CLAIMS

1. Apparatus for sensing in-sole force in footwear comprising:

a lower layer, an upper layer, a plurality of force sensors arranged in zones, a flexible electronic circuit that connects the force sensors, and a power and handling unit connected to the electronic circuit, the power and handling unit receiving raw signals from the sensors in which the lower layer is integral or in contact with the sole of the footwear and the upper layer is in contact with the foot, characterized in that the force sensors comprise at least two different types of force sensor, type A and type B, in which type A and type B force sensors differ in one or more of the following ways: type A has a higher range of force than type B, type A has a greater accuracy than type B, and/or type A has a faster response rate than type B.

2. Apparatus according to Claim 1, in which the upper layer comprises regions of rigid material and regions of flexible material.

3. Apparatus according to Claim 2, in which each region of rigid material is placed above at least part of each zone of force sensors.

4. Apparatus for sensing in-sole force in footwear comprising:

a lower layer, an upper layer, a plurality of force sensors arranged in zones, a flexible electronic circuit that connects the force sensors, and a power and handling unit connected to the electronic circuit, the power and handling unit receiving raw signals from the sensors in which the lower layer is integral or in contact with the sole of the footwear and the upper layer is in contact with the foot, in which the upper layer comprises regions of rigid material and regions of flexible material, in which each region of rigid material is placed above at least part of each zone of force sensors.

5. Apparatus according to any of Claims 2 to 4, in which each zone of force sensors is in contact with one or more regions of rigid material of the upper layer.

6. Apparatus according to any preceding claim, in which the force sensors are disposed at essentially the same depth with respect to the surface of the upper layer distal from the foot.

7. Apparatus according to any preceding claim, in which the flexible electronic circuit and the force sensors are integrally connected and form an intermediate layer between the upper layer and the lower layer.

8. Apparatus according to any preceding claim, in which the lower layer further comprises depressions where sensors at least partially fit.

9. Apparatus according to any preceding claim, in which the lower layer further comprises regions of higher rigidity and regions of lower rigidity.

10. Apparatus according to any preceding claim, in which the zones at the front of the foot comprise at least one sensor with a measuring range wide enough to cover an entire range of possible values that the zone at the front of the foot may encounter.

11. Apparatus according to any preceding claim, in which sensors measure force in vertical or traverse or longitudinal direction.

12. Apparatus according to any preceding claim, in which sensors measure vertical ground reaction force.

13. Apparatus according to any preceding claim, in which an accelerometer and gyroscope are included in the power and handling unit to measure foot orientation, gait speed and acceleration.

14. Apparatus according to any preceding claim, in which a GPS is included in the power and handling unit to record location.

15. Apparatus according to any preceding claim, in which the flexible electronic circuit comprises a memory module adapted such that data may be downloaded from the memory module for processing externally.

16. Apparatus according to any preceding claim, in which power is provided by a rechargeable battery, the power and handling unit integrating a wireless charging capability to recharge the battery.

17. A system for assessing in-sole force in footwear, comprising apparatus according to any preceding claim and a processing unit adapted to receive and process signals from the apparatus.

18. A system according to Claim 17, in which the flexible electronic circuit comprises a wireless transmitter and in which the processing unit is connected to the flexible electronic circuit wirelessly.

19. A system according to Claim 17 or 18, in which the processing unit is adapted to be worn by the user.

20. A system according to Claim 17, 18 or 19, in which the processing unit is comprised by a smart phone or another generic wearable device, having installed thereon a dedicated application for processing data received from the apparatus.

21. A system according to any of Claims 17 to 20, in which force measurements from force sensors within each zone are summed or averaged to provide a total or an average force value for that zone.

22. A system according to Claim 21, in which signals used for calculating forces consist of signals from force sensors such that a value read from the force sensor falls within a defined minimum and maximum value of an operating range of that sensor.

23. A system according to any of Claims 17 to 22, in which force sensors of one force range are used to calibrate force sensors of another, different, force range.

24. A system according to any of Claims 17 to 23, in which data from the force sensors is collected as time series, and in which processing by the processing unit comprises comparisons of time series data.