

BIT BREAKER

BACKGROUND OF THE INVENTION

This invention relates to oil well drilling equipment, and more particularly to a so-called "bit breaker" for use in connecting and disconnecting rotary drill bits to a drill string having a drill collar, drill pipe or a so-called "sub" at its lower end.

This invention involves an improvement over conventional bit breakers comprising a generally square metal plate adapted to be fitted in the socket of a Kelly drive of a drill rig. The plate has an opening therein for receiving the lower end of a conventional tri-cone drill bit to be connected to a drill string. Conventional tri-cone bits, such as shown for example in U.S. Pat. No. 4,174,759, comprise a generally cylindrical bit body, three spaced apart legs extending down from the bit body and terminating in bearing journals at the lower end of the bit, three roller cutters rotatably mounted on the bearing journals, and three nozzles in the bit body, each directing drill fluid under pressure down in the recess between a respective pair of adjacent roller cutters.

The opening in the bit breaker is configured to correspond to the shape of the lower end of a tri-cone bit of a predetermined size. The conventional bit breaker thus has so-called "breakout lugs" extending into the opening, which are adapted to be received in the recesses in the lower end of the drill bit when positioned in the opening in the bit breaker. These breakout lugs are engageable with the drill bit and prevent its rotation relative to the bit breaker, so that upon rotation of the Kelly drive, the bit breaker and drill bit rotate along with it. This enables the Kelly drive to rotate the drill bit in one direction to effect a threaded connection between the threaded pin on the bit and a drill string having an internally threaded lower end portion, and in the other direction to disconnect the bit from the drill string.

As indicated, bit breakers of the above-noted type are designed for drill bits of a predetermined size or diameter. While it may be possible to use the bit breaker for drill bits of slightly different diameter than the predetermined diameter (e.g., $\frac{3}{8}$ inch larger diameter) the bit breaker cannot be used for drill bits of significantly larger diameter than the design size because the bits cannot be received in the opening in the bit breaker or bits of significantly smaller diameter because the bits are not engaged by the breakout lugs for holding the bit in fixed position in the opening. Since oil and gas well drilling often involves the use of drill bits of different sizes, ranging from relatively large diameter surface bits to small completion bits, a series of bit breakers having openings of different sizes are also required. This increases the cost of bit breakers for a drill rig and poses handling and storage problems.

Moreover, bit breakers of the above-described type are not usable with drill bits of the so-called "extended nozzle" type having nozzle members extending down into the recesses between adjacent roller cutters. These extended nozzles prevent entry of the breakout lugs into the recesses of a drill bit and thus positioning of the bit in the opening in the bit breaker. Specially designed bit breakers thus are required for extended nozzle drill bits. This further increases the number (and thus the cost) of bit breakers needed for certain drilling operations.

SUMMARY OF THE INVENTION

Among the several objects of this invention may be noted the provision of an improved bit breaker which is usable with tri-cone bits of all types including those having extended nozzle members; the provision of such a bit breaker which has an adjustability feature enabling its use with drill bits of different sizes within a range of sizes; the provision of such a bit breaker which is capable of replacing a number of conventional bit breakers; and the provision of such a bit breaker which is relatively simple and economical to manufacture.

In general, the bit breaker of this invention comprises a bottom engageable by the bottom of a drill bit for supporting the bit, a top having an opening therein through which the bit may be lowered into engagement with the bottom of the bit breaker, and means for selectively securing the bit in fixed annular position in said opening in the bit breaker. Said securing means comprises a stop member slidably mounted on the top of the bit breaker adjacent the opening therein for movement inwardly and outwardly relative to the opening between an extended position and a retracted position. In its extended position, the stop member engages the side of the drill bit when in the opening for holding the drill bit against rotation relative to the bit breaker, and its retracted position, the stop member is spaced from the drill bit to enable the drill bit to be raised and lowered through the opening. The securing means further comprises means for selectively locking the stop member in its extended position, thereby preventing retraction of the stop member when the drill bit is rotated.

Other objects and features will be in part apparent and in part pointed out hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top plan of a bit breaker of this invention having stop members shown in their extended position in which they engage a drill bit (shown in phantom) in the bit breaker;

FIG. 2 is a vertical central section of the bit breaker on line 2—2 of FIG. 1;

FIG. 3 is an enlarged partial side elevation of the bit breaker on line 3—3 of FIG. 1 showing one of two movable lock members of the bit breaker in its locking position;

FIG. 4 is a view similar to FIG. 1 but with the stop members in their retracted position and the lock members in their unlocked position;

FIG. 5 is a vertical central section of the bit breaker on line 5—5 of FIG. 4;

FIG. 6 is a side elevation of a lock member of alternative construction for enabling the bit breaker to be used for bits of different sizes; and

FIG. 7 is a transverse section of the lock member on line 7—7 of FIG. 6.

Corresponding reference characters indicate corresponding parts throughout the several views of the drawings.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the Figs. there is generally indicated at 1 a bit breaker of this invention adapted to be fitted in the socket of a Kelly drive of a drill rig (not shown) for detachably securing a drill bit (such as shown in phantom at 3) to the Kelly drive. This enables the Kelly drive to rotate the bit relative to a drill string (a portion