

cation to the entire gamut of consumer electronics that include touch screen technology, including, in particular, PDAs.

[0034] Touch screen **20** has rigid contact surface **21** (usually constructed of glass) upon which indicia may be electrically displayed. Rigid contact surface **21** has a periphery with top edge **22**, bottom edge **23**, left edge **24** and right edge **25**. In the telephone embodiment shown in the drawings, displayed indicia may include alphanumeric characters configured in the well-known matrix configuration of a touch-tone telephone keypad (as shown in **FIG. 1**). Additionally, the flexibility of touch screen **20** may allow the user to alternatively receive text messages, input and review an electronic telephone number/address book, and maintain a “to-do list” and/or calendar of appointments. Similar functionality can be found in PDAs, such as the PALM PILOT sold by 3COM Corporation. In each of these devices, indicia can be displayed on rigid contact surface **21** using well-known technologies, such as those involving liquid crystal displays.

[0035] In the embodiment shown in **FIG. 1**, touch screen overlay apparatus **100** includes flexible membrane **101** and frame **102**. In alternate embodiments, other means for removeably maintaining flexible membrane **101** in operable association with touch screen **20** e.g. (See **FIGS. 3, 7, 8, 9** and **10**), which will be discussed hereinbelow.

[0036] Flexible membrane **101** is preferably made of a transparent, flexible material, such as mylar film (by heat forming process) or low to mid density tetrafluoropolyethylene (by an injection moulding process). However, it is contemplated that flexible membrane **101** may also be formed of a translucent or even an opaque material, so long as its flexibility is maintained. In an embodiment where flexible membrane **101** is formed of an opaque material, indicia related to the displayed indicia expected to be beneath that portion of the membrane or commands executed upon touching the region associated with each indicia may be printed on flexible membrane **101**. This may have particular utility in providing a foreign language translation of indicia displayed on touch screen **20**.

[0037] As shown in **FIG. 1**, in a preferred embodiment, flexible membrane **101** includes a plurality of raised dome-shaped regions **120a-1**. Each of these raised dome-shaped regions may be formed integrally to flexible membrane **101** (see **FIG. 2a**) or by adding additional material to the membrane (see **FIG. 2b**). As shown in **FIG. 2c**, where a user's finger depresses dome-shaped region **120e**, it is temporarily deformed such that a portion of flexible membrane **101** physically contacts touch screen **20**. Nevertheless, as shown in **FIG. 2**, flexible membrane **101** need not include such raised regions to provide improved some tactile characteristics for user input. Where the flexible membrane includes raised dome-shaped regions **120a-1**, each raised dome shaped region is preferably as to be in substantial registration with a respective one of the display indicia (or associated regions) to facilitate input into touch screen **20** when flexible membrane **101** is overlaid over rigid contact surface **21** and used. Accordingly, each application will require a particular configuration to match the display configuration on the touch screen, a configuration typically programmed by the user input device manufacturer or software provider.

[0038] Where the raised dome-shaped regions are formed in a transparent membrane or from transparent material added to a pre-existing membrane, the user can view the indicia displayed by touch screen **20** to assist in selection of the desired input. Where the raised dome-shaped regions are formed a translucent or opaque membrane or from translucent or opaque material added to a pre-existing membrane, printed indicia may be required on flexible membrane **101** and applied using standard printing techniques. However, given the notoriety of the touch-tone telephone keypad configuration, it is also possible that the user will not require any visual indicia whatsoever and will rely instead upon tactile sensation and prior knowledge of this standard layout—known relationships of one key to another. No matter the type of material is employed, using the tactile landmarks provided by the addition of the domes provided by flexible membrane **101**, the user can tactually locate the desired input. This functionality will prove extremely useful when operating cellular telephones under driving situations.

[0039] As shown in **FIG. 1**, flexible membrane **101** is of sufficient size to cover the entirety of rigid contact surface **21**. However, it is within the scope of the present invention for flexible membrane **101** to cover only a portion of rigid contact surface **21**. This approach, for instance, would be useful in association with the PALM PILOT manufactured by 3COM Corporation, which includes a “Graffiti writing area” that accepts and requires pen strokes of a stylus in the form of a proprietary alphabet to input various alphanumeric characters. Accordingly, in constructing flexible membrane **101** for use in association with a PALM PILOT PDA it would be desirable to provide a cutout region in substantial registration or alignment with the “graffiti writing area”.

[0040] In the embodiment shown in **FIG. 1**, frame **102** is used to removably maintain flexible membrane **101** in a predetermined position where flexible membrane **101** is disposed above touch screen **20** and in registration with at least a desired portion of rigid contact surface **21** and possibly the displayed indicia thereon. As shown, frame **102** is a rectangle having four frame members, preferably formed of at least a semi-rigid material, such as plastic. Flexible membrane **101** is attached about its entire periphery to each of the frame members using various types of fastening means, such as adhesive, heat-bonding, or mechanical fastening means. In other commercial applications, such as a watch, frame **102** may be circular and, thus, comprise only one frame member. In view of the flexible material used to fabricate flexible membrane **101** and frame **102**, there is no limit to the variation of shapes that can be formed.

[0041] As shown in **FIG. 1**, frame **102** has associated therewith hinge members **103, 105** and **107**, which operably mate with hinge members **104** and **106** disposed on the face of telephone housing **16** adjacent bottom edge **23** of rigid contact surface **21**. Rod **108** (shown in association with frame **102**), is threaded through each of hinge members **103** through **107** and capped so as to be permanently connected with the hinge members. In this manner, frame **102** and flexible membrane **101** are hingedly connected to telephone housing **16** and, thus, associated with touch screen **20**. The hinge members may be positioned at various locations about the housing **16** and in a manner so as to permit membrane **101** to swing away and fold back against the rear face of housing **16**.