This invention relates to new and useful improvements in coring apparatus and more particularly to a locking device for core barrels and/or a device to be used in connection with any other instrument or apparatus incidental to general oil field, water or sulphur operations.

There are several types and kinds of core barrels, that is instruments used in taking core tests in the general oil field operations. The particular kind of core barrels that are presently in use are of a type that are very expensive due to the particular and intricate construction and such is more particularly, due to the type and construction of locking devices employed in conjunction with these core barrels. The type of core barrel now in use requires specially constructed drill collars and "subs," as it is in these drill collars and "subs" that the locking devices for the core barrels are installed.

It is therefore, necessary for an oil field operator to have this expensive equipment on hand at all times to be used in connection with taking a core and when it becomes necessary for the operator to take a core test, he must pull the entire assembly sections of drill pipe out of the ground hole to attach the special drill collar and "subs" required to be used in connection with the present or known core barrels, so that the core barrel he might use in taking the core will have the advantage of the locking device found in the drill collar and "sub."

Accordingly, it is the primary object of the present invention to provide a type of locking device that can be used in connection with any type and construction of core barrel and a type of locking device which does not require, the use of a particular type and construction of drill collar and "sub." More specifically, the purpose of this invention is to provide a locking device that requires no drill collar or "sub" other than standard equipment.

Commonly, with the use of present coring equipment, it is necessary that the core barrel and drill collar and "subs" must coincide insofar as measurements are concerned and it is often difficult, expensive and effects a lossage of time to rearrange the length and size of the core barrel, drill collars and "subs." In actual practice, it is almost impossible and impractical to change the dimensions of the core barrel, drill collar and "sub" in the field.

Therefore, another important object of the present invention is to provide a locking device that is applicable for core barrels without the necessity of having to change the dimensions of the core barrel, drill collar and "subs."

Another aim of the present invention is to provide a locking device of the aforementioned character that is simple and practical in construction, strong and reliable in use, relatively inexpensive to manufacture, and otherwise well adapted for the purpose for which the same is intended.

Other objects and advantages reside in the details of construction and operation as more fully hereinafter described, and claimed, reference being had to the accompanying drawings forming part hereof, wherein like numerals refer to like parts throughout, and in which:

Figure 1 is a longitudinal cross section through the lower portion of a drill pipe in which is located and shown partly in section and partly in elevation, the present invention in a locked position, and supporting a drill stem shown in longitudinal section;

Figure 2 is a similar view of Figure 1, and showing the present invention in an unlocked position; and,

Figure 3 is a transverse horizontal sectional view taken substantially on the plane of section line 3-3 of Figure 1.

Referring now to the drawings in detail, wherein for the purpose of illustration, there is disclosed a preferred embodiment of the present invention, the numeral 10 represents the substantially cylindrical head portion of the present invention having an integral conical end portion 12 supporting a preferably integrally formed spear head or pointed project 14 having an annular shoulder 16.

A central recess or depression 18 is provided in the head portion 10 and terminates in an enlarged internally threaded opening 20 that receivably engages the reduced, externally threaded end portion 22 of a cylindrical cage 24.

One end 26 of the cage 24 is provided with a substantially frusto-conical chamber 28 that engages the frusto-conical body portion 30 of a mandrel 32 having an annular flanged base 34 of a diameter greater than the diameter of the enlarged open end of the chamber 28.

Projecting upwardly from the reduced upper end of the mandrel 32, is a cylindrical neck 35 having an externally threaded portion 36 that receivably engages a jam nut 40 and a lock nut 42. This neck 35 extends through a recess 44 provided in the upper portion of the cage that opposes recess or depression 18 and the threaded portion 36 of the neck is positioned in recess 18.
Biased between the jam nut 40 and an annular shoulder 46, at the juncture of the recess 44 with chamber 28, is a coil spring 45 mounted on the neck 36 that sufficiently supports the mandrel within the cage.

Circumferentially spaced ball seats or openings 50 are provided in the cage 24 communicating with chamber 28, and loosely engage spherical elements 52. The opening 54 of these seats 50 is of such a size as to permit only a segment of the spherical elements to project outwardly therefrom.

In practical use of the device, a suitable tool or grapple (not shown) is engaged upon the spear head 14 and bears against the annular shoulder 16. The locking device is then lowered within a drill pipe 56 and due to the weight of the mandrel 32 and the weight of a drill stem 58 receivably engaging the threaded lower end 60 of the mandrel, the flanged base 34 of the mandrel depends and is spaced from the open end of the chamber 28 with the spherical element 52 bearing against the body portion of the mandrel and well inwardly on the seats 50 as shown best in Figure 2. Upon release of pressure on the lowering tool, the head portion 10 and cage 24 will extend downwardly so that the spherical elements 52 bearing against an enlarged portion of the body portion 30 thereby forcing the spherical element outwardly from the opening 54 whereby the same will frictionally engage the inner periphery of the well pipe to frictionally lock the present invention in a selected position therein to be actuated or rotated with the drill pipe.

Obviously, to remove the present device from the drill pipe it is merely necessary to again move up the head portion inwardly by the lowering tool or grapple.

In view of the foregoing description taken in conjunction with the accompanying drawings it is believed that a clear understanding of the construction, operation and advantages of the device will be quite apparent to those skilled in this art. A more detailed description is accordingly deemed unnecessary.

It is to be understood, however, that even though there is herein shown and described a preferred embodiment of the invention the same is susceptible to certain changes fully comprehended by the spirit of the invention as herein described and the scope of the appended claims.

What is claimed as new is:

1. A locking device for drill pipes and the like comprising a cage having a removable head portion, said cage having a lower end and a frusto-conical chamber in the lower end of said cage, the upper end of said cage having a recess and said head portion having a depression forming a continuation of the recess in said cage, a frusto-conical mandrel slidably received in said chamber and extending throughout the length of said chamber, a rod fixed to and rising from said mandrel, said rod being received in said recess and said depression, an abutment threaded on said rod and received in said cage, a spring embracing said rod and biased between said shoulder and said abutment for resiliently supporting said mandrel, said abutment being adjustable for adjusting the tension of said spring, and means slidably located in the wall of said chamber, said means engaging the conical surface of said mandrel and being actuated by said mandrel for locking the cage within a drill pipe.

2. A locking device for drill pipes and the like comprising a cage having a frusto-conical chamber at its lower end, a frusto-conical mandrel slidably mounted in said chamber and extending throughout the length of said chamber, a threaded rod carried by said mandrel and having an upper end, said cage having a recess at its upper end communicating with said chamber and receiving said rod, a springer provided in said recess adjacent said chamber, an abutment receivably mounted on said rod, a spring embracing said rod and biased between said shoulder and said abutment, and means extending through the wall of said chamber riding against the conical surface of said mandrel and actuated by the mandrel in response to a lowering of the cage with respect to said mandrel for locking said cage within a drill pipe, said abutment being adjustable for adjusting the tension of said spring.

3. The combination of claim 2 wherein said cage includes a removable head portion having a grapple engaging element, said head portion having a depression in one end receiving the upper end of said rod and said abutment.

4. The combination of claim 2 wherein said last-mentioned means includes a plurality of spherical elements, and circumferentially spaced openings provided in said cage communicating with said chamber, said openings loosely receiving said spherical elements, said spherical elements bearing against said mandrel.

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