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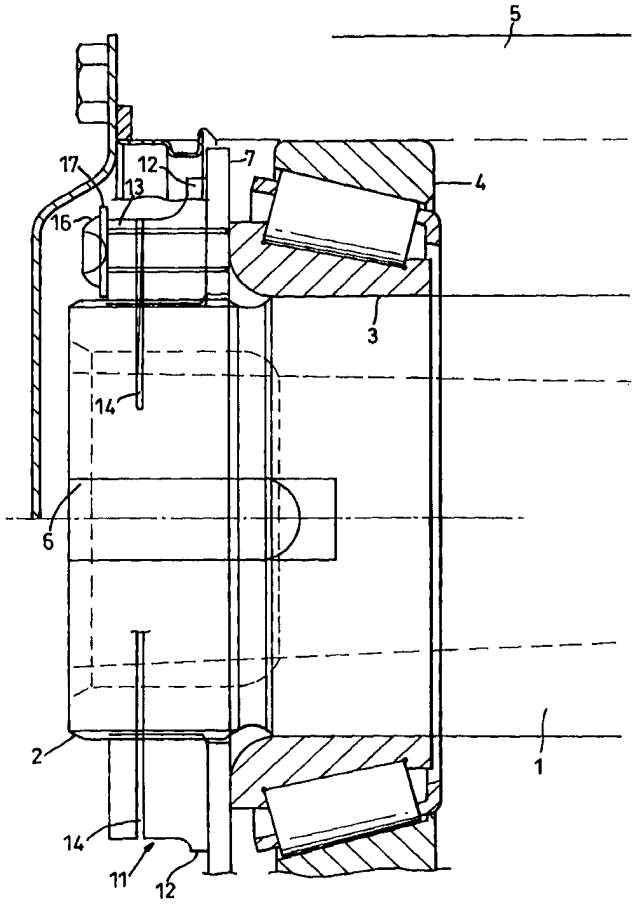
(54) Title: HUB AND AXLE ASSEMBLIES

(57) Abstract

A hub and axle assembly having a bearing assembly (4) supported on a journal (3) of an axle beam (1) which has a screw threaded spindle (2) adjacent to the journal formed with a longitudinally extending keyway (6), has a hard faced washer (7) inside the hub (5) formed with through holes (9) and a key (8) to engage in the keyway. An adjusting nut (11) co–operates with the spindle (2) and has at least one hole (13), at least partially screw threaded, extending through it parallel to its rotational axis. The nut (11) receives and retains a securing screw (16) which can be engaged in any aligned one of the holes (9) in the washer (7). Bearing adjustment is made by tightening the adjusting nut against the washer, backing the nut off a pre–determined amount and then locking the adjustment by engaging the securing screw (16) in an aligned one of the holes (9) in the washer. Correct adjustment of the bearing assembly (4) can be achieved within the tolerance defined by the spacing of the holes in the washer, and the locking of the adjustment is possible without affecting the adjustment made.



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HUB AND AXLE ASSEMBLIES

This invention relates to hub and axle assemblies.

When assembling a hub and bearing assembly to an axle beam, for example of a trailer axle, it is necessary to ensure correct adjustment of the bearing assembly and locking of that adjustment to obtain satisfactory bearing life.

Current practice is to use a hard faced adjusting nut which is tightened against the bearing assembly to a specified torque whilst the hub is being rotated in order to position the bearing rollers correctly. The nut is then backed off a specified amount, for example one flat, a lock washer is fitted and a lock nut is applied to secure the adjustment and assembly.

This is not ideal because the adjustment so obtained is sensitive to the screw thread clearance class and tolerance. For example, if the nut has a clearance on the thread and is tightened and then backed off, the lock washer applied and then the lock nut, the latter pushes the adjusting nut in the opposite direction to its last movement and can therefore reduce the set clearance.

Inherently the loading applied by the lock nut is against the direction of backing off and the effect of thread clearance is to decrease the adjustment clearance. Inevitably variations in the thread clearance will directly influence the net adjustment and consequently the bearing life.

Furthermore, to avoid a pre-loaded condition on the bearings (which may be disastrous for bearing life) it is necessary to allow for variation in thread clearance in the mean recommended setting. This means that some bearings will run with a greater clearance than is desirable for optimum life.

According to the present invention a hub and axle assembly comprises, in combination, a hub and bearing assembly, an axle beam having a journal or journals to receive and support the bearing assembly, a screw threaded spindle at an end of the axle beam adjacent the at least one journal and a keyway extending longitudinally of the spindle and through the screw thread, characterised in that there is provided a hard faced washer having external clearance inside the hub, a plurality of through holes and an internal key adapted to engage in the keyway, and an adjusting nut threaded to co-operate with the threaded spindle and having at least one axially extending through hole which is at least partially screw threaded to receive and retain a securing screw whose inner end is adapted to engage in one of the plurality of holes in the washer, whereby the bearing adjustment is made by tightening the adjusting nut against the washer which bears against the inner race of the bearing assembly, backing the nut off a predetermined amount and then locking the adjustment by a securing screw passing through the nut and engaged in a hole in the washer.

Preferably the holes are equi-spaced, and of the same diameter and on a pitch circle which is concentric with the washer.

Preferably there are an even number of holes, each one being diametrically opposed to another one.

The outer face of the washer, that is to say the face of the washer which is engaged by the adjusting nut, may have a marking radially outwardly of each hole arranged so as to be visible when the adjusting nut is applied to facilitate alignment of the, or at least one, axially extending hole in the nut with a hole in the washer for reception of a securing screw. The marking may, for example, comprise an indentation or a radially extending linear marking.

Preferably the adjusting nut has two holes extending parallel to its axis which are diametrically opposed and arranged on the same pitch circle as the holes in the washer whereby the adjusting nut is locked by the two securing screws.

The adjusting nut may have a slot generally normal to the axis of the nut located between opposed faces of the nut and through which the axial hole passes whereby the securing screw, when fastened, axially elastically deflects the outer of the opposed faces towards the inner of the opposed faces to enhance the locking of the bearing assembly adjustment. When the adjusting nut has holes for two securing screws then the nut is preferably provided with two similar slots for the same purpose.

The face of the adjusting nut which is outermost when assembled may be machined, or otherwise formed, so that it has a flat central portion from which one or more outer portions, above the slot or slots, are upwardly inclined. When the securing screw or screws are secured in the hole(s) the inclined surface(s) may be deflected elastically to close the slot(s) and in this condition the formerly inclined surface(s) may become co-planar with the central portion.

The screw-threaded portion of the or each hole in the nut is preferably the portion of the hole below/beyond the slot(s).

The construction is such that it is necessary to use a tubular spanner to enter the space within the hub to tighten the adjusting nut. To help prevent incorrect assembly the securing screws are provided with heads which extend beyond the periphery of the adjusting nut, whereby the screws cannot be fitted until after the adjusting nut has been fitted, and the nut cannot be tightened with the screws in situ. A hub cap may be provided which, when fitted, has a small clearance from the heads of the securing screws so that if the latter are not fully engaged and tightened the hub cannot be fitted.

The adjusting nut whose surface engages the washer may be flanged, or partially flanged, so that the nut has to be fitted the correct way round or a tube spanner cannot be applied to it.

The hub bore may include an annular recess to house a retaining ring whereby, following removal of the securing screws and adjusting nut, as the hub is withdrawn from the axle beam the bearing assembly is retained in the hub due to engagement of the periphery of the washer with the retaining ring.

An embodiment of the invention will now be described, by way of example only, with reference to the accompanying drawings in which:

Figure 1 is a scrap view, partly in section, of a hub and axle assembly;

Figure 2 is a plan view of a washer, and

Figure 3 is a plan view of an adjusting nut

Referring to the drawings, an axle beam 1 has a screw threaded spindle 2 and an outer journal 3 which supports an outer roller bearing 4 in the bore of a hub 5. An inner journal and inner roller bearing in hub 5 are not shown

An external keyway 6 traverses the screw thread on spindle 2. A hard faced washer 7 has an internal key or lug 8 which is received by keyway 6 to prevent rotation of washer 7 relative to axle beam 1. Washer 7 has a ring of equi-spaced holes 9 around a pitch circle which is concentric with the washer. An even number of holes is preferred so that each hole has another hole diametrically opposite it.

An adjusting nut 11 has a flange 12, through holes 13 and lateral slots 14, best seen in Figure 1 and whose inner limits are indicated by dot and peck lines 15 in Figure 3. The outer face of nut 11 may be machined, or otherwise formed, so that it has a flat centre section and slightly upwardly inclined outer section above the lateral slots. Preferably the inner end (or part thereof) of each hole 13 is screw threaded to receive a screw, as 16. During adjustment of the nut 11 the holes 13 are aligned with corresponding holes in washer 7. As the screws 16 are tightened they elastically deform the outer face of the nut, closing the slots. In this condition the formerly inclined outer sections may become co-planar with the flat centre section.

It will be seen that the screws 16 have heads with extended flanges 17 which protrude beyond the flats of the nut 11, see Figure 3. The nut 11 has to be applied with a tube spanner for space reasons and

consequently the screws 16 must be removed before the nut can be tightened, helping to ensure correct assembly. Similarly, the flange ensures the nut cannot be fitted the wrong side outermost.

Referring to Figure 2, it will be seen that on a face of the washer 7 which is engaged by the nut 11 radial line markings are provided outwardly of each hole 9. The holes 9 are covered when the nut 11 is applied consequently the linear markings facilitate alignment of the holes 13 in the nut with the holes 9 in the washer.

The construction described enables a correct adjustment of the bearing assembly within a tolerance defined by the spacing of the holes in the washer. The locking of the adjustment is accomplished without affecting the adjustment which has been made, thus helping to ensure an extended bearing life.

CLAIMS

1. A hub and axle assembly comprising, in combination, a hub (5) and bearing assembly (4), an axle beam (1) having a journal or journals (3) to receive and support the bearing assembly, a screw threaded spindle (2) at an end of the axle beam adjacent the at least one journal (3), a keyway (6) extending longitudinally of the spindle (2) and through the screw thread, characterised in that there is provided a hard faced washer (7) having external clearance inside the hub (5), a plurality of through holes (9) and an internal key (8) adapted to engage in the keyway (6), and an adjusting nut (11) threaded to co-operate with the threaded spindle (2) and having extending therethrough parallel to its rotational axis at least one hole (13) which is at least partially screw threaded to receive and retain a securing screw (16) whose inner end is adapted to engage in any aligned one of the plurality of holes (9) in the washer (7), whereby bearing adjustment is made by tightening the adjusting nut (11) against the washer (7) to press it against the bearing assembly (4), backing the nut off a predetermined amount and then locking the adjustment by the securing screw (16) passing through the nut (11) and engaged in an aligned one of the holes (9) in the washer.

2. A hub and bearing assembly as claimed in claim 1 characterised in that the holes (9) in the washer (7) are equi-spaced.

3. A hub and bearing assembly as claimed in claim 2 characterised in that the washer (7) has an even number of the holes (9).

4. A hub and bearing assembly as claimed in any preceding claim characterised in that a face of the washer (7) which is engaged by the

adjusting nut (11) has a marking radially outwardly of at least one hole (9).

5. A hub and bearing assembly as claimed in claim 3 or claim 4 characterised in that the adjusting nut (11) has two of said holes (13) extending parallel to its rotational axis, diametrically opposed, and on the same diameter pitch circle as the holes (9) in the washer (7) whereby the adjusting nut may be locked by two of the securing screws (16) in said holes.

6. A hub and axle assembly as claimed in any preceding claim characterised in that the adjusting nut (11) has a slot (14) generally normal to its rotational axis and located between opposed faces of the nut through which the at least one of said holes parallel to the rotational axis passes, whereby the or each securing screw (16), when fastened, axially elastically deflects the outer of the opposed faces towards the inner of the opposed faces to enhance the locking of the bearing assembly adjustment.

7. A hub and axle assembly as claimed in claim 6 as dependent from claim 5 characterised in that the adjusting nut (11) has two similar of said slots (14) and the two securing screws (16) are used to enhance the locking of the bearing assembly adjustment.

8. A hub and bearing assembly as claimed in claim 6 or claim 7 characterised in that the face of the adjusting nut which is outermost when assembled is formed so that it has a flat central section from which an upwardly inclined section extends above the or each slot.

9. A hub and bearing assembly as claimed in any one of claims 4 to 8 characterised in that the face of the washer (7) which is engaged by the

adjusting nut (11) has a marking radially outwardly of at least half of the plurality of holes (6) in the washer (7).

10. A hub and bearing assembly as claimed in claim 8 characterised in that the face of the washer (7) which is engaged by the adjusting nut (11) has a marking radially outwardly of each of the plurality of holes (9) in the washer (7).

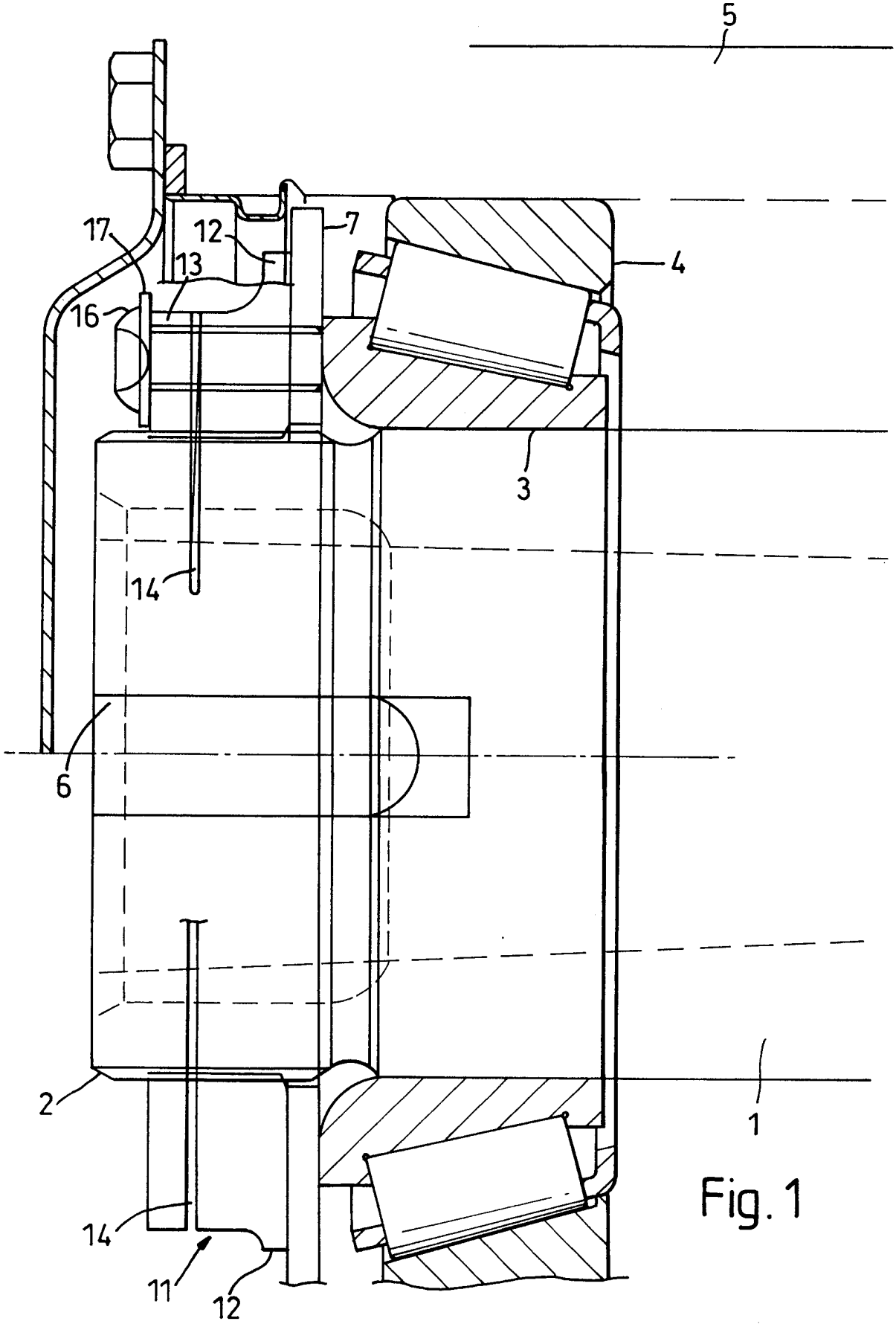

Fig. 1

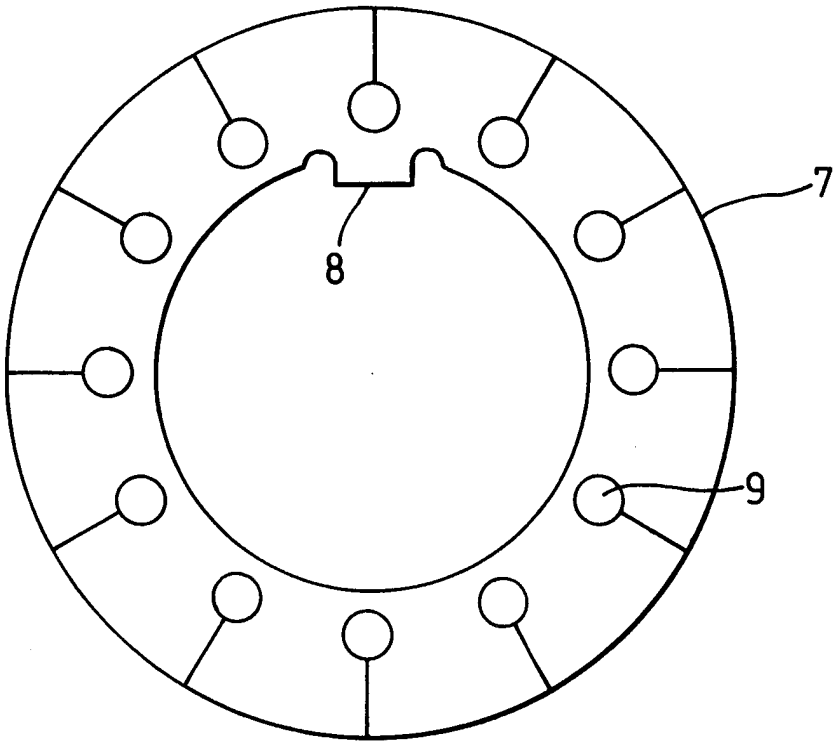

Fig. 2

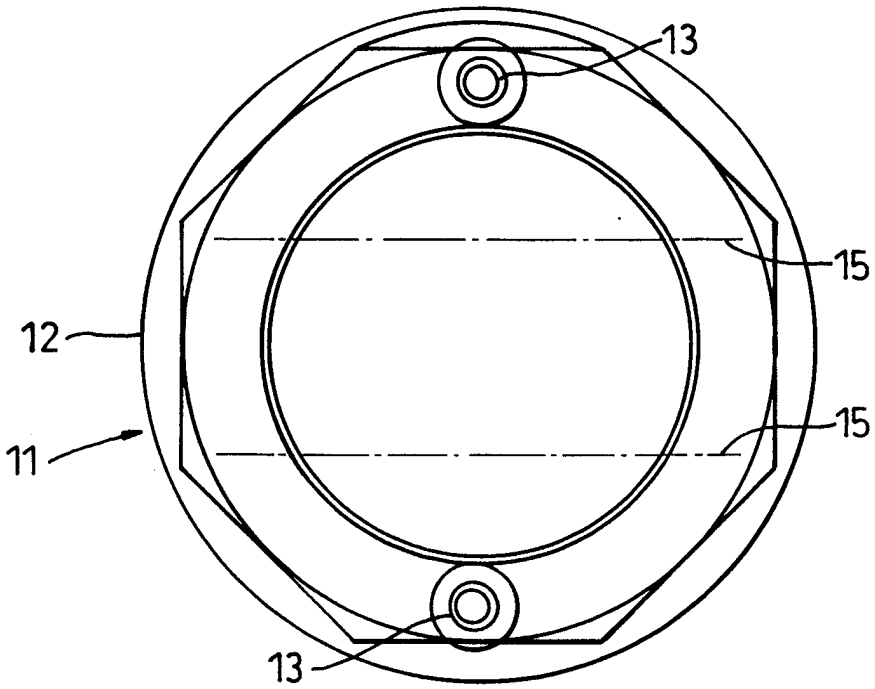

Fig. 3

INTERNATIONAL SEARCH REPORT

Interr ıal Application No
PCT/GB 98/00260

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 B60B27/00 F16C35/063

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 6 B60B F16C F16D

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 533 794 A (FAISON) 9 July 1996 see column 3, line 20 - column 4, line 67; figures	1-3,5
A	DE 43 39 978 A (INA WÄLZLAGER SCHAEFFLER KG) 1 June 1995 see column 2, line 31 - column 3, line 38	6
A	US 5 492 393 A (PEISKER) 20 February 1996 see column 5, line 16 - line 27; figures	1
A	US 5 560 687 A (HAGELTHORN) 1 October 1996	
A	GB 1 392 182 A (AIRSCREW HOWDEN) 30 April 1975	

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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INTERNATIONAL SEARCH REPORT

Information on patent family members

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