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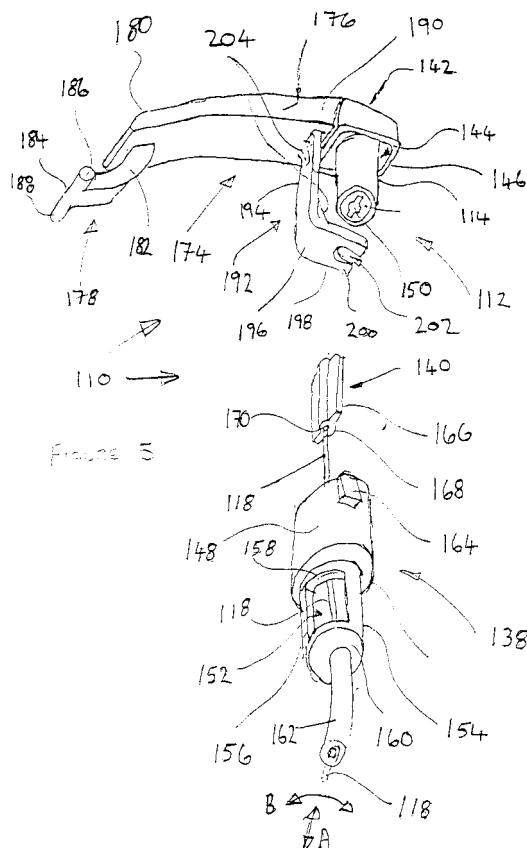
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(54) **Key barrel drive arrangement**

(57) A latch assembly (10) for securing a vehicle door or other closure including a lockable latch mechanism, a separate key actuated lock unit (12) and a coupling means (18) operatively drive connecting a locking input member of the latch mechanism, rotatable about a first axis, to a locking output member of the lock unit, rotatable about a second axis, the coupling means further operatively drive connecting a movement means, proximal the key actuated lock unit, to an unlatching input member of the lockable latch mechanism, operation of the movement means causing the coupling means to move in an axial direction to unlatch the lockable latch mechanism.



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Description

[0001] This invention relates to key actuated locks for securing vehicle doors and other lockable body closures.

[0002] Door or other closures commonly incorporate latch mechanisms releasably engaging a striker or other elements on the frame or other surrounding fixed structure of the vehicle body. This mechanism retains the door or other closure safety shut, and can be switched between locked and unlocked conditions, for security against unauthorised access. The latch mechanism may additionally incorporate electrically powered or other servo actuators, for example forming part of a central locking system whereby more than one door or other closure can be locked and unlocked simultaneously inside or outside the vehicle. However, at least some of the doors of a typical passenger vehicle, usually the front driver's and passenger door, are provided with traditional manual key controlled cylinder or similar mechanical locks.

[0003] A recent trend of the automotive industry is to assemble vehicles from components that have already been pre-assembled into so called "modules". In the case of vehicle doors, such modules are typically bodies on which various door components, such as latch mechanisms, window components, interior door trim, stereo speakers and so on, have been attached by the module supplier. Use of such modules is beneficial as it reduces both the time and the manpower required for final vehicle assembly. It may also have reliability benefits in that the accurate assembly of components on the module is carried out by the component supplier. Thus the risk of incorrect assembly later on the vehicle production line is reduced.

[0004] In vehicle doors or other lockable body closures there is a need for an effective connection between the key controlled mechanical lock and the lockable latch mechanism. In the case of vehicle doors, this is conventionally achieved by means of an often convoluted system of pivoted rods and levers. These may be complicated to manufacture and assemble. The increased use of modules, as described above, has exacerbated the problem: the module body may present a further obstacle to connection between the latch mechanism and key barrel.

[0005] An object of the present invention is to provide a particularly effective and adaptable drive connection between the cylinder or other lock and an associated latch mechanism, thereby at least mitigating some or all of the above problems.

[0006] Thus according to one aspect of the invention there is provided a latch assembly for securing a vehicle door or other closure including a lockable latch mechanism, a separate key actuated lock unit and a coupling means operatively drive connecting a locking input member of the latch mechanism, rotatable about a first axis, to a locking output member of the lock unit, rotatable about a second axis, the coupling means further operatively drive connecting a movement means, proximal the key actuated lock unit, to an unlatching input member of the lockable latch mechanism, operation of the movement means causing the coupling means to move in an axial direction to unlatch the lockable latch mechanism.

[0007] Advantageously this allows the use of a single coupling member such as a cable or rod to connect an outside door handle/key actuated lock unit to a lockable latch mechanism of the door and still provide the function of unlocking and/or locking and also provide the function of unlatching.

[0008] The invention will now be described, by way of example only, with reference to the following figures in which:

Figure 1 is a schematic perspective view of components of a latch assembly according to a first aspect of the invention;

Figure 2 is a side elevation view of components of the latch assembly shown in figure 1:

Figure 3 is a cross-sectional view of part of a latch assembly showing a tapered end fitting according to a second embodiment of the invention.

Figure 4 is an enlarged schematic cross-sectional view of part of the connector for use in the latch assembly of the invention;

Figure 5 is a schematic exploded view of components of a latch assembly according to a third aspect of the invention;

Figure 6 is a schematic view of the components of the latch assembly of figure 5 when assembled; and

Figure 7 is a schematic cross-sectional view illustrating the means to connect parts of the latch assembly of figures 5 and 6 to the body of a car door.

Figure 8 is a schematic view of components of a lockable latch mechanism, for use in the latch assembly of the invention.

[0009] Considering the Figures 1 and 2, various parts of a latch assembly 10 are shown. The latch assembly includes a lock unit 12 such as key barrel 14 actuated by key 16. Key barrel 14 includes a locking output member 30 (shown cut away in Figures 1 and 2 for clarity).

[0010] Lock unit 12 is connected to the input member 32 of a lockable latch mechanism (not shown) of the latch assembly by coupling means comprising an elongate flexible member such as cable or wire 18.

[0011] Cable 18 has respective end connectors 20 and 22 which have generally square cross sections, as

shown. End connectors 20,22 are integrally formed on cable 18 by compressing the ends of the cable to form the square cross section.

[0012] In use, end connectors 20 and 22 are received in respective cavities or slots 26 and 28 formed in output member 30 and input member 32 (shown in partial cross section). Output member 30 rotates with key 16, applying torque to cable member 18 and rotating input member 32 to operate the latch mechanism (not shown).

[0013] With reference to figure 3 there is shown an alternative form of coupling means in which an end of cable 18A has been frayed and then connector 22A has been diecast onto the frayed end.

[0014] In this case, the end connector 22A has tapered outer surfaces 34 that mate with complimentary tapered surfaces 36 of, in this case, cavity 28 in input member 32A. This tapering is beneficial in reducing rattling between end connector 22A and input member 32A, as the tapering encourages the respective components to bed together. Of course, the end connectors and bodies may be of any suitable cross section or configuration that allows transmission of torque between the key barrel and the latch mechanism. The end of cable 18A remote from connector 22A may also have a similar diecast connector or alternatively can have a connector integrally formed with the cable.

[0015] Figure 4 shows an enlarged cross section of a beneficial configuration of cable 18. Cable 18 is shown comprising a central core 18A and respective outer and inner helically coiled portions 19A and 19B. These are arranged substantially co-axially and have helical windings in opposite directions. The use of oppositely wound helical portions is advantageous as it allows torque to be transmitted effectively in either rotational direction. Figure 4 shows two helically wound layers 19A and 19B but preferably more layers would be used, typically five layers. Each layer could be made of a single strand or, more preferably, between four and eight strands would make up each layer. For example, in a four-strand layer, coiled cable portions 19A' and 19A'' would be formed from the same cable. Cable 18 is typically the type of cable used to drive a vehicle speedometer, and has a thickness in the range 3 to 4 mm.

[0016] When in torsion, much of the force in cable 18 is transmitted by the outer coil, ie. coil 19A as shown in the figure. As a result, the maximum load which can be applied to the coil in the different rotational directions is different. Typically, about 30% less torsional load can be applied in the direction with helical windings than in the direction against the helical windings. In either torsional direction, the cable can withstand at least 1NM of torque without unravelling; when in use in the latch mechanism of the invention, the torsional load applied will generally be much less than this.

[0017] Preferably the cable strands are orientated such that the cable is rotated in a direction capable of withstanding the maximum loads when the latch is moved from a locked condition to an unlocked condition.

[0018] The cable for use in the invention may be of the flexible shaft type, as manufactured by S.S. White using the PERFLEXION (RTM) flexible shaft design program. Such shafts have been applied to automotive seat adjusters but have not, until now, been applied to vehicle or other latch assemblies.

[0019] Turning to figure 5, a further embodiment of the invention is shown. In this case, like features of the first embodiment are referenced using the same reference numerals, prefixed by "1". Thus, latch assembly 110 comprises a lock unit 112 such as key barrel 114 operably connected by a flexible cable or wire 118 to a locking input member (not shown) of a latch mechanism (not shown). At the end of cable 118 there is attached a cable end fitting 140, described below in more detail.

[0020] Lock unit 112 has an outer moulding 142 having a flange or edge region 144 that defines a cavity 146 around a portion of key barrel 114.

[0021] When assembled, the hollow body 148 of ferrule 138 encloses the key barrel 114 and the cable end fitting 140 is positioned within ferrule 138. End fitting 140 engages and is positioned in a locking output member in the form of a key barrel interface slot 150 extended into key barrel 114. When in position (see also figure 6) end fitting 140 is located in a region of an aperture 152 provided in a second portion 154 of ferrule body 148. As shown, aperture 152 is substantially rectangular, having respective longitudinal and lateral edges, 156 and 158.

[0022] The remainder of cable 118 passes out of end 160 of second portion 154, and is contained within a cable sleeve 162. Cable sleeve 162 is secured to end 160 of ferrule 138.

[0023] Body 148 has projection 164 to engage a complementary depression (not shown) within cavity 146 of moulding 142 to secure both the ferrule and moulding 142 onto a door (not shown).

[0024] End fitting 140 is diecast and is shaped to cooperate and rotate with key interface slot 150. It is in the form of a planar body 166 (also known as a third abutment) with an enlarged region 168 around the end of cable 118. Of course, end fitting 140 may be of any form that allows rotational motion to be transmitted from key barrel 114 to cable 118, as shown by double-headed arrow B. End fitting 140 presents an end face 172 (also known as a fourth abutment), the function of which will be described later.

[0025] Also shown in Figure 5 there is a flexible member movement means in the form of an outer handle or lever 174 having a body 176 that is grippable and is separate from lock unit 112. As shown, there is a projection 178 from an end 180 of handle 174. Projection 178 comprises curved body 182, terminating at an enlarged portion 184 comprising cylindrical projections 186 and 188. Projections 186 and 188 engage a portion of the car door (not shown), allowing rotation of the handle thereabout.

[0026] In a region 190 of handle body 176 distal of end 180 there is provided an arm or limb 192. The limb

has a first limb portion 194, extending substantially perpendicular of body 176 and having a bend portion 196 leading to a second limb portion 198. As shown, the first and second limb portions are substantially perpendicular to each other. Second limb portion 198 terminates in an output member in the form of an end region 200 having a slot 202. Reinforcement pieces 204 may be present to strengthen limb 192 as appropriate.

[0027] When the latch assembly 110 is assembled, end 200 of limb 198 passes into aperture 152 of ferrule body 154. In this position, cable 118 passes through slot 202 allowing limited free movement of cable 118 in the directions shown by double-headed arrow A. When the lever 174 is operated in the direction of arrow C end region 200 of limb 192 engages face 172 of end fitting 140, transmitting movement of the lever 174 in the axial movement of cable 118. The assembled configuration is shown in Figure 6. This axial movement of cable 118 serves to unlatch the door.

[0028] Note that since the lever 174 is mounted on the outside of a door which opens in an outward direction (ie in the direction of arrow C) then the lever 174 operates to both unlatch the latch and also to subsequently open the door.

[0029] Note that to unlatch the door cable 118 acts in tension. In further embodiments the door could be unlatched by arranging the flexible member to act in compression. Under such circumstances the movement means could be arranged to be manually moved in any particular direction but preferably in a door opening direction.

[0030] Thus, whereas the arrangement shown in Figures 1 and 2 allows for the transmission of torsional forces between lock barrel 14 and a latch mechanism, the arrangement of figures 5 and 6 additionally allows reciprocating motion in the direction shown by double-headed arrow A. When a key 116 (see Figure 6) is inserted in and rotates the lock mechanism, this rotation is transmitted via key interface slot 150 to cable end fitting 140 and thus to the cable 118. Conversely, if handle or lever 174 is lifted this motion is transferred to end surface 172 of the cable end fitting 140, therefore causing longitudinal movement of the cable 118 in direction A.

[0031] Referring to Figure 7, a means is shown for attaching ferrule 138 to a car body portion 206, such as an outer vehicle door skin. In this case notches or projections 164 on body 148 of ferrule 138 engage portion 206 to retain the ferrule in position. Moulding 142, forming part of the lock mechanism and or door handle, may then be fitted inside ferrule 138 as shown. Alternatively, or additionally, notch 164 or additional similar notches engage a surface, such as surface 144 of moulding 142 of the lock mechanism/door handle.

[0032] Referring to figure 8, components 210 of a lockable latch mechanism (not shown) for use in the latch assembly of the invention are shown. Components 210 comprises linear or axial movement means 212, rotating movement means 214 and cable abutment 216.

[0033] Axial movement means 212 is provided with a projection 218, which may be cylindrical as shown, to engage the release mechanism (not shown) of the latch mechanism (also not shown). Projection 218 extends from a substantially planar body 220 of means 212. Body 220 terminates at one end in a curved region 222 having a slot 224 as shown. Region 222 and slot 224 retain a ball drive 226 (also known as a second abutment), attached to the end of cable 18. Thus axial movement A of the cable 18 is transmitted through means 212 to operate the latch release mechanism.

[0034] Rotary movement means 214 comprises a substantially planar body 228 having an end 230 provided with a projecting stub 232. Cable 18 further comprises a drive 234, (also known as a first abutment) which may have a square cross section as shown. Drive 234 passes through a complementary aperture 236 in body 228 of means 214.

[0035] Drive 234 rotates with cable 18 and transmits rotational motion B of the cable to body 228. Also, drive 234 is moveable axially relatively to body 228, within aperture 236, with axial movement of cable 18, to which it is fixed.

[0036] Thus body 228 may remain in a fixed position relative to the rest of the latch mechanism (not shown), even when there is axial movement of the cable 18 and means 212. Preferably, drive 234 is elongate, positioned co-axially with cable 18, and has a generally rectangular cross section.

[0037] Rotational movement B of the body 228 causes end projection stub 232 to operate a locking mechanism (not shown), moving between a locked state B, and an unlocked state, B₂, as shown in the figure.

[0038] Cable abutment 216 engages an end region of cable sleeve 162, retaining the sleeve in a fixed axial position relative to the body of the latch mechanism (not shown). Sleeve 162 is gripped and retained within an aperture 238 provided in abutment 216.

[0039] In addition to operating the release mechanism of a latch mechanism, axial movement means 212 and rotary movement means 214 may perform other functions. For example they may operate switches or actuators for a central locking system such that keyed operation of the latch mechanism of one door can be transmitted to other vehicle doors.

[0040] Beneficially, the arrangements of the invention provide for adaptable connection between a lock unit and a latch mechanism and are particularly applicable where the latch mechanism forms part of a module. In the latter aspect of the invention, the arrangement allows for both rotary and linear motion to be transmitted from a key barrel/handle to a locking latch mechanism. The use of a flexible connector between the key barrel and the locking latch mechanism also allows the key barrel and the latch mechanism to be orientated at a range of angles to each other, thereby allowing the assembly to be used in a range of different car door designs, for example.

Claims

1. A latch assembly for securing a vehicle door or other closure including a lockable latch mechanism, a separate key actuated lock unit and a coupling means operatively drive connecting a locking input member of the latch mechanism, rotatable about a first axis, to a locking output member of the lock unit, rotatable about a second axis, the coupling means further operatively drive connecting a movement means, proximal the key actuated lock unit, to an unlatching input member of the lockable latch mechanism, operation of the movement means causing the coupling means to move in an axial direction to unlatch the lockable latch mechanism.
2. A latch assembly as defined in claim 1 in which the coupling means includes at least one flexible member enabling positive transmission of torque.
3. A latch assembly as defined in claim 2 wherein the flexible member comprises a cable.
4. A latch assembly as defined in claim 2 or 3 wherein the flexible member comprises at least a first and second helically wound cable positioned co-axially relative to each other.
5. A latch assembly as defined in claim 4 wherein the first and second cables are helically wound in opposing directions.
6. A latch assembly as defined in claims 4 or 5 in which the cable can withstand a higher torque when twisted in a first direction than when twisted in a second direction, and the latch assembly is arranged such that the cable is twisted in the first direction to unlock the latch mechanism.
7. A latch assembly as defined in any preceding claim wherein the flexible member has respective end connectors engaging, in use, complementary portions of the locking input member and locking output member.
8. A latch mechanism as defined in claim 7 wherein at least one end connector is tapered, engaging a respective complementary tapered portion of the locking input member or locking output member.
9. A latch assembly as defined in claims 2 to 8 wherein the output member of the movement means is operably connected to an end fitting of the flexible member, the end fitting comprises a planar body operably locating in a complementary cavity formed in a rotating portion of the lock unit, the end fitting being axially moveable within the cavity, and rotatable therewith.
10. A latch assembly as defined in any preceding claim wherein axial movement of the coupling means is effected by a handle.
11. A latch assembly as defined in claims 1 to 10 wherein the first axis is coincident with the second axis.
12. A latch assembly as defined in claims 1 to 10 wherein the first axis is parallel with the second axis.
13. A latch assembly as defined in claims 1 to 10 wherein the first axis is angled relative to the second axis.
14. A latch assembly as defined in claims 1 to 10 wherein the first axis skew relative to the second axis.
15. A coupling means for use in a latch assembly according to any preceding claim.
16. A coupling means as defined in claim 15 comprising a rod or cable having a first abutment for rotating a locking input member of a latch mechanism, a second abutment for operating an unlatching input member of a latch mechanism, a third abutment for providing rotation of the coupling means about an axis by a locking output member of a lock unit and a fourth abutment for providing movement of the coupling means along the axis by a movement means.
17. A coupling means as defined in claim 16 wherein the second abutment includes an elongate body arranged co-axially on the cable, the body passing in use through an aperture provided in the unlatching input member.
18. A coupling means as defined in claim 17 wherein the second abutment has a rectangular or other polygon shaped cross-section.
19. A sub assembly comprising the combination of a key actuated lock unit and a movement means, for use in a latch assembly according to any preceding claim.
20. A sub assembly as defined in claim 19 in which the movement means is a manually operable door handle.

FIGURE 1

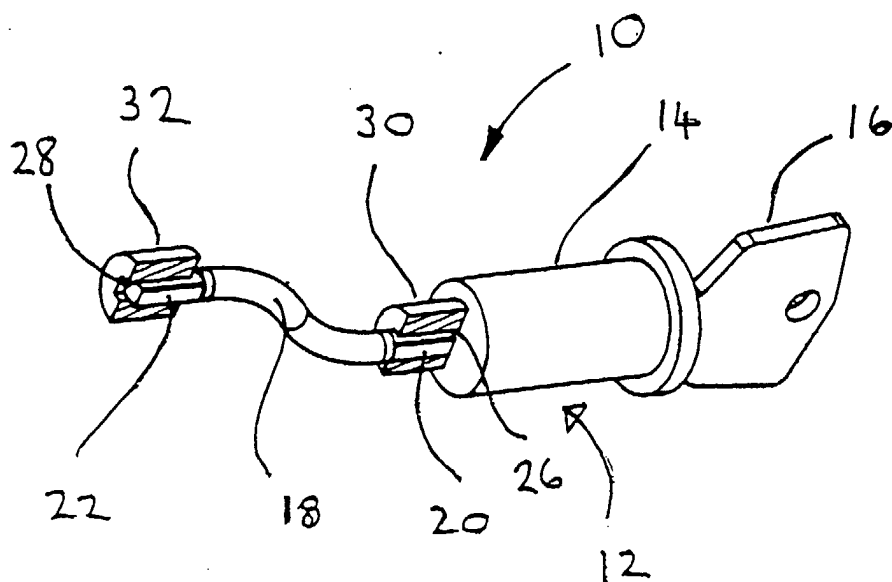


FIGURE 2

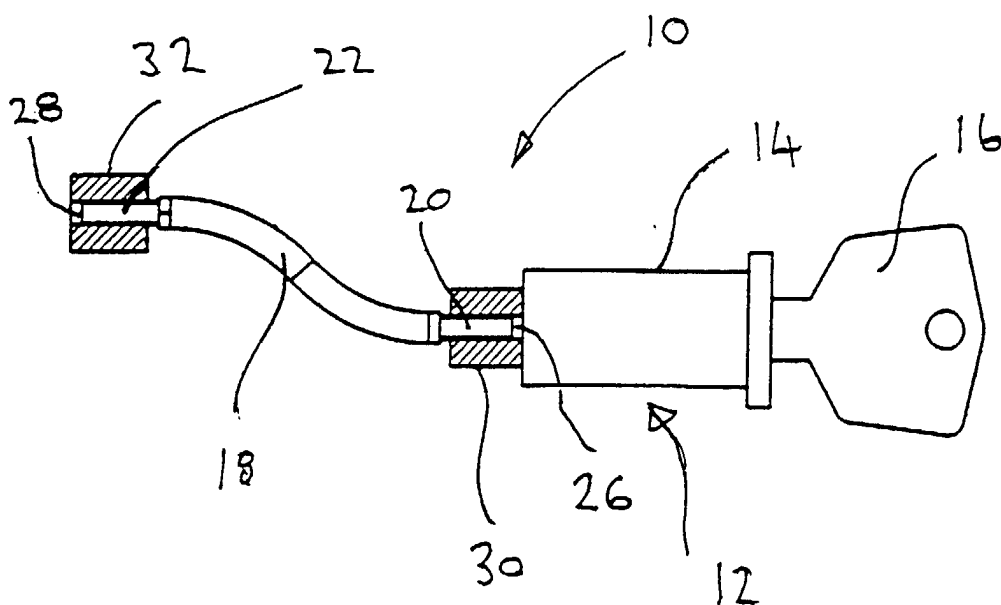


FIGURE 3

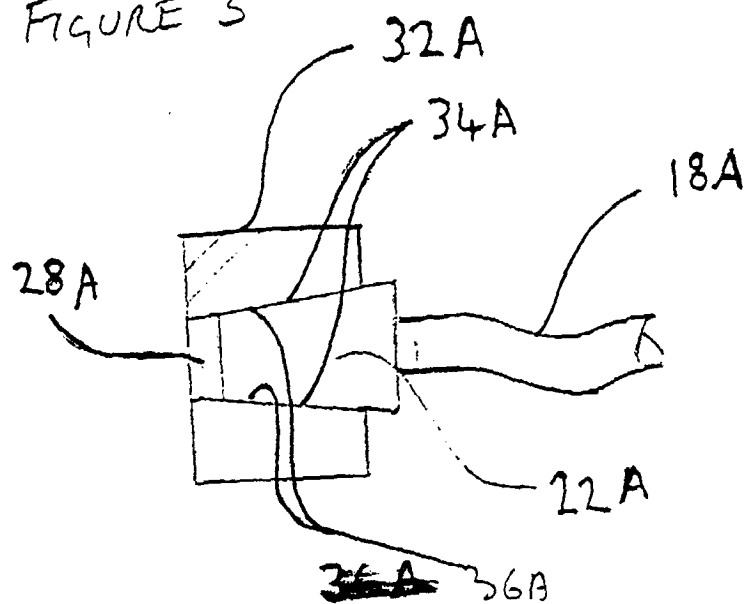
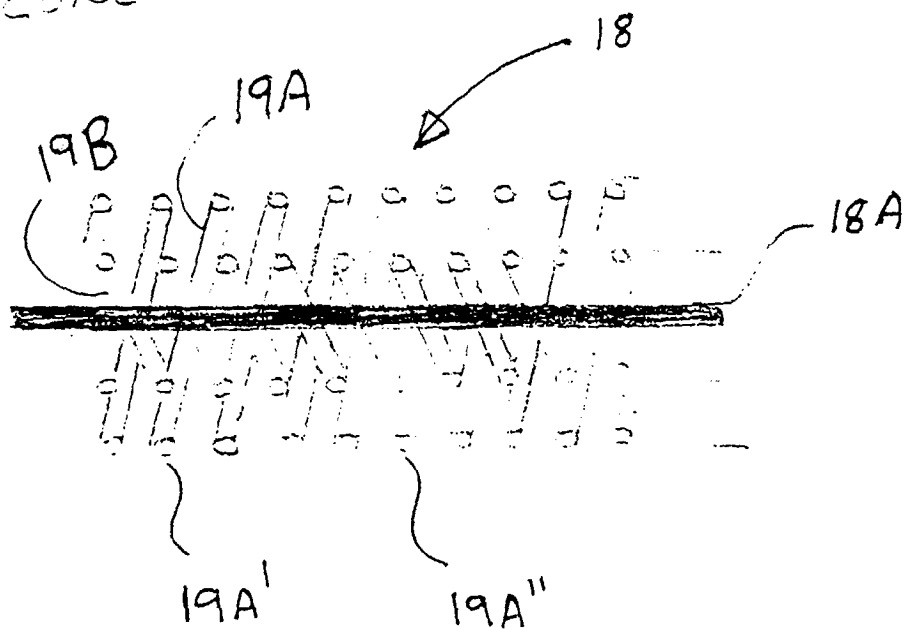


FIGURE 4



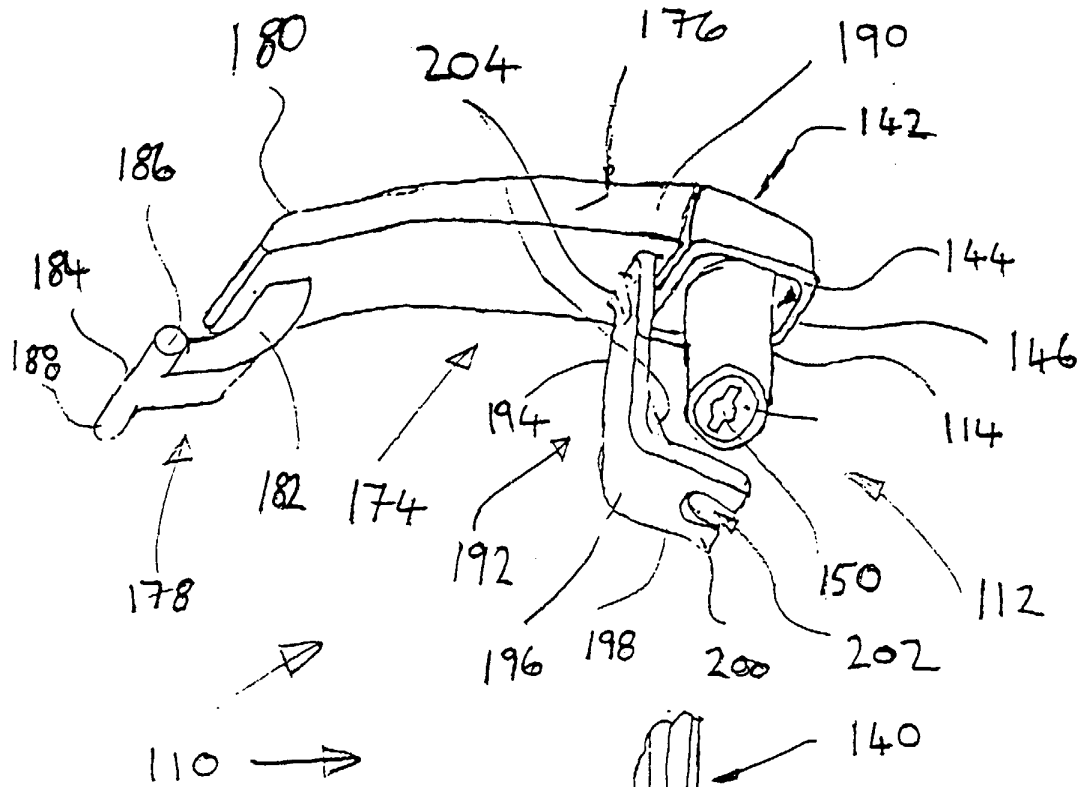
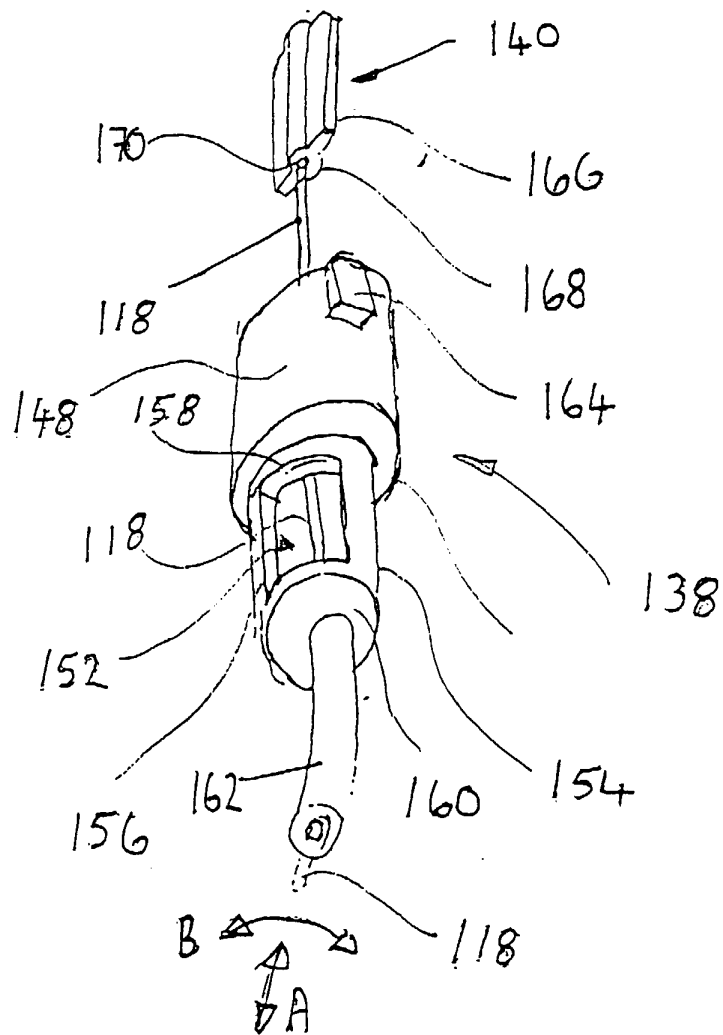


FIGURE 5



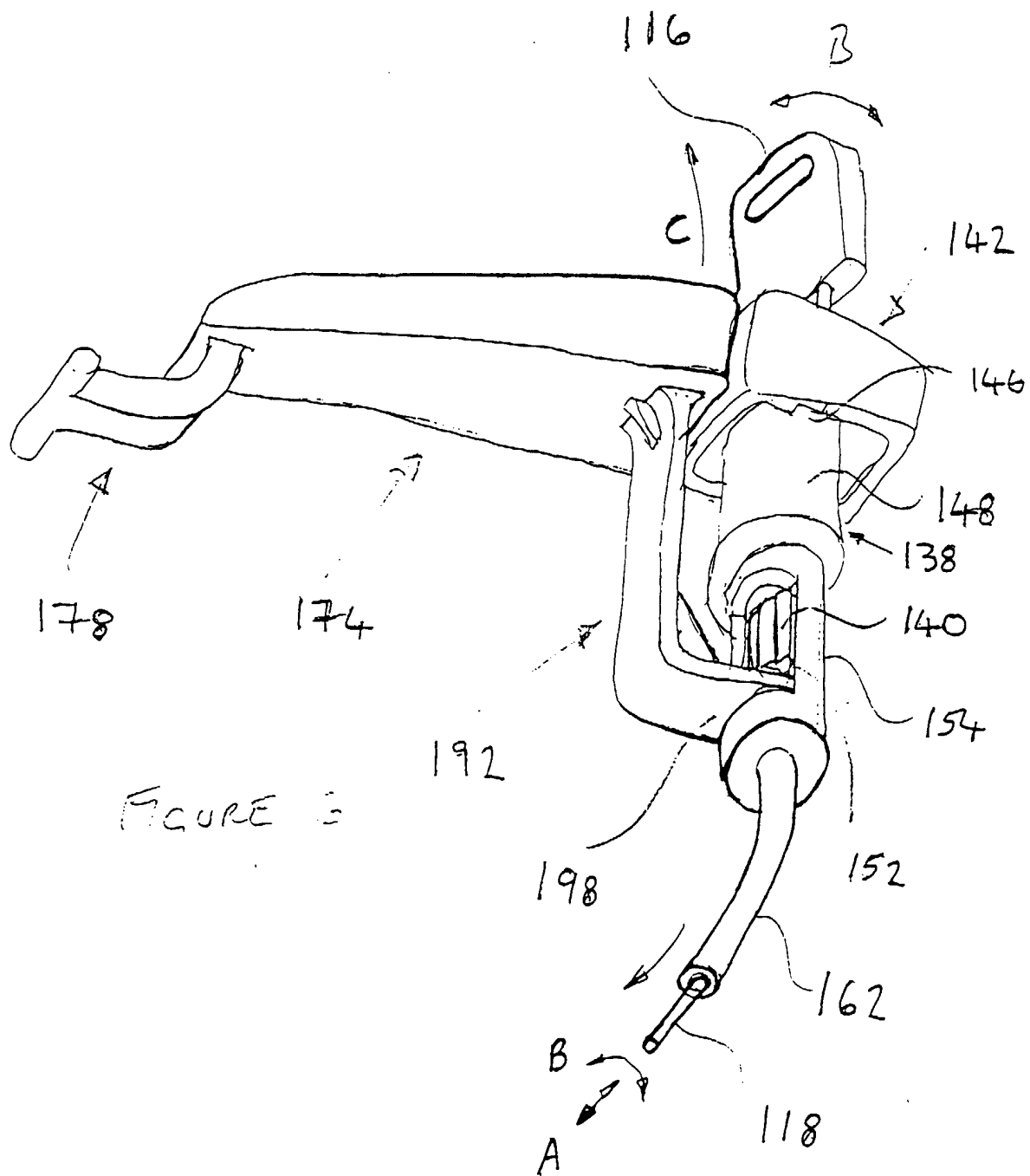
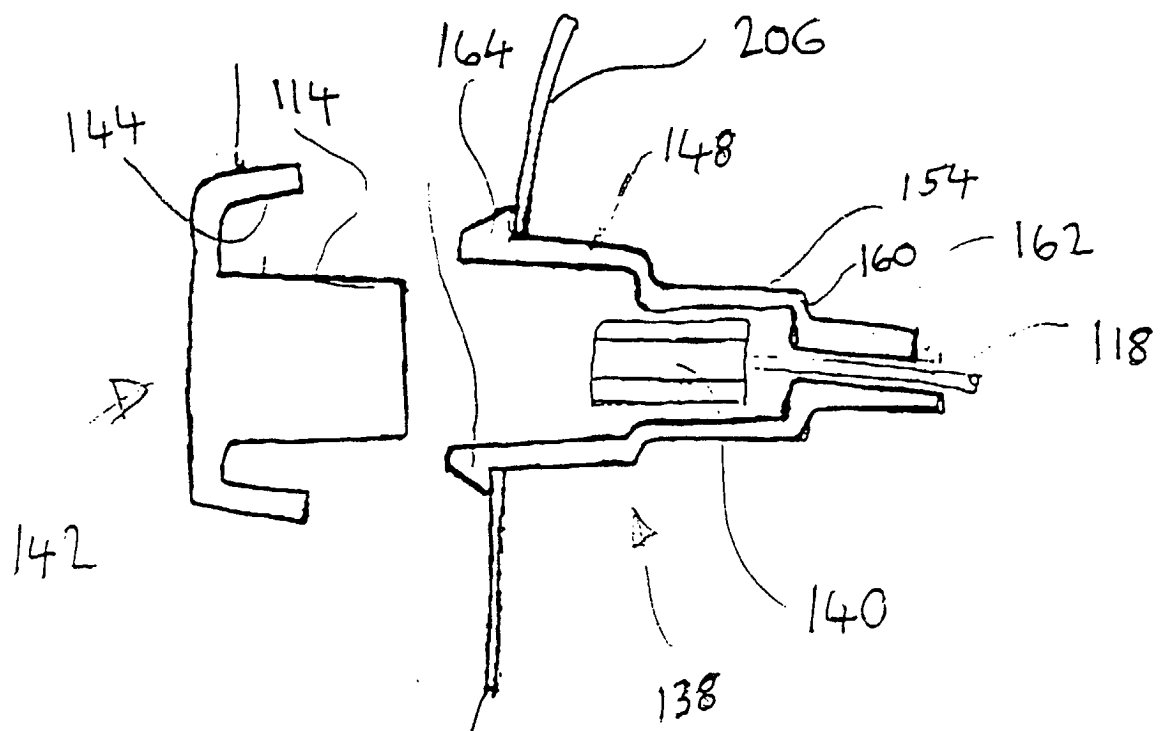
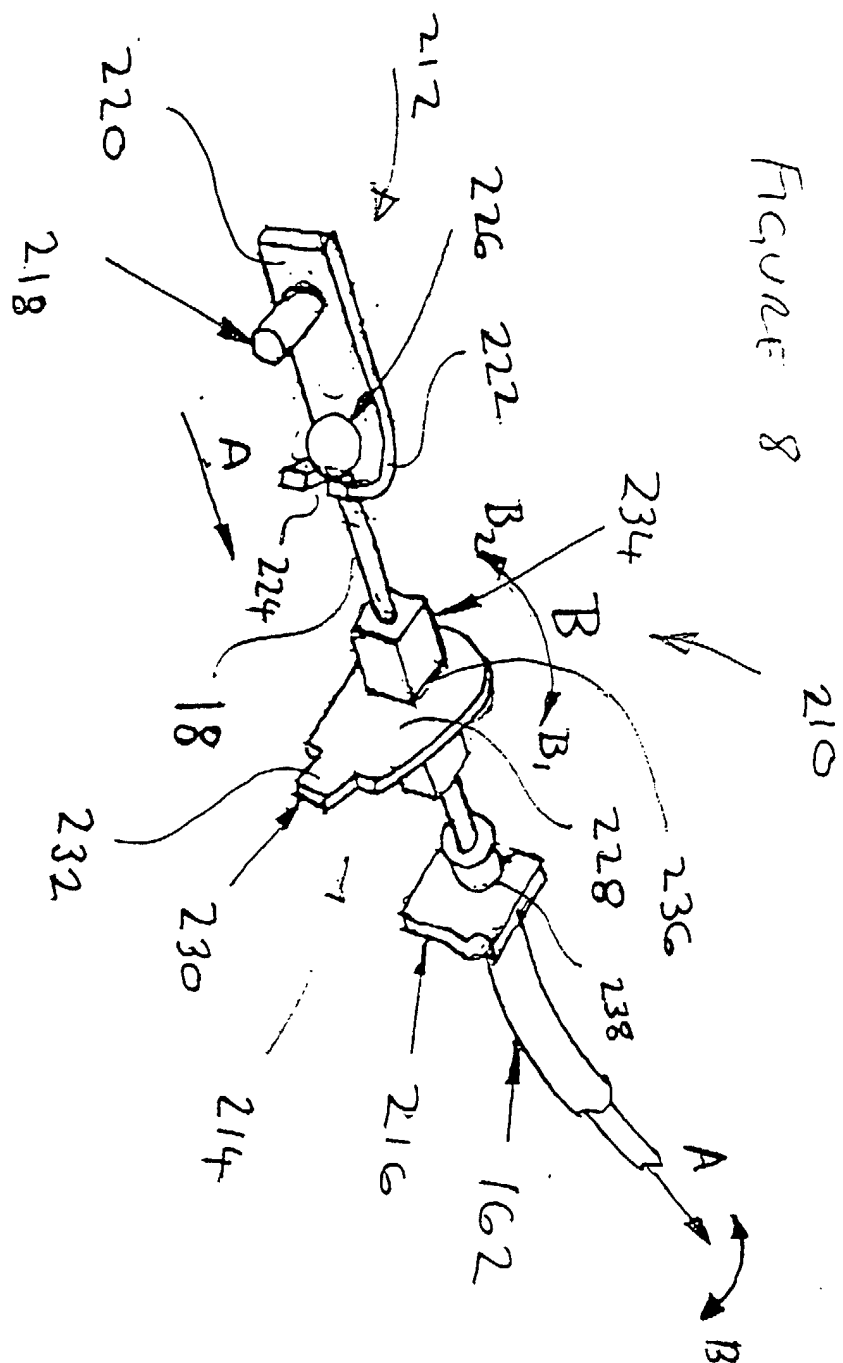


FIGURE 7







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EUROPEAN SEARCH REPORT

Application Number
EP 00 30 7157

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The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 15 December 2000	Examiner Van Beurden, 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			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 00 30 7157

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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