CPC  COOPERATIVE PATENT CLASSIFICATION

C  CHEMISTRY; METALLURGY
(NOTES omitted)

CHEMISTRY

C10  PETROLEUM, GAS OR COKE INDUSTRIES; TECHNICAL GASES CONTAINING CARBON MONOXIDE; FUELS; LUBRICANTS; PEAT

C10G  CRACKING HYDROCARBON OILS; PRODUCTION OF LIQUID HYDROCARBON MIXTURES, e.g. BY DESTRUCTIVE HYDROGENATION, OLIGOMERISATION, POLYMERISATION (cracking to hydrogen or synthesis gas C01B; cracking or pyrolysis of hydrocarbon gases to individual hydrocarbons or mixtures thereof of definite or specific constitution C07C; cracking to cokes C10B); RECOVERY OF HYDROCARBON OILS FROM OIL-SHALE, OIL-SAND, OR GASES; REFINING MIXTURES MAINLY CONSISTING OF HYDROCARBONS; REFORMING OF NAPHTHA; MINERAL WAXES (inhibiting corrosion or incrustation in general C23F)

NOTES
1. In this subclass,
   • groups C10G 9/00 - C10G 49/00 are limited to one-step processes;
   • combined or multi-step processes are covered by groups C10G 51/00 - C10G 69/00;
   • refining or recovery of mineral waxes is covered by group C10G 73/00
2. In this subclass, the following terms or expressions are used with the meanings indicated:
   • “in the presence of hydrogen” or “in the absence of hydrogen” mean treatments in which hydrogen, in free form or as hydrogen generating compounds, is added, or not added, respectively;
   • “hydrotreatment” is used for conversion processes as defined in group C10G 45/00 or group C10G 47/00;
   • “hydrocarbon oils” covers mixtures of hydrocarbons such as tar oils or mineral oils.
3. In this subclass, in the absence of an indication to the contrary, classification is made in the last appropriate place.

WARNINGS
1. The following IPC groups are not in the CPC scheme. The subject matter for these IPC groups is classified in the following CPC groups:
   C10G 73/23 covered by C10G 73/06
2. In this subclass non-limiting references (in the sense of paragraph 39 of the Guide to the IPC) may still be displayed in the scheme.

1/00  Production of liquid hydrocarbon mixtures from oil-shale, oil-sand, or non-melting solid carbonaceous or similar materials, e.g. wood, coal (mechanical winning of oil from oil-shales, oil-sand, or the like B03B)

1/002 . (in combination with oil conversion- or refining processes)
1/004 . [Inhibiting of corrosion]
1/006 . [Combinations of processes provided in groups C10G 1/02 - C10G 1/08]
1/008 . [Controlling or regulating of liquefaction processes (controlling or regulation in general G05)]
1/02 . by distillation (destructive distillation of oil-shale C10B 53/06)
1/04 . by extraction
1/042 . . . [by the use of hydrogen-donor solvents]
1/045 . . . [Separation of insoluble materials]
1/047 . . . [Hot water or cold water extraction processes]
1/06 . by destructive hydrogenation
1/065 . . . [in the presence of a solvent]

1/08 . . with moving catalysts
1/083 . . . [in the presence of a solvent]
1/086 . . . [Characterised by the catalyst used]
1/10 . . from rubber or rubber waste

2/00  Production of liquid hydrocarbon mixtures of undefined composition from oxides of carbon

2/30 . . from carbon monoxide with hydrogen
2/31 . . . [thermal, non catalytic conversion]
2/32 . . . . [with the use of catalysts]
2/33 . . . . . [characterised by the catalyst used]
2/331 . . . . . . [containing group VIII-metals]
2/332 . . . . . . [of the iron-group]
2/333 . . . . . . [of the platinum-group]
2/334 . . . . . . . [containing molecular sieve catalysts]
2/34 . . . . [Apparatus, reactors]
2/341 . . . . . [with stationary catalyst bed]
2/342 . . . . . [with moving solid catalysts]
2/343 . . . . . . {according to the "moving-bed" method]
Production of liquid hydrocarbon mixtures from oxygen-containing or organic materials, e.g. fatty oils, fatty acids (production from non-melting solid oxygen-containing carbonaceous materials Cl0G 3/00; preparation of individual hydrocarbons or mixtures thereof of definite or specified contribution Cl0G 3/40)

WARNING

Groups Cl0G 3/40-Cl0G 3/62 are incomplete pending reclassification of documents from group Cl0G 3/00.

Groups Cl0G 3/40-Cl0G 3/62 and Cl0G 3/00 should be considered in order to perform a complete search.

Cracking in the absence of hydrogen

Thermal non-catalytic cracking, in the absence of hydrogen, of hydrocarbon oils (cracking in direct contact with molten metals or salts Cl0G 9/34)

Catalytic cracking, in the absence of hydrogen, of hydrocarbon oils (cracking in direct contact with molten metals or salts Cl0G 9/34)
Refining in the absence of hydrogen

15/00 Cracking of hydrocarbon oils by electric means, electromagnetic or mechanical vibrations, by particle radiation or with gases superheated in electric arcs

15/08 . . . by electric means or by electromagnetic or mechanical vibrations
15/10 . . . by particle radiation
15/12 . . . with gases superheated in an electric arc, e.g. plasma

Refining in the absence of hydrogen

17/00 Refining of hydrocarbon oils in the absence of hydrogen, with acids, acid-forming compounds or acid-containing liquids, e.g. acid sludge
17/02 . . . with acids or acid-containing liquids, e.g. acid sludge
17/04 . . . Liquid-liquid treatment forming two immiscible phases
17/06 . . . using acids derived from sulfur or acid sludge thereof
17/07 . . . using halogen acids or oxyacids of halogen (acids generating halogen C10G 27/02)
17/08 . . . with acid-forming oxides (refining with CO₂ or SO₂ as a selective solvent C10G 21/06)
17/085 . . . with oleum
17/09 . . . with acid salts
17/095 . . . with "solid acids", e.g. phosphoric acid deposited on a carrier
17/10 . . . Recovery of used refining agents

19/00 Refining hydrocarbon oils in the absence of hydrogen, by alkaline treatment
19/02 . . . with aqueous alkaline solutions
19/04 . . . containing solubilisers, e.g. solutisers
19/06 . . . with plumbites or plumbates
19/067 . . . with molten alkaline material
19/073 . . . with solid alkaline material
19/08 . . . Recovery of used refining agents

21/00 Refining of hydrocarbon oils in the absence of hydrogen, by extraction with selective solvents (C10G 17/00, C10G 19/00 take precedence; dewaxing oils C10G 73/02)
21/003 . . . {Solvent de-asphalting}
21/006 . . . {of waste oils, e.g. PCB's containing oils}
21/02 . . . with two or more solvents, which are introduced or withdrawn separately
21/04 . . . by introducing simultaneously at least two immiscible solvents counter-current to each other
21/06 . . . characterised by the solvent used
21/08 . . . Inorganic compounds only
21/10 . . . Sulfur dioxide
21/12 . . . Organic compounds only

21/14 . . . Hydrocarbons
21/16 . . . Oxygen-containing compounds
21/18 . . . Halogen-containing compounds
21/20 . . . Nitrogen-containing compounds
21/22 . . . Compounds containing sulfur, selenium, or tellurium
21/24 . . . Phosphorus-containing compounds
21/26 . . . Silicon-containing compounds
21/27 . . . Organic compounds not provided for in a single one of groups C10G 21/14 - C10G 21/26
21/28 . . . Recovery of used solvent
21/30 . . . Controlling or regulating (controlling or regulating in general G05)

25/00 Refining of hydrocarbon oils in the absence of hydrogen, with solid sorbents

NOTE

When classifying in this group, classification is also made in group B01D 15/08 insofar as subject matter of general interest relating to chromatography is concerned.

27/00 Refining of hydrocarbon oils in the absence of hydrogen, by oxidation
27/02 . . . with halogen or compounds generating halogen; Hypochlorous acid or salts thereof
27/04 . . . with oxygen or compounds generating oxygen
27/06 . . . in the presence of alkali solutions
27/08 . . . in the presence of copper chloride
27/10 . . . in the presence of metal-containing organic complexes, e.g. chelates, or cationic ion-exchange resins
27/12 . . . with oxygen-generating compounds, e.g. per-compounds, chronic acid, chromates (plumbites or plumbates C10G 19/06)
27/14 . . . with ozone-containing gases

29/00 Refining of hydrocarbon oils in the absence of hydrogen, with other chemicals
29/02 . . . Non-metals
29/04 . . . Metals, or metals deposited on a carrier
29/06 . . . Metal salts, or metal salts deposited on a carrier
29/08 . . . containing the metal in the lower valency
29/10 . . . Sulfides
29/12 . . . Halides
29/16 . . . Metal oxides
29/20 . . . Organic compounds not containing metal atoms
29/205 . . . {by reaction with hydrocarbons added to the hydrocarbon oil}
Refining in the absence of hydrogen

NOTE

By reforming is meant the treatment of naphtha, in order to improve the octave number or its aromatic content.

- Thermal reforming
- Catalytic reforming
- Characterised by the catalyst used
- Controlling or regulating

Hydrotreatment processes.

NOTE

Treatment of hydrocarbon oils in the presence of hydrogen-generating compounds not provided for in a single one of groups C10G 45/02.

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Hydrotreatment processes

45/72 Controlling or regulating (controlling or regulating in general G05)

47/00 Cracking of hydrocarbon oils in the presence of hydrogen or hydrogen generating compounds, to obtain lower boiling fractions, (C10G 15/00) takes precedence; destructive hydrogenation of non-melting solid carbonaceous or similar materials C10G 1/06

47/02 . characterised by the catalyst used
47/04 . Oxides
47/06 . Sulfides
47/08 . Halides
47/10 . with catalysts deposited on a carrier
47/12 . Inorganic carriers
47/14 . the catalyst containing platinum group metals or compounds thereof
47/16 . Crystalline alumino-silicate carriers
47/18 . the catalyst containing platinum group metals or compounds thereof
47/20 . the catalyst containing other metals or compounds thereof
47/22 . Non-catalytic cracking in the presence of hydrogen
47/24 . with moving solid particles
47/26 . suspended in the oil, e.g. slurries
47/28 . according to the “moving-bed” technique
47/30 . according to the “fluidised-bed” technique
47/32 . in the presence of hydrogen generating compounds
47/34 . Organic compounds, e.g. hydrogenated hydrocarbons
47/36 . Controlling or regulating (controlling or regulating in general G05)

49/00 Treatment of hydrocarbon oils in the presence of hydrogen or hydrogen generating compounds, not provided for in a single one of the groups C10G 45/02, C10G 45/32, C10G 45/44, C10G 45/58 or C10G 47/00

49/002 . (Apparatus for fixed bed hydrotreatment processes)
49/005 . (Inhibiting corrosion in hydrotreatment processes)
49/007 . (in the presence of hydrogen from a special source or of a special composition or having been purified by a special treatment)
49/02 . characterised by the catalyst used
49/04 . containing nickel, cobalt, chromium, molybdenum, or tungsten metals, or compounds thereof
49/06 . containing platinum group metals or compounds thereof
49/08 . containing crystalline alumino-silicates, e.g. molecular sieves
49/10 . with moving solid particles
49/12 . suspended in the oil, e.g. slurries
49/14 . according to the “moving-bed” technique
49/16 . according to the “fluidised-bed” technique
49/18 . in the presence of hydrogen generating compounds, e.g. ammonia, water, hydrogen sulfide
49/20 . Organic compounds
49/22 . Separation of effluents
49/24 . Starting-up hydrotreatment operations
49/26 . Controlling or regulating (controlling or regulating in general G05)

50/00 Production of liquid hydrocarbon mixtures from lower carbon number hydrocarbons, e.g. by oligomerisation (preparation of individual hydrocarbons or mixtures thereof of definite or specified constitution C07C)

50/02 . of hydrocarbon oils for lubricating purposes

Multi-step processes

**NOTE**

Groups C10G 51/00 - C10G 69/00 cover only those combined treating operations where the interest is directed to the relationship between the steps.

51/00 Treatment of hydrocarbon oils in the absence of hydrogen, by two or more cracking processes only

51/02 . plural serial stages only
51/023 . [only thermal cracking steps]
51/026 . [only catalytic cracking steps]
51/04 . including only thermal and catalytic cracking steps
51/06 . plural parallel stages only

53/00 Treatment of hydrocarbon oils in the absence of hydrogen, by two or more refining processes

53/02 . plural serial stages only
53/04 . including at least one extraction step
53/06 . including only extraction steps, e.g. deasphalting by solvent treatment followed by extraction of aromatics (refining in one step with two or more solvents which are introduced or withdrawn separately C10G 21/02)

53/08 . including at least one sorption step
53/10 . including at least one acid-treatment step
53/12 . including at least one alkaline treatment step
53/14 . including at least one oxidation step
53/16 . plural parallel stages only

55/00 Treatment of hydrocarbon oils in the absence of hydrogen, by at least one refining process and at least one cracking process

55/02 . plural serial stages only
55/04 . including at least one thermal cracking step
55/06 . including at least one catalytic cracking step
55/08 . plural parallel stages only

57/00 Treatment of hydrocarbon oils in the absence of the hydrogen, by at least one cracking process or refining process and at least one other conversion process

57/005 . [with alkylation]
57/02 . with polymerisation

59/00 Treatment of naphtha by two or more reforming processes only or by at least one reforming process and at least one process which does not substantially change the boiling range of the naphtha

59/02 . plural serial stages only
59/04 . including at least one catalytic and at least one non-catalytic reforming step
59/06 . plural parallel stages only

61/00 Treatment of naphtha by at least one reforming process and at least one process of refining in the absence of hydrogen

61/02 . plural serial stages only
61/04 . . the refining step being an extraction
61/06 . . the refining step being a sorption process
61/08 . plural parallel stages only
61/10 . processes also including other conversion steps
63/00 Treatment of naphtha by at least one reforming process and at least one other conversion process (C10G 59/00, C10G 61/00 take precedence)
   63/02 . plural serial stages only
   63/04 . . including at least one cracking step
   63/06 . plural parallel stages only
   63/08 . . including at least one cracking step
65/00 Treatment of hydrocarbon oils by two or more hydrotreatment processes only
   65/02 . plural serial stages only
   65/04 . . including only refining steps
   65/043 . . . [at least one step being a change in the structural skeleton]
   65/046 . . . [at least one step being an aromatisation step]
   65/06 . . . at least one step being a selective hydrogenation of the diolefins
   65/08 . . . at least one step being a hydrogenation of the aromatic hydrocarbons
   65/10 . plural parallel stages only
   65/12 . . including cracking steps and other hydrotreatment steps
   65/14 . plural parallel stages only
   65/16 . . including only refining steps
   65/18 . . including only cracking steps
67/00 Treatment of hydrocarbon oils by at least one hydrotreatment process and at least one process for refining in the absence of hydrogen only
   67/02 . plural serial stages only
   67/04 . . including solvent extraction as the refining step in the absence of hydrogen
   67/0409 . . . [Extraction of unsaturated hydrocarbons]
   67/0418 . . . [The hydrotreatment being a hydrorefining]
   67/0427 . . . [The hydrotreatment being a selective hydrogenation of diolefins or acetylenes]
   67/0436 . . . [The hydrotreatment being an aromatic saturation]
   67/0445 . . . [The hydrotreatment being a hydrocracking]
   67/0454 . . . [Solvent desasphalting]
   67/0463 . . . [The hydrotreatment being a hydrorefining]
   67/0472 . . . [The hydrotreatment being a selective hydrogenation of diolefins or acetylenes]
   67/0481 . . . . [The hydrotreatment being an aromatics saturation]
   67/049 . . . . . [The hydrotreatment being a hydrocracking]
   67/06 . . including a sorption process as the refining step in the absence of hydrogen
   67/08 . . including acid treatment as the refining step in the absence of hydrogen
   67/10 . . including alkaline treatment as the refining step in the absence of hydrogen
   67/12 . . including oxidation as the refining step in the absence of hydrogen
   67/14 . . including at least two different refining steps in the absence of hydrogen
   67/16 . plural parallel stages only
69/00 Treatment of hydrocarbon oils by at least one hydrotreatment process and at least one other conversion process (C10G 67/00 take precedence)
   69/02 . plural serial stages only
   69/04 . . including at least one step of catalytic cracking in the absence of hydrogen
   69/06 . . including at least one step of thermal cracking in the absence of hydrogen
   69/08 . . including at least one step of reforming naphtha
   69/10 . . . hydrocracking of higher boiling fractions into naphtha and reforming the naphtha obtained
   69/12 . . . including at least one polymerisation or alkylation step
   69/123 . . . [alkylation]
   69/126 . . . [polymerisation, e.g. oligomerisation]
   69/14 . plural parallel stages only
70/00 Working-up undefined normally gaseous mixtures obtained by processes covered by groups C10G 9/00, C10G 11/00, C10G 15/00, C10G 47/00, C10G 51/00
   70/002 . [by forming adducts or complexes]
   70/004 . . [with solutions of copper salts]
   70/006 . . [with the use of acids or sulfur oxides]
   70/008 . . [with the use of organometallic compounds]
   70/02 . by hydrogenation
   70/04 . by physical processes
   70/041 . . . (by distillation)
   70/042 . . . [with the use of auxiliary compounds]
   70/043 . . . [by fractional condensation]
   70/044 . . . (by crystallisation)
   70/045 . . . [using membranes, e.g. selective permeation]
   70/046 . . . [by adsorption, i.e. with the use of solids]
   70/047 . . . [by molecular sieve technique]
   70/048 . . . [by liquid-liquid extraction]
   70/06 . by gas-liquid contact
71/00 Treatment by methods not otherwise provided for of hydrocarbon oils or fatty oils for lubricating purposes (by Fischer-Tropsch C07C 1/00, lubricating compositions C10M)
   71/02 . Thickening by voltolising (chemical modification of drying oils by voltolising C09F 7/04)
73/00 Recovery or refining of mineral waxes, e.g. montan wax (compositions essentially based on waxes C08L 91/00)
   73/02 . Recovery of petroleum waxes from hydrocarbon oils; Dewaxing of hydrocarbon oils
   73/025 . . . [by filtration]
   73/04 . . with the use of filter aids
   73/06 . . with the use of solvents
   73/08 . . . Organic compounds
   73/10 . . . Hydrocarbons
   73/12 . . . Oxygen-containing compounds
   73/14 . . . Halogen-containing compounds
   73/16 . . . Nitrogen-containing compounds
   73/18 . . . containing sulfur, selenium or tellurium
   73/20 . . . containing phosphorus
   73/22 . . . Mixtures or organic compounds
   73/24 . . . by formation of adducts
   73/26 . . . by flotation
   73/28 . . . by centrifugal force
   73/30 . . with electric means
Multi-step processes

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**2300/00** Aspects relating to hydrocarbon processing covered by groups C10G 11/00 - C10G 99/00

- Feedstock materials
- Waste materials
- Used oils
- Biomass
- of vegetable origin
- of animal origin
- Fischer-Tropsch products
- Natural gas
- Gas hydrates
- Oil well production fluids
- Hydrocarbon fractions
- Light gasoline having a boiling range of about 20 - 100 °C
- Heavy gasoline or naphtha having a boiling range of about 100 - 180 °C
- Middle distillates
- Kerosene having a boiling range of about 180 - 230 °C
- Diesel having a boiling range of about 230 - 330 °C
- Gasoil having a boiling range of about 330 - 427 °C
- Lubricating oils
- Special oils
- Atmospheric residues having a boiling point of at least about 538 °C
- Vacuum distillates
- Vacuum residues
- Alkanes
- Solid paraffins
- Olefins
- C2-C4 olefins
- Aromatics or polyaromatics
- Characteristics of the feedstock or the products
- Impurities
- Heteroatoms content, i.e. S, N, O, P
- Naphthenic acids, TAN
- Metal content
- Asphaltenes
- Acid gases, e.g. H₂S, COS, SO₂, HCN
- Sediments, e.g. bottom sediment and water or BSW
- Physical properties of feedstocks or products
- Boiling range
- Viscosity
- Pour point, cloud point, cold flow properties
- Octane number, e.g. motor octane number [MON], research octane number [RON]
- Cetane number, cetane index
- Gravity, density, e.g. API
- Characteristics of the process deviating from typical ways of processing
- Temperature
- Pressure
- Spatial velocity, e.g. LHSV, WHSV
- Yield
- Start up or shut down operations
- In-situ processes
- Limiting CO₂ emissions
- Limiting CO, NOx or SOx emissions
- Retrofitting operations
- Geographical aspects, e.g. different process units form a combination process at different geographical locations
- Moveable devices or units, e.g. on trucks, barges
- Limiting deterioration of equipment
- Recycling aspects
- Catalytic distillation
- Catalyst stripping
- Hydrogen of special source or of special composition
- Solvents
- Catalyst aspects
- Use of spent catalysts
- Activation
- Passivation
- Catalytic metal recovery
- Coking aspect, coke content and composition of deposits
- Additives
- Diluents
- Water
- Steam

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**2400/00** Products obtained by processes covered by groups C10G 9/00 - C10G 69/14

- Gasoline
- Diesel oil
- Gasoil
- Jet fuel
- Lubricating oil
- Electrical isolation oil
- White oil, eating oil
- Residues
- Solvents
- C2-C4 olefins
- Higher olefins
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<td>2400/28</td>
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