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(71) Applicant: **Continental Automotive GmbH**
30165 Hannover (DE)

(72) Inventors:
- **Zhu, Wei**
  Jinghu Zone / Wuhu, 241004 (CN)
- **Wang, Qin**
  Dangtu, 243100 (CN)
- **Cheng, Dong**
  Jiu Jiang Zone, 241009 (CN)

(54) **THROTTLE**

(57) The present device relates to a throttle, comprising: a housing, having a throttle throat; a cover mated with the housing, the material of the cover being plastic; an electric machine; a torque transfer apparatus meshed with an output end of the electric machine; a throttle shaft connected in a fixed manner to the torque transfer apparatus, the throttle shaft passing through the throttle throat, and being supported by being inserted into a first mounting hole and a second mounting hole in the throttle housing; a butterfly valve mounted on the throttle shaft and located inside the throttle throat; the electric machine being located in the cover. Since the electric machine is located in the cover, there is no need for a chamber for accommodating the electric machine to be provided in the housing, so material costs are reduced, and there is no need for the chamber and screw holes for fixing the electric machine to be formed in the cover by machining, so processing costs are reduced.

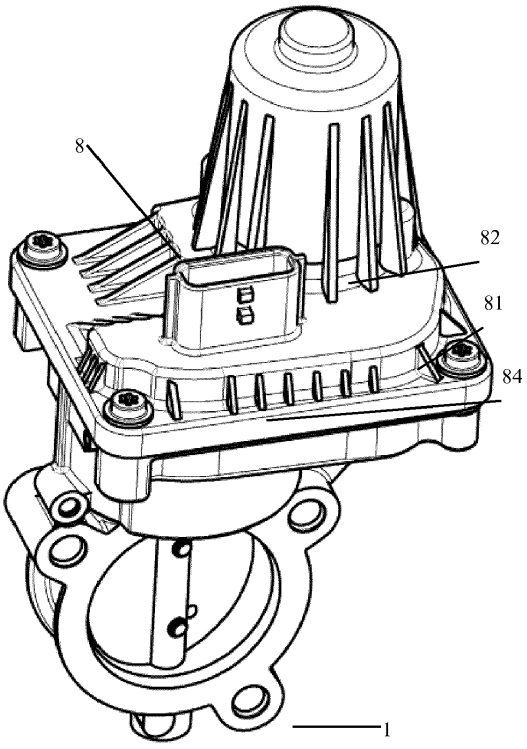

FIG. 1

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Description

TECHNICAL FIELD

[0001] The present device relates to a motor vehicle spare part product, in particular to a throttle for use in a motor vehicle motive power assembly.

Background Art

[0002] A throttle device is generally provided in an internal combustion engine, arranged upstream of the air intake manifold and in communication with the air intake pipeline. It is used to control the flow rate of air supplied to the air intake manifold, and thereby control the flow rate of air entering the engine cylinders.

[0003] A throttle in common use on the market at present comprises a throttle housing, an electric machine located inside the throttle housing, a torque transfer apparatus meshed with an output end of the electric machine, a throttle shaft connected in a fixed manner to the torque transfer apparatus, a butterfly valve mounted on the throttle shaft and located inside a throttle throat, and a cover mated with the throttle housing. The throttle housing has a chamber for accommodating the electric machine, the chamber being located on one side of the throttle throat.

[0004] The following drawbacks are associated with having the electric machine installed in the throttle housing: 1) Since the housing material is metal, generally an aluminum alloy, a considerable amount of aluminum alloy must be consumed to form the chamber which accommodates the electric machine, so material costs are high. 2) To install the electric machine in the housing, it is necessary to machine the housing to form the chamber and screw holes for fixing the electric machine, so processing costs are high. 3) The chamber is located at one side of the throttle throat, making the transverse dimension of the throttle large, so that specific space demands cannot be met.

SUMMARY OF THE INVENTION

[0005] The object of the present device is to provide a throttle capable of reducing manufacturing costs effectively.

[0006] The throttle provided by the present device comprises: a housing, having a throttle throat; a cover mated with the housing, the material of the cover being plastic; an electric machine; a torque transfer apparatus meshed with an output end of the electric machine; a throttle shaft connected in a fixed manner to the torque transfer apparatus, the throttle shaft passing through the throttle throat, and being supported by being inserted into a first mounting hole and a second mounting hole in the throttle housing; a butterfly valve mounted on the throttle shaft and located inside the throttle throat; the electric machine being located in the cover.

[0007] Preferably, the cover has a body and a chamber which is formed as an extension from the body and used for accommodating the electric machine, the electric machine being mounted in the chamber by means of screws.

[0008] Preferably, an inside wall of the chamber is provided with a ridge which presses against the electric machine.

[0009] Preferably, the electric machine has a top; a wave washer and a flat washer are provided between the top and a top wall of the chamber; the wave washer presses against the top end of the electric machine, and the flat washer is located between the wave washer and the top wall of the chamber.

[0010] Preferably, an outside wall of the chamber is provided with a rib extending to the body.

[0011] Preferably, the electric machine is fixed in the chamber by means of glue.

[0012] Preferably, the electric machine is fixed in the cover by injection molding.

[0013] Preferably, thermally conductive adhesive is provided between the housing and the cover.

[0014] Preferably, the torque transfer apparatus is two-stage transmission, comprising a first gear and a second gear meshed with each other, the first gear being mounted on an axle and meshed with the output end of the electric machine, and the second gear being connected in a fixed manner to the throttle shaft.

[0015] Preferably, the torque transfer apparatus is one-stage transmission; the torque transfer apparatus is a single gear connected in a fixed manner to the throttle shaft, with the gear being meshed with the output end of the electric machine.

[0016] Compared with the prior art, since the electric machine is located in the plastic cover, there is no need for a chamber for accommodating the electric machine to be provided in the housing made of metal material, so material costs are reduced, and there is no need for the chamber and screw holes for fixing the electric machine to be formed in the cover by machining, so processing costs are reduced.

Description of the accompanying drawings

[0017] The accompanying drawings, which form part of the present application, are used to furnish further understanding of the present device. The schematic embodiments of the present device and the explanations thereof are intended to explain the present device, without constituting an inappropriate limitation thereof.

Drawings:

[0018]

Fig. 1 is a schematic perspective view of the throttle of the present device after assembly;

Fig. 2 is a schematic sectional view of the throttle of

the present device after assembly;

Fig. 3 is an enlarged schematic view of part A of the throttle shown in Fig. 2;

Fig. 4 is a schematic perspective view of the cover of the throttle shown in Fig. 1;

Fig. 5 is a schematic perspective view of another embodiment of the throttle of the present device, wherein the cover has been removed.

PARTICULAR EMBODIMENTS

[0019] Referring to Figs. 1 and 2, the throttle comprises: a housing 1, the material thereof being metal, and the housing 1 having a throttle throat; a cover 8 mated with the housing 1, the material of the cover 8 being plastic, and an electric machine 2 located in the cover 8; a torque transfer apparatus 3 meshed with an output end 20 of the electric machine 2; a throttle shaft 4 connected in a fixed manner to the torque transfer apparatus 3, the throttle shaft 4 passing through the throttle throat, and being supported by being inserted into a first mounting hole (not shown in the figures) and a second mounting hole (not shown in the figures) in the housing 1; and a butterfly valve 5 mounted on the throttle shaft 4 and located inside the throttle throat.

[0020] Since the electric machine 2 is located in the cover 8, there is no need for a chamber for accommodating the electric machine 2 to be provided in the housing 1 made of metal material, so material costs are reduced. Furthermore, the cover 8 may be injection molded first, wherein the cover 8 has a body 81, a chamber 82 which is formed as an extension from the body 81 and used for accommodating the electric machine 2, and screw holes (not shown in the figures) for fixing the electric machine, and then the electric machine 2 may be fixed in the chamber 82 by means of screws. Thus, there is no need for the chamber 82 and screw holes for fixing the electric machine 2 to be formed in the cover 8 by machining; injection molding may be used, so processing costs are reduced. Referring to Fig. 4, ridges 821 are provided on an inside wall of the chamber 82; the ridges 821 press against the electric machine 2, thereby avoiding transverse vibration of the electric machine 2 during operation, and at the same time helping to dissipate heat. Referring to Fig. 3, the electric machine 2 has a top 21; a wave washer 6 and a flat washer 7 are provided between the top 21 and a top wall 822 of the chamber 82. The wave washer 6 presses against the top 21 of the electric machine 2, thereby reducing axial vibration of the electric machine 2; the flat washer 7 is located between the wave washer 6 and the top wall 822 of the chamber 82, to prevent stress caused by the wave washer 6 from damaging the cover 8. An outside wall of the chamber 82 is provided with ribs 823 which extend to the body 81; the ribs can increase the rigidity of the cover 8, reduce transverse deformation, and thereby reduce transverse vibration of the electric machine 2. To dissipate heat better, a thermally conductive adhesive may be provided between the housing 1 and the cover 8.

[0021] Referring to Fig. 2, the torque transfer apparatus 3 is two-stage transmission, comprising a first gear 31 and a second gear 32 meshed with each other, the first gear 31 being mounted on an axle and meshed with the output end 20 of the electric machine 2, and the second gear 32 being connected in a fixed manner to the throttle shaft 4. The throttle also comprises a return spring 12 with two ends fixed to the housing 1 and the second gear 32 respectively. The return spring 12 is mounted on the housing 1 and second gear 32 with a certain preload. Due to the action of the preload, one end of the return spring 12 will pull the second gear 12 and fix it to the housing 1; this position is an initial position of the second gear 32. When a break in current is encountered, under the action of the preload the return spring 12 can pull the second gear 32 to rotate, thereby impelling the throttle shaft 4 to rotate and pull the butterfly valve 5 back to an initial position.

[0022] Referring to Figs. 1 and 4, the cover 8 has an electrical connection port 84 and a position sensor 86 located therein. The position sensor 86 senses a rotation angle of the butterfly valve 5 through a change in a magnetic field of a magnet (not shown in the figures), and provides feedback to an electronic control unit.

[0023] Referring to Fig. 5, optionally, the torque transfer apparatus 3 is one-stage transmission; the torque transfer apparatus 3 is a single gear 30 connected in a fixed manner to the throttle shaft 4, with the gear 30 being meshed with the output end 20 of the electric machine 2, and at the same time being connected in a fixed manner to the throttle shaft 4. In this embodiment, the gear 30 is meshed internally with the output end 20 of the electric machine 2, but could also be meshed externally. Thus the number of components is small, the assembly process is more simple, and the space occupied is smaller.

[0024] Optionally, after the cover 8 has been injection molded, the electric machine 2 is fixed in the chamber by means of glue. The electric machine 2 could also be fixed in the cover 8 directly by injection molding. These two methods of fixing the electric machine solve the problems of vibration and heat dissipation very well.

[0025] Although the present device has been disclosed above through preferred embodiments, it is by no means limited to these. Changes and amendments of all kinds made within the spirit and scope of the present device by any person skilled in the art shall be included in the scope of protection of the present device. Thus the scope of protection of the present device shall be the scope defined by the claims.

Claims

1. A throttle, comprising:

   a housing, having a throttle throat;
   a cover mated with the housing, the material of the cover being plastic;
   an electric machine;
   a torque transfer apparatus meshed with an output end of the electric machine;
   a throttle shaft connected in a fixed manner to the torque transfer apparatus, the throttle shaft passing through the throttle throat, and being supported by being inserted into a first mounting hole and a second mounting hole in the throttle housing;
   a butterfly valve mounted on the throttle shaft and located inside the throttle throat;
   wherein the electric machine is located in the cover.

2. The throttle as claimed in claim 1, wherein the cover has a body and a chamber which is formed as an extension from the body and used for accommodating the electric machine, the electric machine being mounted in the chamber by means of screws.

3. The throttle as claimed in claim 2, wherein an inside wall of the chamber is provided with a ridge which presses against the electric machine.

4. The throttle as claimed in claim 2, wherein the electric machine has a top; a wave washer and a flat washer are provided between the top and a top wall of the chamber; the wave washer presses against the top end of the electric machine, and the flat washer is located between the wave washer and the top wall of the chamber.

5. The throttle as claimed in claim 2, wherein an outside wall of the chamber is provided with a rib extending to the body.

6. The throttle as claimed in claim 2, wherein the electric machine is fixed in the chamber by means of glue.

7. The throttle as claimed in claim 1, wherein the electric machine is fixed in the cover by injection molding.

8. The throttle as claimed in claim 1, wherein thermally conductive adhesive is provided between the housing and the cover.

9. The throttle as claimed in any one of claims 1 - 8, wherein the torque transfer apparatus is two-stage transmission, comprising a first gear and a second gear meshed with each other, the first gear being mounted on an axle and meshed with the output end of the electric machine, and the second gear being connected in a fixed manner to the throttle shaft.

10. The throttle as claimed in any one of claims 1 - 8, wherein the torque transfer apparatus is one-stage transmission; the torque transfer apparatus is a single gear connected in a fixed manner to the throttle shaft, with the gear being meshed with the output end of the electric machine.

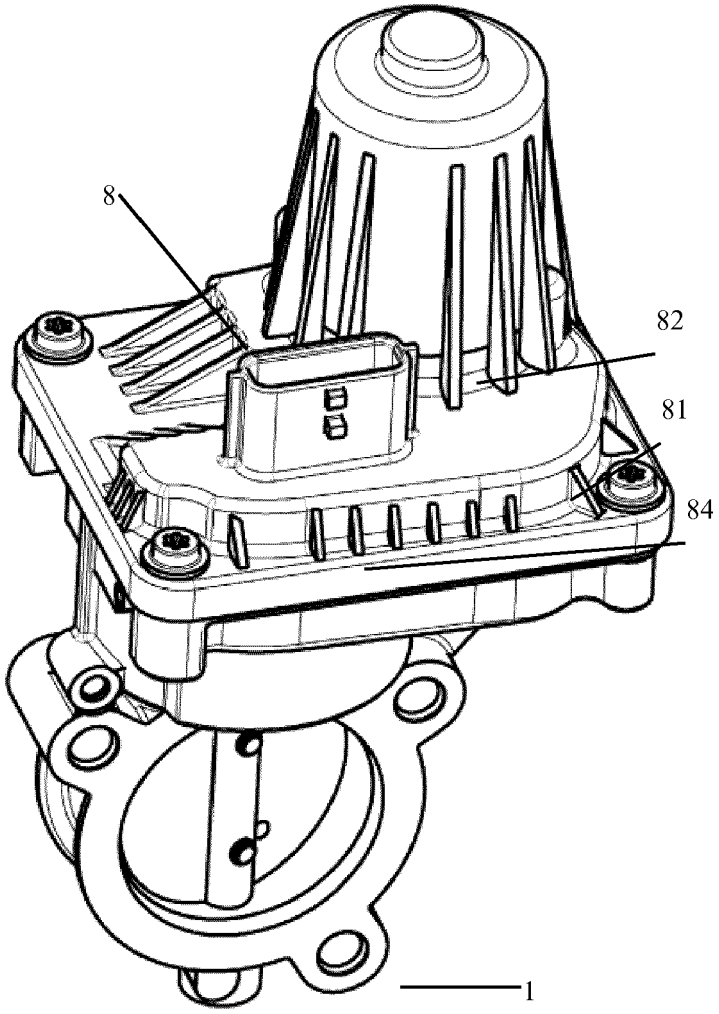

FIG. 1

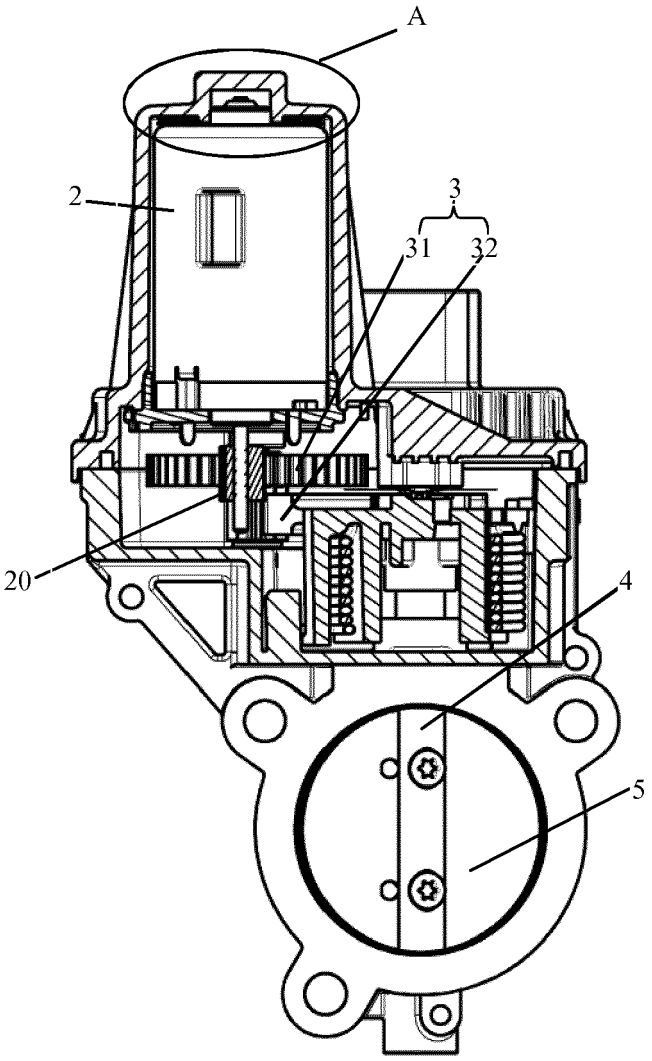

FIG. 2

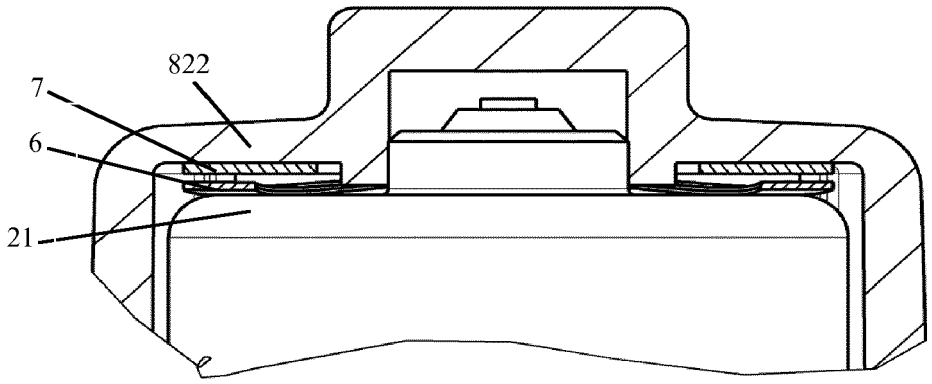

FIG. 3

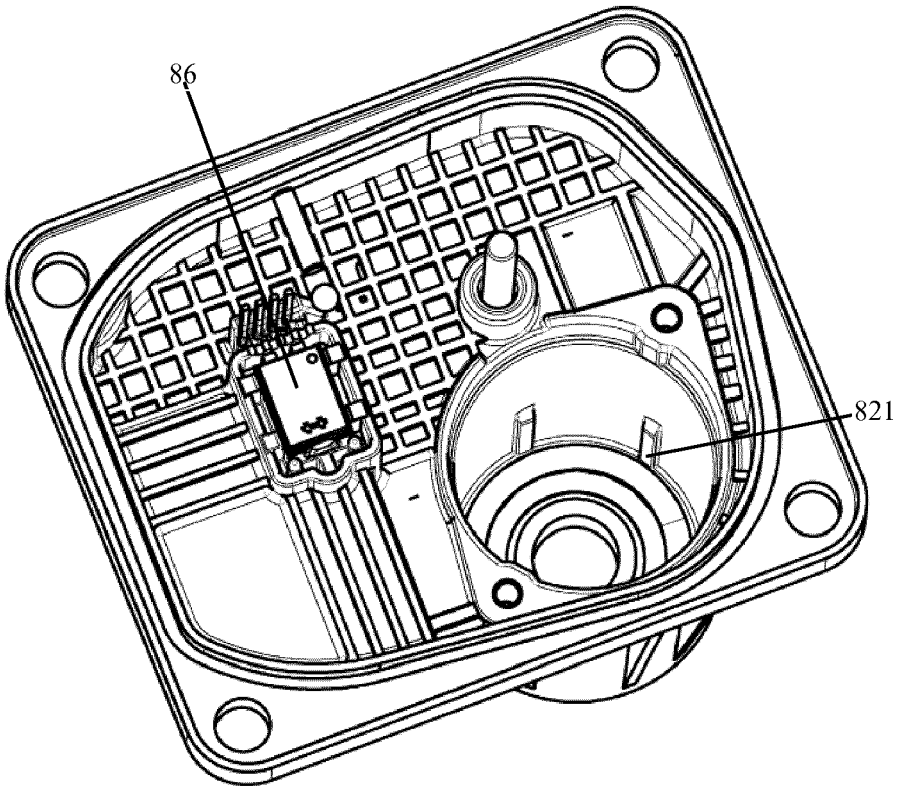

FIG. 4

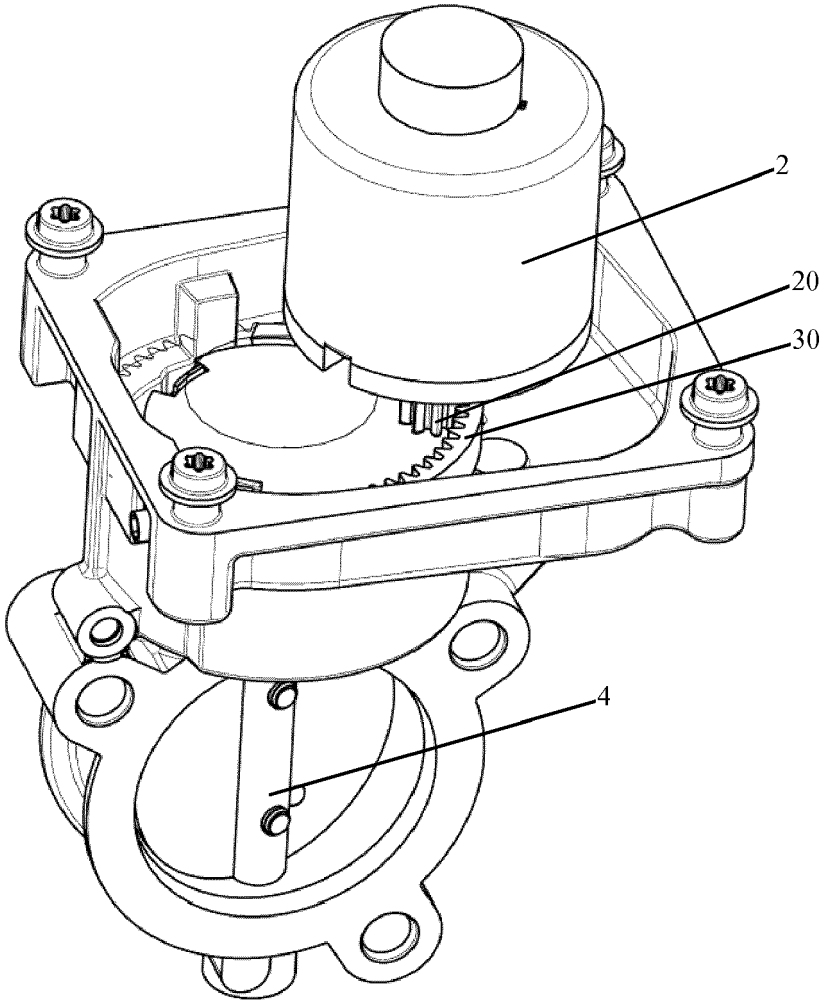

FIG. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 17 16 9845

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	2 October 2017	Van Zoest, Peter

CATEGORY OF CITED DOCUMENTS

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