

PROCESS AND PLANT FOR THE SEPARATION OF A MIXTURE OF
HYDROGEN AND/OR AT LEAST ONE HYDROCARBON AND/OR NITROGEN
AND/OR CARBON MONOXIDE

The present invention relates to a process and a plant for the separation of a mixture of carbon monoxide and/or hydrogen and/or at least one hydrocarbon and/or nitrogen.

5 Known plants for the separation of mixtures of carbon monoxide and hydrogen include only tray columns.

Although the use of packings has become commonplace for distillations of other types, such as air distillation, the equilibrium coefficient of air is
10 substantially different from that of mixtures of carbon monoxide, hydrogen and/or methane.

In systems with methane washing (Figure 1) the synthesis gas under pressure cooled to -180°C is washed with liquid methane in the column K01, the carbon
15 monoxide is entrained into the bottom of the column and hydrogen is produced at the top.

The dissolved hydrogen is then removed in the intermediate pressure flash column K02. The CO/CH_4 binary is then separated in the low pressure
20 distillation column K03. Gaseous CO is produced at the top, the liquid methane produced at the bottom being pumped and recycled for washing in K01.

The refrigerating power is produced in a CO cycle.

25 In systems with partial condensation (Figure 2) the synthesis gas, washed of its methane in K11 by liquid CO originating from B01, is cooled to the lowest possible temperature, the restriction being the solidification temperature of CO; the liquid condensed
30 in B02 is essentially CO.

The flash columns K12 and K13 remove the dissolved hydrogen, respectively, in the bottom liquids of K11 (methane-rich) and in the liquids of the pot B02 (CO-rich).

35 The liquids originating from the columns K12 and K13 then feed the distillation column K14 where the CO/CH_4 separation takes place.

The refrigerating power is obtained by hydrogen expansion in turbines.

In the particular case where nitrogen is present, an N_2/CO separation column can be added downstream of the CO/CH_4 column.

According to a subject-matter of the invention
5 a plant is provided for separating a gaseous mixture including hydrogen and/or at least one hydrocarbon and/or nitrogen and/or carbon monoxide, including a washing column and/or a flash column and/or a distillation column, characterized in that at least one
10 of these columns contains packings.

The packings are preferably structured packings.

According to another subject-matter of the invention a process is provided for the separation of a
15 gaseous mixture including hydrogen and/or at least one hydrocarbon and/or nitrogen and/or carbon monoxide in a system of columns including at least one column, this column containing at least one section of packings.

According to other embodiments a process is
20 provided in which the packings are structured packings which have a density of between 400 and 1000 m^2/m^3 .

The packings can therefore be installed inside the washing, flash and distillation columns.

In the case of columns operating at low
25 pressure, such as the columns for distillation of carbon monoxide and methane or carbon monoxide and nitrogen, the pressure drops are relatively high in the case of conventional trays.

The use of packings enables the pressure drops
30 to be divided by 10. If the low pressure at the exit of the equipment is fixed, it is therefore possible to distil at lower pressure and to achieve an energy saving of a few per cent.

The packings allow the height and the diameter
35 of the washing and distillation columns to be reduced. By replacing the trays with packings which have a density of 870 m^2/m^3 the height of the column can be reduced by approximately 20%.

In the case of flash columns, which have a gas flow rate which is low and very variable between the bottom and the top, the perforation of the trays is therefore weak and very different from one tray to another, making them difficult to produce.

In addition, when a $H_2/CO/CH_4$ mixture is distilled, the flow rates vary greatly within the same section. This does not present any problem with a packing, but makes trays tricky to use.

The structured packings of the invention may be of the intersecting corrugated type.



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CLAIMS

1. Plant for separating a gaseous mixture including hydrogen and/or at least one hydrocarbon and/or nitrogen and/or carbon monoxide, including a washing column (K01, K11) and/or a flash column (K02, K12, K13) and/or a distillation column (K03, K14), characterized in that at least one of these columns contains packings.
- 10 2. Plant according to Claim 1, in which the packings are structured packings.
3. Plant according to Claim 2, in which the packings have a density of $400 \text{ m}^2/\text{m}^3$ to $1000 \text{ m}^2/\text{m}^3$.
- 15 4. Process for the separation of a gaseous mixture including hydrogen and/or at least one hydrocarbon and/or nitrogen and/or carbon monoxide in a system of columns including at least one column, this column containing at least one section of packings.
5. Process according to Claim 4, in which the packings are structured packings.
- 20 6. Process according to Claim 5, in which the packings have a density of between 400 and $1000 \text{ m}^2/\text{m}^3$.

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ABSTRACT

A synthesis gas consisting of a mixture of hydrogen and/or at least one hydrocarbon and/or nitrogen and/or carbon monoxide is separated in a washing (K01), flash (K02) or distillation (K03) column, containing structured packings.

Figure 1

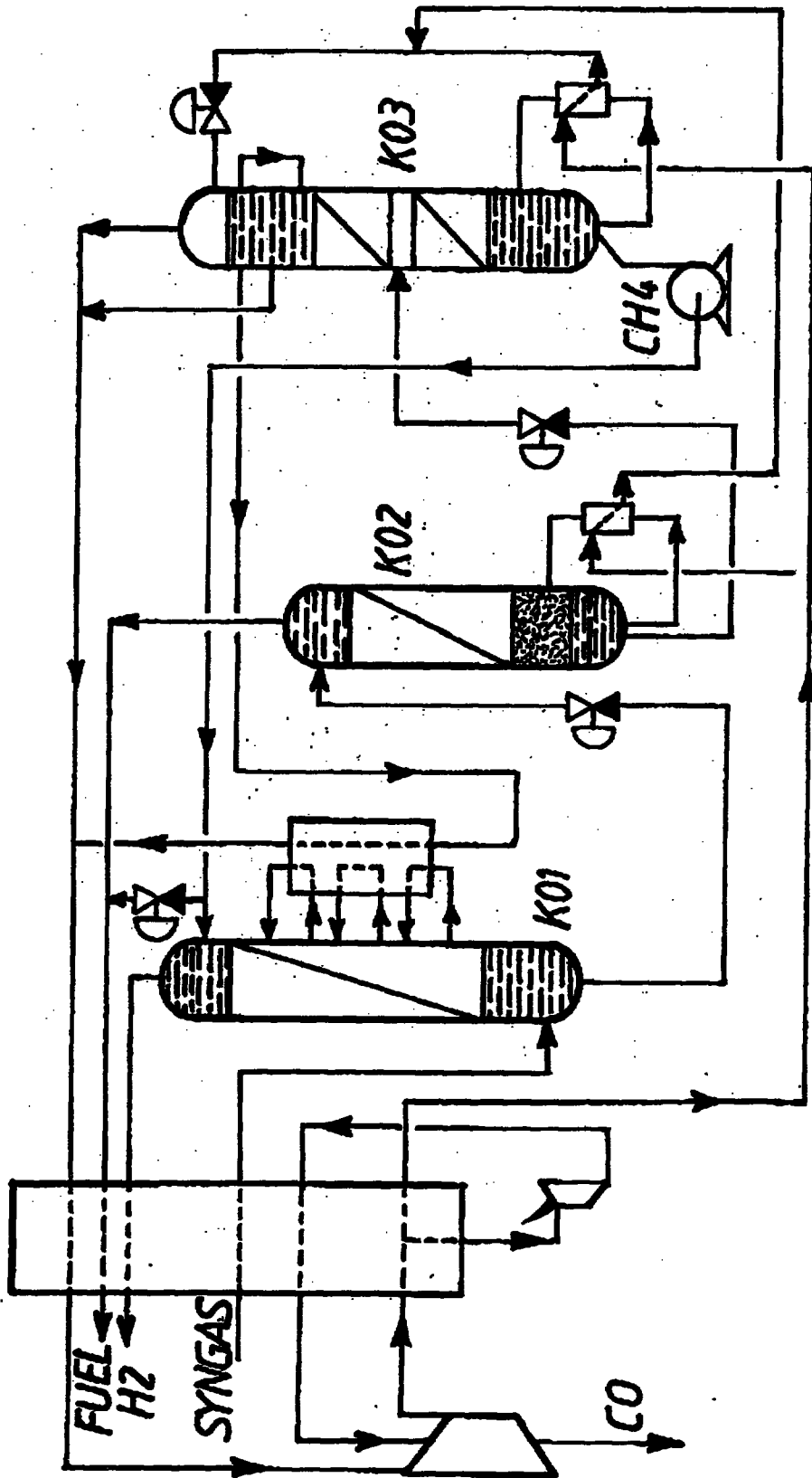


FIG. 1

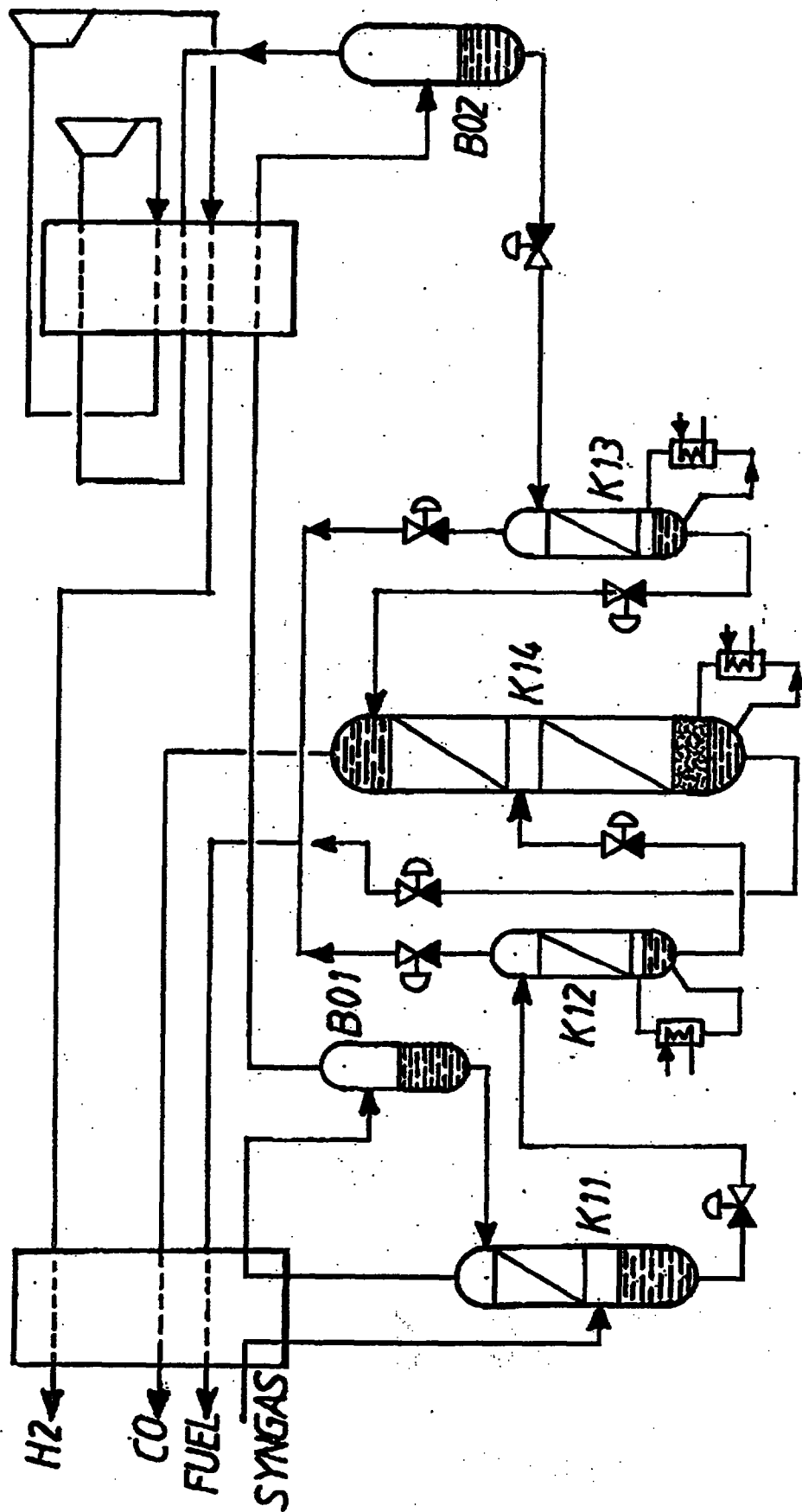


FIG. 2

CLAIMS

1. Process for the separation of a gaseous mixture including nitrogen and at least one hydrocarbon or hydrogen or carbon monoxide or a mixture comprising at least two of the following components : a hydrocarbon, hydrogen and carbon monoxide, in a system of columns including at least one column, this column containing at least one section of structured packings.
2. Process according to claim 1, in which the structured packings have a density of between 400 and 1000 m²/m³.
3. Process according to claim 1 or 2 wherein said column is a methane washing column.
4. Process according to claim 1 or 2 wherein said column is a flash column.
5. Process according to any preceding claim wherein said hydrocarbon is methane.

