CLAIMS

1. A breast pump system comprising at least one wearable milk collection hub connected via an air line to a combined external air pump and control unit; and in which the milk collection hub(s) each comprise:

(a) a breast shield made up of a breast flange and a nipple tunnel;

(b) a flexible diaphragm that is configured to prevent milk from reaching the external air pump;

(c) an outer shell that is configured to be removably attachable to the breast shield, such that the breast shield and outer shell, when attached, form a vessel for collecting milk, and the front face of the outer shell includes a curved portion;

(d) a diaphragm cap that is configured to be secured in use over the diaphragm, and forms part of a front face or forward facing part of the outer shell, and includes an air port connected to the air line.

2. The breast pump system of Claim 1, in which the diaphragm cap is rotatable in the outer shell to adjust the position of the air port.

3. The breast pump system of Claim 1 or 2, in which the diaphragm cap is removable from the outer shell.

4. The breast pump system of any preceding Claim, in which the diaphragm cap includes a pair of recesses configured to enable the cap to be gripped and removed from the outer shell, and installed into the outer shell, with a single hand.

5. The breast pump system of any preceding Claim, in which the diaphragm cap includes a flat portion such that the milk collection hub can rest on a flat surface positioned on this flat portion.

6. The breast pump system of any preceding Claim, in which the diaphragm cap is shaped to fit inside an inner portion of a bra.

7. The breast pump system of any preceding Claim, in which the diaphragm cap is made of a transparent or optically clear, dishwasher safe polypropylene, polycarbonate or copolyester material.

8. The breast pump system of any preceding Claim, in which the outer shell includes or is made from a transparent or optically clear, dishwasher safe polypropylene, polycarbonate or copolyester.

9. The breast pump system of any preceding Claim, in which the breast shield is a transparent or optically clear, dishwasher safe polypropylene, polycarbonate or copolyester, breast shield.

10. The breast pump system of any preceding Claim, in which the breast shield includes a diaphragm housing that has sides that are parallel to the nipple tunnel.

11. The breast pump system of Claim 10, in which the diaphragm housing has an outer, approximately cylindrical side wall that is generally parallel to the nipple tunnel, and an inner, approximately cylindrical side wall that is generally parallel to the nipple tunnel.

12. The breast pump system of any of Claims 10 - 11, in which the diaphragm housing has a front wall that forms the end of the nipple tunnel.

13. The breast pump system of any of Claim 10 - 12, in which the diaphragm housing has an annular rear wall that joins the outer and the inner sides walls and that lies over a region of the nipple tunnel that in use is subject to negative air pressure, the entire diaphragm housing being positioned towards the end of the nipple tunnel such that the user has a clear view of the position of the nipple when positioning the breast shield or the outer shell onto the breast.

14. The breast pump system of any of Claim 10 - 13, in which the diaphragm is flexible and moves within an air-pump chamber formed (i) on one side by the diaphragm housing and the flexible diaphragm includes walls that are parallel to the long or central axis of the nipple tunnel and (ii) on another side by the diaphragm cap

15. The breast pump system of any of Claim 10 -14, in which the breast shield is integrated with the diaphragm housing portion as a single, one piece moulded item.

16. The breast pump system of any preceding Claim, in which the outer shell is a transparent or optically clear, dishwasher safe polypropylene, polycarbonate or copolyester, outer shell.

17. The breast pump system of any preceding Claim, in which the diaphragm is positioned at the end of the nipple tunnel, and includes a portion that extends over the end of the nipple tunnel, so as not to obstruct a mother's view of a substantial part of the nipple tunnel when placing the collection hub onto her breast.

18. The breast pump system of any preceding Claim, in which the diaphragm is a single flexible membrane shaped to include inner and outer substantially cylindrical walls that are generally parallel to the center axis of the nipple tunnel.

19. The breast pump system of any preceding Claim, in which the diaphragm is shaped to be flush to a diaphragm housing that has an outer, approximately cylindrical side wall that is generally parallel to the nipple tunnel, and an inner, approximately cylindrical, concentric side wall that is also is generally parallel to the nipple tunnel.

20. The breast pump system of any preceding Claim, in which the diaphragm includes portions that run substantially parallel to the center axis of the nipple tunnel.

21. The breast pump system of any preceding Claim, in which the diaphragm includes a portion that sits over the end of the nipple tunnel, facing away from the breast.

22. The breast pump system of any preceding Claim, in which the diaphragm is a single flexible membrane shaped to include inner and outer substantially cylindrical walls that are generally parallel to the center axis of the nipple tunnel, an annular wall that joins the inner and outer substantially cylindrical walls, and an end wall that sits over the end of the nipple tunnel.

23. The breast pump system of any preceding Claim, in which the control unit is configured to control suction delivered to the at least one wearable milk collection hubs, and the control unit houses an air pump subsystem that is configured to generate negative air pressure and transfer negative air pressure to the wearable milk collection hub(s).

24. The breast pump system of preceding Claim 23, in which the air pump subsystem is held in place between two blocks, each configured to absorb vibration from the pump unit.

25. The breast pump system of any preceding Claim, further comprising an airflow block in the control unit, the airflow block configured to transfer air or suction from the pump unit and to absorb vibrations from the pump unit.

26. The breast pump system of any preceding Claim, in which a sound valve in the control unit is configured to regulate the pressure inside the control unit such that the inside of the control unit remains at ambient pressure and the sound valve is configured to attenuate noise from the pump unit escaping from inside the control unit.

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27. The breast pump system of Claim 26, in which the sound valve includes a small cut that is configured to deform under pressure.

28. The breast pump system of any preceding Claim, in which a solenoid foam cap in the control unit is configured to reduce the speed of air that enters the solenoid valve when the solenoid valve opens to ambient air pressure and hence to reduce the sound of that air entering the solenoid valve.