(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 012 142**
A1

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **78300857.6**

(22) Date of filing: **19.12.78**

(51) Int. Cl.³: **G 05 G 9/08**

(43) Date of publication of application: **25.06.80**
Bulletin 80/13

(84) Designated Contracting States: **BE DE FR GB IT NL SE**

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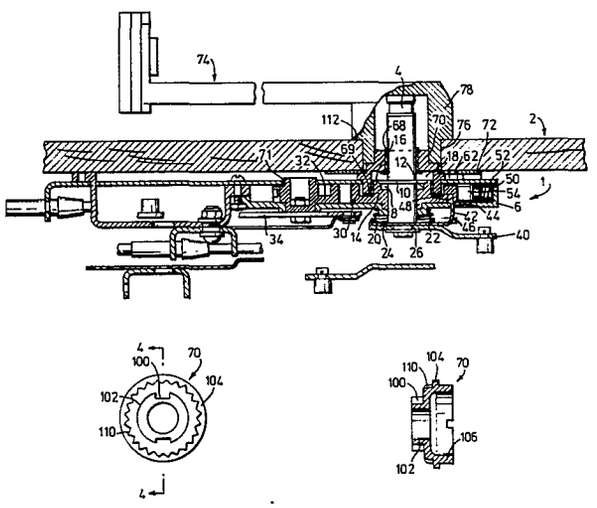
(54) Control unit adjustable interlock apparatus.

(57) Control unit adjustable interlock apparatus in a control unit which includes a housing (6) through which a rotatable and axially movable shaft (4) projects has a collar (70) located in the housing (6) which collar (70) surrounds the shaft (4) and which has a notch (100) capable of being engaged by engaging means (80) associated with a member (78) rotatable with the shaft (4) to interlock the shaft. The collar (70) has a section which has serrations (110) which enable the collar (70) to be fitted on to a retainer plate (72) in a plurality of positions.

The invention enables the sahft of the unit to be selectively interlocked and also makes it possible for the collar to be adjusted relative to the retaining plate so that the position where the interlock becomes effective is also adjustable.



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Control unit adjustable interlock apparatus

This invention relates to a control unit adjustable interlock apparatus in which the control unit includes a housing rotatably supporting a shaft.

Control units such as those used in marine applications are conveniently controlled with a single lever control handle. This handle or lever is used selectively to engage forward or reverse gear and to control the throttle setting. It is useful if the throttle setting can be operated independently of the gear setting when this is neutral and this can be achieved by allowing axial movement of the shaft to disengage the throttle control from the gearing. It is necessary to provide suitable interlock arrangements to ensure that the various components of the control unit cannot be operated unless they are correctly positioned and it is an object of the present invention to achieve this.

It is also convenient to allow the interlock and the handle to be able to be positioned in any one of a number of positions according to the convenience of operation for a person controlling the unit and it is also an object of the invention to provide a unit which has provision for this.

Examples of pertinent patents are United States Patent Nos. 2,254,144; 3,126,785; 3,511,117; 3,581,603;

3,842,695 and 3,929,039.

In US Patent 3,842,695, the lever and shaft are not capable of axial movement, but a slider shaft in the lever assembly can be retracted. When the transmission is in the neutral position, retraction of the slider shaft disengages key 96 having projection 100 from the driving gear 56, and pulls pin 108 into hole 110. US Patent 3,581,603 discloses a similar mechanism. US Patent 3,842,695 differs from the invention in several ways; first, the lock is on the slider shaft, not the lever; second, the slider shaft is non-rotatable; third, the lock is not spring biased. In US Patent 3,581,603 the slider shaft is rotatable.

US Patents 3,511,117 and 3,127,785 disclose control levers which can be pulled outward when in neutral position, to open the throttle independently of the shift function. The control lever is spring biased. In US Patent 3,511,117, blocking flange 134 locks curved portion 133 against reverse of interlocking plate 131 to prevent accidental shift while in the neutral throttle mode. Lateral wings 135 or 136 are interposed between the blocking flange 134 and gear 38 to prevent axial translation of the control lever 18 except in the neutral position. US Patent 3,127,785 has a similarly functioning plate 70 and flange 37.

The lever in Patent 3,929,039 contains a spring-loaded coupling shaft which can be disengaged while the lever is in a neutral position. The coupling shaft has radially extending pins 25 which couple the main shaft to the throttle gear. Pressing in the coupling shaft against the spring disengages the pins from the gear, and the gear from the shaft. In operation, this mechanism functions in the reverse manner from the present invention.

Many problems remain in the prior art devices. One problem lies in mounting restrictions which must necessarily be imposed in order to assure that the hand lever is placed in a convenient and accessible position. No mechanism is disclosed which allows the control unit to be mounted in any position while permitting orientation of a neutral interlock hand lever at any desired position.

These objects are achieved by providing a control unit adjustable interlock apparatus in which the control unit includes a housing rotatably supporting a shaft and in which a collar is located in the housing and through which collar the shaft passes, the collar has a notch and engaging means associated with the shaft and rotatably therewith is shaped to engage the notch when the shaft is rotated to a selected interlock position, retaining means connectable to a mounting member and to the collar secure the collar in a selected rotatable position to permit engagement of the notch by the engaging means when the shaft is rotated to the interlock position.

The retaining means, which may be a plate, further secures the collar against axial movement. The collar preferably is provided on an exterior lateral surface with annular serrations and the retaining means is provided with an opening having corresponding mating serrations. The collar may have a flange having a diameter which is sufficiently large to abut the retaining means when an axial portion on one side of the flange projects into the opening in the retaining means. An axially projecting portion may also extend on the other side of the flange and be arranged to engage the housing with the flange abutting the housing.

The shaft is preferably axially movable relative to the housing and the collar and the engaging means is provided with an axially inward surface abutting the axially outward surface of the collar for preventing axial movement of the shaft towards the housing when the shaft is rotated from a selected interlock position, the engaging means being shaped to engage the notch when the shaft is rotated to the selected interlock position thereby permitting axial movement of the shaft towards the housing.

The release means may be connected to the engaging means for disengaging it from the notch when the shaft is in the interlock position.

It will thus be appreciated that the invention provides an easy form of interlock which is adjustable to many positions to allow a great flexibility of positioning to be achieved.

One example of a control unit braking apparatus will now be described with reference to the accompanying drawings which illustrate one form of the apparatus. In the drawings Figure 1 is a longitudinal cross section through the control unit braking apparatus; Figure 2 is a top plane view of a retainer plate; Figure 3 is a top plan view and Figure 4 is a sectional side view taken on the line 4-4 of Figure 3 of a collar, Figure 5 is cross-sectional detail of the hand lever shown in Figure 1, Figure 6 is top plan view of a detail of a throttle gear included in Figure 1, Figure 7 is a rear plan view of the apparatus shown in Figure 1, and Figure 8 is scrap sectional detail of an additional braking feature of the apparatus.

Referring to Figure 1, a single lever control unit 1 is shown attached to a mounting board 2. Preferably, the

unit is adapted to operate sequentially a transmission and throttle and, selectively, to operate the throttle independently of the transmission.

The control unit 1 has a shaft 4 mounted in a housing 6 for rotational and axial movement. The shaft 4 is provided with keys 8 adjacent an annular flange 10. The keys 8 are shaped to engage keyways 12 in a hub 14 rotatably mounted in the housing 6. The flange 10 abuts an annular shoulder 16 on the hub 14 when the keys 8 and keyways 12 are engaged. The shaft 4 communicates rotary actuating forces to the hub 14 through the keys 8.

A space 18 is provided adjacent the shaft 4 above the annular flange 10 to permit axial movement of the shaft 4. When the shaft is moved axially, the keys 8 and keyways 12 disengage, thereby permitting rotation of the shaft 4 without consequent rotation of the hub 14. The lower surface of the keys 8 abut the upper surface of the hub 14 until further rotation of the shaft 4 causes the keys 8 to realign with the keyways 12.

One end of the shaft 4 projects beyond the housing 6 and a spring 20 surrounds this end. One end of the spring 20 abuts an annular shoulder 22 on the housing 6. The lower end of the spring 20 abuts a friction plate 24 mounted on the shaft 4 adjacent a throttle actuating member 26 rigidly connected to the end of the shaft 4. The spring 20 continuously urges the keys 8 automatically to engage the keyways 12 when the shaft 4 rotates the keys 8 into alignment with the keyways 12.

The hub 14 has a throttle gear portion 30 and constitutes a driven member. The throttle gear 30 is a Geneva type wheel which operatively engages a Geneva wheel 32 rotatably mounted in the housing 6. The Geneva wheel 32 is rigidly connected to a shift control arm 34; the

arm 34 and wheel 32 rotating simultaneously. As shown in Figure 6, rotation of the throttle gear 30 causes rotation of the Geneva wheel shift gear 32 only when the teeth of the gears 30 and 32 are meshed. Substantial rotation of the throttle gear 30 in either direction causes the teeth of the throttle gear 30 and shift gear 32 to disengage. Continued rotation of the throttle gear 30 causes a reversed curve portion 34 of the shift gear 32 to mate with a curved surface 36 on the throttle gear 30 to prevent rotation of the shift gear 32.

The sequential shifting and throttling operations of the control unit as well as the selective independent throttling operation of the control unit can now be readily understood. A throttle control arm 40 is connected to an engine throttle operator (not shown). Similarly, the shift control arm 34 is connected to a transmission operator (not shown). The connections are made in a manner to permit neutral idling of the engine when the throttle gear 30 and shift gear 32 are aligned as in Figure 6. Rotation of the shaft 4 in one direction rotates the throttle gear 30 in the same direction. Initially, the shift gear 32 is also rotated in the same direction. When the reversed curve portion 34 of the shift gear 32 abuts the curved portion of the throttle gear 30, the shift gear 32 stops rotating. At this point, the shifting of the transmission from neutral to an operative gear, for example, forward gear, is complete. Continued rotation of the shaft 4 causes rotation of the throttle gear 30 and throttle actuating member 26. Consequently, the engine is throttled. When the shaft 4 is rotated in the opposite direction, the throttle gear 30 and throttle actuating member 26 also rotate in the opposite direction. Initially, engine throttle is reduced. Continued rotation of the shaft 4 causes the teeth on the throttle gear 30 and shift gear 32 to mesh. The transmission

is shifted from forward gear to neutral. If the shaft 4 is further rotated, the transmission is shifted from neutral to reverse gear. Reverse throttle is then applied by continued rotation of the shaft 4. In order to prevent throttling while the shifting gear 32 is rotating, the throttle control arm 40 is connected to the throttle operator by an appropriate lost motion device, or any similarly functioning device.

A locking arm 42 is connected to the friction plate 24 and is received within an opening 44 in the housing 6. The end 46 of the spring 20 projects through an opening in the locking arm 42 and is thereby connected to the locking arm 42. The throttle gear 30 is provided with a notch 48 formed to receive the locking arm 42 when the notch 48 is aligned with the opening 44 in the housing 6. The notch 48 is positioned to align with the opening 44 in the housing 6 when the throttle gear 30 and shift gear 32 are in neutral alignment.

Axial movement of the shaft 4 in neutral disengages the keys 8 from the keyways 12 and projects the locking arm 42 into the notch 48 in the throttle gear 30, thereby locking the throttle gear 30 and shift gear 32 in neutral position. Rotation of the shaft 4 throttles the engine. The spring 20 urges the friction plate 24 into frictional engagement with the throttle actuating member 26 to prevent throttle creep. When the shaft 4 is rotated to the neutral position, the keys 8 automatically engage the keyways 12 and the locking arm 42 automatically disengages the notch 48 in the throttle gear 32 by means of axial loading created by the spring 20. The end 46 of the spring 20 connected to the locking arm 42 facilitates removal of the arm 42 from the notch 48 in the throttle gear 30 and supports the arm 42.

When the throttle gear 30 is rotated from neutral alignment, the notch 48 in the throttle gear 30 is moved from alignment with the opening 44 in the housing 6. The locking arm 42 prevents axial translation of the shaft 4.

A detent 50 is mounted in the housing 6 adjacent the throttle gear 30. The detent has a spring 52 which continuously urges a roller 54 against the side of the throttle gear 30. The gear 30 is provided with spaced notches 56, 58 and 60 configured to receive the roller 54. The central notch 58 is positioned to receive the roller 54 when the throttle gear 30 is in neutral alignment. The side notches 56 and 60 are positioned to receive the roller 54 when the reverse curved portion 34 of the shift gears 32 is first rotated into contact with the curved portion 36 of the throttle gear 30. Engagement of the roller 54 with the notches 56, 58 and 60 tends to lock the throttle gear 30 against rotation. The operator of the control unit 1 is thereby given indications that the engine is in neutral or forward or reverse gear. Additionally, the side notches 56 and 60 are positioned to engage the roller 54 when the control unit 1, operating in sequential mode, completes the shifting operation and begins the throttling operation.

A friction pad 61 is connected to the end of a screw 62 threadedly mounted in the housing 6. As best shown in Figure 8, the pad 61 is positioned to abut a specially profiled surface 64 of the throttle gear 30. The surface 64 has a portion 66 recessed from the friction pad 60; the arc length of the portion 66 corresponding to the amount of angular displacement of the throttle gear 30 during which the throttle gear 30 rotates the shifting gear 32. When the control unit 1 operates in the shifting mode, the friction pad 61

offers relatively little frictional resistance to the rotation of the throttle gear 30 since the friction pad 61 is aligned with the recessed portion 66 of the throttle gear 30. In the throttling mode, however, the friction pad 61 is aligned with the portion 67 of the profiled surface 64 of the gear 30 closely adjacent the inward surface of the housing 6, thereby offering a relatively large frictional resistance to the rotation of the throttle gear 30. The amount of frictional resistance offered by the pad 61 to the rotation of the gear 30 can be adjusted by the screw 62.

It is appreciated that the control unit 1 is readily adaptable for use with power boat engines. Consequently, sleeve bearings 68, 69 and 71 are provided to seal the unit 1 and to prevent damage to the components of the unit 1 due to the environment.

Referring now also to Figures 2, 3 and 4 an interlock collar 70 and a collar retainer 72 are connected to the control unit 1 prior to mounting the control unit 1 on the mounting surface 2. A neutral interlock hand lever 74 is connected to the end of the shaft 4 projecting through an opening 76 in the mounting board 2. The lower end of a hand lever cap 78 surrounds a portion of the interlock collar 70 and is provided with means to lock the hand lever 74 against further rotation when the hand lever 74 is moved to a neutral position.

As shown most clearly in Figure 5, the hand lever 74 has a block 80 slidably mounted within the cap 78. The block 80 is connected to a release button 82 by an arm 84 slidably mounted within the shaft 86 of the hand lever 74. A spring 88 connected to the arm 84 and the shaft 86 urges the block 80 toward the centre of the cap 78. A screw 90 projects through a slot in the arm 84 and is received within a sliding block 92 formed inside the

shaft 86 to keep the arm 84 in proper alignment. Moving the button 82 in the direction indicated by the arrow 94 slides the block 80 toward the side of the cap 78. When the button 82 is released the spring 88 causes the block 80 to automatically move toward the centre of the cap 78.

The cap 78 is positioned on the collar 70 in a manner which enables the radially inward surface of the block 80 to abut the radially outward surface of the upper axial portion 102 of the collar 70 (Figures 3 and 4). The cap 78 is connected to the shaft 4 and rotates with the shaft 4. Rotation of the shaft 4 causes the block 80 to move along the surface 102 of the collar 70. A notch 100 provided in the upper axial portion 102 of the collar 70 is shaped to receive the block 80 when the block 80 is aligned with the notch. Preferably, the notch 100 is positioned to engage the block 80 when the hand lever 74 and shaft 4 are rotated to a neutral position. Engagement of a block 80 and notch 100 prevents further rotation of the hand lever 74 and shaft 4.

Moving the button 82 in the direction indicated by arrow 94 moves the block 80 toward the side of the cap 78, thereby disengaging the block 80 and the notch 100. The hand lever 74 and shaft 4 can then be rotated from the neutral position. When the hand lever 74 and shaft 4 are returned to the neutral position, the spring 88 causes the block 80 automatically to engage the notch 100 thereby automatically preventing further rotation of the hand lever 74 and shaft 4.

The collar 70 is held against the housing 6 by the retainer 72 which overlies an annular flange 104 on the lower axial portion 106 of the collar 70. The retainer 72 is provided with serrations 108 shaped to engage serrations 110 on the lower axial portion 106 of

the collar 70 adjacent the flange 104. The serrations 108 and 110 prevent rotation of the collar 70 when engaged. Prior to mounting the control unit 1 on the mounting plate 2, the collar 70 is orientated in the retainer 72 in any desired position. Preferably, the collar 70 is orientated in a manner which positions the interlock notch 100 to engage the block 80 when the hand lever 74 is in an appropriate neutral orientation.

Cap 78 is provided with an annular shoulder 112 which abuts the outward surface of the mounting board 2 when the keys 8 on the shaft 4 engage the keyways 12 in the hubt 14. When the shaft 4 is moved axially to disengage the keys 8 and keyways 12, the shoulder 112 is spaced from the surface of the mounting board 2 thereby providing an indication to the operator that the control unit 1 is in the neutral throttle mode of operation.

In an alternative embodiment, the cap 78 is positioned on the collar 70 in a manner which enables the axially inward surface of the block 80 to abut the axially outward end of the upper axial portion 102 of the collar 70 when the hand lever 74 is rotated from the neutral position while the control unit 1 is in the neutral throttle mode of operation. When the hand lever 74 is rotated to the neutral position, the block 80 engages the notch 100, therby permitting axial movement of the shaft 4 and engagement of the keys 8 with the keyways 12 under loading from the spring 20. The hand lever 74 is rotated from the neutral position in the manner previously described.

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Claims:

1. Control unit adjustable interlock apparatus in which the control unit includes a housing (6) rotatably supporting a shaft (4),
characterised by a collar (70) located in the housing (6) and through which collar (70) the shaft (4) passes, the collar having a notch (100), engaging means (80), associated with the shaft (4) and rotatable therewith and shaped to engage the notch (100) when the shaft (4) is rotated to a selected interlock position, and retaining means (72) connectable to a mounting member (2) and to the collar (70) to secure the collar (70) in a selected rotational position to permit engagement of the notch (100) by the engaging means (80) when the shaft (4) is rotated to the interlock position.

2. Control unit adjustable interlock apparatus as claimed in Claim 1 in which the retaining means (72) further secure the collar (70) against axial movement.

3. Control unit adjustable interlock apparatus as claimed in Claim 1 or Claim 2 in which the collar (70) is provided on an exterior lateral surface with annular serrations (110) and the retaining means (72) is provided with an opening having corresponding mating serrations (108).

4. Control unit adjustable interlock apparatus as claimed in Claim 3 in which the retainer means (72) is a plate.

5. Control unit adjustable interlock apparatus as claimed in either Claim 3 or Claim 4, in which the collar (70) is provided with a flange (104) having a diameter which is sufficiently large to abut the retaining means (72) when an axial portion (102) on one side of

the flange (104) projects into the opening in the retaining means (72).

6. Control unit adjustable interlock apparatus as claimed in Claim 5 in which the collar (70) has an axially projecting portion (106) extending on the other side of the flange (104) and arranged to engage the housing (6) with the flange (104) abutting the housing (6).

7. Control unit adjustable interlock apparatus as claimed in any preceding claim in which the shaft (4) is axially movable relative to the housing (6) and the collar (70) and further characterised by the engaging means having an axially inward surface abutting the axially outward surface of the collar (70) for preventing axial movement of the shaft (4) towards the housing (6) when the shaft (4) is rotated from a selected interlock position, the engaging means (80) being shaped to engage the notch (100) when the shaft (4) is rotated to the selected interlock position thereby permitting axial movement of the shaft (4) towards the housing (6).

8. Control unit adjustable interlock apparatus as claimed in any preceding claim in which release means (82, 84) are connected to the engaging means (80) for disengaging it from the notch (100) when the shaft (4) is in the interlock position.

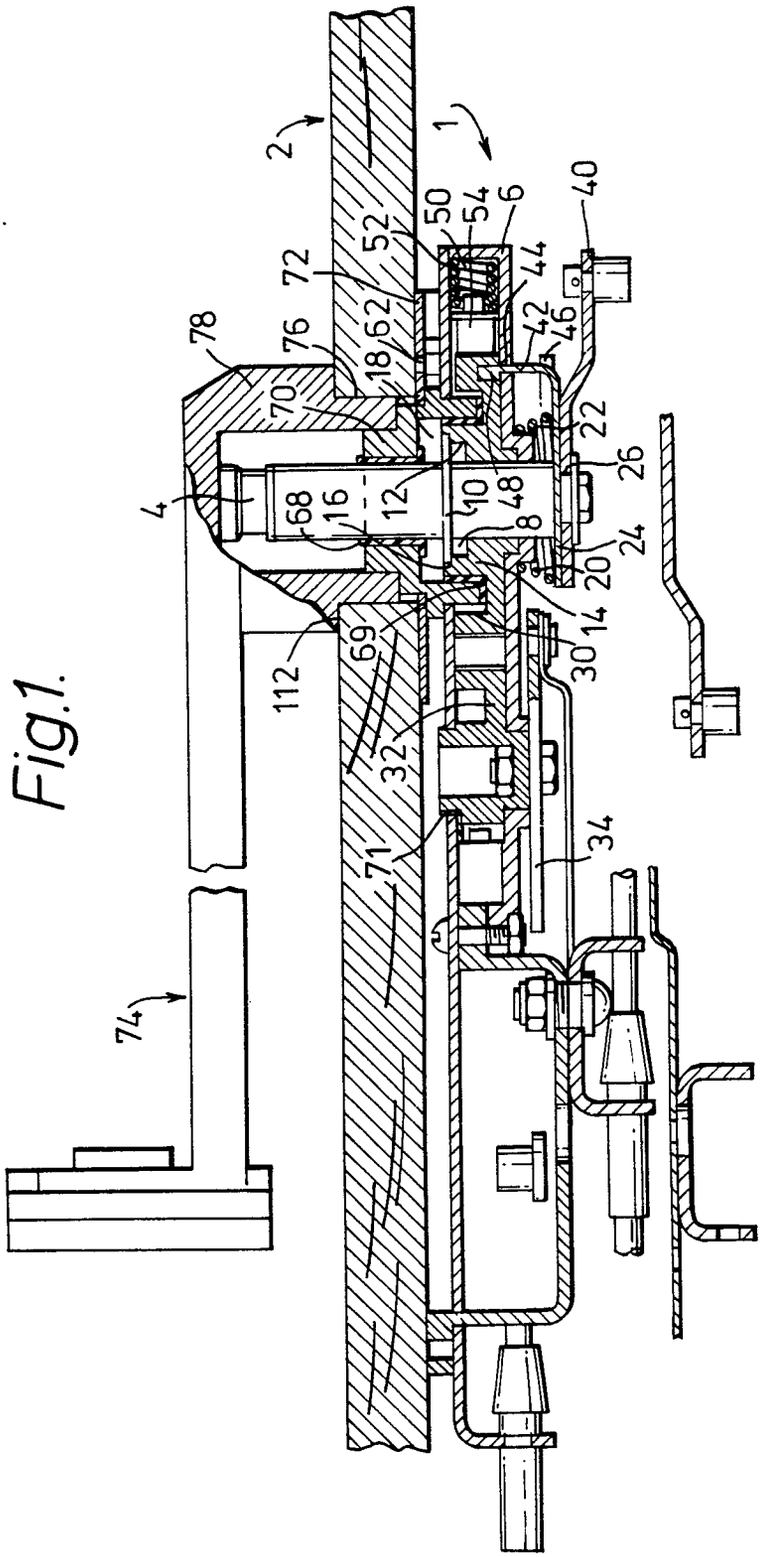
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Fig.1.

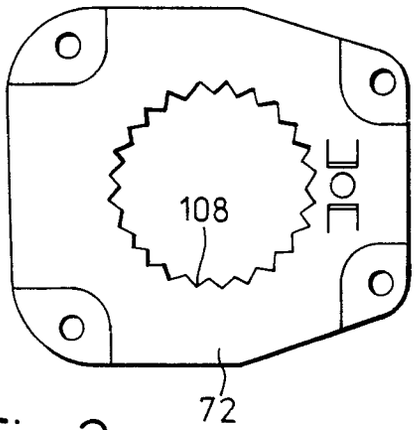


Fig.2.

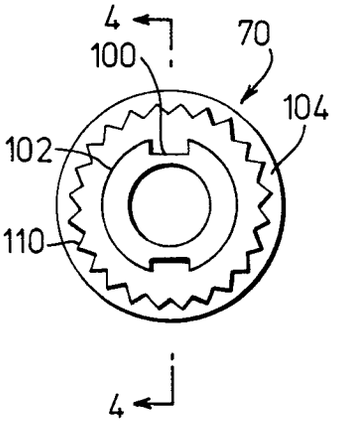


Fig.3.

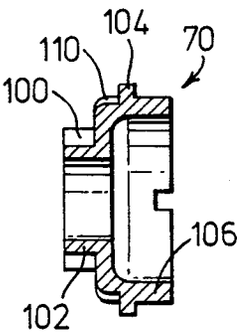


Fig.4.

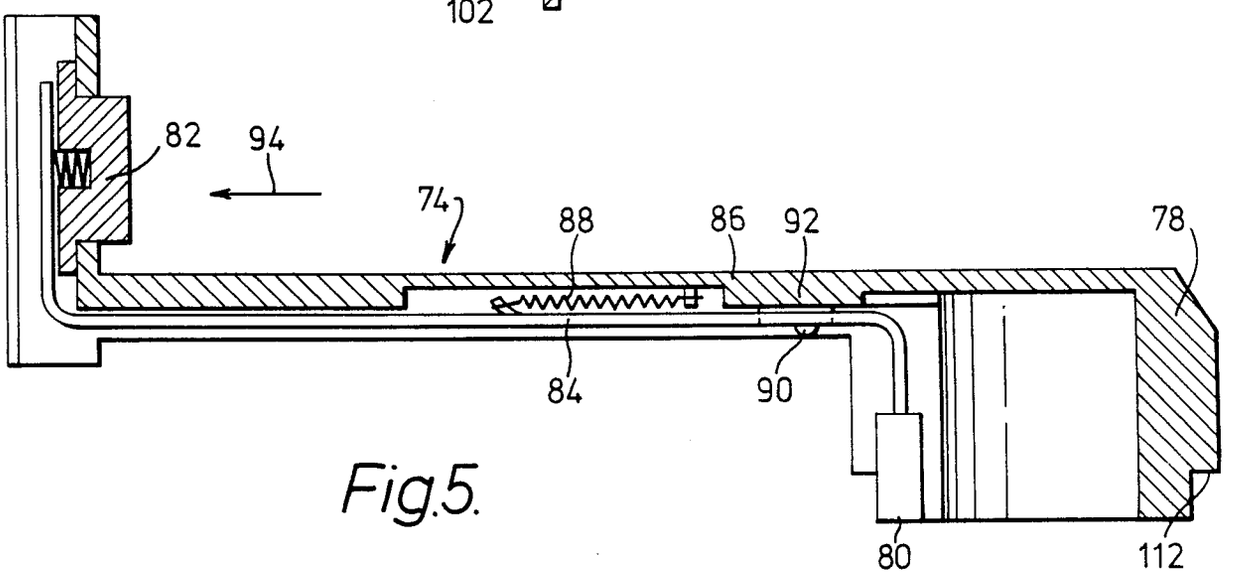


Fig.5.

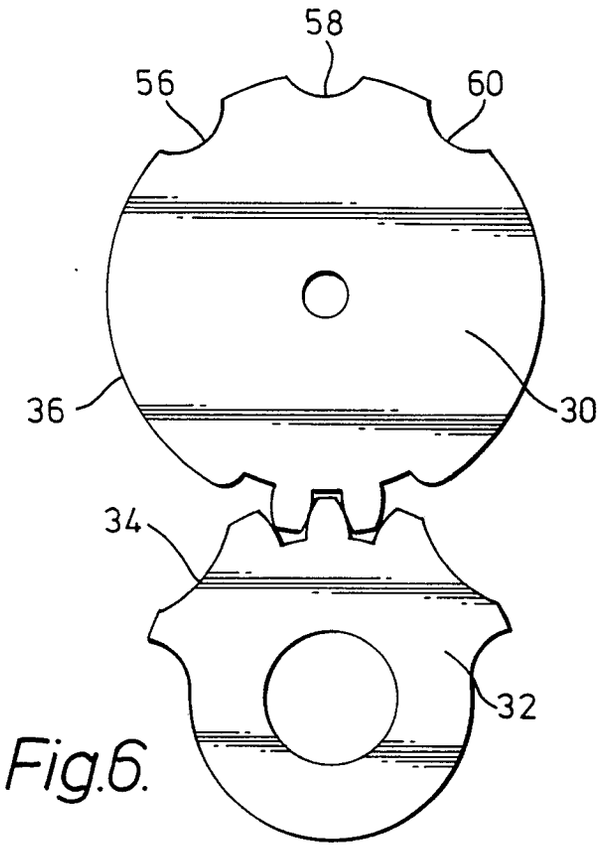
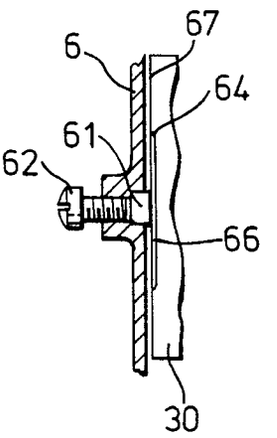


Fig.6.

Fig.8.



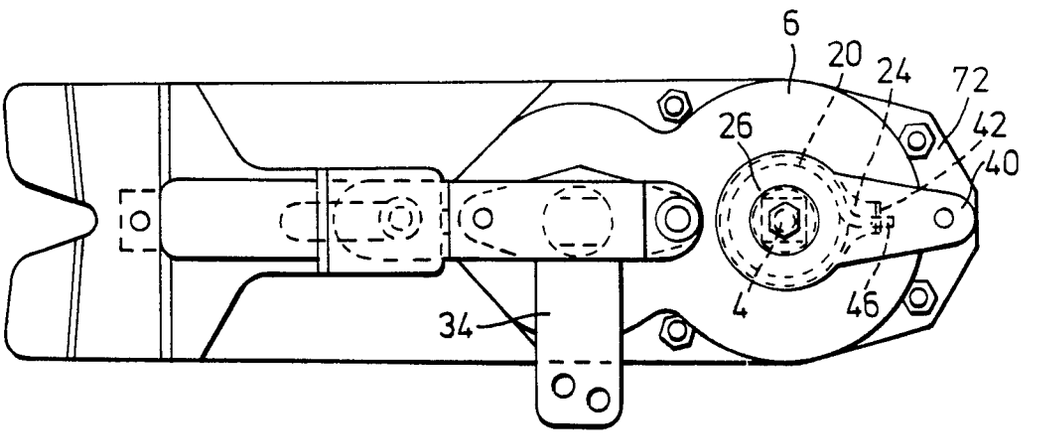


Fig.7.

European Patent Office

EUROPEAN SEARCH REPORT

0012142

Application number
EP 78 30 0857

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
	US - A - 4 106 604 (M. BABA et al.) * abstract; figure 2 *	1
	US - A - 4 090 598 (A.P. PRINCE et al.) * abstract; figure 2 *	1
	US - A - 4 089 397 (M. BABA et al.) * abstract; figures 3,5 *	1
A	US - A - 4 078 446 (M. BABA et al.) * abstract *	1
	US - A - 4 013 155 (R.F. OLSEN et al.) * abstract *	1
A	US - A - 4 034 835 (M. BABA et al.) * abstract *	1
A	US - A - 4 027 555 (R.J. RAUCHLE et al.) * abstract *	1
D	US - A - 3 127 785 (J.F. MORSE et al.)	1 ./.

X The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	16-08-1979	BIGGIO

CLASSIFICATION OF THE APPLICATION (Int. Cl.²)

G 05 G 9/08

TECHNICAL FIELDS SEARCHED (Int.Cl.²)

G 05 G 9/08
9/09
9/10
F 16 C 1/10
1/11
1/12
1/13
1/14
F 02 D 29/02
F 02 D 37/00
B 63 H 21/22
G 05 G 5/02

CATEGORY OF CITED DOCUMENTS

X: particularly relevant
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention
E: conflicting application
D: document cited in the application
L: citation for other reasons

&: member of the same patent family, corresponding document

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DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl.²)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
	* column 3, line 21 - column 5, line 14 *		
D	US - A - 3 581 603 (R.K. FARRINGTON et al.) * abstract *	1	
D	US - A - 3 929 039 (T.E.K. COMSTEDT et al.) * abstract; figure 1 *	1	TECHNICAL FIELDS SEARCHED (Int. Cl.²)
D	US - A - 3 511 117 (J.F. MORSE et al.) * column 9, line 69 - column 10, line 12 *	1	
D	US - A - 3 842 695 (R.K. FARRINGTON et al.) * abstract *	1	