The invention relates to a rubber bushing (6) preferably intended to simplify fitting and reduce fitting time during the assembly of constructional elements, comprising a rubber unit (7) which has elements firmly moulded in or to it. The invention is effected by an integrally moulded element (10) being firmly attached to the periphery of the rubber unit (7). The invention relates also to a vehicle provided with a rubber bushing (6) according to the invention.
RUBBER BUSHING

TECHNICAL FIELD

The present invention relates to a rubber bushing intended to simplify fitting and reduce fitting time in the manufacture and assembly of engineering parts. The invention is particularly intended for heavy commercial vehicles such as trucks and buses but might of course also be used for other types of vehicles, e.g. cars, construction site machines, boats/ships, aircraft etc. or for quite other areas of application. The invention relates also to a vehicle equipped with one or more rubber bushings according to the invention.

STATE OF THE ART

In the manufacturing industry it is important to simplify the fitting process and reduce the time taken to assemble a product. If production time can be saved, the product becomes less expensive to make, which affects its final price and makes it more competitive on the market. This applies not least in vehicle manufacture, which involves the storage, handling and fitting of thousands of parts.

The fitting for example of air ducts, so-called cab ducts, on vehicles with high-level air intakes usually involves fitting them on the outside of the cab rear wall, against the sheetmetal bodywork. This usually entails using some form of conventional rubber bushing, e.g. a type of studbolt damper which is provided with two metal studscrews or studbolts situated on their respective sides of a rubber damping unit. One of the damper's studbolts is screwed firmly into the cab rear wall in a purpose-made fitting hole, and the opposite other studbolt is screwed firmly into some part of the air duct, in a purpose-made fitting hole. This results in desirable and advantageous flexibility between cab and air
duct and damps out shaking and vibration which may occur between the cab and the air duct.

This known fitting technique involves various manual operations in that a plurality of bushings have to be placed between the cab bodywork and the air duct. As parts which are relatively large, bulky and not very easy to handle are here concerned, access for placing the studbolt dampers in intended fitting holes may be difficult and cramped. This makes the fitting operation less ergonomic, the work both time-consuming and tedious and the manufacturing process consequently less cost-effective.

Moreover, damage to painted bodywork surfaces or other fitting parts with sensitive and smooth/fine surfaces may also occur when putting in place and tightening the studbolt dampers, since metal studbolts with sharp edges are involved. Paint damage may easily occur and may later lead to corrosion. Spoilt, scratched and rusty metal surfaces are certainly undesirable. It may also happen that the studbolt dampers disintegrate when being tightened, further increasing the risk of damage to and spoiling of neighbouring surfaces.

Similar problems do of course arise if the air duct has for any reason to be removed and replaced, e.g. if it has suffered external mechanical damage.

There is in prior art no suitable rubber bushing which makes fitting easy and quick, reduces the risk of paint damage and at the same time reduces the ergonomic problems involved in fitting and removing substantial parts.

**SUMMARY OF THE INVENTION**

One object of the invention is to solve the above problems and propose a rubber bushing which makes fitting easy and quick, reduces the risk of paint damage and at the same time reduces the ergonomic problems involved in fitting and removal.
A further object of the invention is that it be possible for the rubber bushing to be integrated in one of the parts which are to be fitted to one another, so that the bushing is kept in the right position without special fitting measures.

Another object of the invention is to reduce the number of parts which need be kept in stock and handled on the manufacturing line, thereby speeding up production.

A further object of the invention is that it be functional and durable and that the parts be easy and cost-effective to make.

These and other objects and advantages are achieved according to the invention by a rubber bushing defined by the features indicated in the characterising part of the independent claim 1.

The invention is therefore particularly intended for commercial vehicles such as trucks, buses and the like, but is of course also conceivable for use in the manufacture of other types of vehicles where there is need for a rubber bushing which makes fitting easy and quick, reduces the risk of paint damage and reduces the ergonomic problems involved in fitting and removal, e.g. cars, construction site machines, ships/boats, aircraft etc.

The invention is achieved by configuring a bushing so that it is easy to mould integrally with a constructional element which is to be fitted, e.g. a plastic air duct for fitting to a vehicle cab. This obviates the need for any separate and often complicated fitting of individual rubber bushings, thus eliminating such operations.

Advantages of the configuration according to the invention comprise the rubber bushing being easy to make and easy to integrate with other constructional elements, resulting in quicker and less expensive final fitting. The fact that the bushing may be made of rubber or plastics greatly reduces or eliminates the risk of painted surfaces being scratched. The
design of the bushing can also be easily adapted as desired to suit the fitting or moulding requirements which apply in the particular case. The bushing according to the invention will also be of relatively low weight.

A further advantage of the solution according to the invention is that it will be easy and inexpensive to implement at production stage in that the bushing is already integrated in the making of the constructional elements, reducing the number of parts which have to be handled during for example the manufacture of a vehicle.

Further features and advantages of the invention are indicated by the more detailed description of it set out below and the attached drawings and other claims.

**BRIEF LIST OF DRAWINGS**

The invention is described in more detail below in some preferred embodiment examples with reference to the attached drawings.

**Figure 1** is a view obliquely from behind of part of a vehicle cab with an air duct, for high-level air intake, fitted on the right side of the car rear wall.

**Figure 2** depicts part of the vehicle cab directly from behind, with the air duct fitted with rubber bushings according to the invention which are integrated with the duct and its fastening points.

**Figure 3** depicts a rubber bushing according to the invention provided with a cylindrical centrehole and, moulded about it, a rubber unit with an outer annular integrally moulded element which has a discontinuous/open outer edge.

**Figure 4** is a view of a rubber bushing according to Figure 3.
Figure 5 depicts an alternative embodiment of a rubber bushing according to the invention provided with an annular integrally moulded element which has a continuous /closed outermost edge.

Figure 6 is a view of a rubber bushing according to Figure 5.

Figure 7 is a perspective view of a rubber bushing with incorporated recesses running through the outer edge of the integrally moulded element.

DESCRIPTION OF PREFERRED EMBODIMENTS

Figure 1 is thus a perspective view of part of a vehicle cab where an air duct, made of plastic material, for supply of air to the vehicle's combustion engine is fitted on the right side of the cab rear wall. The duct's air intake is situated high up near the cab roof and faces outwards from the cab transversely to the vehicle's direction of movement. To achieve a certain mechanical flexibility between the air duct and the cab, and to damp vibrations between them, the duct is fitted to the cab wall by means of its fastening points. Prior art involved using studbolt dampers fitted at these fastening points.

Figure 2 depicts the vehicle cab as seen directly from the rear, showing the air duct and its fastening points more clearly. In this case four rubber bushings are integrated in the duct's plastic material, more specifically in the protruding fastening points at the duct's side edges.

Figure 3 is a plan view of a rubber bushing according to the invention. The circular central portion of the rubber unit has running through it a preferably integrally moulded hollow cylinder with a centrehole intended for a bolt (not depicted) to run through. The periphery of the rubber unit has firmly moulded to it an outer annular element which is integrally moulded with and joined to the material of the constructional element for which bushing is to be used, here for example an air duct. The moulded element or ring may
be configured in different ways and the object is that its shape should facilitate effective and strong connection to surrounding material which is preferably plastic material.

The integrally moulded element 10 depicted comprises two annular and concentric elements 10a, b of different diameters, one situated outside the other. These annular elements are joined together by connecting elements 11. The outer annular element 10b is provided with recesses 12 to make it easier to fasten/mould to the constructional element in which it is desired to integrate the bushing. The particular configuration of the moulded element 10 which is most optimum depends on surrounding materials, the moulding and forming processes employed, moulding temperatures etc.

When in use, the rubber bushing 6 is thus firmly integrally moulded with the constructional element which is to be fitted, e.g. a plastic air duct 2, while the cylinder 8 in bushing's central portion is for example fastened to a vehicle cab rear wall 3 by means of a bolt which runs through it (not depicted).

The material of the cylinder 8 and the integrally moulded element 10 needs to be wear-resistant and durable. A plastic is preferable, but other materials such as a metal, e.g. magnesium, steel, aluminium or the like, are also conceivable.

The shape of the integrally moulded element 10 may also be adapted to suit different ways of moulding the bushing. A certain configuration may be preferable for injection moulding, but another may give better results in rotary moulding.

Figure 4 is a perspective view of a rubber bushing 6 according to Figure 3. The bushing and the thickness of the integrally moulded element 10 in the axial direction may be adapted to the characteristics desired and needed in the particular case.

Figure 5 depicts an alternative embodiment variant of a rubber bushing according to the invention. In this case the
configuration of the outer circular element 10c is continuous and unbroken.

**Figure 6** is a perspective view of the rubber bushing 6 according to the invention depicted in Figure 5. It shows the outer annular element 10c somewhat less wide in the axial direction, making it easier to mould integrally with surrounding material. This means that the outer annular element 10c is not visible in the final moulded state.

Greater strength is thus also achieved.

Finally, **Figure 7** is a perspective view of a rubber bushing 6 with recesses 13 incorporated in the outer integrally moulded element 10d. These recesses contribute to effective integration with surrounding material and result in more durable and stronger anchoring of the bushing.

The above description is primarily intended to facilitate understanding of the invention and is of course not restricted to the embodiments indicated, since other variants of the invention are also possible and conceivable within the scope of the inventive concept and the protective scope of the claims set out below. Thus it is conceivable that instead of a cylindrical centrehole 9 for a bolt to run through, the rubber bushing 6 may be provided with a central studbolt moulded firmly to the rubber unit 7 and pointing outwards from the bushing in one direction. This may be advantageous in certain applications.
CLAMS

1. A rubber bushing (6) preferably intended to simplify fitting and reduce fitting time in the assembly of constructional elements, comprising a rubber unit (7), characterised in that an integrally moulded element (10) is provided at the periphery of the rubber unit (7).

2. A rubber bushing (6) according to claim 1, characterised in that the moulded element (10) comprises inner and outer annular elements (10a-d).

3. A rubber bushing (6) according to claim 1 or 2, characterised in that the inner and outer annular elements (10a-d) of the integrally moulded element (10) are arranged to be joined together by means of connecting elements (11) which extend transversely and radially.

4. A rubber bushing (6) according to any one of the foregoing claims, characterised in that the rubber unit (7) is made of deformable and mechanically damping material.

5. A rubber bushing (6) according to any one of the foregoing claims, characterised in that a cylinder (8) is provided centrally in the rubber unit (7) and is intended for a bolt to run through.

6. A rubber bushing (6) according to any one of the foregoing claims, characterised in that the integrally moulded element (10) is made of plastic material.
7. A rubber bushing (6) according to any of the foregoing claims, characterised in that the integrally moulded element (10) is made of metal, e.g. magnesium, steel, aluminium or the like.

8. A vehicle provided with a rubber bushing (6) according to any one of the foregoing claims.
**INTERNATIONAL SEARCH REPORT**

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC: see extra sheet  
According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC: B29C, B60K, B62D, F16F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE, DK, FI, NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, PAJ, WPI data

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

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Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents:
  "A" document defining the general state of the art which is not considered to be of particular relevance
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  "O" document referring to an oral disclosure, use, exhibition or other means
  "P" document published prior to the international filing date but later than the priority date claimed
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Date of the actual completion of the international search
22-02-2013

Date of mailing of the international search report
25-02-2013

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International Patent Classification (IPC)

F16F 1/38 (2006.01 )
B29C 45/14 (2006.01 )
B29C 65/70 (2006.01 )
B60K 13/02 (2006.01 )
B62D 27/04 (2006.01 )
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