Abstract

The invention concerns a gear shifting device (1) comprising a head housing (2) and at least one gearshift shaft (3), as also at least one functional element (4) on the gearshift shaft (3), said gearshift shaft (3) being mounted on two longitudinally spaced-apart mounting points (7, 10) in the gear shifting device (1) for movement relative to the head housing (2), and at least the functional element (4) is arranged in longitudinal direction between the two mounting points (7, 10).

Figure 1

Patent claims

1. Gear shifting device (1) comprising a head housing (2) and at least one gearshift shaft (3), as also at least one functional element (4) on the gearshift shaft (3), said gearshift shaft (3) being mounted on two longitudinally spaced mounting points (7, 10) in the gear shifting device (1) for movement relative to the head housing (2), and at least the functional element (4) being arranged in longitudinal direction between the two mounting points (7, 10), **characterised in that** at least one of the mounting points (10) is configured in a separate mounting plate (11), said mounting plate (11) being retained by at least one first traverse member (17) that starts from the head housing (2) and extends next to the gearshift shaft (3).

2. Gear shifting device according to claim 1, **characterised in that** at least one of the mounting points (7) is configured on the head housing (2).

3. Gear shifting device according to claim 1, **characterised in that** the mounting plate (11) is fixed on the first traverse member (17) and on a second traverse member (17), the second traverse member (17) being arranged next to the gearshift shaft (3).

4. Gear shifting device according to claim 1, **characterised in that** the traverse member (17) is a separate component that is fixed on the head housing (2).

5. Gear shifting device according to claim 3, **characterised in that** at least one of the traverse members (17) is a component configured separately from the head housing and fixed on the head housing (2).

6. Gear shifting device according to claim 3, **characterised in that** the traverse members (17) are situated opposite each other, and the gearshift shaft (3) extends between the traverse members (17).

7. Gear shifting device according to claim 3, **characterised in that** the traverse members (17) are configured identically.

8. Gear shifting device according to claim 1, **characterised in that** at least one of the traverse members (17) comprises a shifting gate (19), and a guide pin (20) fixed relative to the gearshift shaft (3) engages into the shifting gate (19).

9. Gear shifting device according to claim 7, **characterised in that** the traverse members (17) comprise shifting gates (19), and at least one guide pin (20) fixed relative to the gearshift shaft (3) engages into at least one of the shifting gates (19) and is movably guided therein.

10. Gear shifting device according to claim 1 or 3, **characterised in that** the mounting plate (11) and the traverse member (17) are interlocked with each other by means of a plug connection.

11. Gear shifting device according to claim 1 or 3, **characterised in that** the mounting plate (11) and the traverse member (17) are connected to each other by fusion of materials.

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NO.

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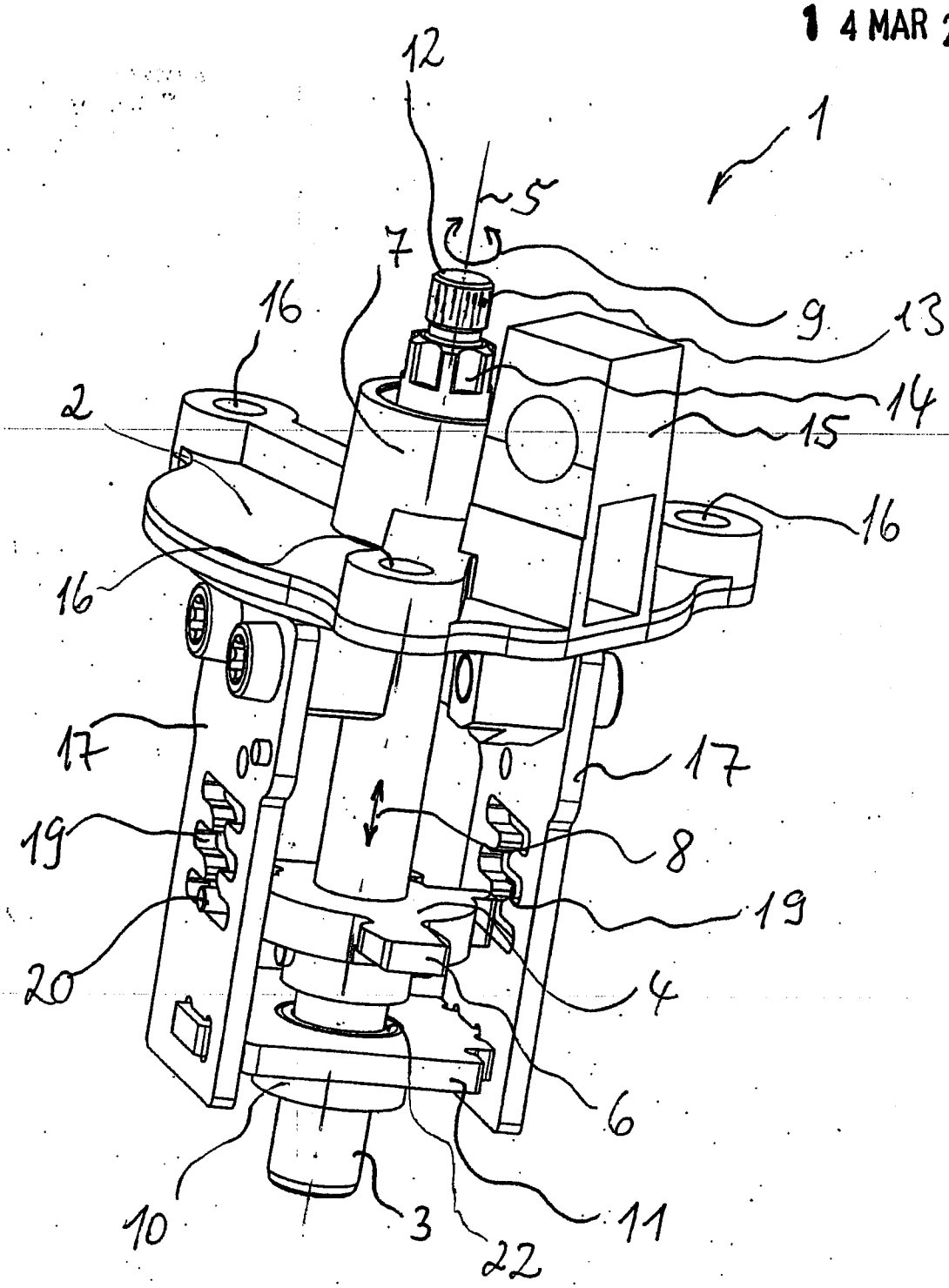

Fig. 1

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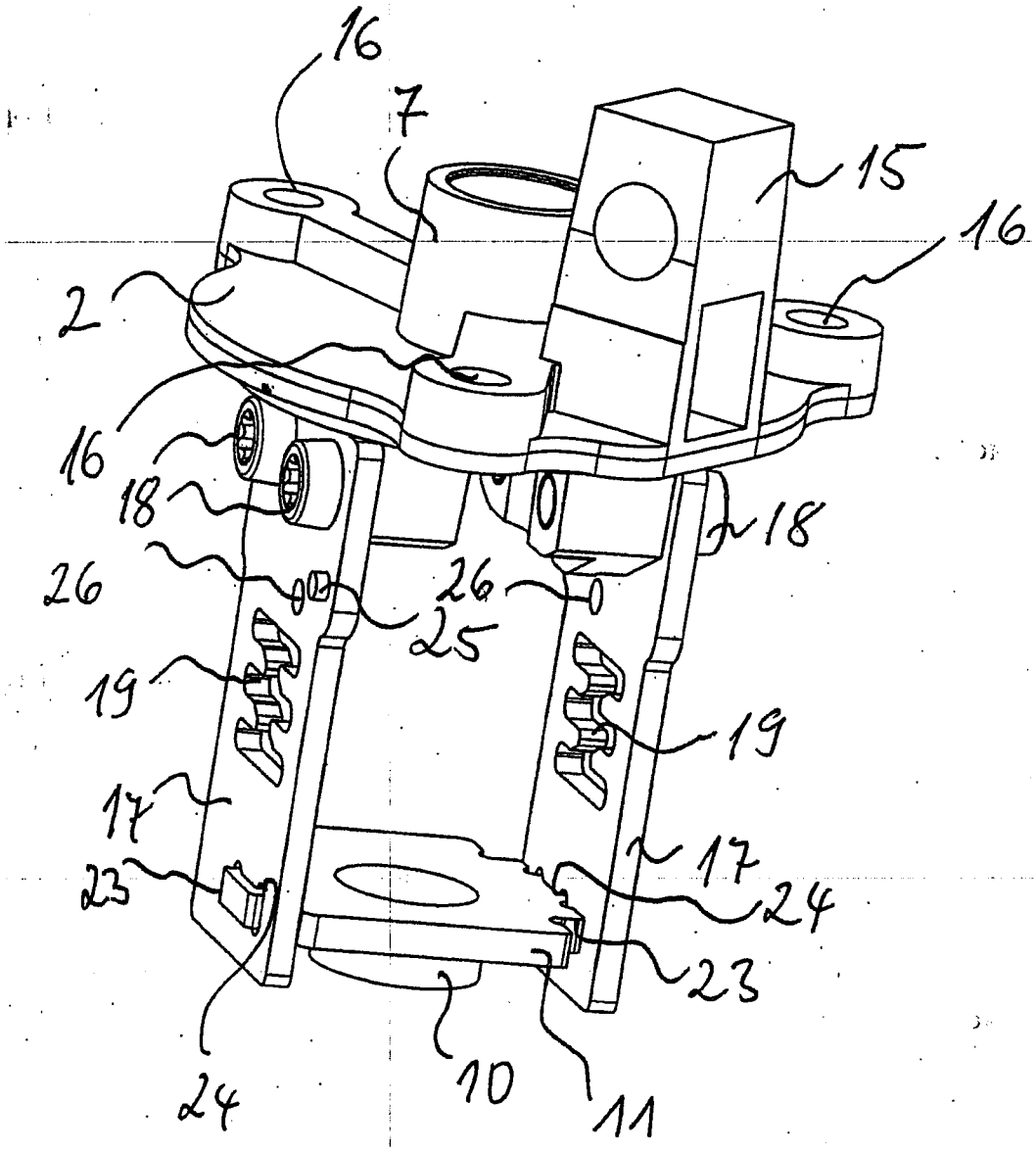

Fig. 2

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Gear shifting device

Description

Field of the invention

The invention concerns a gear shifting device comprising a head housing and at least one gearshift shaft, as also at least one functional element on the gearshift shaft, said gearshift shaft being mounted on two longitudinally spaced mounting points of the gear shifting device for movement relative to the head housing, and at least the functional element being arranged in longitudinal direction between the two mounting points.

Background of the invention

As a rule, gear shifting devices of the pre-cited type are inserted during the assembly of the transmission, together with the gearshift shaft, through a through-aperture of a gearbox casing, of a cover or of an intermediate wall of a transmission, and fixed, together with the head housing, at or on the gearbox casing, the cover or the intermediate wall. A gear shifting device of the pre-cited type is described in EP 0 582 804 B1. This device comprises two mounting points for the gearshift shaft that are lodged in cast elements. Such arrangements are used when it is not possible to integrate the mounting point for the lower shaft end in the gearbox casing. This poses a problem especially when a larger support spacing is to be attained between the upper and the lower shaft mounting.

Other gear shifting devices of this type are fixed during the assembly of the transmission, together with one or more functional elements such as gearshift

fingers, in such a way on the head housing at or on the gearbox casing, the cover or the intermediate wall that the functional elements project into the interior of the transmission through a through-aperture of the gearbox casing, the cover or the intermediate wall of the transmission. The gearshift shaft itself, however, is arranged outside of the head housing which, as a rule, is arranged on and fixed to housing, the cover or the intermediate wall. An arrangement of this type is described in US 4,660,433.

The advantage of such arrangements is that the gearshift shaft can be pre-assembled with a plurality of further functional elements outside of the transmission with the head housing and only then be connected as a structural unit to the transmission. The complexity and costs of assembly of the transmission are low. Transmissions and gear shifting devices of this type can be combined after the modular principle. Repair or exchange of the transmissions is simpler because, in the case of malfunctioning of the gear shifting device, it is no longer necessary to open up the entire transmission for repairing the damage.

Description of the invention

The object of the invention is to create a gear shifting device comprising individual parts that can be economically manufactured and that are simple to assemble.

The invention achieves this object through the subject matter of claim 1.

The invention provides a gear shifting device comprising a head housing in or on which at least one gearshift shaft is mounted for rotation about its own axis of pivot and for sliding displacement along the axis of pivot.

The head housing is any one-piece or multi-piece structure of injected or cast metallic or plastics material configured, for example in the shape of a dish, a

plate or a box. Alternatively, the head housing can be a structure out of sheet metal which is capable of receiving and carrying the gearshift shaft, the functional elements and the traverse member entirely or partially within itself or on the outside. Finally, after assembly, the through-aperture of the housing is closed or at least partly covered by the head housing. The through-aperture is the entrance for the gearshift shaft or the functional elements into the transmission through which the gearshift shaft and functional elements project into the interior of the transmission.

In this connection, it is also imaginable for the gear shifting device pre-assembled into a structural group to comprise, for example, mounting blocks/receptions and rocker arms or finger levers mounted thereon and connected through pull cables or linkages of the transmission mechanism which is connected to the shift lever in the vehicle. Alternatively, elements of automated drive systems or their actuators for operating the gearshift shaft are components of the structural group. It is further conceivable for the structural group to comprise venting systems, locking and/or detent elements that are fixed or configured, for example, on the head housing.

During the assembly of the transmission, the head housing of the gear shifting device is supported, screwed or fixed in another manner at or on the gearbox casing, the cover or the intermediate wall.

A gearshift shaft can be, for instance, a profiled rod profile of any one-piece or multi-piece configuration, frequently with a round or rectangular cross-section and made of any suitable material like metal or plastic. As transmission element, the gearshift shaft is suitable for converting gear shifting or selecting movements of the shift lever or of an actuating system into linear and/or pivotal movements, and for transmitting these further through gearshift fingers.

As a rule, the gearshift shaft is mounted on the gear shifting device with its ends on two longitudinally spaced-apart mounting points either for pivotal or for

longitudinal displacement, or preferably for pivotal and longitudinal displacement on the gear shifting device so that the gearshift shaft is adequately, reliably supported and guided on at least two mounting points. At least one functional element starting from the gearshift shaft is arranged in longitudinal direction between the two mounting points.

Functional elements are any, suitable one-piece or multi-piece gearshift fingers, locking devices, gearshift or detent rollers, arrangements of transmission sensory systems or other elements that are movably or rigidly fixed on the gearshift shaft.

The mounting points comprise any suitable sliding and / or rolling bearings for permitting pivotal and / or linear movements.

According to the invention, at least one of the mounting points is configured in a separate mounting plate. The mounting plate is fixed on a traverse member that starts from the head housing and extends next to the gearshift shaft. In this case, the traverse member is configured in one piece with the head housing, or it is detachably or non-detachably fixed on the head housing. Alternatively, the mounting plate is made in one piece with the traverse member. In this last-mentioned case, the traverse member must be detachably or non-detachably fixed on the head housing. Further developments of the invention concern gear shifting devices comprising more than one mounting plate, each of which mounting plates comprises one or more mounting points that are either fixed on one and the same traverse member or on different traverse members. If two or more mounting plates are arranged in the gear shifting device, these mounting plates are alternatively intended for a complete or a partial mounting of one and the same gearshift shaft or for mounting different gearshift shafts.

A mounting plate is a one-piece or multi-piece component of any configuration that is suitable for receiving one or more of the sliding or rolling bearings for mounting at least the gearshift shaft. Besides this, according to a further

development of the invention, the mounting plate is intended to receive or comprise further functional elements. The mounting plate preferably has a plate-shaped configuration and can alternatively be a cast or an injected part out of a metal or a plastics material, but preferably a punched part out of sheet steel.

The traverse member can be bent at a right angle or at any other angle but is preferably and mostly oriented longitudinally to the gearshift shaft. By traverse member is to be understood a mechanical carrier of any one-piece or multi-piece configuration that is fixed in any manner with one end on the head housing and otherwise, preferably, has no contact with the head housing. Alternatively, the traverse member can also be supported or fixed between or outside of the mounting points on the head housing.

The mounting plate may have contact with the head housing but is preferably suspended or fixed freely from the head housing on one or more of the traverse members. At the same time, the traverse member may be arranged entirely or partially inside or outside of the head housing. The traverse member is a cast or an injected part out of a metal or plastics materials. According to alternative variations of the invention, the traverse member is a punched part made of sheet metal.

The advantage of the invention is that the individual components of the device can be manufactured in a simple manner, in particular if the individual parts are made of sheet metal. Gear shifting devices according to the State of the Art are received, for example, in two-part head housings or in one-piece head housings made of cast material as described respectively in EP 0 582 804 B1 and in US 4,660,433. The costs of the casting dies are relatively high. With gear shifting devices according to the invention, it is possible to dispense partly or completely with components made of cast material. This is particularly advantageous if, by reason of the small series to be manufactured, the purchasing costs of the casting dies are prohibitive or if cost savings can be expected in the case of

small or large series by using sheet material in place of cast material. Cast parts in the gear shifting device according to the invention have a simple design and the cast dies are accordingly not too expensive.

The capsular structure of the head housing of the devices according to the State of the Art permits the mounting of gear shifting elements like gearshift fingers often only when the gear shifting devices have been arranged on the transmission. Under certain circumstances, this can unnecessarily increase the costs of assembly of the transmission. Besides this, as a rule, casting dies for manufacturing the elements of the generic State of the Art are expensive and worthwhile only in the case of large piece numbers. By reason of using individual parts like traverse member(s) and mounting plate(s), the gear shifting device according to the invention can be assembled in a simple and economic manner. In addition, the gear shifting devices made after the modular principle out of different components can be adapted to different installation conditions. Thus, it is possible, for instance, to lengthen or shorten the support distances for two mounting points of the gear shifting device as desired by choosing appropriately longer or shorter traverse members. The other components like the head housing remain uninfluenced by such variations. The arrangement according to the invention can also replace transmission arrangements in which the lower mounting point has been hitherto arranged in the interior of the transmission.

In some developments of the invention, at least one of the mounting points for mounting a gearshift shaft is configured in the head housing and one or more mounting points are situated in one or more mounting plates. The choice of such arrangements depends, for example, on the magnitude of the gear shifting forces to be transmitted and on the length of the gearshift shaft.

According to one further development of the invention, the mounting plate is fixed on two traverse members. The traverse members extend preferably substantially in longitudinal orientation to the gearshift shaft while being

arranged opposite each other in a 180° arrangement so that the gearshift shaft is aligned between the traverse members. It is also conceivable for the position of the traverse members relative to each other to deviate from the 180° arrangement. The mounting plate is fixed either on an end of the traverse member at a distance from the head housing or at any other desired position between the traverse members. It is further conceivable for more than one mounting plate to be received on or between two or more traverse members.

According to a further development of the invention, the two traverse members are identical parts. The advantage of this is that, due to the double number of the parts, the manufacturing costs of the traverse member and thus of the gear shifting device are reduced.

According to still further developments of the invention, the traverse members comprise or receive at least one further functional element. Thus, for example, at least one of the traverse members can comprise a shifting gate, a guide pin or a similar machine element fixed on the gearshift shaft engaging into this shifting gate. By shifting gate is to be understood, in this case, the known guide paths that can have, for example, an arc-shaped or herringbone-type or H-shaped configuration or any other configuration, through which guide paths movements of the gearshift shaft or of other machine parts operatively connected to the gear shifting device are positively guided or limited.

With a view to the advantageous feature of the traverse members being identical parts, it is conceivable for both traverse members to comprise shifting gates so that both traverse members can be manufactured with the same tool, at least one of the shifting gates being used.

The traverse members and mounting plates are preferably detachable, but alternatively also non-detachable. Imaginable are familiar connections such as screwed, riveted or plug connections, coining and swaging and/or combinations of these.

Detailed description of the drawing

The invention will be described more closely below with reference to the drawings. Fig. 1 shows an example of embodiment of a gear shifting device 1 according to the invention, comprising a head housing 2 for seating or inserting the gear shifting device into a gearbox casing, not illustrated, or alternatively on the gearbox cover or on an intermediate wall of a transmission comprising at least one gearshift shaft 3. A functional element 4 is configured or fixed on the gearshift shaft 3. The functional element 4 comprises at least one gearshift finger 6 oriented crosswise to the axis of pivot 5 of the gearshift shaft 1 and at least one locking contour.

The gearshift shaft is mounted at a first mounting point 7 and at a second mounting point 10, for instance, through a bearing for pivoting and linear movement, i.e. for longitudinal displacement in direction of the double arrow 8 and for pivotal movement in the peripheral directions, symbolised by the double arrow 9, about the axis of pivot 5. The mounting points 7 and 10 are spaced in longitudinal direction from each other. The functional element 4 is seated in longitudinal direction between the mounting points 7 and 10. The first mounting point 7 is configured in the head housing 2. The head housing 2 is provided with a mounting block 15 that is intended for the mounting of a pivoting lever, not illustrated. The pivoting lever enables a longitudinal movement of the gearshift shaft 3. In addition, the edge of the head housing 2 has a flange-like configuration and comprises through-holes 16 for screws, not illustrated. With the screws, the head housing 2 is screwed, for example, on a housing of a vehicle transmission, not illustrated.

A mounting plate 11 discrete from the head housing 2 comprises the second mounting point 10. The gearshift shaft 3 projects with its ends out of the mounting points 7 and 10, the upper end 12 of the gearshift shaft comprising

application profiles 13 and 14 that are configured as mounting aids and/or seats for activating elements, not illustrated.

The mounting plate 11 is received between two traverse members 17 that start from the head housing 2 and extend next to the gearshift shaft 3 and longitudinally to the gearshift shaft 3. The traverse members 17 are situated opposite each other in a 180° arrangement, and the gearshift shaft 3 extends between these traverse members 17. Shifting gates 19 are configured on the traverse members 17. A guide pin 20 starting from the functional element 4 is positively guided in one of the shifting gates 19, so that the movement paths of the gearshift shaft 3 in longitudinal direction and the angles of pivot about the axis of pivot 5 are pre-defined by the length of herringbone-type shifting gate 19 shown on the left in the figure. Moreover, the traverse members 17 comprise further functional elements 25 and 26 such as, for instance, a plug-in hole for a pivoting pin of a detent pawl and a support pin for the spring with which the detent pawl is pre-stressed.

Fig. 2 shows a pre-assembled group 21 of the gear shifting device 1 into which the gearshift shaft 3 can be installed together with the functional element 4. Alternatively, the gearshift shaft 3 can be inserted at first into the head housing 2 after which, the traverse members 17 and the mounting plate 11 can be mounted.

The traverse members 17 are identical parts and manufactured substantially by punching out of sheet metal. The mounting plate 11 is likewise a punched part into which a rolling bearing 22 is pressed. As also disclosed in Fig. 2, the traverse members 17 are fixed detachably on the head housing 2 by means of screws 18. The mounting plate 11 is clamped between the traverse members 17 and engages with projections 23 through corresponding holes 24 in the traverse members 17 for forming a plug connection. The mounting plate 11 can also be additionally secured by swaging, riveting of the projections 23 on the

traverse members 17. Alternatively, securing is also possible through weld joints.

Reference numerals

1	Gear shifting device
2	Head housing
3	Gearshift shaft
4	Functional element
5	Axis of pivot
6	Gearshift finger
7	Mounting point
8	Double arrow
9	Double arrow
10	Mounting point
11	Mounting plate
12	End of the gearshift shaft
13	Application profile
14	Application profile
15	Mounting block
16	Through-hole
17	Traverse member
18	Screws
19	Shifting gate
20	Guide pin
21	Pre-assembled group
22	Rolling bearing
23	Projection
24	Hole
25	Functional element
26	Functional element