Optionally, the mechanism may be selected to direct a force that represents only a single axial component of the overall acceleration.

[0034] A further embodiment includes multiple mechanisms that each direct a force representing a different axial component of an overall acceleration. For example, a set of three mechanisms may be included, where each mechanism directs a force representative of one component of a Cartesian coordinate system. The force measurements from each of the three axis can be utilized separately or in combination to determine the overall acceleration of the device.

[0035] A first type of mechanism may allow only forces directed perpendicular to the touch sensitive device (i.e., a "z direction") to be applied against the deformable member. Examples of such mechanisms include a lever having a pivot axis and lever arm that are both substantially parallel to the plane of the touch screen, and a tubular slide extending substantially perpendicular to the plane of the touch screen. A second type of mechanism may allow only forces directed in a first lateral direction parallel to the touch screen (i.e., an "x direction") to be applied against the deformable member. Examples of such mechanisms include a right angle lever arm or a bell crank. If it is desired to measure a component of force in a third direction (i.e., a "y direction"), then another of the second type of mechanism may be disposed at a right angle to measure that force. Other types of mechanisms may be utilized to measure the same or different force components.

[0036] The mechanism may be used in conjunction with a biasing member, such as a spring or elastic cord, which limits the range of motion of the mechanism, maintains contact between the mechanism and the deformable member, and maintains contact between the deformable member and the touch screen. Furthermore, a biasing member may apply a sufficient force to partially deform the deformable member, such that touch screen can sense when the force, and therefore the contact area, both increases and decreases. Typically, the spring will have a first end coupled to the lever and a second end coupled to the structure. For example, a coil spring, tension spring, compression spring or wave spring may be utilized. See FIG. **10**.

[0037] The deformable member must be secured in position between the mechanism and the touch sensitive device. Suitably, the deformable member may be secured to the mechanism, such as at the end of a lever facing the touch sensitive device. The lever is pivotally coupled to a structure and maintains the position of the pivot point of the lever. A mass is secured to, or forms part of, the mechanism.

[0038] Each mechanism is secured to a structure that can be selectively coupled to the touch sensitive device or a device providing the touch sensitive device. The structure may, for example, take the form of a housing a frame. The structure may be suitably coupled to the touch sensitive device with a clip, or other fastener.

[0039] FIG. **1** is a plan view of a mobile phone **10** having a touch screen **12** and various conventional buttons **14**. The touch screen **12** overlays a display that provides a graphical user interface. Depending upon the operating system or software application that control the operation of the display and touch screen, a number of icons are displayed to the user for selecting a desired operation. For example, a typical mobile phone display will provide a signal strength indicator **16**, battery charge gauge **18**, calendar icon **20**, text message icon **22**, contacts directory **24**, and a clock **26**. A special icon **28** may also be provided to facilitate entering an accelerometer mode of operation.

[0040] FIG. **2** is a block diagram showing the components of the mobile phone **10**. The mobile phone **10** includes components for user input to a processor **30**, such as a microphone **32**, keypad **14** and touch screen **12**. User feedback and information is generated by the processor **30** and provided to the user via a speaker **32** and display **34**. The processor **30** has access to a memory device **36** that enables storage and retrieval of data. The mobile phone communicates with a wireless telephone network via a radio subsystem **38** coupled to an antenna **39**. Note that the block diagram does not include many components or features known in existing mobile phones. Of course, mobile phone **10** could also include any component or feature that is known in the art in addition to those shown within the scope of the preferred embodiments.

[0041] FIG. **3** is plan view of a mobile phone **10** having a touch screen **12** in accelerometer mode. Certain high priority information has been moved to the bottom of the touch screen **12**, such as the signal strength indicator **16**, the battery charge gauge **18**, contacts directory **24** and an accelerometer mode exit button **40**. An upper portion of the touch screen **12** will be used in cooperation with an accelerometer module to be coupled to the phone **10**. As shown, there are three predetermined regions **42**, **44**, **46** of the touch screen **12** where a deformable member will be positioned to indicate the X component, Y component and Z component of a force, respectively. It is not necessary for these predetermined regions to the displayed to the user, but these regions are shown for purpose of illustration. Rather, this portion of the display might suitably display a message, such as "Please attach accelerometer", or an image illustrating proper attachment of the accelerometer.

[0042] FIG. **4** is a perspective view of one embodiment of an accelerometer module **50** being coupled to the mobile phone **10**. This accelerometer module forms a housing **52** that slides over the upper end of the mobile phone **10**.

[0043] FIG. **5** is a plan view of the accelerometer module **50** coupled to the mobile phone **10** in its operative position. As shown, the accelerometer module **50** extends over the three predetermined regions **42**, **44**, **46** of the touch screen **12**. Separate subassemblies of the accelerometer module **50** will cooperate with the predetermined regions **42**, **44**, **46**, as described further in reference to FIG. **6**.

[0044] FIG. **6** is a cross-sectional view of the accelerometer module **50** coupled to the mobile phone **10**. Optionally, the module **50** forms clips **52** that frictionally engage the perimeter of the mobile phone and secure the module in position. The accelerometer module **50** positions three accelerometer mechanisms over the touch screen **12**. Specifically, a first accelerometer mechanism **54** is positioned over the region **42** and senses acceleration in the X direction, a second accelerometer mechanism **56** is positioned over the region **46** and senses acceleration in the Z direction, and a third accelerometer mechanism **58** is positioned over the region **44** and senses acceleration in the Y direction. The operation of the individual mechanisms is described further below.

[0045] FIGS. **7**A-B are partial cross-sectional views of a mechanism **56** for measuring force in a "Z" direction (up and down on the page as shown) with a deformable ball **60**. A fixed support bracket **62** extends from the wall and supports a proximal end of the lever **66**. The proximal end of the lever **66** includes a pivot pin **64** and a distal end of the lever supports a