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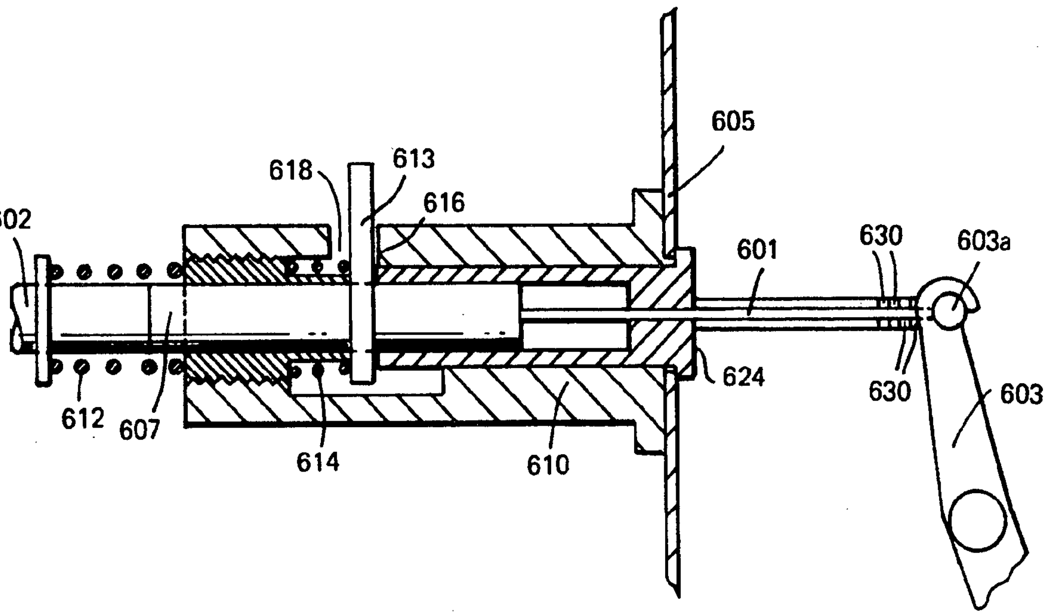

(57) Abstract

The assembly comprises a cable having an outer conduit (602) and an inner core (601) which is attached to a control pedal (603). The end of the conduit abuts a sleeve (607) which passes through a tiltable lockplate (613). The other end of the sleeve (607) is received in a tube (624), one end of which abuts the lockplate to hold it in its disengaged position when the assembly is inoperative. The assembly is thus "open-centered" and adjustment takes place under the influence of spring (612) between operating cycles. A further spring (614) biases the lockplate into its tilted, locking position, in which the tube (624) is biased from the lockplate by the spring (614) upon commencement of each operating cycle.

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SELF-ADJUSTING CABLE ASSEMBLY

This invention relates to self-adjusting cable assemblies comprising compensating mechanisms which automatically compensate for wear in control cable systems. Control cables of the kind comprising an inner core cable and an outer conduit are sometimes called Bowden-type cables.

Cable operated controls are utilised in a number of control systems within the automotive and other industries. For example, a clutch mechanism in a vehicle with manual transmission is often connected by means of a Bowden-type control cable to the clutch pedal mounted on the bulkhead separating the engine compartment from the passenger compartment of the vehicle.

With a clutch actuated by means of a clutch control cable a problem arises in that the effective cable length has to be reset from time to time due to tolerances in the system, cable wear and elongation, and wear of the friction lining of the clutch. Similar problems arise with other control cables, including those for parking brakes, accelerator controls, and other automotive and non-automotive applications.

Previously such control systems had to be manually adjusted to achieve the desired reset position. With automotive applications, this had the disadvantage that adjusting the system required the vehicle to be taken off the road and the services of a mechanic obtained. The adjustment tended to be made irregularly allowing the system quickly to fall out of optimal adjustment. Determining the initial adjustment of the system during manufacture also led to increased cost and assembly time.

Various mechanisms have been proposed to provide for self-adjustment. These can be classified in two groups: (1) core cable adjusters and (2) conduit adjusters. Both have the same objective: to maintain the control cable at its optimal effective length. However, all the mechanisms have disadvantages associated with them, including cost, unreliability, installation requirements, incremental adjustment and susceptibility to environmental conditions and corrosion. The components may need hardening or similar treatment and tend not to be smooth or quiet in operation.

The earlier self-adjusting control cables had a self-adjusting device in the form of an automatically releasing clamp of the ratchet and pawl type. This mechanism allowed the core and/or the conduit to move relative to an anchorage point under the influence on the cable of a tensioning spring allowing the cable to adjust itself when in its rest position.

More recent market requirements are for a self-adjusting device to be provided as part of the control cable itself. These devices may take the form of an automatically releasing clamp of either the wedged ball type or the wedged jaw type: see, for example, US 4378713, WO 85/03113, WO 86/05849 and EP 0443935. In these devices, a clamp which is mechanically linked to the core of the cable becomes displaced on depression of a control pedal. This axial movement causes the clamp to close on the conduit.

It is an object of this invention to provide an inexpensive continually self-adjusting cable control mechanism which overcomes the disadvantages associated with the prior art and ensures that, for example, a clutch control system is always working at its optimal.

There is accordingly provided a self-adjusting cable assembly comprising outer conduit means and inner core means, an anchorage means through which the core means extends and in which an end portion of the conduit means is slidable, resilient biasing means acting between the conduit means end portion and the anchorage, and releasable coupling means for coupling the conduit means end portion to the anchorage means at an adjusted effective conduit means length established by forces acting on the conduit means, the coupling means coupling the conduit means to the anchorage means in a way to transmit to the anchorage means the reaction force generated in the conduit means in use of the cable assembly but releasing the conduit means end portion for movement relative to the anchorage means when adjustment of the conduit means effective length is to take place in response to the said forces acting thereon.

There can thus be provided a cable assembly in which the coupling means couples the conduit means to the anchorage means in response to the reaction force being generated but releases the conduit means end portion in the inoperative condition of the assembly.

The resilient biasing means may act in a direction to increase or in a direction to decrease the effective length of the conduit.

Release of the coupling means is conveniently provided for by means for inhibiting operation of the coupling means in the inoperative condition of the assembly.

It is thus possible to provide an assembly which is "open-centred" in that the conduit end portion can adopt a correctly adjusted position relative to the anchorage means between successive operating cycles of the cable assembly. The adjusted position is established according to the forces acting on the conduit means in the inoperative condition.

The adjusted position can be a position in which the effective conduit length is shorter or longer than in the previous adjusted position, according to whether shortening or lengthening is required by wear and other changes taking place in use of the cable assembly and the clutch or other mechanisms which it operates.

The direction in which adjustment takes place can be the same as or opposite to the direction in which the resilient biasing means acts, depending upon whether or not the force of the resilient biasing means is greater or less than the external forces imposed on the conduit means in use of the cable assembly.

In another aspect, the present invention provides a self-adjusting cable assembly comprising outer conduit means and inner core means, an anchorage means through which the core means extends and in which an end portion of the conduit means is slidable, resilient biasing means acting between the conduit means end portion and the anchorage in a direction tending to increase the effective length of the conduit, and releasable coupling means for coupling the conduit means end portion to the anchorage means at an adjusted effective conduit means length established by the resilient biasing means, the coupling means normally coupling the conduit means to the anchorage means in a way to transmit to the anchorage means the reaction force generated in the conduit means in use of the cable assembly but releasing the conduit means end portion for movement relative to the anchorage means when adjustment of the conduit means effective length takes place under the influence of the resilient biasing means.

In such a cable assembly, the coupling means anchors the conduit means to the anchorage means except when adjustment becomes necessary, when release takes place automatically to allow for adjustment to take place. The coupling means is therefore not released as part of the normal operating cycle and the assembly does not require relative movement between the conduit and the anchorage to take place during each operating cycle in order to establish coupling between the conduit and the anchorage. Lost motion and wear in the system can thus be avoided. It is not necessary for a load to be applied for a correctly adjusted condition to be established.

The assembly preferably includes second resilient biasing means which bias the coupling means towards its coupling position, the second biasing force being overcome by the first biasing force when adjustment takes place.

Advantageously, the coupling means is such that the coupling to the anchorage means is enhanced by the reaction force in the conduit means.

A particularly preferred coupling means comprises a locking element on the conduit means end portion, the locking element having an aperture through which the conduit means end portion extends and being movable relative to the end portion between a first position in which it is inclined to the axis of the end portion and engaged therewith, and a second position in which it is freed from engagement and orientated more perpendicularly to the axis.

When a second biasing means is present, it urges the locking element towards its first position. This can be achieved by a stop on the anchorage, against which the locking element is biased and on which the locking element pivots to attain its first position.

When the coupling means comprises an apertured locking element and the assembly is "open-centred" as mentioned above, the coupling means preferably includes a frictional inhibiting means which frictionally engages the conduit means end portion and/or the core means and which abuts the apertured locking element in the inoperative condition of the assembly in order to maintain the locking element in its second portion in which it is freed from engagement with the conduit means end portion.

Conveniently, the frictional means comprises a stop member which is in sliding frictional engagement with the conduit end portion and/or the core means.

The stop member may be an interference fit on the end portion and/or core means. Other arrangements include resilient biassing means. For example, one or more bow springs, may act between the stop member and the end portion and/or the core means.

In some constructions it may be advantageous to have a linking means operative between the locking element and the stop member, so that the two parts are maintained in their correct operative positions relative to each other.

In another arrangement, the stop member is tubular and has a hollow interior into which the conduit means end portion extends, the end of the tubular stop member distant from the conduit means end portion having an opening in which the core means is a frictional fit and the end of the stop member adjacent the conduit means end portion abutting the locking element in the inoperative condition of the assembly.

In a further arrangement, the stop member is tubular and has a hollow interior into which the conduit means end portion extends, the end of the tubular stop member distant from the conduit means end portion extending from the assembly to abut, in use of the assembly, an actuating member for the cable, whereby the locking element is maintained in its free position in the inoperative condition of the assembly but is allowed to move to its coupling position upon operation of the actuating member.

Preferably, the conduit means end portion is formed as a sleeve fitted over a casing component of the conduit means.

Conveniently, a portion of the sleeve projecting beyond the anchorage means has an external flange and the first resilient biassing means, for example a helical compression spring, acts between the flange and the anchorage means.

The helical compression spring may be cylindrical and extend around the projecting portion of the sleeve to act on the outer end of a portion of the anchorage means receiving the conduit end portion. As an alternative, the spring may be frusto-conical and extend around the projecting portion and the portion of the anchorage means receiving the conduit means portion.

In other embodiments, the first resilient biasing means is located within the anchorage means and acts between the inner end of the conduit end portion and the anchorage means.

The second resilient biasing means may be located within the anchorage means and may comprise a helical compression spring extending around the conduit means end portion.

The stop means conveniently comprise an abutment on the anchorage means, against which the locking element is biased by the second resilient biasing means and on which the locking element pivots to attain its first, inclined position.

The abutment is conveniently provided by an edge of an aperture in the anchorage means, a portion of the locking element being located in the aperture.

The locking element may protrude through the aperture to allow for access of a tool to the locking element to free it from engagement with the conduit means end portion, for example during assembly or initial setting-up of the assembly. Alternatively, the locking element can be accessed through the aperture if it does not protrude from the aperture.

The locking element conveniently comprises an apertured plate. If desired, there may be a compound locking element comprising two or more apertured plates in face-to-face contact.

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

Figure 1 is a part-sectional view of a control cable incorporating a self-adjusting device, for operating the clutch of a motor vehicle engine,

Figure 2 is a part-sectional view of a first modified self-adjusting device at rest,

Figure 3 is a part-sectional view of the self-adjusting device of Figure 2 when a load is applied,

Figure 4 is a part-sectional view of the self-adjusting device of Figure 2 at rest after adjustment has taken place,

Figure 5 is a part-sectional view of a second modified self-adjusting device,

Figure 6 is a part-sectional view of a third modified self-adjusting device,

Figure 7 is a part-sectional view of a fourth modified self-adjusting device,

Figure 8 is a part-sectional view of a fifth modified self-adjusting device, and

Figure 9 is a part-sectional view of a sixth modified self-adjusting device.

Referring first to Figure 1, there is shown a Bowden-type control cable comprising a core cable 1 and a flexible conduit 2. The core cable 1, which is of a fixed length, extends between a clutch pedal 3 and a clutch actuating lever 4, to each of which it is secured by terminal nipples 3a, 4a. The conduit 2 is adjustable to fill the space between the two fixed positions or anchorages, for example an engine bulkhead 5 and a bracket 6 on the clutch housing.

An adjusting sleeve 7 fits over and is secured to an end portion of the flexible conduit 2. In a modification, the sleeve has a recess which receives the end of the conduit which abuts the sleeve within the recess. Positive securement of the sleeve to the conduit is therefore unnecessary. In the embodiment described, the core cable 1 passes freely through a hole in the outer end of the sleeve 7. The outer end of the sleeve 7 has a flange 8 which forms a circular abutment 9 facing the bulkhead 5.

The sleeve itself is slidable in a tubular metal anchorage bracket 10 which is secured to the bulkhead 5 by being welded in an opening in the bulkhead. Alternatively, the anchorage bracket can be of plastics and fit into a keyhole slot in the bulkhead. The core cable passes freely through the opening in the bulkhead to the clutch pedal 3. The anchorage bracket 10 has an outwardly extending flange which provides an annular abutment 11 which is larger in diameter than the abutment 9 on the sleeve 7. A frusto-conical compression adjusting spring 12 is seated at its larger end on the abutment 11 and at its smaller end on the abutment 9. The spring 12 constitutes a first resilient biasing means urging the sleeve 7 in the direction which increases the effective length of the conduit 2.

An apertured lockplate 13 is located on the sleeve 7 within the bracket 10. The lockplate 13 is movable relative to the sleeve 7 between an inclined position (as shown in Figure 1), in which it engages the sleeve, and a position in which it is more nearly perpendicular to the axis of the sleeve and the sleeve is freely slidable through the aperture. The sleeve 7 can be suitably serrated or roughened if required or of differing cross-sectional shape to assist locking to the lockplate.

A helical lockplate biasing spring 14, constituting a second resilient biasing means, is located between the lockplate 13 and an abutment 15 which is provided by a collar 15a which is screwed into the bracket 10 and through which the sleeve 7 is freely slidable. The collar could instead be an interference fit or be secured by adhesive. One end of the lockplate 13 protrudes through a slot 18 in the bracket 10. The spring 14 biases the lockplate 13 towards the right (as seen in Figure 1). The edge of the slot 18 however acts as a fulcrum on which the lockplate 13 pivots in an anti-clockwise direction (as seen in Figure 1). This pivotal movement results in the lockplate attaining its inclined position referred to above and therefore in engagement taking place between the lockplate and the sleeve 7. The spring 14 thus biases the lockplate into engagement with the sleeve 7.

The slot 18 allows the lockplate 13 to be inserted into the bracket 10 during assembly of the adjusting device. The protruding part of the lockplate can then be engaged by a tool to hold the lockplate in its perpendicular position whilst the sleeve 7 is inserted and the collar 15a fitted around the sleeve.

In an alternative construction, the lockplate 13 does not protrude from the slot 18 (but still pivots on slot edge 16) and can be held perpendicular for assembly by insertion of a suitable tool into the slot 18.

In either construction, the lockplate 13 could be held in its perpendicular position by a plastics plug or blocking piece which could be removed after assembly. Alternatively a slidable or rotatable collar could be used to hold the lockplate in position prior to assembly.

Figure 2 is a view corresponding to part of Figure 1 of a first modified self-adjusting device. Parts corresponding to parts of Figure 1 are indicated by reference numerals increased by "100". The device of Figure 2 differs from that of Figure 1 in that the frusto-conical compression spring 12 is replaced by a cylindrical helical compression spring 112 which acts between the annular abutment 109 on the adjusting sleeve 107 and an abutment on the outer end of the collar 115a. As a result, the flange 111 could be omitted.

Operation of the adjustment device of Figure 2 will now be described with reference to Figures 3 and 4. The device of Figure 1 operates in an exactly similar way.

The vehicle clutch will be assumed to be engaged. When the pedal 3 is depressed to disengage the clutch, a load in the direction of arrow A on Figure 3 is applied to the core cable 101. This load results in movement of the core cable to the right (as seen in Figure 3) and in anti-clockwise pivoting movement of the clutch actuating lever to disengage the clutch.

The tensile load on the core cable 101 tends to straighten the conduit 102, in which a compressive reaction force is generated. This force is directed as shown by the arrow B on Figure 3 and is transmitted through the lockplate 113 to the bracket 110 and the vehicle bulkhead 105. Because the lockplate-biasing spring 114 urges the lockplate 113 into engagement with the sleeve 107, the conduit 102 maintains its adjusted length and disengagement of the clutch takes place through movement of the core cable 101, as mentioned above.

Re-engagement of the clutch is achieved by release of the pedal 3, resulting in a reverse movement of the actuating lever and the core cable 101, under the influence of the diaphragm or other spring in the clutch itself.

Figure 4 shows the situation when some wear has taken place in the cable control system. The adjusting spring 112 acting between the collar 115a and the abutment 109 at the end of the adjusting sleeve 107 has moved the adjusting sleeve relative to the bracket 110 in the direction of arrow B and has thus increased the effective length of the conduit 102 so that it retains its optimal effective length.

The relative movement between the adjusting sleeve 107 and the lockplate 113 which takes place during self-adjustment of the device takes place through the spring force of the adjusting spring 112 exceeding that of the lockplate-biasing spring 114. The adjusting sleeve 107 is thus urged to the left (as seen in Figure 4) by the spring 112. The biasing force of the spring 114 is overcome and the sleeve 107 moves to the left (as seen in Figure 4). This movement causes pivotal movement of the lockplate 113 about the slot edge 116 so the lockplate moves towards its perpendicular position. The sleeve 107 is now freed from engagement with the lockplate and relative movement between the sleeve and the lockplate can take place until the effective length of the conduit 102 between the bulkhead 105 and its anchorage adjacent the clutch actuating lever has increased to compensate for the wear in the cable control system. The locking-biasing spring 114 returns the lockplate 113 to its inclined position and into engagement with the sleeve 107, after the adjustment has taken place.

Figure 5 of the drawings shows a second modification, in which the reference numerals have been increased by "200" compared with those of Figure 1.

Figure 5 shows an adjusting device in which the adjusting spring 212 is relocated within the anchorage bracket 210 and acts between a shoulder 211 on the bracket 210 and the inner end 209 of the adjusting sleeve 207. This has the advantage of a more compact assembly protected from the outside environmental conditions. Figure 5 also shows the use of a compound lockplate having two elements 213a, 213b which spread the work required in order to increase the effectiveness of the engagement with the sleeve 207.

Figure 6 of the drawings shows a further modification of the device shown in Figure 1. Parts of the device of Figure 6 corresponding to parts of Figure are indicated by reference numerals increased by "300".

Figure 6 shows the addition of a friction boot 319 which abuts at 321 the bottom of the lockplate 313 to maintain the lockplate 313 in a perpendicular position in abutment with the extension 315b to the threaded plug 315, the boot 319 maintaining the lockplate in its perpendicular position against the bias of the spring 314. The resulting position of the lockplate allows the adjusting spring 312 to lengthen or shorten the conduit 302 in response to any wear, until the system reaches its equilibrium and the cable attains its correctly adjusted effective length.

When the pedal 303 is depressed the core cable 301 is pulled to the right which increases the compressive forces in the conduit. This results in the conduit collapsing through the lockplate carrying the friction boot 319 away from the lockplate 313 and allowing the lockplate to pivot about the point 316 under the influence of the light spring 314 wedging the lockplate onto the conduit sleeve 307 and allowing the reaction force in the conduit to be transmitted to the anchorage bracket 310.

The friction boot has an aperture 320 which can be of a frictional material to be an interference fit, or can incorporate means such as bow springs also allowing it to be carried by the conduit sleeve.

When the pedal 303 is returned to its rest position, the core cable 301 is pulled to the left under the influence of the clutch spring and under the influence of the balancing spring 312 the friction boot 319 is pulled to the left and abuts the lockplate as before. Once the system reaches its equilibrium the friction boot will allow the lockplate to return to its perpendicular position against the light force of spring 314. It should be noted that the compensation takes place on the return cycle of the system.

Also included in Figure 6 are two further modifications. The conduit sleeve simply abuts the conduit at 325. There is no need for any flanges or bracket attachments etc. Also, a groove 322 is provided which, together with a wedge inserted at 318, enables easy assembly by pre-loading the system: a U-component fits into the groove 322 to stop the adjusting spring pulling the conduit through the mechanism. It should be noted that conduit sleeve 307 could be omitted and the lockplate 313 act instead on the outer casing of the conduit, any screw-threaded formations on the conduits surface enhancing engagement with the lockplate aperture.

Figure 7 shows a further modification which differs in one respect with the modification of Figure 6: the friction boot 419 is connected to the lockplate by a link 423. This is against the possibility of the frictional boot being carried away from the lockplate during use of the mechanism. The other parts of the device of Figure 7 are indicated by reference numerals corresponding to those of Figure 6 but increased by a further "100".

The device of Figure 8 (where reference numerals are increased by a further "100") differs from that of Figures 6 and 7 in that it uses an extended friction boot 524 which controls the lockplate 513 by moving when the core 501 is actuated. The friction boot 524 is long enough to allow the sleeve 507 to travel into it as wear is compensated for. An advantage of this construction is that the movement of the friction boot is limited by a flange 524 on the boot abutting the bracket 510, so the movement of the core, which is greater than the travel of the friction boot, always returns the friction boot to the lockplate.

Figure 9 shows yet another modification, in which reference numerals increased by a further "100" are used. The adjusting device of Figure 9 is similar to that of Figure 8 except that the friction boot 524 is replaced by a non-friction sleeve 624 which is freely slidable on the core cable 601 and the rearward part of the rod 607. The rearward end of the sleeve 624 abuts the pedal 603, when the pedal is in its rest position, if necessary for adjustment purposes by way of one or more spacers 630 which are fitted over the cable 601. The spacers may also have a dampening effect and prevent transfer of vibrations to the pedal.

In this Figure 9 modification, the sleeve 624 maintains the lockplate 613 in its perpendicular position when the pedal 603 is in its rest position. When the pedal 603 is depressed, the upper end of the pedal pivots in a clockwise direction (as seen in Figure 9) and the sleeve 624 moves under the influence of the spring 614 to the right (in Figure 9) so that the lockplate can also be pivoted into its locking position by the spring 614. The pedal then drives the cable. On return of the pedal to rest, the sleeve 624 frees the lockplate 613 from the rod 607 which can then adopt its adjusted position relative to the lockplate, under the influence of the spring 612.

It will be understood that the cable assemblies described and claimed in this specification are not limited to clutch-control applications. The assemblies are equally applicable to other automotive applications, including parking brake and throttle control, and to non-automotive applications.

In the particular clutch-control arrangements described, the self-adjusting device may be located at either the clutch pedal or the clutch mechanism end of the cable. In the latter case, the clutch pedal can be replaced by the release arm of the clutch mechanism.

CLAIMS

1. A self-adjusting cable assembly comprising outer conduit means and inner core means, an anchorage means through which the core means extends and in which an end portion of the conduit means is slidable, resilient biasing means acting between the conduit means end portion and the anchorage, and releasable coupling means for coupling the conduit means end portion to the anchorage means at an adjusted effective conduit means length established by forces acting on the conduit means, the coupling means coupling the conduit means to the anchorage means in a way to transmit to the anchorage means the reaction force generated in the conduit means in use of the cable assembly but releasing the conduit means end portion for movement relative to the anchorage means when adjustment of the conduit means effective length is to take place in response to the said forces acting thereon.

2. An assembly according to claim 1, in which the resilient biasing means acts to increase the effective length of the conduit means.

3. An assembly according to claim 1 or 2, including means for inhibiting operation of the coupling means in the inoperative condition of the assembly.

4. An assembly according to any preceding claim, in which the coupling means is such that the coupling of the conduit means to the anchorage means is enhanced by the reaction force in the conduit means.

5. An assembly according to any preceding claim, in which the coupling means comprises a locking element on the conduit means end portion, the locking element having an aperture through which the conduit

means end portion extends and being movable relative to the end portion between a first position in which it is inclined to the axis of the end portion and engaged therewith, and a second position in which it is freed from engagement and orientated more perpendicularly to the axis.

6. An assembly according to preceding claim, including second resilient biasing means which bias the coupling means towards its coupling position.

7. An assembly according to claim 6, in which the second resilient biasing means is located within the anchorage means.

8. An assembly according to claim 7, in which the second resilient biasing means comprises a helical compression spring extending around the conduit means end portion.

9. An assembly according to claim 5, including stop means on the anchorage means, on which the locking element pivots to attain its first, coupling position.

10. An assembly according to claim 9, in which the stop means comprises an abutment on the anchorage means.

11. An assembly according to claim 10, in which the abutment is provided by an edge of an aperture in the anchorage means, a portion of the locking element being located in the aperture.

12. An assembly according to claim 11, in which the locking element protrudes through the aperture to allow for access of a tool to the locking element.

13. An assembly according to claim 11, in which the locking element does not protrude through the aperture but can be accessed therethrough by a tool.

14. An assembly according to any of claims 5 to 13, in which the locking element comprises an

apertured plate.

15. An assembly according to claim 14, in which the locking element is compound and comprises two or more apertured plates in face-to-face contact.

16. An assembly according to any of claims 5 to 15, including means for maintaining the locking element in its second position prior to assembly and/or use of the assembly.

17. An assembly according to any of claims 5 to 16, in which the coupling means includes a frictional inhibiting means which frictionally engages the conduit means end portion and/or the core means and which abuts the apertured locking element in the inoperative condition of the assembly in order to maintain the locking element in its second portion in which it is freed from engagement with the conduit means end portion.

18. An assembly according to claim 17, in which the frictional inhibiting means comprises a stop member which is in sliding frictional engagement with the conduit means end portion and/or the core means.

19. An assembly according to claim 18, in which the stop member is an interference fit on the end portion and/or the core means.

20. An assembly according to claim 19, including resilient means acting between the stop member and the end portion and/or the core means.

21. An assembly according to any of claims 17 to 20, including linking means operative between the locking element and the stop member to maintain the locking element and stop member in their correct operative positions relative to each other.

22. An assembly according to any of claims 17 to 20, in which the stop member is tubular and has a hollow interior into which the conduit means end

portion extends, the end of the tubular stop member distant from the conduit means end portion having an opening in which the core means is a frictional fit and the end of the stop member adjacent the conduit means end portion abutting the locking element in the inoperative condition of the assembly.

23. An assembly according to any of claims 17 to 20, in which the stop member is tubular and has a hollow interior into which the conduit means end portion extends, the end of the tubular stop member distant from the conduit means end portion extending from the assembly to abut, in use of the assembly, an actuating member for the cable, whereby the locking element is maintained in its free position in the inoperative condition of the assembly but is allowed to move to its coupling position upon operation of the actuating member.

24. An assembly according to claim 23 including at least one spacer member positionable, in use of the assembly, between the said distant end of the stop member and the actuating member.

25. An assembly according to any preceding claim, in which the conduit means end portion comprises a sleeve forming an end extension of a casing component of the conduit means.

26. An assembly according to claim 25, in which an end portion of the casing component is received in a recess in one end of the sleeve.

27. An assembly according to claim 25, in which an end of the casing component is in abutment with one end of the sleeve.

28. An assembly according to any of claims 25 to 27, in which a portion of the sleeve projecting beyond the anchorage means has an external shoulder and the first resilient biasing means acts between the

shoulder and the anchorage means.

29. An assembly according to claim 28, in which the first resilient biasing means comprises a helical compression spring.

30. An assembly according to claim 29, in which the helical compression spring is frusto-conical, its larger end acting on the anchorage means.

31. An assembly according to any of claims 1 to 27, in which the first resilient biasing means is located within the anchorage means.

32. An assembly according to claim 31, in which the first resilient biasing means acts between an inner end of the conduit end portion and the anchorage means.

33. An assembly according to claim 31, in which the first resilient biasing means is a helical compression spring.

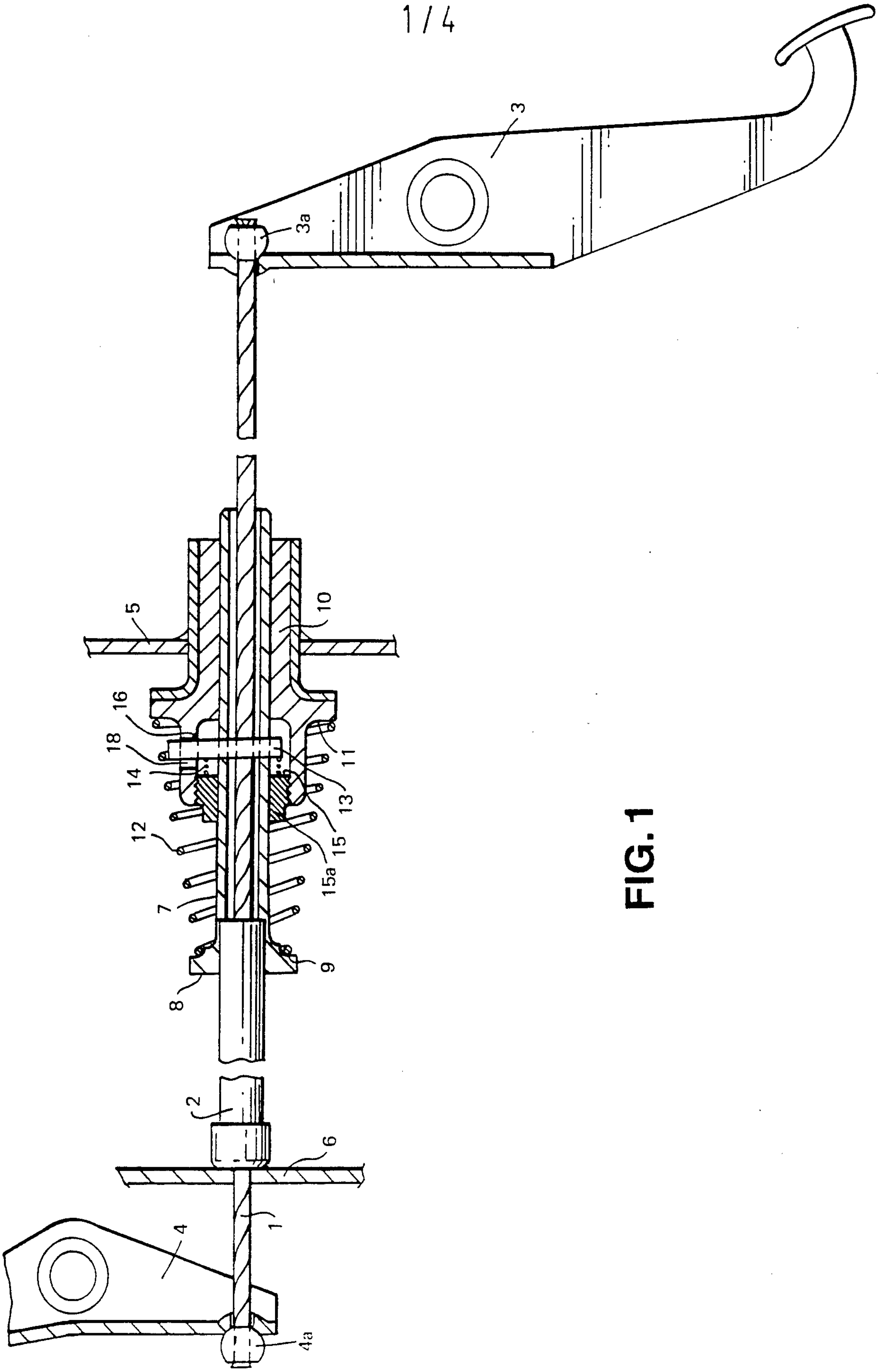

FIG. 1

2/4

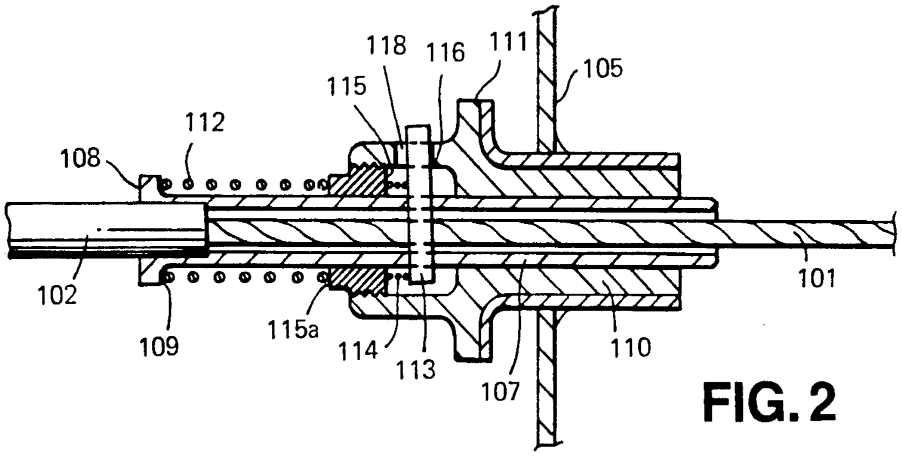

FIG. 2

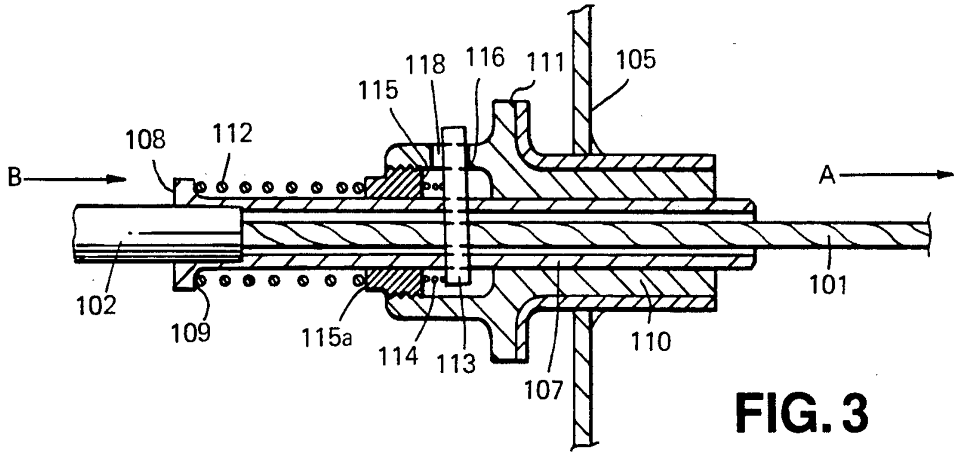

FIG. 3

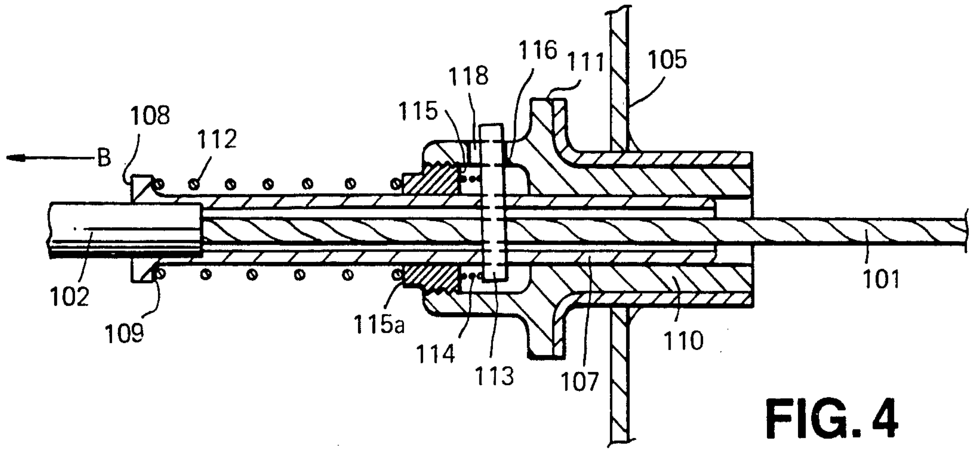

FIG. 4

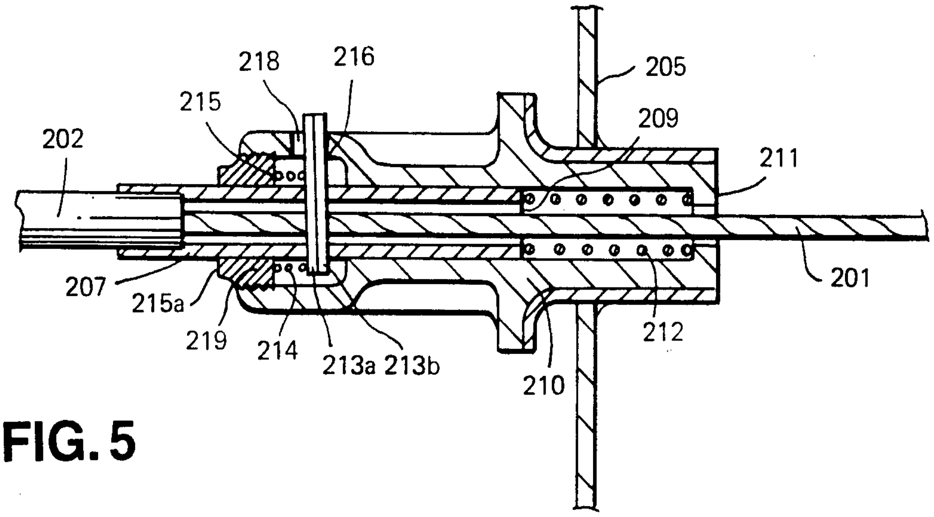

FIG. 5

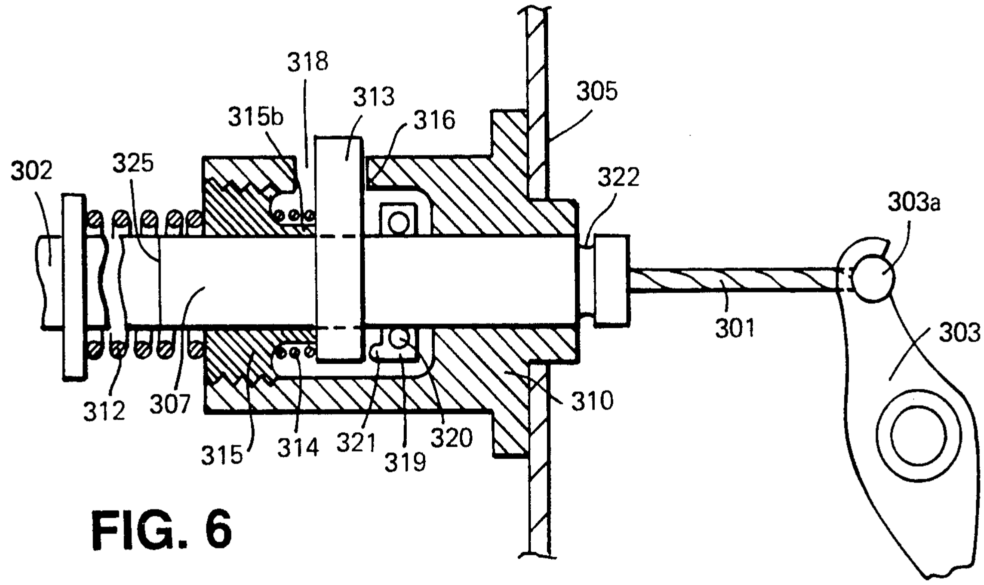

FIG. 6

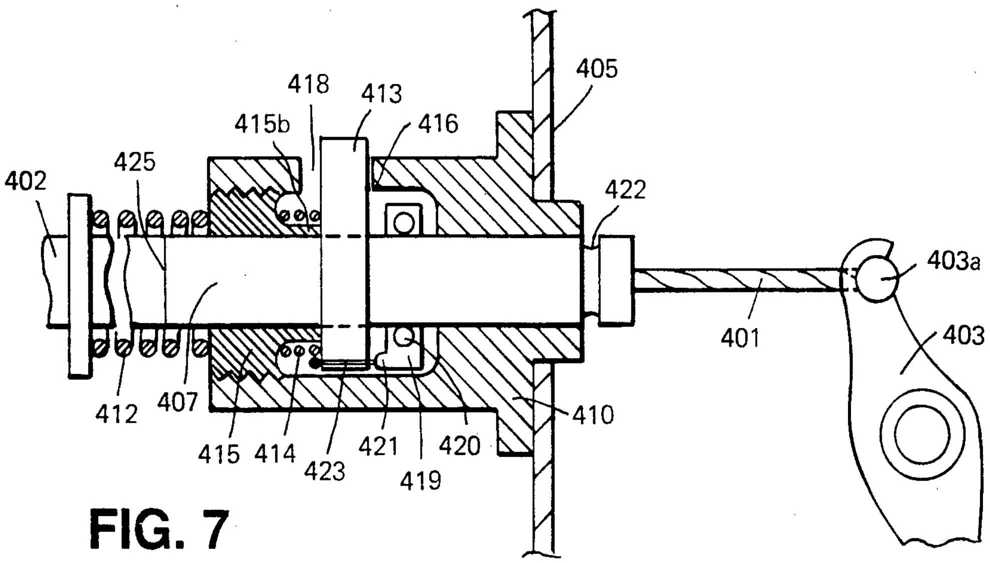

FIG. 7

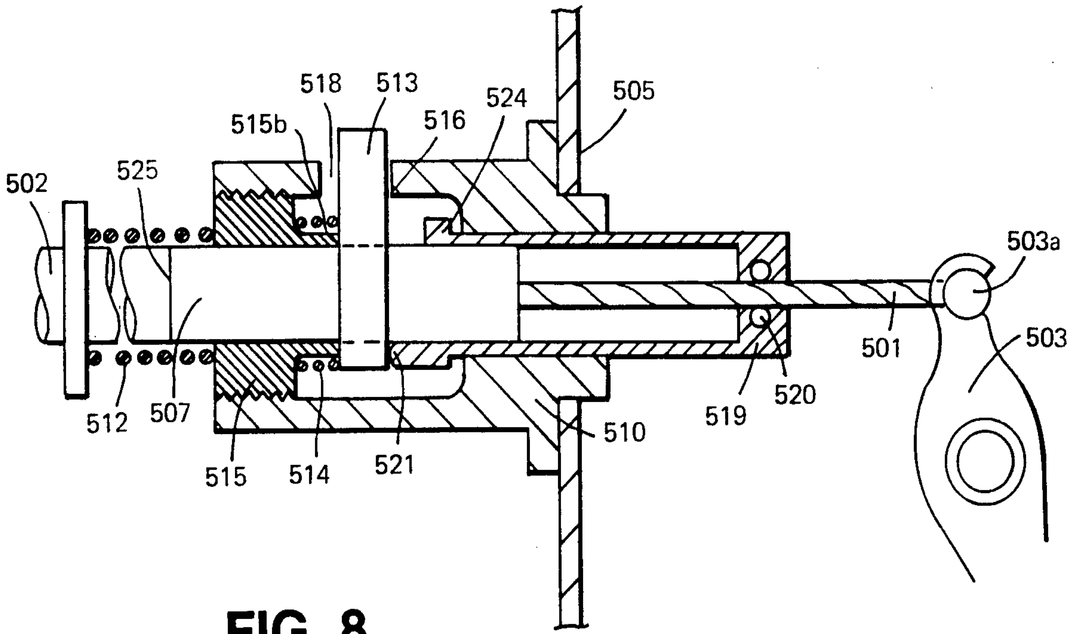
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FIG. 8

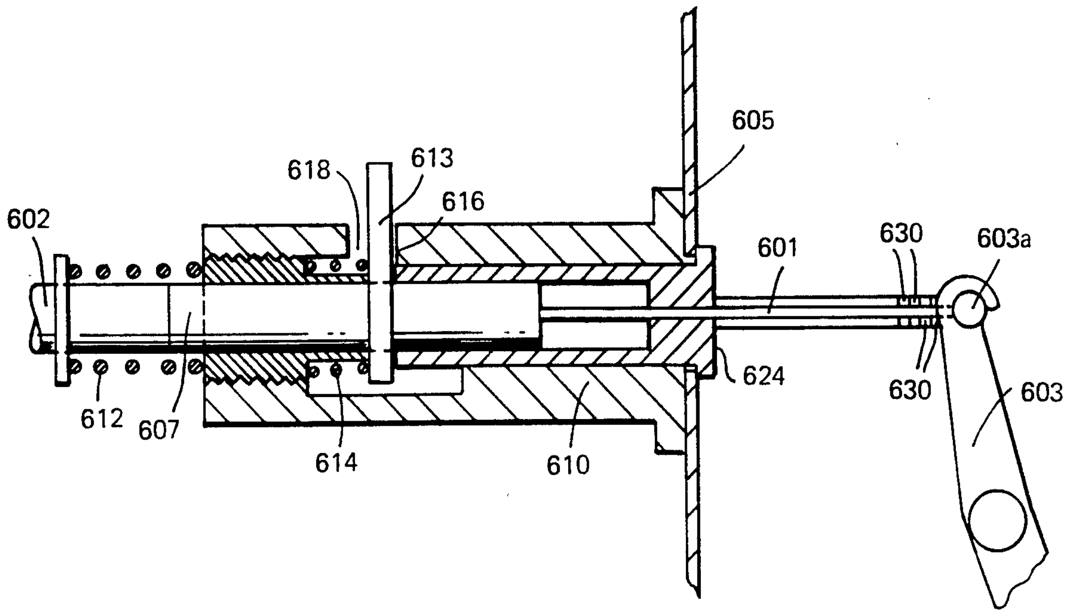
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FIG. 9

INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 94/00251

A. CLASSIFICATION OF SUBJECT MATTER
IPC 5 F16C1/22

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 5 F16C F16D B60T

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.
Y	EP,A,0 370 685 (MOPROD SUPRA AUTOMOTIVE LTD.) 30 May 1990 see the whole document	1,2,4-9, 14,15,29
A		13,22, 23,25

Y	FR,A,2 553 479 (DBA) 19 April 1985 see the whole document	1,2,4-9, 14,15,29
A		10-12, 16-20, 24,27

X	WO,A,85 03113 (HOYLE) 18 July 1985 cited in the application see the whole document	1,2
A		3-33

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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"O" document referring to an oral disclosure, use, exhibition or other means

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"&" document member of the same patent family

1

Date of the actual completion of the international search	Date of mailing of the international search report
13 April 1994	27.04.94
Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Authorized officer BEGUIN, C

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 94/00251

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US,A,4 378 713 (HASKELL ET AL.) 5 April 1983 cited in the application see the whole document -----	1-33

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/GB 94/00251

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
EP-A-0370685	30-05-90	GB-A,B	2225403	30-05-90
		JP-A-	2217605	30-08-90
		US-A-	5138897	18-08-92
FR-A-2553479	19-04-85	DE-A-	3433568	25-04-85
WO-A-8503113	18-07-85	DE-A-	3562294	26-05-88
		EP-A,B	0167612	15-01-86
		JP-T-	61501043	22-05-86
		US-A-	4690262	01-09-87
US-A-4378713	05-04-83	JP-A-	57031017	19-02-82