Claims

1. A magnetorheological brake device (1) for varying a torque of rotational movements, in particular a magnetorheological operating device (100) for adjusting operating states at least by means of rotational movements, with at least one axle unit (2) and at least one rotary body (3) which is rotatable relative to the axle unit (2), wherein a torque for the rotatability of the rotary body (3) can be adjusted in targeted fashion by means of at least one magnetorheological braking apparatus (4), and comprising a sensor device (5) at least for detecting a rotary position of the rotary body (3), wherein the sensor device (3) comprises at least one magnetic ring unit (15) and at least one magnetic field sensor (25) which is rotationally fixedly connected to the axle unit (2) and arranged radially and/or axially next to the magnetic ring unit (15), wherein the magnetic field sensor (25) is arranged at least partially inside the axle unit (2),characterized in that
the axle unit comprises at least one axle portion which at least in portions radially surrounds the magnetic field sensor (25), and wherein the axial portion has a lower magnetic conductivity than a core cooperating with an electrical coil of the braking apparatus (4).

2. The magnetorheological brake device (1) as claimed in any of the preceding claims, wherein the magnetic ring unit (15) is arranged on an axial end face of the rotary body (3).

3. The magnetorheological brake device (1) as claimed in any of the preceding claims, wherein at least portions of the magnetic ring unit (15) surround the

magnetic field sensor (25) and/or the axle unit (2) in the manner of a ring.

4. The magnetorheological brake device (1) as claimed in any of the preceding claims, wherein the magnetic ring unit (15) and the magnetic field sensor (25) are arranged coaxially to one another.

5. The magnetorheological brake device (1) as claimed in any of the preceding claims, wherein the magnetic field sensor (25) is arranged in a bore (12) of the axle unit (2) through which an electrical connection (14) of the braking apparatus (4) also runs.

6. The magnetorheological brake device (1) as claimed in any of the preceding claims, wherein the magnetic field sensor (25) is arranged on at least one circuit board (35), and wherein also at least the braking apparatus (4) is electrically connected to the circuit board (35), and wherein also at least one connecting line (11) for contacting the brake device (1) is connected to the circuit board (35), and wherein the circuit board (35) is arranged inside the axle unit (2) and the connecting line (11) extends out of the axle unit (2).

7. The magnetorheological brake device (1) as claimed in the preceding claim, wherein the magnetic field sensor (25) is encased by at least one material in the axle unit (2), and/or wherein the circuit board (35) is encased by at least one material in the axle unit (2).

8. The magnetorheological brake device (1) as claimed in any of the preceding claims, wherein at least portions of the magnetic ring unit (15) surround the axle unit (2) in the manner of a ring.

9. The magnetorheological brake device (1) as claimed in any of the preceding claims, wherein the rotary body (3) can be decelerated and/or blocked by means of at least one wedge bearing device (6), and wherein the wedge bearing device (6) is arranged axially between the magnetic ring unit (15) and a coil unit (24) of the braking apparatus (4).

10. The magnetorheological brake device (1) as claimed in any of the preceding claims, wherein the magnetic field sensor (25) and/or the magnetic ring unit (15) are arranged on the end face of the rotary body (3) which also lies on an end face of the axle unit (2) from which at least one signal line (45) of the magnetic field sensor (25) emerges, so that the signal line (45) does not run through a magnetic field of the braking apparatus (4).

11. The magnetorheological brake device (1) as claimed in any of the preceding claims, wherein the magnetic field sensor (25) and the magnetic ring unit (15) are arranged on the end face of the rotary body (3) which lies opposite an end face of the axle unit (2) from which at least one signal line (45) of the magnetic field sensor (25) emerges, and wherein the signal transmission in the signal line (45) takes place optically.

12. The magnetorheological brake device (1) as claimed the preceding claim, wherein the signal line (45) is provided at least in portions by at least one bore in the axle unit (2) so that the axle unit (2) itself serves as a light wave guide.

13. The magnetorheological brake device (1) as claimed in any of the preceding claims, wherein the magnetic ring unit (15) and/or the magnetic field sensor (25)

are arranged inside a radial circumferential line delimited by the rotary body (3).

14. The magnetorheological brake device (1) as claimed in any of the preceding claims, wherein the magnetic ring unit (15) is arranged outside a receiving chamber (13) delimited by the rotary body (3), and wherein between the magnetic ring unit (15) and the rotary body (3), at least one sealing device (7) is arranged which bears sealingly on the rotary body (3) and the axle unit (2) in order to prevent the emergence of a magnetorheological medium (34) arranged in the receiving chamber (13).

15. The magnetorheological brake device (1) as claimed in any of the preceding claims, wherein at least one magnetically conductive wall (8) is arranged between the magnetic ring unit (15) and the braking apparatus (4).

16. The magnetorheological brake device (1) as claimed the two preceding claims, wherein the wall (8) is at least partially provided by an end wall of the rotary body (3), and/or wherein the wall (8) at least partially closes an open end face of the rotary body (3), and/or wherein the wall (8) is configured as a support structure for the sealing device (7).

17. The magnetorheological brake device (1) as claimed in any of the preceding claims, wherein the magnetic field sensor (25) is arranged inside a receiving chamber (13) delimited by the rotary body (3), and wherein the magnetic field sensor (25) is separated at least by means of a sealing unit (17) from a magnetorheological medium (34) arranged in the receiving chamber (13).

18. The magnetorheological brake device (1) as claimed in any of the preceding claims, wherein the magnetic field sensor (25) is configured and suitable for detecting, in addition to the rotary position of the rotary body (3), also at least one axial position of the rotary body (3) relative to the axle unit (2).