

[54] **MAGNET GRIPPING FIXTURE**
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3,149,268 9/1964 Hansen et al. 335/306 A
 3,195,021 7/1965 Martin 335/285
 3,419,832 12/1968 Baermann 335/285

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 248/206 A

[57] **ABSTRACT**

A magnet gripping fixture which has at least two continuous, laterally spaced parallel permanent magnetic rods extending longitudinally from end-to-end of a supporting body of non-magnetic material. Each magnetic rod is a flexible permanent magnet extrusion of uniform flux distribution throughout its length and is sandwiched between a pair of ferromagnetic strips which provide flux concentrating pole pieces therefor.

[56] **References Cited**
UNITED STATES PATENTS
 2,966,992 1/1961 Dunkelberger et al. 335/285 UX

3 Claims, 4 Drawing Figures

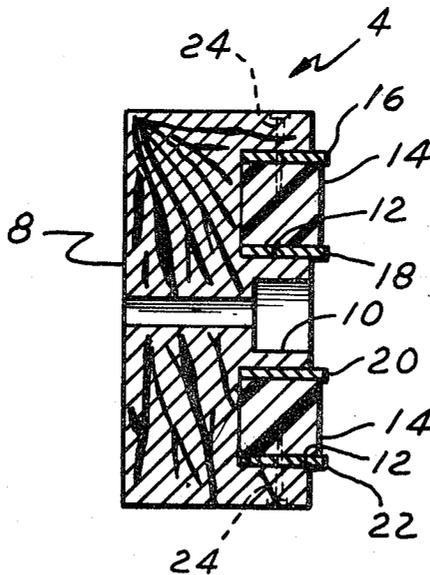


Fig. 1.

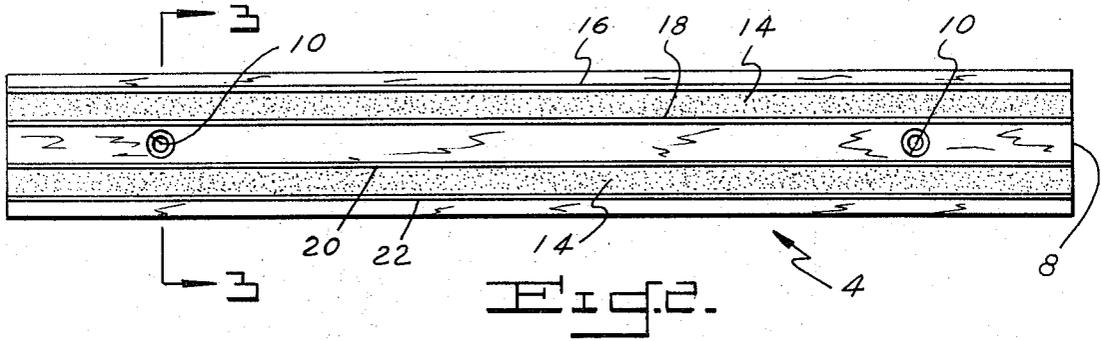
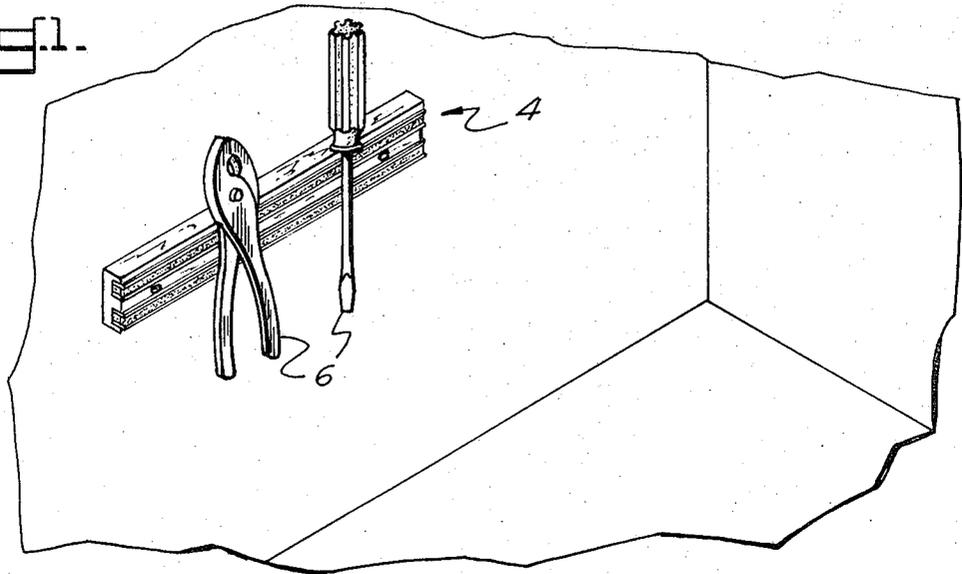


Fig. 3.

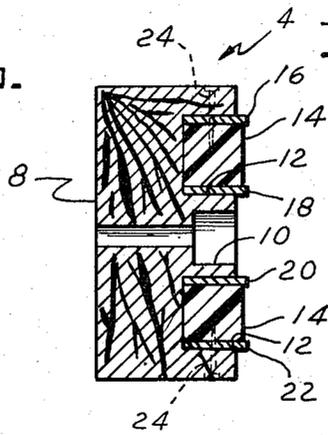
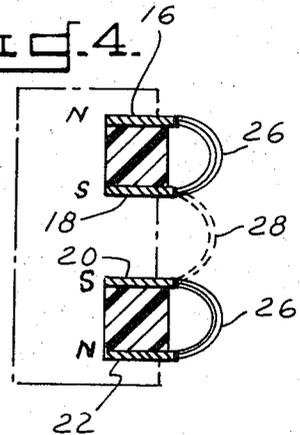


Fig. 4.



MAGNET GRIPPING FIXTURE

BACKGROUND

Magnet gripping fixtures, such as widely used in kitchens and workshops to hold kitchen utensils and hand tools are generally constructed by using a number of longitudinally spaced permanent bar magnets with continuous ferromagnetic strips of generous cross section spanning the ends of the bar magnets of like polarity to provide pole pieces for the fixture. Ordinarily, the bar magnets are magnets of high energy product and flux density, such as Alnico magnets. Such magnetic gripping fixtures may have two or four pole pieces with each pair providing one flux path. The pole pieces are usually selected from ferromagnetic bar stock of a sufficiently large cross section so that flux emanating from the longitudinally spaced magnets is distributed longitudinally through the pole pieces to provide improved uniformity of flux distribution from end-to-end of the gripping fixture. As a result, an object may be magnetically gripped by the fixture at any point along the length of the pole pieces. Unfortunately, however, if an unusually large ferromagnetic object, such as a meat cleaver, is placed across the pole pieces, flux is drawn by the cleaver away from adjacent portions of the pole pieces with consequent diminution of flux in such areas. It has been learned that in such instances, utensils or tools adjacent such large objects drop off the fixture. Furthermore, where such magnetic gripping fixtures are equipped with four pole pieces they are invariably of alternate polarity. Usually such fixtures are magnetized subsequent to assembly and as a result it is not feasible to obtain other than an alternate pole arrangement. Such alternate pole arrangements have been found to be undesirable since they tend to magnetize the objects held by the fixture, with the result that small metal chips, brads and the like are magnetically attracted to the tool or utensil so magnetized.

Moreover, in such prior devices, when an object is magnetically clamped across the four pole pieces of alternate polarity, a leakage flux path results between two adjacent pole pieces in the center of the fixture which is opposite in direction to the flux of the two pairs of pole pieces. Since in these fixtures high energy Alnico magnets are invariably used, a leakage flux path, such as described, does not generally diminish the flux density of the two pole pieces sufficiently to adversely effect the gripping capacity of the fixture unless a large object is applied to the fixture, as referred to above.

The principal object of this invention is to provide an improved magnetic gripping fixture of economical construction which insures uniform flux distribution over its entire length and wherein its magnetic uniformity is not disrupted by placing objects of large ferromagnetic mass across the poles of the fixture.

Another object of this invention is to provide a magnet gripping fixture which is fabricated of relatively inexpensive components easy to assemble, and which in combination provides effective performance.

A further object of this invention is to provide a simple and effective method of fabricating magnet gripping fixtures of the above type in which magnetization of articles held by the fixture is minimized.

A still further object of this invention is to provide a magnetic gripping fixture of the above type which is of such construction as to facilitate its assembly whereby

the magnetic element may be charged before assembly of the fixture.

The above and other objects of the invention will be more readily apparent from the following description and with reference to the accompanying drawings, in which:

FIG. 1 is an overall perspective view showing in use a magnet gripping fixture of the type embodying this invention;

FIG. 2 is an elevational view of the magnet gripping fixture shown in FIG. 1 with the tools removed therefrom;

FIG. 3 is a sectional view on an enlarged scale taken along line 3—3 of FIG. 2; and

FIG. 4 is a schematic view showing flux distribution characteristics of the fixture.

In FIG. 1 is shown an overall view of a magnet gripping fixture 4 of the type embodying this invention mounted on a wall, as it would generally be used in a workshop or kitchen for holding a plurality of kitchen utensils or hand tools 6. The gripping fixture comprises an elongated body or block 8 of any suitable non-magnetic material, such as plastic or wood. The use of wood is preferable to other materials, since it is relatively inexpensive, can be readily milled with grooves to accommodate the pole pieces and lends an attractive appearance to the fixture. As shown, a pair of longitudinally spaced holes 10 may be formed in the block to receive fastener elements, such as screws or nails by which the fixture may be attached to the wall. Alternatively, a suitable pressure sensitive adhesive may be applied to the back of the block 8 for adhesively mounting the fixture. The block is also provided with two laterally spaced, parallel, longitudinally extending grooves or recesses 12 which extend over the length of the block from end-to-end thereof.

Magnet gripping means is disposed within each groove or slot 12 and in the embodiment shown comprises a flexible, moisture-impervious, permanent rod 14, such as a plastic magnet extrusion of square cross section. As is well known, plastic magnets of this type are relatively inexpensive and possess the unique advantage of having uniform magnetic flux distribution over their entire length. One side of the strip provides a north pole and the opposite side a south pole. Such magnets are characterized by excellent magnetic retention even without the use of magnetic "keepers." Consequently, these plastic magnets can be fully magnetized prior to installation in the fixture, thereby facilitating the assembly procedure. While possessing many advantageous characteristics, one drawback of such plastic magnets is their relatively low flux density and energy product, especially in comparison to Alnico bar magnets. It has been found, however, that this drawback can be overcome in magnet gripping fixtures embodying this invention by combining with each rod a pair of magnetically saturable ferromagnetic strips engaged with essentially the entire surfaces of opposite polarity.

In the embodiment shown, strips 16 and 18 are disposed along the upper and lower surfaces of the upper flexible magnetic rod and pole pieces 20 and 22 are engaged with the upper and lower surfaces of the second magnet rod. The pole pieces are of relatively inexpensive ferromagnetic stock of sufficient width and length to be coextensive with the magnet pole surfaces of the rods. The outer edges of the pole pieces may either be

smooth, as shown, or notched at spaced intervals, so that if desired, the fixture may be mounted vertically and the notches will aid in preventing articles from sliding downward along the pole pieces. The strips 16 and 18 are each sufficient in width to extend slightly outwardly of the outer surface of the flexible magnet rods 14 when bottomed in the grooves 12, as best shown in FIG. 3, and are relatively thin so that they concentrate the lines of flux emanating from the relatively large surface areas of the magnet bars. These strips are moreover sufficiently thin in cross section so that magnetic saturation is obtained with the result that magnetic flux is not transferred longitudinally along the pole pieces. Thus, even large steel objects will not decrease the fixture's holding power for adjacent tools and utensils.

From top to bottom of the fixture, the poles 16 and 18 and 20 and 22 are arranged respectively either as: north, south, south, north poles or south, north, north, south. This pole arrangement may be achieved rather simply in assembly of the unit by utilizing previously charged, magnet extrusions of square cross section. Each section is generally equal in length to the longitudinal dimensions of the magnet support body 8 and may be obtained by severing a continuous length of extruded plastic magnet material. The separate lengths are then reversed end-to-end and inserted in the grooves or recesses 12. This end-to-end reversal will result in locating the pole surfaces of opposite polarity toward the same side of the fixture. Preferably, the magnet rod has some indicia along one edge such as to represent the magnet's north pole, thus facilitating this polar arrangement. Pole-shoe pieces or strips 16 and 18 and 20 and 22 are inserted in the grooves, which are dimensioned so that with rods 14 a snug fit results, and are of sufficient size to cover substantially the entire pole surfaces of the magnet rods. The pole pieces and flexible magnet rods may be further retained in the body 8 by use of any suitable adhesive or other fastening means, such as brads 24. If brads are used, small holes would, of course, be provided in the metal bars. After assembly the unit is dipped in a sealer or lacquer which seals the wood body and provides a protective coating on the metallic pole pieces.

With this arrangement, the adjacent poles 18 and 20 of the upper and lower magnets are of like polarity. In any event, however, the relatively thin ferromagnetic strips, magnetically saturated, greatly concentrate the lines of flux along the edges of the strips so as to substantially increase the magnetic gripping power of the magnet rods. In addition, the pole arrangement described minimizes flux leakage between the upper and lower magnet groups when an iron or steel body spans the four pole pieces. In FIG. 4 the two flux paths 26

provide the magnet gripping power by which a ferromagnetic object is held and since poles 18 and 20 are of like polarity the leakage path, as represented at 28, is essentially eliminated when compared to such fixtures where the opposite poles are adjacent. By concentrating the flux along the pole strips and minimizing the effect of flux leakage in this way, it has been found that extruded plastic magnets can be successfully used in such magnet gripping fixtures and will perform in a manner comparable to fixtures heretofore available which employ much stronger Alnico magnets. In addition, the assembly of such units is relatively simple and inexpensive.

Having thus described the invention, what is claimed is:

1. Magnet gripping fixture comprising a body of non-magnetic material having a pair of laterally spaced, longitudinally extending channels, an integral, flexible permanent magnet rod fitted in each of said channels, the upper and lower surfaces of each rod being of opposite magnetic polarity, said rods being oriented in said channels with their surfaces of like polarity being adjacent, a pair of continuous, generally flat ferromagnetic strips engaged with the upper and lower polar surfaces of each of said rods and coterminous therewith and serving as flux concentrating poles therefor.

2. Magnet gripping fixture as set forth in claim 1 in which each of said ferromagnetic strips has an outer edge portion disposed outwardly of the outer surface of said magnetic rod, each of said strips having a thickness of about 10-20 percent of the thickness of the magnetic rod, whereby said magnetic pole pieces provided by said strips are magnetically saturated.

3. Magnet gripping fixture assembly comprising a body of wood having a pair of parallel, longitudinally extending, laterally spaced recesses, a continuous, plastic permanent magnet rod of generally square cross section disposed in each recess, the edges of like polarity of said rods being disposed in adjacent relationship, a pair of generally flat, ferromagnetic strips of continuous length engaged with the entire north and south polar surfaces of each plastic rod and together therewith fitted snugly into said recesses and providing flux concentrating poles therefor, each of said strips having a cross section of about 10-20 percent the cross sectional size of said rods, each strip having a width greater than the thickness of said rods and the depth of said recesses, whereby the outer edge portions of the poles are disposed outwardly of the outer surface of said rods and said body of wood, said assembly having an overall coating to seal the wood body and provide a protective coating for the ferromagnetic strips.

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