



US 20090153369A1

(19) **United States**(12) **Patent Application Publication**  
**Baier et al.**(10) **Pub. No.: US 2009/0153369 A1**(43) **Pub. Date: Jun. 18, 2009**(54) **APPARATUS AND METHOD FOR INPUTTING INFORMATION****Publication Classification**(75) Inventors: **Brent Michael Baier**, Lloydminster (CA); **Leslie Howard Messmer**, Lloydminster (CA)(51) **Int. Cl.**  
**H03K 17/94**

(2006.01)

(52) **U.S. Cl. .... 341/20**

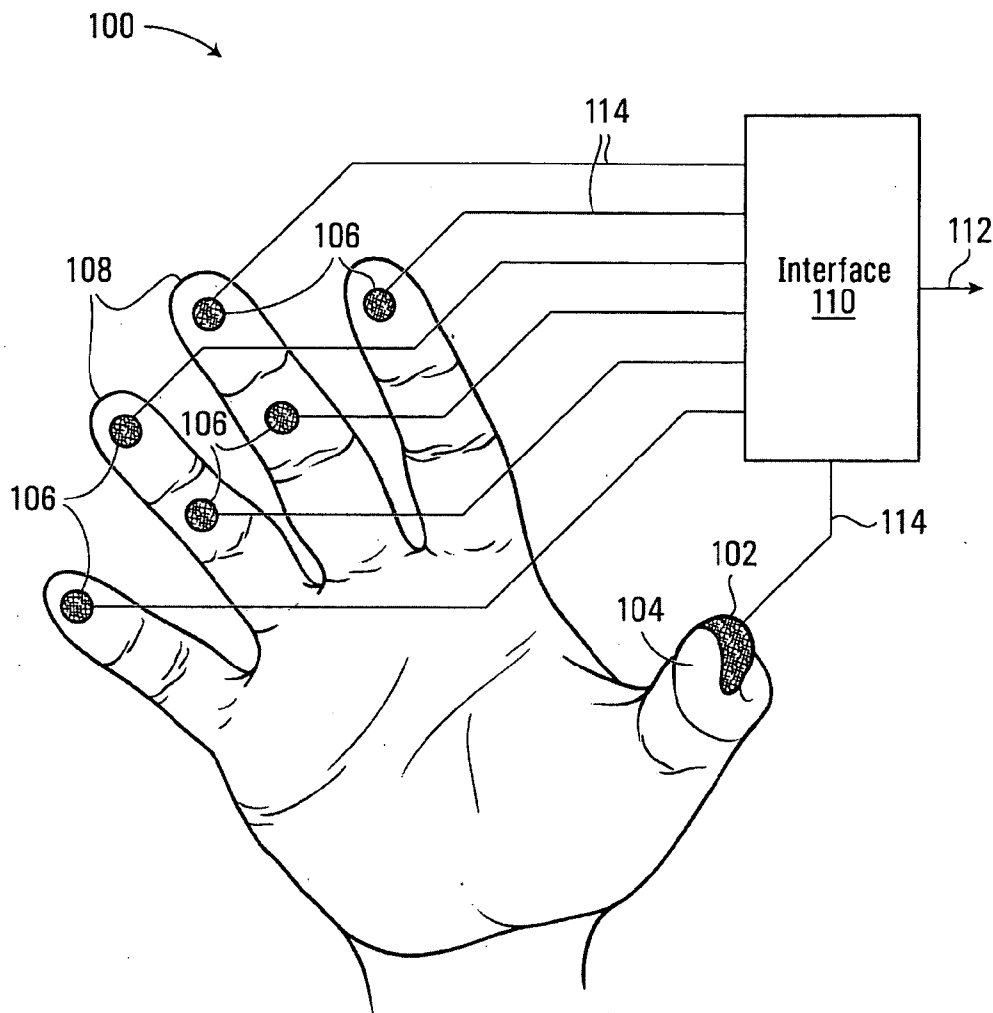
Correspondence Address:

**KOLISCH HARTWELL, P.C.****200 PACIFIC BUILDING, 520 SW YAMHILL STREET  
PORTLAND, OR 97204 (US)**(57) **ABSTRACT**(73) Assignee: **Iron Will Creations, Inc.**,  
Lloydminster, AB (CA)(21) Appl. No.: **12/389,290**(22) Filed: **Feb. 19, 2009**

An apparatus for inputting information is disclosed. The apparatus includes a first sensor operably configured to be mounted on a user's thumb and a plurality of sensors operably configured to be mounted on the user's fingers, such that the user can move the user's thumb and/or fingers to cause contact between the first sensor and at least one of the plurality of sensors. The apparatus also includes an interface in communication with the first sensor and the plurality of sensors, the interface being operably configured to associate contact between the first sensor and sensors of the plurality of sensors with respective data items and to produce a data signal representing the data item. Frequently used data items are associated with sensors of the plurality of sensors located in positions on the user's fingers that permit ergonomically favourable conditions when causing the contact.

**Related U.S. Application Data**

(63) Continuation of application No. 11/326,029, filed on Jan. 4, 2006, now Pat. No. 7,498,956.



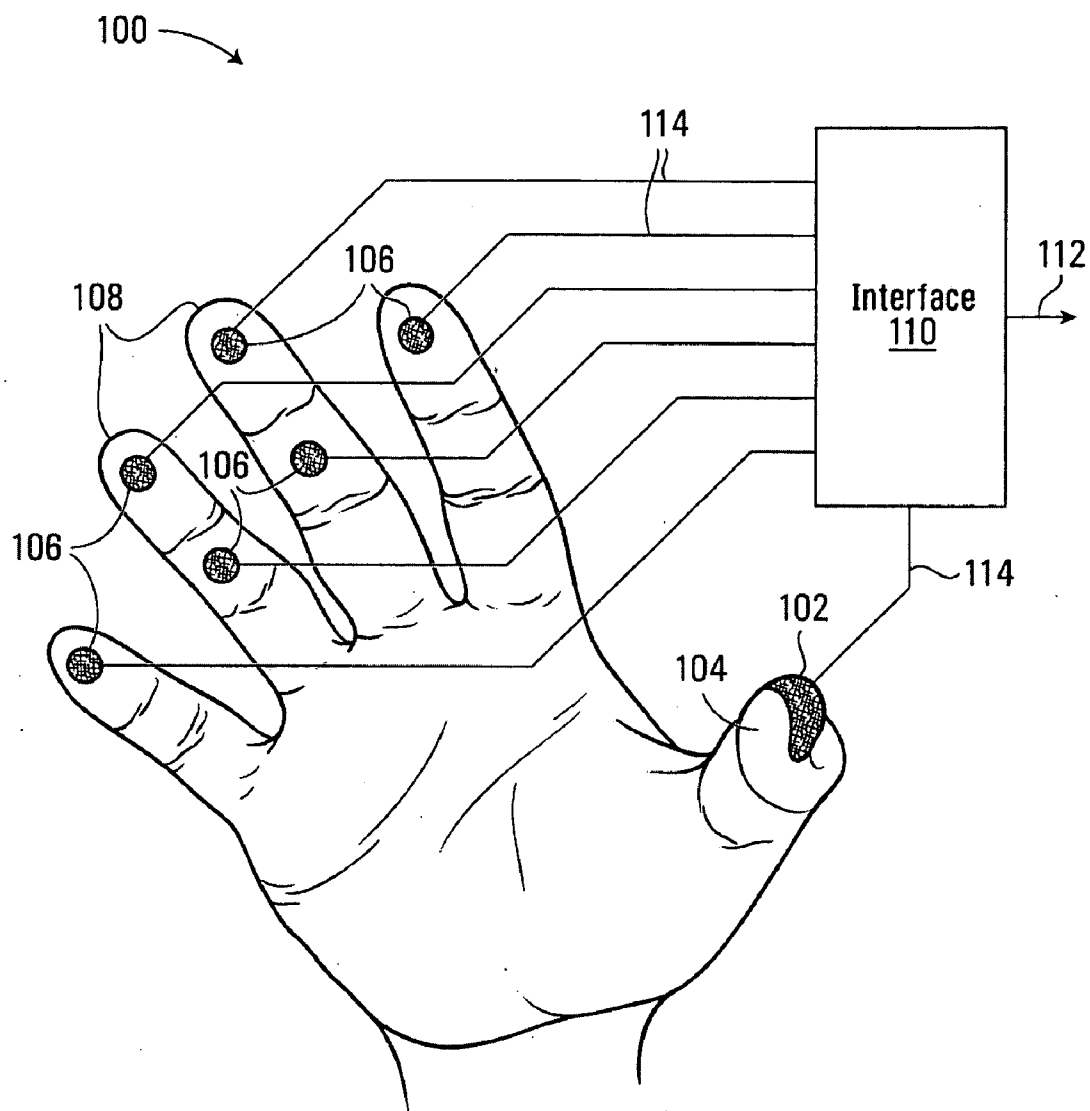


FIG. 1

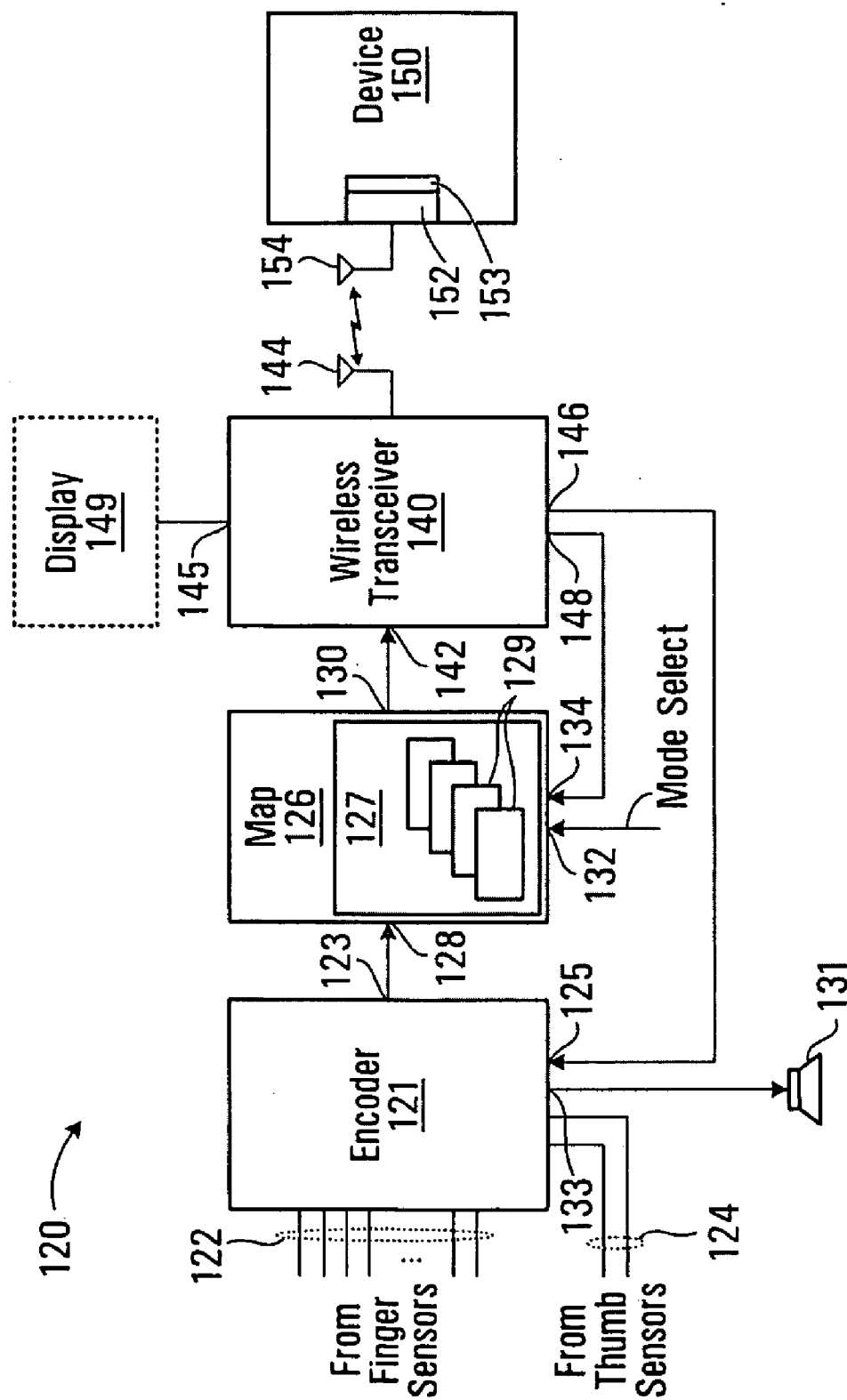
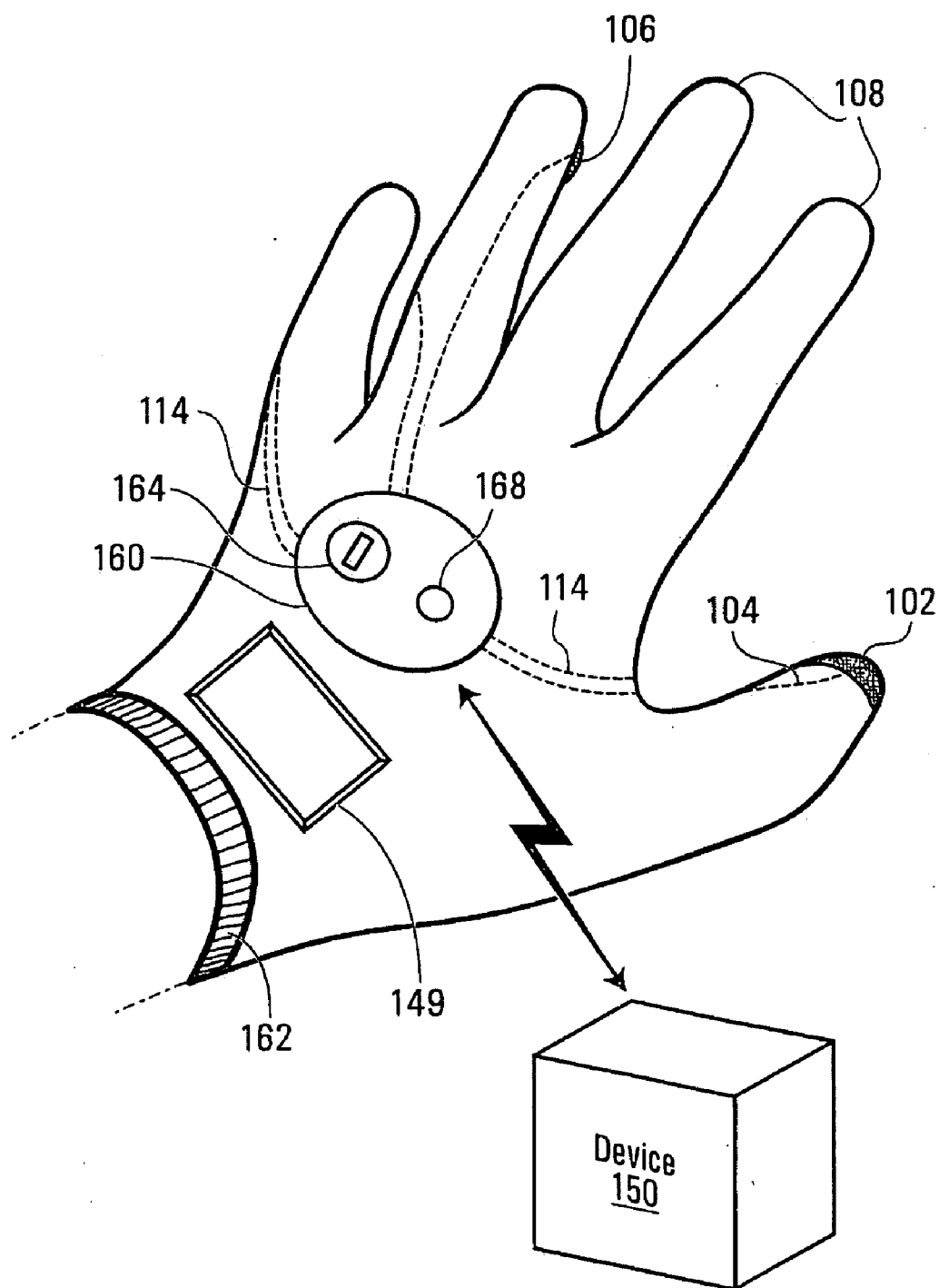


FIG. 2



**FIG. 3**

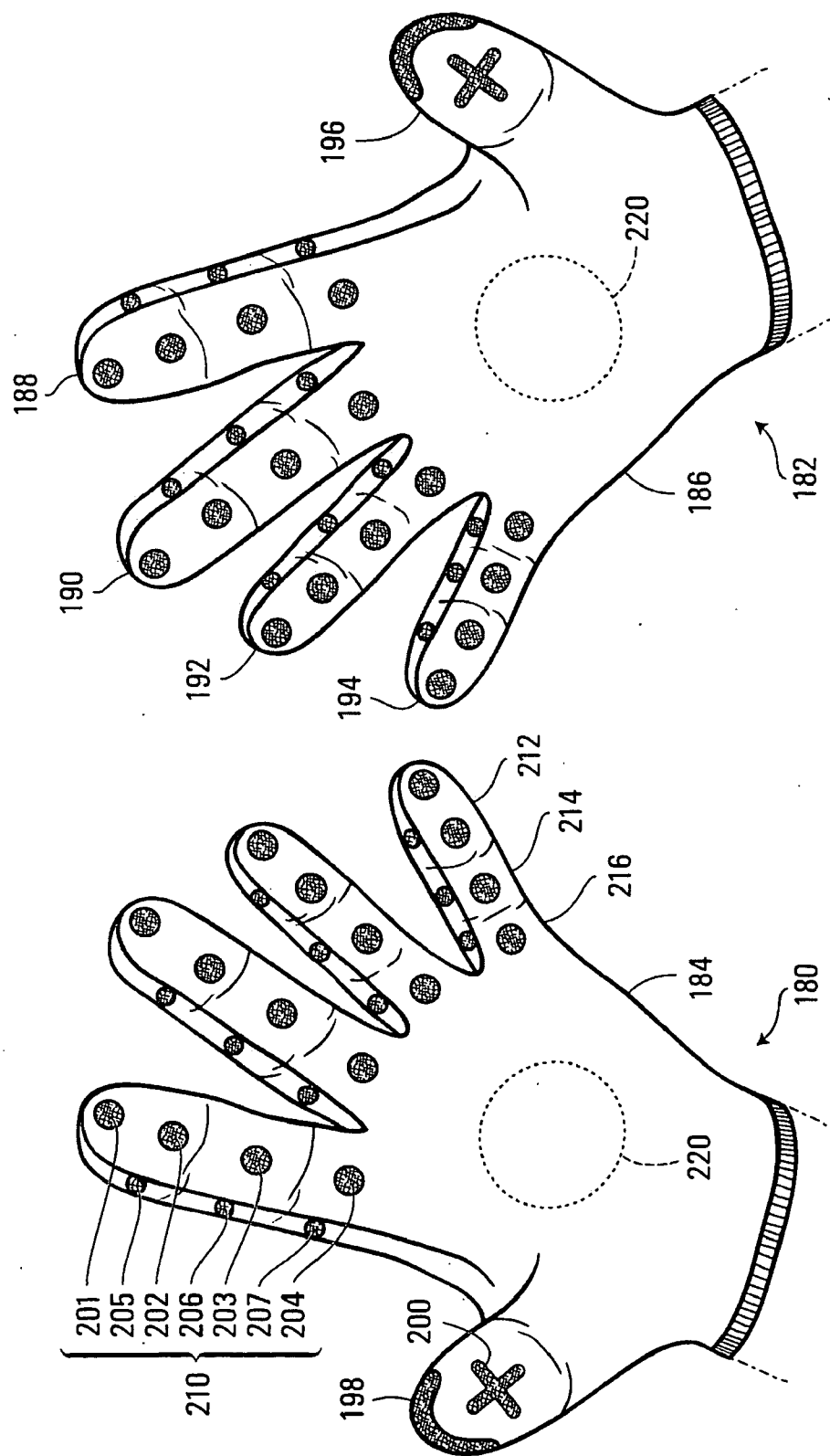


FIG. 4

FIG. 5

250

Finger Sensor	Left Hand: first thumb sensor 198				Right Hand: first thumb sensor 198			
	Index	Middle	Ring	Small	Index	Middle	Ring	Small
201	Space	e	a	n	Space	t	o	i
202	r	s	u	p	c	h	l	w
203	Period / ?	: / ;	( / <	[ / {	Comma / !	" / '	) / >	] / }
204		Back / \	@ / &	J		# / \$	_ / ^	Q
205	k			% /	v			` / ~
206								
207	Num/Arrow	ALT	CTRL	z	Num/Arrow	ALT	CTRL	x

Finger Sensor	Left Hand: second thumb sensor 200				Right Hand: second thumb sensor 200			
	Index	Middle	Ring	Small	Index	Middle	Ring	Small
201	Backspace	d	f	g	Enter	m	y	b
202	Del	Tab	Home		Ins	Esc	End	
203								
204								
205	Up	Pg Down			Left			
206	Down	Pg Up			Right			
207	Shift				Shift			

252

FIG. 6

Finger Sensor	Left Hand: first thumb sensor 198				Right Hand: first thumb sensor 198			
	Index	Middle	Ring	Small	Index	Middle	Ring	Small
201	1	2	3	4	Left	Up	Right	
202	5	6	7	8	+	-	/	*
203								
204					=			
205								
206								
207								

Finger Sensor	Left Hand: second thumb sensor 200				Right Hand: second thumb sensor 200			
	Index	Middle	Ring	Small	Index	Middle	Ring	Small
201								
202								
203								
204	9	F11						
205	0	F12						
206								
207		Num /Arrow			Function			

FIG. 7



Finger Sensor	Left Hand: first thumb sensor 198							Right Hand: first thumb sensor 198						
	Index		Middle		Ring		Small	Index		Middle		Ring		Small
	Space	shift	e	s	ctrl	a	alt	Space	shift	t	h	ctrl	o	alt
201	r					u		c					i	
202	Period		?			Comma		Period		?		Comma		w
203	q		v			j		q		v		j		i
204	@		d			f		@		m		y		k
205	:		(			)		:		(		)		b
206	Num /Arrow							Num /Arrow						x
207														z

Finger Sensor	Left Hand: second thumb sensor 200							Right Hand: second thumb sensor 200						
	Index		Middle		Ring		Small	Index		Middle		Ring		Small
	Backspace		t		o		i	Enter		e		a		n
201														
202	c		h		i		w	r		s		u		p
203														
204	Quotation		m		y		b	Quotation		d		f		g
205	Apostrophe							Apostrophe						
206	Backslash							Backslash						
207	Comb.							Comb.						

FIG. 8

Finger Sensor	Left Hand: first thumb sensor 198			
	Index	Middle	Ring	Small
201	0	1	2	3
202	4	5	6	7
203		*	#	
204				End
205	8			
206	9			
207	Send			

Finger Sensor	Left Hand: second thumb sensor 200			
	Index	Middle	Ring	Small
201	Speed Dial	Voice Mail		
202				
203				
204				
205				
206				
207				

FIG. 9

## APPARATUS AND METHOD FOR INPUTTING INFORMATION

### CROSS-REFERENCE TO RELATED APPLICATIONS

**[0001]** This is a continuation application of U.S. patent application Ser. No. 11/326,029, filed on Jan. 4, 2006, which is incorporated herein by reference in its entirety for all purposes.

### BACKGROUND OF THE INVENTION

#### **[0002]** 1. Field of Invention

**[0003]** This invention relates generally to inputting information, and more particularly to an input apparatus and method for inputting information into an electronic device.

#### **[0004]** 2. Description of Related Art

**[0005]** Recent years have seen a dramatic increase in mobile computing. Devices such as cellular telephones, audio and video devices, and many other electronic devices have become increasingly complex, while at the same time being miniaturised for mobile use. Miniaturisation causes a problem for information entry into the devices, since such devices typically have very small keys that are generally difficult to operate. Attempts to address this problem have resulted in cellular telephones being provided with voice recognition capability and computing devices being provided with handwriting recognition capabilities. However, such devices are still awkward to use and user input is slow.

**[0006]** Some manufacturers have made portable keyboards available for use with their mobile devices. However such portable keyboards generally need to be supported on a surface and may leave the user feeling cramped for space. Some users may even develop health problems such as carpal tunnel syndrome due to using such keyboards in un-ergonomic positions.

**[0007]** There remains a need for methods and apparatus for inputting of information into electronic devices.

### SUMMARY OF THE INVENTION

**[0008]** In accordance with one aspect of the invention there is provided an apparatus for inputting information. The apparatus includes a first sensor operably configured to be mounted on a user's thumb and a plurality of sensors operably configured to be mounted on the user's fingers, such that the user can move the user's thumb and/or fingers to cause contact between the first sensor and at least one of the plurality of sensors. The apparatus also includes an interface in communication with the first sensor and the plurality of sensors, the interface being operably configured to associate contact between the first sensor and sensors of the plurality of sensors with respective data items and to produce a data signal representing the data item. Frequently used data items are associated with sensors of the plurality of sensors located in positions on the user's fingers that permit ergonomically favourable conditions when causing the contact.

**[0009]** The frequently used data items may be associated with sensors of the plurality of sensors such that when the first sensor and ones of the sensors are in contact, the user's thumb and/or fingers are in ergonomically favourable positions.

**[0010]** The frequently used data items may be associated with sensors of the plurality of sensors, such that when mov-

ing the user's thumb and/or fingers to cause the contact, the user's thumb and/or fingers follow an ergonomically favourable path.

**[0011]** The frequently used data items may be associated with ones of the plurality of sensors, such that causing the contact includes a minimum of movement of the user's thumb and/or fingers when inputting a plurality of frequently used data items.

**[0012]** The interface may be operably configured to be mounted on the user's hand.

**[0013]** The apparatus may include a holder operably configured to fit over the user's thumb and fingers and the first sensor and the plurality of sensors may be disposed on the holder.

**[0014]** The interface may be mounted on the holder.

**[0015]** The holder may include a shaped covering.

**[0016]** The shaped covering may include a glove.

**[0017]** The plurality of sensors may be disposed on the holder such that at least some of the plurality of sensors are positioned on distal phalanges of the user's fingers when the holder is fitted on the user's hand, the frequently used data items being associated with ones of the plurality of sensors positioned on the distal phalanges.

**[0018]** The plurality of sensors may be disposed on the holder such that at least some of the plurality of sensors are positioned on middle phalanges of the user's ring and middle fingers when the holder is fitted on the user's hand, the frequently used data items being further associated with ones of the plurality of sensors positioned on the middle phalanges of the user's ring and middle fingers.

**[0019]** The plurality of sensors may be disposed on the holder such that at least some of the plurality of sensors are positioned on distal and middle phalanges on a side of the user's index finger when the holder is fitted on the user's hand, the frequently used data items being further associated with ones of the plurality of sensors positioned on the distal and middle phalanges on the side of the user's index finger.

**[0020]** The plurality of sensors may be disposed on the holder such that at least one of the plurality of sensors is positioned proximate a tip of a distal phalange of one of the user's fingers when the holder is fitted on the user's hand and at least one data item from the group consisting of "e", "a", "n", "t", "o", and "i" may be associated with the at least one of the plurality of sensors.

**[0021]** The plurality of sensors may be disposed on the holder such that at least one of the plurality of sensors is positioned on a palm side of the user's hand and spaced inwardly from a tip of a distal phalange when the holder is fitted on the user's hand and at least one data item from the group consisting of "s", "u", "p", "c", "h", "l", "r", and "w" may be associated with the at least one of the plurality of sensors.

**[0022]** The first sensor may be disposed on the holder such that the first sensor is positioned proximate a tip of the user's thumb when the holder is fitted on the user's hand.

**[0023]** The first sensor may be disposed on the holder such that the first sensor extends at least partway around a periphery of the tip when the holder is fitted on the user's hand.

**[0024]** The plurality of sensors may be disposed on the holder such that at least one of the plurality of sensors is positioned on a side of one of the user's fingers when the holder is fitted on the user's hand.

**[0025]** The plurality of sensors may be a first plurality of sensors, and the apparatus may further include a second plu-

rality of sensors disposed on the holder in closely spaced relation such that the second plurality of sensors are positioned along a side of one of the user's fingers when the holder is fitted on the user's hand, the interface being operably configured to produce a repeating data signal in response to successive contact between adjacent ones of the second plurality of sensors and the first sensor.

**[0026]** The repeating data signal may be a first repeating data signal associated with successive contact between adjacent ones of the second plurality of sensors and the first sensor in a first direction, and the interface may be operably configured to associate a second repeating data signal with successive contact between adjacent ones of the second plurality of sensors and the first sensor in a second direction, the second direction being opposite to the first direction.

**[0027]** The first repeating data signal and the second repeating data signal may be representative of data items that are operable to cause a display to scroll up and down respectively.

**[0028]** The apparatus may include a mode sensor operably configured to produce a mode selection signal for reception by the interface and the interface may be configured to associate data items in a set of data items with respective ones of the plurality of sensors in response to receiving the mode selection signal.

**[0029]** The set of data items may include at least one of numeric data items, alphanumeric data items, data items corresponding to function keys and data items associated with actions.

**[0030]** The set of data items may include data items that are frequently used in conjunction with at least one of a computer program, a language, and an electronic device.

**[0031]** The apparatus may include a holder operably configured to fit over the user's thumb and fingers, the first sensor and the plurality of sensors being disposed on the holder and the set of data items may include data items associated with ones of the plurality of sensors positioned on at least one of the user's left hand and the user's right hand when the holder is fitted on the user's hand.

**[0032]** The mode sensor may include one of the plurality of sensors, and the mode signal may be produced in response to contact between the first sensor and the one of the plurality of sensors.

**[0033]** The mode sensor may include at least one actuator and the mode selection signal may be produced in response to actuation of the actuator by the user.

**[0034]** The apparatus may include a second sensor operably configured to be mounted on a palm side of a user's thumb in spaced apart relation to the first sensor, the interface being in communication with the second sensor and being operably configured to associate contact between the second sensor and sensors of the plurality of sensors with respective data items and to produce a data signal representing the data items.

**[0035]** The second sensor may include a shaped conductive strip, the shape configured to facilitate ergonomically favourable conditions when causing the contact.

**[0036]** The second sensor may include first and second conductive strips arranged in a "T" shape.

**[0037]** The second sensor may include first and second conductive strips arranged in a cruciform shape.

**[0038]** The interface may be operably configured to associate data items frequently occurring in a sequence in words associated with a particular language with adjacently positioned ones of the plurality of sensors.

**[0039]** The particular language may be the English language and the data items frequently occurring in the sequence may include at least one of the sequences of items "es", "er", "th", "ed", and "ng".

**[0040]** The interface may be operably configured to associate contact between the first sensor and two adjacently positioned ones of the plurality of sensors with a data item and to produce a data signal representing the data item.

**[0041]** The data item may include at least one of a "shift" data item, a "ctrl" data item, an "alt" data item, and a data item that causes an action to be performed.

**[0042]** The interface may be operably configured to produce the data signal such that the data signal represents an ordered sequence of data items in response to contacting an assigned one of the plurality of sensors a number of times in succession, and then contacting sensors associated with the ordered sequence of data items.

**[0043]** The first sensor may include a first electrical contact point and the plurality of sensors may each include a respective electrical contact point and the first sensor and the plurality of sensors may be configured to complete an electrical circuit when the first electrical contact is in physical contact with at least one of the respective electrical contact points, and the interface may be operably configured to produce the data signal in response to sensing the completed electric circuit.

**[0044]** At least one of the plurality of sensors may include a pressure sensor in communication with the interface such that the interface produces the data signal in response to contact pressure being applied between the first sensor and the pressure sensor.

**[0045]** The interface may be operably configured to produce a signal for driving a transducer to generate one of tactile feedback and audible feedback to the user, the feedback confirming that a data-item has been sensed.

**[0046]** The apparatus may include a display in communication with the interface, the display being operably configured to display information to the user.

**[0047]** The apparatus may include a transmitter for transmitting the data signal to an electronic device.

**[0048]** The transmitter may include a radio frequency transmitter operable to transmit a radio frequency signal representing the data signal.

**[0049]** In accordance with another aspect of the invention there is provided an electronic device operably configured to receive the data signal from the above apparatus.

**[0050]** The electronic device may include one of a cellular telephone, a computing device, a vehicle mounted device, an audio device, and a video device.

**[0051]** In accordance with another aspect of the invention there is provided an apparatus for inputting information. The apparatus includes a first sensor operably configured to be mounted on a user's thumb and a plurality of sensors operably configured to be mounted on the user's fingers such that the user can move the user's thumb and/or fingers to cause contact between the first sensor and at least one of the plurality of sensors. The apparatus also includes provisions for associating contact between the first sensor and the plurality of sensors with respective data items such that frequently used data items are associated with sensors of the plurality of sensors located in positions on the user's fingers that permit ergonomically favourable conditions when causing the contact. The apparatus further includes provisions for producing a data signal representing the data item.

**[0052]** The apparatus may further include provisions for mounting the provisions for producing the data signal on the user's hand.

**[0053]** The apparatus may include provisions for mounting the first sensor and the plurality of sensors on the user's hand, the provisions being configured to fit over the user's thumb and fingers.

**[0054]** The apparatus may include provisions for producing a mode selection signal and the provisions for associating may include provisions for associating data items in a set of data items with respective ones of the plurality of sensors in response to receiving the mode selection signal.

**[0055]** The apparatus may include a second sensor operably configured to be mounted on a palm side of a user's thumb in spaced apart relation to the first sensor and the provisions for associating may be operably configured to associate contact between the second sensor and the plurality of sensors with respective data items.

**[0056]** The first sensor may include a first electrical contact point and the plurality of sensors may each include a respective electrical contact point and the first sensor and the plurality of sensors may be configured to complete an electrical circuit when the first electrical contact is in physical contact with at least one of the respective electrical contact points, and the provisions for producing the data signal are operably configured to produce the data signal in response to sensing the completed electric circuit.

**[0057]** The apparatus may include provisions for producing a signal for driving a transducer to generate one of tactile feedback and audible feedback to the user, the feedback confirming that a data-item has been sensed.

**[0058]** The apparatus may include provisions for transmitting the data signal to an electronic device.

**[0059]** The provisions for transmitting may include provisions for transmitting a radio frequency signal representing the data signal.

**[0060]** In accordance with another aspect of the invention there is provided in a system including a first sensor operably configured to be mounted on a user's thumb and a plurality of sensors operably configured to be mounted on the user's fingers such that the user can move the user's thumb and/or fingers to cause contact between the first sensor and at least one of the plurality of sensors, a method of producing a signal representing contact between the first sensor and at least one of the plurality of sensors. The method involves associating contact between the first sensor and the plurality of sensors with respective data items such that frequently used data items are associated with sensors of the plurality of sensors located in positions on the user's fingers that permit ergonomically favourable conditions when causing the contact. The method further involves producing a data signal representing the data item.

**[0061]** The method may involve producing a mode selection signal and associating may involve associating data items in a set of data items with respective ones of the plurality of sensors in response to receiving the mode selection signal.

**[0062]** Producing the data signal may involve transmitting a radio frequency signal representing the data signal.

**[0063]** Other aspects and features of the present invention will become apparent to those ordinarily skilled in the art

upon review of the following description of specific embodiments of the invention in conjunction with the accompanying figures.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0064]** In drawings which illustrate embodiments of the invention,

**[0065]** FIG. 1 is a perspective view of an apparatus for inputting information according to a first embodiment of the invention;

**[0066]** FIG. 2 is a schematic diagram of an embodiment of an interface shown in FIG. 1;

**[0067]** FIG. 3 is a perspective view of a housing for the interface shown in FIG. 2;

**[0068]** FIG. 4 is a perspective view of an apparatus for inputting information according to a second embodiment of the invention;

**[0069]** FIG. 5 is a perspective view of an apparatus for inputting information according to a third embodiment of the invention.

**[0070]** FIG. 6 is a table of associations between data items and sensors shown in FIG. 4;

**[0071]** FIG. 7 is a table of associations between data items and sensors shown in FIG. 4, in accordance with an alternate embodiment;

**[0072]** FIG. 8 is a table of associations between data items and sensors shown in FIG. 4, in accordance with an alternate embodiment; and

**[0073]** FIG. 9 is a table of associations between data items and sensors shown in FIG. 4, in accordance with an alternate embodiment.

## DETAILED DESCRIPTION

**[0074]** Referring to FIG. 1, an apparatus for inputting information according to a first embodiment of the invention is shown generally at **100**. The apparatus **100** includes a first sensor **102** which is operably configured to be mounted on a user's thumb **104** and a plurality of sensors **106** operably configured to be mounted on the user's fingers **108**, such that the user can move the user's thumb and/or fingers to cause contact between the first sensor and at least one of the plurality of sensors. The apparatus **100** also includes an interface **110** in communication with the first sensor **102** and the plurality of sensors **106**. The interface **110** is operably configured to associate contact between the first sensor **102** and sensors of the plurality of sensors **106** with respective data items. The interface **110** further includes an output **112** for producing a data signal representing the data item, such that frequently used data items are associated with sensors of the plurality of sensors **106** located in positions on the user's fingers that permit ergonomically favourable conditions when causing the contact.

**[0075]** The data item may include a numeric, punctuation, or alphanumeric data character, or a code corresponding to a function key (the keys F1-F12 provided on an extended computer keyboard are one example of a function key). The data item may also include symbols (e.g. "@", "#", and "\$") or may cause some action to occur such as an "Enter" key on a computer, or a "send" key on a cellular telephone, for example. The data signal representing the data item may be encoded with a code that is received and interpreted by an associated device, which then performs some action in response to receiving the code.

[0076] Referring to FIG. 2, an embodiment of the interface 110 is shown at 120. The interface 120 includes an encoder 121, which includes a plurality of inputs 122, each one of the inputs corresponding to one of the plurality of sensors 106 on the user's fingers 108. The encoder 121 also includes at least one input 124, for receiving signals from the sensor 102 positioned on the user's thumb 104. In some embodiments a second sensor (not shown in FIG. 1) may be positioned on the user's thumb, in which case the input 124 would also include a second input for receiving signals from the second sensor. The encoder 121 also includes an input 125 for receiving configuration commands and data for configuring the encoder.

[0077] Referring back to FIG. 1, in one embodiment the sensors 106 and 104 each include conductive electrical contact points, each connected to a respective one of the inputs 122 and 124 by a plurality of conductors 114.

[0078] Referring again to FIG. 2, the encoder 121 produces a signal at the output 123, in response to sensing a completed electrical circuit between one of the sensors 106 and the first sensor 102 when the sensors are brought into physical contact by the user. The signal at the output 123 includes a code that uniquely identifies which one of the sensors 106 was contacted by the sensor 102.

[0079] In one embodiment the interface 120 includes a transducer 131 and the encoder 121 includes an output 133 for producing a signal in response to each sensing of contact between one of the sensors 106 and the sensor 102. The signal at the output 133 is in communication with the transducer 131 for providing audible or tactile feedback to the user. For example, the transducer 131 may produce a "beep" or "click" sound. Alternatively, the transducer may be positioned in close proximity to the user's hand and may produce a vibration or other disturbance that can be felt by the user. The audible or tactile feedback serves to confirm to the user that a data-item has been sensed.

[0080] The interface 120 further includes a map 126, which has an input 128 for receiving the signal from the output 123 of the encoder 121, and an output 130 for producing the data signal. The map 126 also includes an input 132 for receiving a mode selection signal, and an input 134 for receiving configuration commands and data for configuring the map. The map further includes a memory 127, such as a non-volatile flash memory device, for storing one or more association tables 129. The map 126 is operable to associate contact between the first sensor 102 and sensors 106 with data items in accordance with the association table 129 in the memory 127, and to produce the data signal representing the data item.

[0081] The interface 120 further includes a wireless transceiver 140, which has an input 142 for receiving the data signal from the output 130 of the map 126. The wireless transceiver 140 also includes an antenna 144, for producing a radio frequency signal representing the data signal and for receiving radio frequency signals representing configuration data and commands from a device 150. The wireless transceiver 140 further includes an output 148 for providing configuration commands and data to the input 134 of the map 126, and an output 146 for providing configuration commands and data to the input 125 of the encoder 121.

[0082] The wireless transmitter 140 may optionally include an output 145 which is in communication with a display 149 such as a liquid crystal display device (LCD) for displaying information to the user.

[0083] The interface 120 is in wireless communication with the device 150. The device 150 may be an electronic device including, but not limited to, a cellular telephone, a handheld computing device such as a Personal Digital Assistant (PDA), a laptop or desktop computer, a vehicle mounted device such as a car stereo, an audio device such as an MP3 player, and a video device such as a DVD player. The device 150 includes a wireless transceiver 152, which includes an antenna 154 for receiving the radio frequency signal representing the data signal from the wireless transceiver 140, and for transmitting the radio frequency signals representing configuration data and commands to the wireless transceiver 140. The device 150 further includes an input interface 153 in communication with the wireless transceiver 152 for receiving the data signal from the wireless transceiver. In one embodiment the input interface 153 may include a keyboard port or a universal serial bus (USB) port.

[0084] In other embodiments, communication between the device 150 and the interface 120 may not involve configuration data and commands being sent to the apparatus by the device, in which case the interface 120 may include a wireless transmitter, instead of the wireless transceiver 140, and the device 150 may include a wireless receiver, instead of the wireless transceiver 152.

[0085] In one embodiment the wireless transceivers 140 and 152 are implemented as Bluetooth® wireless devices. Alternatively the wireless transceivers 140 and 152 may be implemented as Universal Serial Bus (USB) wireless transceivers, which use ultra wide band communications to reduce power consumption of wireless devices. In other embodiments the wireless transceivers 140 and 152 may be eliminated and replaced by a wired connection to the device 150, such as a Universal Serial Bus (USB) cable and USB interface.

[0086] In other embodiments the device 150 may include an infrared port for receiving user input from an infrared transmitter and the wireless transceivers 140 and 152 may be implemented as infrared devices, which communicate by transmitting and receiving encoded infrared light signals.

[0087] Referring to FIG. 3, in one embodiment the interface 120 is mounted in a housing 160, which further includes a battery compartment 164, for receiving a battery (not shown) that provides power to the encoder 121, the map 126, and the wireless transceiver 140. In this embodiment the housing 160, and the sensors 102 and 106 are mounted on a shaped covering such as a glove 162 shown generally at 162, such that when the glove is worn by the user, the housing is positioned on the back of the user's hand and the sensors are located in ergonomically favourable positions on the user's thumb 104 and fingers 108. Optionally, the glove 162 may also include the display 149, mounted on the glove such that when the glove is fitted on the user's hand, the display is positioned on the back of the hand. The glove 162 may be fabricated from a material that is breathable and stretchable, for example. The material may also be transparent or semi-transparent or may be a meshed fabric to make it lighter. The glove 162 also includes the conductors 114 connecting the sensors 102 and 106 to the interface 120. The conductors 114 may include flexible conductive traces that may be routed inside or outside the glove 162. Alternatively, the housing 160 and sensors 102 and 106 may be mounted on any other shaped covering that is adapted to fit on the user's hand.

[0088] In another embodiment the housing 160 may include a charging port (not shown) for receiving electrical

energy supplied externally to the housing and for providing energy to recharge the battery.

[0089] The operation of the interface 120 is described in reference to FIGS. 1 and 2. Referring to FIG. 1, desired data items to be input are selected by the user by contact between the sensor 102 on the thumb 104 and one of the sensors 106 on the fingers. This completes an electric circuit between one of the inputs 122 and one of the inputs 124 on the encoder 121. The encoder 121 activates each of the inputs 122 and senses when a particular circuit is completed, which indicates that a particular one of the sensors 106 has been activated. The encoder 121 then produces the signal encoded with a code representing the selected one of the sensors 106 at the output 123.

[0090] When the user completes a circuit between one of the sensors 106 and the sensor 102, there is usually a small amount of vibration between the surfaces which results in the circuit being repeatedly completed, and then disconnected in a short time. This fluctuation is known as “bounce” and the encoder 121 includes a filter (not shown) that de-bounces the circuit, such that the contacting is treated as a single data item. The device 150 may optionally produce configuration commands and data for configuring the filter, which are transmitted by the transceiver 152 to the transceiver 140 and received at the input 125. Other configuration commands and data may also be received at the input 125 of the encoder 121, for example, configuration data corresponding to common keyboard configuration parameters such as typematic repeat rate etc.

[0091] The signal produced by the encoder 121 at the output 123 uniquely identifies one of the sensors 106, which has been selected, but does not necessarily associate the sensor with a particular data item. In this embodiment the association is performed by the map 126 which receives the signal from the output 123 of the encoder 121 at the input 128. The signal produced at the output 123 is encoded with data indicating which of the sensors 106 has been contacted. The map 126 looks up an associated data item corresponding to the sensor, in the association table 129 stored in the memory 127. Advantageously, by not permanently associating certain sensors with specific data items, the sensors may be re-configured for different applications or devices.

[0092] The association table 129 in the map 126 is configured when a configuration command signal is received at the input 134, followed by data signals representing data items that are to be associated with particular sensors 106. The data signals are received at the input 134 of the map 126 and the association data is stored in the association table 129 in the memory 127. In this embodiment, the memory 127 is large enough to store a plurality of association tables 129, and the map 126 is responsive to the mode selection signal at the input 132 to select one of the plurality of association tables 129 to be active. One of the sensors 106 may be configured to cause the mode selection signal to be generated when contacted by the first sensor 102. Alternatively, the apparatus may include a mode selection actuator switch 168, shown in FIG. 3 in communication with the map 126, which may be activated by the user to cause the map to select an association table or mode.

[0093] In another embodiment the mode selection signal is generated by activating one of a plurality of mode selector switches (not shown), each of the plurality of mode selector switches corresponding to one of the plurality of association tables 129. Advantageously, the mode selection signal allows

the user to conveniently switch between different modes, which are suitable for particular electronic devices, specific activities, or specific software programs running on an electronic device.

[0094] The map 126 produces a data signal at the output 130, which is received at the input 142 by the wireless transceiver 140. The wireless transceiver produces a radio frequency signal representing the data signal at the antenna 144. The radio frequency signal is received at the antenna 154 of the transceiver 152, and the data signal is recovered from the radio frequency signal, and sent to the input interface 153.

[0095] The display 149, when included, may be configured to display information received from the device 150 via the wireless link. The display 149 may simply echo data items or may display other information provided by the device 150.

[0096] Referring to FIG. 4, in a second embodiment of the invention, both the user's left hand 180 and the user's right hand 182 are used to input information. In this embodiment a first glove 184 is adapted to fit the user's left hand 180 and a second glove 186 is adapted to fit the user's right hand 182. The gloves 184 and 186 include shaped coverings that conform to the user's index fingers 188, middle fingers 190, ring fingers 192, and small fingers 194. The gloves 184 and 186 further include shaped coverings that conform to the user's thumbs 196, for each of the gloves respectively.

[0097] Each glove 184 and 186 includes a first sensor 198 mounted on the gloves such that when fitted on the user's hands, the first sensor will be positioned on a tip of the user's thumbs 196 respectively. Similarly, a second sensor 200 is positioned spaced inwardly from the tip of the user's thumbs 196 respectively.

[0098] Each glove 184 and 186 further includes a plurality of finger sensors 210 mounted on the gloves such that when fitted on the user's hands, the sensors will be positioned on the user's fingers 188-194. The plurality of finger sensors 210 includes finger sensors 201-207. For sake of clarity the finger sensors, thumb sensors, user's fingers, and the phalanges of the user's fingers are commonly numbered for each finger on the user's hands 180 and 182.

[0099] The plurality of finger sensors 210 includes a sensor 201 positioned on the gloves 184 and 186 to be adjacent to a tip of a distal phalange 212, a sensor 202 positioned on the gloves to be spaced inwardly from the tip of the user's distal phalange, a sensor 203 positioned on the gloves to be on a middle phalange 214, and a sensor 204 positioned on the gloves to be on a proximate phalange 216, all on a palm side of the user's hands 180 and 182, respectively. The plurality of finger sensors 210 further includes a sensor 205 positioned on the gloves 184 and 186 to be on a side of the distal phalange 212, a sensor 206 positioned on the gloves to be on a side of the middle phalange 214, and a sensor 207 positioned on the gloves to be on a side of the proximate phalange 216, of the user's hands 180 and 182, respectively.

[0100] In this embodiment the plurality of finger sensors 210 include conductive electrical contact points. The first sensors 198 each include a conductive strip and when the gloves 184 and 186 are fitted on the user's hands the conductive strips extend partway around a periphery of the tip of the user's thumbs 196 respectively. The second sensor 200 includes a conductive area shaped in the form of a cross. Alternatively, the second sensor 200 may be shaped in the form of a “T”. Advantageously the shaped first and second sensors 198 and 200 facilitate ergonomically favourable conditions when contacting the plurality of sensors 201-207 with the first and

second sensors. Each of the sensors **201-207** is connected to one of the inputs **122** of the encoder **121**, shown in FIG. 2. The first and second sensors **198** and **200** are each connected to one of the inputs **124** of the encoder **121**. In this embodiment each of the gloves **184** and **186** include an interface housing **220** mounted on the gloves such that when the glove is worn by the user, the housing is positioned on the back of the user's hand as shown in FIG. 3.

[0101] The sensor **201** and the sensor **202**, on each of the user's fingers **188-194** are positioned such that movement of the user's thumbs **196** and/or fingers to bring the first sensor **198** into contact with the sensors **201** and **202** is easily accomplished without discomfort to the user. Accordingly the map **126** is configured such that the most frequently used data items are associated with contact between the first sensor **198** and the sensors **201** and **202** on each of the user's fingers thus permitting ergonomically favourable conditions when the sensors are in contact and when moving the user's thumb and/or fingers to perform the contact between the sensors.

[0102] Similarly, the sensor **201**, on each of the user's fingers is ergonomically favourably positioned for contacting by the second sensor **200**. Accordingly the map **126** is configured such that further frequently used data items are associated with contact between the second sensor **200** and the sensor **201** on each of the user's fingers. Each of the plurality of sensors **210** may thus be associated with two different data items, depending on whether they are contacted by the first sensor **198** or the second sensor **200**.

[0103] The sensor **205**, on the side of the user's index fingers **188** and small fingers **194** are also somewhat ergonomically favourably positioned for contacting by the first sensor **198**. Accordingly the map **126** is configured such that some frequently used data items are associated with contact between the first sensor **198** and the sensor **205** on the side of the user's index fingers **188** and small fingers **194**.

[0104] Some of the plurality of sensors **210** may be very difficult to contact with either the first sensor **198** and/or the second sensor **200**. For example most users will find contacting the second sensor **200** with any of the sensors **203** and **204**, to be quite uncomfortable and therefore these sensors are not considered to be ergonomically favourable positioned, and thus may only be used for infrequently used data items, or not used at all.

[0105] Advantageously, in associating sensors in ergonomically favourable positions with frequently used data items, hand movement is kept to a minimum when inputting information, thus reducing user fatigue and enabling the user to input information at a higher rate.

[0106] In other embodiments, other types of sensors may be used, such as pressure sensitive sensors, touch sensors, thermal or capacitive sensors etc.

[0107] Referring to FIG. 5, a third embodiment of the invention is shown generally at **301**. In this embodiment, the user's right hand **182** or left hand (only a right hand is shown in FIG. 5), is used to mimic the operation of a wheel on a wheel mouse or other similar input device. The user's hand **182** is covered by a glove **300**, which includes a first plurality of sensors including sensors **302** mounted on the palm side of the glove, and sensors **307** mounted on the glove such that when the glove is worn on the user's hand, the sensors **307** are disposed on the sides of the user's fingers. The glove **300** also includes a first sensor **304**. The sensors **302**, **307** and **304** operate in a similar fashion as the plurality of sensors **210**, and the first sensor **198**, described above in reference to FIG. 4.

[0108] The glove **300** further includes a second plurality of sensors **306** mounted on a side of the glove such that when the glove is worn by the user the sensors will be disposed on the user's index finger **308**, positioned in-between the sensors **307**. The plurality of sensors **306** are positioned in closely spaced relation and each sensor includes a conductive electrical contact point, which is in communication with one of the inputs **122** of the encoder **121** shown in FIG. 2. In this embodiment an area of each sensor **306** is smaller than an area of the sensors **307**.

[0109] In this embodiment the second plurality of sensors **306** is used to implement functionality similar to the wheel on the wheel mouse, by sliding the first sensor **304** down the side of the user's index finger **308**, thus successively contacting adjacent ones of the second plurality of sensors **306** with the first sensor. The encoder **121** and map **126** are configured to produce a repeating data signal in response to each successive contact. The encoder **121** is configured to ignore contact of the sensors **307** on the user's index finger **308**, when successive contacting of adjacent ones in the second plurality of sensors **306** is detected.

[0110] Alternatively the encoder **121** may be configured to produce a first repeating data signal when contacted by the first sensor **304** in a first direction, and a second repeating signal when contacted by the first sensor in a second direction, opposite to the first direction. The first and second repeating data signals provide signals that mimic the operation of the wheel on the wheel mouse. Such a repeating data signal may be used to cause a display, in an associated device to scroll up and down or to select an item from a list of items.

[0111] Referring to FIG. 5, in one embodiment the glove **300** may be marked with symbols or letters **320** indicating specific associations between the sensors **302** and data items. Advantageously, the symbols or letters may be applied to a transparent covering **322**, such as a vinyl or latex glove, which can be pulled over the glove **300** such that a user can temporarily have access to a visual association between sensors and data items while learning how to use the apparatus **301**. In embodiments where the first sensor and the plurality of sensors include electrical contact points, the transparent covering would require correspondingly positioned holes to provide access to the contacts.

[0112] The following describes modes of operation of the apparatus, which may be activated by changing the mode select signal provided to the input **132** of the map **126** shown in FIG. 2.

#### Two Handed Input Mode

[0113] An embodiment for inputting information into an associated device using both of the user's hands **180** and **182** is described with reference to FIG. 4 and FIG. 6. Referring to FIG. 6, one possible association of data items with finger sensors **201-207**, for contact with the first sensors **198** is shown in the table at **250**. For example, contacting between the first sensor **198** on the thumb **196** of the left hand, and the finger sensor **201** on the ring finger, produces a data item "a". Contacting between the first sensor **198** on the thumb **196** of the right hand, and the finger sensor **202** on the index finger, produces a data item "c". Similarly, one possible association of data items with finger sensors **201-207**, for contact with the second sensors **200** is shown in the table at **252**.

[0114] Advantageously, for the association shown in FIG. 6 and when inputting text characters in the English language, approximately 57% of the text characters commonly include



the data items “space”, “e”, “a”, “n”, “t”, “o”, and “i”, and are thus associated with contacting between the first sensors **198** and the finger sensors **201** adjacent the finger tips. Approximately 25% of the text characters commonly include the data items “r”, “s”, “u”, “p”, “c”, “h”, “l”, “r”, and “w”, which are thus associated with contacting between the first sensor **198** and the finger sensors **202** positioned spaced inwardly from the finger tip. A further 10% of the text characters commonly include the data items “Backspace”, “d”, “f”, “g”, “Enter”, “m”, “y”, and “b”, which are associated with contacting between the second sensors **200** and the finger sensors **201** adjacent the finger tips. A further 1% of text characters commonly include the data items “k” and “v”, which are associated with contacting between the first sensors **198** and certain ones of the finger sensors **205** positioned adjacent the sides of the user’s finger tips.

[0115] Consequently, in this embodiment approximately 93% of data items may be input by contacting either the first sensor **198** or the second sensor **200** with one of sensors **201**, **202**, and **205**, which are ergonomically favourably positioned on the distal phalanges of the user’s fingers. Other less frequently used data items may be associated with less ergonomically positioned sensors. In general, the ergonomics of contacting any of the plurality of sensors **210** and the first or second sensors **198** and **200** may vary slightly between users. For example a user who plays an instrument such as a guitar, which conditions the fingers to awkward movements, may find some less ergonomic sensors of the plurality of sensors **210** to be easily contactable, while a person with mild arthritis may find the same sensor impossible to contact.

[0116] Further, by contacting the second sensor **200** and the finger sensor **207**, the apparatus may be placed in a “shifted” mode, whereby uppercase characters and alternate characters may be accessed (e.g. the sensor **203**, on the left hand “Period/?” causes the interface **110** to produce a period when in the un-shifted mode, and to produce a “?” when in the shifted mode).

[0117] Advantageously with the association shown in FIG. 6, data items frequently occurring in sequence in words associated with a particular language may be associated with adjacently positioned sensors. For example, “e” and “s” are associated with sensors **201** and **202** on the middle finger of the left hand. Similarly, “e” and “r” are associated with sensor **201** on the middle finger and sensor **202** on the index finger of the left hand respectively. Further “t” and “h” are associated with sensors **201** and **202** on the middle finger of the right hand. The data items “n” and “g” are both associated with the sensor **201** on the small finger of the right hand, and are selected by first contacting the sensor **201** with the first sensor **198** and then the second sensor **200**. The data items “e” and “d” are both associated with the sensor **201** on the middle finger of the right hand, and are selected by first contacting the sensor **201** with the first sensor **198** and then the second sensor **200**. Advantageously, these and other frequently used sequences of data items may be inputted in a single sliding movement between the above identified adjacently positioned sensors.

#### Numeric Input Mode

[0118] An embodiment for inputting numeric information is described with reference to FIG. 4 and FIG. 7. In this embodiment numeric information is input using the user’s left hand **180** for numbers 1-9, and the user’s right hand for other data items usually located on a numeric keypad. The numeric

input mode may be activated from the two handed input mode described above, by contacting the first sensor **198** and the finger sensor **207** on the user’s left hand index finger.

[0119] In the numeric input mode, contacting the second sensor **200** and the finger sensor **207** on the user’s right hand index finger activates a function key mode, in which each number key becomes a corresponding function key (i.e. “1” becomes “F1”, “5” becomes “F5” etc), except for “F11” and “F12”, which are associated as shown in FIG. 7.

[0120] Contacting the second sensor **200** and the finger sensor **207** on the user’s left hand middle finger returns the user to the mode described in the two handed input mode embodiment above.

#### Single Handed Input Mode

[0121] An embodiment for single handed input is described with reference to FIG. 4 and FIG. 8, and illustrates a mode for inputting information into an associated device using only one of the user’s left hand **180** and the user’s right hand. In FIG. 8, associations for each of the user’s left and right hands are shown, although it should be understood that the user will choose one or the other, in accordance with the user’s preference.

[0122] In the single handed mode, not all characters usually found on a keyboard are made available. The single handed mode may be particularly useful for inputting information into an associated device which is customized for messaging applications such as email.

[0123] The single handed mode may provide access to a numeric entry mode, such as that shown in FIG. 7, which is activated by contacting the first sensor **198** and the finger sensor **207** on the index finger.

[0124] In this embodiment, the “shifted” mode may be accessed by contacting between the first sensor **198** and two of the sensors **210** on adjacent fingers simultaneously. For example, the sensors **201** on the index and middle fingers **188** and **190** may be associated with placing the apparatus in the shifted mode. Other data items such as the control key and the alt key may be associated with other sensors located on adjacent fingers, e.g. the sensors **201** on the middle and ring fingers **190** and **192**, and the sensors **201** on the ring and small fingers **192** and **194**.

[0125] Some data items require inputting three key combinations in an ordered sequence e.g. “ctrl-alt-del”, which may be difficult to input using a single hand (or even with two hands). In this embodiment, the encoder **121** is configured to receive ordered sequences in response to contacting the sensor **207** on the index finger **188** three times in quick succession with the second sensor **200**. The map **126** includes entries corresponding to valid combinations of data items and the map produces a data signal corresponding to the desired combination for the following three data items that are input by the user.

#### Dial Mode

[0126] An embodiment for inputting dialing information into an associated device, such as a cellular telephone is described with reference to FIG. 4 and FIG. 9. In this embodiment the user’s left hand **180** is used for input, although either hand could be used. The dial mode is similar to the numeric input mode embodiment above, but has additional data items such as “send” and “end”, commonly found on cellular telephones, associated with index finger sensor **207** and small

finger sensor **204**. Other data items may be associated with finger sensors **201** on the index finger and middle fingers respectively of the left hand, which are operable to activate speed dial and voice mail modes of operation of the cellular telephone.

**[0127]** While specific embodiments of the invention have been described and illustrated, such embodiments should be considered illustrative of the invention only and not as limiting the invention as construed in accordance with the accompanying claims.

What is claimed is:

**1.** An apparatus for inputting information, the apparatus comprising:

a first sensor operably configured to be mounted on a user's thumb;

a plurality of sensors operably configured to be mounted on the user's fingers, such that the user can move the user's thumb and/or fingers to cause contact between said first sensor and at least one of said plurality of sensors; and  
an interface in communication with said first sensor and said plurality of sensors, said interface being operably configured to associate contact between said first sensor and sensors of said plurality of sensors with respective data items and to produce a data signal representing said data item, such that frequently used data items are associated with sensors of said plurality of sensors located in positions on the user's fingers that permit ergonomically favorable conditions when causing said contact.

**2.** The apparatus of claim **1** further comprising a holder operably configured to fit over the user's thumb and fingers and wherein said first sensor and said plurality of sensors are disposed on said holder.

**3.** The apparatus of claim **2** wherein said holder comprises a shaped covering and wherein said shaped covering comprises a glove.

**4.** The apparatus of claim **2** wherein said plurality of sensors are disposed on said holder such that at least some of said plurality of sensors are positioned on distal phalanges of the user's fingers when said holder is fitted on the user's hand, said frequently used data items being associated with ones of said plurality of sensors positioned on said distal phalanges.

**5.** The apparatus of claim **4** wherein said plurality of sensors are disposed on said holder such that at least some of said plurality of sensors are positioned on middle phalanges of the user's ring and middle fingers when said holder is fitted on the user's hand, said frequently used data items being further associated with ones of said plurality of sensors positioned on said middle phalanges of the user's ring and middle fingers.

**6.** The apparatus of claim **5** wherein said plurality of sensors are disposed on said holder such that at least some of said plurality of sensors are positioned on distal and middle phalanges on a side of the user's index finger when said holder is fitted on the user's hand, said frequently used data items being further associated with ones of said plurality of sensors positioned on said distal and middle phalanges on said side of the user's index finger.

**7.** The apparatus of claim **2** wherein said plurality of sensors are disposed on said holder such that at least one of said plurality of sensors is positioned proximate a tip of a distal phalange of one of the user's fingers when said holder is fitted on the user's hand and wherein at least one data item from the group consisting of "e", "a", "n", "t", "o", and "i" is associated with said at least one of said plurality of sensors.

**8.** The apparatus of claim **2** wherein said plurality of sensors are disposed on said holder such that at least one of said plurality of sensors is positioned on a palm side of the user's hand and spaced inwardly from a tip of a distal phalange when said holder is fitted on the user's hand and wherein at least one data item from the group consisting of "s", "u", "p", "c", "h", "l", "r", and "w" is associated with said at least one of said plurality of sensors.

**9.** The apparatus of claim **2** wherein said first sensor is disposed on said holder such that said first sensor is positioned proximate a tip of the user's thumb when said holder is fitted on the user's hand.

**10.** The apparatus of claim **2** wherein said plurality of sensors are disposed on said holder such that at least one of said plurality of sensors is positioned on a side of one of the user's fingers when said holder is fitted on the user's hand.

**11.** The apparatus of claim **2** wherein said plurality of sensors comprises a first plurality of sensors, and further comprising a second plurality of sensors disposed on said holder in closely spaced relation such that said second plurality of sensors are positioned along a side of one of the user's fingers when said holder is fitted on the user's hand, said interface being operably configured to produce a repeating data signal in response to successive contact between adjacent ones of said second plurality of sensors and said first sensor.

**12.** The apparatus of claim **1** further comprising a mode sensor operably configured to produce a mode selection signal for reception by said interface and wherein said interface is configured to associate data items in a set of data items with respective ones of said plurality of sensors in response to receiving said mode selection signal.

**13.** The apparatus of claim **1** further comprising a second sensor operably configured to be mounted on a palm side of a user's thumb in spaced apart relation to said first sensor, said interface being in communication with said second sensor and being operably configured to associate contact between said second sensor and sensors of said plurality of sensors with respective data items and to produce a data signal representing said data items.

**14.** The apparatus of claim **1** wherein said interface is operably configured to associate data items frequently occurring in a sequence in words associated with a particular language with adjacently positioned ones of said plurality of sensors.

**15.** The apparatus of claim **14** wherein said particular language comprises the English language and wherein said data items frequently occurring in said sequence comprise at least one of the sequences of items "es", "er", "th", "ed", and "ng".

**16.** The apparatus of claim **1** wherein said interface is operably configured to associate contact between said first sensor and two adjacently positioned ones of said plurality of sensors with a data item and to produce a data signal representing said data item.

**17.** The apparatus of claim **16** wherein said data item comprises at least one of a "shift" data item, a "ctrl" data item, an "alt" data item, and a data item that causes an action to be performed.

**18.** The apparatus of claim **1** wherein said interface is operably configured to produce said data signal such that said data signal represents an ordered sequence of data items in response to contacting an assigned one of said plurality of sensors a number of times in succession, and then contacting sensors associated with said ordered sequence of data items.

19. The apparatus of claim 1 wherein said interface is operably configured to produce a signal for driving a transducer to generate one of tactile feedback and audible feedback to the user, said feedback confirming that a data-item has been sensed.

20. The apparatus of claim 1 further comprising a display in communication with said interface, said display being operably configured to display information to the user.

21. The apparatus of claim 1 further comprising a transmitter for transmitting said data signal to an electronic device.

22. An apparatus for inputting information, the apparatus comprising:

a first sensor operably configured to be mounted on a user's thumb;

a plurality of sensors operably configured to be mounted on the user's fingers such that the user can move the user's thumb and/or fingers to cause contact between said first sensor and at least one of said plurality of sensors;

means for associating contact between said first sensor and said plurality of sensors with respective data items such that frequently used data items are associated with sen-

sors of said plurality of sensors located in positions on said user's fingers that permit ergonomically favorable conditions when causing said contact; and  
means for producing a data signal representing said data item.

23. In a system comprising a first sensor operably configured to be mounted on a user's thumb and a plurality of sensors operably configured to be mounted on the user's fingers such that the user can move the user's thumb and/or fingers to cause contact between said first sensor and at least one of said plurality of sensors, a method of producing a signal representing contact between said first sensor and at least one of said plurality of sensors, the method comprising:

associating contact between said first sensor and said plurality of sensors with respective data items such that frequently used data items are associated with sensors of said plurality of sensors located in positions on said user's fingers that permit ergonomically favorable conditions when causing said contact; and

producing a data signal representing said data item.

\* \* \* \* \*