CLAIMS

1. A packed tower (10) for treating an effluent stream (5) comprising a fluid and particles from an abatement apparatus, said packed tower comprising:

a packed tower housing having

an inlet (30) for receiving said effluent stream;

an outlet (35) for venting said effluent stream;

a packed substrate (40) housed within said packed tower housing between said inlet and said outlet, said packed substrate being configured to entrain at least some of said particles from said fluid as said effluent stream flows therethrough;

a fan (20) housed within said packed tower housing, said fan being configured to propel said effluent stream from said inlet towards said outlet and to remove at least some of said particles from said fluid

wherein said fan comprises an axial centrifugal fan having a centrifugal impeller, preferably wherein said centrifugal impeller is configured to remove at least some of said particles from said fluid;

said packed tower further comprising:

a conical structure, said fan being downstream of said conical structure (70),

said fan (20) comprising a housing (140) having a circular end plate (150) and a cylindrical wall (160), said end plate (150) carrying fan vanes (170) and the cylindrical wall (160);

the end plate (150) comprising vents (240) formed therein to permit fluid communication, in use, through the fan (20);

said fan vanes (170) and the curved portion (130) being positioned to provide a running clearance between the fan vanes (170) and the curved portion (130), said fan vanes (170) shaped to form said axial centrifugal fan;

at least one aperture configured to convey a tower fluid, a force generated from conveying said tower fluid from said at least one aperture causing said fan to rotate;

a floatation ring (210), positioned along a circumferential edge of an open end of the cylindrical wall (160), and
an annular trough (220) extending radially inwards from an inner surface of the packed tower housing (200), within which the floatation ring (210) and, in use tower fluid, is received to form a fluid bearing.

2. The packed tower of claim 1, wherein said fan is configured to generate a motive force to induce a flow of said effluent stream from said inlet to said outlet.

3. The packed tower of claim 1 or 2, wherein said fan comprises an axial centrifugal fan having a centrifugal impeller, preferably wherein said centrifugal impeller is configured to remove at least some of said particles from said fluid.

4. The packed tower of claim 3, wherein said centrifugal impeller is axially-aligned with a major direction of flow of said effluent stream from said inlet to said outlet.

5. The packed tower of any one of claims 3 or 4, wherein said centrifugal impeller is configured to propel said effluent stream along said major direction of flow of said effluent stream from said inlet to said outlet and to propel said particles in a director transverse to said major direction of flow.

6. The packed tower of any preceding claim, wherein said fan defines at least one axial opening configured to convey said effluent stream towards said outlet, preferably wherein said fan comprises an annular ring defining said at least one axial opening.

7. The packed tower of any preceding claim, wherein said fan is at least one of mechanically, electromagnetically and fluidly driven, and/ or wherein said fan comprises circumferentially-positioned magnets arranged thereon and said packed tower comprises corresponding circumferentially-positioned driver coils located on said packed tower housing.

8. The packed tower of any preceding claim, wherein said fan comprises at least one aperture configured to convey a tower fluid, a force generated from conveying said tower fluid from said at least one aperture causing said fan to rotate.

9. The packed tower of any preceding claim, comprising at least one aperture configured to convey a tower fluid towards said fan, a force generated from said tower fluid by said fan causing said fan to rotate.

10. The packed tower of any preceding claim, wherein said packed tower housing comprises a shaft coupled with said fan and configured to cause said fan to rotate.

11. The packed tower of any preceding claim, wherein said packed tower housing comprises a converging structure configured to concentrate flow of said effluent stream towards said fan, preferably wherein said converging structure comprises a conical structure configured to concentrate flow of said effluent stream towards a centre of said fan.

12. The packed tower of claim 11, wherein said converging structure is positioned upstream of said fan and downstream of said inlet.

13. The packed tower of any preceding claim, wherein said packed tower housing comprises a fluid-trap structure configured to resist flow of said effluent stream towards said inlet.

14. The packed tower of any preceding claim, wherein said packed tower housing comprises at least one cyclone separator configured to receive said effluent stream from said fan, preferably wherein said at least one cyclone separator is positioned downstream of said fan and upstream of said outlet.

15. The packed tower of any one of claims 8 to 14, wherein said packed tower housing comprises at least one spray nozzle configured to spray said fan with said tower fluid.