

Stabiliser bars

This invention relates to stabiliser bars, commonly termed anti-roll bars. Such bars are used in automotive suspension systems; they are produced by hot or cold forming steel rod which is thereafter shot peened and painted. In use, the bar is secured adjacent each end so that relative displacement results in the bar being put into torsion. It is usual for the bar to extend through and be supported by metallic and non-metallic hardware, the latter including for example rubber bushes, and/or non-metallic axial travel limiting means associated with the suspension system.

According to this invention a stabiliser bar is formed from a steel rod and provided with at least one non-metallic suspension component integrally moulded thereonto. The suspension component is preferably integrally moulded onto the bar from a

rubber or plastics composition, optionally containing reinforcing fillers such as fibres and/or particulate fillers together with such bonding agents, flow promoters and the like as are commonly used. Preferably two such components are integrally moulded onto the bar substantially simultaneously to form separate elements of the suspension system respectively located towards opposite ends of the bar.

Particularly preferred compositions include thermoplastic elastomers, conventional rubbers, thermoplastics and thermoset compositions. Moulding may be by compression, transfer or injection, using tooling adapted to support the bar relative to a mould cavity having the configuration of the desired suspension component. It will be appreciated that where two non-metallic suspension components are moulded simultaneously, it may be more convenient to use two separate moulding machines synchronised to operate in tandem, rather than a single much larger machine provided with two moulding stations. To enhance the adhesion between the non-metallic suspension component and the bar, the component may include at least one axially extending collar portion integral with the component. This applies in particular to non-metallic axial travel-limiting washers; it will not normally be needed for a conventionally-shaped rubber bush.

Although stabiliser bars according to the invention have the non-metallic suspension components moulded in situ on the bar, it is still necessary to fabricate the associated metallic suspension components for locating and mounting purposes. However, assembly and installation will normally be simplified. The normal shot peened surface finish provides a good "key" to the rubber or plastics material. The bonding achieved is satisfactory for most applications, since non-metallic suspension components have only a limited structural function. For example rubber bushes are normally supported/enclosed by metal clamping brackets in the suspension system. Axial travel limiting washers serve only to control axial movement at the extremes of steering position and to minimise squeaking caused by displacement through the bushes. Furthermore, by using a standard non-metallic suspension component size, it may be possible to use a common pattern of non-metallic suspension component for stabiliser bars of different sizes, by changing only the sizes of the metallic components, thereby simplifying suspension design/assembly.

Bonding to the bar can be enhanced by degreasing the bar prior to moulding; epoxy compounds are particularly preferred thermoset compositions for the purposes of the invention. Suitable thermoplastics include PBT and PPS materials. Conventional rubber compositions compounded for

compression or injection moulding may be used. The choice of material is not critical, provided that it withstands any normal painting/stoving treatments which may be subsequently applied to the finished bar. For most purposes, it will be preferable to apply such treatments prior to moulding.

The invention further comprises a method of making an anti-roll bar, comprising the steps of forming a bar from steel rod and thereafter integrally moulding thereto at least one suspension component of rubber or plastics material. Preferably the component is attached by integrally moulding it in situ from a rubber or plastics composition. Preferably the bar is shot peened prior to the moulding step; preferably it is also painted. Preferably the method comprises moulding two spaced-apart suspension components substantially simultaneously, using either compression, transfer or injection moulding.

In order that the invention be better understood preferred embodiments of it will now be described by way of example with reference to the following Examples.

Example 1A

An epoxy resin moulding compound was injection moulded directly onto a shot peened stabiliser bar to form an

annular washer. The bar was pre-treated with a commercial de-greasing agent and moulding was carried out with the moulding tool and bar heated to 180°C, the barrel temperature of the machine at the injection nozzle being 80°C. The latter temperature was selected to achieve satisfactory flow of the epoxy compound which subsequently cured in situ on the bar.

The washer produced had good resistance to lateral thrust and was useful as a travel-limiting component in conjunction with a conventional rubber bush.

Example 1B

A glass fibre reinforced, mineral filled poly-phenylene sulphide composition was injection moulded onto a shot peened, de-greased, painted stabiliser bar, using the following machine conditions:-

Barrel temperature profile	300°C, 300°C, 280°C, 260°C
Tool temperature	80°C
Injection pressure	16000 psi
Injection time	15 seconds
Cooling time	10 seconds
Holding pressure (cooling)	7000 psi

The products were moulded collars which were tested for lateral loading strength as follows:-

Collar Size (mm)		Bar Diameter	Load (KN)
OD	Width	(mm)	
22	5	14	1.5
22	5	16	1.4
30	5	18	2.6

In each case the load was that developed prior to lateral slippage.

Example 1C

A polybutylene terephthalate composition was injection moulded onto shot peened and already-painted stabiliser bars, under the following conditions:-

Barrel temperature profile	260°C, 260°C, 240°C, 220°C
Mould temperature	40°C
Injection pressure	17000 psi
Injection time	15 seconds
Cooling time	15 seconds
Holding pressure (cooling)	7000 psi

For comparison purposes, both shot peened unpainted and shot peened painted bars were used and tested for lateral loading strength, as before.

Collar Size (mm)		Bar Diameter	State	Load (KN)
OD	Width	(mm)		
25	5	15	unpainted	0.99
25	5	15	painted	0.94

Example 2

In this case, the material of example 1B was used to produce a collar with an integral, axially extending annular flange. The moulding conditions were as in example 1B, but with a clamping pressure of 10000 psi.

This configuration of collar was adopted to show that despite using bars of different diameters, a common collar size would give satisfactory results, thereby enabling its use with a single, split suspension bush size.

This particular embodiment is further illustrated by the accompanying drawing in which the sole Figure is a cross-sectional side view through part of a stabiliser bar onto which has been moulded a collar which incorporates an integral, axially-extending annular flange. In the Figure,

the stabiliser bar 1 is cylindrical; its surface was shot peened and painted prior to injection moulding the collar 2 which its axially-extending cylindrical flange 3. The same collar/flange was moulded onto bars of different diameter and the lateral loading strength was determined, with the following results:-

Bar Diameter (mm)	Load (KN)
12	2.9
14	1.8
16	1.6

These results were satisfactory.

Example 3

A rubber bush was injection moulded in situ on a stabiliser bar using a natural rubber composition consisting of:-

natural rubber	100 parts by weight
carbon black	30 parts by weight
curing agents	2.75 parts by weight
anti-oxidants, processing aids	14 parts by weight

This was plasticised at 80°C and injected into a tool heated to 170°C where it was allowed to cure for three minutes. The moulding produced was sufficiently well bonded to the bar and had sufficient mechanical stiffness to perform satisfactorily as a suspension bush.

Example 4

A suspension bush was injection moulded in situ on a stabiliser bar from a thermoplastic elastomer composition of the kind sold under the trade mark SANTOPRENE, grade 101-80, described as a dynamically vulcanised polypropylene/EPDM. Moulding was carried out onto a previously shot peened and painted bar, using a barrel temperature of 180°C with a cold moulding tool. The injection pressure was 12000 psi and the holding pressure (cooling) was 6000 psi. The total cycle time was 30 seconds, comprising 10 seconds for injection and 20 seconds for cooling.

The thus-moulded bush performed satisfactorily as a suspension bush.

CLAIMS

1. A stabiliser bar formed from a steel rod and provided with at least one non-metallic suspension component integrally moulded thereonto.
2. A stabiliser bar according to claim 1 wherein said suspension component comprises a rubber or plastics composition, optionally containing reinforcing fillers such as fibres and/or particulate fillers integrally moulded in situ.
3. A stabiliser bar according to claim 1 or claim 2 wherein the plastics composition comprises a thermoset resin.
4. A stabiliser bar according to claim 1 or claim 2 wherein the composition comprises a rubber.
5. A stabiliser bar according to claim 1 or claim 2 wherein the plastics composition comprises a thermoplastic elastomer.
6. A stabiliser bar according to claim 1 or claim 2 wherein the plastics material comprises a thermoplastic resin.



7. A stabiliser bar according to claim 6 wherein the plastics material comprises a poly-phenylene sulphide composition.
8. A stabiliser bar according to claim 6 wherein the plastics material comprises a polybutylene terephthalate composition.
9. A stabiliser bar according to any one of the preceding claims in which the suspension component comprises an annular thrust collar having a radial width greater than its axial thickness.
10. A stabiliser bar according to claim 9 in which the thrust collar includes, moulded integrally therewith, an axially extending flange portion of less radial width than the collar and operable to provide a cylindrical suspension bush mounting surface on the bar.
11. A stabiliser bar according to any one of the preceding claims in which the steel rod has a shot peened surface and a coating of paint between the shot peened surface of the rod and the suspension component.



12. A stabiliser bar according to any one of the preceding claims including two non-metallic suspension components moulded onto the bar spaced apart and located towards opposite ends of the bar.
13. A method of making a stabiliser bar according to any one of claims 1 to 12 comprising the steps of forming the bar from steel rod and then moulding two spaced-apart non-metallic suspension components thereon substantially simultaneously from rubber or plastics material.
14. A method according to claim 13 wherein the moulding operation is carried out by compression, transfer or injection moulding.
15. A method according to claim 14 wherein the moulding operation is carried out using two moulding machines in tandem synchronised to operate together.
16. A stabiliser bar with an integrally formed suspension component thereon and a method of making the same, substantially as hereinbefore described with reference to the Examples.

