

**Title: Device for opening and/or closing a door**

**Description**

The invention relates to a device for opening and/or closing a door with an electrical motor and with further electrical,  
5 mechanical and/or hydraulic driving elements and with a support for receiving the driving elements.

A so-called servo-closer with a hydraulic piston/cylinder unit, with a closing spring and opening motor, consisting of an electrical motor and a hydraulic pump, is described in  
10 DE 43 23 150 A1. The electrical motor and the pump, as a structural unit, are integral with a superior housing. The housing consists of a base plate, which is screwed onto the door leaf or the door frame, two lateral parts and a frontal cover hood. The electrical motor with the pump are laterally  
15 flange-mounted to the housing.

This state-of-the-art is disadvantageous in that the motor for each individual servo-closer needs to be individually flange-mounted to the pump and to the housing. With a production of several thousands of servo-closers per year,  
20 the series fabrication is very expensive.

The object of the invention is to provide a device for opening and/or closing a door, in which the complete drive can be mounted with a few manipulations such that the series fabrication can be realized at lower expense.

The invention solves the given problem with the teaching according to claim 1.

In order to rationalize the series fabrication, a pre-mounted motor-gear-unit, a printed circuit board and a cable harness  
5 with transformer are inserted into the support and are electrically interconnected by means of connectors. The motor-gear-unit, the printed circuit board and the cable harness with transformer are delivered by the suppliers completely pre-mounted and tested, and can be mounted  
10 into the support with a few manipulations.

For receiving the pre-mounted components, the support has at least one aperture for receiving the motor-gear-unit and at least one aperture for receiving the printed circuit board and the cable harness with the transformer.  
15 Furthermore, the support is provided with an aperture for a connector module.

The motor-gear-unit is entirely pre-mounted on a base plate. However, the base plate may be also integral part of the housing of the motor-gear-unit, or may be integrally  
20 connected to the latter.

The base plate is provided with bores or oblong holes for the attachment to a mounting plate. Vibration dampers can be mounted into the bores or the oblong holes.

The printed circuit board consists of a first and second control board, which are disposed at an angle to each other and are interconnected by means of cable links.

5 The cable harness with transformer consists of a transformer, a power cable, a power plug and at least one connecting plug. In a preferred embodiment, the support has a cable conduit, in which the power cable is run. This results in a traction relief for the plugs and connections disposed within the support.

10 The electrical connection of the cable harness with transformer and the printed circuit board is realized via insulated connecting plugs. Covering the printed circuit board and the transformer with a covering achieves an electrically screened functional unit, which makes screwing  
15 of the covering unnecessary.

The mounted support is attached to a mounting plate, which has two pairs of threaded bushings, wherein each pair of the threaded bushings corresponds to the bores or oblong holes in the base plate. Thereby, once the mounting  
20 plate is attached, the support or the entire door operator are optionally rotatable about 180° and are thus usable for DIN-left or DIN-right applications.

Screw channels, which correspond to the bores or oblong holes in the base plate and to the threaded bushings of the  
25 mounting plate, are machined into the support. By screwing the support to the mounting plate, the base plate of the

motor-gear-unit is likewise fixed, in this case, the motor-gear-unit being attached to the support by clamping members and latching projections.

In an alternative embodiment, the screw channels are  
5 through bores. As the motor-gear-unit is connected to the support via latching projections and clamping members, it is sufficient to connect the base plate of the motor-drive unit to the mounting plate via screws. In this case, the screw channels allow for access to the screws, which are  
10 secured against the risk of being lost and engage into the mounting plate through the base plate.

In the following, the invention will be explained in more detail, reference being made to an exemplary embodiment, in which:

15 Figure 1: shows, in a perspective view, a support with printed circuit board and a cable harness with transformer,

Figure 2: shows a view on the motor-gear-unit and the mounting plate,

20 Figure 3: shows a view on the support with the motor-gear-unit.

Figure 1 shows an elongate support 50 having a substantially rectangular cross-section. On the rear side when mounted, namely in the direction of the door or the  
25 wall, the support 50 has an aperture 51 for a motor-gear-

unit, not illustrated in this Figure, as well as a shaft opening 52. On the front side when mounted, namely in the direction of the user, an aperture 54 is also provided for a cable harness with transformer 40 and for a printed circuit board 30. The apertures 51 and 54 are disposed at  
5 opposite ends of the support 50. A cable conduit 55 is recessed, likewise on the front side of the support 50. An aperture 56 for connectors is provided at a first frontal face 58 of the support 50. Several screw channels 60 are  
10 disposed at the support 50, which pass through the inside of the support 50. Not illustrated screws, protected against the risk of being lost, are inserted into these screw channels 60. Each aperture 51 and 54 at the front or at the rear side of the support 50 is associated to one frontal face  
15 58 or 59 respectively such that the result is a torsion-resistant support 50, which can be manufactured from sheet metal, light metal or plastic material.

A printed circuit board 30 is executed as a so-called "broken and folded" printed circuit board consisting of a first  
20 control plate 31 and a second control plate 32. The second control plate 32 may as well consist of several superposed control plates. Both control plates 31, 32 could be disposed in plane on one plate. However, due to space conditions and the function, they are disposed at an angle to each  
25 other. Therefore, the second control plate 32 can serve simultaneously as a support for not illustrated indicating devices or switches, which are integral with the second

frontal face 59 of the support 50. The control plates 31 and 32 are interconnected via not illustrated cable links.

A pre-fabricated cable harness with transformer 40 substantially consists of a transformer 41, a power cable 42, a power plug 44 and of at least one connecting plug 45. As an alternative, the cable harness with transformer may have also directly an integral connector module 43, which is disposed at or between the power cable 42 and the power plug 44.

Figure 2 illustrates a motor-gear-unit 20, which consists of a base plate 21 and a motor 22 disposed on the base plate 21, a drive shaft 23 and a gear 24. A not illustrated motor control with connector 29 is attached at the motor 22. However, the base plate 21 may be integral part of the housing of the motor-gear-unit 20, or may be integrally connected to the latter. Bores or oblong holes 26, which are able to accommodate the vibration dampers 25, are machined into the base plate 21. The vibration dampers 25 can be made from rubber, plastic material or from any other elastic material. Latching projections 28 are attached to the base plate 21 and/or to the gear 24. In this example, the motor-gear-unit 20 is an electro-mechanical drive unit. Obviously, as an alternative, other drive units, such as hydraulic-mechanical or similar drive units are also possible. It is essential in this case only that the entire drive unit, as an independent component or as a module, is completely pre-mounted installed in the support 50.

A mounting plate 10 has several bores 13, by means of which an attachment of the entire door operator to a wall, a door, a door frame or to another mounting plate, can be realized via screws or the like. In this example, four  
5 threaded bushings 11 and 12 respectively are provided on the mounting plate 10 which correspond to the oblong holes 26 of the base plate 21. The mounting plate 10 with the bores 13 and the threaded bushings 11 and 12 is formed symmetrically to allow for change-over. Depending  
10 on the opening direction (DIN left or DIN right) of the door, the entire door operator, with the mounting plate 10 already attached, can be rotated about 180°, by placing the oblong holes 26 of the base plate 21, in this case, not onto the threaded bushings 11, but, after a rotation of the door  
15 operator, onto the threaded bushings 12.

The first step in the mounting process of the door operator according to Figure 1 is as follows: The printed circuit board 30, including the first and the second control plate 31, 32, is inserted into the aperture 54 of the support 50 in  
20 not illustrated reception slots. The transformer 41 is likewise recessed in a not illustrated reception slot. The transformer 41 and the printed circuit board 30 are interconnected by means of one or more connecting plugs 45. The connector module 43 is inserted into the aperture  
25 provided for the connector 56 and fixed via a clip-connection. The power cable 42 of the transformer 41 is run in the cable conduit 55. In this way the integral

connectors and the connections are traction relieved, if a too important load is applied to the power cable 42 or the power plug 44. The aperture 54 is then closed with a covering 57, which is likewise fixed by a clip-connection.

5 Thus an electrically screened functional unit is achieved, which does not require subsequent screwing of a cover hood. The execution of a covering or casing which is releasable only by tools is likewise unnecessary.

In the second mounting step according to Figure 3, the

10 motor-gear-unit is inserted into the aperture 51. At the same time the cabling of the motor-gear-unit 20 via the motor control with connector 29 with the transformer 41 and the printed circuit board 30 via the connecting plug 45 (see Figure 1) is realized. The drive shaft 27 of the motor-

15 gear-unit 20 engages with the shaft opening 52. The latching projections 28 engage into the clamping members 61 and are arrested therein. The motor-gear-unit 20 is thus fixed in the support 50. The oblong holes 26 with the vibration dampers 25 are in true alignment with the screw

20 channels 60.

Also the cabling of the motor-gear-unit 20 by means of insulated connectors with the one or more connecting plugs 45 of the cable harness with transformer 40 contributes to achieve an electrically screened functional

25 unit.

The mounting plate 10 of Figure 2 is attached at the wall, the door or the door frame by means screws or the like via the bores 13. The completely equipped support 50, including its vibration dampers 25, is then placed onto the threaded bushings 11. This allows for an easy preliminary  
5 fixing. Subsequently, the screws disposed in the screw channels 60 pass through the vibration dampers 25 and are screwed to the threaded bushings 11.

In an alternative embodiment, the screw channels 60 are  
10 through bores. As the motor-gear-unit 20 is connected to the support 50 via latching projections 28 and clamping members 61, it is sufficient to connect the base plate 21 of the motor-drive unit 20 to the mounting plate 10 via screws. In this case, the screw channels 60 enable the access to  
15 the screws, which are secured against the risk of being lost and engage into the mounting plate 10, through the base plate 21. As the aperture 51 for the motor-gear-unit 20 extends only over a partial length of the support 50, also the mounting plate 10 is significantly shorter than the  
20 support 50.

A not illustrated cover hood with end caps is then placed onto the support 50 and attached by means of a clip-connection.

**List of reference numerals**

|    |    |                                |
|----|----|--------------------------------|
|    | 10 | mounting plate                 |
|    | 11 | threaded bushing               |
|    | 12 | threaded bushing               |
| 5  | 13 | bore                           |
|    | 20 | motor-gear-unit                |
|    | 21 | base plate                     |
|    | 22 | motor                          |
|    | 23 | drive shaft                    |
| 10 | 24 | gear                           |
|    | 25 | vibration damper               |
|    | 26 | oblong hole                    |
|    | 27 | drive shaft                    |
|    | 28 | latching projection            |
| 15 | 29 | motor control with connector   |
|    | 30 | printed circuit board          |
|    | 31 | first control plate            |
|    | 32 | second control plate           |
|    | 40 | cable harness with transformer |
| 20 | 41 | transformer                    |
|    | 42 | power cable                    |
|    | 43 | connector module               |
|    | 44 | power plug                     |
|    | 45 | connecting plug                |
| 25 | 50 | support                        |
|    | 51 | aperture (for motor-gear-unit) |
|    | 52 | shaft opening                  |

- 54 aperture (for printed circuit board and transformer)
- 55 cable conduit
- 56 aperture (for plug)
- 57 covering
- 5 58 first frontal face
- 59 second frontal face
- 60 screw channel
- 61 clamping member

**Patent claims**

1. A device for opening and/or closing a door with an electrical motor and further electrical, mechanical and/or hydraulic driving elements and with a support (50) for receiving of driving elements, a pre-mounted motor-gear-unit (20), a printed circuit board (30) and a cable harness with transformer (40) being inserted into the support (50) and electrically interconnected by means of connecting plugs (45).  
5
2. A device according to claim 1, characterized in that the support (50) comprises at least one aperture (51) for the reception of the motor-gear-unit (20) and at least one aperture (54) for the reception of the printed circuit board (30) and of the cable harness with the transformer (40).  
10
3. A device according to claim 1, characterized in that the support (50) has a cable conduit (55).  
15
4. A device according to claim 1, characterized in that the support (50) has an aperture (56) for a connector module (43).  
20
5. A device according to claim 1, characterized in that the support (50) has screw channels (60).

6. A device according to claim 1, characterized in that the motor-gear-unit (20) is completely pre-mounted on a base plate (21).
7. A device according to claim 6, characterized in that the base plate (21) has oblong holes (26) for the attachment to a mounting plate (10).
8. A device according to claim 6, characterized in that the oblong holes (26) accommodate vibration dampers (25).
9. A device according to claim 1, characterized in that the printed circuit board (30) consists of a first and second control board (31, 32), which are disposed at an angle to each other and are interconnected by means of cable links.
10. A device according to claim 1, characterized in that the cable harness with transformer (40) comprises a transformer (41), a power cable (42), a power plug (44) and at least one connecting plug (45).
11. A device according to any of the preceding claims, characterized in that the power cable (42) is run in the cable conduit (55).
12. A device according to any of the preceding claims, characterized in that the printed circuit

board (30) and the transformer (41) are covered by a covering (57).

- 5 13. A device according to any of the preceding claims, characterized in that the mounted support (50) is attached to a mounting plate (10), which has two pairs of threaded bushings (11, 12) respectively, each pair of threaded bushings (11 or 12) respectively corresponding to the oblong holes (26) of the base plate (21).
- 10 14. A device according to any of the preceding claims, characterized in that screws pass through the screw channels (60) and through the oblong holes (26) and connect the support (50) to the threaded bushings (11 or 12) of the mounting  
15 plate (10).
- 20 15. A device according to any of the preceding claims, characterized in that screws pass through the screw channels (60) and through the oblong holes (26), the support (50) being connected to the motor-gear-unit (20) and the base plate (21) being connected to the mounting plate (10).