



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
02.01.2019 Bulletin 2019/01

(51) Int Cl.:
B05B 3/04 (2006.01)

(21) Application number: **18179563.4**

(22) Date of filing: **25.06.2018**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

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(30) Priority: **30.06.2017 IT 201700073460**

(54) **TIME RESPONSIVE CONTROL SYSTEM OF IRRIGATION SECTORS FOR AN IMPULSE SPRINKLER AND IMPULSE SPRINKLER COMPRISING SUCH CONTROL SYSTEM**

(57) A timed control system (1) for timed control of irrigation sectors for an impulse sprinkler (2) with a barrel (3), a joint (4) swiveling about a vertical axis (X) and an actuator (7). The system comprises a first pair of limit stop members (11, 12) in first angular positions relative to the axis of rotation (X) to define a first irrigation sector (α), and at least one first reversing lever (23) which is adapted to be operably coupled to the actuator (7) and is adapted to interact with the first pair of limit stop members (11, 12) to reverse the direction of rotation in the first sector (α). The system also comprises a second pair of limit stop members (24, 25) in second angular positions to define a second irrigation sector (β) differing from the first. A second reversing lever (33) is provided, which is adapted to interact with the second pair of limit stop members (24, 25) to reverse the direction of rotation in the second sector (β). A selector (34) is further provided, which is configured to alternately cause interaction of the first lever (23) with the first pair of limit stop members (11, 12) and interaction of the second lever (33) with the second pair of limit stop members (24, 25) after a given scheduled interval of time to move from the first irrigation sector (α) to the second irrigation sector (β).

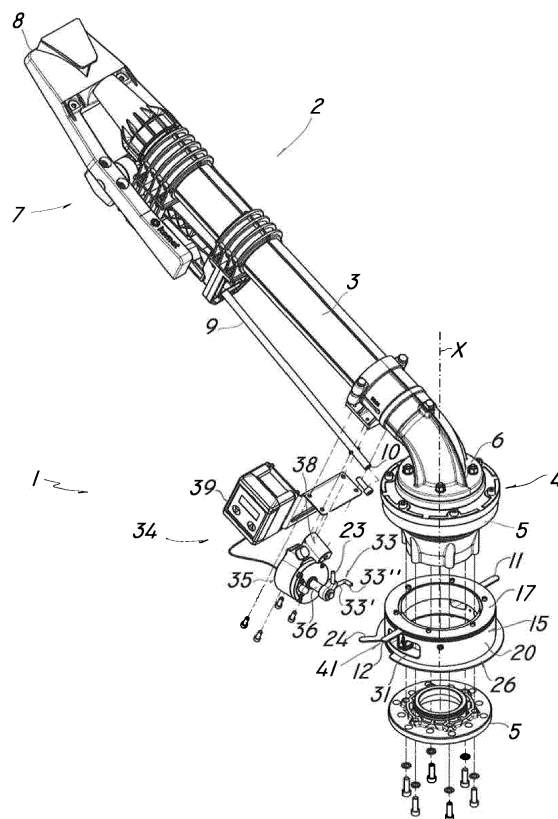


FIG. 1

Description

Field of The Invention

[0001] The present invention generally finds application in the field of irrigation systems for agricultural and industrial applications, and particularly relates to an irrigation sector control system for an impulse sprinkler.

[0002] The invention further relates to an impulse sprinkler comprising such control system.

Background art

[0003] Agricultural and/or industrial sprinklers are known in the art, which are connected to a line for supplying an irrigation liquid, and are designed to distribute a jet of such liquid to a soil portion to be irrigated.

[0004] Generally, sprinklers swivel about their own vertical axis and comprise a barrel for spraying a pressurized liquid jet and limit stop members delimiting an angular sector that corresponds to an angular portion of the soil to be irrigated.

[0005] Furthermore, these sprinklers comprise an actuator which is driven by the liquid jet delivered by the barrel and is adapted to cause the rotation of the barrel, as well as a reversing lever coupled to the actuator and adapted to alternately interact with one of the two stops to periodically reverse the direction of rotation of the barrel.

[0006] A first drawback of these sprinklers is that they cannot adjust the angular sector covered by the barrel during irrigation.

[0007] Thus, at the end of each irrigation cycle, the user is required to manually change the position of the stops and actuate the sprinkler again to irrigate a different angular sector.

[0008] In an attempt to obviate the aforementioned drawbacks, systems and devices have been developed for time responsive control of the irrigation sectors covered by a sprinkler barrel, affording automatic adjustment of the irrigated angular sector, without requiring any action of the operator.

[0009] These systems are usually adapted to be connected to a programmable selector for automatic adjustment of the irrigation angle at predetermined time intervals.

[0010] IT1408444 discloses a system for reversing the rotation of a rotating sprinkler, which comprises a ring designed to be fitted to the sprinkler and having a pair of limit stop members that define respective limit stop positions for the rotation of the barrel.

[0011] In addition, the system comprises a reversing lever coupled to the barrel actuator and adapted to interact with the two limit stop members within a predetermined angular irrigation range.

[0012] One of the limit stop members is connected to a mechanical selector which is adapted to automatically lower it after a predetermined user-selectable delay.

[0013] In this operating state, the interaction between the stop and the reversing lever is prevented and the latter continues its pivotal motion reaching beyond the stop into an angular sector that is partially complementary to the predetermined sector.

[0014] In the new angular sector, the reversing lever interacts with a third stop and this interaction lifts the stop that was previously lowered by the selector. Now, the barrel starts to rotate in the angular sector that is partially complementary to the predetermined sector until the end of the irrigation schedule.

[0015] A first drawback of this arrangement is that this system does not allow the barrel of the sprinkler to cover, and hence to irrigate, all the angular sectors of a round angle at predetermined time intervals.

[0016] Furthermore, this system has a rather large size, with overhanging parts that may be easily damaged as a result of accidental impacts with the ground or other structures and parts of the irrigation system during installation or operation of the sprinkler.

[0017] US2008179421 discloses a further system for reversing the rotation of a rotating sprinkler, which comprises a ring having two limit stop members for the barrel to be rotated within a pair of adjustable arcs.

[0018] Nevertheless, this arrangement is also affected by certain drawbacks, as this system has a large number of parts which add to its complexity and require a non-negligible assembly time.

Technical Problem

[0019] In the light of the prior art, the technical problem addressed by the present invention may be deemed considered how to provide an irrigation sector control system for an impulse sprinkler that allows the barrel of the sprinkler to cover, and hence irrigate, all the angular sectors of a round angle at regular time intervals with no need to change the orientation of the sprinkler.

Disclosure of the invention

[0020] The object of the present invention is to solve the above mentioned technical problem and obviate the above discussed drawbacks, by providing a time responsive irrigation sector control system for an impulse sprinkler and an impulse sprinkler comprising such system that are highly efficient and relatively cost-effective.

[0021] A particular object of the present invention is to provide a system as described above that allows the sprinkler barrel to cover all the angular sectors of a round angle without changing the orientation of the sprinkler.

[0022] Another object of the present invention is to provide a control system as described above that has a small size.

[0023] A further object of the present invention is to provide a control system as described above that prevents the barrel from being stopped in its travel or jamming.

[0024] Another object of the present invention is to provide a control system as described above that is simply assembled and used as compared with prior art systems.

[0025] These and other objects, as well as others that will be more clearly explained hereinafter, are fulfilled by an irrigation sector control system for an impulse sprinkler as defined in claim 1, in which the sprinkler comprises a jet-producing barrel connected to a pressurized water supplying line with a joint that swivels about a substantially vertical axis and an actuator that is driven by the jet to cause automatic rotation of the barrel with periodic reversal of the direction of rotation.

[0026] The control system comprises a first pair of limit stop members which are adapted to be associated with a stationary portion of the joint in predetermined first angular positions relative to the axis of rotation of the barrel to define a predetermined first irrigation sector, and at least one first reversing lever which is designed to be operably coupled to the actuator of the sprinkler and is adapted to interact with the first pair of limit stop members during rotation of the barrel to reverse the direction of rotation in the predetermined first irrigation sector.

[0027] The system further comprises a second pair of limit stop members which are adapted to be associated with the stationary portion of the swivel joint in predetermined second angular positions to define a predetermined second irrigation sector, other than the first irrigation sector, and a second lever which is designed to be operatively coupled to the actuator of the sprinkler to interact with the second pair of limit stop members during rotation of the barrel to reverse the direction of rotation in the second irrigation sector.

[0028] A time-programmable selector is further provided, which is configured to control the first and second levers and alternately cause interaction of the first lever with the first pair of limit stop members while preventing interaction of the second lever with the second pair, and cause interaction of the second lever with the second pair of limit stop members after a given programmed time interval while preventing interaction of the first lever with the first pair of limit stop members, to move from the first irrigation sector to the second irrigation sector.

[0029] In a further aspect, the invention relates to an impulse sprinkler comprising the aforementioned control system, as defined in claim 10.

[0030] Advantageous embodiments of the invention are obtained in accordance with the dependent claims.

Brief Description of The Drawings

[0031] Further features and advantages of the invention will be more apparent from the detailed description of a preferred, non-exclusive embodiment of a time responsive irrigation sector control system for an impulse sprinkler, and an impulse sprinkler of the invention, which are described as a non-limiting example with the help of the annexed drawings, in which:

FIG. 1 is an exploded perspective view of the control system of the invention, coupled to an impulse sprinkler;

FIG. 2 is an exploded perspective view of a part of the control system of Fig. 1;

FIGS. 3 to 12 are perspective side views with respective enlarged portions, and front views of the control system coupled to the sprinkler in different operating configurations;

FIG. 13 is a top view of the sprinkler with the control system in two different operating configurations.

Detailed description of a preferred exemplary embodiment

[0032] Particularly referring to the figures, numeral 1 shows and designates a time-responsive irrigation sector control system for an impulse sprinkler 2, which is configured to deliver a liquid, e.g. water, to a given soil surface area to be irrigated T.

[0033] As is known per se, the sprinkler 2 comprises a pressurized water jet producing barrel 3 connected to a liquid supply line, not shown, with a joint 4 that swivels about a substantially vertical axis X.

[0034] Advantageously, the joint 4 comprises a stationary portion 5 that is coupled to the liquid supply line and a rotating portion 6 that is coupled to the barrel 3 to rotate it.

[0035] Furthermore, as is known per se, the sprinkler comprises an actuator 7 driven by the pressurized liquid jet to cause automatic rotation of the barrel 3 with periodic reversal of the direction of rotation.

[0036] Namely, the actuator 7 comprises a baffle 8 which is adapted to interfere with the liquid jet delivered by the barrel 3 to cause rotation of the latter, as is well known in the art, and a rod 9 having one end 10 that faces the joint 4 of the sprinkler 1.

[0037] In a preferred embodiment of the invention, as shown in the figures, the control system 1 comprises a first pair of limit stop members 11, 12 which are adapted to be associated with the stationary portion 5 of the joint 4 in first predetermined angular positions relative to the vertical axis of rotation X to define a predetermined first irrigation sector α .

[0038] As best shown in FIG. 2, each of the first limit stop members 11, 12 is formed on a respective annular elements 13, 14 which is coupled to the stationary portion 5 of the joint 4 and projects radially outwards.

[0039] Furthermore, the first annular elements 13, 14 rotate relative to each other to change the angular position of the first limit stop members 11, 12 and, accordingly, the width of the first irrigation sector α .

[0040] The system may comprise an annular support body 15, as shown in FIG. 2, which is coupled to the stationary portion 5 of the joint 4, and the first two annular elements 13, 14 may be stably coupled to the upper portion 16 thereof with their respective bottom and top surfaces contacting each other by means of a first annular

disc 17, which is fastened to the body 15 by a plurality of screws 18.

[0041] Conveniently, the control system 1 may comprise first lock means 19 associated with the first pair of annular elements 13, 14 and operable by a user to lock mutual rotation thereof once the width of the first irrigation sector α has been selected.

[0042] The annular body 15 may comprise a cylindrical side wall 20 with first seat 21 that is open to the outside to receive the first lock means 19.

[0043] These may comprise a first clamping screw 22 that is driven upwards along its vertical axis X' by means of a first rotating ring nut 22'.

[0044] The clamping screw can press the first annular elements 13, 14 against the first annular disk 17 that overlies them and lock mutual rotation thereof.

[0045] The system 1 also comprises a first reversing lever 23 which is adapted to be operably coupled to the actuator 7 of the sprinkler 2, namely to the end 10 of the rod 9 that faces the joint 4.

[0046] The first reversing lever 23 is adapted to interact with the first pair of limit stop members 11, 12 during rotation of the barrel 3 to reverse the direction of rotation in the predetermined first irrigation sector α .

[0047] Particularly, the contact of the first reversing lever 23 with a respective limit stop member 11 will cause the actuator 7 of the sprinkler 2 to pivot in a given direction of rotation. This movement of the actuator 7 will cause the barrel 3 to rotate about the axis X in a clockwise or counterclockwise direction.

[0048] Furthermore, the contact of the first reversing lever 23 with the other first limit stop member 12 will cause the actuator 7 to pivot in the opposite direction and the direction of rotation of the barrel 3 to be accordingly reversed in the first irrigation sector α .

[0049] Referring to the sprinkler 2 as shown herein, upon interaction with one of the first two stops 11, 12, the first reversing lever 23 uses the rod 9 operably associated therewith to change the position of the baffle 8, such that the latter will interfere with the liquid jet from an opposite side and change the direction of rotation of the barrel 3.

[0050] In a peculiar aspect of the invention, the control system 1 comprises a second pair of limit stop members 24, 25 which are adapted to be associated with the stationary portion 5 of the joint 4 in second predetermined angular positions to define a second irrigation sector β other than the first irrigation sector α .

[0051] Similar to what has been described above for the first pair of limit stop members 11, 12, each of the limit stop members of the second pair 24, 25 projects radially outwards and is formed on a respective second annular element 26, 27.

[0052] The second annular elements 26, 27 also rotate relative to each other to change the position of the second limit stop members 24, 25 and adjust the width of the second angular irrigation sector β .

[0053] Furthermore, the second annular elements 26,

27 are axially offset from the first annular elements 13, 14 and are placed on the opposite side with respect to the annular support body 15 as described above.

[0054] Namely, the second annular elements 26, 27 are coupled to the lower portion 28 of the support body 15, at the stationary portion 5 of the joint 4, by means of a second annular disc 29, which is fastened to the body 15 by a plurality of screws 18, similar to what has been described for the first annular elements 13, 14.

[0055] The first 13, 14 and second 26, 27 annular elements are coupled to the upper portion 16 and the lower portion 28 respectively of the support body 15 such that part of their annular surfaces radially project out of the side wall 20 of the body 15.

[0056] Conveniently, second lock means 30 may be provided which are accommodated in a second seat 31 that is open to the outside and is formed in the side wall 20 of the support body 15 in a position that is diametrically opposite to the first seat 21.

[0057] The second lock means 30 may comprise a second clamping screw 32 that is driven downwards along its vertical axis X" by means of a second rotating ring nut 32' to press the second annular elements 26, 27 against the second annular disc 29 underlying them, and preventing them from rotating relative to each other, upon adjustment of the width of the second irrigation sector β .

[0058] In a further peculiar aspect of the invention, a second reversing lever 33 is provided, which is designed to be operably coupled to the actuator 7 of the sprinkler 2, and is adapted to interact with the second pair of limit stop members 24, 25 during rotation of the barrel 3 in the second irrigation sector β as described above for the first pair of limit stop members 11, 12 and the first reversing lever 23.

[0059] A time-programmable selector 34 is further provided, which is configured to control the levers 23, 33 to alternately cause interaction of the first lever 23 with the first pair of limit stop members 11, 12 while preventing interaction of the second lever 33 with the second pair of limit stop members 24, 25, as shown in FIGS. 4 to 6, or cause interaction of the second lever 33 with the second pair of limit stop members 24, 25 while preventing interaction of the first lever 23 with the first pair of limit stop members 11, 12, as shown in FIGS. 10 to 12.

[0060] The selector 34 may comprise an electromechanical drive 35 having a shaft 36 that rotates about a second axis of rotation Y, in a vertical position with respect to the vertical axis of rotation X.

[0061] The first 23 and second 33 reversing levers are fixed to the end of the shaft 36 that faces the annular elements 13, 14; 26, 27 in positions that are angularly offset by a predetermined angle δ .

[0062] Namely, the two levers 23, 33 are rigidly joined to an annular support member 37 that is fitted on the end of the shaft 36, the second lever 33 comprising a first portion 33' that extends from the support member 37 in the same vertical plane as the first lever 23 and an end pin 33" folded by 90° with respect to the first portion 33'

and parallel to the axis of rotation Y.

[0063] In addition, the end 10 of the rod 9 of the actuator 7 that faces the joint 4 may be operably coupled to the two reversing levers 23, 33, as described above, via a specially shaped flange 38 that is coupled to the electromechanical drive 35 and has a hole therein for receiving the end 10 of the rod 9.

[0064] The selector 34 may further comprise a timer 39 that is electrically connected to the electromechanical drive 35 to enable the shaft 36 to rotate at predetermined time intervals.

[0065] Then, the shaft 36 of the selector 34 rotates about its own axis of rotation Y between angular end positions corresponding to the first α and second β irrigation sectors and a temporary intermediate position.

[0066] In the first angular end position of the shaft 36, the first lever 23 interacts with the first pair of limit stop members 11, 12, and in the second angular end position the second lever 33 interacts with the second pair of limit stop members 24, 25.

[0067] Conveniently, the electromechanical drive 35 may comprise an electromechanical actuator and a spring mechanism, not shown, which are associated with the shaft 36 and are configured to prevent them from rotating from the first end position to the second end position, and hence from moving from the first irrigation sector α to the second irrigation sector β , until the trigger signal by the timer 39.

[0068] The rotation angle of the shaft 36 is calculated according to the predetermined angle δ between the first 23 and second 33 reversing levers. Of course, this predetermined angle δ may also be changed as needed, as long as the second lever 33 does not interact with the second limit stop members 24, 25 in the first end position, and that the first lever 23 does not interact with the first limit stop members 11, 12 in the second end position.

[0069] Furthermore, the end pin 33" of the second lever 33 is configured to slidingly move along the top surface 40 of the top annular element 26 of the second pair when the drive 35 is in the temporary intermediate position.

[0070] The second annular element 26 on which the pin 33" of the second reversing lever 33 slides may comprise a peripheral recess 41 immediately downstream from its respective limit stop member 24.

[0071] Therefore, the pin 33" of the second lever 33, after the first rotation of the shaft 36, slides on the top surface 40 of the annular sliding element 26 until it abuts the peripheral recess 41.

[0072] The latter enables the second rotation of the drive 35 to move the second lever 33 to the second angular position corresponding to the second irrigation sector β .

[0073] As shown in FIGS. 10 to 12, the first portion 33' of the second lever 33 interacts with the pair of second limit stop members 24, 25 to reverse the direction of rotation of the barrel 3 in the second irrigation sector β , whereas the pin 33" is located below the second pair of

annular elements 26, 27.

[0074] As best shown in FIG. 13, the first α and β second irrigation sectors may be in partially overlapping relationship, or even complementary to each other, without departure from the scope of the present invention.

[0075] In operation, the control system 1 and the sprinkler 2 are initially configured for the barrel 3 to rotate in the first irrigation sector α by the action of the actuator 7 and the first lever 23 associated therewith, which alternately interacts with the two limit stop members 11, 12 of the first pair, as shown in FIGS. 3 to 5. In this position, the barrel 3 irrigates a first portion of the soil T corresponding to the first angular sector α .

[0076] The barrel 3 moves in the first sector α during a first predetermined time interval as programmed in the timer 39 of the selector 34. Furthermore, during this first time interval, the rotation of the shaft 36 of the selector 34 is prevented by the actuator and the spring mechanism.

[0077] In the operating configuration in which the timer 39 is off, the sector α will be the only irrigation sector in which the barrel 3 rotates to irrigate the corresponding portion of the soil T.

[0078] Once the first time interval has elapsed, the timer 39 sends an electrical signal to the electromechanical actuator and the spring mechanism, which move from an active position to a rest position in which when the rotation of the shaft 36 is allowed.

[0079] Nevertheless, the first rotation of the shaft 36 from the first end position to the temporary intermediate position only occurs when the first lever 23 contacts the first available limit stop member 12, as it moves counterclockwise in the first sector α , after actuation of the timer 39, as shown in FIG. 6.

[0080] In the temporary intermediate position, the pin 33" of the second lever 33 slides on one of the two annular elements 26, as described above, still counterclockwise, until it abuts the peripheral recess 41, as shown in FIGS. 7 to 9.

[0081] As the pin 33" is not supported by the top surface 40 of the annular sliding element 26 the second rotation of the shaft 36 occurs, from the temporary intermediate position to the second end position, as shown in FIGS. 10 to 12.

[0082] In this position, the second lever 33 interacts, via the first portion 33' with the limit stop members of the second pair 24, 25 and the barrel 3 moves in the second angular sector β to irrigate a second sector of the soil T, other than the first sector.

[0083] In a further aspect, the invention relates to an impulse sprinkler 2 comprising a pressurized water jet producing barrel 3 connected to a water supply line, a joint 4 coupled to the barrel 3 and having a portion 6 that swivels about a substantially vertical axis X, an actuator 7 driven by the jet to cause the barrel 3 to automatically rotate with periodic reversal of the direction of rotation, and a time responsive irrigation sector control system 1 as described above.

Industrial Applicability

[0084] The present invention may find application in industry, because it can be produced on an industrial scale in irrigation system manufacturing factories.

Claims

1. A time responsive control system (1) for time responsive control of the irrigation sectors for an impulse sprinkler (2) wherein the sprinkler (2) comprises a jet-producing barrel (3) connected to a pressurized water supplying line with a joint (4) that swivels about a substantially vertical axis (X) and an actuator (7) that is driven by the jet to cause automatic rotation of the barrel (3) with periodic reversal of the direction of rotation, which system (1) comprises:

- a first pair of limit stop members (11, 12) which are adapted to be associated with a stationary portion (5) of the joint (4) in predetermined first angular positions relative to the axis of rotation (X) of the barrel (3) to define a predetermined first irrigation sector (α);
- at least one first reversing lever (23) adapted to be operably coupled to the actuator (7) and to interact with said first pair of limit stop members (11, 12) during rotation of the barrel (3) to reverse the direction of rotation in the predetermined first irrigation sector (α);

characterized in that it comprises a second pair of limit stop members (24, 25) for association with the stationary portion (5) of the joint (4) in predetermined second angular positions to define a predetermined second irrigation sector (β), other than the first irrigation sector, a second reversing lever being provided, which is designed to be operatively coupled to the actuator (7) to interact with said second pair of limit stop members (24, 25) during rotation of the barrel (3) to reverse the direction of rotation in said second irrigation sector (β), a time-programmable selector (34) being provided, which is configured to control said levers (23, 33) and alternately cause interaction of said first lever (23) with said first pair of limit stop members (11, 12) while preventing interaction of said second lever (33) with said second pair of limit stop members (24, 25), and cause interaction of said second lever (33) with said second pair of limit stop members (24, 25), after a given programmed time interval, while preventing interaction of said first lever (23) with said first pair of limit stop members (11, 12), to move from said first irrigation sector (α) to said second irrigation sector (β).

2. System as claimed in claim 1, **characterized in that** each of said limit stop members (11, 12; 24, 25) is

formed on a respective annular element (13, 14; 26, 27) coupled to the stationary portion (5) of the joint (4), and outwardly radially projecting, the annular elements (13, 14; 26, 27) of the limit stop members of said first pair (11, 12) and said second pair (24, 25) respectively, being adapted to rotate relative to each other to change the width of said first irrigation sector (α) and said second irrigation sector (β) respectively.

3. System as claimed in claim 2, **characterized in that** the limit stop members of said first pair (11, 12) are formed on a first pair of annular elements (13, 14), which are axially offset from the limit stop members of said second pair (24, 25) formed on a second pair of annular elements (26, 27) and are located on opposite sides with respect to an annular support body (15).

4. System as claimed in claim 3, **characterized in that** it comprises first locking means (19) associated with said first pair of annular elements (13, 14) and second locking means (30) associated with said second pair of annular elements (26, 27), said first (19) and said second (30) locking means being adapted to be actuated by a user to lock rotation of said annular elements (13, 14; 26, 27) relative to each other, once the width of said first (α) and said second (β) irrigation sectors has been selected.

5. System as claimed in claim 1, **characterized in that** said selector (34) comprises an electromechanical drive (35) having a shaft (36) that rotates about a second axis of rotation (Y).

6. System as claimed in claim 5, **characterized in that** said first lever (23) and said second lever (33) are fixed to the end of the shaft (36) that faces said annular elements (13, 14, 26, 27) in positions that are angularly offset from each other by a predetermined angle (δ).

7. System as claimed in claim 5, **characterized in that** said selector (34) also comprises a timer (39) which is electrically connected to said electromechanical drive (35) to enable rotation of said shaft (36) about said second axis (Y) between angular end positions that are operatively associated to said first (α) and said second (β) irrigation sectors and a temporary intermediate position.

8. System as claimed in claim 7, **characterized in that** said second lever (33) comprises an end pin (33") substantially parallel to said second axis (Y), which is adapted to slidingly move along the top annular element (26) of said second pair when the drive (35) is in said temporary intermediate position.

9. System as claimed in claim 1, **characterized in that**

said annular sliding element (26) has a peripheral recess (41) located immediately downstream of its respective limit stop member (24) to enable rotation of said actuator (35) for said second lever (33) to move to said second angular position corresponding to said second irrigation sector (β).

10. An impulse sprinkler (2) comprising:

- a pressurized water jet-producing barrel (3) connected to a water supply line;
- a joint (5) that is coupled to said barrel (3) for pivoting about a substantially vertical axis (X);
- an actuator (7) driven by the jet to cause automatic rotation of the barrel (3) with periodic reversal of the direction of rotation;
- a time responsive irrigation sector control system (1);

characterized in that said control system (1) is as claimed in one or more of claims 1 to 9.

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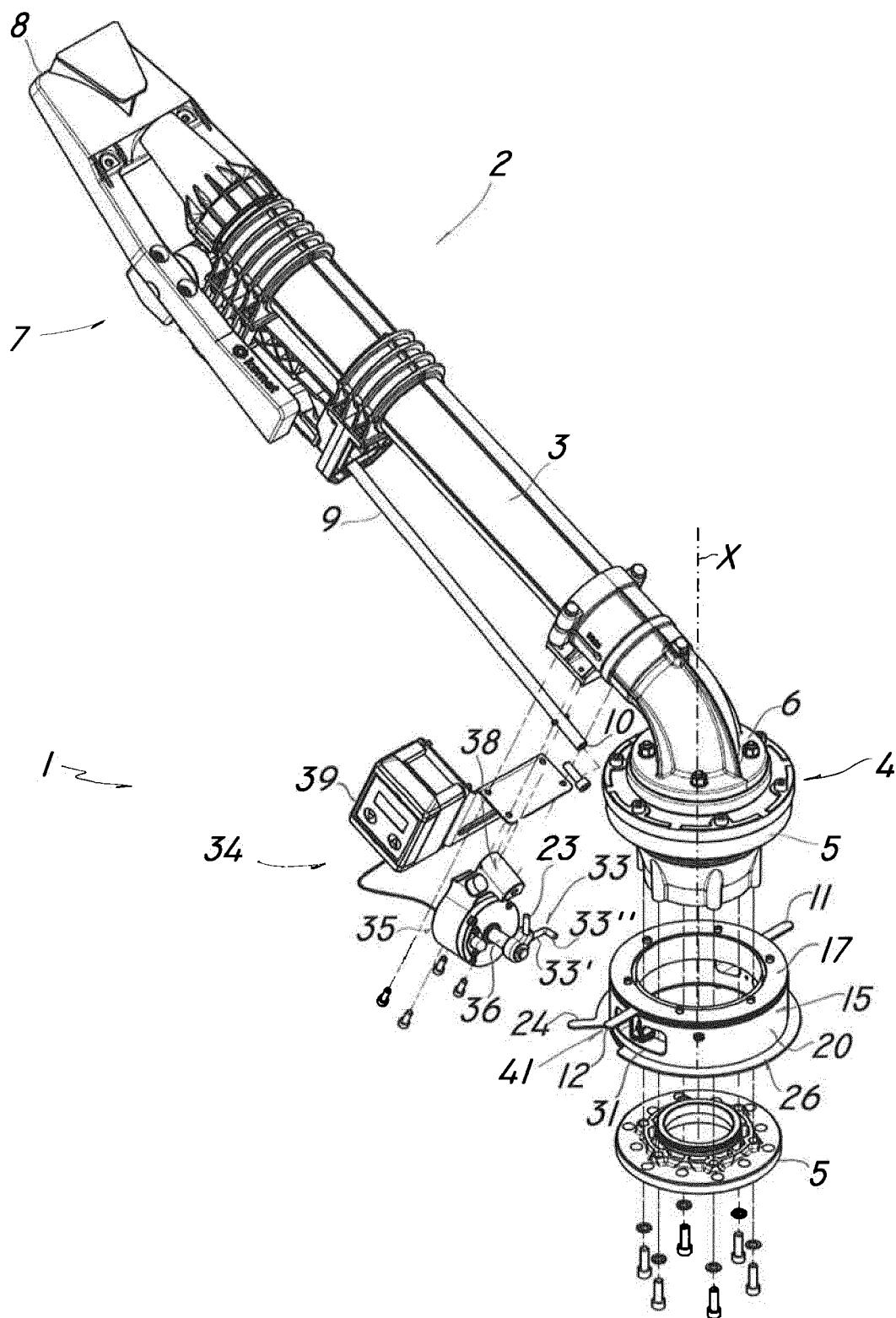


FIG. 1

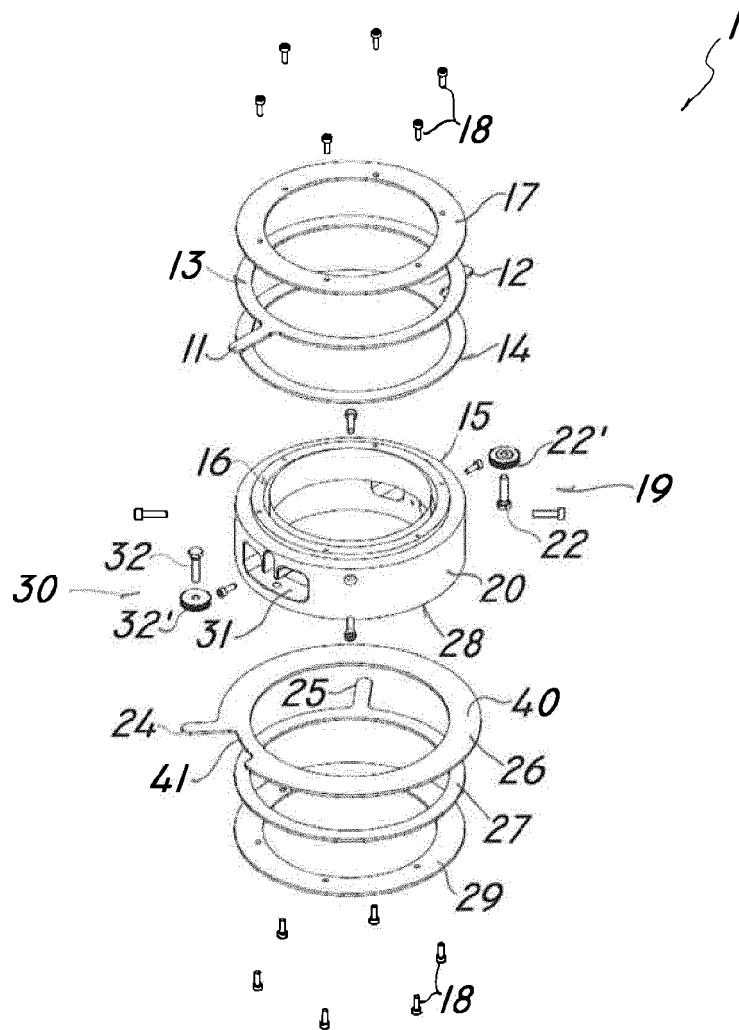


FIG. 2

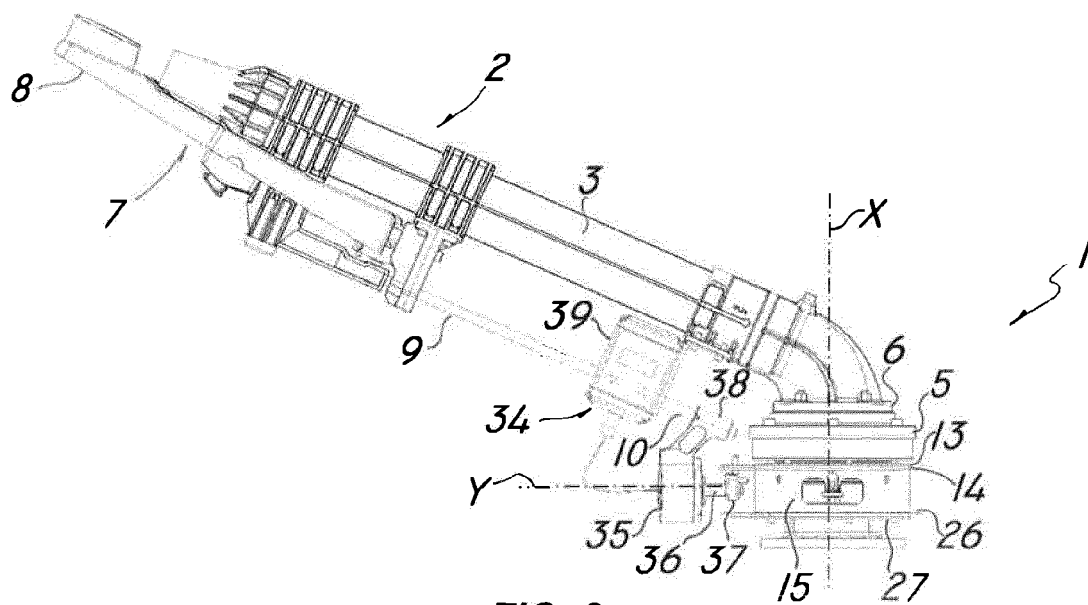


FIG. 3

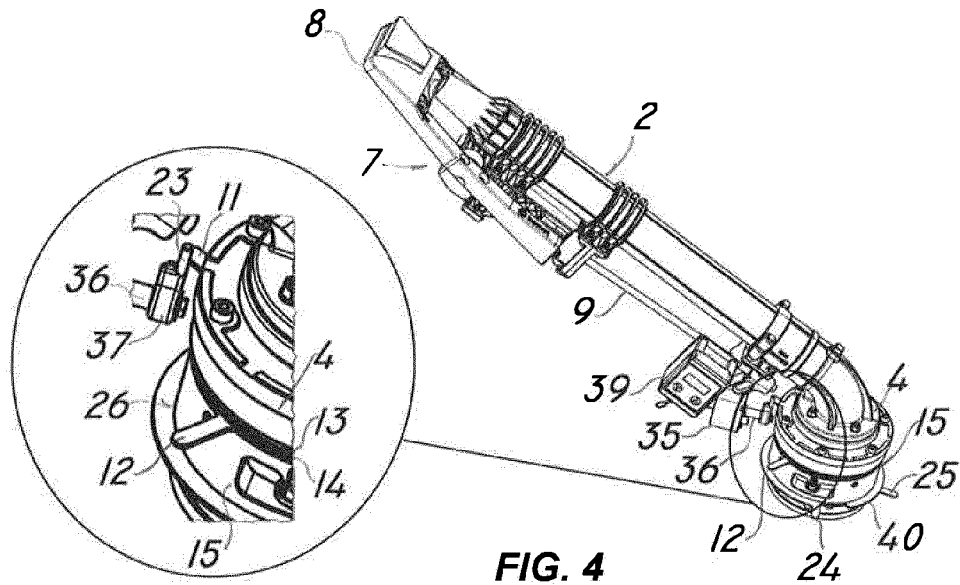


FIG. 4

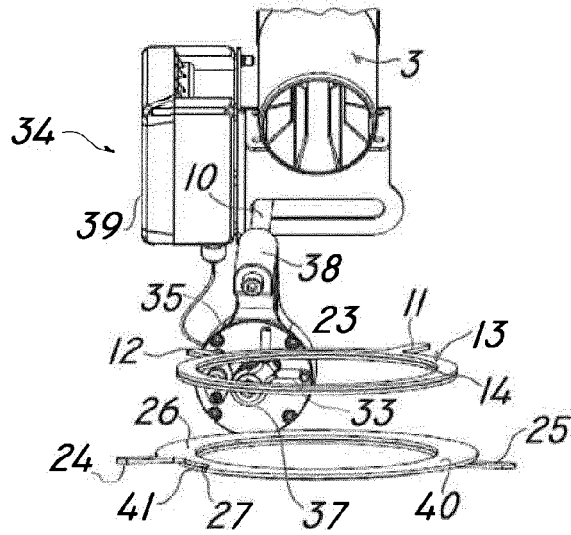


FIG. 5

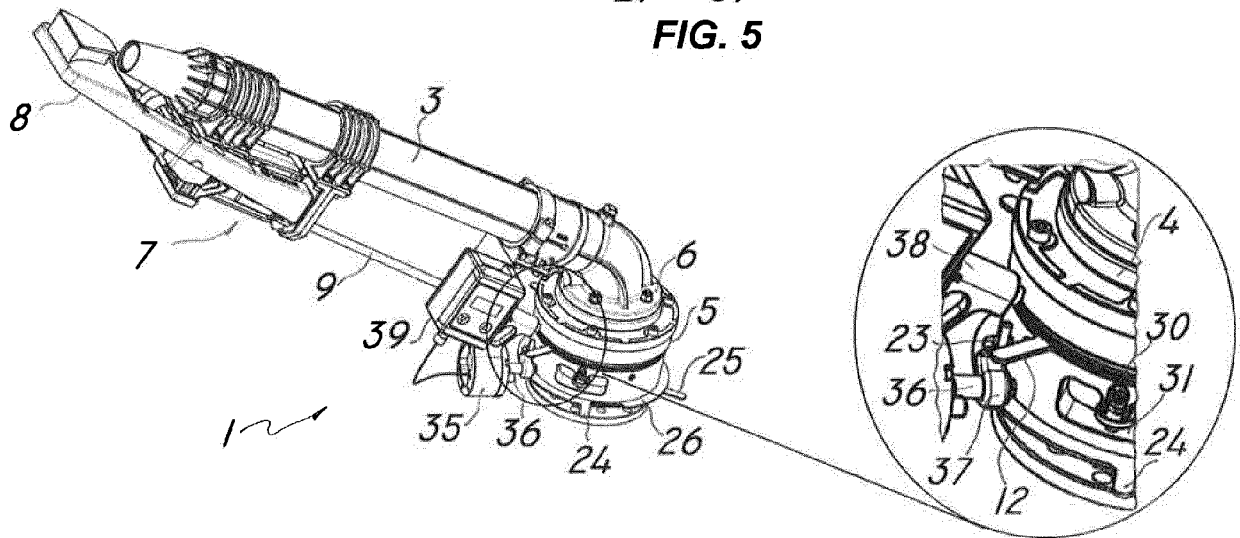
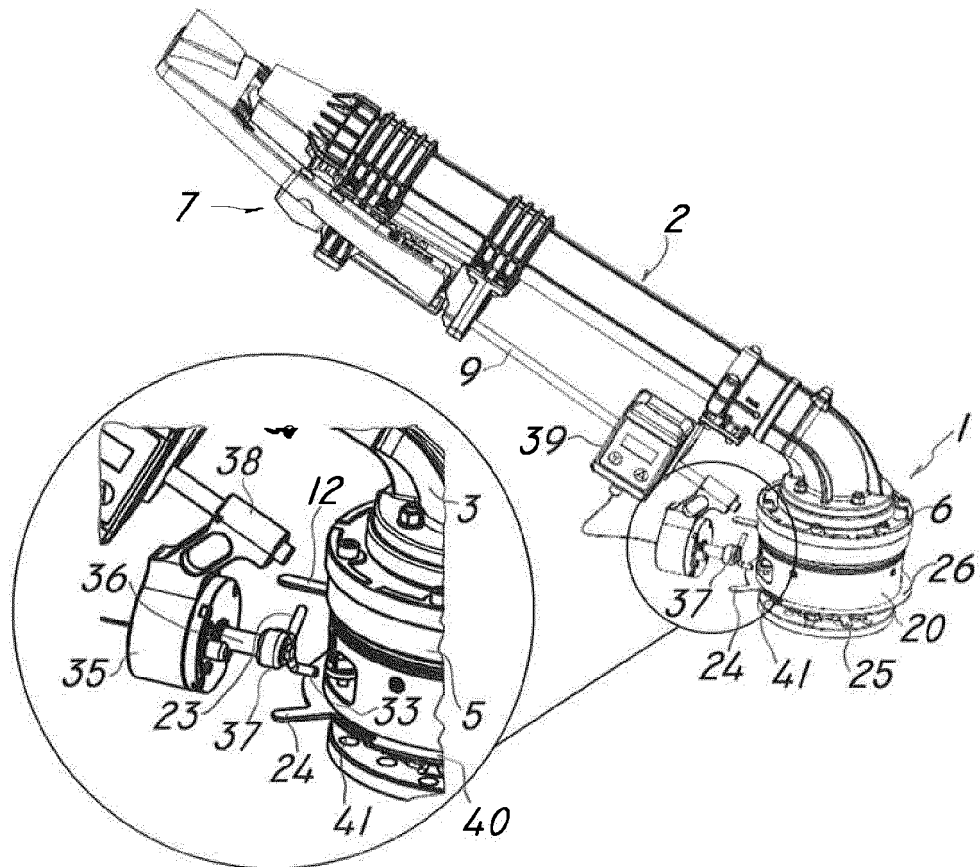
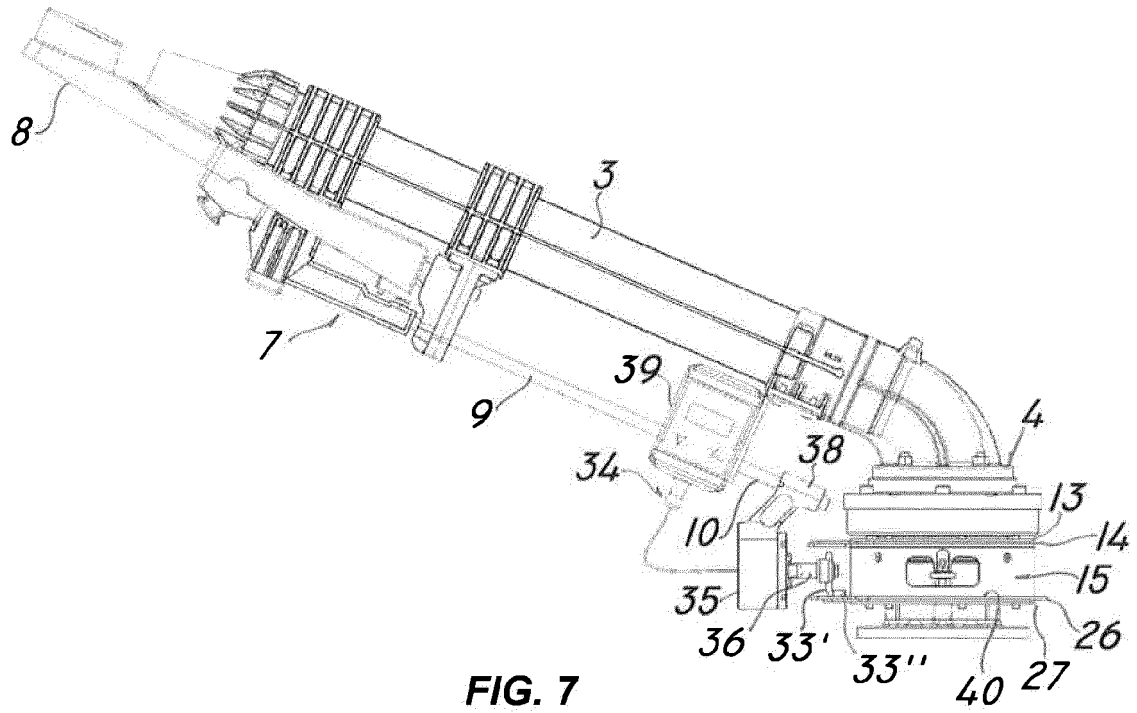


FIG. 6



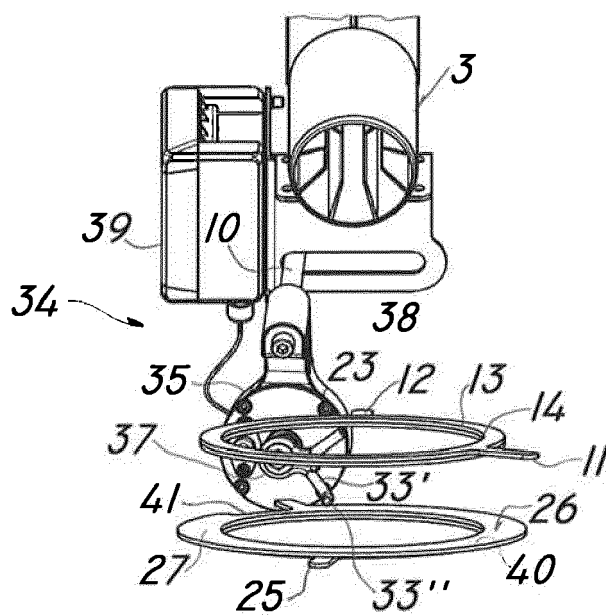


FIG. 9

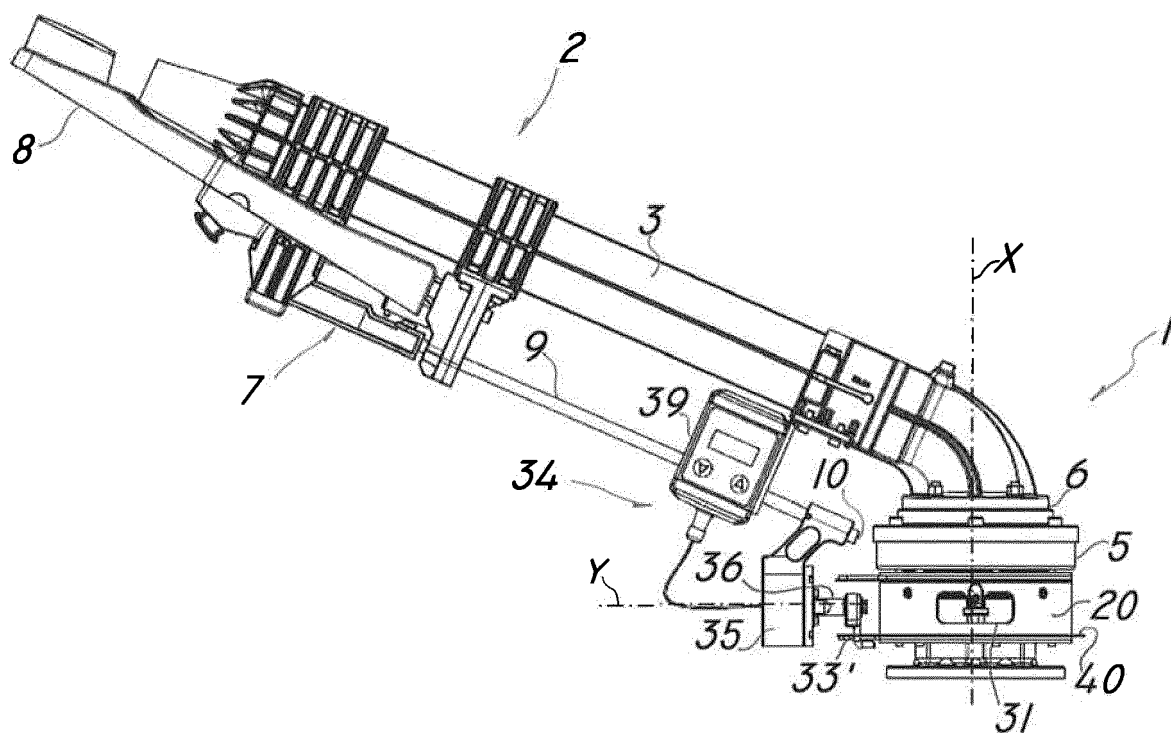


FIG. 10

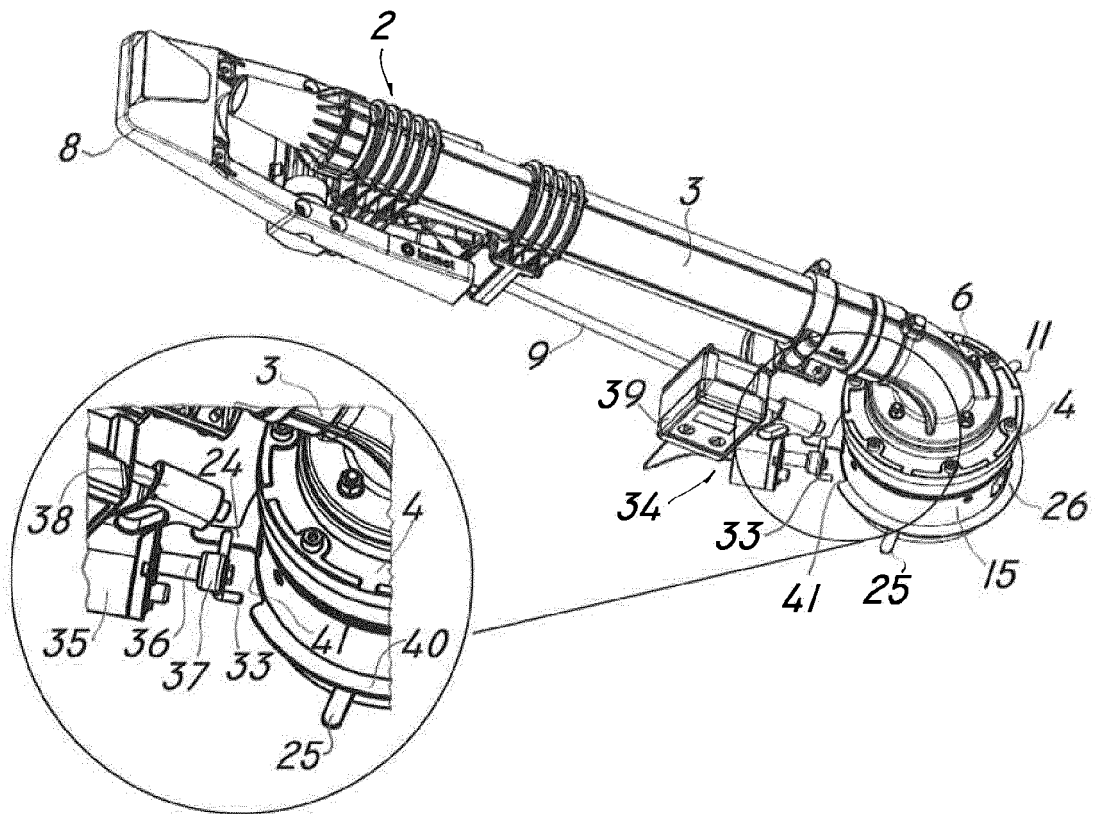


FIG. 11

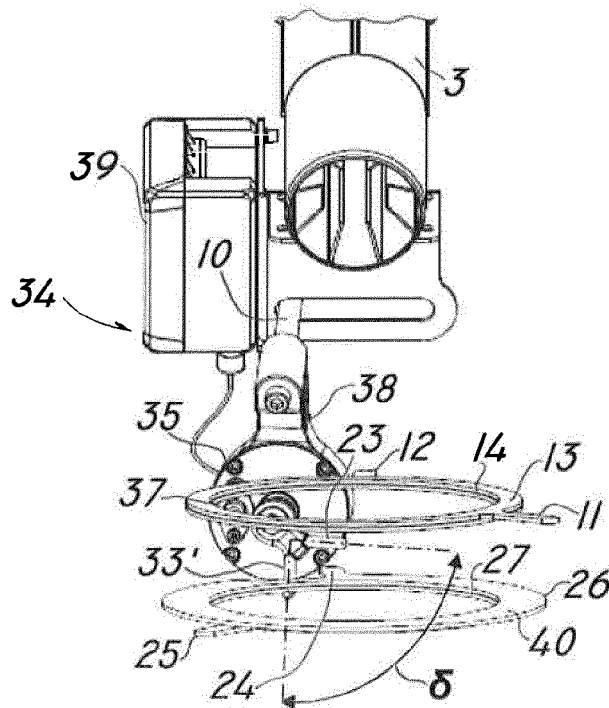


FIG. 12

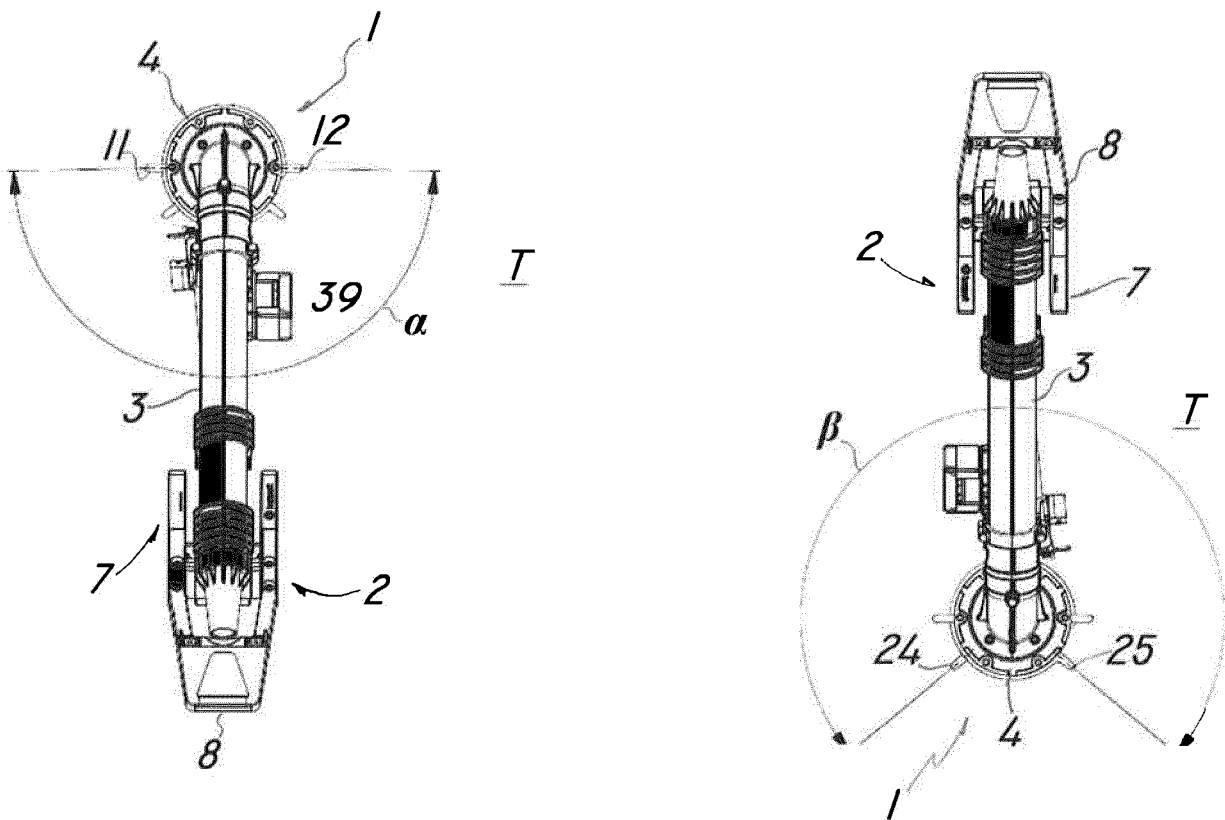


FIG. 13



EUROPEAN SEARCH REPORT

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 2008/179421 A1 (NELSON CRAIG B [US] ET AL) 31 July 2008 (2008-07-31) * the whole document *	1-10	INV. B05B3/04
A	EP 3 153 238 A1 (DRECHSEL ARNO [AT]) 12 April 2017 (2017-04-12) * abstract *	1	
A	US 2002/158145 A1 (SCHNEIDER GREG V [US] ET AL) 31 October 2002 (2002-10-31) * paragraph [0031] - paragraph [0033]; figures 1,3,7 *	1	
A	US 4 669 663 A (MEYER LARRY P [US]) 2 June 1987 (1987-06-02) * abstract; figure 1 *	1	
			TECHNICAL FIELDS SEARCHED (IPC)
			B05B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 16 November 2018	Examiner Bork, Andrea
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

 1
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ON EUROPEAN PATENT APPLICATION NO.**

EP 18 17 9563

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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16-11-2018

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2008179421 A1	31-07-2008	AU 2008211202 A1	07-08-2008
		EP 2120530 A2	25-11-2009
		US 2008179421 A1	31-07-2008
		WO 2008094513 A1	07-08-2008
EP 3153238 A1	12-04-2017	NONE	
US 2002158145 A1	31-10-2002	US 2002158145 A1	31-10-2002
		WO 02081099 A1	17-10-2002
US 4669663 A	02-06-1987	NONE	

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- IT 1408444 [0010]
- US 2008179421 A [0017]