

European Patent No. 0331797

The invention relates to a gearshift device for an automatic transmission of a motor vehicle according to the preamble of claim 1.

A transmission of this type is described in Bosch Tech. Berichte 7 (1983) 4, pages 160 to 166. Propulsion is effected via a hydrodynamic converter which serves as a starting clutch and effects the transmission of moments. By means of a bridging coupling, the converter can be bridged and a rigid through-drive to a subsequently connected 4-speed planetary gear can be produced. The transmission output speed, the load state of the engine, the engine speed and the position of the selector lever are detected by sensors and fed to an electronic control device as electrical values. From this information, the optimum speed is determined according to a preset computing program and hydraulically changed by the control device via electro-magnetic gearshift valves on the transmission. Three control programs can be selected by the driver on one program switch: an economy program for particularly economical driving, a performance program for sports driving and a program with manual setting of the desired gear speed via the selector lever. In a further development, the first two programs are integrated into the electronic control device, which for this purpose has been extended by control units which will not be discussed in more detail here.

An automatic transmission with a selector lever which is movable in a gearshift path is known from the

publication "Electronically Controlled Mechanical Automatic Transmission for Heavy Duty Trucks and Buses", 31 October 1986, SAE, Warrendale Pa, USA. The drive stages R, N, D can be preselected by moving the selector lever longitudinally. The forward speeds of the transmission can be shifted manually by moving the selector lever transversely in the gearshift path.

The object of the invention is to produce a gearshift device for automatic transmissions which allows ease of operation and renders ergonomic driving possible for the driver of the motor vehicle, extensively eliminating operating errors.

The features of claim 1 serve to achieve this object. If the usual optional positions of an automatic transmission can be preselected with the selector lever in a first gearshift path and the forward speeds of the transmission can be manually shifted by a tipping operation after shifting over into a second parallel gearshift path, the driver has the possibility of driving either in automatic operation or in manual operation. In order to shift the gears in the second gearshift path, a short tipping movement in one direction is sufficient to change gear. The tilting lever then automatically returns to the neutral centre position. Shifting up or down by two gears is produced by two tipping movements. In the chosen four-speed transmission, shifting up or down by a maximum of three gears can be produced by three tipping movements. For this purpose, the sub-claims contain advantageous structural embodiments of the selector lever and its mounting in a hollow frame of the vehicle body.

An embodiment of the invention is shown in the drawing and is explained in the following.

The diagrams show:

- Fig. 1 A transmission control system with a gearshift device;
- Fig. 2 A gearshift device in longitudinal section;
- Fig. 3 A gearshift device in cross-section;
- Fig. 4 A section along the line IV-IV in Fig. 3.

Using a selector lever 1, which is tiltable in a first gearshift path 2 in the longitudinal direction of the motor vehicle, the different positions P = parking, R = reverse gear, N = neutral, D = drive in 4th gear, 3 = 3rd gear, 2 = 2nd gear, 1 = 1st gear of an automatic transmission 3 can be selected. The optional positions are detected by sensors 4 which transmit electrical signals to a control device 5 of the transmission 3. From the optional position D, the selector lever 1 can be shifted over into a second gearshift path 7 parallel to the first gearshift path 2 via a cross-path. The shifting-over process is detected by a sensor 8 which then sends a signal to the control device 5.

When the selector lever 1 is tilted in the second gearshift path 7 in the direction of travel of the motor vehicle, a plus sensor 9 responds, the signal from which induces the control device to execute shifting up by one gear on the transmission 3. The selector lever 1 is then pushed back into the neutral centre position of the gearshift path 7 by a spring 10. If the sensor 9 is contacted again, a further operation of shifting up by one gear is effected, as long as the highest gear is not already engaged. If the selector lever is tilted against the direction of travel, a minus sensor 11 transmits a signal to the control device 5 and triggers shifting down by one gear on the transmission 3. An optical

indicator 12 is connected to the control device 5 and indicates the angular positions in the first gearshift path 2 and the gear 1, 2, 3 or 4 which is currently engaged.

The structural design of the gearshift device is shown in Fig. 2, Fig. 3 and Fig. 4.

The first gearshift path 2 and second gearshift path 7, which extend in the longitudinal direction of the motor vehicle, and the cross-path 6 are formed in a cover plate 13 as gates for the selector lever 1. The cover plate 13 is screwed to a front side part 14 and a rear side part 15 and, together with these and a base plate 16, forms a hollow frame 17 which is mounted on the body of the motor vehicle. The part of the selector lever 1 projecting into the hollow frame 17 is connected to a cardan joint 18, about the two bearing bolts 19 and 20 of which the selector lever 1 can be tilted, the said bearing bolts lying transversely to each other.

The upper bearing bolt 19 is mounted in the hollow frame 17. The selector lever is tiltable therearound for execution of the optional positions P, R, N, D, 3, 2, 1. For this purpose, a tilting angle of 34.6° in all is provided from the centre optional position D in the direction of travel of the motor vehicle, and in the opposite direction a tilting angle of 28.2° is provided. An actuating lever 21 mounted outside the hollow frame on the bearing bolt 19 is entrained during the tilting operation and engages in the transmission 3 via an actuating rod 22 articulated on the said actuating lever and actuates the sensors 4 located there for the optional positions P, R, N, D, 3, 2, 1.

An articulated frame 23 is connected to the selector

lever 1 on the lower region thereof and is also tilted on execution of the optional positions. In the articulated frame 23, below the bearing bolt 19, is mounted the bearing bolt 20, about which the selector lever 1 is tiltable when shifting over from the first gearshift path 2 to the second gearshift path 7. The tilting angle required for this is approximately 10°. The shifting-over positions of the selector lever are fixed by a spring detent 24 acting on the underside of the selector lever 1 and mounted on the articulated frame 23. If the selector lever 1 is shifted over from position D through the cross-path 6 into the second gearshift path 7, the connection to the carrier component 26, which is rotationally fixed on the bearing bolt 19 by means of a square connection 25, is released so as not to transmit the tilting movements to be executed in the second gearshift path 7 to the optional position sensors 4 located in the transmission 3.

After shifting over into the second gearshift path 7 has taken place, a pin 27 projecting from the selector lever 1 in a perpendicular manner engages between two retaining pins 28 which rest against the said pin 27 on both sides and are supported by the spring 10 in a spring pot 29. The spring pot is formed on the outside of the hollow frame so as to be in one piece therewith. The selector lever is retained in the neutral centre position in the second gearshift path 7 by the retaining pins 28 and the springs 10. Tilting the selector lever in the second gearshift path 7 by approximately 5° is sufficient to cause the plus sensor 9, or in the opposite direction the minus sensor 11, to respond and to trigger shifting up or shifting down by one gear on the transmission 3. The plus sensor 9 and the minus sensor 11 and the sensor 8 detecting the shifting-over process are formed as electro-mechanical microswitches

and accommodated in a switch housing 30 which is screwed onto the top of the cover plate 13.



Claims

1. A) A gearshift device for an automatic transmission (3) controlled by an electronic control device,
B) having a selector lever (1), by means of which the optional positions (P, R, N, D, 3, 2, 1) of the automatic transmission can be preselected by longitudinally tilting the selector lever in a first gearshift path (2)
C) and with which the forward speeds of the transmission can additionally be manually shifted in a second gearshift path (7),
D) wherein in the second gearshift path (7), by tilting the selector lever (1) once from a neutral centre position and by making contact with a plus sensor (9), shifting up by one gear can be carried out manually, and by tilting once in the opposite direction and making contact with a minus sensor (11), shifting down by one gear can be carried out manually, and
E) the selector lever (1) is then automatically returned to the neutral centre position in the second gearshift path, characterised in that
 - a) the selector lever (1) can be shifted from the position D in the first gearshift path (2) over into a second gearshift path (7) via a cross-path (6),
 - b) the second gearshift path (7) is parallel to the first gearshift path (2) and
 - c) the forwards speeds of the transmission can be manually shifted by longitudinally tilting the selector lever (1) in the second gearshift path (7).
2. A gearshift device according to claim 1, characterised in that the optional positions (P, R, N, D, 3, 2, 1) of the selector lever (1) in the



first gearshift path (2) are detected by sensors (4), and shifting over from the first gearshift path (2) to the second gearshift path (7) is detected by a sensor (8), and in that the signals of the sensors (4, 8) are transmitted to an electronic control device (5), by which the transmission (3) is electro-hydraulically actuated and an indicator (12) for the optional positions is activated.

3. A gearshift device according to claims 1 and 2, characterised in that the tilting movements of the selector lever (1) are detected by sensors (8, 9 11) and fed into the control device (5) and processed therein in such a way that the transmission (3) is shifted up or down by one, two or three gears according to the number of consecutive tilting movements of the selector lever.
4. A gearshift device according to claim 1, characterised in that the first gearshift path (2), extending in the direction of travel, the second gearshift path (7) and the cross-path (6) are provided in a cover plate (13) which, together with a front side part (14) and a rear side part (15) and a base plate (16), forms a hollow frame (17) mounted on the body of the motor vehicle.
5. A gearshift device according to claim 4, characterised in that the selector lever (1) is mounted on the hollow frame (17) in a cardan joint (18) with two bearing bolts (19, 20) perpendicular to each other for the purposes of executing the optional movements and the transverse movement necessary for shifting over.
6. A gearshift device according to claims 4 and 5,



characterised in that the selector lever (1) in the second gearshift path (7) is held in the neutral centre position by resiliently supported retaining pins (28) resting against its pin (27) on both sides.

7. A gearshift device according to claim 4 or 6, characterised in that microswitches serve as sensors (8, 9, 11) for the shifting-over process and for the tilting movement for shifting up and shifting down, the said microswitches being arranged on a switch housing (30) screwed onto the top of the cover plate (13).
8. A gearshift device according to claims 5 and 6, characterised in that the shifting-over tilting positions of the selector lever (1) are fixed by a spring detent (24) acting on the underside thereof, the said spring detent also being tilted during the tilting movements of the selector lever (1) along the gearshift paths (2, 7).

