Claims

1. A joystick device comprising:

a hollow housing formed by an endless boundary structure and a ceiling structure having an opening;

a control-stick having a head portion and a stem portion, the hollow housing surrounding the stem portion of the control-stick such that the control-stick extends through the opening in the ceiling structure of the hollow housing with the head portion of the control-stick outside the hollow housing; and

a plurality of biasing curved arm members extending outwardly from the stem portion of the control-stick in a manner so as to be movable with the control-stick relative to the hollow housing along a plane at least substantially perpendicular to the stem portion, wherein each of the plurality of biasing curved arm members extends from the stem portion along the plane and has a curved segment with a convex side of the curved segment directed towards a respective corresponding portion of the endless boundary structure of the hollow housing so as to bias the stem portion of the control-stick away from the respective corresponding portion of the endless boundary structure of the hollow housing when the control-stick is being moved towards the respective corresponding portion of the endless boundary structure,

wherein the plurality of biasing curved arm members are movable with the control-stick as a whole relative to the hollow housing along the plane, and

wherein the plurality of biasing curved arm members are distributed along a circumference of the stem portion of the control-stick in a manner so as to cooperate with each other to centre the control-stick with respect to the opening of the ceiling of the hollow housing.

2. The joystick device of claim 1, wherein the plurality of biasing curved arm members comprises four biasing curved arm members forming a quatrefoil-like shape around the stem portion of the control-stick.

3. The joystick device of claim 1~~, wherein the stem portion of the control-stick comprises an endless groove around a cylindrical surface of the stem portion of the control-stick.~~

or 2,

~~4. The joystick device of claim 3,~~ further comprising a ring from which each of the plurality of biasing curved arm members extends, wherein the ring is insert moulded into ~~the~~an endless groove around a cylindrical surface of the stem portion of the control-stick.

~~4.~~

~~5.~~ The joystick device of claim ~~4~~3, wherein the plurality of biasing curved arm members is integrally moulded with the ring.

~~6.~~

5. The joystick device of claim ~~5~~4, wherein

(A) each of the plurality of biasing curved arm members comprises a first end integral to the ring and a second free-end~~.~~; and/or

~~7. The joystick device of claim 5, wherein~~(B) the ring and the plurality of biasing curved arm members are made of electrical insulating material.

~~8~~6. The joystick device of claim ~~4~~3, wherein the ring and the plurality of biasing curved arm members are separate parts coupled together such that each of the plurality of biasing curved arm members extends from the ring.

~~9~~7. The joystick device of claim ~~8~~6, wherein

(A) each of the plurality of biasing curved arm members has a first end coupled to the ring and a second end coupled to an adjacent biasing curved arm member~~.~~; and/or

~~10. The joystick device of claim 8, wherein~~(B) the ring is made of electrical insulating material and the plurality of biasing curved arm members is made of metal~~.~~

~~11. The joystick device of claim 10~~, preferably, wherein the ring and the plurality of biasing curved arm members are attached to each other via a heat staking process.

~~12~~8. The joystick device of ~~claim~~any one of claims 1 to 7, wherein the stem portion of the control-stick and the head portion of the control-stick are made of electrical conductive material.

~~13~~9. The joystick device of ~~claim~~any one of claims 1 to 8, wherein a bottom end of the stem portion of the control-stick contacts a touchscreen of an electronic device when the joystick device is placed on top of the electronic device.

~~14~~10. The joystick device of ~~claim~~any one of claims 1 to 9, wherein the stem portion and the head portion of the control-stick are two separate parts coupled together in a manner in which a protrusion of the head portion is inserted into a recess in an end surface of the stem portion to form the control-stick.

~~15~~11. The joystick device of claim ~~14~~10, wherein the stem portion and the head portion of the control-stick are coupled via a screw~~.~~

~~16. The joystick device of claim 15, further comprising~~, preferably, wherein a cap made of electrical conductive material is attached to the head portion of the control-stick to conceal a screw head of the screw which couples the head portion to the stem portion.

~~17. A joystick device comprising:~~

~~a hollow housing which comprises an endless boundary structure and a ceiling structure to define an internal space, and which is provided with an opening through the ceiling structure;~~

~~a control-stick having a head portion and a stem portion extending through the opening of the ceiling structure, the hollow housing surrounding the stem portion of the control-stick with the head portion of the control-stick outside the hollow housing, wherein the control-stick is made of electrical conductive material;~~

~~a ring made of electrical insulating material fixedly coupled around the stem portion of the control-stick; and~~

~~a plurality of biasing curved arm members extending from the ring to form a radial arrangement around the stem portion of the control-stick in a manner so as to be movable with the control-stick as a whole relative to the hollow housing along a plane at least~~

substantially perpendicular to the stem portion, wherein each of the plurality of biasing curved arm members extends from the ring along the plane and has a curved segment with a convex side of the curved segment directed towards a respective corresponding portion of the endless boundary structure of the hollow housing so as to bias the stem portion of the control-stick away from the respective corresponding portion of the endless boundary structure of the hollow housing when the control-stick is being moved towards the respective corresponding portion of the endless boundary structure,

wherein the plurality of biasing curved arm members are distributed along a circumference of the stem portion of the control-stick in a manner so as to cooperate with each other to centre the control-stick with respect to the opening of the ceiling of the hollow housing.

18. The joystick device of claim 17, wherein the stem portion of the control-stick comprises an endless groove around a cylindrical surface of the stem portion of the control-stick, and wherein the ring is insert moulded into the endless groove of the stem portion of the control-stick.

19. The joystick device of claim 17, wherein the plurality of biasing curved arm members are integrally moulded with the ring.

20. The joystick device of claim 19, wherein each of the plurality of biasing curved arm members comprises a first end integral to the ring and a second free-end.

21. The joystick device of claim 20, wherein the plurality of biasing curved arm members are made of polypropylene.

22. The joystick device of claim 17, wherein the ring and the plurality of biasing curved arm members are separate parts coupled together such that each of the plurality of biasing curved arm members extends from the ring.

23. The joystick device of claim 22, wherein each of the plurality of biasing curved arm members has a first end coupled to the ring and a second end coupled to an adjacent biasing curved arm member.

~~24. The joystick device of claim 22, wherein the plurality of biasing curved arm members are made of metal.~~

~~25. The joystick device of claim 22, wherein the ring and the plurality of biasing curved arm members are coupled via a heat staking process.~~

~~26. The joystick device of claim 17, wherein the hollow housing is configured to be attached to a touchscreen with the control-stick at least substantially perpendicular to the touchscreen, wherein movement of the control-stick is detectable by the touchscreen.~~

~~27~~12. A method of manufacturing a joystick device, the method comprising:

insert moulding a ring made of electrical insulating material around a stem portion of a control-stick made of electrical conductive material, wherein four biasing curved arm members extends from the ring to form a quatrefoil-like shape around the stem portion of the control-stick; and

providing the control-stick to a hollow housing which comprises an endless boundary structure and a ceiling structure to define an internal space and which is provided with an opening through the ceiling structure of the hollow structure such that the hollow housing surrounds the stem portion of the control-stick and the control-stick extends through the opening in the ceiling structure of the hollow housing with the head portion of the control-stick outside the hollow housing,

wherein the four biasing curved arm members and the control-stick are movable as a whole relative to the hollow housing along a plane at least substantially perpendicular to the stem portion of the control-stick, wherein each of the four biasing curved arm members extends from the ring along the plane and has a curved segment with a convex side of the curved segment directed towards a respective corresponding portion of the endless boundary structure of the hollow housing so as to bias the stem portion of the control-stick away from the respective corresponding portion of the endless boundary structure of the hollow housing when the control-stick is being moved towards the respective corresponding portion of the endless boundary structure,

wherein the four biasing curved arm members are distributed along a circumference of the stem portion of the control-stick in a manner so as to cooperate with each other to centre the control-stick with respect to the opening of the ceiling of the hollow housing.

~~28~~13. The method of claim ~~27~~12, wherein the stem portion of the control-stick comprises an endless groove around a cylindrical surface of the stem portion of the control-stick, and wherein the insert moulding of the ring around the stem portion of the control-stick comprises insert moulding the ring into the endless groove of the stem portion of the control-stick.

~~29~~14. The method of claim ~~27~~12 or 13, wherein the insert moulding of the ring around the stem portion of the control-stick comprises integrally moulding the four biasing curved arm members with the ring.

~~30~~15. The method of claim ~~27~~12 or 13, further comprising coupling the four biasing curved arm members to the ring via a heat staking process.–