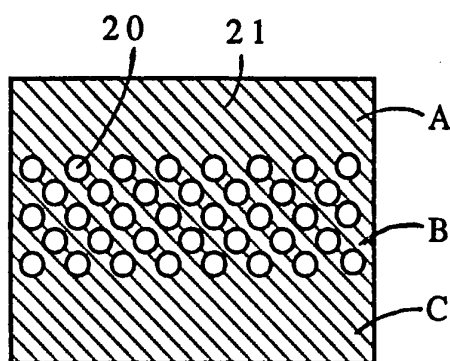




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification 5 :</b>  <b>B32B 3/26</b>	<b>A3</b>	<b>(11) International Publication Number:</b> <b>WO 94/02257</b>  <b>(43) International Publication Date:</b> 3 February 1994 (03.02.94)
<b>(21) International Application Number:</b> PCT/US93/06638 <b>(22) International Filing Date:</b> 13 July 1993 (13.07.93)  <b>(30) Priority data:</b> 07/913,246                      14 July 1992 (14.07.92)                      US  <b>(60) Parent Application or Grant</b> (63) Related by Continuation US    07/913,246 (CIP) Filed on                                      14 July 1992 (14.07.92)  <b>(71)(72) Applicant and Inventor:</b> BUCKLEY, Theresa, M. [US/ US]; 424 Homer Ave., Palo Alto, CA 94301 (US).		<b>(74) Agent:</b> LEARY, James, J.; 823 Poplar Avenue, Sunnyvale, CA 94086 (US).  <b>(81) Designated States:</b> AU, JP, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).  <b>Published</b> <i>With international search report.</i> <i>Before the expiration of the time limit for amending the</i> <i>claims and to be republished in the event of the receipt of</i> <i>amendments.</i>  <b>(88) Date of publication of the international search report:</b> 31 March 1994 (31.03.94)

**(54) Title:** PHASE CHANGE THERMAL CONTROL MATERIALS, METHOD AND APPARATUSES

**(57) Abstract**

A highly flexible composite material (21) having a flexible matrix (B) containing a phase change thermal storage material (20). The composite material (21) can be made to heat or cool the body or to act as a thermal buffer to protect the wearer from changing environmental conditions. The composite (21) may also include an external insulation layer (A) and/or an internal control layer (C) to regulate the rate of heat exchange between the composite (21) and the skin of the wearer. Other embodiments of the PCM composite (21) also provide 1) a path for evaporation or direct absorption of perspiration from the skin of the wearer for improved comfort and thermal control, 2) heat conductive pathways within the material for thermal equalization, 3) surface treatments for improved absorption or rejection of heat by the material, and 4) means for quickly regenerating the thermal storage capacity for reuse of the material. Applications of the composite materials (21) are also described which take advantage of the composite's thermal characteristics. The examples described include a diver's wet suit, ski boot liners, thermal socks, gloves and a face mask for cold weather activities, and a metabolic heating or cooling blanket useful for treating hypothermia or fever patients in a medical setting and therapeutic heating or cooling orthopedic joint supports.

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## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US93/06638

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(5) :B32B 3/26

US CL :428/304.4

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)

U.S. : 428/304.4, 311.1, 317.9

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)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US, A, 4,756,958 (BRYANT ET AL) 12 JULY 1988, see Abstract.	1,15,19 ----- 2-14,16-18
X --- Y	US, A, 4,894,931 (SENEE ET AL) 23 JANUARY 1990, see entire document.	1,15,19 ----- 2-14,16-18

☐ Further documents are listed in the continuation of Box C.
 ☐ See patent family annex.

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*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	

Date of the actual completion of the international search

02 DECEMBER 1993

Date of mailing of the international search report

FEB 07 1994

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# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US93/06638

## Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international 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:

Group I, claims 1-16, and 18, drawn to a material, process of use and method of making, class 428, subclass 304.4.

Group II, claim 17, drawn to a window, class 52.

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.