United States Patent [19]

Jenkins

[11] **3,885,497**

[45] **May 27, 1975**

[54] **MAGNETIC PRINTING BASE AND METHOD OF MAKING SAME**

[75] Inventor: **William A. Jenkins,** Englewood, Ohio

[73] Assignee: **Monarch Marking Systems, Incorporated,** Dayton, Ohio

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

[21] Appl. No.: **87,673**

[52] **U.S. Cl.** ..... **101/382 MV;** 269/8; 29/DIG. 29; 29/428; 51/105 R

[51] **Int. Cl.** **B41f 27/00**

[58] **Field of Search** ..... 101/378, 382 R, 382 MV, 101/426; 269/8; 335/285, 286, 288, 296, 297, 301, 302, 306; 18/DIG. 62; 29/602, 607, 609, 629, DIG. 29, 428; 51/105 R

[56] **References Cited**

UNITED STATES PATENTS

1,531,492	3/1925	Marquardt	101/382 MV
2,178,774	11/1939	Bogoslowsky	18/DIG. 62
2,269,149	1/1942	Edgar	269/8 X
2,952,205	9/1960	Dunwoodie	101/378
2,996,791	8/1961	Hicks	29/609 X
3,039,389	6/1962	Meese et al.	101/378
3,097,598	7/1963	Hotop et al.	101/378
3,126,502	3/1964	Denis	335/306 X
3,180,259	4/1965	McKay	101/378
3,336,551	8/1967	Stead	269/8 X
3,352,000	11/1967	Altenburger	29/609 X
3,496,866	2/1970	Nystrand	101/378

FOREIGN PATENTS OR APPLICATIONS

933,666	8/1963	United Kingdom	101/382 MV

Primary Examiner—Edgar S. Burr
Assistant Examiner—E. H. Eickholt
Attorney, Agent, or Firm—Joseph J. Grass

[57] **ABSTRACT**

There is disclosed a magnetic printing base for one or more printing plates, a method of making the magnetic base, and a mold in which moldable, non-magnetic adhesive material is molded about various parts of the magnetic base. The base is structured to permit circuit devices and end plates to be interconnected by the non-magnetic material into a unitary arrangement. Each magnetic circuit device includes a flat magnet disposed between and in contact with a pair of flat magnetizable plates. The permanent magnets extend short of the final desired dimension of the base. The plates and the molded material initially extend beyond the final desired dimension of the base, but are trimmed off by a cutter to the final desired dimension after assembly of the base. To obviate the tendency of the printing plate to creep or drift, the spacing between the magnetic circuits is such that the strength, at surface of the base, of the magnetic flux field between next adjacent pole plates of adjacent magnetic circuit devices is equal to the strength, at the surface of the base, of the magnetic flux field between the pole plates of a magnetic circuit device itself.

18 Claims, 8 Drawing Figures

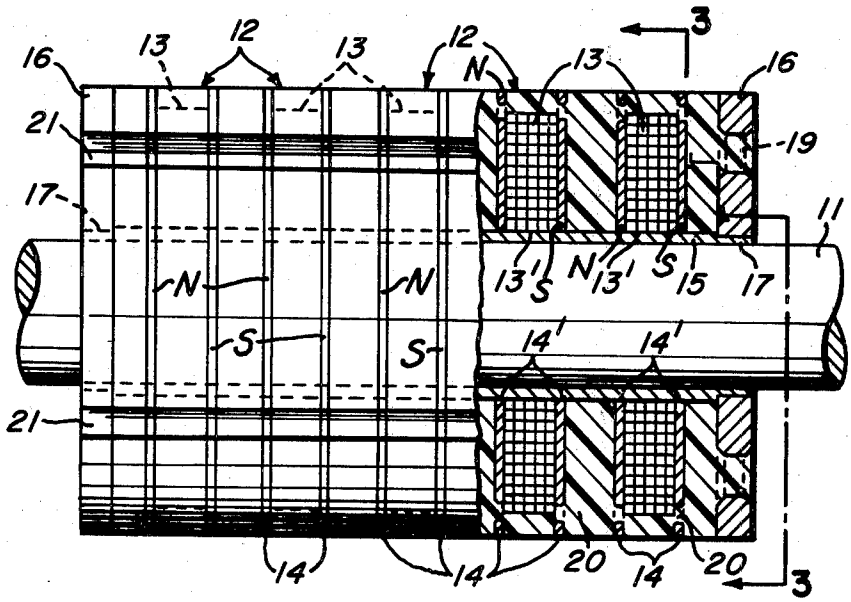


FIG-1

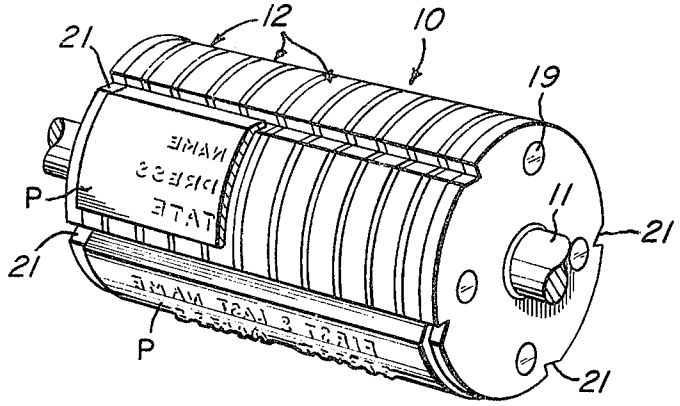


FIG-2

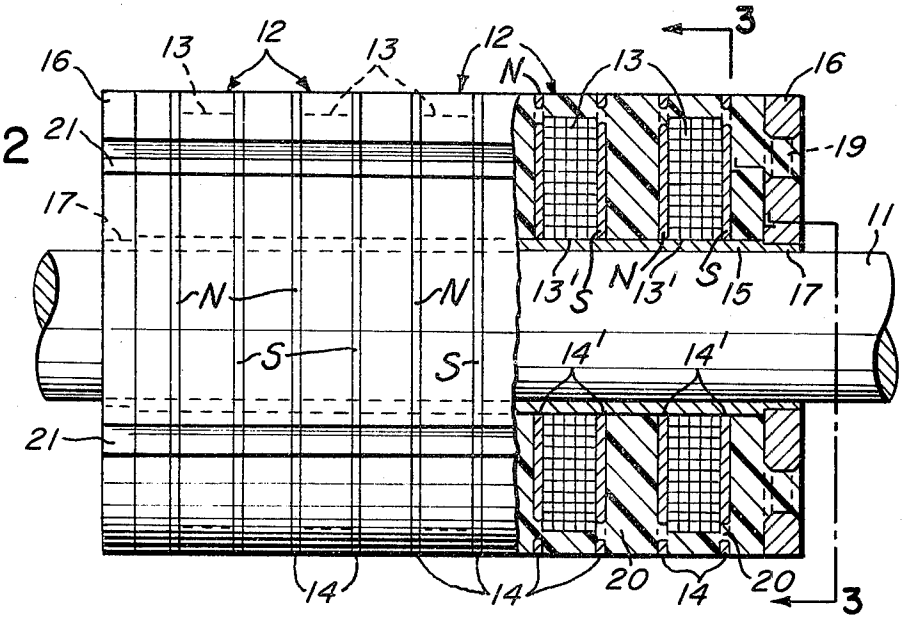
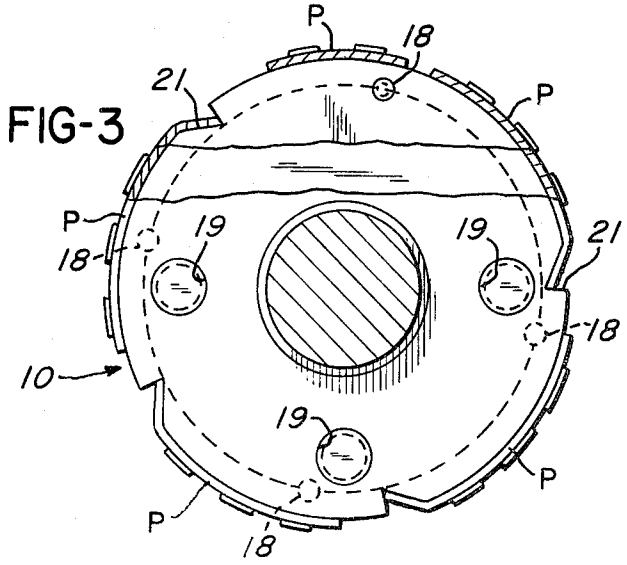


FIG-3



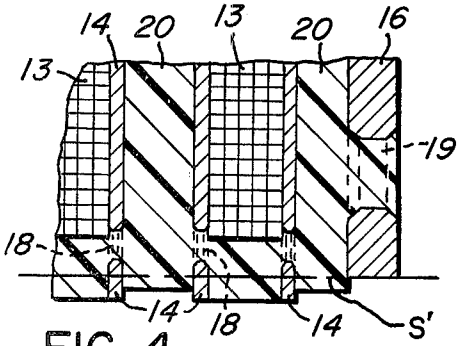


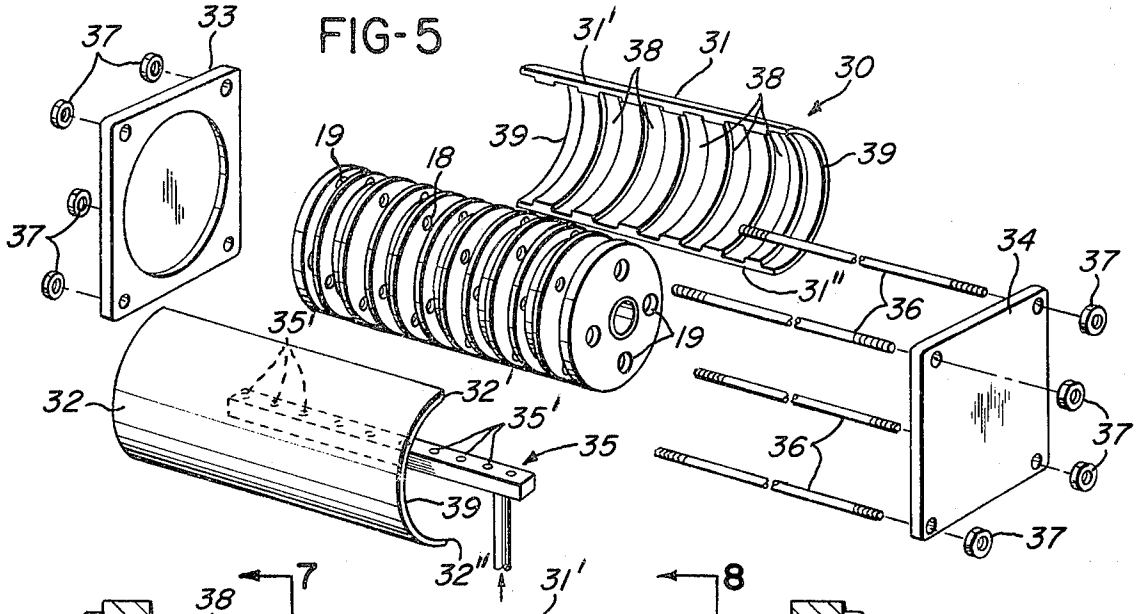
FIG-4

INVENTOR
WILLIAM A. JENKINS

BY Joseph J. Grass

ATTORNEY

FIG-5



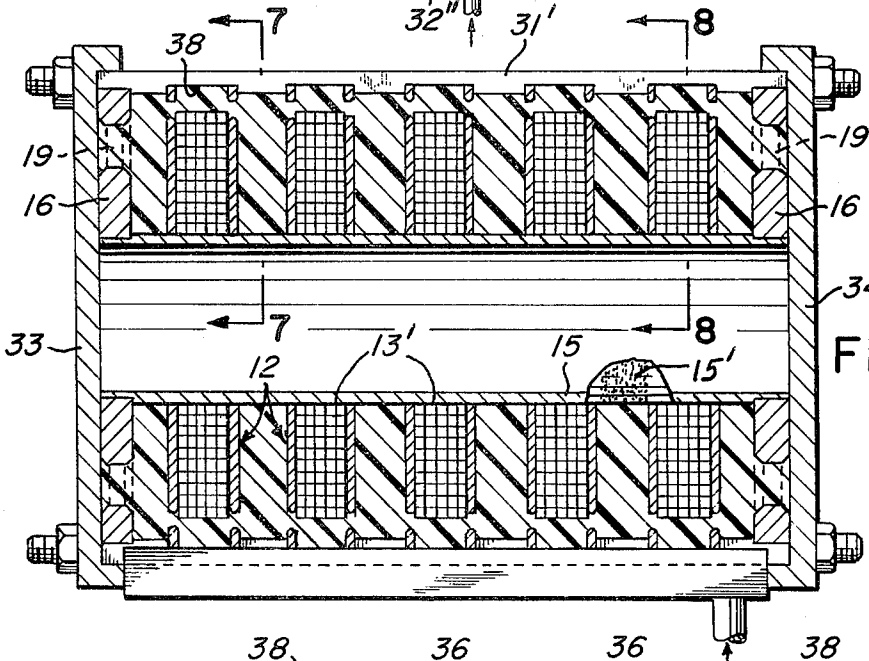


FIG-6

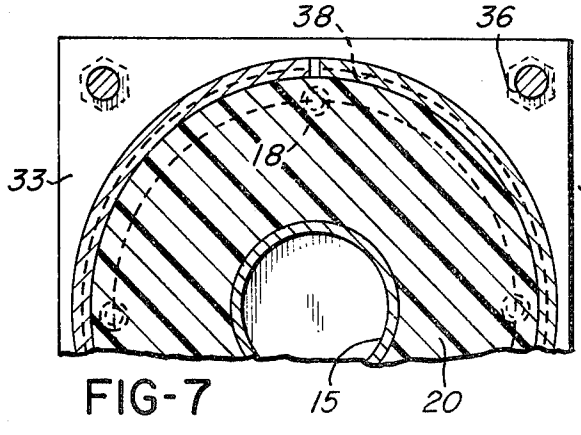


FIG-7

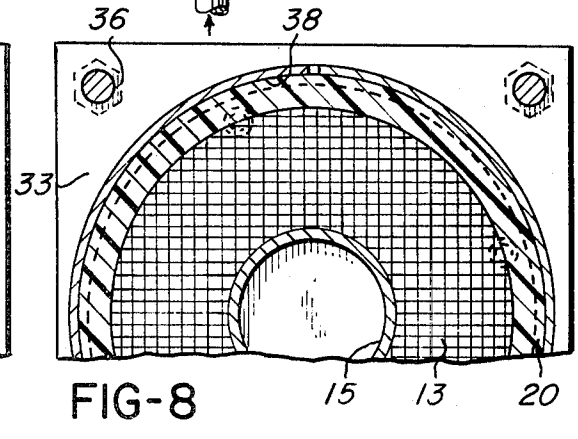


FIG-8

MAGNETIC PRINTING BASE AND METHOD OF MAKING SAME

BACKGROUND OF THE INVENTION

This invention relates to the art of magnetic printing bases, and methods of and molds for making same. There are numerous prior art patents relating to magnetic bases and the like; examples are U.S. Pat. Nos. 1,657,287, 2,481,191, 2,952,205, 2,992,733, 3,024,392, 3,027,835, 3,039,390, 3,086,461, 3,097,598, 3,180,259 and 3,509,819.

SUMMARY OF THE INVENTION

The invention resides in a low-cost, unitized magnetic base especially adapted for holding a printing plate and in a method of for making such a magnetic base. Although the invention is illustrated in the form of a circular cylindrical roll, it is also applicable to a flat base of the type disclosed in above mentioned U.S. Pat. Nos. 2,481,191 and 3,027,835. The method of the invention includes, in general, the steps of providing magnetic circuit means in the form of a flat magnet disposed between and in contact with magnetizable plates, the magnet extending short of the final desired surface of the base and initially the plates extending beyond the final surface of the base. No attempt is made to size the plates exactly prior to assembly so long as they extend beyond the final surface of the base. Similarly, no attempt is made to size the magnets exactly so long as they extend short of the desired surface of the base. It is preferred to fill the space between adjacent plates around the magnet with moldable, non-magnetic adhesive material and to key the plates together. Spaces between the magnetic circuits are preferably also filled with the non-magnetic material. Keying is very simply effected by providing holes in the plates in a position so that at least a portion of each hole extends beyond the magnet, and in this manner the plates are keyed against rotation. Following the molding step, the partly finished base is trimmed off by turning it on a lathe in the case of a circular cylindrical base or by milling with a milling cutter in the case of a flat type base. An important feature of the invention is providing permanent magnets to create a constant strength magnetic flux field on the surface of the base by positioning the magnetic circuit devices so that irrespective of whether or not the printing plate (or plates) is as wide as the base and irrespective of the location of the plate on the base, the plate will be held in position without a tendency to creep or drift. One way of accomplishing that is to provide the magnetic circuit devices described above, to arrange the magnets so that alternate plates are poled north-south-north-south, and so on, and to space the magnetic circuit devices so that the strength of the magnetic flux field between next adjacent pole plates of adjacent magnetic circuit devices is equal to the strength of the magnetic flux field between the pole plates of a magnetic circuit device itself. The mold for making the base of the invention is economical to construct having basically a pair of mold sections and end caps or plates. The mold sections have positioning means specifically in the form of grooves, formed at its inner surface. The end plates are clamped against the ends of the mold sections by means of tie rods which extend through the end plates externally of the mold sections.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a magnetic base for printing plates;

FIG. 2 is a side elevational view, partly in section, of the magnetic base shown in FIG. 1;

FIG. 3 is a sectional view taken generally along line 3—3 of FIG. 2;

FIG. 4 is an enlarged fragmentary sectional view showing a portion of the magnetic base as it appears during one of the manufacturing steps;

FIG. 5 is an exploded perspective view of a mold in which the magnetic base can be molded;

FIG. 6 is a vertical sectional view of the mold, showing the magnetic base in the mold after the moldable material has filled the mold;

FIG. 7 is a sectional view taken generally along line 7—7 of FIG. 6; and

FIG. 8 is a sectional view taken generally along line 8—8 of FIG. 6.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

With particular reference to FIGS. 1, 2, and 3, there is shown a magnetic base in the form of a printing cylinder or drum generally indicated at 10 mounted on shaft 11. The base 10 can be secured to and driven by the shaft 11 or the base 10 can be rotatable with respect to the shaft 10 and driven by other means, as desired. The magnetic base 10 is illustrated as including a plurality of spaced apart permanent magnetic circuit devices generally indicated at 12. Each magnetic circuit device 12 includes a flat, annular, permanent magnet 13 and a pair of magnetizable pole plates 14. Each magnet has a central hole 13' and each plate 14 has a central hole 14'. A cylindrical mounting member 15 in the form of a sleeve is shown to pass through the holes 13' and 14' and forms a flux path for each of the magnetic circuits. The plates 14 and the member 15 are composed of magnetizable, easily machinable material such as low carbon steel. End plates 16 are received about reduced portions 17 of the mounting member 15 at locations spaced apart from the endmost magnetic circuit devices 12. The magnetic circuit devices 12 are all constructed with equal strength; the magnets 13 are of the same size and composition and the pole plates 14 are of the same size and composition. The magnets 13 are so arranged that alternate pole plates 14 are poled north-south-north-south, and so on, in a direction longitudinally of the base 10 as indicated by N and S in FIG. 2. Accordingly, the next adjacent pole plates 14 of adjacent magnetic circuit devices 12 are of opposite polarity. In accordance with the invention, the distance between adjacent magnetic circuit devices 12 is not arbitrary, but rather it is established by spacing the magnetic circuit devices 12 apart by a distance at which the magnetic flux field strength between next adjacent pole plates 14 of adjacent magnetic circuit devices 12 are equal, or substantially so, to the magnetic flux field strength of the magnetic circuit devices 12 themselves. Once the spacing has been established for a magnetic base having circuit devices of a particular size, strength, material and configuration, any number of such bases can be constructed using the same spacing.

The external diameters of the magnets 13 are less than the external diameter of the base 10 whereas the plates 14 extend all the way to the final surface of the

magnetic base **10**. Each of the plates **14** has four equally spaced apart holes **18** near its periphery. The holes **18** extend at least partly beyond the associated magnets **13**. The end plates **16** have four spaced apart apertures or holes **19** which are larger in diameter than the holes **18** in the plates **14**. Moldable, non-magnetic, adhesive material **20**, such as epoxy fills: the space between the magnets **13** and the surface of the base **10** between associated plates **14**, the spaces between the outer surface of the cylinder member **15** and the outer surface of the base between plates **14** of adjacent magnetic circuit devices **12**, the spaces between the plates **14** of the endmost magnetic circuit devices and the associated end plates **16** between the cylindrical member **15** and the surface of the base **10**, and the holes **18** and **19** in respective plates **18** and **19**. The magnetic base **10** is accordingly formed into a unitary support structure in which a magnetizable printing plate or a printing plate having a magnetizable holding portion is held to the base **10** by magnetic attraction, and in addition, the plates **14** and the non-magnetic material **20** serve to provide a solid support for the printing plate or plates. To assure adequate keying of the material **20** to the member **15**, the outer surface of the member **15** between the next adjacent plates **14** of adjacent magnetic circuit devices **12**, and between the plates of endmost circuits **12** and associated end plates **16** is roughened at annular zones **15'**. A fragmentary portion of one of these zones **15'** is shown in FIG. **6**. Roughening can be accomplished by knurling or any other suitable means.

With reference to FIGS. **1** and **3**, printing plates P constructed at least in part of magnetizable material are shown held onto the base **10** by magnetic attraction. The base **10** is shown to be provided with four longitudinally extending slots or grooves **21** in its periphery. The slots **21** cut through the end plates **16**, the non-magnetic material **20**, and the plates **14**. Leading edges of four of the printing plates are shown to be received in the grooves **21** which prevents the printing plates P from creeping around the base **10** as its rotates during the printing operation. The grooves **21** are preferably milled into the base **10** by a milling cutter (not shown).

With particular reference to FIG. **4**, there is shown in exaggerated form, the manner in which plates **14** initially extend beyond the final desired surface S' of the base **10**. In the particular embodiment of a base **10** of cylindrical form illustrated in the drawings, the plates **14** initially extend beyond the final desired surface S' and in particular have a larger diameter than the final diameter of the base **10**. It has been found to be most economical to eliminate close tolerances by sizing the plates **14** larger than necessary and allowing wide positive tolerances, and by sizing the magnets **13** smaller than necessary and allowing wide tolerances. As one of the final steps in the manufacturing operation, the base **10** is turned on a lathe by rotating the base **10** in conventional manner relative to a cutter which moves at a predetermined rate of feed in a direction longitudinally with respect to the base **10**, thereby removing material **20** and the portions of the plates **14** radially beyond the final desired surface S' of the base **10**.

With reference to FIGS. **5–8**, there is shown a mold generally indicated at **30** which is useful in performing the molding step of the invention. The mold **30** is shown to include a pair of mold sections **31** and **32** and a pair of end plates **33** and **34**. The mold sections **31** and **32** are curved and extend through arcs of about 170° each. The mold section **31** has side edges **31'** and **31''**, and the mold section **32** has side edges **32'** and **32''**. When the mold is assembled side edges **31''** and **32''** of the respective mold sections **30** and **31** are in liquid-tight abutment with an elongated nozzle **35**, and there is a gap between the side edges **31'** and **32'** as best shown in FIGS. **7** and **8**. A plurality of tie rods **36** cause the end plates **33** and **34** to exert clamping pressure on the ends of the mold sections **31** and **32** when nuts **37** are tightened.

Each of the mold sections **31** and **32** has a plurality of positioning and holding grooves **38** formed at its inside surface. These grooves **38** extend in an arcuate direction between the respective side edges **31'** and **31''** and **32'** and **32''**. Assuming that a circular cylindrical printing base is to be fabricated, a circular cylindrical member **15** shown to take the form of a sleeve is provided. Then plates **14** and magnets **13** can be assembled onto the member **15** either individually or as sets or groups of magnet circuits. In the illustrated embodiment, one magnetic circuit comprises a permanent magnet **13** disposed between and in contact with a pair of plates **14**. If the magnetic circuits are to be assembled as sets the attractive force of the magnet **13** will hold the associated magnetizable plates **14** to it and hence each magnetic circuit is easily moved into position by sliding the magnetic circuit onto the member **15**. In the illustrated embodiment the magnetic circuits **12** are shown to be spaced apart. As the magnets **13** have a diameter which is intentionally less than the final diameter of the base **10** and the plates **14** having a diameter greater than the final diameter of the base **10**, the accuracy of the outer surface of the base **10** is not dependent upon accurate sizing or location of the holes **13'** and **14'**. Accordingly, holes **13'** and **14'** are acceptable even though larger than necessary by a considerable tolerance.

Endmost grooves **39** in the mold sections **31** and **32** are shown to receive end plates **16**. The grooves **38** have a width which is slightly greater than the combined thicknesses of two plates **14** and the magnet **13** so that during the molding operation the magnetic circuits **12** are not apt to be displaced by the moldable material. Here again accuracy of positioning the magnetic circuits **12** is not necessary. With the components which are to comprise the base **10** disposed within the mold and the mold in the clamped condition as shown in FIG. **6**, the moldable, non-magnetic adhesive material is forced into the mold through orifices **35'** in the nozzle **35**. As the material enters the mold, air escapes through the gap between side edges **31'** and **32'** of the mold sections **31** and **32**. As the magnets **13** and the associated plates **14** have flat sides, the moldable material does not flow between the contacting surfaces. However, material is able to flow into the spaces between plates **14** of adjacent magnetic circuits **12**, into the space around the magnets **13** and between the associated plates **14**, between the plates **14** of the endmost magnetic circuits **12** and the end plates **16**, into and through holes **18** in the plates **14**, and into holes **19** in the end plates **16**, thereby providing a unitized base. As the moldable material, preferably in the form of epoxy gradually fills the spaces described above until excess non-magnetic material flows into the gap between side edges **31'** and **32'** at the time flow of additional material into the mold through the nozzle **35** is interrupted

and the moldable material is allowed to set and harden. After the material **20** sets and hardens, the mold **30** is removed with respect to the base **10** and the base **10** is ready to be turned on a lathe.

If desired, many of the benefits of this invention can be achieved by applying the invention to a flat bed type of magnetic base. In that event the final desired surface of the base **10** can be achieved by using a milling cutter (not shown). The milling cutter would make passes relative to the base **10** in the same direction as the direction in which the plate and magnets extend.

It is preferred to use one-piece magnets **13** although segmented magnets can be employed, if desired, within the spirit of the invention.

Other embodiments and modifications of this invention will suggest themselves to those skilled in the art, and all such of these as come within the spirit of this invention are included within its scope as best defined by the appended claims.

I claim:

1. Method of making a printing base for mounting a printing plate, comprising the steps of: providing a cylindrical member, placing at least two magnetic circuit means on said cylindrical member, each circuit means including annular magnet means disposed between a pair of annular magnetizable plates, said plates having a greater diameter than said magnet means, placing said cylindrical member with said magnetic circuit means in a mold, flowing non-magnetic moldable material between the plates of adjacent magnetic circuit means, between the plates of each magnetic circuit means around the associated magnet means, and beyond the final desired diameter of the base, and trimming off the portions of all the plates and non-magnetic material beyond to the final desired diameter.

2. Method of making a printing base as defined in claim **1**, further comprising the steps of: flowing the moldable non-magnetic material into the mold from the bottom so as to purge air out of the mold as the non-magnetic material fills the mold.

3. Method of making a printing base as defined in claim **1**, further comprising the steps of: providing at least one groove in the outer surface of the base to accommodate a leading edge of a printing plate.

4. Method of making a printing base for mounting a printing plate, comprising the steps of: providing a cylindrical member, placing at least one magnetic circuit means on said cylindrical member, a circuit means including annular magnet means disposed between a pair of annular magnetizable plates, said plates having a greater diameter than said magnet means, placing said cylindrical member with said magnetic circuit means in a mold, molding non-magnetic material between said plates and around said magnet means to beyond the final surface of the base, removing the base from the mold, and trimming off the plates and the non-magnetic moldable material to the desired diameter which is greater than the diameter of said magnet means.

5. Method of making a printing base as defined in claim **4** wherein said step of trimming includes turning the outer surface of said base on a lathe.

6. Method of making a printing base as defined in claim **4**, providing at least one hole in each plate, at least a part of each hole extending beyond the surface of said magnet means so that the moldable non-magnetic material can flow into said holes and thereby key said plates together.

7. Method of making a magnetic base for mounting a printing plate, comprising the steps of: providing flat magnet means disposed between and in contact with a pair of magnetizable plate means, said magnet means extending short of the final desired surface of the base, said plate means extending beyond the final desired surface of the base, flowing moldable non-magnetic material between said plate means and around said magnet means to beyond the final surface of the base, and thereafter trimming off the portions of all said plates means and all the material beyond to the final surface.

8. Method of making a magnetic base for mounting a printing plate, as defined in claim **7**, further comprising the steps of: providing a hole in each of said plates, at least a part of each hole extending beyond the surface of said magnet means so that the moldable non-magnetic material can flow into said holes and thereby key said plates together.

9. Method of making a magnetic base for mounting a printing plate, comprising the steps of: providing flat magnet means disposed between a pair of magnetizable plates, providing each of said plate means with a keying means, said magnet means extending short of the final desired surface of the base, said plates extending beyond the final desired surface of the base, keying said plate means together by means of non-magnetic moldable material engageable with said keying means, and thereafter trimming off the portions of all of said plates beyond the final surface.

10. Method of making a magnetic base for mounting a printing plate, comprising the steps of: assembling magnet means and plates in a mold in alternating relationship, providing holes in the plates at locations so that at least a part of each hole is beyond the surface of the associated magnet means, and keying the plates together by flowing moldable non-magnetic material into spaces between the plates and into the holes.

11. Method of making a printing base for mounting a printing plate, comprising the steps of: providing at least two permanent magnetic circuit devices having substantially equal magnetic flux fields at the surface of the base, each magnetic circuit device having permanent magnet means disposed between a pair of magnetizable plates, arranging the magnets such that the plates are alternately poled in a north-south-north-south pattern, and spacing the magnetic circuit devices apart by a distance such that the strength, at the surface of the base, of the flux field between the next adjacent plates of adjacent magnetic circuit devices is substantially equal to the strength, at the surface of the base, of the flux field between the plates of a magnetic circuit device.

12. Method as defined in claim **11**, further comprising the steps of: the plates extending to the surface of the base and the magnets terminating short of the surface of the base, and flowing moldable non-magnetic material into the space between the plates of each magnetic circuit device and into the space between adjacent magnetic circuit devices.

13. A magnetic base for mounting a printing plate, comprising: mounting means, a plurality of magnetic circuit means disposed in spaced apart relationship on said mounting means, each circuit means including an annular magnet, an annular magnetizable plate dis-

posed on each side of and in contact with each magnet, end plates spaced apart from the endmost magnetizable plates, at least one hole in each magnetizable plate extending at least partly beyond the associated magnet, and non-magnetic material disposed:

a. between the magnetizable plates of adjacent magnetic circuit means,
b. between the endmost magnetizable plates and the associated end plates,
c. around said magnets, and
d. in said holes,

the initial diameter of said magnetizable plates and of said non-magnetic material being greater than the final desired diameter of said base, the initial diameter of said magnets being less than the final desired diameter of said base, the portion of said magnetizable plates and of the non-magnetic material beyond the final desired diameter being removed after assembly of said base.

14. A magnetic base for mounting a printing plate, comprising: at least two permanent magnetic circuit devices having substantially equal magnetic flux fields at the surface of the base, each magnetic circuit device having permanent magnet means disposed between a pair of magnetizable plates, the magnets being alternately poled in a north-south-north-south pattern, said magnetic circuit devices being spaced apart a distance such that the strength, at the surface of the base, of the flux field between next adjacent plates of adjacent magnetic circuit devices is substantially equal to the strength, at the surface of the base, of the flux field between the plates of a magnetic circuit device.

15. A magnetic printing base as defined in claim **14**, wherein the plates extend to the surface of the base and the magnets terminate short of the surface of the base, and moldable non-magnetic material in the space between the plates of each magnetic circuit device and the space between adjacent magnetic circuit devices.

16. Method of making a printing base for mounting a printing plate, comprising the steps of: providing a cylindrical member, placing at least two magnetic circuit means on said cylindrical member, each circuit means including annular magnet means disposed between a pair of annular magnetizable plates, said plates having a greater diameter than said magnet means, providing at least one hole in each plate, placing said cylindrical member with said magnetic circuit means in a mold, flowing non-magnetic moldable material between the plates of adjacent magnetic circuit means, and between the plates of each magnetic circuit means around the associated magnet means, at least a part of each hole extending beyond the surface of the associated magnet means so that there is flow of the non-magnetic material into and through said holes.

17. A magnetic base for mounting a printing plate, comprising: a pair of magnetizable plate means, magnet means disposed between and in contact with said plate means, keying means disposed below the surface of said base for each of said plate means, and non-magnetic moldable material disposed between said plate means and around said magnet means and in engagement with said keying means, wherein said keying means includes a hole in each plate means, at least a portion of each of said holes extending beyond the magnet means.

18. A magnetic base as defined in claim **17**, wherein each hole extends short of the surface of said base.

* * * * *