CLAIMS

1. A process for the separation of a synthesis gas comprising hydrogen, carbon monoxide and methane, and possibly nitrogen, by cryogenic distillation, in which:

i) the synthesis gas (1, 5) is purified and cooled down to a cryogenic temperature,

ii) the cooled synthesis gas is separated by a first means (9, 15) in order to produce a liquid depleted in hydrogen (91), the separation carried out by the first means consists of a stage of scrubbing in a scrubbing column (15) with at least a part of a liquid enriched in methane withdrawn from a column for the separation of carbon monoxide and methane (45) having an overhead condenser, the condenser being cooled by a carbon monoxide cycle, and

iii) the liquid depleted in hydrogen is introduced into an upper part of a stripping column (25) which also comprises a lower part,

iv) a gas enriched in hydrogen (27, 29) is withdrawn at the top of the stripping column,

v) a liquid (33) is withdrawn at the bottom of the stripping column and sent to the column for the separation of carbon monoxide and methane (45), a gas (43) enriched in carbon monoxide and depleted in methane is withdrawn at the top of the column for the separation of carbon monoxide and methane, a liquid (77) depleted in carbon monoxide and enriched in methane is withdrawn at the bottom of the column for the separation of carbon monoxide and methane and the gas enriched in carbon monoxide and depleted in methane is heated by heat exchange with the synthesis gas from stage i) in order to form a product (29),

vi) a gas (27) withdrawn in the upper part of the stripping column is at least partially condensed and returned at least in part to the upper part of the stripping column, characterized in that the gas withdrawn in the upper part of the stripping column is at least partially condensed in a heat exchanger (23) which also serves to cool at least one gas (210, 211) withdrawn from the scrubbing column, the heat exchanger also serving to heat a refrigerant.

2. The process as claimed in claim 1, in which the gas (27) withdrawn in the upper part of the stripping column condenses against at least a part (51) of a carbon monoxide cycle liquid.

3. The process as claimed in either of the preceding claims, in which the synthesis gas (1, 3) comprises nitrogen and the liquid withdrawn from the stripping column (25) or a fluid derived from this liquid is separated in a denitrogenation column, the liquid of which serves to at least partially condense an overhead gas from the stripping column.

4. The process as claimed in one of the preceding claims, in which the gas (27) withdrawn in the upper part of the stripping column is at least partially condensed by heat exchange with a liquid enriched in carbon monoxide withdrawn from the separation column (45), which heats up and optionally vaporizes, at least partially.

5. The process as claimed in claim 4, in which the liquid (47) enriched in carbon monoxide is withdrawn from a distillation section of the separation column (45) or from a capacity forming the top of the separation column.

6. The process as claimed in one of the preceding claims, in which the gas withdrawn from the upper part of the stripping column (27) is an overhead gas from the stripping column withdrawn at a level above any heat and mass transfer means of the stripping column.

7. The process as claimed in one of claims 1 to 6, in which the gas withdrawn from the upper part of the stripping column is withdrawn at least one theoretical plate below the top of the stripping column, a part of the liquid enriched in methane withdrawn from the separation column being sent to a level of the stripping column above the level for withdrawal of the gas.