Claims

1. A magnetic sector (120) comprising:
    - magnetic means (117),
    - a yoke (160) including a first magnetic portion (166), and a second portion comprising a magnetic shunt (152;154;155) forming an outlet face (124) of the magnetic sector;
    - a deflection gap (129) in the first magnetic portion (166);

    the magnetic sector (120) being configured such that the magnetic means (117) are adapted for generating a magnetic field through the deflection gap (129) in order to deflect charged particles moving in said deflection gap (129),
    wherein the magnetic shunt (152; 154; 155) comprises a shunt passage (168) for the charged particles to pass across the magnetic shunt, the shunt passage (168) extending along the outlet face (124), and wherein the magnetic shunt (152; 154; 155) is arranged for directing a magnetic flux leaked from the deflection gap (129) into the first magnetic portion (166).

2. The magnetic sector (120) in accordance with claim 1, wherein the magnetic sector (120), notably the yoke (160), comprises magnetic connection means (172) for magnetically coupling the magnetic shunt (152; 154; 155) to the first magnetic portion (166).

3. The magnetic sector (120) in accordance with claim 1 or 2, wherein the magnetic sector (120) comprises an inner separation (171) between the first magnetic portion (166) and the magnetic shunt (152; 154; 155), the inner separation (171) extending between the deflection gap (129) and the shunt passage (168).

4. The magnetic sector (120) in accordance with any of claims 1 to 3, wherein the magnetic shunt (152; 154; 155) comprises at least one magnetic plate (170), preferably two coplanar magnetic plates (170), which is/are perpendicular to the deflection gap (129), said at least one magnetic plate (170) defining the shunt passage (168).

5. The magnetic sector (120) in accordance with claim 4 wherein the magnetic shunt (152; 154; 155) comprises at least one branch (184) which is inclined with respect to the at least one magnetic plate (170) and which extends toward the deflection gap (129), preferably the magnetic shunt (152; 154; 155) comprises two branches (184), each of said branch (184) extending from one of the two coplanar magnetic plates (170) toward the deflection gap (129).

6. The magnetic sector (120) in accordance with claim 5, wherein the inclination angle α between the at least one branch (184) and the at least one magnetic plate ranges: from 10° to 90°, or from 30° to 80°, or from 45° to 60°.

7. The magnetic sector (120) in accordance with any of claims 1 to 6, wherein the magnetic means (117) comprise at least one permanent magnet (127) and/or at least one coil (182).

8. The magnetic sector (120) in accordance with claim 7, wherein the coil (182) extends on a majority of a space between (171) the first magnetic portion (166) and the magnetic shunt (152; 154; 155).

9. The magnetic sector (120) in accordance with any of claims 1 to 8, wherein the magnetic sector (120) defines an inlet face (122), and an outlet face (124) and wherein the magnetic sector (120) further comprises a second magnetic shunt (152) at the inlet face (122), said second magnetic shunt (154) being configured for directing a magnetic flux leaked from the deflection gap (129) in the first magnetic portion (166).

10. The magnetic sector (120) in accordance with claim 9, wherein the magnetic sector (120) further defines an opposite face (125) at the opposite of the inlet face (122), wherein the magnetic sector (120) further comprises a third magnetic shunt (155) at the opposite face (125), the third magnetic shunt (155) being symmetrical to the inlet shunt (152).

11. The magnetic sector (120) in accordance with any of claims 1 to 10, wherein the yoke (160) comprises a main magnetic circuit (123) in the first magnetic portion (166) and at distance from the magnetic shunt (152; 154; 155), and an auxiliary magnetic loop (174) through the magnetic shunt (152; 154; 155) and the first magnetic portion.

12. The magnetic sector (120) in accordance with any of claims 1 to 11, wherein the yoke (160) and the magnetic shunt (152; 154; 155) comprise a magnetic material such as iron or other ferromagnetic materials, and wherein the width WG of the deflection gap (129) is equal to the width WP of the shunt passage (168).

13. A magnetic sector mass spectrometer (100) comprising: an ion source (110), an electrostatic sector (140), a magnetic sector mass analyser, and at least one detection system (130), wherein the magnetic sector mass analyser is a magnetic sector (120) in accordance with any of claims 1 to 12.

14. Charged particle deviation process, notably a mass to charge ratio measuring process, the process comprising the steps:
providing (200) a magnetic sector (120) in accordance with any of claims 1 to 12;
generating (204) a magnetic field through the deflection gap (129),
moving (206) a charged particle through the deflection gap (129),
deflecting (208) the charged particle in the deflection gap (129) by means of the magnetic field,
crossing (210) the magnetic shunt (152; 154; 155) with the charged particle outside the first magnetic portion.

15. The charged particle deviation process in accordance with claim 14, wherein the process comprises a step entering (205) the yoke (160) during which the charged particle crosses the magnetic shunt (152; 154; 155), and/or the process comprises a step leaving (209) the yoke during which the charged particle crosses the magnetic shunt (152; 154; 155).