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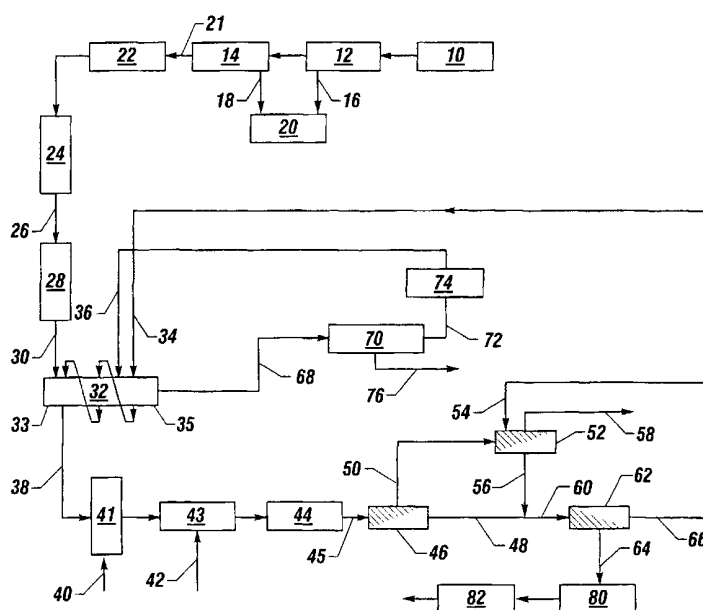
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[Continued on next page]

(54) Title: SUGAR BEET MEMBRANE FILTRATION PROCESS



(57) Abstract: The present invention relates to a process for producing sugar from beets, comprising the steps of: (a) macerating beets or pieces thereof; (b) mechanically separating juice from the macerated beets; and (c) membrane filtering the separated juice, producing a retentate and a permeate. The mechanical extraction of juice can be done on a moving porous vacuum filtration belt with countercurrent flow of macerated beets and water. The pH of the vacuum extracted juice can be adjusted to at least about 7 by addition of sodium hydroxide. This process does not use conventional beet diffusion. No lime and no carbon dioxide are required to be contacted with the juice or the permeate in this process.



NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM,
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INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 00/22301

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 C13D3/16 C13D3/00 C13D1/00 C13D3/14

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 7 C13D

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 practical, search terms used)

EPO-Internal, WPI Data, PAJ, FSTA

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	EP 0 126 512 A (SUIKER UNIE) 28 November 1984 (1984-11-28) page 1, line 1-6 page 2, line 15-32 page 4, line 33 -page 6, line 13 claims 1,2,5; examples 1,3,4 --- -/--	1 2-65,67, 70



Further documents are listed in the continuation of box C.



Patent family members are listed in 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 document but published on or after the international filing date
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- *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
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Date of the actual completion of the international search

18 May 2001

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INTERNATIONAL SEARCH REPORT

Intern. Application No

PCT/US 00/22301

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	US 4 432 806 A (MADSEN RUD F ET AL) 21 February 1984 (1984-02-21) claims 1-3,5-7,11; examples 1-3 column 1, line 8-21 column 2, line 11-20,34-39	1,71,72 8,10,13, 14,19, 20,26, 27, 30-32, 36,37, 41, 49-56, 60,61, 64-66, 69,70,73
X A	WO 97 43454 A (WESTERN SUGAR COMPANY) 20 November 1997 (1997-11-20) claims 1,7,15,17-19; figures 2,4 page 1, line 13-30 page 11, line 25 -page 12, line 5 page 14, line 30 -page 16, line 22 page 19, line 24 -page 20, line 9	1 2-70
X A	WO 95 27798 A (INT FOOD PROCESSING INC) 19 October 1995 (1995-10-19) claims 1,6,10; examples 1,2 page 7, line 4-13	1 2-70
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X A	US 5 281 279 A (GIL ENRIQUE G ET AL) 25 January 1994 (1994-01-25) claims 1,4,8-10; figures 1,2; example 1 column 1, line 10-18,42-62 column 2, line 48-51 column 3, line 11-20 column 4, line 24-68 column 5, line 46 -column 6, line 18 column 8, line 35 -column 9, line 7	71 1-70,72, 73
A	GB 1 361 674 A (DANSKE SUKKERFAB) 30 July 1974 (1974-07-30) claims 1-6; figure 1; examples 1-3 page 1, line 23-48,66 -page 2, line 8,32-43,49-60	1-70

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INTERNATIONAL SEARCH REPORT

International Application No

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 92 08810 A (APPLIED MEMBRANE SYSTEMS PTY L) 29 May 1992 (1992-05-29) claims 1-13; figure 3 page 5, line 21 -page 6, line 4,27-29 page 8, line 28 -page 9, line 5 page 14, line 4 -page 15, line 7 page 16, line 21-29 ---	1-70
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A	GB 477 312 A (BLANES) 1938 page 1, line 33-61; claims 1-3,5,6 ---	1-70
A	EP 0 655 507 A (APPLEXION) 31 May 1995 (1995-05-31) column 1, line 1-10 column 2, line 1-9,36 -column 3, line 4 column 3, line 57 -column 4, line 6 column 5, line 37 -column 6, line 23,34-49 column 7, line 9-19 column 8, line 6-21; claims 1-8 ---	1-70
A	US 3 926 662 A (RUNDELL JOHN TRETHOWAN ET AL) 16 December 1975 (1975-12-16) claim 1; examples 1-6 column 3, line 21-29 column 5, line 8-31 column 7, line 37-55 -----	71-73

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 00/22301

Box I Observations where certain claims were found unsearchable (Continuation of item 1 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 II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

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

see additional 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 fee, this Authority did not invite payment of any 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.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☒ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1 (partially), 2-18, 19, 21-27 (partially), 28,29, 30-32 (partially), 33-35, 36-64 (partially), 65, 67-70 (partially)

A process for producing sugar from beets comprising the steps of:

- a) Macerating beets or pieces thereof
- b) Separating juice from the macerated beets
- c) Membrane filtering the separated juice, producing a retentate and a permeate.

2. Claims: 1 (partially), 20, 21-27 (partially), 30-32 (partially), 36-64 (partially), 66, 67-70 (partially)

A process for producing sugar from beets comprising the steps of:

- a) Slicing beets into cosettes
- b) Separating juice from the cosettes
- c) Membrane filtering the separated juice, producing a retentate and a permeate.

3. Claims: 71-73

A process for producing sugar from beets comprising the steps of:

- a) Introducing sufficient air into the juice to cause polymerisation of color bodies
- b) Removing at least some of the color bodies from the juice by membrane filtering through at least one ultrafiltration membrane or nanofiltration membrane.

INTERNATIONAL SEARCH REPORT

Information on patent family members

Intern. Application No

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Information on patent family members

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