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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
18 November 2021 (18.11.2021)

WIPO | PCT

(10) International Publication Number
WO 2021/231281 A1

(51) International Patent Classification:
G06F 3/042 (2006.01)

(21) International Application Number:
PCT/US2021/031545

(22) International Filing Date:
10 May 2021 (10.05.2021)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
63/022,532 10 May 2020 (10.05.2020) US
63/055,984 24 July 2020 (24.07.2020) US

(71) Applicant: **CENTRAL TECHNOLOGY, INC.** [US/US]; 188 N. Avon Avenue, Suite 101, Avon, IN 46123 (US).

(72) Inventor: **CZAPLA, Kenneth**; 5329 Abbington Avenue, Plainfield, IN 46168 (US).

(74) Agent: **YATES, Jonathan, F.**; Brannon Sowers & Cracraft PC, 47 South Meridian St., Suite 400, Indianapolis, IN 46204 (US).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, IT, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report (Art. 21(3))*

(54) Title: DEVICES AND SYSTEMS FOR TOUCHLESS INFORMATION INPUT

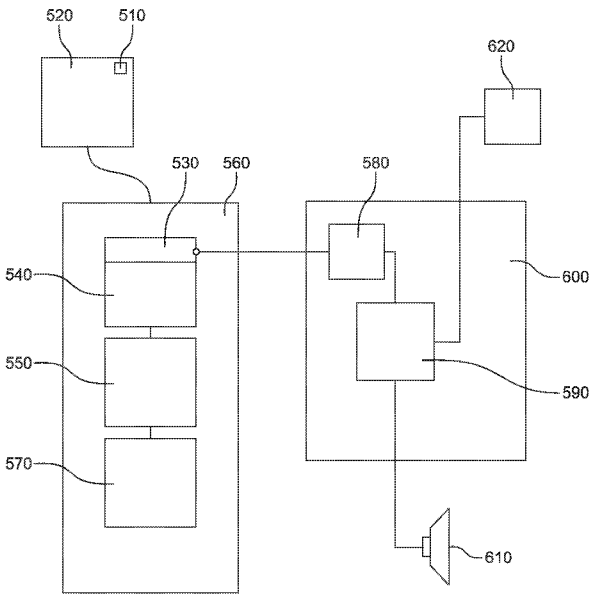

FIG. 21

(57) Abstract: Devices and systems for inputting information using touchscreen point of sale (POS) systems without having to physically touch the screen are disclosed. An IR-frame overlay detects when a user's finger or other object breaks the plane of the frame and displays an image on the screen to indicate which part of the touchscreen is currently being chosen. A signal is transmitted to the POS device which then performs the action associated with the portion of the touchscreen chosen by the user as if the screen had been touched at that location. In a related aspect, operating a POS system includes disabling a touchscreen of a display, and associating a user interaction signal from a touchless input device with one of a plurality of functional graphics of a graphical user interface displayed on the display. The POS system is caused to perform a predetermined function responsive to the user input.

WO 2021/231281 A1

DEVICES AND SYSTEMS FOR TOUCHLESS INFORMATION INPUT

Technical Field

[0001] The present disclosure relates generally to information input devices and, more particularly, to devices and systems allowing for the touchless input of information.

Background

[0002] Self-service point of sale (POS) systems have become increasingly common at many retail locations, grocery stores, fast food restaurants, gas stations, libraries, and similar settings. The use of such devices has several advantages such as allowing for more checkouts in a given amount of floor space, having to staff fewer workers at checkouts for a given number of customers, and preventing over- or understaffing of checkout locations as customer volume fluctuates during the day. Most self-service POS systems include one or more touchscreens allowing a customer to input information such as payment options, account and/or credentialing information, selection of items to purchase, information about items to purchased, and the like. Such systems in retail settings also generally include one or more scanning devices for collecting information concerning the items being purchased. Many full-service restaurants use similar systems which allow servers to input orders which are transmitted to kitchen staff as well as to complete sales transactions using a customer's credit or debit card, for instance.

[0003] One drawback of such systems is the touchscreen itself. These screens are touched by potentially hundreds of customers or other users each day. Pathogens such as bacteria and viruses are known to be able to survive on glass or similar surfaces such as touchscreens for hours or up to several days. During flu season or a pandemic such as the COVID-19 pandemic a single infected user of a touchscreen POS device could put every user who later uses that device at risk of infection. Cleaning the touchscreen can reduce the risk of infection, but this requires a thorough disinfection routine performed after each user which requires more employees, slows the checkout process, and keeps users waiting in line to checkout longer, potentially increasing the risk of exposure to pathogens. United States Patent No. 6,130,663 is directed to one known touchless input

method and apparatus adapted for conventional desktop computers. What is needed is a way for adapting existing touchscreen POS systems to accept information in an efficient way without requiring the user to physically touch the screen.

Summary of the Disclosure

[0004] In one aspect, a method includes positioning a sensing plane defined by a touchless input device at an air gap distance from a display in a POS system. The method further includes connecting the touchless input device to the POS system, and disabling a touchscreen of the display. The method further includes displaying a graphical user interface on the display, and outputting a user interaction signal associated with one of a plurality of functional graphics of the graphical user interface from the touchless input device. The method further includes causing the POS system to perform a predetermined function responsive to the user interaction signal.

[0005] In another aspect, a method of operating a touchless input system includes displaying a graphical user interface on a touchscreen in a point of sale (POS) system, and producing, on the graphical user interface, an indicator image associated with an object penetrating a sensing plane of a touchless input device positioned at an air gap distance from the touchscreen. The method further includes outputting a user interaction signal associated with a functional part of the graphical user interface from the touchless input device, and causing the POS system to perform a predetermined function responsive to the user interaction signal.

[0006] In still another aspect, a method of retrofitting a self-serve kiosk in a point of sale (POS) system for touchless operation includes positioning a sensing plane defined by a touchless input device at an air gap distance from a display in a POS system having a touchscreen display configured to display a graphical user interface. The method further includes electrically connecting the touchless input device to a computer of the self-serve kiosk. The method still further includes storing control software for the touchless input device on the computer, and configuring the computer by way of the control software to: produce, on the graphical user interface, an indicator image for an object penetrating the sensing plane, output a user interaction signal from the touchless input device to the POS

system, and cause the POS system to perform a predetermined function responsive to the user interaction signal.

[0007] In still another aspect a touchless input system for a POS system includes a touchscreen having one or more functional graphics which cause a POS system to perform a predetermined function when selected, a touchless input device defining a sensing plane disposed at a distance from the touchscreen, and a computer. The computer is configured to produce, on the graphical user interface, an indicator image for an object penetrating the sensing plane, and to receive a user interaction signal from the touchless input device associated with a selected one of the functional graphics. The computer is further configured to cause the POS system to perform a predetermined function responsive to the user interaction signal.

[0008] In still another aspect a kit for retrofitting a POS system having a touchscreen display includes an IR frame overlay, at least one mounting bracket adapted for mounting the IR frame overlay at a distance from the touchscreen display of a POS system, an interface cable for operably connecting the IR frame overlay to the POS system, and a software package which can be run on the POS system and allows the POS system to receive input from the IR frame overlay and to generate an indicator image on the visual display.

Brief Description of the Drawings

[0009] Fig. 1 is a diagrammatic side view of a system for the touchless input of information, according to one embodiment;

[0010] Fig. 2 is a diagrammatic side view of a system for the touchless input of information, according to one embodiment;

[0011] Fig. 3 is a diagrammatic side view of a system for the touchless input of information, according to one embodiment;

[0012] Fig. 4 is a diagrammatic side view of the system for the touchless input of information shown in Fig. 3;

[0013] Fig. 5 is a diagrammatic side view of a system for the touchless input of information mounted to a display screen, according to one embodiment;

[0014] Fig. 6 is a diagrammatic view of a touchless input device, according to one embodiment;

[0015] Fig. 7 is a perspective view of a touchless input device mounted to a POS display, according to one embodiment;

[0016] Fig. 8 is a diagrammatic view of a system for the touchless input of information, according to another embodiment;

[0017] Fig. 9 is a diagrammatic view of a kit for retrofitting a touchless input device to an existing display screen, according to one embodiment;

[0018] Fig. 10 is a diagrammatic side view of a system for the touchless input of information, according to one embodiment;

[0019] Fig. 11 is a diagrammatic side view of a system for the touchless input of information, according to one embodiment;

[0020] Fig. 12 is a schematic diagram of a system for the touchless input of information, according to one embodiment;

[0021] Fig. 13 is a flowchart of logic flow and methodology in a system for the touchless input of information, according to one embodiment;.

[0022] Fig. 14a is a diagrammatic front view of a touchless input device and display screen, according to still another embodiment;

[0023] Fig. 14b a diagrammatic side view of the touchless input device and display screen of Fig. 14a;

[0024] Fig. 15 is a diagrammatic view of a touchless input assembly, according to one embodiment;

[0025] Fig. 16 is a diagrammatic view of a touchless input assembly as in Fig. 15 shown in the process of installation to a POS system;

[0026] Fig. 17 is another view of a touchless input assembly installed in a POS system, according to one embodiment;

[0027] Fig. 18 is yet another view showing a portion of the touchless input assembly of Figs. 15-17;

[0028] Fig. 19 is a side diagrammatic view of portions of a POS system, according to one embodiment;

[0029] Fig. 20 is a diagrammatic view of a touchscreen monitor configured according to one embodiment;

[0030] Fig. 21 is a functional block diagram of a POS system, according to one embodiment;

[0031] Fig. 22 is a diagrammatic view of a touchless input assembly, according to one embodiment; and

[0032] Fig. 23 is a diagrammatic view of a touchless input assembly, according to one embodiment.

Detailed Description

[0033] Referring now to Fig. 1, a touchless input system 10 is shown. System 10 includes a touchless input device of any suitable type such as a rectangular infra-red (IR) frame overlay 18 (hereinafter referred to at times as an "IR frame" or an "IR overlay") disposed at a distance from a touchscreen 12 input device. Touchscreen 12 is operatively connected to a control system such as a computer in a point of sale (POS) system. Touchscreen 12 includes a screen surface 14 capable of displaying a variety of images such as functional icons, or functional graphics, in a graphical user interface (GUI). The terms "graphic" and "icon" are used interchangeably herein. A "functional graphic" refers to a graphic that when selected by a user by touching at the location of the graphic or touchlessly selecting that graphic causes a POS system to perform a predetermined function, as further discussed herein. A part of a graphical user interface that is not itself a graphic as such could also be functional. A non-functional graphic would be a graphic displayed on touchscreen 12 at a location where no action/function is taken responsive to touch or attempted touchless interaction. Predetermined functions performed by a POS system as contemplated herein may, for example, select a desired good or service for purchase, look up an item, login, logout, enter a numeral, "advance" the screen display or "go back," confirm a payment or select a payment type, enter a payment value, check out a book, select to print a receipt, call an attendant, and many others). Screen surface 14 may itself be formed by or include a touch-sensitive layer, such as a capacitive layer, or multiple resistive layers, of known design as further described herein. Thus, a "touchscreen" includes hardware over and above that of a non-touchscreen computer

display. The present disclosure is not limited to any particular touchscreen hardware technology, nor to any particular touchless input device technology.

[0034] IR overlay 18 is capable of detecting and tracking both the horizontal (X-axis) position and vertical (Y-axis) position of an object such as a user's finger or a stylus when inserted within the area or central opening defined by IR overlay 18, in particular when the object penetrates a sensing plane defined by IR overlay 18. The IR overlay 18 is disposed at a distance from the surface of touchscreen 12 thereby creating an air gap 16 between screen surface 14 and the sensing plane defined by IR overlay 18. The exact size of air gap 16 may vary from system to system, but preferably is large enough that a user may insert an object within IR overlay 18 to penetrate the sensing plane without touching and thereby risking contamination of either screen surface 14 or the inserted object. In some applications such as where users are exclusively employees who have been trained on system 10 the air gap may be relatively smaller. In other applications, such as where customers unfamiliar with system 10 who might be prone to sticking their fingers further past IR overlay 18 than is necessary, the gap may be relatively larger. In a practical implementation the air gap distance is from 0.5 inches to 1 inch, more particularly from 0.7 inches to 0.8 inches and still more particularly about 0.75 inches. It has been discovered that at approximately 0.75 inches users are generally unlikely to touch the display and parallax, further discussed herein, is relatively manageable. In other instances, the air gap distance may be about 0.75 inches or greater such as from two to four inches.

[0035] As IR overlay 18 is disposed at a distance from screen surface 14 the phenomenon of parallax may be an issue, and as further discussed herein is the displacement or difference in the apparent relative positions of objects or targets when viewed along different lines of sight. As seen in Fig. 1, a user's viewing position 20 having a line of sight 22 to a particular icon 28 displayed on touchscreen 12 may have a perceived location 24 relative to IR overlay 18 which is displaced from its actual location 26. The magnitude of the displacement can vary according to factors such as the viewing angle as well as the distance between the IR frame and the touchscreen surface. In this particular example, the perceived icon location 24 is displaced vertically (along the Y-axis) above its actual location 26.

[0036] As shown in Fig. 2, a touchless input system 30 having an IR frame overlay 38 disposed at a distance 36 from a touchscreen 32 having a screen surface 34 is disposed at an angle from a user's viewing position 40. The declined angle of the screen 32 and frame 38 relative to the viewer 40 results in a line of sight 42 which displaces the perceived image 44 at a distance below (lower) along the Y-axis with respect to IR frame 38 relative to the actual position 46 of an icon 48. Similarly, displacements along the X-axis are also possible when an icon is viewed from the left or right of its actual position.

[0037] Referring now to Figs. 3 and 4, a system for inputting information into a touchscreen device ("system") 50 is shown. System 50 includes an infra-red (IR) frame overlay 58 disposed at a distance from a touchscreen 52 input device. Touchscreen 52 is operatively connected to a control system such as a computer running POS software. Touchscreen 52 includes a screen surface 54 capable of displaying a variety of images such as icons, in a graphical user interface indicated generally at 53, for a POS system and detecting the selection of an icon by a user who touches the screen surface 54 at a desired icon 68 which then may trigger a predetermined action. IR overlay 58 is capable of detecting and tracking both the horizontal (X-axis) position and vertical (Y-axis) position of an object such as a user's finger when it is inserted within the area encompassed by the IR overlay 58 and penetrates the sensing plane. IR overlay 58 is disposed at a distance from the surface of touchscreen 52 thereby creating an air gap 56.

[0038] When a user 60 viewing an icon 68 inserts a finger 70 to within the area encompassed by IR overlay 58 at the position along the user's line of sight 62 where the icon is perceived to be located 66, the system 50 produces a visual indicator image 72 ("indicator 72") which is displayed on screen surface 54 where the user's finger is actually pointing. Indicator 72 is two-dimensional but is shown three-dimensionally for illustrative purposes. Producing indicator 72 enables compensating for parallax, as a user may otherwise assume they are pointing at a location on screen surface 54 different from the location at which they are actually pointing. Indicator 72 may be a variety of icons or images such as an arrow, a circle, a finger, or any other image or icon, collectively referred to as a "pointer," capable of indicating to a user a particular area or location on the screen. Indicator 72 may be translucent or opaque, of any color, and may incorporate motion, blinking, or other animation or characteristics as desired. In other examples, an

indicator may create shading or a halo effect around the icon or area being pointed at. Once a user sees where indicator 72 is located on touchscreen 52 the user may move finger 70 within IR overlay 58, in an X-Y coordinate system in the sensing plane, until indicator 72 is over the desired icon 68 as shown in Fig. 4. Thus, indicator image 72 is displayed at a location in an X-Y coordinate system that is aligned with a location of penetration of the sensing plane by object/finger 70 in the X-Y coordinate system.

[0039] When the user has moved the indicator 72 over the desired icon 68 a selection of the icon may be made by the user. The selection action might be if a user holds an object still, for instance within a motion tolerance of a few pixels, over a particular location for a predetermined time duration (e.g., 1 second or less), if a user makes a particular gesture within the IR frame area (e.g., turning the finger in a tight loop), or if the user issues an audible command (if the POS system includes a microphone). The system may optionally include a confirmation step where a "confirm" icon is brought up on the touchscreen once a select action is detected by the system. Once a selection is made, and optionally confirmed, the POS system then proceeds as if the selection was made by touching the touchscreen even though the touchscreen was never actually directly touched by the user. A selection action as discussed herein can be understood as the physical action taken by a user, holding an object still, moving an object in a certain way, penetrating and exiting the sensing plane, or something else. The selection action can further be understood to be analogous to performing a mouse click (mouse-down + mouse-up) as further discussed herein. A user interaction input or signal as discussed herein can be understood as the electrical action(s) taken by a touchless input device in response to a selection action or parts thereof. Outputting a user interaction signal could include outputting raw X-Y coordinate data from an IR overlay to a computer in a POS system in some instances. The POS system can be understood to perform a predetermined function based on a selection action and based on a user interaction signal.

[0040] Thus, in one example the POS system detects that an icon is selected and is caused to perform a predetermined function based on a time duration an object has penetrated the sensing plane. The computer in the POS system may track time that an object is held still at any given X-Y location, such as by starting a counter once a time duration of a few milliseconds is detected at the given X-Y location. In another example,

the selection action is based on penetration of the sensing plane with the object and exiting of the object from the sensing plane, analogous to the penetration of the sensing plane with the object being a mouse-down portion of a mouse click and removal of the object from the sensing plane being a mouse-up portion of a mouse click. In this case a user interaction signal could be produced when the object penetrates the sensing plane, exits the sensing plane, or moves in X-Y directions in the sensing plane. The selection action is recognized based on both actions of penetrating and exiting the sensing plane, much like the user is pushing a button without actually touching the button. The performance of the predetermined function is thus triggered when the user withdraws the object from the sensing plane. In a related aspect, a user-perceptible alert such as an audible sound or a display of a graphic, text, screen flash, etc. may be produced to alert or instruct the user to remove the object from the sensing plane after a predetermined time duration has elapsed, since so long as the user maintains the object in the sensing plane a selection action cannot be recognized, analogous to the user holding a mouse button down but not having released it.

[0041] Fig. 5 shows a touchless input system 80 according to one embodiment. In this particular example, a touchless input device 86 is mounted to a touchscreen 82 of an existing POS system. Touchless input device 86 includes an IR frame overlay 88 and one or more mounting brackets 90 for mounting input device 86 to touchscreen 82 at a distance to define an air gap 92 between IR overlay 88 and touchscreen 82. IR overlay 88 and mounting bracket 90 may be separate components or they may be formed as a unitary body. Bracket 90 may be mountable to touchscreen 82 using screws, bolts, clips, or other fasteners or using adhesives, epoxy, or the like. IR overlay 88 may be oversized in at least one of height or width, and typically both, relative to touchscreen 82. Such a configuration allows the physical structure of IR overlay 88 to be outside of the area with which a user is likely to interact, minimizing touch risk to IR overlay 88 itself. In particular, the central opening defined by IR overlay 88 is oversized to touchscreen 82 in at least one of a vertical aspect or a horizontal aspect.

[0042] Bracket 90, and other brackets contemplated herein, could be L-shaped, for instance, in the manner of an angle iron and having a flat mounting surface oriented generally parallel to the touchscreen itself for attachment to the touchscreen or parts of

the touchscreen such as a housing. In other embodiments, a bracket could include a pad or a peg that extends linearly from an IR overlay and having a first end or side attached to the IR overlay, and an opposite end free for attachment to the touchscreen or a touchscreen housing, for instance. While brackets are shown positioned along left and right sides of an IR overlay in the attached drawings, in other instances brackets could be located at each of the corners of the IR overlay, upon top and bottom edges, or elsewhere. Rather than discrete separate brackets, a pad or wall could be continuous, or nearly continuous, around a periphery of the IR overlay, and extend between the IR overlay and the touchscreen. Brackets for mounting an IR overlay as discussed herein can be sized and shaped such that upon installation a desired spacing distance between the IR overlay and the touchscreen is obtained, providing a desired air gap distance between the sensing plane of the IR overlay and touchscreen. In some embodiments, the mounting brackets could be adjustable to vary the spacing distance, such as by way of slots in the bracket receiving fasteners that can be loosened to enable sliding, or tightened to set a position of the bracket relative to the IR overlay.

[0043] An example of an IR overlay 94 similar to or the same as those previously described is shown in Fig. 6. The IR overlay 94 includes an outer frame 96. Outer frame 96 may be shaped as desired, but will be generally shaped as a corresponding touchscreen, typically rectangular or square. Frame 96 may be sized as desired, but typically will be slightly larger than a corresponding touchscreen. That is, the frame will typically extend beyond the area of a touchscreen in both the vertical and horizontal dimensions. IR overlay 94 additionally includes two light producing arrays 98 (such as light emitting diodes (LED), one disposed along a horizontal portion of frame 96 and one disposed along a vertical portion of frame 96, as well as two light detecting arrays 100 also disposed along one horizontal portion of frame 96 and one vertical portion of frame 96. Frame overlay 94 can detect when an object such as a stylus or finger has entered the area (sensing plane) of frame 96 by an interruption of light arriving at a light detecting array from a light producing array. The exact location of the object within the frame 96 is determined by where along the horizontal (X-axis) and vertical (Y-axis) the interruptions are detected.

[0044] Another example of an IR overlay 102 is shown in Fig. 7 as it might appear having been retrofitted upon a touch screen 108. In this example IR overlay 102 includes a frame portion 104 and two bracket portions 106. Bracket portions 106 are mounted to a touchscreen 108 of a POS system 109. POS system 109 is shown in the context of a self-check kiosk having a base 111 and a stand 113 supporting touchscreen 108 at a location vertically above base 111.

[0045] Turning to Fig. 8, a touchless input system 110 is shown. In this example a touchless input system 110 includes a display screen 114 mounted inside a cabinet 112. Images from display screen 114 are reflected off of a reflective surface 116 such as a mirror or a prism through an IR frame opening 118 such that a user may view images displayed on display screen 114 through IR frame opening 188. Selections may be made by the user 120 via an IR frame overlay 118 similar to those systems previously described. Touchless input system 110 in this particular example has the advantage of positioning display screen 114 far out of reach so that the possibility of accidental contact of the screen by a user is essentially impossible.

[0046] A kit 122 for retrofitting existing POS systems having a touchscreen display, or as an optional add-on piece of equipment for a new POS system, with a touchless input system according to one embodiment is shown in Fig. 9. In this example, a retrofitting kit 122 includes an IR overlay 124 having one or more mounting brackets 126 adapted for mounting IR overlay 124 at a distance from a touchscreen display, an interface cable 128, a software package 130, and optionally mounting bracket adapters 132. The size of IR overlay 124 as well as the location, type, and number of mounting brackets 126 and/or bracket adapters 132 may vary according to the particular touchscreen and/or POS system the kit 122 is intended for retrofitting. The type of interface cable may include a universal serial bus (USB) style cable, a micro-USB, an ethernet cable, a firewire, eSATA, MIDI, or other suitable interface cable. Optionally, IR overlay may include appropriate hardware and firmware for wireless interfacing with a POS system such as Bluetooth®, wi-fi, infra-red, radio frequency, or other suitable wireless communication protocols. The software package includes software which can be run on the POS system and allows the POS system to receive inputs from IR frame overlay 124 for interfacing and delivering information from IR frame overlay 124 to the POS system. The software

package may be delivered via a physical medium such as a compact disc, DVD, flash drive, secure digital (SD) card, or via a downloadable package delivered digitally over the internet. It should be appreciated that the software package can configure a computer on a POS system to perform any or all of the functions of a touchless input system as described herein in connection with any of the various contemplated embodiments.

[0047] A touchless information input system 140 suitable for use with a physical keypad 142 is shown in Fig. 10. In this particular example, keypad 142 includes physical keys 144 each having an individual light source 146. An IR frame overlay 150 is disposed at a distance from keypad 142 creating an air gap 148. As with the systems previously described, when a user places an object such as a finger within the area of IR overlay 150 the system detects the location of the object. Rather than causing an indicator image to appear such as with a visual display, system 140 causes the light 146 of the individual key 144 which is being pointed at to light up. If this is the desired key then the user can perform a suitable select action as described herein and the POS system then performs the specific function which would have been generated by physically depressing that key.

[0048] Another touchless information input system 160 suitable for use with a physical keypad 162 is shown in Fig. 11. In this particular example, keypad 162 includes physical keys 164. An IR frame overlay 168 is disposed at a distance from keypad 162 creating an air gap 166. As with the systems previously described, when a user places an object such as a finger within the area of IR overlay 168 to penetrate the sensing plane the system detects the location of the object. The system then causes a light 172 to be projected from one or more light sources 170 located on the IR frame 168 onto the key 164 being pointed at by the user. If this is the desired key then the user can perform a suitable selection action to produce a user interaction signal and the POS system then performs the specific predetermined function which would have been generated by physically depressing that key. Optionally, light sources 170 are capable of producing UV light which may be periodically activated to direct UV light at and thereby disinfect keys 164. UV light sources could be included in other non-keyed touchscreen embodiments contemplated herein.

[0049] Fig. 12 shows a schematic diagram of one example of a touchless information input system 174. In this example a POS system or device 180 such as a computer in a self-check or other kiosk is operationally connected to a touchless interface 176 such as one of the IR frame overlays previously described as well as to a display device 178. POS system 180 is typically capable of running software for operating the POS system, running software for operating the touchless interface device, accepting input from the touchless interface device, optionally accepting input from the display device, outputting information to the display device, and optionally outputting commands to other devices such as printers, servers, handheld electronic devices of employees, or still others.

[0050] Fig. 13 shows a flowchart of example logic and methodology flow of how a touchless information input system 182 might operate. First, an object is detected 184 within the area enclosed by an IR overlay where the object penetrates the sensing plane. The system then calculates the pointer (indicator image) location 186 based on the X and Y coordinates of the object within the area encompassed by the IR overlay. The pointer is then displayed 188 on the POS touchscreen. The system then waits for a user interaction signal (and/or queries if an indicated location is a desired selection), for instance, waiting a time duration, or detecting penetration of the sensing plane with an object and removal of the object from the sensing plane, detecting a confirmation gesture, a user voice input, or still another. If no selection is detected then the system may loop back to detect an object within the IR overlay again. If a selection is confirmed then the selection is made 192 and the POS performs the function the selection would have caused had the screen actually been touched at that location. Depending upon what type of selection action the computer is configured to recognize, a user-perceptible alert can be generated to prompt a user to withdraw the object from the sensing plane.

[0051] Figs. 14a-14b show a diagrammatic view of a touchless input system 200 according to another embodiment. In this example a touchless display device 204 such as an IR overlay as previously described is disposed at a distance from a visual display 202 such as a touchscreen. The distance forms an air gap 210 between touchless display device 204 and visual display 202. The size of air gap 210 may vary depending on a particular application. In some examples the air gap is relatively smaller such as one inch. In other examples, the air gap is relatively larger such as two to four inches so as to

allow for objects to penetrate the sensing plane defined by touchless display device 204 to a greater distance without contacting visual display 202. Typically, the area of touchless display device 204 is larger than the area of visual display 202. As is shown in Fig. 14a, touchless display device 204 is larger in both the vertical 206 dimension as well as the horizontal 208 dimension. The exact size of the vertical and horizontal overages may vary depending on the application, but typically will range from one to four inches in each direction. Making touchless display device 204 larger in area than visual display 202 allows for a larger usable viewing angle for users and limits risk of a user actually contacting device 204.

[0052] Referring now to Figs. 15-18, there is shown a touchless input assembly 317 including a touchless input device, for example an IR frame overlay, 318 attached to a bezel bracket 319. Assembly 317 is structured to slide over an existing touch monitor, or conventional monitor, and includes sidewalls 321 formed by bezel bracket 319. Sidewalls 321 may depend downwardly, into the page in Fig. 15 approximately, from a main body section 323 that forms three sides of a rectangle. A bottom side 331 or edge of the rectangle is an open side to enable slipping bezel bracket 319 over an existing monitor. As can be seen in the drawings, bezel bracket 319 may be formed of a plurality of separate bracket pieces, such as elongate metal frame pieces having walls oriented at about 90 degrees to one another, two of which may be equipped with slots 327 that can receive fasteners 328 for securement, or other protrusions, at a range of locations. Slots and fasteners, or another adjustment mechanism, can enable bezel bracket 319 to be adjusted in width and secured in a desired state upon a display of an existing POS system 325.

[0053] A deformable member 320, which can include an elastically deformable shock cord or bungee cord, can conform to various shapes of hardware in POS system 325, such as a touchscreen monitor. Fig. 16 illustrates assembly 317 as it might appear in the process of being fitted over an existing touchscreen monitor of POS system 325. Standoff connector mounts 329 position IR frame 318 at a distance relative to bezel bracket 319 that provides a desired air gap. Bezel bracket 319 may form a central opening 333 that is generally in register with the touchscreen display of POS system 325. IR frame 318 may be structured similarly to other IR frames disclosed herein and

equipped with a USB cable or another electrical communication connection cord 335 that plugs into an open port in POS system 325. Deformable member 320 can be detached in some instances to be routed around, through, over, under, or behind other apparatus of POS system 325. Alternative deformable members could be provided that are plastically deformable, or have variable, adjustable configurations, to provide a secure attachment to hardware in POS system 325.

[0054] As can also be seen from Figs. 15-18, bezel bracket 319 may be structured generally complementarily to a touchscreen monitor in POS system 325 and adjusted by way of sliding individual frame elements to different widths as desired. It should be appreciated that rather than standoff connector mounts 329, a different connecting structure, for example, a continuous peripheral wall, or threaded rotatable fasteners threadedly engaged with one or both of bezel bracket 319 or IR frame 318, clamps, or any other suitable structure could attach IR frame 318 to bezel bracket 319 at the desired air gap distance, which air gap distance may be adjustable. Protective non-metallic pads 337 may be attached to bezel bracket 319 as shown in Fig. 18.

[0055] Referring now to Fig. 19, there is shown an original/existing touchscreen monitor 470 including a touchscreen 430. In the Fig. 19 illustration an IR touchless add-on frame device (not shown) has been fitted to monitor 470 and defines a sensing plane 420 located at a distance 410 in front of an original sensing/touch plane 460 formed by a display panel 440 and touchscreen 430. Touchscreen 430 defines an original touch sensing plane 460. Sensing plane 420, when broken, takes over the role of the original touchscreen 430, with the associated IR frame sending raw touch event data to a running application when a finger or other object breaks plane 420. Consistent with other embodiments discussed herein, this configuration eliminates the need to physically touch the original touchscreen 430.

[0056] In some instances, however, users may physically touch the original screen by continuing to plane 460. In other words, consistent with how users have become accustomed to using various devices, such as self-serve kiosks, including ATMs, retail checkout stations, and others, providing an add-on IR touchless input device is not interpreted or otherwise detected by the user. At least until users become accustomed to the use of a touchless overlay they may physically touch the original screen, potentially

repeatedly touching the original display through an entire session, creating risk of spreading or contracting pathogens. The original touch panel could be one of many known touch technologies, such as 5-wire resistive, surface capacitive, projected capacitive, SAW (surface acoustic wave), and infrared.

[0057] It has been observed in the field that users engaging with unattended kiosks may not read signage affixed on or near a kiosk before use, and thus any effort to inform the user to not touch the original touchscreen device may be ineffective. It has also been observed, however, that when users hear a recorded voice command, or visual instruction from a self-serve kiosk, their attention is more reliably drawn. As further discussed herein, in a system such as that depicted in Fig. 19, when the original touchscreen 430 is touched by a finger, or object, the user can be immediately alerted by an audio voice or visual message displayed on touchscreen 430 that informs the user it is not necessary (or even disfavored or dangerous) to touch the display panel. Methods of stimulus could include, for example, an audible alert, a full-screen momentary flash, a pop-up window message DO NOT TOUCH, or still another user-perceptible stimulus. Both an audible alert and a visual alert could be used at the same time.

[0058] Referring also now to Fig. 20, there is depicted an original touchscreen monitor 400 reconfigured using the touchscreen monitor configuration utility, such that most, or all, of the touch display area is disabled or inactivated, providing an inactive zone 480. A block 401 shown in the inactive zone represents a touch controller (a computer) resident on original touchscreen monitor 400 and configured to output raw touch data to other parts of the POS system. Inactive or disabled means that touching the touchscreen will not trigger the operating system in the POS system to take any responsive action, although raw touch data will still be transmitted. In other words, once inactivated the native driver software for the touchscreen will not communicate touch data received from the touch controller to the operating system. The touchscreen may be inactivated by opening the touchscreen driver software, on-site using an input device such as a keyboard plugged into the POS system, or remotely, and switching a setting from active to inactive. In this instance, if the touchscreen 490 is physically touched by a user, raw touch data will be sent to a host computer resident in the POS system, but no mouse-down, mouse-

up, enter key, or other touch event will trigger an action in the operating system such as a logical click or pointer movement.

[0059] The present strategy is contemplated to prevent duplicated button entry from occurring, which might happen if a finger or object is pointed toward a selected graphical button, such as where a user breaks plane 450 and continues to plane 460. An example might be where a user's finger initially breaks plane 450 and selects the numeral 5 button in a graphical keypad displayed for a user to enter a personal identification number or the like. The user's finger might then proceed further and physically touch the number 5 button on touchscreen 430. Absent the methodology and strategy disclosed herein, the host computer in the POS system could interpret the user having pressed the numeral 5 button twice, and thus produce an error such as a user login failure.

[0060] As noted above, although an original touchscreen is inactivated according to the present disclosure and no longer sending touch events, the original touchscreen can still be turned on and continue to transmit raw touch data. The raw touch data can be thought of as an electrical signal produced by the original touchscreen irrespective of whether the touchscreen driver is set to active or inactive (disabled).

[0061] Referring also now to Fig. 21, there is shown a block diagram including a touch controller at 510 that transmits raw touch data when the touch panel of a touchscreen monitor 520 is physically touched. The raw touch data can consist of X-Y coordinates, as an example, sent to a USB driver 540 by way of a USB bus 530. Also shown in Fig. 21 is touch driver software 550, and operating system software 570, together with USB bus 530 and USB driver 540 being resident on a computer processor 560 such as a microprocessor or a microcontroller and/or an associated computer readable memory. Processor 560 may be a native processor in a POS system. Touchless application software 600, which may be an example software package that is downloaded to the POS system as discussed herein, is shown at 600, and stored on a computer processor 560 and/or an associated computer readable memory. Software 600 includes a USB traffic monitor module 580 configured to monitor a touch device based on VID/PID (vendor identification/product identification) hardware IDs that is then forwarded to a TCP port listener which flags an event to a touchless processor module 590. Software 600 may run in the same buffer as operating system software 570. Touchless processor module 590

may run in a Windows or Linux or other operating system. In another implementation, raw serial communications for touchscreens could be captured using a serial interface. In still another implementation raw touch data can be captured using a HID (human interface device) application programming interface (API), or potentially a custom software driver to communicate directly to the touchscreen.

[0062] As noted above, a user may be alerted to an unnecessary and undesired touch having occurred. Software 600 can set an event flag, for instance, indicating that the original touch panel was touched unnecessarily. In one implementation, a recorded audio file is played, for instance using a speaker 610, to inform the user they no longer need to or should not touch the touchscreen. One or more speakers 610 can be integral to the original touch monitor in the POS system or mounted elsewhere in the kiosk, for example. In still other instances, a third-party self-serve application 620 can be provided to communicate directly to an API of software 600. This feature could enable third-party self-serve applications to forward the user's current selected language mode using an API string (language call) in order to provide a recorded audio file, such as a .wav file, in a user's preferred language if the touchscreen is touched. In this example, a user might start a session at the kiosk and "press" the Spanish language button. Third-party software 620 would send a string to the touchless application software 600 so that in the event the user touched the touchscreen they would receive a voice audio message or text message in their preferred language.

[0063] Any of the example embodiments contemplated herein can include positioning a sensing plane defined by a touchless input device at an air gap distance from a display in a POS system. The touchless input device, including an IR frame overlay for example, is then electrically connected to the POS system. Personnel operating the POS system, including a technician or information technology professional installing the touchless input device can then disable an original touchscreen in the POS system. Disabling a touchscreen of a display is a routine operation in known touchscreen systems as discussed herein, and can be performed by way of a textual user interface or a graphical user interface displayed on the touchscreen itself, or potentially a connected computer, and with a user switching a preexisting setting in the touchscreen driver from ON to OFF.

[0064] As part of a setup procedure such as during retrofitting a touchscreen in a POS system, or during normal use, a graphical user interface will be displayed on the display screen of the POS system. When a user positions an object or a part of their body within the sensing plane, the touchless input device can output a user interaction signal to the POS system. As discussed herein, the user interaction signal can include a location or a motion of the user's finger, object, et cetera, according to X-Y coordinates defined by the touchless input device. Operating the POS system can further include associating the user interaction signal with one of a plurality of functional graphics of the graphical user interface that is displayed. As discussed herein, the functional graphics could include numeral buttons, or any of an essentially endless variety of icons, images, zones, words, or other functional graphics. A plurality of functional graphics means more than one graphical element, each having a different predetermined function when activated such as by a mouse click. Operating the POS system can further include causing the POS system to perform a predetermined function, such as execute a user account login, display a popup graphic, display a visual or audio alert, or take any other predetermined action perceptible or not perceptible to a user, responsive to the user interaction signal. The predetermined action is based on the association of the user interaction signal with the one of a plurality of functional graphics of the graphical user interface. In other words, the predetermined action may be dependent upon which graphical button the user touchlessly activates. As also discussed herein, while the touchscreen may be disabled in the sense that touch data is not forwarded to and acted upon by the operating system of the POS system, the touchscreen is still turned on and will output raw touch data or a touch signal from the disabled touchscreen indicative of a user touching the disabled touchscreen. A user-perceptible alert, such as a visual alert or an audio signal, may be produced based on the touch signal. As discussed herein, the user-perceptible alert may be a screen flash, a text message, a popup graphic, an audio alert, or still another.

[0065] Referring now to Fig. 22, there is shown a POS system 710 according to one embodiment and including a kiosk 712 having a base 714 and a touchscreen display 716 supported upon base 714. POS system is shown as it might appear having been retrofitted for touchless entry of information in a system that, prior to retrofitting, employed a touchscreen display 716. POS system is shown as it might appear where a

bezel bracket 718 is being mounted to touchscreen display 716. Bezel bracket 718 can be formed by three legs 719 attached so as to form three sides of a square or rectangular shape, with an open side shown at 732. Bezel bracket 718 further incudes sidewalls 722 formed upon opposed ones of legs 719 enabling bezel bracket 718 to fit over touchscreen display 716 to position an attached face frame 720 equipped for touchless information input in a manner similar or identical to that of preceding embodiments. Face frame 720 will thus be positioned at an air gap distance from a touch sensitive screen surface of touchscreen display 716, again consistent with other embodiments described herein. Face frame 720 includes an inner perimeter 730 that will include emitters and detectors defining a sensing plane that is broken by a user's finger or other object. Face frame 720 includes a first mounting flange 724 on a first side of face frame 720 and a second mounting flange (not numbered) on a second side of face frame 720. Each mounting flange 724 is attached to one of legs 719, such as by way of attachment screws 728. In other embodiments mounting flashes may be positioned upon bezel bracket 718 in addition to or instead of mounting flanges upon face frame 720. Shock cord mounting screws 726 are used to attach with a shock cord as described in connection with other embodiments.

[0066] Referring now to Fig. 23, there is shown a point of sale system 810 similar to other systems described herein, but having certain differences. POS system 810 is shown in the process of being fitted with a face frame 820. Face frame 820 will be configured similarly to other embodiments but is attached to a kiosk 812 having a touchscreen display 816 in a different manner. POS system 810 includes a top bracket 822 attached to face frame 820, and a bottom bracket 826 attached to face frame 820. Rather than a bezel bracket mounting configuration as discussed in connection with the embodiment of Fig. 22, in POS system 810 only the upper or top mounting bracket 822 and the lower or bottom mounting bracket 826 is used, in conjunction with a shock cord or the like that can be attached by way of a mounting screw 832. Lower bracket 826 fits under and contacts a bottom edge of touchscreen display 816 and upper bracket 822 fits over and contacts a top edge thereof. In POS system 810 leg portions 819 of face frame 720 may form a complete rectangular shape, as opposed to the open-sided rectangular shape in

other embodiments. Peripheral edges 828 of face frame 820 may be spaced from touchscreen display 716 when POS system 810 is fully assembled for service.

Industrial Applicability

[0067] Referring to the drawings generally, as explained above setting up a touchless information input system, such as by retrofitting an existing POS system, can also include configuring an existing computer in the POS system to operate with the add-on touchless input device. Configuring the computer can include downloading a software package as described herein, for example delivering it digitally, such that the computer is configured by way of control software newly stored thereon. The computer may be configured by way of the control software to operate the POS system much the same as before, but receiving information inputted touchlessly instead of responsive to actually touching a touchscreen. The computer may be configured in particular by way of the control software to produce, on the graphical user interface, an indicator image for an object penetrating the sensing plane, as described herein, to receive a user interaction signal from the touchless input device to the POS system, and cause the POS system to perform one or more predetermined functions responsive to the user interaction signal. The computer may also be configured by way of the control software to disable the touchscreen, although disabling the touchscreen could also be performed manually, and to produce a user-perceptible alert based on a user touching the touchscreen.

[0068] As also discussed previously, a major concern for businesses is the possible transmission of pathogens caused when numerous people use their fingers to touch graphical buttons of a touchscreen of a self-service kiosk. Self-serve kiosks are used in many markets, including grocery, fast-food restaurants, retail stores, as well as libraries as an example. POS systems used by staff members of bars and restaurants are also subject to disease transmission. It is commonly known that pathogens, including bacteria and viruses survive on glass surfaces of touchscreen monitors for days, which greatly increase the possibility of transmitting disease between people. Unfortunately, touchscreens are not disinfected often enough, if at all.

[0069] One strategy to greatly reduce the transmission of pathogens between people is to eliminate the need of physically touching buttons of a graphical user interface on a touchscreen when using a self-service kiosk. This is accomplished by the methodologies discussed herein of introducing an IR frame overlay, mounted a distance in front of the original touchscreen of a kiosk's monitor, creating air-gap space between the original touchscreen surface and the IR frame. The IR touch frame overlay then takes over the role of detecting finger pointing and positioning. This method affords a patron to simply "break the plane" by penetrating the IR frame with a finger, or a pointer object at the desired graphical button without the need to physically touch any surface.

[0070] However, increasing the air-gap between the IR frame and the original touchscreen display creates the undesirable effect of parallax, which can cause a user to accidentally select the wrong point on a touchscreen as the desired point appeared to the user to be shifted slightly from its actual location on the screen. The disclosed systems compensate for this issue by generating a visual indicator when the IR frame is penetrated by an object at the location on the display where the system detects the object to be pointing. The visual indicator may be an image similar to a mouse pointer, or it may be an indicator light generated by the visual display or even projected by the IR frame itself. If the indicated location is the desired location to be selected by the user then a confirmation such as holding the indicator at the location for a predetermined period of time causes the system to generate an event such as a mouse click to confirm the selection and the POS system performs the triggered operation. The disclosed systems may be retrofitted to existing POS or other touchpad driven systems such as those found in hotels, airports, grocery stores, retail outlets, gas stations, restaurants, and anywhere else such systems are used. The disclosed systems may also be built into new POS or other systems allowing for the use of cheaper visual displays which lack touchscreen functionality.

[0071] The present description is for illustrative purposes only, and should not be construed to narrow the breadth of the present disclosure in any way. Thus, those skilled in the art will appreciate that various modifications might be made to the presently disclosed embodiments without departing from the full and fair scope and spirit of the present disclosure. It will be appreciated that certain features and/or properties of the

present disclosure, such as relative dimensions or angles, may not be shown to scale. As noted above, the teachings set forth herein are applicable to a variety of different instruments, implements, and the like having a variety of different structures than those specifically described herein. Moreover, it should be appreciated that description or discussion herein of any one embodiment should be understood to refer by way of analogy to any other embodiment except where otherwise indicated or apparent from the context. Other aspects, features, and advantages will be apparent upon an examination of the attached drawings and appended claims. As used herein, the articles "a" and "an" are intended to include one or more items, and may be used interchangeably with "at least one." Where only one item is intended, the term "one" or similar language is used. Also, as used herein, the terms "has," "have," "having," or the like are intended to be open-ended terms.

Claims

What is claimed is:

1. A method comprising:

positioning a sensing plane defined by a touchless input device at an air gap distance from a display in a point of sale (POS) system;

connecting the touchless input device to the POS system;

disabling a touchscreen of the display;

displaying a graphical user interface on the display;

producing, on the graphical user interface, an indicator image associated with an object penetrating the sensing plane;

outputting a user interaction signal associated with one of a plurality of functional graphics of the graphical user interface from the touchless input device; and

causing the POS system to perform a predetermined function responsive to the user interaction signal.

2. The method of claim 1 further comprising outputting raw touch data from the disabled touchscreen indicative of a user touching the disabled touchscreen.

3. The method of claim 2 further comprising producing a user-perceptible alert based on the raw touch data.

4. The method of claim 1 wherein the causing of the POS system to perform a predetermined function is based on a time duration the object has penetrated the sensing plane.

5. The method of claim 1 wherein the causing of the POS system to perform a predetermined function is based on the object penetrating and exiting the sensing plane.

6. The method of claim 5 further comprising alerting a user to move the object out of the sensing plane.

7. The method of claim 1 further comprising compensating, by way of the producing of the indicator image, for parallax between an apparent location and an actual location of the object relative to the one of the plurality of functional graphics, and wherein the indicator image includes a pointer displayed at a location in an X-Y coordinate system that is aligned with a location of penetration of the sensing plane by the object in the X-Y coordinate system.

8. A method of operating a touchless input system comprising:

displaying a graphical user interface on a touchscreen in a point of sale (POS) system;

producing, on the graphical user interface, an indicator image associated with an object penetrating a sensing plane of a touchless input device positioned at an air gap distance from the touchscreen;

outputting a user interaction signal associated with a functional part of the graphical user interface from the touchless input device; and

causing the POS system to perform a predetermined function responsive to the user interaction signal.

9. The method of claim 8 wherein the producing of the indicator image includes producing the indicator image on one of a plurality of functional graphics of the graphical user interface, and further comprising associating the user interaction signal with the one of a plurality of functional graphics.

10. The method of claim 9 wherein the causing of the POS system to perform a predetermined function is based on at least one of, the object penetrating and exiting the sensing plane, or a time duration that the object has penetrated the sensing plane.

11. The method of claim 10 further comprising alerting a user to move the object out of the sensing plane.

12. The method of claim 8 further comprising:

disabling the touchscreen;

outputting raw touch data from the disabled touchscreen indicative of a user touching the disabled touchscreen; and

producing a user-perceptible alert based on the raw touch data.

13. The method of claim 8 wherein the indicator image is displayed at a location in an X-Y coordinate system that is aligned with a location of penetration of the sensing plane by the object in the X-Y coordinate system.

14. A touchless input system for a point of sale (POS) system, comprising:

a screen including a graphical user interface having one or more functional graphics which cause a POS system to perform a predetermined function when selected;

a touchless input device defining a sensing plane disposed at an air gap distance from the screen; and

a computer configured to:

produce, on the graphical user interface, an indicator image for an object penetrating the sensing plane;

receive a user interaction signal from the touchless input device associated with a selected one of the functional graphics; and

cause the POS system to perform a predetermined function responsive to the user interaction signal.

15. The system of claim 14 wherein a selection action by a user causes the POS system to perform a predetermined function related to the selected one of the functional graphics on which the indicator image was displayed.

16. The system of claim 15 wherein the selection action is holding the object penetrating the sensing plane still for a predetermined period of time.

17. The system of claim 16 wherein the selection action is both penetration and exiting of the sensing plane.

18. The system of claim 14 wherein the touchless input device includes an IR frame disposed at least 0.75 inches from the screen, and the screen includes a disabled touchscreen.

19. The system of claim 18 wherein the IR frame defines a central opening, and the central opening is oversized to the screen in at least one of a vertical aspect or a horizontal aspect.

20. The system of claim 18 wherein the touchscreen is disabled, and the computer is further configured to receive raw touch data from the disabled touchscreen, and to produce a user-perceptible alert based on the raw touch data.

21. The system of claim 14 further comprising at least one bracket coupled to the screen and supporting the touchless input device so as to position the sensing plane at the air gap distance.

22. The system of claim 21 wherein the at least one bracket includes a bezel bracket having a rectangular configuration with one open side for sliding the bezel bracket over the screen.

23. The system of claim 21 wherein the at least one bracket includes an upper bracket in contact with a top edge of the screen and a lower bracket in contact with a lower edge of the screen.

24. The system of claim 21 further comprising an elastic cord coupling the at least one bracket and the touchless input device to the screen.

25. A kit for retrofitting a point of sale (POS) system having a touchscreen display, comprising:

an IR frame overlay;

at least one mounting bracket adapted for mounting the IR frame overlay at a distance from the touchscreen display of a POS system;

an interface cable for operably connecting the IR frame overlay to the POS system; and

a software package which can be run on the POS system and allows the POS system to receive input from the IR frame overlay and to generate an indicator image on the touchscreen display.

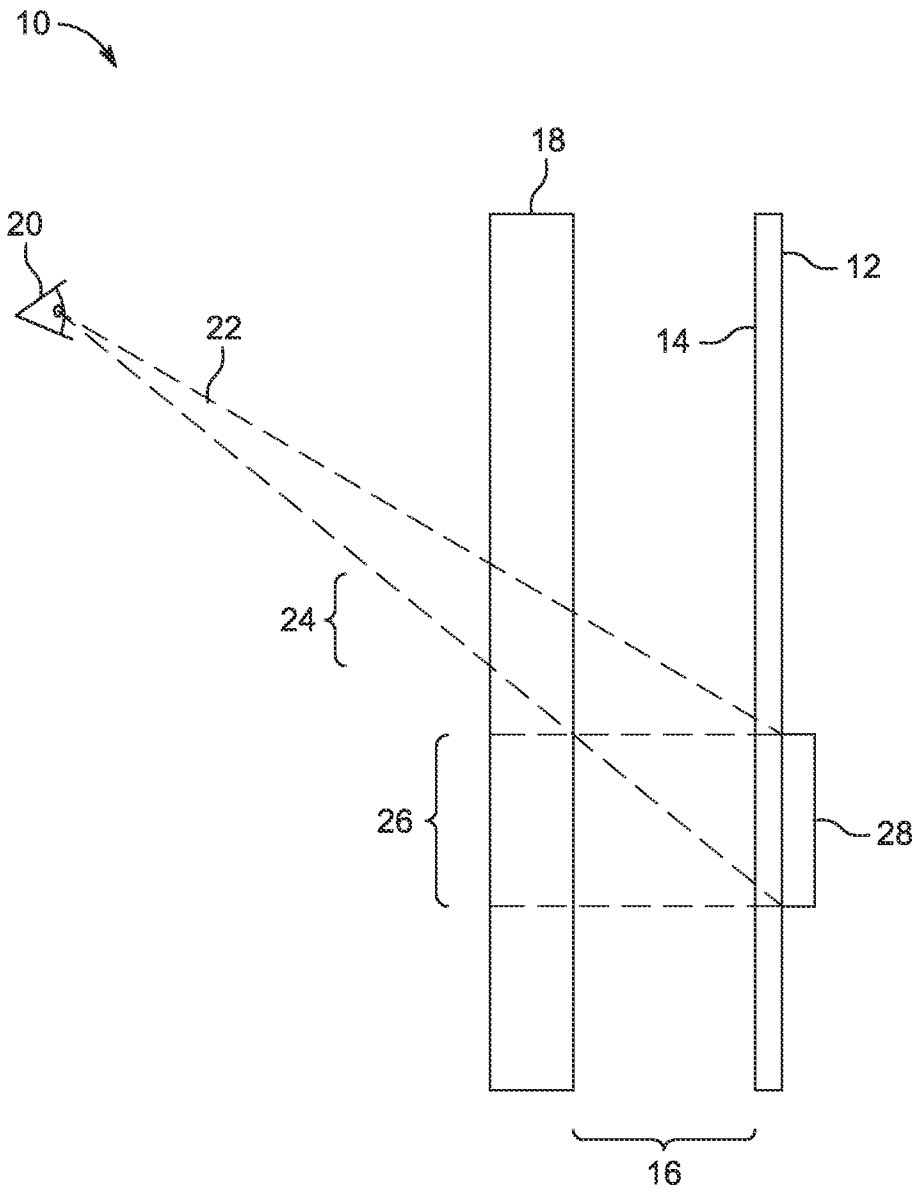

FIG. 1

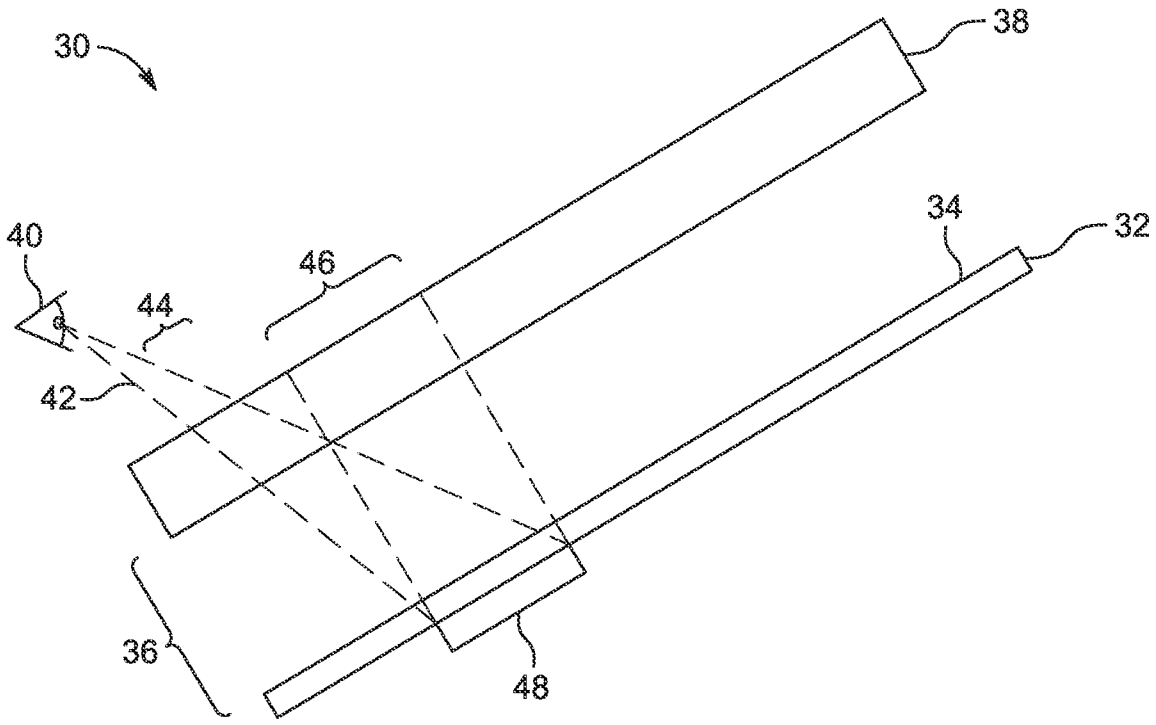

FIG. 2

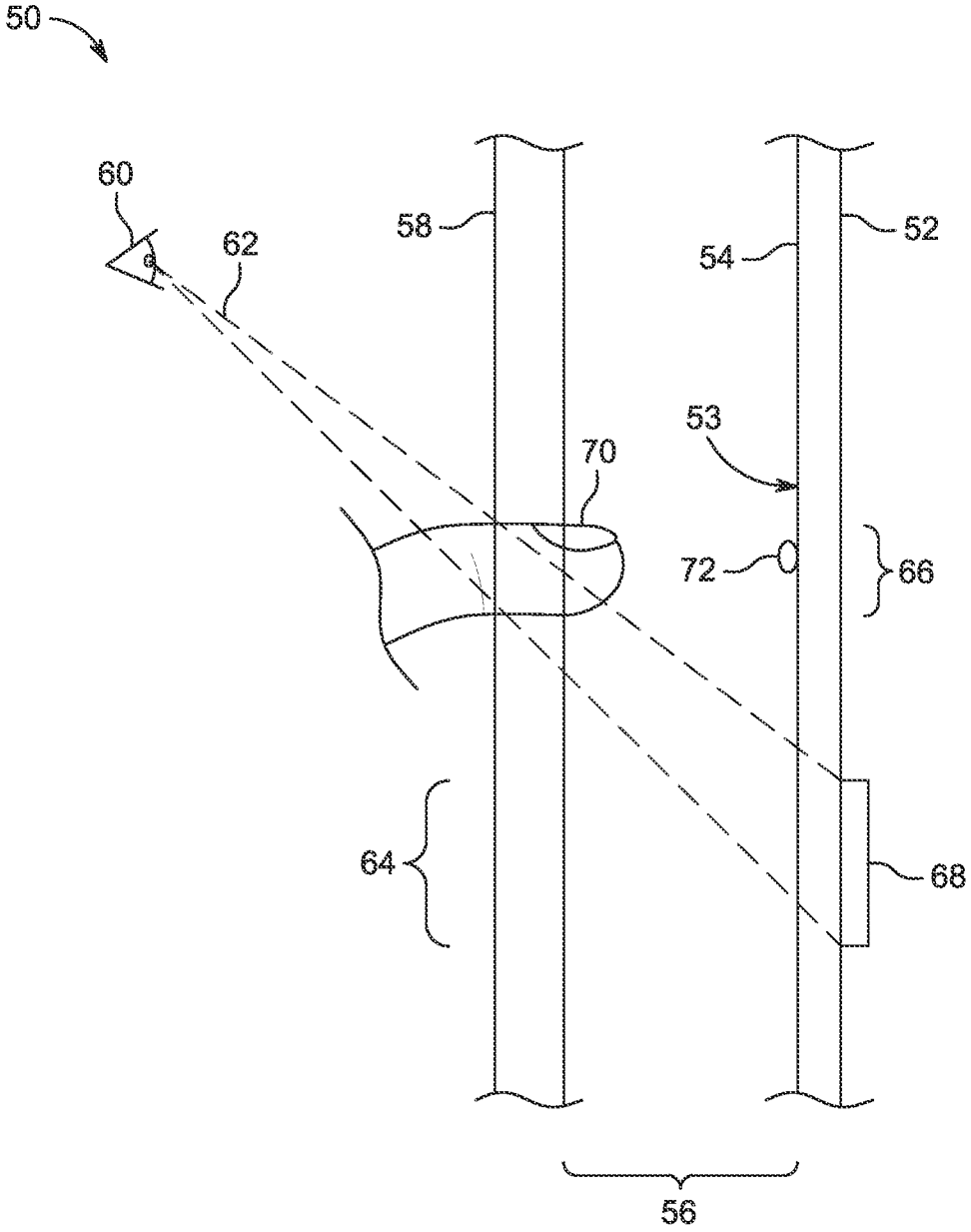

FIG. 3

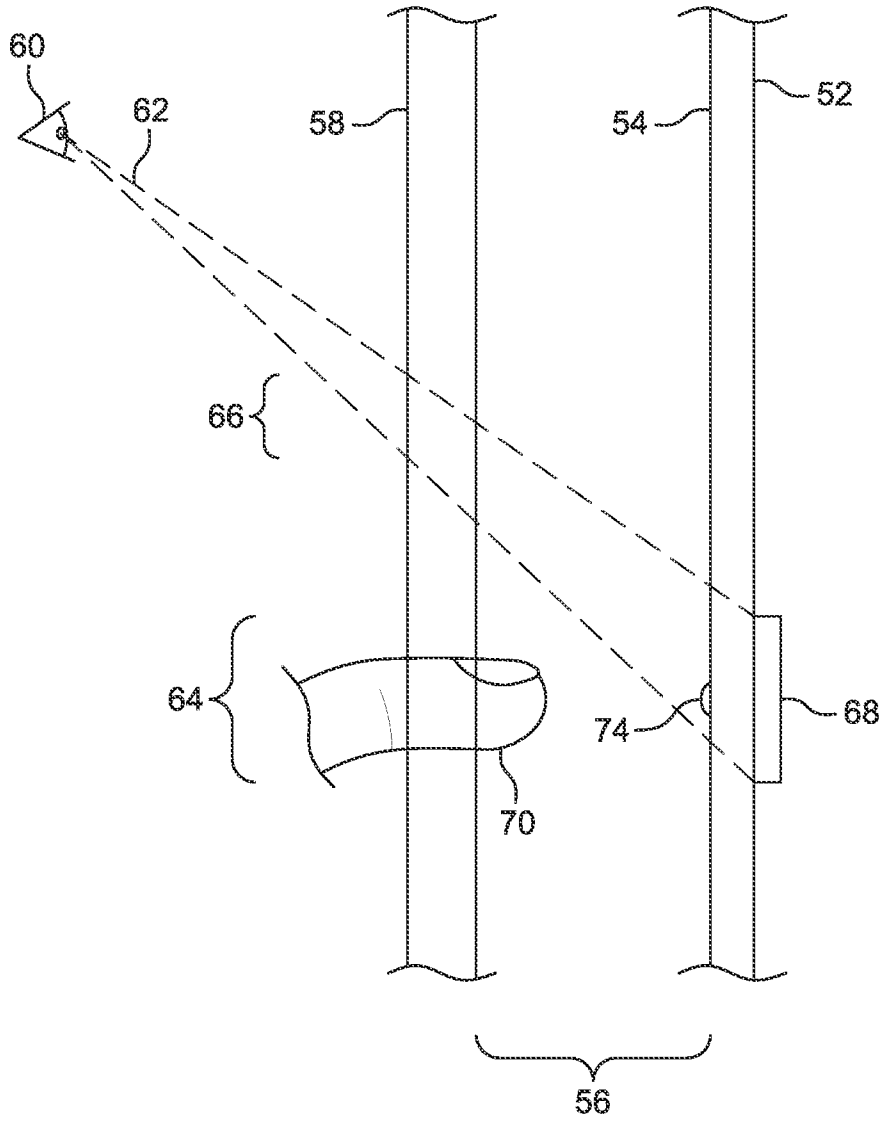

FIG. 4

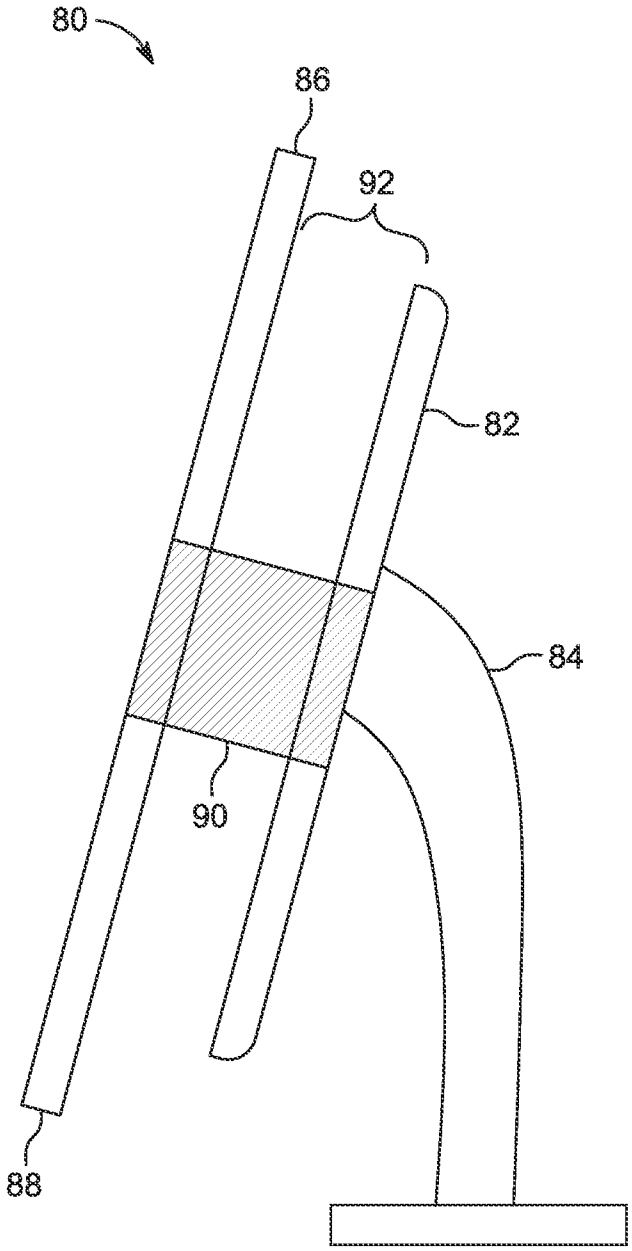

FIG. 5

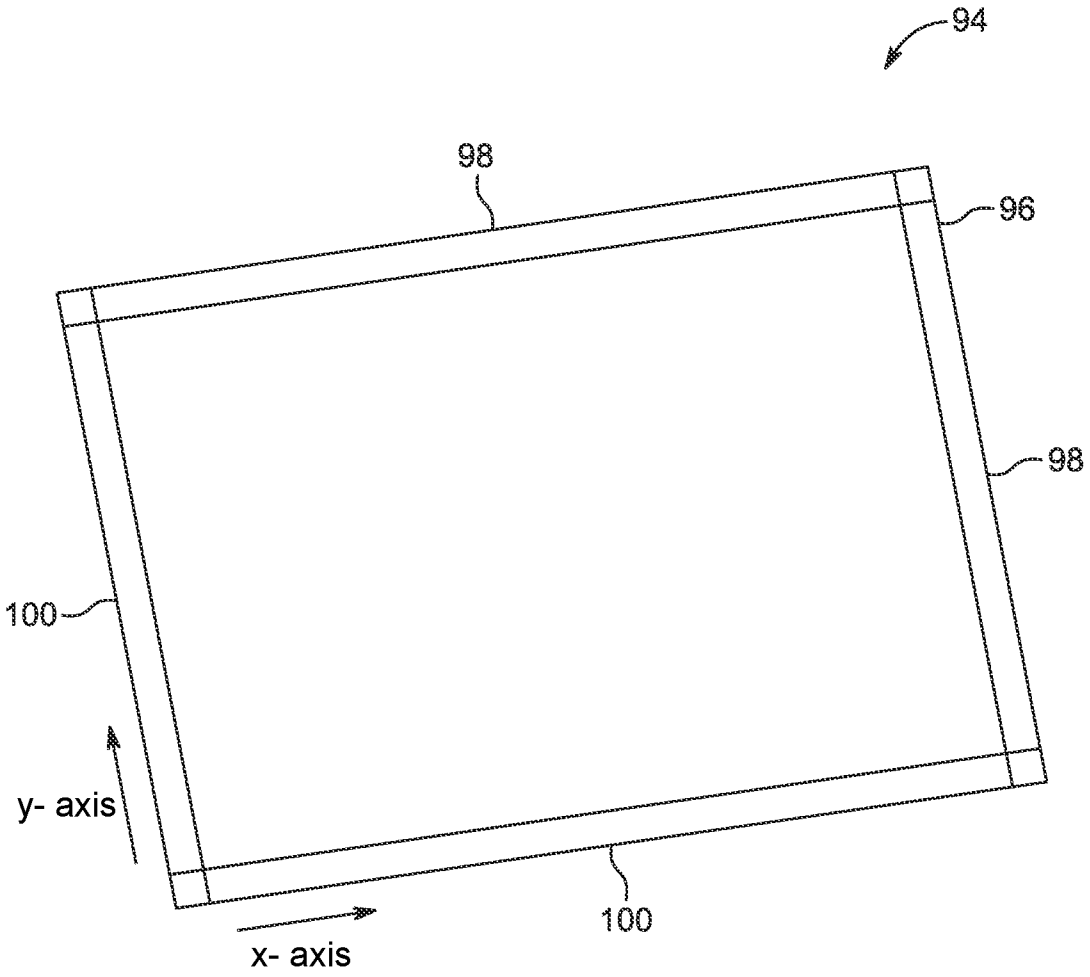

FIG. 6

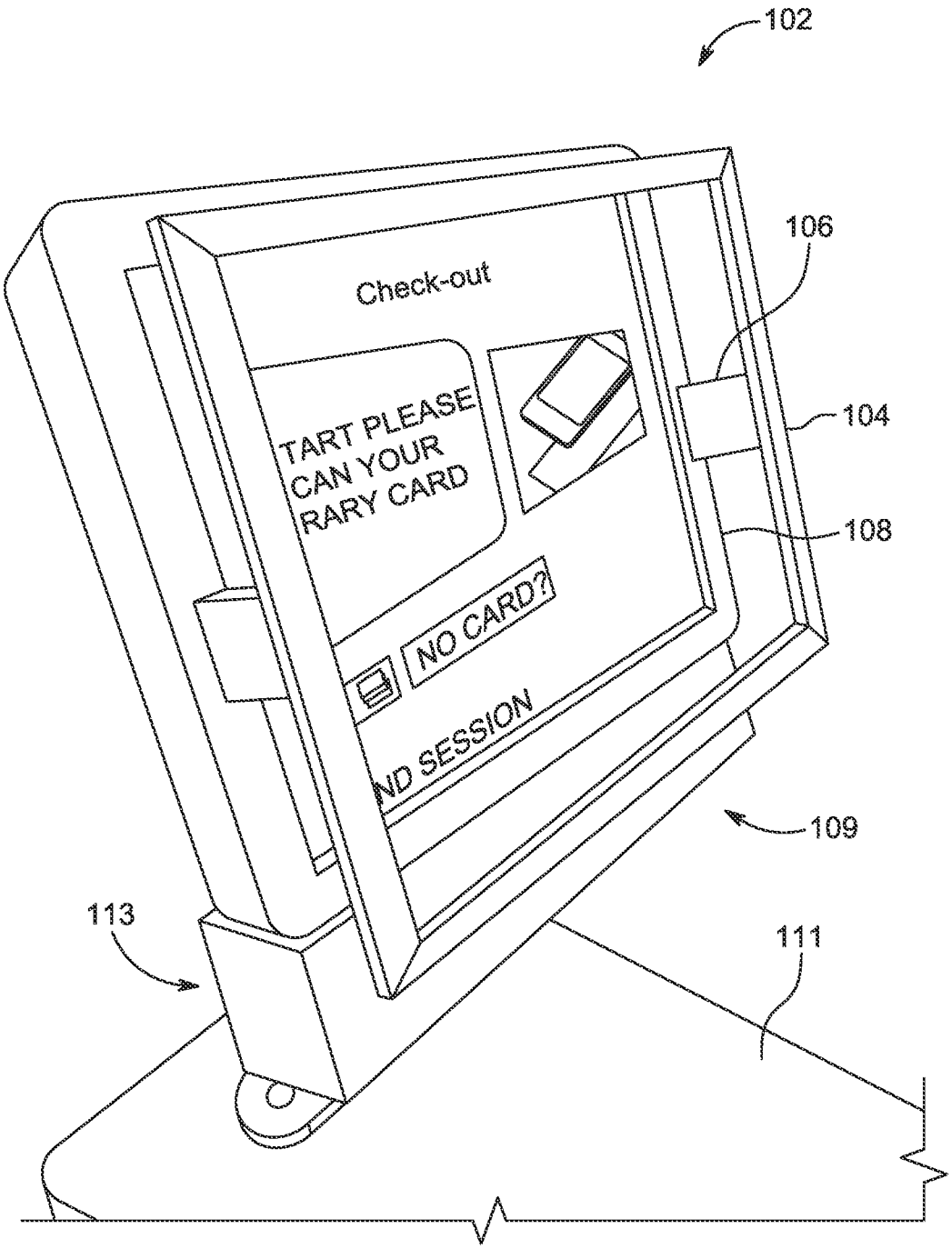
102
106
Check-out
TART PLEASE
CAN YOUR
RARY CARD
104
108
NO CARD?
ND SESSION
109
113
111

FIG. 7

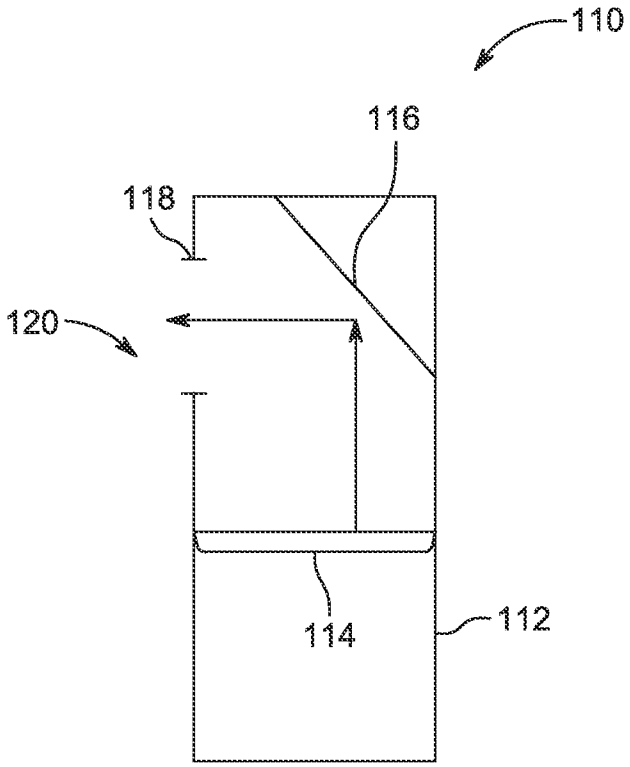

FIG. 8

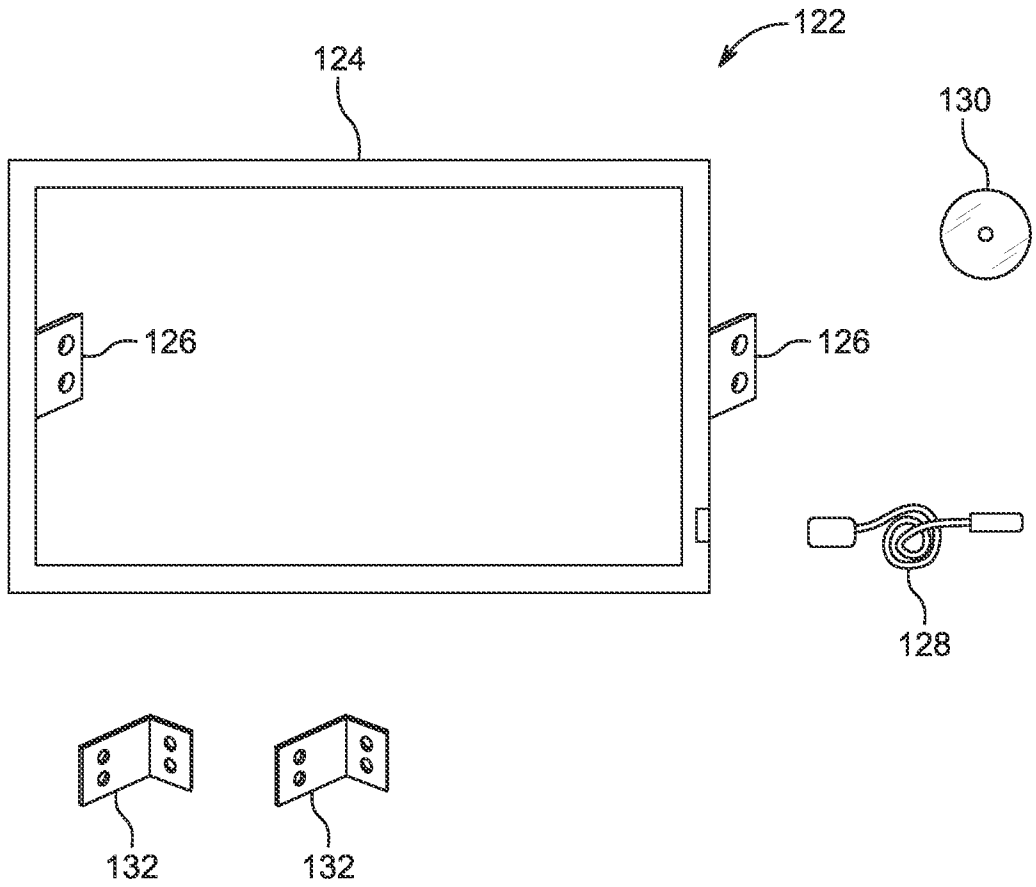

FIG. 9

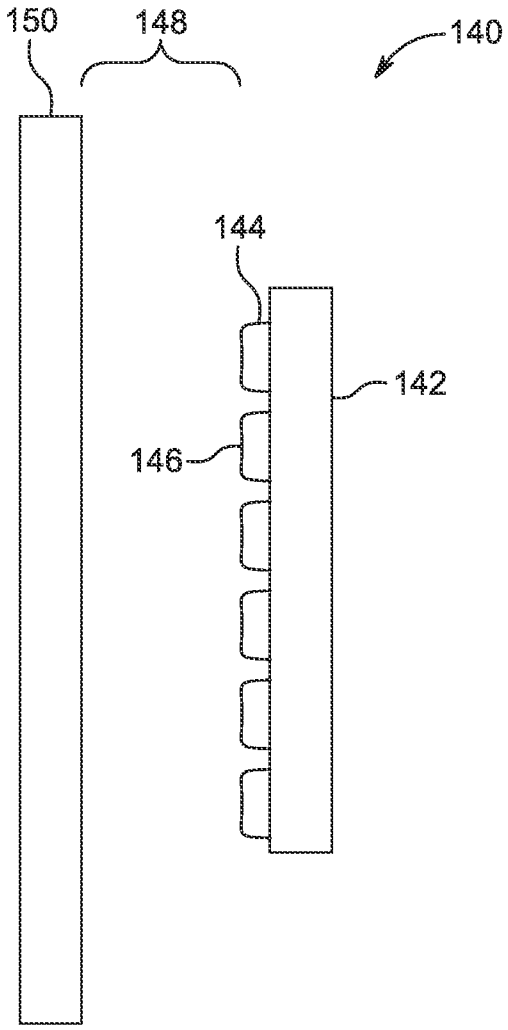

FIG. 10

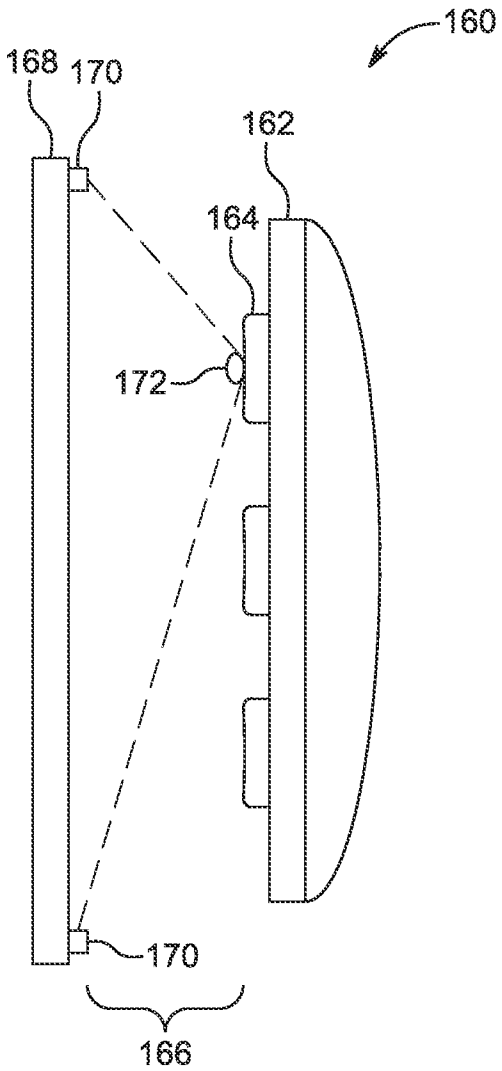

FIG. 11

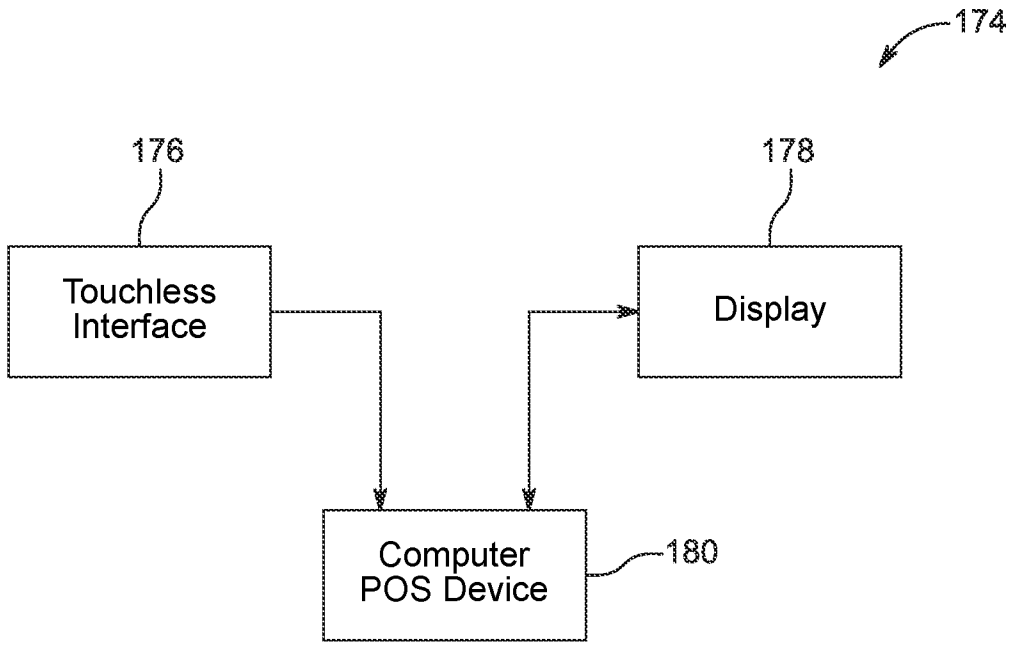
174
176
178
Touchless Interface
Display
Computer POS Device
180

FIG. 12

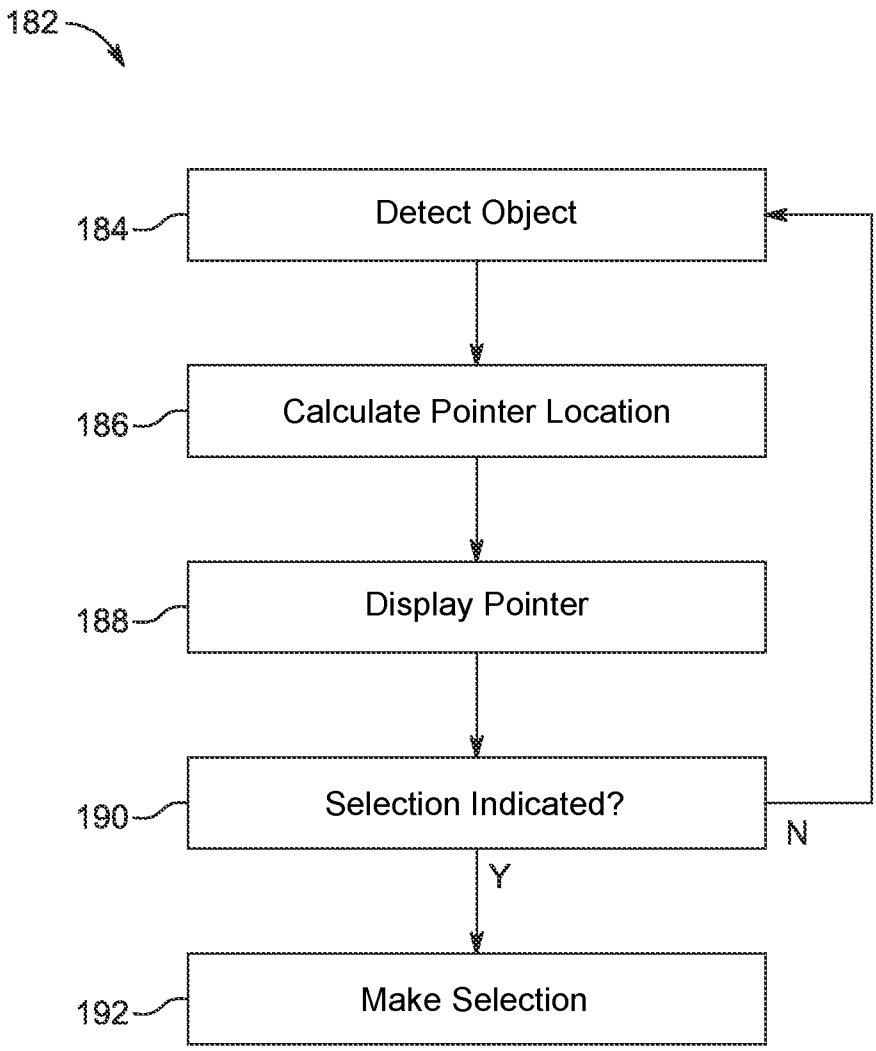
182
184
Detect Object
186
Calculate Pointer Location
188
Display Pointer
190
Selection Indicated?
N
Y
192
Make Selection

FIG. 13

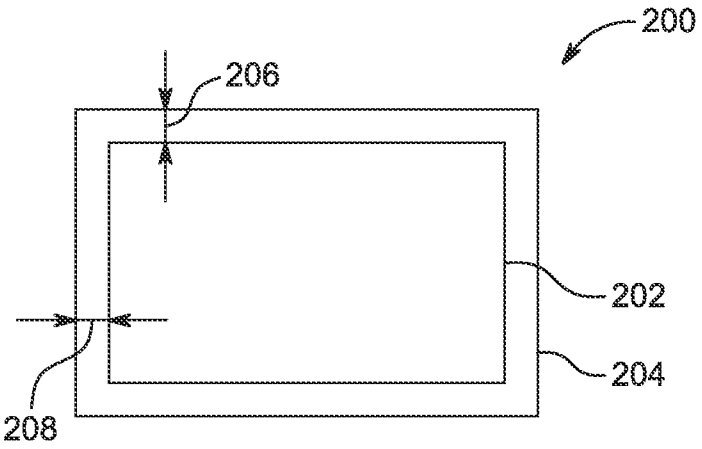

FIG. 14a

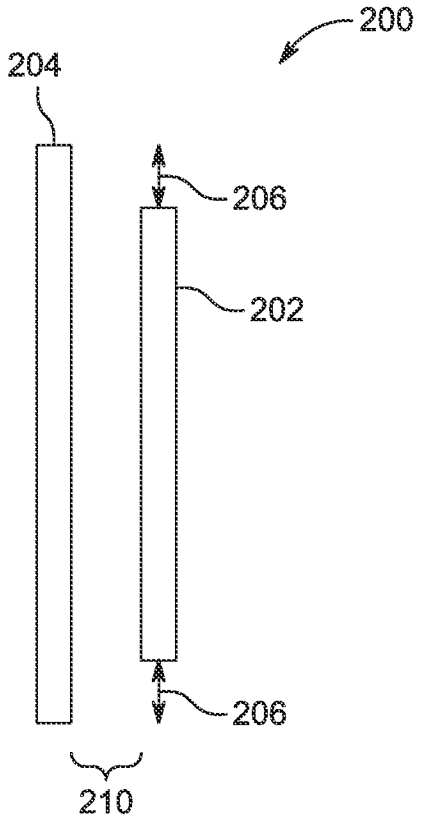

FIG. 14b

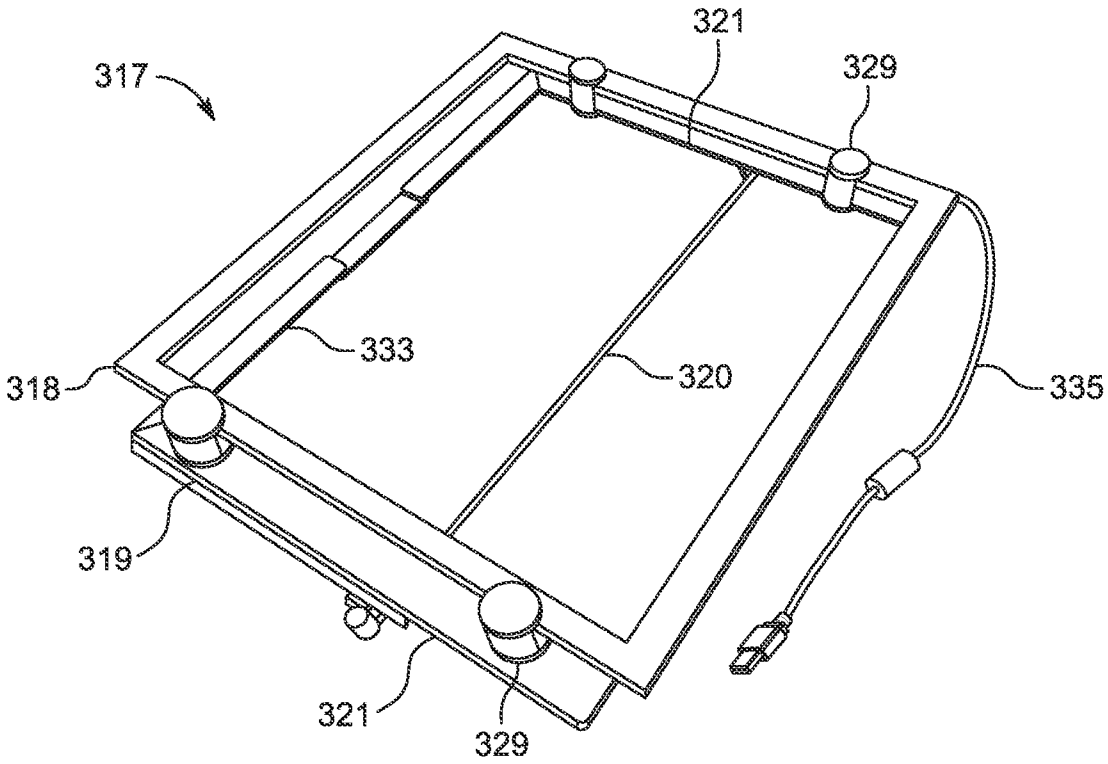

FIG. 15

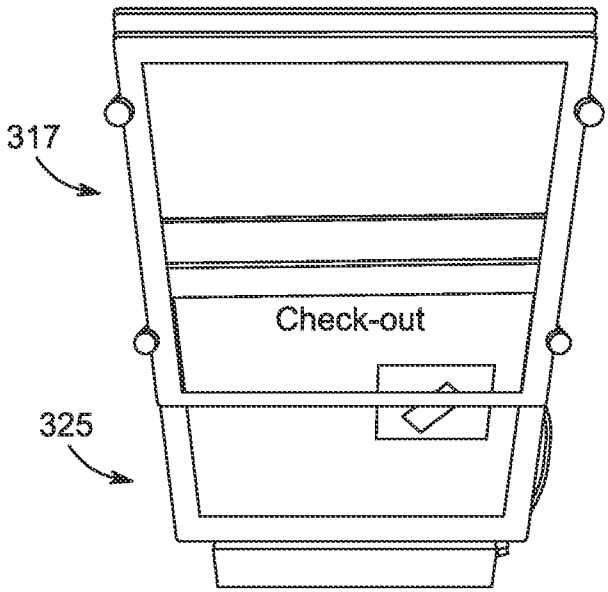

FIG. 16

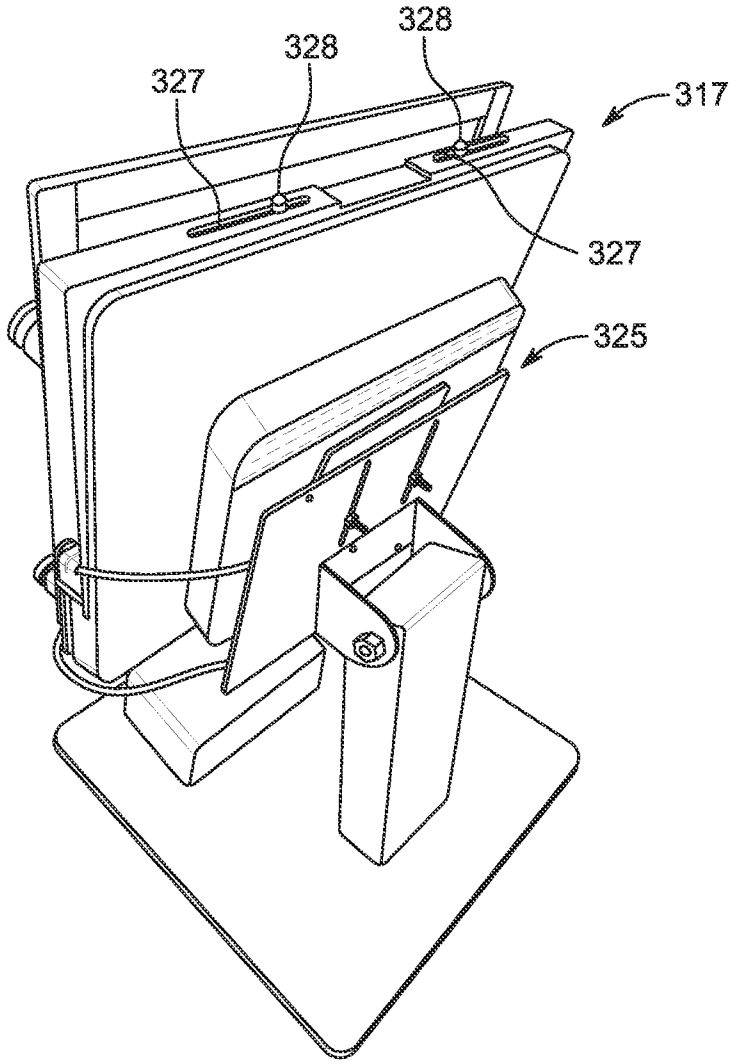

FIG. 17

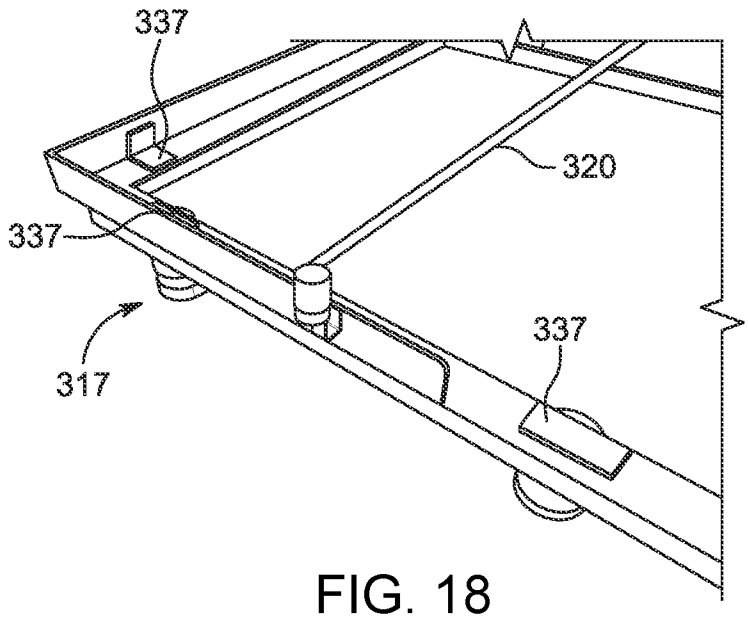

FIG. 18

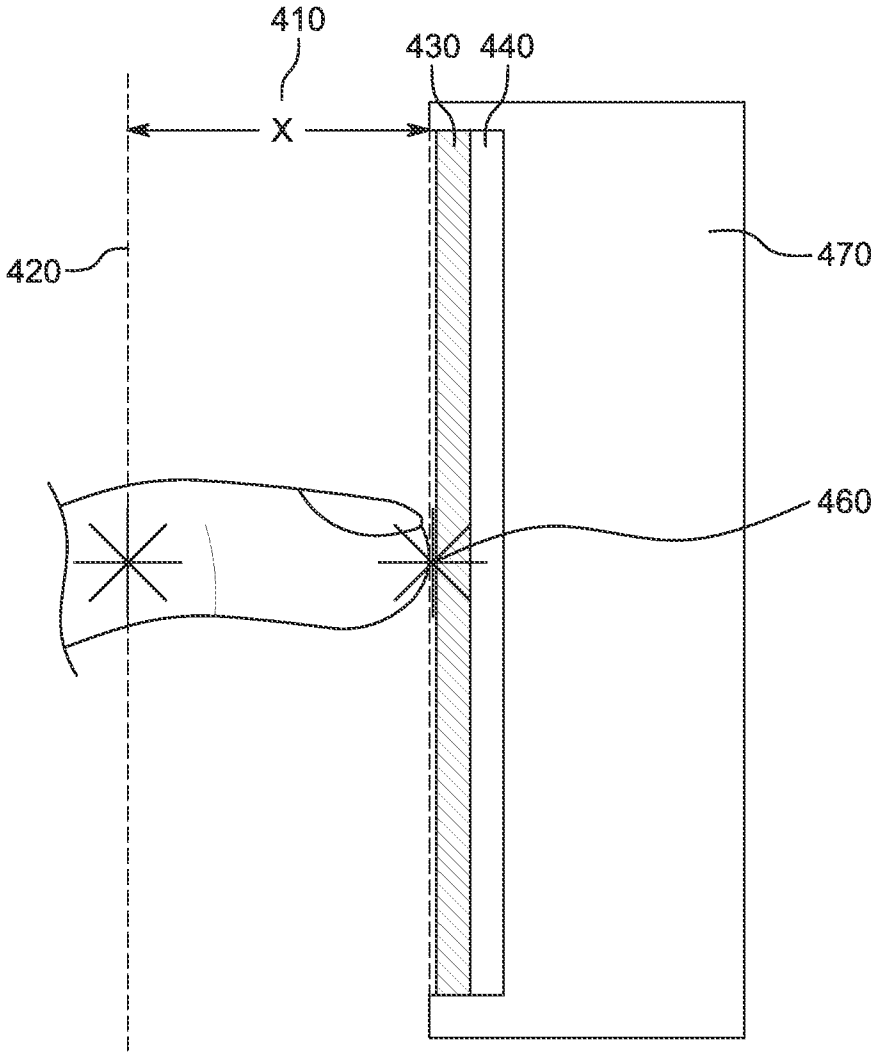

FIG. 19

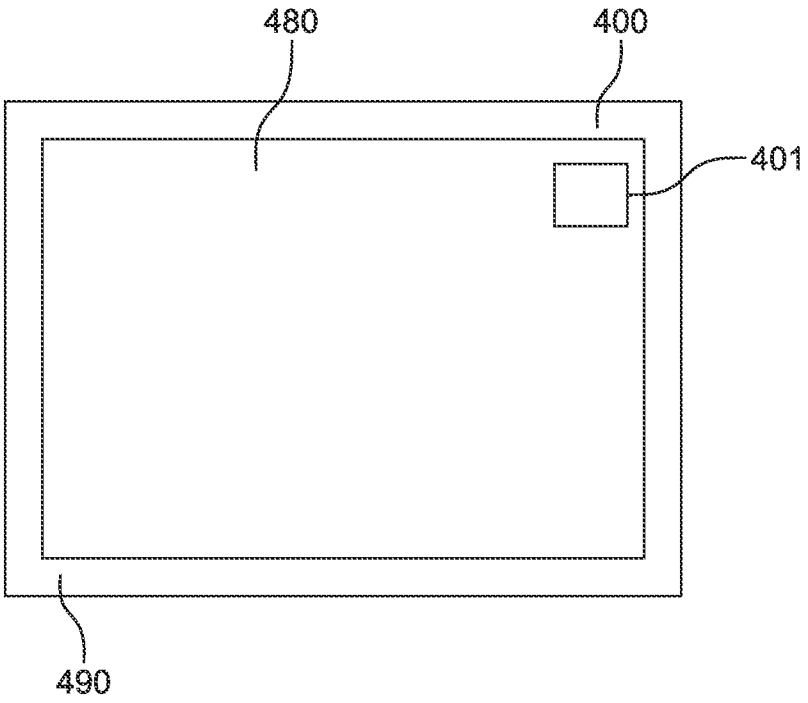

FIG. 20

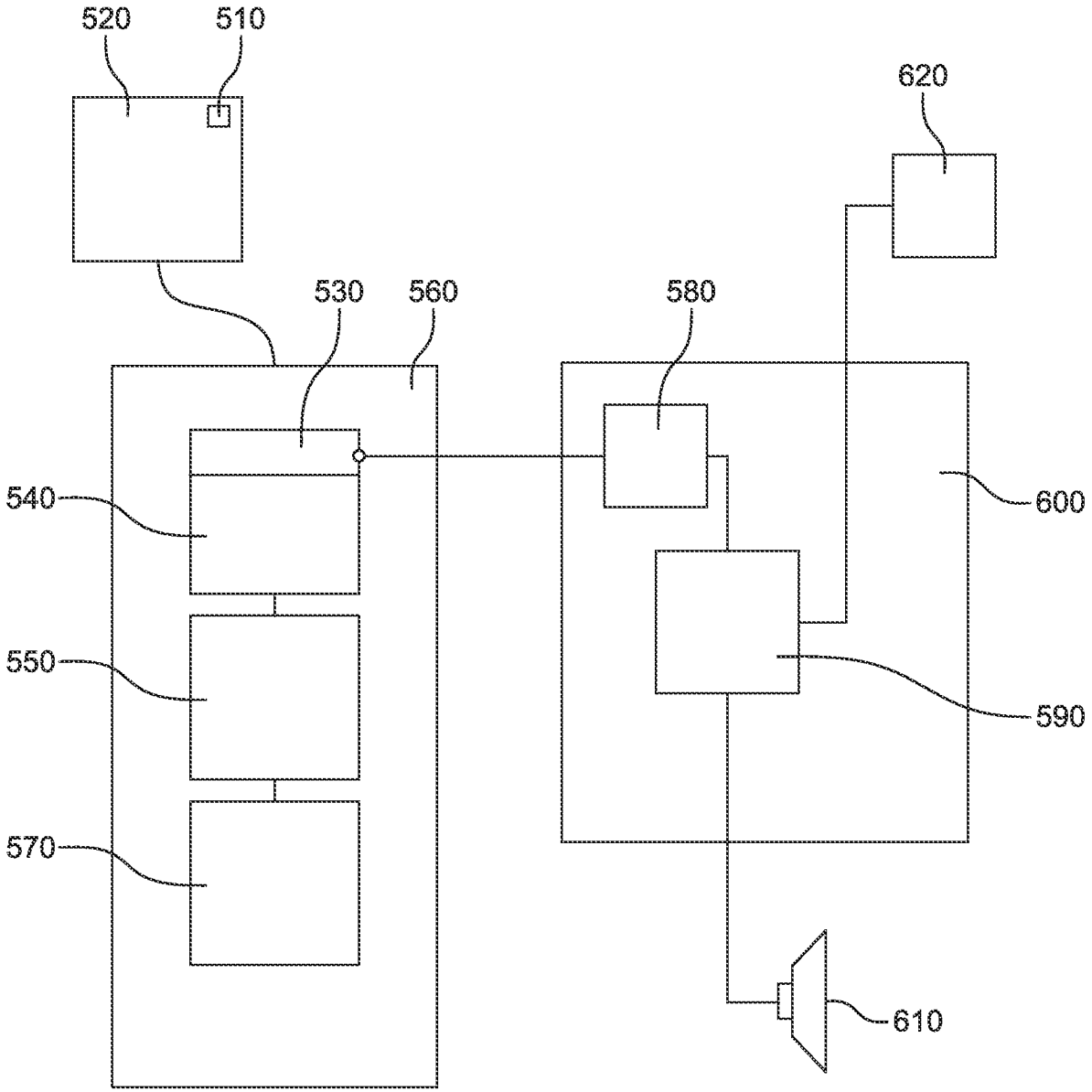

FIG. 21

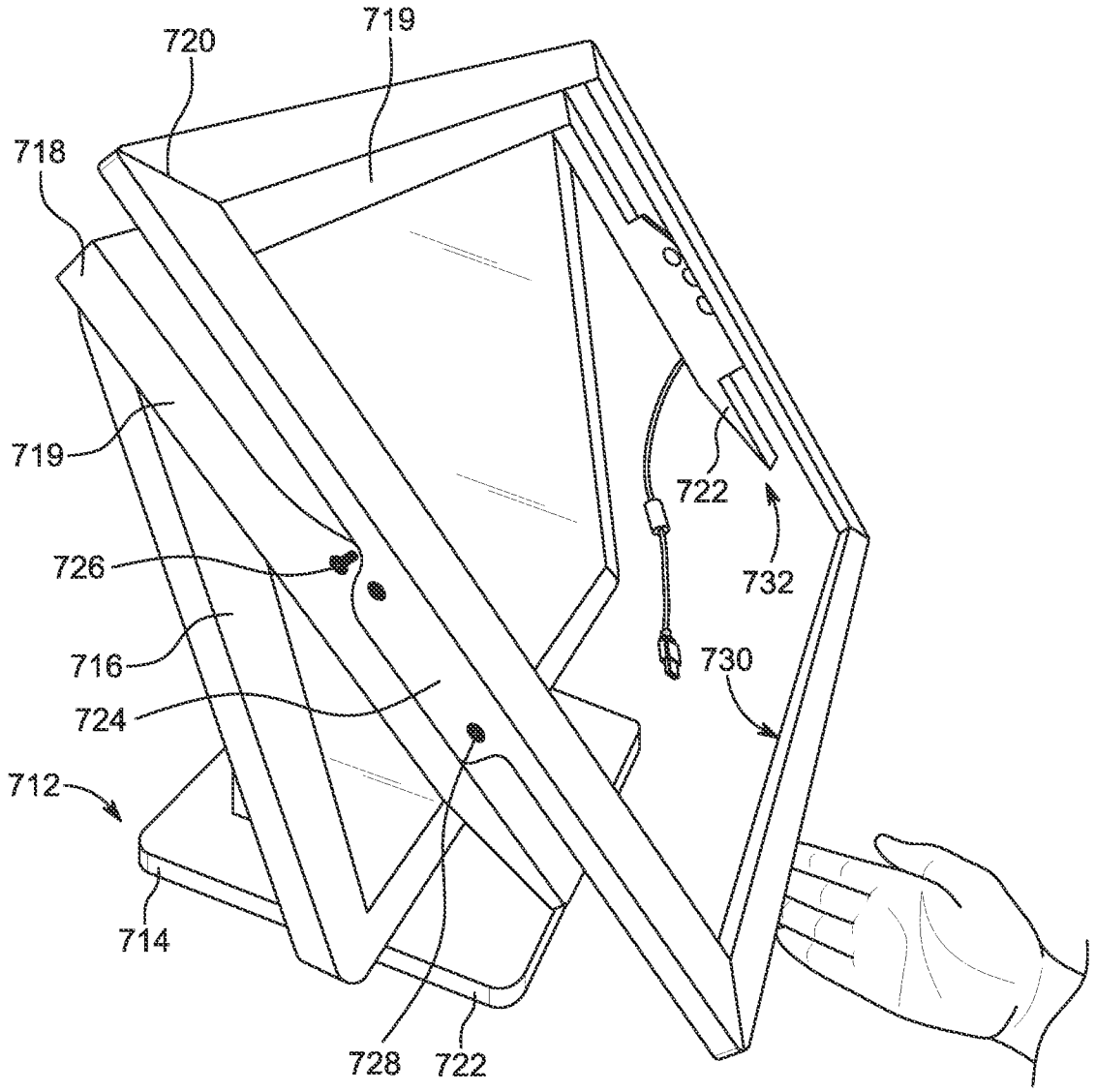

FIG. 22

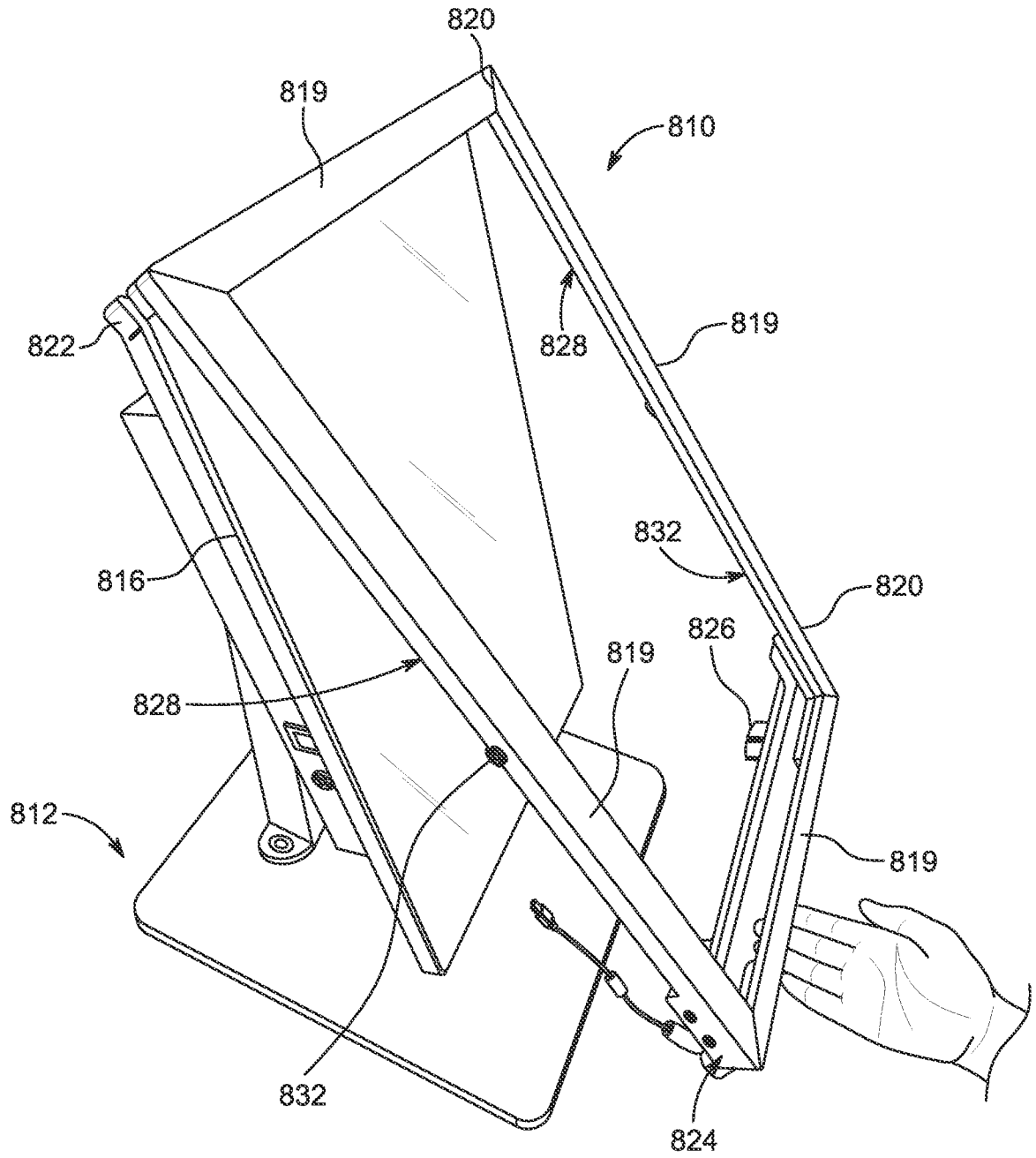

FIG. 23

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 21/31545

A. CLASSIFICATION OF SUBJECT MATTER

IPC - G06F 3/042 (2021.01)

CPC - G06F 3/0421, G06F 3/0412, G06F 3/042, G06F 3/03545, G06F 3/0317, G06F 3/0488, G06F 3/04883, G06F 3/044, G06F 3/04886, G06F 3/045, G06F 3/0386, G06F 3/03545, G06F 3/03542

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)
See Search History document

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
See Search History document

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
See Search History document

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 2011/0090147 A1 (GERVAIS et al.) 21 April 2011 (21.04.2011) para [0005]-[0006], [0022], [0030]-[0031], [0034], [0038], [0047]-[0048], [0051], [0053], [0056]-[0057], [0067]-[0068	8-11, 13-17, 21-23, 25 ---------- 1-7, 12, 18-20, 24
Y	US 7,928,964 B2 (KOLMYKOV-ZOTOV et al.) 19 April 2011 (19.04.0211) col 15, ln 43-47	1-7, 12, 18-20
Y	US 2004/0011932 A1 (DUFF) 22 January 2004 (22.01.2004) para [0052]	24
Y	US 2019/0212849 A1 (GM GLOBAL TECHNOLOGY OPERATIONS LLC) 11 July 2019 (11.07.2019) para [0036]-[0037]	2-3, 12, 20
Y	WO 2016/102948 A1 to (UNIVERSITY OF HERTFORDSHIRE HIGHER EDUCATION CORPORATION) 30 June 2016 (30.06.2016) pg 16, ln 25-32	7

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

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"D" document cited by the applicant in the international application
"E" earlier application or patent but published on or after the international filing date
"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)
"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
"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
"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
"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
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
16 July 2021 (16.07.2021)	AUG 10 2021
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-8300	Authorized officer Kari Rodriquez Telephone No. PCT Helpdesk: 571-272-4300