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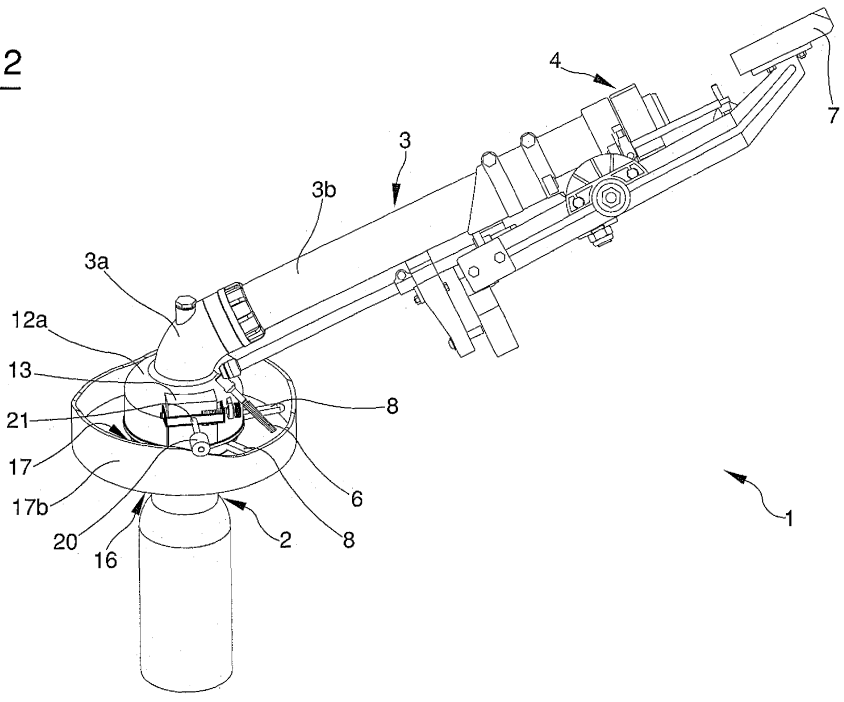
(54) **An irrigator**

(57) An irrigator comprises a base (2) and a spray tube (3) rotatably connected to the base (2) and destined to rotate about a rotation axis (X), the spray tube (3) directing a flow of the fluid towards a portion of terrain to be irrigated. The irrigator further comprises an intermediate element (10) fixed to the base (2) and having a cylindrical lateral surface (10b) on which a collar (11) is contactingly engaged. The collar (11) is solidly constrained to the spray tube (3) and rotated by the spray tube (3) about the rotation axis (X) in order to drag on the lateral surface (10b) of the intermediate element (10). The irrigator further comprises braking means (10, 11a), acting between the spray tube (3) and the base (2) by dragging in order to reduce the rotation velocity of the spray tube (3) about the rotation axis (X), and means for regulating (11c, 17, 20), commanded by the rotation of the spray tube (3) about the rotation axis (X) and acting on the braking means (10, 11a) in order to vary a braking force exerted by the braking means (10, 11a) according to an angular position assumed by the spray tube (3) about the rotation axis (X).

Fig. 2



EP 2 130 427 A1

Description

[0001] The invention relates to an irrigator, in particular a mobile irrigator of a type destined to irrigate terrains of any form, such as agricultural land or football or rugby fields, or the like.

[0002] The prior art comprises mobile irrigators comprising a spray tube mounted on a trolley and connected via a flexible pipe to a water dispenser generally located externally of the terrain to be irrigated. These irrigators are retreated, for example by means of traction exerted directly on the flexible pipe by action of a coil reel, while they direct a jet of water onto a portion of terrain arranged forward of the irrigator. The irrigator follows a prevalent development direction of the terrain, while distributing a flow of water onto the zones surrounding the terrain.

[0003] The spray tube is generally rotated about a vertical axis by action of the flowing water, and the rotation of the spray tube is such as to cover an angle which is sufficient to irrigate the portion of terrain the irrigator is facing. The rotation alternates back and forth and is commanded by commonly known devices for the inversion of the spray tube rotation.

[0004] Further, at the start of the irrigation, the spray tube is turned towards the coil reel, such as initially to irrigate the marginal zones of the terrain which would otherwise not be irrigated by the circular trajectory of the jet. Thereafter the traction exerted on the flexible tube by the coil reel recalls the irrigator, tending to rotate it and bring it into the operating position, which is specular with regard to the above-described position. Once this position is reached, the irrigator dispenses a water jet frontally, while retreating towards the coil reel under the traction force exerted thereby.

[0005] It has disadvantageously been noted that in the case of irrigation of rectangular terrains, or in any case of irregularly-shaped terrain with an irrigator of traditional type, in some zones of the terrain and in particular in the lateral zones of the terrain (at which the rotation of the spray tube is inverted), the supply of water is less than in the central zone of the terrain, with consequent non-uniform irrigation. In particular, an excessive quantity of water is sprayed into the central zone of the irrigated surface, a particularly disadvantageous situation.

[0006] During irrigation, the central zone receives a quantity of water which is greater than that received by the lateral zones and the irrigator, together with its support trolley, moves into the muddy zone with the consequent risk that the irrigator, together with its support trolley, might stick or even stop altogether. This would lead to a risk of breakage of the flexible pipes, which would still be under traction on the part of the coil reel, while the irrigator would be unable to move.

[0007] In addition, by using pluviometers, i.e. means for measuring the quantity of water dispensed onto the field to be irrigated in a predetermined time unit, it has been possible to measure, for traditional irrigators, the unit of water dispensed by the irrigator along the field to be irrigated.

[0008] Figure 1 shows a pluviometry graph of traditional known irrigators known on the market.

[0009] The curve obtained in the graph of figure 1, which on the x axis has the millimetres of water measured by each pluviometer and on the y axis the number of pluviometers used, exhibits a bell-shaped progression which demonstrates the lack of uniformity in the water dispensed by the irrigator along the irrigated field.

[0010] The graph shows a greater quantity of water collected by the pluviometers arranged in the central zone of the field and a smaller quantity of water collected in the pluviometers arranged in the peripheral zones. The technical aim of the present invention is to provide an irrigator which does not provide a result exhibiting the above-described drawbacks.

[0011] In the ambit of this technical task, an aim of the invention is to provide an irrigator which realises a uniform irrigation on terrains having a square or rectangular shape or, more in general, having an irregular shape.

[0012] A further aim of the invention is to provide a very reliable irrigator which is very safe to use.

[0013] The specified aims and more besides are substantially attained by an irrigator as described in claim 1 and/or in one or more of the claims dependent thereon.

[0014] A description of a preferred though not exclusive embodiment of an irrigator will now be made, illustrated in the accompanying figures of the drawings, in which:

figure 1 is a pluviometer diagram, exhibiting on the y axis a quantity of water measured in millimetres and on the x axis the number and position of the pluviometers, relating to traditional field irrigators in the prior art;
figure 2 is a perspective view of an irrigator of the present invention;
figure 3 is a partially-exploded perspective view of a part of the irrigator of figure 2;
figure 4 is a section view in a vertical plane of a part of the irrigator of figure 2;
figure 5 is a lateral view of the portion of irrigator shown in figure 4;
figure 6 is a perspective view of a detail of the irrigator of figure 2, in a first embodiment thereof;
figure 7 is a perspective view of the detail of figure 6, in a second embodiment thereof;
figure 8 is a pluviometer diagram, exhibiting a quantity of water measured in millimetres on the y axis and a number and position of the pluviometers on the x axis, of an irrigator of the present invention.

[0015] In the figures, 1 denotes in its entirety an irrigator of the present invention.

[0016] The irrigator 1 comprises a base 2 and a spray tube 3. The spray tube 3 is internally crossed by a through-channel C and is rotatably coupled to the base 2 in order to rotate about a vertical rotation axis X. The

spray tube 3 has a lower portion 3a which extends along the rotation axis X and an upper portion 3b, connected to a lower portion 3a, which upper portion 3b extends in a distancing direction from the rotation axis X. The upper portion exhibits a dispensing nozzle 4 of a jet of water and is connected to inversion means 5, 6 of the rotation of the spray tube 3. The inversion means 5, 6, which are of substantially known type, comprise a command rod 5 and a check element 6, which are interconnected and act on a deviator element 7 acting at the position of the nozzle 4. The check element 6 is destined to enter into contact with stop elements 8, arranged at the extreme positions reached by the check element 6 during operating rotation of the spray tube 3, and following contact with the stop elements 8 the check element 6 switches the deviator 7, inverting the rotation direction of the spray tube 3. The spray tube 3 is set in rotation by the water jet dispensed from the nozzle 4 and colliding with the deviator element 7.

[0017] Figure 3 is a detailed illustration of the structure of the irrigator 1. In particular, the irrigator 1 comprises a flange 9, an intermediate element 10, a collar 11 and a covering element 12. The four elements described are arranged about the rotation axis X and in a centred position with respect thereto, and have an operating function which will be described herein below.

[0018] The flange 9 is stably fixed to the base 2, for example by means of a plurality of screws, and the intermediate element 10 is stably keyed on the flange 9, for example by means of the fastening screws of the flange 9. The flange 9 is preferably made of metal, for example aluminium, plastic or steel, while the intermediate element 10 is made of plastic or another material.

[0019] The intermediate element 10 exhibits a base portion 10a which serves to fasten the whole intermediate element 10 to the base 2, and a cylindrical wall 10b having a vertical development which stretches out from the base wall. The cylindrical wall 10b has a circular section and is arranged coaxially to the rotation axis X.

[0020] The collar 11 comprises a curved plate 11a, preferably made of metal and arranged along an open circular profile and having two terminal portions 11b which can be connected to one another by fastening means 11c. The curved plate 11a is substantially counter-shaped to the cylindrical lateral wall 10b of the intermediate element in order to be keyed on the cylindrical lateral wall 10b. The collar 11 further comprises a hooking portion 11d defining a seating S, arranged preferably on a diametrically opposite side from the fastening means 11c, and even more preferably arranged externally of the circular profile along which the curved plate 11a develops. The covering element 12 comprises a concave body 12a mounted with a concavity thereof facing downwards and in particular is destined to contain the flange 9, the intermediate element 10 and the collar 11. In more detail, the concave body 12a exhibits a tubular extension 12b extending internally of the concavity and internally insertable of the flange 9. As shown in figure 4, an annular housing A is thus created between the tubular extension 12b and a lateral portion 12c of the concave body 12a, in which housing A the intermediate element 10, keyed on the flange 9, and the collar 11 are arranged.

[0021] Furthermore, in the view of figure 3 the concave body 12a exhibits a lateral protuberance 13 internally defining a broadening of the annular housing A and in which the fastening means 11c of the collar 11 are inserted.

[0022] The covering element 12, which is solidly constrained to the spray tube 3, is further solidly constrained to the collar 11 by means of a partially-threaded pin G which fits in an opening of the concave body 12a and at the same time engages the seating S of the collar 11.

[0023] A connecting element 14 is internally keyed to the extension 12, which connecting element 14 defines a downwards extension of the channel C. The connecting element 14 passes through the intermediate element 10, the flange and the collar 11 and connects to an inlet opening N realised in the base 2. The inlet opening N is in turn set in fluid communication with a source of water, not illustrated.

[0024] The connecting element 14 is supported to the base 2 by a bearing 15, an internal ring of which is externally keyed to the connecting element 14 and an external ring of which abuts on the base 2.

[0025] Seal rings T are also comprised, interposed between the rotatably connecting element 14 and the fixed base 2.

[0026] The irrigator 1 further comprises a guide element 16 stably fixed to the base 2, for example by means of screws, and exhibiting a guide surface 17 defining a cam. The guide surface 17, which is preferably defined by a vertical wall 17a supported by a horizontal plate 17b extends about the rotation axis X by an angular amount which is equal to or greater than the angular range that the spray tube 3 covers during its rotation.

[0027] As can be seen in figures 6 and 7, the irrigator 1 comprises a command bar 18, or screw, which passes through the two terminal portions 11b of the collar 11, and a nut screw 19 coupled by a thread to the screw 18.

[0028] The fastening means 11c comprise a first element 23 which is stably connected to a first terminal portion 11b of the collar 11, and a second element 24 which can be abutted to the first element 23 along an inclined surface 25 which at least partially extends in a nearing direction between the two elements 23, 24. The two elements 23, 24 are reciprocally aligned and when they are neared to the minimum distance define an external cylindrical body. The inclined surface 25 is such that a reciprocal rotation of the second element 24, rotating with respect to the fixed first element 23, causes a reciprocal nearing/distancing between the elements 23, 24, i.e. a screwing movement of the second element 24 with respect to the first element 23.

[0029] The fixed first element 23 and the rotating second element 24 are preferably respectively defined by a left-directed helix and a right-directed helix.

[0030] A nut screw 19 is abutted to the second terminal

portion 11b of the collar 11, while the screw 18 passes through the two elements 23, 24 (preferably with play, i.e. not coupled to the two elements 23, 24) and terminates in the illustrated preferred embodiments, in a knurled grip.

[0031] In a first embodiment, illustrated in figure 6, two nuts 27 are arranged on the screw 27, which nuts 27 are flanked and define a stable stop element. In the mounted configuration of figure 6, the elements 23, 24 are interposed between the nuts 27 and the nut screw 19 and are pushed towards one another by a spring 26 having a first end which abuts, directly or indirectly, on the second element 24 and another end which abuts on one of the two nuts 27. In this configuration the spring 26 is compressed and distances the second element 24 from the nuts 27 and, therefore, compacts the two elements 23, 24 to one another, forcing them to take on a predetermined reciprocal angular orientation, defined by the conformation of the surface 25.

[0032] In the embodiment of figure 7, in the mounted configuration the screw 18 also passes through a strike portion 28 defined by a projection of the spray tube 3 and, in more detail, by a projection of the concave body 12a. This projection, which is slot-shaped, defines a stop element for the spring 26. The spring, as before in the compressed state, nears the first and the second elements 23, 24 to one another, forcing them to take on a predetermined reciprocal angular orientation, defined by the conformation of the surface 25.

[0033] A cam follower 20 is eccentrically connected to the second element 24, by means of a connecting organ 21, 22. In the embodiment of figure 6, the connecting organ comprises a first lateral arm 22a of a support bracket 22 which exhibits a second lateral arm 22b, parallel to the first and engaged restingly on the screw 18. In the embodiment of figure 7, the connecting organ comprises a connecting rod 21 which is solidly connected to the second element 24 and which extends transversally of a rotation axis of the second element 24, such that to a rise or fall of the cam follower 20 corresponds a rotation of the second element 24 with respect to the first element 23.

[0034] The cam follower 20 is arranged such as to roll along a curved trajectory which develops about a rotation axis X of the spray tube 3 and which is defined by the guide surface 17. For this purpose, the cam follower 20 is rotatable about a respective rotation axis Y which preferably passes through a reciprocal screwing axis of the two elements 23, 24 and which assumes a variable orientation according to the portion of the guide surface 17 at a given moment engaged by the cam follower 20. In other words, the cam follower 20 changes its position with respect to the spray tube 3, and in particular rotates about the reciprocal screwing axis of the two elements 23, 24 according to the angular position assumed by the spray tube 3 about the rotation axis X.

[0035] Figures 3 and 4 denote, respectively in a continuous and a broken line, the extreme positions achieved by the cam follower 20 during the rotation of the spray tube 3, to which corresponding extreme inclinations of the rotation axis Y of the cam follower 20 relate.

[0036] The guide surface 17 exhibits an undulated profile, i.e. having a height (measured along a parallel direction to the rotation axis X of the spray tube 3) which is continuously variable along the angular range covered by the spray tube 3 during the rotation thereof. In other words, considering a rotation movement of the spray tube 3 between a first extreme position and a second extreme position, the guide surface 17 has a conformation which determines a progressive lowering of the cam follower 20 up to reaching an intermediate position between the extreme positions, and such as to determine a successive rising of the cam follower 20 from the intermediate position towards the second extreme position. This conformation of the guide surface 17, which can be described as a dropping of the guide surface 17 into a central position thereof, determines a corresponding movement of the cam follower 20 which in turn and in cooperation with the surface 25 defined by the two elements 23, 24, causes a reciprocal distancing and/or a nearing of the two elements 23, 24. This causes a variable locking force on the terminal portions 11b of the collar 11 and, consequently, a variable braking force on the spray tube 3. In particular, a rotation of the second element 24 generates a compression of the spring 26 with a consequent thrust on the nuts 27 to distance them from the second element 24. This thrust tends to near the two terminal portions 11b to one another, with an increase of the locking force on the collar 11.

[0037] Furthermore, the presence of the spring 26 tends to keep the two elements 23, 24 against one another and this configuration corresponds to the central portion of the guide surface 17, i.e. the lowered portion, while the rise of the terminal tracts of the guide surface 17 causes a rotation of the command organ 21, 22 and thus a rotation of the second element 24, opposed by the thrust of the spring 26. The spring 26 thus keeps the cam follower 20 continuously pushed against the guide surface 17.

[0038] The above-described irrigator 1 is advantageously installable on a trolley, not illustrated in the figures, to move the irrigator 1 along a predetermined irrigation trajectory. In particular, the trolley might be drawn by the same flexible tubing used for connecting the irrigator 1 to the water source, in particular a dispenser. This can be obtained by means of winding the flexible tubing on a coil reel, and by means of programmed motorisation of the coil reel in order to displace the position thereof at regular time intervals.

[0039] The present invention attains the set aims and obviates the cited drawbacks in the prior art.

[0040] The possibility of automatically varying the rotation velocity of the spray tube enables a reduction in the quantity of water dispensed towards the central zones of the terrain to be irrigated (or, more exactly, the water directed towards the central zone of the angular sector

covered by the rotation of the spray tube, which extends through about 180 degrees) and also enables the quantity dispensed towards the lateral zones to be increased. In particular, the intermediate element and the metal plate define dragging braking means, which reduce the braking action between the base and the spray tube. In turn, the guide surfaces, the cam follower and the locking means define means for continuously regulating the braking action, and are directly active on the braking means in order to continuously vary the contact pressure between the plate and the intermediate element and, therefore, the rotation velocity of the spray tube. This variation is obtained automatically, i.e. exclusively according to the angular position taken on by the spray tube about the rotation axis.

[0041] Further, the undulating or curved conformation of the guide surface, having very gradual changes in height, reduces the stresses to which the spray tube (and the whole irrigator) is subjected during the braking stages of the rotation. Also, the braking stress is distributed along the whole development of the collar, which extends almost entirely through 360°, with small wear on the collar and/or the underlying intermediate element. The braking element is thus regulated continuously, thanks to the described curved conformation of the guide surface.

[0042] Also worthy of note is that the better distribution of the quantity of irrigated water enables the terrain to be kept in ideal conditions, preventing stagnation of water and thus preventing the formation of puddles and muddy zones. It follows that should the trolley with the irrigator transit on previously-irrigated water, there would be no obstacles to the advancing of the trolley, without running risks of sticking in the terrain or breaking the irrigator trolley.

[0043] Figure 8 is the pluviometer diagram of the irrigator of the present invention.

[0044] As can be seen in the figures, the curve obtained illustrates a flattening of the central zone, showing uniformity of water distributed over the terrain.

[0045] This leads, as a further advantage, to a reduction in waste of water, to the benefit of the vegetation on the terrain.

[0046] Additionally, by preventing or drastically reducing the amount of water sprayed centrally, particularly muddy areas in the central irrigation zone are limited, thus facilitating an increase in the speed the irrigator can be retreated with, together with its support trolley; this leads to faster irrigation cycles.

Claims

1. An irrigator, comprising:

a base (2);
a spray tube (3) rotatably connected to the base (2) and destined to rotate about a rotation axis (X), the spray tube (3) being connectable to a fluid source and having a nozzle (4) for directing a flow of the fluid towards a portion of terrain to be irrigated;
braking means (10, 11a) acting between the spray tube (3) and the base (2) by dragging in order to a rotation velocity of the spray tube (3) about the rotation axis (X);
means for regulating (11c, 17, 20) commanded by the rotation of the spray tube (3) about the rotation axis (X) and acting on the braking means (10, 11a) in order to vary a braking force exerted by the braking means (10, 11a) according to an angular position assumed by the spray tube (3) about the rotation axis (X).

2. The irrigator of claim 1, **characterised in that** the means for regulating (11c, 17, 20) act on the braking means (10, 11 a) for continuously varying the braking force during the rotation of the spray tube (3) about the rotation axis (X).

3. The irrigator of claim 1 or 2, **characterised in that** during rotation about the rotation axis (X) the spray tube (3) irrigates a horizontal range of an angle of less than a full circle, and preferably 180°, the means for regulating (11c, 17, 20) determining a braking force which is greater when the spray tube (3) approaches extreme angular positions of the horizontal range covered by the spray tube (3).

4. The irrigator of claim 1, **characterised in that** the braking means (10, 11a) comprise an intermediate element (10) stably connected to the base (2) and exhibiting a lateral surface (10b), and a braking element (11a) stably coupled to the spray tube (3) and slidably engaged in contacting relation on the lateral surface (10b); the means for regulating (11c, 17, 20) acting on the braking element (11a) in order to determine a contact pressure between the braking element (11a) and the intermediate element (10).

5. The irrigator of claim 4, **characterised in that** the lateral surface (10b) of the intermediate element (10) has a cylindrical conformation having a circular section, the braking element (11a) having an arched conformation substantially complementarily shaped to at least an angular portion of the lateral surface (10b) in order to adhere to the angular portion of the lateral surface (10b).

6. The irrigator of claim 5, **characterised in that** the braking element (11a) has an arched conformation complementarily shaped substantially to a whole angular development of the lateral surface (10b), the irrigator (1) further comprising locking means (11c) acting on two terminal portions (11b) of the braking element (11a) in order to determine a locking of the braking element (11a) about the lateral surface (10b)

of the intermediate element (10); the means for regulating (11c, 17, 20) acting directly on the locking means (11c).

7. The irrigator of claim 5 or 6, **characterised in that** the braking element (11a) comprises a metal plate (11a).

8. The irrigator of claim 4, **characterised in that** the braking element (11a) exhibits a hooking portion (11d) which is engageable by a pin (G), the pin (G) being stably couplable to the spray tube (3) in order to render the spray tube (3) rotatingly solid with the braking element (11a).

9. The irrigator of claim 6, **characterised in that** the locking means (11c) comprise a first element (23) which is solidly constrained to a first terminal portion (11b) of the braking element (11a) and a second element (24) which is active on the second terminal portion (11b) and restingly engaged against the first element (23), the first element and the second element (23, 24) being shaped such that a reciprocal rotation of the elements (23, 24) generates a reciprocal nearing and/or a distancing of the first element and the second element (23, 24); the means for regulating (11c, 17, 20) being active on one of the first element and the second element (23, 24).

10. The irrigator of claim 9, **characterised in that** the first element and the second element (23, 24) abut against one another with respective ends which ends are complementarily shaped, the ends being reciprocally abuttable along a surface (25) which surface is at least in part transversal with respect to a reciprocal nearing and/or a distancing direction of the first element and the second element (23, 24).

11. The irrigator of claim 10, **characterised in that** the surface determines a reciprocal screwing movement between the first element and the second element (23, 24) following a rotation of the second element (24) with respect to the first element (23); the means for regulating (11c, 17, 20) being active on the second element (24).

12. The irrigator of claim 1, **characterised in that** the means for regulating (11c, 17, 20) comprise cam means (17, 20) activated directly by the rotation of the spray tube (3) about the rotation axis (X) and acting on the braking means (10, 11a) in order to vary the braking force exerted by the braking means (10, 11 a).

13. The irrigator of claim 12, **characterised in that** the cam means (17, 20) comprise a guide element (16) fixed to the base (2) and defining a guide surface (17), and a cam follower (20) which is rotatable about the rotation axis (X) together with the spray tube (3) and which is engaged by contact on the guide surface (17).

14. The irrigator of claim 13, **characterised in that** the cam follower (20) is engaged on the guide surface (17) by means of rolling about a respective rotation axis (Y).

15. The irrigator of claim 14, **characterised in that** the rotation axis (Y) of the cam follower (20) has a variable orientation during movement of the cam follower (20) on the guide surface (17).

16. The irrigator of one or more of claims from 13 to 15, **characterised in that** the guide surface (17) exhibits a curved progression in order to determine a variation in orientation of the rotation axis (X) of the cam follower (20) during rotation of the spray tube (3) about the rotation axis (X) thereof.

17. The irrigator of claim 6 and 13, **characterised in that** it comprises a connecting organ (21) connected to the locking means (11c) and supporting the cam follower (20).

18. The irrigator of claim 11 and 17, **characterised in that** the connecting organ (21) is connected to the locking means (11c) such that the variation of orientation of the rotation axis (X) of the cam follower (20) determines a reciprocal rotation between the first element and the second element (23, 24).

19. The irrigator of claim 18, **characterised in that** the connecting organ (21) is stably connected to the second element (24).

20. The irrigator of claim 9 and 13, **characterised in that** it comprises elastic means (26) acting on the second element (24) in order to maintain the second element (24) abutting against the first element (23), opposing a rotation of the second element (24) in such a way as to maintain the cam follower (20) pressed against the guide surface (17).

21. The irrigator of claim 20, **characterised in that** it comprises a command bar (18) having a stop element (27) and being solidly constrained to the second terminal portion (11b) of the braking element (10a); the elastic means (26) comprising a spring interposed between a portion of the second element (24), opposite the first element (23), and the stop element (27) such that a reciprocal distancing of the first element and the second element (23, 24) determines a nearing of the terminal portions (11b) of the braking element (10a).

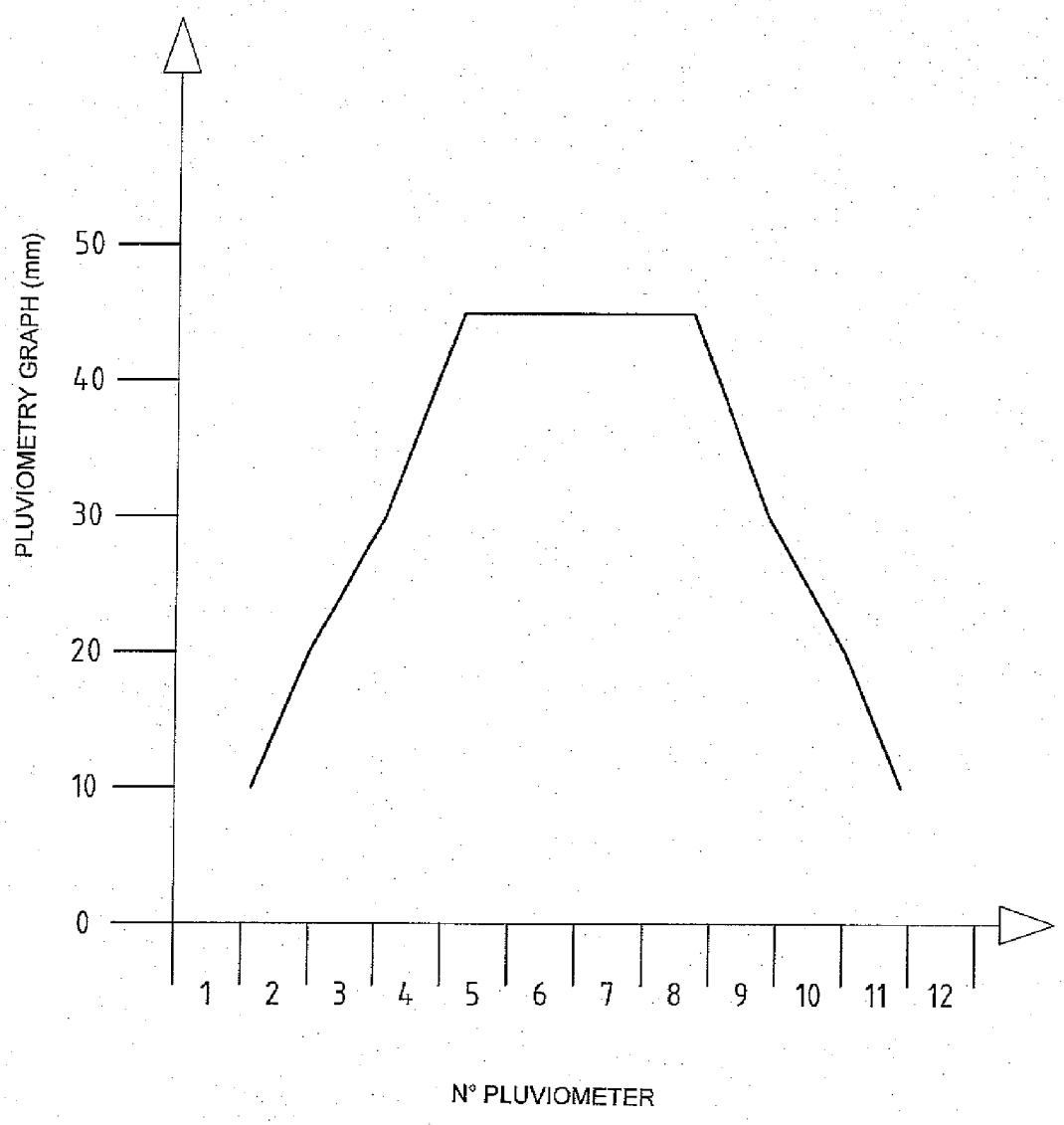
22. The irrigator of claim 20, **characterised in that** the

elastic means (26) comprise a spring interposed between a portion of the second element (24), opposite the first element (23), and a strike portion (28) solidly constrained to the spray tube (3).

23. The irrigator of one or more of the preceding claims, **characterised in that** the spray tube (3) is set in rotation by the flow of fluid dispensed from the spray tube (3) itself.

24. The irrigator of one or more of the preceding claims, **characterised in that** it comprises a trolley associated to the base (2) in order to make the irrigator (1) displaceable and/or drawable along a terrain to be irrigated.

Fig. 1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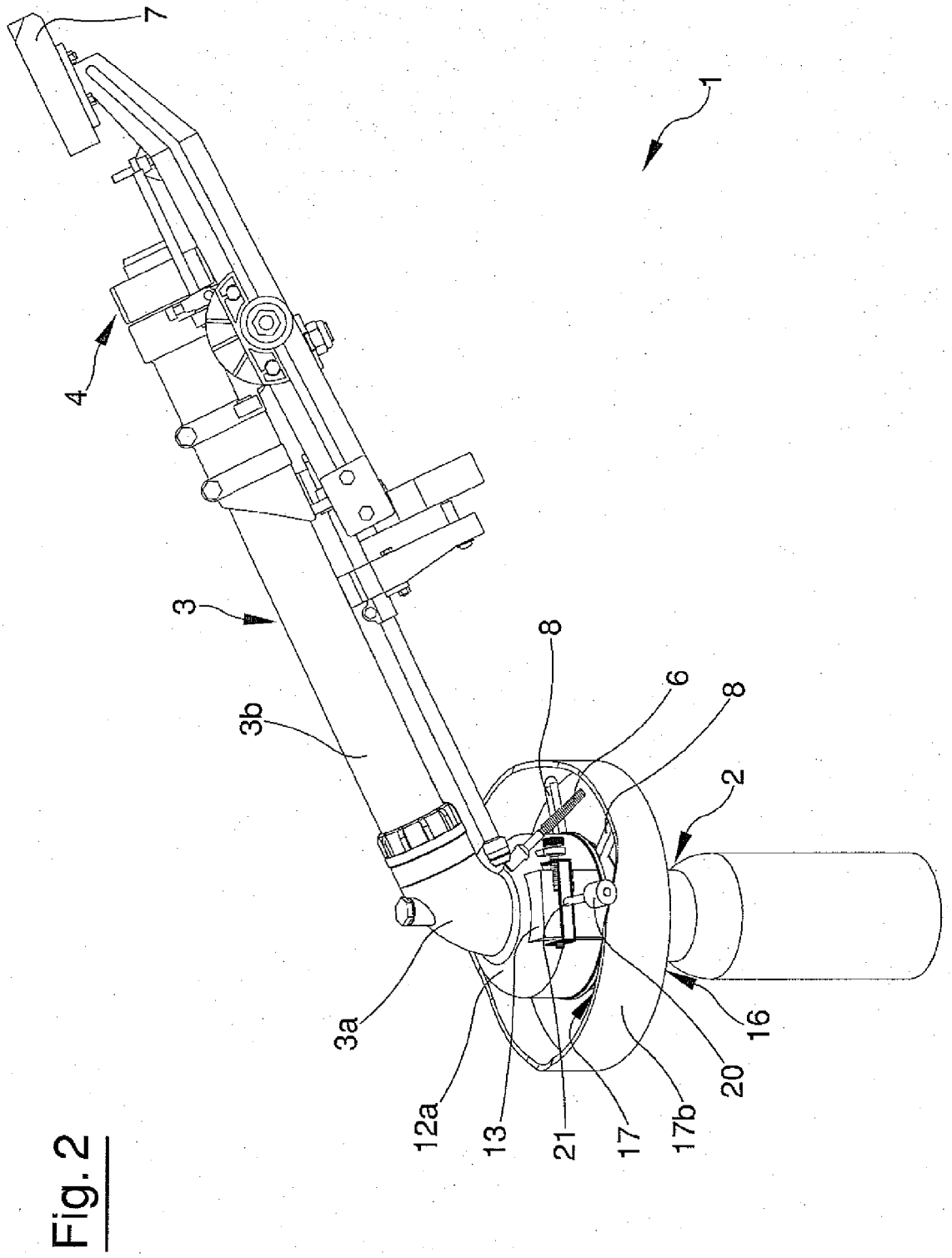

Fig. 2

Fig. 3

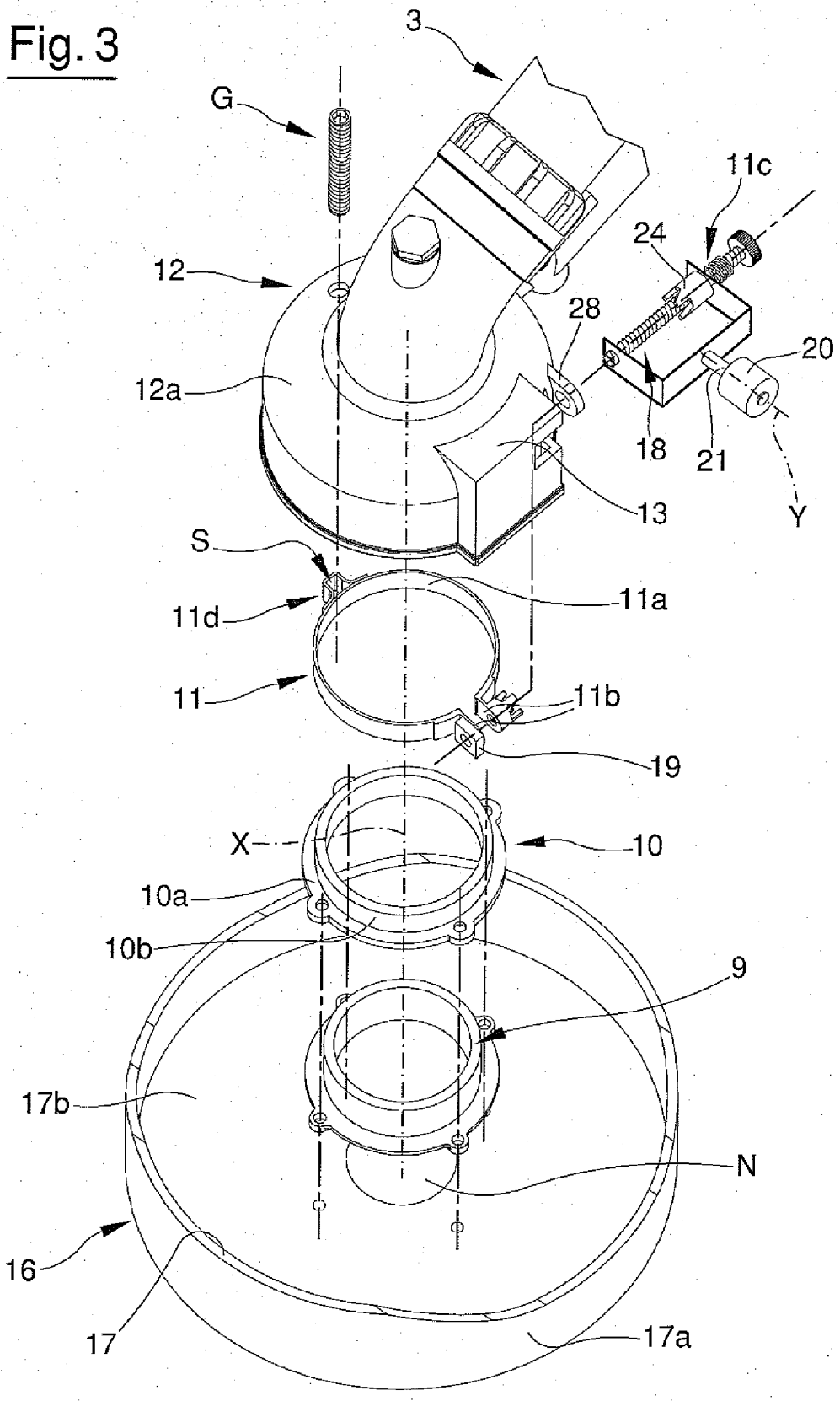
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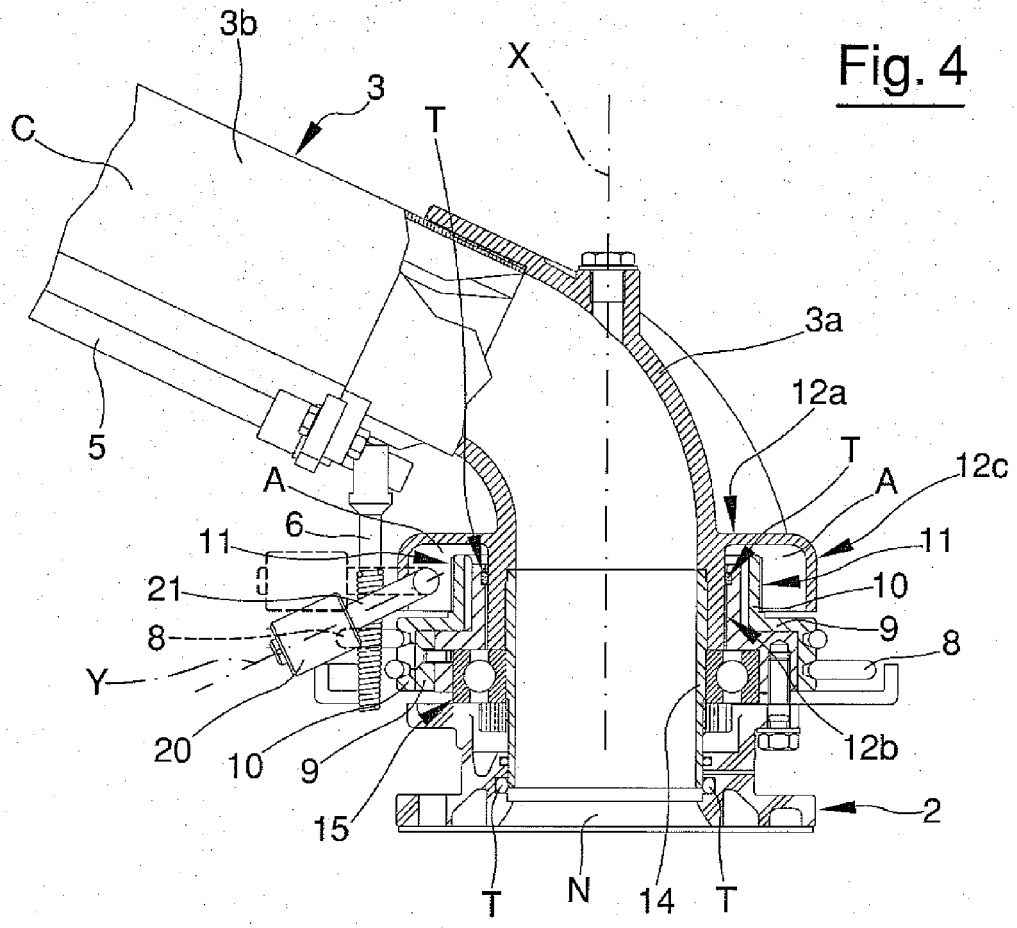
Fig. 4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T

Fig. 5

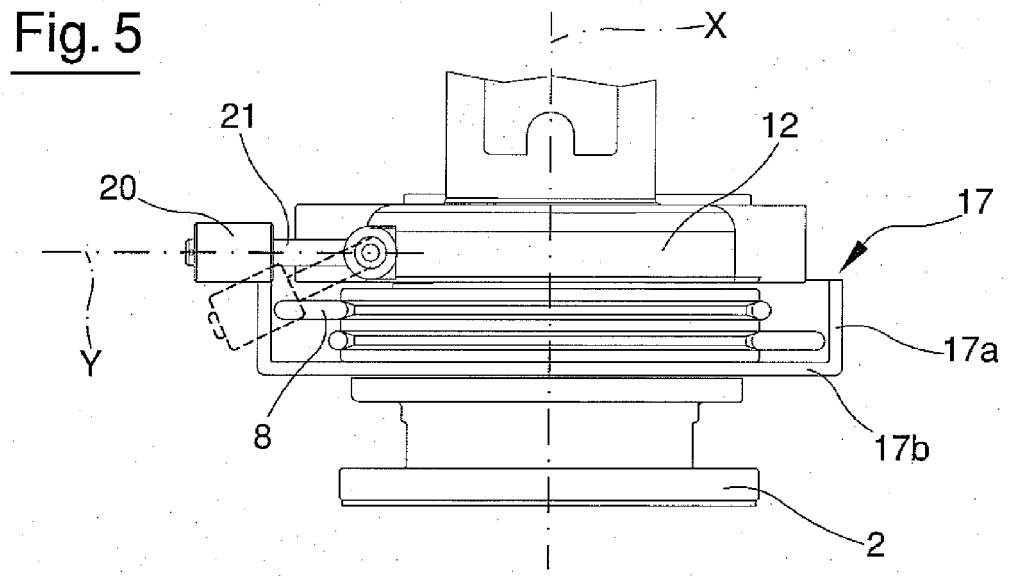

X
21
12
20
17
Y
17a
8
17b
2

Fig. 6

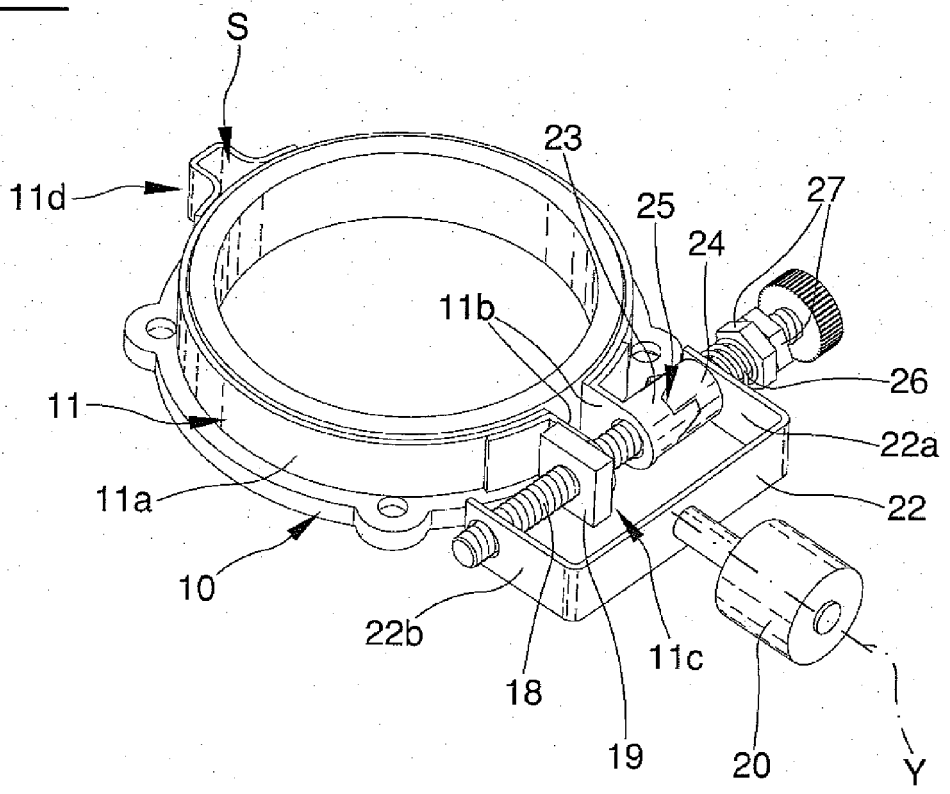

S
23
11d
25
27
24
11b
26
11
22a
11a
22
10
22b
11c
18
19
20
Y

Fig. 7

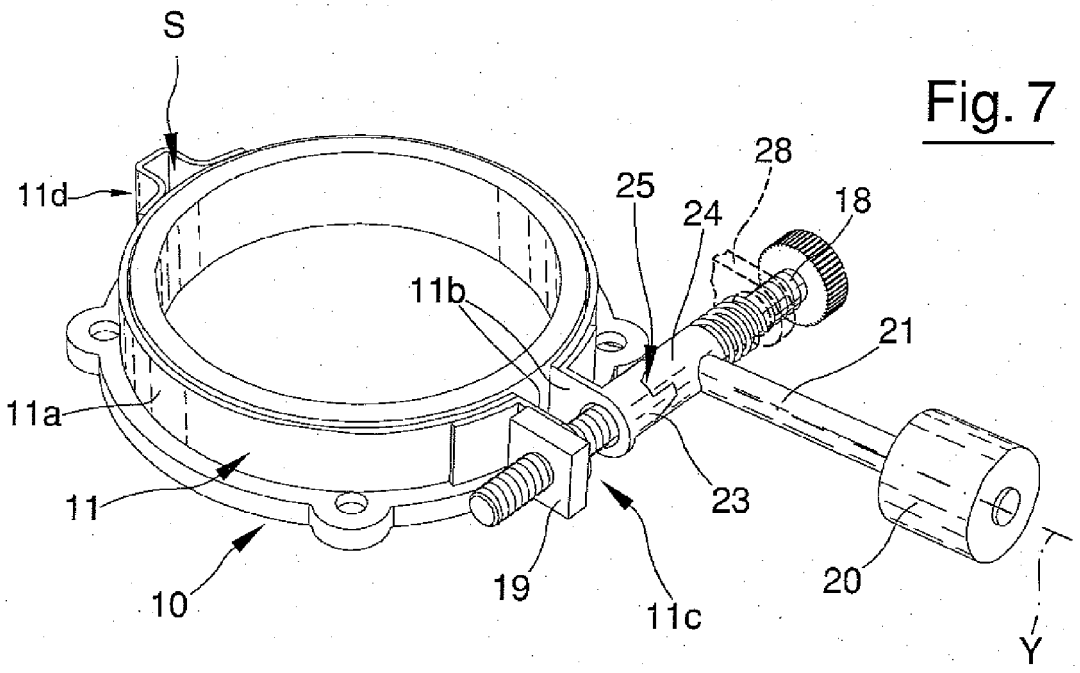
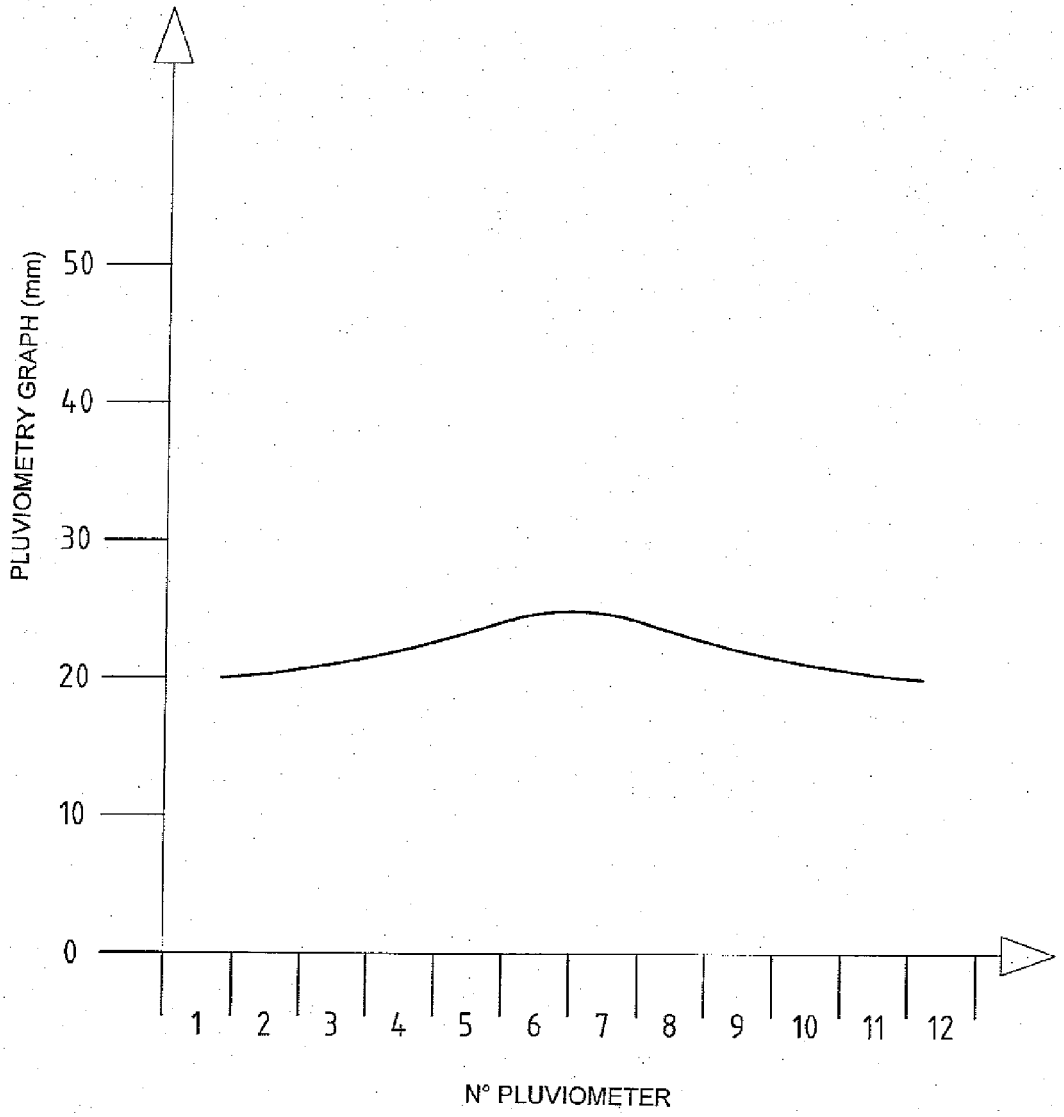

S
28
11d
25
24
18
11b
21
11a
23
11
10
19
11c
20
Y

Fig. 8


PLUVIOMETRY GRAPH (mm)
50
40
30
20
10
0
1
2
3
4
5
6
7
8
9
10
11
12
N° PLUVIOMETER

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EUROPEAN SEARCH REPORT

Application Number
EP 09 15 5850

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2 986 339 A (KOVICK WILLIAM E ET AL) 30 May 1961 (1961-05-30) * column 3, line 21 - column 5, line 32; figures *	1-10,12, 13, 16-19,23	INV. A01G25/09 B05B3/16 B05B3/04
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A	US 5 476 223 A (DRECHSEL ARNO [IT]) 19 December 1995 (1995-12-19) * column 3, line 21 - column 4, line 18; figures *	1	
A	US 2 254 270 A (COLES WALTER H ET AL) 2 September 1941 (1941-09-02) * column 2, line 16 - line 74; figures *	1	TECHNICAL FIELDS SEARCHED (IPC) A01G B05B
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	14 September 2009	Bunn, David

CATEGORY OF CITED DOCUMENTS

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1

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