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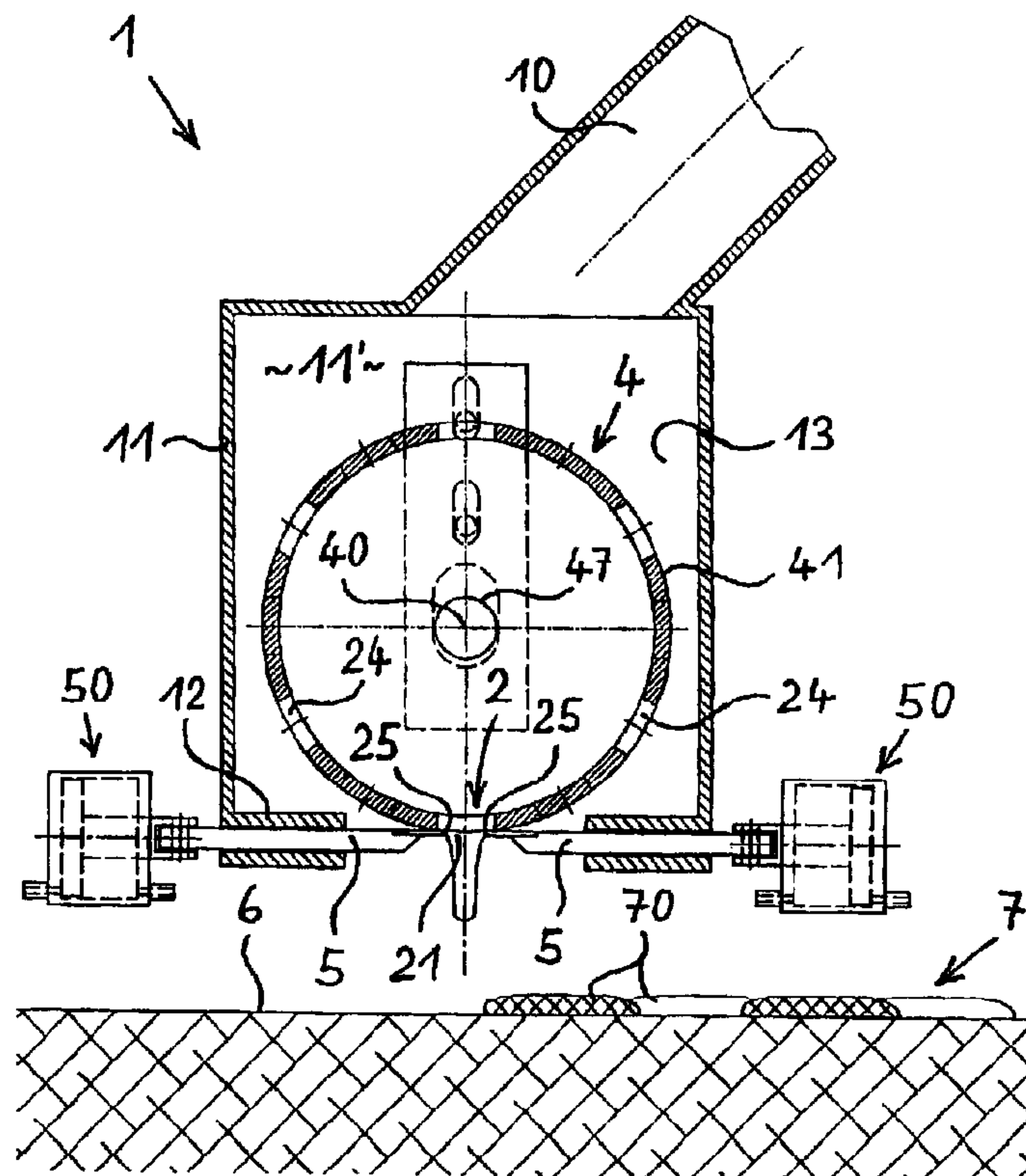
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(54) Title: METHOD AND DEVICE FOR CREATING MARKING LINES



(57) Abrégé/Abstract:

The invention relates to a method and a device for creating marking lines (7) which comprise a plurality of elements (70) and are made of a highly viscous material on a surface (6) that is to be marked, especially a road surface. According to the invention, pressurized marking material is discharged through an outlet that can be opened and closed while being moved relative to the surface (6). The cross section of the opening is periodically modified during movement relative to the surface (6) by means of a first, fixed discharge element and a second discharge element which rests against the first discharge element so as to cooperate therewith and is moved relative thereto in an oscillating or rotating fashion on a contact plane.

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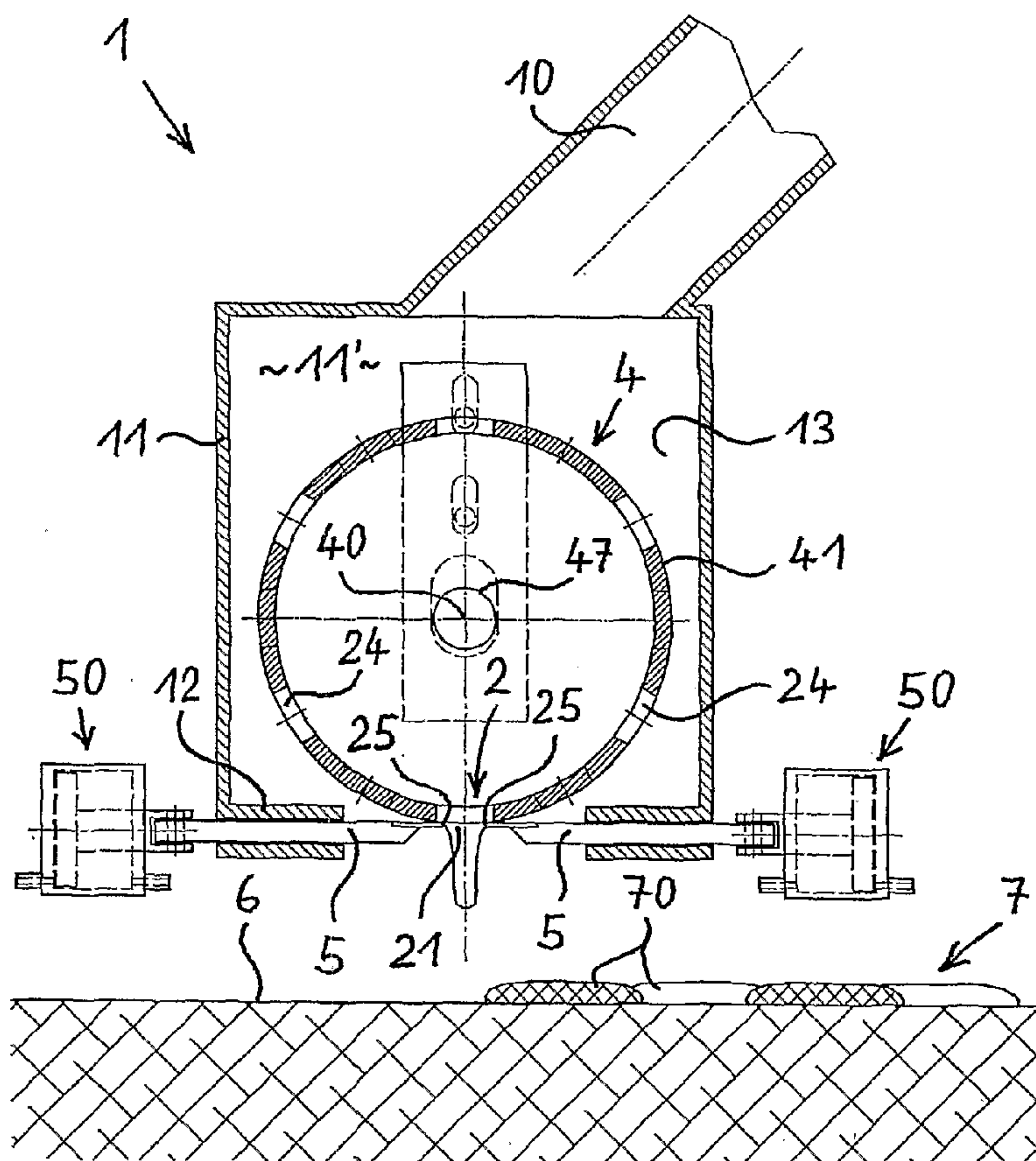
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(54) Title: METHOD AND DEVICE FOR CREATING MARKING LINES

(54) Bezeichnung: VERFAHREN UND VORRICHTUNG ZUR ERZEUGUNG VON MARKIERUNGSLINIEN



(57) Abstract: The invention relates to a method and a device for creating marking lines (7) which comprise a plurality of elements (70) and are made of a highly viscous material on a surface (6) that is to be marked, especially a road surface. According to the invention, pressurized marking material is discharged through an outlet that can be opened and closed while being moved relative to the surface (6). The cross section of the opening is periodically modified during movement relative to the surface (6) by means of a first, fixed discharge element and a second discharge element which rests against the first discharge element so as to cooperate therewith and is moved relative thereto in an oscillating or rotating fashion on a contact plane.

(57) Zusammenfassung: Die Erfindung betrifft ein Verfahren und eine Vorrichtung zur Erzeugung von aus einer Vielzahl von Elementen (70) bestehenden Markierungslinien (7) aus hochviskosem Markierungsmaterial auf einer zu markierenden Oberfläche (6) insbesondere Strassenoberfläche, wobei unter Druck befindliches Markierungsmaterial durch einen Auslass, der geöffnet und geschlossen werden kann, unter Fortbewegung

relativ zur Oberfläche

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(84) Bestimmungsstaaten (soweit nicht anders angegeben, für jede verfügbare regionale Schutzrechtsart): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), eurasisches (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), europäisches (AT, BE, BG, CH, CY, CZ, DE, DK,

Zur Erklärung der Zweibuchstaben-Codes und der anderen Abkürzungen wird auf die Erklärungen ("Guidance Notes on Codes and Abbreviations") am Anfang jeder regulären Ausgabe der PCT-Gazette verwiesen.

(6) ausgetragen wird, wobei der Durchlassquerschnitt durch ein erstes, festes Durchlasselement und ein daran zusammenwirkend anliegendes, relativ dazu in einer Anlageebene oszillierend oder rotierend bewegtes zweites Durchlasselement bei der Fortbewegung relativ zur Oberfläche (6) periodisch verändert wird.

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New Specification of 20 October 2005:

Method and Device For Creating Marking Lines

This invention relates to a device for creating marking lines comprising a plurality of elements and consisting of a highly viscous marking material on a surface that is to be marked, especially a road surface, with a rotary cylinder rotating with the movement of a vehicle carrying the device, said cylinder being provided with a plurality of clearances - which according to a desired arrangement of the marking line elements, depending on the rotary position, establish a connection between a pressurized material supply line and a discharge slot extending transversely to a direction of movement of the vehicle - with the discharge slot being limited by one discharge slot edge each, in the front and the rear, seen in the direction of movement of the vehicle.

For the creation of such markings, a device of document WO-A-03/006744 has become known.

With this device, the marking material moves - via a cylindrical slide, centrically arranged in a cylindrical housing and rotating with only minor radial clearance, said slide connecting an opening of the cylindrical housing with the material supply line via grooves, channels, openings or hollow spaces, depending on the rotary position of the slide -

to a discharge slot directed towards the road surface and from there it drops, in the desired portions and in the desired distribution, onto the road surface. The size of the individual portions and their extension in the direction of movement depends on the pressure of the marking material in the material supply line, on the cross section of the channels in the rotary slide and on the corresponding period of time of the connection of inlet opening and discharge slot, with the period of time in turn depending on the rotary speed of the rotary slide.

Disadvantageous with the known device is the tight sealing gap - extending over the entire cylindrical surface of the rotary slide - between the outer cylindrical surface of the rotary slide and the inner surface of the housing. This tight sealing gap causes problems due to the abrasive solid substances usually contained in a large percentage in the marking material, and due to the round glass spheres used for the reflection of light. There is the risk of the rotary slide blocking due to solid substances clogged in the sealing gap and the risk of wear enlarging the sealing gap. Starting at a certain width of the sealing gap enlarged by wear, the material discharge consisting of individual portions will be increasingly superposed by an additional continuous planar material flow through the enlarged sealing gap, as is shown in Figure 4 of the aforementioned document WO-A-03/006744. There is no possibility to compensate for the wear by reducing the sealing gap.

Another disadvantage of the known device is the considerable distance of the material discharge openings of the rotary slide from the discharge opening, closable with closing slides, of the housing discharge slot. This distance depends on the wall thickness of the housing cylinder. With closed slot, the closing slides and the walls of the discharge slot

in the rotary slide housing are forming a channel extending transversely to the direction of movement. With several closing slides arranged side by side of which, according to the desired line width to be created, one or several closing slides are in a closed position and others in an opened position, in the channel areas formed by the closed slides, a material flow is created - by the marking material flowing from the rotary slide openings into these channel areas - towards the opened areas of the discharge slot whereby the marginal areas of the marking line created with the opened slot area will be negatively influenced.

It is the objective of the invention to remedy the aforementioned disadvantages and especially to ensure the processability of marking materials filled with coarse abrasive solid substances and/or glass spheres, to be able to compensate the wear on the components influencing the marking line quality and being exposed to the flow of the marking material, and to remedy an interfering material flow from the closed discharge slot areas to the opened slot areas. Another objective of the invention is to make the device also applicable for closed, smooth marking lines, not resolved in individual elements. Finally, the automatic reproducibility of the look of the marking resolved into individual elements is to be ensured with the variation of the speed of movement over a great speed range.

The problems are solved by a device with the characteristics of Claim 1.

In contrast to the rotary slide with the known device which rotates on all sides on the circumference of the cylinder with only minor distance to the cylindrical housing wall, a rotary cylinder should be used in the present invention, preferably designed as a hollow cylinder provided with openings, said

cylinder coming into contact with stationary components only in narrow areas along the discharge slot edges or forming with such components a sealing gap without contact.

The components resting against the rotating rotary cylinder or forming a sealing gap with it should preferably consist of metal strips of minor thickness or tapering in cutting edge shape toward the edge on the rotary cylinder side.

Either both discharge slot edges are to be allocated to closing slides, or one of the two edges to a closing slide and the other edge to a component firmly connected with the housing. Due to the fact that the closing slide edges or, respectively, edge coincides with the edge forming the discharge slot on the rotary cylinder, no channel will be created - upon closed discharge slot - between the rotary cylinder and the closing slide, which would run parallel to the rotary cylinder, through which marking material would be pressed to the opened closing slides in case of several closing slides arranged side by side and which would negatively influence the marking line created with opened slides.

The sealing gap on the two edges of the discharge slot should be adjustable, on the one hand to be able to adjust to the marking material and the solid substances contained therein and to minimize wear and, on the other hand, to be able to compensate for wear. Either the adjustment of the sealing gap should be done by sliding the rotary cylinder relative to the plane extending through the two sealing edges, or the components comprising the sealing edges should be slidable relative to the housing and to the rotary cylinder.

According to another feature of the invention, the rotary cylinder can be displaced into a position spaced so far to the

discharge slot edges that - within the housing chamber - a free material flow, passing the rotary body, to the discharge slot is ensured, and the device is thus suitable in the most simple manner for the creation of standard full-surface, smooth marking lines.

The rotary cylinder can be made to rotate e.g. by a suitably motorized rotary drive, preferably with variable speed. To prevent undesirable changes in the look of the markings, in case of changes of the speed of movement relative to the surface to be marked, it is preferably provided, however, that the device comprises a drive ensuring the driving of the rotary cylinder with a speed proportional to the speed of movement of the device relative to the surface. The proportionality of the rotary cylinder drive to the speed of movement of the device can here also be simply reached e.g. by means of the rotary drive being taken over by a travel drive of the device by means of several wheels carrying the device and rolling on the surface to be marked or coupled with at least one of the wheels.

In the following, the invention is explained on the basis of a drawing. The figures of the drawing show:

- Figure 1 a first example of a marking line comprising a plurality of elements;
- Figure 2 a second example of a marking line comprising a plurality of elements;
- Figure 3 the device in a vertical section, with the cutting plane in the direction of movement, in an operating condition for the creation of a marking line comprising a plurality of elements;
- Figure 4 the device in the same presentation as in Figure 3, in an operating condition for the creation of a continuous marking line;

- Figure 5 the device in vertical section with the cutting plane transverse to the direction of movement;
- Figure 6 a second device in vertical section with the cutting plane transverse to the direction of movement;
- Figure 7 a drive for the device, in a side view.

The examples described hereinafter of the devices 1 according to the invention are used for creating marking lines 7 which comprise a plurality of elements 70 and are made of a highly viscous marking material on a surface 6 that is to be marked, especially a road surface. Two examples for such marking lines 7 are presented in Figures 1 and 2 in a top view as line sections.

In the example according to Figure 1, the individual marking elements 70 have an approximately round, droplet-like form. In the example according to Figure 2, the individual marking elements 70 have an approximately oval or elliptical form. The longitudinal direction of the marking line 7 extends in the direction of the arrow 8 in each case.

As will yet be explained in the following, the device 1 can furthermore create marking lines which comprise a plurality of bulges extending transversely to the longitudinal direction of the marking lines, as well as the usual continuous marking lines.

The device 1 according to the Figures 3 to 5 comprises a housing 11 with a chamber 11' into which pressurized marking material is supplied via a channel-shaped material inlet 10 from a supply system here not shown.

6

On its side facing the road surface 6, the housing 11 comprises, on its housing bottom 12, two open/closed slides or locking slides 5 slidable in and against the direction of movement 8 which each form an adjustable discharge slot edge 25. By means of these slides 5 - and with the aid of the usual actuating means, here in the form of pneumatic cylinders 50 - a discharge slot 21 which forms a discharge opening can be opened or closed on the bottom 12 of the housing 11 and extends transversely to the direction of movement 8. The length of the slot 21 in transverse direction to the direction of movement 8 is equivalent to the width of a marking line 7 to be created.

In the chamber 11', a rotary cylinder 4 is located - with clearances 24 provided in its jacket 41 - with two shaft journals 47 which are provided in shaft bearings 48.

Versus the lateral housing walls 13 of the housing 11, the shaft bearings 48 are vertically displaceable and can be adjusted in height - as Figure 5 shows - by means of two adjusting devices 46 with one hand wheel each and one threaded spindle each. By means of this, not only the gap between the discharge slot edges 25 and the rotary cylinder 4 can be adjusted such that - on the rotary cylinder 4 and on the discharge slot edges 25 - there will be the lowest possible wear in case of sufficient tightness, but wear can even be compensated. Moreover, the rotary cylinder 4 can be shifted between the position presented in the right half of Figure 5, resting against the discharge slot edges 25 and the position presented in the left half of Figure 5, spaced apart from the discharge slot edges 25. In this spaced position, the marking material supplied by the material inlet 10 passes unhindered by the rotary cylinder 4 to the slot 21 and - in the opened condition of the slides 5 - as a continuous strip onto the

road surface 6 and there forms a continuous, smooth marking line 7.

In the lower position of the rotary cylinder 4 presented in Figure 3 and in the right part of Figure 5, the marking material passes only through the interior room of the rotary cylinder 4 designed as a hollow cylinder and then in portions through the cross sections - just free in the area of the slot 21 toward the outside - of the clearances 24 in the rotary cylinder 4, in an exact and reproducible dose from the chamber 11' onto the road surface 6 and there forms the droplet-shaped elements 70 of the marking line 7 upon the simultaneous movement of the device 1 in the direction of movement 8.

Figure 6 shows one example for a device 1 which corresponds in large parts with the device according to the Figures 3 to 5. The design of the rotary cylinder 4 varies which, in the example according to Figure 6, comprises slot-shaped clearances 24 in its jacket 41. The clearances 24 extend parallel to each other and parallel to the axial direction of the cylinder 4. In the lower position of the cylinder 4, presented in Figure 6, it rests with the outer circumference of its jacket 41 against the discharge slot edges 25 of the two slides 5. Here again, the discharge slot edges 25 delimit a slot 21 in the bottom 12 of the housing 11.

With the device 1 according to Figure 6, pressurized marking material - from the chamber 11' of the housing 11 - can be created in the form of bulges extending transversely to the direction of movement (the direction of movement extends in Figure 6 perpendicularly to the drawing plane) and parallel to each other, with the individual bulges each forming one element 70 of the marking line 7.

The length L of the elements 70 in longitudinal direction of the marking line 7 depends on the ratio of the speed of movement of the device 1 to the rotary speed of the rotary cylinder 4. The lower the rotary speed in relation to the speed of movement, the larger the length L of the individual elements 70, as is illustrated in Figures 1 and 2.

With the devices 1 according to Figures 3 to 6, the speed of the rotary cylinder 4 should be preferably proportional to the speed of movement of the device 1 relative to the road surface 6 to create uniformly long elements 70 independent of the speed. This can be achieved according to Figure 7 in a simple manner by a friction wheel 43 rolling on the road surface 6 which drives the rotary cylinder 4 by means of simple transmission means - here in the form of a chain drive - proportional to the speed of movement of the device 1. The chain drive comprises a chain 44 and two chain wheels 45 and 45'. The chain wheel 45 is connected torsion-proof with the friction wheel 43, the chain wheel 45' is connected torsion-proof with one of the shaft journals 47 of the rotary cylinder 4.

The ratio of the rotary speed of the rotary cylinder 4 to the speed of movement of the device, i.e. the length of the elements 70, can be adjusted with the chain drive transmission through a corresponding selection of the chain wheels 45 and 45', and the drive can also be designed shiftable between the different transmissions.

CLAIMS:

1. A device (1) for creating marking lines (7) consisting of a highly viscous marking material on a surface (6) to be marked, especially a road surface, wherein with the device pressurized marking material is dischargeable through an outlet which can be opened and closed while being moved relative to the surface (6), the device (1) comprising an opening (2) upstream of the outlet or forming the outlet for the marking material, wherein the opening cross section of the opening (2) is periodically modifiable during movement relative to the surface (6), wherein the device (1) comprises a housing (11) with a housing bottom (12) forming the first, fixed discharge element, with at least one slotshaped discharge opening (21) extending transversely to the direction of movement (8), and wherein the opening cross section of the opening (2) is modifiable by means of a cylinder (4) forming the second discharge element and rotatably movable around an axis (40) extending transversely to the direction of movement (8),

characterized in that the cylinder (4) is a hollow cylinder (4) having discharge openings (24) arranged in its jacket surface (41),

for creating marking lines (7) comprising a plurality of elements the hollow cylinder (4) cooperates with the outer circumference of its jacket surface (41) in a sealing manner with two discharge opening edges (25) limiting the slot-shaped discharge opening (21) in the housing bottom (12) on the front and on the rear, seen in the direction of movement (8), and

the marking material at the same time reaches the discharge opening (21) in the housing bottom (12) only through an interior room of the hollow cylinder (4).

2. The device according to claim 1, characterized in that the discharge openings (24) in the hollow cylinder (4) are formed by round or polygonal openings which are arranged staggered to each other in the circumferential direction of the cylinder as well as in its axial direction.

3. The device according to claim 1, characterized in that the discharge openings (24) in the hollow cylinder (4) are formed by slot-shaped openings which are arranged staggered to each other in the circumferential direction of the cylinder, parallel to the axial direction of the hollow cylinder (4).

4. The device according to any one of claims 1 to 3, characterized in that the slot (21) forming the discharge opening (21) in the housing bottom (12) and extending transversely to the direction of movement (8) is designed with a length which is equivalent to a desired width of the marking lines (7).

5. The device according to claim 4, characterized in that the slot forming the discharge opening (21) in the housing bottom (12) is provided with adjustable means for varying and fixing its length.

6. The device according to any one of claims 1 to 5, characterized in that at least one open/close slide (5) is allocated to the discharge opening (21) in the housing bottom (12) which slide (5) forms at least one discharge opening edge (25) adjustable in an adjusting direction parallel to the direction of movement (8).

7. The device according to any one of claims 1 to 6, characterized in that for creating continuous smooth marking lines (7) the hollow cylinder (4) is displaceable into a position spaced apart from the discharge opening edges (25).

8. The device according to any one of claims 1 to 7, characterized in that the device (1) comprises a drive (42) ensuring a driving of the hollow cylinder (4) with a speed which is proportional to the speed of movement of the device (1) relative to the surface (6).

9. The device according to any one of claims 1 to 8, characterized in that the housing (11) or the housing bottom (12) and/or the hollow cylinder (4) each form an exchangeable part of the device (1).

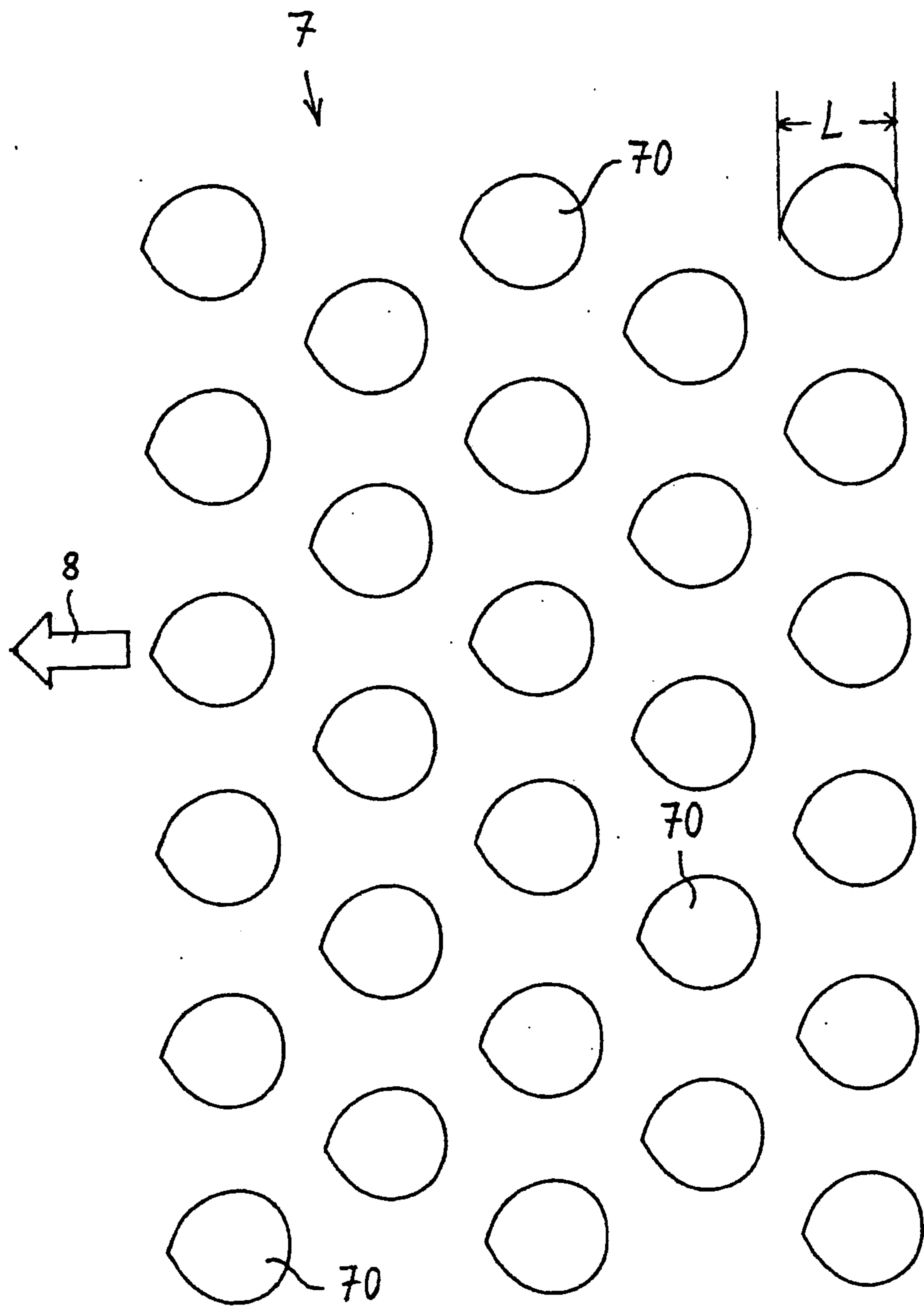


Fig. 1

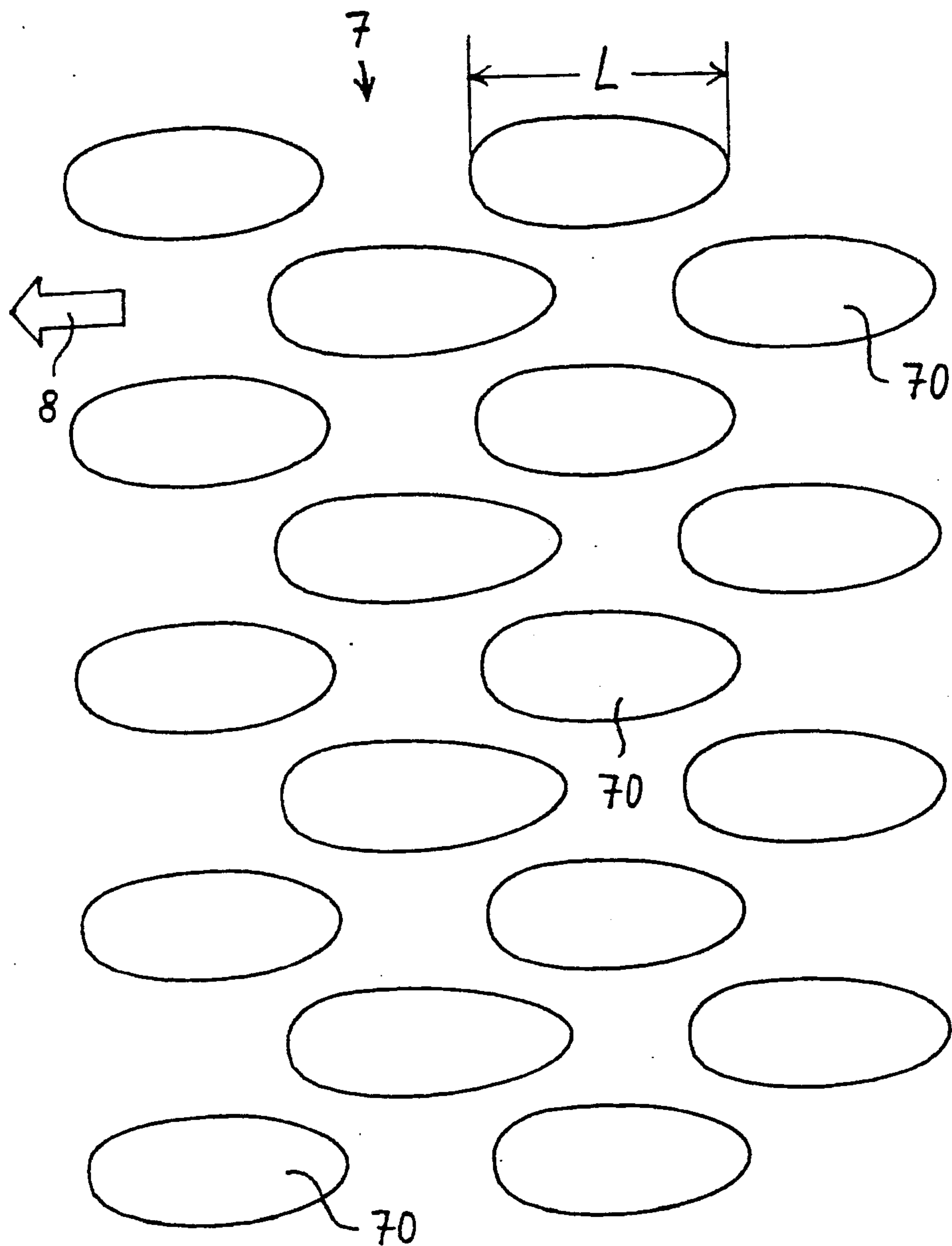


Fig. 2

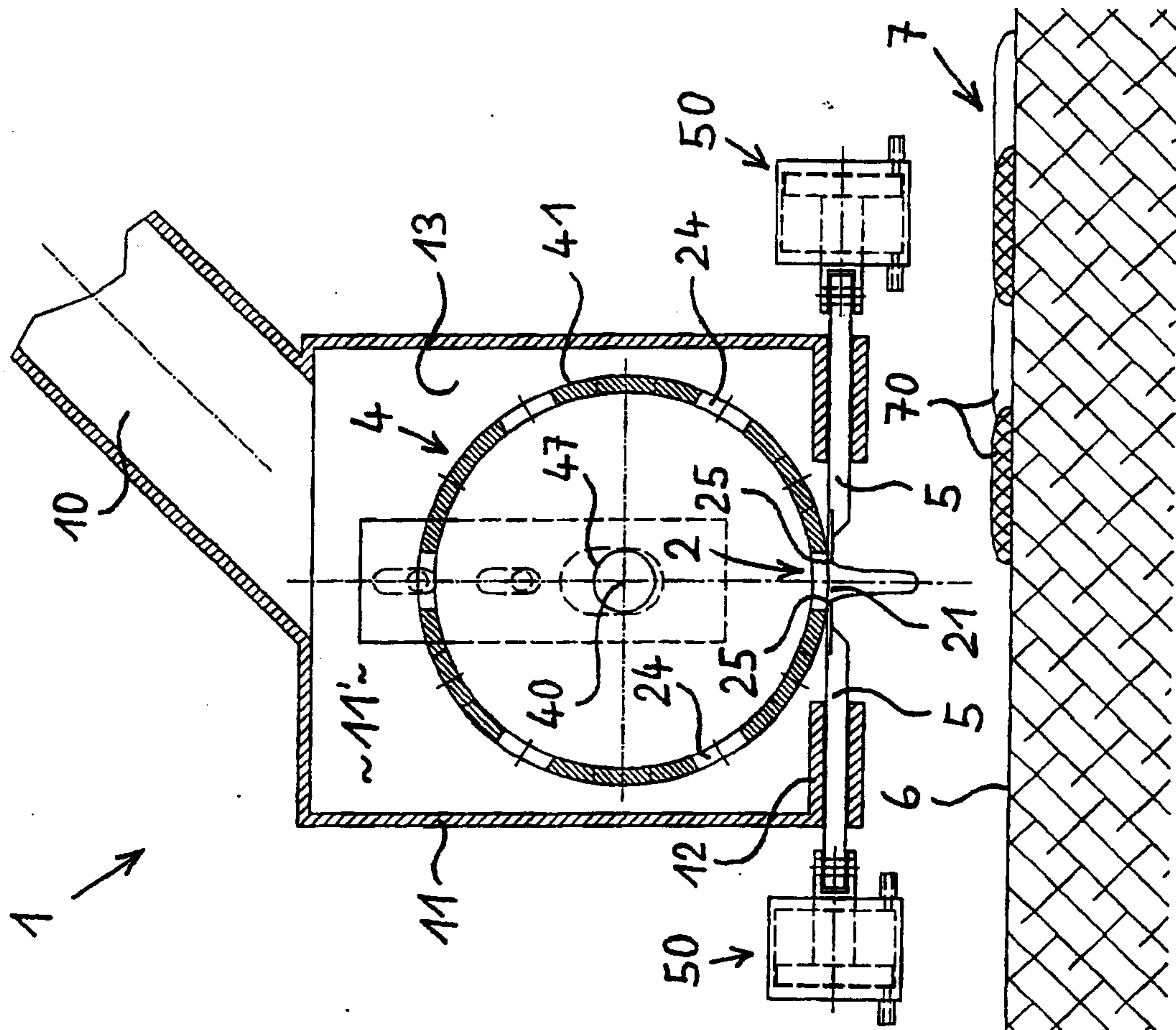


Fig. 3

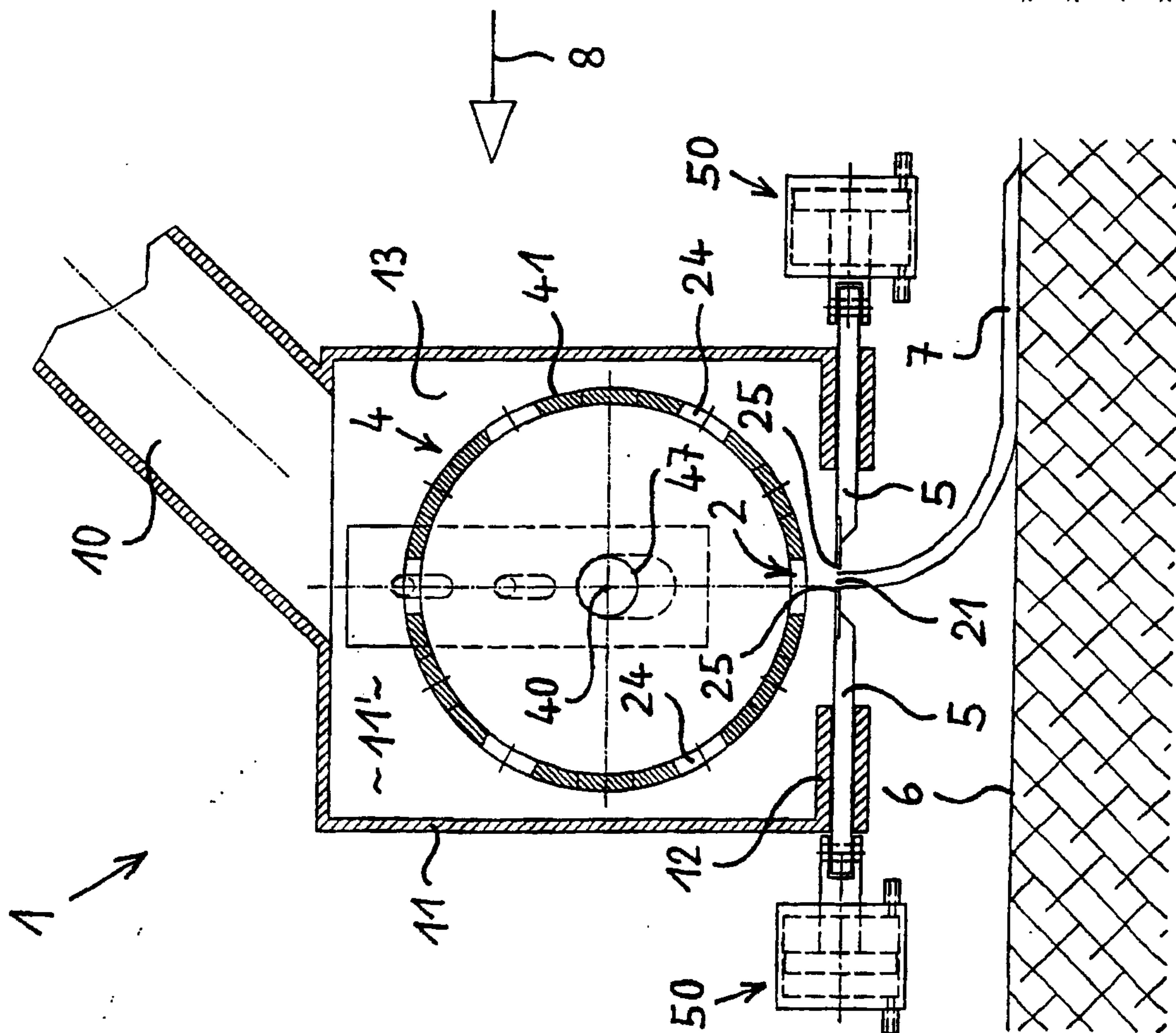


Fig. 4

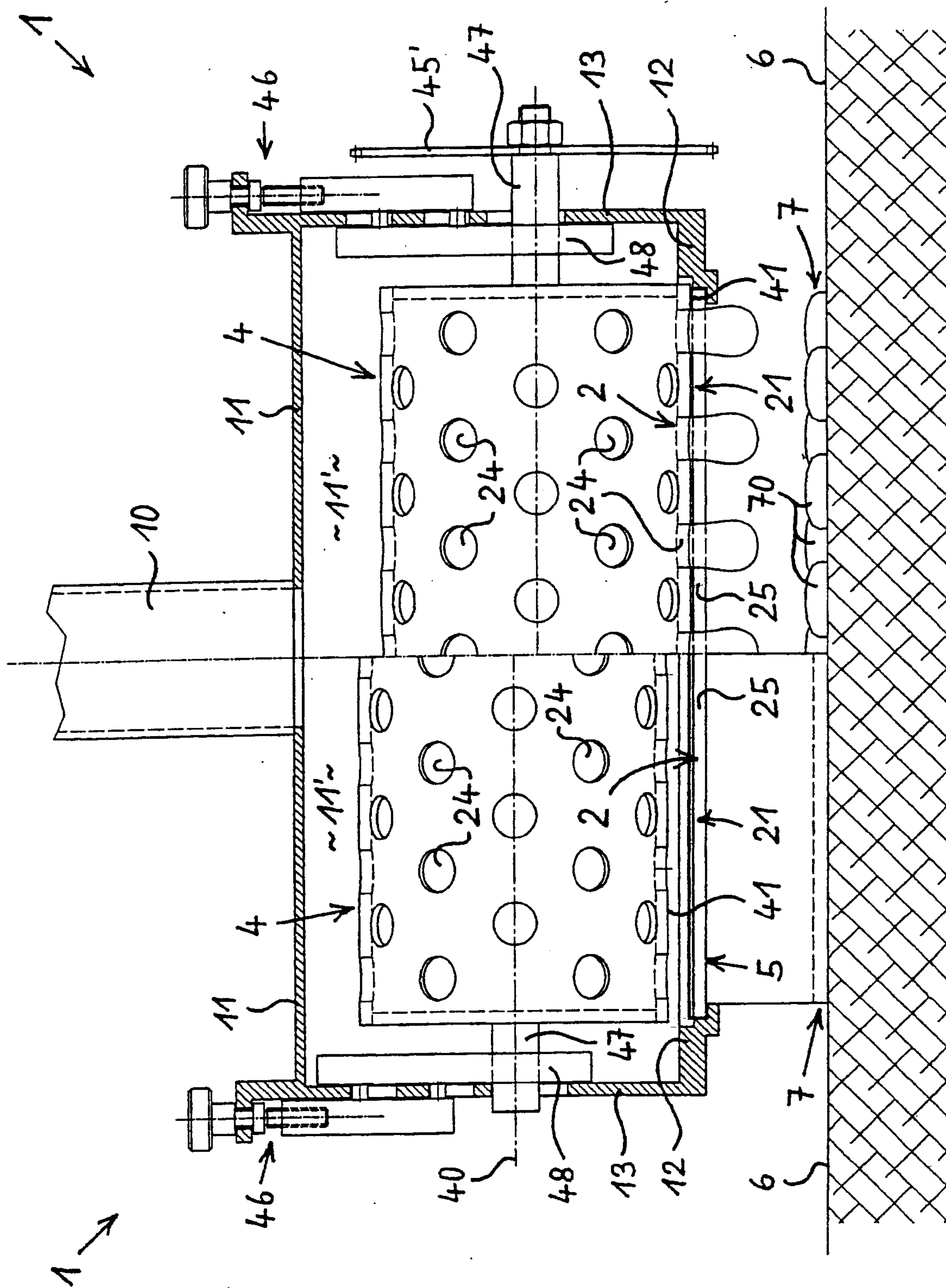


Fig. 5

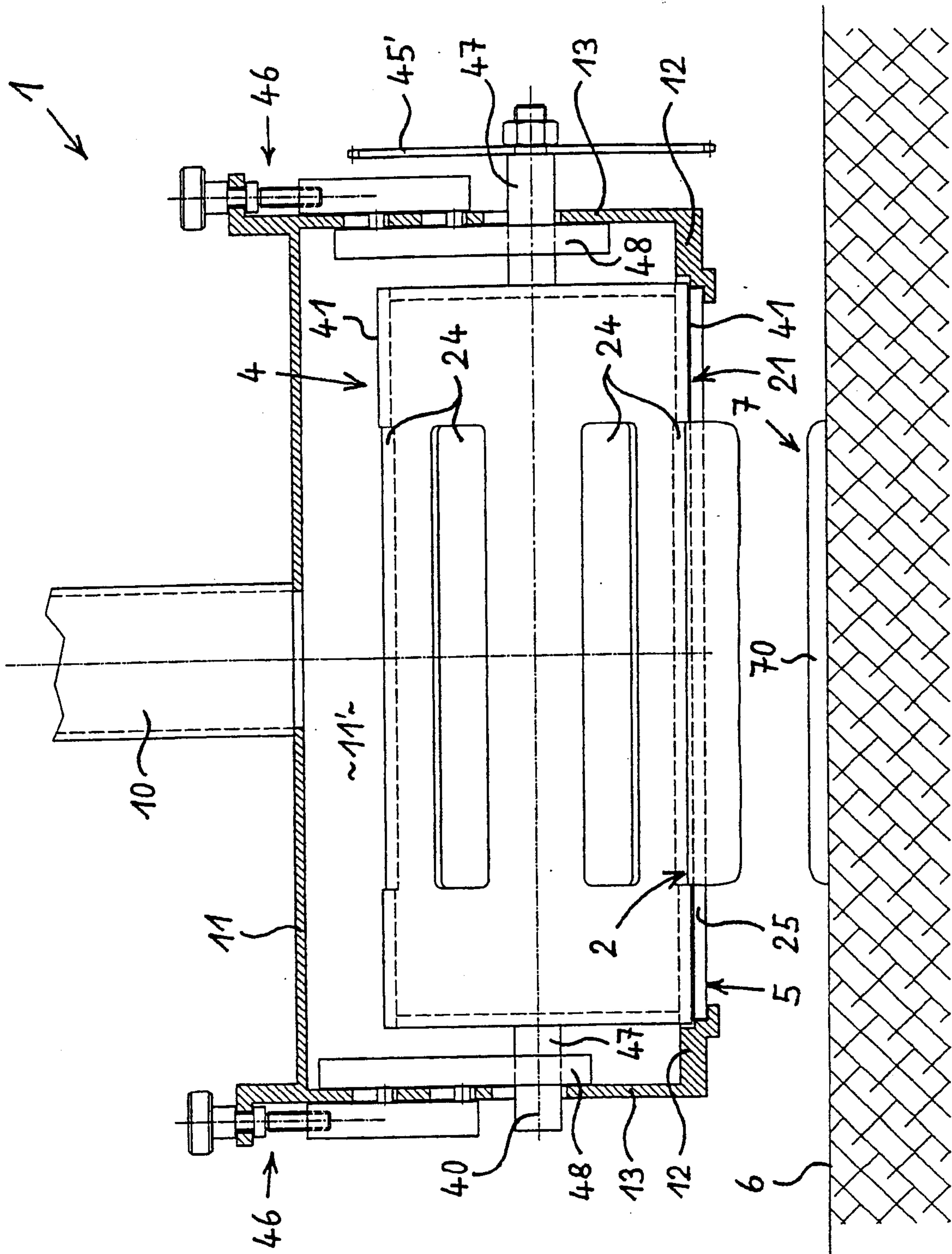


Fig. 6

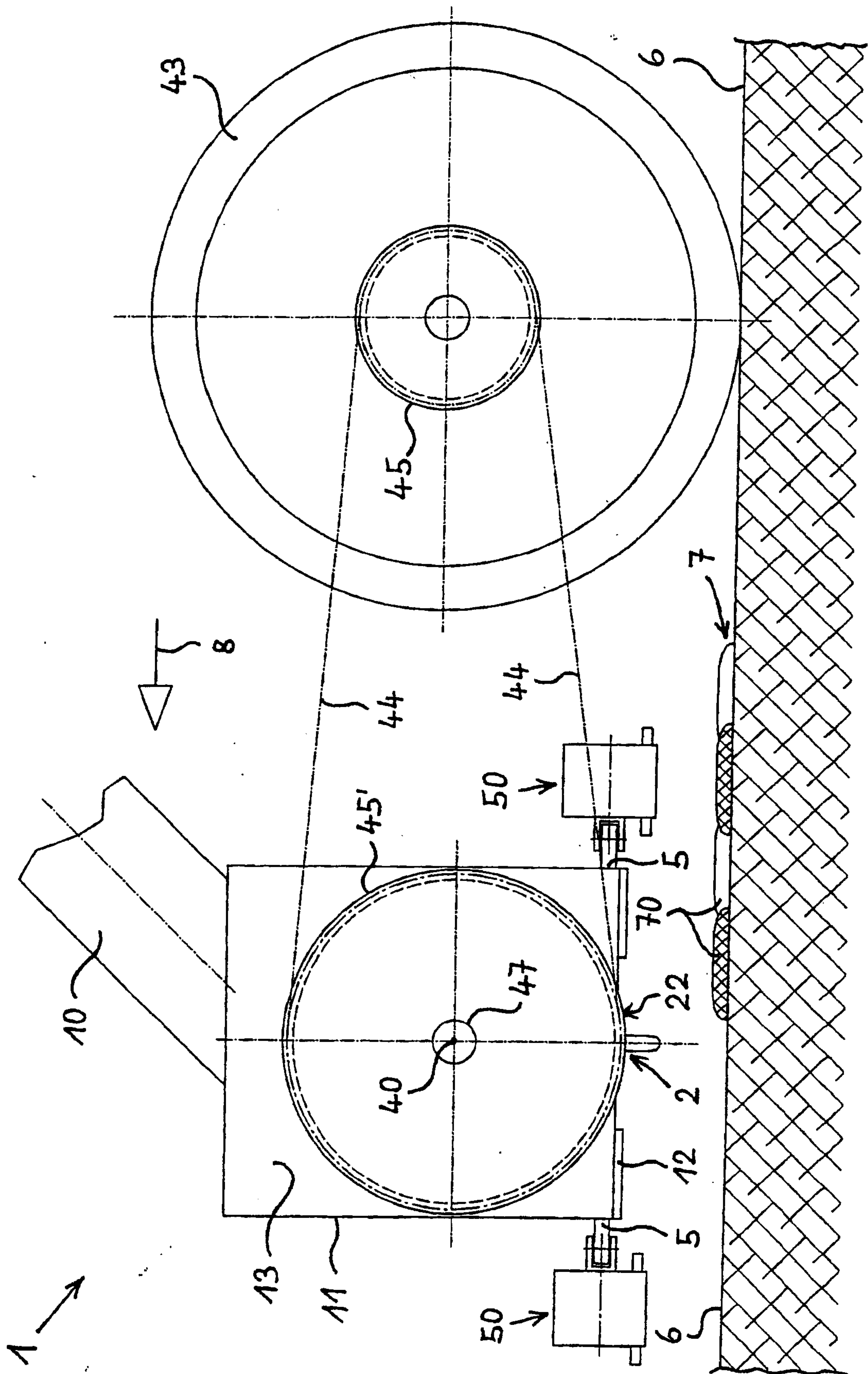


Fig. 7

