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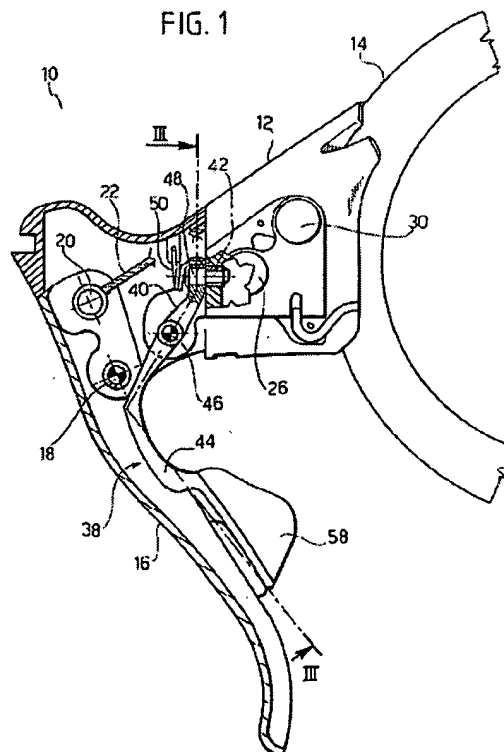
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(54) **Electric control device for a motor-driven derailleur for bicycles**

(57) Electric control device for a motor-driven derailleur for bicycles, comprising:

- a supporting body (12) provided with means for fixing it to a handlebar (14) of a bicycle,
- a brake control lever (16) hinged to the supporting body (12),
- a pair of electric switches to control the gear change (24, 26) carried by the supporting body (12), and
- a gear change lever (38) that can be manually operated to control a first of said switches (24).

The gear change lever (38) comprises a first part (40) connected to the supporting body (12) so as to consent shift of the gear change lever (38) between a position at rest and an operating position, and a second part (44) hinged to the first part (40).



Description

[0001] The present invention relates to an electric control device for a motor-driven derailleur for bicycles.

[0002] More precisely, the invention relates to a control device of the type comprising:

- a supporting body provided with means for fixing it to a bicycle handlebar,
- a brake control lever hinged to the supporting body,
- a pair of electric switches to control gear change carried by the supporting body, and
- a gear change lever that can be operated manually to control at least one of said switches.

[0003] A control device of the type specified above is known from the United States patent no. 5470277 by the same Applicant, which describes an electric control device provided with two switches positioned in a supporting body fixed to the handlebar of a bicycle. A first switch is operated by a gear change lever positioned immediately behind the brake control lever and a second switch is operated by a push button positioned on a side wall of the supporting body. The two electric switches may be used to operate in opposite directions an electric motor associated with a derailleur for bicycles. Operation of the derailleur motor in a first direction shifts the chain in a first direction, for example towards higher speed gears and operation in the opposite direction shifts the chain in the opposite direction, for example towards lower speed gears.

[0004] The document US 6015036 describes an electric control device for a bicycle including a gear change switch supported by the brake lever. A second gear change switch may be positioned near the brake lever. This solution is less advantageous than the one in which both switches are positioned on the supporting body, as it is necessary to take an electric connection to the brake lever which pivots in relation to the supporting body.

[0005] The object of the present invention is to provide an electric control device of an improved type which is ergonomic, of simple construction and more functional than prior art devices.

[0006] According to the present invention, this object is attained by a control device with the characteristics contained in Claim 1.

[0007] The present invention shall now be described in detail with reference to the accompanying drawings, provided purely as a non-limiting example, in which:

- Figures 1 and 2 are sectional side views of a control device according to the present invention in two operating positions,
- Figures 3 and 4 are sections according to the line III-III in Figure 1 in two operating positions,
- Figures 5 and 6 respectively show a second and a third variant of the solution illustrated in Figures 3 and 4,

- Figure 7 shows a fourth variant of the solution according to the invention,
- Figure 8 is a detail in a larger scale of the encircled part in Figure 7,
- Figure 9 shows the variant in Figure 7 in the operating position,
- Figure 10 is a detail in a larger scale of the encircled part in Figure 9,
- Figure 11 shows a fifth variant of the solution according to the invention,
- Figure 12 shows the variant in Figure 11 in the operating position,
- Figure 13 is a section corresponding to figure 3 showing a variant of the solution according to figure 3, and
- Figure 14 is a partially sectioned plan view of a further embodiment of the present invention.

[0008] With reference to Figures from 1 to 4, number 10 indicates an electric control device for a motor-driven derailleur for bicycles. The control device according to the present invention may be used to control a motor-driven gear change, for example of the type described in the United States patent no. 5470277 by the same Applicant.

[0009] The control device 10 comprises a supporting body 12 provided with means of conventional type for fixing it to a bicycle handlebar 14. The control device 10 comprises a brake control lever 16 hinged to the supporting body 12 by means of a pivot pin 18. One end of a brake control cable 22 is fixed in a conventional manner to a top portion of the brake control lever 16. As can be seen in Figures 1 and 2, the brake control lever 16 may be made to pivot manually around the pivot pin 18 to control the brake of the bicycle, in an entirely conventional manner.

[0010] The supporting body 12 carries a pair of electric switches to control gear change, indicated with 24 and 26 in Figures 3 and 4. In accordance with a first embodiment of the invention, these switches are positioned on opposite faces of a supporting plate 28 fixed to the supporting body 12. The switches 24, 26 are microswitches per se known, including a body fixed to the supporting plate 28 and a mobile operating push button. The operating push buttons of the switches are covered by respective deformable membranes. In the Figures, the real switches are not visible and therefore the reference numbers 24, 26 used to distinguish the switches in fact indicate the deformable membranes of the switches. In the example of embodiment shown in the Figures, the supporting plate 28 also carries a third switch 30 (Figures 1 and 2) suitable to control a cycle computer (not shown).

[0011] The first switch 24 is provided for operating an electric motor for gear change (not shown) in a first direction for example to shift the chain towards higher speed gears (or upshifting). The second switch 26 is provided for operating the same gear change motor in

the opposite direction, for example to shift the chain towards lower speed gears (or downshifting). The control device 10 may be used irrespectively to control the front derailleur or the rear derailleur of a bicycle. Therefore, in the control device positioned on the right side of the handlebar of the bicycle (normally used to control the rear derailleur) the switch 24 controls shift towards lower speed gears (that is towards gears with a larger number of teeth) and the switch 26 controls shift towards higher speed gears (gears with a smaller number of teeth). On the contrary, in the control device positioned on the left side of the handlebar, usually destined to control the front derailleur, the situation is reversed so that the switch 24 controls shift towards higher speed gears (towards a sprocket wheel with a larger number of teeth) and the switch 26 controls shift towards lower speed gears (towards a sprocket wheel with a smaller number of teeth).

[0012] In the embodiment according to figures 1 to 4 the switch 26 facing the external side of the supporting body is preferably controlled by a push-button lever (indicated by the reference number 80 in figure 14) that can be pushed downwardly by the cyclist's thumb while the hand engages the supporting body 12 or the curved part of the handlebar 14, as described in the Italian patent application no. TO2000A000540 by the same applicant, not yet published on the filing date of the present application.

[0013] The control device 10 comprises a gear change lever (or control lever) 38 connected in a pivoting manner to the supporting body 12 and positioned immediately behind the brake control lever 16. The lever 38 is composed of two separate parts hinged together: an upper part 40 hinged to the supporting body 12 around a first axis 42 and a lower part 44 hinged to the upper part 40 around a second axis 46. The two pivotal axes 42, 46 are orthogonal or substantially orthogonal in relation to each other. In the embodiment shown in the figures, the first axis 42 extends along a substantially orthogonal direction in relation to the pivotal axis 18 of the brake control lever 16 and, consequently, the second pivotal axis 46 is parallel or substantially parallel in relation to the pivotal axis 18 of the brake control lever 16. Alternatively, this layout could be inverted so that the upper part 40 of the lever 38 is hinged to the supporting body 12 around an axis parallel or substantially parallel to the pivotal axis of the brake control lever while the lower part 44 of the lever 38 is hinged to the upper part 40 around an axis orthogonal to the pivotal axis of the brake control lever.

[0014] In the embodiment shown in figures 1 to 4, the upper part 40 of the lever 38 is hinged to the supporting body 12 by means of a pin 48 which extends according to a direction substantially parallel in relation to the supporting plate 28 which carries the control switches of the gear change 24, 26. A first return spring 50 is associated with the upper part 40 of the lever 38 and tends to hold the lever 38 in the position at rest shown in Figure 3.

The lower part 44 and the upper part 40 of the lever 38 are hinged to each other by means of a pin 52. The pin 52 has a head 53 facing the switch 24. A second return spring 54 is positioned coaxially to the pin 52 and cooperates with the two parts 40, 44 of the lever 38. The spring 54 tends to push the second part 44 towards its position at rest shown in Figure 1.

[0015] As can be seen by comparing Figures 1 and 2, when the control lever of the brake 16 pivots around its pivotal axis 18 to control braking, the first part 40 of the lever 38 remains motionless, while the second part 44 of the lever 38 pivots around the pivotal axis 46 and follows the movement of the brake control lever. When the brake control lever 16 is released, the second return spring 54 returns the second part 44 of the lever 38 to the position at rest in Figure 1. To control gear change, the cyclist applies light pressure in the direction indicated by the arrow 56 in Figures 3 and 4 to a control portion 58 of the lever 38. Following this pressure, the lever 38 pivots around the first axis 42 as illustrated in Figure 4 and the head 53 of the pin 52 operates the switch 24. When the cyclist releases the pressure on the control portion 58, the gear change lever 38 is returned to the position at rest shown in Figure 3 under the return action of the spring 50. It can be noted that the pin 52 always remains facing the switch 24, even when the second part 44 of the lever 38 pivots around the axis 46 to follow the braking movement of the brake control lever 16. Therefore, the cyclist may control gear change by means of the lever 38 even while operating the brake control lever 16, as shown in Figure 2.

[0016] In the variant shown in Figure 5, the lower part 44 of the lever 38 has an operating portion 60 facing the switch 24 and the pin 52 is moved upwards in relation to the switch 24. In the variant shown in Figure 6 the pin 52 is moved downwards in relation to the switch 24 and the upper part 40 of the lever 38 has an operating portion 62 facing the switch 24. Operation of the devices according to the variants in Figures 5 and 6 is identical to the operation described previously, the only variation being that the switch 24 is operated by the portions 60 and 62 as opposed to the head 53 of the pin 52.

[0017] The gear change lever 38 may be associated with a check device that limits the pivoting stroke of the lever 38, to avoid damages to the switch 24 in the case in which the lever 38 is pushed against the switch with excessive force. This check device may be produced as described in the Italian patent application no. TO2000A000540 by the same Applicant.

[0018] Figures 7 to 10 show an alternative embodiment of the control device according to the present invention. The parts corresponding to those previously described are indicated with the same reference numbers. In this embodiment, the upper part 40 of the gear change lever 38 is composed of an elastic element which may be used to shift the lower part 44 of the gear change lever 38 between the position at rest shown in Figures 7 and 8 and the operating position shown in Fig-

ures 9 and 10. The upper part 40 of the gear change lever 38 is preferably composed of an elastic lamina of metal material with a base 64 fixed to the support 12, for example by means of a screw 66. The lamina has an elastically deformable branch 68 at the lower end of which the lower part 44 is hinged by means of a pin 52. In the position at rest, the deformable branch 68 holds the lower part 44 in the position shown in Figures 7 and 8. When the cyclist applies pressure to the control portion 58 in the direction indicated by the arrows 56, the deformable branch 68 of the upper portion 40 becomes elastically deformed and allows the lower portion 44 to move towards the operating position shown in Figures 9 and 10. When the cyclist releases the pressure on the operating portion 58, the deformable branch 68 of the upper portion 40 elastically returns to its position at rest and returns the lower portion 44 of the gear change lever to the position at rest shown in Figures 7 and 8.

[0019] Figures 11 and 12 show a further embodiment of the control device according to the invention. In this case, the upper part 40 of the gear change lever 38 is composed of a block which slides in a direction parallel or substantially parallel in relation to the operating direction of the switch 24. In the embodiment shown in Figures 11 and 12, the block forming the upper part 40 is slidably mounted on a pair of guide elements 70 integral with the supporting body 12 and which extend in an orthogonal direction in relation to the plate 28 carrying the switches 24, 26. An elastic element 72, composed for example of a compressed helical screw, is interposed between the block and the plate 28 and tends to maintain the block in the position at rest shown in Figure 11. At its lower end, the block forming the upper end 40 carries the pivot pin 52 around which the lower part 44 of the lever 38 is mounted pivotally. Figures 11 and 12 show the control device in the position at rest and in the operating position, respectively. As in the case described above, shift from the position at rest to the operating position is obtained by applying pressure on the control portion 58 and the lever 38 returns to the position at rest by the action of the spring 72 after releasing the pressure in the direction indicated by the arrow 56.

[0020] The described embodiments perform the upshifting and the downshifting by means of two levers (the control lever 38 and the push button lever 80). In accordance with a further aspect of the present invention, both said functions can be performed by a single lever.

[0021] As shown in Figure 13, the first switch 24 can be mounted on a first plate 28 and the second switch 26 can be mounted on a second plate 29 facing the first plate 28. The pin 52 is preferably provided with a second head 55 facing the second switch 26. The control lever 38 is illustrated in a central rest position in which none of the two switches 24 or 26 is operated. The control lever 38 can be pivoted in a first direction 56 for operating the first switch 24 and in the opposite direction 57 to operate the second switch 26.

[0022] The control lever 38 can operate both the

switches 24 and 26 also in the embodiments in accordance with figures 5 to 12. In these embodiments the first switch 24 can be mounted on a first plate 28 and the second switch 26 can be mounted on a second plate 29 facing the first plate 28. Further, in the embodiments shown in figures 5 and 6, the lower part 44 of the control lever 38 can present a second operating portion (not shown), opposite to the operating portion 60 and, respectively, 62 to operate the second switch 26. In the embodiment of figures 7 to 10, the pin 52 can be provided with a second head 55, to operate the second switch 26 and in the embodiment of figures 11 and 12 the block 40 of upper part of the control lever 38 can operate, with its opposing surfaces, both the switches 24 and 26.

[0023] As a further alternative of the present invention, as schematically indicated in figure 14, both the switches 24 and 26 can be operated by the push button lever 80. In the plan view of figure 14, the push button lever 80 is illustrated in a central rest position in which none of the two switches 24 or 26 is operated. The push button lever 80 can be pushed downwardly in the direction indicated by the arrow 82 to operate a first of said switches 24, 26 or pulled upwardly in the direction indicated by the arrow 81 to operate the other of said switches. The push button lever 80 can operate the switches 24 and 26 in any known manner, by means of either a pivotable or sliding movement, or any others kind of movement.

[0024] Naturally, without prejudice to the principle of the invention, the constructional details and embodiments may vary widely in relation to what is described and illustrated herein purely as an example, without however departing from the scope of the present invention as defined in the accompanying claims.

Claims

1. A control lever (38) for operating at least one switch (24) of a bicycle electric device, **characterised in that** said lever is movable in at least two directions, the movement in a first direction operating said switch (24) and the movement in a second direction having no influence on said switch (24).
2. A control lever (38) according to claim 1, **characterised in that** the two movements are substantially perpendicular to each other.
3. A control lever (38) according to claim 1, **characterised in that** said lever is movable in a third direction for operating a second switch (26).
4. A control lever (38) according to claim 1, **characterised in that** said first movement for operating said switch (24) is performed by a first lever part (40) and said second movement having no influ-

- ence on said switch (24) is performed by a second lever part (44).
5. A control lever (38) according to claims 3 and 4, **characterised in that** said third movement for operating said second switch (26) is performed by said first lever part (40). 5
 6. A control lever (38) according to claim 5, **characterised in that** said second lever part (44) is movable with respect to said first lever part (40). 10
 7. A control lever (38) according to claim 6, **characterised in that** said first lever part (40) is fixed to a supporting body (12) of said bicycle. 15
 8. A control lever (38) according to claim 6, **characterised in that** said second lever part (44) is articulated on said first lever part (40) around a pivoting axis (46). 20
 9. A control lever (38) according to claim 8, **characterised in that** said first lever part (40) acts on said switch (24) by pivoting around a second axis (42) in a first direction (56). 25
 10. A control lever (38) according to claim 9, **characterised in that** said first lever part (40) acts on said second switch (26) by pivoting around said second axis (42) in a second direction (57). 30
 11. A control lever (38) according to claims 9 and 10, **characterised in that** said first pivoting axis (42) is substantially perpendicular with respect to said first axis (46). 35
 12. A control lever (38) according to claim 9, **characterized in that** it comprises an articulation pin (52) having a head (53) for operating said switch (24).
 13. A control lever (38) according to claim 12, **characterized in that** said articulation pin (52) has two opposite heads (53, 55) for operating, respectively, said first (24) and said second (26) switch, respectively.
 14. A control lever (38) according to claim 8, **characterized in that** it comprises elastic means (54) operatively associated between the first lever part (40) and the second lever part (44). 50
 15. A control lever (38) according to claim 8, **characterized in that** the first lever part (40) comprises an elastically deformable element. 55
 16. A control lever (38) according to claim 8, **characterized in that** the first lever part (40) acts on said switch (24) by means of sliding means (70).
 17. A control lever (38) according to claim 8, **characterized in that** the first lever part (40) acts on said switch (24) by means of elastic means (68).
 18. A control lever (38) according to any of the preceding claims, **characterized in that** the first lever part (40) is provided with at least one operating portion (62) for operating at least one of said switches (24, 26).
 19. A control lever (38) according to any of the preceding claims, **characterized in that** the second lever part (44) is provided with at least one operating portion (60) for operating at least one of said switches (24, 26).
 20. A control lever (38) according to any of the preceding claims, **characterized in that** said at least one switch (24, 26) controls the gear change of a bicycle.
 21. A control lever (38) according to any of the preceding claims, **characterized in that** said lever (38) is positioned behind a bicycle brake lever (16).
 22. A control lever (38) according to claim 21, **characterized in that** said second movement which does not influence the switch (24) is the braking movement of the brake lever (16).
 23. Electric control device for a motor-driven derailleur for bicycles, comprising a supporting body (12) provided with means for fixing it to a bicycle handlebar (14) and a pair of electric switches (24, 26), to control the gear change, carried by the supporting body (12), **characterized in that** both of said electric switches (24, 26) are operated by a single lever (38; 80).
 24. Electric control device according to claim 23, **characterized in that** said single lever (38; 80) presents a central rest position in which none of said electric switches (24, 26) is operated.
 25. Electric control device according to claim 24, **characterized in that** said single lever (38; 80) operates one of said electric switches (24, 26) when moved in a first direction (and operates the other of said electric switches (24, 26) when moved in the substantially opposed direction.
 26. Electric control device according to claim 23, **characterized in that** said single lever (38; 80) is hinged on said supporting body (12).
 27. Electric control device according to claim 23, **characterized in that** said single lever (38; 80) is hinged on a bicycle brake control lever (16).

28. Electric control device according to claims 26 or 27, **characterized in that** said single lever is a control lever (38) positioned behind and substantially parallel to said bicycle brake control lever (16).
29. Electric control device according to claim 26, **characterized in that** said single lever is a push button lever (80) positioned substantially perpendicular to a brake control lever (16) of the bicycle.
30. Electric control device for a motor-driven derallleur for bicycles, comprising:
- a supporting body (12) provided with means for fixing it to a bicycle handlebar (14),
 - a pair of electric switches (24, 26) to control the gear change, carried by the supporting body (12), and
 - a gear change lever (38) that can be operated manually to control at least one of said switches (24, 26),
- characterized in that** the gear change lever (38) comprises:
- a first part (40) connected to the supporting body (12) in order to allow shift of the gear change lever (38) between a position at rest and an operating position of said first switch (24), and
 - a second part (44) hinged to the first part (40).
31. Device according to Claim 30, **characterized in that** said first part (40) is hinged to the supporting body (12) around an axis (42) orthogonal or substantially orthogonal in relation to the pivotal axis (46) between the first part (40) and the second part (44).
32. Device according to Claim 30, **characterized in that** said first part (40) comprises an elastically deformable element.
33. Device according to Claim 32, **characterized in that** said elastically deformable element comprises a metal lamina with a base (64) fixed to the supporting body (12) and an elastically deformable branch (68) hinged to which is the second part (44).
34. Device according to Claim 30, **characterized in that** said first part (40) comprises a block mounted slidably in relation to the supporting body (12) along a rectilinear direction.
35. Device according to Claim 34, **characterized in that** said block is mounted slidably on guide means (70) carried by the supporting body (12).
36. Device according to Claim 35, **characterized in that** it comprises elastic means (72) tending to push said block towards a rest position.
37. Device according to Claim 31, **characterized in that** one of said axes (42, 46) is parallel or substantially parallel to the pivotal axis of the brake control lever (16).
38. Device according to Claim 37, **characterized in that** the pivotal axis (46) between the first and the second part (40, 44) is parallel or substantially parallel to a pivotal axis of a bicycle brake control lever (16).
39. Device according to Claim 30, **characterized in that** the first and the second part (40, 44) of the gear change lever (38) are hinged to each other by means of a pin (52) with at least one head (53, 55) facing at least one of said switches (24, 26).
40. Device according to Claim 30, **characterized in that** the second part (44) of the gear change lever (38) has an operating portion (60) facing at least one of said switches (24, 26).
41. Device according to Claim 30, **characterized in that** the first part (40) of the gear change lever (38) has an operating portion (62) facing at least one of said switches (24, 26).
42. Device according to Claim 30, **characterized in that** it comprises a return spring (50) operatively positioned between the supporting body (12) and the first part (40) of the gear change lever (38).
43. Device according to Claim 42, **characterized in that** it comprises a second return spring (54) operatively positioned between the first and the second part (40, 44) of the gear change lever (38).
44. Device according to Claim 30, **characterized in that** it comprises a third electric switch (30) suitable to control operation of a cycle computer.
45. Device according to Claim 30, **characterized in that** said electric switches (24, 26) are mounted on a supporting plate (28) in turn mounted on the supporting body (12).
46. Device according to Claim 45, **characterized in that** the aforesaid electric switches (24, 26) are positioned on opposite faces of said supporting plate (28).
47. Device according to Claim 30, **characterized in that** said gear change lever (38) is movable in a first direction (56) to operate a first switch (24) and in a

second direction to operate a second switch (26).

48. Device according to Claim 30, characterized in that said switches (24, 26) are mounted on opposite sides with respect to the gear change lever (38). 5

49. Device according to Claim 48, characterized in that said switches (24, 26) are mounted on respective plates (28, 29) facing each other. 10

50. Device according to Claim 30, characterized in that said gear control lever (38) is positioned behind a brake control lever (16) hinged to the supporting body (12). 15

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FIG. 1

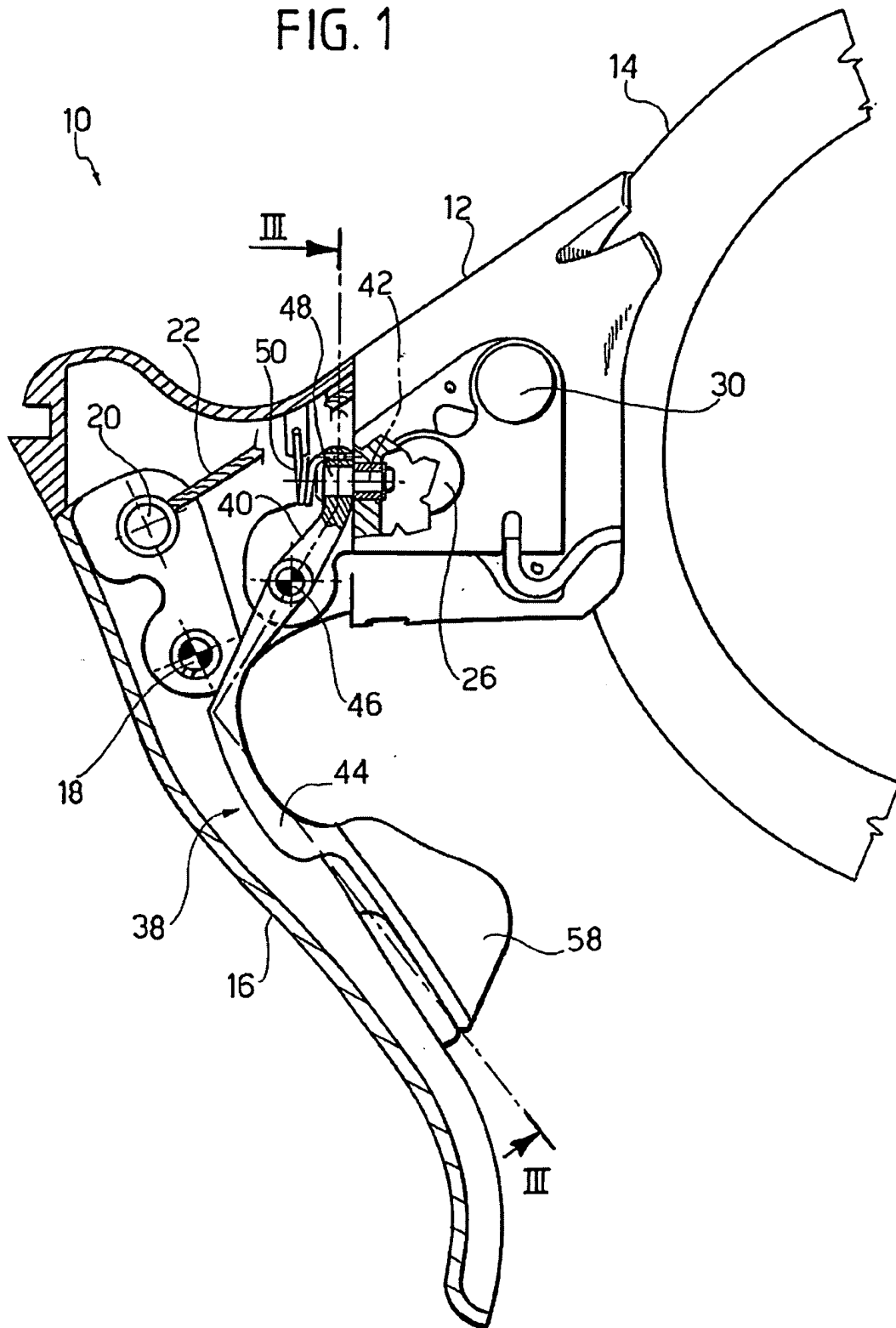


FIG. 2

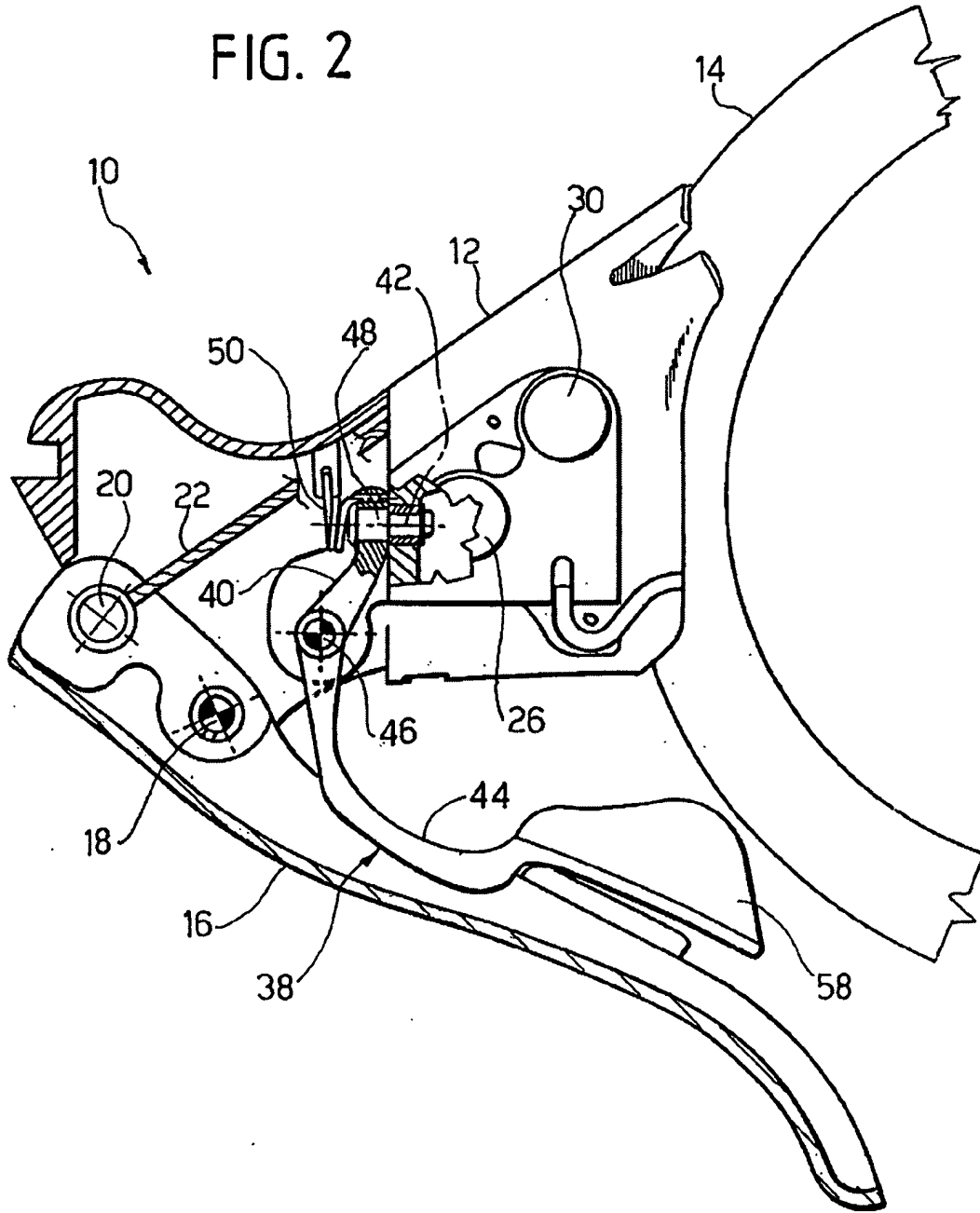


FIG. 3

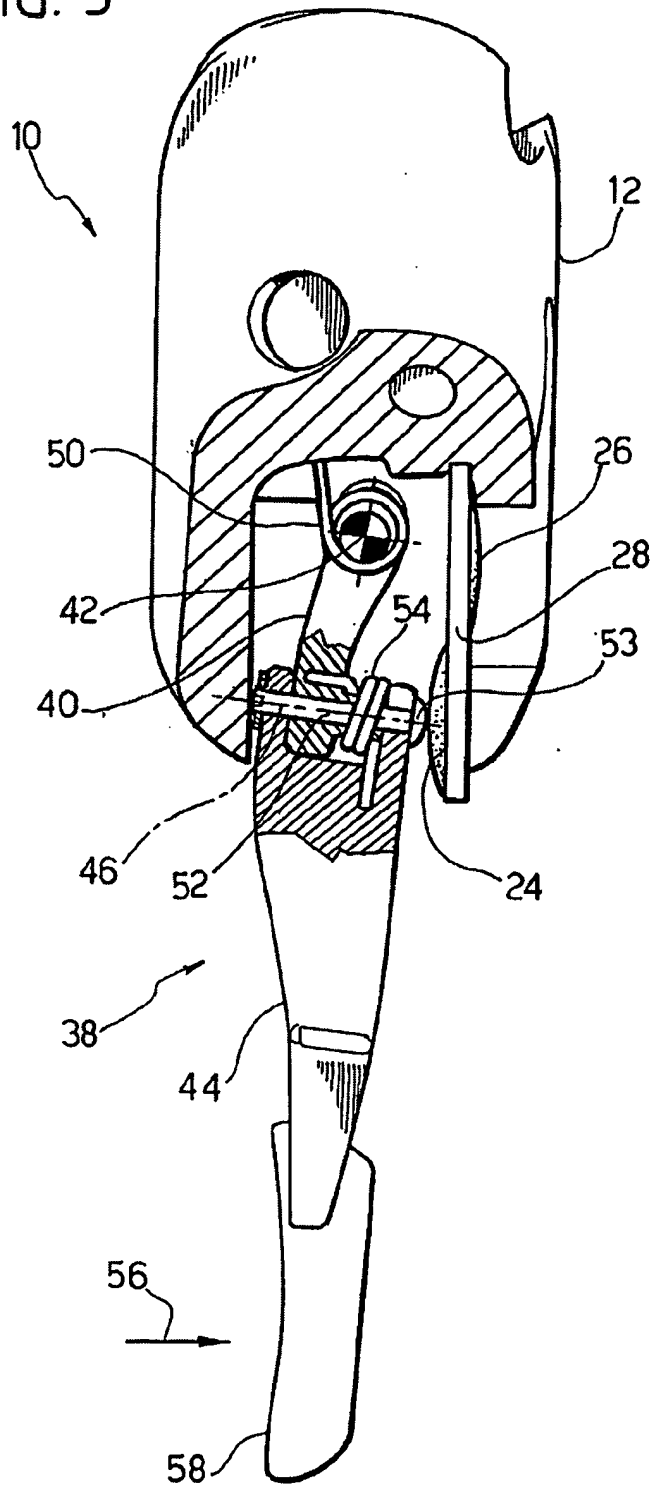


FIG. 6

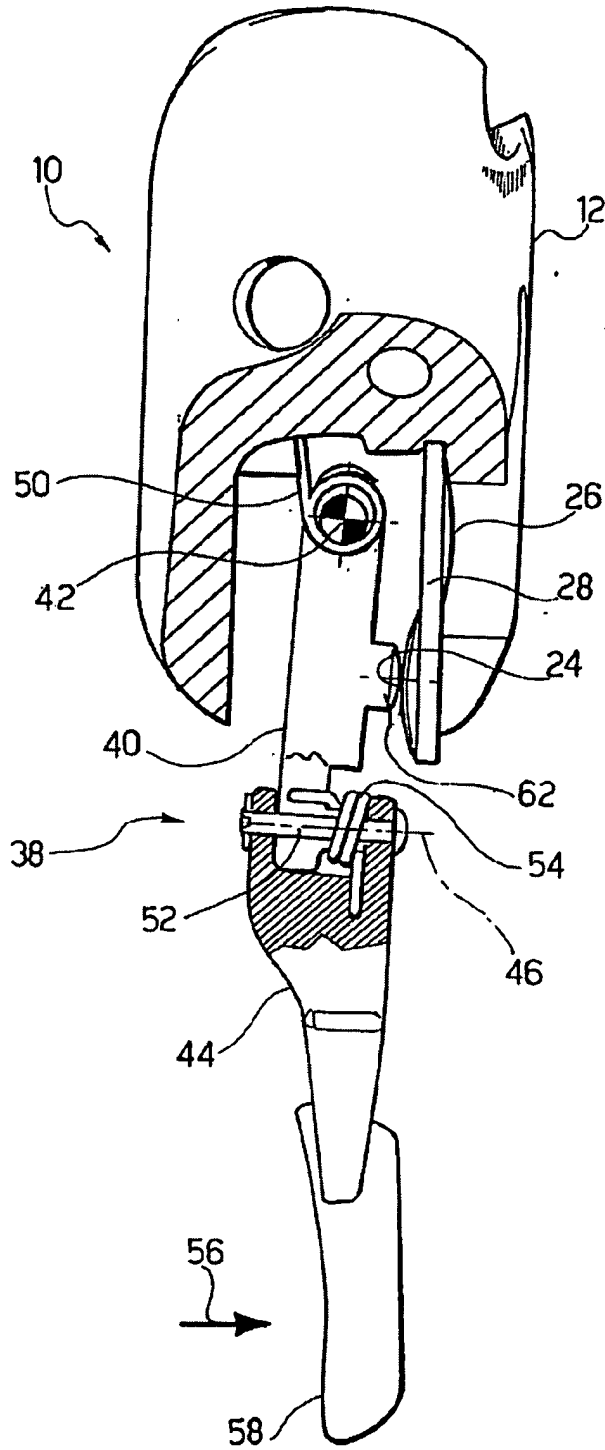


FIG. 7

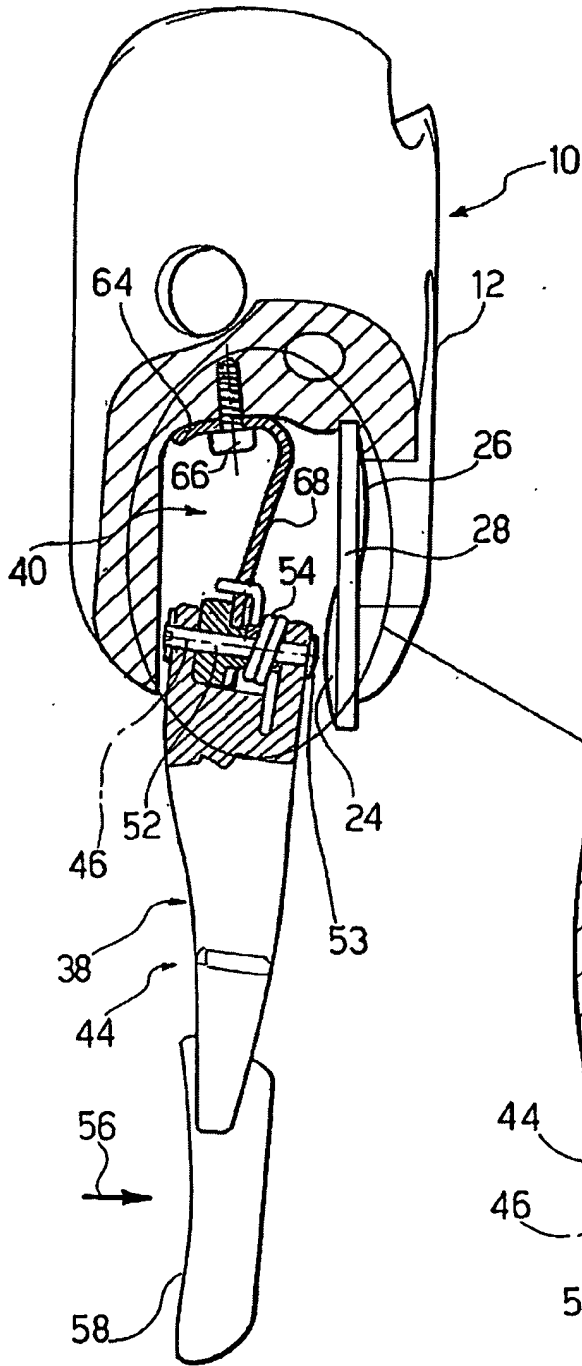


FIG. 8

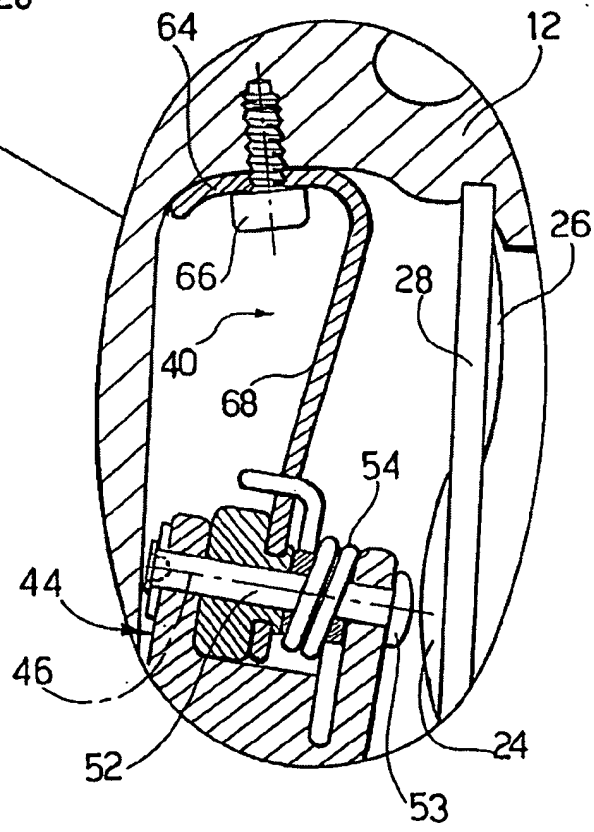


FIG. 9

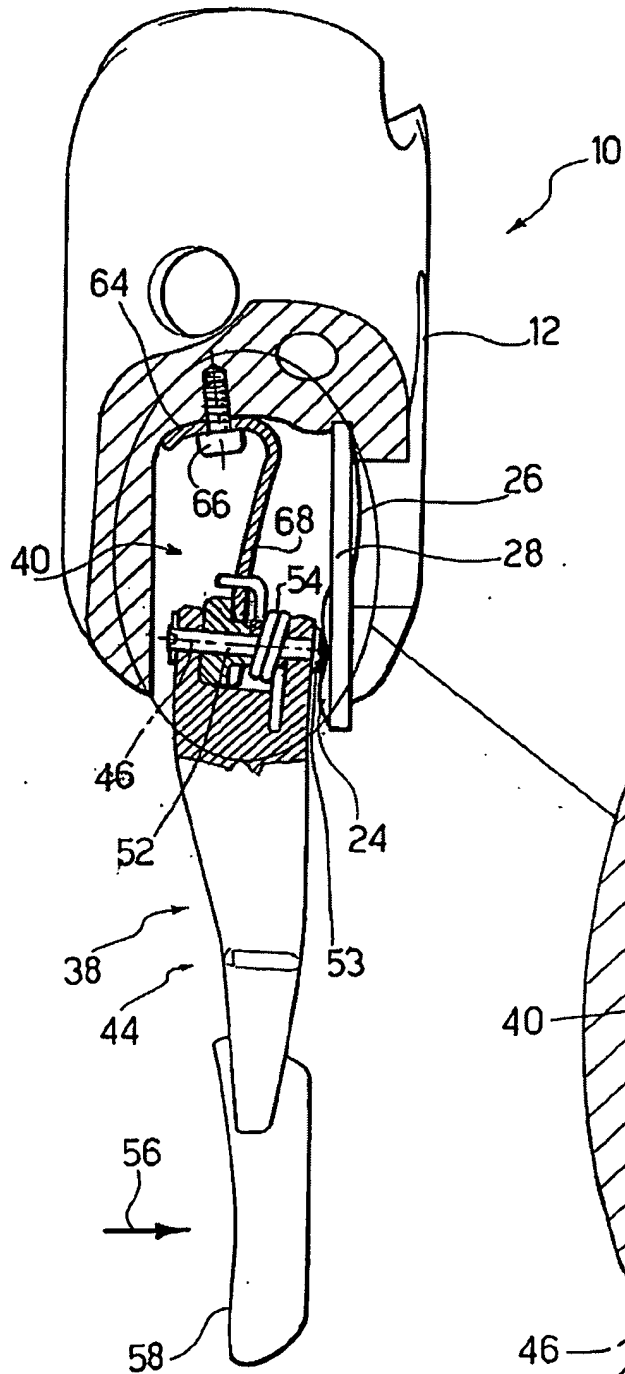


FIG. 10

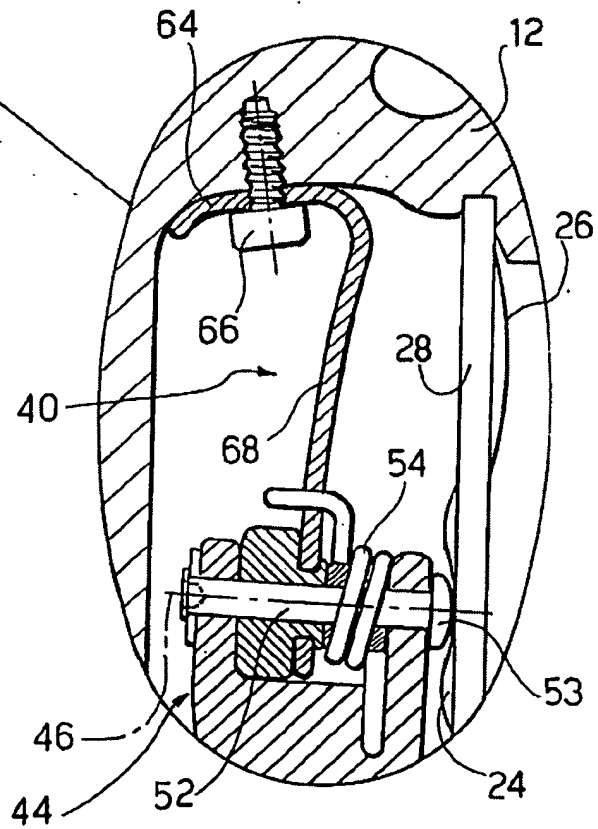


FIG. 11

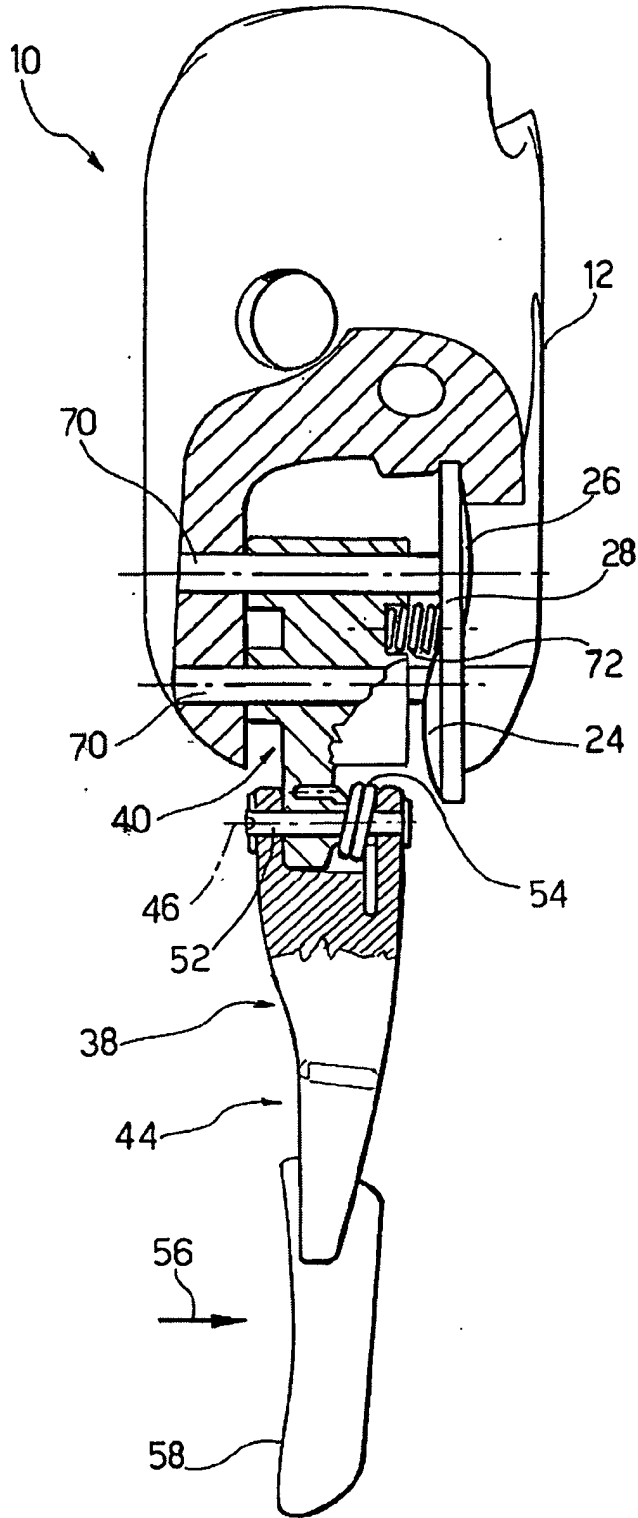


FIG. 12

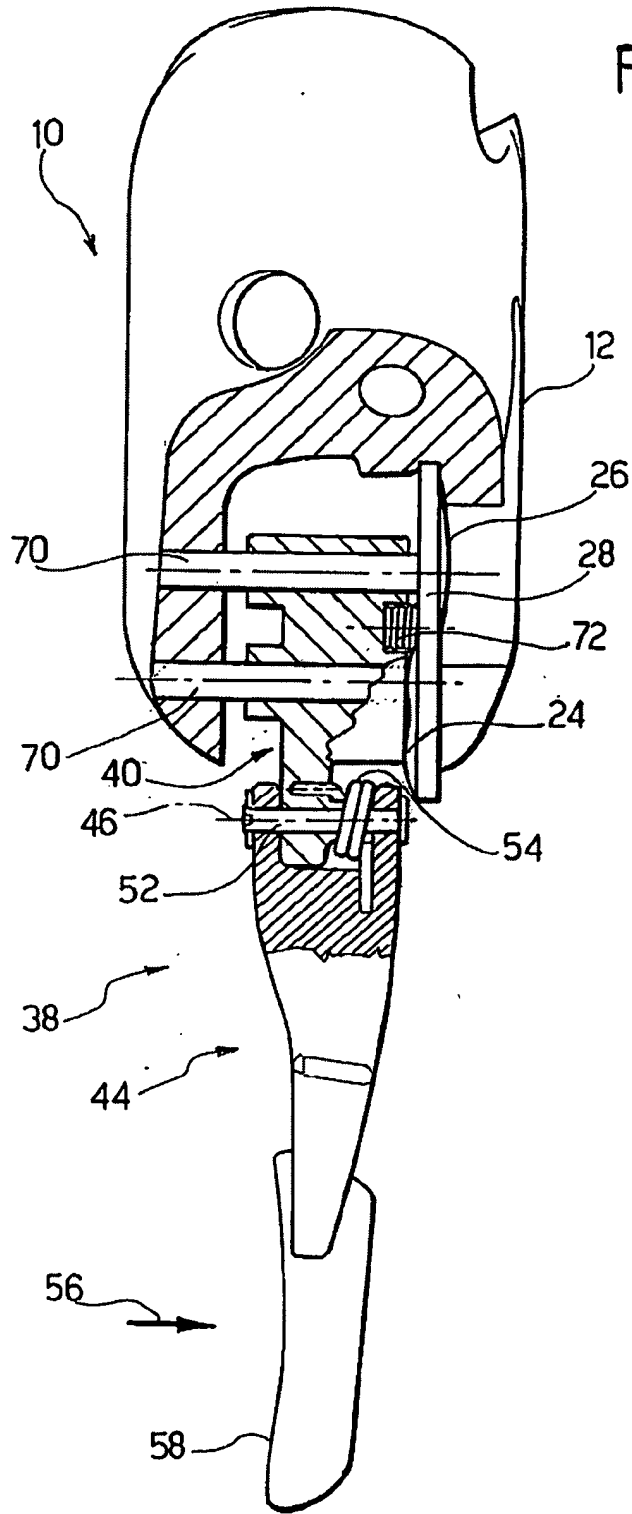


FIG.13

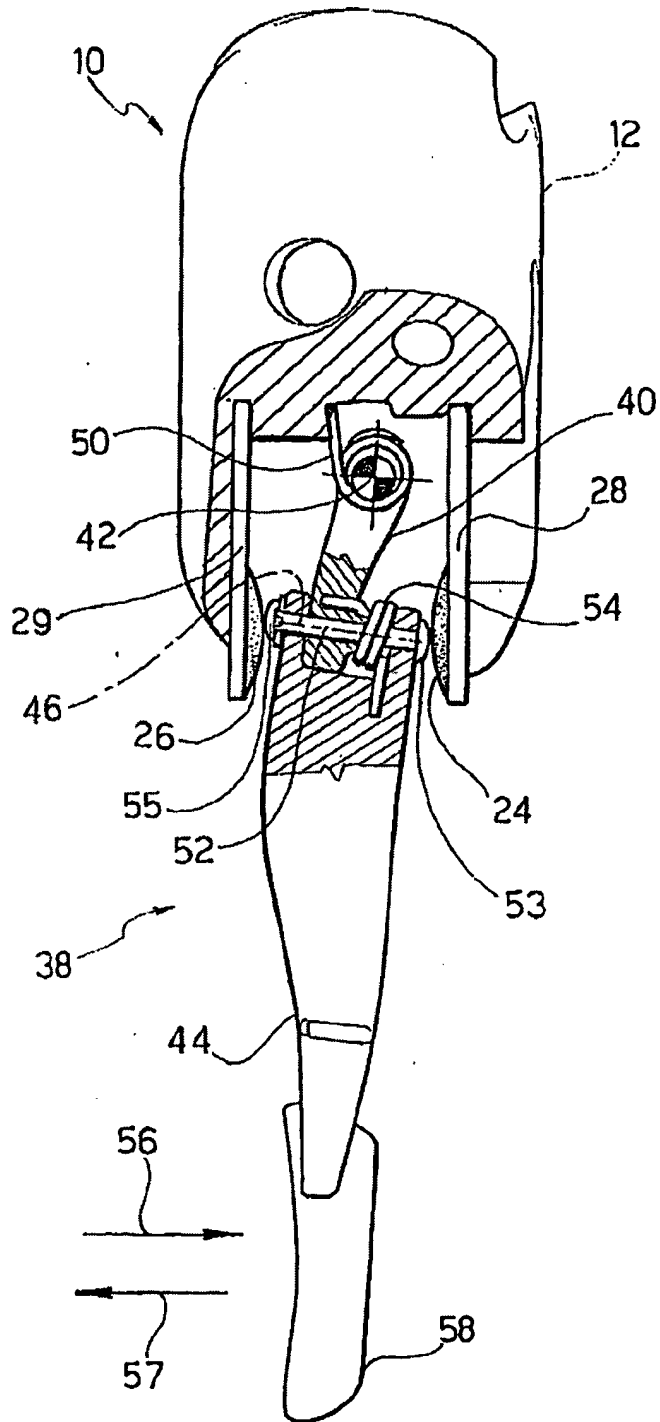
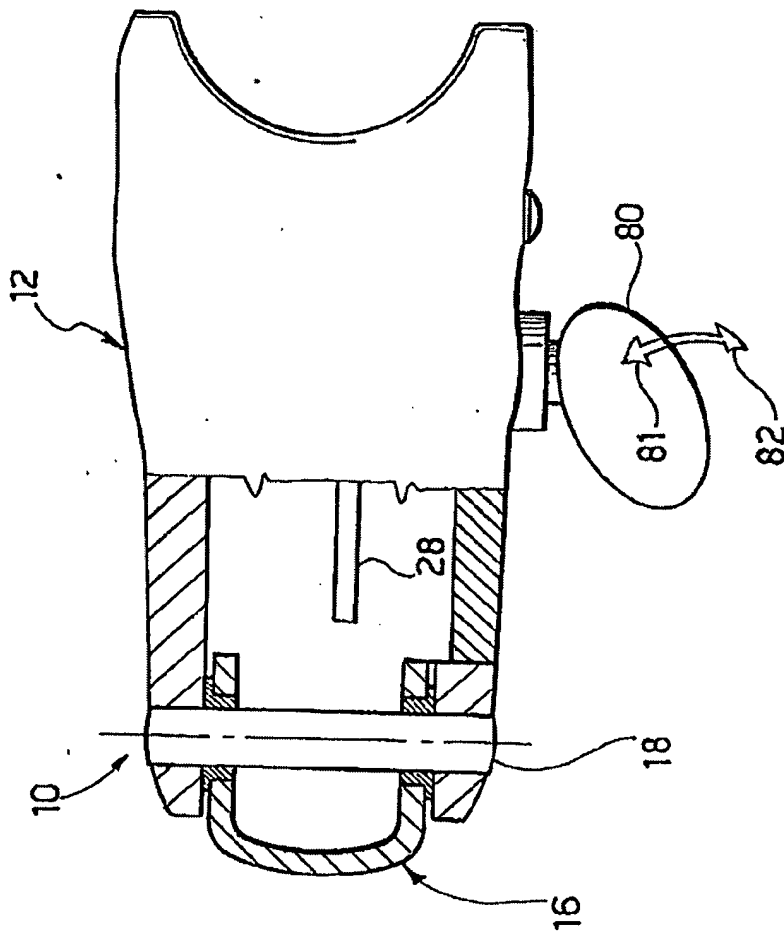


FIG. 14





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 02 01 2047

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, X	US 5 470 277 A (ROMANO) 28 November 1995 (1995-11-28) * column 5, line 5 - line 30; figure 8 *	1-3, 23-30	B62M25/08 B62M25/04
X	US 5 653 649 A1 (WATARAI) 5 August 1997 (1997-08-05) * figures 2,3 *	1,23-25, 30	
A	US 5 479 776 A (ROMANO) 2 January 1996 (1996-01-02) * the whole document *	4-10, 31-34	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			B62M
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		6 September 2002	Denicolai, G
CATEGORY OF CITED DOCUMENTS			
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EPO FORM 1503 03 02 (P04-001)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 02 01 2047

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06-09-2002

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