

CLAIMS

1. An apparatus comprising:
a fluid reservoir; and
a laminate fluidic circuit positioned above the fluid reservoir, wherein the laminate fluidic circuit comprises:
two or more layers laminated together to define a substantially planar substrate;
one or more channels defined ~~within~~ between two layers of the substrate, wherein each channel is defined by upper and lower walls and opposed side walls; and
a flexible conduit defined by a portion of the substrate encompassing an extent of at least one of the channels, wherein the flexible conduit ~~that~~ is partially separated or separable from the remainder of the substrate, the flexible conduit comprising the portion of the substrate and the encompassed extent of the channel,
~~wherein the flexible conduit is deflectable with respect to the planar substrate toward the fluid reservoir such that the flexible conduit fluidly connects the at least one channel to the fluid reservoir.~~
- ~~2. The apparatus of claim 1, wherein the~~ and wherein the substrate comprises a cutout formed through the substrate and partially surrounding the portion of the substrate encompassing the extent of the channel.
- ~~3. The apparatus of claim 1, wherein~~ or the substrate comprises a score line partially circumscribing the portion of the substrate encompassing the extent of the channel, wherein the score line enables the portion of the substrate to partially separate from the remainder of the

substrate upon application of an external force to the portion of the substrate and wherein the flexible conduit, when separated from the remainder of the substrate, is deflectable between an undeflected position above the fluid reservoir in which the flexible conduit is substantially coplanar with the planar substrate and a deflected position in which a portion of the flexible conduit is in the fluid reservoir,

and wherein the upper and lower walls and the opposed side walls of the encompassed extent of the channel are deflectable with the flexible conduit and with respect to the planar substrate toward the fluid reservoir such that the flexible conduit fluidly connects the at least one channel to the fluid reservoir when the flexible conduit is in the deflected position.

42. The apparatus of claim 1, wherein the two or more layers comprise a first layer, a second layer, and a third layer, and wherein the first layer is disposed between the second layer and the third layer and comprises at least one slot forming the one or more channels when covered on opposed sides by the second layer and the third layer.

53. The apparatus of claim 1, wherein the two or more layers comprise a first layer and a second layer laminated to the first layer, and wherein at least the first layer comprises at least one groove formed in a surface thereof and forming the one or more channels when covered by the second layer.

64. The apparatus of claim 1, wherein the substrate comprises two or more layers of a polymeric material adhesively or thermally bonded together.

75. The apparatus of claim 1 further comprising one or more electrodes disposed on the flexible conduit.

86. The apparatus of claim 75, wherein the one or more electrodes are for one or more of detecting a fluid level of a fluid held in the fluid reservoir, detecting a presence of a fluid held in the fluid reservoir, or heating a fluid held in the fluid reservoir.

97. The apparatus of claim 1 further comprising a valve operatively associated with at least one of the channels and the fluid reservoir to control flow between the fluid reservoir and at least one of the channels.

~~108~~. The apparatus of claim 1 further comprising a rigid cover disposed on the fluidic circuit, the rigid cover ~~and~~ including a punch to deflect the flexible conduit away from the planar substrate and into the fluid reservoir.

~~119~~. The apparatus of claim ~~108~~ further comprising a pierceable foil covering an opening of the fluid reservoir such that the fluid reservoir is sealed,
wherein the punch pierces the foil and deflects the flexible conduit through the pierced foil to fluidly connect the flexible conduit to the fluid reservoir.

~~1210~~. A method comprising:

forming a channel in a first layer and laminating one or more layers to the first layer to form a planar, multilayer substrate such that the channel is defined within the substrate, wherein each channel is defined by upper and lower walls and opposed side walls; and

disrupting a portion of the substrate encompassing an extent of the channel so that the disrupted portion is partially separated or separable from the remainder of the substrate to form a flexible conduit comprising the portion of the substrate and the encompassed extent of the channel, wherein the flexible conduit is deflectable with respect to the planar substrate between an undeflected position above a fluid reservoir disposed below the multilayer substrate in which the flexible substrate is substantially coplanar with the planar substrate and a deflected position in which a portion of the flexible conduit is in the fluid reservoir; and

deflecting the flexible conduit separated from the remainder of the substrate from the undeflected position to the deflected position to deflect the upper and lower walls and the opposed side walls of the extent of the channel encompassed by the flexible conduit with respect to the substrate toward the fluid reservoir, such that the encompassed extent of the channel in the flexible conduit fluidly connects the channel defined within the substrate to the fluid reservoir when the flexible conduit is in the deflected position, and wherein the step of disrupting a portion of the substrate comprises:

forming a cutout through the substrate that partially surrounds the portion of the substrate encompassing the extent of the channel, or

forming a score line partially circumscribing the portion of the substrate encompassing the extent of the channel, wherein the score line enables the portion of the substrate to partially separate from the remainder of the substrate upon application of an external force to the portion of the substrate.

~~13~~11. The method of claim ~~12~~10, wherein the step of forming the channel in the first layer comprises forming a groove in a surface of the first layer, and the one or more layers laminated to the first layer encloses the groove.

~~14~~12. The method of claim ~~12~~10, wherein the step of forming the channel in the first layer comprises forming a slot through the first layer, and the one or more layers laminated to the first layer encloses the slot.

~~15.~~—The method of claim 12, wherein the step of disrupting a portion of the substrate comprises forming a cutout through the substrate that partially surrounds the portion of the substrate encompassing the extent of the channel.

~~16.~~—The method of claim 12, wherein the step of disrupting a portion of the substrate comprises forming a score line partially circumscribing the portion of the substrate encompassing the extent of the channel, wherein the score line enables the portion of the substrate to partially separate from the remainder of the substrate upon application of an external force to the portion of the substrate.

~~17.~~—The method of claim 12, further comprising connecting the multilayer substrate to a fluid reservoir such that the fluid reservoir is disposed below the multilayer substrate and the flexible conduit while set at an undeflected position.

~~18.~~ The method of claim 17, further comprising deflecting the flexible conduit with respect to the substrate toward the fluid reservoir, such that the encompassed extent of the channel in the flexible conduit fluidly connects the channel defined within the substrate to the fluid reservoir.

~~19~~13. The method of claim ~~18~~10, further comprising, after the step of deflecting the flexible conduit from the undeflected position to the deflected position to deflect, aspirating a fluid held in the fluid reservoir through the encompassed extent of the channel in the flexible conduit to the channel defined in the substrate.

~~20~~14. The method of claim ~~18~~10, further comprising, after the step of deflecting the flexible conduit from the undeflected position to the deflected position to deflect, introducing a fluid through the channel defined within the substrate and the encompassed extent of the channel in the flexible conduit and into the fluid reservoir.

~~21~~15. The method of claim ~~12~~10, further comprising connecting the multilayer substrate to a rigid cover.

~~22~~16. The method of claim ~~18~~15, wherein the rigid cover comprises a punch for deflecting the flexible conduit ~~with respect to the planar substrate~~ from the undeflected position to the deflected position to deflect.

~~23~~17. The method of claim ~~16~~10, wherein the first layer and the one or more layers laminated to the first layer comprise two or more layers of a polymeric material, and the step of laminating the one or more layers to the first layer comprises adhesively or thermally bonding the layers together.

~~24~~18. The method of claim ~~12~~10, further comprising applying electrodes to a portion of the substrate forming the flexible conduit.

~~25. — An apparatus comprising:~~
~~two or more layers laminated together to define a substantially planar substrate;~~
~~one or more channels defined within the substrate, and~~
~~a flexible conduit defined by a portion of the substrate encompassing an extent of at least one of the channels that is partially separated or separable from the remainder of the substrate, the flexible conduit comprising the portion of the substrate and the encompassed extent of the channel, wherein the flexible conduit is deflectable with respect to the planar substrate.~~

~~26. — The apparatus of claim 25, wherein the two or more layers comprise a first layer, a second layer, and a third layer, and wherein the first layer is disposed between the second layer and the third layer and comprises at least one slot forming the one or more channels when covered on opposed sides by the second layer and the third layer.~~

~~27. — The apparatus of claim 25, wherein the two or more layers comprise a first layer and a second layer laminated to the first layer, and wherein at least the first layer comprises at~~

least one groove formed in a surface thereof and forming the one or more channels when covered by the second layer.

28.—The apparatus of claim 25, further comprising:

a fluid reservoir, and the substrate is positioned above the fluid reservoir such that the flexible conduit is deflectable toward the fluid reservoir to fluidly connect at least one channel defined within the substrate to the fluid reservoir;

wherein the flexible conduit comprises a first channel for aspirating a fluid held in the fluid reservoir to the channel defined with the substrate and a second channel for introducing a fluid into the fluid reservoir.

29.—The apparatus of claim 28, further comprising a sensor disposed on the flexible conduit for detecting a presence of a fluid held in the fluid reservoir.

30.—The apparatus of claim 25, further comprising:

one or more electrical contacts disposed along the multilayer substrate for receiving power from a power source; and

one or more electrodes disposed on the flexible conduit and electrically connected to the one or more electrical contacts.

31.—The apparatus of claim 25, wherein the flexible conduit is deflectable between an undeflected position and one or more deflected positions,

~~wherein the flexible conduit is substantially co-planar with the substrate at the undeflected position, and the flexible conduit is inclined, curved, or bent with respect to the substrate at the one or more deflected positions.~~