

Feb. 17, 1953

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2,628,822

MAGNETIC PLUG FOR CORE BITS

Filed Nov. 18, 1949

FIG. 1.

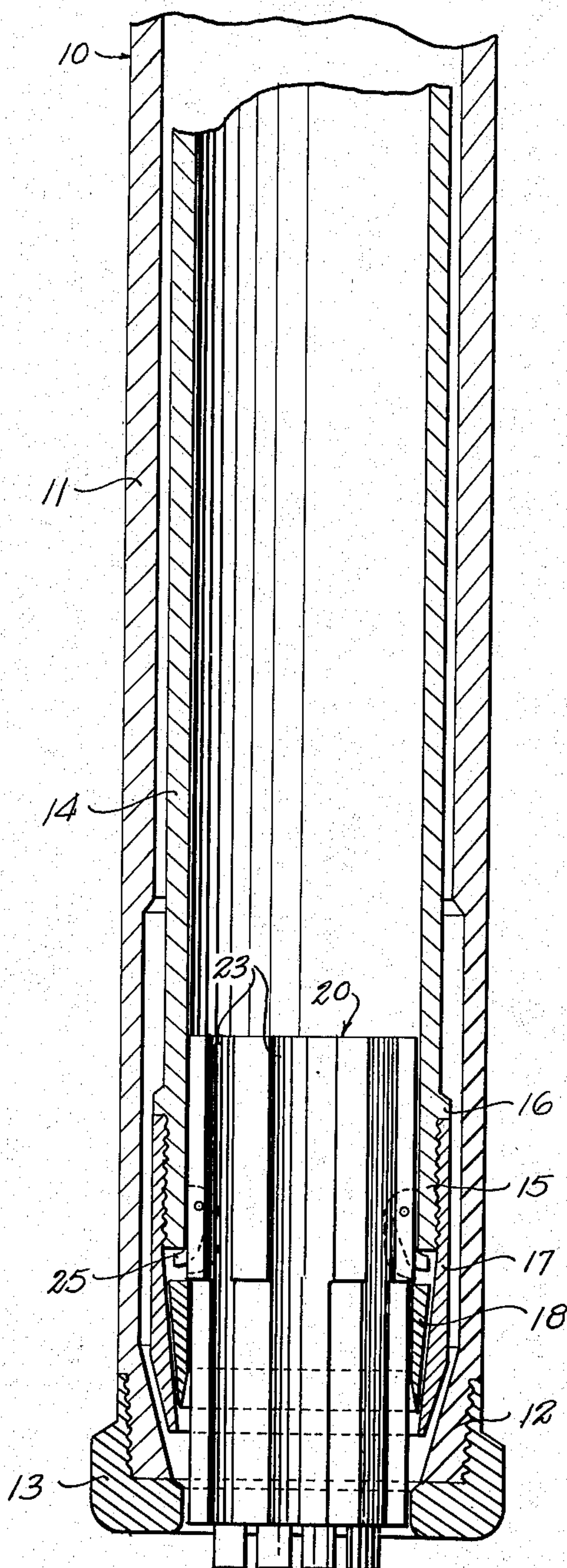


FIG. 2.

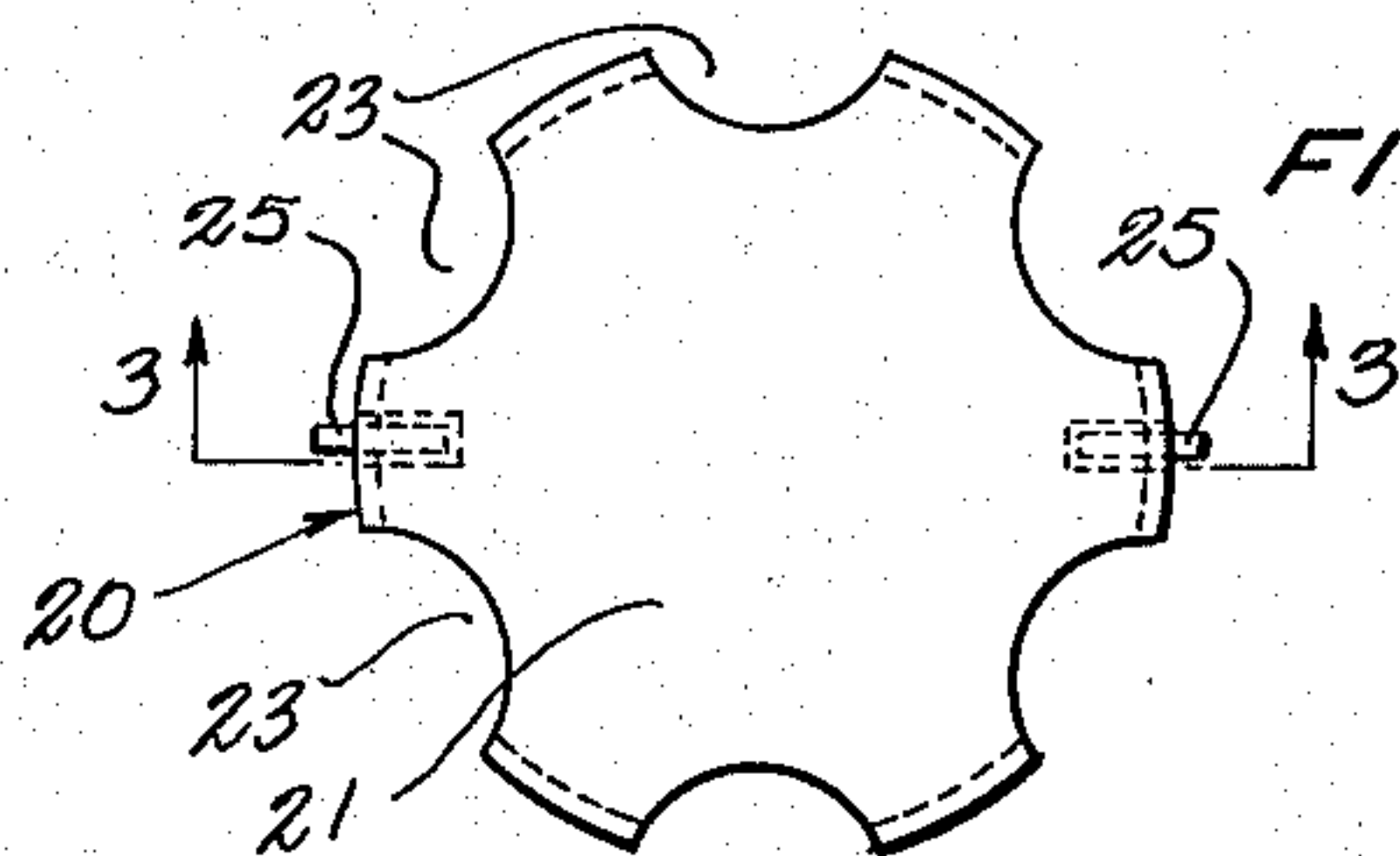


FIG. 3.

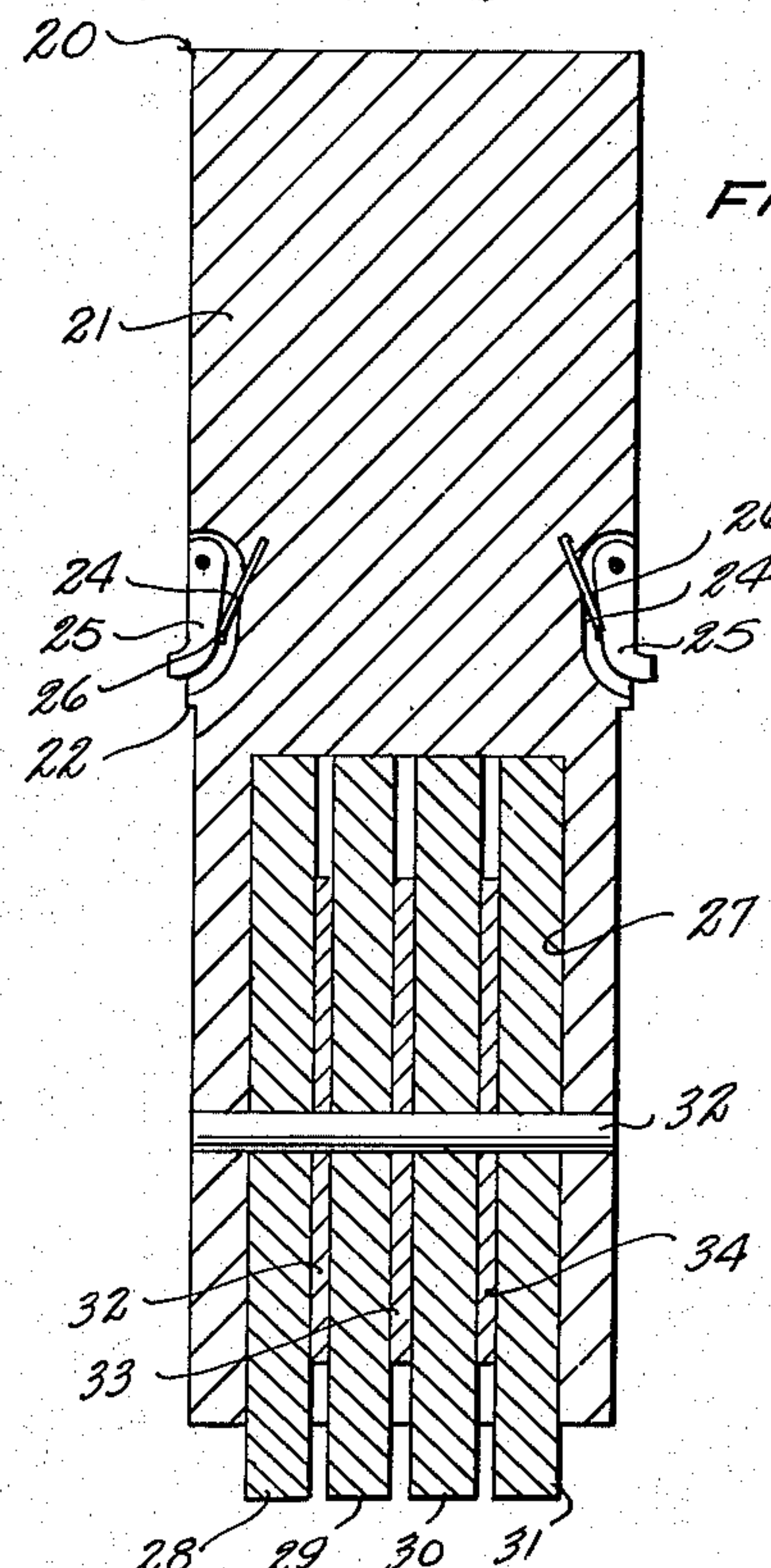
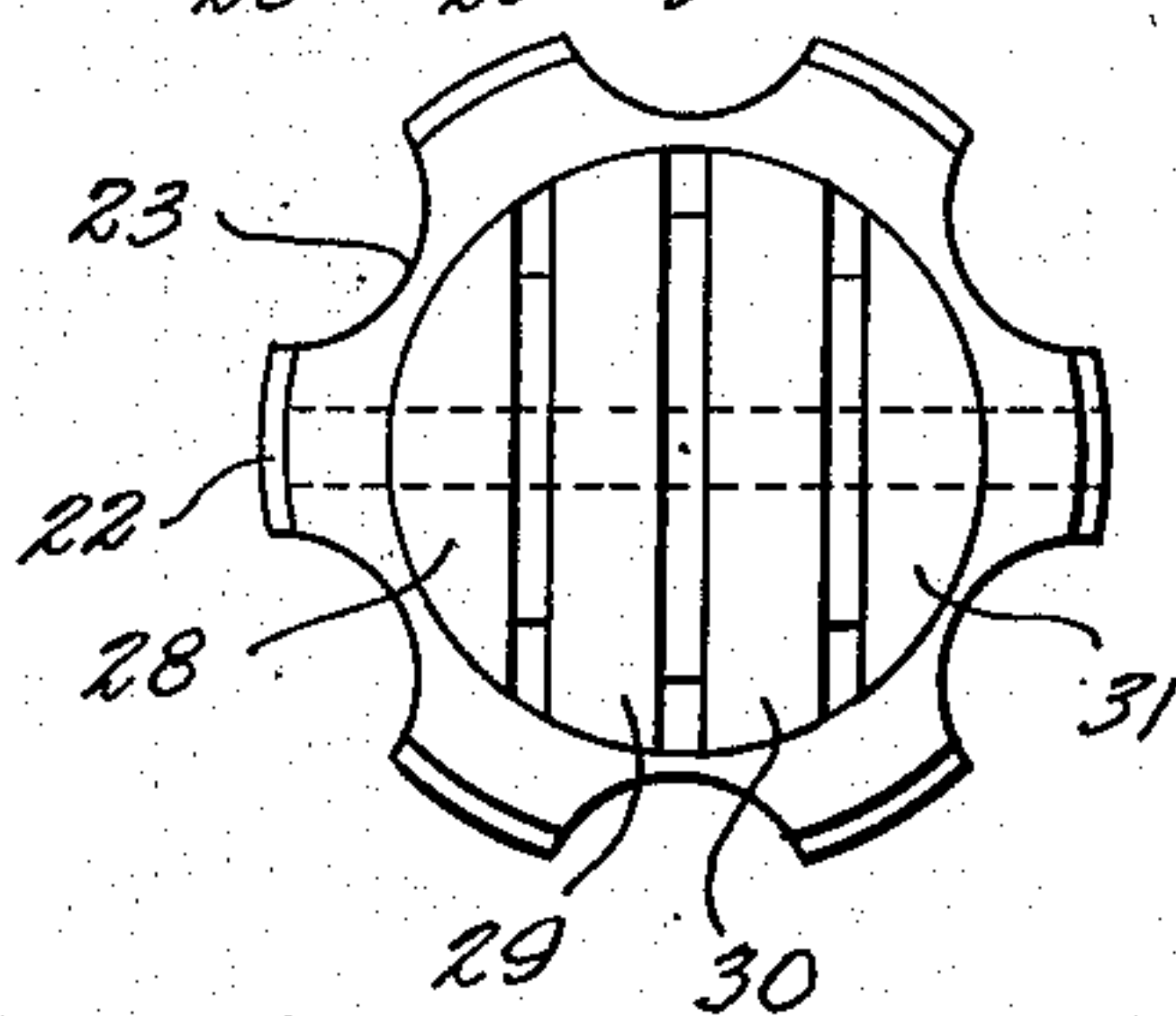


FIG. 4.



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# UNITED STATES PATENT OFFICE

2,628,822

## MAGNETIC PLUG FOR CORE BITS

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Application November 18, 1949, Serial No. 128,066

5 Claims. (Cl. 255—72)

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This invention relates to protective magnetic plugs for core bits and more particularly to a magnetic plug to be carried in a diamond core bit to protect the bit from damage by metallic particles or fragments.

It is among the objects of the invention to provide a protective magnetic plug for a core bit which plug is freely slidable in the core bit so that it protrudes slightly at the bottom end of the bit when the bit is empty and is moved upwardly in the bit as a core enters the bit, which is provided with latch means engageable with the interior of the bit to prevent accidental loss of the plug from the bit, which includes strong permanent magnets and a housing of non-magnetic material supporting the permanent magnets and slidable in the bit, and which is simple and durable in construction, and easy to install in an existing core drill bit with no modification of the bit construction.

Other objects and advantages will become apparent from a consideration of the following description and the appended claims in conjunction with the accompanying drawing, wherein:

Figure 1 is a longitudinal medial cross sectional view of a core drill bit showing a protective magnetic plug illustrative of the invention operatively mounted in the bit;

Figure 2 is a top plan view of the magnetic plug;

Figure 3 is a longitudinal cross section on the line 3—3 of Figure 2; and

Figure 4 is a bottom plan view of the protective plug.

With continued reference to the drawing, the core bit, generally indicated at 10, comprises an outer cylindrical shell or tube 11 attachable at its upper end to a drill tube section, not illustrated, and having at its lower end an externally screw threaded portion 12 of reduced diameter and having its inner surface inclined inwardly toward the lower end of the shell. An annular diamond carrying nut or shoe 13 is threaded onto the portion 12 and extends over the end of this portion at the bottom end of the shell 11. A cylindrical core sleeve 14 is secured in the shell 11 in circumspacial relationship to the latter and has its lower end spaced from the bottom end of the shell 11 and including an externally screw threaded portion 15, the threads of which terminate at an annular shoulder formation 16. A resilient finger formation 17 is threaded onto the screw threaded portion 15 of the core receiving sleeve 14 and projects below the bottom end of the sleeve 14 and a resilient core retainer 18 is

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mounted in the lower end of the formation 17 to frictionally engage a core cut by the bit and retain the core in the receiving sleeve 14, the core retaining ring 18 being spaced from the adjacent end of the sleeve 14, as is clearly illustrated in Figure 1.

As the core bit 10 is of well known construction, a more detailed description thereof is considered unnecessary for the purposes of the present disclosure.

The protective magnetic core of the present invention is generally indicated at 20 and comprises an elongated, cylindrical plug 21 of non-magnetic material, such as brass or bronze, divided into two portions by an annular shoulder 22 which extends around the plug body 21 adjacent the mid-length location of the body. The portion of the plug body above the shoulder 22 has a diameter slightly less than the internal diameter of the sleeve 14 so that the plug is freely slidable in the sleeve and the portion of the plug below the shoulder 22 has a diameter less than the diameter of the portion above the shoulder by the width of the shoulder. When the plug is operatively mounted in the core bit, as illustrated in Figure 1, the shoulder 22 engages the upper end of the core retaining ring 18 when the bit is empty to restrain the plug 20 from falling out of the bit. As a core is cut by the bit and moves inwardly of the bit the plug is forced upwardly sliding in the sleeve 14.

The plug body 21 is provided in its surface with a plurality of longitudinally extending, angularly spaced apart grooves 23 of arcuate cross sectional shape which grooves provide fluid passages so that drilling fluid can flow between the plug and the sleeve 14. The plug is provided in its upper portion near the shoulder 22 with two diametrically opposed recesses 24 which are elongated longitudinally of the plug and dogs 25 are respectively mounted in these recesses and urged outwardly of the recesses by springs 26 so that the outwardly turned lower ends of these dogs will enter the space between the bottom end of the sleeve 14 and the upper end of the core retaining ring 18 and provide an additional safety lock to prevent accidental loss of the plug from the drill.

The lower portion of the plug body 21 is provided with a coaxial, cylindrical bore or recess 27 which, in the arrangement illustrated, opens to the lower end of the plug body and terminates inwardly of the plug body adjacent the location of the shoulder 22. It is to be understood that the length of the plug body 21 is such as to give the desired stability to the plug relative to the sleeve 14 of the bit and that the length of the



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recess 27 may be greater or less in relationship to the length of the plug body than that illustrated in Figure 3 without in any way exceeding the scope of the invention.

The recess 27 has a diameter which is less than the outside diameter of the lower portion of the plug body by an amount sufficient only to leave a wall of sufficient thickness surrounding the recess to provide adequate strength for this lower portion of the plug body and a group of permanent bar magnets, as indicated at 28, 29, 30 and 31 are mounted in the recess 27 and protrude a slight amount out of the open end of the recess. These permanent magnets extend longitudinally of the recess and are secured therein by suitable means such as the pin 32 of non-magnetic material extending through diametrically opposite apertures in the plug body wall surrounding the recess and through registering apertures in the several magnet bars. The adjacent magnets are spaced apart and separated by plates 32, 33 and 34 of non-magnetic material which plates are also apertured to receive the pin 32.

The outer magnets 28 and 31 are of arcuate cross sectional shape so that they fit closely against the surface of the cylindrical recess 27 at diametrically opposite sides of the recess and the inner magnets 29 and 30 are of substantially rectangular cross sectional shape but have arcuately curved longitudinal edges which also fit the internal curvature of the recess 27.

Before the bit 10 is reinserted into a drill hole to continue drilling, the magnetic protective plug 20 is slipped into the bottom, open end of the drill and is held in the drill in the position illustrated in Figure 1 by contact of the shoulder 22 with the upper end of the core retaining ring 18. When the drill reaches the bottom of the drill hole the ends of the permanent magnets protruding from the bottom end of the plug body 21 and somewhat below the nut or shoe 13 of the drill will attract to themselves any metallic particles or fragments on the bottom of the drill hole, removing such fragments from the path of the diamond equipped shoe or nut 13 to protect the drill from damage by such metallic fragments or particles. As the plug is moved upwardly of the drill by the entry of the core into the drill the metallic fragments or particles are carried along with the plug and, when the drill is removed from the drill hole, the plug 20 is removed, cleaned and replaced before the drill is again lowered into the drill hole.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is, therefore, to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are, therefore, intended to be embraced therein.

What is claimed is:

1. In combination with a core bit including an outer shell attachable at its normally upper end to the normally lower end of a drill tube section and having a portion of its inner surface at its lower end inwardly inclined, an annular shoe threaded onto the shell at the lower end of the latter, a core sleeve disposed within said shell and circumferentially spaced therefrom, a spring finger formation threaded onto said shell at the end of the latter adjacent said shoe and engage-

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able at its end remote from said sleeve with the inwardly inclined inner surface portion of said shell, and an annular core retainer supported by said spring finger formation coaxially of said sleeve and adjacent to but spaced from the end of said sleeve adjacent said shoe, a magnetic core bit plug comprising a plug body of non-magnetic material and of elongated cylindrical shape slidably received in said core sleeve and having a longitudinally extending recess opening to the end thereof adjacent said shoe, means on said plug body engaging said core retainer and supporting said plug body in a position in which it extends through said core retainer with its end to which said recess opens at the end of said core retainer remote from said sleeve, and a group of permanent magnets disposed in the recess in said plug body and extending from the end of the latter to which said recess opens, said magnets extending through said shoe in the absence of a core in said bit and said plug being slidable along said core sleeve away from said shoe by a core moving through said shoe into said core sleeve.

2. In combination with a core bit including an outer shell attachable at its normally upper end to the normally lower end of a drill tube section and having a portion of its inner surface at its lower end inwardly inclined, an annular shoe threaded onto the shell at the lower end of the latter, a core sleeve disposed within said shell and circumferentially spaced therefrom, a spring finger formation threaded onto said shell at the end of the latter adjacent said shoe and engageable at its end remote from said sleeve with the inwardly inclined inner surface portion of said shell, and an annular core retainer supported by said spring finger formation coaxially of said sleeve and adjacent to but spaced from the end of said sleeve adjacent said shoe, a magnetic core bit plug comprising a plug body of non-magnetic material and of elongated cylindrical shape slidably received in said core sleeve and having a longitudinally extending recess opening to the end thereof adjacent said shoe, means on said plug body engaging said core retainer and supporting said plug body in a position in which it extends through said core retainer with its end to which said recess opens at the end of said core retainer remote from said sleeve, and a group of permanent magnets disposed in the recess in said plug body and extending from the end of the latter to which said recess opens, said magnets extending through said shoe in the absence of a core in said bit and said plug being slidable along said core sleeve away from said shoe by a core moving through said shoe into said core sleeve, said plug body having longitudinally extending and angularly spaced apart grooves therein for the passage of fluid through said core sleeve past said plug.

3. In combination with a core bit including an outer shell attachable at its normally upper end to the normally lower end of a drill tube section and having a portion of its inner surface at its lower end inwardly inclined, an annular shoe threaded onto the shell at the lower end of the latter, a core sleeve disposed within said shell and circumferentially spaced therefrom, a spring finger formation threaded onto said shell at the end of the latter adjacent said shoe and engageable at its end remote from said sleeve with the inwardly inclined inner surface portion of said shell, and an annular core retainer supported by said spring finger formation coaxially of said sleeve and adjacent to but spaced from the end



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of said sleeve adjacent said shoe, a magnetic core bit plug comprising a plug body of non-magnetic material and of elongated cylindrical shape slidably received in said core sleeve and having a longitudinally extending recess opening to the end thereof adjacent said shoe, means on said plug body engaging said core retainer and supporting said plug body in a position in which it extends through said core retainer with its end to which said recess opens at the end of said core retainer remote from said sleeve, and a group of permanent magnets disposed in the recess in said plug body and extending from the end of the latter to which said recess opens, said magnets extending through said shoe in the absence of a core in said bit and said plug being slidable along said core sleeve away from said shoe by a core moving through said shoe into said core sleeve, said plug body having angularly spaced apart recesses therein, and dogs pivotally mounted one in each of said recesses and spring urged into engagement in the space between the adjacent ends of said core sleeve and said core retainer to releasably secure said core bit plug at the end of said core sleeve adjacent said shoe.

4. In combination with a core bit including a core sleeve, an annular core retainer disposed adjacent one end of said core sleeve, and a resilient finger formation threaded onto said core sleeve at said one end of the latter and supporting said core retainer in position adjacent to but spaced from said one end of said core sleeve, a magnetic core plug comprising a plug body of non-magnetic material and of elongated cylindrical shape slidably received in said core sleeve and extending through said core retainer in the absence of a core in the latter, said body having a coaxial recess therein opening to the end thereof remote from said core sleeve, means on said body engaging said core retainer and precluding movement of said body out of said core sleeve through said core retainer, a group of permanent magnet bars disposed in side by side relationship in the recess in said plug body and projecting from the end of the latter to which said recess opens, separator plates of non-magnetic material disposed one between each two adjacent magnetic bars,

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and means securing said magnet bars and said separator plates in the recess in said plug body.

5. In combination with a core bit including a core sleeve, an annular core retainer disposed adjacent one end of said core sleeve, and a resilient finger formation threaded onto said core sleeve at said one end of the latter and supporting said core retainer in position adjacent to but spaced from said one end of said core sleeve, a magnetic core plug comprising a plug body of non-magnetic material and of elongated cylindrical shape slidably received in said core sleeve and extending through said core retainer in the absence of a core in the latter, said body having a coaxial recess therein opening to the end thereof remote from said core sleeve, means on said body engaging said core retainer and precluding movement of said body out of said core sleeve through said core retainer, a group of permanent magnet bars disposed in side by side relationship in the recess in said plug body and projecting from the end of the latter to which said recess opens, separator plates of non-magnetic material disposed one between each two adjacent magnet bars, means securing said magnet bars and said separator plates in the recess in said plug body, and means carried by said plug body and engaging said core sleeve at said one end of the latter releasably securing said plug in position in which it extends through said core retainer.

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