

PATENT SPECIFICATION

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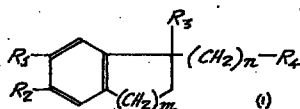


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(54) NEW HYDROAROMATIC COMPOUNDS

(71) We, CIBA GEIGY AG, a body corporate organised according to the laws of Switzerland, of Basle, Switzerland, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to new hydroaromatic compounds of the general formula I



wherein one of the two radicals R_1 and R_2 denotes the acyl radical of a carboxylic acid of aromatic character and the other denotes hydrogen or optionally esterified or etherified hydroxyl, R_3 denotes hydrogen, alkyl or hydroxyalkyl, R_4 denotes optionally esterified or amidised carboxyl, m denotes 1 or 2 and n denotes 0 or 1, in the free form or in the form of their salts, processes for the manufacture of these compounds, pharmaceutical preparations containing these compounds, and the use of these preparations.

The acyl radical of a carboxylic acid of aromatic character, R_1 or R_2 , is, for example, a radical of the formula $R-CO-$, wherein R denotes a radical of aromatic character bonded via a carbon atom and such a radical is to be understood as an aromatic radical which is optionally substituted and optionally contains one or more than one heteroatom. An aromatic radical which optionally contains one or more than one heteroatom is, for example, a bicyclic, but preferably a monocyclic, aryl or heteroaryl radical with 5 or 6 ring members, a heteroaryl radical preferably containing one heteroatom, such as nitrogen, oxygen or sulphur. Substituents of R which should be mentioned in particular are lower alkyl, such as methyl, lower alkoxy, such as methoxy or ethoxy,

halogen, such as chlorine, bromine or fluorine, and/or trifluoromethyl. Accordingly, the preferred acyl radical or aromatic character is in particular thenoyl, pyridoyl or especially benzoyl, which are optionally polysubstituted or, above all, monosubstituted, by lower alkyl, for example methyl, lower alkoxy, for example methoxy, halogen, for example chlorine, bromine or fluorine, or trifluoromethyl, but are preferably unsubstituted.

The word "lower", in this specification, when used in relation to an alkyl, alkoxy, alkanyl, or alkanoyloxy group, or in relation to an alkane carboxylic acid or an alkanol, means that the group or substance in question has up to 7 carbon atoms.

Alkyl is, for example, a straight-chain or branched lower alkyl, bonded in any desired position, with 1—7, especially 1—4, carbon atoms, such as, for example, straight-chain or branched heptyl hexyl or pentyl bonded in any desired position, and also, in particular, *n*-, *sec*-, *iso*- or *tert*-butyl, isopropyl, propyl, ethyl and methyl.

Esterified hydroxyl is, for example, a hydroxyl group esterified with a carboxylic acid, preferably with a lower alkane carboxylic acid with up to 7, especially with 2—4 carbon atoms. Examples of esterified hydroxyl R_1 or R_2 which may be mentioned are caproyloxy, valeroyloxy, isovaleroyloxy and, in particular, butyryloxy, propionyloxy and acetoxy.

Etherified hydroxyl is, for example, lower alkoxy with 1—7, especially with 1—4, carbon atoms, such as, for example, straight-chain or branched heptyloxy, hexyloxy and pentyloxy, as well as *n*-, *sec*-, *iso*- or *tert*-butoxy, isopropoxy, propoxy, ethoxy and methoxy.

Hydroxyalkyl is for example, hydroxy-lower alkyl, preferably monohydroxy-lower alkyl with 1—7, especially with 1—4, carbon atoms, the hydroxyl group preferably being in the α -position. Hydroxymethyl may be

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mentioned, above all, as an example of hydroxylalkyl R_4 .

5 Esterified carboxyl is, for example, carboxyl esterified with an alcohol of aliphatic character which is optionally substituted and optionally interrupted by one or more hetero-atoms, an alcohol of aliphatic character being understood to mean an alcohol of which the carbon atom bonded to the ester-forming
10 hydroxyl group is not part of an aromatic system. An alcohol of aliphatic character which is optionally substituted and optionally interrupted by one or more hetero-atoms is, for example, an alkanol which is optionally substituted by an aryl or heteroaryl radical (which can also be substituted by lower alkoxy, halogen and/or trifluoromethyl) or by lower alkoxy or hydroxyl.

20 Lower alkoxy alkanols are, for example, lower alkoxy lower alkanols which contain 1—7, especially 1—4, carbon atoms in the lower alkyl part and 2—4, especially 2, carbon atoms in the lower alkylene part. Ethoxyethanol and methoxyethanol may be mentioned as examples.

25 Alkanols which are optionally substituted in the aryl part are, for example, α - or β -phenyl-lower alkanols with 1—4, especially 1—3, carbon atoms in the lower alkylene part, which are optionally substituted in the phenyl part by lower alkyl and/or lower alkoxy each with 1—4 carbon atoms, such as methyl, methoxy or ethoxy, halogen, such as fluorine, chlorine or bromine, and/or trifluoromethyl. 2-Phenylpropanols, 1- or 2-phenylethanols, such as phenethyl alcohol, and benzyl alcohols, which are optionally substituted as indicated, may be mentioned as examples.

40 Heteroaryl alkanols which are optionally substituted in the heteroaryl part are, for example, pyridyl-lower alkanols with 1—4 carbon atoms, preferably 1 carbon atom, in the lower alkyl part, which are optionally substituted in the pyridyl part by lower alkyl or lower alkoxy with 1—4 carbon atoms, such as methyl or methoxy, but are preferably unsubstituted. (2-Pyridyl) methanol, (4-pyridyl)methanol and (2-pyridyl)ethanol may be mentioned as examples.

50 Hydroxyalkanols are, for example, hydroxy-lower alkanols which contain one or more, preferably 1—3, hydroxyl groups and 2—4, especially 2 or 3, carbon atoms in the lower alkylene part. Propylene glycol, ethylene glycol and glycerol may be mentioned as examples.

60 Unsubstituted alkanols are, for example, straight-chain or branched lower alkanols with 1—7, especially with 1—4, carbon atoms, such as one of the isomeric heptanols, hexanols, pentanols or butanols, isopropanol, propanol, ethanol or methanol.

Amidised carboxyl contains a primary,

secondary or tertiary amino group as the amino group.

Secondary amino groups are, for example, amino groups substituted by a hydroxyl or amino group or by lower alkyl or optionally substituted alkyl. Substituted alkylamino groups are preferably alkoxy-substituted or mono- or di-alkylamino-substituted alkylamino groups with 1—4, especially 1 or 2, carbon atoms in the alkyl part and 2—4, especially 2, carbon atoms in the alkylene part. Unsubstituted lower alkylamino can be straight-chain or branched and contains, for example, 1—7, especially 1—4, carbon atoms. Hydroxylamino, hydrazino, dimethylamino, ethylamino, diethylamino, ethoxyethylamino, butylamino, isopropylamino, propylamino, ethylamino and methylamino may be mentioned as examples of secondary amino groups.

80 Tertiary amino groups are, for example, amino groups substituted by two identical or different lower alkyl radicals with 1—7, especially with 1—4, carbon atoms, or amino groups substituted by straight-chain or branched alkylene which is optionally interrupted by a hetero-atom, such as sulphur, nitrogen or oxygen, and together with the amino nitrogen atom forms a 4—7-membered, especially 5-membered or 6-membered, ring. Examples of tertiary amino groups which may be mentioned are optionally C-lower alkylated, thiomorpholino, piperazino, piperidino, pyrrolidino, morpholino and N'-lower alkylpiperazino, such as N'-methylpiperazino or N'-ethylpiperazino, radicals, as well as dimethylamino, diethylamino, ethylmethylamino and dipropylamino.

100 The new compounds possess valuable pharmacological properties, above all an antipyretic and an anti-inflammatory action. Thus, for example, in the yeast-induced fever test they show, when orally administered to rats, a distinct antipyretic action and, in the kaolin, oedema test, when orally administered a distinct anti-inflammatory action. The compounds are therefore useful as anti-phlogistics, as anti-rheumatic agents, as antipyretics and as mild analgesics.

The invention relates primarily to:

110 Compounds of the general formula I, wherein one of the two radicals R_1 and R_2 denotes a radical of the formula $R-CO-$, wherein R represents a benzoyl, pyridoyl or thenoyl radical which is optionally substituted by lower alkyl, lower alkoxy, halogen and/or trifluoromethyl, and the other denotes hydrogen or hydroxyl optionally esterified by a lower alkanecarboxylic acid or etherified by a lower alkanol, R_3 denotes hydrogen or alkyl or α -hydroxy-alkyl each with up to 4 carbon atoms, R_4 denotes a carboxyl group which is optionally esterified by a lower alkanol, which is substituted by an aryl radical which is optionally substituted by lower

group as the 65

for example, hydroxyl or 70
or optionally alkylamino
substituted or
optionally 1 or 2,
and 2-4, 75
the alkylene
amino can be
contains, for
carbon atoms.
methylamino-
ino, ethoxy-
propylamino,
methylamino
of secondary 80

for example, 85
identical or
with 1-7,
ms, or amino
ht-chain or
ionally inter- 90
as sulphur,
ner with the
7-membered,
mbered, ring,
groups which 95
ally C-lower
azino, piperi-
and N'-lower
hydropiperazino
as well as 100
ethylmethyl-

less valuable
bove all an
atory action. 105
induced fever
ministered to
n and, in the
administered
action. The 110
ful as anti-
ents, as anti-

by to:
formula I, 115
as R_1 and R_2
as $R-CO-$,
pyridoyl or
ly substituted
halogen and/or 120
denotes hydro-
esterified by a
rogen or alkyl
up to 4 car- 125
boxyl group
by a lower
an aryl radi-
ated by lower

alkoxy, lower alkyl, halogen and/or trifluoro-
methyl, by a heteroaryl radical which is
optionally substituted by lower alkyl or lower
alkoxy, by lower alkoxy or by hydroxyl, or an
amidised carboxyl group which contains, as
the amino group, a di-lower alkylamino-lower
alkylamino group, hydroxylamino, hydrazino,
a mono- or di-lower alkylamino group or an
optionally C-lower alkylated thiomorpholino,
piperidino, pyrrolidino or N'-lower alkyl-
piperazino group, and n denotes 0 or 1 and m
denotes 1 or 2.

The invention relates, in particular, to:

Compounds of the general formula I, 15
wherein one of the two radicals R_1 and R_2
denotes a radical of the formula $R-CO-$,
wherein R represents a benzoyl, pyridoyl or
thenoyl radical which is optionally substituted
by lower alkyl, lower alkoxy, halogen and/or
trifluoromethyl, and the other denotes hydro- 20
gen, or hydroxyl which is optionally esterified
by an alkanecarboxylic acid with 2 to 4
carbon atoms or etherified by an alkanol with
1 to 4 carbon atoms, R_3 denotes hydrogen or
alkyl with up to 4 carbon atoms, R_4 denotes 25
a carboxyl group which is optionally esterified
by a lower alkanol, which can also be
substituted by a phenyl or pyridyl radical
which is optionally substituted by methyl,
methoxy, chlorine and/or trifluoromethyl, by 30
lower alkoxy or by hydroxyl, or an amidised
carboxyl group which contains, as the amino
group, hydroxylamino, hydrazino or an option-
ally N-mono-lower alkylated or N,N-di-lower
alkylated amino group, n is 0 or 1 and m is 1 35
or 2.

The invention relates, above all, to:

Compounds of the general formula I, where- 40
in one of the radicals R_1 and R_2 denotes
benzoyl, thenoyl or pyridoyl optionally sub-
stituted by methyl, methoxy, chlorine and/or
trifluoromethyl and the other denotes hydro-
gen, acetoxy or hydroxyl, R_3 denotes hydro- 45
gen, R_4 denotes carboxyl optionally esterified
by an alkoxyethanol with up to 4 carbon
atoms, such as methoxyethanol or ethoxy-
ethanol, a phenyl alkanol with up to 4 car-
bon atoms, such as phenethyl alcohol or
benzyl alcohol, a pyridylmethanol, or by a 50
hydroxy alkanol with up to 4 C atoms, such
as ethylene glycol, propylene glycol or gly-
cerol, or by a lower alkanol with up to 4
carbon atoms, or denotes carbamyl, n is 0
or 1 and m is 1.

The invention relates especially to:

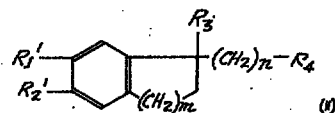
Compounds of the general formula I, where- 55
in one of the radicals R_1 and R_2 denotes
benzoyl optionally monosubstituted by alkyl
or alkoxy each with up to 4 carbon atoms,
such as methoxy or methyl, by trifluoro-
methyl or halogen, such as chlorine, and the
other denotes hydroxyl, R_3 denotes hydrogen, 60
 R_4 denotes carboxyl optionally esterified by
an alkanol with 1-4 carbon atoms, n is 0
and m is 1. 65

The invention relates specifically to:

The compounds of the general formula I
named in the examples.

The new compounds can be manufactured
according to methods which are in themselves 70
known.

Thus, for example, a possible procedure is
to introduce the acyl radical R_3 or R_4 of a
carboxylic acid of aromatic character into a
compound of the general formula II 75



wherein one of the radicals R_1' and R_2'
represents hydrogen and the other denotes
hydrogen or optionally esterified or etherified
hydroxyl R_1 or R_2 or an acyloxy radical R_3O
or R_4O derived from a carboxylic acid of
aromatic character, and R_1 , R_2 , R_3 and R_4 ,
n and m have the indicated meanings. 80

The introduction of the acyl radical R_3
or R_4 can be carried out in a manner which
is in itself known, for example by C-acyla- 85
tion.

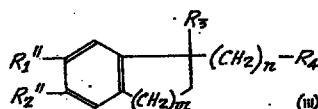
The C-acylation can be carried out in the
customary manner, in particular in the man- 90
ner known for analogous reactions from the
literature, starting from compounds of the
formula II, wherein one of the radicals R_1'
and R_2' represents hydrogen and the other
represents hydrogen or optionally esterified
or etherified hydroxyl R_1 or R_2 , by reaction 95
with preferably functionally modified
carboxylic acid of aromatic character, of the
formula R_3-OH or R_4-OH , or starting
from a compound of the formula II, wherein
one of the radical R_1' and R_2' is hydrogen 100
and the other is an acyloxy radical R_3O-
or R_4O- derived from a carboxylic acid
of aromatic character, by a rearrangement
leading to hydroxy compounds (R_1 or
 $R_2=OH$). 105

Optionally functionally suitably modified
carboxylic acids R_3-OH and R_4-OH are,
for example, these acids themselves, or the
nitriles, but preferably anhydrides of these
acids, such as the anhydrides of these acids
or mixed anhydrides of these acids with
other organic acids, for example with lower
alkanecarboxylic acids or organic sulphonic
acids, or, above all, with inorganic acids, for
example with hydrogen halide acids, for ex- 115
ample with hydrochloric acid or hydrobromic
acid.

The abovementioned reaction of an
optionally functionally suitably modified
carboxylic acid with a compound of the for- 120
mula II, and its rearrangement to compounds
of the formula I, can be carried out in the
usual manner, for example in the presence
of an acid catalyst, such as a Lewis acid, for
example a suitable metal halide, such as 125

aluminium chloride or aluminium bromide, boron trifluoride, zinc chloride or antimony trichloride, or a strong protonic acid, such as sulphuric acid or polyphosphoric acid, advantageously in an inert solvent, such as a halogeno-hydrocarbon, for example in chlorobenzene, carbon tetrachloride, or dichloromethane or tetrachloroethane, in carbon disulphide or in nitrobenzene, if necessary with application of energy, for example thermally at a reaction temperature between 0 and 150°, preferably 0—100°, and/or photochemically, for example in the case of the rearrangement of compounds of the formula II, wherein one of the radicals R_1' and R_2' is hydrogen and the other is an acyloxy group R_3O- or R_4O- .

The new compounds can furthermore be obtained by oxidising the radical Y to the acyloxy radical R_2 or R_1 of a carboxylic acid of aromatic character, in a compound of the general formula III



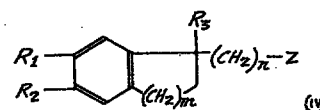
wherein one of the radicals R_1'' and R_2'' is hydrogen or optionally esterified or etherified hydroxyl and the other denotes an aryl- or heteroaryl-hydroxymethyl radical Y corresponding to an acyl radical R_2 or R_1 and R_1 , R_2 , R_3 , R_4 , n and m have the indicated meanings.

An arylhydroxymethyl or heteroaryl-hydroxymethyl radical is, for example, a group of the formula $R-CH(OH)-$, wherein R has the indicated meaning.

The oxidation can be carried out in the usual manner, for example by means of a customary oxidising agent, for example with an inorganic oxidising agent, such as with a complex of dimethylsulphoxide and chlorine in the presence of a tertiary amine, for example of triethylamine, or with sodium periodate, preferably in the presence of ruthenium oxide and of water, with a copper(II) salt, for example copper(II) acetate or copper(II) sulphate, with bismuth oxide, with manganese dioxide or above all with chromic acid or chromium trioxide, advantageously in a solvent which is inert towards the oxidising agent used, for example in a lower alkane-carboxylic acid, such as acetic acid, or in pyridine, quinoline or similar heterocyclic bases, or with organic oxidising agents, for example with N-chlorosuccinimide in the presence of a dialkyl sulphide, such as dimethyl sulphide, or with hypohalites, for example with tert.-butyl hypochlorite, or halogenated quinones, for example with chloranil, or in particular with aldehydes or above all ketones, for example with alkanones, cyclo-

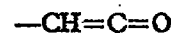
alkanones or quinones, such as acetone, cyclohexanone or benzoquinone, in the presence of suitable catalysts, such as metal salts, especially aluminium salts, of branched lower alkanols or phenols, for example with aluminium isopropylate, aluminium tert.-butylate or aluminium phenolate, here again preferably in a solvent, especially an excess of the ketone used and/or of the alcohol corresponding to the metal alcoholate used. However, in carrying out the oxidation, care must be taken that other oxidisable groups should not be attacked.

The new compounds can furthermore be prepared by converting Z into a group R_1 in a compound of the general formula IV



wherein R_1 , R_2 , R_3 , R_4 , n and m have the indicated meanings and Z denotes a functionally modified carboxyl group which differs from esterified or amidised carboxyl groups R_4 .

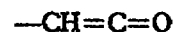
Functionally modified carboxyl groups Z which differ from esterified or amidised carboxyl groups are, for example, groups of the formula $-CZ_1Z_2Z_3$ wherein Z_1 , Z_2 and Z_3 conjointly represent the nitrilo group or Z_1 and Z_2 conjointly represent the oxo or imino group and Z_3 denotes a halogen atom or, if Z_1+Z_2 denotes imino, an etherified hydroxyl group. The group of the formula



should further be mentioned as a group which can be converted into an optionally esterified or amidised carboxymethyl group.

Etherified hydroxyl groups Z_3 are, for example, hydroxyl groups etherified with lower alkanols, such as methanol or ethanol, or with lower alkanediols, such as ethylene glycol or a propylene glycol. Halogen atoms Z_3 are; for example, chlorine or bromine.

The conversion of a functionally modified carboxyl group Z' which differs from esterified or amidised carboxyl groups R_4 into groups of the formula R_4 , and of the group of the formula



into groups of the formula $-CH_2R_4$ can be carried out in the usual manner, by solvolysis, that is to say hydrolysis (reaction with water), alcoholysis (reaction with an alcohol) or aminolysis reaction with ammonia or an amine having at least one hydrogen atom).

By hydrolysis it is possible to convert, for example, the group of the formula

none, cyclo- 60
he presence
metal salts,
nche lower
with amine
ert-butylate 65
gain prefer-
excess the
ohol corres-
used. How-
n, care must 70
roups should

thermore be
a group R_1
formula IV 75

z
(iv)

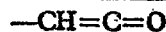
m have the
otes a func-
which differs
boxyl groups 80

yl groups Z
midised carb-
groups of the
 Z_1 and Z_2 85
group or Z_1
oxo or imino
gen atom or,
an etherified
the formula 90

as a group
an optionally
methyl group.
are, for ex- 95
ed with lower
hanol, or with
lene glycol or
ms Z_3 are; for
100

nally modified
s from esteri-
roups R_1 into
of the group 105

CH_2R_1 can be
er, by solvoly-
reaction with
th an alcohol) 110
monia or an
rogen atom).
to convert, for
formula



into the carboxymethyl group, or a function-
ally modified carboxyl group Z into the free
carboxyl group, or a nitrile group Z of the
formula $-CZ_1Z_2Z_3$, wherein Z_1 , Z_2 and Z_3
conjointly represent the nitrilo group, into
the carbamoyl group R_4 , or an iminoether
group Z' , of the formula $-CZ_1Z_2Z_3$, where-
in Z_1 and Z_2 conjointly represent the imino
group and Z_3 denotes an etherified hydroxyl
group, into esterified carboxyl groups R_4 . The
hydrolysis can be carried out in the usual
manner, preferably in the presence of a cata-
lyst, for example of a strong base, such as an
alkali metal hydroxide or carbonate or alka-
line earth metal hydroxide or carbonate, for
example sodium hydroxide or carbonate or
potassium hydroxide or carbonate, or of a
strong acid, such as a mineral acid, for ex-
ample hydrochloric acid, sulphuric acid or
phosphoric acid, or of a carboxylic acid, for
example acetic acid, if necessary with addi-
tion of nitrous acid when hydrolysing a nitrile
group Z' to the free carboxyl group.

By alcoholysis it is possible to convert, for
example, a cyano group, an acid, halide
grouping Z of the formula $-CZ_1Z_2Z_3$, where-
in Z_1 , Z_2 and Z_3 denote the nitrilo group or
 Z_1 and Z_2 conjointly represent the oxo group
and Z_3 denotes halogen atom group, into
an esterified carboxyl group, R_4 , or to con-
vert the ketene group of the formula



into an esterified carboxymethyl group
 $-CH_2-R_4$.

The alcoholysis can be carried out in the
usual manner, for example in the presence of
a basic agent, such as an alkali metal
alcoholate, for example sodium alcoholate or
potassium alcoholate, or of an inorganic base,
for example sodium hydroxide or carbonate
or potassium hydroxide or carbonate, or cal-
cium carbonate, or an organic nitrogen base,
for example triethylamine or pyridine, or
starting from nitriles, in the presence of
hydrohalides of nitrogen bases, for example
of ammonium chloride or pyridinium bro-
mide, and in the presence of an approxi-
mately equimolecular amount of water, if
necessary at an elevated temperature.

By aminolysis it is possible to convert,
for example, an acid halide grouping Z of
the formula $-CZ_1Z_2Z_3$, Z_1 and Z_2 conjointly
representing the oxo group and Z_3 denot-
ing a halogen atom into an amidised carboxyl
group R_4 , or to convert the ketene group
 $-C=C=O$ into an amidised carboxymethyl
group $-CH_2-R_4$.

The aminolysis can be carried out in a
manner which is in itself known, preferably
in the presence of a basic condensation agent,
such as an inorganic base, for example

sodium hydroxide or carbonate or potassium
hydroxide or carbonate, or calcium carbonate,
or a nitrogen base, such as an excess of the
ammonia or amine used for the aminolysis,
or a tertiary organic nitrogen base, for ex-
ample triethylamine or pyridine, if necessary
at elevated temperature.

In resulting compounds, substituents can
be introduced, modified or split off, within
the scope of the definition of the end pro-
duct.

Thus, for example, free, esterified and
amidised carboxyl groups R_4 can be con-
verted into one another.

Thus, a free carboxyl group can be esteri-
fied, to give an esterified carboxyl group
 R_4 , by reaction with an alcohol or a reactive
derivate of an alcohol, such as a carboxylic
acid ester or carbonic acid ester, for example
a lower alkanecarboxylic acid ester or the
carbonate, or a mineral acid ester or sul-
phonic acid ester, for example the hydro-
chloric acid ester, hydrobromic acid ester,
sulphuric acid ester, benzenesulphonic acid
ester, toluenesulphonic acid ester or methane-
sulphonic acid ester, of an alcohol or an
olefine derived therefrom.

The reaction with an alcohol can be carried
out in the usual manner, advantageously in
the presence of an acid catalyst such as a
protonic acid, for example hydrochloric acid
or hydrobromic acid, sulphuric acid, phos-
phoric acid, boric acid, benzenesulphonic acid
and/or toluenesulphonic acid, or of a Lewis
acid, for example boron trifluoride etherate,
in an inert solvent, especially in an excess
of the alcohol employed, and, if necessary,
in the presence of a water-binding agent
and/or whilst removing the water of reac-
tion by distillation, for example by azeo-
tropic distillation, and/or at elevated tem-
peratures.

The reaction with a reactive derivative of
an alcohol can be carried out in the usual
manner, starting from a carboxylic acid ester
or carbonic acid ester, for example in the
presence of an acid catalyst, such as one of
those mentioned, in an inert solvent, such
as an ether, for example diethyl ether or
tetrahydrofuran, a hydrocarbon, for example
benzene or toluene, or a halogenohydro-
carbon, for example trichloroethane or tetra-
chloroethane, chloroform, carbon tetra-
chloride or methylene chloride, or an excess
of the alcohol derivative employed or of the
corresponding alcohol, if necessary, whilst
distilling off the water of reaction, e.g. azeo-
tropically. If the starting material is a mineral
acid ester or sulphonic acid ester, the acid
to be esterified is advantageously employed
in the form of a salt, for example the sodium
salt or potassium salt, and the reaction is
carried out, if necessary, in the presence
of a basic condensation agent, such as an
inorganic base, for example sodium carbonate,

potassium carbonate or calcium hydroxide or carbonate, or of a tertiary organic nitrogen base, for example triethylamine or pyridine, in inert solvent, such as one of the above-mentioned tertiary nitrogen bases or a polar solvent, for example phosphoric acid tris-(dimethylamide), and/or at an elevated temperature.

The reaction with an olefine can be carried out, for example, in the presence of an acid catalyst, e.g. a Lewis acid, e.g. boron trifluoride, a sulphonic acid, e.g. benzenesulphonic acid, toluenesulphonic acid or methanesulphonic acid, or, above all, a basic catalyst, for example a strong base, such as an alkali metal hydroxide or carbonate or alkaline earth metal hydroxide or carbonate, for example sodium hydroxide or carbonate or potassium hydroxide or carbonate, advantageously in an inert solvent, such as an ether, for example diethyl ether or tetrahydrofuran, a hydrocarbon, for example an alkane, benzene or toluene, or a halogenohydrocarbon, for example tetrachloroethane or trichloroethane, chloroform, methylene chloride or carbon tetrachloride.

A free carboxyl group R_1 can furthermore be converted into an amidised carboxyl group R_1 by reaction with ammonia or with an amine possessing at least one hydrogen atom, in the usual manner, for example with dehydration of the ammonium salt formed as an intermediate, for example by azeotropic distillation with benzene or toluene, or by dry heating.

The conversions of free carboxyl groups to esterified or amidised carboxyl groups R_1 , described above, can however also be carried out by first converting the resulting acid of the formula I in the usual manner, into a reactive derivative, for example into an acid halide by means of a halide of phosphorus or sulphur, such as phosphorus trichloride or tribromide, phosphorus pentachloride or thionyl chloride, or into a reactive ester, that is to say an ester containing electron-attracting structures, such as the ester with phenol, thiophenol, p-nitrophenol or cyanomethyl alcohol, by reaction with a corresponding alcohol, or into a reactive amide, for example the amide derived from imidazole or 3,5-dimethylpyrazole, by reaction with a corresponding amine, and then reacting the resulting reactive derivative in the usual manner, for example as described above for the alcoholysis or aminolysis of groups Z' or described below for the transesterification, transamidation or interconversion of esterified and amidised carboxyl groups R_1 , with an alcohol, ammonia or an amine possessing at least one hydrogen atom.

An esterified carboxyl group R_1 can be converted into the free carboxyl group R_1 in the usual manner, for example by hydrolysis in the presence of a catalyst, for ex-

ample a strong base, such as an alkali metal hydroxide or carbonate or alkaline earth metal hydroxide or carbonate, for example sodium hydroxide or carbonate or potassium hydroxide or carbonate, or a strong acid, such as a mineral acid, for example hydrochloric acid, sulphuric acid or phosphoric acid, or a carboxylic acid, for example acetic acid, or can be converted to an amidised carboxyl group R_1 , for example by reaction with ammonia or an amine possessing at least one hydrogen atom.

An esterified carboxyl group R_1 can furthermore be trans-esterified to another esterified carboxyl group R_1 in the usual manner, for example by reaction with a metal salt, such as the sodium salt or potassium salt, of an alcohol, or by reaction with the alcohol itself in the presence of a catalyst, for example a strong base, such as an alkali metal hydroxide or carbonate or alkaline earth metal hydroxide or carbonate, for example sodium hydroxide or carbonate or potassium hydroxide or carbonate, or a strong acid, such as a mineral acid, for example hydrochloric acid, sulphuric acid or phosphoric acid, or a carboxylic acid, for example acetic acid, benzenesulphonic acid or toluenesulphonic acid, or a Lewis acid, for example boron trifluoride etherate.

An amidised carboxyl group R_1 can be converted into the free carboxyl group R_1 in the usual manner, for example by hydrolysis in the presence of a catalyst, for example a strong base, such as an alkali metal hydroxide or carbonate or alkaline earth metal hydroxide or carbonate, for example sodium hydroxide or carbonate or potassium hydroxide or carbonate, or a strong acid, such as a mineral acid, for example hydrochloric acid, sulphuric acid or phosphoric acid.

In resulting compounds it is furthermore possible to convert free hydroxyl groups and esterified or etherified hydroxyl groups R_1 or R_2 into one another.

Thus, for example, a free hydroxyl group can be esterified by reaction with a preferably functionally modified acid, for example a lower alkanecarboxylic acid, for example to give a lower alkanoyloxy group R_1 or R_2 , or can be etherified by reaction with an etherifying agent, for example with a lower alkylating agent, for example to give a lower alkoxy group R_1 or R_2 .

A functionally modified acid, for example lower alkanecarboxylic acid is, for example, an anhydride, such as the anhydride, for example a lower alkanecarboxylic acid, anhydride, an anhydride with a hydrogen halide acid, such as hydrochloric acid or hydrobromic acid, for example a lower alkanecarboxylic acid chloride or bromide, or the inner anhydride, for example a lower alkylketene, a reactive ester, that is to say an

an alkali metal
alkaline earth
for example
or potassium
strong acid, such
hydrochloric
nitric acid, or
acetic acid,
disubstituted carboxyl
reaction with
at least one

R₁ can fur-
another esteri-
usual manner,
a metal salt,
potassium salt,
with the alcohol
catalyst, for ex-
an alkali metal
alkaline earth
for example
or potassium
strong acid, such
hydrochloric
nitric acid, or a
acetic acid,
benzenesulphonic
multiple boron tri-

R₁ can be
oxyl group R₁
multiple by hydro-
catalyst, for ex-
an alkali metal
alkaline earth
for example
or potassium
a strong acid,
example hydro-
or phosphoric

is furthermore
oxyl groups and
oxyl groups R₁

hydroxyl group
with a prefer-
ed, for example
for example to
R₁ or R₂, or
with an etherify-
a lower alkylat-
a lower alkoxy

id, for example
is, for example,
hydride, for ex-
ic acid, anhyd-
hydrogen halide
acid or hydro-
a lower alkane-
bromide, or the
a lower alkyl-
it is to say an

ester with electron-attracting structures, for example a lower alkanecarboxylic acid phenyl ester, p-nitrophenyl ester or cyanomethyl ester, or a reactive amide, for example a N-lower alkanoylimidazole or N-lower alkanoyl-3,5-dimethylpyrazole.

Examples of etherifying agents are reactive esterified alcohols, such as alcohols esterified with a mineral acid, for example with hydriodic acid, hydrochloric acid or hydrobromic acid, fluorosulphonic acid or sulphuric acid, or organic sulphonic acids, for example p-toluenesulphonic acid, p-bromobenzenesulphonic acid, benzenesulphonic acid, methanesulphonic acid, ethanesulphonic acid or ethenesulphonic acid, as well as diazoalkanes. Examples of lower alkylating agents to be mentioned are therefore lower alkyl chlorides, iodides and bromides, for example methyl iodide, di-lower alkyl sulphates, for example dimethyl sulphate or diethyl sulphate or methyl fluorosulphonate, lower alkyl sulphonates, such as lower alkyl, for example methyl, p-toluenesulphonates, p-bromobenzenesulphonates, methanesulphonates or ethanesulphonates, as well as diazoalkanes, for example diazomethane.

The reactions with preferably functionally modified acids or with etherifying agents, for example those singled out above, can be carried out in the usual manner, in the case of the reaction with diazoalkanes in an inert solvent, such as an ether, for example diethyl ether, or in the case of the reaction of reactive esterified alcohols, for example, in the presence of a basic condensation agent, such as an inorganic base, such as an alkali metal hydroxide or carbonate, or alkaline earth metal hydroxide or carbonate, for example sodium hydroxide or carbonate, or potassium hydroxide or carbonate, or calcium hydroxide or carbonate, or a tertiary or quarternary nitrogen base, for example pyridine, α -picoline, quinoline, triethylamine, tetraethylammonium hydroxide or benzyltriethylammonium hydroxide, and/or in the presence of a solvent customary for the particular reaction, which solvent can also consist of an excess of the functional acid derivative used for the esterification, for example a lower alkanic acid anhydride or lower alkanic acid chloride, or of the lower alkyl halide or lower alkyl sulphate used, for example, for the etherification, and/or of a tertiary nitrogen base used as the basic condensation agent, for example triethylamine or pyridine, if necessary at elevated temperatures.

Particular methods of carrying out the reaction which are to be recommended are methylation by means of methyl iodide in amyl alcohol/potassium carbonate at the boil, and acylation by means of a lower alkanic acid anhydride at 50-150° or by means of a lower alkanoyl chloride in pyridine or

pyridine/triethylamine at temperatures between -20 and +100°C.

Conversely, it is also possible to convert etherified or, above all, esterified hydroxyl groups R₁ or R₂ into the free hydroxyl group, for example by hydrolysis. These conversions can be carried out in the usual manner, in the case of the hydrolysis, for example, in the manner described initially for the hydrolysis of functionally modified carboxyl groups Z' to the free carboxyl group. The conversion of an etherified hydroxyl group into a free hydroxyl group can however also be carried out conjointly with the acylation, described above, of starting materials of the formula II which contain an etherified hydroxyl group R₁' or R₂'. Under drastic reaction conditions, for example when using aluminium chloride as the catalyst, this gives, alongside or in place of end products of the formula I, wherein R₁ or R₂ denotes an etherified hydroxyl group, also the corresponding compounds in which a free hydroxyl group R₁ or R₂ is present.

The reactions mentioned can optionally be carried out simultaneously or successively, and in any desired sequence.

The reactions mentioned are carried out in the usual manner, in the presence or absence of diluents, condensation agents and/or catalysts, at lowered, ordinary or elevated temperatures, if appropriate in a closed vessel.

Depending on the process conditions and starting materials, end products which form salts may be obtained in the free form or in the form of their salts which can be converted in the usual manner into one another or into other salts. Thus acid end products, such as carboxylic acids or hydroxamic acids are obtained in the free form or in the form of their salts with bases. Free acid compounds obtained can be converted into the salts with a base, for example salts with organic amines, or metal salts, in the usual manner, for example by reaction with corresponding basic agents. Metal salts can be, above all, alkali metal salts or alkaline earth metal salts, such as sodium salts, potassium salts, magnesium salts or calcium salts. Free acids can be liberated from the salts in the usual manner, for example by reaction with acid agents. Equally, basic compounds are obtained in the free form or in the form of their salts with acids. Resulting salts with acids can be converted into the free compounds in a manner which is in itself known, for example by means of alkalis or ion exchangers. Salts can be obtained from the free compounds by reaction with organic or inorganic acids, especially those suitable for forming therapeutically usable salts. As examples of such acids there may be mentioned; hydrogen halide acids, sulphuric acids, phosphoric acids, nitric acid, perchloric acid, aliphatic, alicyclic, aromatic or heterocyclic

carboxylic acids or sulphonic acids, such as formic acid, acetic acid, propionic acid, succinic acid, glycollic acid, lactic acid, malic acid, tartaric acid, citric acid, ascorbic acid, malic acid, hydroxymaleic acid or pyruvic acid; phenylacetic acid, benzoic acid, p-aminobenzoic acid, anthranilic acid, p-hydroxybenzoic acid, salicylic acid or p-aminosalicylic acid, embonic acid, methanesulphonic acid, ethanesulphonic acid, hydroxyethanesulphonic acid and ethylenesulphonic acid; halogenobenzenesulphonic acids, toluenesulphonic acid, naphthalenesulphonic acid or sulphanilic acid: methionine, tryptophan, lysine or arginine.

These and other salts can also be used to purify the new compounds, for example by converting the free compounds to their salts, isolating these and reconvertng the salts to the free compounds. Because of the close relationships between the new compounds in the free form and in the form of their salts, the free compounds are, in the preceding and following text, where appropriate also to be understood to include the corresponding salts, in respect of general sense and intended use.

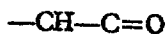
The invention also relates to those embodiments of the process according to which a compound obtainable as an intermediate product at any stage of the process is used as the starting material and the missing steps are carried out, or a starting material is used in the form of a salt and/or racemate or antipode or, in particular, is formed under the reactive conditions.

Thus it is possible, for example, in the oxidation of compounds of the formula III to start from a corresponding starting material wherein Y is the arylmethyl or heteroaryl-methyl radical, for example of the formula $-\text{CH}_2-\text{R}_1$ derived from the acyl radical of a carboxylic acid. In this case, the corresponding hydroxymethyl radical, for example of the formula

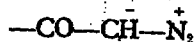


is formed as an intermediate stage and is then oxidised further in accordance with the invention.

Furthermore it is possible, in the solvolysis of compounds of the modification of formula IV, wherein $-(\text{CH}_2)_n\text{Z}$ has been replaced by a

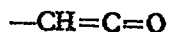


group, to start from the corresponding diazoketone, wherein $(\text{CH}_2)_n\text{Z}$ has been replaced by a



group, and to react this compound with

water, an alcohol, ammonia or an amine possessing at least one hydrogen atom, if required in the presence of a catalyst, for example of silver or a silver compound, such as silver oxide, and/or at an elevated temperature. In this reaction, the corresponding ketene, wherein Z is the



group, is produced as an intermediate, and this is then solvolysed, in accordance with the invention, to an optionally esterified or amidised carboxymethyl group $-\text{CH}_2\text{R}_2$.

The oxidation is carried out in the usual manner with an oxidising agent in an alkaline, neutral or acid solution, such as with silver oxide and alkali, for example sodium hydroxide solution, with aqueous potassium permanganate solution, or with an acid chromate solution, for example a chromate solution containing sulphuric acid, for example at room temperature or by warming.

The new compounds can, depending on the choice of the starting materials and procedures, be in the form of one or more of the particular stereoisomers which are possible, for example in the form of positional isomers with respect to the position of R_1 and R_2 , or of mixtures thereof, and, depending on the number of asymmetrical carbon atoms, in the form of pure optical isomers, for example optical antipodes, or of isomer mixtures, such as racemates, diastereomer mixtures or racemate mixtures.

Resulting stereoisomer mixtures, such as diastereomer mixtures or mixtures of positional isomers and/or racemate mixtures, can be separated into the pure isomers, such as positional isomers or diastereomers or racemates, on the basis of the physico-chemical differences of the constituents, in a known manner, for example, by chromatography and/or fractional crystallisation.

Resulting racemates can be resolved into the optical antipodes in accordance with known methods, for example by recrystallisation from an optically active solvent, by means of micro-organisms, or by reaction of an end product with an optically active acid or base which forms salts with the racemate and separation of the salts obtained in this manner, for example on the basis of their different solubilities, into the diastereomers, from which the antipodes can be liberated by treatment with suitable agents. Particularly customary optically active acids are, for example, the D- and L-forms of tartaric acid, di-o-toluytartaric acid, malic acid, mandelic acid, camphorsulphonic acid or quinic acid. Advantageously, the more active of the two antipodes is isolated.

Examples of preferred optically active bases are brucine, strychnine, morphine, methylamine or α -phenylethylamine or their

or an amine
atom, if re-
catalyst, for ex-
mpo, such
elevated tem-
peratures correspond-

intermediate, and
in accordance with
y esterified or
-CH₂R₄.

it in the usual
in an alkaline,
as with silver
sodium hydrox-
potassium per-
manganate chromate
solution
or example at
aming.

depending on
materials and pro-
cedure or more of
R which are
form of posi-
to the position
s thereof, and,
if asymmetrical
of pure optical
antipodes, or of
isomers, diastereo-
isomers.

isomers, such as
mixtures of posi-
e mixtures, can
isomers, such as
isomers or race-
physico-chemical
is, in a known
chromatography
method.

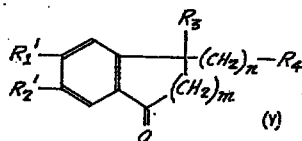
be resolved into
in accordance with
by recrystalliz-
ing solvent, by
by reaction of
ally active acid
with the racemate
obtained in this
basis of their
diastereomers,
be liberated by
agents. Particularly
acids are, for ex-
of tartaric acid,
acid, mandelic
or quinic acid.
ative of the two

optically active
morphine, men-
amine or their

quaternary ammonium bases. Advantage-
ously, the more active or less toxic of the
two antipodes is isolated.

Preferably, those starting materials are used
to carry out the reactions according to the
invention which give the groups of end pro-
ducts particularly mentioned initially, and
especially the end products which have been
specifically described or singled out.

The starting materials are known or can,
if they are new, be prepared according to
methods which are in themselves known.
Thus, starting materials of the general formu-
la II can be obtained, for example, by re-
ducing the oxo group in a compound of
the formula V



wherein R₁', R₂', R₃, R₄, n and m have the
indicated meanings. The reduction of the oxo
group can be effected, for example, in accord-
ance with the Wolff-Kishner method by con-
version to a hydrazone or semicarbazone and
reaction with an alkali metal alcoholate, for
example sodium ethylate, preferably under
pressure and/or at elevated temperatures, or
in accordance with the Huang-Minlon method
by heating with hydrazine and an alkali
metal hydroxide in a high-boiling solvent,
such as diethylene glycol or diethylene glycol
monomethyl ether, or by treatment with
nascent or catalytically activated hydrogen,
for example by reaction with a metal, such
as zinc or iron, and an acid, for example
hydrochloric acid or acetic acid, or by treat-
ment with elementary hydrogen in the pre-
sence of a hydrogenation catalyst such as
palladium/charcoal, if necessary under ele-
vated pressure and/or at elevated tempera-
tures.

Compounds of the formula V, wherein
n=0, m=1 and R₃ is hydrogen or alkyl,
can be prepared by condensing a 3 - R₁' - 4 -
R₂' - benzaldehyde or a corresponding alkyl
phenyl ketone with a malonic acid lower alkyl
ester, adding hydrocyanic acid to the result-
ing benzylidenemalonic acid ester in the
manner of a Michael addition, saponifying and
decarboxylating the resulting α - cyano -
α - R₃ - 3 - R₁' - 4 - R₂' - benzylmalonic
acid ester to give β - carboxy - β - R₃ -
β - (3 - R₁' - 4 - R₂' - benzyl) - propionic
acid and cyclising the latter by means of
sulphuric acid or polyphosphoric acid or after
conversion into the chloride, by means of
aluminium chloride.

Compounds of the formula V, wherein
n=0, m=2 and R₃ is hydrogen or alkyl can
be obtained, for example, by reacting an α -
R₃ - α - (3 - R₁' - 4 - R₂' phenyl) - acetic
acid alkyl ester or α - R₃ - α - (3 - R₁' - 4 -

R₂' phenyl) - acetonitrile with an acrylonitrile
or acrylic acid alkyl ester, saponifying the
resulting γ - carboxy - γ - (3 - R₁' - 4 -
R₂' - phenyl) - butyric acid nitrile or -butyric
acid alkyl ester to the corresponding γ -
carboxy - γ - (3 - R₁' - 4 - R₂' - phenyl) -
butyric acid and cyclising the latter, for ex-
ample as described above.

Compounds of the formula II, wherein
n=1, can furthermore be prepared, start-
ing from the corresponding 5 - R₁' - 6 -
R₁' - 1 - indanone or 6 - R₂' - 7 - R₁' - α -
tetralone, in accordance with the Reform-
atsky reaction, by reacting them with an α -
metal - acetic acid alkyl ester, for example
α - zinc - acetic acid alkyl ester, to give the
corresponding indene- or 3,4 - dihydronaph-
thalene - acetic acid ester, hydrogenating the
ester and, if required, saponifying and/or
otherwise functionally modifying the pro-
duct.

Compounds of the formula II, wherein
n=0, can furthermore be prepared ana-
logously by reaction of the above 1 - in-
danones or α - tetralones with methoxy-
methylene - triphenylphosphorane, hydrolysis
to the aldehyde and oxidation thereof.

Starting materials of the formula III can
be prepared, for example, from compounds
of the formula II indicated above, by intro-
ducing the formyl group instead of hydrogen
R₁' or R₂', for example in accordance with
the Vilsmeier reaction, and/or reaction of
the aldehyde thus obtainable with a metal
compound, for example the lithium com-
pound, of a compound of the formula R-H.

Iminoethers and iminohalides of the for-
mula IV, wherein Z denotes a -CZ₂Z₂ group,
Z₂ denotes a halogen atom or an etherified
hydroxyl group and Z₁+Z₂ denotes the
imino group, can be prepared, for example by
cyclisation of a β - cyano - β - (3 - R₁ - 4 -
R₂ - phenyl) - β - R₃ - acetic acid or γ -
cyano - γ - (3 - R₁ - 4 - R₂ - phenyl) - γ -
R₃ - propionic acid or a functional carboxy
derivative thereof, which can be prepared,
for example, by reaction of an α - R₃ -
3 - R₁ - 4 - R₂ - benzylidenemalonic ester
with an alkali metal cyanide, decarboxyla-
tion and hydrolysis, or reaction of an α - R₃ -
3 - R₁ - 4 - R₂ 1 acetonitrile with acrylic
esters and hydrolysis and, if desired, func-
tional modification of the resulting acid, and
reaction of the resulting nitrile with an acid
to give the iminoester, and, if desired, with
an alcohol to give the iminoether.

In the processes for the preparation
of the starting materials, explained above,
R₁, R₁', R₂, R₂', R₃, R₄, n and m unless
stated otherwise, each have the initially men-
tioned meanings, especially the meanings
initially singled out.

The pharmacologically utilisable com-
pounds of the present invention can be used,
for example, to produce pharmaceutical pre-

parations, for example for the treatment of fever, for the treatment of illnesses of the rheumatic type, or for the treatment of non-infectious inflammation conditions and/or pains of medium severity, which preparations contain an effective amount of the active substance together with, or mixed with, inorganic or organic, solid or liquid, pharmaceutically usable excipients which are suitable for enteral, for example oral or parenteral administration or topical application. Preferably, tablets or gelatine capsules are used, which contain the active compound together with diluents, for example lactose, dextrose, sucrose, mannitol, sorbitol, cellulose and/or glycine, and lubricants, for example silica, talc, stearic acid or salts thereof, such as magnesium stearate or calcium stearate, and/or polyethylene glycol; tablets also contain binders, for example magnesium silicate, starches, such as maize starch, wheat starch, rice starch or arrowroot, gelatine, tragacanth, methylcellulose, sodium carboxymethylcellulose and/or polyvinylpyrrolidone and, if desired, disintegrating agents, for example starches, agar, alginic acid or a salt thereof, such as sodium alginate, enzymes for the binders and/or effervescent mixtures, or absorbents, dyestuffs, flavouring substances and sweeteners. Injectable preparations are preferably isotonic aqueous solutions or suspensions, and suppositories or ointments, above all fat emulsions or fat suspensions may also be used. The pharmacological preparations can be sterilised and/or contain auxiliaries, for example preservatives, stabilisers, wetting agents and/or emulsifiers, solubilising agents, salts for regulating the osmotic pressure and/or buffers. The present pharmaceutical preparations which can, if desired, contain further pharmacologically valuable materials, are prepared in a manner which is in itself known, for example by means of conventional mixing, granulating or dragee-making processes, and contain from 0.1% to 75%, in particular from 1% to 50%, of the active compound. The recommended daily dose for a warm-blooded animal weighing about 75 kg is 25—250 mg.

The invention is described in more detail in the examples which follow.

Example 1

40 g of finely powdered aluminium chloride are added in portions to a stirred solution of 20.6 g of 6-methoxy-indane-1-carboxylic acid methyl ester and 15.5 g of benzoyl chloride in 200 ml of absolute methylene chloride at 20°C, in an anhydrous atmosphere, stirring is continued overnight at room temperature and the reaction solution is then poured onto 500 g of ice and extracted with 3 times 100 ml of methylene chloride. The organic phases are washed successively with 500 ml of saturated sodium

bicarbonate solution, 500 ml of 2 N hydrochloric acid and 500 ml of water, dried over anhydrous sodium sulphate and evaporated in vacuo. The evaporation residue, when crystallised from ether-petroleum ether after treatment with active charcoal, gives 5-benzoyl-6-hydroxy-indane-1-carboxylic acid methyl ester of melting point 89—91°C.

Example 2

A solution of 8.2 g of 5-benzoyl-6-hydroxy-indane-1-carboxylic acid methyl ester in 150 ml of methanol is mixed with 20 ml of 2 N sodium hydroxide solution and the mixture is boiled for 3 hours under reflux. It is then evaporated to dryness in vacuo and the evaporation residue is partitioned between 100 ml of 2 N hydrochloric acid and 3 times 100 ml of methylene chloride. The organic phases are washed until neutral, dried over sodium sulphate, treated with active charcoal and evaporated in vacuo. The evaporation residue, when crystallised from ethanol-petroleum ether, gives 5-benzoyl-6-hydroxy-indane-1-carboxylic acid in the form of yellow platelets of melting point 185—7°C.

Example 3

A solution of 12 g of 5-benzoyl-6-hydroxy-indane-1-carboxylic acid in 100 ml of n-butanol and 8 drops of concentrated sulphuric acid is boiled for 6 hours under reflux in an anhydrous atmosphere. It is then evaporated to a volume of approx. 20 ml in vacuo and the evaporation residue is partitioned between 3 times 100 ml of methylene chloride and 3 times 100 ml of water. The organic phases are dried over sodium sulphate and evaporated in vacuo. The evaporation residue, when crystallised from cold ether-petroleum ether, gives 5-benzoyl-6-hydroxy-indane-1-carboxylic acid n-butyl ester in the form of yellow platelets of melting point 43—44°C.

Example 4

Analogously to Example 3, 12 g of 5-benzoyl-6-hydroxy-indane-1-carboxylic acid and ethanol containing sulphuric acid give 5-benzoyl-6-hydroxy-indane-1-carboxylic acid ethyl ester in the form of yellow platelets of melting point 83—4°C.

Example 5

A solution of 20.6 g of 6-methoxy-indane-1-carboxylic acid methyl ester in a little methylene chloride is first slowly added dropwise, at 0°C to 10°C, to a suspension of 66.8 g of finely powdered aluminium chloride in 100 ml of methylene chloride, which is being stirred under anhydrous conditions; 64.3 g of p-methylbenzoyl chloride are then added dropwise under such con-

2 N hydro- 65
dried over
evaporated
idue, when
ether, after
ves 5 - ben- 70
- carboxylic
89—°C.

benzoyl - 6 -
acid methyl 75
mixed with
side solution
hours under
dryness in
due is parti- 80
hydrochloric
ethylene chlor-
washed until
state, treated
ted in vacuo.
crystallised
ves 5 - ben- 85
- carboxylic
lets of melt-
90

benzoyl - 6 -
xylic acid in
rops of cond-
d for 6 hours
atmosphere. It
e of approx.
ation residue
100 ml of
s 100 ml of 100
dried over
ed in vacuo.
n crystallised
er, gives 5 -
e - 1 - car- 105
the form of
ut 43—44°C.

12 g of 5 -
e - 1 - car- 110
aining sul-
6 - hydroxy -
ethyl ester in
melting point 115

- methoxy -
ethyl ester in
first slowly
C, to a sus- 120
wdered alumi-
ethylene chlor-
der anhydrous
benzoyl chlor-
der such con- 125

ditions that the reaction mixture boils gently under reflux. After completion of the addition, the mixture is heated to the boil for a further 3½ hours. It is then allowed to cool to room temperature, poured onto 500 g of ice and extracted with twice 500 ml of methylene chloride. The organic phases are washed until neutral, dried over sodium sulphate and evaporated in vacuo (finally in a high vacuum). The evaporation residue, when crystallised from cold ether-petroleum ether, gives 5 - (p - toluoyl) - 6 - hydroxy - indane - 1 - carboxylic acid methyl ester which after a further crystallisation from ethanol-petroleum ether, melts at 74—76°C.

Example 6

Analogously to the method described in Example 2, 8.5 g of 5 - (p - toluoyl) - 6 - hydroxy - indane - 1 - carboxylic acid methyl ester give 5 - (p - toluoyl) - 6 - hydroxy - indane - 1 - carboxylic acid in the form of yellow crystals of melting point 186—8°C (from ether).

Example 7

Analogously to the process described in Example 5, 19 g of 6 - methoxy - indane - 1 - carboxylic acid methyl ester and 48 g of p - chlorobenzoyl chloride give 5 - (p - chlorobenzoyl) - 6 - hydroxy - indane - 1 - carboxylic acid methyl ester of melting point 96—98°C (from ether-petroleum ether).

Example 8

Analogously to the process described in Example 2, 10 g of 5 - (p - chlorobenzoyl) - 6 - hydroxy - indane - 1 - carboxylic acid methyl ester give 5 - (p - chlorobenzoyl) - 6 - hydroxy - indane - 1 - carboxylic acid in the form of dark yellow crystals of melting point 187—9°C (from ethanol-petroleum ether).

Example 9

A solution of 10 g of 5 - benzoyl - 6 - hydroxy - indane - 1 - carboxylic acid methyl ester in 100 ml of acetic anhydride is heated to the reflux temperature for 4 hours under anhydrous conditions. It is then evaporated to dryness in vacuo. The evaporation residue is mixed with 200 ml of toluene and evaporated in vacuo. Distillation of the evaporation residue in a high vacuum gives, in the fraction boiling at 195—200°C/0.06 mm Hg, 5 - benzoyl - 6 - acetoxy - indane - 1 - carboxylic acid methyl ester in the form of a colourless oil.

Example 10

Analogously to the description of Example 1, 15.5 g of 6 - methoxy - indane - 1 - carboxylic acid methyl ester and 33 g of thiophene - 2 - carboxylic acid chloride give, after chromatographic purification of the

crude product on 300 g of silica gel using methylene chloride as the eluting agent, 5 - thenoyl - 6 - hydroxy - indane - 1 - carboxylic acid methyl ester of melting point 111—113°C (from ether-petroleum ether). 65

Example 11

Analogously to the description in Example 2, 4.0 g of 5 - thenoyl - 6 - hydroxy - indane - 1 - carboxylic acid methyl ester and 20 ml of 2 N sodium hydroxide solution in 50 ml of methanol give 5 - thenoyl - 6 - hydroxy - indane - 1 - carboxylic acid of melting point 183—184°C (from ethyl acetate/petroleum ether). 70

Example 12

Analogously to the description in Example 1, 14.5 g of 6 - methoxy - indane - 1 - carboxylic acid methyl ester and 36.8 g of o - chlorobenzoyl chloride give 5 - (o - chlorobenzoyl) - 6 - hydroxy - indane - 1 - carboxylic acid methyl ester of melting point 78—80°C (from ether-petroleum ether). 75

Example 13

Analogously to the description in Example 2, 8.7 g of 5 - (o - chlorobenzoyl) - 6 - hydroxy - indane - 1 - carboxylic acid methyl ester and 27 ml of 2 N sodium hydroxide solution in 100 ml of methanol give 5 - (o - chlorobenzoyl) - 6 - hydroxy - indane - 1 - carboxylic acid of melting point 188—190°C (from ethyl acetate-petroleum ether). 80

Example 14

A solution of 10.3 g of 6 - methoxy - indane - 1 - carboxylic acid methyl ester in 200 ml of absolute methylene chloride is added slowly to 33 g of finely powdered aluminium chloride at -10°C, whilst excluding moisture. 21 g of benzoyl chloride are added dropwise over the course of 1 hour to the resulting suspension, whilst stirring at -10 to -5°C. After completion of the addition, the mixture is stirred for a further hour at -10°C to -5°C. The reaction mixture is then poured onto 200 g of ice and extracted with 3 times 50 ml of methylene chloride. The organic phases are combined, washed with twice 200 ml of water, dried over sodium sulphate and evaporated in vacuo. The excess benzoyl chloride is distilled off under reduced pressure at 100°C. On triturating the distillation residue with ether-petroleum ether, 5 - benzoyl - 6 - methoxy - indane - 1 - carboxylic acid methyl ester of melting point 107—109°C crystallises out. 100

Example 15

Analogously to the description in Example 2, 4.7 g of 5 - benzoyl - 6 - methoxy - indane - 1 - carboxylic acid methyl ester and 20 ml of N sodium hydroxide solution in 120

50 ml of methanol give 5 - benzoyl - 6 - methoxy - indane - 1 - carboxylic acid of melting point 126—128°C (from ether-petroleum ether).

Example 16

0.45 g of paraformaldehyde and 0.4 ml of benzyl - trimethyl - ammonium hydroxide (40% strength in methanol) are added to a solution of 3.0 g of 5 - benzoyl - 6 - hydroxy - indane - 1 - carboxylic acid methyl ester in 20 ml of absolute dimethylsulphoxide, and the mixture is stirred for 3 hours at 80°C, whilst excluding moisture. It is then allowed to cool to room temperature, 100 g of ice are added to the reaction mixture, the pH is adjusted to 7 with acetic acid and the mixture is extracted with 3 times 50 ml of ether. The organic phases are combined, washed until neutral, dried over sodium sulphate and evaporated to dryness in vacuo. This gives 1 - hydroxy - methyl - 5 - benzoyl - 6 - hydroxy - indane - 1 - carboxylic acid methyl ester in the form of a yellow oil (IR spectrum in CH_2Cl_2 ; ν_{OH} : 3,600 cm^{-1} , $\nu_{\text{C=O}}$: 1,725 cm^{-1}).

Example 17

A solution of 2.8 g of 1 - hydroxymethyl - 5 - benzoyl - 6 - hydroxy - indane - 1 - carboxylic acid methyl ester in 12 ml of 2 N sodium hydroxide solution and 50 ml of methanol is heated to the reflux temperature for 5 hours. It is then evaporated in vacuo to a volume of approx. 10 ml of the evaporation residue is partitioned between twice 50 ml of water and 50 ml of ether. The aqueous phases are combined, acidified to pH 1 with concentrated hydrochloric acid and extracted with twice 50 ml of ether. The organic extracts are washed until neutral, dried over sodium sulphate and evaporated to dryness in vacuo. Chromatography of the evaporation residue on 100 g of silica gel using ether as the eluting agent gives pure 1 - hydroxymethyl - 5 - benzoyl - 6 - hydroxy - indane - 1 - carboxylic acid in the form of yellow crystals of melting point 104—110°C.

Example 18

18 g of finely powdered aluminium chloride are added in portions to a solution of 8 g of indane - 1 - carboxylic acid methyl ester and 8.2 g of benzoyl chloride in 100 ml of carbon disulphide, whilst stirring in an anhydrous atmosphere. After completion of the addition, the reaction mixture is heated for 2 hours to the reflux temperature. It is then allowed to cool to room temperature, poured onto a mixture of 100 g of ice and 50 ml of concentrated hydrochloric acid and extracted with twice 100 ml of ether. The organic phases are combined, washed with twice 100 ml of water, dried over sodium sulphate and evaporated in vacuo. Distilla-

tion of the evaporation residue in a high vacuum gives 6 - benzoyl - indane - 1 - carboxylic acid methyl ester in the fraction boiling at 165—170°C (0.5 mm).

Example 19

Analogously to the description in Example 2, 13 g of 6 - benzoyl - indane - 1 - carboxylic acid methyl ester and 75 ml of 2 N sodium hydroxide solution in 500 ml of methanol give 6 - benzoyl - indane - 1 - carboxylic acid of boiling point 200°C/0.04 mm Hg as a yellowish, viscous oil.

Example 20

Dry ammonia is passed into a solution of 27 g of crude 5 - benzoyl - 6 - acetoxy - indane - 1 - carboxylic acid chloride in 200 ml of anhydrous benzene at a temperature of 15—20°C, with exclusion of moisture, until saturation is reached. The reaction solution is then evaporated to dryness in vacuo and the evaporation residue is partitioned between 200 ml of water and 3 times 200 ml of methylene chloride. The organic phases are washed until neutral, dried over sodium sulphate and evaporated in vacuo. Fractional crystallisation of the evaporation residue from hot dimethylformamide-water gives 5 - benzoyl - 6 - hydroxy - indane - 1 - carboxylic acid amide of melting point 205—207°C. The starting material can be obtained as follows. A solution of 20 g of 5 - benzoyl - 6 - hydroxy - indane - 1 - carboxylic acid in 200 ml of acetic anhydride is heated to the reflux temperature for 4 hours. It is then evaporated to dryness in vacuo, 50 ml of toluene are added to the evaporation residue and the mixture is evaporated to dryness. This procedure is repeated twice more. The crude 5 - benzoyl - 6 - acetoxy - indane - 1 - carboxylic acid thus obtained is used directly for further conversion.

20 ml of oxalyl chloride are added to a solution of the crude product, obtained as above, in 200 ml of anhydrous benzene at 0°C and the mixture is left to stand overnight at room temperature, with exclusion of water. It is then evaporated to dryness in vacuo. In order to remove the excess oxalyl chloride completely, 50 ml of absolute benzene are added and the mixture is evaporated to dryness in vacuo. This procedure is repeated twice. The crude 5 - benzoyl - 6 - acetoxy - indane - 1 - carboxylic acid chloride which remains in the evaporation residue is used directly for further conversion.

Example 21

Analogously to the description in Example 2, 10 g of a mixture of 5 - benzoyl - and 6 - benzoyl - indane - 1 - acetic acid methyl ester and 30 ml of 2 N sodium hydroxide solution in 300 ml of methanol give 5 - benzoyl - or 6 - benzoyl - indane - 1 - acetic

Example 29

With stirring, 6 ml of dimethyl sulphide are added at 0°C in an atmosphere of nitrogen to a suspension of 8.05 g of N-chloro-succinimide in 200 ml of absolute toluene and then at -25°C a solution of 12 g of crude 5 - benzylol 6 - methoxy - indane - 1 - carboxylic acid methyl ester in 50 ml of absolute toluene is added. Upon completion of the addition, the mixture is further stirred for 90 minutes at -25°C. Then 8.3 ml of triethylamine are added to the reaction solution, which is stirred for a further 5 minutes and partitioned between 2×100 ml of 2 normal hydrochloric acid and 2×100 ml of ether. The organic phases are washed neutral, dried over sodium sulphate and evaporated to dryness in vacuo. The residue is chromatographed on silica gel with methylene chloride as eluant to yield 5 - benzoyl - 6 - methoxy - indane - 1 - carboxylic acid methyl ester.

The starting material can be obtained as follows:

With stirring, 90 ml of titanium tetrachloride are added dropwise at 0°C in an inert atmosphere to a solution of 103 g of 6 - methoxy - indane - 1 - carboxylic acid methyl ester in 500 ml of methylene chloride and then a solution of 60 g of dichloromethyl - methyl ether in 100 ml of absolute methylene chloride is added over the course of 30 minutes. Stirring is subsequently continued for 40 minutes at 0°C and then for 60 minutes at room temperature. The reaction mixture is then poured onto 1 kg of ice and extraction is performed with 5×100 ml of water. The organic phase is dried over sodium sulphate and evaporated in vacuo. Distillation of the residue yields in the fraction which boils at 180°C (0.09 mm Hg) a mixture of 5- and 7 - formyl - 6 - methoxy - indane - 1 - carboxylic acid methyl ester, which can be resolved by fractional crystallisation from ether/methylene chloride/pentane or by chromatography on silica gel with methylene chloride as eluant. The 5 - formyl - 6 - methoxy - indane - 1 - carboxylic acid methyl ester melts at 82°-84°C.

With stirring, a solution of 15.7 g of bromobenzene in 100 ml of absolute tetrahydrofuran is added slowly dropwise in an atmosphere of nitrogen to 2.4 g of magnesium chips which are covered with a small amount of absolute tetrahydrofuran. Upon completion of the addition, stirring is continued for 1 hour at 40°C. The reaction mixture is then cooled to room temperature, conveyed to a drip funnel and added slowly dropwise with stirring in an inert atmosphere at -10°C to 23 g of 5 - formyl - 6 - methoxy - indane - 1 - carboxylic acid methyl ester in 150 ml of absolute tetrahydrofuran. Upon completion of the addition, stirring is continued for 1 hour at 0°C and overnight

at room temperature. The reaction solution is then poured into 200 ml of a saturated aqueous ammonium chloride solution and extraction is performed with 2×500 ml of methylene chloride. The organic phases are washed neutral, dried over sodium sulphate, treated twice with activated charcoal and evaporated in vacuo. The crude 5 - benzylol - 6 - methoxy - indane - 1 - carboxylic acid methyl ester (diastereoisomer mixture) is further processed direct without additional purification.

Example 30

5 g of finely powdered sodium hydroxide are added to 5 g of 5 - benzoyl - 6 - hydroxy - indane - 1 - carboxylic acid nitrile in 50 ml of ethylene glycol and the mixture is heated with stirring for 18 hours to 160°C in an inert atmosphere. The reaction mixture is then cooled to room temperature, poured into 100 g of ice water and extraction is performed with 2×100 ml of ether. The aqueous phase is adjusted to a pH of 2 with concentrated hydrochloric acid and extraction is performed with 2×100 ml of chloroform. The organic phases are washed neutral, dried over sodium sulphate and evaporated to dryness. Fractionally crystallisation from ethanol yields 5 - benzoyl - 6 - hydroxy - indane - 1 - carboxylic acid (m.p. 185°-187°C).

The starting material can be obtained as follows:

10 ml of phosphoroxo chloride are added to 1.0 of 5 - benzoyl - 6 - hydroxy - indane - 1 - carboxylic acid amide and the mixture is heated to 60°C under anhydrous conditions. The reaction mixture is then evaporated to dryness and the residue is partitioned between 2×200 ml of methylene chloride and 20 ml of water. The organic phases are washed neutral, dried over sodium sulphate and evaporated in vacuo. Crystallisation of the residue from ether/petroleum ether yields the 5 - benzoyl - 6 - hydroxy - indane - 1 - carboxylic acid nitrile, which melts at 90°-91°C (yellow flakes).

Example 31

Tablets, containing 100 mg of active substance are prepared in the usual manner to have the following composition:

Composition:

5 - Benzoyl - 6 - hydroxy - indane - 1 - carboxylic acid	100 mg
Wheat starch	73 mg
Lactose	50 mg
Colloidal silica	13 mg
Talc	12 mg
Magnesium stearate	2 mg
	250 mg

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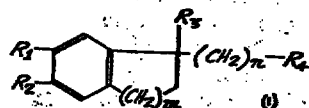
Preparation:

The 5 - benzoyl - 6 - hydroxy - indane - 1 - carboxylic acid is mixed with a part of the wheat starch, with lactose and with colloidal silica and the mixture is forced through a sieve. A further part of the wheat starch is worked into a paste with a 5-fold amount of water on a waterbath and the powder mixture is kneaded with this paste until a slightly plastic mass has been produced.

The plastic mass is forced through a sieve of approx. 3 mm mesh width and dried and the resulting dry granules are again forced through a sieve. The remaining wheat starch, talc and magnesium stearate are then added to the mixture and the mixture is pressed to give tablets weighing 250 mg and having a breaking groove.

WHAT WE CLAIM IS:—

1. A compound of the general formula I



wherein one of the two radicals R_1 and R_2 denotes the acyl radical of a carboxylic acid of aromatic character and the other denotes hydrogen or optionally esterified or etherified hydroxyl, R_3 denotes hydrogen, alkyl or hydroxyalkyl, R_4 denotes optionally esterified or amidised carboxyl, m denotes 1 or 2 and n denotes 0 or 1, in the free form or in the form of a salt.

2. A compound as claimed in claim 1, of the general formula I, wherein one of the two radicals R_1 and R_2 denotes a radical of the formula $R-CO-$, wherein R represents a benzoyl, pyridoyl or thenoyl radical which is optionally substituted by lower alkyl, lower alkoxy, halogen and/or trifluoromethyl and the other denotes hydrogen or hydroxyl optionally esterified by a lower alkanecarboxylic acid or etherified by a lower alkanol, R_3 denotes hydrogen or alkyl or α - hydroxy - lower alkyl each with up to 4 carbon atoms, R_4 denotes a carboxyl group which is optionally esterified by a lower alkanol, which is substituted by an aryl radical which is optionally substituted by lower alkoxy, lower alkyl, halogen and/or trifluoromethyl, by a heteroaryl radical which is optionally substituted by lower alkyl or lower alkoxy or by hydroxyl, or an amidised carboxyl group which contains, as the amino group, a di-lower alkylamino-lower alkyl-amino group, hydroxylamino, hydrazino, a mono- or di-lower alkylamino group or an optionally C-lower alkylated thiomorpholino, piperidino, pyrrolidino or N'-lower alkyl-piperazino group, n is 0 or 1 and m denotes 1 or 2.

3. A compound as claimed in claim 1, of the general formula I, wherein one of the

two radicals R_1 and R_2 denotes a radical of the formula $R-CO-$, wherein R represents a benzoyl, pyridoyl or thenoyl radical which is optionally substituted by lower alkyl, lower alkoxy, halogen and/or trifluoromethyl and the other denotes hydrogen, or hydroxyl which is optionally esterified by an alkane carboxylic acid with 2 to 4 carbon atoms or etherified by an alkanol with 1 to 4 carbon atoms, R_3 denotes hydrogen or alkyl with up to 4 carbon atoms, R_4 denotes a carboxyl group which is optionally esterified by a lower alkanol, which can also be substituted by a phenyl or pyridyl radical which is optionally substituted by methyl, methoxy, chlorine and/or trifluoromethyl, by lower alkoxy or by hydroxyl, or an amidised carboxyl group which contains, as the amino group, hydroxylamino, hydrazino or an optionally N - mono - lower alkylated or N,N - di - lower alkylated amino group, n is 0 or 1 and m is 1 or 2.

4. A compound as claimed in claim 1, of the general formula I, wherein one of the radicals R_1 and R_2 denotes benzoyl, thenoyl or pyridoyl optionally substituted by methyl, methoxy, chlorine and/or trifluoromethyl and the other denotes hydrogen, acetoxyl or hydroxyl, R_3 denotes hydrogen, R_4 denotes carboxyl optionally esterified by alkoxy-ethanol with up to 4 C atoms, a phenyl alkanol with up to 4 C atoms in the alkyl part, by a pyridylmethanol, a hydroxy alkanol or an alkanol with up to 4 carbon atoms, or denotes carbamyl, n is 0 or 1 and m is 1.

5. A compound as claimed in claim 1, of the general formula I, wherein one of the radicals R_1 and R_2 denotes benzoyl, thenoyl or pyridyl and the other denotes hydroxyl, R_3 denotes hydrogen, R_4 denotes carboxyl optionally esterified by an alkanol with 1-4 carbon atoms, n is 0 and m is 1.

6. A compound as claimed in claim 1, of the general formula I, wherein one of the radicals R_1 and R_2 denotes benzoyl which is optionally monosubstituted by alkyl or alkoxy each with up to 4 carbon atoms, by trifluoromethyl or halogen and the other denotes hydroxy, R_3 denotes hydrogen, R_4 denotes carboxyl optionally esterified by an alkanol with 1-4 carbon atoms, n is 0 and m is 1.

7. 5 - Benzoyl - 6 - hydroxy - indane - 1 - carboxylic acid methyl ester.

8. 5 - Benzoyl - 6 - hydroxy - indane - 1 - carboxylic acid.

9. 5 - Benzoyl - 6 - hydroxy - indane - 1 - carboxylic acid n - butyl ester.

10. 5 - Benzoyl - 6 - hydroxy - indane - 1 - carboxylic acid ethyl ester.

11. 5 - (p - Chlorobenzoyl) - 6 - hydroxy - indane - 1 - carboxylic acid.

12. 5 - Benzoyl - 6 - hydroxy - indane - 1 - carboxylic acid amide.



13. 5 - (o - Chlorobenzoyl) - 6 - hydroxy - indane - 1 - carboxylic acid.

14. 6 - Benzoyl - indane - 1 - carboxylic acid.

5 15. One of the compounds mentioned in one of Claims 2-4 and 14 in the form of a mixture of isomers.

10 16. One of the compounds mentioned in one of Claims 2-4 and 14, in the form of a pure isomer.

17. One of the compounds mentioned in one of Claims 2-4, in the form of a pure optical antipode.

15 18. One of the compounds mentioned in one of Claims 2-4 and 14-17, in the free form.

19. One of the compounds mentioned in one of Claims 2-4 and 14-17, in the form of a salt.

20 20. One of the compounds mentioned in one of Claims 2-4 and 14-17, in the form of a therapeutically usable salt.

21. One of the compounds mentioned in one of Claims 1 and 5-13, in the form of a mixture of isomers.

22. One of the compounds mentioned in one of Claims 1 and 5-13, in the form of a pure isomer.

23. One of the compounds mentioned in one of Claims 1, 5 and 6, in the form of a pure optical antipode.

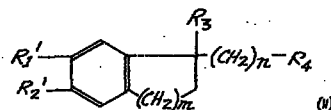
24. One of the compounds mentioned in one of Claims 1, 5-13 and 21-23, in the free form.

25 25. One of the compounds mentioned in one of Claims 1, 5-13 and 21-23, in the form of a salt.

26. One of the compounds mentioned in one of Claims 1, 5-13 and 21-23, in the form of a therapeutically usable salt.

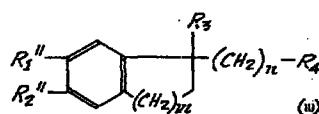
27. Process for the manufacture of new hydroaromatic compounds of the general formula I as defined in claim 1 characterised in that

45 a) the acylradical R_2 or R_1 of a carboxylic acid of aromatic character is introduced into a compound of the general formula II



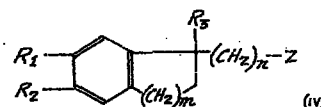
50 wherein one of the radicals R_1' and R_2' represents hydrogen and the other represents hydrogen or optionally esterified or etherified hydroxyl R_1 or R_2 or an acyloxy radical R_2O or R_1O derived from a carboxylic acid of aromatic character, and R_1 , R_2 , R_3 , R_4 , n and m have the indicated meanings, or

55 b) in a compound of the general formula III



wherein one of the radicals R_1'' and R_2'' is hydrogen or optionally esterified or etherified hydroxyl and the other denotes an aryl- or heteroaryl - hydroxymethyl radical Y corresponding to an acyl radical R_2 or R_1 of a carboxylic acid of aromatic character, and R_1 , R_2 , R_3 , R_4 , n and m have the indicated meanings, the radical Y is oxidised to the acyl radical R_2 or R_1 of a carboxylic acid of aromatic character, or

c) in a compound of the formula IV



wherein Z denotes a functionally modified carboxyl group which differs from an esterified or amidised carboxyl group and R_1 , R_2 , R_3 , R_4 , n and m have the indicated meanings, Z is converted into a group R_1 and, if desired, in resulting compounds substituents are introduced, modified or split off within the scope of the definition of the end products, and/or resulting isomer mixtures are separated into the pure isomers and/or resulting racemates are resolved into the optical antipodes and/or a resulting salt is converted into the free compound or a resulting free compound is converted into one of its salts.

28. Process according to Claim 27, characterised in that a compound of the formula II, wherein one of the radicals R_1' and R_2' represents hydrogen and the other represents hydrogen or optionally esterified or etherified hydroxyl R_1 or R_2 , is reacted with a functionally modified carboxylic acid of aromatic character, of the formula R_2-OH or R_1-OH .

29. Process according to Claim 28 characterised in that the functionally modified carboxylic acid R_2-OH or R_1-OH which is used is the corresponding acid chloride or bromide.

30. Process according to Claim 27, characterised in that a compound of the formula II, wherein one of the radicals R_1' and R_2' is hydrogen and the other is hydroxyl esterified with a carboxylic acid of aromatic character, R_2-OH or R_1-OH , is subjected to rearrangement.

31. Process according to one of Claims 28-30, characterised in that it is carried out in the presence of aluminium chloride or bromide.

32. Process according to Claim 27, characterised in that a compound of the formula IV, wherein Z is a functionally modified carboxyl group of the formula $-CZ_1Z_2Z_3$, wherein Z_1 , Z_2 and Z_3 conjointly represent the nitrile group or Z_1 and Z_2 conjointly represent the oxo or imino group and Z_3 denotes halogen atom or, if Z_1 and Z_2 denote imino, denotes an etherified hydroxyl group,



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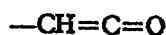
or a modification of the compound of formula
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 water), alcoholysis (reaction with an alcohol)
 or aminolysis (reaction with ammonia or with
 an amine possessing at least one hydrogen
 atom).

10 33. Process according to Claim 32, charac-
 terised in that in a compound of the formula
 IV or modified formula IV a group of the
 formula — $C=C=O$ is hydrolysed to the
 carboxymethyl group or a functionally modi-
 fied carboxyl group Z is hydrolysed to the
 free carboxyl group or a cyano group Z,
 wherein Z represents a group $CZ_1Z_2Z_3$ and
 Z_1 , Z_2 and Z_3 conjointly prepared the nitrile
 group, is hydrolysed to the carbamoyl group
 R_4 or an iminoether group Z of the formula
 — $CZ_1Z_2Z_3$, wherein Z_1 and Z_2 conjointly
 represent the imino group and Z_3 denotes
 an etherified hydroxyl group, is hydrolysed
 to an esterified carboxyl group R_4 .

20 34. Process according to Claim 32, charac-
 terised in that in a compound of the formula
 IV an acid anhydride grouping Z, wherein
 Z is the — $CZ_1Z_2Z_3$ group, Z_1 and Z_2 con-
 jointly represent the oxo group and Z_3 de-
 notes a halogen atom, is alcoholysed to an
 esterified carboxyl group R_4 , or a group of
 the formula



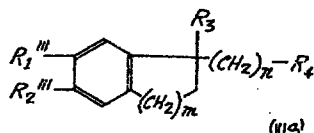
35 is alcoholised to an esterified carboxymethyl
 group — CH_2 — R_4 .

35 35. Process according to Claim 32, charac-
 terised in that in a compound of the formu-
 la IV an acid anhydride grouping Z, where-
 in Z is the — $CZ_1Z_2Z_3$ group, Z_1 and Z_2
 40 conjointly represent the oxo group and Z_3
 denotes halogen atom group, is aminolysed to
 an amidised carboxyl group R_4 , or a group
 of the formula



45 is aminolysed to an amidised carboxylmethyl
 group — CH_2 — R_4 .

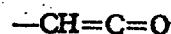
50 36. Process according to Claim 27, charac-
 terised in that the starting material of the
 formula III is formed in situ by oxidising a
 compound of the formula IIIa



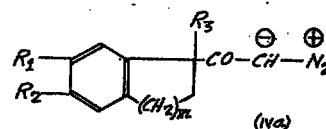
wherein one of the radicals R_1''' and R_2'''
 is hydrogen or optionally esterified or etheri-
 fied hydroxyl and the other denotes the aryl-

55 methyl or heteroarylmethyl radical derived
 from the acyl radical of a carboxylic acid,
 and is oxidised further in accordance with
 the invention.

60 37. Process according to Claim 27, charac-
 terised in that the starting material of the
 formula V, wherein — $(CH_2)_n$ —Z represents a



group, is formed in situ by rearrangement of
 the corresponding diazoketone of the formula
 IVa



and is allowed to react further, in accordance
 with the invention, with water, an alcohol,
 ammonia or an amine possessing at least one
 hydrogen atom.

70 38. Process according to Claim 27, charac-
 terised in that an iminoether of the formula
 IV, wherein Z is a — $CZ_1Z_2Z_3$ group, Z_3 is
 an etherified hydroxyl group and Z_1 and Z_2
 75 conjointly represent the imino group, is
 formed in situ by reacting the correspond-
 ing nitrile, wherein Z_1 , Z_2 and Z_3 conjointly
 represent the nitrilo group, with an alcohol
 in the presence of an acid agent, for ex-
 ample hydrochloric acid or ammonium chlor-
 80 ide, is hydrolysed in accordance with the
 invention.

39. Process according to any one of Claims
 27 to 38, characterised in that a compound
 as claimed in any one of claims 1, 5 to 13
 and 21 to 26 is manufactured.

40. Process according to any one of Claims
 27 to 38, characterised in that a compound
 as claimed in any one of claims 2, 4 and
 14 to 20 is manufactured.

41. Process according to one of Claims
 27—40, characterised in that a compound
 as claimed in claim 1 and/or mentioned in
 Examples 10—19 or 22—30 is manufactured.

42. The processes as claimed in any one of
 Claims 27 to 40 are described in Examples
 10—19 and 23—30.

43. A compound as claimed in Claim 1
 whenever obtained in accordance with the
 processes of Claims 27—41.

44. Process according to one of Claims
 27—39, characterised in that a compound as
 claimed in Claim 1 and mentioned in Ex-
 amples 1—9, 20 or 21 is manufactured.

45. The processes as claimed in any one
 of Claims 27 to 40 and described in Ex-
 amples 1—9, 20 and 21.

46. A compound as claimed in Claim 1
 whenever obtained according to the processes
 of Claims 44 and 45.

47. Pharmaceutical preparations containing
 one of the compounds mentioned in one of





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Claims 2—4, 14—18, 20, 42, 43 together with a pharmaceutical excipient.

- 5 48. Pharmaceutical preparations containing one of the compounds mentioned in one of Claims 1, 5—13, 21—24, 26 and 46, together with a pharmaceutical excipient.

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PATENTS ACT 1949

SPECIFICATION NO 1470468

The following amendments were allowed under Section 29 on 20 January 1978

Page 2, lines 117 and 118. Page 3, lines 16 and 17 *after* denotes *delete* a radical of the formula R—CO—, wherein R represents

Page 15 *delete* lines 33 to 35 *insert* two radicals R₁ and R₂ denotes a benzoyl, pyridol or thenoyl radi-

Page 15 *delete* lines 61 to 63 *insert* two radicals R₁ and R₂ denotes a benzoyl, pyridoyl or thenoyl radical

THE PATENT OFFICE
17 February 1978

Bas 45933/10

ERRATUM

SPECIFICATION No. 1,470,468
Slip No. 2

Page 1, line 44, *for or read of*
THE PATENT OFFICE
13th March, 1978