89-294351/41 E17 J04 AIRP 07.04.88
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Conversion of carbon monoxide-rich synthesis gas to methanol - in liq. phase reactor with addn. of water to effect shift reaction in reactor

C89-130331 R(BE DE ES FR GB IT NL SE)

In the conversion of a carbon-monoxide rich synthesis gas (I) to a crude methanol product (II), (I) is balanced by reaction with water in the presence of a water/gas shift catalyst to decrease its carbon monoxide content and increase its hydrogen and carbon dioxide contents. At least part of the carbon dioxide is removed from the shifted gas to produce a balanced synthesis gas, which is then reacted in presence of a methanol synthesis catalyst to produce (II).

The improvement comprises combining the water/gas shift and methanol synthesis reactions into a single step, by reacting (I) with water in presence of a catalyst in a liquid phase reactor, to produce both (II) and a synthesis gas of reduced carbon monoxide content and increased hydrogen and carbon dioxide contents suitable after carbon dioxide removal for further conversion to methanol.

E(10-E4E1) J(4-E1) N(1-C2, 2-D1, 3-F)

EMBODIMENT

Carbon monoxide-rich synthesis gas and liquid water are fed together or separately to liquid phase reactor (7) operating in slurry or ebullated mode with a methanol synthesis catalyst (e.g. $CuO/ZnO/Al_2O_3$) opt. mixed with a low temp. shift catalyst.

Vapour effluent is cooled, separated at (11) and liquid recycled; vapour is further cooled and passed to CO_2 absorber (17) where it is contacted countercurrent with cold methanol solvent which removes CO_2, methanol and water; crude methanol is recovered in unit (23). Water-free methanol-free synthesis gas (19) is passed to a second liquid phase reactor (31) where further synthesis takes place. Further crude methanol is recovered by separator (43), and unconverted synthesis gas from this separator is compressed and passed to third liquid phase reactor (51). Further crude methanol is recovered by separator (61) and unreacted gas (63) compressed after removal of a purge stream, and recycled to the reactor.

Conventional gas-phase methanol synthesis reactors may be used instead of the liquid phase reactors (31) and (51).

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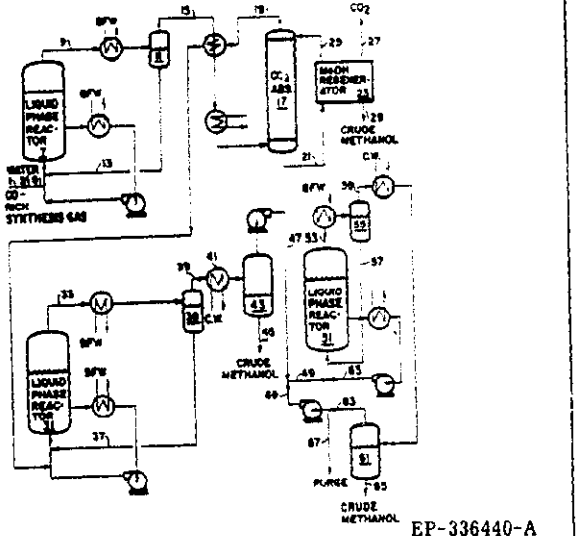
(E) ISR: No Search Report.



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