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(56) Documents cited

GB A 2161562 GB A 2160939 EP A1 0168286

Bleckmann and Weise. The New four-wheel anti-lock generation. I Mech E Sept 1985

(58) Field of search

F2F

Selected US specifications from IPC sub-class B60T

(54) **Hydraulic brake system**

(57) An hydraulic slip-controlled brake system for motor vehicles with a power booster actuating a brake master cylinder, with an auxiliary pressure source constituted by a pressure fluid pump (9) driven by a controllable electromotive drive system (8) and an hydraulic pressure accumulator (16), and with a compensating reservoir (2) connected to an inlet of the pressure fluid pump (9) with at least one valve cluster comprising solenoid valves for supplying and relieving hydraulic pressure fluid to and from brake members, an electronic control unit, as well as means such as valves (10, 11) for limiting brake pedal travel in the event of a wheel slip control action.

In order to achieve a particularly space-saving arrangement of the components of the hydraulic brake system already available, the power booster (1), the brake master cylinder (5), the electronic control unit, the compensating reservoir (2) as well as the valve cluster (3, 4) are in the form of modules. The pump (9), motor (8) and accumulator (16) are preferably arranged separately and remotely from the other components.

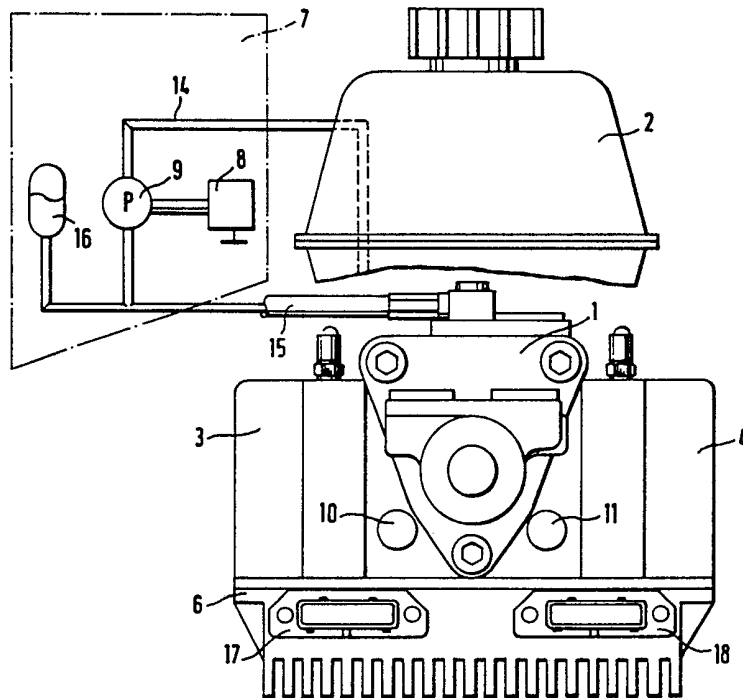


FIG. 2

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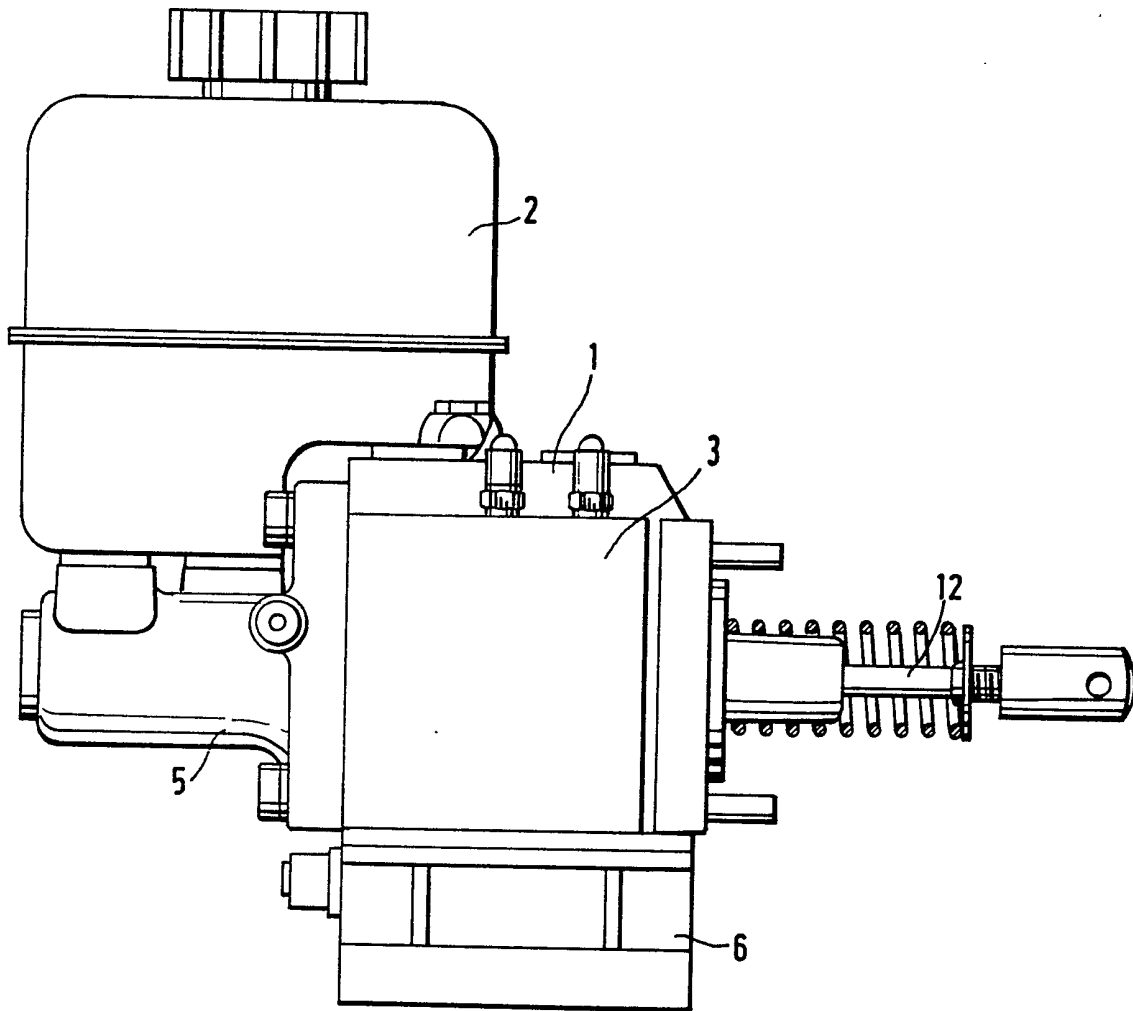


FIG. 1

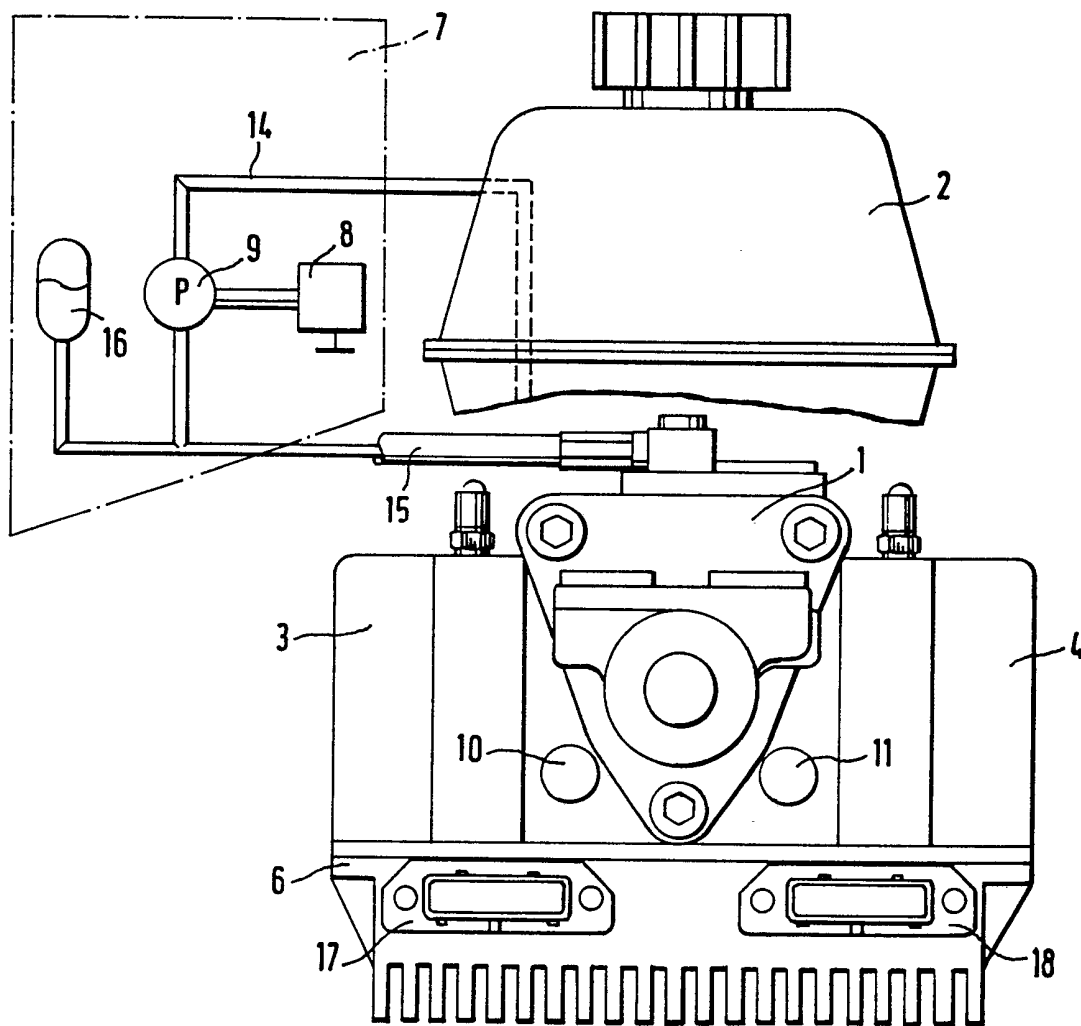


FIG. 2

SPECIFICATION

Hydraulic brake system

5 This invention relates to an hydraulic slip-controlled brake system for motor vehicles with a brake master cylinder and a power booster preceding the brake master cylinder, with an auxiliary pressure source constituted by a pressure fluid pump comprising a controllable electromotive drive system as well as by an hydraulic accumulator, and with a compensating reservoir connected to an inlet of the pressure fluid pump, with at least one valve cluster comprising solenoid valve for applying hydraulic pressure fluid upon brake members, an electronic control unit as well as a device confining brake pedal travel in the event of a wheel slip control action.

20 All known hydraulic slip-controlled brake systems require, due to their very complicated design, considerable space which is regarded as disadvantageous in that the installation space available in the engine compartment of a motor vehicle is, at any rate, limited.

25 It is, therefore, an object of the present invention to arrange the components already available in a known hydraulic slip-controlled brake system such that a considerable reduction of the installation space is achieved.

30 According to the present invention, there is provided an hydraulic slip-controlled brake system for motor vehicles with a brake master cylinder and a power booster preceding the brake master cylinder, with an auxiliary pressure source constituted by a pressure fluid pump comprising a controllable electromotive drive system as well as by an hydraulic accumulator, and with a compensating reservoir connected to an inlet of the pressure fluid pump, with at least one valve cluster comprising solenoid valves for applying hydraulic pressure fluid upon brake members, an electronic control unit, as well as a device confining brake pedal travel in the event of a wheel slip control action, characterised in that the power booster, the brake master cylinder, the electronic control unit, the compensating reservoir as well as the valve cluster are in the form of modules.

50 By means of the measures according to the invention, an hydraulic system will be created which permits, due to its very reduced space requirements, to use the installation space provided for a vacuum brake power booster in the motor vehicle.

55 An expedient improvement of the brake system according to the invention provides that two valve clusters are provided which are arranged symmetrically in the vicinity of the power booster. Thereby, a higher standardisation is achieved since the left-hand and the right-hand versions are identical. This enables, in addition, the use of a narrow brake master cylinder by means of which the overall height

can be reduced considerably.

60 Another advantageous embodiment of the brake system according to the invention consists in that the auxiliary pressure source constituted by the pressure fluid pump, the electromotive drive system and the hydraulic accumulator is arranged apart from the power booster. With an embodiment of this type, it will be advantageously achieved that the noises and/or vibrations which are being generated when the assembly is in operation can be reduced to a large extent since both the pressure fluid pump with the accumulator and the motor driving the pump can be installed at any place desired in the motor vehicle.

75 A further reduction of the overall length of the hydraulic brake system according to the invention will be achieved in that the device for confining the brake pedal travel is formed by blocking valves which are arranged symmetrically to the power booster.

80 An embodiment of the invention will now be described with reference to the accompanying drawings, in which:

85 *Figure 1* shows the first view of an embodiment of the hydraulic brake system according to the invention; and

90 *Figure 2* shows a second view of the brake system illustrated in Fig. 1.

95 The hydraulic slip-controlled brake system illustrated in Fig. 1 and Fig. 2 comprises a brake master cylinder 5 which is actuable by means of a brake pedal (not depicted in the drawing) through the intermediary of an actuating rod 12 via a preceding hydraulic power booster 1. Another component of the brake system is an unpressurised compensating reservoir 2 communicating with the individual circuits of the brake master cylinder 5. Connected to both sides of the hydraulic power booster 1 is a valve cluster 3, 4, respectively, accommodating the solenoid valves required for the functioning of the hydraulic brake system and not illustrated in more detail, said solenoid valves being actuated by means of an electronic control unit 6 in the event of slip control and serving to modulate the hydraulic pressure. The electronic control unit 6 is attached to the hydraulic power booster 1 in a manner similar to that of the valve clusters 3, 4.

100 Attached to the compensating reservoir 2 is an inlet conduit 14 of a pressure fluid pump 9 constituting, together with an electromotive drive system 8 and a hydraulic accumulator 16 connected to the pump's outlet, an auxiliary pressure source 7. At the same time, the pressure side of the pressure fluid pump 9 communicates via a pressure conduit 15 with a main valve arrangement accommodated in one of the valve clusters 3, 4.

105 Two blocking valves 10, 11 serving to confine the brake pedal travel during a control action are, in addition, arranged symmetrically to the power booster 1.

Finally, Fig. 2 also shows two electrical connecting sockets 17, 18 serving to connect an external as well as an internal wiring harness (not depicted in the drawing). Whereas the

5 external wiring harness supplying signals from individual wheel sensors to the electronic control unit 6 and transmitting corresponding signals to the stop light switch is connected to the left-hand connecting socket 17, as depicted in the drawing, the right-hand connecting socket 18, as depicted in the drawing, cooperates with the internal wiring harness, through the intermediary of which the signals originating from a reservoir warning device

10 and the stop light switch as well as the signals required to control the electromotive drive system 8 of the auxiliary power source are, among other things, transmitted.

Since the mode of operation of hydraulic

20 brake systems of this type is known, it need not be explained.

CLAIMS

1. An hydraulic slip-controlled brake system for motor vehicles with a brake master cylinder and a power booster preceding the brake master cylinder, with an auxiliary pressure source constituted by a pressure fluid pump comprising a controllable electromotive drive system as well as by an hydraulic accumulator, and with a compensating reservoir connected to an inlet of the pressure fluid pump, with at least one valve cluster comprising solenoid valves for applying hydraulic pressure fluid upon brake members, an electronic control unit, as well as a device confining brake pedal travel in the event of a wheel slip control action, characterised in that the power booster (1), the brake master cylinder (5), the electronic control unit (6), the compensating reservoir (2) as well as the valve cluster (3, 4) are in the form of modules.

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2. An hydraulic brake system according to claim 1, characterised in that two valve clusters (3, 4) are provided which are arranged symmetrically in the vicinity of the power booster (1).

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3. An hydraulic brake system according to claim 1, characterised in that the electronic control unit (6) is arranged at the power booster (1).

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4. An hydraulic brake system according to claim 1, characterised in that the auxiliary pressure source (7) constituted by the pressure fluid pump (9), the electromotive drive system (8) as well as the hydraulic accumulator (16) is arranged apart from the power booster (1).

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5. An hydraulic brake system according to claim 1, characterised in that the device for confining the brake pedal travel is formed by blocking valves (10, 11) which are arranged symmetrically to the power booster (1).

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6. An hydraulic slip-controlled brake system for motor vehicles substantially as herein

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described with reference to the accompanying drawings.

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