Claims:

1. An improved high force linear motor system comprising a linear motor with a first coil assembly, a second coil assembly and a plurality of magnets forming a row of magnets, wherein

the row of magnets held by a magnet support structure made from Aluminum is positioned between the first coil assembly and the second coil assembly~~,~~;

the first coil assembly is aligned along the length of the row of magnets, and the second coil assembly is aligned along the length of the row of magnets~~,~~;

so each coil assembly is geometrically and exactly opposite one another and equidistant from one another about a center mirror line formed by the horizontal axis of the row of magnets; and

the force of attraction between the row of magnet and the first coil assembly being completely balanced by the force of attraction between the row of magnets and the second coil assembly.

2. An improved high force linear motor system as claimed in Claim 1 wherein the magnets in the row of magnets are movable along the length of the center mirror line formed by the horizontal axis of the row of magnets.

3. An improved high force linear motor system as claimed in Claim 1 wherein the magnets in the row of magnets are each held by a magnet support structure, which is non magnetic.

~~4. An improved high force linear motor system as claimed in Claim 1 wherein the row of magnets are held by a magnet support structure made from Aluminum.~~

~~5~~4. An improved high force linear motor as claimed in Claim 1 wherein the row of magnets are held by a magnet support structure made from other light but stiff non-metallic materials.

~~6~~5. An improved high force linear motor system as claimed in Claim 1 wherein the row of magnets are held by a magnet support structure made from fiber reinforced resin.

~~7~~6. An improved high force linear motor as claimed in Claim 1 wherein the row of magnets are held by a magnet support structure made from plastic.

~~8~~7. An improved high force linear motor as claimed in Claim 1 wherein the magnets are skewed at an angle, to reduce cogging force.

~~9~~8. An improved high force linear motor system in a XY table, comprising a X axis high force linear motor and a Y axis high force linear motor, the high force linear motor of each axis having a first coil assembly, a second coil assembly s and a plurality of magnets forming a row of magnets, wherein

the row of magnets held by a magnet support structure made from Aluminum is positioned between the first coil assembly and the second coil assembly;

the first coil assembly is aligned along the length of the row of magnets, and the second coil assembly is aligned along the length of the row of magnets;

so each coil assembly is geometrically and exactly opposite one another and equidistant from one another about a center mirror line formed by the horizontal axis of the row of magnets; and

the force of attraction between the row of magnets and the first coil assembly being completely balanced by the force of attraction between the row of magnet and the second coil assembly, wherein the XY table for positioning a load, using an X motor and a Y motor having the following relationships:

$Sx = Cx - Mx$

$Sy = Cy - My$

$Cyx - Myx > Sx$

where

Sx is the maximum stroke of the X axis

Cx is the length of the X coil in the direction of travel

Mx is the distance between the edges of the magnets for the X motor in the direction of X travel

Sy is the maximum stroke of the Y axis

Cy is the length of the Y coil in the direction of Y travel

My is the distance between the edges of the magnets for the Y motor in the direction of Y travel

Cyx is the length of the Y coil in the direction of X travel

Myx is the distance between the edges of the magnets for the Y motor in the direction of X travel.

~~10~~9. An improved high force linear motor system in a XY table as claimed in Claim ~~9~~8 wherein the row of magnets are not mounted onto any back iron, but are held by a magnet support structure.

~~11~~10. An improved high force linear motor system in a XY table as claimed in Claim ~~9~~8 or Claim ~~10~~9, wherein the row of magnets are held by a magnet support structure, which is non magnetic.

~~12. An improved high force linear motor system in a XY table as claimed in Claim 9 or Claim 10, wherein the row of magnets are held by a magnet support structure made from Aluminum.~~

~~13~~11. An improved high force linear motor system in a XY table as claimed in Claim ~~9~~8 or Claim ~~10~~9, wherein the row of magnets are held by a magnet support structure made from other light but stiff non-metallic materials.

~~14~~12. An improved high force linear motor system in a XY table as claimed in Claim ~~9~~8 or Claim ~~10~~9, wherein the row of magnets are held by a magnet support structure made from fiber reinforced resin.

~~15~~13. An improved high force linear motor system in a XY table as claimed in Claim ~~9~~8 or Claim ~~10~~9, wherein the row of magnets are held by a magnet support structure made from plastic.

~~16~~14. An XY table for positioning a load, using an X ~~axis high force linear motor and a Y axis high force linear motor as claimed in Claim 9~~ motor and a Y motor, each axis of the motor having a first coil assembly, a second coil assembly and a plurality of magnets forming a row of magnets, wherein

the row of magnets are held by a magnet support structure made from aluminum, and XY table having the following relationships:

Sx = ~~Mx~~ Cx - Mx

Sy = ~~My~~ Cy - My

Cyx - Myx > Sx

where

Sx is the maximum stroke of the X axis

Cx is the length of the X coil in the direction of travel

Mx is the distance between the edges of the magnets for the X motor in the direction of X travel

Sy is the maximum stroke of the Y axis

Cy is the length of the Y coil in the direction of Y travel

My is the distance between the edges of the magnets for the Y motor in the direction of Y travel

Cyx is the length of the Y coil in the direction of X travel

Myx is the distance between the edges of the magnets for the Y motor in the direction of X travel.

~~17. An XY table for positioning a load, using an X motor and a Y motor as claimed in Claim 9 having the following relationships:~~

~~Sx = Cx - Mx~~

~~Sy = Cy - My~~

~~Cyx - Myx > Sx~~

~~where~~

~~Sx is the maximum stroke of the X axis~~

~~Cx is the length of the X coil in the direction of travel~~

~~Mx is the distance between the edges of the magnets for the X motor in the direction of X travel~~

~~Sy is the maximum stroke of the Y axis~~

~~Cy is the length of the Y coil in the direction of Y travel~~

~~My is the distance between the edges of the magnets for the Y motor in the direction of Y travel~~

~~Cyx is the length of the Y coil in the direction of X travel~~

~~Myx is the distance between the edges of the magnets for the Y motor in the direction of X travel~~

~~18~~15. An improved, single axis high force linear motor system as claimed in Claim 1 having the following relationships:

Sx = Mx – Cx, where Mx is longer than Cx

OR

Sx = Cx – Mx, where Cx is longer than Mx

where
Sx is the maximum stroke of the linear motor system in the direction of travel or driving force
Cx is the length of the coil assembly in the direction of travel or driving force
Mx is the distance between the edges of the magnets for the linear motor in the direction of travel or driving force.

~~19~~16. An improved, single axis high force linear motor system as claimed in Claim 1 having the following relationships:

Sy = My – Cy, where Sy is longer than Cy
Cyx - Myx > Sx

Or
Sy = Cy – My, where Cy is longer than My
Cyx - Myx > Sx

where
Sy is the maximum stroke of the linear motor system in the direction of travel or driving force;
Cy is the length of the coil assembly in the direction of travel or driving force;
My is the distance between the edges of the magnets for the linear motor in the direction of travel or driving force;

Sx is the maximum stroke of the linear motor system in the direction perpendicular to its driving force~~.~~ ;
Cyx is the length of the coil assembly in the direction perpendicular to its driving force~~.~~ ;
Myx is the distance between the edges of the magnets in the direction perpendicular to its driving force.