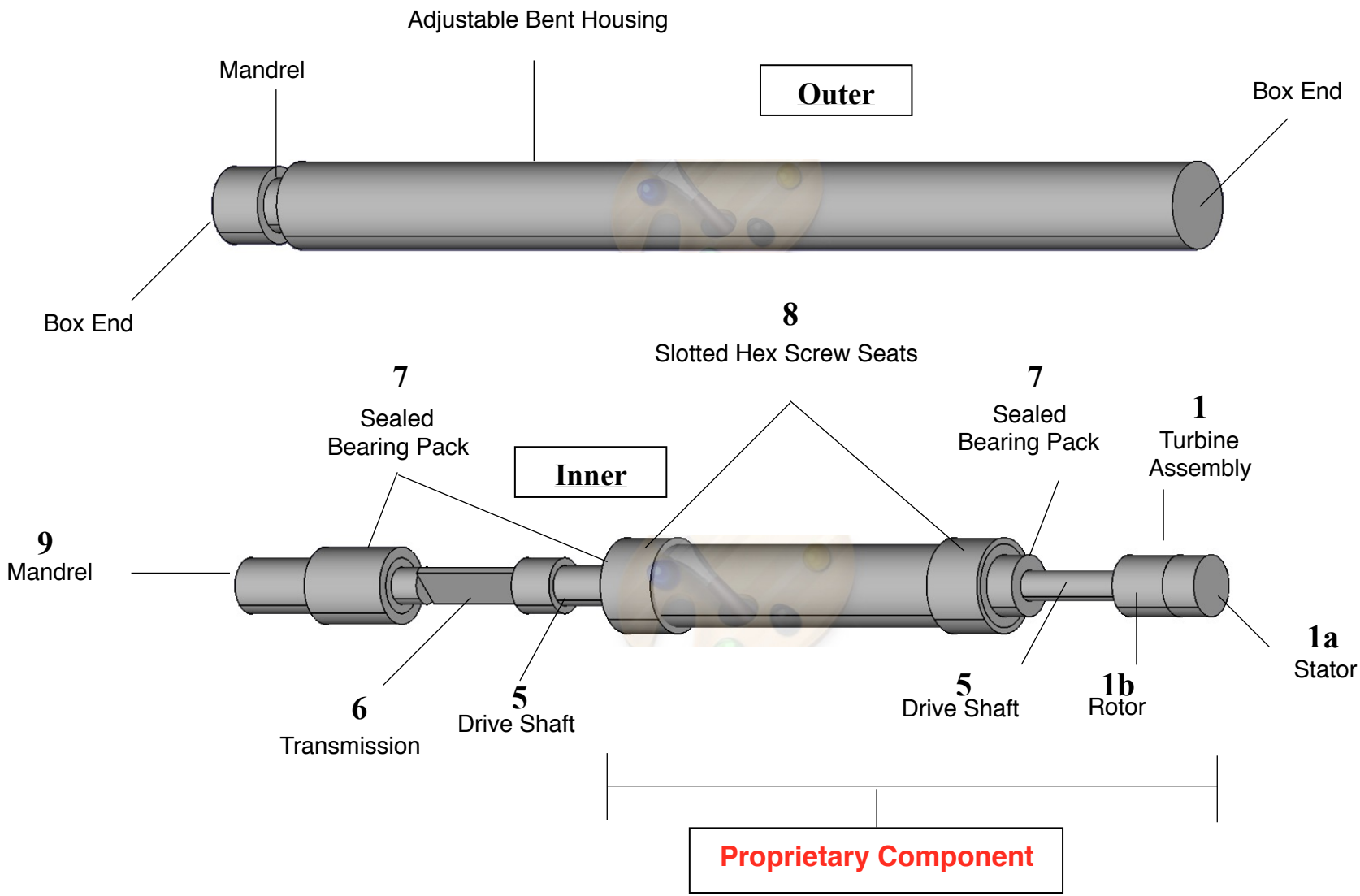
AC Induction Drilling Motor



AC Induction Power Section

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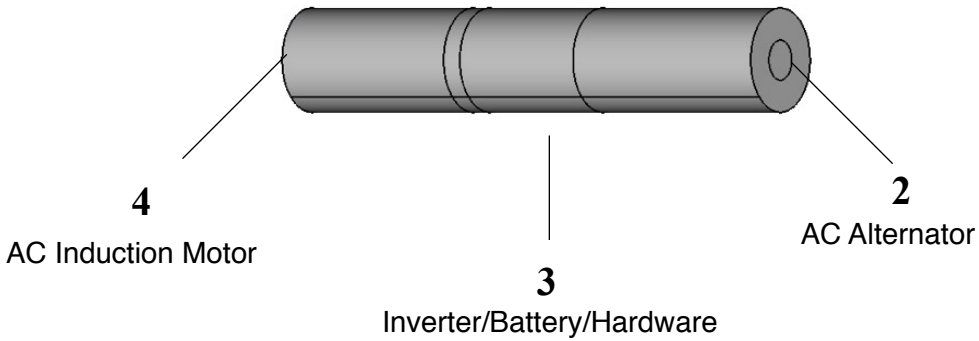
Proprietary Component



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AC Induction Power Section

FIELD

The present invention relates to a drive mechanism and more particularly, but not by way of limitation, to a drive mechanism capable of delivering a range of rotations per minute in low to high torque applications and may be suitable for use in a downhole environment or on a pipeline.

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BACKGROUND

Mechanisms for inducing motion from a driving member, such as a shaft or a piston, to a driven member, such as another shaft or axle, are widespread throughout many technical areas.

In an underground environment, such as in an oil or gas wellbore, a variety of technical operations carried out which involve moving and placing a variety of equipment in a number of ways. Drive mechanisms for use in such an underground environment would be highly useful.

However, this environment presents significant engineering constraints restricting the design of such devices. It is typically the case that a general lack of space restricts the size such devices can take, and the relative difficulty of obtaining power to drive such a mechanism means that only low power devices are practical. Additionally, it is often desirable that the drive mechanism be disposed in the downhole location such that fluids or the like may pass through a section of the wellbore proximal to the drive mechanism. Similar constraints may be associated with drive mechanisms for use on pipelines.

If additional constraints are present, such as requireing a high torque and/or requiring fine control, which control may be in the range of few revolutions per minute to > 1000, then design options become severely restricted. Known mechanisms fail to satisfy all of these requirements. There is therefore a need for an improved drive mechanism, particularly for use in a downhole environment and/or for operation on pipelines.

SUMMARY

In a first aspect of the present invention, a drive mechanism with a self sustained power source is provided comprising: (a) A turbine assembly comprising of a stator, rotor and drive shaft; (b) an AC electric generator or “Alternator”; (c) a module comprising of a battery, AC inverter and hardware; and (d) an AC induction motor comprising of a plurality of drivers linearly translatable with respect to the driving member.

This drive assembly is designed to transfer the energy of the drilling fluid being pumped down the drill string and converting it from mechanical energy to electrical energy. Said energy is then transferred through an inverter to an AC induction motor that will in turn provide the torque to turn the lower drive shaft and effectively rotate the drill bit. Excess energy being stored in the battery module located between the Alternator and Motor.

The hardware module is designed to give the operator an array of different options with respect to RPM. The module will also house sensors that detect bottom hole torque as well as efficiency.

There is also the concern of ensuring that the power section assembly housing the AC motor and alternator are water tight. To address this water tight bearing packs are installed around the respective drive shafts to ensure a seal.

The main factors that make this innovative drive so appealing to oil and gas drilling applications in particular are: (a) AC motors do not have a rubber stator that decays rapidly in modern oil based drilling fluids, and (b) operational control of RPM that will save oil companies the need to trip out of the hole to change traditional positive displacement mud motors(“PDM”) to one geared more specifically to the desired RPM and flow rate.

Translation, huge savings.

Another phenomenon encountered while drilling, especially in a well that has a well bore full of an oil based mud(invert) and has a temperature in excess of 175 Kelvin, is excessive stalling and break down of the hardened rubber stator inside the power section of the PDM. Which can subsequently cause all kinds of problems including plugged nozzles, increase in pressure and loss of torque capabilities.

In order for this AC power section assembly to match maximum full load torque of conventional positive displacement drilling motor it needs to generate roughly 8,000-9,000nm of torque at 150rpm. This is possible in the 93 - 112kW power range.

However this level of torque is by no means necessary to drill. It could be done with a high level of success at one third - one half of that value, indefinitely. Even on extended reach horizontals where depths can and often do exceed 5,000m Measured Depth.