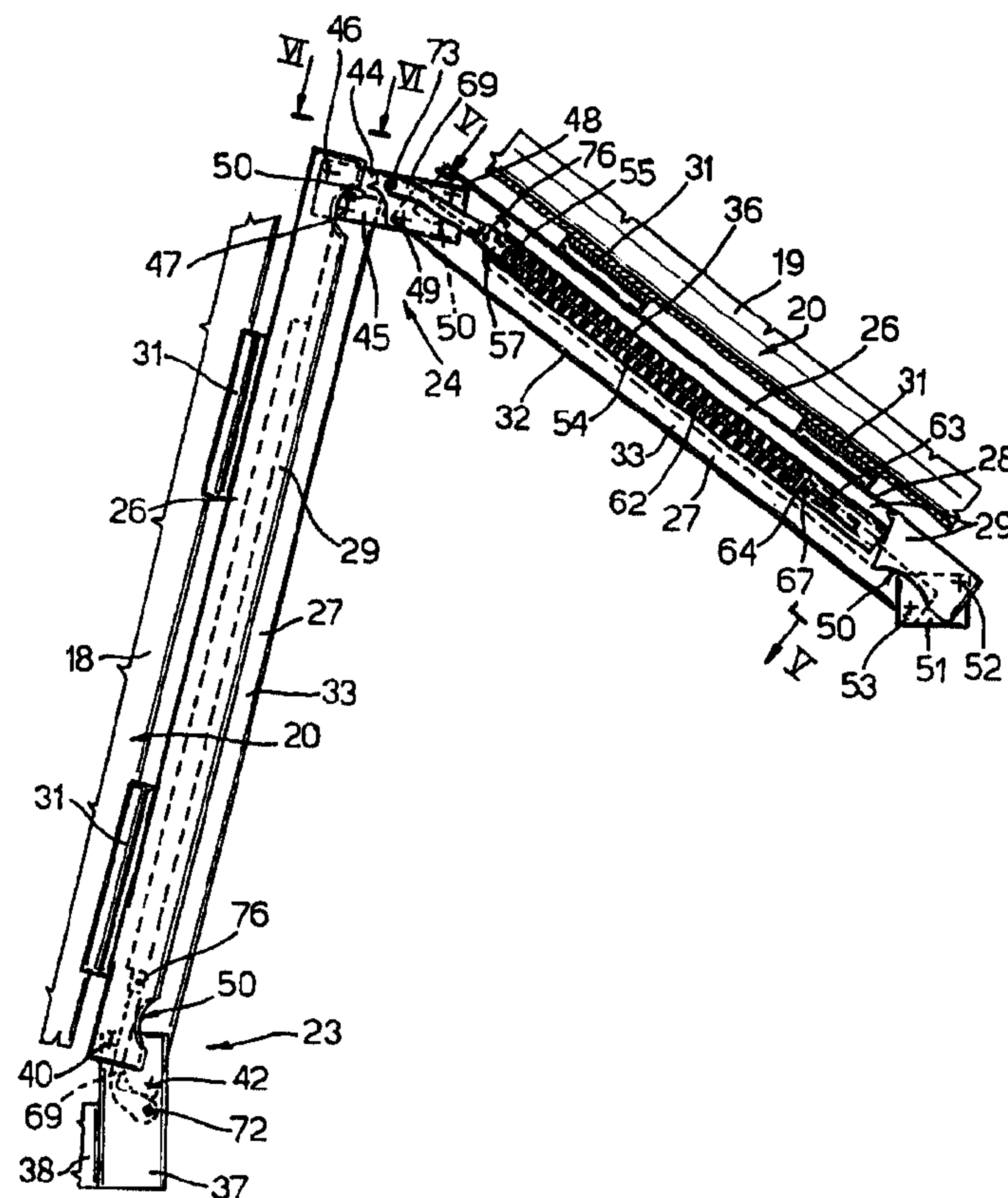




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(54) Titre : CONDUIT POLYVALENT DESTINE AU TRANSPORT DE FUMEEES OU GAZ NOCIFES A PARTIR D'UN
POSTE DE TRAVAIL
(54) Title: ALL-PURPOSE CONDUIT FOR CONVEYING HARMFUL FUMES OR GASES AWAY FROM A WORK
STATION



(57) Abrégé/Abstract:

The conduit (5) includes a rotary fitting (11), and two segments (18, 19) elbow-connected to each other and each having an articulated mechanism (23, 24) including a pair of U-section bars (26, 27) connected to each other in the form of an articulated



(57) **Abrégé(suite)/Abstract(continued):**

parallelogram by means of two articulated elements (37, 44; 44, 51). A spiral compression spring (35, 36) is housed between each pair of bars (26, 27), and is compressed between a disk (55), integral with one of the bars (26, 27), and a flange (64) sliding along a threaded rod (62). The flange (64) is locked on the rod (62) by means of a nut (67), and the rod (62) is connected to a lever member (69) pivoting on one of the articulated elements (37, 44) so as to adjust the action of the spring (35, 36) as a function of the angular position of the relative segment (18, 19) with respect to the articulated element (37, 44).

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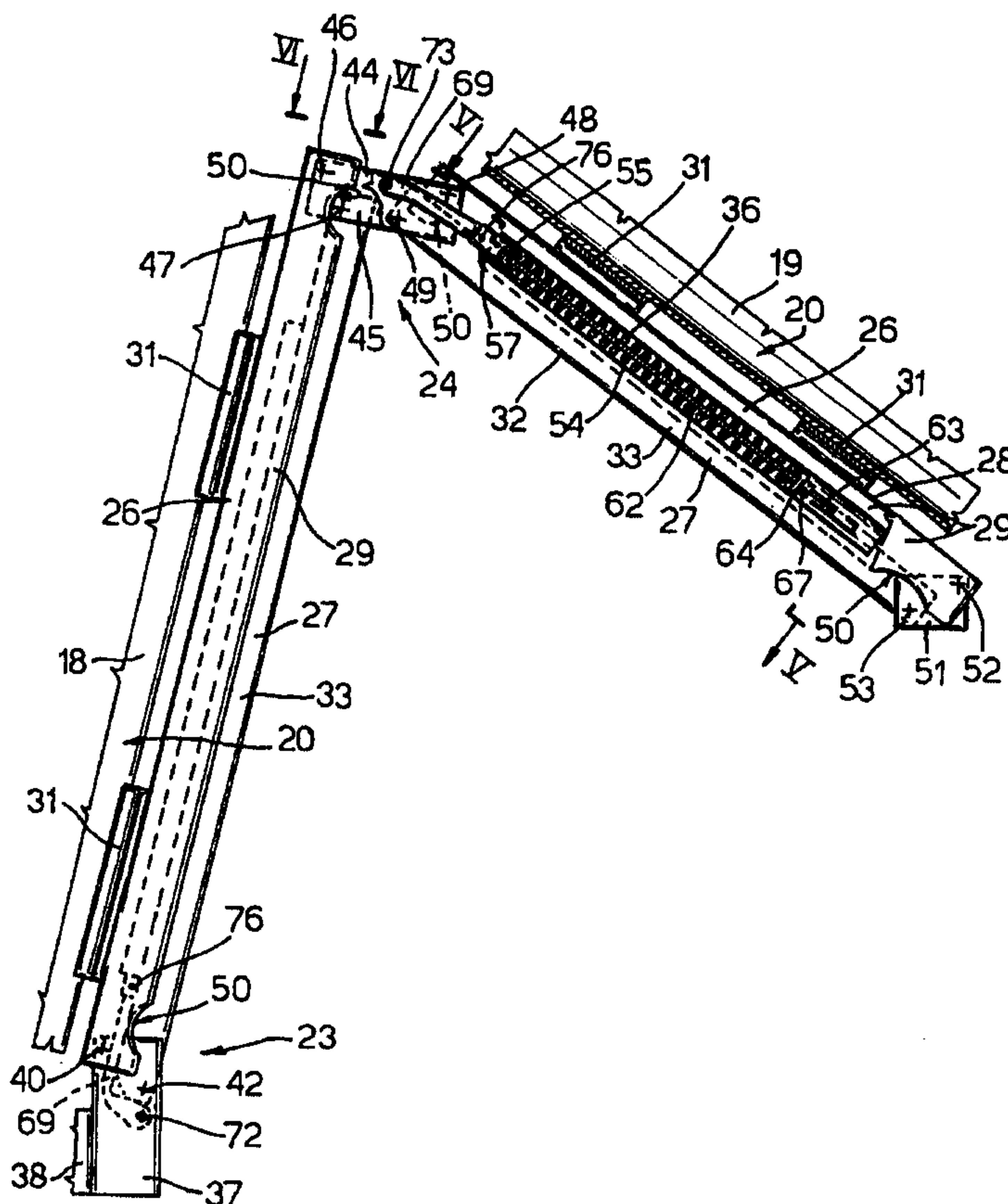
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(54) Title: ALL-PURPOSE CONDUIT FOR CONVEYING HARMFUL FUMES OR GASES AWAY FROM A WORK STATION

(57) Abstract

The conduit (5) includes a rotary fitting (11), and two segments (18, 19) elbow-connected to each other and each having an articulated mechanism (23, 24) including a pair of U-section bars (26, 27) connected to each other in the form of an articulated parallelogram by means of two articulated elements (37, 44; 44, 51). A spiral compression spring (35, 36) is housed between each pair of bars (26, 27), and is compressed between a disk (55), integral with one of the bars (26, 27), and a flange (64) sliding along a threaded rod (62). The flange (64) is locked on the rod (62) by means of a nut (67), and the rod (62) is connected to a lever member (69) pivoting on one of the articulated elements (37, 44) so as to adjust the action of the spring (35, 36) as a function of the angular position of the relative segment (18, 19) with respect to the articulated element (37, 44).



ALL-PURPOSE CONDUIT FOR CONVEYING HARMFUL FUMES OR GASES
AWAY FROM A WORK STATION

TECHNICAL FIELD

5 The present invention relates to an all-purpose
conduit for conveying harmful fumes or gases away from a
work station. More specifically, the present invention
relates to a conduit comprising a fitting between an
aspirator and a flexible conduit portion, and wherein
10 the fitting rotates about its own axis to permit both
radial and angular movement of a conveying element about
the same axis.

BACKGROUND ART

15 Various conduits of the above type are known. In
one, a long flexible conduit is provided between the
fitting and the conveying element, and houses an
articulated mechanism enabling the conduit to bend
substantially at the center line; and the mechanism
comprises a pair of spiral tension springs also housed
20 inside the conduit and acting between an articulated
plate and two opposite points of the mechanism. A major
drawback of this type of conduit is the rapid

deterioration caused by particles of the fumes depositing on the mechanism and springs.

Another known conduit features two rigid conduit segments, one of which is connected to the fitting at the top by means of a first flexible conduit portion; a second flexible conduit portion is fitted between the two rigid segments; the articulated connections between the fitting and the rigid segment and between the two rigid segments are made by means of pairs of hinged forks; high-friction disks are inserted between the arms of the forks; and spiral tension springs are inserted between the fitting and an intermediate point on the outside of the conduit.

A major drawback of this type of conduit is the considerable force required to overcome the friction of the disks to move the conveying element. Moreover, the springs, being external, are subject to fouling, and are released when struck accidentally; and, being a safety hazard, both the springs and forks should be shielded, thus increasing the cost of the conduit.

DISCLOSURE OF INVENTION

It is an object of the present invention to provide a highly straightforward, reliable conduit for conveying harmful fumes or gases, designed to overcome the aforementioned drawbacks typically associated with known conduits.

According to the present invention, there is provided an all-purpose conduit for conveying harmful

fumes or gases away from a work station, and comprising a fitting between an aspirator and a flexible conduit portion, said fitting rotating about its own axis; at least one conduit segment connected to said flexible
5 conduit portion; an articulated mechanism for varying the angular position of said conduit segment with respect to said fitting; and balancing spring means; characterized in that said mechanism comprises a pair of bars connected to each other in the form of an
10 articulated parallelogram and forming a substantially closed channel; said spring means comprising a spiral compression spring housed in said channel and so connected as to function variously according to the angular position of said conduit segment with respect to
15 said fitting.

BRIEF DESCRIPTION OF DRAWINGS

Two preferred, non-limiting embodiments of the present invention will be described by way of example with reference to the accompanying drawings, in which:

20 Figure 1 shows a view in perspective of a first embodiment of an all-purpose conduit for conveying harmful fumes or gases away from an industrial work station, in accordance with the present invention;

25 Figure 2 shows a schematic, partially sectioned vertical view of the articulated mechanisms of the Figure 1 conduit;

Figure 3 shows a larger-scale vertical section of a portion of Figure 2;

Figure 4 shows a section along line IV-IV in Figure 3;

Figure 5 shows a larger-scale section along line V-V in Figure 2, in a different operating position;

5 Figure 6 shows a partial, larger-scale view along line VI-VI in Figure 2;

Figure 7 shows a view in perspective of a further embodiment of an all-purpose conduit for conveying harmful fumes or gases, in accordance with the present
10 invention.

BEST MODE OF CARRYING OUT THE INVENTION

Number 5 in Figure 1 indicates as a whole a conduit for conveying harmful fumes or gases away from an industrial or nonindustrial work station. Conduit 5
15 is preferably of circular section, and connects an electric-motor-powered aspirator 6 to a fume conveying element acting as a suction hood 7.

Aspirator 6 is normally fitted beneath a fixed or trolley-mounted support 8, e.g. a horizontal support
20 substantially on a level with the work station from which the fumes are to be conveyed; and hood 7 is movable for positioning directly over the region in which the fumes are produced, is normally made of plastic material, is truncated-cone-shaped with an axis
25 inclined with respect to the two parallel ends, and comprises a grip 9.

Conduit 5 comprises an annular fitting 11 between aspirator 6 and a known bellows type flexible portion 12

of conduit 5; fitting 11 is connected to aspirator 6 by means of a rolling bearing (not shown) so as to rotate about its own axis 14; and another bellows type flexible portion 16 of conduit 5 is fitted rigidly to the top edge of hood 7.

Flexible portions 12 and 16 are connected respectively to the ends of two preferably straight, and therefore cylindrical, segments 18 and 19 of conduit 5; segments 18 and 19 are elbow-connected to each other by a further bellows type flexible portion 21; a known hinge bracket 22 is fitted between segment 19 and hood 7 to curve flexible portion 16; a first articulated mechanism 23 is provided to adjust the angular position of segment 18 with respect to fitting 11; and, similarly, a second articulated mechanism 24 is provided to adjust the angular position of segment 19 with respect to segment 18.

Segments 18 and 19 may be either rigid or limp; mechanisms 23 and 24 may be located inside or outside conduit 5; and, in the Figure 1 and 2 embodiment, segments 18 and 19 have a rigid, cylindrical wall 20.

According to the invention, each mechanism 23, 24 comprises a pair of bars 26 and 27 (Figure 2) connected to each other in the form of an articulated parallelogram; bar 26 has a U-shaped section with a rib 28 (see also Figure 4) and two parallel wings 29; and rib 28 of bar 26 is fitted to the outside of relative segment 18, 19 by means of at least two fastening

elements or brackets 31. More specifically, rib 28 may be pinned, riveted or welded to brackets 31, which in turn are pinned, riveted or welded along the bottom generating line in the vertical diametrical plane of relative segment 18, 19.

Bar 27 is also U-shaped with a rib 32 and two parallel wings 33 closer together than wings 29; bar 27 is positioned opposite bar 26, with wings 33 inserted between wings 29 to form a substantially closed channel 34; and the two channels 34 of mechanisms 23 and 24 house respective compression springs 35 (Figure 3) and 36 (Figure 5) described in detail later on.

Each mechanism 23, 24 comprises two articulated elements for parallelogram-connecting bars 26 and 27. One of the two articulated elements of mechanism 23 (Figures 1 and 3) comprises a U-shaped section 37 fixed by a bracket 38 to fitting 11, and having two wings 39 (see also Figure 4) spaced so as to fit between wings 29 of bar 26 and wings 33 of bar 27.

A pin 40 is fitted close to the ends of wings 29 of bar 26 adjacent to section 37, and extends through two spacer washers 41 and two holes formed in wings 39 of section 37, so that bar 26 is connected in articulated manner to section 37. Similarly, a further pin 42 is fitted to wings 39 of section 37, and extends through a further two spacer washers 43 and two holes formed in the ends of wings 33 of bar 27, which is therefore also connected in articulated manner to

section 37.

5 The second articulated element of mechanism 23 comprises a further U-shaped section 44 (Figure 2) having two wings 45 the same distance apart as the wings of section 37, and which, in the same way as pins 40 and 42, are connected in articulated manner, by means of a further two pins 46 and 47, to the other ends of wings 29 and 33 of bars 26 and 27. Pins 40 and 42 are so located that the respective axes lie in a plane P (Figure 3) inclined, in the example shown, at a 45° angle with respect to axis 14 of fitting 11; and pins 46 and 47 obviously lie in a plane parallel to plane P.

10 One of the two articulated elements of mechanism 24 (Figure 2) comprises the same section 44, the wings 45 of which are connected in articulated manner to the ends of wings 29 and 33 of relative bars 26 and 27 by means of a further two pins 48 and 49, so that section 44 defines an articulated element common to both mechanisms 23 and 24, which are thus self-supporting.

15 Pins 46-49 are arranged in the form of a trapezium with the longer side at the top.

20 The second articulated element of mechanism 24 comprises a third U-shaped section 51, which, by means of two pins 52 and 53, is only connected in articulated manner to the other ends of wings 29 and 33 of bars 26 and 27. At each end, the wings 29 of bars 26 of both mechanisms 23 and 24 comprise a cavity 50 to enable bars 26 to rotate with respect to sections 37, 44, 51

25

without interfering with the ends of respective pins 42, 47, 49, 53.

5 The edges of wings 33 of bar 27 of each mechanism 23, 24 are welded with a respective metal tube 54 (Figures 2-5) in which respective spring 35, 36 is inserted; and, at a given distance from the end of bar 27 adjacent to section 37 (mechanism 23) and section 44 (mechanism 24), tube 54 is fitted inside with a stop for arresting spring 35, 36, and which comprises a disk 55
10 having a hole and secured to tube 54 by means of a radial screw or pin 56.

A member comprising a piston 57 slides inside the portion of tube 54 adjacent to section 37, 44, and comprises two annular grooves housing two piston rings
15 58 made of low-friction material for guiding piston 57 smoothly along tube 54. Each piston 57 comprises a threaded hole 59 engaged by a threaded end 61 of a rod 62 about which respective spring 35, 36 is wound.

20 The other end 63 of rod 62 is fitted with a second stop for arresting respective spring 35, 36, and which comprises a flange 64 of a sleeve 66 sliding freely along rod 62. End 63 is also threaded, and is engaged by a nut 67 for locking flange 64 in opposition to the action of spring 35, 36. As shown in Figures 2 and 5,
25 rod 62 may advantageously be threaded along its whole length to integrate both ends 61 and 63.

Each nut 67 is screwed adjustably to end 63 of rod 62 to adjust the preload of respective spring 35, 36;

for which purpose, the rib of section 44 comprises a hole or cavity 68 (Figure 6) and the rib of section 51 (Figure 2) comprises a similar cavity enabling access to each nut 67 by a wrench. The preload of each spring 35, 36 is adjusted accurately by means of respective nut 67, so as to balance the action of springs 35 and 36 and minimize the effort required on the part of the operator to move hood 7 along the work table.

As each mechanism 23, 24 rotates on the respective first articulated element defined by section 37, 44, the tension of each spring 35, 36 is varied by a respective lever member 69. More specifically, each lever member 69 comprises two similar parallel levers 71 (Figures 4 and 5) pivoting about a pin 72 (Figure 2) fitted to wings 39 of section 37 in the case of mechanism 23, and about a pin 73 fitted to wings 45 of section 44 in the case of mechanism 24.

The ends of each pair of levers 71 are housed inside two parallel slots 74 (Figure 5) at the outward end of respective piston 57; the two levers 71 are hinged to said end of piston 57 by means of a further pin 76; and each section 37, 44 comprises a pin 77 (Figure 3) against which each pair of levers 71 is arrested in the limit position shown in Figures 2 and 3.

Pins 72 and 73 in respective sections 37 and 44 are located further away from respective second stops 64 than respective pins 40, 42 and 48, 49, and are therefore eccentric with respect to pins 42 and 49 of

bars 27. Consequently, when each pair of levers 71 is rotated from the limit position against respective pin 77, respective piston 57 moves closer to disk 55 to reduce the preload of respective spring 35, 36. Disk 55 therefore defines the other limit stop when rotating levers 71, and hence respective mechanism 23, 24, into the bent position shown by the dot-and-dash line in Figure 3 and in Figure 5.

Conduit 5 as described operates as follows.

Using grip 9, the operator can move hood 7 angularly about axis 14, by rotating fitting 11 on its bearing, or along the work table, or vertically towards the source of fumes or gas for removal. More specifically, commencing from the Figure 1 and 2 position, hood 7 is moved away from fitting 11 by bending mechanism 23, and hence rigid segment 18 of conduit 5, with respect to section 37 and fitting 11, and is moved towards fitting 11 by bending mechanism 24 with respect to section 44.

Positioning hood 7, however, normally involves moving it both vertically and radially by rotating one or both of mechanisms 23, 24 with respect to sections 37, 44. By virtue of the articulated parallelogram connection of each pair of bars 26, 27, rotation of mechanism 23 causes common section 44 to move parallel to itself, so that both mechanism 24 and segment 19 also move parallel to themselves; and, similarly, rotation of mechanism 24 with respect to section 44 causes section

51 to move parallel to itself. Finally, by appropriately bending bracket 22, hood 7 is rotated to position the bottom edge of the hood as required with respect to the table of the work station.

5 In the Figure 7 embodiment, in which any parts similar to those in Figure 1 are indicated using the same numbering system, segments 18 and 19 again comprise a rigid wall 20; and mechanisms 23 and 24 are again defined by a pair of U-section bars 26, 27 between which
10 respective spring 35, 36 is inserted (see also Figures 3-5), but in this case are shorter and are not connected directly to each other.

 More specifically, bar 26 of each mechanism 23, 24 is fitted, e.g. welded or pinned, to an annular bracket
15 78 in turn fitted in any known manner to the end of the corresponding segment 18, 19; bars 26 and 27 of mechanism 23 are connected in the form of an articulated parallelogram to articulated element 37 and to a second articulated element defined by a further U-shaped
20 section 79; and section 79 is connected by pins 46 and 47 to bars 26 and 27 only, and comprises a hole or cavity similar to that of section 51.

 Bars 26 and 27 of mechanism 24 are connected in the form of an articulated parallelogram to an
25 articulated element defined by a further U-shaped section 81, which is separate from section 79 and is fitted rigidly, e.g. by means of two pins 83, to a further annular bracket 82 fitted in any known manner to

the end of segment 18 adjacent to flexible portion 21; and bars 26 and 27 of mechanism 24 are connected to section 51 in the same way as mechanism 24 in Figure 1.

5 When the Figure 7 segment 18 is rotated together with mechanism 23 with respect to section 37, section 81 also rotates integrally with segment 18, so that segment 19 and mechanism 24 also rotate with respect to section 37. Mechanism 24, in turn, may be rotated with respect to section 81 independently of mechanism 23.

10 In both the Figure 1 and 7 embodiments, mechanisms 23 and 24 may be housed inside segments 18 and 19 and protected by sealing rings to prevent dust or suspended particles in the fumes from settling inside the mechanisms. If defined by a limp wall, segments 18 and 15 19 in Figure 1 are supported by mechanisms 23 and 24, which are self-supporting, and segments 18 and 19 in Figure 7 may be supported by any known type of supporting structure, possibly inside the segments.

20 As compared with known conduits, the advantages of the conduit according to the present invention will be clear from the foregoing description. In particular, channel 34 of each mechanism 23, 24 provides for fully protecting both tube 54 and respective balancing spring 35, 36; and the articulated parallelogram connection of 25 bars 26 and 27 provides for stable rotation of mechanisms 23 and 24.

Moreover, rod 62 and nut 67 provide for accurately adjusting the preload of each spring 35, 36 to achieve

the best balance; and the connection of rod 62 to levers 71 provides for varying the preload of spring 35, 36 as a function of the bend angle of mechanism 23, 24 with respect to the corresponding articulated element 37, 44, 81.

Clearly, changes may be made to the fume and gas conduits as described and illustrated herein without, however, departing from the scope of the accompanying Claims. For example, rod 62 may be threaded at ends 61 and 63 only, as opposed to along its whole length; the angle of plane P with respect to axis 14 may vary according to the type of application; disk 55 may be welded to tube 54 as opposed to using a pin or screw; and flange 64 may be dispensed with, and the spring 35, 36 stop defined by nut 67 itself.

Moreover, bars 26 and 27 may have a curved as opposed to a U-shaped section; lever member 69 may be defined by only one lever 71 and/or the wings of one or more of sections 37, 44, 51, 79, 81 may be located outwards of those of bars 26; and fitting 11 may be ceiling-mounted, may be fitted to a support at a higher level than the work station, and may be connected to a centralized suction system as opposed to directly to a single aspirator.

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CLAIMS

1. An all-purpose conduit for conveying harmful fumes or gases away from a work station, and comprising

a fitting for connection to a flexible conduit portion, said fitting rotating about its own axis;

at least one conduit segment connected to said flexible conduit portion;

an articulated mechanism for varying the angular position of said conduit segment with respect to said fitting; and

balancing spring means;

characterized in that said mechanism comprises a pair of bars connected to each other in the form of an articulated parallelogram by means of two articulated elements and forming a substantially closed channel;

said spring means comprising a spiral compression spring housed in said channel and so connected such that its action varies as a function of the angular position of said conduit segment with respect to said fitting.
2. A conduit as claimed in Claim 1, characterized in that said conduit segment may be rigid or limp; and said articulated mechanism is located inside or outside said conduit segment.

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3. A conduit as claimed in Claim 2, characterized in that said pair of bars comprises a first bar having a U-shaped section and the rib of which is fitted to the outside of said conduit segment, and a second bar having a U-shaped section and located opposite said first bar; the wings of said second bar being inserted between the wings of said first bar to form said channel; and a first articulated element in said pair of articulated elements being fixed to said fitting.
4. A conduit as claimed in Claim 3, characterized in that said spring is inserted inside a rigid tube fitted to the wings of said second bar; said spring being compressed between a first stop fixed to said tube, and a second stop; and a lever member, hinged to said first articulated element, being connected to said second stop.
5. A conduit as claimed in Claim 4, characterized in that said second stop is fitted to a rod inserted inside said spring; a sliding member inside said tube being fitted to said rod and being hinged to said lever member.
6. A conduit as claimed in Claim 5, characterized in that said rod comprises at least one threaded portion to which is screwed a nut for locking said second stop and adjusting the preload of said spring.
7. A conduit as claimed in any one of claims 4 to 6, characterized in that said lever member pivots about a pin so located as to vary the preload of said spring as a function of the rotation of said mechanism with respect to said first articulated element.

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8. A conduit as claimed in Claim 7, characterized in that said bars are hinged to said first articulated element by means of two respective pins; the pin of said lever member being located further away from said second stop than each of said respective pins.
9. A conduit as claimed in any one of claims 6 to 8, characterized in that said first stop comprises a disk having a hole and fixed inside said tube; said second stop comprising a flange sliding along said rod and pushed by said spring against said nut.
10. A conduit as claimed in Claim 9, characterized in that said sliding member comprises a piston having at least two piston rings made of low-friction material and for guiding the piston along the inner surface of said tube; said rod having a second threaded portion engaging a threaded hole in said piston.
11. A conduit as claimed in Claim 10, characterized in that said piston is arrested against said disk to define one end of the travel of said lever member; said first articulated element comprising a stop defining another end of the travel of said lever member.
12. A conduit as claimed in Claim 11, characterized in that said piston terminates outwards of said tube with a pair of slots; said lever member comprising two similar parallel levers inserted inside said slots; and a through pin, perpendicular to said slots, being provided to connect said levers in articulated manner to said piston.

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13. A conduit as claimed in any one of claims 3 to 12, characterized in that each of said articulated elements comprises a U-shaped section, the wings of which are inserted between the wings of said first and said second bar; the U-shaped section of said first articulated element being fixed to said fitting by a bracket fixed to the outside of said fitting.
14. A conduit as claimed in Claim 13, characterized in that the U-shaped section of said second articulated element comprises a cavity permitting adjustment of said nut on said rod.
15. A conduit as claimed in Claim 13 or 14, wherein the section of the fume passage is circular, characterized in that said conduit segment comprises a rigid, cylindrical wall; said first bar being fixed to the outside of said conduit segment by means of at least two elements fixed along a generating line of said wall.
16. A conduit as claimed in Claim 13 or 14, wherein the section of the fume passage is circular, characterized in that said at least one conduit segment forms a first conduit segment comprising a rigid, cylindrical wall; said first bar being fixed to the outside of said first conduit segment, along a generating line of said wall, by means of an annular bracket surrounding said wall.
17. A conduit as claimed in any one of claims 1 to 16, characterized in that said first conduit segment is connected by a second flexible conduit portion to a second conduit segment; said second conduit segment being provided with a second articulated mechanism; and said two articulated mechanisms being similar.

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18. A conduit as claimed in claim 13,

characterized in that said first conduit segment is connected by a second flexible conduit portion to a second conduit segment; said second conduit segment being provided with a second articulated mechanism; said two articulated mechanisms being similar;

and further characterized in that the pair of bars of said second mechanism is connected in the form of an articulated parallelogram to a first and a second articulated element; said second articulated element comprising a cavity permitting adjustment of the respective nut on the corresponding rod.

19. A conduit as claimed in Claim 15,

characterized in that said first conduit segment is connected by a second flexible conduit portion to a second conduit segment; said second conduit segment being provided with a second articulated mechanism; and said two articulated mechanisms being similar; and

further characterized in that said two articulated mechanisms have a common articulated element; the first bar of said second mechanism being fixed to said second conduit segment by means of a corresponding pair of elements; and the other articulated element of said second articulated mechanism being connected to the relative pair of bars only.

- 19 -

20. A conduit as claimed in Claim 19, characterized in that the axes of said respective pins of said first articulated element lie in a plane at a substantially 45° angle with respect to the axis of said fitting; the pins of the pairs of bars of said articulated mechanisms being arranged in the form of a trapezium, so as to keep said two conduit segments at an angle with respect to each other.
21. A conduit as claimed in Claim 16
- characterized in that said first conduit segment is connected by a second flexible conduit portion to a second conduit segment; said second conduit segment being provided with a second articulated mechanism; and said two articulated mechanisms being similar,
- and further characterized in that said articulated mechanisms are independent of each other; the first bar of said second mechanism being fixed to said second conduit segment by means of a respective bracket surrounding the respective cylindrical wall.
22. A conduit as claimed in Claim 21, characterized in that the first articulated element of said second mechanism is fitted to a bracket fitted to one end of said first conduit segment; the second articulated element of each of said mechanisms being connected to the respective two bars only.
23. A conduit as claimed in any one of claims 17 to 22, characterized in that said second conduit segment is connected to a fume or gas conveying element by means of a third flexible conduit portion.

- 20 -

24. A conduit as claimed in any one of claims 1 to 23, characterized in that said fitting is connected to an aspirator fitted to a fixed or movable support substantially on a level with or at a lower level than the work station.
25. A conduit as claimed in any one of claims 1 to 23, characterized in that said fitting is ceiling-mounted or fitted to a support at a higher level than said work station.

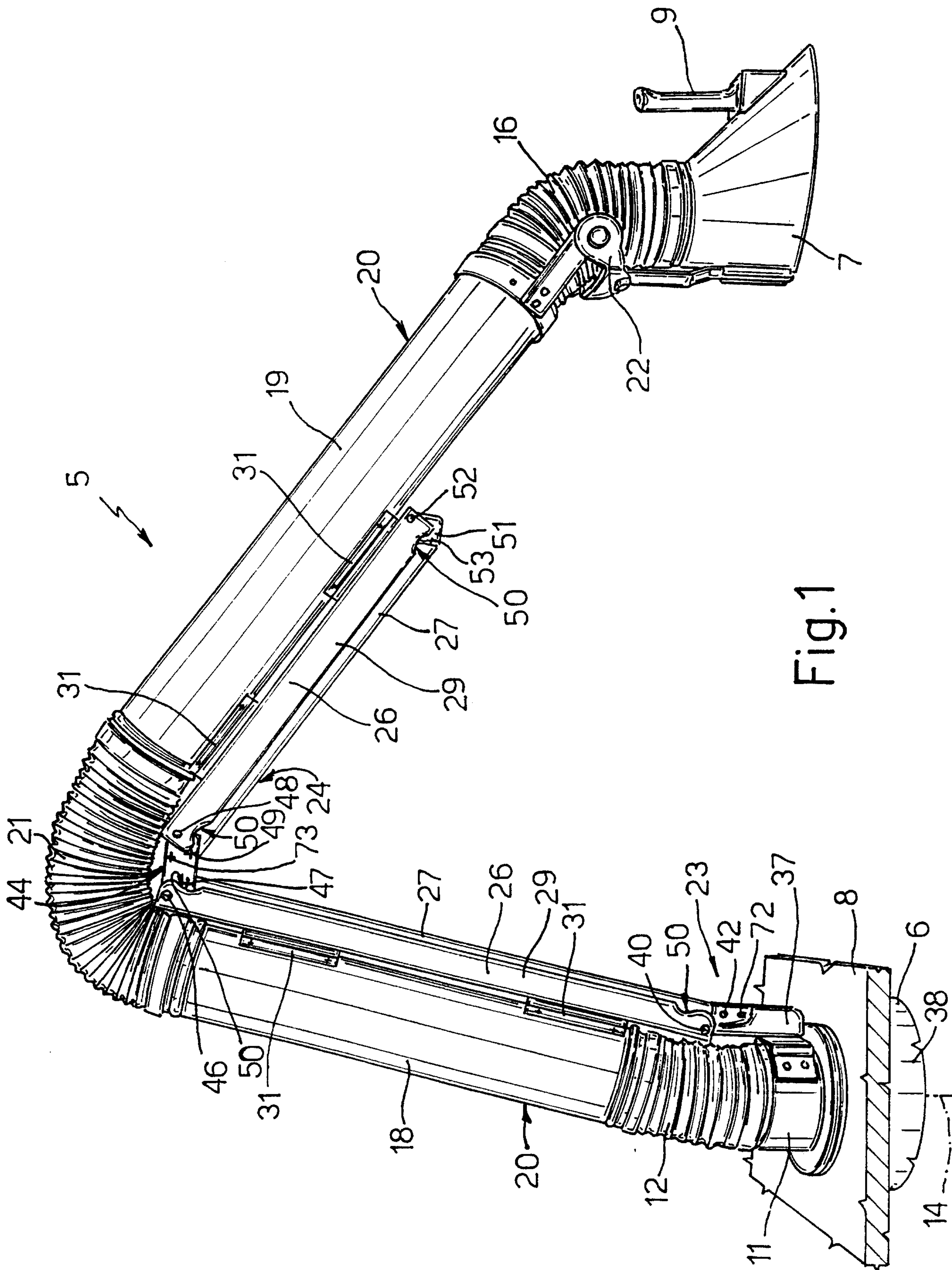


Fig.1

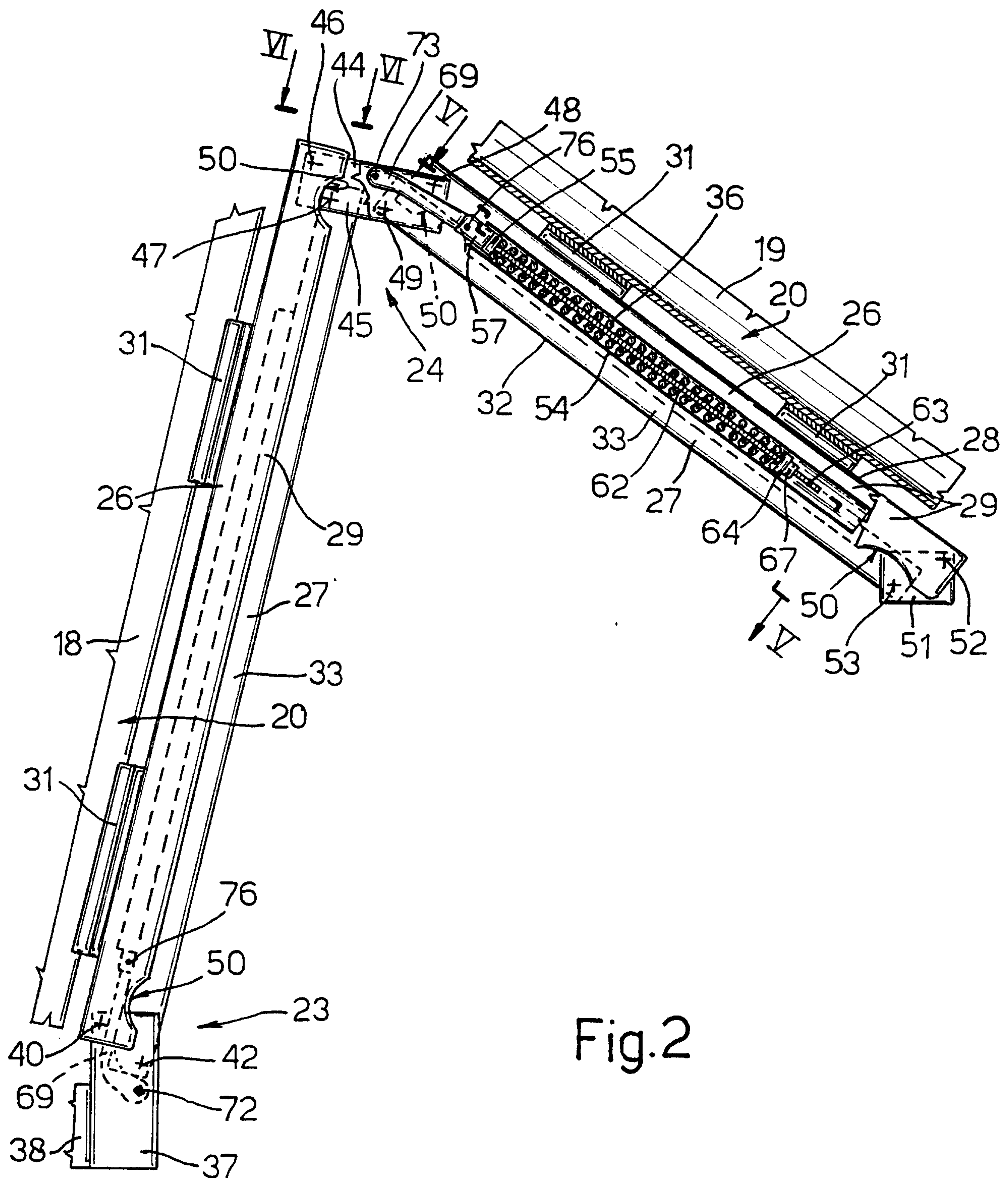


Fig.2

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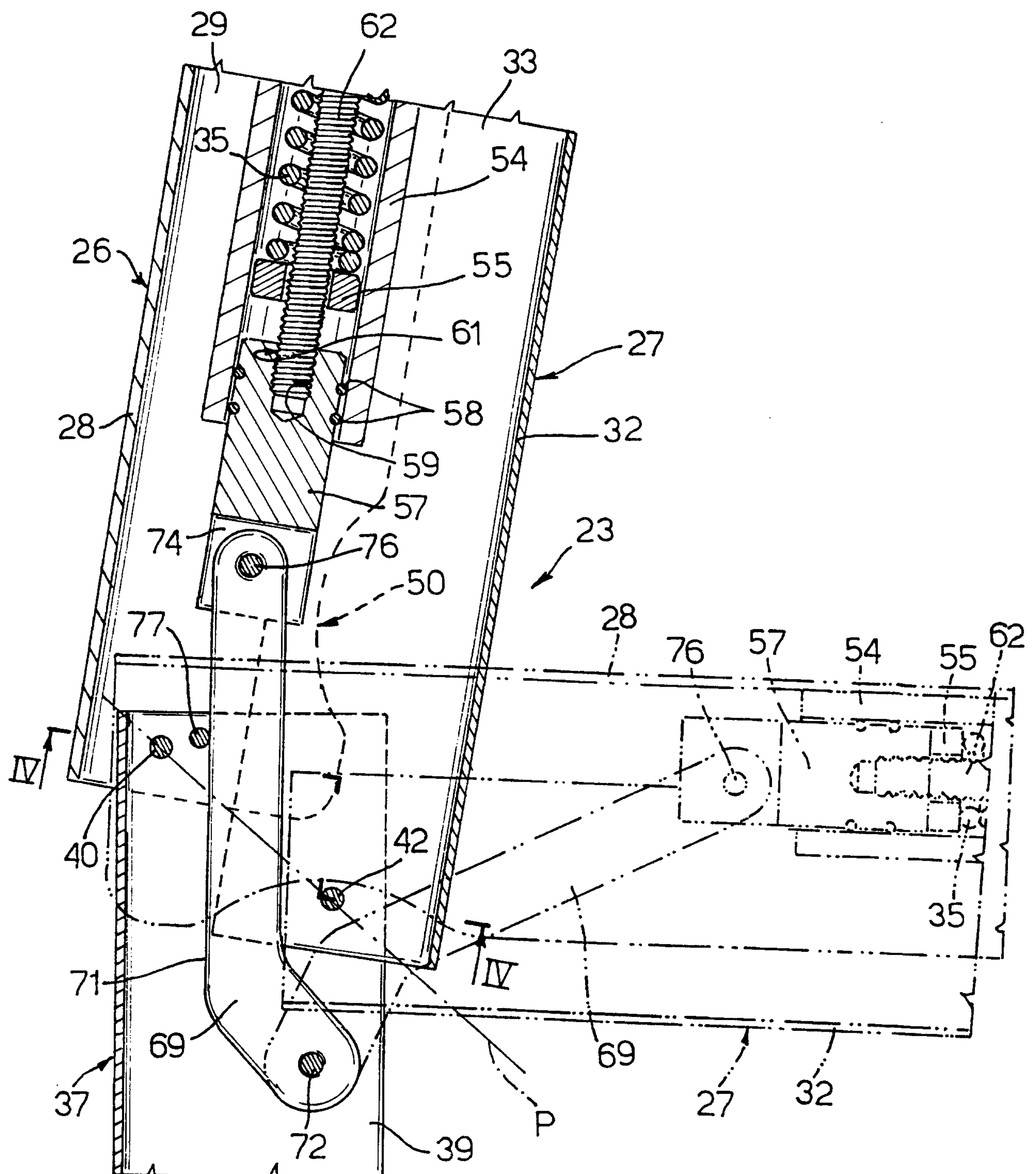


Fig.3

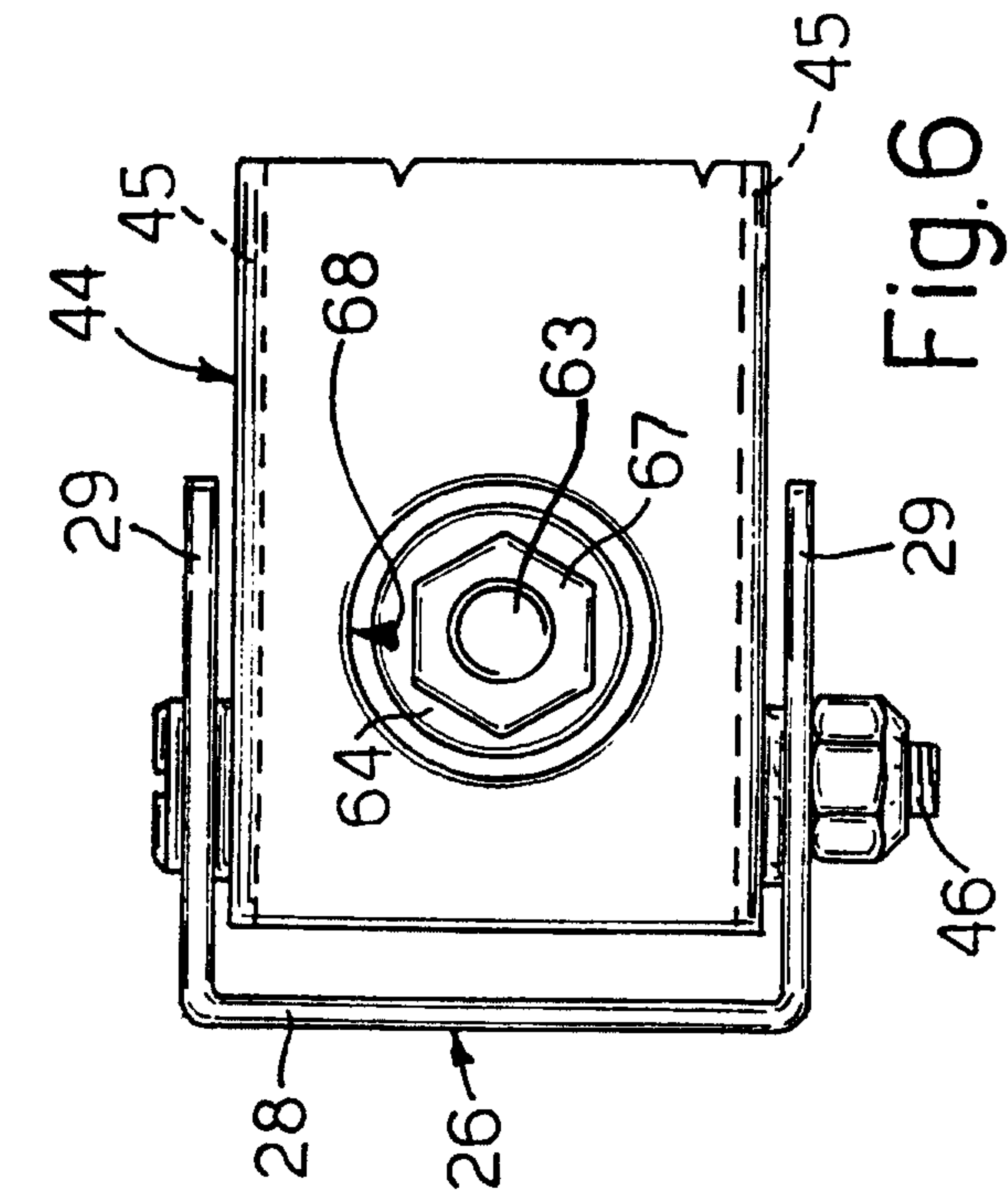


Fig. 4

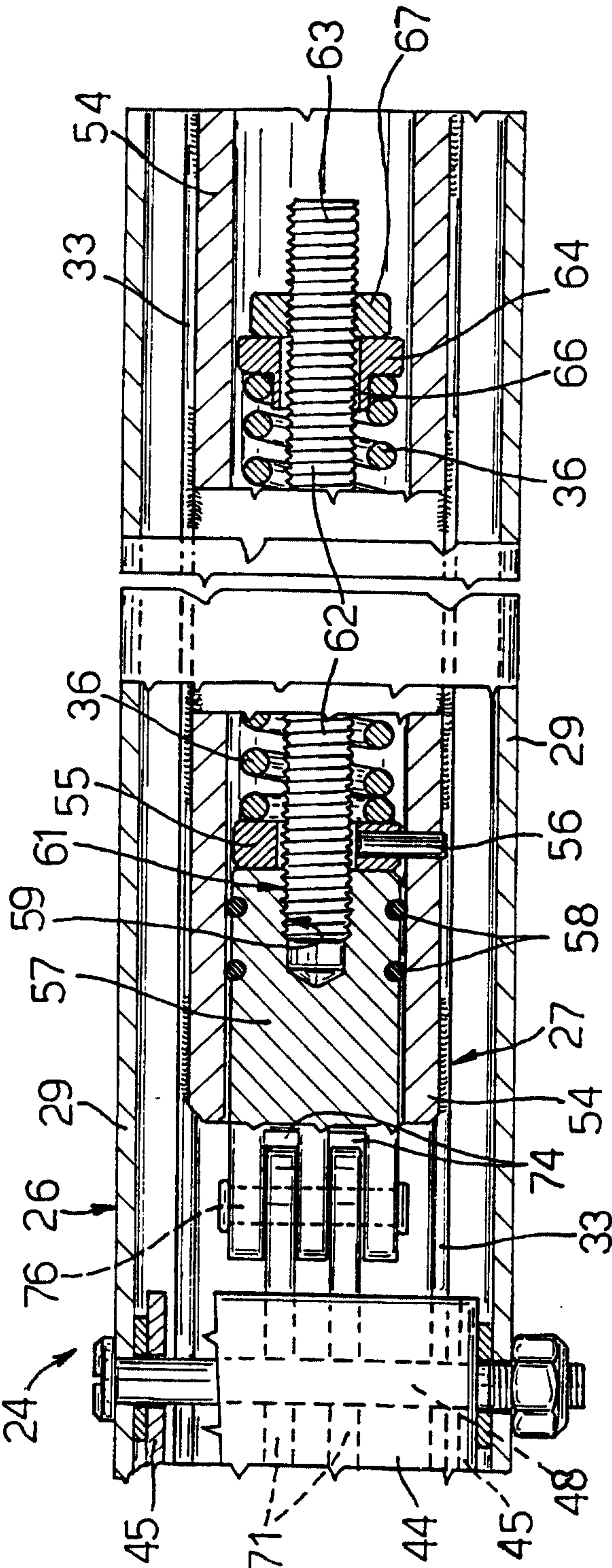


Fig. 5

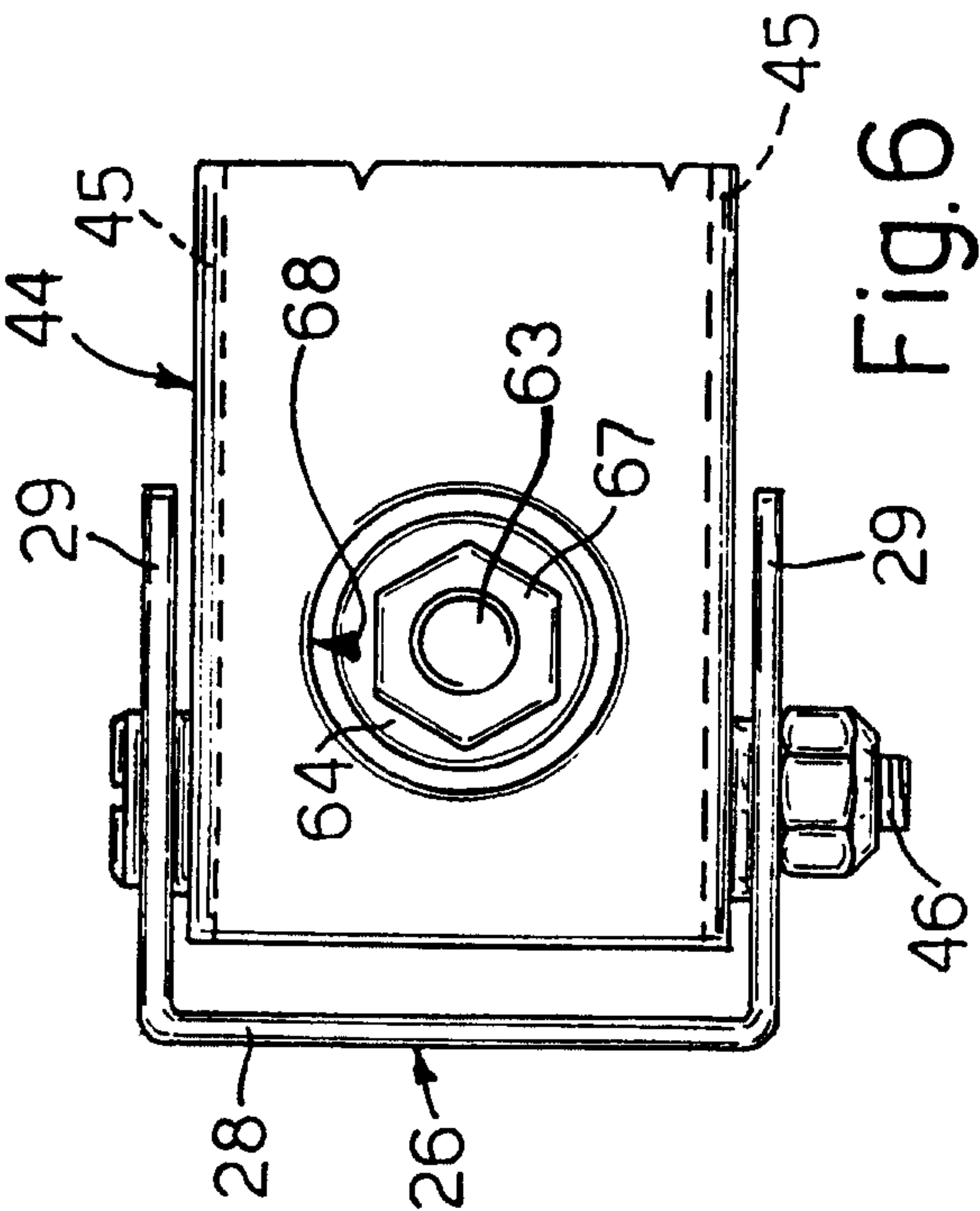


Fig. 6

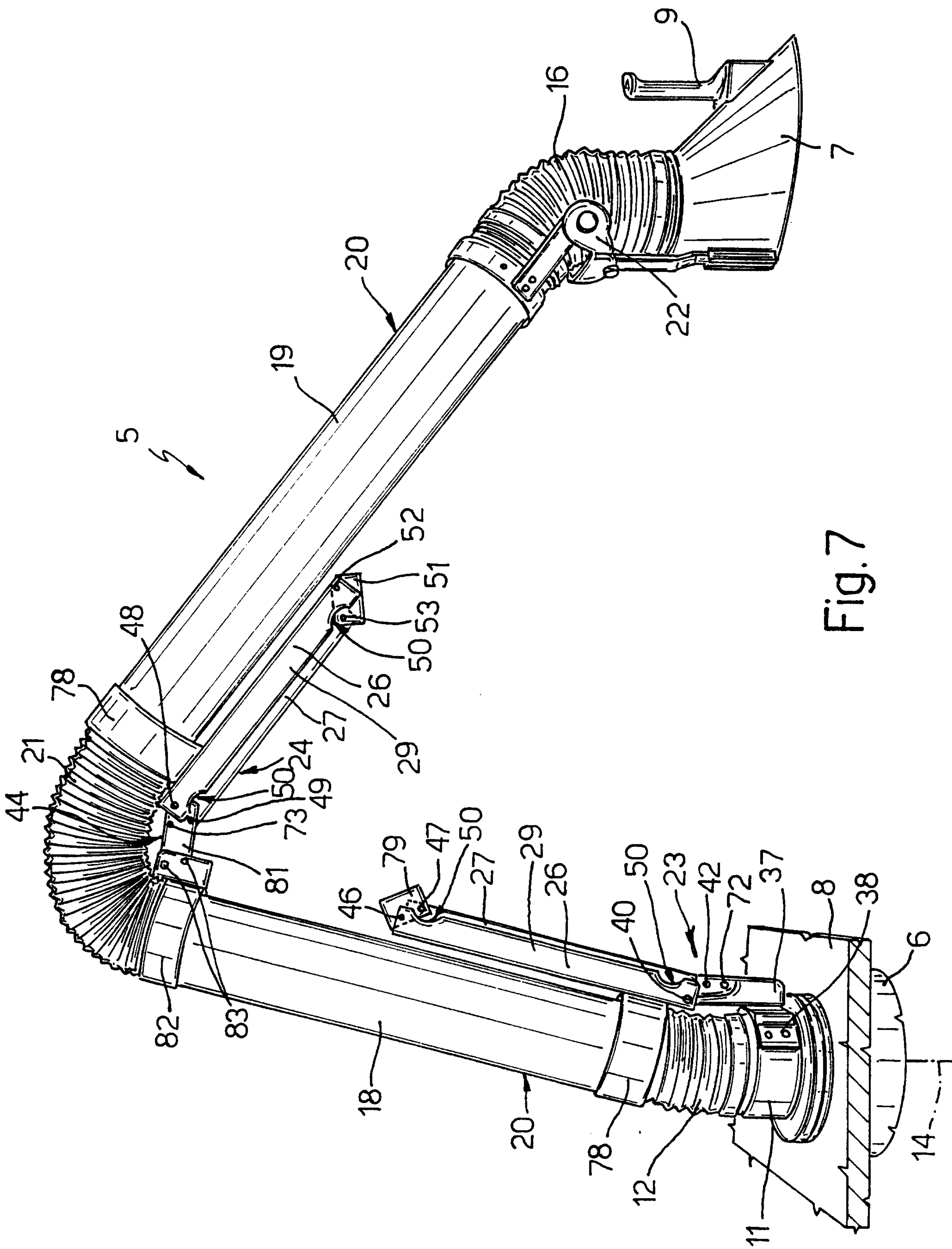


Fig. 7

