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(52) UK CL (Edition R)
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(56) Documents Cited
GB 2018174 A GB 1510511 A EP 0748944 A2
WO 94/12286 A1 US 4848935 A US 4828423 A

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(54) Abstract Title
Centering bush

(57) A centering bush 10 for ensuring concentricity of two coaxial shafts 30, 36 arranged end to end has a body to be received in a socket 38 in the end of shaft 36 and axially extending fingers 22 surrounding the common axis. An inner surface of each finger has a rib (28, Fig 1) and the internal extent of the ribs (28) is such that the fingers are displaced resiliently outwardly on insertion of a spigot 34 of the other shaft 30 between the fingers 22. The resilience of the fingers 22 maintains concentricity of the two shafts.

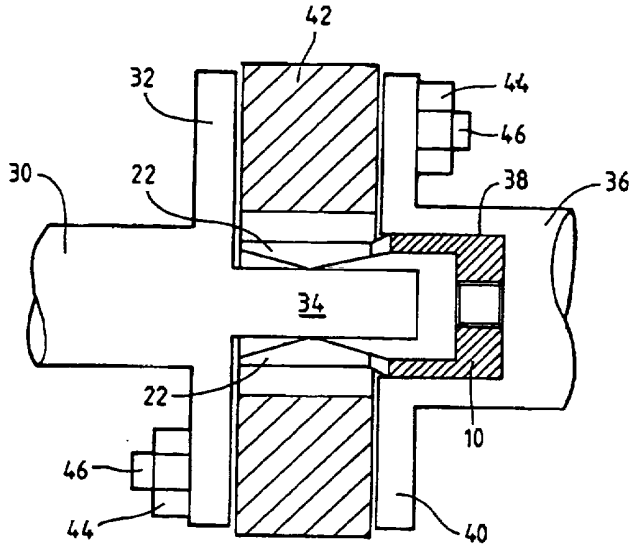

Fig. 2

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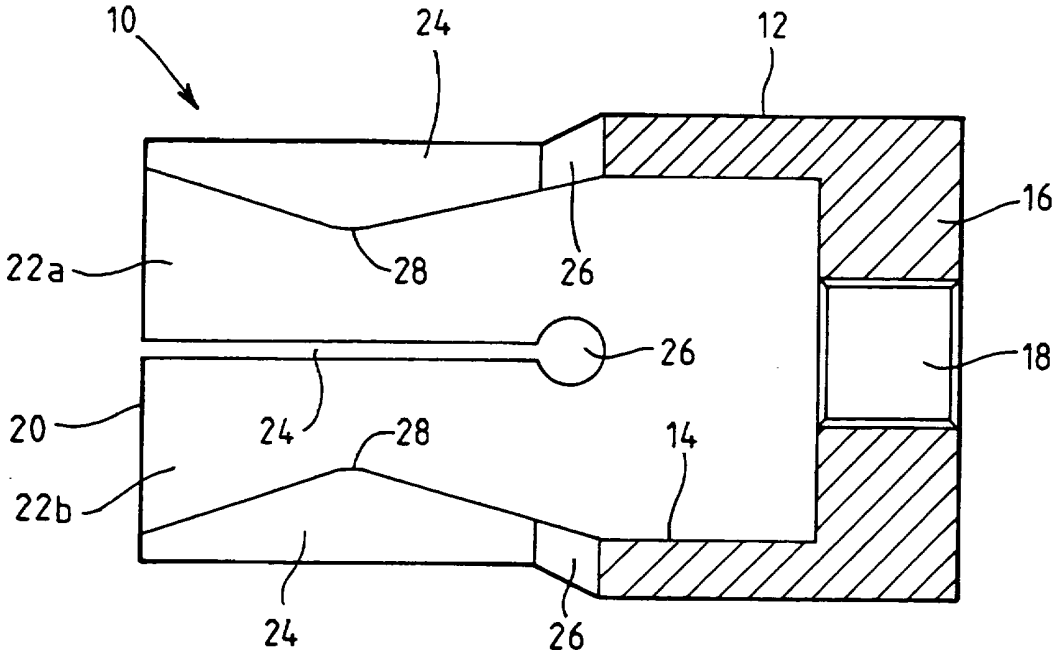
At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.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22a
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22b
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Fig. 1

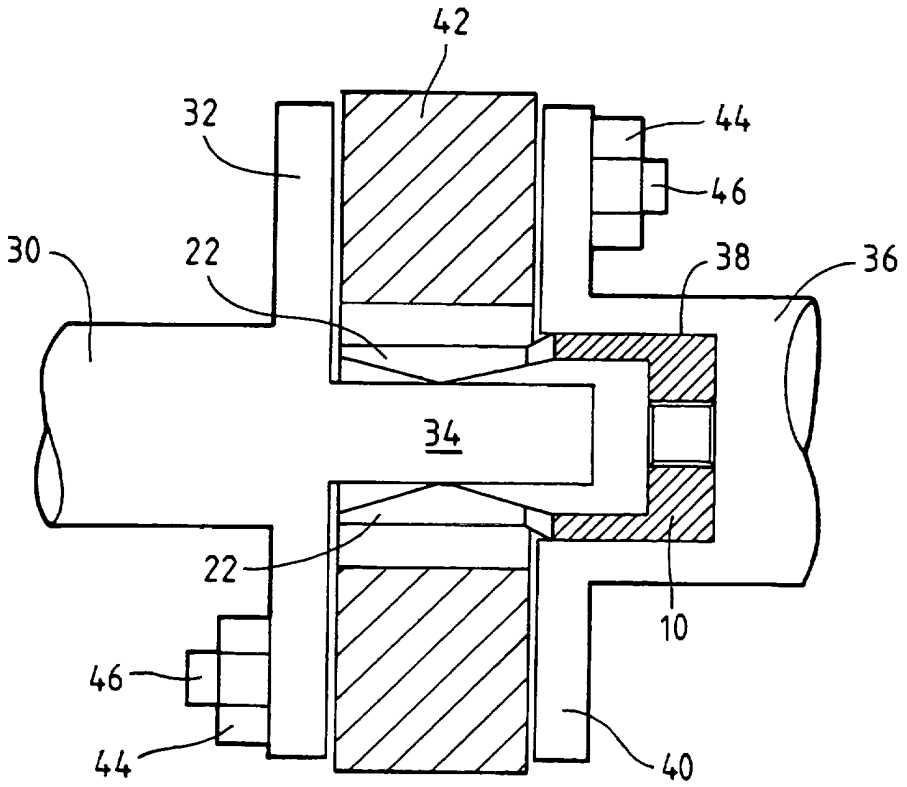
42
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Fig. 2

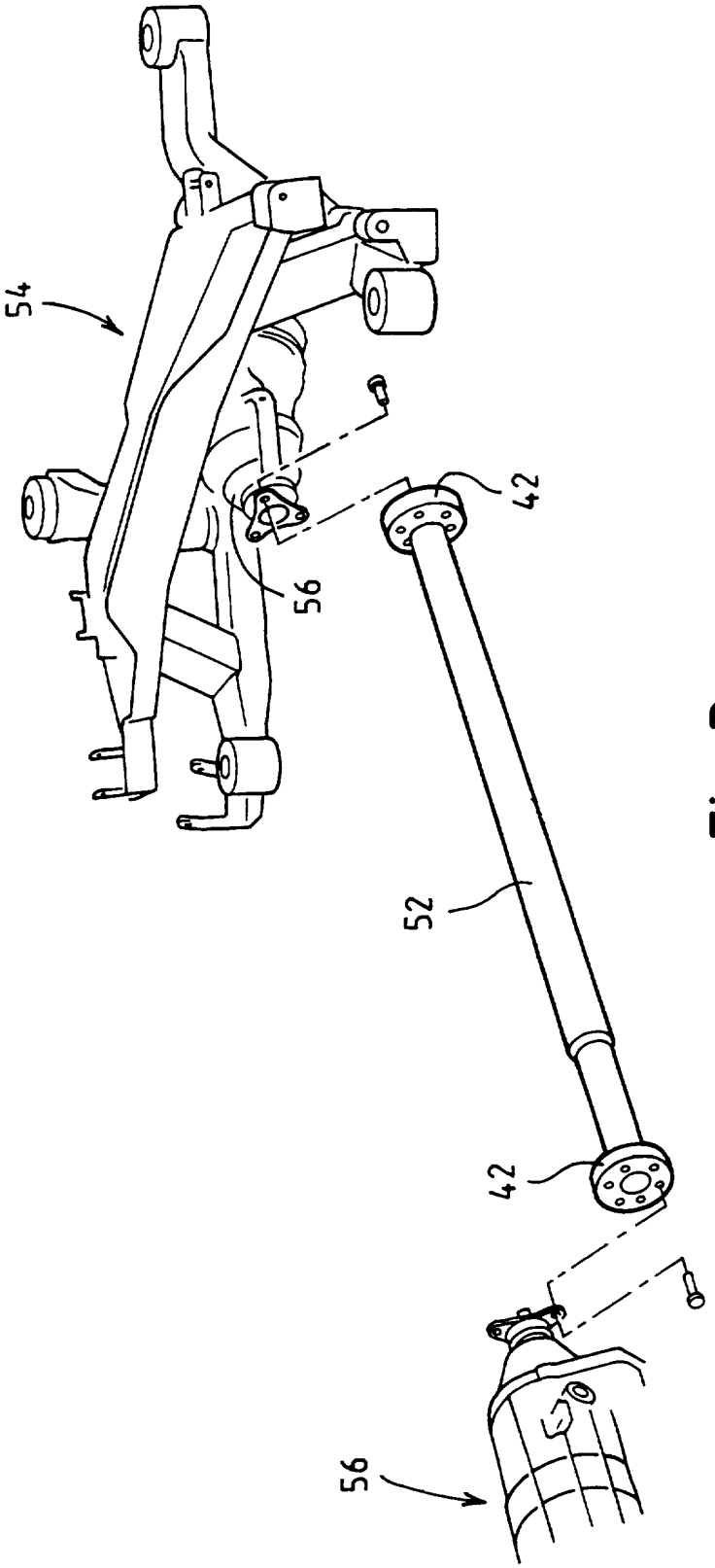

Fig. 3

Centering Bush

This invention relates to a centering bush, for centering one cylindrical member within a cylindrical socket in another member.

The invention is particularly appropriate for the centering of two motor vehicle drive shaft sections mounted end to end.

According to the invention, there is provided a centering bush having an external surface and an internal bore coaxial with the external surface, the internal bore being open at one end and having axially extending fingers extending from the open end, the diametral distance between diametrically opposite fingers being less than the diameter of the internal bore and the fingers being adapted to yield resiliently when a shaft is inserted axially into the internal bore, to centre and grip the shaft.

The bush is preferably cylindrical with a cylindrical internal bore to accept a cylindrical shaft. However it is within the scope of the invention for the bush to have a non-circular form, for example, hexagonal.

As a result of the gripping action of the fingers on the shaft, the shaft will be reliably centred in the bush and any play between the external diameter of the shaft and the internal diameter of the bush will be taken out by the resilient fingers.

The bush can be made from plastics or metal, but metal is preferred, especially spring steel.

The bush may be open at both ends, but it is preferred to have one open end and one closed end.

The fingers preferably surround at least 80% of the circumference of the bush. The fingers will be separated from one another by axial slits and there may be any number of fingers, from two upwards. A preferred number of fingers is four.

The invention will now be further described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a cross-section through a centering bush in accordance with the invention;

Figure 2 is a cross section, similar to Figure 1 but showing the bush in position between two shafts; and

Figure 3 shows schematically a motor vehicle driveshaft.

Figure 1 shows a bushing in accordance with the invention separated from other components. The bushing 10 has an external surface 12 and an internal bore 14. One end 20 of the bushing is open. In the embodiment shown in the drawings, the other end 16 is closed (apart from a central access hole 18) but this end does not need to be closed. The open end 20 is formed by four fingers 22a (the fingers 22a and 22b can be seen in the section of Figure 1), and these fingers are separated from one another by axial slits 24 which lead from the open end 20 of the bushing to stress relieving circular holes 26.

Each Finger 22 has an internal rib 28, and the diametral distance between opposing ribs 28 is less than the diameter of the internal bore 14.

The material of the bushing must have sufficient inherent resilience to allow fingers 22 to be displaced outwardly when a shaft having a diameter larger than the diametral distance between opposing ribs 28 is inserted between the fingers. Normally the bushing will be made from a single piece of spring steel.

The bushing will be used in a situation substantially as shown in Figure 2. Figure 2 shows a flexible coupling between two drive shaft sections in a motor vehicle drive train. One section 30 has a flange 32 and a spigot 34. The other section 36 has a cylindrical socket 38 and a flange 40. To assemble the joint, the bushing 10 is first fitted in the socket 38. A flexible coupling 42 is then bolted to the flange 40 by means of nuts 44 threaded onto studs 46 extending from the coupling 42. This type of coupling is in itself well known.

The external diameter of the bushing 10 is such that it will be a close or interference fit in the socket 38.

Next the spigot 34 of the shaft section 30 is pushed into the bushing, between the fingers 22 and the diameter of the spigot will be such that the fingers 22 have to yield to allow the spigot to enter the bushing, and thereafter the resilience of the material of the bushing ensures that the fingers remain in contact with and thus centre the spigot relative to the bushing and thus relative to the shaft section 36. Finally, the flexible coupling 42 is connected to the flange 32 through nuts 44 and studs 46.

In use, the flexible coupling 42 allows for some relative angular movement between the shaft sections 30 and 36 by deformation of the elastic flexible coupling body. However the effect of the resilient fingers 22 will be to ensure that the shaft sections 30 and 36 remain centred relative to one another at all times.

Figure 3 shows schematically the drive train of a motor vehicle, with a gear box housing at 50, a drive shaft 52 and a rear axle assembly 54 with a differential housing 56. At each end of the drive shaft 52 there will be a flexible coupling 42, and a coupling as shown in Figure 2 will be included between each end of the drive shaft 52 and, respectively, the gear box housing 50 and the differential 56.

As a result of the construction of the bushing with the fingers 22, the radial concentricity of the coupling will be maintained at all times and under all conditions. This is done without affecting the ease of assembly of the joint. Thus a possible source of vehicle drive line vibration is eliminated.

In order to prevent excessive radial movement of the fingers 22, the walls of the socket 38 which support the bushing 10 could be extended axially beyond the flange 40 to provide a small radial clearance between the shaft housing and the resilient fingers 22. This measure would limit the possible radially outward movement of the fingers which could assist in preventing excessive radial movement of the fingers.

Although this invention has been described particularly with reference to vehicle drive line shafts, the invention is not restricted to this application and the inventive features could be used to advantage in other forms of

coupling, particularly rotary couplings where two components are to be allowed to rotate about a substantially common axis, with some degree of misalignment of the axis being tolerated.

Claims

1. A centering bush having an external surface and an internal bore coaxial with the external surface, the internal bore being open at one end and having axially extending fingers extending from the open end, the diametral distance between diametrically opposite fingers being less than the diameter of the internal bore and the fingers being adapted to yield resiliently when a shaft is inserted axially into the internal bore, to centre and grip the shaft.

2. A bush as claimed in Claim 1, wherein the bush is cylindrical and has a cylindrical internal bore to accept a cylindrical shaft.

3. A bush as claimed in Claim 1 or Claim 2 which is made from spring steel.

4. A bush as claimed in any preceding claim, which has one open end and one substantially closed end.

5. A bush as claimed in any preceding claim, wherein the fingers surround at least 80% of the circumference of the bush.

6. A bush as claimed in any preceding claim, wherein the fingers are separated from one another by axial slits.

7. A bush as claimed in Claim 6, wherein the axial slits end in circular cut-outs.

8. A bush as claimed in Claim 7, wherein there are four fingers each of the same dimensions.

9. A centering bush substantially as herein described with reference to the accompanying drawings.

10. A vehicle driveshaft assembly comprising a gearbox with an output flange, a driveshaft and a differential with an input flange, wherein at least one of the flanges has a socket in which centering bushes in accordance with the invention are arranged, and the respective end of the driveshaft has a spigot to be received in the centering bush, to be centred by the fingers of the bush.

11. An assembly as claimed in Claim 10, wherein both flanges have sockets and both driveshaft ends have spigots.

12. An assembly as claimed in Claim 10 or Claim 11, wherein the centering bush is an interference fit in the or each socket.

13. An assembly as claimed in any one of Claims 10 to 12, wherein the or each socket has an axial extension which surrounds the fingers of the bush and limits radially outward movement of the fingers.

Application No: GB 9821506.4 **Examiner:** C J Duff
Claims searched: 1 - 13 **Date of search:** 22 March 1999

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.Q): F2U

Int Cl (Ed.6): F16D 1/08, 1/10, 1/108, 1/12, 3/48, 3/50, 3/70, 3/76, 3/77

Other: On-line: EDOC, WPI, JAPIO

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
A	GB 2018174 A	(ESSILOR) Whole document	
A	GB 1510511	(SYCOR) Whole document	
A	EP 0748944 A2	(EBARA) Figs 2, 3, 5	
A	WO 94/12286 A1	(SAMES) Figs 1, 2, 3	
A	US 4848935	(SEIBIG) Whole document	
A	US 4828423	(CRAMER) Figs 5, 6	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.