



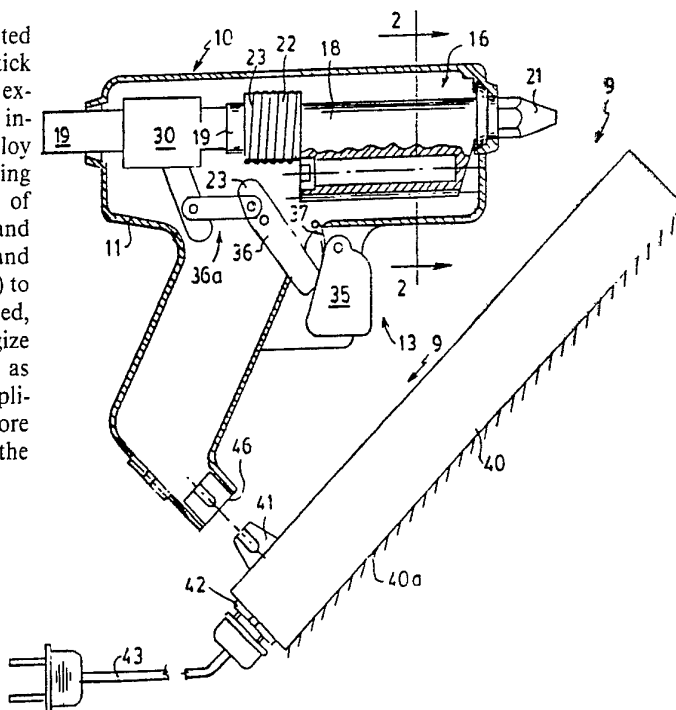
## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<b>(21) International Application Number:</b> PCT/US89/01703 <b>(22) International Filing Date:</b> 24 April 1989 (24.04.89) <b>(30) Priority data:</b> 187,785 25 April 1988 (25.04.88) US <b>(71) Applicant:</b> SWINGLINE INC. [US/US]; 32-00 Skillman Avenue, Long Island City, NY 11101 (US). <b>(72) Inventors:</b> CUNNINGHAM, Eric ; 26 Pritchard Avenue, Somerville, MA 02144 (US). LOEFFLER, Herbert ; 53 Spy Pond Road, Arlington, MA 02174 (US). STOECKMAN, Walter ; 50 Water Street, 27, Medford, MA 02155 (US). JAIRAM, Anthony ; 107-58 128th Street, Richmond Hill, NY 11419 (US). BEIRNE, Anne ; 52-26 79th Street, Elmhurst, NY 11373 (US).		<b>(74) Agent:</b> McKenney, Charles, E.; Pennie & Edmonds, 1155 Avenue of the Americas, New York, NY 10036 (US).  <b>(81) Designated States:</b> AT (European patent), BE (European patent), CH (European patent), DE (European patent), FR (European patent), GB (European patent), IT (European patent), LU (European patent), NL (European patent), SE (European patent).  <b>Published</b> <i>With international search report.</i>

**(54) Title:** PORTABLE ELECTRICALLY HEATED APPLIANCE EMPLOYING FUSIBLE HEAT STORAGE MATERIAL

**(57) Abstract**

The heating unit (16) of a hand-held electrically heated glue gun (10) has an electric heater (31) for heating a glue stick (19) to its application-ready temperature prior to being extruded through an orifice applicator tip (21). The unit (16) includes a chamber (26) containing a low melting point alloy (28) heat storage material, e.g., 60 % tin and 48 % lead, having a melting point above the application-ready temperature of the glue stick (19), in heat exchange relationship therewith and the heater (31). The gun (10) is initially situated on a stand (40) for energization of the heater (31) to raise the alloy (28) to above its melting temperature. After the alloy (28) is melted, the gun (10) is removed from the stand for use to deenergize the heater (31). During use, latent heat of fusion, released as the alloy (28) solidifies, sustains the glue stick (19) in its application-ready temperature range for an extended period before the gun (10) must be returned to the stand (40) to remelt the heat storage material for subsequent use of the gun.



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PORTABLE ELECTRICALLY HEATED APPLIANCE EMPLOYING  
FUSIBLE HEAT STORAGE MATERIAL

Background of the Invention

Electrically heated appliances such as glue guns,  
5 hair-curling irons, soldering irons and so forth require a  
supply of heat to control the state of fluidity of the  
fusible material or to control the temperature of other  
substances to be heated for selected periods of time to  
attain temperatures for obtaining necessary flow  
10 characteristics or for other purposes.

In prior appliances, heating has been  
accomplished by heating a portion of the appliance using a  
selected electrical heating element connected to a source of  
electricity such as an electrical outlet. When such an  
15 appliance is to be moved to a work location distant from the  
electric source, it is unplugged and the appliance  
thereafter cools at a rate dependent on the amount of heat  
then in the appliance, the temperature differentials  
involved and other variables effecting heat transfer from  
the appliance to its surrounding environment.

20 Prior appliances with stationary heat sinks have  
been proposed: U. S. Patent No. 3,430,816. Soldering pens  
in which solder metal is heated to a molten state have been  
disclosed but the use of heated solder has not been  
suggested as a source of heat: U. S. Patent No. 3,876,857.

25 Portable appliances for dispensing hot melt  
adhesives are old: U. S. Patent No. 3,970,395 and heat  
exchanger shape and size design have been proposed for  
controlling the consistency of adhesions over time: U. S.  
Patent No. 4,601,597.

30 None of the prior proposals provide an appliance  
with sufficient lasting heat capacity to give satisfactory  
results.

### Summary of the Invention

Broadly, the present invention is a portable appliance heating unit comprising a housing having therein a heat source element (preferably an electrical heating element), a sealable chamber in the housing and a low melting point metal in the sealable chamber. The heating unit is located adjacent the material to be heated such as a glue stick, a hank of human hair, solder, or other substances to be heated.

It is a feature of the invention that the material to be heated may be positioned in the heating unit in an adjacent holding and dispensing chamber.

### Brief Description of the Drawings

Fig. 1 is side elevational view of a portable glue gun appliance with its stand;

Fig. 2 is a sectional view taken along lines 2-2 of Fig. 1; and

Fig. 3 is a partial perspective view of the heating unit of the glue gun.

### Description of the Preferred Embodiment

Referring to the Figures, appliance glue gun 9 includes movable hand-held appliance section 10, body 11 with handle 12 and trigger mechanism 13. Heating unit 16 within body 11 includes housing 17 containing a glue stick chamber 18 which accommodates a glue stick 19. Glue stick chamber 18 projects from the appliance body 11 and includes an orifice applicator tip 21. Since glue stick 19 is shaped to fit loosely in chamber 18 it is held in its initial rest position by rubber socket 22 and coil spring 23. Glue stick 19 is urged to the right, as shown in Fig. 1, and is extruded through orifice tip 21 for deposit on a selected surface. The mechanical arrangement for moving the stick 19 includes lever 36 cammed by the action of trigger 35. Also

shown is glue stick gripper 30, linkage 36a and return spring 37.

Metal chamber 26 houses, with its force-fit sealable cap 27, low-melting-point metal alloy stick 28 (shown in a broken view for illustrative purposes) in its solid or liquid form as further described. Heater 31 comprising an insulated element 32 and electrical resistance element within the insulated element (not shown) having electrical leads 33a, 33b which heater 31 is positioned in housing 17 adjacent glue chamber 18 and metallic chamber 26. It is seen that both glue stick 19 and metal alloy 28 are heated by heater 31 as further explained.

In operation, appliance 9 is initially situated on stand 40 which rests on surface 40a (such surface being normally horizontal but tipped in Fig. 1 for illustrative purposes) having two (2) sockets 41, 42; one socket 42 to receive power cord 43 and the other socket 41 serves to transfer power to appliance section 10 through appliance inlet socket 46. When the portable appliance section 10 is taken off stand 40, electrical heater 31 is disconnected and no further heat is thereafter supplied to appliance section 10 until it is replaced on stand 40.

The principle of operation of appliance 9, with respect to providing heat to glue stick 19, is based on fashioning appliance housing 17 of selected material with a shape and size to transfer heat for use in maintaining the heating and melting conditions of the glue stick for as long a time as practicable. As glue stick 19 cools and solidifies to a certain consistency, application of glue through tip 21 can no longer be effectively continued.

Housing 17 is preferably made of cast metal having some heat holding capacity. Heater 31 is employed to heat the metal alloy 28 to its melting temperature and above. In addition to the capacity of the heat-holding metal of housing 17, latent heat of fusion of the low-melting-point metal alloy

28 is also used to provide heat to glue stick 19 as cooling of the stand-removed appliance section 10 reaches a temperature level at which solidification of the low-melting-point metal 28 or a portion thereof takes place. The weight of the low-melting-point metal 28 for the appliance shown is about 3.4 ounces but it can vary between 3 ounces and 5 ounces. Low-melting-point metal 28 is an alloy of about 60% tin and 40% lead having a melting point of about 10° Fahrenheit above the glue stick application-ready temperature range. This alloy has been selected as preferable so that as the alloy metal 28 goes from liquid to solid at its melting temperature heat transfers from the alloy to the glue stick to hold the stick in its application-ready range. As solidification or fusion takes place heat is liberated from alloy metal 28 which heat is transferred to the glue stick to help sustain glue stick 19 in its application-ready range for an extended period while appliance section 10 remains removed from its stand 40.

Latent heat of solidification refers to the heat transferred into and out of substances accompanying the change of state of the substance at a constant temperature. For metallic substances that are solid at room temperature, such as tin-lead alloys, the latent heat which is transferred from the alloys during fusion (solidification) at the fusion temperatures is known as the heat of fusion. (See the following Table 1 including certain melting points).

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Table 1

	<u>Substance</u>	<u>Heat of Fusion Btu/per Lb.</u>	<u>Melting Point °F.</u>
5	Silver	26.2	1760.9
	Sodium	49.5	207.1
	Tin	25.4	449.4
	Zinc	46.8	787.1
	Alloys:		
10	30.5 Pb+69.5 Sn	30.6	--
	36.9 Pb+61.3 Sn	28.0	--
	38.0 Pb+62.0 Sn	--	361.0
	63.7 Pb+36.3 Sn	11.6	--
	77.8 Pb+22.2 Sn	17.0	--
15	78.4 Sn+21.6 Zn	42.3	--
	93.56 Sn+6.44 Zn	31.8	--
	97.32 Sn+2.68 Zn	27.2	--

20        Once appliance section 10 has cooled to a point that glue application is no longer possible or desirable, appliance section 10 is replaced on stand 40, the electrical connections restored and heater 31 will heat the low-melting-point metal 28 back to its molten or liquid state.

25 The appliance 10 is then again ready for use.

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## We Claim:

1. A portable appliance having a housing, a heat-generating element, and a heat-holding element, the improvement comprising

- 5           a) a quantity of low-melting-point metal positioned in and forming a part of the heat-holding element; and
- 10           b) the heat-generating element capable of melting the metal alloy and thereafter allowing it to solidify and transfer latent heat of fusion from the metal alloy to the housing.

15           2. The appliance of claim 1 having a quantity of adhesive in the appliance which adhesive receives latent heat of fusion from such metallic portion as it solidifies.

20           3. The appliance of claim 1 having a hand-held portable section and a stand with the portable section having as its heat-generating element an electric heat source powered through the stand such that when the portable section is moved away from the stand the electric heat source is turned off.

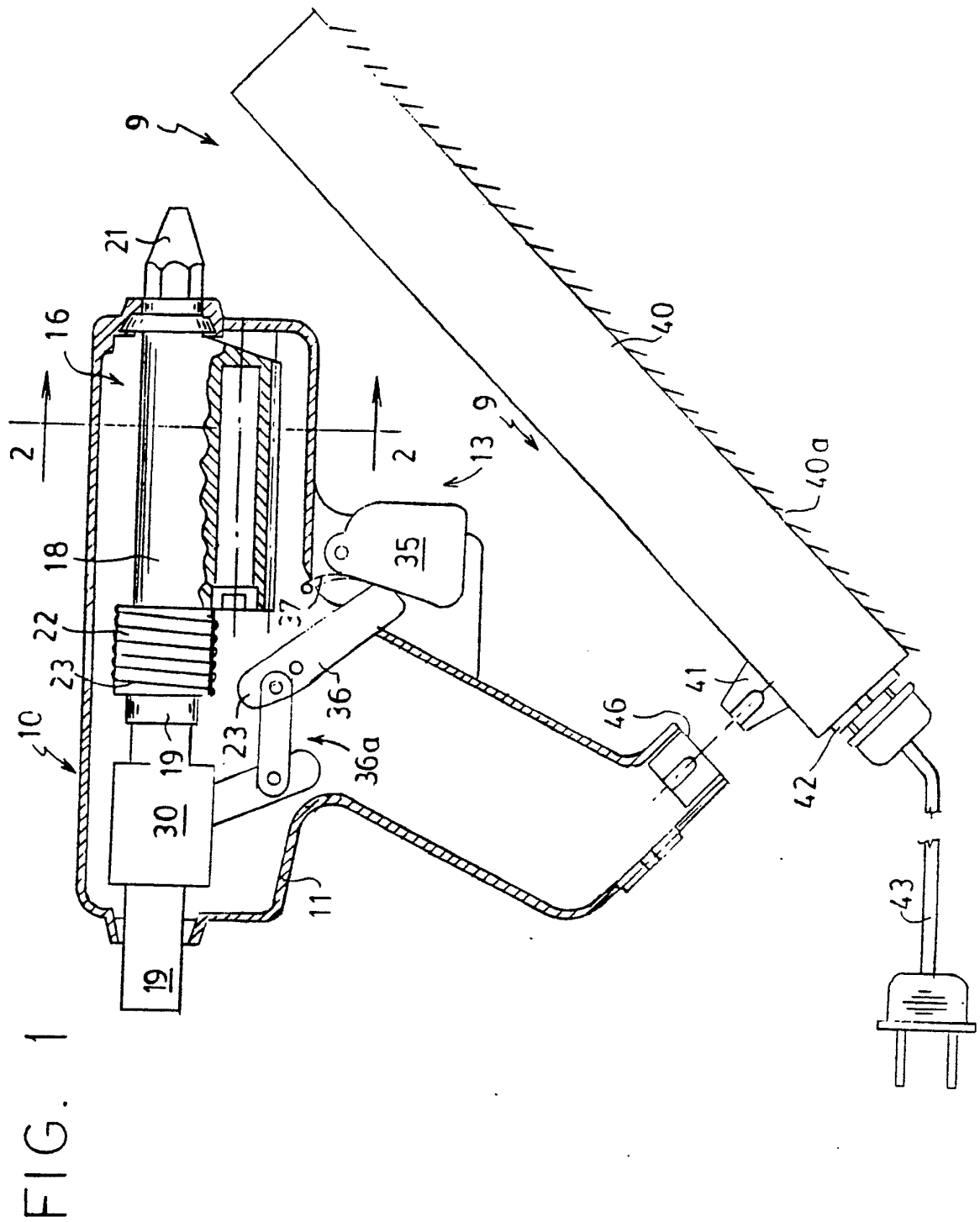
25           4. The appliance of claim 1 in which such portion of metal alloy is housed in the portable section in a sealable chamber.

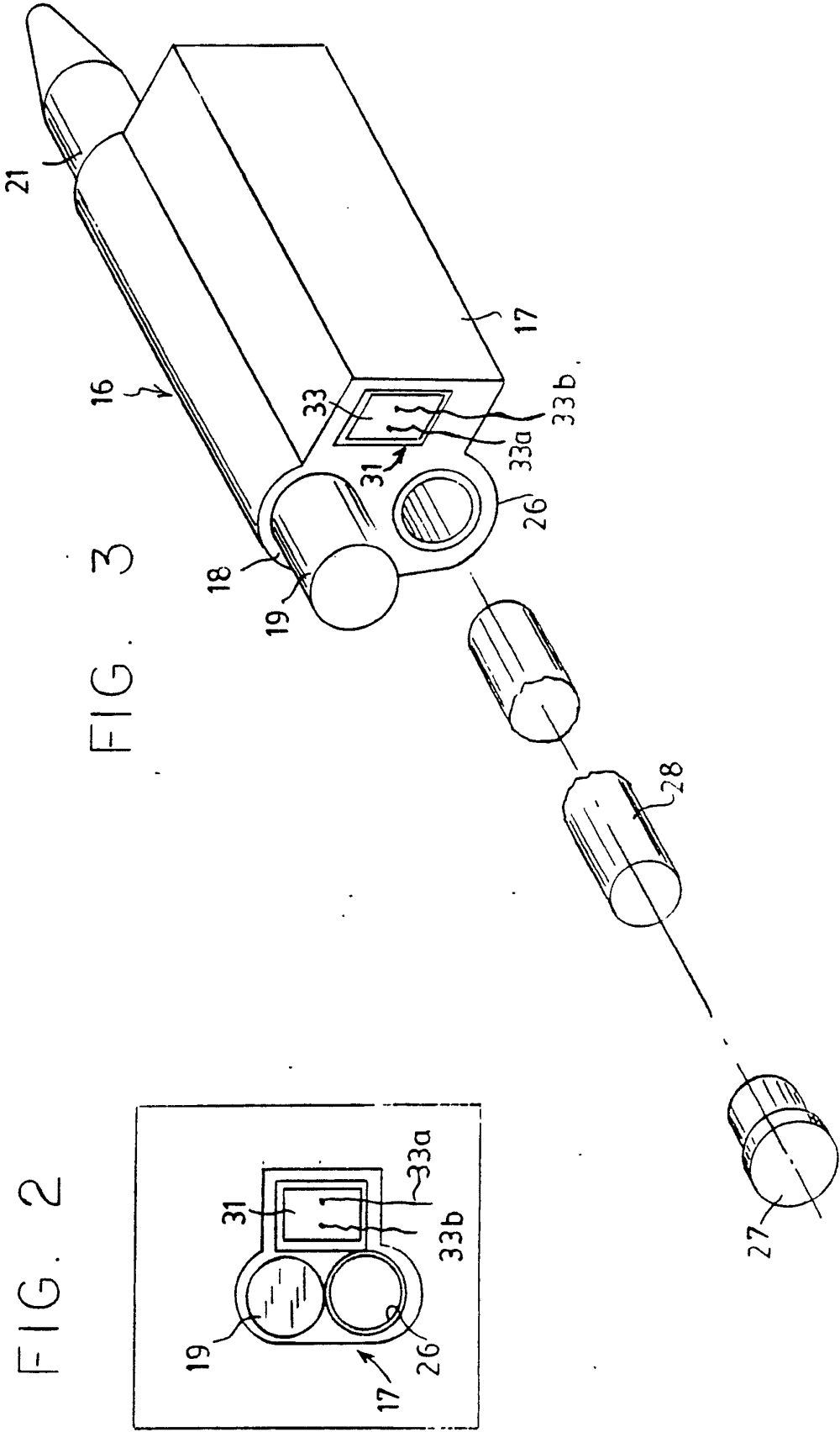
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# INTERNATIONAL SEARCH REPORT

International Application No. PCT/US89/01703

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (if several classification symbols apply, indicate all) <sup>6</sup>		
According to International Patent Classification (IPC) or to both National Classification and IPC <b>IPC(4):</b> B67D 5/62, H05B, 1/02, B23K 3/02 <b>U.S. C1:</b> 219/227,230,242,325,378,421,540; 165/902; 222/146.5; 228/51		
<b>II. FIELDS SEARCHED</b>		
Minimum Documentation Searched <sup>7</sup>		
Classification System	Classification Symbols	
U.S.	219/227-230, 240, 242, 325, 326, 378, 421, 530, 540 165/902; 222/146.1, 146.5; 228/51-55	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched <sup>8</sup>		
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT</b> <sup>9</sup>		
Category *	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>
X	US, A, 1,432,864 ( <b>JOHNSTON</b> ) 24 October 1922 See page 1, lines 9-47 and 53-85.	1, 4
X	US, A, 2,338,691 ( <b>TUCKER</b> ) 04 January 1944 See Fig.1, page 2, col. 1, lines 11 to 65 and page 3, col. 1, lines 8-43.	1, 2, 4
X	US, A, 2,066,127 ( <b>SLAYTER</b> ) 12 December 1936 See Fig. 3 and page 2 col. 1, line 58 to page 2, col. 2, line 29.	1,4
X	US, A, 3,419,666 ( <b>GROOM</b> ) 31 December 1968 See Figs. 1-3 and col. 2, lines 19-53.	1-4
X	US, A, 4,692,587 ( <b>SPIRK, ET AL.</b> ) 08 September 1987 See Figs. 11-13, col. 6, lines 14-60 and col. 8, lines 13-19.	1-4
Y	US, A, 2,534,257 ( <b>FLOURNOY</b> ) 19 December 1950 See col. 4, line 49 to col. 5, line 37.	1-4
Y	US, A, 2,584,999 ( <b>FLOURNOY</b> ) 12 February 1952, See col. 4, lines 68 to col. 5, line 23.	1-4
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>* Special categories of cited documents: <sup>10</sup></p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"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)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 45%;"> <p>"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</p> <p>"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"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.</p> <p>"&amp;" document member of the same patent family</p> </div> </div>		
<b>IV. CERTIFICATION</b>		
Date of the Actual Completion of the International Search		Date of Mailing of this International Search Report
26 June 1989		10 JUL 1989
International Searching Authority		Signature of Authorized Officer
ISA/US		A. Bartis

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
A	US, A, 1,602,266 (JARKOVSKY) 05 October 1926, See page 1, lines 33-50.	1-4
A	US, A, 2,236,837 (RIMMEL) 01 April 1941. See page 1, col. 1, lines 5-49.	1-4
A	US, A, 3,513,290 (BURLEY ET AL.) 19 May 1970, See Figs. 1-5 and col. 2, line 61 to col. 3, line 73.	1-4
A	US, A, 3,430,816 (NADHERNEY ET AL.) 04 March 1969 See Fig. 2 and col. 5, line 61 to col. 6, line 26.	1-4