

FIGURE 1

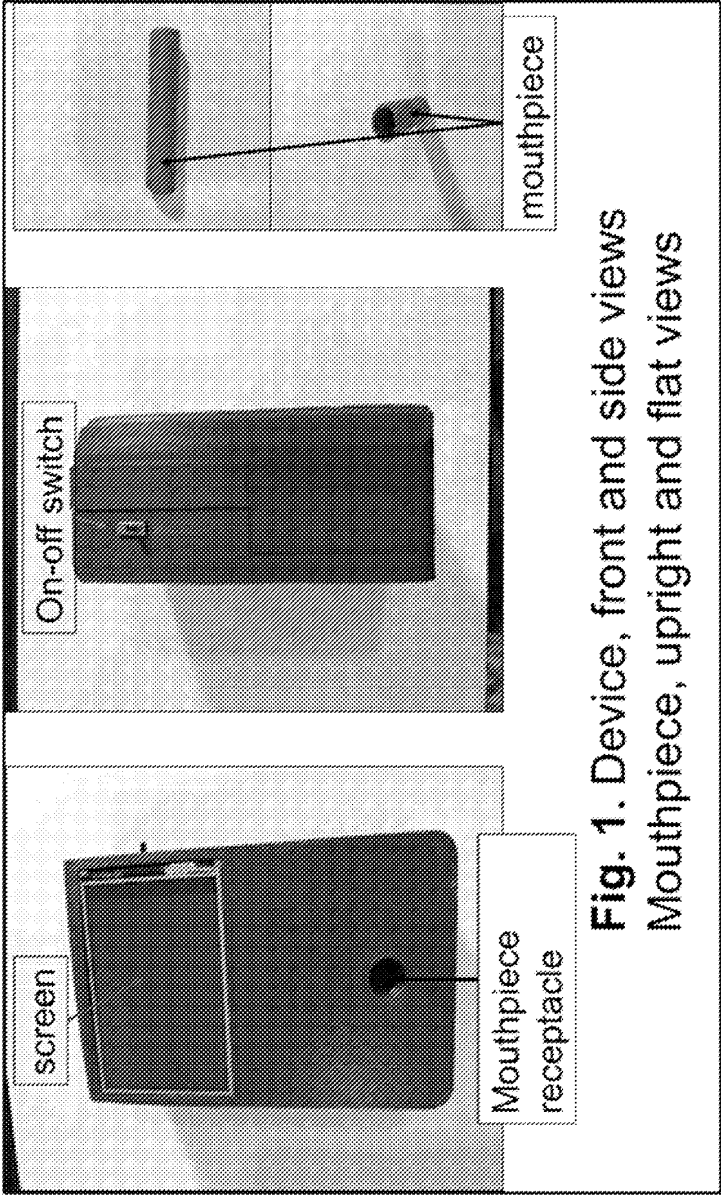
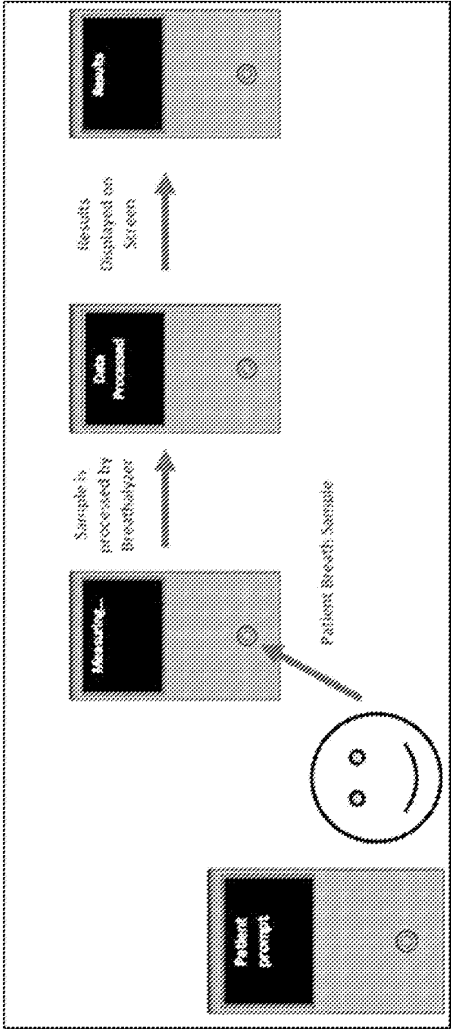
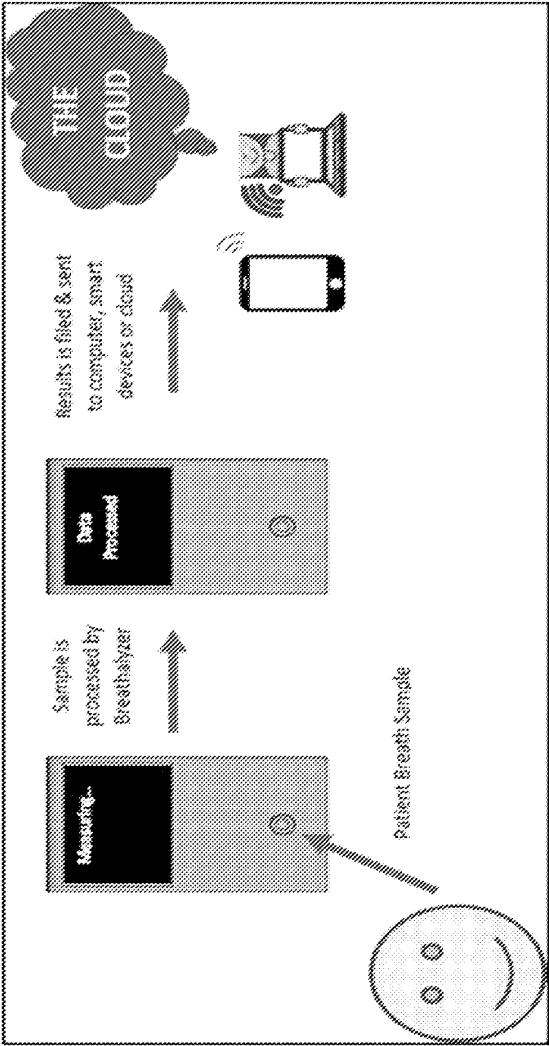


FIGURE 2



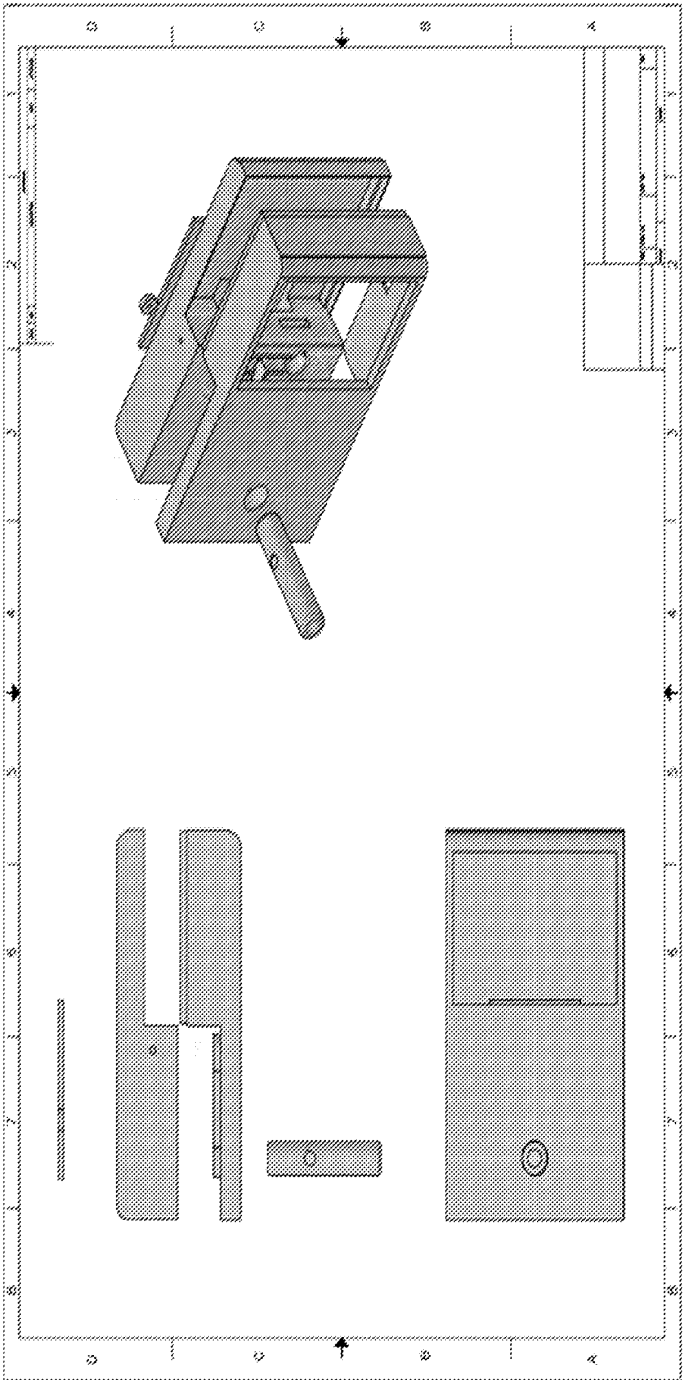
Schematic of device operation

FIGURE 3



Schematic of device operation and wireless communication

FIGURE 4



Breathalyzer Design. 3D-printed Housing of Device

FIGURE 5

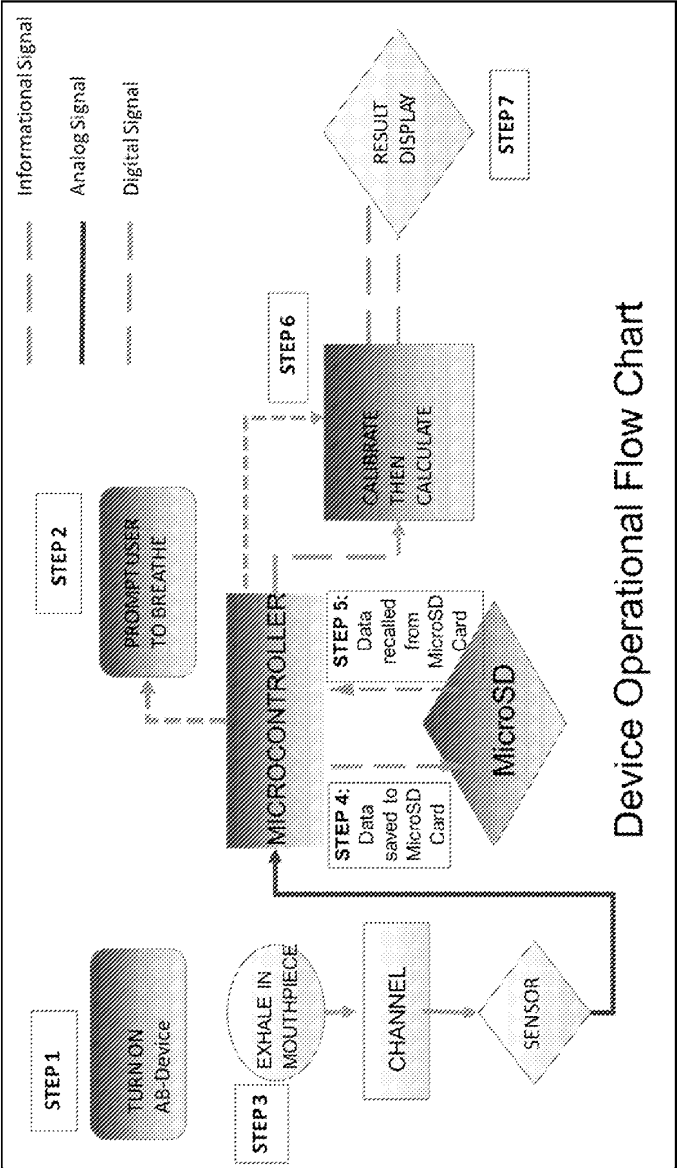
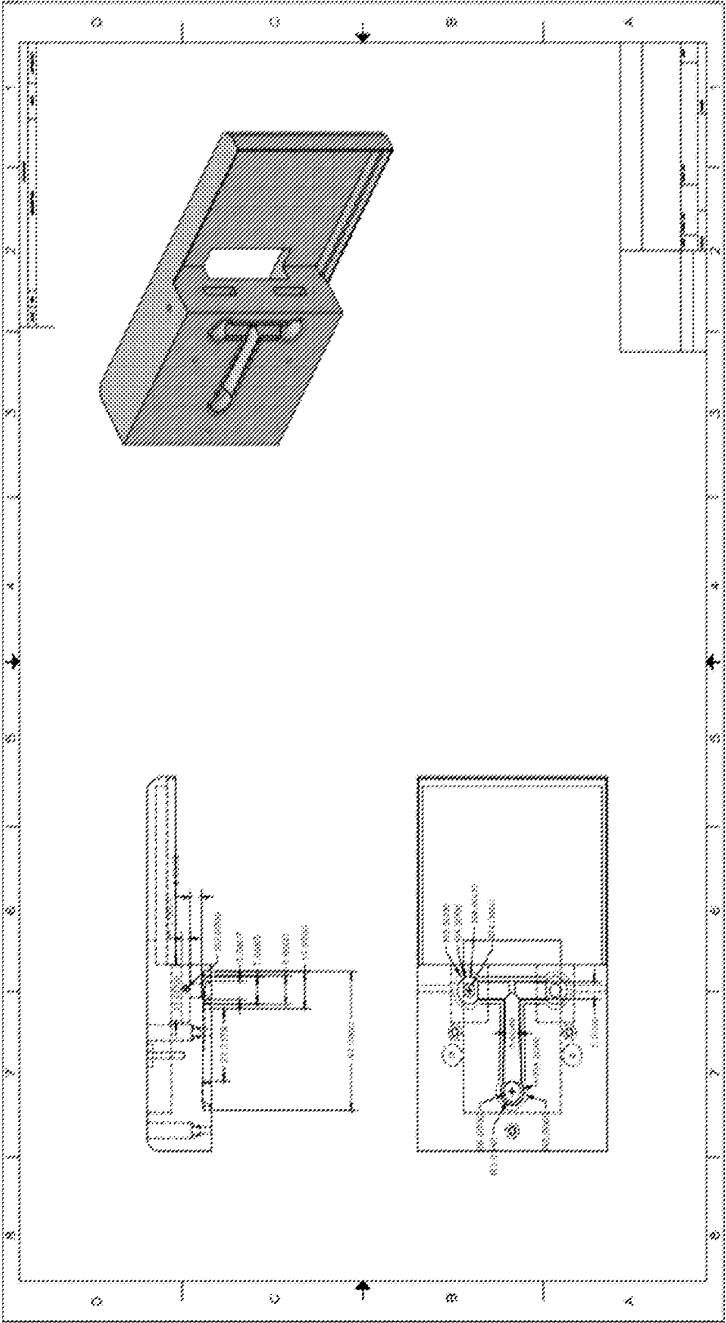
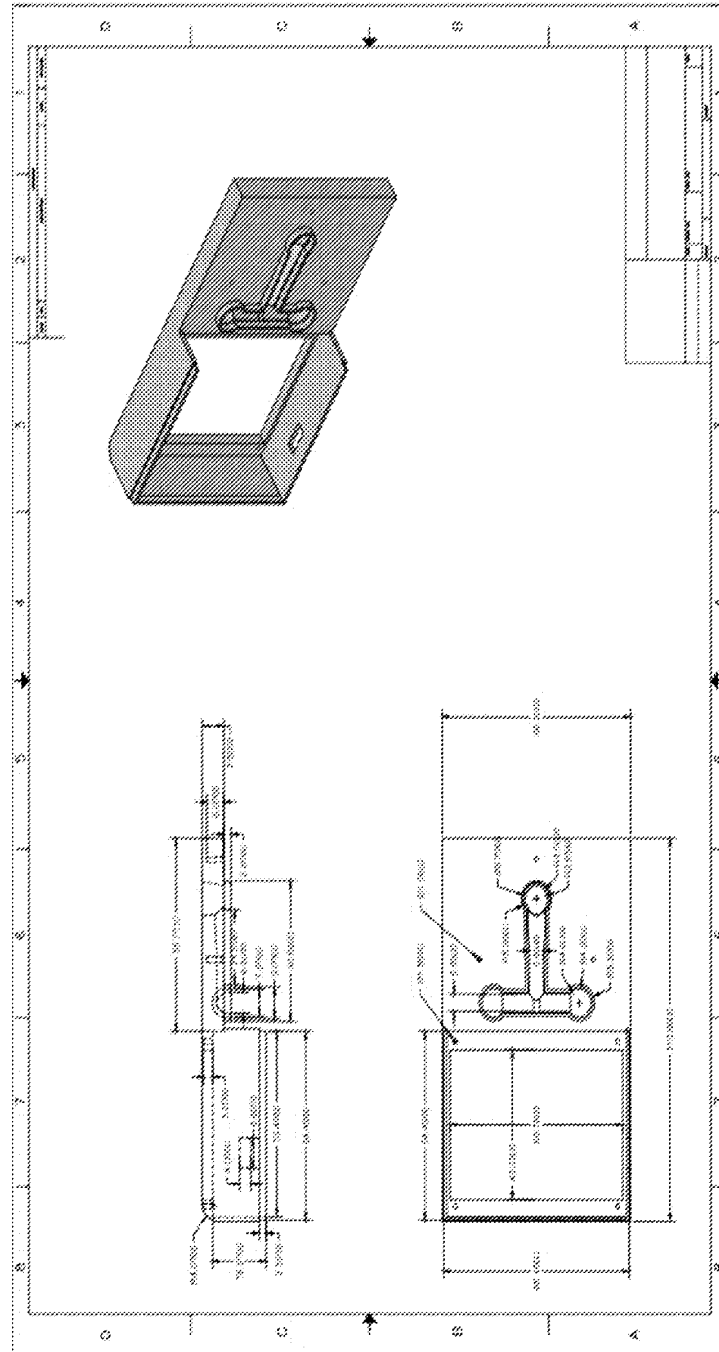


FIGURE 6



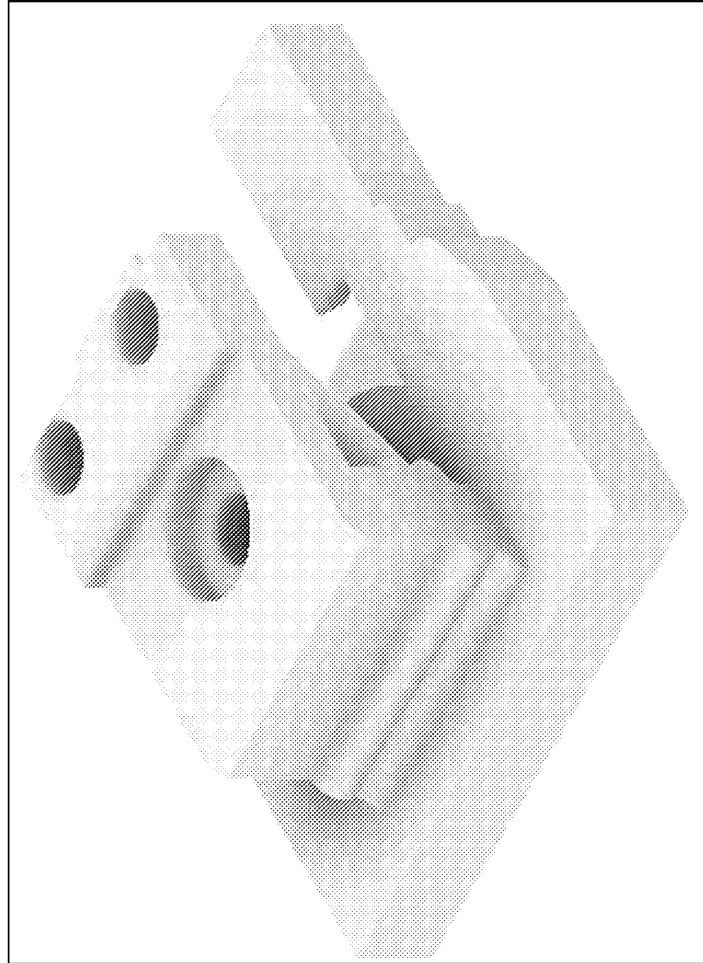
Two-channel device bottom half detail

FIGURE 7



Two-channel device top half detail

FIGURE 8



Sensor holder

FIGURE 9

Single-channel device top half

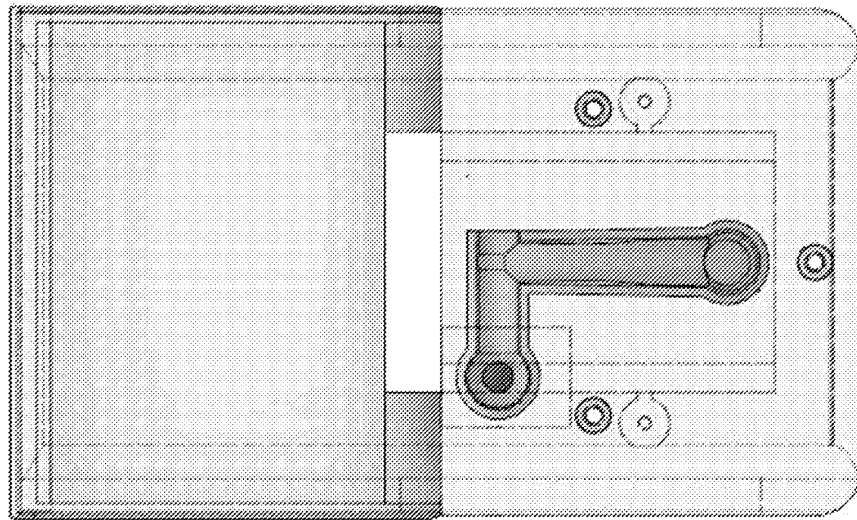
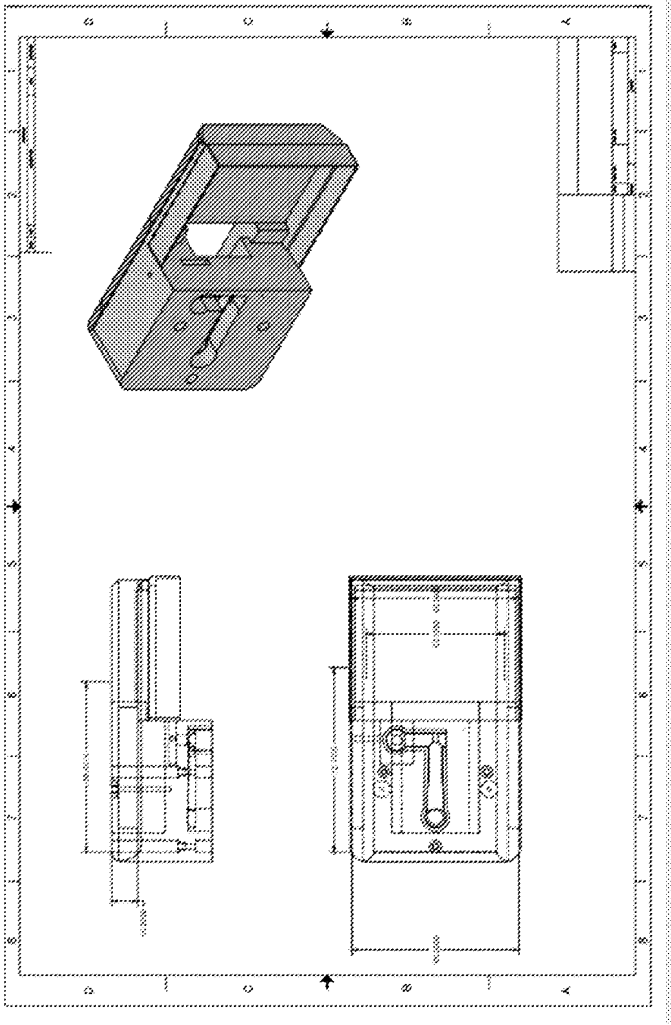
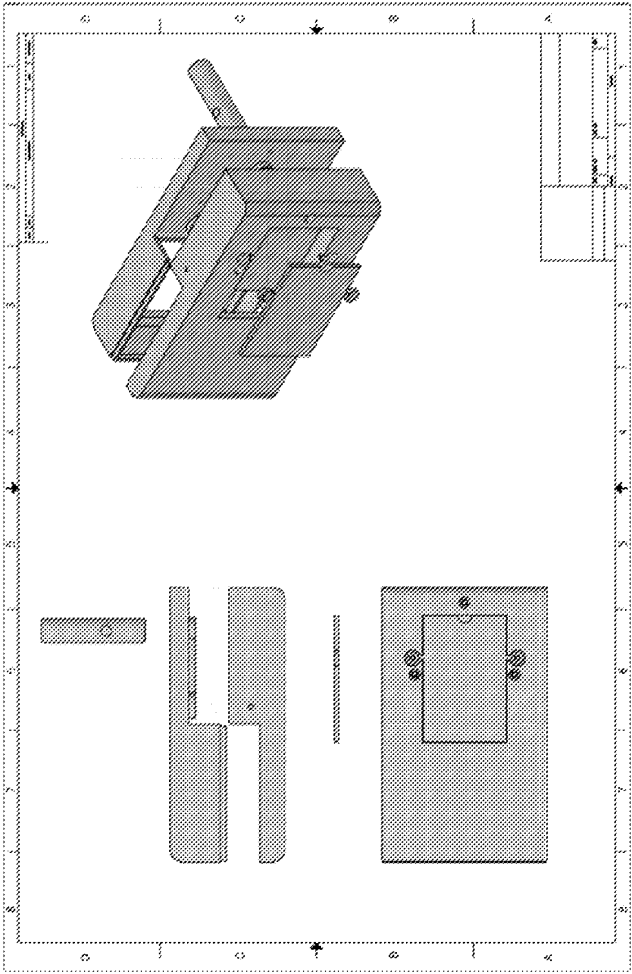


FIGURE 10



Single-channel bottom half detail

FIGURE 11



3-D printed device assembled

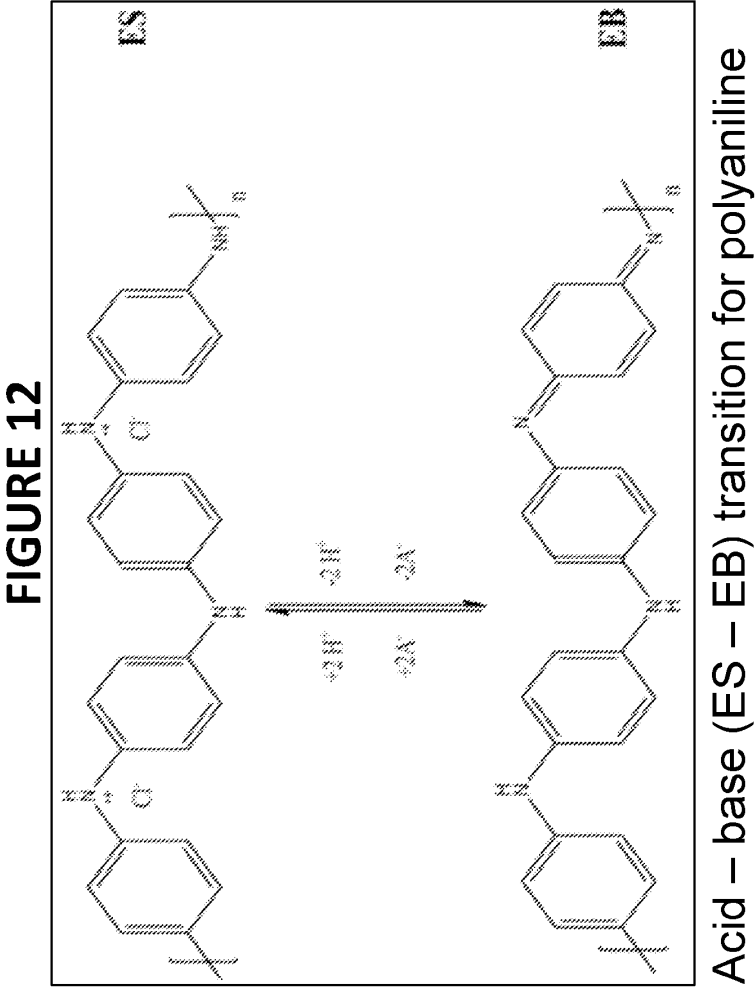


FIGURE 13

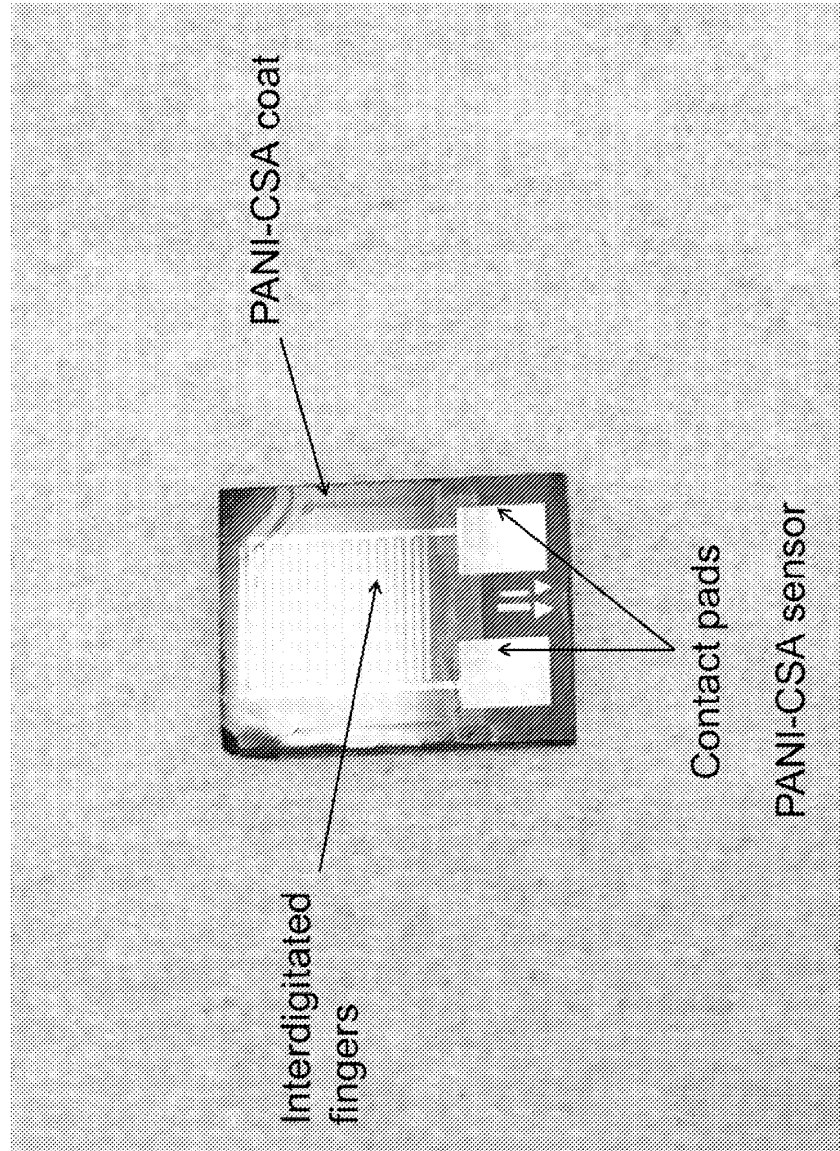


FIGURE 14

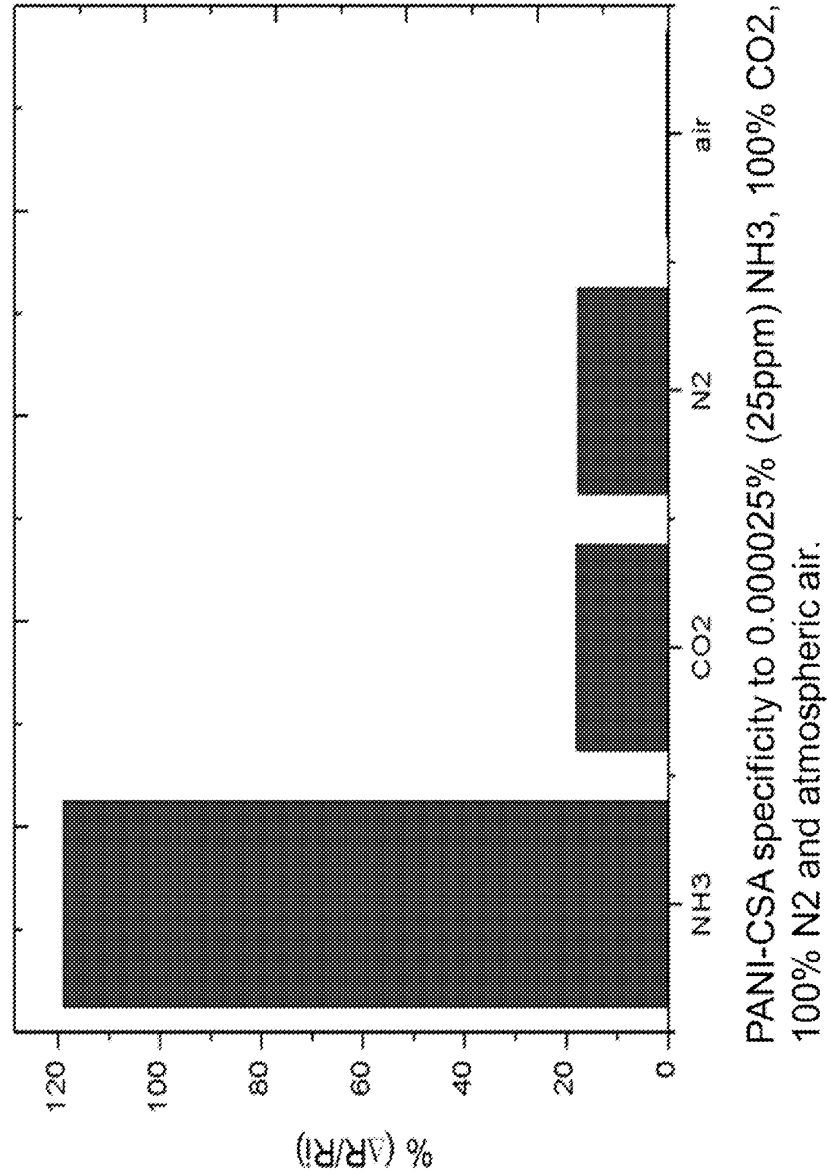
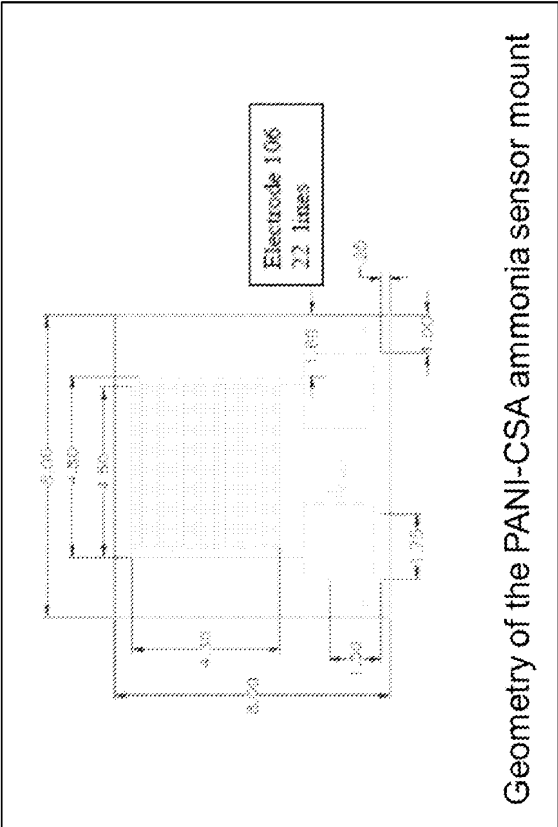
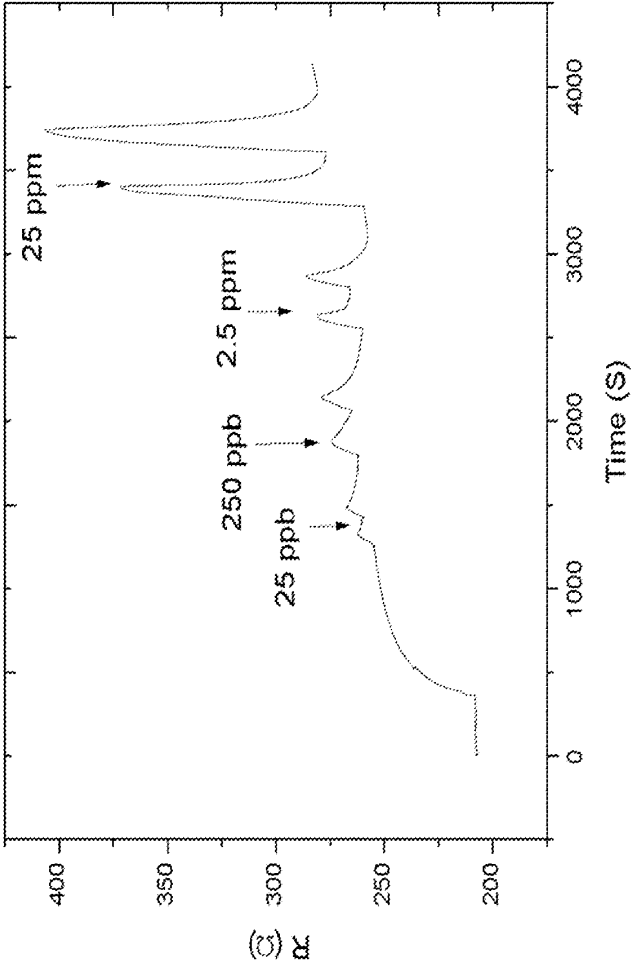


FIGURE 15



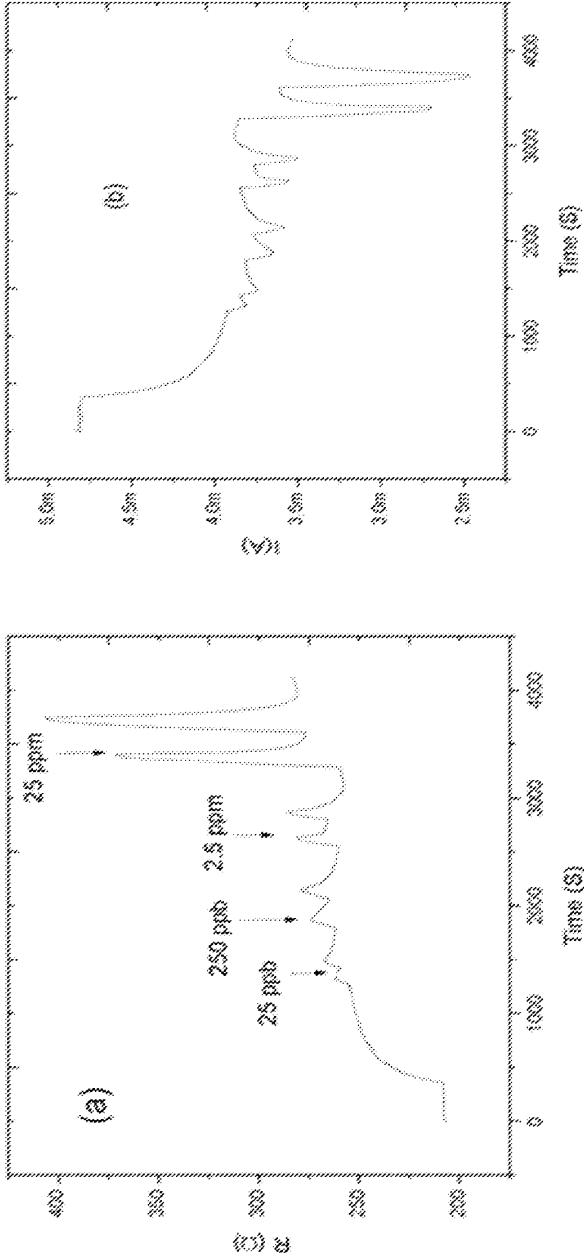
Geometry of the PANI-CSA ammonia sensor mount



PANI-CSA resistivity (R) at various concentrations of NH3. The resistivity, as measure of sensitivity, indicates that the sensor is sensitive at concentration as low as 25ppb.

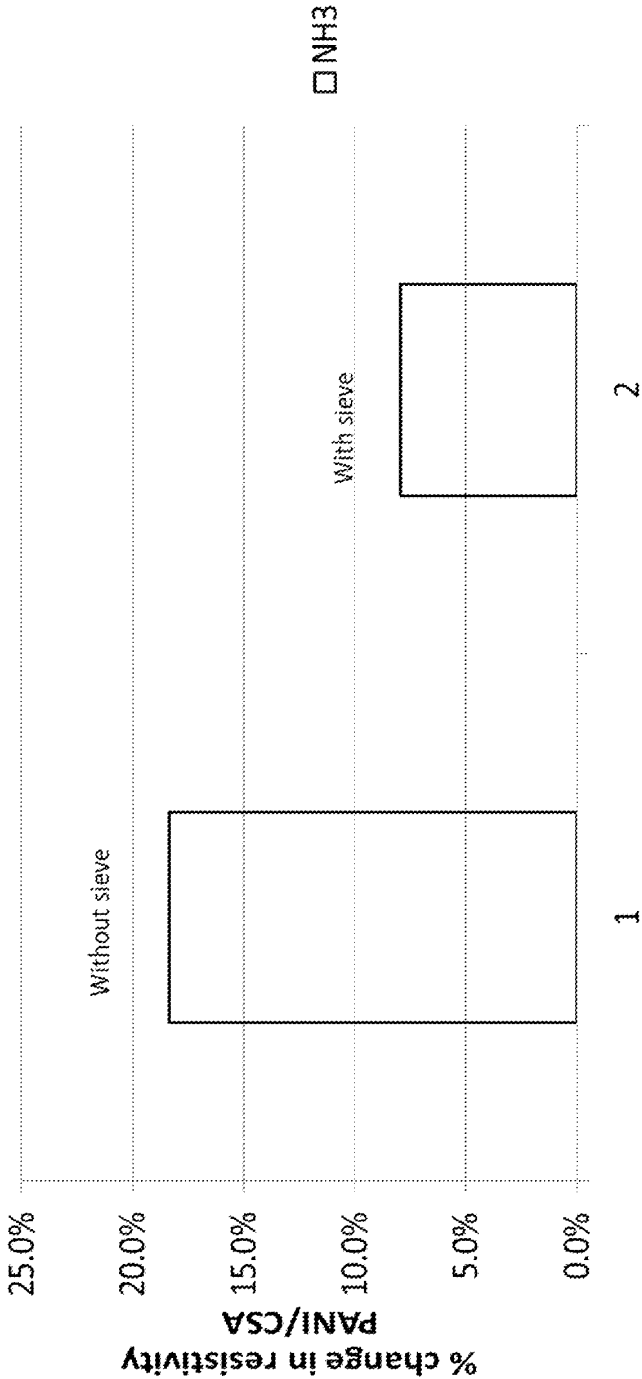
FIGURE 16

FIGURE 17



Calibration of the PANI-CSA sensor
(a) Change in resistivity (R) and
(b) Corresponding change in current

FIGURE 18



PANI-CSA resistivity to 100ppm NH3 was decreased by almost 50% in the presence of molecular sieve desiccant (3A, Sigma Aldrich)

FIGURE 19

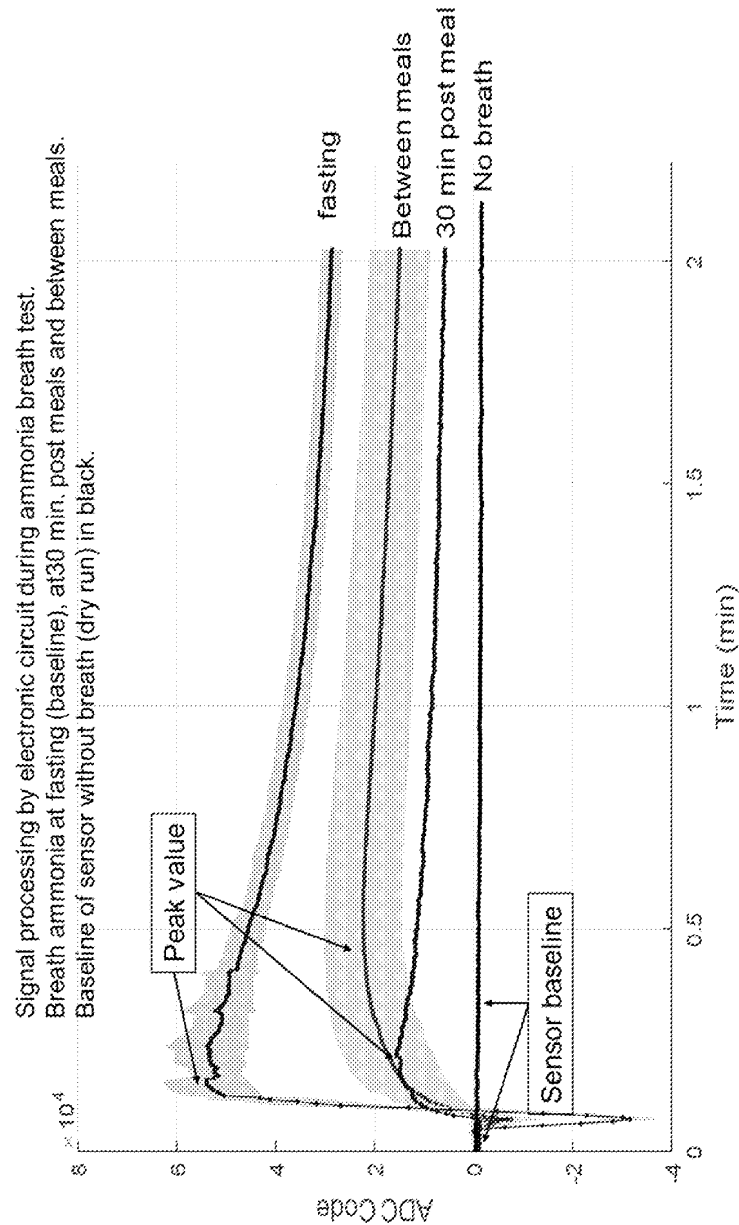
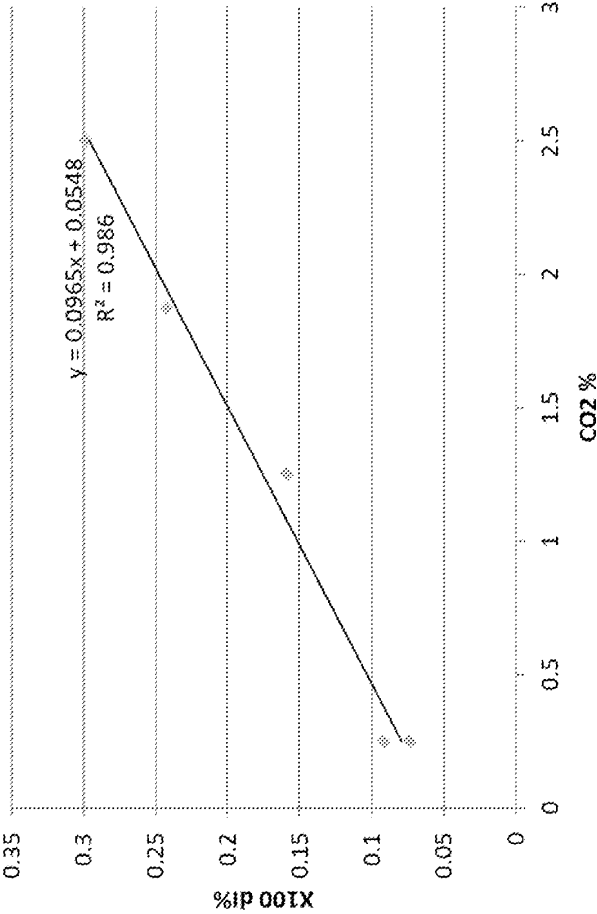


FIGURE 20



Calibration of Sulfonated Polyaniline (SPANI) CO2 sensor

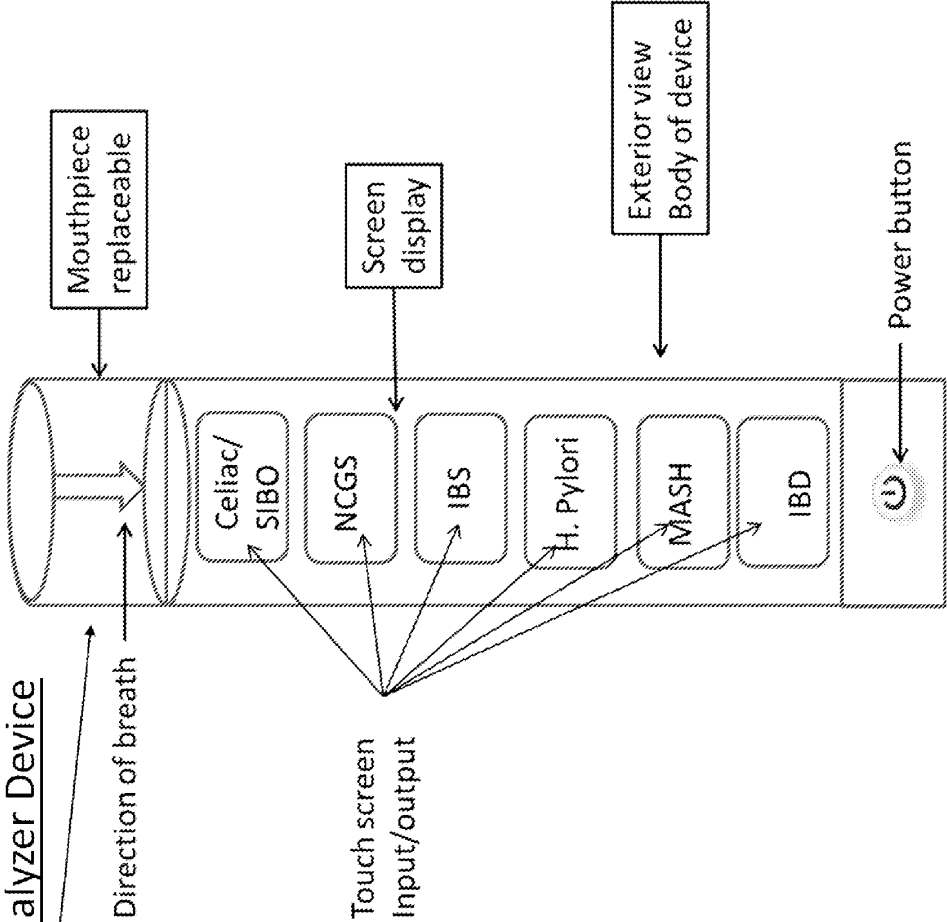


FIGURE 21

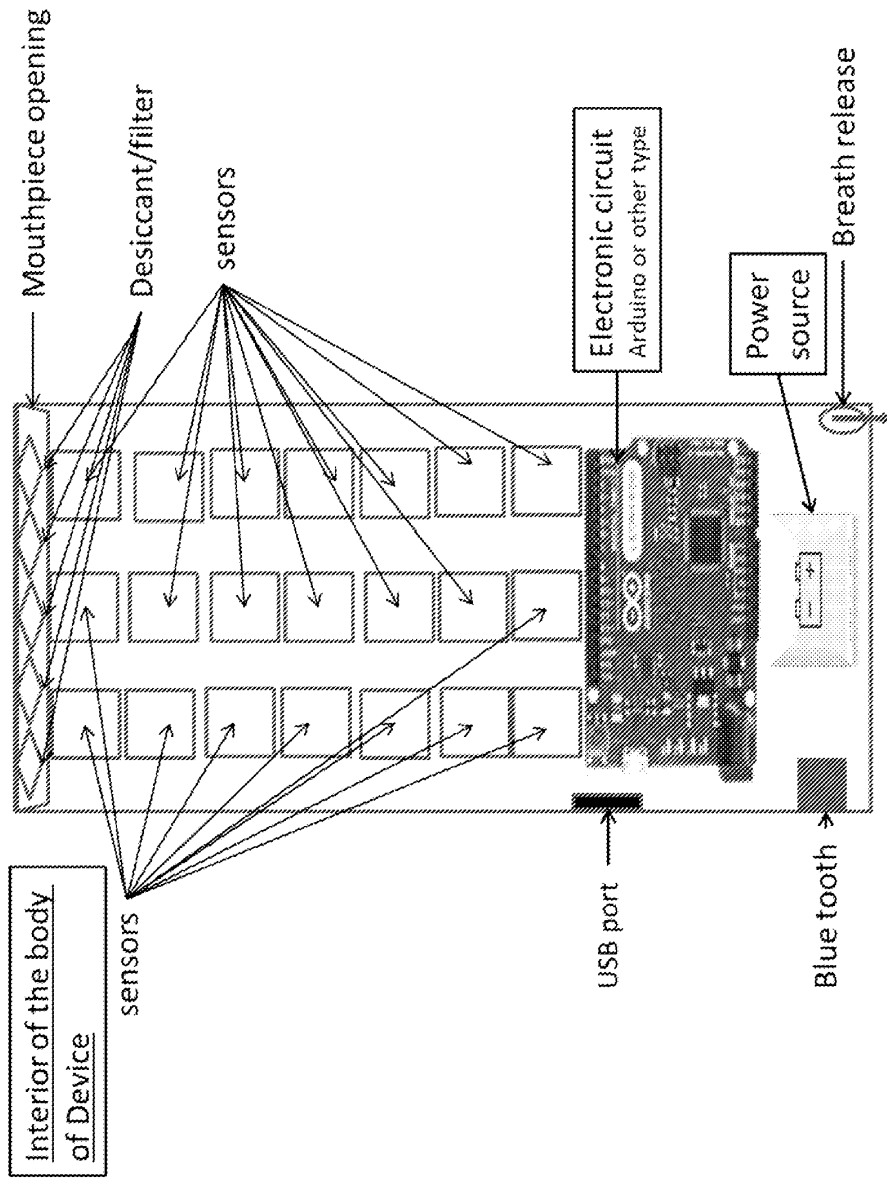


FIGURE 22

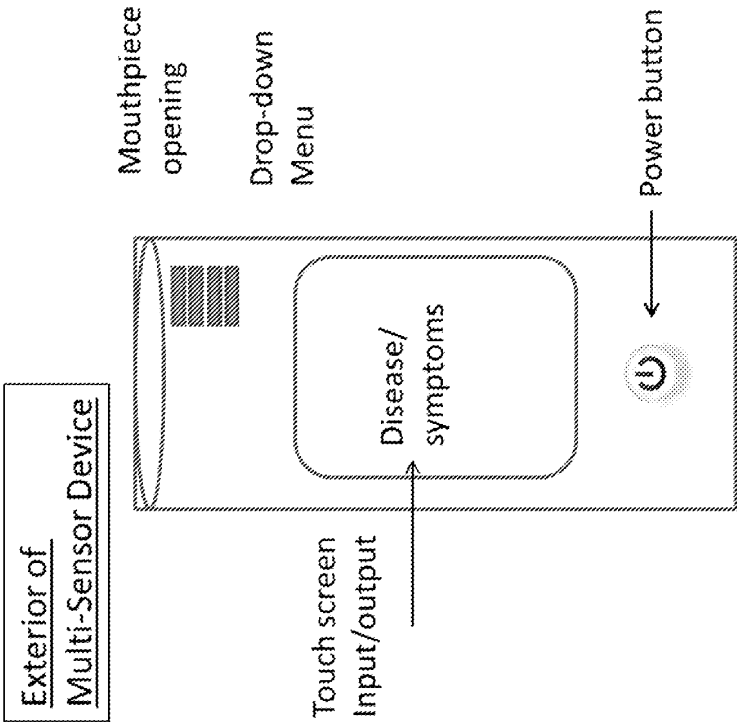


FIGURE 23

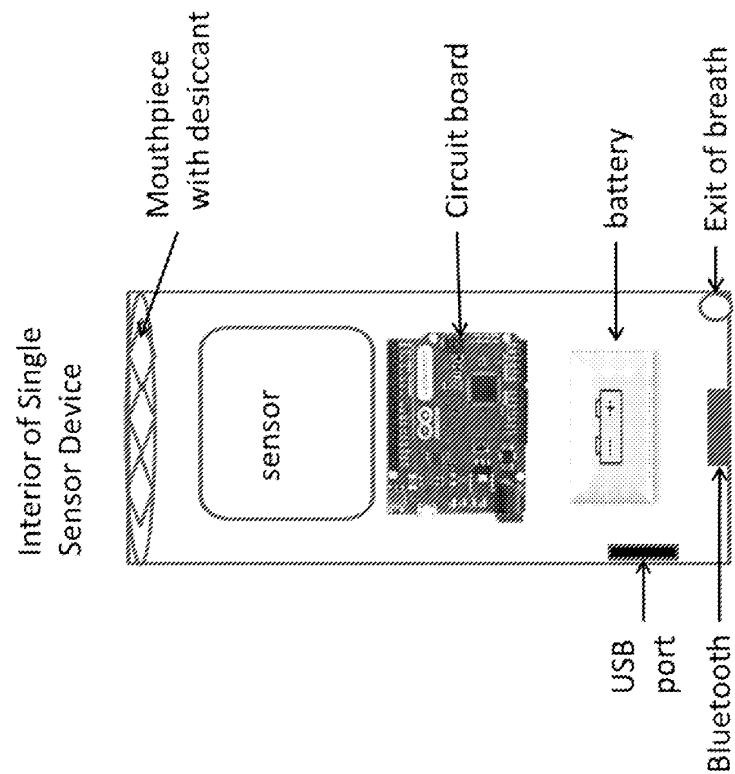


FIGURE 24

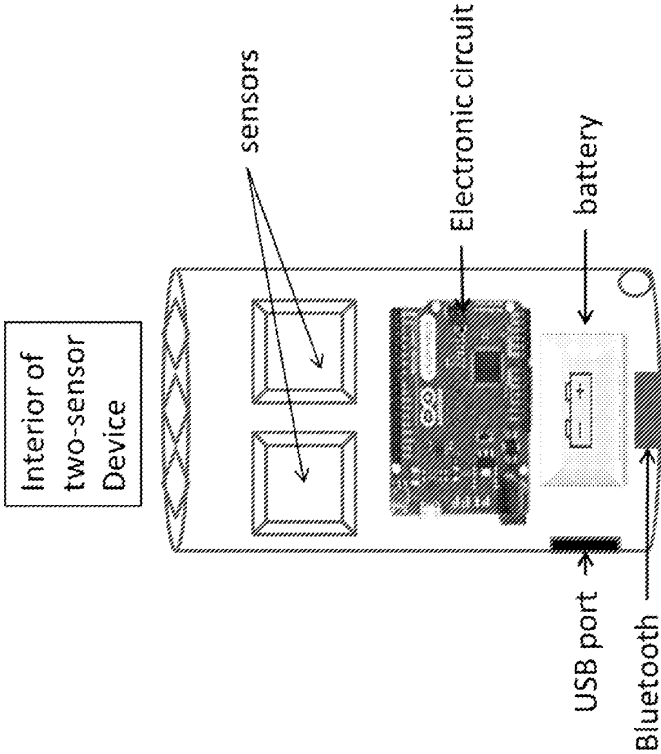


FIGURE 25

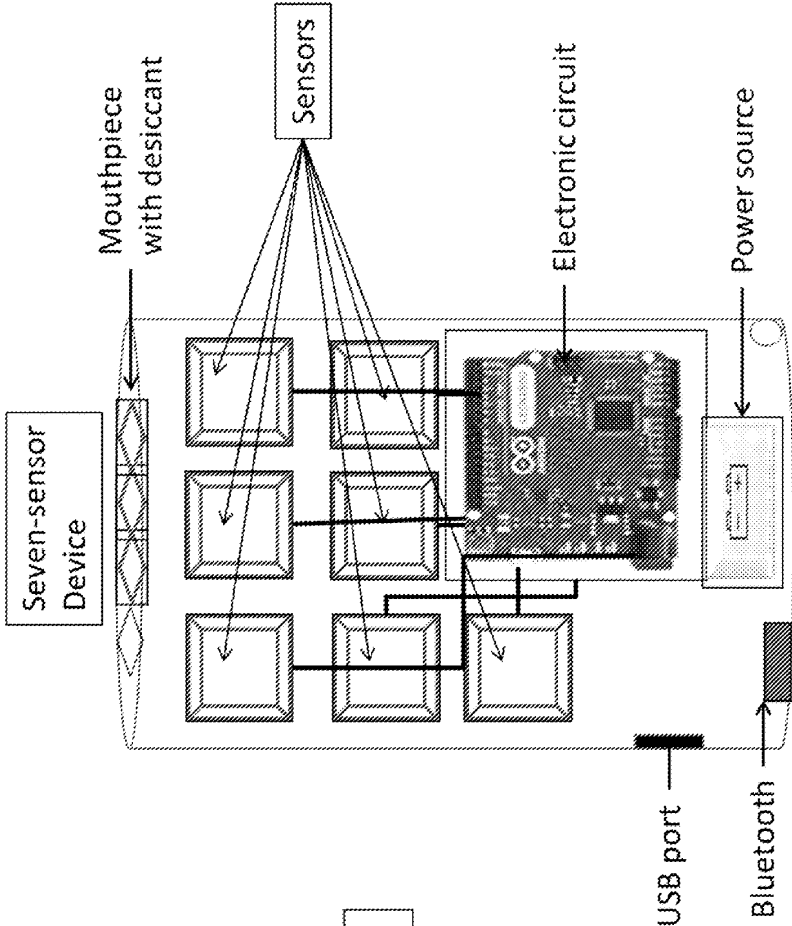


FIGURE 26

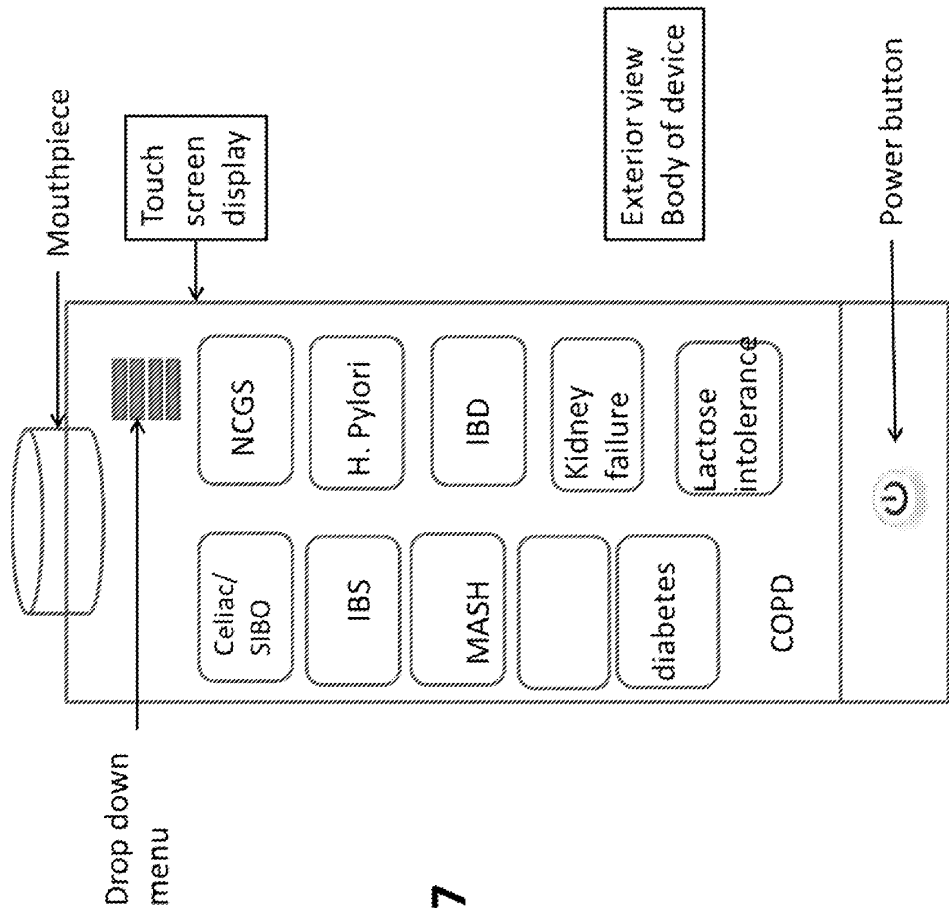
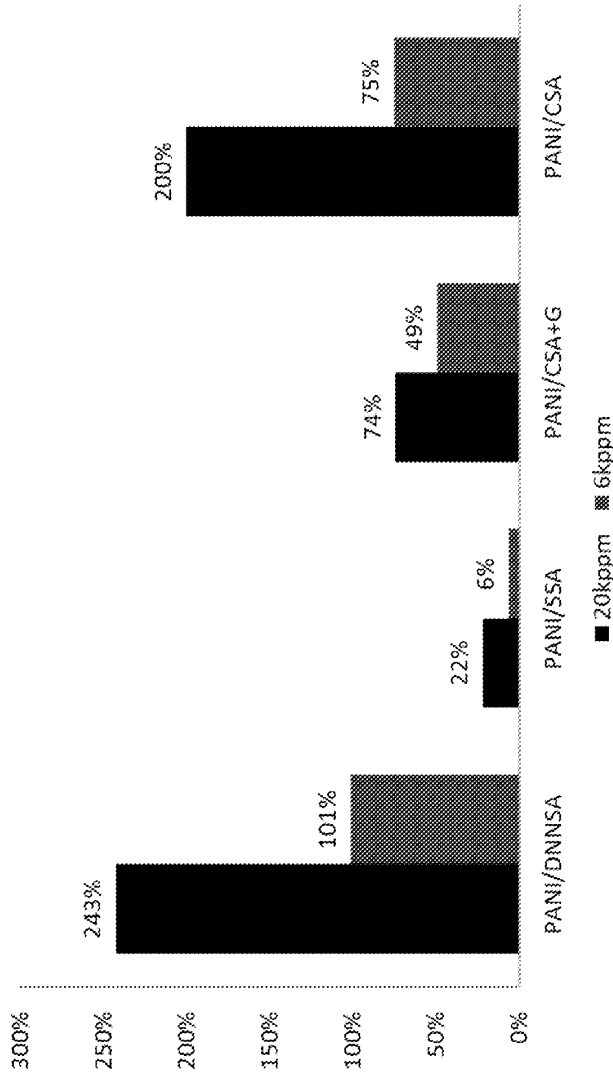


FIGURE 27

FIGURE 28



Comparison of sensitivity among various PANI dopants in 2 concentrations of hydrogen gas 20kppm and 6ppm. PANI/DNNSA has higher sensitivity in both concentrations.

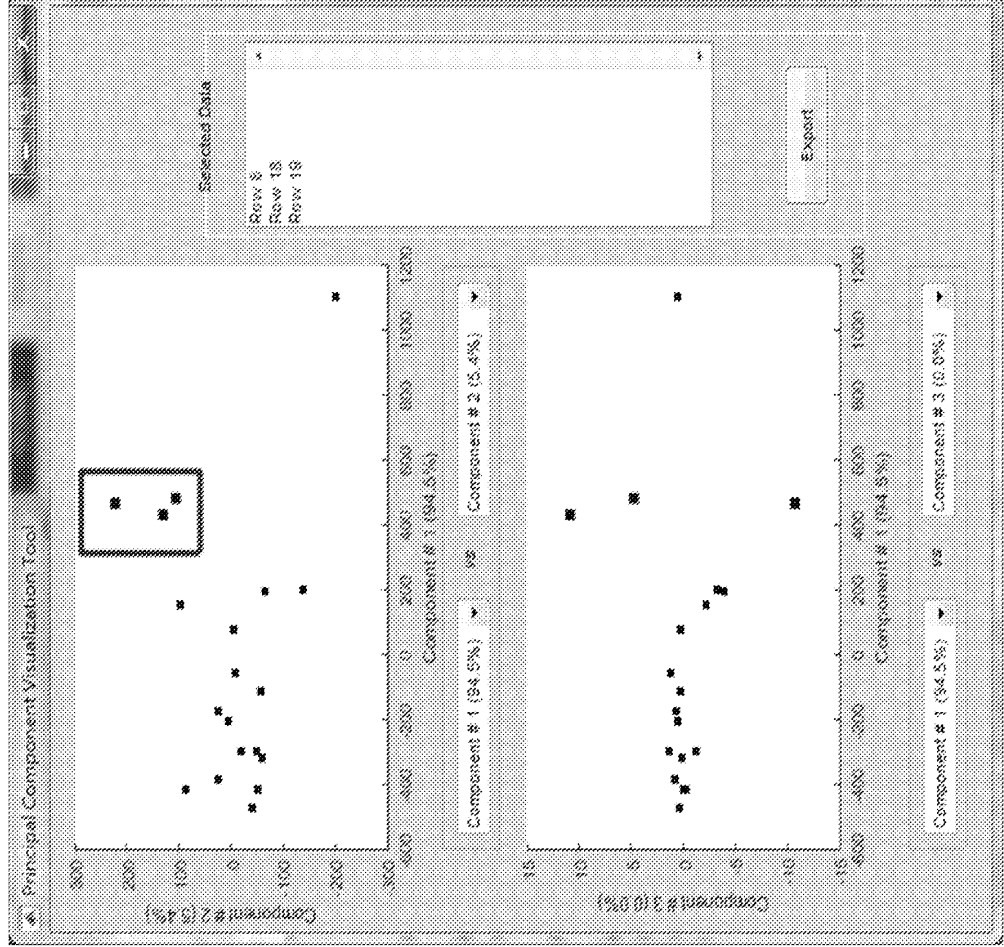


FIGURE 29

PCA analysis of data from breath hydrogen testing. Clustered (in box) are data from patients positive for Celiac disease (top graph). Data from patients positive for Celiac disease are in line (middle bottom graph-larger square).

FIGURE 30



Comparison of sensitivity to CO2 from PPY and PANI with various dopants. SPANI is significantly more sensitive than the other.

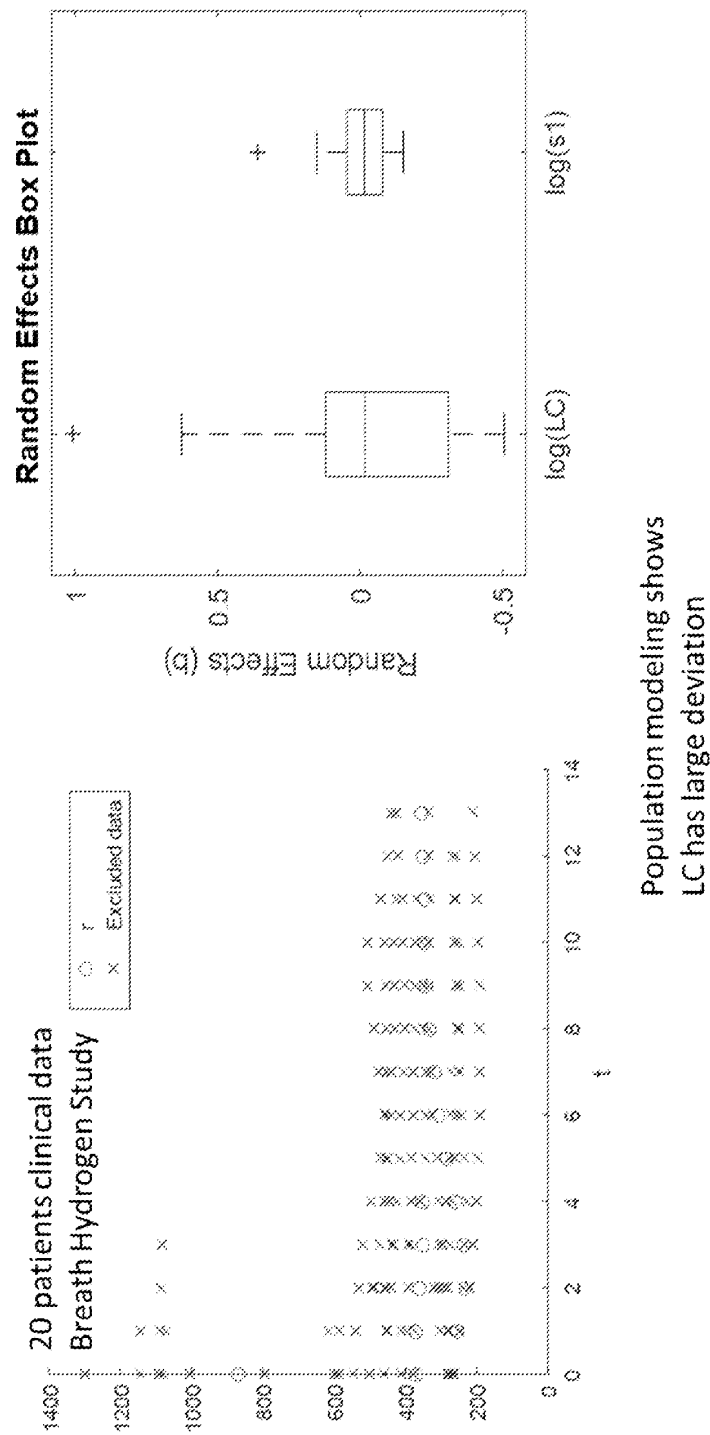


FIGURE 31

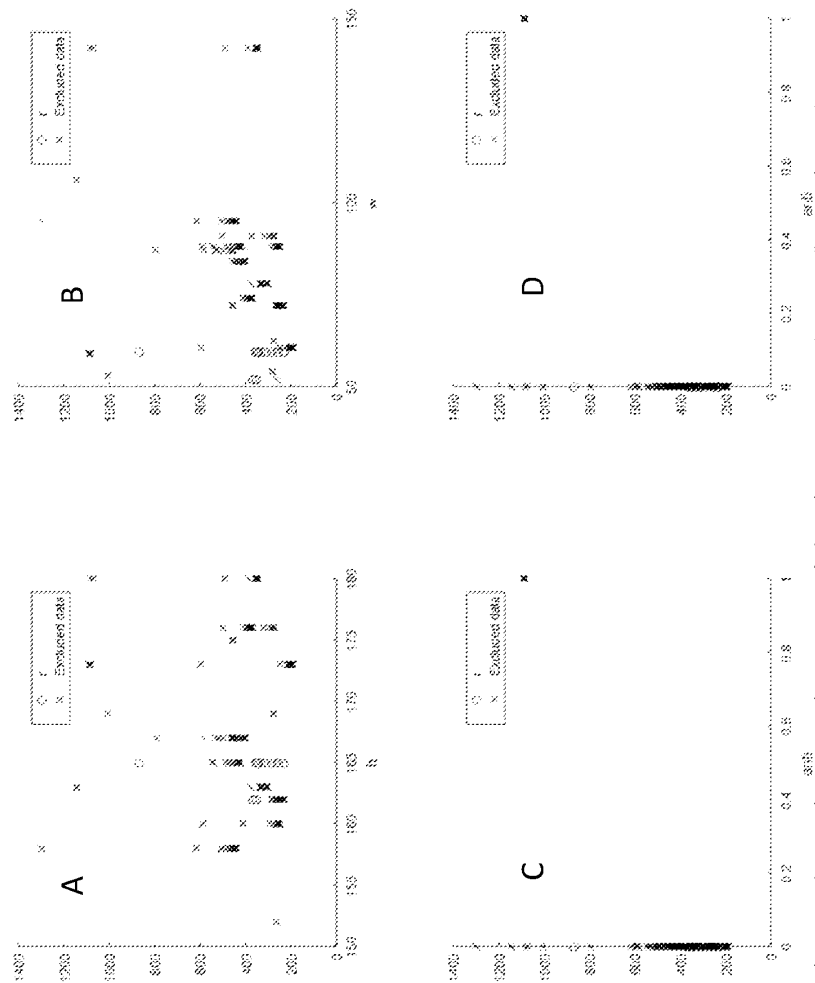
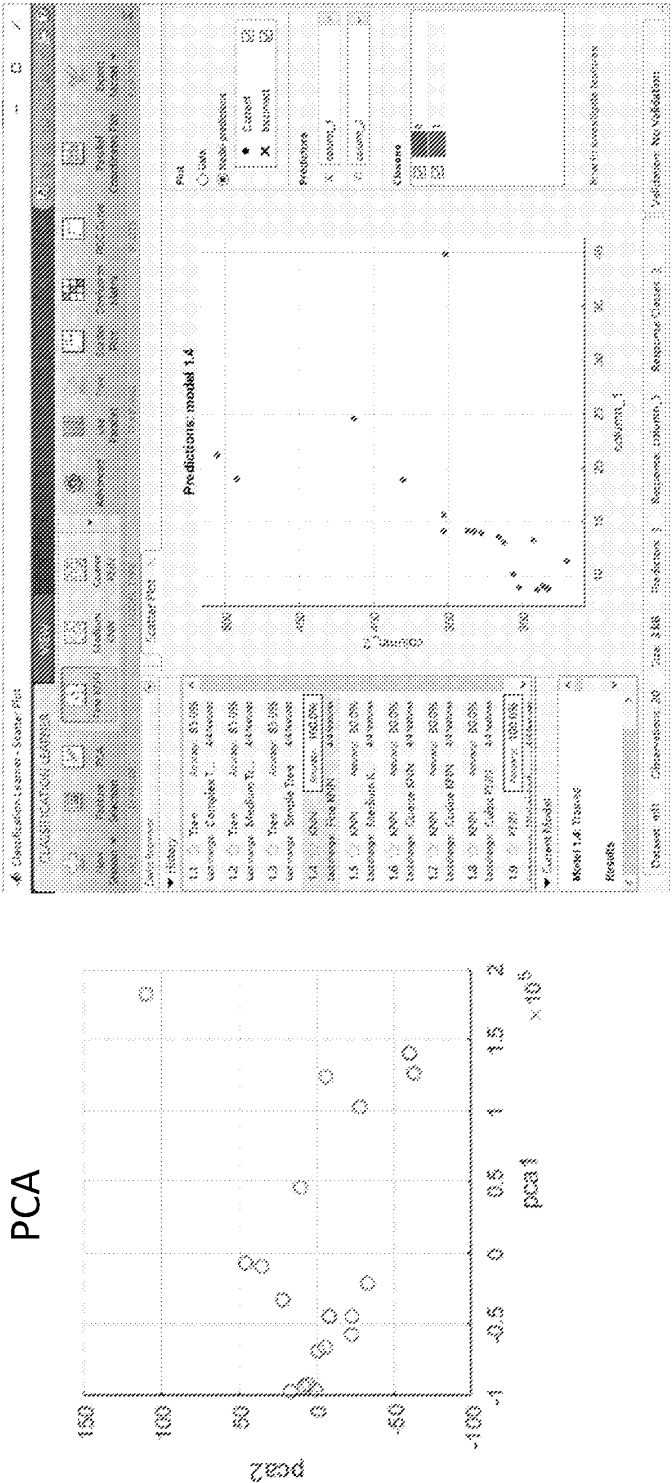


FIGURE 32

The absolute data is likely correlated to body weight

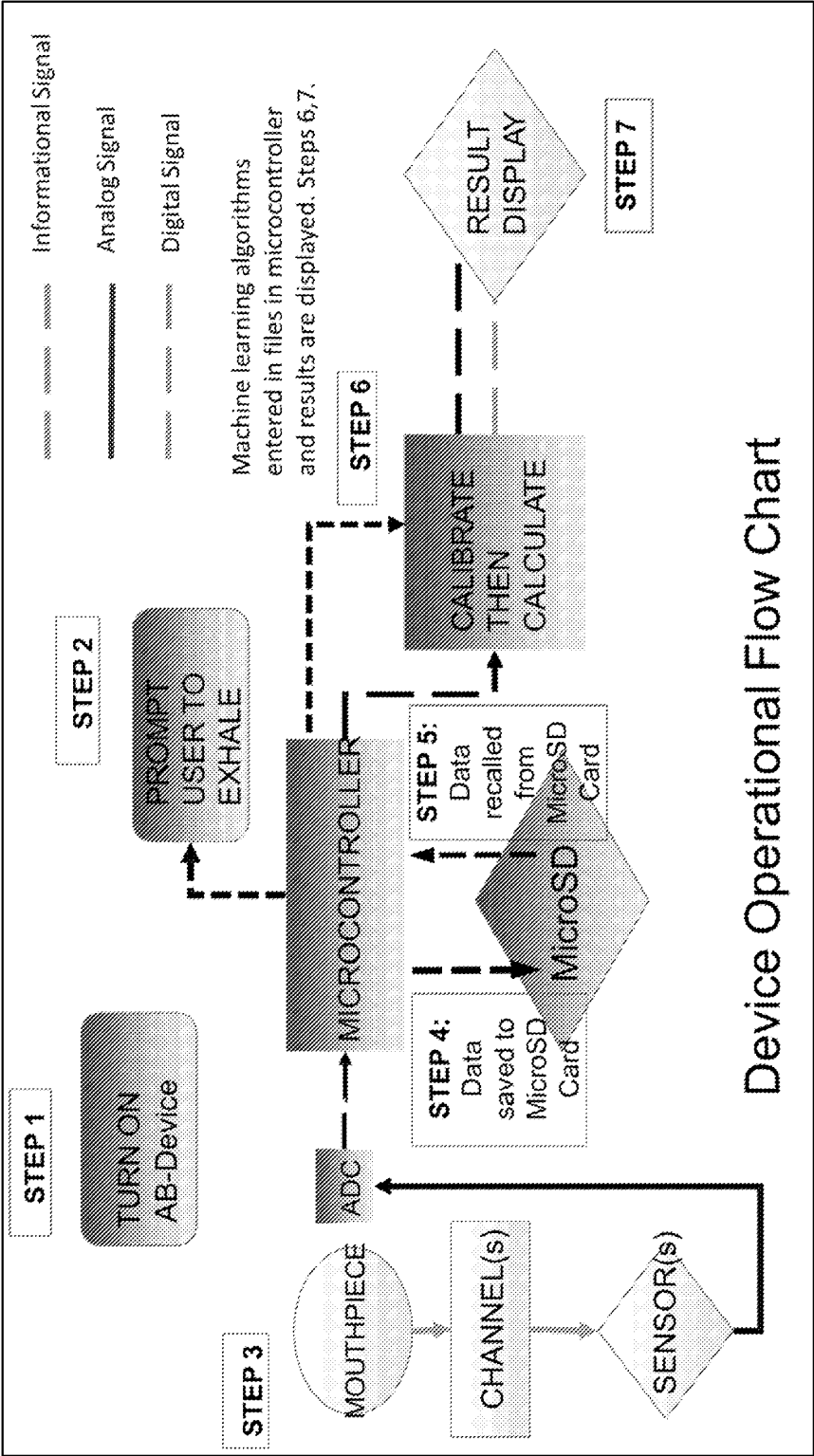
FIGURE 33

Machine Learning



Breath Hydrogen study. PCA shows clustered patients positive for Celiac disease.
Machine learning algorithms demonstrate 100% of prediction of positive for Celiac disease.

FIGURE 34



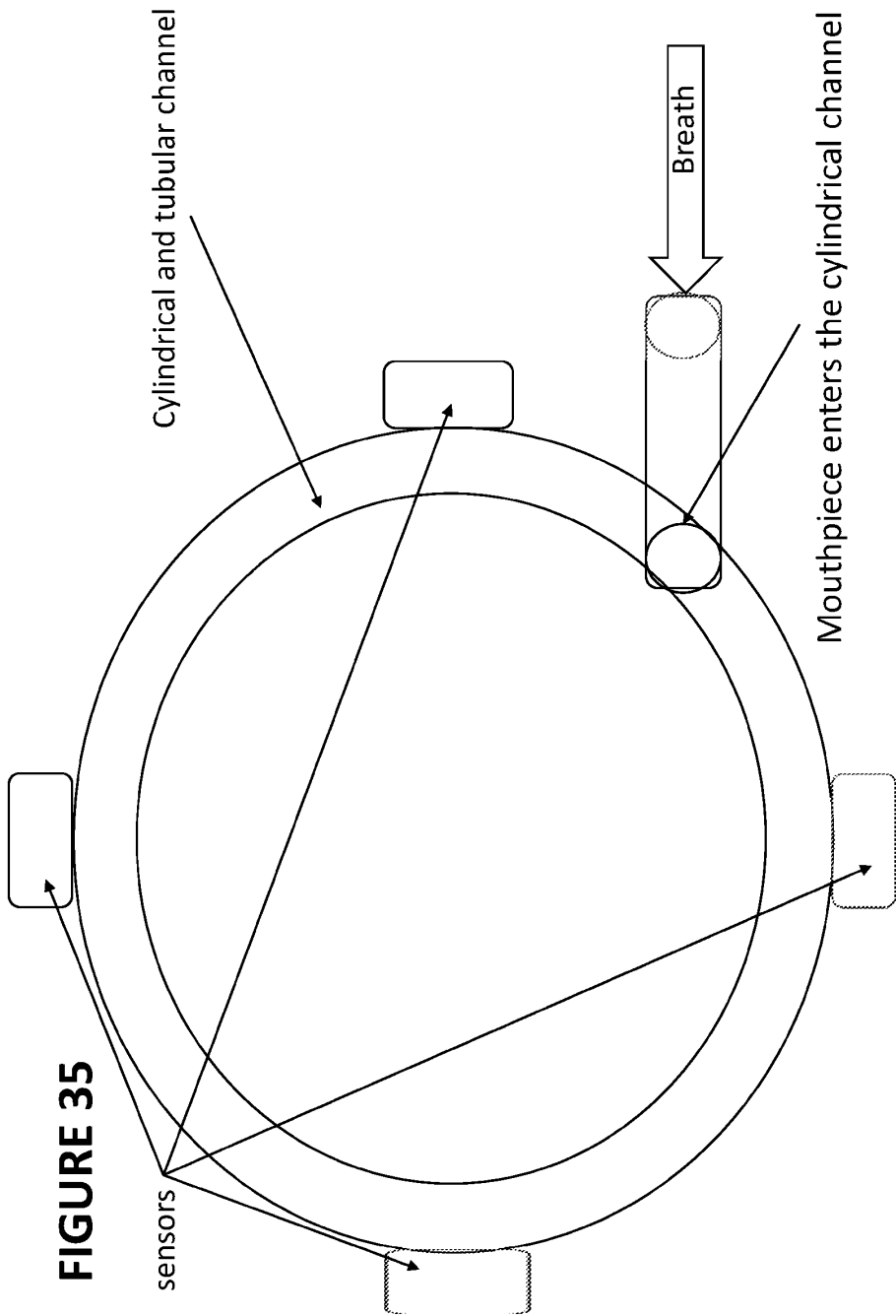


FIGURE 35