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(54) Latch Mechanism

(57) A latch mechanism (10) comprising a drive input means (12) arranged coaxially with a fixed housing (14), and an output shaft (16) coaxially arranged therewith, the output shaft being moveable in sequential rotational and axial modes of operation as result of rotation of the drive input means, the housing being provided with a guide cam follower (60) engaging a guide cam surface (30) on the output shaft, the guide cam surface having a circumferential portion (34) and an axial portion (36) to control the sequential rotational and axial modes, the drive input means further being provided with a drive cam follower (70) engaging an axially inclined drive cam surface (50) on the output shaft so as to be capable of converting rotational movement of the drive input means into the axial movement of the shaft when in the axial mode of operation.

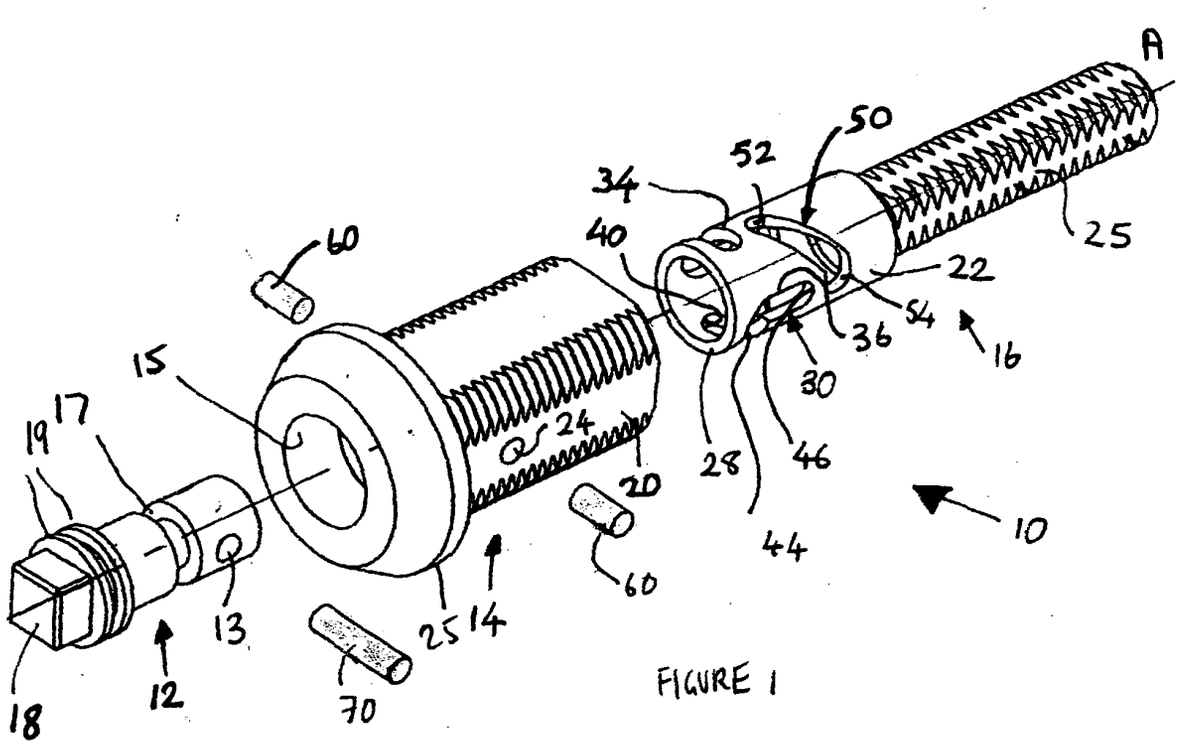


FIGURE 1

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Description

[0001] The present invention relates to a latch mechanism, in particular to a pull-up type latch mechanism for use with doors, for example cabinet doors.

[0002] Known pull-up type latch mechanisms include a handle which upon rotation of the handle imparts two sequential stages of motion to a latch pawl connected to the mechanism. Starting from an unlatched state, the first stage moves the latch pawl rotationally, and the second stage moves the latch pawl axially. The latch mechanism includes drive and guidance features to provide for this sequential rotational and axial motion.

[0003] Such pull-up type mechanism are known, and are shown in, for example GB2158866 and GB2153426 (both Southco Inc.). GB2153426 discloses an arrangement including two pins, and, as is apparent from the drawings, requires many components, resulting in a mechanism which is expensive to produce and assemble. GB2158866 on the other hand utilises a single pin and concentric sleeve arrangement, resulting in a requirement for fewer parts. However the cost of manufacturing the sleeves is high, in particular when small production runs of latches are required.

[0004] The present invention seeks to overcome, or at least mitigate the problems of the prior art.

[0005] Thus according to the present invention there is provided a latch mechanism comprising a drive input means arranged coaxially with a fixed housing, and an output shaft coaxially arranged therewith, the output shaft being moveable in sequential rotational and axial modes of operation as result of rotation of the drive input means, the housing being provided with a guide cam follower engaging a guide cam surface on the output shaft, the guide cam surface having a circumferential portion and an axial portion to control the sequential rotational and axial modes, the drive input means further being provided with a drive cam follower engaging an axially inclined drive cam surface on the output shaft so as to be capable of converting rotational movement of the drive input means into the axial movement of the shaft when in the axial mode of operation.

[0006] Advantageously this provides a simple latch mechanism with the cam surfaces located on the shaft determining the motion of the shaft.

[0007] The drive cam surface preferably includes a drive cam circumferential portion located at one end of the surface, the drive cam circumferential portion allowing further rotation of the drive pin without moving the shaft axially or rotationally. An alternative drive cam surface includes a drive slot angled portion, the drive slot angled portion allowing further rotation of the drive cam follower to cause the shaft to move axially in the opposite direction.

[0008] One advantage of this arrangement is that the angled or circumferential portion provides a rest or positive location position at the full extent of the axial travel of the shaft.

[0009] In another embodiment, the drive input means includes an annular recess, the guide cam follower engaging with the annular recess to axially retain the drive input means in the housing. Thus a simple means of retaining the drive input means within the housing is provided.

[0010] Furthermore, the output shaft is retained within the housing by engagement of the drive cam follower with the drive cam surface, and therefore, in combination with the guide cam follower, the whole latch mechanism is held together. Thus the mechanism can be easily assembled.

[0011] In another embodiment, the axially inclined drive cam surface is arranged such that one end is proximate the axial portion and the other end is proximate the circumferential portion. By arranging the drive and guide cam surfaces in such a way, the output shaft depth can be minimised, thereby minimising the depth of the latch.

[0012] According to a second aspect of the present invention there is provided a latch assembly including a handle, a latch pawl, and a latch mechanism comprising a drive input means arranged coaxially with a fixed housing, and an output shaft coaxially arranged therewith, the output shaft being moveable in sequential rotational and axial modes of operation as result of rotation of the drive input means, the housing being provided with a guide cam follower engaging a guide cam surface on the output shaft, the guide cam surface having a circumferential portion and an axial portion to control the sequential rotational and axial modes, the drive input means further being provided with a drive cam follower engaging an axially inclined drive cam surface on the output shaft so as to be capable of converting rotational movement of the drive input means into the axial movement of the shaft when in the axial mode of operation, in which the handle is connected to the drive input means, and the latch pawl is connected to the output shaft, such that a transmission path is formed between the handle and the latch paw.

[0013] According to a third aspect of the present invention there is provided a method of assembling a latch mechanism comprising the steps of providing a drive input means, providing a housing, providing an output shaft, inserting the drive input means into a sleeve portion of the output shaft, locating a drive pin through a drive slot of the output shaft and through a hole in the drive input means, inserting the drive input means and output shaft into the housing, then locating guide pins through a hole in the housing and through a guide slot in the output shaft so as to retain the drive input means and the output shaft within the housing.

[0014] Preferably the method of assembling a latch mechanism further includes the step of connecting a handle to the drive input means.

[0015] Preferably the method of assembling a latch mechanism further includes the step of connecting a latch pawl to the output shaft.

[0016] The present invention will now be described by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is an exploded perspective view of a latch mechanism according to an embodiment of the present invention;

Figure 2 is a flattened schematic view showing the guide and drive slots of the latch mechanism of figure 1;

Figure 3 is a perspective view of the latch mechanism of figure 1 after assembly;

Figure 4 is a side partial sectional view of the latch mechanism of figure 1 mounted on a cabinet door, with the latch mechanism in an unlatched condition,

Figure 5 is a flattened schematic view showing the position of guide and drive pins with the latch mechanism in an unlatched condition;

Figure 6 is a flattened schematic view showing the position of guide and drive pins with the latch mechanism in a partially latched condition;

Figure 7 is a side partial sectional view of the latch mechanism of figure 1 mounted on a cabinet door, with the latch mechanism in a fully latched condition;

Figure 8 is a flattened schematic view showing the position of guide and drive pins with the latch mechanism in a fully latched condition; and

Figure 9 is a flattened schematic view showing an alternative drive slot.

[0017] Figure 1 shows a latch mechanism 10 having input drive means in the form of a generally cylindrical drive component 12, a housing 14, and an elongate output shaft 16. The drive component 12, housing 14, and shaft 16 are aligned along a longitudinal axis A when assembled (see Figure 3).

[0018] The drive component 12 has a transverse through hole 13 located proximate one end, and a square drive formation 18 located at its other end. The square drive formation 18 enables a handle 82 (shown in figure 4) to be releasably connected thereto. In other embodiments the drive component may have an alternative drive, for example, a hexagonal drive, or an integral handle. The drive component 12 further includes an annular recess 17, and ring portions 19 located adjacent the square drive formation 18.

[0019] The housing 14 has a substantially axial cylindrical through bore 15 and a substantially square or non-circular threaded outer surface 20. The housing 14 includes two co-axial transverse through holes 24 extending between the outer surface 20 and the through bore 15. An enlarged front portion 25 is provided on the housing to enable the latch to be mounted on a door 90 or the like (see Figure 4).

[0020] The shaft 16 has a co-axial sleeve portion 22 and threaded portion 25 with the threaded portion having to substantially square cross-section. The sleeve portion 22 is dimensioned to receive a portion of the drive component 12 and allow both relative axial and rotation movement to occur therebetween. The threaded portion allows connection of a latch pawl 84 (shown in figure 4), such that relative rotation between the latch pawl 84 and the threaded portion is prevented, but the axial position may be adjusted by the use of nuts (not shown) or the like. In other embodiments, the latch pawl 84 may be non-adjustably secured to the shaft 16.

[0021] The sleeve portion 22 includes a guide cam surface in the form of a pair of identical guide slots 30, and a drive cam surface in the form of a pair of identical substantially helical drive slots 50. The guide slots 30 are angularly spaced by 180 degrees. Drive slots 50 are also arranged such that they are angularly spaced by 180 degrees. The drive slots may take any form providing the slots have an axial and a circumferential component.

[0022] In another embodiment the drive and guide cam surfaces could be in the form of radial recesses in the sleeve 22.

[0023] Figure 2 shows more clearly the features of each guide 30 and drive slot 50. The guide slot 30 is generally L-shaped and includes a circumferential portion 34 and an axial portion 36 which is substantially perpendicular to the circumferential portion 34.

[0024] The circumferential portion 34 has a circumferential end 40 and is joined to the axial portion 36 at junction 44 opposite end 40. The axial portion 36 has an axial end 46. Thus junction 44 defines the transition between the axial portion 36 and the circumferential portion 34 such that, in effect, the guide slot 30 is a contiguous slot defined by the axial and circumferential portions. The circumferential portion has an inside surface 63. The circumferential end 40 and the junction 44 are angularly spaced by substantially 90 degrees. In other embodiments this angular spacing can be varied, the effect of which will be described later.

[0025] The helical drive slot 50 has a first drive slot end 52 and a second drive slot end 54 and a helical front surface 56 between the ends. The drive slot includes a drive slot circumferential portion 57 which is adjacent the second end, such that the drive slot 50 has a helical and circumferential profile.

[0026] The first 52 and second 54 drive slot ends have an angular separation of substantially 90 degrees, and an axial separation of X. The second drive slot end 54 and the first axial end 46 of the guide slot 50 are located substantially at the same circumferential position on the outer wall, i.e. no angular separation. The first drive slot

end 52 and the circumferential end 40 of the guide slot 30 are radially opposite, i.e. have an angular separation of substantially 180 degrees. The first drive slot end 52 is proximate the circumferential end 40 of the other one guide slot 30, and the second drive slot end 54 is proximate the axial end 46 of the other guide slot 30. Arranging the drive 30 and guide slots 50 in this way minimises the space required on the sleeve 28 of the output shaft 16, and thus minimises the axial depth of the mechanism.

[0027] The latch mechanism further includes a guide cam follower in the form of a pair of guide pins 60 which locate in through holes 24, each guide pin protruding into the guide slot 30 of the shaft 16 when assembled, and a drive cam follower in the form of a drive pin 70 which locates in through hole 13, respective drive pin ends protruding into both drive slots 50 when assembled.

[0028] Figure 3 shows the latch mechanism 10 after assembly, where it can be seen that the drive component 12 and the sleeve portion 22 of the shaft 16 are received in the cylindrical housing 14, and a portion of the drive component 12 is received in the sleeve portion. The threaded portion 25 of the shaft protrudes from the housing. Assembly is achieved first by fitting the drive component 12 in the sleeve portion 22 and locating pin 70, then by inserting drive component 12 and shaft 16 into the housing 14, and finally by fitting and securing pins 60 in holes 24 such that the pins locate in guide slots 30. Once the drive component is assembled into the housing 14, the ring portions 19 abut against the bore 15 so as to form a seal and prevent unwanted material from entering the bore 15. The ring portions 19 may retain an additional resilient O-ring type seal (not shown) therebetween if further sealing is required.

[0029] Once assembled, guide pins 60 also locate on opposite sides of the annular recess 17, thereby retaining the drive component 12 within the housing 14. However the principal function of the guide pins 60 is to cooperate with the axial 36 and circumferential 34 portions of the guide slot 30 so as to control shaft movement between rotational and axial movement.

[0030] Drive pin 70 engages with the drive slot 50 so as to drivingly connect the drive component 12 to the shaft 16, the shaft movement being controlled by the guide slot 30.

[0031] Figure 4 shows the latch mechanism 10 mounted onto door 90 of a cabinet 86 e.g. by using a nut (not shown) screwed onto outer surface 20 of housing 14. A handle 82 is releaseably connected to the drive component, and a latch pawl 84 connected to the threaded portion 25 of the shaft. The cabinet 86 has a frame 88 onto which a door 90 locates. The frame 88 has a resilient seal (not shown) which may go into compression when it comes into contact with the door 90 to create a substantially weatherproof seal.

[0032] The position of the latch pawl in relation to the frame determines whether the latch mechanism 10 is fully unlatched (in which the latch pawl is misaligned with the frame and the door can thus be opened), partially latched (in which the latch pawl is aligned with the frame but the seal is not compressed and full opening of the door is prevented), or fully latched (in which the latch pawl 84 is aligned and engaged with frame such that the seal is compressed and the door may not be opened).

[0033] Operation of the latch mechanism is as follows, noting that figures 5, 6, and 8 show the position of the guide pin 60 and drive pin 70 in the corresponding guide slot 30 and drive slot 50 as the latch mechanism moves between unlatched, partially latched and fully latched conditions.

[0034] Referring to figure 4, the latch mechanism is in an unlatched condition, with latch pawl 84 misaligned with the frame 88. Figure 5 shows that the drive pin 70 is located at the first drive slot end 52, and guide pin 60 is located at the circumferential end 40 of the guide slot.

[0035] Rotation of the drive component 12 through 90 degrees (typically clockwise) via the handle 82 (indicated by arrow R) results in the drive pin 70 bearing against its helical front surface 56 but being prevented from sliding along slot due to guide pin 60 being in the circumferential portion 34 of slot 30, resulting in rotation of the shaft until the guide pin 60 abuts against the junction 44 (figure 6). Thus during handle rotation, the guide pin 60 abuts against the inside surface 63 of the circumferential portion 34 so as to prevent axial movement of the shaft, but allow rotational shaft movement. During rotation of the shaft, the latch mechanism has moved from the unlatched condition, to a partially latched condition where the latch pawl 84 overlies the frame 88.

[0036] It will be appreciated that the limit of rotational movement of the handle is determined by the angular separation of the first end 40 and the junction 44. In this embodiment a rotation through approximately 90 degrees is permitted.

[0037] As the junction 44 has now been reached, further rotation of the shaft is prevented. However, as pin 60 is now in axial portion 36 of guide slot 30, axial movement of shaft 16 may occur. Thus, rotation of the drive component 12 through a further 90 degrees via the handle 82 results in the drive pin 70 sliding between the first drive slot end 52 (figure 6) and the second drive slot end 52 (figure 8). As the drive pin 70 slides between the first 52 and second 54 ends, the shaft is driven axially (to the left when viewing figure 4), to a position where the drive pin 70 abuts against the second end 54 of the drive slot, and the guide pin 60 is at the axial end 46 of the guide slot 30. As drive pin 70 slides between the first 52 and second 54 ends of the drive slot, there is no rotational movement of the shaft. With reference to figure 8, it can be seen that after rotation of the handle through a further 90 degrees, the latch pawl 84 is in engagement with the frame 88 having moved a distance X towards the frame and brought the seal into a compressed state. In the final stage of the latching process, drive pin 70 enters the circumferential portion 57 of the drive slot 50, at which

position the fully latched state of the latch mechanism can be maintained, since the resilient force of the seal is prevented from driving the shaft 16 back out of the housing 14.

[0038] Thus it can be seen that by rotating the handle through 180 degrees, the first 90 degrees moves the shaft rotationally by 90 degrees, with no axial shaft movement, and the second 90 degrees moves the shaft axially by a distance X with no rotation. The axial motion of the shaft causes the resilient seal to be compressed thereby improving the seal between door 90 and frame 88. Such a seal may not be achieved by the use of a latch mechanism imparting just a rotational motion to a latch pawl.

[0039] The procedure described above relates to rotating the handle through 180 degrees to move the latch from an unlatched to a fully latched condition. To move the latch from a fully latched to an unlatched condition the above procedure is reversed by rotating the handle in the opposite direction. It will be appreciated that the unlatching sequence occurs as a reverse of the latching sequence. Namely, an axial movement of the shaft occurs prior to rotational movement thereof.

[0040] In another embodiment the drive slot 50 may be include an angled portion 61, as shown in figure 9. The angled portion 61 provides an "overcentre" positive location for the drive pin 70 in the fully latched condition. It will be appreciated that as the drive pin 70 moves into the angled portion, a small amount of axial shaft movement in the opposite direction occurs under the influence of the resilient seal.

[0041] In the embodiment of figures 1 to 9, the axial shaft movement X corresponds to a predetermined handle rotation, in this case 90 degrees, i.e. rotating the handle through 90 degrees moves the shaft a distance X axially. In another embodiment, the drive slot could be arranged to provide the same axial movement X, but alter the amount of handle rotation required by altering the angular separation of the drive slot ends. This will alter the mechanical advantage of the mechanism to make the amount of rotational force required higher or lower for a given axial movement X.

[0042] Similarly, it is possible to vary the axial movement of the shaft by increasing the axial separation of the drive slot ends.

[0043] Thus by altering the angular and axial separation of the drive slot ends it is possible to easily adapt the latch mechanism for different applications where different rotational and/or axial latch pawl movement is required.

[0044] In another embodiment, the circumferential portion of the guide slot could be provided by an axial recess in the surface of the free end of sleeve portion 22. The shaft would be free to rotate along the extent of the recess, and axial movement would be prevented by the guide pin abutting against the recess, not the inside surface 63.

[0045] In another embodiment, the drive cam surface could be in the form of a single drive slot, and the guide cam surface could be in the form of a single guide slot, or by three or more drive and guide slots arranged around the sleeve 22.

Claims

1. A latch mechanism (10) comprising a drive input means (12) arranged coaxially with a fixed housing (14), and an output shaft (16) coaxially arranged therewith, the output shaft being moveable in sequential rotational and axial modes of operation as result of rotation of the drive input means, the housing being provided with a guide cam follower (60) engaging a guide cam surface (30) on the output shaft, the guide cam surface having a circumferential portion (34) and an axial portion (36) to control the sequential rotational and axial modes, the drive input means further being provided with a drive cam follower (70) engaging an axially inclined drive cam surface (50) on the output shaft so as to be capable of converting rotational movement of the drive input means into the axial movement of the shaft when in the axial mode of operation.

2. A latch mechanism according to claim 1 in which the drive cam surface includes a drive cam circumferential portion (57) located at one end of the surface, the drive cam circumferential portion allowing further rotation of the drive pin without moving the shaft axially or rotationally.

3. A latch mechanism according to claim 1 in which the drive cam surface includes a drive cam angled portion (61), the drive cam angled portion allowing further rotation of the drive cam follower to cause the shaft to move axially in the opposite direction.

4. A latch mechanism according to any preceding claim in which the drive input means includes an annular recess (17), the guide cam follower engaging with the annular recess to axially retain the drive input means in the housing.

5. A latch mechanism according to any preceding claim in which the output shaft is axially retained within the housing by engagement of the drive cam follower with the drive cam surface.

6. A latch mechanism according to any preceding claim in which the axially inclined drive cam surface is arranged such that a first end (52) is proximate a circumferential end (40) of the circumferential portion of the guide cam surface, and a second end (54) is proximate an axial end (46) of the axial portion of the guide cam surface.

7. A latch mechanism according to any preceding claim in which the axially inclined drive cam surface is arranged such that a first end (52) is angularly separated from a circumferential end (40) of the circumferential portion of the guide cam surface by substantially 180 degrees and a second end (54) is angularly separated from an axial end (46) of the axial portion of the guide cam surface by substantially 0 degrees.

8. A latch mechanism according to any preceding claim in which the axially inclined drive cam surface is arranged such that a first end (52) is angularly separated from a second end (54) by substantially 90 degrees.

9. A latch mechanism according to any preceding claim in which the circumferential portion of the guide cam surface is substantially perpendicular to the axial portion of the guide cam surface.

10. A latch mechanism according to any preceding claim in which the guide cam surface and/or the drive cam surface is in the form of at least one guide or drive slot or recess, preferably a pair of substantially identical guide or drive slots or recesses, preferably the pair of substantially identical guide or drive slots or recesses are angularly separated by substantially 180 degrees.

11. A latch mechanism according to any preceding claim in which the guide cam and/or the drive cam follower is in the form of at least one guide or drive pin.

12. A latch assembly including a handle (82), a latch pawl (84), and a latch mechanism (10) according to any preceding claim, in which the handle is connected to the drive input means, and the latch pawl is connected to the output shaft, such that a transmission path is formed between the handle and the latch pawl.

13. A method of assembling a latch mechanism (10) comprising the steps of:

providing a drive input means (12),
providing a housing (14),
providing an output shaft (16),
inserting the drive input means into a sleeve portion (22) of the output shaft,
locating a drive pin (70) through a drive slot (50) of the output shaft and through a hole (13) in the drive input means,
inserting the drive input means and output shaft into the housing,
then locating guide pins (60) through a hole (24) in the housing and through a guide slot (30) in the output shaft so as to retain the drive input means and the output shaft within the housing.

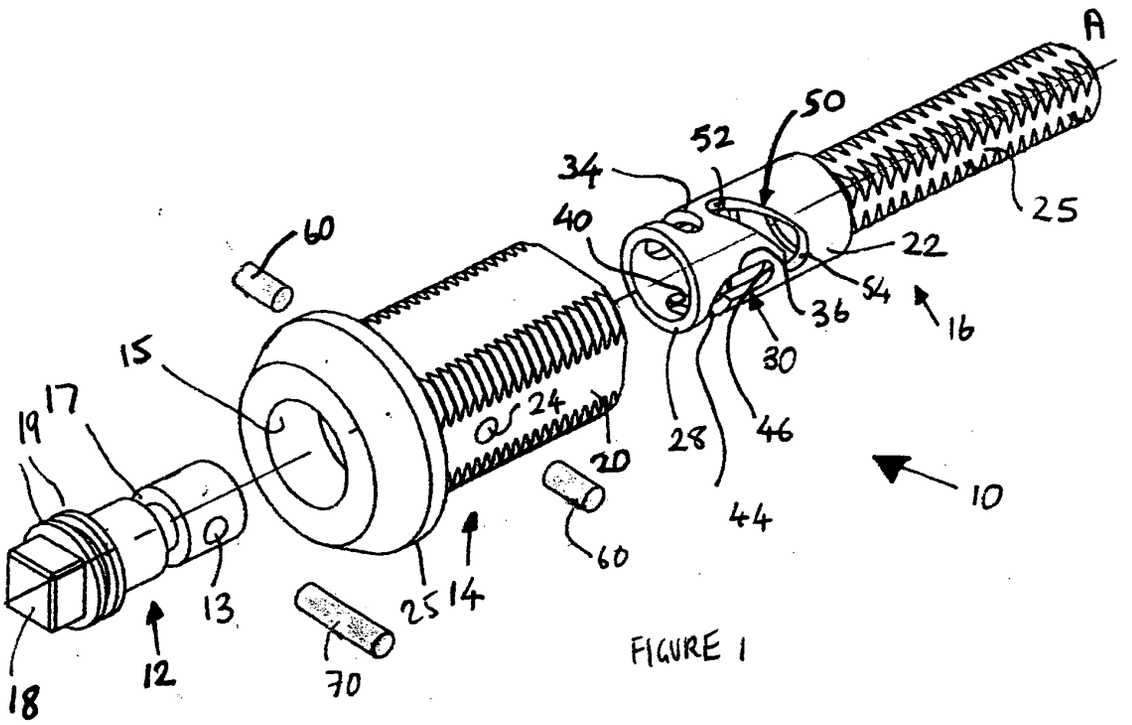


FIGURE 1

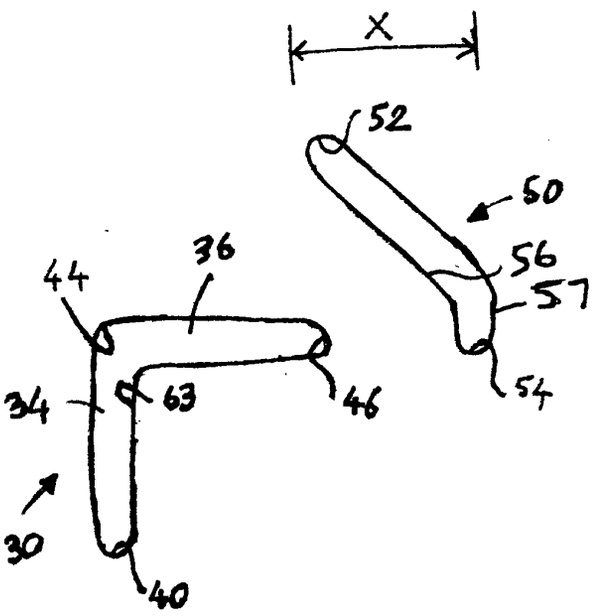


FIGURE 2

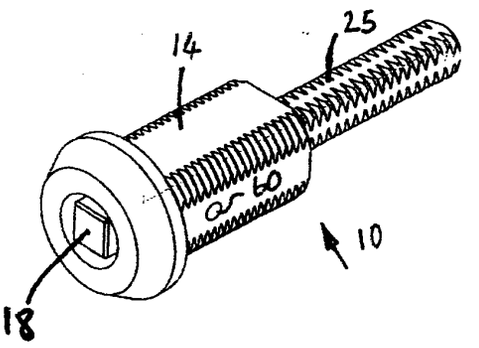


FIGURE 3

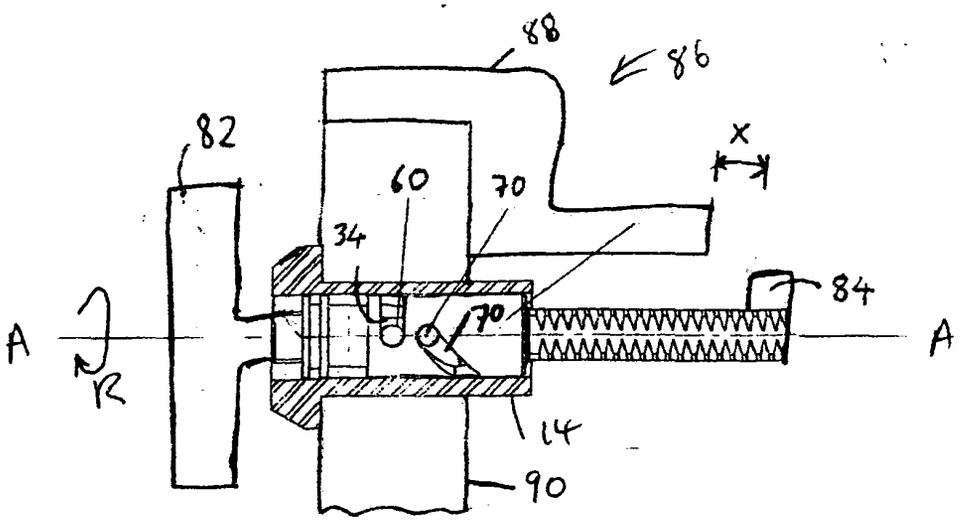


FIGURE 4

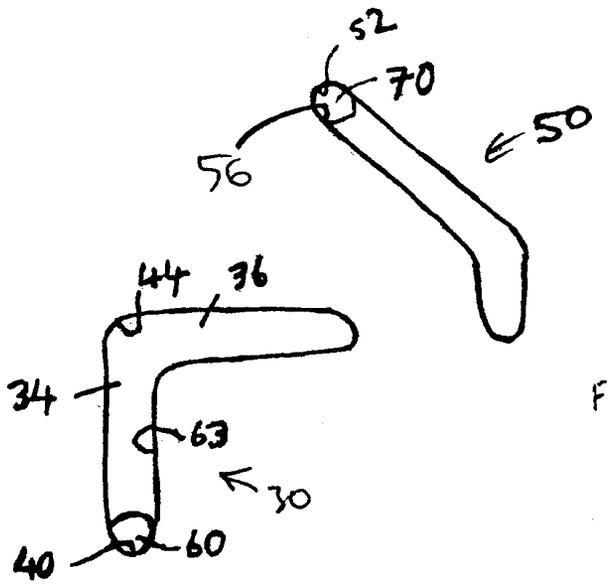


FIGURE 5

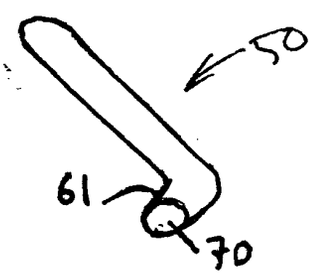


FIGURE 9

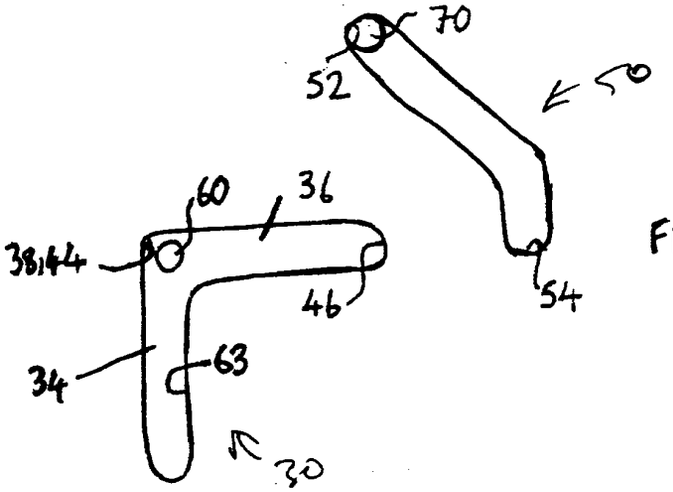


FIGURE 6

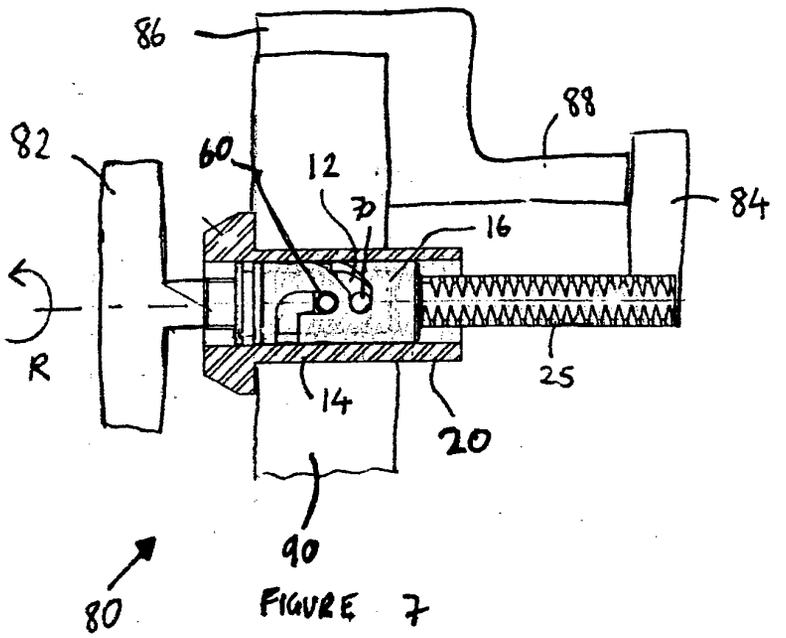


FIGURE 7

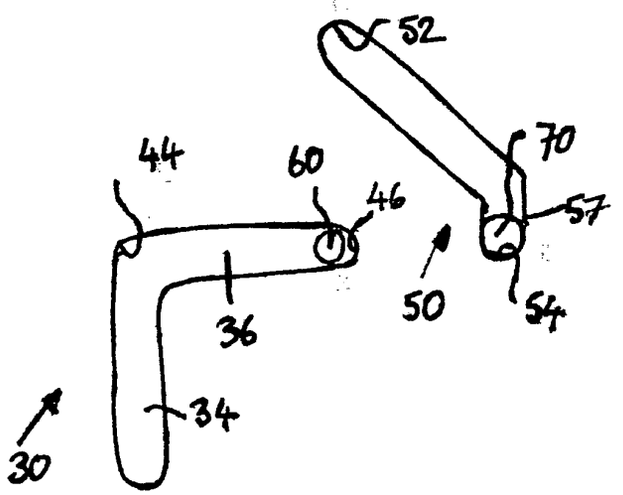


FIGURE 8

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 03 25 6571

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
D,A	GB 2 158 866 A (SOUTHCO) 20 November 1985 (1985-11-20) * abstract * * page 2, line 98 - page 3, line 41; figures * ---	1-13	E05C5/02 E05B65/02 E05B65/00
A	GB 2 298 234 A (SECURISTYLE LTD) 28 August 1996 (1996-08-28) * abstract; figures * ---	1-13	
A	US 1 907 625 A (VOGT ENGELBERT J) 9 May 1933 (1933-05-09) * figures * -----	1-13	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

E05C
E05B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	28 January 2004	Vacca, R

CATEGORY OF CITED DOCUMENTS

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 03 25 6571

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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28-01-2004

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 2158866 A	20-11-1985	DE 3504691 A1	21-11-1985
		US 4583775 A	22-04-1986
GB 2298234 A	28-08-1996	GB 2295190 A	22-05-1996
US 1907625 A	09-05-1933	NONE	

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