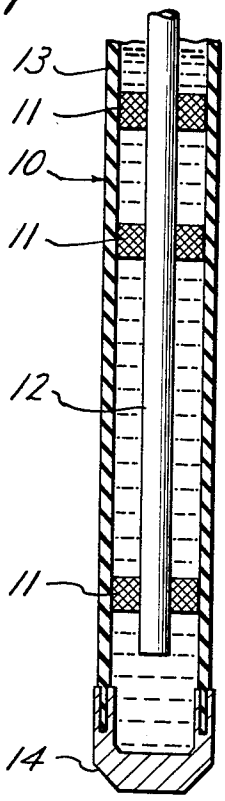
Jan. 12, 1965 F. P. KOKESH 3,165,156

BOREHOLE APPARATUS

Filed Nov. 8, 1960

Fig. 1



PRIOR ART

Fig. 2

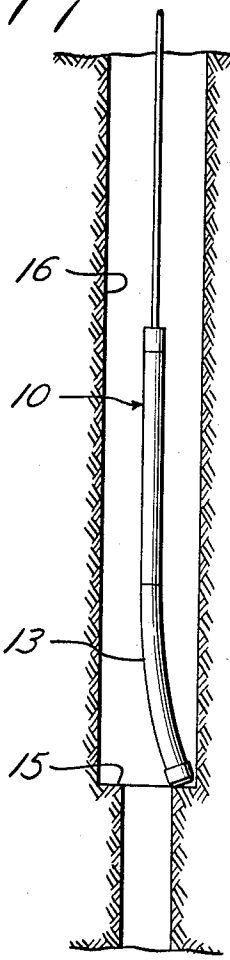
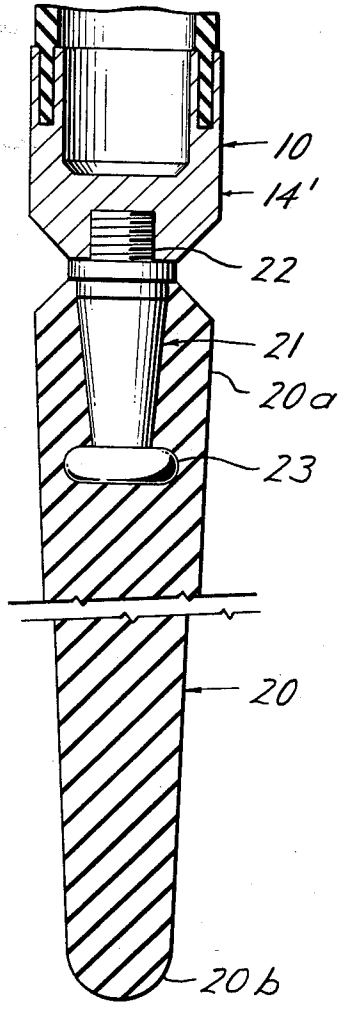


Fig. 3



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BOREHOLE APPARATUS

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2 Claims. (Cl. 166—243)

This invention relates to devices for use in well bores and, more particularly, a device for facilitating descent of tools into well bores.

The wall surface of well bores is generally irregular and many times includes ledges (such as in well bores drilled through salt-anhydrite sections). Such ledges tend to impair the smooth passage of well tools through such bores and the tools may be damaged or stuck at these sections. With well tools, such as an acoustic logging tool which is slightly flexible, a sudden stop and undue flexing will permanently damage the tool.

Accordingly, it is an object of the present invention to provide new and improved means to avoid hanging portions of a tool on a ledge in a borehole or causing undue flexing of a flexible section of a tool.

Apparatus in accordance with the present invention includes an elongated nose piece attached to the lower end of an elongated tool. The nose piece may be made of a suitable synthetic rubber compound and is relatively flexible, at least in its lower portion. Where the tool itself is flexible, the nose piece preferably is more flexible, at least adjacent its lower end. Hence, when the nose piece encounters a ledge in a well bore, the nose piece yields to deflect the tool back toward the center of the well bore.

The novel features of the present invention are set forth with particularity in the appended claims. The present invention, both as to its organization and manner of operation, together with further objects and advantages thereof, may best be understood by way of illustration and example of certain embodiments when taken in conjunction with the accompanying drawings in which:

FIG. 1 is a view in cross section of a lower portion of a typical acoustic apparatus;

FIG. 2 is a view, partially in cross section, of a typical acoustic apparatus as in FIG. 1, disposed in a borehole;

FIG. 3 is a view, partially in cross section, of apparatus embodying the present invention.

The general construction of a commonly employed acoustic well tool **10** for measuring acoustic velocities is illustrated in FIG. 1 wherein a number of acoustic transducers **11** are supported on a tubular rod member **12** which, for example, may be composed of "Teflon." The just described sub-assembly is, in turn, disposed in an oil filled, tubular housing **13** which is typically constructed of rubber and terminated at its lower end with a metallic nose piece **14**. This section of an acoustic logging apparatus is typically employed for probing earth formations with pulses of acoustic energy. The "Teflon" of rod **12** and rubber of housing **13** are typical of the materials used in the construction of the section because of their low acoustic velocity properties. It has been found, in operation, that a permanent set or distortion of the supporting rod **12** due to bending, once accomplished, ends the useful life of acoustic tool. FIGURE 2 illustrates the manner in which the flexible lower section of tool **10** will buckle when the lower end encounters a

ledge **15** in a well bore **16**. Therefore, it will be appreciated that, due to the weight of the housing sections above the lower section, the rod **12** may be stressed until it permanently distorts.

As shown in FIG. 3, apparatus embodying the present invention includes an elongated flexible member **28** hereinafter sometimes referred to as a nose piece or guide. The nose piece **20** is generally conically shaped between an upper coupling section **20***a* and a lower, spherically shaped end section **20***b* of reduced diameter. In the upper coupling section **20***a* is a metal or rigid coupling member having a threaded upper end for attachment of the nose piece **20** to the lower end of a well tool, and an enlarged lower retaining end **23** embedded in the flexible nose piece **20**.

The nose piece **20** is preferably manufactured by molding a rubber composition to the coupling member **21**. A suitable rubber composition is neoprene rubber composition #333, manufactured by F. H. Maloney Co., of Houston, Texas. This rubber has a Shore hardness of 55 to 65 durometers.

Exemplary dimensions for the nose piece are a 1½" spherical end radius, a taper of ½" per foot and a length of 19" for a tool with a flexible section of 7'.

The nose piece **20** is affixed or dependently secured to the lower end **14'** of a tool, for example, the tool **10** illustrated in FIG. 1, and lowered into a well bore. For this purpose, lower end **14'** is like nose piece **14** (FIG. 1) but is provided with a threaded socket **22** for detachable securement to the coupling member **21** of flexible nose piece **20**. Also, for this use, the nose piece should be more flexible than the flexible section of the well tool.

It will be appreciated that the nose piece **20** provides a guiding action for the lower end of the tool over any irregular surfaces along the well bore. When direct contact with a substantial ledge is made, the bending of the nose piece is almost invariably such that the end of the nose piece is diverted towards the center of the well bore. It has also been found that the elasticity of the nose piece **20** provides a shock absorber action when the tool is dropped on an obstruction in the well bore thereby reducing the possibility of damage to the tool. The nose piece **20** also extends the lower end of tool **10** so that there is less tendency of the flexible portion (housing **13**) to buckle in well bores of large diameter.

It will further be appreciated that the nose piece provides guidance for the end of any tool tending to direct it away from a jamming action with the wall of the well bore.

While a particular embodiment of the present invention has been shown and described, it is apparent that changes and modifications may be made without departing from this invention in its broader aspects and, therefore, the aim in the appended claims is to cover all such changes and modifications as fall within the true spirit and scope of this invention.

What is claimed is:

1. Apparatus particularly for use in an open well bore having irregular wall surfaces, obstructions or ledges, comprising an elongated well tool having a central axis and guiding means affixed to the lower end of said well tool, said guiding means comprising a short coupling member having one end coupled to said well tool and a remaining end for receiving a nose piece, an elongated tapered nose piece having one end portion attached to

said remaining end of said coupling means and the remaining major portion of said nose piece extending downwardly a distance substantially greater than the length of said coupling member, said nose piece having a central axis in longitudinal alignment with the central axis of said well tool, said nose piece constructed of an elastomer material of sufficient flexibility to allow said remaining portion of said nose piece and its axis to be bent relative to said central axis of said well tool after contact with an obstruction in a well bore and thereby guide said well tool away from said obstruction and toward the center of the well bore to prevent said well tool from jamming with such an obstruction, said nose piece further providing shock absorber action for said well tool.

2. The apparatus of claim 1 wherein said elastomer material is rubber having a Shore hardness of 55 to 65 durometers.

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