What is claimed is:

1. A motorized drum comprising:

a drum shell;

a motor disposed within said drum shell, said motor having:

a stationary central shaft,

a plurality of stator windings,

a ferromagnetic stator structure supporting the plurality of stator windings, said ferromagnetic stator structure being affixed to the stationary central shaft;

a rotor arranged to rotate coaxially around the plurality of stator windings; and

a reducer disposed within said drum shell, said reducer having:

a reducer input coupled to receive a rotatory input from the rotor; and

a reducer output that rotates at a reduced output rate of rotation relative to an input rate of rotation of the reducer input, and is rotationally fixed to the drum shell, whereby the reducer output transmits rotatory power to said drum shell at the reduced rate of rotation;

wherein the stationary central shaft is arranged to extend through said reducer, said stationary central shaft supporting said drum shell at a first region of said stationary central shaft that is axially distal from said motor relative to said reducer, and at a second region of said stationary central shaft that is axially distal from said reducer relative to said motor, whereby said motor and said reducer are disposed axially intermediate of said first and second regions of said stationary central shaft.

~~2. The motorized drum of claim 1, wherein the stationary central shaft is arranged to extend through said reducer, said stationary central shaft supporting said drum shell at a first region of said stationary central shaft that is axially distal from said motor relative to said reducer, and at a second region of said stationary central axis that is axially distal from said reducer relative to said motor, whereby said motor and said reducer are disposed axially intermediate of said first and second regions of said stationary central axis.~~

~~3~~ 2. The motorized drum of claim 1, wherein said reducer is a cycloidal rotatory speed reducer having an input gear, an output gear, and an eccentric input shaft that engages the input gear, whereby the input gear is urged into eccentric motion within the reducer as the input shaft rotates, the input gear having *n* external gear teeth and the output gear having at least n+1 internal gear teeth for engaging the external gear teeth of the input gear in response to rotatory motion of the eccentric input shaft.

~~4~~ 3. The motorized drum of claim ~~3~~ 2, wherein the said output gear is affixed to said drum shell, whereby the output gear rotates and urges the drum shell into rotation at same rate of rotation as said output gear.

~~5~~ 4. The motorized drum of claim ~~3~~ 2, wherein, said cycloidal rotatory speed reducer has an input that is hollow.

~~6~~ 5. The motorized drum of claim 1, wherein, said reducer is an harmonic drive speed reducer, comprising an input shaft that provides rotatory motion to a wave generator that is disposed against a flexible splined member, whereby the flexible splined member engages a rigid circular spline member at two radially opposed zones, the flexible spline member having *n* external teeth, and the circular spline member having at least *n+1* internal teeth.

~~7~~ 6. The motorized drum of claim ~~6~~ 5, wherein said circular spline member is affixed to said drum shell, whereby said circular spline member rotates and urges said drum shell into rotation at the same rate of rotation as said circular spline member.

~~8~~ 7. The motorized drum of claim ~~6~~ 5, wherein, said harmonic drive reducer has an input that is hollow.

~~9~~ 8. The motorized drum of claim 1, wherein the motor is an induction motor, and the rotor comprise:

a plurality of rotor conductors arranged in predetermined spatial relationship to one another and to the stationary central shaft, each rotor conductor having first and second conductor ends;

a first short circuit element for short-circuiting the first conductor ends of said rotor conductors to one another; and

a second short circuit element for short-circuiting the second conductor ends of said rotor conductors to one another.

~~10~~ 9. The motorized drum of claim 1, wherein the motor is a permanent magnet motor, and the rotor comprises:

a ferromagnetic rotor element formed of a ferromagnetic material; and

a plurality of permanent magnets disposed in determined relation to the ferromagnetic rotor element.

~~11~~ 10. The motorized drum of claim ~~10~~ 9, wherein the ferromagnetic rotor element is formed to have an inner circumferential surface, and the plurality of permanent magnets is mounted to the inner circumferential surface of the ferromagnetic rotor element.

~~12~~ 11. The motorized drum of claim ~~11~~ 10, wherein the plurality of permanent magnets is mounted to the inner circumferential surface of the ferromagnetic rotor element with an adhesive.

~~13~~ 12. The motorized drum of claim ~~10~~ 9, wherein the ferromagnetic rotor element is formed to have an inner circumferential surface and an outer circumferential surface,

and there is provided a plurality of magnet receiving slots interposed between the inner and outer circumferential surface, the plurality of permanent magnets being installed within respectively associated ones of the plurality of magnet receiving slots.

~~14~~ 13. The motorized drum of claim ~~13~~ 12, wherein the ferromagnetic rotor element is formed of a plurality of ferromagnetic laminations.

~~15~~ 14. The motorized drum of claim ~~13~~ 12, wherein the plurality of permanent magnets is radially embedded within the ferromagnetic rotor element.

~~16~~ 15. The motorized drum of claim ~~13~~ 12, wherein each of the permanent magnets in the plurality of permanent magnets has a rectangular configuration.

~~17~~ 16. The motorized drum of claim ~~15~~ 14, wherein each permanent magnet of the plurality of permanent magnets embedded within the ferromagnetic rotor element has a magnet face intermediate of two magnet corners, the plurality of permanent magnets being arranged in an alternating pattern of north polarity pairs of juxtaposed permanent magnets and south polarity pairs of juxtaposed permanent magnets arranged around the circumference of the rotor, each pair of juxtaposed permanent magnets of like polarity being disposed such that adjacent ones of like polarity corners are radially farther from an inner circumference surface of the rotor than distal ones of like polarity corners.

~~18~~ 17. The motorized drum of claim ~~17~~ 16, wherein the permanent magnets in a pair of like polarity juxtaposed permanent magnets are disposed to have a circumferential gap therebetween, and there is further provided a fastener arranged to extend axially through the circumferential gap.

~~19~~ 18. The motorized drum of claim ~~18~~ 17, wherein said fastener is arranged to extend axially through said ferromagnetic rotor element for holding the ferromagnetic laminations in fixed relation to one another.

~~20~~ 19. The motorized drum of claim 1, wherein there is further provided a rotary air impeller coupled to the rotor for urging air along a first substantially axial flow path that is disposed between the rotor and the ferromagnetic stator structure, and a second substantially axial flow path that is disposed between the rotor and an inner surface of the drum shell, the first and second substantially axial flow paths forming a continuous loop wherein the flow of air in the first and second substantially axial flow paths is in axially opposite directions.

~~21~~ 20. The motorized drum of claim ~~20~~ 19, wherein said rotary air impeller is an axial fan impeller.

~~22~~ 21. The motorized drum of claim ~~20~~ 19, wherein said rotary air impeller is a centrifugal fan impeller.

~~23~~ 22. The motorized drum of claim 1, wherein a mounting face system is further disposed toward an axial end of the motorized drum distal from the determined axial location where said reducer output delivers power to the drum shell, said mounting face

system being configured to enable attachment of additional components that alter an axial length of the motorized drum.

~~24~~ 23. The motorized drum of claim ~~23~~ 22, wherein said mounting face system comprises:

a spring ring disposed in a corresponding groove circumferentially located on the inner periphery of the drum shell;

a mounting ring disposed on the axially interior side of the spring ring within the drum shell; and

a clamp ring disposed axially outward of the spring ring;

~~25~~ 24. The motorized drum of claim ~~24~~ 23, wherein said mounting ring has a chamfer on an outer circumference on an axially outward side for engaging said spring ring whereby when the clamp ring is drawn axially toward said spring ring, said spring ring is urged to expand radially into said drum shell and thereby distribute transaxial forces to said drum shell.

~~26~~ 25. A motorized drum comprising:

a drum shell;

a motor disposed inside the drum shell;

a reducer disposed inside the drum shell, said reducer having a reducer output that produces a rotatory output that has a lower rate of rotation than the rate of rotation of the motor, the reducer output being connected to the drum shell and transmits rotary power to the drum shell;

a stationary shaft having a central axis;

a plurality of stator windings;

a stator structure for supporting said plurality of stator windings, said stator structure being affixed to said stationary shaft; and

a rotor arranged to rotate coaxially around an outer circumference of said stator windings.

~~27~~ 26. The motorized drum of claim ~~26~~ 25, wherein, said stationary shaft extends through the center of the reducer, and is connected to said drum shell at drum shell connections that are located on axially distal ends of said motor and said reducer, whereby said motor and said reducer are both disposed within the axially distal drum shell connections.

~~28~~ 27. The motorized drum of claim ~~26~~ 25, wherein said reducer is a cycloidal rotatory speed reducer, comprising an eccentric input shaft which engages an input gear such that said input gear moves eccentrically within the reducer as said input shaft rotates, said input gear having *n* external gear teeth, and an output gear having at least *n +1* internal gear teeth for engaging the external gear teeth of said input gear in response to

rotatory motion of said eccentric shaft, said output gear being affixed to said drum shell, there being no relative rotary motion between said reducer output and said drum shell.

~~29~~ 28. The motorized drum of claim ~~28~~ 27, wherein, said cycloidal rotatory speed reducer has an input that is hollow for accommodating other components that pass therethrough.

~~30~~ 29. The motorized drum of claim ~~26~~ 25, wherein said reducer is an harmonic drive speed reducer, comprising:

a wave generator disposed against a flexible splined member, the flexible splined member engaging a rigid circular spline member at two radially opposed zones;

an input shaft for driving said wave generator, wherein the flexible spline member has *n* quantity of external teeth, and the circular spline member has at least *n + 1* internal teeth, said circular spline member being affixed to said drum shell, there being no relative rotary motion between the circular spline member and said drum shell.

~~31~~ 30. The motorized drum of claim ~~30~~ 29, wherein, said harmonic drive reducer has an input that is hollow for accommodating other components therethrough.

~~32~~ 31. The motorized drum of claim ~~26~~ 25, wherein there is further provided a coupler having orthogonally arranged driving face pairs for coupling said rotor to the reducer input.

~~33~~ 32. The motorized drum of claim ~~26~~ 25, wherein said reducer has a fixed reference point that is coupled to said fixed shaft by means of a coupler having orthogonally arranged driving face pairs.

~~34~~ 33. The motorized drum of claim ~~33~~ 32, wherein, the coupler engages a keyless bushing that is affixed to said fixed shaft.

~~35~~ 34. The motorized drum of claim ~~26~~ 25, wherein the reducer output is connected to the drum shell at a determined power transmission axial region of said drum shell, and there is provided a mounting face system disposed at an axial end of said motorized drum, distal from the determined power transmission axial region, said mounting face system being configured to facilitate attachment of components that alter an overall axial length of said motorized drum.

~~36~~ 35. The motorized drum of claim ~~35~~ 34, wherein said mounting face system comprises:

a spring ring disposed in a corresponding groove circumferentially located on an inner periphery of said drum shell;

a mounting ring disposed on an axially interior side of said spring ring within said drum shell, said mounting ring having a chamfer on an outer circumference on the axially outward side for engaging said spring ring;

a clamp ring disposed axially exterior of the said ring;

a fastener disposed through said clamp ring for urging said mounting ring axially toward said spring ring, whereby said spring ring is urged to expand radially into the corresponding groove in said drum shell to distribute transaxial forces to said drum shell.