(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 719 901 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
03.07.1996 Bulletin 1996/27

(51) Int. Cl.[6]: **E05D 7/10**

(21) Application number: **95118868.9**

(22) Date of filing: **30.11.1995**

(84) Designated Contracting States:
DE ES FR GB SE

(30) Priority: **01.12.1994 IT TO940983**

(71) Applicant: **SKF INDUSTRIE S.p.A.**
I-10128 Torino (IT)

(72) Inventors:
- **Raveggi, Marzio**
  10024 Moncalieri (IT)
- **Goitre, Maria Gabriella**
  10028 Trofarello (IT)

(74) Representative: **Plebani, Rinaldo et al**
c/o Studio Torta,
Via Viotti 9
10121 Torino (IT)

(54) Separable low-friction door hinge, particularly for vehicles

(57) A hinge separable into two subunits (2,3) connectable and disconnectable rapidly, a first (3) of which is secured adjustably to the door post (5) of a vehicle body, and a second (2) of which remains connected to the vehicle door (4) to enable the door to be removed and reassembled from/to the vehicle body; the first subunit (3) presents retaining means (15) in turn presenting rolling (21) and plain (22) bearings and designed to receive corresponding connecting means (16) on the second subunit (2) to connect the second subunit to the first subunit in low-friction rotary manner about a common hinge axis; the retaining means permitting the connecting means to slide axially and parallel to the hinge axis in at least one given direction; and a movable connecting element (38) being provided between the two subunits and acting along an axis other than and parallel to the hinge axis.

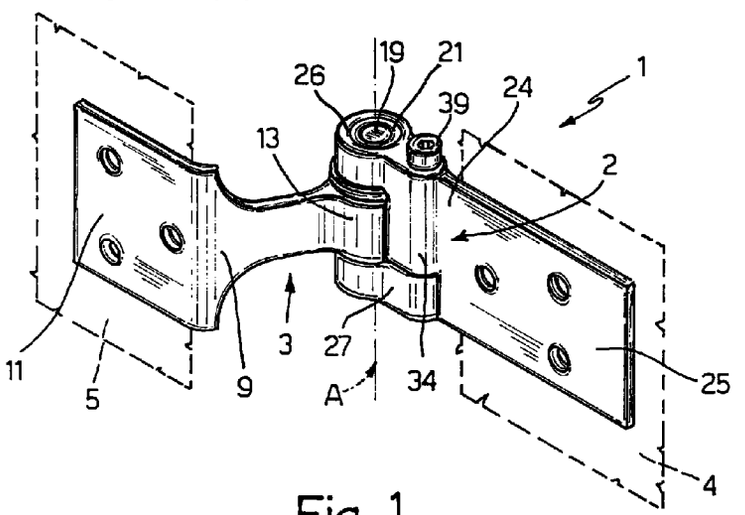

Fig. 1

EP 0 719 901 A1

Description

The present invention relates to a separable door hinge, particularly for vehicles, comprising two subunits connectable and disconnectable rapidly, a first of which is fitted adjustably to the door post, in particular to the door post of a vehicle body, and a second of which remains fitted to the door to enable rapid removal and reassembly of the door from/to the vehicle body.

When assembling and painting vehicle bodies, in particular motor vehicle bodies, the side doors are fitted to the door posts of the body in white; the hinges are adjusted (e.g. by shimming and/or making minor adjustments to the part of the hinge integral with the door post) to compensate for relatively ample working tolerances and ensure the doors are fitted flush with the body; the body as a whole is painted; the doors are removed to assemble the various operating devices to the doors and body; and the finished doors are then reassembled to the original body.

To speed up the above operations and avoid readjusting the hinges when reassembling the doors to the body, door-body hinges are used which are divided into two parts or subunits: one is connected directly to the door post of the body, and is the one which is adjusted to position the door correctly in relation to the door opening; and the other remains integral with the door and is removed and reassembled with it. This is normally done by removing a pin, normally the hinge pin or a pin or screw fitted coaxially with the bushes on which the hinge rotates.

Known hinges of the above type present several drawbacks. Firstly, they present a relatively high degree of friction by virtue of rotating entirely on straightforward bushes (plain bearings) which must be kept greased. Secondly, to enable the doors to be removed/reassembled by means of a straightforward linear movement, known hinges operate in projecting manner, which considerably increases the working strain on them, particularly when the vehicle features a large number of accessories and the normal weight of the door is increased by numerous operating devices (window regulator motor, centralized locking units, etc.).

It is an object of the present invention to provide a new type of hinge separable into two parts or subunits, and which, in addition to being compact and extremely straightforward in design, provides for reducing friction and in-service strain, even when applied to doors featuring numerous operating devices. It is a further object of the present invention to provide for fast, troublefree connection and disconnection of the two parts or subunits of the hinge, to enable troublefree assembly/painting of the vehicle body.

According to the present invention, there is provided a separable door hinge, particularly for vehicles, comprising two subunits connectable and disconnectable rapidly, a first of which is fitted adjustably to the door post, in particular to the door post of a vehicle body, and a second of which remains fitted to the door to enable the door to be removed from and reassembled to the door post; characterized in that the first subunit presents retaining means in turn presenting antifriction means and designed to receive corresponding connecting means on the second subunit, for securing the second subunit to the first subunit in low-friction rotary manner about a common hinge axis; said retaining means permitting the connecting means to slide axially and parallel to the hinge axis; and the hinge also comprising a movable connecting element between the two subunits and acting along an axis other than and parallel to the hinge axis.

This therefore provides for separating the element/s rotationally supporting the hinge from that/those by which it is assembled in use; for enabling it to be divided rapidly into two subunits; and, while maintaining the compactness of the hinge, for creating the necessary space for rolling bearings (or sliding bearings, such as bushes or similar) for substantially eliminating friction, with no interference between the bearings and the fastening members of the hinge.

According to a preferred embodiment of the present invention, the hinge also comprises a link connected releasably by said movable connecting element to the eye of a bracket of the second subunit, and in turn comprising a head cooperating with the lower shoulder face of a support of the first subunit. The link forms part of said retaining means, which also comprise a pin element connected integral with the support and projecting from the lower shoulder face of the support, coaxially with said hinge axis; a second radial bearing being interference-fitted inside the head of the link, which head is in the form of an eye and is engaged idly by said pin element via the interposition of said second radial bearing.

As opposed to operating in projecting manner, the hinge therefore operates at two points a given distance from each other and aligned along the hinge axis, thus providing for optimum load distribution, even when applied to heavily accessoried doors.

A non-limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a schematic view in perspective of a hinge in accordance with the present invention;
Figure 2 shows an exploded view of the internal components of the Figure 1 hinge;
Figure 3 shows a cross section of a detail of the Figure 1 and 2 hinge;
Figure 4 shows a schematic view of the hinge as it is disconnected.

Number 1 in the accompanying drawings indicates a hinge separable into two elements or subunits 2 and 3. In particular, hinge 1 may be applied to a vehicle, preferably a motor vehicle, for connecting, in easy-fit/easy-remove manner, a side door 4 of the vehicle to a corresponding door post 5 of the vehicle body (not shown). As explained in detail later on, subunits 2 and 3 are so formed as to be connected and disconnected easily and

rapidly; subunit 3 being connected adjustably in known manner to door post 5, and subunit 2 remaining connected to door 4.

Hinge 1 thus provides for troublefree removal and reassembly of door 4 from/to door post 5, and, in the case of a vehicle, for performing a known assembly/painting cycle comprising the steps of preassembling door 4 to door post 5, aligning the door, painting the door and body, removing door 4 to assemble the operating devices (to door 4 and inside the vehicle body), and reassembling door 4 to door post 5 of the same body as prior to painting, with no further adjustments to hinge 1.

As shown in Figure 2, subunit 3 comprises a bracket 9 terminating at one end 10 in a plate 11 for assembly to door post 5, and at the opposite end 12 in a support 13 defined, in the example shown, by a cylindrical stop. Plate 11 is formed in known manner to permit hinge 1 to be adjusted in known manner in relation to door post 5 (e.g. by inserting shims beneath plate 11 and/or by making minor adjustments to plate 11 as permitted by holes 14 for known assembly screws (not shown) and slightly larger than the screw shanks), whereas support 13 is so formed as to present retaining means 15 in turn designed to receive connecting means 16 (Figure 2) on subunit 2, to connect subunit 2 to subunit 3 with very little friction, as will be seen, and in rotary manner about a common hinge axis A.

More specifically, retaining means 15 comprise a cylindrical pin 19 integral with, e.g. formed in one piece with, support 13, and projecting coaxially with hinge axis A from the upper shoulder face 20 of support 13. According to the invention, subunit 3 also comprises a radial rolling bearing 21 of any known type suitable for the purpose (e.g. a roller or needle bearing) and fitted idly to pin 19; and a rolling thrust bearing 22 of any known type suitable for the purpose (e.g. a needle bearing) and fitted to support 13 coaxially with and about pin 19, against face 20, and preferably inside a seat 23 in the form of a recess on face 20.

Subunit 2 on the other hand comprises a bracket 24 terminating at one end in a known plate 25 for assembly to door 4 and similar to plate 11, and at the opposite end in an eye 26 engaged in axially-sliding manner by pin 19 via the interposition of bearing 21 (Figure 1) which is interference-fitted inside eye 26. In the example shown, the sliding connection is therefore formed between bearing 21 and pin 19, though obviously, without departing from the scope of the present invention, bearing 21 may be interference-fitted to pin 19 so that the axially-sliding connection is formed between bearing 21 and eye 26, by providing a movable connection between eye 26 and the outer ring of bearing 21.

Eye 26 is so formed as to contact shoulder face 20 of support 13 via the interposition of thrust bearing 22, so that the weight of door 4 is borne by support 13 while at the same time permitting low-friction rotation of subunits 2 and 3.

Subunit 3 also comprises a link 27 connected removably to support 13 and, in the example shown, comprising a head 28 in the form of an eye and cooperating with the lower shoulder face 29, opposite face 20, of support 13. More specifically, link 27 forms part of retaining means 15, which also comprise a pin element 30 integral with support 13, e.g. formed in one piece with support 13 and pin 19, and projecting from face 29 coaxially with hinge axis A. A second radial rolling bearing 31, identical to bearing 21, is interference-fitted inside head 28 which, via the interposition of bearing 31, idly engages pin element 30 to which link 27 is then locked axially between the free end of pin 30 and face 29 by a retaining ring, e.g. a Seeger, 32 fitted inside a groove 33 on the free end of pin 30.

Bracket 24, which constitutes the main component of subunit 2, comprises a prismatic-cylindrical body 34 connecting plate 25 to eye 26, located to the side of and parallel to eye 26, and presenting a through hole 35 (Figure 2) parallel to hinge axis A. Subunit 2 also comprises a movable connecting element for connecting eye 26 to head 28 of link 27, and in turn comprising, in the example shown, a pin 38 presenting a head 39 (e.g. with a hexagonal socket 40) at one end, and a threaded portion 42 at the opposite end. Pin 38 engages hole 24 in sliding manner, and is longer than body 34 so that threaded end 42 projects from the bottom of hole 35 towards link 27, while head 39 remains adjacent to eye 26.

At the end opposite head 28, link 27 in turn presents a threaded through hole 44, which is engaged by threaded end 42 so that link 27, in addition to being connected for rotation to support 13, is also connected releasably to eye 26, and pin 38 defines a movable connecting element forming part of hinge 1 and for mechanically connecting subunits 2 and 3. According to the invention, however, said connection by pin 38 is made, not along hinge axis A, but along an axis B coincident with the axis of hole 35 (Figure 2) and therefore other than, even though parallel to, hinge axis A.

To improve the connection between bracket 24 and link 27, connecting means 16 comprise at least one prismatic projection 50 - in the example shown, a pair of side by side projections 50 formed in one piece with bracket 24 and projecting from the bottom of body 34, on a side of body 34 facing away from support 13. Conversely, the end of link 27 with threaded hole 44 presents two corresponding side by side grooves 54 (Figure 3) for receiving projections 50 and formed in a rear outer lateral surface portion 55 of link 27 facing bracket 24 in use. Consequently, when projections 50 are engaged inside grooves 54, link 27 is substantially flush with body 34 and eye 26, and, when threaded pin 38 is locked inside holes 35, 44, substantially defines an integral bottom extension of bracket 24.

The retaining means defined by pin 19 and grooves 54 therefore permit the connecting means defined by eye 26 and projections 50 to slide axially and parallel to hinge axis A, which axial movement is only prevented when threaded pin 38 is locked inside holes 35, 44. Consequently, in actual use, hinge 1 may be preassembled, as shown in Figure 2, to connect subunits 2 and 3 one on

top of the other in low-friction rotary manner (by virtue of bearings 21, 22, 31); hinge 1 may be fitted in known manner to the vehicle, i.e. by fitting plates 11 and 25 to door post 5 and door 4 respectively; and the position of hinge 1 may be adjusted in known manner so that door 4 is aligned with the door opening and flush with the outside of the vehicle body.

To remove door 4 after the painting operation, subunits 2 and 3 may be disconnected rapidly, substantially in the same time taken to disconnect known hinges, by unscrewing pin 38 out of hole 44 (Figure 4) to release link 27; link 27 is rotated (from the Figure 1 position) in the direction of the arrow into the Figure 4 position; and door 4 is lifted off post 5 together with subunit 2. Pin 38 may either remain integral with subunit 2, inside hole 35, or be removed completely.

To reassemble the door, hinge 1 is reassembled by performing the same operations in reverse. This is simplified by projections 50 which, when inserted inside grooves 54, provide on the one hand for correctly positioning link 27 (to insert pin 38 directly with no trial and error alignment of pin 38 and hole 44), and on the other for forming a further mechanical connection of bracket 24 and link 27, so that, in use, link 27 acts as an extension of bracket 24, which is thus connected to support 13 not only by pin 19 (projecting connection) but also by bottom pin 30 engaged inside link 27. When pin 38 is removed to disconnect subunits 2 and 3, link 27 is retained on pin 30 by retaining ring 32.

Depending on the amount of space available, rolling bearings 21, 22, 31 may of course be replaced by respective bushes or sliding bearings, or by any other similar antifriction means.

Claims

1. A separable door hinge, particularly for vehicles, comprising two subunits connectable and disconnectable rapidly, a first of which is fitted adjustably to the door post, in particular to the door post of a vehicle body, and a second of which remains fitted to the door to enable the door to be removed from and reassembled to the door post; characterized in that the first subunit presents retaining means in turn presenting bearing means and designed to receive corresponding connecting means on the second subunit, for securing the second subunit to the first subunit in bearing rotary manner about a common hinge axis; said retaining means permitting the connecting means to slide axially and parallel to the hinge axis; and the hinge also comprising a movable connecting element between the two subunits and acting along an axis other than and parallel to the hinge axis.

2. A hinge as claimed in Claim 1, characterized in that said first subunit comprises a bracket terminating, at one end, with fastening means for securing the first subunit to the door post, and, at the opposite end, with a support for said retaining means; said retaining means comprising a pin rigid with the support and projecting, coaxially with said hinge axis, from the upper shoulder face of the support; a first radial bearing being fitted on said pin; and a thrust bearing being fitted coaxially about said pin, against said upper shoulder face of the support, and preferably inside a seat formed in said upper shoulder face.

3. A hinge as claimed in Claim 2, characterized in that said second subunit comprises a bracket terminating, at one end, with fastening means for securing the second subunit to the door, and, at the opposite end, with an eye which is engaged by said pin via the interposition of said first radial bearing, and which rests on said upper shoulder face of the support via the interposition of said thrust bearing.

4. A hinge as claimed in Claim 3, characterized in that it also comprises a link connected releasably by said movable connecting element to the eye of said bracket of the second subunit, and in turn comprising a head cooperating with a lower shoulder face, formed on the opposite side to said upper shoulder face, of the support.

5. A hinge as claimed in Claim 4, characterized in that said link forms part of said retaining means, which also comprise a pin element rigid with the support and projecting, coaxially with said hinge axis, from the lower shoulder face of the support; a second radial bearing being fitted inside the head of said link, which head presents an eye engaged idly by said pin element via the interposition of said second radial bearing.

6. A hinge as claimed in Claim 5, characterized in that said link is locked axially to said pin element, between the free end of the pin element and said lower shoulder face of the support, by removable shoulder means, for example by means of an elastic shoulder ring such as a snap-ring, fitted to said free end of the pin element.

7. A hinge as claimed in one of the foregoing Claims from 4 to 6, characterized in that said bracket of said second subunit comprises a connecting body between said fastening means and said eye; said connecting body being located to the side of and parallel to the eye, and presenting a through hole parallel to the hinge axis and housing said movable connecting element; said movable connecting element comprising a pin presenting an engageable head at one end and, at the opposite end, a threaded portion projecting from the bottom of the through hole in the connecting body and engaging a corresponding threaded hole in the end of said link opposite the head of the link.

8. A hinge as claimed in Claim 7, characterized in that said connecting means also comprise at least one prismatic projection formed in one piece with the bracket of said second subunit, and projecting from the bottom of said connecting body, on the side of the connecting body facing away from said support; said link end with said threaded hole also presenting at least one groove engaged by said projection and formed in an outer lateral surface portion of the link facing the bracket of said second subunit.

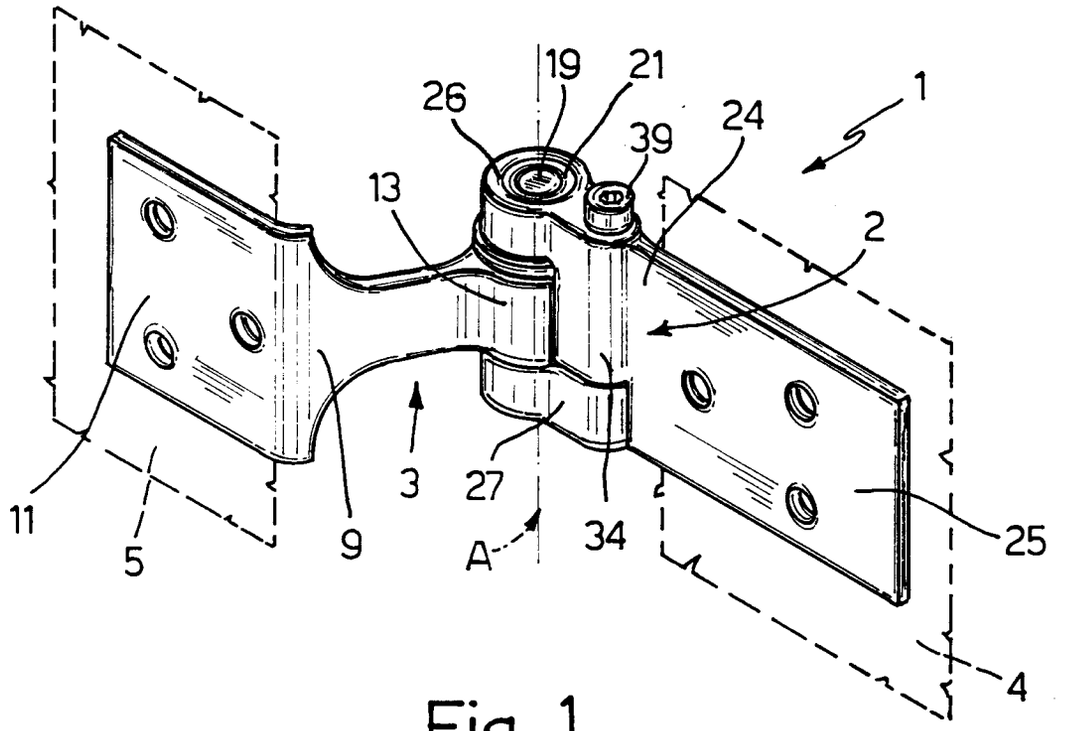
19
21
26
1
24
39
13
2
11
3
27
25
5
9
A
34
4

Fig. 1

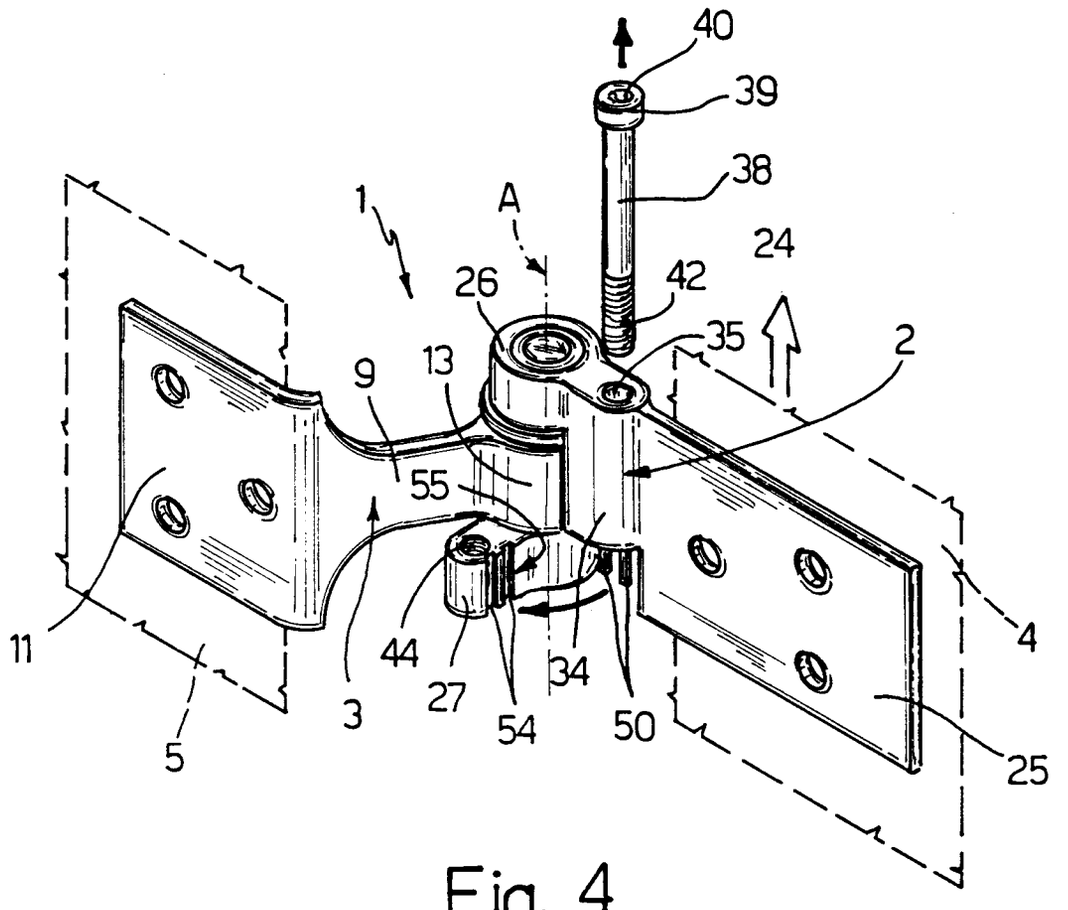
40
39
38
1
A
24
26
42
35
2
9
13
55
11
44
34
4
3
27
54
50
5
25

Fig. 4

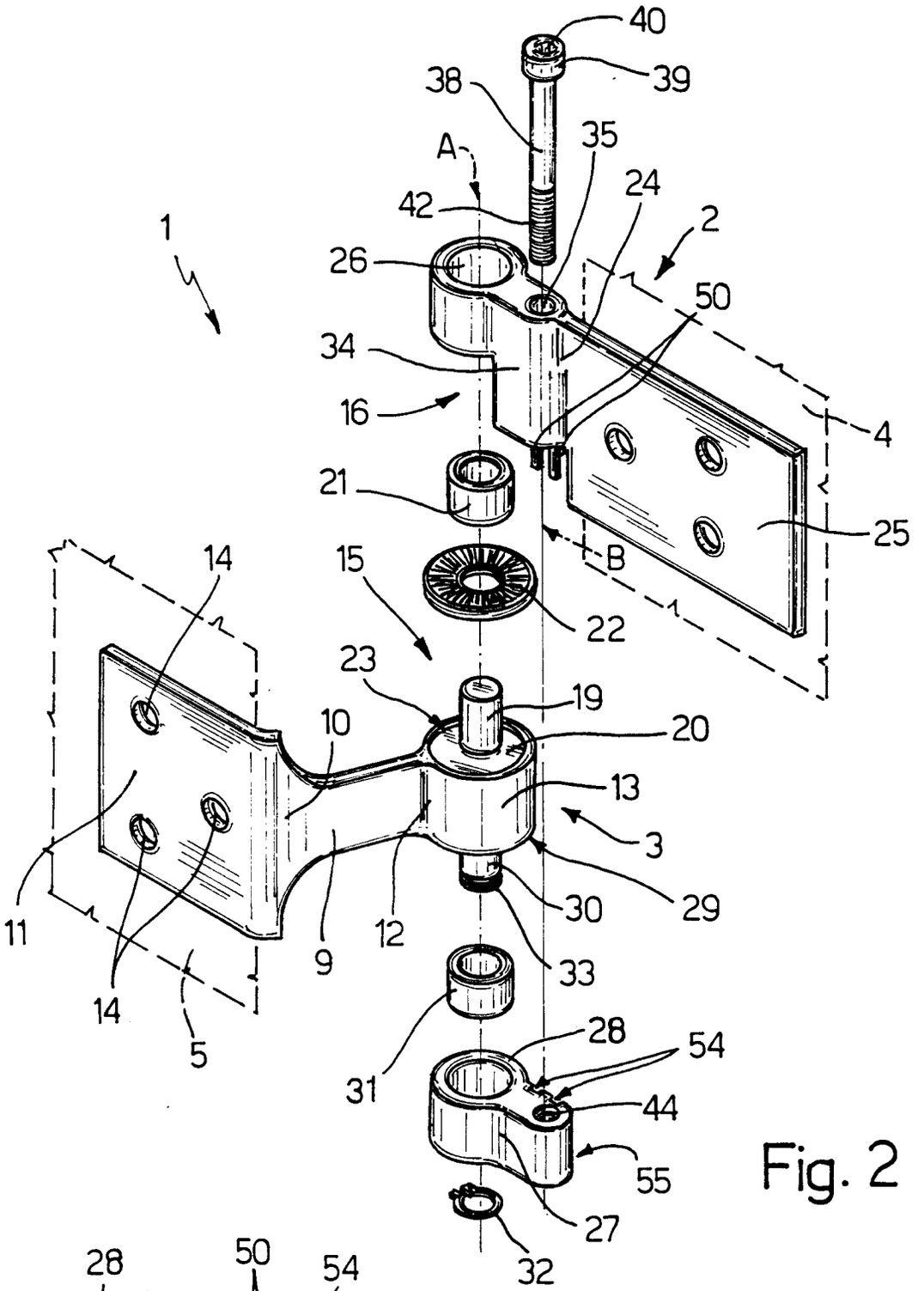
40
39
38
35
A
24
42
2
1
26
50
34
16
4
21
25
B
14
15
22
23
19
10
20
13
3
11
30
29
12
9
33
14
5
31
28
54
44
55
27
32

Fig. 2

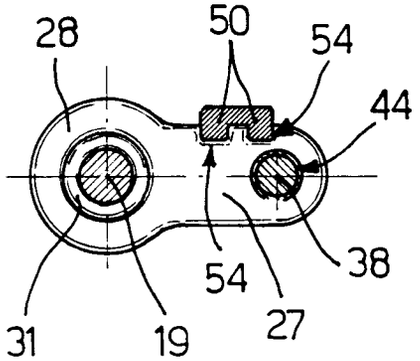
28
50
54
44
38
54
27
31
19

Fig. 3

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 95 11 8868

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X Y A	DE-A-37 06 845 (SCHARWÄCHTER) * column 7, line 29 - line 63; figures 3-13 * ---	1 2-4 5,6	E05D7/10
Y	EP-A-0 508 806 (ITW LTD) * abstract * ---	2-4	
X Y	GB-A-376 682 (SCHNEIDER) * page 1, line 32 - line 50; figures 1-5 * -----	1 2-4	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

E05D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	4 March 1996	Van Kessel, J

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)