Claims

1. An inductive joystick comprising:

a control structure comprising an elongate member movable along at least one direction substantially perpendicular to a length of the elongate member; and

a position sensing assembly comprising:

a printed circuit board having at least one surface arranged adjacent to the control structure, wherein the at least one surface is substantially parallel with the length of the elongate member and with the at least one direction; and

at least one metal dial arranged over the at least one surface;

wherein the control structure is coupled with the position sensing assembly such that movement of the elongate member along the at least one direction causes relative movement between the at least one surface and the at least one metal dial;

wherein the at least one surface of the printed circuit board is provided with at least one transmitter coil and at least one receiver coil, and wherein the at least one transmitter coil is configured to induce at least one signal in the at least one receiver coil, and the at least one metal dial is configured to interfere with the induction of the at least one signal such that relative movement between the at least one surface and the at least one metal dial varies the at least one induced signal based on a position of the at least one metal dial.

2. The inductive joystick according to claim 1, further comprising a plurality of electrical components and wherein the printed circuit board further comprises at least one extension member extending from the at least one surface to hold the plurality of electrical components.

3. The inductive joystick according to claim 2, wherein the at least one extension member is substantially perpendicular to the at least one surface.

4. The inductive joystick according to claim 1, wherein the at least one metal dial is connected to the control structure such that movement of the elongate member along the at least one direction causes movement of the at least one metal dial over the at least one surface.

5. The inductive joystick according to claim 1, wherein the at least one metal dial comprises:

a base portion connected to the control structure; and

an elongate element extending from the base portion;

wherein movement of the elongate member along the at least one direction causes rotation of the base portion to move the elongate element over the at least one transmission coil and the at least one receiver coil.

6. The inductive joystick according to claim 1, further comprising at least one plastic pin connecting the at least one metal dial to the control structure.

7. The inductive joystick according to claim 1, wherein the control structure further comprises a shaft configured to rotate about an axis substantially perpendicular to the at least one direction upon movement of the elongate member along the at least one direction, and wherein the at least one metal dial is connected to the shaft.

8. The inductive joystick according to claim 1, further comprising a support structure surrounding the control structure and wherein the printed circuit board is connected to the support structure.

9. The inductive joystick according to claim 8, further comprising a reinforcing member connected between the printed circuit board and the support structure.

10. The inductive joystick according to claim 1, further comprising a base to which the elongate member is coupled and wherein the base is arranged at a level substantially in a middle of the at least one surface.

11. The inductive joystick according to claim 1, wherein the at least one transmitter coil comprises at least four turns.

12. The inductive joystick according to claim 1, wherein the at least one receiver coil comprises a sine coil and a cosine coil.

13. The inductive joystick according to claim 1, wherein the at least one metal dial is movable between a first position and a second position, and wherein the inductive joystick further comprises a processing unit configured to process the at least one induced signal to

determine the position of the at least one metal dial based on a predetermined map, wherein the predetermined map indicates the positions between the first and second positions.

14. The inductive joystick according to claim 1, further comprising a mid-switch in connection with a base of the inductive joystick.

15. The inductive joystick according to claim 1, wherein the elongate member is movable along a first direction and a second direction, wherein the at least one surface comprises a first surface and a second surface, the first surface coupled with the second surface to surround at least a part of the control structure and wherein the at least one metal dial comprises a first metal dial arranged over the first surface and a second metal dial arranged over the second surface.

16. The inductive joystick according to claim 15, wherein the printed circuit board comprises a connecting member connecting the first and second surfaces.

17. The inductive joystick according to claim 15, wherein the printed circuit board comprises a flex cable.

18. An inductive joystick comprising:

a control structure comprising an elongate member movable along a first direction and a second direction, wherein the first and second directions are substantially perpendicular to a length of the elongate member; and

a position sensing assembly comprising:

a printed circuit board having a first surface and a second surface arranged adjacent to the control structure, wherein the first and second surfaces are substantially parallel with the length of the elongate member and with the first and second directions respectively, and wherein the first surface is coupled with the second surface such that the printed circuit board surrounds at least part of the control structure;

a first metal dial arranged over the first surface; and

a second metal dial arranged over the second surface;

wherein each of the first and second surfaces is provided with at least one transmitter coil and at least one receiver coil;

wherein the control structure is coupled with the position sensing assembly such that movement of the elongate member along the first or second direction causes relative movement between the surface parallel with the direction and the metal dial arranged over the surface; and

wherein for each of the first and second surfaces, the at least one transmitter coil is configured to induce at least one signal in the at least one receiver coil, and the at least one metal dial is configured to interfere with the induction of the at least one signal such that relative movement between the surface and the metal dial varies the at least one induced signal based on a position of the metal dial.

~~19. The inductive joystick according to claim 18, further comprising a plurality of electrical components and wherein the printed circuit board further comprises at least one extension member extending from at least one of the first and second surfaces to hold the plurality of electrical components.~~

~~20. The inductive joystick according to claim 19, wherein the at least one extension member is substantially perpendicular to the surface from which the at least one extension member extends.~~

~~21. The inductive joystick according to claim 18, wherein the first and second metal dials are connected to the control structure such that movement of the elongate member along the first direction causes movement of the first metal dial over the first surface and movement of the elongate member along the second direction causes movement of the second metal dial over the second surface.~~

~~22~~19. The inductive joystick according to claim 18, wherein each of the first and second metal dials comprises:

a base portion connected to the control structure; and

an elongate element extending from the base portion,

wherein movement of the elongate member along the first direction causes rotation of the base portion of the metal dial arranged over the first surface to move the elongate element of the metal dial over the at least one transmitter coil and the at least one receiver coil of the first surface, and movement of the elongate member along the second direction causes rotation of the base portion of the metal dial arranged over the second surface to move the elongate

element of the metal dial over the at least one transmitter coil and the at least one receiver coil of the second surface.

~~23. The inductive joystick according to claim 18, further comprising plastic pins connecting the first and second metal dials to the control structure.~~

~~24. The inductive joystick according to claim 18, wherein the control structure further comprises a first shaft and a second shaft configured to rotate about a first axis and a second axis respectively, wherein the first and second axes are substantially perpendicular to the first and second directions respectively and wherein the first and second metal dials are connected to the first and second shafts respectively.~~

~~25. The inductive joystick according to claim 18, further comprising a support structure surrounding the control structure and wherein the printed circuit board is connected to the support structure.~~

~~26. The inductive joystick according to claim 25, further comprising a reinforcing member connected between the printed circuit board and the support structure.~~

~~27. The inductive joystick according to claim 18, further comprising a base to which the elongate member is coupled and wherein the base is arranged at a level substantially in a middle of the first and second surfaces.~~

~~28. The inductive joystick according to claim 18, wherein the at least one transmitter coil of each of the first and second surfaces comprises at least four turns.~~

~~29. The inductive joystick according to claim 18, wherein the at least one receiver coil of each of the first and second surfaces comprises a sine coil and a cosine coil.~~

~~30. The inductive joystick according to claim 18, wherein each of the first and second metal dials is movable between a first position and a second position, and wherein the inductive joystick further comprises a processing unit configured to process the at least one induced signal for each surface to determine the position of the metal dial over the surface~~

~~based on a predetermined map, wherein the predetermined map indicates the positions between the first and second positions.~~

~~31. The inductive joystick according to claim 18, further comprising a mid-switch in connection with a base of the inductive joystick.~~

~~32. The inductive joystick according to claim 18, wherein the printed circuit board comprises a connecting member connecting the first and second surfaces.~~

~~33. The inductive joystick according to claim 18, wherein the printed circuit board comprises a flex cable.~~

~~34~~20. An inductive joystick comprising:

a control structure comprising an elongate member movable along at least one direction substantially perpendicular to a length of the elongate member; and

a position sensing assembly comprising:

a printed circuit board having at least one surface arranged adjacent to the control structure, wherein the at least one surface is substantially parallel with the length of the elongate member and with the at least one direction; and

at least one metal dial arranged over the at least one surface;

wherein the at least one metal dial is connected to the control structure such that movement of the elongate member along the at least one direction causes movement of the at least one metal dial over the at least one surface; and

wherein the at least one surface of the printed circuit board is provided with at least one transmitter coil and at least one receiver coil and wherein the at least one transmitter coil is configured to induce at least one signal in the at least one receiver coil, and the at least one metal dial is configured to interfere with the induction of the at least one signal such that movement of the at least one metal dial over the at least one surface varies the at least one induced signal based on a position of the at least one metal dial.

~~35. The inductive joystick according to claim 34, further comprising a plurality of electrical components and wherein the printed circuit board further comprises at least one extension member extending from the at least one surface to hold the plurality of electrical components.~~

~~36. The inductive joystick according to claim 35, wherein the at least one extension member is substantially perpendicular to the at least one surface.~~

~~37. The inductive joystick according to claim 34, wherein the at least one metal dial comprises:~~

~~a base portion connected to the control structure; and~~

~~an elongate element extending from the base portion;~~

~~wherein movement of the elongate member along the at least one direction causes rotation of the base portion to move the elongate element over the at least one transmission coil and the at least one receiver coil.~~

~~38. The inductive joystick according to claim 34, further comprising at least one plastic pin connecting the at least one metal dial to the control structure.~~

~~39. The inductive joystick according to claim 34, wherein the control structure further comprises a shaft configured to rotate about an axis substantially perpendicular to the at least one direction upon movement of the elongate member along the at least one direction, and wherein the at least one metal dial is connected to the shaft.~~

~~40. The inductive joystick according to claim 34, further comprising a support structure surrounding the control structure and wherein the printed circuit board is connected to the support structure.~~

~~41. The inductive joystick according to claim 40, further comprising a reinforcing member connected between the printed circuit board and the support structure.~~

~~42. The inductive joystick according to claim 34, further comprising a base to which the elongate member is coupled and wherein the base is arranged at a level substantially in a middle of the at least one surface.~~

~~43. The inductive joystick according to claim 34, wherein the at least one transmitter coil comprises at least four turns.~~

~~44. The inductive joystick according to claim 34, wherein the at least one receiver coil comprises a sine coil and a cosine coil.~~

~~45. The inductive joystick according to claim 34, wherein the at least one metal dial is movable between a first position and a second position, and wherein the inductive joystick further comprises a processing unit configured to process the at least one induced signal to determine the position of the at least one metal dial based on a predetermined map, wherein the predetermined map indicates the positions between the first and second positions.~~

~~46. The inductive joystick according to claim 34, further comprising a mid-switch in connection with a base of the inductive joystick.~~

~~47. The inductive joystick according to claim 34, wherein the elongate member is movable along a first direction and a second direction, wherein the at least one surface comprises a first surface and a second surface, the first surface coupled with the second surface to surround at least a part of the control structure and wherein the at least one metal dial comprises a first metal dial arranged over the first surface and a second metal dial arranged over the second surface.~~

~~48. The inductive joystick according to claim 47, wherein the printed circuit board comprises a connecting member connecting the first and second surfaces.~~

~~49. The inductive joystick according to claim 47, wherein the printed circuit board comprises a flex cable.~~