

12 **EUROPEAN PATENT APPLICATION**

21 Application number: 86107086.0

51 Int. Cl.³: **A 61 H 1/02**
A 63 B 23/04

22 Date of filing: 24.05.86

30 Priority: 14.06.85 GB 8515074
 10.09.85 GB 8522437

43 Date of publication of application:
 17.12.86 Bulletin 86/51

88 Date of deferred publication of search report: 05.08.87

84 Designated Contracting States:
 AT BE CH DE FR IT LI LU NL SE

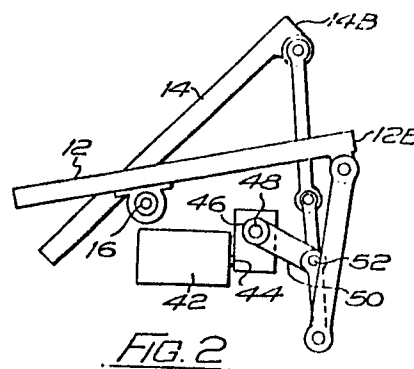
71 Applicant: **Heaton, Samuel**
4 Beacon View
Embsay, Skipton, Nr. Yorks.(GB)

72 Inventor: **Heaton, Samuel**
4 Beacon View
Embsay, Skipton, Nr. Yorks.(GB)

74 Representative: **Denmark, James**
5 York Place
Leeds LS1 2SD Yorkshire(GB)

54 Improvements relating to leg exercisers.

- 57 A process for the separation of methane and nitrogen
- (a) introducing a feed comprising methane and nitrogen into a rectification column operating at a pressure in the range of from 200 to 450 psia;
 - (b) separating the feed in the rectification column into a nitrogen-enriched vapor and a methane-enriched liquid;
 - (c) partially condensing nitrogen-enriched vapor by indirect heat exchange with heat pump fluid to warm the heat pump fluid;
 - (d) employing at least some of the resulting liquid of step (c) as reflux liquid for the column;
 - (e) partially vaporizing methane-enriched liquid by indirect heat exchange with warm heat pump fluid;
 - (f) employing at least some of the resulting vapor of step (e) as reflux vapor for the column;
 - (g) warming remaining methane-enriched liquid of step (e) by indirect heat exchange with warm heat pump fluid wherein not more than 75 percent of the remaining methane-enriched liquid is vaporized;
 - (h) further warming the warmed methane-enriched fluid of step (g) by indirect heat exchange with feed prior to the introduction of the feed into the column; and
 - (i) recovering resulting methane-enriched fluid as product-methane, thereby providing refrigeration to the column at or below column temperature levels.





European Patent
Office

EUROPEAN SEARCH REPORT

0205018

Application number

DOCUMENTS CONSIDERED TO BE RELEVANT			EP 86107086.0
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 4)
X	US - A - 2 815 020 (BARKSCHAT) * Totality * --	1-4,6, 7,14, 17-19	A 61 H 1/02 A 63 B 23/04
X	US - A - 3 370 584 (GIRTEN) * Totality * --	1-4,6, 7,14, 17-19	
X	US - A - 3 774 597 (ROOT) * Abstract; fig. 1-6 * --	1-4,6, 7,9,14, 17-19	
X	US - A - 3 316 898 (BROWN) * Totality * --	1-4,6- 8,14, 17-19	
X	US - A - 2 413 351 (HERRICK) * Totality * --	1-4,6- 9,14, 17-19	TECHNICAL FIELDS SEARCHED (Int. Cl. 4) A 61 H A 63 B
X A	US - A - 2 969 060 (SWANDA) * Totality * --	1-4,7, 14,17- 19	
X A	US - A - 4 470 597 (MC FEE) * Abstract; fig. 1,3-5; column 3, line 31 - column 4, line 14 * --	1-4,14, 15 7,17	
The present search report has been drawn up for all claims			
Place of search VIENNA		Date of completion of the search 13-04-1987	Examiner NEGWER
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date O : document cited in the application L : document cited for other reasons A : member of the same patent family, corresponding document	



European Patent
Office

EUROPEAN SEARCH REPORT

0205018

- 2 -
Application number

DOCUMENTS CONSIDERED TO BE RELEVANT			EP 86107086.0
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 4)
X	US - A - 3 526 220 (SMALL) * Abstract; column 1, lines 48-64; column 2, lines 3-27; fig. 1-3 *	1-4,6,7,10-12,14,17-19	
X	US - A - 4 474 176 (FARRIS) * Abstract; fig. 1,2,6,7 *	1-4,6,7,13,17	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int. Cl. 4)
Place of search VIENNA		Date of completion of the search 13-04-1987	Examiner NEGWER
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	