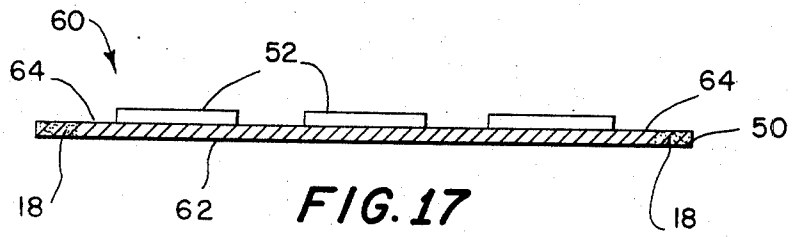

FIG. 17

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MAGNETICALLY SECURABLE PRINTING PLATE

The present invention relates to a flexible printing plate which includes magnetic particles in non-printing regions thereof, to a printing press saddle having magnetic means for cooperating with the printing plate and to a method for removably securing the plate to a printing press element for use in printing.

Flexible printing plates and methods for securing these plates to printing presses are known in the art. Known means for securing plates to presses involve, for example, the use of vacuum, adhesives and mechanical fasteners. These and other means are of questionable practicability due to cumbersome or inefficient design, construction, and use requirements. The securing methods of the prior art oftentimes are tedious, time-consuming and, in some instances, even damaging to the plates and associated supporting devices.

U.S. Pat. No. 3,217,641 to Goffredo discloses a flexible printing plate which may be formed of various molded or cast resins having magnetic powder or small magnets suspended therein. The Goffredo patent teaches a plate having substantially uniform lengthwise and widthwise distribution of magnetic powder in the plate with the powder concentrated at the printing surface of the plate. Although the printing plate taught in U.S. 3,217,641 offers several advantages over various other prior art methods for securing printing plates to printing presses, as a practical matter there are certain disadvantages in use and preparation thereof. Concentrating magnetic powder at the printing surface of the plate, as taught in U.S. 3,217,641, creates a tendency for abrasive destruction of a paper web or the like which may be contacted with the magnetic powder during a printing operation. Preparation of the Goffredo plate includes pouring over a matrix a resin mass having magnetic powder initially dispersed across a thickness of the resin mass. Thereafter a strong magnet included in a table specially equipped therewith is used to cause migration of the magnetic powder through the resin thickness to concentrate the powder near the printing surface of the ultimately thermoset resin plate. The resulting planar uniformity of magnetic powder distribution renders the area density of magnetic force substantially everywhere equivalent throughout a supported surface of the plate. A disadvantage of the U.S. 3,217,641 plate is therefore apparent with respect to use on rotary printing presses where the greatest impact stress typically occurs at transverse edges of the printing plate, particularly at a leading edge which may cyclically first contact a newspaper web or other material to be printed in a rotary printing operation. Where magnets are included in a plate in accordance with another teaching of the Goffredo patent, the printing plate may tend to retard transfer of increasingly popular magnetic ink to a surface to be printed.

It has now been found by practice of the present invention that incorporation of magnetic particles in non-printing areas of a printing plate provides an improved means for securing the printing plate to a printing press. The present invention provides an excellent means for securely fastening a printing plate to a printing press in readily adjustable printing register therewith, rapid removal of the plate from the press, and ease of adaption of existing printing presses to use recently developed thin flexible printing plates. In an embodiment, the present printing plate includes a dispersion of magnetic particles localized near edges thereof whereby there is provided, for a given amount of magnetic particles, improved resistance to first-contact stresses such as may be developed near a leading edge of the present plate when used for printing with rotary presses. For the aforesaid and other reasons, practice of the present invention overcomes many of the prior art disadvantages, while the present printing plate may be simply and efficiently prepared without sacrificing the effective utility thereof.

Generally stated, the present invention provides a flexible printing plate including magnetic particles in non-printing regions thereof for removably securing the plate to a printing press element for printing use. This invention further provides

a printing press saddle for supporting the printing plate in use. The saddle includes magnetic means for cooperating with the printing plate disposed magnetic particles to removably secure the printing plate in combination with the saddle for printing. The invention also provides an effective method for removably securing the present printing plate to a printing press element having magnetic means, associated therewith, such as the present saddle.

The present printing plate may be composed of, for example, rubber, metal, plastic or polymeric material. Other materials which are compatible with magnetic particles, when formed into a printing plate, may also be used. In an embodiment, the plate is formed from photocurable composition.

The present printing plate may be formed, generally, by photocuring, molding, casting or other forming means known in the art, and may be for letterpress, letterset, lithographic, or other printing methods and variations thereof.

Magnetic particles are included in the present printing plate to provide a means for readily and removably securing the plate to a printing press for use. The particles may be distributed throughout non-printing portions of the plate. Alternatively the particles may be localized in suitable segments of non-printing portions of the plate. For use on a rotary printing press, it is generally preferred to use an embodiment plate having relatively high concentration of magnetic particles localized near transverse edges of the plate. Inclusion of the particles may be effected at any suitable stage of formation of the plate; i.e., the particles may be incorporated into a previously formed plate, in material prior to the time at which a plate is to be formed therefrom, or at such other suitable stage as may be desired.

In an embodiment of the present printing plate, a flexible relief printing plate is formed of a liquid photocurable composition having magnetic iron shavings particularly dispersed in the composition.

The invention will be further understood by referring to the following detailed description taken in connection with the accompanying drawings wherein like numerals refer to similar elements throughout the several views.

FIG. 1 is a bottom plan view of an embodiment of the present flexible printing plate;

FIG. 2 is a sectional elevation view of the embodiment flexible printing plate of FIG. 1 taken at line B—B thereof;

FIG. 3 is a sectional elevation view of the embodiment flexible printing plate of FIG. 1 taken at line A—A thereof;

FIG. 4 is a pictorial view of an embodiment of the present printing press saddle;

FIG. 5 is an enlarged partial view of an embodiment of an edge of the saddle of FIG. 4 in sectional elevation taken at line C—C thereof;

FIG. 6 is an enlarged partial view of another embodiment of an edge of the saddle of FIG. 4 taken at line C—C thereof;

FIG. 7 is a pictorial view of a magnet for use in the FIG. 6 saddle edge embodiment;

FIG. 8 is a sectional elevational view of the embodiment plate of FIG. 1 in flexed configuration and in removably secured assembly with the saddle of FIG. 4, wherein the combination of plate and saddle is shown mounted on a printing press cylinder and the plane of the sectional view includes line A—A of the plate and line C—C of the saddle;

FIG. 9 is a sectional elevation view of the embodiment plate of FIG. 1 in flexed configuration and in removably secured assembly with the saddle of FIG. 4, wherein the combination of plate and saddle is shown mounted on a printing press cylinder and the plane of the sectional view includes line B—B of the plate and line D—D of the saddle;

FIG. 10 is a bottom plane view of another embodiment of the present flexible printing plate;

FIG. 11 is a sectional elevation view of the embodiment flexible printing plate of FIG. 10 taken at line F—F thereof;

FIG. 12 is a sectional elevation view of the embodiment flexible printing plate of FIG. 10 taken at line E—E thereof;

FIG. 13 is a sectional elevation view of the embodiment plate of FIG. 10 in flexed configuration and in removably secured assembly with the saddle of FIG. 4, wherein the combination of plate and saddle is shown mounted on a printing press cylinder and the plane of the sectional view includes line E—E of the plate and line C—C of the saddle;

FIG. 14 is a sectional elevation view of the embodiment plate of FIG. 10 in flexed configuration and in removably secured assembly with the saddle of FIG. 4, wherein the combination of plate and saddle is mounted on a printing press cylinder and the plane of the sectional view includes line F—F of the plate and line D—D of the saddle;

FIG. 15 is a sectional elevation view of yet another embodiment of the present flexible printing plate;

FIG. 16 is a sectional view of the embodiment plate of FIG. 15 in removably secured assembly with a printing press cylinder; and

FIG. 17 is a sectional elevation view of still another embodiment of the present flexible printing plate.

In FIGS. 1–3 there is shown rectangular flexible printing plate 10 having bottom 12, top-disposed printing regions appearing as relief printing surfaces 14 and oppositely dis-posed edge regions 16. Printing plate 10 may be of any convenient size such as, for example, a standard 14 ½ × 21 ¾ inches found suitable in the newspaper printing industry. A plurality of magnetic particles appearing as shavings 18 are included in the plate in non-printing narrow band regions such as within about 1 inch adjacent to edges 16. The magnetic shavings are included for magnetic lock-up of the plate with a printing press element having magnetic securing means associated therewith. A number of spaced holes 20 are desirably included for receiving register pins which may be mounted in an element of a printing press with which plate 10 may be used.

A shown in FIGS. 1–3, magnetic shavings 18 are typically dispersed transverse a thickness of the embodiment illustrated by printing plate 10. The shavings may be concentrated near bottom 12 and may be entirely omitted from the top of the plate. For greater lock-up strength, it is desirable to include a high concentration of the shavings along or near bottom 12.

The magnetic shavings alternatively may be magnetic materials in the form of filings, splinters, slivers, whiskers, beads, variously shaped granules, combinations thereof and a variety of other shapes, as desired, having effective magnetic properties and a convenient size for incorporation with the printing plate without limiting plate formation or use properties. Magnetic materials effective herein include any material which is attracted by magnetic force. Among such materials there may be mentioned iron, steel, nickel, cobalt and alloys composed of ferro-aluminum, nickel, cobalt and iron.

Magnetic shavings, such as may be formed as by-products of metal lathe work and like machine shop operations on magnetic materials, are preferred herein for their ready availability and low cost. Such materials are often discarded as waste, and therefore may be used in the present printing plate and method with no increase in the cost thereof.

Printing plate 10 may be formed of a variety of materials which are compatible with magnetic particles and which are flexible when formed into the printing plate herein described. Printing plate 10 may be formed using such materials as a network or matrix in which magnetic particles are dispersed. These materials are hereinafter referred to as matrix materials for simplicity. The plate may be formed conveniently by incorporating iron shavings into such matrix materials as rubber, plastic, resins, polymers, photocurable compositions and the like. Such incorporation may be effected using any of various known methods for blending essentially non-plastic materials, such as iron shavings, with plastic or elastomeric materials such as rubber. The blend of matrix material and magnetic particles may then be distributed along opposite edges of the cavity of a mold for forming a printing plate. The balance of the cavity is then filled with a desired matrix material. A printing plate, having a blend of magnetic shavings dispersed in the matrix material at opposite ends of the plate, is thereafter formed using known molding procedures. The matrix material inserted in the balance of the cavity is typically of the same type matrix material used in the blended edges. However, other matrix materials which are compatible with the blend may be used.

The flexibility of printing plate 10 provides for versatility in use. The plate may be used with printing presses of varying shapes, including flat bed presses and plate cylinders for rotary presses.

Where portions of the remainder of this description relate to use of the present plate, reference is had to rotary printing presses using printing cylinders. Use of the present printing plate with other types and shapes of printing presses will be obvious to those skilled in the art having the benefit of this disclosure.

In FIG. 4 there is shown saddle 22 consisting of a rigid or semi-rigid material of uniform thickness and having a generally rectangular arcuate or shell shape adaptable for conforming to the shape of a printing cylinder. Saddle 22 includes outer arcuate surface 25 and edge regions 28 transversing widths of oppositely disposed saddle ends. The edge regions are formed having recesses therein for receiving magnets. Narrow rectangular bar magnets 30, having substantially the same size and shape as the recesses, are disposed in the recesses and transverse widths of the saddle. Each of magnets 30 is near outer surface 24 and includes a surface which substantially forms an extension of surface 24. The saddle includes a number of register pins 32 secured thereto and projecting radially outward therefrom at spaced intervals along magnets 30. The magnets may be secured to the saddle by any suitable means such as, for example, by threaded fasteners not shown. An efficient means in the use of register pins which are threaded on a portion thereof extending through the magnet and into the saddle. Alternatively, the magnets and the register pins may be formed in combination and the combination secured to the saddle by any suitable means.

In another embodiment, the register pins are secured to the saddle shell in a region other than recesses occupied by the magnets, and preferably proximate opposite saddle edges 28. In the several embodiments given, in this description, the pins preferably, but not necessarily, project radially outward from, and substantially normal to, the outer saddle surface wherein there may be a magnet surface forming an extension thereof. Other suitable register means may be used, as desired, provided such means do not render inoperative the magnetic securing means embodied herein.

In FIG. 5 a portion of a saddle, such as saddle 22, appears having edge region 28 fitted with register pins 32 formed in combination with bar magnet 30. The combination in turn is secured to the saddle by fastening means not shown.

In FIG. 6 a portion of a saddle, such as saddle 22, appears having edge region 29 fitted with bar magnet 31 having holes 35 disposed in the magnet transverse thicknesses thereof. Register pins 33 extend through holes 35 into the saddle shell. Register pins 33 are fastened to the shell by mechanical means such as engagement of pin thread means with cooperating shell thread means. The magnet may be secured to the saddle by any suitable means. One such means is by engagement of pin thread means with cooperating magnet thread means disposed in holes 35.

FIGS. 8–9 illustrate assembly 34 composed of printing plate 10, saddle 22 and rotary printing press cylinder 39. Printing plate 10 is removably secured to saddle 22 in register therewith by placing bottom 12 of flexible plate 10 adjacent saddle surface 24 with holes 20 aligned with and receiving register pins 32 as shown in FIG. 8. Pins 32 cooperate with holes 20 to maintain printing plate 10 in printing register with cylinder secured saddle 22. Typically the diameter of holes 20 and register pins 32 are substantially identical thereby tending to increase register precision. In the FIG. 8 illustration, saddle 22 includes the embodiment edge region described above with reference to FIG. 5.

Each of saddle **22** disposed magnet bars **30** is in close proximity with plate **10** disposed magnetic shavings **18**, as indicated in FIG. **8** and particularly in FIG. **9**. The resulting attractive force of each of bar magnets **30** on the adjacently dispersed magnetic particles such as shavings **18** thereby magnetically secures plate **10** to saddle **22**. The printing plate is indirectly secured to printing cylinder **39** by means connecting saddle **22** to printing cylinder **39** with saddle surface **26** adjacent the cylinder. A suitable means therefor is a conventional compression lock-up by contacting rings around the circumference of the cylinder with beveled arcuate edges of the saddle.

Typically, saddle **22** is essentially permanently secured to printing cylinder **39**, thereby, in effect forming a partial enlarged cylinder having radius equal to a combination of cylinder **39** radius plus a thickness of saddle **22**. In use a variety of interchangeable embodiments of the present printing plates may be readily and interchangeably secured to the cylinder mounted saddle using the present plate-saddle lock-up method. A first printing plate to be used for printing may be effectively secured to the cylinder-secured saddle by simply placing the plate on the saddle with the pins and holes aligned. At such time as it may be desired to change printing plates, the first plate may be removed from the saddle and a second plate inserted in place of the first plate, etc. The simplicity of the present inventive concept conveniently provides for such a change to be made with minor effort and with minimal interruption of printing operations.

Use of saddle **22** permits using thin embodiments of the present flexible printing plates with existing rotary presses designed for using thick stereotype plates known in the art.

FIGS. **10–12** illustrate another embodiment of the present flexible printing plate. There is shown flexible printing plate **36** of generally rectangular shape, including bottom **38**, top-disposed printing regions appearing as relief-printing surfaces **40**, and oppositely disposed edge regions **42**. A number of spaced holes **46** are desirably included in the plate for receiving register pins which may be mounted in a printing press cylinder or saddle. As thus far described, plate **36** is identical to plate **20** of FIGS. **1–3**. Plate **36**, however, has a number of magnetic wafers **44** disposed in bottom **38** thereof and spaced along two widths proximate opposite non-printing edges **42**. The magnetic wafers may conveniently have diameter from about 0.25 to about 1 inch and thickness from about 25 to about 100 percent of a thickness of plate **36** at the locality of the wafer. Preferably the diameter is from about 0.25 to about 0.50 inch and thickness is from about 25 to about 80 percent the plate.

The embodiment illustrated by flexible plate **36** is particularly useful where the plate is formed of aluminum or other flexible metal. Recesses of substantially the same size and shape as wafers **44** are provided in the plate as by adapting a mold in which an aluminum plate is to be formed, by drilling out, or by other suitable forming means. Thereafter magnetic wafers may be force fitted into the recesses.

Plate **36** may be used with saddle **22** in a manner similar to that described for plate **10**. In FIGS. **13–14** there is shown assembly **37** composed of printing plate **36**, saddle **22** and rotary printing press cylinder **39**. In FIG. **13**, saddle **22** is shown including edge embodiment **29** of FIG. **6**. Printing plate **36** is removably secured to saddle **22** in register therewith by placing bottom **38** to flexible plate **36** adjacent saddle surface **24** with holes **46** aligned with and receiving register pins **33**. Typically, diameters of holes **46** and register pins **33** are substantially identical for increased register precision.

Each of saddle **22** disposed magnet bars **31** abuts plate **36** disposed magnetic wafers **44**, as indicated in FIG. **14**. The resulting attractive force of each of bar magnets **31** on abutting magnetic wafers **44** thereby magnetically secures plate **36** to saddle **22**. Printing cylinder **39** supports saddle **22** in secured assembly therewith by suitable securing means not shown, thereby indirectly supporting and removably securing saddle-supported plate **36** to the cylinder.

Yet another embodiment of the present flexible printing plate is illustrated in FIG. **15** wherein there is shown, in sectional elevation, thin photocured printing plate **48** consisting of non-printing substrate **50** having relief printing surfaces **52** disposed thereon. The substrate comprises a matrix of photocured composition and a plurality of magnetic particles appearing as shavings **18** dispersed throughout the matrix. The plate may be formed by initially dispersing iron shavings or the like throughout any liquid photocurable composition which is suitable for forming a printing plate. Such compositions are known in the art and may be exemplified by those disclosed in French Pat. No. 1,471,432; and British Pats. Spec. Nos. 1,102,910 and 1,007,345. Generally, liquid photosensitive compositions are disclosed in the French patent include an unsaturated polyester, an ethylenically unsaturated monomer lending itself to a reaction of addition polymerization, and a photosensitizer. The British patents disclose a liquid composition consisting of a polyboron acid salt, a halide promoter which is dissociable by actinic light of wavelength between 2,500 A. and 7,000 A., and at least one substance capable of undergoing cationic polymerization, which composition is cationically polymerized on exposure to actinic light having a wavelength in the range 2,500 to 7,000 A.

After the shavings are dispersed throughout the photocurable composition, the thus formed dispersion may then be deposited in a substantially uniform thin layer onto a support surface adapted for non-adhesion to the dispersion composition in photocured form. For example, a support may be thus adapted by applying a film of silicone release agent thereto. Then the deposited dispersion composition may be photocured or the like using methods therefor known in the art. Thereafter photocurable composition, which may be adhered to photocured substrate **50** by photoexposing and which contains essentially no magnetic particles, may be coated onto photocured substrate **50**. Next, the substrate **50** disposed photocurable coating may be imagewise exposed to selectively photocure this layer, while simultaneously bonding selectively photocured printing region **52** to the substrate. Next, substrate **50** having the imagewise exposed layer disposed thereon may be removed from the support and the imagewise exposed layer may be developed into a printing plate by any of various suitable means such as are known in the art.

A plate thus formed, such as is symbolically illustrated by plate **48**, may be used by magnetically securing the plate to a saddle in a manner similar to that described for plate **10**. Alternatively plate **48** may be included in assembly **54**, where the plate is secured to, and in direct contact with, printing cylinder **56**. As shown in FIG. **16**, printing cylinder **56** is provided with a number of bar magnets **58** disposed in spaced relationship about the surface of the cylinder for securing plate **48**. Printing cylinder **56** may optionally include register pins not shown for cooperating with plate **48** disposed pin receiving holes not shown.

In another embodiment of the present printing plate a plate may be formed of a photocurable composition having magnetic particles dispersed in localized non-printing edge regions of the plate. Such a plate is illustrated by plate **60** shown in sectional elevation in FIG. **17**. Plate **60** is generally similar to plate **48** and may be formed using a modification of the forming method set forth for plate **48**. However, non-printing substrate **50** of plate **60** includes central section **62** and oppositely disposed edge regions **64** adjacent to section **62**. Edge regions **64** include magnetic particles appearing as shavings **18** dispersed therein. Non-magnetic printing areas **52** are disposed on substrate **50** adjacent central section **62**. Plate **60** may be formed by coating onto a support surface a thickness of blend of photocurable composition with dispersed magnetic particles and thereafter curing the blend. Next a desirable equivalent thickness of the photocurable composition, with no magnetic particles may be deposited on the support surface between edge regions **64** and thereafter photocured. Next, a coating of composition such as used in central section **62** may be applied to cured substrate **50**, and thereafter selectively ex-

posed and developed as described for plate **48** to effect non-magnetic printing areas **52** on substrate **50**. Edge regions **64** desirably include from about 30 to about 50 or even up to 75 percent by weight of magnetic particles for eminently suitable direct or indirect adherence of the plate to a printing cylinder in high speed heavy-duty rotary printing operations.

It is understood that the foregoing detailed description is given merely by way of illustration and that various modifications may be made therein without departing from the spirit or scope of the present invention.

What is claimed is:

1. A printing plate-saddle assembly which comprises in combination, a flexible printing plate and a saddle, said plate having holes dispensed near each opposite end thereof, said saddle having a magnet bar along each opposite end thereof, pins disposed essentially normal and outwardly projecting from each magnet bar for engaging said holes disposed near opposite ends of said printing plate, and magnetic particles disposed within the printing plate in non-printing areas in a strip along opposite ends of said printing plate about said holes, whereby the saddle magnet bars cooperate with magnetic particles disposed in a printing plate to removably secure the plate to the saddle and said pins engage holes in the printing plate to maintain the plate in printing register with the saddle.

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