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[54] **ROTARY ANVIL CONSTRUCTION**

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[51] **Int. Cl.** **B26d 7/20**

[58] **Field of Search** 83/658, 659, 347

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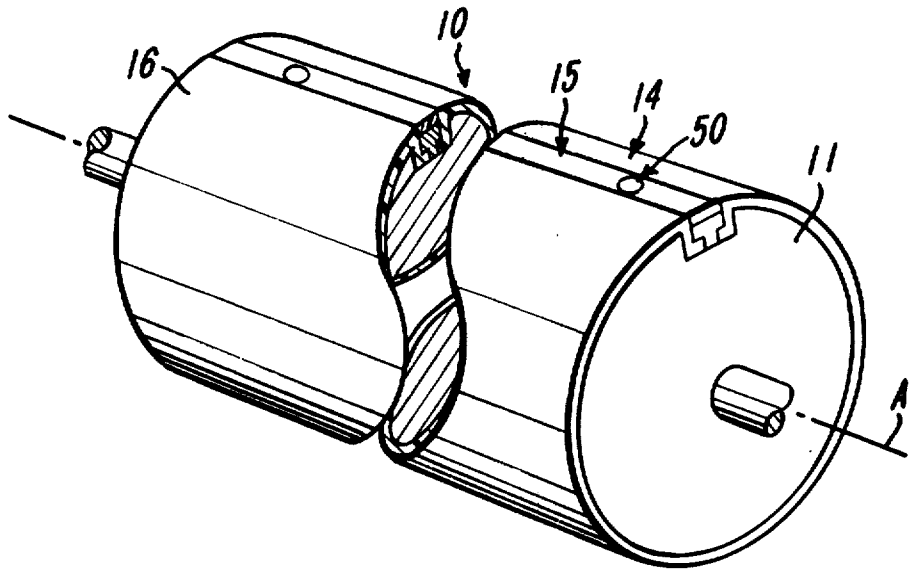
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Assistant Examiner—Leon Gilden

[57] **ABSTRACT**

A rotary anvil construction is provided which includes a rotary anvil having an outer substantially cylindrical surface and having a longitudinally extending groove extending inwardly from the surface. A die cutting mat is provided and comprises a main body terminating in substantially identical L-shaped end portions which are received within the groove and each L-shaped portion has a first planar surface including an outermost edge, a second surface arranged transverse the inner edge of the first planar surface, and a third surface extending from the terminal outer edge of the second surface and transverse the second surface. A clamping bar is provided which has at least an outer portion thereof made of a mat-like material similar to the mat and the bar extends the entire distance between the first planar surfaces and has a pair of spaced clamping surface portions each engaging an associated one of the second transverse surfaces. The bar holds the mat against the anvil and has a pair of opposed outer edges each adjoining an outermost edge of an associated first surface.

19 Claims, 5 Drawing Figures



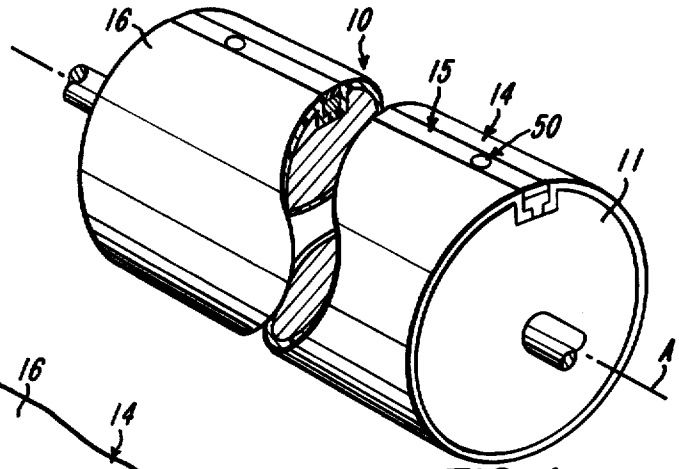


FIG-1

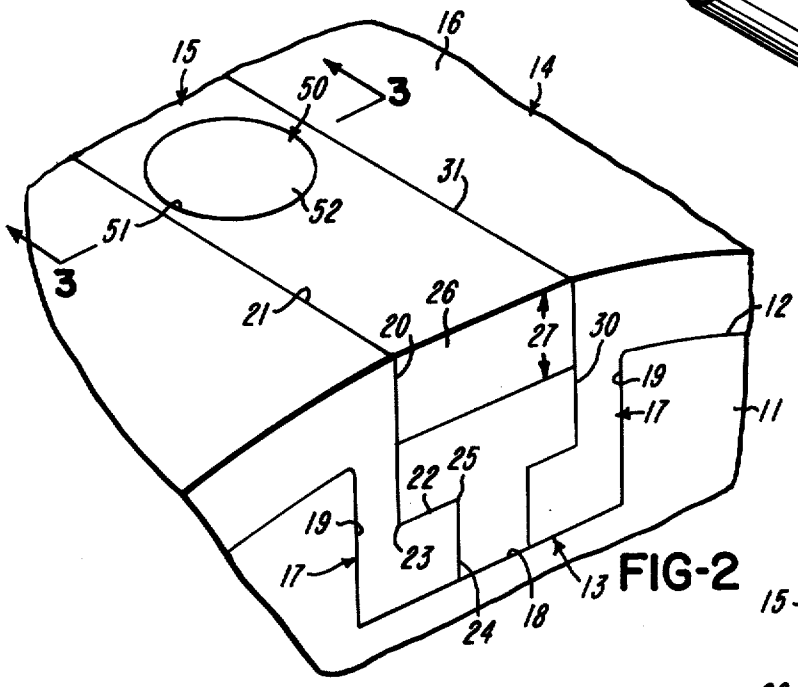


FIG-2

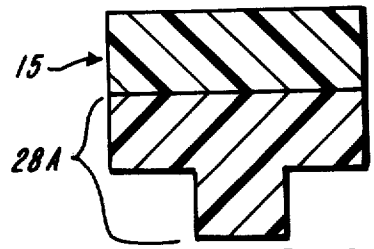


FIG-4

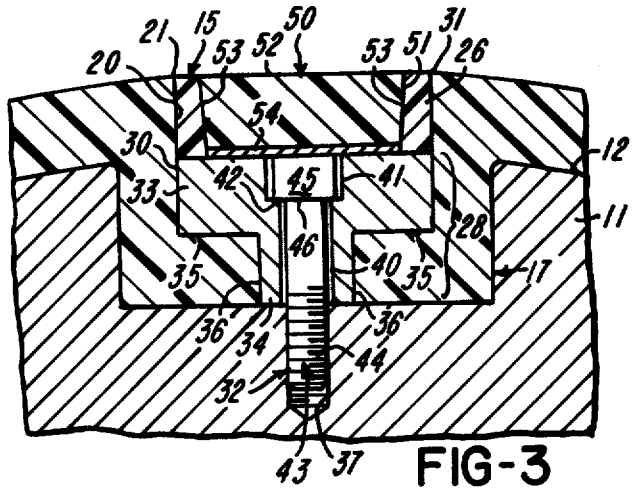


FIG-3

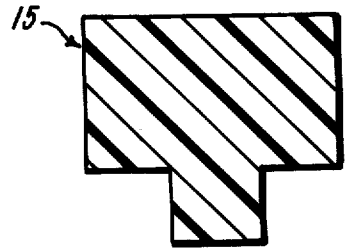


FIG-5

ROTARY ANVIL CONSTRUCTION

BACKGROUND OF THE INVENTION

Rotary anvil constructions are used widely throughout industry, and in general such rotary anvil constructions employ die-cutting mats which are attached against the outside surfaces of such anvils. There are numerous devices and techniques for attaching die-cutting mats in position; nevertheless, the need exists for an improved rotary anvil construction comprised of an anvil, die-cutting mat, and fastening means of simple and economical construction and wherein the component portions of such an improved rotary anvil construction may be installed or assembled by relatively unskilled personnel.

SUMMARY

This invention provides an improved rotary anvil construction which satisfies the above-mentioned need and such construction comprises a rotary anvil having an outer substantially cylindrical surface and having a longitudinally extending groove extending inwardly from the surface. A die cutting mat is provided and comprises a main body terminating in substantially identical L-shaped end portions which are received within the groove and each L-shaped portion has a first planar surface including an outermost edge, a second surface arranged transverse the inner edge of the first planar surface, and a third surface extending from the terminal outer edge of the second surface and transverse the second surface. A clamping bar is provided which has at least an outer portion thereof made of a mat-like material similar to the mat and the bar extends the entire distance between the first planar surfaces and has a pair of spaced clamping surface portions each engaging an associated one of the second transverse surfaces. The bar holds the mat against the anvil and has a pair of opposed outer edges each adjoining an outermost edge of an associated first surface.

Other details, uses, and advantages of this invention will be readily apparent from the exemplary embodiments thereof presented in the following specification, claims, and drawing.

BRIEF DESCRIPTION OF THE DRAWING

The accompanying drawing shows present preferred embodiments of this invention, in which

FIG. 1 is a fragmentary perspective view illustrating one exemplary embodiment of a rotary anvil construction of this invention having a die cutting mat fastened in position on a rotary anvil by a clamping bar;

FIG. 2 is an enlarged fragmentary perspective view particularly illustrating the manner in which the end portions of the die cutting mat of FIG. 1 are held in position;

FIG. 3 is a cross-sectional view taken essentially on the line 3—3 of FIG. 2;

FIG. 4 is a cross-sectional view illustrating another exemplary embodiment of a clamping bar which may be used interchangeably with the clamping bar of FIG. 1; and

FIG. 5 is a cross-sectional view illustrating still another exemplary embodiment of a clamping bar which may be used interchangeably with the clamping bar illustrated in FIG. 1.

DESCRIPTION OF ILLUSTRATED EMBODIMENTS

Reference is now made of FIG. 1 of the drawing which illustrates one exemplary embodiment of a rotary anvil construction of this invention which is designated generally by the reference numeral **10**. The anvil construction **10** is particularly adapted to be used with an associated rotary cutter or cylinder (not shown) which has cutting means or blades thereon for cutting a sheet-like workpiece such as paper, cardboard, and other materials and the anvil construction **10** serves as a backup allowing the blades of such a rotary cutter to be urged against the workpiece to enable cutting thereof efficiently and without jagged edges.

The rotary anvil construction **10** comprises a rotary anvil which has an outer substantially cylindrical surface **12** and has a longitudinally extending groove **13** in the anvil **11** with such groove extending inwardly from the cylindrical surface **12** toward a central longitudinal axis A of the anvil **11** which is also the axis of the anvil construction **10**. The anvil construction **10** has a die-cutting mat **14** which is of optimum simplicity and the mat **14** is held in position by a clamping bar **15** in a manner to be described in detail subsequently.

As seen particularly in FIGS. **1** and **2** the mat **14** has a main body portion **16** terminating in substantially identical L-shaped end portions each designated generally by the reference numeral **17** and the end portions **17** are received within the groove **13** and suitably detachably fixed in position by the clamping bar **15**. The groove **13** of this example has a roughly U-shaped outline defined by a bight **18** and a pair of legs **19** extending perpendicularly outwardly from opposite ends of the bight **18**. Due to its simplicity the groove **13** may in many instances be cut in presently used rotary anvils by modifying a similar existing groove therein to thus provide the anvil construction **10** of this invention by rework of existing anvils.

Each L-shaped portion **17**, see FIGS. **2** and **3**, has a first planar surface **20** which includes an outermost edge **21**, a second planar surface **22** arranged transverse to and extending from the inner edge **23** of the first planar surface **20** and in this example the second planar surface **22** extends substantially perpendicular to the planar surface **20**. Each L-shaped portion **17** also has what will be referred to as a third planar surface **24** which extends from the terminal outer edge **25** of the substantially perpendicularly arranged planar surface **22** and the planar surface **24** is arranged transverse, approximately perpendicular in this example, the planar surface **22** and hence approximately parallel the planar surface **20**.

The clamping bar **15** is adapted to engage the L-shaped end portions **17** in a manner now to be described now in detail and the bar **15** is a substantially T-shaped bar which extends the full axial length of the groove **13** which in turn extends the full axial length of the anvil **11**. The bar **15** is suitably detachably fixed in position and extends parallel to the longitudinal axis A of the rotary anvil construction **10**.

The bar **15** has at least an outer portion **26** thereof, which in this example has a thickness indicated at **27**, which is made of a mat-like material similar to the material used to make the mat **14** and hence such outer portion **26** is fully useable as a die cutting mat. The bar **15** also has an inner portion **28** which in this example

is made of a suitable metallic material. In addition, it will be seen that the clamping bar **15** has a pair of oppositely arranged approximately parallel planar surfaces **30** and each planar surface **30** has an outer edge **31**; and, each planar surface is defined by a rectangular planar strip of portion **26** cooperating and being coplanar with a similar rectangular planar strip of portion **28**.

The clamping bar **15** has fastening means designated generally by the reference numeral **32** for fastening such bar and hence the mat **15** against the rotary anvil **11** and the fastening means **32** will be described in detail subsequently; however, with the clamping bar **15** fastened in position by the fastening means **32**, it will be seen that the oppositely arranged planar surfaces **30** of the clamping bar **15** are in fact-to-face contact with the first planar surfaces **20** and each outer edge **31** of the clamping bar adjoins an associated outer edge **21** of a surface **20** comprising the mat **14**.

As previously mentioned, the clamping bar **15** is a substantially T-shaped bar as viewed either from an end thereof or in cross-section and the T-shaped configuration thereof is defined by a transverse arm portion **33**, see FIG. **3**, which is supported on a perpendicularly arranged leg portion **34** thereof so as to define a pair of spaced clamping surfaces **35** on opposite sides of the leg portion **34**. The leg portion **34** has a pair of parallel surfaces each designated by the reference numeral **36** and defining opposite sides thereof, and once the clamping bar **15** is fastened in position by its fastening means **32**, the clamping surfaces **35** are urged firmly against the transverse surfaces **22** with the leg portion **34** of the clamping bar **15** being received between the substantially parallel surfaces **24** of end portions **17**.

The fastening means **32** comprises a plurality of threaded openings **37** in the anvil **11**, a plurality of bores **40** in the clamping bar **15**, which with the clamping bar **15** placed in position each bore **40** is arranged in aligned relation with a threaded opening **37**, a plurality of counter-bores **41** in the bar **15** with each counterbore being arranged coaxially with an associated bore **40** and each counterbore **41** defining a flat annular surface **42** at the outer edge of its bore **40**, and a plurality of bolts each designated generally by the reference numeral **43**. Each bolt **43** has a threaded portion **44** threadedly received in an associated threaded opening **37** and a head **45** provided with a bottom annular bearing surface **46** so that the annular surface **46** of the head is received against an associated annular surface **42** to thereby urge the clamping bar **15** toward the central axis A of the anvil and detachably fix the end portions **17** of the mat **14** in position against the anvil **11**.

To provide access for each threaded bolt **43** comprising the fastening means **32** the rotary anvil construction **10** has a plurality of plugs **50** each having a substantially right circular cylindrical outside surface **51** and a top surface **52** which conforms in contour or configuration to the clamping bar **15**. Each plug **50** is received within an associated right circular cylindrical bore **53** in the outer portion **26** and the outside surface **51** corresponds substantially in configuration to the cylindrical surface **53** and is tight-fitting therewithin. The plug being of a mat-like material is compressible yet it is resilient and springs back to its original configuration once a compressing force is removed therefrom. Accordingly, the plug may be held by friction alone with its surface **51** against surface **53** so that the plug **50** will not fall out during normal operation of the rotary anvil construction **10**.

However, friction alone may not be sufficient to hold each plug **50** in position, especially with centrifugal force also acting thereon and although a suitable adhesive means may be provided on the outside surface of the plug to hold such plug in position, if desired, such use of adhesive means requires added machine down time to allow such plug adhesive to dry or set. Also, it is very difficult to remove an adhesively fastened plug from a rotary anvil construction without substantial damage to the mat and plug. Plug removal may be desirable to rotate the mat end-for-end on its anvil, for example, or to reuse a bar **15** with a new mat.

However, it is preferred that each bolt **43** have at least its head **45** made of a suitable magnetic material. As seen in FIG. **3**, each plug **50** preferably has a backing strip **54** made of a suitable material, such as a ferrous material, capable of being magnetically attracted by the magnetic head **45**. The strip **54** is suitably bonded or fixed to the plug **50** and once a bolt **43** has been threaded in position to hold the clamping bar as described above and its plug installed in position thereabove it will be held in position either solely by magnetic attraction or by magnetic attraction cooperating with the previously mentioned friction fit, depending on the size tolerances involved.

It will also be appreciated that instead of making each bolt **43** with a magnetic head **45** each bolt **43** may be of conventional construction and made of a ferrous material whereupon each plug **50** may be made with its strip **54** having magnetic capabilities by being made of a suitable permanent magnet material **54**. Indeed, both the head **45** and strip **54** may be in the form of permanent magnets.

It will also be appreciated that the entire plug **50** may be made of a suitable elastomeric mat-like material and have magnetized particles dispersed throughout so that the entire plug **50** would be in the form of a permanent magnet so that it would be attracted to the head **45** of a bolt **43**. In this latter type construction the mat-like material would also be capable to being repeatedly engaged by cutting means of a rotary cutter without any more damage thereto than to the remainder of top portion **26** of the clamping bar **15**.

The T-shaped clamping bar **15** of FIGS. **1-3** has an outer portion **26** and a lower or inner portion **28** made of a suitable metallic material as previously described and the outer portion **26** is bonded or fixed by a suitable adhesive means, or the like, against the inner portion **28**. However, it will be appreciated that such lower portion of the clamping bar need not necessarily be made of a magnetic material but may be made of a monmetallic material such as a high-strength plastic material as shown in FIG. **4**, and in this latter instance the outer portion **26** is also suitably bonded or fixed against the inner portion **28**, whereupon it will be seen that in FIG. **4** the bar is also designated by the reference numeral **15** and its lower portion designated by the reference numeral **28A**.

The clamping bar need not necessarily be made of two different materials as shown in FIGS. **1-3** and **4**, indeed, the entire clamping bar may be made of the same material as illustrated in FIG. **5** and such clamping bar may be made of a suitable comparatively strong material having essentially the properties of the outer portion **26** in the clamping bar **15** previously described.

The clamping bar of FIG. 5 is also designated by the reference numeral 15 and the entire cross-section thereof is cross-hatched as a plastic material; and, the bar 15 of FIG. 5 may be made by any known process including by extrusion thereof through a suitable die.

The clamping bars illustrated in FIGS. 4 and 5 are fastened in position in substantially the identical manner described in connection with clamping bar 15 presented in FIGS. 1-3 of the drawing and the bars 15 of FIGS. 4 and 5 are fully interchangeable with the bar of FIGS. 1-3. In addition, each bar 15 of FIGS. 1-5 is attached in position using substantially identical fastening means to hold an associated mat 14 in position and may utilize the various types and combinations of plugs and fastening bolts with or without magnetized heads as described above.

The mat 14 may be made of any suitable elastomeric material which is capable of being used with a rotary cutter; and, such mat may be made of a suitable polymer such as polyurethane or a suitable rubber compound whether natural or synthetic rubber.

A suitable vacuum tool may be provided with the anvil construction of this invention to remove the plugs 50 and such tool may be in the form of a plunger arrangement capable of exerting vacuum against the top surface 52 of each plug 50 whereby the plug would be simply removed by vacuum.

The top or outer portion of the clamping bar 15 and plug 50 is also preferably made of a mat-like elastomeric material similar to the material used to make the mat 14 and as previously defined. The plug 50 may also be made of such elastomeric mat-like material impregnated with magnetic particles, or the like, as mentioned before and when thus made each plug may be simply removed by using any article made of a ferrous metal and the plug removed using magnetic attraction.

While present exemplary embodiments of this invention, and methods of practicing the same, have been illustrated and described, it will be recognized that this invention may be otherwise variously embodied and practiced within the scope of the following claims.

What is claimed is:

1. In combination: a rotary anvil having an outer substantially cylindrical surface and having a longitudinally extending groove therein extending inwardly from said surface; a die-cutting mat comprising a main body terminating in substantially identical L-shaped end portions which are received within said groove; each L-shaped portion having, a first planar surface including an outermost edge, a second surface arranged transverse the inner edge of said first planar surface, and a third surface extending from the terminal outer edge of said second surface and transverse said second surface; a clamping bar extending the entire distance between said first planar surfaces and having a pair of spaced clamping surface portions each engaging an associated one of said second transverse surfaces, said bar holding said mat against said anvil and having a pair of opposed outer edges each adjoining an outermost edge of an associated first planar surface, said bar having at least an outer portion thereof made of a mat-like material similar to said mat; and means fastening said bar and hence said mat against said anvil.

2. A combination as set forth in claim 1 in which said bar has a pair of oppositely arranged planar surfaces in face-to-face contact with said first planar surfaces and each of said pair of opposed outer edges defines an edge of its associated planar surface.

3. A combination as set forth in claim 1 in which said second and third surfaces are also planar surfaces, said second planar surface is arranged substantially perpendicular said first planar surface, and said third planar surface is arranged substantially perpendicular to said second planar surface whereby said first and third planar surfaces are approximately in parallel relation.

4. A combination as set forth in claim 1 in which said clamping bar is a substantially T-shaped bar defined by a transverse arm portion which is supported on a perpendicularly arranged leg portion so as to define said pair of spaced clamping surfaces on the underside of said arm and on opposite sides of said leg portion.

5. A combination as set forth in claim 4 in which said leg portion of said T-shaped clamping bar has a pair of parallel surfaces defining opposite sides thereof and once said T-shaped clamping bar is fastened into position said pair of parallel surfaces of said leg portion are arranged between said third surfaces.

6. A combination as set forth in claim 1 in which said clamping bar comprises a T-shaped clamping bar and has an inner portion made of a metallic material with said outer portion thereof being bonded thereagainst.

7. A combination as set forth in claim 1 in which said clamping bar comprises a T-shaped clamping bar and has an inner portion made of a comparatively hard and high-strength plastic material with said outer portion thereof being bonded thereagainst.

8. A combination as set forth in claim 1 in which said clamping bar comprises a T-shaped clamping bar and has an inner portion made of the same material as said outer portion.

9. A combination as set forth in claim 8 in which said clamping bar is made by an extrusion process and said inner portion and outer portion thereof blend smoothly together as a unitary structure.

10. A combination as set forth in claim 1 in which said groove is a substantially U-shaped groove having a bight and a pair of substantially parallel legs extending from opposite ends thereof.

11. A combination as set forth in claim 1 in which said fastening means comprises a threaded opening in said anvil, a bore in said bar arranged in aligned relation with said opening, a counterbore in said bar outwardly of and coaxial with said bore and defining a flat annular surface at the outer edge thereof, a bolt having a threaded portion threadedly received in said threaded opening and a head received against said flat annular surface, and a plug made of said mat-like material and being received in said counterbore.

12. A combination as set forth in claim 4 in which said mat-like material of which said plug is made is a compressible yet resilient material and said plug has an outside diameter which is larger than the corresponding inside diameter of said counterbore whereby said plug is compressed radially inwardly and received within said counterbore so that it is held at least in part by friction.

13. A combination as set forth in claim 4 in which at least one of said threaded bolt and plug is comprised of a magnetic material and the other of said bolt and plug is comprised of a material capable of being attracted by said magnetic material whereby said plug is at least partially held within said counterbore by magnetic attraction.

14. A combination as set forth in claim 4 in which said bolt has at least a head thereon made of a magnetic material and said plug is comprised of a material which is attracted by said magnetic material whereby said plug is at least partially held within said counterbore by magnetic attraction.

15. A combination as set forth in claim 14 in which said material which is attracted by said magnetic means comprises a flat strip made of a ferrous metal bonded to the underside of said plug.

16. A combination as set forth in claim 14 in which said material which is attracted by said magnetic material comprises a plurality of magnetic particles randomly dispersed throughout said plug.

17. A combination as set forth in claim 14 in which said head has a substantial vertical height thereby providing a substantial volume of magnetic material to assure adequate magnetic attraction.

18. A combination as set forth in claim 4 in which said fastening means comprises another threaded opening in said anvil, another bore in said bar arranged in aligned relation with said other opening, another counterbore in said bar outwardly and coaxial with said other bore and defining another flat annular surface at the outer edge of said outer bore, another bolt having a threaded portion threadedly received in said other threaded opening, said other bolt having a head received against said other flat annular surface, and another plug made of said mat-like material and being received in said other counterbore.

19. A combination as set forth in claim 18 in which each of said bolts has at least a head thereon made of a magnetic material and each of said plugs is comprised of a material which is attracted by said magnetic material whereby each plug is at least partially held within its counterbore by magnetic attraction.

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