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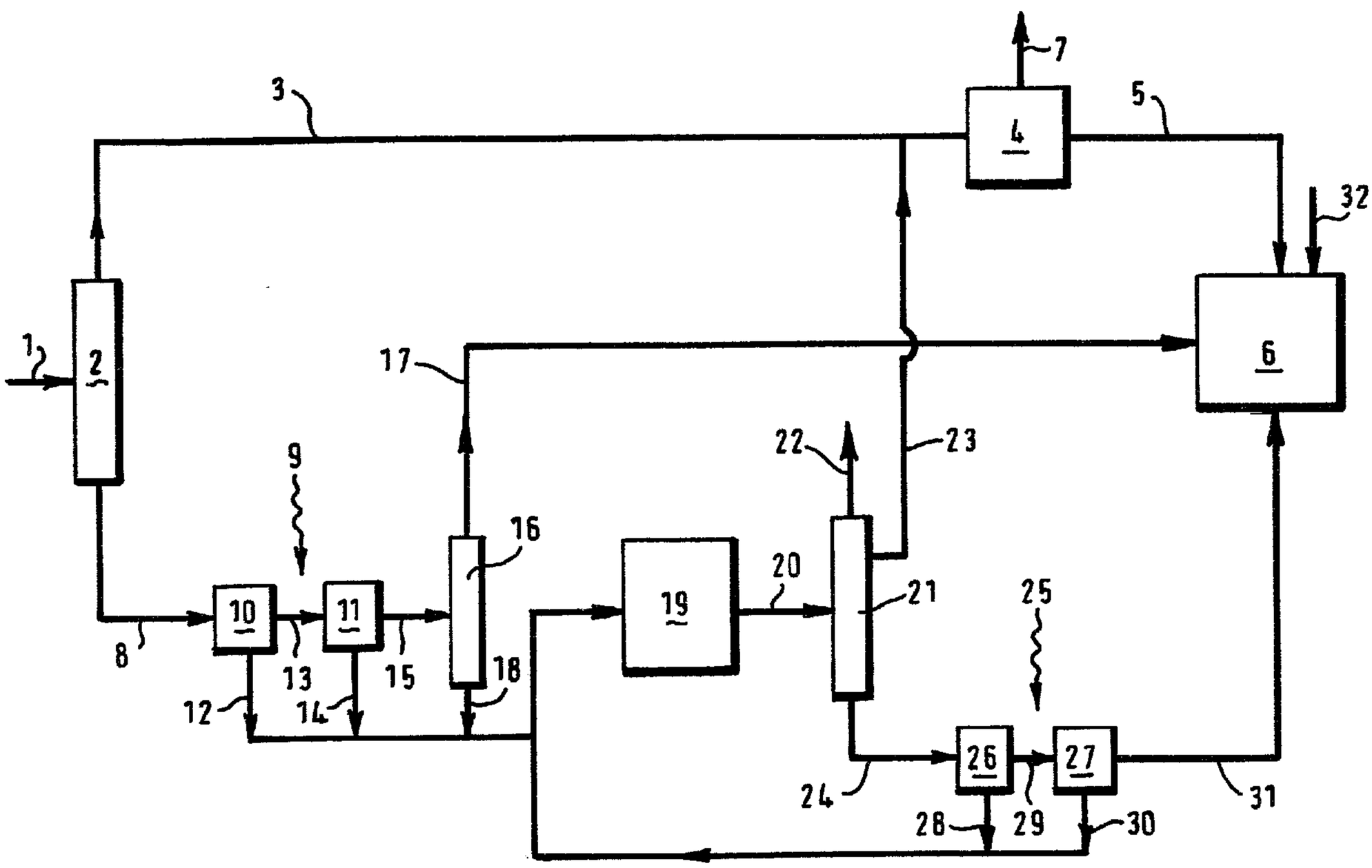
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(54) Titre : PROCEDE DE VALORISATION D'UNE CHARGE HYDROCARBONEE
(54) Title: PROCESS FOR UPGRADING A HYDROCARBONACEOUS FEEDSTOCK



(57) Abrégé/Abstract:
Process for upgrading a hydrocarbonaceous feedstock substantially boiling in the gasoline range, which process comprises: a) subjecting the feedstock to a separation treatment wherein normal paraffins and optionally mono-isoparaffins are separated from di-isoparaffins; b) recovering therefrom a first separation effluent stream comprising normal paraffins and optionally mono-isoparaffins and a second separation effluent stream comprising di-isoparaffins; c) separating at least part of the second separation effluent stream into a light fraction comprising hydrocarbons of the C_6-C_{10} range and a heavy fraction comprising C_8 and greater hydrocarbons; and d) subjecting at least part of the heavy fraction comprising C_8 and greater hydrocarbons to a reforming step to produce a reformate.

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T 6146

A B S T R A C T

PROCESS FOR UPGRADING A HYDROCARBONACEOUS FEEDSTOCK

Process for upgrading a hydrocarbonaceous feedstock substantially boiling in the gasoline range, which process comprises:

a) subjecting the feedstock to a separation treatment wherein normal paraffins and optionally mono-isoparaffins are separated from di-isoparaffins;

b) recovering therefrom a first separation effluent stream comprising normal paraffins and optionally mono-isoparaffins and a second separation effluent stream comprising di-isoparaffins;

c) separating at least part of the second separation effluent stream into a light fraction comprising hydrocarbons of the C_6-C_{10} range and a heavy fraction comprising C_8 and greater hydrocarbons;

and

d) subjecting at least part of the heavy fraction comprising C_8 and greater hydrocarbons to a reforming step to produce a reformate.

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T 6146

PROCESS FOR UPGRADING A HYDROCARBONACEOUS FEEDSTOCK

The present invention relates to a process for upgrading a hydrocarbonaceous feedstock substantially boiling in the gasoline range.

One of the main objects in nowaday's oil refining is to produce gasolines fulfilling the increasing environmental demands on product quality and having a high octane number.

This means for gasoline that the octane specification has now to be established without lead-containing additives, less aromatics, in particular benzene, less olefins and lower gasoline vapour pressure.

Object of the present invention is to provide a process for the preparation of gasolines fulfilling both the increasing environmental demands on product quality and the high octane requirement.

It has now been found that gasolines can be produced having a high octane number and a reduced aromatics content, in particular benzene, when use is made of an upgrading process comprising a specific sequence of process steps.

Accordingly, the present invention relates to a process for upgrading a hydrocarbonaceous feedstock substantially boiling in the gasoline range, which process comprises:

a) subjecting the feedstock to a separation treatment wherein normal paraffins and optionally mono-isoparaffins are separated from di-isoparaffins;

b) recovering therefrom a first separation effluent stream comprising normal paraffins and optionally mono-isoparaffins and a second separation effluent stream comprising di-isoparaffins;

c) separating at least part of the second separation effluent stream into a light fraction comprising hydrocarbons of the

C_6-C_{10} range and a heavy fraction comprising C_8 and greater hydrocarbons;

and

d) subjecting at least part of the heavy fraction comprising C_8 and greater hydrocarbons to a reforming step to produce a reformate.

In this way a direct octane enhancement of the resultant gasoline blending pool is established whilst a substantial reduction of aromatics content, in particular of the benzene content, is realized. In refineries with restriction on production of gasoline due to octane and/or capacity limitations, this octane enhancement can permit increased gasoline production. Moreover, it is established that the amount of gas make and the production of hydrocarbons having a low octane rating can substantially be reduced in the reforming step.

The hydrocarbonaceous feedstock substantially boiling in the gasoline range can suitably be obtained by distillation of crude oil or from catalytic cracking although it may be obtained by other cracking processes such as thermal cracking, delayed coking, visbreaking and flexicoking. Such gasoline feedstocks usually contain unacceptable levels of sulphur and nitrogen and benefit from a hydrotreatment before they are subjected to the process according to the present invention. While the full gasoline boiling range fraction may be included in the feedstock, it may be preferred to employ as feedstock a cut thereof substantially boiling in the range of 70 to 220 °C. Suitably, the hydrocarbonaceous feedstock consists essentially of a hydrocarbon mixture substantially boiling in the gasoline range.

In step a) the separation treatment can suitably be established by passing the feedstock to a separation zone comprising a shape-selective separatory molecular sieve having a pore size of 4.5 x 4.5 Å or smaller and being shaped to permit adsorption of normal paraffins in a selective manner vis-à-vis mono-isoparaffins, di-isoparaffins, other multi-branched paraffins, cyclic paraffins and aromatic hydrocarbons. In this way the normal

paraffins can selectively be separated from mono-isoparaffins and di-isoparaffins. Subsequently, the first separation effluent stream comprising substantially normal paraffins can be recovered and at least part of the second separation effluent stream comprising di-isoparaffins can be subjected to the separation treatment in step c). Suitably, at least part of the first separation effluent stream can be co-processed in step d). At least part of this separation effluent stream can also suitably be used as a preferred chemical feedstock. For instance, as a feedstock for a highly selective cyclization process.

Suitably, the process according to the present invention is carried out in such a way that in step a) both the normal paraffins and mono-isoparaffins are separated from the di-isoparaffins. The separation treatment can suitably be established by passing the hydrocarbonaceous feedstock to a separation zone comprising a shape-selective separatory molecular sieve having a pore size intermediate 5.5 x 5.5 to 4.5 x 4.5 Å but excluding 4.5 x 4.5 Å, the pore size being sufficient to permit entry of normal paraffins and mono-isoparaffins but restrictive to prohibit entry of di-isoparaffins, other multi-branched paraffins, cyclic paraffins and aromatic hydrocarbons. In this way the normal paraffins and mono-isoparaffins can selectively be separated from the di-isoparaffins. Subsequently, the first separation effluent stream comprising both normal paraffins and mono-isoparaffins can be recovered and at least part of the second separation effluent stream comprising di-isoparaffins can be subjected to the separation treatment in step c). Suitably, at least part of this first separation effluent stream can be co-processed in step d). At least part of this separation effluent stream can also suitably be used as a preferred chemical feedstock as indicated hereinbefore.

Suitably, in step a) the normal paraffins are firstly separated from the mono-isoparaffins and di-isoparaffins, whereas the mono-isoparaffins are subsequently separated from the di-isoparaffins. To this end use can be made of a multiple select adsorbent molecular sieve system having particular separatory

qualities. Preferably, the multiple separatory sieve system to be used comprises a first molecular sieve having a pore size of 4.5 x 4.5 Å or smaller and being shaped to permit adsorption of normal paraffins in a selective manner vis-à-vis mono-isoparaffins, di-isoparaffins, other multi-branched paraffins, cyclic paraffins and aromatic hydrocarbons and a second molecular sieve having a pore size intermediate 5.5 x 5.5 to 4.5 x 4.5 Å, but excluding 4.5 x 4.5 Å, being selected to permit adsorption of mono-isoparaffins (and any remaining normal paraffins) in deference to di-isoparaffins and other multi-branched paraffins, cyclic paraffins and aromatic hydrocarbons. In operation, the hydrocarbonaceous feedstock is firstly passed to a first separation zone comprising the first shape-selective separatory molecular sieve as defined hereinabove to produce the first separation effluent stream comprising the normal paraffins and the second separation effluent stream comprising both mono- and di-isoparaffins. The latter hydrocarbon effluent stream is subsequently passed to a second separation zone comprising the second shape-selective separatory molecular sieve as described hereinabove. Subsequently, a third separation effluent stream comprising mono-isoparaffins can be recovered and at least part of a fourth separation effluent stream comprising di-isoparaffins can be separated into a light and a heavy fraction in step c).

Suitably, at least part of the first and/or third separation effluent streams can be co-processed in step d). At least part of these streams can also suitbly be used as a preferred chemical feedstock as indicated hereinbefore.

The multiple select adsorbent molecular sieve system as described hereinabove comprises at least two molecular sieves. These can be arranged in separate vessels, or they can be arranged in a stacked flow scheme within one vessel.

The first molecular sieve can be a calcium 5 Å zeolite or any other sieve of similar pore dimensions, i.e. pore dimensions of 4.5 x 4.5 Å. It is not necessary to size the first sieve to adsorb all of the normal paraffins, but it is preferred so that the second

molecular sieve does not have to function as a normal paraffin adsorption sieve.

The second sieve to be applied in a multiple select adsorbent molecular sieve system is exemplified by a molecular sieve which has eight and ten member rings and pore dimensions intermediate 5.5 x 5.5 and 4.5 x 4.5 Å, but excluding 4.5 x 4.5 Å.

The preferred second molecular sieve of this invention is exemplified by a ferrierite molecular sieve. It is preferred that the ferrierite sieve be present in a hydrogen form, but it alternatively can be exchanged with a cation of an alkali metal, or alkaline earth metal or transition metal cation. The molecular sieves of this invention include ferrierite and other analogous shape-selective materials with pore openings intermediate in dimensions to those of the calcium 5 Å zeolite and ZSM-5. Other examples of crystalline sieves include aluminophosphates, silicoaluminophosphates, and borosilicates.

The aluminophosphate, silicoaluminophosphate and borosilicate molecular sieves which can be used as a second molecular sieve will have a pore opening intermediate between 5.5 x 5.5 and 4.5 x 4.5 Å, but excluding 4.5 x 4.5 Å.

It is feasible that the molecular sieve comprises a large pore zeolite that has been ion exchanged with cations to diminish the effective pore size of the sieve to within the aforementioned range of dimensions.

When applying a multiple select adsorbent molecular sieve system the sequence of the sieves, whether in discrete vessels or in a stacked variety, is very important. If the sieves are interchanged the process loses effectiveness because the larger sieve will rapidly fill with normal paraffins, prohibiting the efficient adsorption of mono-isoparaffins.

The respective sieves in a multiple select adsorbent molecular sieve system should be arranged in a process sequence to first provide adequate adsorption of the normal paraffin hydrocarbons, and then, adsorption of the mono-isoparaffins. Each of these respective sieves can be provided with a common desorbent stream or

each sieve may have its own desorbent stream. The desorbent is preferably a gaseous material such as a hydrogen gas stream.

Alternatively, the normal paraffins can firstly be separated from the mono-isoparaffins and di-isoparaffins using a molecular sieve as described hereinbefore, whereafter the second separation effluent stream comprising mono-isoparaffins and di-isoparaffins is separated in step c) into a light fraction comprising hydrocarbons of the C_6-C_{10} range and a heavy fraction comprising C_8 and greater hydrocarbons. Subsequently, the heavy fraction obtained can be subjected to a separation treatment as described hereinbefore wherein mono-isoparaffins are separated from di-isoparaffins. Thereafter, a third separation stream comprising mono-isoparaffins can be recovered and at least part of a fourth separation effluent stream comprising di-isoparaffins can be subjected to the reforming step. At least part of the streams comprising normal or di-isoparaffins can be co-processed in step d), or applied as a preferred chemical feedstock as indicated hereinbefore.

The light and heavy fraction in step c) can suitably be obtained by distillation.

In a preferred embodiment of the processes according to the present invention as described hereinbefore, at least part of the reformate is subjected to a separation treatment wherein normal paraffins and optionally mono-isoparaffins are separated from di-isoparaffins, and whereby a first hydrocarbon product stream comprising normal paraffins is recovered and a second hydrocarbon product stream comprising di-isoparaffins is recovered.

In this way upstream the reforming step the initially present normal paraffins and optionally mono-isoparaffins are separated from di-isoparaffins, whereas downstream the reforming step normal paraffins and optionally mono-isoparaffins, which were still present in the separation effluent stream comprising di-isoparaffins together with those which have been produced in the reforming step, are separated from di-isoparaffins.

The separation treatment downstream the reforming step can suitably be established by passing at least part of the reformate

to a separation zone comprising a shape-selective separatory molecular sieve having a pore size of 4.5 x 4.5 Å or smaller and being shaped to permit adsorption of normal paraffins in a selective manner vis-à-vis mono-isoparaffins, di-isoparaffins, other multi-branched paraffins, cyclic paraffins and aromatic hydrocarbons. In this way the normal paraffins can selectively be separated from mono-isoparaffins and di-isoparaffins. At least part of the first hydrocarbon product stream comprising substantially normal paraffins thus obtained can suitably be used as a preferred chemical feedstock as indicated hereinbefore. In another suitable embodiment of the process according to the present invention at least part of this stream is co-processed in step d).

Preferably, the process according to the present invention is carried out in such a way that downstream the reforming step both the normal paraffins and mono-isoparaffins are separated from the di-isoparaffins. To this end at least part of the reformate can be passed to a separation zone comprising a shape-selective separatory molecular sieve having a pore size intermediate 5.5 x 5.5 to 4.5 x 4.5 Å but excluding 4.5 x 4.5 Å, the pore size being sufficient to permit entry of normal paraffins and mono-isoparaffins but restrictive to prohibit entry of di-isoparaffins, other multi-branched paraffins, cyclic paraffins and aromatic paraffins. In this way the normal paraffins and mono-isoparaffins can selectively be separated from the di-isoparaffins. Subsequently, a first hydrocarbon product stream comprising both normal paraffins and mono-isoparaffins can be recovered and a second product stream comprising di-isoparaffins can be recovered. The separation treatments upstream and downstream the reforming step can suitably be carried out in the same separation zone.

Suitably, at least part of the first hydrocarbon product stream can be applied as a preferred chemical feedstock as indicated hereinbefore, or co-processed in step d).

Preferably, in the second separation treatment the normal paraffins are firstly separated from the mono-isoparaffins and the di-isoparaffins, whereas the mono-isoparaffins are subsequently

separated from the di-isoparaffins. To this end use can be made of a multiple select adsorbent molecular sieve system as described hereinbefore. In this way a first hydrocarbon product stream comprising normal paraffins and a second hydrocarbon product stream comprising mono-isoparaffins can be selectively separated from a third hydrocarbon product stream comprising di-isoparaffins. At least part of the first and/or second hydrocarbon product stream can suitably be applied as a preferred chemical feedstock as indicated hereinbefore, or co-processed in step d).

The application of a multiple select adsorbent molecular sieve system both upstream and downstream of the reforming step is very attractive since it offers product flexibility together with product quality. Suitably, at least part of the reformate obtained is passed to a hydrogenation unit before being subjected to any of the separation treatments described hereinbefore.

Suitably, at least part of the reformate obtained is separated, for instance by distillation, into a gaseous fraction, a light fraction comprising C_5-C_6 hydrocarbons and a gasoline fraction. At least part of the light fraction can be introduced with another light refinery hydrocarbon stream comprising C_5-C_6 hydrocarbons into an isomerization unit. The isomerate so obtained can subsequently be passed to the gasoline blending pool.

The gasoline fraction obtained can subsequently directly be passed to the gasoline blending pool or it can be subjected to a separation treatment wherein normal paraffins and optionally mono-isoparaffins are separated from di-isoparaffins as described hereinbefore.

At least part of the light fraction obtained in step c) can directly be passed to the gasoline blending pool. In a preferred embodiment of the present invention at least part of the light fraction obtained in step c) is co-processed with the reformate and subjected to a separation treatment as described hereinbefore wherein normal and optionally mono-isoparaffins are separated from di-isoparaffins. Alternatively, the light fraction obtained in step c) can directly be subjected to the separation treatment downstream

the reforming step wherein mono-isoparaffins are separated from di-isoparaffins.

The light and heavy fraction in step c) can suitably be obtained by distillation.

At least part of one or more of the separation effluent streams comprising normal paraffins and/or mono-isoparaffins can suitably be co-processed with the heavy fraction in step d).

Suitably, butane can be added to to the gasoline obtained in the gasoline blending pool in order to obtain an overall gasoline having the maximum allowable RVP (Reid Vapour Pressure) specification.

Suitably, at least part of the gasoline fraction obtained downstream the reforming step can be separated, for instance by means of distillation, into a light gasoline fraction comprising hydrocarbons of the C_6-C_{10} range and a heavy gasoline fraction comprising C_8 and greater hydrocarbons. At least part of the light gasoline fraction obtained can suitably be subjected to a separation treatment as described hereinbefore wherein normal paraffins and optionally mono-isoparaffins are separated from di-isoparaffins. At least part of the heavy gasoline fraction obtained can directly be passed to the gasoline blending pool.

In the reforming step any conventional reforming catalyst can be applied. Preferably, in the reforming step a catalyst is used having a substantial (dehydro)cyclization activity. Exemplary of a conventional reforming catalyst is a platinum-containing catalyst platinum present in for instance a range of 0.005 wt% to 10.0 wt%. The catalytic metals associated with the reforming function are preferably noble metals from Group VIII of the Periodic Table of elements, such as platinum and palladium. The reforming catalyst can be present per se or it may be mixed with a binder material.

It is well appreciated that the application of noble metal(s)-containing reforming catalysts normally requires a pretreatment in the form of a catalytic hydrotreatment of the feedstock to be upgraded. In this way nitrogen-compounds and sulphur-compounds can be removed from the feedstock which compounds would otherwise

reduce the performance of the reforming catalyst considerably.

The reforming step can suitably be carried out under conventional reforming conditions. Typically the process is carried out at a temperature from 450 to 550 °C and a pressure of 3 to 20 bar. The reaction section in which the reforming step is to be performed can suitably be separated into several stages or reactors.

The present invention will now be illustrated by means of the following Example.

Example

A process according to the present invention is carried out in accordance with the flow diagram as schematically shown in Figure 1.

A hydrocarbonaceous feedstock substantially boiling in the gasoline range and having properties as set out in Table 1 is introduced via a line 1 into a distillation column 2 wherein the feedstock is separated into a first light fraction comprising hydrocarbons of the C_5-C_6 range and a heavy fraction comprising C_6 and greater hydrocarbons. The light fraction is withdrawn via a line 3 and introduced into an isomerization unit 4. The isomerate effluent obtained therefrom is withdrawn via a line 5 and introduced into the blending gasoline pool 6, whereas a gaseous fraction is withdrawn via a line 7. The heavy fraction is withdrawn via a line 8, and passed to a separation zone 9 which contains two molecular sieves 10 and 11.

Molecular sieve #1 (10) is a commercial zeolite having pore size of from 4.5 to 4.5 Å or smaller. Molecular sieve 11, referred to as molecular sieve #2, has a pore size intermediate 5.5 x 5.5 to 4.5 x 4.5 Å, but excludes 4.5 x 4.5 Å.

The first molecular sieve 10 selectively adsorbs normal paraffins in preference to mono-isoparaffins, di-isoparaffins, other multi-branched paraffins, cyclic paraffins and aromatic hydrocarbons. A fraction comprising the normal paraffins is withdrawn via a line 12. The separation effluent stream substantially freed from normal paraffins is withdrawn via a

line 13 and contacted with molecular sieve #2 (11). In this particular sieve, mono-isoparaffins are adsorbed while di-isoparaffins and other multi-branched paraffins, cyclic paraffins and aromatic hydrocarbons are passed through the sieve without adsorption. A fraction comprising mono-isoparaffins is withdrawn via a line 14, and the remaining separation effluent (di-isoparaffins fraction) which is now substantially freed from normal paraffins and mono-isoparaffins is withdrawn via a line 15. Subsequently, the separation effluent comprising the di-iso-paraffins is introduced into a distillation column 16 wherein the effluent stream is separated into a light fraction comprising hydrocarbons of the C_6-C_{10} range, which is passed via a line 17 to the gasoline blending pool 6, and a heavy fraction comprising C_8 and greater hydrocarbons. The heavy fraction is withdrawn via a line 18 and then introduced into a reforming reactor 19. The reforming is carried out at a temperature of 498 °C, a pressure of 10.6 bar, a weight hourly space velocity of 1.8 kg/kg/hr and a hydrogen/feed ratio of 510 Nl/kg. The commercially available reforming catalyst comprises platinum and tin on alumina. The fractions withdrawn via the lines 12 and 14 are co-processed in the reforming step. The reformate obtained is subsequently withdrawn via a line 20 and introduced into a distillation column 21. In the distillation column 21 the reformate is separated into a gaseous fraction, a second light fraction comprising C_5-C_6 hydrocarbons and a gasoline fraction. The gaseous fraction is withdrawn via a line 22, the second light fraction is co-processed with the first light fraction comprising C_5-C_6 hydrocarbons via a line 23 and the gasoline fraction is withdrawn via a line 24. Via the line 24 the gasoline fraction is passed to a separation zone 25 containing molecular sieves 26 and 27. Molecular sieve #3 (26) is a commercial zeolite having pore size of from 4.5 to 4.5 Å or smaller. Molecular sieve 27, referred to as molecular sieve #4, has a pore size intermediate 5.5 x 5.5 to 4.5 x 4.5 Å, but excludes 4.5 x 4.5 Å.

The first molecular sieve 26 selectively adsorbs normal paraffins in preference to mono-isoparaffins, di-isoparaffins,

cyclic paraffins and aromatic hydrocarbons. A fraction comprising the normal paraffins is withdrawn via a line 28. The separation effluent stream substantially freed from normal paraffins is withdrawn via a line 29 and contacted with molecular sieve #4 (27). In this particular sieve, mono-isoparaffins are adsorbed while di-isoparaffins and other multi-branched paraffins, cyclic paraffins and aromatic hydrocarbons are passed through the sieve without adsorption. The fraction comprising mono-isoparaffins is withdrawn via a line 30, and the remaining separation effluent (di-isoparaffins fraction) which is now substantially freed from normal paraffins and mono-isoparaffins is withdrawn via a line 31 and introduced into the blending gasoline pool 6. The fractions withdrawn via the lines 28 and 30 are co-processed in the reforming step.

100 pbw of the feedstock in line 1 yields the various product fractions in the following quantities:

17.7 pbw light fraction (line 3)
82.3 pbw heavy fraction (line 8)
22.5 pbw isomerate fraction (line 5)
2.2 pbw gaseous fraction (line 7)
16.8 pbw normal paraffins fraction (line 12)
65.5 pbw separation effluent stream (line 13)
16.4 pbw mono-isoparaffins fraction (line 14)
49.1 pbw di-isoparaffins fraction (line 15)
31.9 pbw light fraction (line 17)
17.2 pbw heavy fraction (line 18)
52.2 pbw reformate fraction (line 20)
12.0 pbw gaseous fraction (line 22)
7.0 pbw light fraction (line 23)
33.2 pbw gasoline fraction (line 24)
0.6 pbw normal paraffins fraction (line 28)
32.6 pbw separation effluent stream (line 29)
1.2 pbw mono-isoparaffins fraction (line 30)
31.4 pbw di-isoparaffins fraction (line 31)

In the gasoline blending pool 6, 3.8 pbw of butane has been added

to the gasoline obtained via a line 32. In this way 89.6 pbw of an overall gasoline is obtained having the maximum allowable RVP specification.

The overall gasoline obtained in the blending gasoline pool 6 has the properties as set out in Table 2.

From Table 2 it is clear that a very attractive gasoline, in terms of octane number and content of aromatics, in particular benzene, can be produced by applying the present invention. In conventional upgrading processes gasolines are obtained having a considerable higher content of aromatics, in particular benzene.

Table 1

C (%wt)	:	84.9
H (%wt)	:	15.1
S (ppm)	:	15
d (70/4)	:	0.729
I.B.P. (°C, ASTM)	:	50
10% wt rec.	:	82
30% " "	:	100
50% " "	:	110
70% " "	:	128
90% " "	:	149
F.B.P.	:	183
RON	:	55
naphthenes "	:	34
aromatics "	:	6

Table 2

Gasoline properties:

RON	95.0
total aromatics (%vol)	31.6
benzene (%vol)	1.0
naphthenes (%vol)	25.9
RVP (kPa)	62

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CLAIMS:

1. A process for upgrading a hydrocarbonaceous feedstock substantially boiling in the gasoline range, which process comprises:

a) subjecting the feedstock to a separation treatment wherein normal paraffins are separated from di-isoparaffins;

b) recovering therefrom a first separation effluent stream comprising normal paraffins and a second separation effluent stream comprising di-isoparaffins;

c) separating at least part of the second separation effluent stream into a light fraction comprising hydrocarbons of the C_6-C_{10} range and a heavy fraction comprising C_8 and greater hydrocarbons; and

d) subjecting at least part of the heavy fraction comprising C_8 and greater hydrocarbons to a reforming step to produce a reformate.

2. The process according to claim 1, wherein the feedstock is a fraction boiling in the range of 70 to 220°C.

3. The process according to claim 1 or 2, wherein normal paraffins and mono-isoparaffins are separated from di-isoparaffins in the separation treatment of step a), and wherein the first separation effluent stream comprises the normal paraffins and mono-isoparaffins.

4. The process according to claim 3, wherein in step a) firstly the normal paraffins are separated from the mono-isoparaffins and di-isoparaffins, and subsequently the mono-isoparaffins are separated from the di-isoparaffins.

5. The process according to any one of claims 1 to 4, wherein at least part of the reformate is subjected to a

separation treatment wherein normal paraffins are separated from di-isoparaffins, and whereby a first hydrocarbon product stream comprising normal paraffins is recovered and a second hydrocarbon product stream comprising di-isoparaffins is recovered.

6. The process according to claim 5, wherein normal paraffins and mono-isoparaffins are separated from di-isoparaffins in the separation treatment of at least part of the reformate.

7. The process according to claim 6, wherein firstly the normal paraffins are separated from the mono-isoparaffins and di-isoparaffins, and subsequently the mono-isoparaffins are separated from the di-isoparaffins in the separation treatment of at least part of the reformate.

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PATENT AGENTS

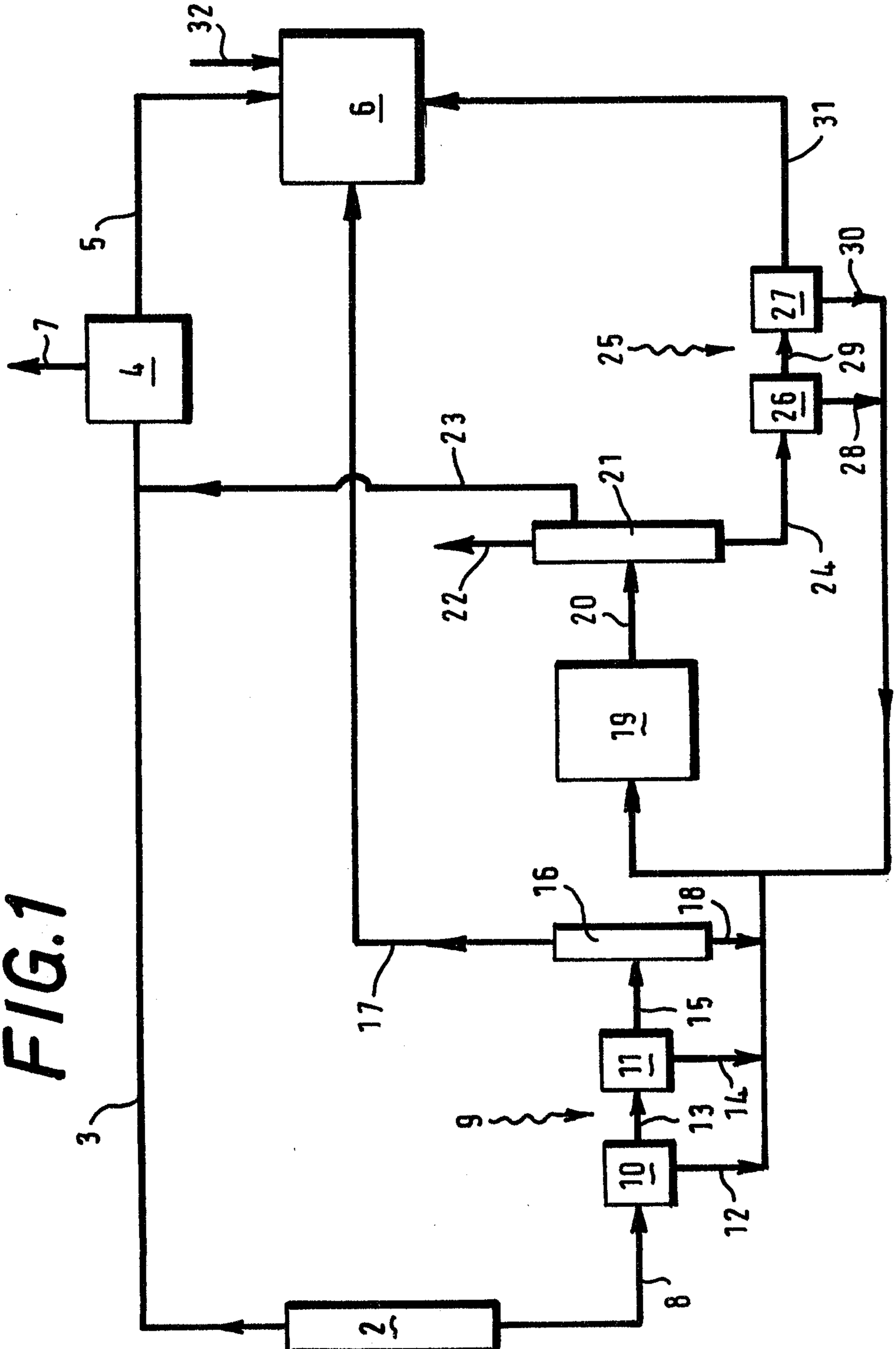
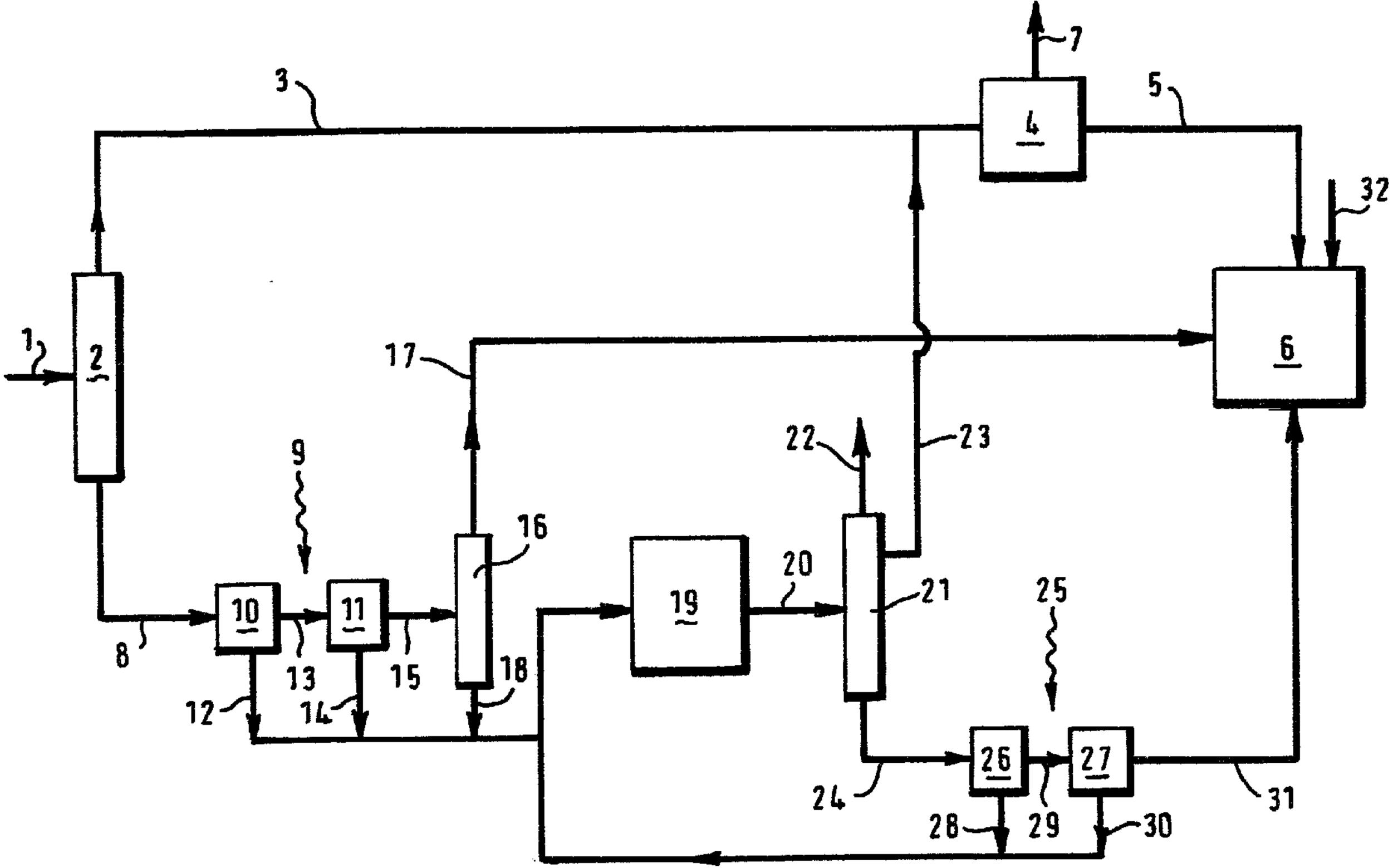


FIG.1

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