



- (51) International Patent Classification:
C07C 211/00 (2006.01) *C07D 333/20* (2006.01)
- (21) International Application Number:
PCT/IB2012/000922
- (22) International Filing Date:
27 April 2012 (27.04.2012)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
- | | | |
|---------------|-------------------------------|----|
| 1502/CHE/2011 | 29 April 2011 (29.04.2011) | IN |
| 1597/CHE/2011 | 9 May 2011 (09.05.2011) | IN |
| 61/497,228 | 15 June 2011 (15.06.2011) | US |
| 61/499,957 | 22 June 2011 (22.06.2011) | US |
| 2401/CHE/2011 | 13 July 2011 (13.07.2011) | IN |
| 61/527,742 | 26 August 2011 (26.08.2011) | US |
| 4524/CHE/2011 | 22 December 2011 (22.12.2011) | IN |
| 61/595,189 | 6 February 2012 (06.02.2012) | US |

(71) Applicant (for all designated States except US): **DR. REDDY'S LABORATORIES LTD.** [IN/IN]; 8-2-337, Road No. 3, Banjara Hills, Hyderabad, Andhara Pradesh 500 034 (IN).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **KATKAM, Srinivas** [IN/IN]; H. No: 13-1/32/3, Saipuri Colony, Malkajgiri, Hyderabad, Andhra Pradesh 500 047 (IN). **SAGYAM, Rajeswar, Reddy** [IN/IN]; Plot No. 1322 & 1323, Flat No. 204, Vindhya Hills, Pragathi Nagar, Hyderabad, Andhra Pradesh 500 072 (IN). **MORTHALA, Raghavendar, Rao** [IN/IN]; P-13, Pracruthi Nivas, Opp. Dundigal Air Force Academy, Annaram, Jinnaram (mandal), Medak (dist), Andhra Pradesh 502 313 (IN). **IRENI, Babu** [IN/IN]; Adarsh Nagar, H. No. 4-83/232, Hyderabad,

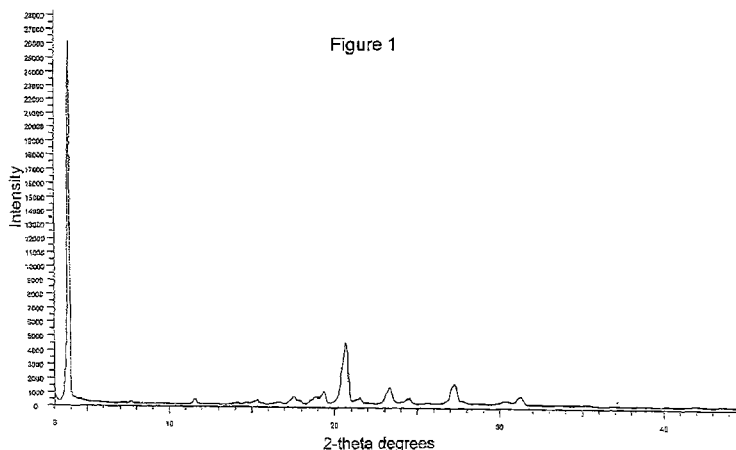
Andhra Pradesh 500 088 (IN). **VINIGARI, Krishna** [IN/IN]; H. No. 2-127, Shivaji Nagar, Devarakadara (post/mandal), Mahabubnagar, Andhra Pradesh 509 204 (IN). **RAMDOSS, Suresh, Kumar** [IN/IN]; H. No. 2/1888-24, Sethupathy Nagar (N), Ramanathapuram, Tamil Nadu 623 503 (IN). **RANGINENI, Srinivasulu** [IN/IN]; Machinenipally (Village), Yenmenbetla (Post), Kollapur (Mandal), Mahabubnagar, Andhra Pradesh 509 102 (IN). **TUMMALA, Arjunkumar**; H. No: 39-26-25, Rajiv Nagar, NH-5, Marripalem, Visakhapatnam, Andhra Pradesh 530 027 (IN). **IQBAL, Javed** [IN/IN]; 113 Villa Gardens, Gandipet, Hyderabad, Andhra Pradesh 500 075 (IN). **ORUGANTI, Srinivas** [IN/IN]; 404 Sai Sir Apartments, Camelot Layout, Kondapur, Hyderabad, Andhra Pradesh 500 032 (IN). **KANDAGATLA, Bhaskar** [IN/IN]; H. No. 2-2-129/102, Pushpa Enclave, Vijayapuri Colony, Uppal, Hyderabad, Andhra Pradesh 500 039 (IN).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM,

[Continued on next page]

(54) Title: PREPARATION OF FINGOLIMOD AND ITS SALTS



(57) Abstract: The present application provide processes for the preparation of fingolimod and its pharmaceutically acceptable salts, process for the purification of fingolimod hydrochloride and process for the preparation of amorphous fingolimod hydrochloride.

WO 2012/146980 A3



TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

Published:

— with international search report (Art. 21(3))

(88) Date of publication of the international search report:

27 December 2012

INTERNATIONAL SEARCH REPORT

International application No.

PCT/IB2012/000922

A. CLASSIFICATION OF SUBJECT MATTER

see extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC:C07C211/-; C07D333/-

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI;EPODOC;PAJ;CNKI;IEE;CNPAT;STN (REGISTRY,CAPLUS,CASREACT), fmgolimod, FTY720, FTY,CAS RN: 162359-56-0, 162359-55-9

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	BISWAJIT Kalita et al. Synthesis of 2-nitro alcohols by regioselective ring opening of epoxides with MgSO ₄ /MeOH/NaNO ₂ system: a short synthesis of immunosuppressive agent FTY-720, Synlett, 2001, No.9, pages 1411-1414 see scheme 2	26-28
A	CN1765872A (JIANGSU WUZHONG SUYAO DRUGS DEVELOPMENT CO., LTD.) 03 May 2006 (03.05.2006), see pages 8-9, examples 1-8	1-28

Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents:

“A” document defining the general state of the art which is not considered to be of particular relevance

“E” earlier application or patent but published on or after the international filing date

“L” document which may throw doubts on priority claim (S) or which is cited to establish the publication date of another citation or other special reason (as specified)

“O” document referring to an oral disclosure, use, exhibition or other means

“P” document published prior to the international filing date but later than the priority date claimed

“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

“X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

“&”document member of the same patent family

Date of the actual completion of the international search
24 Sep. 2012 (24.09.2012)

Date of mailing of the international search report
18 Oct. 2012 (18.10.2012)

Name and mailing address of the ISA/CN
The State Intellectual Property Office, the P.R.China
6 Xitucheng Rd., Jimen Bridge, Haidian District, Beijing, China
100088
Facsimile No. 86-10-62019451

Authorized officer
WANG Ying
Telephone No. (86-10)62086304

INTERNATIONAL SEARCH REPORT

International application No.

PCT/IB2012/000922

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see extra sheet

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fee.
3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:1-28

Remark on protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/IB2012/000922

Continuation of

A. Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This application contains the following four groups of inventions:

Group 1: the subject-matter of claims 1-28 relating to a process for the preparation of fingolimod of (Ia);

Group 2: the subject-matter of claims 29-30 relating to a process of the purification of fingolimod hydrochloride;

Group 3: the subject-matter of claims 31-34 relating to a process for the preparation of amorphous fingolimod hydrochloride;

Group 4: the subject-matter of claim 35 relating to amorphous fingolimod hydrochloride having purity greater than 99.8%.

Although there are the common technical feature fingolimod among groups 1-4, fingolimod is known compound in prior art. So fingolimod is not the common special technical feature. Therefore there is no special technical feature among Groups 1-4. The application hence does not meet the requirement of unity of invention as defined as PCT Rule 13.2.

B. CLASSIFICATION OF SUBJECT MATTER

C07C211/00 (2006.01) i

C07D333/20 (2006.01) i

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/IB2012/000922

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN1765872A	03.05.2006	CN 1310869C	18.04.2007