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MULTI-LAYERED MAGNETIC SHIELD FOR A MAGNETIC VISE

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Sheet 1 of 2

FIG. 1. PRIOR ART

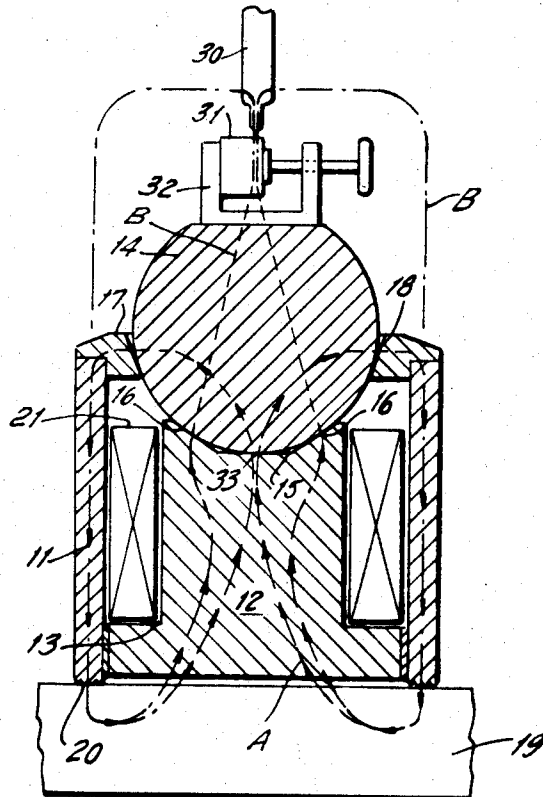
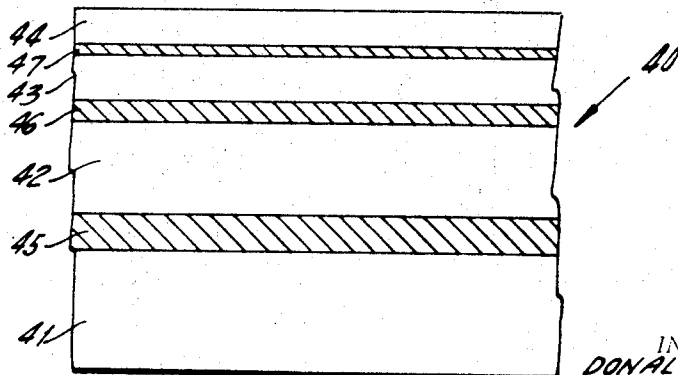


FIG. 2.



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Sheet 2 of 2

FIG. 3.

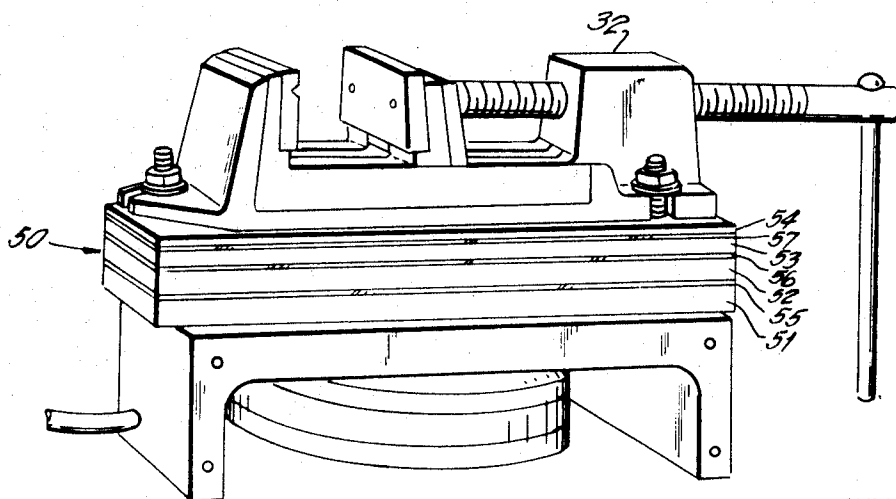
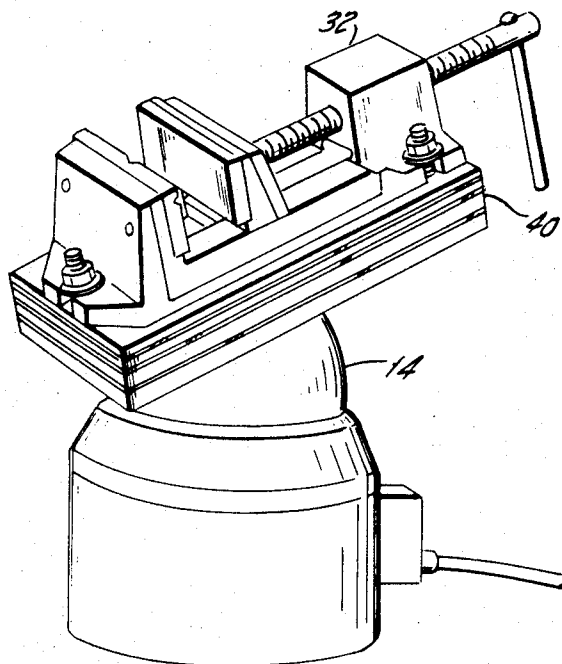


FIG. 4.

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1

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MULTI-LAYERED MAGNETIC SHIELD FOR A MAGNETIC VISE

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9 Claims

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ABSTRACT OF THE DISCLOSURE

A multi-layered magnetic shield for a magnetic vise is provided with a plurality of alternate layers of magnetizable and non-magnetizable material. The layers of magnetizable and non-magnetizable materials are arranged so that as the distance from the layers to a source of magnetic lines of force associated with the vise increases, the thicknesses of respective magnetizable and non-magnetizable layers decrease.

This invention relates to a shield for a magnetic vise and more particularly to tapered magnetic shield for a magnetically lockable vise.

In magnetically lockable vises, such as that appearing in U.S. Patent 2,993,395 issued to the instant inventor, a clamping means is mechanically attached to a magnetizable member, such as a steel ball. The magnetizable member is in contact with an electro-magnet by means of intervening magnetizable material. When the electro-magnet is energized the magnetic field created magnetizes the magnetizable means holding that means stationary.

While the independent clamping mechanism is insulated from the magnetizable means to which it is attached, stray lines of magnetic force travel through the clamping means thereby slightly magnetizing it. If a work piece comprised of magnetizable material is being held in the clamping means, and if the tool operating on the work piece causes cuttings or filings of that work piece to form, the stray magnetic lines of force, by traveling through the tool, cause the cuttings or filings to adhere to the cutting surface of the tool thereby reducing its efficiency.

Shields to protect against stray lines of magnetic force generated by a magnetic vise are known in the art. Generally they consist of a single block of non-magnetizable material or of a laminated block with alternate layers of magnetizable and non-magnetizable material, each alternate layer being of the same thickness.

Applicant's novel shielding means accomplishes the same shielding as other shielding means; but, applicant has invented a shield of much lighter weight and lesser thickness. Applicant's novel shield is a bimetallic multi-level sandwich. Alternate layers are comprised of a non-magnetizable metal. The intervening layers are comprised of a magnetizable metal. Each set of alternate layers decreases to a lesser thickness further from the source of magnetic force than the set before it. Each layer of magnetizable material is much thinner than the adjacent layers of non-magnetizable material.

It is a primary object of the instant invention to provide a shield for a magnetically lockable vise, which prevents magnetizing of a tool being used in conjunction with the vise.

It is a second object of the instant invention to provide a magnetically lockable vise shield of lighter weight and lesser thickness than those presently in use.

It is another object of the present invention to provide a magnetically lockable vise comprised of a multi-layered bimetallic sandwich.

It is another object of the present invention to provide a magnetically lockable vise shield comprised of a multi-

2

layered bimetallic sandwich, with each set of layers decreasing to a lesser thickness further away from the source of magnetic force than the set before it.

These and other objects of the present invention will become apparent from the following description when taken in connection with the drawings in which:

FIGURE 1 is a cross sectional view through a magnetically lockable vise existing in the prior art showing the paths taken by magnetic lines of force generated by the electromagnet in the vise.

FIGURE 2 is a side view of a shield according to the instant invention.

FIGURE 3 is a perspective of a vise having the device of the instant invention mounted thereon.

FIGURE 4 is a perspective of a magnetic flat vise showing the device of the instant invention adapted thereto.

Refer now to FIGURE 1. Steel tube 11 surrounds steel core 12. Steel core 12 is machined around its circumference to provide an indentation 13. Collar 17, seated atop steel tube 11, tangentially meets spherical member 14 at line 18. The vertical position of spherical member 14 is established by the circular line of contact with collar 17. The machined aperture 15 at the top of core 12 is made to provide a small air gap (for instance .015 to .025") surface 16 and spherical member 14 so that the downward magnetic pull on spherical member 14 provides a high value of frictional locking with collar 17. Steel tube 11 meets magnetizable base 19 at the circularly corrugated rim 20 of steel tube 11.

Electromagnet coil 21 encircles steel core 12 and sits in machined aperture 13 of steel core 12. Electromagnet 21 is connected to a power source (not shown). Energizing of the electromagnet 21 causes magnetic lines of force to travel around path A from base 19, through steel core 12, through the small air gaps adjacent to surface 16 of through line 18 to collar 17, into steel tube 11, and back again to base 19. Unfortunately, the magnetic field does not confine itself to the path it would be hoped it would travel. Stray lines of magnetic force follow path B and pass through work tool 30, work piece 31 clamping means 32, spherical member 14, steel core 12, base 19, and back to tool 30. The magnetizing of tool 30 causes filings and cuttings from work piece 31 to magnetically adhere to the cutting surface of work tool 30 impeding thereby the efficiency of the cutting surface. The present invention is a novel shield to prevent the magnetic field from reaching tool 30.

Refer to FIGURE 3. Clamping means 32 is bolted or otherwise non-magnetically attached to magnetic shield 40. Shield 40 is insulatedly attached at its lower surface to spherical member 14. Shield 40 prevents stray lines of magnetic force from reaching tool 30.

Refer to FIGURE 2. Shield 40 is a bimetallic multi-level sandwich. The shield can consist of a number of layers, for instance seven. Layers 41, 42, 43 and 44 are composed of a non-magnetizable material, for instance, aluminum. Each higher layer of non-magnetizable material of a lesser thickness than the layer of non-magnetizable metal beneath it. Layer 42 is thinner than layer 41; layer 43 is thinner than layer 42; layer 44 is thinner than layer 43.

Sandwiched between the four layers of non-magnetizable metal are three comparatively thin layers 45, 46 and 47 of a magnetizable metal, for instance steel. Layer 46, being above layer 45 is a lesser thickness than layer 45. Layer 47, similarly, is thinner than layer 46. The thickest layer 45 of magnetizable material is approximately equal in thickness to the thinnest layer 44 of non-magnetizable metal.

Sample thicknesses for the layers of shield 40 are layer 41, .500 inch; layer 45, .084 inch; layer 42, .375 inch; layer 46, .056 inch; layer 43, .250 inch; layer 47, .028

inch and layer 44, .102 inch. These shield layer thickness measurements are merely exemplary and other more optimum thicknesses may be discovered.

Applicant has found that while a shield composed merely of a block of non-magnetizable metal will fairly well shield against stray magnetic lines of force, the above described sandwich shield much more efficiently blocks stray magnetic lines of force for the same shield thickness. Applicant has also found that layers, decreasing in thickness as they increase in distance from the source of magnetic lines of force, provide just as efficient shielding as does a laminated sandwich shield with each layer of magnetic and non-magnetic material being respectively of the same thickness. A shield of the latter type would be much taller causing undesirable further removal of the clamping means from the spherical member 14 and the work surface below.

FIGURE 4 shows the magnetic shield of the instant invention being used in conjunction with a magnetic flat vise. When the magnet holding the flat vise securely to the metallic surface being worked on is energized, the shield 50 prevents the stray magnetic lines of force from reaching the tool that is taking filings or cuttings off the work piece.

Magnetic flat vise shield 50 has alternate layers of non-magnetizable material 51, 52, 53 and 54 and alternate thinner layers of magnetizable metal 55, 56 and 57. As with the spherical member vise, the layers of magnetizable metal are comparatively thinner than the layers of non-magnetizable material. Again, each layer of magnetizable and non-magnetizable material is tapered to a lesser thickness than the layer of the same material beneath it, as measured up from the source of magnetic lines of force.

Sample thicknesses for the layers of shield 50 are, layer 51, .500 inch; layer 55, .140 inch; layer 52, .375 inch; layer 56, .112 inch; layer 53, .250 inch; layer 57, .084 inch and layer 54, .125 inch. These shield layer thickness measurements are merely exemplary and other more optimum thicknesses may be discovered.

In the magnetic flat vise, as in the vise connected to a spherical member a laminated shield is more efficient than a single block of non-magnetizable material for protecting against stray magnetic lines of force. Using layers decreasing thickness as they increase in distance from the magnetic force just as efficiently carries out the shielding function as does laminations having an equal thickness. But, the decreasing thickness laminations make the whole shield much thinner thereby permitting the clamping means of the vise 50 to be closer to the base upon which the vise is set.

While certain specific embodiments of the invention have been described and illustrated, it will be obvious to one skilled in the art that various modifications may be made and I, therefore, desire to be limited only by the scope of the appended claims.

The embodiments of the invention in which an exclusive privilege or property is claimed are defined as follows:

1. A shield for a vise which may be magnetically secured to a support, said shield comprised of alternate layers of magnetizable metal and non-magnetizable material in which each layer of magnetizable metal is thinner than the adjacent layers of non-magnetizable material.

2. The shield of claim 1 in which the alternate layers of non-magnetizable material are thick close to a source of magnetic lines of force and are of a lesser thickness at a further distance from said source of magnetic lines of force.

3. The shield of claim 2, in which the alternate layers of non-magnetizable material are, measuring from a layer closest to said source of magnetic lines of force to the layer furthest from said source, of a thickness of .500 inch, .375 inch, .250 inch and .120 inch and the alternate layers of magnetizable metal are, measuring from the layer closest to the source of magnetic lines of force to the layer furthest from said source, of a thickness of .084 inch, .056 inch and .028 inch.

4. The shield of claim 2, in which the alternate layers of non-magnetizable material are, measuring from a layer closest to said source of magnetic lines of force to the layer furthest from said source, of a thickness of .500 inch, .375 inch, .250 inch and .125 inch and the alternate layers of magnetizable metal are, measuring from the layer closest to the source of magnetic lines of force to the layer furthest from said source, of a thickness of .140 inch, .112 inch and .084 inch.

5. The shield of claim 2, in which the magnetizable metal is steel and the non-magnetizable material is aluminum.

6. In combination, a vise which may be magnetically secured to a support and a shield; said vise being comprised of an electromagnet within a moveable base; said moveable base having a clamping means attached thereto; said shield disposed between said moveable base and said clamping means; said shield being comprised of alternate layers of magnetizable metal and non-magnetizable material.

7. The combination of claim 6 in which the alternate layers of non-magnetizable material are thick close to said electromagnet and are of a lesser thickness at a further distance from said electromagnet.

8. The combination of claim 6, in which the magnetizable metal is steel and the non-magnetizable material is aluminum; said alternate layers of aluminum, measuring from the layer closest to said electromagnet to the layer furthest therefrom, are of a thickness of .500 inch, .375 inch, .250 inch, and .120 inch; and the alternate layers of steel are, measuring from the layer closest to said electromagnet to the layer furthest therefrom, of a thickness of .084 inch, .056 inch and .028 inch.

9. The combination of claim 7, in which the magnetizable metal is steel and the non-magnetizable material is aluminum; said alternate layers of aluminum, measuring from the layer closest to said electromagnet to the layer further therefrom, are of a thickness of .500 inch, .375 inch, .250 inch and .125 inch; and the alternate layers of steel are, measuring from the layer closest to said electromagnet to the layer furthest therefrom, of a thickness of .140 inch, .112 inch and .084 inch.

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U.S. Cl. X.R.

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