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PROCESS FOR DECOKING A DELAYED COKER

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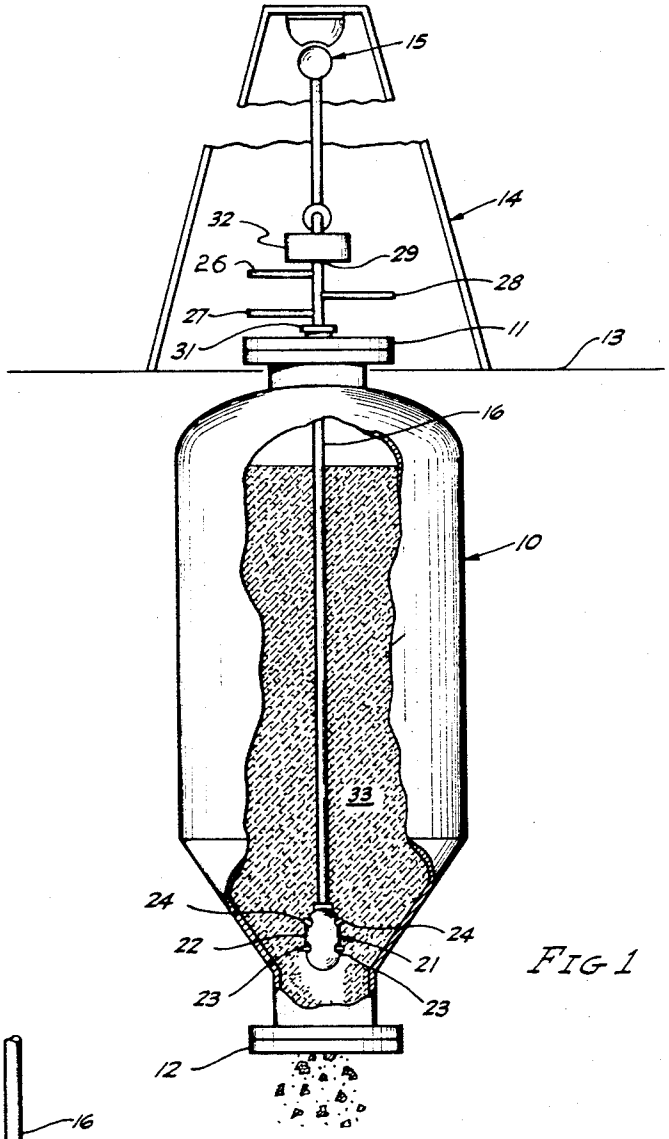

FIG 1

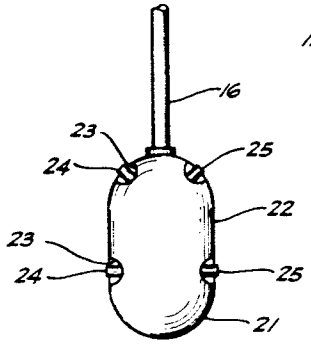

FIG 2

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PROCESS FOR DECOKING A DELAYED COKER

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ABSTRACT OF THE DISCLOSURE

The coke is formed around the drill stem used to remove coke from the delayed coker. The drill stem is rotated during coke formation.

This invention relates to a process for operating a delayed coking plant, and more particularly to a process and apparatus for removing coke which has been formed in coke drums by a delayed coking process.

The production of coke by the delayed coking process involves the rapid heating to a high temperature of a hot oil compound such as a topped crude or residual feed and permitting the residual heat of the oil to convert it to coke. The conversion to coke is carried out in a low pressure drum, the coke being removed by mechanical means. This method of coke removal requires that hydrocarbon vapors be purged from the drum with steam at a temperature in excess of 800° F. followed by water flooding the drum thereby cooling it to below 200° F. A hole is then bored in the coke and a cutting head supplied by high pressure water is inserted into and along the bore; the high pressure water breaks up the coke which is then removed from the bottom of the drums.

Since this procedure necessitates cooling the drum to less than 200° F. to avoid subjecting operating personnel to the hazard of steam and fumes, the drum must remain out of production longer than if decoking could occur at higher temperatures. This procedure, when applied to each drum, lowers the coking capacity of the entire plant besides consuming water to cool the coke down to a safe operating temperature. In addition, cooling the coking drum or vessel to a lower temperature is time consuming and this of course is expensive from the standpoint of non-productive unit hours.

With this background in mind it is an object of this invention to provide an apparatus and method for removing coke from drums.

Another object is to reduce the down time of a coking drum during the coking operation.

Another object is to reduce the amount of water required to cool the coke before decoking.

Another object is to minimize the hazard to personnel of steam and fumes during the coke removal process.

Another object is to eliminate the need for drilling a hole through solid coke in order to cause fragmentation of the coke.

Other objects will become more apparent from the disclosure to follow.

Broadly speaking, the process of the present invention comprises forming the coke around a drill stem having a cutting head mounted at one end, the cutting head being provided with high pressure water nozzles. Upon completion of the coke formation the drill stem is lifted upwardly through the coke mass and rotated and water pressure is applied to the nozzles. This will fracture the coke which will then fall from the container vessel. Preferably the drill stem may be rotated continuously or intermittently during the coking process, to prevent it becoming jammed because of the coke formation. Also it is desirable to maintain a small flow of gas through the drill stem and cutting head to prevent plugging of the cutting head orifices with coke.

The process and apparatus of this invention will be more readily understood from the drawings and description to follow in which:

FIG. 1 is a sectional side elevation of a coking vessel and ancillary structure according to the invention; and FIG. 2 is a sectional side elevation of the cutting tool and nozzles employed to fragment the coke.

In the drawings, FIG. 1 shows a drum **10** employed in the delayed coking process for containing a hot oil compound while it is undergoing a coking process. The drum is provided with a top head **11** and bottom head **12**, both heads being removable. The drum may be positioned from a platform **13** or it may be supported by other means (not shown). A derrick **14** is mounted on the platform and the derrick provides a hoist **15** which supports a hollow drill stem **16** for vertical movement within the drum. A cutting tool **21** is mounted at the end of the drill stem and has an interior communicating with the drill stem. The outer shell **22** of the cutting tool is provided with a plurality of recesses **23** within which are mounted jet nozzles **24**; preferably, the orifices **25** of the nozzles do not extend beyond the outer shell. Gas such as natural gas, water and steam are supplied to the drill stem through conduits **26**, **27** and **28** respectively, the conduits being connected to the drill stem at its upper end **29**.

A stuffing gland **31** is mounted on the drill stem and seals off the inside of the drum. An air motor **32** is employed to rotate the cutting tool.

In operation the bottom head **12** and top head **11** of the drum **10** are closed and the drill stem and cutting tool are positioned inside the drum, with a small space between the cutting tool **21** and the bottom head. A residual oil which has been rapidly heated is fed to the drum through inlet piping at the bottom of the drum (not shown). The oil is allowed to convert into coke around the drill stem **11** which is rotated slowly by the air motor **31** to prevent it from becoming jammed or stuck by the formation of the coke. To prevent the jet nozzles from becoming plugged, a small amount of gas is passed through the drill stem and out the nozzles. When the formation of coke has progressed upward to the point where it reaches the safe fill level, steam is passed into the bottom of vessel **10** to purge hydrocarbon vapors from the coke mass **33**. A piping system (not shown) is provided to vent the hydrocarbons and steam. When the hydrocarbons have been purged, the steam is cut off and water is then forced through the bottom piping and into the vessel to cool the coke. The bottom head **12** is then removed. The motor **32**, is actuated to rotate the drill stem **11**, and with high pressure water flowing through the jets the drill stem is raised by the hoist **15** thus causing the coke to be broken up by the cutting tool and by the water issuing from the jet nozzles **24**. The fragmented coke **34** then drops out the bottom of the drum.

The down-time of a coking vessel is reduced by about two hours using the process of the present invention and this in turn permits an increase in throughput. The process itself is inherently safer because the top of the vessel is sealed during the fragmenting process. Furthermore, the amount of water required for cooling has been reduced since decoking can progress at a higher temperature and the necessity of drilling a hole through the coke has been eliminated.

We claim:

1. A process for removing coke from a delayed coking container which comprises forming the coke around a vertically moveable drill stem; rotating the stem during the coke formation; purging hydrocarbon vapors from

the container with steam following completion of the coke formation; cooling the coke; and vertically and upwardly moving and rotating the drill stem; applying fluid through the drill stem under pressure to fragment the coke; and removing the coke fragments from the container.

2. A process for removing coke from a delayed coking container which comprises forming the coke around a vertically moveable stem provided with a cutting head having jet nozzles; rotating the stem during coke formation; purging hydrocarbon vapors from the container with steam following completion of the coke formation; cooling the coke with water; vertically and upwardly moving and rotating the stem through the coke mass; simultaneously applying fluid under pressure to the stem and through the jet nozzles to fragment the coke; and removing the coke fragments from the container.

3. The process of claim 1 wherein the fluid is water.

4. The process of claim 1 in which a small amount of gas is passed along the drill stem and out the nozzles during the formation of the coke to maintain the jet nozzles free of coke.

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