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Vehicle locking systems.

A multi-purpose switch assembly (10) used in combination with a latch assembly as part of a vehicle central door locking (CDL) system incorporates a switch shaft (14), see Figure 3, whose inner end is provided with camming formations (16) co-acting with switch contact blades (20) protected within a housing (12). Part of the shaft outside the housing carries selectively interchangeable levers enabling a standard switch assembly to be readily adapted to different CDL operating modes, thus the shaft may carry a first lever (44) in positive drive engagement with the shaft and directly coupled to a latch lever (42) of the latch mechanism so that the switch contacts are operated whenever locking or unlocking movement takes place and the shaft will conveniently also carry a separate key lever (52) not directly drivingly engaged therewith or with lever 44. Alternatively the shaft may carry a single lever (60) serving as the key lever of the latch mechanism but having lost motion engagement so that the shaft is only displaced during part of the full range of movement of the latter lever to provide for a second switching mode.

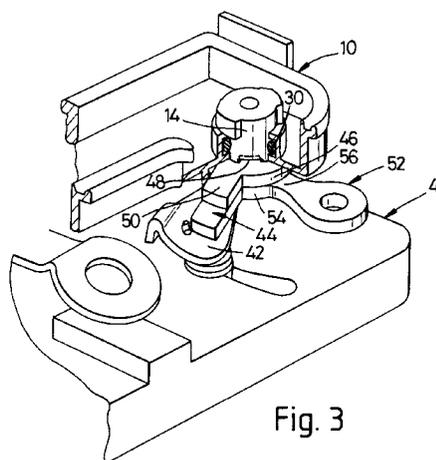


Fig. 3

This invention relates to vehicle door locking systems and more specifically to switch assemblies for electro-mechanical actuation of locking systems.

The continuing rapid increase in vehicle-related crime has led to ever more urgent need for improvements in built-in vehicle security both to ensure that all the doors of a vehicle can be speedily and positively locked by a simple operation and to make it much more difficult for vehicle locks to be broken or tampered with.

Central door locking (CDL) systems are finding increasing favour as standard original equipment even on mass-produced vehicles in the lower price ranges. The basic concept of CDL is to provide automatic positive locking of all the door latches of a vehicle from a single operation at a central point, typically in unison with the locking or unlocking of the latch assembly of the drivers door. The majority of CDL systems use electro-mechanical actuators in or associated with the slave door latches to lock and unlock them automatically in response to electro-mechanical sensor switches on or related to a master unit, e.g. the drivers door lock and/or its associated latch mechanism, through an electric or electronic control centre.

One or more master latch assemblies e.g. latch assemblies of the drivers door and often also that of the front passenger door, each include mechanism for locking the respective latch directly by actuation of a key lever when locking the door externally using the door key in conjunction with a lock cylinder of the mechanism, or internally by actuation of a sill lever, typically by manual shifting of a push-pull sill plunger internally of the door. Actuation of either lever causes the associated latch to be locked or unlocked depending on the direction of motion applied. Electrical lock actuation is achieved with the addition of an electro-mechanical actuator usually applied for selective shifting of the sill lever. On some vehicles the sill lever is manually actuated by press button or trigger, e.g. positioned on or adjacent the inside door handle, rather than a push-pull sill plunger but the principle is the same.

Use of such a latch assembly, e.g. on the drivers door, as the master unit in a CDL system is commonly achieved in one of two ways:-

A) Operation by either the key lever or the sill lever - a single sensing switch is mounted in the driver's door, e.g. in combination with an electrical actuator unit of that latch assembly. This switch will be actuated from the latch mechanism on movement of either the key or the sill lever during locking and unlocking. Thus the switch will only energise the circuit to the control centre for actuation of the other door locks in unison on a full movement of the key or sill lever and the master latch has to be at least partly mechanically driven between locked and unlocked conditions for ac-

tuation of the switch to take place, therefore the operating forces needed to effect locking of and from the drivers door may be high. This arrangement will be referred to as the "single switch mode".

B) Operation by either the key lever or an auxiliary control element - here two sensing switches are used, neither being directly linked to or associated with the mechanism of the latch itself, thus they may be separate from the latch unit. One switch will be linked directly to the key lever or the door key barrel so that it is responsive to movement of the key lever itself regardless of the state of the rest of the latch mechanism and the second switch is actuated by its own auxiliary control element, e.g. a button mounted at some convenient location inside the vehicle on the driver's door, dashboard or elsewhere. Operation of the sill lever of that latch will still effect mechanical locking or unlocking but the sill lever position does not play any part in the CDL operation. This arrangement has the advantage that electrical actuation through either of the switches can be effected immediately the key or auxiliary button or other element is operated and without the delay and loading of mechanically driving the related latch mechanism; all the latches including that of the driver's door will be electro-mechanically operated thereby from the control centre. This arrangement will be referred to as the "dual switch mode".

Arrangement B, the dual switch mode, is generally regarded as superior to single switch mode arrangement A and is favoured for vehicles in the upper price ranges.

Hitherto the need to provide for these different operating modes has necessitated manufacture and stocking of a range of different components, and different assembly and maintenance procedures.

The object of the invention is to provide greater flexibility of choice between the modes referred to above while utilising substantially standardised components and sub-assemblies so as to reduce manufacture, stock and assembly costs.

According to the invention there is provided a multi-purpose switch assembly for a vehicle CDL system comprising a mounting carrying switch contacts, a switch shaft rotatable in or on the mounting for opening or closing the contacts at respective angular positions of the shaft, and actuating levers selectively mountable on the shaft for angular displacement about the shaft axis, said levers comprising a first lever formed to have positive drive connection with the shaft when mounted thereon and to be selectively linked for direct displacement on actuation of door latch mechanism on or in combination with which the assembly is operatively located; and a second lever formed to have drive connection with the shaft, pre-

ferably with a degree of lost motion, and to be selectively linked for displacement on actuation of an exterior door key of or associated with said latch mechanism independently of any motion of that mechanism in use. Thus a single switch mode incorporating said assembly and related latch mechanism will be provide by use of the first lever; or a dual switch mode by substituting the second lever.

The second lever will conveniently be or will function as a key lever of the latch mechanism in use.

Where the first lever is used, in the single switch mode, the switch shaft will conveniently also carry a key lever of the latch mechanism in use in non-driving engagement thereon for movement independently of the first lever.

The invention further resides in the combination of a switch assembly as above defined and a vehicle door latch or latch mechanism and/or a vehicle CDL system including said assembly or said combination; and in a vehicle including the latter system.

In said combination the switch shaft is conveniently mounted with its axis coincident with the axis of angular movement of a lever of the mechanical locking and unlocking mechanism of that latch, and the first lever, when mounted, will be coupled directly to said mechanism lever for movement in unison therewith.

An example of the invention is now more particularly described with reference to the accompanying drawings wherein

Fig.1 is a plan view of part of a vehicle locking system switch assembly,

Fig. 2 is a diagrammatic perspective view (with parts broken away or omitted) of a portion of said assembly showing a switch shaft thereof,

Fig. 3 is a like view to Fig.2 but showing a first disposition of levers on said shaft and

Fig. 4 is a like view but showing an alternative disposition of another actuating lever on said shaft.

Referring firstly to Fig. 1 a switch assembly 10 is of unitary construction having its own housing 12 which can be built into or directly mounted on an electro-mechanically actuated door latch assembly of known kind.

Switch assembly 10 comprises a switch cam shaft 14 whose operative part within housing 12 includes a pair of angularly spaced radially projecting cam formations 16a, 16b.

The switch assembly has three connecting terminals which will be operatively connected to circuitry of the CDL system of the vehicle through a control centre (not shown) of the system in known manner.

A first terminal 18 leads to a pair of contact blades 20a, 20b shaped to be acted on respectively by formations 16a and 16b when shaft 14 is angularly displaced from a neutral position of rest shown in Fig. 1 in one or other direction during locking or unlocking respectively as referred to hereafter. A return spring

21 may be provided to bias the shaft to said neutral position if it is not positively returned thereto by the action of related mechanism.

The second terminal 22 carries a fixed contact 24 against which blade 20a closes when shifted by formation 16a, while third terminal 26 has a fixed contact 28 co-acting with contact blade 20b under the action of formation 16b.

Shaft 14 is journaled in and extends through the base of housing 12 as best seen in Fig. 2 (the contact blades 20 and fixed contacts 24,28 are not shown in Figs. 2-4 for clarity) and an O-ring seal 30 prevents ingress of dirt and oil which might otherwise reach the switch contacts.

The end portion 32 of shaft 14 remote from formation 16 and extending outside housing 12 is generally cylindrical and terminates in radially outwardly projecting lips 34. Parts of the cylindrical wall of portion 32 are cut away at diametrically opposite locations to provide drive notches 36 (one only visible in the drawings). These notches also permit limited flexure of the remaining wall parts enabling snap engagement with a lever or levers referred to hereafter. Said engagement is sufficient at least to retain the lever(s) in place up to final positioning of the assembly in or on the latch. Snap engagement may alternatively be provided by local deformation of lips 34 alone.

End portion 32 will receive a lever or combination of levers selected according to the mode of CDL operation desired for the particular latch and vehicle. Fig. 3 shows the arrangement for single switch mode and also illustrates the relationship of the completed switch assembly 10 to the relevant portions of the latch assembly 40. The latter includes a lever 42 which is an active part of the latch mechanism of the latch itself, switch assembly 10 being operatively so mounted that switch cam shaft 14 is coincident with the axis of angular movement of lever 42 during the mechanical locking and unlocking of the particular latch, this movement taking place regardless of whether actuation is by movement of a key barrel using an exterior key of the door or by operation of a sill button or other interior manual locking and unlocking actuator or otherwise.

In this mode switch assembly 10 is adapted to sense and respond directly to movement of lever 42 by being coupled to the latter through the medium of a first sensing lever 44 having an apertured boss 46 which is a push fit onto portion 32 of shaft 14 and which includes radially inwardly directed drive lugs 48 (one only shown) positively drive connecting it to shaft 14. An arm 50 of lever 44 projects radially from boss 46 and is shaped to include a formation (not shown) which locates in an aperture in latch lever 42 to couple lever 44 directly thereto for movement in unison therewith.

Boss 46 occupies an axially inner part of portion 32 and a key lever 52 locates by snap engagement as

aforesaid on the remaining outer part. A boss 54 of lever 52 is apertured to be journalled on shaft 14 but does not include any engaging lugs so that it can move angularly independently of said shaft and of lever 44. Key lever 52 has an arm 56 which will be operatively linked to and be moved by rotation of the key barrel for mechanical locking and unlocking of the latch in known manner.

In this single switch mode mechanical locking or unlocking whether by use of the sill button or equivalent or by the exterior door key will cause mechanical shifting of lever 42 and carry with it first lever 44, closing one or other of the pairs of switch contacts. The operation so sensed will cause the CDL control centre to actuate all the slave latches likewise.

The alternative arrangement for dual switch mode is shown in Fig.4. Here, instead of the combination of first sensing lever 44 and separate key lever 52 on shaft 14 a second and different sensing lever 60 is provided on its own. This lever serves as the key lever of the associated latch. Lever 60 has a deeper boss 62 occupying the full length of shaft end portion 32 and snap engaging thereon as referred to above. The central aperture of boss 62 includes a pair of drive lugs 64 (one only shown) which engage in the notches 36 of shaft 14. However, lugs 64 are less in angular width than the associated notches 36 so that there is a degree of lost motion in the drive between lever 60 and switch cam shaft 14. Thus when lever 60 is displaced angularly in either direction in its function as key lever on locking or unlocking respectively from the neutral position shown in Fig. 4 there will be a lag before it moves shaft 14 from its neutral position to close one or other of the pairs of switch contacts.

Lever 60 co-acts with the latch mechanism through lever 42 in known manner when the exterior door key is used to mechanically lock and unlock the associated latch directly. Again the latch serves as the master unit, with related electro-mechanical actuation of the remaining locks of the vehicle through operation of the switch contacts as part of the CDL system as referred to above. But in this mode switch assembly 10 is not affected by shifting of the latch mechanism itself or by operation of the interior sill button or equivalent. A second switch will be provided for effecting central locking from the interior of the vehicle from a button or other auxiliary control element as referred to above.

When switch assembly 10 is located on or in the latch assembly 40 and secured in place following mounting the chosen levers on shaft 14 the outer end of said shaft will locate closely against the other parts of the latch assembly so that it is impossible for levers 44 and 52 or lever 60 to become axially displaced from shaft 14, i.e. the security of the final assembly is not dependant on the snap engaging lip 34 of shaft 14.

It will be seen that a standard switch assembly 10 and latch assembly 40 can be used and only an inex-

pensive inventory of alternative levers 44,52 and 60 need be provided to enable speedy and simple provision at choice and according to immediate requirement of the vehicle assembly line of either single switch or dual switch mode.

Claims

1. A multi-purpose switch assembly (10) for a vehicle central door locking system comprising a mounting (12) carrying switch contacts (20, 24, 28), and a switch shaft (14) rotatable in or on the mounting and having camming means (16) for opening or closing the contacts at respective angular positions of the shaft; characterised in that the assembly further includes a plurality of actuating levers selectively interchangeably mountable on the shaft for angular displacement about the shaft axis, said levers comprising a first lever (44) formed to have positive drive connection with the shaft when mounted thereon and to be selectively linked for direct displacement on actuation of door latch mechanism (40) on or in combination with which the assembly is operatively located; and a second lever (60) formed to have drive connection with the shaft when mounted thereon to be selectively linked for displacement on actuation of an exterior door key of or associated with said latch mechanism independently of any motion of that mechanism in use.
2. An assembly as in Claim 1 characterised in that said second lever (60) is formed to have drive connection with the shaft (14) with a degree of lost angular motion.
3. An assembly as in Claim 1 or 2 characterised in that the second lever (60) is or will function as a key lever of the latch mechanism (40) in use.
4. An assembly as in Claim 1, 2 or 3 characterised in that said plurality of levers comprises a third lever (52) selectively mountable on the shaft (14) along with the first lever (44) but angularly movable independently of either the first lever or the shaft by not having any direct drive connection therewith, said third lever being or functioning as the key lever of the latch mechanism (40) in use.
5. An assembly as in any preceding claim characterised in that the mounting is constituted by a housing (12) of the assembly for operative attachment to a latch assembly comprising said door latch mechanism (40) in use, said housing operatively enclosing the switch contacts (20, 24, 28) and camming means (16) with the part of the shaft (14) which carries the lever or levers (44, 52, 60)

projecting outside the housing.

- 6. An assembly as in Claim 5 characterised in that an intermediate part of the shaft (14) is journaled in a wall of the housing (12) and is provided with sealing means (30). 5

- 7. An assembly as in any preceding claim characterised in that an end portion (32) of the shaft (14) remote from the camming means (16) is shaped for snap-engagement with the lever or levers (44 etc) to resist their axial displacement from the shaft once mounted thereon. 10
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- 8. The combination of a switch assembly (10) characterised as in any preceding claim and a latch assembly (40) comprising said door latch mechanism. 20

- 9. A combination as in Claim 8 characterised in that the latch mechanism (40) includes a latch lever (42) which is angularly displaced during locking and unlocking, the switch assembly being so mounted that the axis of the shaft (14) is co-incident with the axis of movement of said latch lever whereby, if the first lever (44) is selected, it will be directly coupled to the latch lever for said direct displacement. 25
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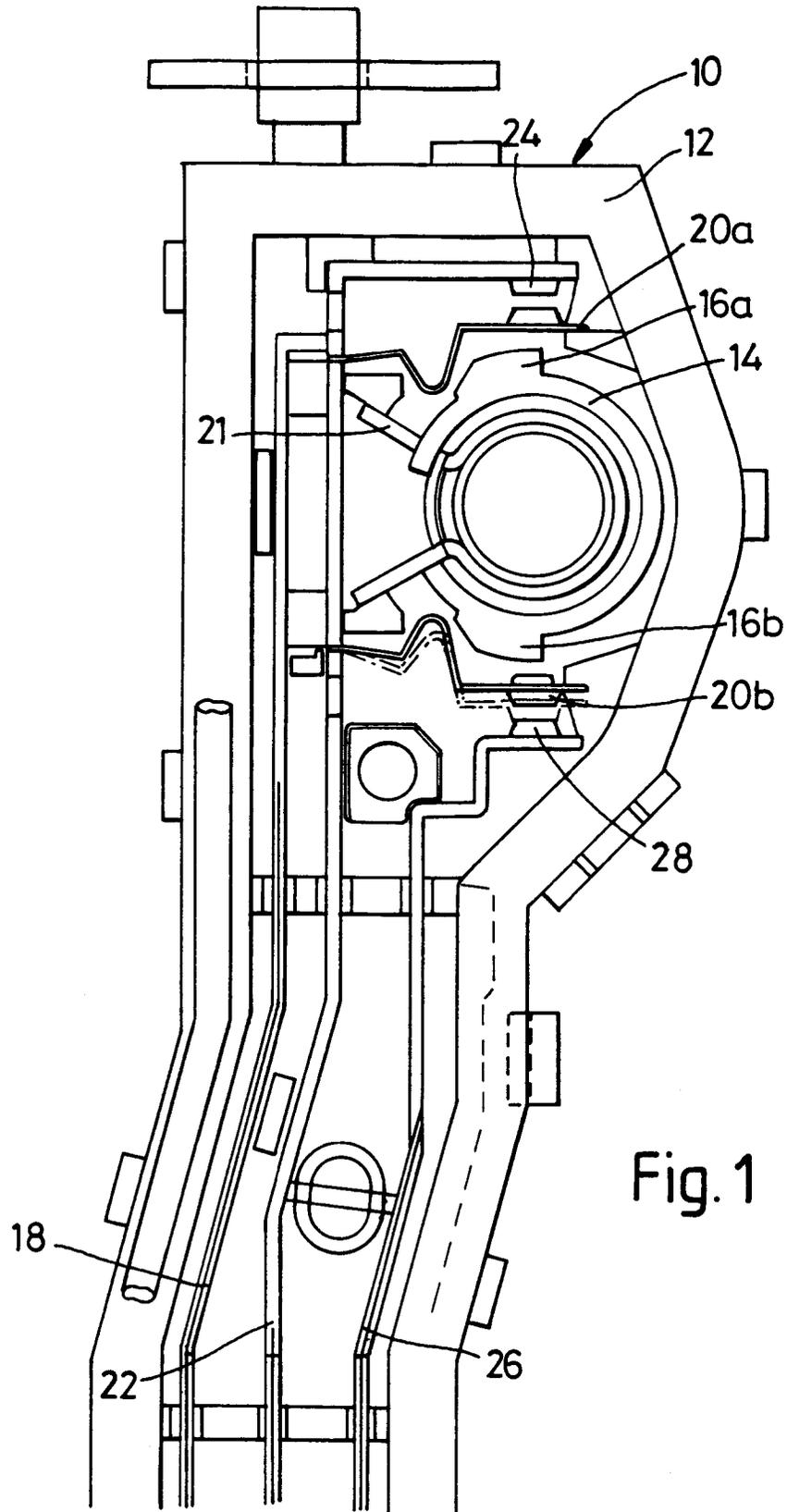
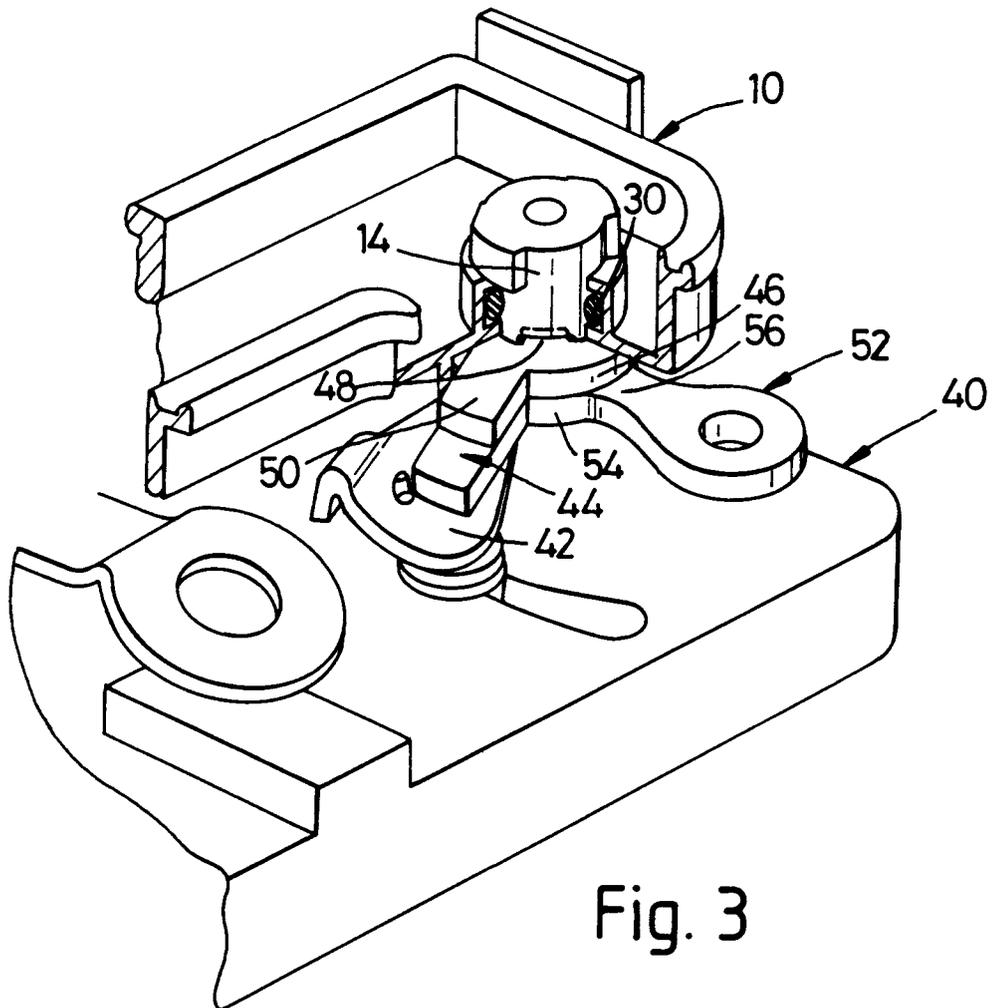
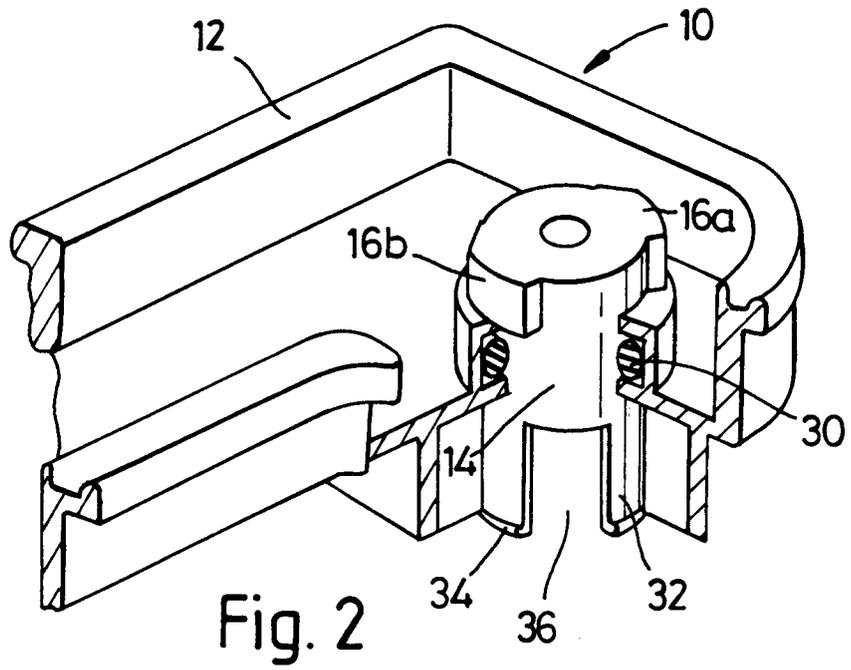


Fig. 1



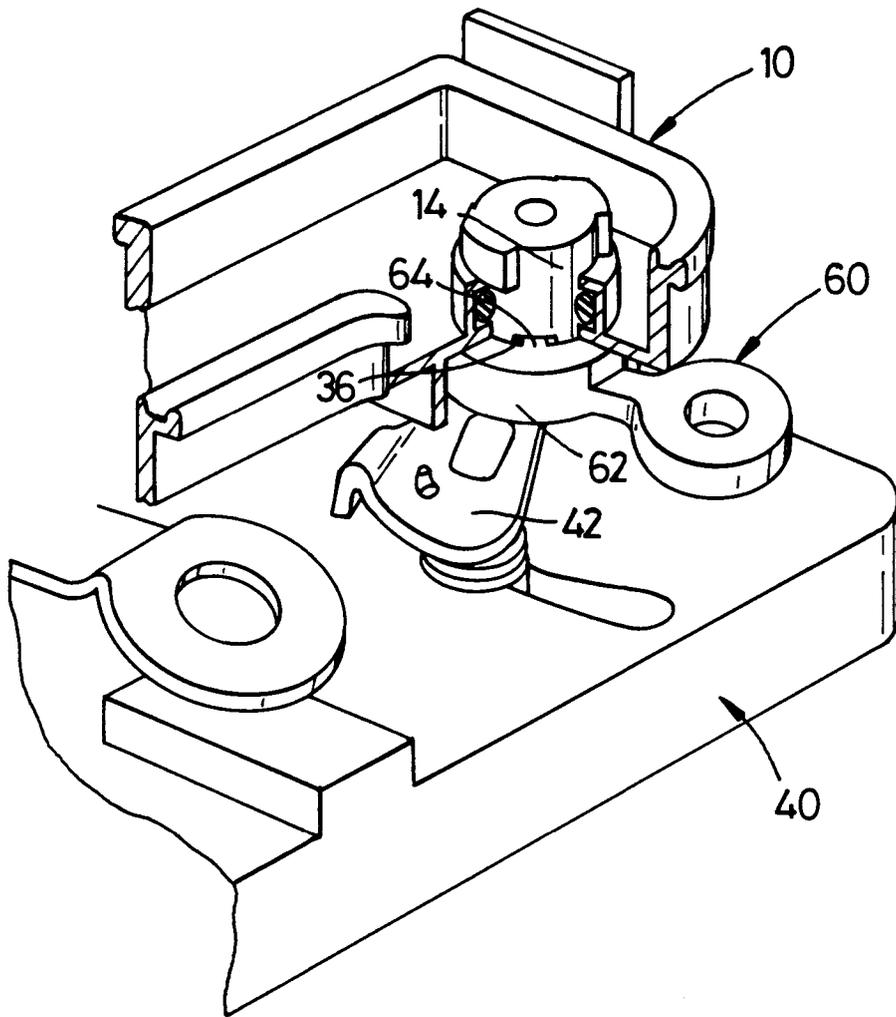


Fig. 4



European Patent
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EUROPEAN SEARCH REPORT

Application Number

DOCUMENTS CONSIDERED TO BE RELEVANT			EP 93301054.8
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	<p><u>GB - A - 2 240 583</u> (BOMORO BOCKLENBERG & MOTTE GMBH & CO. KG) * Fig. 6-11; claims 4-16 *</p> <p>--</p>	1-9	E 05 B 65/12
A	<p><u>GB - A - 1 557 208</u> (ENOCH PINSON LTD.) * Fig. 1-3; claims 1-5 *</p> <p>--</p>	1-9	
A	<p><u>FR - A - 2 637 937</u> (NEIMAN) * Fig. 1-6; claims 1-7 *</p> <p>--</p>	1-9	
A	<p><u>FR - A - 2 470 837</u> (SODEX-MAGISTER D'EXPLORATION DES BREVETS NEIMAN) * Fig. 1-12; claims 1-7 *</p> <p>----</p>	1-9	
The present search report has been drawn up for all claims			<p>TECHNICAL FIELDS SEARCHED (Int. Cl.5)</p> <p>E 05 B</p>
Place of search		Date of completion of the search	Examiner
VIENNA		30-07-1993	CZASTKA
<p>CATEGORY OF CITED DOCUMENTS</p> <p>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</p>			<p>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</p> <p>..... & : member of the same patent family, corresponding document</p>

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