A downhole magnetic debris tool (100) is disclosed that may be connected to the bottom of a packer isolation plug. The downhole magnetic debris tool may include a magnetic shield assembly (90) that shields the magnets (110) and prevent the collection of magnetic debris as the packer isolation plug (10) assembly is run into the well. The packer isolation plug assembly is inserted into the internal seal bore of a set packer. The assembly protects the seal bore from damage and prevents debris from moving downhole. The magnets of the downhole magnetic debris tool may be unsheathed upon removal of the packer isolation plug from the packer. The downhole magnetic debris tool may be used to collect magnetic debris that has collected on top of the packer. Additionally, the magnet shield assembly may act as a debris basket collecting downhole debris while the assembly is pulled from the hole.
For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.
DOWNHOLE ACTIVATED PACKER PLUG MAGNETIC DEBRIS TOOL

CROSS REFERENCE TO RELATED APPLICATION

This application is a Non-provisional application claiming benefit of U.S. Provisional Application Ser. No. 60/801,152, entitled, “Downhole Activated Packer Plug Magnetic Debris Tool,” by Maximiliano Mondelli, George Krieg, David Hebert, and Dewayne Turner, filed May 17, 2006, hereby incorporated by reference in its entirety herein.

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates generally to a downhole magnetic debris tool connected to the bottom of a packer isolation plug. The disclosed tool includes a magnetic shield assembly that shields the magnets as the packer isolation plug assembly is run into the well. The packer isolation plug is inserted into the internal seal bore of a set packer to protect the seal bore from damage and debris while a well bore is perforated. The magnets of the downhole magnetic debris tool are unsheathed upon removal of the packer isolation plug from the set packer allowing the magnets to collect metallic debris deposited on top of the packer. In the unsheathed position, the magnet shield assembly may act as a debris basket collecting nonmetallic downhole debris.

Description of the Related Art

The process of perforating and gravel packing or fracturing is a well known method to potentially increase the production of a well. However, the process of perforating the well generally produces debris within the wellbore. Generally a designated zone of the wellbore is hydraulically isolated within the wellbore to be perforated and then gravel packed or fractured. The designated zone may be hydraulically isolated by setting a packer within the wellbore below the zone of interest, which hydraulically isolates the designated zone from wellbore below. While the hydraulic isolation of the zone prevents the debris from traveling downhole, debris from the perforation process may settle on top of the packer.

As discussed above, the perforation of a well creates various debris in the wellbore such as gun debris, steel particles, cement, and/or well formation material. Some of this debris may be removed from the wellbore by reverse circulation of the well fluids. However, reverse
circulation typically cannot remove all of the debris from the wellbore. Additionally, the well may include a configuration that increases the difficulty of removing debris by reverse circulation. For example, in a highly deviated well the removal of the debris via reverse circulation can be very difficult. It can also be difficult to remove debris by reverse circulation from a well that includes tapered strings or liner tops. The debris itself may also present difficulties its removal from the wellbore. For example, steel particles are generally difficult to remove from the well by reverse circulation. Reverse circulation may also allow for potential fluid loss from the well perforations.

[0005] Because some debris, such as metal particles, is difficult to remove from a well by circulation of the well fluids, different techniques have been used to remove debris. In regards to metal particles, it has been known to use magnets to remove metallic debris from a well. U.S. Patent no. 3,520,359 discloses a magnetic tool consisting of a non-magnetic casing which houses a plurality of permanent magnets. The casing includes a fluid path to provide the circulation of fluid downwardly through the magnetic tool in an attempt to wash away non-magnetic materials. The magnetic tool disclosed in U.S. Patent no. 3,520,359 is not generally equipped to collect magnetic debris off the top of a packer, but rather collects magnetic debris as the tool travels down the wellbore. The magnets of the disclosed tool are unshielded as the tool is moved within the well allowing the magnets to collect magnetic particles prior to arrival at a desired collection zone.

[0006] Another type of magnetic fishing device is disclosed in Canadian Patent Application No. 2,232,941. This patent application is directed to cutting openings or windows in a downhole casing and discloses that the apparatus of the application can be used with a magnetic retrieval tool. The magnetic retrieval tool disclosed may be used to retrieve sections of the casing that are cut out from the casing. The application discloses that the magnets of the fishing device may initially be shielded when run into the well, but fails to disclose an efficient configuration for collecting debris from off the top of a packer. Further, the magnets of the disclosed device must be manually unshielded prior to collecting of the sections of the casing.

[0007] U.S. Patent No. 6,269,877 discloses a magnetic collection tool that is attached to the bottom of a perforating gun assembly. The object of the magnetic collection tool is to collect metallic debris as it falls past the magnets located below the perforation gun. The magnetic
collection tool is not configured to collect metallic debris off the top of a packer, which will inevitably be present even with the presence of a magnetic tool below the perforation gun. The magnets of the tool are unshielded as the assembly is moved within the well, thus allowing for the magnets to collect particles prior to arrival in the desired collection zone.

None of the above discussed magnetic collection devices are adapted to specifically collect metallic debris from on top of an well isolation device, such as a packer. Each of the above discussed collection devices are for the collection of metallic debris, but none are adapted to also remove non-metallic debris that may remain in the wellbore after fluid circulation has been completed.

In light of the foregoing, it would be desirable to provide a downhole magnetic debris tool that is adapted to collect metallic debris from the top of an isolation packer set in a wellbore. It would also be desirable to provide a downhole magnetic debris tool that shields the magnet when the tool is ran into the well, but that automatically unsheathes the magnets when desired. It would further be desirable to provide a downhole magnetic debris tool that is adapted to collect both metallic debris as well as non-metallic debris while traveling up the wellbore. It would also be desirable to provide a downhole assembly adapted to protect and seal the inner seal bore of a downhole packer that also includes means for cleaning off the packer upon removal of the assembly.

The present invention is directed to overcoming, or at least reducing the effects of, one or more of the issues set forth above.

SUMMARY OF THE INVENTION

The object of the present disclosure is to provide a downhole magnetic debris tool that may be connected to the bottom of a packer plug. The assembly is inserted into the inner seal bore of a packer that is set downhole in a wellbore, thus sealing the packer and protecting the inner seal bore of the packer from being damaged during the perforation of the casing. The assembly also prevents the passage of debris through the inner seal bore to the wellbore below the packer. The magnets of the downhole magnetic debris tool may be shielded while the assembly is tripped into the well to prevent the premature collection of metallic debris. After the well has been perforated, the assembly is removed from the packer seal bore. The removal of the assembly from the isolation packer internal seal bore may automatically cause the magnets of the
tool to unsheathe such that the magnets may collect metallic debris as they pass the top of the set packer. The assembly also may provide means for the collection of non-metallic debris as the assembly travels away from the packer.

The downhole magnetic debris tool, hereinafter "magnetic debris tool," of the present disclosure may be connected to a conventional packer isolation plug. The magnetic debris tool may include a top adapter having a first end connected to a lower portion of the packer isolation plug and a second end connected to an upper portion of an internal mandrel. The outer diameter of the internal mandrel may be slotted to accept magnet tubes. An internal adapter or internal coupling may be connected to the lower connection of the internal mandrel, the internal coupling allowing additional internal mandrels and internal couplings to be connected together to configure the assembly with a desire length. The magnetic debris tool includes a guide nose that is connected to the bottom end of the lowest internal mandrel. The guide nose may provide an easier entry into the internal seal bore of the isolation packer. Each of the above components may be comprised of any material that provides adequate material strength and anti-corrosive properties, such as stainless steel, as would be appreciated by one of ordinary skill in the art having the benefit of this disclosure.

As discussed above, the top adapter, internal mandrel couplings, and guide nose each are connected to the internal mandrel. Each of these components may include an internal counter bore that corresponds to the outer diameter of the internal mandrel. Due to the internal counter bore, each end of the internal mandrel may be positioned within the corresponding adjacent top adapter, internal coupling or guide nose. Slots may be cut into the major outer diameter of the internal mandrel to create a cavity between the bottom of the slot and the inner diameter of the counter bore on each end. The magnet tubes may be located in the slots and housed within the corresponding cavities.

The internal mandrel may be substituted with a slotted tubing that houses magnet tubes. Preferably the slotted tubing would be comprised of stainless steel, but could be comprised of other materials as would be appreciated by one of ordinary skill in the art having the benefit of this disclosure. The slotted housing includes a machined undercut and a buffer material (i.e., brass) sleeve which together houses the magnet tubes. When using a slotted housing and a buffer sleeve, a steel tubing mandrel is the preferred means for connecting the top adapter and
the guide nose. The magnet tube may comprise a stainless steel tube that has a solid plug, which may be stainless steel, on each end of the tube and rare earth magnets located between the plugs in the inner diameter of the tube. The rare earth magnets may be neodymium magnets or samarium cobalt magnets.

The plugs may be connected by various means to each end of the magnet tube. For example, in one such embodiment each plug is fully seamed welded to the magnet tube. The plugs may include a machined recess that is utilized to fill the cavity between the internal mandrel, top adapter, couplings or guide nose, such that the magnet tubes are securely retained within the assembly.

The magnetic debris tool may include means for shielding the magnets while the magnetic debris tool is ran into the well. In one embodiment, two sleeves working in combination may shield the entire magnet assembly, preventing the magnets from picking up any metallic debris while tripping in the wellbore. In a preferred embodiment, one of the shielding sleeves may be a steel tubing sleeve while the other sleeve may be a stainless steel tubing sleeve. These two sleeves are connected to an indicating collet or other indicating device which is located at an upper portion of the magnetic debris tool, but below the top adapter. A top collet sub is connected to the upper portion of the collet. The top collet sub includes means to secure the collet and attached components in the unsheathed position when the tool is actuated downhole. A bottom collet adapter may connect the indicating collet to the magnet shields. Directly under the indicating collect is a shearable connecting means, such as a set of shear pins or shear screws, that fasten the indicating collet, bottom collet adapter, and magnet shields to the internal mandrel.

One embodiment of the present disclosure is the method of running the magnetic debris tool into the well and removing debris after perforation of the well casing has been completed. After an isolation packer has been set within a wellbore, but prior to perforating the casing wall, a packer isolation plug must be placed within the internal seal bore of the isolation packer to prevent damage to the internal seal bore. Additionally, the placement of a packer isolation plug prevents debris from entering the lower interval completion hardware. By modifying the lower portion of the packer isolation plug, a down-hole magnetic debris tool is made up to the packer isolation plug. The packer isolation plug / debris magnetic tool assembly must be set in the
packer prior to perforating the casing wall. When setting the assembly into the packer seal bore the collet will indicate through the isolation packer bore and a snap latch of the isolation plug will locate in the isolation packer, which both ensure the correct placement of the assembly within the seal bore. The magnetic debris tool will be located below the packer isolation plug in the lowermost portion of the isolation packer and also any accessory equipment connected to the isolation packer. The accessory equipment may be any accessory, such as a multiple service closing sleeve, an internal seal bore extension, or a seal house extension, as would be appreciated by one of ordinary skill in the art having the benefit of this disclosure.

Generally the casing-perforating assembly will be run into the wellbore with the packer isolation plug / magnetic debris tool assembly. After the packer isolation plug / magnetic debris tool assembly has been secured within the internal seal bore, the casing-perforating assembly may be separated from the assembly and pulled up to the perforation zone. Due to the perforation operation, the casing annular area between the casing perforating assembly and the lower packer will contain debris such as casing steel particles, cement, formation material and potentially other unforeseen debris.

After the perforation of the wellbore, the operator will usually attempt to reverse circulate the well fluid in an attempt to kill the well. The casing-perforation assembly will be pulled from the well upon completion of the fluid circulation. The next phase is to enter the well bore with the packer plug retrieving tool. Prior to retrieving the packer plug the operator will usually attempt to reverse circulate the well fluid in an attempt to remove the previously mentioned debris from the casing annular area. Steel particles are especially difficult to remove by reverse circulation. Also wellbores that include tapered strings or liner tops may further exacerbate the removal of the debris by reverse circulation. Typically high annular velocities (pump rates) combined with viscous polymer pill sweeps fall short of completely removing the debris under these adverse well conditions. Reverse circulating the debris from the well provides limited benefits due to the potential for fluid loss to open perforations.

After removing as much debris via circulation, the operator can use the magnetic debris tool to remove debris that remains in the well bore. The isolation plug / magnetic debris tool assembly must be removed from the internal seal bore of the isolation packer. The operator may use a running tool to pull up on a retrieval neck that may be connected to the top of the isolation...
plug. Once the operator begins to pull up on the assembly, the indicating collet of the magnetic debris tool will indicate in the internal seal bore of the isolation packer. A pre-designated downward force is required to snap the indicating collet, when picking up, through the internal seal bore. As would be recognized by one of ordinary skill in the art having the benefit of this disclosure, the specific dimensions, configuration, and materials of the indicating collet and the internal seal bore may be adapted to vary the requisite downward force required to snap the collet through the internal seal bore.

The downward force applied to the indicating collet is also asserted on the shearable connecting means, such as shear pins or shear screws, which secure the indicating collet and magnet shield to the internal mandrel. The shearable connecting means are adapted to shear or break before the indicating collet is pulled through the internal seal bore of the isolation packer. Upon releasing of the shearing means, the indicating collet and the magnet shield which are connected to an internal shaft will travel downwards thus, unsheathing the magnets of the magnetic debris tool. The internal shaft may include a shaft coupling on its upper end. The magnetic debris tool may include a stop positioned such that will engage the shaft coupling once the indicating collet, magnet shield, and internal shaft assembly has traveled downwards a predetermined distance. Once the shaft coupling has engaged the stop, the string pick up tension will allow the collet to snap through the internal seal bore of the isolation packer.

The unsheathed magnets will pick up metallic debris that remains in the wellbore as the magnetic debris tool is stroked out of the wellbore: The magnet shield assembly may include an open bore that may act as a junk collection basket collecting debris as the assembly is stroked out of the wellbore. The down-hole debris magnetic tool will retain the collected debris and remove out of the hole up to the surface.

**BRIEF DESCRIPTION OF THE DRAWINGS**

[0023] Figure 1 is a cross-section of an assembly comprised of a magnetic debris tool and an isolation packer plug 10.

[0024] Figure 2 is a cross-section of the assembly of Figure 1 after the assembly has been pulled from the internal seal bore of an isolation packer.

[0025] Figure 3 is the cross-section of one embodiment of the bottom connector 170 that includes recessed portions 141 to house retention lugs and open passages 146.
Figure 4 is an isometric view of the magnetic debris tool 100 in the non-actuated state. Figure 5 is an isometric view of the magnetic debris tool 100 of Figure 4 in the actuated state.

While the invention is susceptible to various modifications and alternative forms, specific embodiments have been shown by way of example in the drawings and will be described in detail herein. However, it should be understood that the invention is not intended to be limited to the particular forms disclosed. Rather, the intention is to cover all modifications, equivalents and alternatives falling within the spirit and scope of the invention as defined by the appended claims.

**Description of Illustrative Embodiments**

Illustrative embodiments of the invention are described below as they might be employed in the use of magnetic debris tool adapted to be connected to an isolation packer plug and the methods of running such an assembly into a wellbore. In the interest of clarity, not all features of an actual implementation are described in this specification. It will of course be appreciated that in the development of any such actual embodiment, numerous implementation-specific decisions must be made to achieve the developers’ specific goals, such as compliance with system-related and business-related constraints, which will vary from one implementation to another. Moreover, it will be appreciated that such a development effort might be complex and time-consuming, but would nevertheless be a routine undertaking for those of ordinary skill in the art having the benefit of this disclosure.

Further aspects and advantages of the various embodiments of the invention will become apparent from consideration of the following description and drawings.

Figure 1 shows one embodiment of an assembly, in a non-actuated position, consisting of a magnetic debris tool 100 attached to the lower portion of an isolation packer plug 10. A retrievable neck 5 is attached to the isolation packer plug 10 and provides an interface for a running tool to retrieve the assembly after it has been inserted into an isolation packer. The magnetic debris tool 100 may be used in conjunction with any conventional packer plug as would be appreciated by one of ordinary skill in the art having the benefit of this disclosure. The magnetic debris tool 100 includes a top adapter 20 which is connected to the lower portion of the packer isolation plug 10 and also connected to an upper portion of an internal mandrel 50.
Below the top adapter 20 is an indicating collet 40, which is connected to a bottom collet adapter 70. The bottom collet adapter 70 fastens the collet 40 and the magnet shield 90 together. The bottom collet adapter 70 is secured to the internal mandrel 50 through shearable connecting means 60. Shearable connecting means 60 may comprise shear pins or shear screws that shear upon the exertion of a predetermined force. A top collet sub 144 is connected to the upper portion of the indicating collet 40. The top collet sub 144 includes recessed portions 145 for the engagement of the retention lug 140 as discussed below.

The internal mandrel 50 is further connected to a magnet mandrel 130 by an internal adapter 80. The use of additional internal adapters permits the coupling of additional internal mandrels and could be used to vary the overall length of the tool as would be appreciated by one of ordinary skill in the art having the benefit of this disclosure. Magnets 110 are connected to the magnet mandrel 130. A magnet spacer 120 separates the two magnet sections 110. Various configurations of magnets and spacers may be used depending on the length of the magnet mandrel as would be recognized by one of ordinary skill in the art having the benefit of this disclosure. The magnet mandrel 130 contains a hollow central bore and is connected on the lower end to a bottom connector 170. The lower end of the bottom connector 170 includes at least one retention lug 140, which is spring loaded. In a preferred embodiment, the bottom connector 170 includes three retention lugs 140 spaced equilaterally around its lower perimeter. While in the non-actuated state as shown in Figure 1, the spring of the retention lug 140 is compressed and the retention lug 140 rests flush against the inner magnet shield 91.

An internal shaft 25 is located within the inner bore of the magnet mandrel 130. A shaft coupling 30 is located on the upper end of the internal shaft 25. The lower end of the internal shaft 25 is connected to a guide nose 160. The guide nose 160 includes fluid passages 165, which allows for the drainage of fluid as will be discussed below. The guide nose 160 is also connected to the lower end of the magnet shields 90, 91. As depicted in Figure 1, the magnet shield 90 may be comprised of an inner sleeve 91 and an outer sleeve 90. One purpose of the guide nose 160 is to ease entry into the internal seal bore of the isolation packer. Further, the guide nose 160 acts to combine the top collet sub 144, collet 40, bottom collet adapter 70, magnet shield 90, and the internal shaft 25 as a "shield assembly". While the isolation packing
plug 10 and magnetic debris tool 100 is tripped into the well, the shield assembly is connected to the internal mandrel 50 by the shearable connecting means 60.

Figure 2 shows the isolation packer plug / magnetic debris tool assembly in the actuated position after is has been pulled from the internal seal bore of an isolation packer. The retrievable neck 5 may be used to pull the assembly out of the internal seal bore. The collet 40 requires a pre-determined force be applied to the assembly to snap the collet 40 through the internal seal bore. The shearable connecting means 60 is adapted to shear when a pre-determined force has been exerted on the connecting means 60. The force required to shear the connecting means 60 is designed to be less than the force required to snap the collet 40 through the internal seal bore. Thus, the shearable connecting means 60 shears before the assembly is pulled from the isolation packer.

Upon shearing of the connecting means 60, the shield assembly, which includes the top collet sub 144, the collet 40, the bottom collet adapter 70, the magnet shields 90, 91, and the internal shaft 25 travels down the magnetic debris tool 100 away from the isolation plug 10. The internal shaft 25 travels down the inner bore 111 of the magnet mandrel 130 until the shaft coupling 30 of the internal shaft 25 lands on the upper end of the bottom connector 170. At this point, the shield assembly has fully extended away from upper end of the tool completely unsheathing the magnets 110. The magnets 110 are then able to collect metallic debris located in the well and in particular metallic debris that has collected on the top of the isolation packer as the magnetic debris tool 100 moves past the isolation packer.

The shield assembly may be locked into the actuated or fully extended position by the engagement of retention lugs 140 into the recessed portions 145 of the top collet sub 144. In a preferred embodiment, three retention lugs 140 are spaced equilaterally around the perimeter of the bottom connector 170. The number and mechanism of the retention lugs may be varied to lock the shield assembly in the actuated position as would be appreciated by one of ordinary skill in the art having the benefit of this disclosure. The shaft coupling 30 in combination with the upper end of the bottom connector 170 are provided as an additional measure to prevent the travel of the shield assembly off of the magnetic debris tool 100 in the event the retention lug locking mechanism fails.
After the extension of the shield assembly into the actuated position, the force exerted on the retrieving neck is increased until the entire assembly is removed from the internal seal bore of the isolation packer. The unsheathed magnets 110 collect metallic debris from the top of the isolation packer and within the wellbore as the magnetic debris tool 100 passes out of the internal seal bore. The shield assembly includes an inner cavity 112 when in the extended position. The inner cavity 112 of the shield assembly may act as a debris basket and collect wellbore debris as the tool is pulled up the wellbore. Debris may enter into the inner cavity 112 through the openings 146 located around the perimeter of the bottom connector 170 as shown in Figure 3. The guide nose 160 may include at least one fluid path 165 provided to allow well fluids to drain from the inner cavity 112 of the shield assembly.

Figure 3 is the cross-section of one embodiment of the bottom connector 170. The bottom connector 170 includes flanges 147 having retaining lugs 140 that are adapted to expand into a recessed area in the top collet sub 144. The bottom connector 170 includes openings 146 located between adjacent flanges 147. The openings 146 allow for the entrance of debris and fluid into inner cavity 112 of the shield assembly as the magnetic debris tool 100 travels up the well. The bottom connector 170 also includes a central opening 148 through which the internal mandrel 25 may travel. As discussed above, the upper portion of the bottom connector 170 is connected to the magnet mandrel 130 as well as the magnet assembly 100.

Figure 4 is an isometric view of the magnetic debris tool 100 in the non-actuated stage. In the non-actuated stage, the magnets 110 are sheathed within the magnet shield 90. In this position the magnetic debris tool 100 may be run into the wellbore without collecting any metallic debris. A top adapter 20 is located at the upper end of the magnetic debris tool 100. In the non-actuated state, the collet 40 is positioned directly below the top adapter and is connected to the bottom collet adapter 70, which holds the magnet shield 90 in the sheathed position. The bottom collet adapter 70 is connected to an inner mandrel 50 (shown in Figure 5) by a set of shear screws. The embodiment shown in Figure 4 includes two sets of magnets 110 separated by a spacer 120. The end of the magnetic debris tool 100 includes a guide nose 160.

Figure 5 shows the magnetic debris tool 100 of Figure 4 in the actuated state. A force has been exerted on the magnetic debris tool 100 shearing the set of shear pins that connect the bottom collet adapter 70 to the inner mandrel 50 allowing the collet 40, bottom collet adapter 70,
magnet shield 90, and guide nose 160 to travel down the magnetic debris tool 100 until reaching a fully extended position. The travel of these components is limited by an internal shaft having a shaft coupling on its upper end, which lands on the bottom connector 70. The movement of the magnet shield 90 unsheathes the magnets 110, which may be separated by a magnet spacer 120. The upper end of the magnet 110 is connected to an internal mandrel 50 by an internal adapter 80. The internal mandrel is connected to the top adapter 20 of the magnetic debris tool 100. In the actuated state, the magnetic debris tool 100 may collect metallic debris located within the wellbore.

[0042] Although various embodiments have been shown and described, the invention is not so limited and will be understood to include all such modifications and variations as would be apparent to one skilled in the art.
CLAIMS:

1. A device for collecting debris in a wellbore, the device comprising:
   a packer plug;
   a mandrel connected to the packer plug;
   at least one magnet connected to the mandrel;
   a shield assembly selectively connected to the mandrel being movable along the mandrel
   from a first position that covers the at least one magnet to a second position along the
   mandrel that uncovers the at least one magnet;
   wherein upon removal of the packer plug from a packer set within a wellbore the shield
   assembly moves from the first position to the second position.

2. The device of claim 1 wherein debris may be collected in an inner cavity when the shield
   assembly is in the second position along the mandrel.

3. An apparatus for use to collect debris out of a wellbore, the apparatus comprising:
   a plug having an upper end and a lower end, wherein the plug may be inserted into a
   packer set within the wellbore;
   a retrievable neck connected to the upper end of the plug;
   a mandrel having an upper end and a lower end, the upper end of the mandrel being
   connected to the bottom of the plug;
   a plurality of magnets connected to the mandrel;
   a collet connected by a shearable device to the mandrel at a first position along the
   mandrel, wherein the collet is adapted to move to a second position along the mandrel
   upon shearing of the shearable device;
   an outer shield connected to the collet, wherein in the first position the outer shield covers
   the plurality of magnets;
   a bottom connector attached to the lower end of the mandrel; and
   means for securing the collet at the second position along the mandrel.

4. The apparatus of claim 3 wherein the means for securing the collet at the second position
   is at least one spring loaded lug connected to the lower bottom connector.

5. The apparatus of claim 3 wherein the means for securing the collet at the second position
   includes a coupling on an end of a shaft, wherein the shaft is positioned within the mandrel.
6. The apparatus of claim 3 further comprising a nose guide attached to the bottom connector.

7. The apparatus of claim 6 wherein the nose guide includes at least one fluid passage.

8. The apparatus of claim 3 further comprising a cavity between the mandrel and the outer shield when the collet is in the second position along the mandrel.

9. The apparatus of claim 8 wherein the bottom connector includes at least one longitudinal opening in communication with the cavity between the mandrel and the outer shield.

10. The apparatus of claim 3 further comprising an inner shield connected to the outer shield.

11. The apparatus of claim 10 wherein one of the shields is steel tubing.

12. The apparatus of claim 11 wherein one of the shields is stainless steel tubing.

13. The apparatus of claim 3 wherein the plurality of magnets include at least one rare earth magnet.

14. The apparatus of claim 13 wherein the at least one rare earth magnet is neodymium.

15. The apparatus of claim 13 wherein the at least one rare earth magnet is samarium cobalt.

16. A method for collecting debris from a wellbore, the method comprising:

   unsheathing magnets on the magnetic debris tool, wherein the magnetic debris tool is connected beneath a packer plug;
   removing the packer plug from a set packer within the wellbore;
   moving the packer plug up the wellbore, wherein the magnets on the magnetic debris tool collect metallic debris in the wellbore.

17. The method of claim 16 further comprising collecting non-metallic debris in the wellbore within a cavity of the magnetic debris tool.

18. The method of claim 16 further comprising draining fluid from the cavity of the magnetic debris tool.

19. A method for collecting debris from off the top of a packer set within a wellbore, the method comprising:

   setting an isolation plug into a packer set within a wellbore, wherein a magnetic debris tool having at least one magnet and a shield assembly covering the at least one magnet is connected to the bottom of the isolation plug;
   applying a force to the isolation plug;
releasing the shield assembly to uncover the at least one magnet of the magnetic debris tool;
removing the isolation plug from the packer; and
moving the at least one magnet past the top of the set packer, wherein the at least one magnet collect metallic debris from off of the top of the packer.

20. The method of claim 19 further comprising collecting non-metallic debris in a cavity of the shield assembly.

21. The method of claim 20 further comprising draining fluid from the cavity of the shield assembly.

The method of claim 18 wherein the shield assembly is comprised of a guide nose, collet, and a magnet shield.
According to International Patent Classification (IPC) or to both national classification and IPC:

**A. CLASSIFICATION OF SUBJECT MATTER**

Inv. E21B 31/06

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols):

- E21B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched:

**Electronic data base consulted during the international search (name of data base and, where practical, search terms used)**

- EPO-Internal

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

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<td>US 6 655 462 B1 (CARMICHAEL MARK [GB] ET AL) 2 December 2003 (2003-12-02) column 2, lines 6-13,60-67; figure 1 column 3, lines 19-24</td>
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Further documents are listed in the continuation of Box C

See patent family annex

- **X** Special categories of cited documents
  - **A** document defining the general state of the art which is not considered to be of particular relevance
  - **E** earlier document but published on or after the international filing date
  - **L** document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
  - **O** document referring to an oral disclosure, use, exhibition or other means
  - **P** document published prior to the international filing date but later than the priority date claimed

- **T** later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- **X** document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- **Y** document of particular relevance, the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- **S** document member of the same patent family

**Date of the actual completion of the international search**: 5 October 2007

**Date of mailing of the international search report**: 18/10/2007

**Name and mailing address of the ISA/ Authorized officer**

-European Patent Office, P B 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel (+31-70) 340-2040, Tx 31 651 epo nl. Fax (+31-70) 340-3016
-Georgescu, Mihnea
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Form PCT/ISA/210 (patent family annex) (April 2005)